

Town of Morinville

Municipal Engineering Standards

Bylaw No. 28/2003



Includes amendments to March 2005

Londrex
Brentwood
Trans America
Sterling

March 16, 2005

Dear Developer:

Re: Municipal Engineering Standards Addendum No. 1

Please find enclosed a copy of the Town of Morinville Bylaw 9/2005 amending Bylaw 28/2003 the Municipal Engineering Standards.

Addendum No. 1 is amending Article 7.5.5.2 and also adding a new section 23.0 Multiways. Please pass this information onto your engineer.

If you have any questions or concerns please feel free to contact me at 939-4361.

Yours truly,

Louise Champis
Development & Regional Planning Coordinator

**TOWN OF MORINVILLE
PROVINCE OF ALBERTA**

BYLAW 9/2005

BEING AN ADDENDUM TO THE BYLAW FOR THE PURPOSE OF
SETTING A STANDARD FOR MUNICIPAL INFRASTRUCTURE
WITHIN THE TOWN OF MORINVILLE.

WHEREAS The Council of the Town of Morinville deems it appropriate to
approve the Municipal Engineering Standards dated December,
2003,

WHEREAS The Addendum No. 1 to the Municipal Engineering Standards
was prepared by UMA Engineering Ltd.,

WHEREAS The Administration of the Town of Morinville has reviewed
said Addendum No. 1 and met with Developers to discuss this
said standard,

NOW THEREFORE Under the authority of the Municipal Government Act,
the Council of the Town of Morinville, in the Province of
Alberta, duly assembled enacts as follows:

1. Schedule A (Addendum No. 1) attached hereto be adopted and form part
of the Municipal Engineering Standards, being Bylaw 28/2003 and any
amendments thereto.
2. That this Bylaw shall come into full force and effect on the third reading
thereof.

READ a first time this 22nd day of February, 2005.

READ a second time this 8 day of March

READ a third time and finally passed this 8 day of March



Mayor



Town Manager

SECTION 1 SEVERABILITY

- 1.1 If any Section or Section of this Bylaw or parts thereof are found in any
court of law to be illegal or beyond the power of Council to enact, such
Section or Sections or parts thereof shall be deemed to be severable and
all other Sections or parts of this Bylaw shall be deemed to be separate
and independent therefrom and to be enacted as such.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS – ADDENDUM NO. 1

February 15, 2005

File: F270-001-00

To: All holders of the Town of Morinville Municipal Engineering Standards dated December, 2003

Gentlemen:

The following additions, deletions and/or corrections are hereby made to the Town of Morinville Municipal Engineering Standards:

1. Refer to Section 7.0 – Water Distribution System and amend Article 7.5.5.2 to read:
“2 One (1) 100 mm Pumper connection.”

The intent is to delete any reference to a “Stortz” connection on the pumper outlet. All outlets (hose and pumper) shall have standard A.M.A. threads.

2. Add new Section 23.0 – Multiways as follows:

“23.0 Multiways

23.1 General

23.1.1 Multiways shall be constructed at locations as determined through discussions with the Town.

23.1.2 The Developer, or his Engineer, shall prepare an overall plan of the subdivision on which is shown proposed multiways and their connections to the Town’s proposed overall multiway system. This plan shall be submitted to the Town for review with the detail design drawings.

23.2 Design

23.2.1 Multiways shall be designed to conform with the overall grading and landscaping plans for the subdivision.

23.2.2 Multiways shall have a minimum finished top width of 3.0 metres and shall be constructed to have the following minimum pavement structure:

150 mm depth of cement modified subgrade
150 mm depth of 20 mm minus crushed granular base
65 mm depth of asphaltic concrete surface course

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS – ADDENDUM NO. 1

23.3 Construction

- 23.3.1 Multiway development shall be constructed to conform fully with the standards and requirements as set out in Section 3.0 – Roadways.
- 23.3.2 Bollards shall be provided at all points of connection to the roadway system to prevent unauthorized vehicular entry. The bollards shall be designed to be both moveable and lockable. A rotatable bollard design is preferred.”

- 3. Refer to Appendix B – Typical Details and amend Drawing No. 1.01 – 9 Metre Local Roadway, Drawing No. 1.02 – 8.5 Metre Short Cul-de-sac on 17 Metre Right-of-way, Drawing No. 1.03 – 8.5 Metre Long Cul-de-sac on 18 Metre Right-of-way, Drawing No. 1.04 – 11 Metre Minor Collector and Drawing No. 1.05 – 12 Metre Major Collector by changing the offset distance of the Sump Pump Collector Main from 2.0 metres from the property line into the easement to 0.3 metres from the property line into the easement.

The intent of this change is to reduce the possibility of the sump pump collector main being undermined during installation of service connections to the individual buildings.

End of Addendum No. 1

Prepared by

UMA Engineering Ltd.

Town of Morinville

Garry R. Maxwell, P. Eng.

R.Foster, Superintendent of
Public Works

Approved by town Council this 8 day of March, 2005.

**TOWN OF MORINVILLE
MUNICIPAL ENGINEERING STANDARDS**

December, 2003

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1.0 GENERAL

1.1 Development Brief for Subdivision Development

Development of new areas may require a subdivision of land in accordance with procedures and requirements set out in the Subdivision and Development Regulation approved pursuant to the Municipal Government Act, R.S.A. 2000.

The Town wishes to be kept informed in regard to the proposed subdivision. To this end, the Developer should present a Development Brief to the Town not less than two months prior to his application for subdivision so that it can be reviewed and commented on prior to subdivision application. This will allow the Developer to modify his application if necessary to take into account any requirements that might arise as a result of the review of the Development Brief. This will also establish the basis for any requirements that will have to be articulated in any development agreement.

The Development Brief shall be prepared to support the proposed subdivision and shall contain the following information:

1.1.1 Proposal

The Developer shall submit a statement indicating the type of subdivision proposed (fee simple or bare land condominium or some other form), how the proposed development conforms to the Town's Municipal Development Plan and other statutory plans and/or natural growth directions, total area, total developable area, total Reserves, detailed land uses, public rights-of-way, utility rights-of-way, applicable densities, number of parcels, number of dwellings, and number and densities of development forms (e.g. number of single family residential lots, acreage and floor area of commercial developments, etc.).

The Town may require that an Area Structure Plan be prepared by a qualified planner for the area in which the proposal is intended.

The Developer should outline any innovative designs, procedures or techniques which are proposed to be incorporated into the development.

1.1.2 Conceptual Servicing Plan

The Developer shall submit a Conceptual Servicing Plan of development to the Town. The plan should include all pertinent information regarding all local improvements including standards of construction, requirements for capacity of water mains, sewer mains, storm drainage, roadways, street patterns, utility easements and other significant aspects relating to the proposed development. The Conceptual Servicing Plan shall be in accordance with the Town's existing Municipal Servicing Plan(s) or existing municipal servicing concepts.

The Conceptual Servicing Plan shall include drawings at a scale of 1:1000 or 1:2000 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 Contours of existing land surface relative to geodetic elevation datum. Contour interval not greater than 0.5 metre;
- .2 Extent and size of water mains;
- .3 Extent, size, and critical elevations of sanitary sewer mains;

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- .4 Extent, size, and critical elevations of storm drainage systems;
- .5 Carriageway types, widths and initial intersection elevations; and
- .6 Any other information that the Developer considers necessary to aid the Town in assessing and considering the proposed development.

1.2 Geotechnical Report

The Developer shall submit a Geotechnical Engineering Report to the Town's Engineer. This report shall be prepared by a qualified geotechnical engineer and shall be of sufficient detail to establish the suitability of the proposed subdivision for the type of development proposed in the Conceptual Servicing Plan.

In the event that the geotechnical investigation reveals areas of high water table and/or unstable subsurface soils conditions, the report will recommend special techniques required to insure the stability of any of the proposed local improvement.

1.3 Developer's Engineer

The Developer shall engage a qualified professional engineer to undertake all phases of the engineering including conceptual design, detailed design, general engineering services during construction, resident layout and construction inspection, quality control assurance, and as-built recording for the proposed development.

1.4 Local Improvements

Local improvements shall be interpreted to include the following:

- .1 Water mains: including all fittings, valves and hydrants;
- .2 Water service connections: to the property line, or as otherwise directed;
- .3 Sanitary sewer mains;
- .4 Sanitary service connections: to the property line, or as otherwise directed;
- .5 Storm drainage system;
- .6 Sump pump collector system;
- .7 Sump pump collector system services to the property line, or as otherwise directed;
- .8 Carriageways: developed to an asphaltic concrete surface;
- .9 Curbs and gutters: both sides of carriageways;
- .10 Sidewalks: both sides of arterial and collector roadways; one side on local roadways; in cul-de-sacs as required by Article 4.6.2 of these Standards; and, in all walkways;
- .11 Driveway aprons;
- .12 Multiways;
- .13 Lanes: developed to an asphaltic concrete surface;
- .14 Pre-grading: the entire subdivision.;
- .15 Landscaping: boulevards, buffer strips, parks, reserves, utility lots, traffic islands, berms, multiways, walkways and easements;
- .16 Street lighting: underground wiring;
- .17 Electric power distribution: underground wiring;
- .18 Traffic signs, traffic control devices and street signs;
- .19 Natural gas distribution system;
- .20 Telephone network: underground wiring;
- .21 Television cable: underground wiring;
- .22 Fibre optics communication systems: underground wiring, and
- .23 Fencing: buffer strips, parks, municipal and school reserves, walkways, stormwater management facilities as required, pipeline rights-of-way, other utility lots as required and easements as required.

24 play ground equip
Plus such other local improvements, municipal trunk mains, or connecting services called for in the development agreement.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

1.5 Development Agreement

The Developer will be required to enter into a "Development Agreement" with the Town prior to servicing of a site

1.6 Plans and Specifications

The Developer shall submit to the Town a minimum of four (4) complete sets of plans and specifications of all the local improvements proposed. Such plans shall also include the franchise utilities (power, gas, telephone and cable T.V.) plans.

Plans shall be prepared in strict accordance with Appendix A - Plan Standards.

The Town shall endeavour to review the plans and specifications promptly, however, the Developer shall schedule his submission of plans and specifications such as to allow the Town not less than seven (7) and not more than fourteen (14) days for its review of the documents.

No construction shall commence or be undertaken until the plans and specifications have been approved in writing by the Town.

1.7 Survey Control System

1.7.1 All legal control and elevations shall be tied into the existing Alberta Survey Control System within the Town.

1.7.2 Should it be necessary to extend the existing Alberta Survey Control System, the Town shall be responsible for all necessary arrangement for such extension. In such case, the Town shall bear all costs associated with the extension.

1.7.3 The Developer shall be responsible to preserve all existing Alberta Survey Control System monuments within or adjacent to his proposed subdivision.

Should it be necessary to destroy a monument, or should an existing monument be disturbed, as a result of the development or because of any of the Developer's or of his agent's actions, a replacement monument shall be arranged for by the Town, the total cost of which shall be borne by the Developer.

Replacement monuments shall be completed and paid for prior to issuance of a Final Acceptance Certificate for paved roads.

1.8 Standards

The standards outlined herein are intended to be the minimum standards. It shall be the Developer's responsibility to develop the subdivision to meet or exceed these standards in accordance with good engineering practices.

1.9 Materials

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

1.10 Service Connections

All service connections including power service connections shall be installed underground from the mains

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to the buildings.

1.11 Overall Layout

The proposed development shall be laid out and designed to meet the overall development of the Town and possible future expansion into abutting areas.

Tie-ins of the proposed local improvements into existing developments shall not create overloads on existing services.

The Developer shall include oversize services to provide sufficient capacity for future developments.

1.12 Layout Concepts

The concepts of layout such as the size of lots, widths of rights-of-way for traffic and other services, park reserves, densities, zoning and other planning requirements of the Town should be approved in principle prior to submission of the detailed engineering plans, in order that any necessary or desirable revisions can be incorporated without requiring major changes.

1.13 Utility Rights-of-Way

Rights-of-way shall be provided for all utilities not located on streets or utility lots, including rights-of-way for ditches or water courses accommodating surface runoff.

Flankage easements on lots will not be permitted.

1.14 Lots on Arterials

No lots shall face on to an arterial roadway unless a frontage road is provided.

1.15 Lots on Major Collectors

No lots shall face on to major collector roadways unless a rear lane is provided.

No private driveways shall exit directly on to a major collector roadway.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

2.0 PROCEDURES

2.1 Before Construction

The following items must be completed and approved by the Engineering Department before construction can start:

- a) Conceptual Servicing Plan;
- b) Tentative Plan of Subdivision and all necessary Rights-of-Way plans and documents of the stage proposed for development;
- c) Final detailed plans and specifications;
- d) signed Development Agreement; and
- e) Letter of Authorization received from Alberta Environment.

The Developer's Engineer shall be responsible to make all necessary arrangements to obtain the Letter of Authorization from Alberta Environment.

Written confirmation from the Town to Alberta Environment in support of the "Letter of Authorization" shall not be issued by the Town of Morinville until the Town has reviewed and approved final detailed plans and specifications and the final rights-of-way plan.

2.2 During Construction

The following procedures shall be followed during the course of construction:

- 2.2.1 The Developer's Engineer shall inspect all construction including the installation of the franchise utilities. Inspection services shall not be limited to casual inspections only. The Developer's Engineer shall conduct sufficient field inspections that he can certify the work has been installed in accordance with the intent of the approved plans and specifications.
- 2.2.2 The Developer shall appoint an accredited material testing firm to carry out quality control testing to ensure that construction is in accordance with the approved design. The frequency of testing shall be in accordance with the requirements of The City of Edmonton - Servicing Standards Manual, latest edition thereof.
All test results shall be supplied to the Town as soon as they become available. Failure to receive test results will be considered sufficient cause to stop the work. Where testing indicates that the required standards have not been met, the deficient areas shall be re-worked and subsequently retested on either side of the failed test until the standards have been met.
- 2.2.3 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 costs incurred by the Town shall be charged to the Developer who will reimburse the Town promptly for such additional expenditures incurred.
- 2.2.4 Approval shall be obtained from the Town a minimum of 48 hours prior to closing of developed streets or shutting off of any existing utility service when required for construction.
- 2.2.5 Town staff only will operate any existing valves on the water distribution system.
- 2.2.6 In the event that a road must be partially or fully closed for crossing or connection, the Developer shall provide all detours, signs, flagpersons, barricades, etc. necessary to provide for the orderly control of traffic around the construction area.

2.3 Following Construction

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

Prior to final acceptance of the development by the Town, the following conditions and procedures shall be completed:

- 2.3.1 A maximum of three (3) Construction Completion Certificates shall be issued by the Town for the development: one for underground utilities; one for surface improvements; and one for landscaping and fencing.
- 2.3.2 Prior to starting the "Maintenance Period" for any of the three phases of the work, all work within that particular phase shall be complete with all deficiencies corrected, and a Construction Completion Certificate shall have been issued for that phase of the work.
- 2.3.3 Prior to issuance of the Construction Completion Certificate for roadways, the Developer's Engineer shall obtain as-built data and submit three (3) sets of as-built plans and Operating Manuals, if applicable, to the Town's Engineer. As-built drawings shall also be submitted in digital format, suitable for use in the Town's AutoCAD system. The as built plans shall include the location of all franchise utilities.
- 2.3.4 On application from the Developer or the Developer's Engineer, the Town may issue a Conditional Construction Completion Certificate that would allow submission of the as-built information to be delayed to not later than six (6) months from the date of the Conditional Construction Completion Certificate.
Where a Conditional Construction Completion Certificate has been issued by the Town and the date of submission of the as-built information exceeds six (6) months from the effective date of the Conditional Construction Completion Certificate, the effective date of the Conditional Construction Completion Certificate shall be amended to be six (6) months prior to the date of submission. The date of submission shall be considered as being the date when all required as-built information has been turned over to the Town, including the correct number and type of copy required.
- 2.3.5 All Local Improvements shall carry a guarantee for all materials and workmanship. The time period covered by any guarantee shall be termed "Maintenance Period". The length of the "Maintenance Period" shall be two (2) years from the date of the Construction Completion Certificate.
- 2.3.6 Not less than sixty (60) days prior to the scheduled date of expiration of the maintenance period on any local improvements, the Developer or the Developer's Engineer shall arrange for an inspection of the local improvement to be carried out. Such inspection shall be carried out by a committee consisting of the Developer, the Developer's Engineer, the Town and the Town's Engineer. Prior to the inspection, the Developer shall arrange and pay for power washing and broom sweeping of all streets in the development area. Any deficiencies found during that inspection shall be rectified by the Developer prior to the issuance by the Town of a "Final Acceptance Certificate".
- 2.3.7 Until such time as a "Final Acceptance Certificate" has been issued, the Town will not assume actual take-over of the subdivision and the Developer shall continue to guarantee all materials and workmanship for the local improvement.

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3.0 ROADWAYS

3.1 Geometric Design Standards

3.1.1 Road classification and designation shall be in accordance with the classification system outlined in the Transportation Association of Canada (TAC) manual - Geometric Design Standards for Canadian Roads and Streets.

3.1.2 Road cross-sections shall be as follows:

<u>Street Classification</u>	<u>Roadway Width Curb Face to Curb Face</u>	<u>Right-of-way Width</u>	<u>Design Speed</u>
Residential Lanes	5 metres	6 metres	
Short cul-de-sac (less than 120 m in length)	8.5 metres	17 metres	50km/hr
Long cul-de-sac (paved length more than 120 m)	8.5 metres	18 metres	50 km/hr
Local streets	9.0 metres	18 metres	50 km/hr
Minor Collectors	11 metres	21 metres	50 km/h
Major Collectors	12 metres	23 metres	60 km/h
Undivided Arterials	16 metres	31 metres	70 km/h
Divided Arterials	2 @ 8 metre + 4.5 m median	45 metres	70 km/h
Special Cases - Including Collectors and Arterials with Service Roads	As required by Town	As required by Town	

3.1.3 Minimum radius to curb face in bulb of cul-de-sac shall be 12 metres; to property line 15 metres.

3.1.4 Concrete curb and gutter shall be constructed on both sides of all streets in accordance with Standard Drawings.

3.1.5 All driveways shall be constructed to give a minimum of 1.5 m clearance from any structures, e.g. hydrants, light standards and service pedestals.

3.1.6 Subdivisions requiring curves on carriageways should reflect rights-of-way boundaries with the same curves or sufficient size corner cutoffs to accommodate the curves.

3.2 Vertical Alignment

3.2.1 Minimum grade shall be 0.6% along all gutters, 0.8% for lanes and 1.0% around curb returns.

3.2.2 Maximum gutter grades shall not exceed six percent (6%).

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3.2.3 All roads shall be crowned or shall have crossfall as shown on the applicable standard drawings.

3.2.4 All vertical curves shall be designed to meet the following minimum requirements:

Design Speed (km/h)	<u>"K" Value</u>	
	Crest (metres)	Sag (metres)
50	7	6
60	15	10
70	22	15

$K = L/A$, where
 L = length of vertical curve in metres, and
 A = algebraic difference in grades (percent).

3.2.5 The minimum length of vertical curve shall be 30 m on local roads and equal to or greater than the design speed on collector and arterial roads..

3.2.6 Vertical curves shall not be required where the algebraic difference in grades is less than 1.5%.

3.3 Horizontal Alignment

3.3.1 The degree of curvature is relative to the Road Classification and its design speed.

3.3.2 All horizontal curves shall be designed to meet the following minimum design requirements:

<u>Street Classification</u>	<u>Design Speed (km/h)</u>	<u>Minimum Radius of Curvature</u>
Local	60	90 metres
Minor Collectors	60	90 metres
Major Collectors	60	130 metres
Industrial	60	130 metres
Arterial	70	450 metres

3.3.3 Curb returns at residential street intersections shall be constructed to a radius of 10 metres.

3.3.4 Curb returns on designated bus routes or industrial roadways shall be constructed to a radius of 15 metres.

3.4 Clearing and Grubbing

3.4.1 The surface of the ground shall be cleared of all trees, logs, stumps, roots, undergrowth, rocks, boulders, structures, debris, and rubbish of any nature for a width of 200 mm beyond walkways and concrete works.

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3.4.2 All material so cleared shall be disposed of by hauling to a disposal area or by other means acceptable to the Town.

3.5 Stripping

3.5.1 All topsoil shall be stripped to its actual depth for the full width of the right-of-way.

3.5.2 Topsoil may be used as fill in depressed areas outside the limits of the subgrade or may be stockpiled for use on other parts of the project.

3.5.3 No topsoil shall be removed from the project area without approval from the Town.

3.6 Earthwork

3.6.1 All the excavation shall be carried out within the limits of proposed work to depths, grades and cross sections as shown on the drawings.

3.6.2 The entire street or lane rights-of-way shall be graded to match the proposed lot elevations at the property line and shall be left in a neat and tidy condition.

3.7 Embankment Construction

3.7.1 Selected native material shall be used for embankment construction.

3.7.2 Material shall be placed in lifts not exceeding 300 mm in uncompacted depth and shall be compacted to not less than 95% of its Standard Proctor Density or in accordance with the recommended density as shown in the Geotechnical report.

3.8 Subgrade

3.8.1 All subgrade shall be cement modified using a minimum of 10 kilograms of cement per square metre per 150 mm depth.

3.8.2 The depth of cement modification shall normally be 150 mm depth except in areas containing large fills from imported sources, or where the existing subgrade soils are excessively soft and wet, in which the depth of cement modification shall be increased to not less than 300 mm. Soft, wet areas may also require the use of additional cement beyond the 10 kgs per square metre per 150 mm depth.

3.8.3 The subgrade shall be prepared for the entire width of the carriageway or lane, plus the full width of the curb and gutter, or monolithic curb, gutter and sidewalk, to 150 mm back of the curb or sidewalk.

3.8.4 The maximum depth of subgrade being prepared at any one time shall not exceed 150 mm in compacted thickness.

3.8.5 The top lift of cement modified subgrade shall be compacted to 100% of Standard Proctor Density or in accordance with the recommended density as per the geotechnical report.

3.8.6 Compaction of the cement modified subgrade shall occur at moisture contents within the limits as set out in the geotechnical report. Where no limits are set, the allowable tolerances during placement shall be not more than three (3 %) percent greater nor one (1 %) percent under the optimum moisture content.

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- 3.8.7 The prepared subgrade shall be proof rolled using a single axle truck loaded to give 8,200 kg on the rear axle. The subgrade shall show no evidence of rolling or weaving under the axle load test.
- 3.8.8 The proof roll test shall be witnessed by both the Developer's and the Town's Engineers.
- 3.8.9 The Town shall be advised of the date and time of the subgrade test and shall be given not less than 48 hours advance notice of the test.
- 3.8.10 Under no circumstances shall the subgrade be covered with granular base or sub-base course until all density test results and the subgrade axle load test have been reviewed and approved by the Developer's Engineer and the Town of Morinville.
- 3.8.11 The prepared subgrade shall be maintained within the allowable limits of moisture content until it is finally covered with hot mix asphaltic concrete pavement.
- 3.8.12 Should the prepared subgrade be allowed to dry out such that the moisture content falls below the accepted tolerances prior to application of the asphaltic concrete pavement, the base course shall be removed and the underlying subgrade shall be scarified, sufficient water added thereto to adjust the moisture content to fall within the tolerance limits, and then the subgrade shall be recompactd to the required density. The base course shall then be replaced, reshaped and recompactd to the required density prior to paving.
- 3.8.13 Cement used for cement modification of subgrades shall be Type 10 - Normal Portland Cement.
- 3.8.14 The Town may consider alternate subgrade preparation methods for site specific instances based on recommendations which must be contained in a written report prepared by an independent soils consultant possessing a permit to practice under the Engineering, Geological and Geophysical Professions Act of Alberta.

3.9 Pavement Structure

- 3.9.1 All streets shall be paved with hot mix asphalt.
- 3.9.2 The Developer shall engage an independent soils consultant possessing a permit to practice under the Engineering, Geological and Geophysical Professions Act of Alberta to conduct tests and to perform calculations to determine the pavement structure requirements for the various classes of roadways. A report outlining recommended pavement structures, including design parameters (eg. traffic count, percentage of types of vehicles, California Bearing Ratio) shall be provided to the Town.

In no case shall the pavement structure be less than the following:

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Town of Morinville Minimum Pavement Structure Requirements

<u>Street Classification</u>	<u>Granular Base Course Pavement Structure</u>
Lanes	150 mm depth of cement modified subgrade 150 mm depth of 20 mm minus crushed granular base 65 mm depth of asphaltic concrete base course 35 mm depth of asphaltic concrete surface course
Local	150 mm depth of cement modified subgrade 200 mm depth of 20 mm minus crushed granular base 75 mm depth of asphaltic concrete base course 40 mm depth of asphaltic concrete surface course
Collectors	150 mm depth of cement modified subgrade 225 mm depth of 20 mm minus crushed granular base 80 mm depth of asphaltic concrete base course 40 mm depth of asphaltic concrete surface course
Arterials	150 mm depth of cement modified subgrade 150 mm depth of 63 mm minus crushed granular sub-base 175 mm depth of 20 mm minus crushed granular base 100 mm depth of asphaltic concrete base course 50 mm depth of asphaltic concrete surface course

3.9.3 Alternative pavement designs of equivalent strength may be submitted to the Town for review and approval prior to construction. All designs must incorporate a drained gravel base.

3.9.4 Staged construction of the pavement is required. The surface course shall be constructed not more than 6 months prior to Final Acceptance of surface improvements. Other than for lanes, the base course shall be not less than 75 mm in depth, the surface course shall be not less than 40 mm in depth.

3.9.5 There shall be a one (1) year maintenance period for the surface asphalt for materials and workmanship.

3.10 Granular Base and Sub-Base Courses

3.10.1 Crushed Gravel

- .1 Material shall consist of crushed rock and/or crushed gravel and sand consisting of sound, hard, durable particles, free from injurious quantities of flaky particles, soft shale, organic or other deleterious materials.
- .2 The granular material shall not contain more than two percent (2 %) of lightweight pieces floating on a liquid with relative density of 2.0.

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3.10.2 20 mm Minus Crushed Gravel

- .1 Material used for base course shall be 20 mm minus crushed gravel. The 20 mm minus material shall be uniformly graded between the following gradation limits when tested in accordance with ASTM C 136:

<u>Sieve Size (mm)</u>	<u>Percent Passing by Weight</u>
20.0	100
12.5	60 - 92
5.0	37 - 62
2.0	26 - 44
0.4	12 - 27
0.16	7 - 18
0.08	2 - 8

- .2 For 20 mm minus gravel, the following quality requirements shall be met:
- a) the aggregate shall be crushed and have a minimum CBR value of 60;
 - b) the coarse fraction of the aggregate shall have a percent wear by the Los Angeles abrasion test of not more than 50;
 - c) the material passing the 0.4 mm sieve shall have a plasticity index of 6 or less; and
 - d) the material retained on the 5 mm sieve shall have a minimum of 60 percent by mass of the gravel pieces with at least two crushed faces.

3.10.3 63 mm Minus Crushed Gravel

- .1 Material used for sub-base course shall be 63 mm minus crushed gravel. The 63 mm minus material shall be uniformly graded between the following gradation limits when tested in accordance with ASTM C136:

<u>Sieve Size (mm)</u>	<u>Percent Passing by Weight</u>
63.0	100
40.0	80 - 100
20.0	60 - 85
12.5	50 - 75
5.0	25 - 50
2.0	20 - 45
0.4	10 - 30
0.16	5 - 15
0.08	2 - 8

- .2 For 63 mm minus gravel, the following quality requirements shall be met:
- a) the aggregate shall be crushed and have a minimum CBR value of 50;
 - b) the coarse fraction of the aggregate shall have a percent wear by the Los Angeles abrasion test of not more than 50;
 - c) the material passing the 0.4 mm sieve shall have a plasticity index of 6 or less; and

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- d) the material retained on the 5 mm sieve shall have a minimum of 40 percent by mass of the gravel pieces with at least two crushed faces.

3.10.4 Prime Coat

- .1 Liquid asphalt used for prime coat shall be MC-30.
- .2 The rate of application of liquid asphalt used for prime coat shall be 1.5 ± 0.5 litres per square metre, at 100% concentration.
- .3 Temperature of application shall fall within the limits of 35 to 55 degrees Celsius.

3.10.5 Spreading

- .1 Approved mineral aggregate shall be hauled and placed on the prepared subgrade in sufficient quantity to provide a layer or layers of base which when compacted and finished will be the specified thickness.
- .2 20 mm crushed gravel base shall be placed and compacted in a single layer when the compacted thickness specified does not exceed 150 mm. When the thickness specified is in excess of 150 mm, the material shall be placed and compacted in more than one layer.
- .3 63 mm crushed gravel sub-base shall be placed and compacted in a single layer when the compacted thickness specified does not exceed 210 mm. When the thickness specified is in excess of 210 mm, the material shall be placed and compacted in more than one layer.
- .4 The aggregate shall be handled in such a manner as to minimize segregation of the sizes. Any coarse material segregated during placing, spreading and bringing to optimum moisture content shall be reblended with the fines and the mixed aggregate shaped by a minimum of blading.

3.10.6 Compaction and Finishing

- .1 Each component layer of the base shall be laid and compacted to 100% of Standard Proctor Density at optimum moisture content.
- .2 Water shall be applied uniformly in an amount necessary to obtain the optimum moisture content and the surface of each layer shall be rolled by pneumatic tire, steel or vibratory steel compaction units in such a manner as to achieve the specified density.
- .3 A blade grader shall be used in conjunction with the rolling operation to maintain a dense, even and uniformly compacted surface shaped to the required cross section. Any ruts or irregularities formed in the surface of any layer shall be smoothed and shaped by blading during this operation.
- .4 The top of the finished base shall exhibit a smooth continuously dense surface.

3.10.7 Priming

- .1 The prime coat shall be applied on the prepared base from which all loose material has been removed or consolidated by rolling and only when surface is slightly moist.

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- .2 It shall be applied at a minimum rate of 1.0 litres per square metre or at a greater rate which will be absorbed by the base material in 24 hours. It shall be the Contractor's responsibility to choose the quantity and employ methods that will provide a continuously dense waterproof surface.
- .3 All traffic shall be kept off primed surfaces for a period of 24 hours or until the prime coat has dried sufficiently to prevent it from picking up.
- .4 If after 24 hours there remains areas where the asphaltic prime has not been completely absorbed, the excess shall be blotted by the application of sand.
- .5 The prime coat shall be allowed to cure completely prior to placing hot-mix asphaltic concrete pavement.

3.10.8 Base Thickness

- .1 The base course shall be constructed to the specified thickness. Any areas deficient in thickness shall be brought to the specified thickness by applying an additional depth of surface course equivalent to the deficient thickness of base course.

3.10.9 Subgrade Drainage

- .1 All streets shall be constructed having continuous longitudinal drainage of the subgrade.
- .2 Longitudinal drains shall be Nudrain MD 7407 as manufactured by Nilex Geotechnical Products Inc., or approved equal, and shall be installed adjacent to the curb line at the bottom of the granular base or sub-base course, whichever is lower, on both sides of all roads or along the centreline of rear lanes.
- .3 Longitudinal drains shall generally be installed at the same grade as the curb and gutter, but in no case shall the grade of the longitudinal drain be less than 0.5 %.
- .4 Transverse drains shall be installed where required to ensure drainage continuity and shall consist of a continuous 100 mm diameter (minimum) perforated pipe complete with sock installed in a free draining trench. The type and class of pipe shall be selected based on anticipated traffic loading and depth of bury.
- .5 Drains shall be connected to the storm drainage system either at catch basins or manholes. Positive drainage must be provided for all subgrade drainage systems.
- .6 Concrete structures on each side of the roadway shall have a granular base installed continuously beneath the concrete structure, to be continuous with the roadway granular base or sub-base, to ensure that drainage from adjacent properties to the longitudinal drainage system is maintained under the concrete structure.
- .7 Alternate forms of subgrade drainage for site specific applications may be considered by the Town based on recommendations which must be contained in a written report prepared by an independent soils consultant possessing a Permit to Practice under the Engineering, Geological and Geophysical

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Professions Act of Alberta.

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3.10.10 Testing

- .1 The Developer shall retain an accredited testing agency possessing a Permit to Practice under the Engineering, Geological and Geophysical Professions Act who shall establish the following for the aggregate proposed to be used on the project:
 - a) sieve analysis of the crushed gravel base and sub-base courses;
 - b) crush count;
 - c) optimum moisture content; and
 - d) minimum dry density.
- .2 Results of the accreditation testing shall be submitted to the Town for approval at least one (1) week prior to commencement of the work. A minimum of one (1) set of tests shall be submitted for each 500 tonnes of each type of aggregate used on the project.
- .3 Field testing shall be carried out for each 1,500 square metres of road, or 1,000 square metres of lane, per layer of crushed gravel base or sub-base, with a minimum of one (1) test each day during placing operations for each type of aggregate. The field testing shall include field densities of in-place material determined in accordance with either the rubber balloon method (ASTM D2167), or the nuclear method (ASTM D2922).
- .4 If a density test result is below the required density, 2 more tests shall be taken for the area represented by the failed test, and the average of the 3 tests shall represent the area. If such average is below the required density, the area represented by the failed test shall be reworked to the full depth of the lift, the aggregate moisture shall be altered as necessary, and the aggregate shall be recompacted to the required density.

3.11 Asphaltic Concrete Pavement

- 3.11.1 Asphaltic concrete pavements (e.g. Surface course, base course) 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.

Mixes are designated according to use as follows:

- .1 Residential Surface
Surface course for paving of residential streets and lanes only.
- .2 Arterial Surface
Surface course for arterials, industrial/commercial and collectors.
- .3 Base
Base course for arterials, industrial/commercial and collectors.

3.11.2 Minerals

- .1 Aggregates in mix
When tested by means of laboratory sieves, the combined aggregates in the mix shall

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meet the following gradation:

Class	12.5	20	25
Application	Overlay/ Residential Surface	Arterial Surface	Base
Sieve Size (mm)			
25			100
20		100	80 - 95
12.5	100	80 - 95	
5	60 - 80	45 - 65	40 - 60
0.160	9 - 14	9 - 14	9 - 14
0.080	4 - 8	4 - 8	4 - 8
5 mm with min 2 fractured faces, % by mass	70 min.	70 min.	70 min.
Plasticity Index passing 0.4 mm	0	0	0
LA Abrasion wear, % by mass	32 max.	32 max.	32 max.
Soundness test loss, % by mass	16 max.	16 max.	16 max.
Soaked CBR		80 min.	80 min.
Lightweight pieces, % by mass max.	2	2	2
Moisture Content, % by dry mass, max.	4	4	4

.2 Asphaltic Binder

The asphaltic binder shall be uniform in character, shall not foam when heated to 177°C and shall meet the following requirements:

Designation	A/C 150/200
Penetration at 25°C, 100 g., 5 sec.	150+
Flash Point (C.O.C.)	218°
Ductility at 25°C, - c.m.	60+
Solubility in carbon tetrachloride - %	99.5
Penetration after loss on heating - % of original	70+

.3 Mineral Filler

Should the grading of the mineral aggregates supplied to the plant not meet the gradation in 3.10.2.1., mineral filler shall be added in the weight hopper of the asphalt plant in such quantities as will be required to meet the specifications.

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Mineral filler shall consist of Portland Cement, Pozzolan, commercially ground stone dust or other mineral dust approved by the Town. Mineral filler shall have a Plasticity Index of zero and when tested by means of laboratory sieves, shall meet the following gradation:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
No. 40	100
No. 100 - not less than	90
No. 200 - not less than	73
No. 325 - not less than	62

3.11.3 Mix Design

.1 A mix design shall be based on the Marshall Method of Mix Design as set out in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2) and shall conform to the following criteria:

.1 Residential Surface Course

Hot mix asphaltic concrete pavement used in the construction of residential surface course shall meet the following test requirements, based on a 50-Blow Marshall:

Maximum Size of Aggregate, mm		12.5
Minimum Stability		4.5 kN
Minimum Retained Stability, %	75	
Flow Value (1 unit = .254 mm)		8 - 16 units
Air voids Total Mix		3.0 ± 1.0 %
Voids filled, %		73 - 85
Minimum film thickness, microns		7.0

.2 Arterial Surface Course

Hot mix asphaltic concrete pavement used in the construction of arterial surface course shall meet the following test requirements, based on a 75-Blow Marshall:

Maximum Size of Aggregate, mm		20
Minimum Stability		6.7 kN
Minimum Retained Stability, %	75	
Flow Value (1 unit = .254 mm)		6 - 12 units
% Air voids Total Mix		4.0 + 0.2%
Voids filled, %		65 - 78
Minimum film thickness, microns		7.0

.3 Base Course

Hot mix asphaltic concrete pavement used in the construction of base course shall meet the following test requirements, based on a 75-Blow Marshall:

Maximum Size of Aggregate, mm		25
Minimum Stability		6.7 kN
Minimum Retained Stability, %	75	

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Flow Value (1 unit = .254 mm)	6 - 12 units
% Air voids Total Mix	4.0 ± 0.4%
Voids filled, %	67 - 78
Minimum film thickness, microns	6.0

.4 Overlay

Hot mix asphaltic concrete pavement used in the construction of overlays shall meet the following test requirements, based on a 75-Blow Marshall:

Maximum Size of Aggregate, mm	12.5
Minimum Stability	6.7 kN
Minimum Retained Stability, %	75
Flow Value (1 unit = .254 mm)	6 - 12 units
Air voids Total Mix	4.0 ± 0.4 %
Voids filled, %	68 - 80
Minimum film thickness, microns	7.0

- .2 The mix design shall be carried out by an accredited testing agency possessing a permit to practice under the Engineering, Geological and Geophysical Professions Act of Alberta and shall be submitted to the Town for approval at least one week prior to commencement of work.

3.11.4 Tie-in to Existing Asphalt

When tying in to an existing asphalt pavement, a minimum 0.5 m width shall be ground out of the old phase and a 1.0 m wide glass grid shall be placed to tie the new and the old pavement together at the joint.

3.11.5 Base Preparation

Prior to delivery of the hot mix asphaltic concrete, the prepared base shall be cleaned of all loose or foreign material.

Prior to placement of the asphaltic surface course, the surface of the base course shall be thoroughly cleaned of dirt or other deleterious material by sweeping with a power broom supplemented by hand brooming and scraping where necessary. A tack coat of asphaltic oil shall then be applied, where required, by means of an approved pressure distributor. No levelling course or surface course mixtures shall be placed until the tack coat is thoroughly set.

3.11.6 Transportation of Mixture

The mixture shall be transported from the mixing plant to the work in tight vehicles with metal bottoms previously cleaned of all foreign material. Each load shall be covered with canvas of sufficient size to protect it from weather conditions.

3.11.7 Spreading the Mixture

The mixture shall be laid at a temperature not lower than 120 degrees Celsius or more than 140 degrees Celsius.

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Hot plant mix bituminous surfaces shall be placed with time remaining so that compaction shall be completed during daylight hours..

Where the asphaltic mixture is to be placed in two or more lifts, the first lift, and all subsequent lifts, shall be placed, finished and compacted for the full width as shown on the approved drawings prior to commencing work on the next lift.

In placing the second and subsequent lifts, the individual mixture spreads shall be aligned in a manner such that the longitudinal joints in each layer will not coincide.

Mixture shall not be placed:

- a) during periods of rain or where there is imminent danger of rain;
- b) during excessive winds;
- c) when air temperature is 2 degrees Celsius or cooler, except in specific situations where, in the opinion of the Engineer, conditions warrant the risk involved.

Asphalt surface course shall not be laid until the base course has been inspected and approved by the Town.

3.11.8 Joints

The mixture shall be spread and laid so that all longitudinal joints are made while the asphalt mat which was laid first is still hot.

A narrow strip along the edge of a mat which is to be joined with another asphalt mat shall be left without rolling until the adjoining mat has been placed against it. The joint which is formed shall be rolled immediately after the adjacent mat has been placed to ensure a bonding of the material while the asphalt is still hot.

Longitudinal and transverse joints shall be made in such a manner as to provide proper bonding between the two mats for the full depth of the joint.

Transverse joints shall be made by cutting back on the previously spread and rolled course in order to expose its full depth. When spreading of the course is resumed, the exposed edge of the joint shall be painted with an approved bituminous material and the freshly laid mixture shall be raked against the joint, tamped with hot tampers and rolled.

Care must be taken during the forming of the joints so that there will be a coincidence of surface planes devoid of ridges or depressions at the joints.

In order to ensure that the surface does not become cooled prior to laying an adjoining mat, the spreader shall not advance beyond the limits shown in the following Table:

<u>Air Temperature</u> <u>Degrees Celsius</u>	<u>Maximum Length of Advance</u> <u>in metres</u>
Above 27°	250
15° - 27°	190
7° - 15°	125
Below 7°	90

All concrete or metal surfaces such as curbs, manholes, etc., that are to come in contact with the plant mix material shall be painted with a thin coat of approved bituminous material.

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Where mechanical placing methods do not produce proper joints at gutters, curbs or other structures, hand methods will be required.

3.11.9 Final Density Requirements

Upon completion of rolling, the minimum in-place densities shall be 98% of the laboratory design density. Densities shall be based on core samples, each of which shall represent not more than 1,000 square metres of the mat in question. If any core fails to meet the density specified, two additional cores shall be taken within the area in question and the average density of the three cores shall represent the density. The Developer shall arrange and pay for testing involved in determining the extent of pavement having insufficient densities.

Asphalt which fails to meet the density specified shall be removed and replaced at the Developer's expense, or a reduced payment shall be applied to the price of the quantity of hot mix asphalt concrete pavement in that mat area, in accordance with the following Table:

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Asphalt Density Pay Factors

98% Required		97% Required		96% Required	
Actual Density %	Pay Factor %	Actual Density %	Pay Factor %	Actual Density %	Pay Factor %
98.0	100.0	97.0	100.0	96.0	100.0
97.9	99.9	96.9	99.9	95.9	99.7
97.8	99.8	96.8	99.7	95.8	99.3
97.7	99.6	96.7	99.4	95.7	98.9
97.6	99.4	96.6	99.1	95.6	98.4
97.5	99.1	96.5	98.7	95.5	97.8
97.4	98.7	96.4	98.2	95.4	97.1
97.3	98.3	96.3	97.7	95.3	96.4
97.2	97.8	96.2	97.1	95.2	95.6
97.1	97.2	96.1	96.3	95.1	94.6
97.0	96.5	96.0	95.5	95.0	93.4
96.9	95.8	95.9	94.6	94.9	92.2
96.8	95.0	95.8	93.6	94.8	90.7
96.7	94.2	95.7	92.5	94.7	89.1
96.6	93.3	95.6	91.3	94.6	87.3
96.5	92.3	95.5	89.9	94.5	85.1
96.4	91.1	95.4	88.4	94.4	82.6
96.3	89.8	95.3	86.7	94.3	79.5
96.2	88.5	95.2	84.8	94.2	75.5
96.1	87.1	95.1	82.7	94.1	69.7
96.0	85.5	95.0	80.3	94.0	60.0
95.9	83.8	94.9	77.6	Under 94.0	Reject
95.8	82.0	94.8	74.3		
95.7	80.0	94.7	70.6		
95.6	77.7	94.6	66.0		
95.5	75.4	94.5	60.0		
95.4	73.0	Under 94.5	Reject		
95.3	70.3				
95.2	67.2				
95.1	63.7				
95.0	30.0				
Under 95.0	Reject				

3.11.10 Surface Smoothness, Grade and Texture

After final compaction, the asphalt surface shall be smooth and true to the established crown and grade and have a smooth riding quality.

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When checked by means of a 3 metre straightedge held in successive positions parallel to the centreline, in contact with the surface, the pavement shall not deviate from the straightedge by more than 5 mm nor shall the finished surface contain any variations which will impede drainage.

If there is sufficient deviation from this standard to result in an objectionable riding surface, the defect shall be repaired in one of the following ways as ordered by the Town:

- .1 Overlay the existing surface with a shallow lift of sheet asphalt, based on a design proposed by an independent agency engaged by the Developer,
- .2 Slurry seal or chip seal designed by an independent, agency engaged by the Developer, or
- .3 Remove and resurface.

The completed pavement shall have a tightly knit texture and shall be free from segregation and surface cracking.

3.11.11 Asphalt Thickness

All asphalt courses shall be constructed to the thickness specified. Any areas suspected to be deficient in thickness shall be cored.

Where initial coring confirms deficient thickness, two additional cores shall be taken, one on either side of the original deficient core, and the average of the three core thicknesses shall be considered as the actual core thickness.

Those areas represented by the deficient thicknesses shall be repaired in the following manner, as applicable:

- .1 Deficient in thickness by 3 mm or less: no action required.
- .2 Deficient in thickness between 3 mm and 15 mm: pay the contractor an adjusted rate calculated as follows:

$$\text{Adjusted Price} = \frac{(\text{Average Core Depth})^2}{(\text{Specified Core Depth})^2} \times \text{Contract Price}$$

The difference between the adjusted payment to the contractor and the contract price shall be paid to the Town.

- .3 Deficient in thickness by more than 15 mm:

Overlay deficient areas with a minimum 40 mm depth of hot mix asphaltic concrete pavement.

3.11.12 Cleanup and Traffic

The entire project, including construction areas as well as Contractor's yards, shall be left in a neat and tidy condition. All construction refuse shall be removed from boulevards, ditches, roadways and yards. Access roads used by the Contractor for hauling materials and equipment to and from the work site shall be cleaned.

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Traffic shall not be permitted on the finished pavement until it has cooled to atmospheric temperature. The Developer shall be responsible for traffic control during construction and shall maintain traffic to the satisfaction of the Town.

3.11.13 Testing and Inspection

The following tests shall be carried out for each 2,000 square metres (per layer) of asphalt pavement or at least one each day during placing operations:

- .1 Marshall Stability using Marshall Apparatus as per A.S.T.M. D1559.
- .2 Sieve analysis on extracted aggregates in accordance with A.S.T.M. C136 and entire washed sample in accordance with A.S.T.M. C117.
- .3 Bulk specific gravity of compacted mixtures in accordance with A.S.T.M. D2726.
- .4 Bitumen content of paving mixtures in accordance with A.S.T.M. D2172.
- .5 % voids in the mineral aggregate is to be calculated on the basis of A.S.T.M. D2726 - Bulk Specific Gravity of the Aggregate.
- .6 Air voids in compacted mix in accordance with A.S.T.M. D3203.
- .7 Film thickness in accordance with Article 3.12.

Samples of asphalt cement used shall be taken weekly from each source and tested for penetration and kinematic viscosity.

Copies of all asphalt test results shall be provided to the Town within 48 hours of the test having been carried out.

3.12 Method for Determining Film Thickness

3.12.1 Surface Area Factors

Surface area factors shall be in accordance with the following:

<u>Sieve Size (mm)</u>	<u>Surface Area Factor (m²/kg)</u>
5.0	0.38
2.5	0.78
1.25	1.55
0.63	2.90
0.315	5.60
0.160	12.20
0.080	29.00

Determine total surface area as the sum of the surface areas for the seven specified sieve sizes according to the formula:

$$Sa = \frac{0.38 + \% \text{ Passing} \times \text{Surface Area Factor}}{100}$$

3.12.2 Corrected Sa (Sag)

Correct Sa for actual Aggregate Bulk Specific Gravity using the formula:

$$Sa = \frac{2.650 \times Sa}{\text{Actual Bulk Specific Gravity}}$$

3.12.3 Film Thickness Calculation

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Calculate film thickness (Ft) in accordance with the formula:

$$Ft = \frac{10(\text{Pac} - \text{Pabs}) \text{ in microns (mm x } 10^{-3}\text{)}}{\text{Sac} \times \text{SGac}}$$

Where:

Pac = Percent Asphalt Cement Content by Dry Mass of Aggregate
 Pabs = Percent of Absorbed Asphalt Cement by Dry Mass of Aggregate
 Sac = Corrected Sa
 SGac = Specific Gravity of Asphalt Cement

3.13 Tolerance in Mix Production

3.13.1 Mixing Temperature Tolerance

Allowable variation from mixing temperature shall be $\pm 9^{\circ}\text{C}$.

3.13.2 Asphalt Content Tolerance

Allowable variation from approved design asphalt content shall be $\pm 0.3\%$ by mass of mix.

3.13.3 Tolerances in Extracted Aggregate from Approved Job-Mix Gradation

Aggregate extracted from the mix shall conform to the grading limits as shown in 3.10.2.1. Allowable variation from the gradations shown therein shall be determined in accordance with the following:

Sieve Size (mm)	% Passing by Mass	
	Individual Sample	Average of Last 10 Samples
5	± 5.0	± 3.0
1.25	± 4.0	± 2.5
0.63	± 3.0	± 2.0
0.315	± 3.0	± 2.0
0.16	± 2.0	± 1.5
0.08	± 1.5	± 1.0

3.13.4 Tolerance for Air Voids in Mix

Air voids in total mix shall conform to the limits shown in Article 3.11.3.1.1, 3.11.3.1.2 and 3.11.3.1.3.

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3.14 Nonconforming Mix Production

If one or more of the preceding mix production tolerances are exceeded, the Engineer will order suspension of mix production until the Developer has demonstrated to the Engineer's satisfaction that corrective measures have been taken to produce a mix that meets requirements.

3.15 Barricades

Reflectorized barricades shall be provided at all dead end streets.

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4.0 CONCRETE WORK

4.1 Scope

- 4.1.1 This section refers to the requirements for all sidewalks, curbs and gutters, driveway aprons, parking pads, drainage swales, walkways and any other concrete structures required in residential developments. All concrete shall be placed to conform with the approved lines, grades and typical cross sections.

4.2 Material

- 4.2.1 Concrete for sidewalks, curbs and gutters, walkways and swales shall be 5.5% to 8% air entrained Portland Cement concrete and shall have a 28 day compressive strength of not less than 30 Mpa. Maximum size of coarse aggregate shall not exceed 28 mm.

- 4.2.2 Concrete aggregates shall conform to CAN3-A23.1M, latest revision thereof. Ironstone content in coarse aggregate shall not exceed 1.0% by mass of total coarse sample, and in fine aggregate down to what is retained on the 2500 micron sieve not to exceed 1.5% by mass of total fines sample, determined according to CAN3-A23.3M-15A, Petrographic Examination of Aggregates for Concrete.

- 4.2.3 Portland cement shall conform to CAN3-A5M, latest revision thereof. All concrete, whether being used for underground or surface improvements, shall be made with Type 50 Sulphate Resistant Cement.

- 4.2.4 An air entraining agent conforming to CAN3-A266.1M shall be added to all concrete in sufficient amounts to produce air entrainment between limits of 5.5% to 8%.

4.2.5 Fly Ash

- .1 Where permitted by the Engineer, fly ash shall conform to CAN3A23.5-M, pozzolan type C.
- .2 Not more than 10% of the specified minimum cement content may be replaced with fly ash.
- .3 After September 15, no portion of the specified minimum cement content may be replaced with fly ash.

- 4.2.6 To provide cold weather protection, calcium chloride conforming to A.S.T.M. D98 may be used with the Town's approval. The maximum amount permitted will be 2% by weight of cement.

4.2.7 Bar Reinforcement

Reinforcing bars shall conform to the following requirements:

- .1 Deformed and plain billet steel bars for concrete reinforcement - A.S.T.M. A615.
- .2 Rail - Steel deformed and plain bars for concrete reinforcement - A.S.T.M. A616.
- .3 Axle - Steel deformed and plain bars for concrete reinforcement - A.S.T.M. A617.

4.2.8 Wire Reinforcement

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Wire reinforcement shall conform to the following requirements:

- .1 Cold drawn steel wire for concrete reinforcement - A.S.T.M. A82.
- .2 Welded steel wire fabric for concrete reinforcement - A.S.T.M. A185 or CSA G30.5.
- 4.2.9 Curing compound shall be white pigmented, resin based, liquid membrane-forming compound and shall conform to A.S.T.M. C309, Type 2, class B.
- 4.2.10 Expansion joints shall conform to standard specifications for preformed expansion joint fillers for concrete - A.S.T.M. D1751.
- 4.2.11 Joint sealant shall conform to ASTM D1190, hot-poured elastic type. 4.2.12 Granular Levelling Course

Where granular levelling course is required and the required depth is less than 50 mm in compacted thickness, material for granular levelling course shall consist of sand crusher screenings or other approved material meeting the following gradation:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
19 mm	100
0.4 mm	20 - 60
0.08 mm	10 - 20

Where granular levelling course is required and the required depth is 50 mm or more in compacted thickness, material for granular levelling course shall consist of crushed gravel meeting the following gradation:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
19 mm	100
12.5 mm	60 - 92
5 mm	37 - 62
2 mm	26 - 44
0.4 mm	12 - 27
0.16 mm	7 - 18
0.080 mm	2 - 10

4.3 Mix Design

- 4.3.1 Concrete for curb, gutter and sidewalk shall meet the following requirements:

Maximum size of coarse aggregate	28 mm
Slump	40 - 80 mm
Entrained air content	6% - 8%

Concrete shall attain in 28 days the minimum compressive strength corresponding to the percent of entrained air in plastic concrete as follows:

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<u>% Air Content</u>	<u>28-Day Minimum Compressive Strength, MPa</u>
6.0	30
7.0	28
8.0 or more	26

Strength values may be interpolated for fractional air contents.

- 4.3.2 Unless otherwise approved by the Town, ready mix concrete shall be used for the work.
- 4.3.3 For concrete placed prior to September 30, the seven day test should give approximately 70% of the 28 day strength. Concrete placed after September 30 shall achieve the specified minimum 28-day strength in 7 days.
- 4.3.4 The mix design shall be carried out by an accredited testing agency possessing a permit to practice under the Engineering, Geological and Geophysical Professions Act of Alberta and shall be submitted to the Town for approval at least one week prior to commencement of work. A complete petrographic analysis of aggregate, also done by an accredited testing agency, shall be submitted together with the concrete mix design.

4.4 Placing of Concrete

- 4.4.1 The subgrade shall be compacted to a minimum density of 100% of Standard Proctor Density.
- 4.4.2 The surface of the subgrade or subbase shall be moistened before placing concrete to minimize absorption of water from deposited concrete. Do not create mud or let water pond.
- 4.4.3 Concrete shall be placed and vibrated to form curbs, gutters and sidewalks in accordance with the standard drawings.
- 4.4.4 Protect freshly placed concrete from premature drying, temperature extremes, adverse weather conditions, and physical disturbance according to Clause 21, CAN3-A23.1M, as supplemented below:

.1 Membrane Curing

Cure exposed concrete surfaces using specified curing compound applied with a pressurized spray nozzle. Cover entire exposed surface with an unbroken and uniform film at a rate depending on surface roughness but not less than 1 litre per 4 square metres of surface.

.2 Moist Curing

Moist curing shall be used only where specified or directed by the Engineer. After the concrete has set, maintain exposed surfaces continuously moist using wet burlap or polyethylene film in contact with the concrete for a minimum of 7 consecutive days after placing when normal or sulphate resistant cement is used, or a minimum of 3 consecutive days when high-early-strength cement is used.

- 4.4.5 Backfilling behind curb, gutter and sidewalk shall be carried out immediately following form removal and shall be compacted to a minimum of 95% of Standard Proctor Density.

Fill shall be placed to provide positive drainage to the street between the back of curb and the

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front edge of sidewalk and to a distance of not less than 1.5 m behind the sidewalk. Backsloping from the completed fill towards the lot shall be at a slope of not less than 3 horizontal to 1 vertical.

4.5 Concreting in Cold Weather

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

4.6 Sidewalks

- 4.6.1 Curb, gutter and separate sidewalks shall be installed on one side only of all local roadways excepting cul-de-sacs.

- 4.6.2 Where there is an existing or proposed walkway within the cul-de-sac, a sidewalk shall be provided on one side of the cul-de-sac for continuity. The sidewalk shall connect to the walkway.

Where there is no existing or proposed walkway:

- a) cul-de-sacs having 18 lots or less, no sidewalk shall be required;
- b) cul-de-sacs having more than 18 lots, separate sidewalk shall be provided on one side only;
- c) where a sidewalk is required, the sidewalk shall terminate at the throat of the bulb.

- 4.6.3 Where sidewalks are provided on one side of the street only, the preferred location for the sidewalk shall be on the north or west side of the roadway.

- 4.6.4 Separate sidewalks shall be provided on both sides of all collector and arterial roadways.

- 4.6.5 Minimum sidewalk width shall be 1.5 metres.

- 4.6.6 Minimum concrete depth for residential sidewalks shall be 125 mm.

- 4.6.7 All residential sidewalks, shall be reinforced with one 10 mm bar placed transversely across the sidewalk at 750 mm on centre.

- 4.6.8 Minimum concrete depth for lane or commercial crossings shall be 180 mm. Lane and commercial crossings shall be reinforced with 10 mm bars at 750 mm on centre each way in the slab portion, and with 2 - 15 mm bars placed longitudinally in the gutter section.

- 4.6.9 Wheelchair ramps shall be provided at all intersections, at walkways and at other locations as may be requested the Town. Wheelchair ramps shall be adequately reinforced and securely dowelled to the curb and gutter.

- 4.6.10 Maximum curb height through the wheelchair ramp shall be 10 mm.

4.7 Curb and Gutter

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4.7.1 Rolled face curb and gutter shall be constructed on both sides of all local streets. Vertical face curb and gutter shall be constructed on both sides of all collector and arterial streets, and on all roads fronting on to parks, public utility lots and walkways.

4.7.2 Vertical face curb and gutter shall be used around the curb returns at all street intersections. The transition from rolled face curb to vertical face shall be made prior to the beginning of the curb return and a reverse transition shall be made after the end of the curb return. The length of transition shall be 1.0 m.

4.7.3 Curb returns shall be steel reinforced, with a minimum of two (2) 15 mm bars.

4.8 Swales

4.8.1 Swales for surface drainage of carriageways shall not be permitted.

4.9 Driveways

4.9.1 The Developer shall ensure that all residential lots are provided with either a concrete or approved equal driveway. Minimum size of driveway pad shall be 3 m wide by 6 m long as measured within the confines of the residential lot. The interconnecting portion of the driveway with the street, including apron if any, shall be constructed as part of and in addition to the driveway.

4.9.2 No driveways shall be permitted to access directly on to an arterial roadway. Additionally, no driveways shall be permitted direct access on to major collector roadways having an estimated traffic volume of 4,000 vehicles per day or more. Trip generation rates used to generate traffic volumes shall be based on a minimum of 12 trips per dwelling per day external to the subdivision.

4.9.3 All driveways shall be constructed to provide a minimum clearance of 1.5 m from any structure including hydrants, light standards, service pedestals, curb cocks and transformers in accordance with the Street Hardware Plan.

4.9.4 No driveways nor any portion thereof shall be permitted to access an abutting road through a curb return.

4.9.5 For corner lots, the driveway zone must be indicated for the street of lesser traffic only.

4.9.6 Concrete used for driveway construction shall comply fully with the requirements of the Section 4.0 - Concrete Work.

4.10 Testing and Inspection

4.10.1 Slump and compressive strength tests shall be made for each 100 cubic metres of concrete placed or at least one test for each day of placing operation.

4.10.2 Sampling and testing shall be carried out in accordance with the following:

.1 Strength tests - Strength tests are defined in Clause 17.1, CAN3A23.1M. Methods shall be in accordance with CAN3-A23.2M-3C and 9C.

.2 Air Content - Air content test- shall be taken at the point of discharge of the middle third of concrete load with every strength test in accordance with CAN3-A23.2M-1C

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and 4C or 6C.

- .3 Slump - Slump tests shall be taken at the point of discharge of the middle third of concrete load with every strength test in accordance with CAN3-A23.2M-1C and 5C.

4.10.3 Copies of all concrete test results shall be provided to the Town within 48 hours of the test having been carried out.

4.10.4 Noncompliance

- .1 Strength tests

The result of each compressive strength test shall equal or exceed the specified minimum compressive strength.

The developer shall have the option, at his expense, to show evidence of strength by coring and testing according to CAN3A23.2M-14C performed by a quality control laboratory within 14 days after the failed cylinder test. Three cores shall be drilled from the hardened concrete at the location represented by the failed cylinder test. If the average strength of the three cores is equal to at least 85% of specified strength and no one core is less than 75% of specified strength, then the concrete specification will be considered met; otherwise, the concrete will be subject to the pay factor as set out in the following Table:

Concrete Strength Pay Factors

Cylinder Strength (% of Specified Strength)	Pay Factor (% of Contract Price)
97.0	100.0
96.0	99.2
95.0	98.2
94.0	96.9
93.0	95.4
92.0	93.6
91.0	91.7
90.0	89.4
89.0	86.7
88.0	83.5
87.0	79.7
86.0	75.5
85.0	70.0
Under 85.0	No Payment

If strength deficiencies persist, the Engineer shall also require changes in concrete mix design for the remainder of the work.

- .2 Air Content

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If tested air content is outside specified limits, the Engineer will require one of the following:

- .1 Air below 6.0% but not below 5.0%.

Concrete poured from the load shall be removed and the rest of the load shall be discarded. However, the Developer may elect at his own risk to pour the rest of the load, provided that within 10 days after placement, he shall submit proof that such load of concrete meets the spacing factor requirement as determined from an air-void examination done by a quality control laboratory according to Article 4.9.5 below, failing which the Developer shall remove all concrete from that load.

- .2 Air below 5.0%.

Concrete poured from the load shall be removed and the rest of the load shall be discarded.

- .3 Air above 8.0%.

Other than for exposed road associated works, concrete poured from the load shall be removed and the rest of the load discarded. For concrete used for exposed road associated works, concrete will be accepted if the strength specified in Article 4.3.1. is met.

- .3 Slump

For any load of concrete, if the measured slump is outside the specified limits, a check test is taken on another portion of the load, or retest is done if retempering with water is permitted by the Engineer. If the second test fails, the Engineer may reject that load of concrete and order removal of portion already poured.

4.10.5 Air-Void Examination

Air-void examination, where required, shall be carried out in accordance with ASTM C457, modified point-count traverse method at 60X magnification.

A 100 mm diameter core sample shall be recovered by drilling from hardened concrete within each portion of pour in question. The top of the core shall be ground to 2 mm plus or minus 0.5 mm below and parallel to the finished concrete surface texture to produce a surface suitable for microscopic examination.

If the spacing factor obtained by a full traverse of the cross section of the single core is greater than 0.20 mm, concrete represented by the core shall be removed and replaced.

4.11 Contraction Joints

- 4.11.1 Contraction joints shall be utilized to control the formation of shrinkage cracks in the hardening concrete, and shall be constructed to the specified dimensions, spacing and arrangement by any of the following methods:

- .1 Sawed Joints

The groove shall be sawed early enough after the concrete is set to prevent

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uncontrolled cracking, but not so soon as to displace aggregate from the edges to the cut. The joint shall be sealed with the specified joint sealer.

.2 Formed Joints

The groove shall be formed by inserting into the plastic concrete a metal or fibre strip, or polyethylene film. The edges shall be finished to a 6 mm radius. The insert shall be removed as soon as the initial set of concrete has taken place. The joint shall be sealed with the specified joint sealer.

.3 Tooled Joints

The joint shall be hand-formed using a jointing tool with a thin metal blade, to impress a plane of weakness into the plastic concrete. The edges shall be finished to a 6 mm radius.

4.12 Joints

4.12.1 Construct joint as required in each type of construction to the following standards as applicable.

4.12.2 Crack control joints intended to control location of shrinkage cracks in hardening concrete: construct to indicated dimensions, spacing, and pattern by any of the following methods:

.1 Formed Joint

Form the groove by inserting in plastic concrete, a metal or fibre strip, or polyethylene film. Finish edges to a 6 mm radius. Remove the insert immediately after initial set of concrete. Seal joint with specified sealant.

.2 Tooled Joint

Hand form the groove using a jointing tool with a thin metal blade to impress a plane of weakness into the plastic concrete. Finish edges to a 6 mm radius. Apply specified joint sealant.

.3 Sawed Joint

Cut the groove with a concrete saw as soon as the concrete surface has hardened sufficiently to resist raveling as the cut is made, and before shrinkage cracks form in the concrete.

4.12.3 An isolation joint shall be provided where concrete is placed adjacent to an immovable structure or where otherwise required by the Engineer. The joint shall be constructed by sawing or forming to create a clean break through the full cross section of the concrete member. The joint shall be made sufficiently wide to permit a snug fit for preformed joint filler. Alternatively, the preformed filler shall be placed against the structure and the concrete poured against the filler.

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4.12.4 A construction joint shall be made between concrete pours or where new work abuts to existing work. The joint shall be constructed with a keyway, dowels or a tie bar. Finish edges to a 6 mm radius. Trim abutting existing concrete vertical by sawing at least 50 mm deep and breaking.

4.12.5 Joints in Concrete Pavement and Concrete Base

Crack control joints shall be provided in concrete pavements by sawcutting at 6 metre maximum spacing. Isolation joints and construction joints shall be provided as detailed in Articles 4.12.3 and 4.12.4.

4.12.6 Crack control joints shall be provided in accordance with Article 4.12.2, supplemented as follows:

.1 Joint Size

Joints shall be 3 to 5 mm wide at the following depths:

For curb and gutter - 50 mm minimum, to a maximum 25% of gutter depth.

For walk and slabs - 25 mm minimum, to a maximum 25% of slab thickness.

.2 Joint Spacing

Maximum separation between joints shall be 3 metres.

4.12.7 Surface Dummy Joints

Surface dummy joints shall be constructed 5 mm wide by 10 mm deep, centred between contraction joints across walks and slabs.

In monolithic construction, place surface joints across the walk portion and contraction joints on curb and gutter, both joints being on the same line.

Where required, a longitudinal surface joint shall be placed on walk and slabs continuing on through lané crossings and driveways.

4.12.8 Transverse Construction Joints

Transverse construction joints shall be placed in accordance with Article 4.12.4, supplemented as follows:

.1 Tie Bars

10M deformed tie bars shall be used, spaced at 300 mm and extending 300 mm minimum into both sides of the joint.

.2 Joint Spacing

Joint spacing near the end of the concrete pour shall be varied as follows:

- .1 If the concrete pour ends within 300 mm of a required joint location, the spacing of the last two joints shall be averaged.

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- .2 If the concrete pour ends within 800 mm of a required joint location, average the spacing of the last three joints.

4.12.9 Longitudinal Construction Joints

Longitudinal construction joints shall be placed in accordance with Article 4.12.4, supplemented as follows:

- .1 Tie Bars

10M deformed tie bars shall be used, spaced at 1 m and extending 300 mm minimum into both sides of the joint.

4.12.10 Joints Abutting Existing Curb

Where new concrete abuts an existing curb, a slot 10 mm wide by 30 mm deep shall be formed between the back of curb and walk or slab.

The slot shall be filled with the specified joint sealant.

4.12.11 Isolation Joints

Isolation joints shall be constructed in accordance with Article 4.12.3.

4.13 Tolerances

4.13.1 Walk or Slab Surfaces

Maximum variation under 3 metre straightedge: 6 mm.

Maximum variation from walk crossfall: $\pm 1\%$, provided the finished crossfall is not less than 1% nor more than 4%.

4.13.2 Grade of Gutter Lip and Walk/Slab

Maximum variation from designated elevation at any station as established from the survey stake shall be ± 6 mm.

Maximum variation from the difference in designated elevations between two consecutive stations as established from survey stakes shall not exceed ± 12 mm., provided there is positive drainage in the designated direction.

4.13.3 Lip of Gutter Alignment

Maximum deviation shall not exceed ± 12 mm in 30 metres.

4.13.4 Should any of the above tolerances be exceeded, the concrete work in question shall be removed and replaced.

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4.13.5 Walk or Crossing Thickness

At the Engineer's request, the quality assurance laboratory shall take one or more sets of cores from suspect concrete walk or crossing, each set comprising 3 cores whose average thickness represents not more than 500 m² of concrete walk or crossing.

If the average core thickness is deficient, that area will be assessed a pay factor according to the following Table:

Concrete Walk/ Crossing Thickness Pay Factors

Thickness Deficiency (mm)	Pay Factor (% of Contract Price)
6	100.0
7	97.0
8	93.7
9	90.0
10	85.8
11	80.5
12	75.0
13	68.0
14	60.0
15	50.0
Over 15	Remove and replace.

Concrete walk or crossing with excess thickness may be accepted if surface and grade tolerances are met.

4.14 Rejected Concrete Work

Remove and replace rejected concrete work by full segments or slabs between crack control or construction joints.

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5.0 LOT GRADING

5.1 Standards

- 5.1.1 Lots shall be graded in accordance with the recommendations of Central Mortgage and Housing Corporation.
- 5.1.2 Details of typical lot grading standards are included in the Standard Drawings Section of this Standard.

5.2 Plan

- 5.2.1 The Developer shall submit to the Town an overall plan of the area to be developed on which shall be indicated the following information:
 - .1 All existing and proposed lot numbers and blocks.
 - .2 All existing contours.
 - .3 Proposed elevations at all lot corners and proposed house elevations.
 - .4 All major drainage flow directions, ponding areas and extent of ponding.
 - .5 Proposed road grade indicating direction of slope.
 - .6 Invert of sanitary sewer service at property line.
 - .7 Proposed or existing elevations along boundary of subdivision and flow patterns.
 - .8 Typical details of the various types of lot grading used in the design. Reference shall be made to each lot for the applicable typical detail. Each sheet of Lot Grading Plan shall show typical details.

5.3 Retaining Walls

- 5.3.1 Where extremes in elevation of abutting lots requires the construction of a retaining wall, such shall be indicated on the plan and no building permit will be issued without a commitment by either owner of the two lots involved to construct such retaining wall at the time of construction of the proposed home.

5.4 Design

- 5.4.1 The following items are to be considered during lot grading design:
 - .1 In general, lot grading plans shall be prepared such that back-to-front drainage is provided throughout the subdivision.
 - .2 Split drainage, or front-to-back drainage (through drainage), will be allowed only when the lot is located such that there is a road, lane, public right-of-way or stormwater management facility at both the front and back of the lot.
 - .3 Drainage flows shall be directed away from houses. When flows are to be carried around the house, it must be in a defined grade.
 - .4 Minimum slope away from the foundation shall be 10% for the first 2 metres.
 - .5 Yard surfaces shall have a minimum slope of 2.0%, with positive drainage from all points within the property. The minimum grade should normally be exceeded unless topography dictates.
 - .6 A common swale shall be formed at adjoining property lines. The minimum grade along the swale shall be 2%.

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5.5 Swales

5.5.1 A swale is any land requirement where drainage flows from one property through two others. Swales for drainage control are not permitted unless proper justification can be documented that no other alternative is available. If the Town Engineer approves a swale, it shall be either:

- .1 A concrete gutter at the rear of all laneless lots on an easement to the satisfaction of the Town Engineer.
- .2 A fenced and grassed swale arrangement on a 2 metre easement to the satisfaction of the Town Engineer. All drainage easements shall be issued in the name of the Town of Morinville.

5.5.2 The minimum allowable grade on a grassed swale shall be two percent (2 %). Where the available slope is less than two percent, the swale shall be of concrete construction. Concrete swales shall be continuously reinforced using 2 - 15 mm bars placed longitudinally along the swale.

5.5.3 The construction of any swale shall be completed to the satisfaction of the Town Engineer and in accordance with approved plans prior to Final Acceptance Certificate issuance for surface improvements.

5.6 Lot Grading Caveat

5.6.1 The Developer shall register a lot grading caveat against all lots within the subdivision prior to Final Acceptance Certificate issuance for surface improvements.

5.7 Implementation

5.7.1 All houses shall be constructed such that all downspouts discharge on to a 1800 mm x 600 mm splash pad. The downspout shall be permanently affixed to the foundation wall and shall discharge not less than 1.5 metres from the foundation.

5.7.2 The Developer shall ensure that all lots are graded in accordance with the approved lot grading plan. Maximum allowable tolerance to finished grade shall be plus 0.00 to minus 0.10 metres.

5.7.3 The Developer must provide to all builders and home owners a pamphlet outlining the purpose and function of lot grading and the splash pad. The pamphlet should indicate that changes in lot grading, house elevations, splash pads or downspout discharge to the splash pads may result in basement flooding, increased sanitary flows and in the possibility of civil action if the drainage is altered in a detrimental way.

5.8 Certification of As-Built Grades

5.8.1 Lot grading certificates shall be submitted in the form as shown in Appendix B - Typical Details, Drawing No. 7.02 entitled "Certification of As-Built Grades".

5.8.2 A minimum of two intermediate elevations shall be provided along the sides of the property, in addition to lot corner elevations. As-built elevations shall be measured on completion of final grading of topsoil or following placement of sod.

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- 5.8.3 The lot grading certificate shall be submitted to the Town by the Developer who, in accordance with Article 5.7.2, shall confirm to the Town by covering letter that the as-built grades shown on the lot grading certificate comply or are within the acceptable tolerances of the approved lot grading plan and that the grades have been reviewed by and are acceptable to the Developer.
- 5.8.4 Within fourteen (14) days of submission, the Town shall review the lot grading certificate and shall advise the Developer of the acceptance or rejection of the lot grading certificate. In the event of a rejection of a lot grading certificate, within thirty (30) days of the date of the notice of rejection, the Developer shall re-work the lot grading and shall submit a revised lot grading certificate to the Town for approval.
- 5.8.5 The Developer shall submit lot grading certificates and shall receive approval from the Town for every lot within the subdivision prior to release of the Final Acceptance Certificate for landscaping and fencing.
- 5.8.5 In the event of a delay in the development of one or more lots such that there will be an extended delay in the issuance of the Final Acceptance Certificate for fencing and landscaping, the Developer may apply to the Town to allow posting of a bond or irrevocable letter of credit in favour of the Town as alternate security against the subsequent submission of the final lot grading certificates. The amount of security required per lot shall be determined by the Town.

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6.0 UTILITY TRENCHES

6.1 General

- 6.1.1 The developer shall make all necessary excavations and shall be entirely responsible for the adequacy of trench and tunnel supports, for any resulting ground subsidence, and for the method of excavation and water control.
- 6.1.2 In all operations, care shall be exercised to avoid damage to, or obstruction of, existing drainage facilities and water courses. If damaged or obstructed, they shall immediately be restored to their original condition.
- 6.1.3 To protect persons from injury and to avoid property damage, adequate fences, barricades, construction signs, torches, lanterns, and guards as required shall be placed and maintained during the progress of the construction work until it is safe for normal traffic or use of land to be resumed. Whenever required, flagmen and/or watchmen shall be provided to prevent accidents.

6.2 Locations

- 6.2.1 Trench alignments for the various utilities shall conform with alignments shown in the Roadway Cross Section Standard Drawings.

6.3 Trench Bottom Conditions

- 6.3.1 Trenches shall be maintained such that pipe can be installed without getting water, mud, silt, gravel or other foreign material into the pipe.
- 6.3.2 Material remaining in the trench bottom on completion of machine excavating which has been disturbed or softened by workmen or trench water shall be removed before bedding material is placed.
- 6.3.3 The trench bottom shall be firm and capable of supporting the pipe to be installed, otherwise the bottom shall be stabilized by means of overexcavation or special foundation designed to support the pipe as hereinafter described.
- 6.3.4 When the material in the trench bottom is unstable or otherwise unsuitable for pipe support or the support of appurtenant structures, a foundation for the pipe must be constructed in accordance with approved plans prepared by a professional Engineer.
- 6.3.5 Bedding material, as specified for normal pipe bedding, may be employed for this purpose, if suitable, to a maximum depth of 300 mm below the normal depth of bedding.

6.4 Backfill Within the Pipe Zone

- 6.4.1 The pipe zone is defined as that portion of the trench between the bottom level of the pipe bedding and a level 300 mm above the top of the installed pipe.
- 6.4.2 Prior to installing the pipe, bedding material shall be placed in the trench bottom and compacted to grade by approved hand operated mechanical tampers to form a firm pipe base.

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6.4.3 Bedding material to be placed in the pipe zone shall be a fine granular material composed of clean, hard sand or a clean well-graded gravel free from organic matter and shall meet the following requirements:

- .1 no less than 95% by weight passing the 5,000 sieve;
- .2 no more than 10% by weight passing the 63 sieve;
- .3 the liquid limit shall not exceed 25; and,
- .4 the plasticity index shall not exceed 6.

6.4.4 This material shall cover the full width of the trench bottom to a compacted depth as shown on Drawing No. 3.01 - "Types of Trench Bedding" in Appendix B - Typical Details.

6.4.5 Bell or coupling holes shall then be dug such that the full barrel of the pipe is supported throughout its length by the bedding material.

6.4.6 After the pipe is in position, bedding material shall be placed around the pipe to a level 300 mm above the top of the pipe. This material shall be compacted in lifts, each having a maximum compacted depth of 150 mm, by using approved hand operated mechanical tampers.

6.4.7 All material in the pipe zone shall be compacted to not less than 95% of Standard Proctor Density, at optimum moisture content.

6.4.8 Where strength requirements dictate, concrete shall be used to provide Class "A" bedding. Concrete used for Class "A" bedding shall have a twenty-eight day strength of not less than 25 MPa..

6.4.9 Where concrete bedding is used, concrete shall be placed as shown on Drawing No. 3.01 - "Types of Trench Bedding" in Appendix B - Typical Details.

6.4.10 Concrete used for Class "A" bedding shall be manufactured using Type 50 Sulphate Resistant Cement and shall meet all of the requirements of Section 4.0 - Concrete Work.

6.5 Backfill Above the Pipe Zone

6.5.1 All trenches excavated within the development area shall be compacted during backfilling.

6.5.2 The Developer shall engage an independent soils consultant to conduct tests and make recommendations on the degree of compaction required for the various classes of trench backfill.

6.5.3 The minimum level of trench compaction that shall be accepted by the Town shall be:

- .1 For utility trenches not underlying proposed surface improvements:

Trenches shall be backfilled with suitable native materials placed in lifts not exceeding 300 mm in uncompacted thickness. Compaction shall be carried out to achieve not less than 97% of a One Point Proctor Density.

The moisture content of the backfill material shall not exceed 25%.

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- .2 For utility trenches underlying proposed surface improvements:

Trenches shall be backfilled with suitable native materials placed in lifts not exceeding 200 mm in uncompacted thickness. Compaction shall be carried out at or near optimum moisture content to achieve not less than 95% of a Standard Proctor Density, to within 1.5 m of final grade.

Within the uppermost 1.5 m of trench: below subgrade level, compaction shall be carried out to achieve not less than 98% of a Standard Proctor Density; from subgrade level and above, compaction shall be carried out to achieve not less than 100% of a Standard Proctor Density. Lifts shall not exceed 200 mm in uncompacted thickness.

- .3 Utility trenches shall be considered as underlying proposed surface improvements when the edge of the trench or excavation is closer than one (1) metre to the back edge of the sidewalk or curb or other form of surface improvement.

6.5.4 Material that has undergone extreme changes in moisture content during the period between excavation and backfilling operations shall not be used as backfill until the moisture content has been adjusted to satisfactory limits.

6.5.5 Plan backfilling operations to minimize exposure of backfill material to frost. Frozen material shall not be used as backfill.

6.5.6 The allowable tolerances for the moisture content of backfill shall not exceed 3% wet, nor less than 1% dry, of optimum moisture content.

6.6 Street and Road Crossing

6.6.1 Crossings of existing roadways shall be made using augering methods only unless written approval for other methods of construction is given by the Public Works Department.

6.6.2 Where such approval is given, any open cut crossings of paved roadways and all trenches or excavations located such that the edge of the trench or excavation is closer than one (1) metre to the back edge of the sidewalk or curb, shall be backfilled in accordance with the following:

.1 From 1.2 metres below finished grade and below, trenches shall be backfilled using selected native material compacted to not less than 95% of Standard Proctor Density. Lift thickness shall not exceed 200 mm in uncompacted thickness.

.2 For the uppermost 1.2 metres, the road structure shall be restored to not less than the original structures and condition. That portion of the trench underlying the road structure and extending to the 1.2 metre depth shall be backfilled with "Fillcrete".

6.7 Backfilling Alternatives

6.7.1 The Town may consider alternative proposals from a professional geotechnical engineer to use special materials or methods that will achieve long term stability of trench backfill. Only alternatives accepted by the Town shall be used.

6.8 Crossing of Other Utilities

6.8.1 Where water, sanitary or storm mains cross, the water main shall cross over the sanitary or storm main wherever possible.

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6.8.2 Special precautions shall be taken to ensure that pipes are properly supported through the crossing area. A special foundation shall be provided from undisturbed ground to the bottom of the pipe zone. This foundation shall consist of bulk concrete, fillcrete, special pre-cast pipe bridge or similar support. Details of the proposed pipe support methods shall be included with the detail design drawings that are submitted to the Town for approval.

6.8.3 Where possible, pipe joints shall not be located within the disturbed area of the crossing.

6.9 Testing Frequency

6.9.1 Trench More Than 15 m in Length:

A minimum of two density tests per 600 mm of trench depth per 100 m of trench length. The tests shall be representative of the entire length, width and depth of trench backfill, including around catch basins, manholes, valves and service connections.

6.9.2 Trench Less Than 15 m in Length:

A minimum of three density tests evenly spaced through the depth of the trench.

6.9.3 Service Trenches:

A minimum of three density tests evenly spaced through the depth of the trench.

6.10 Lift Thickness

6.10.1 During the initial start up of the project, the Developer's engineer and the soils consultant shall review the Contractor's operations to satisfy themselves that lift thicknesses are in accordance with the tolerances set out in Articles 6.5 and 6.6 and that the compaction requirements are being met.

6.11 Failed Tests

6.11.1 Where testing indicates that the required standards have not been met, the deficient areas shall be re-worked and subsequently retested on either side of the failed test until the standards have been met.

6.11.2 Subsequent phases of the work shall not be commenced until the Town has received satisfactory results on re-tests.

6.12 Submission of Test Results to the Town

6.12.1 Copies of all compaction test results shall be provided to the Town within 48 hours of the test having been carried out.

6.12.2 Failure to submit compaction or other tests results promptly to the Town shall be deemed sufficient reason for the Town to issue a Stop Work Order to the Developer of the project.

6.12.3 Any Stop Work Order issued shall remain in effect until such time as the test results have been submitted to and approved by the Town.

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7.0 WATER DISTRIBUTION SYSTEM

7.1 General

- 7.1.1 In no case shall any person other than Town Public Works personnel operate any existing water valve.
- 7.1.2 All work shall be arranged so that there will be a minimum of interruption in water services. In cases where it will be necessary to interrupt domestic water services, the Town office and all affected residents must be notified not less than forty-eight (48) hours in advance, and immediately when service is restored.
- 7.1.3 Approval shall be obtained from the Town to use the Town's water distribution system during construction. Access to the existing Town system shall be through a temporary metered bypass. The first permanent valve from the existing water main to the new water main shall, in each case, be sealed closed and shall only be operated by the Town. Prior to commissioning, the meter(s) and the bypass shall be removed.

7.2 Design

- 7.2.1 The water distribution system shall be designed in accordance with these recommended standards and those of the design manual of the American Water Works Association (AWWA). The system shall be designed as part of the overall or ultimate Town system for peak day consumption plus fire flows. Velocities at maximum flow shall not exceed 1.5 metres per second.

Design criteria to be used shall be as follows:

.1 Average Day Demand:

Residential	=	360 litres per capita per day
Commercial	=	22,500 litres per hectare per day
Industrial	=	16,875 litres per hectare per day

.2 Fire Flows:

Residential	=	115 litres per second
Commercial	=	250 litres per second

.3 Peaking Factors:

Peak Day = 2 x Average Day
Peak Hour = 2 x Peak Day, or 4 x Average Day

- 7.2.2 The waterworks system shall be designed to meet the Insurance Bureau of Canada recommended practice. See "Water Supply for Public Fire Protection, A Guide to Recommended Practice" as published by the Public Fire Protection Survey Services as directed by the Insurance Bureau of Canada.
- 7.2.3 The minimum residual pressure in the system shall be 280 kPa except at the hydrant used to fight the fire where the residual pressure shall be a minimum of 140 Kpa.

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- 7.2.4 Where the size of the area to be developed warrants, or if required by the Town, a network analysis shall be carried out and all relevant information shall be submitted with the design documents.
- 7.2.5 Water distribution and transmission systems in new development areas shall be looped. For the initial purely residential stages, the Town's Engineer may temporarily waive this requirement provided that the Developer can demonstrate that adequate fire flows can be achieved through the single water feed.
- 7.2.6 A maximum of 50 lots may be serviced on a temporary basis from a single water feed. Completion of the looped system shall be made within two years of the date of installation of the initial single water feed.
- 7.2.7 In cul-de-sacs, distribution lines shall be looped except those servicing single residence cul-de-sacs having 21 or fewer houses.

7.3 Water Mains

- 7.3.1 For mains servicing 12 or fewer lots, minimum size of main shall be 150 mm diameter.
- 7.3.2 For mains serving more than 12 lots, minimum size of 200 mm.
- 7.3.3 For commercial/industrial development, minimum main size shall be 300 mm.
- 7.3.4 Minimum size of 150 mm for hydrant leads.
- 7.3.5 Main sizes will be increased as considered necessary by the Town to accommodate future development.
- 7.3.6 Piping material for use in the water distribution system shall be PVC Pipe, DR 18, Class 1035 (150), conforming to AWWA C900, with bell and spigot ends. Alternate piping materials, such as ductile iron or steel, may be considered for use on 300 mm or larger mains, subject to the approval of the Town Engineer.
- 7.3.7 All mains shall be installed to a minimum depth of 2.75 metres of cover below final finished grade.
- 7.3.8 Mains shall be located within the road right-of-way in accordance with the Roadway Cross Section Standard Drawings.
- 7.3.9 In all cases a minimum distance of 1.5 metres from the watermain to the curb or property line shall be maintained.
- 7.3.10 A minimum of 2.5 metres horizontal separation shall be maintained between a water main and any sewer main.
- 7.3.11 At water main crossings of sanitary or storm sewer mains, normally the water main shall be installed above the sewer main with sufficient clearance to allow for proper structural support of the water main and the sewer main.

Where water mains must pass under a sewer main, the minimum clearance shall be 0.5 m measured from the crown of the water main to the underside of the sewer main and the sewer main shall be structurally supported across the full width of the crossing to prevent settling.

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7.4 Fittings

- 7.4.1 Water main fittings shall be Cast Iron, Ductile Iron or PVC Injection Moulded Fittings.
- 7.4.2 Cast Iron and Ductile Iron fittings shall conform to AWWA C110, latest edition thereof. Fittings shall have bell ends and shall be supplied complete with vulcanized synthetic rubber gaskets conforming to AWWA C111 Standards. The exterior of all fittings shall be factory coated with an asphaltic coating or a fusion bonded, epoxy coating conforming to AWWA C213. All fittings shall have a sacrificial zinc anode for corrosion protection.
- 7.4.3 PVC Injection Moulded fittings, sizes 100 mm to 200 mm, Class 150, shall conform to AWWA C907 and CSA B137.2. Fittings shall be supplied with jointless elastomeric gaskets. All gaskets for PVC fittings shall be of a pressure actuated seal design. PVC extruded fittings, sizes 250 mm to 400 mm, shall be Class 150, DR18, conforming to AWWA C900 and CSA B137.3.

7.5 Hydrants

- 7.5.1 Maximum spacing between hydrants measured along curb lines shall be 150 metres in residential areas and 90 metres in multiple family residential, school or industrial/commercial areas.
- 7.5.2 Hydrants shall be located at the projection of the property lines at mid-block and shall conform with the sidewalk and/or the curb and gutter design. At curb returns, hydrants shall be placed in line with the side yard corner cutoff wherever possible.
- 7.5.3 Each hydrants shall have an isolating gate valve on a 150 mm lead.
- 7.5.4 Hydrants shall be set not less than 1.0 metre clear of curb lines and 150 mm clear of the sidewalk.
- 7.5.5 Hydrants shall conform to A.W.W.A. Specification C502, and shall be Canada Valve "Darling" complete with:
- .1 Two (2) 63 mm Hose nozzles.
 - .2 One (1) 100 mm ~~Steel~~ connection.
 - .3 Threads on hose and pumper connection to be standard A.M.A. thread.
 - .4 Compression type shut off.
 - .5 Four section breakaway flange.
 - .6 Designed for working pressure of 1033 Kpa.
 - .7 Minimum distance from flange to bonnet of 600 mm.
 - .8 Drain outlet that can be plugged or unplugged from the interior of the hydrant. Drain outlet to be left plugged.
 - .9 Operating nuts to be 3-sided to match the shape of existing operating nuts in use in the Town.
- 7.5.6 Hydrants shall be set plumb and such that the pumper nozzle faces and is at right angles to the road centreline. Hydrants shall be set with the ground flange 50 mm above finished ground.
- 7.5.7 Care shall be taken to ensure that concrete for thrust blocking does not interfere with the operation of flange bolts and nuts or prevent proper operation of hydrant drains.
- 7.5.8 Bolts and nuts on the hydrant that are intended for buried underground service shall be manufactured from 18-8-3 type 316 stainless steel.

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- 7.5.9 All new hydrants installed shall be painted to conform with the current hydrant painting scheme of the Town.
- 7.5.10 The Developer shall complete a Hydrant Report form for each hydrant installed on the project. A Hydrant Report Form is included as Drawing No. 3.07 in Appendix B - Typical Details.
- 7.5.11 Completed hydrant report forms with As-Built information shall be completed and the originals filed with the Town within 6 months of the date of issuance of the Construction Completion Certificate, or prior to first occupancy within the development, whichever shall first occur.

7.6 Valves

- 7.6.1 Gate valves shall conform to A.W.W.A. Specification C500, latest revision thereof.
- 7.6.2 Valves shall be the same size as the main they are installed on.
- 7.6.3 A sufficient number of valves shall be provided so that no more than three (3) valves must be closed to isolate any one section of water main, no more than 21 lots will be out of service due to service interruption, and no more than one hydrant is taken out of service.
- 7.6.4 Valves shall be iron body, bronze mounted gate valves with a nonrising spindle, to open by turning in a counter-clockwise direction. All nuts and bolts on the valve that are subject to buried underground service shall be manufactured from 18-8-3 type 316 stainless steel.
- 7.6.5 Valve boxes, operating stem and nut are required on all valves. Valve boxes shall be a two section, adjustable type with the upper section being cast iron complete with a cast iron lid, Norwood Foundry Type "A". The lower section shall be either cast iron or PVC, suitable for use in conjunction with the cast iron upper section. Where a PVC lower section is used, it shall have a minimum 7 mm wall thickness, equal to Schedule 40. The internal spindle shall extend within 300 mm of the finished final surface and shall include a rock disc. Valve boxes shall be of sufficient length to provide for vertical adjustments of 300 mm in either direction. Valve box extensions shall be cast iron suitable for use with the valve box to be installed.
- 7.6.6 Valves on the distribution main shall be installed:
 - .1 at the projection of the property line at mid-block.
 - .2 at the projection of the property lines at intersections.
- 7.6.7 Maximum length of a dead end line shall be 120 m. All dead end lines shall have a 50 mm copper blow off valve installed at the end of the line.
- 7.6.8 Valve boxes outside of the limits of the roadway shall be set flush to finished grade. Where valve boxes are within the roadway, valve boxes shall be adjusted to be 5 to 10 millimetres below the finished road surface.
- 7.6.9 Cast iron pavement extension rings will not be acceptable for final adjustment.

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7.6.10 The Developer shall complete a Valve Report form for each valve installed on the project. A Valve Report Form is included as Drawing No. 3.08 in Appendix B - Typical Details.

7.6.11 Completed valve report forms with As-Built information shall be completed and the originals filed with the Town within 6 months of the date of issuance of the Construction Completion Certificate, or prior to first occupancy within the development, whichever shall first occur.

7.7 Disinfection

7.7.1 All watermains shall be disinfected in accordance with A.W.W.A. Specification C651, latest revision thereof, using the continuous feed method.

7.7.2 Prior to initial acceptance of the water system and the system being placed in to service, bacteriological testing of the system shall be completed and satisfactory test results shall be achieved. Copies of the test results shall be provided to the Town prior to the system being placed in to service.

7.7.3 Under Alberta Environmental Protection standards, super chlorinated water shall not be discharged to a storm sewer or open body of water. Dechlorination will be required before discharge to the environment.

7.8 Leakage Testing

7.8.1 All watermains shall be hydrostatically tested in accordance with A.W.W.A. C603, latest revision thereof.

7.8.2 The pressure test shall be conducted in the presence of the Town's Engineer. The Developer shall be responsible to arrange for the pressure testing including the supply of all labour, materials and equipment for the test. The Developer shall give a minimum 24 hours notice to the Town Engineer of the date and time of the test.

7.8.2 Test pressure shall be 1035 kPa.

7.8.3 Test duration shall be not less than 2 hours.

7.8.4 For P.V.C. pipe, the overall leakage for the section of line tested shall not exceed the rate of leakage specified in Table 1.

Table 1

Maximum Allowable Leakage For P.V.C. Pipe (litres /100 joints/hour)

	kPa	345	515	690	860	1035	1380	1550	1724
	PSI	50	75	100	125	150	200	225	250
<u>Pipe Dia.</u>									
150 mm		2.17	2.65	3.07	3.43	3.76	4.34	4.60	4.82
200 mm		2.90	3.54	4.09	4.57	5.02	5.79	6.14	6.46
250 mm		3.62	4.42	5.12	5.71	6.27	7.34	7.67	8.10
300 mm		4.34	5.30	6.14	6.86	7.52	8.69	9.20	9.72
350 mm		5.07	6.19	7.16	8.00	8.77	10.13	10.74	11.34
400 mm		5.79	7.07	8.19	9.14	10.03	11.58	12.27	12.95
450 mm		6.51	7.96	9.21	10.28	11.28	13.03	13.80	14.55

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7.9 Thrust Blocking

7.9.1 Concrete thrust blocking is to be provided at all fittings, valves, and hydrants and shall be designed for pressure equal to the design of the pipe.

7.10 Corrosion Protection

7.10.1 Coatings

- .1 All buried cast iron fittings, valves and hydrants shall be asphaltic coated.
- .2 Primer and tape products shall bear the manufacturer's name and product number.
- .3 Tape materials shall have a minimum thickness of 0.890 mm (35 mils) and shall be wrapped with an overlap to provide for a double layer of tape.
- .4 The following elements in the water distribution system shall be field coated and wrapped, and damaged factory applied coating shall be repaired with materials listed in a manner specified:

.1 Couplings and Flanged Joints

<u>Primer</u>	<u>Tape</u>
Royston 747	Greenline Accessory
Renfrew 327	Renfrew 303-35
Denso Paste	Densol
Polyken 927	Polyken 932

.2 Repairs to Tape Wrap, Coal Tar or Epoxy Coatings

<u>Primer</u>	<u>Tape</u>
Royston 747	Greenline Accessory
Renfrew 327	Renfrew 303-35
Polyken 927	Polyken 932

.3 Cathodic Protection Wire Connections

Royston 747 Primer with Handycap 2, or approved equivalent.

7.10.2 Cathodic Protection

.1 General

Where connection is made to existing steel, cast iron or ductile iron pipe, at least two 7.7 kg magnesium anodes shall be attached to the existing metal pipe at point of connection.

.2 Cathodic Protection for Buried Fittings

All buried fittings and valves shall be cathodically protected with 2.3 kg zinc anodes and all hydrants shall be cathodically protected with a 5.5 kg zinc anode as per Standard Drawing No.'s 48 and 49.

Zinc anodes shall be supplied as specified below:

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- .1 Zinc anodes shall conform to ASTM B418-73 Type II and shall have the following composition:

Aluminum	0.005% maximum
Cadmium	0.003%
Iron	0.001%
Zinc	remainder

- .2 Lead wire No. 10AWG/7, 2 metres long.

- .3 Anodes shall be packed in a permeable cloth bag or cardboard chip type tube containing the anode and backfill material, consisting of:

Ground Hydrated Gypsum	75%
Powdered Wyoming Bentonite	20%
Anhydrous Sodium Sulphate	5%

Grain size limiters are:

100% passing the 850 x 10⁻⁶ m sieve size, and
50% or more retained by the 150 x 10⁻⁶ m sieve size.

- .4 The mixture shall be firmly packaged around the anode by means of adequate vibration. Backfill material should be of sufficient quantity to cover all parts of the anode to a minimum thickness of 25 x 10⁻⁶ metres.
- .5 Anodes packed in cloth bags shall be shipped in a plastic or heavy paper bag of sufficient thickness to permit normal handling without tearing.
- .6 The plastic shipping container is to be removed prior to installation. Anodes shall carry a label identifying the manufacturer, type of anode, metal and backfill composition, and the net weight of the anode.
- .7 Wires shall be connected to fittings with a Cadweld.
- .8 A minimum of 2 litres of water shall be poured on each 2.3 kg anode and 3 litres on 5.5 kg anode to initiate the anode's operation. An alternative is to soak the above anodes in water for a minimum of 10 minutes.

- .3 Exterior Bolts on Valves, Hydrants and Couplings

All exterior bolts on valves, hydrants and couplings shall be Stainless Steel 304 or approved equivalent.

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8.0 SANITARY SEWAGE SYSTEM

8.1 General

8.1.1 In the sewer system, the first new manhole upstream from the existing system shall, in each case, be plugged to prevent flows from entering the existing system. These manholes shall be constructed such as to prevent foreign materials (soils, debris, etc.) from entering the Town's existing system during construction, cleanup, and testing procedures.

8.1.2 The system shall be completely flushed prior to use. Subject to the approval of the Town, and in accordance with Article 7.1.3, water for flushing may be supplied through existing fire hydrants.

8.2 Design Criteria

8.2.1 Sewage contribution is to be designed on the density basis of either the subdivision design population density or 40 persons per hectare, whichever is greater, plus all future contributing areas.

8.2.2 The sewer main capacity shall be designed to convey the peak hourly sewage contribution plus infiltration based on the following:

.1 Domestic Contribution

.1 Minimum average contribution of 360 litres per capita per day.

.2 Peak dry weather flow rates for each contributing area calculated at average flow multiplied by the following peaking factor:

$$\text{Peaking Factor} = 1 + \frac{14}{(4 + P)}$$

Where P equals the square root of the tributary population in 1,000's.

.2 Industrial Contribution

.1 Minimum average contribution of 16,875 litres per hectare per day.

.2 Peak hourly flow for each contributing area calculated at average flow multiplied by three (3).

.3 Commercial Contribution

.1 Minimum average contribution of 22,500 litres per hectare per day.

.2 Peak hourly flow for each contributing area calculated at average flow multiplied by three (3).

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.4 General Inflow/Infiltration Allowance

A general allowance of 0.28 litres per second per hectare shall be applied, irrespective of land use classification, to account for wet weather inflow to manholes not located in street sags and for infiltration flow into pipes and manholes.

In addition, a separate allowance for inflow to manholes located in street sags shall be added as per Article 8.2.2.5.

.5 Inflow Allowance - Manholes in Sag Locations

Where sanitary sewer manholes are located within roadway sags or other low areas and are thus subject to inundation during major rainfall events, the sanitary design peak flow rate shall be increased by 0.4 litres per second for each such manhole, which is applicable for manholes which have been waterproofed. For new construction, all sanitary manholes in sag locations are to be waterproofed, in accordance with Article 8.3.3.4.

.6 Foundation Drain (Weeping Tile) Allowance

Subsequent to October 13, 1987, connection of foundation drains (weeping tile) to sanitary sewer systems is no longer permitted. For new development areas therefore, a specific allowance for foundation drain flow to sanitary sewers is not required. However, an allowance shall be made for foundation drain flow when computing sanitary design flow from previously developed areas where such connections may be present.

Bylaw 10/87 added to the Town of Morinville Land Use Bylaw as follows:

"Section 31A Sub-surface Drainage

Every building in the Town of Morinville containing a basement, shall employ a sump pump system to the satisfaction of the Development Officer for the purpose of transferring stormwater runoff to the on-street drainage system."

"Section 31B Weeping Tiles

Weeping tiles and similar appurtenances will not be permitted to discharge into sanitary sewers. Weeping tiles may be connected to sumps with pumped discharge directly to ground surface (splash pads will be required). Other alternatives may be submitted for approval."

.7 Total Design Peak Flow Rates for Sanitary Sewers

The total design peak flow rates for a sanitary sewer shall be the sum of the peak dry weather flow rates as generated by population and land use, and the rate of all extraneous flow allowances, as determined for the design contributing area.

8.2.3 Minimum pipe size shall be 200 mm diameter for residential and 250 mm diameter for commercial, industrial and institutional land uses.

8.2.4 Minimum velocity of flow in mains shall be 0.61 m/s.

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- 8.2.5 All new sanitary sewers shall be designed to have hydraulic capacity such that the sewer is flowing at no more than 80% of the full depth when conveying the estimated total design peak flow rate as determined by methods specified in Article 8.2.2. This criterion, however, shall not be applied to the evaluation of sewers designed prior to 1991 which were proposed to flow near full under design conditions.
- 8.2.6 Pipe sizing shall be determined by utilizing the manning equation and an "n" value of 0.013 for all smooth wall pipe of approved materials. Application of a depth variable friction factor at a flow depth of 80% of the sewer diameter results in a flow rate of approximately 86% of the sewer's full flow capacity. Therefore, the required flow capacity for sizing of the sewer may be computed using the following relationship:

$$\text{Required Full Sewer Flow Capacity} = \frac{\text{Estimated Total Design Peak Flow Rate}}{0.86}$$

- 8.2.7 The minimum grade for the most upstream reaches of any sanitary system shall be 0.60 % from the terminal manhole downstream to either the second manhole downstream from the terminal manhole or to a change in direction of flow, whichever occurs earlier, and 0.40 % from that point to a point where the design dry weather flow exceeds 10 litres per second. Where existing system depth constraints render satisfaction of this requirement unfeasible, the Engineer may approve an exemption for a specific design. In such instances, the requirements of Article 8.2.7 shall apply.
- 8.2.8 The following listing shows minimum slope which shall be permitted for various sewer sizes:

<u>Sewer Size</u>	<u>Minimum Slope</u>
200 mm	0.40%
250 mm	0.28%
300 mm	0.22%
375 mm	0.15%
450 mm	0.12%
525 mm	0.10%
600 mm	0.10%

8.3 Materials

8.3.1 Pipe

- .1 Pipe for sanitary sewer mains shall be either polyvinyl chloride (PVC) or concrete.
- .2 PVC Pipe:

PVC pipe shall be DR35 in the 200 mm to 900 mm size range and shall conform to CSA B182.2 and ASTM D3034, ASTM F679, NQ 3624-130 and NQ 3624-135 standards, with a minimum stiffness of 320 kPa. The pipe shall be manufactured from 12454-B or 12364-C compound.

Sealing gaskets shall meet the requirements of CSA B182.2 and ASTM F477. Joints shall be able to withstand 345 kPa/50 psi hydrostatic pressure.

Services shall be connected to the mains using prefabricated in-line tees or wyes conforming to CSA B182.2 and ASTM F679. Injection moulded gasketed fittings shall conform to CSA B182.1 or CSA B182.2.

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.3 Concrete Pipe:

All concrete pipe shall be manufactured using Type 50 sulphate resistant cement. Non-reinforced concrete pipe in the 250 mm to 375 mm diameter size range shall be a minimum of Class 3 conforming to CSA A257.1 and ASTM C14.

Reinforced concrete pipe in the 250 mm and larger sizes shall conform to CSA A257.2 and ASTM C76.

All joints shall be preformed polyisoprene flexible synthetic gasket, resistant to chemical attack from the sanitary sewage or sewer gases and must meet the requirements of ASTM C443 and CSA B257.3.

8.3.2 Manholes

.1 Manhole sections shall be precast reinforced concrete sections conforming to A.S.T.M. C478, latest revision thereof.

.2 Manholes shall be a minimum of 1200 mm inside diameter.

.3 Frames and covers shall be asphalt coated cast iron frame and cover conforming to Class 20 ASTM A48 as follows:

- a) Norwood NF80 solid cover or equal for all manholes in streets and driveways;
- b) Norwood NF90 solid cover or equal with rubber gasket-seal for all manholes in street sags or other low areas; or
- c) Norwood F39 with solid cover or equal in all other locations.

All castings shall be true to form and dimensions, free from faults, cracks, blowholes or other defects affecting their strength.

.4 Manhole tops (frames and covers) shall not be located within a sidewalk.

.5 Manhole steps shall be standard safety type, of hot dipped galvanized iron conforming to ASTM A615 and ASTM A123 or aluminum (forged of 6061-76 alloy) having a minimum tensile strength of 200 MPa.

.6 Maximum spacing between steps shall not exceed 400 mm and steps shall be provided for the full depth of the manhole structure.

.7 Pre-benched manhole bases shall be used wherever possible. Connection holes shall be pre-bored with Duraseal water tight joints or approved equal.

.8 Perched manholes shall be constructed on main sizes 600 mm in diameter and larger.

.9 Tee riser manholes shall conform to CSA A257.2/ASTM C76 for the pipe component and CSA A257.4/ASTM C76 for the riser component.

.10 All joints in manholes shall be watertight and joints in manholes shall be tongue and groove. A rubber gasket joint conforming to ASTM C 443 shall be used to seal the joint between manhole sections.

.11 All joints on the interior and exterior of the manhole shall be mortared. The exterior of the manhole structure shall be dampproofed with an approved asphalt based

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material.

.12 Inverts in manholes shall have a minimum 12 mm drop for straight run sewer manholes. At changes in direction, manholes shall have not less than 50 mm fall across the manhole in the direction of flow from inlet to outlet.

.13 Aluminum safety platforms shall be installed in all manholes over 6 m in depth.

8.3.3 Concrete for Manhole and Appurtenances

.1 Concrete shall be made using Type 50 Sulphate Resistant Cement.

.2 The maximum slump of concrete shall not exceed 75 mm.

.3 Concrete shall achieve a minimum 28-day strength of 25 MPa.

8.4 Sewermain Installation and Location

8.4.1 Mains shall be installed to provide a minimum depth of cover of 3.0 metres below final finished grade along the pipe centreline.

8.4.2 Mains shall be installed to provide not less than 2.75 metres of cover to the invert of the sewer service connection at the property line.

8.4.3 Mains shall be located within the road right-of-way in accordance with the Roadway Cross Section Standard Drawings.

8.4.4 Pipe installation shall be in conformance to the pipe manufacturer's specifications.

8.4.5 Construction Tolerances

Alignment shall be within ± 150 mm horizontally, and -5 mm to +20 mm vertically per 1.0 m pipe diameter.

8.5 Manhole Installation and Location

8.5.1 Manholes shall be installed at the end of each line and at all changes in pipe size, grade and alignment.

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

8.5.3 Inverts in manholes at changes in direction shall have at least 60 mm fall across the manhole.

8.5.4 Backfill around manholes shall be compacted using mechanical tampers to achieve densities as set out in Section 6.0 - Utility Trenches.

8.5.5 External drops shall be constructed where the difference in elevation between the influent and effluent sewers is greater than 600 mm. The external portion of the drop shall be encased in concrete.

8.5.6 Tee riser manholes shall be installed with Class "A" concrete bedding.

8.6 Curved Sewers

8.6.1 Curved sewers will be permitted with the following restrictions:

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- .1 the sewer shall be laid as a simple curve, with a radius equal to or greater than 92 m,
- .2 manholes shall be located at the beginning and end of the curve,
- .3 manholes shall be located at intervals not greater than 92 m along the curve,
- .4 the main shall run parallel to the curb or street centreline,
- .5 the minimum grade for sewers on curve shall be 50% greater than the minimum grade required for straight runs of sewers.

8.7 Inspection and Testing of Sewers

- 8.7.1 The Developer shall arrange and pay for a CCTV inspection of the sanitary sewers. All sanitary sewers shall be inspected. Two (2) inspections shall be performed: the first inspection shall be performed immediately prior to issuance of the Construction Completion Certificate and shall include the entire sanitary system that was installed; the second shall be performed immediately prior to issuance of the Final Acceptance Certificate for Underground Improvements and initially, shall involve only a random sampling of the system, amounting to approximately fifteen percent (15%) of the entire system. The random sampling areas shall be determined by the Town. Based on the results of the random inspection, the Town may request that the balance of the system also be inspected. The Developer shall be responsible to arrange for the sanitary sewers to be cleaned and flushed immediately prior to each of the video inspections.
- 8.7.2 The television equipment shall be a self-contained camera and a monitoring unit connected by cable. The camera shall be equipped with lighting equipment capable of illuminating the entire pipe, with provision to adjust the lighting as may be required to reduce or eliminate glare. Picture capabilities shall show the entire pipe periphery clearly. Picture quality shall be such to produce a continuous 600 lines of resolution over the entire pipe. Recording facilities shall include provision for direct voice communication. Rate of progress of the camera through the pipe shall be uniform and shall not exceed 6 m per minute.
- 8.7.3 A television log shall be maintained during the inspection showing the location of all defects referenced from the manhole. A separate log shall be maintained for service connections. Photographs shall be taken at the discretion of the operator and at least one photo shall be taken between successive manholes.
- 8.7.4 Manhole identity shall be clearly noted and shall correspond to the manhole identity shown on the as constructed record drawings.
- 8.7.5 A final typewritten report summarizing the results of the inspection shall be submitted to the Town within two weeks of the date of the inspection, together with a copy of the video tape. Video equipment used shall be standard VHS format.
- 8.7.6 All costs associated with the CCTV inspection, including pipe cleaning and flushing, shall be borne by the Developer.
- 8.7.7 The maximum acceptable long-term deflection for PVC or any other flexible pipe shall be 7½ % of the normal internal diameter.

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- 8.7.8 Where deemed necessary by the Town's Engineer, all sewers shall be tested by either an exfiltration test or an infiltration test. Neither test shall be required if the CCTV inspection is completed immediately following construction and no deficiencies are observed.

An infiltration test shall be performed where the normal ground water level is at or above the pipe invert. Where the normal ground water level is below the pipe invert, an exfiltration test shall be performed. For exfiltration testing, the minimum hydrostatic head at the high manhole on the test section shall be 0.6 metres above the crown of the pipe or groundwater table, whichever is higher.

- 8.7.9 The maximum allowable leakage for infiltration or exfiltration tests shall be calculated as follows:
- .1 For PVC pipe, maximum leakage allowance of 5.0 litres per day per millimetre of pipe diameter per kilometre.
 - .2 For concrete pipe, maximum allowable leakage of 20.0 litres per day per millimetre of pipe diameter per kilometre.
 - .3 The groundwater table shall be above the pipe crown at all locations on the test section.

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9.0 SEWER AND WATER SERVICE CONNECTIONS

9.1 Minimum Requirements

- 9.1.1 Each lot or multi-family unit shall have its own separate water, sanitary sewer and sump pump collector service connection.
- 9.1.2 The minimum size of water service to a single family dwelling shall be 19 mm diameter. Services in excess of 20 m in length, as measured from the main to the curb stop, shall be 25 mm diameter.
- 9.1.3 Parks may require a water service. The size, type and requirement shall be determined by the Town.
- 9.1.4 The minimum size of sanitary service shall be 100 mm in diameter to a single family dwelling.
- 9.1.5 The minimum size of sump pump collector shall be 100 mm in diameter to a single family dwelling.
- 9.1.6 Non-residential or apartment service connections shall be sized according to anticipated requirements. A shut off valve shall be provided at the property line.
- 9.1.7 For non-residential, multi-family and apartment sanitary service connections, the Developer's Engineer shall determine the depth requirements for servicing of these lots in the establishment of the design depth of the sanitary sewer main on the abutting street.
- 9.1.8 Minimum slope on sanitary and sump pump collector service lines shall be 2.0%.
- 9.1.9 Connection to a main sewer line shall be by means of either a saddle or an in line tee or wye, at the top quadrant of the main.
- 9.1.10 Where a sanitary sewer service connection is made to a PVC main, the service shall be connected to the main by means of a manufactured tee or wye.
- 9.1.11 Saddles shall only be permitted for service connections to connect into existing mains. The connection shall be watertight. Where a saddle is used to connect to the main, any metal components of the saddle shall be stainless steel. The saddle shall be coated with Denso mastic and wrapped with Denso tape, or equivalent. Service connections shall not protrude into the main line.
- 9.1.11 For water services 50 mm in diameter and smaller, the tapping shall be at the top quadrant of the distribution main.
- 9.1.12 Tapping for service connections shall be done with normal operating pressure in the mains.
- 9.1.13 Maximum size of tapping without utilization of service clamps shall be:
 - a) 19 mm on 150 mm main, and
 - b) 25 mm on 200 mm main.

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9.1.14 Unless otherwise approved in writing by the Town, a sanitary sewer sampling manhole shall be provided within the road right-of-way or easement for each service to an Industrial or Commercial lot. The sampling manhole, if required, shall be installed at the time the lot develops and the service is installed.

9.2 Materials

9.2.1 All standards referred to shall be the current, amended and updated issues of such.

9.2.2 No deviation from the approved service materials shall be permitted without the written approval of the Town's Engineer.

9.2.3 If other than approved materials are incorporated in the works, such materials shall be removed and replaced with approved materials, to the satisfaction of the Town's Engineer and at the Developer's expense.

9.2.4 Notwithstanding the use of approved materials, the Town's Engineer may at any time require the Developer to produce certification by an independent testing authority that the material currently used conforms to the specified standards.

9.3 Sanitary Sewer Pipe and Sump Pump Collectors Materials

9.3.1 Sewer service pipe shall be PVC SDR 35 conforming to ASTM D3034, latest revision thereof.

9.3.2 Sump pump collector services shall be PVC SDR 28 conforming to ASTM D3034, latest revision thereof.

9.3.3 Service fittings shall conform to pipe material being used and shall be in accordance with the corresponding specifications.

9.4 Water Service - Materials

9.4.1 Water service pipe 50 mm in diameter and smaller shall be Type K copper conforming to AWWA C800. For 19 mm and 25 mm sizes, Kitec XPA composite pipe conforming to AWWA C903-02 is also acceptable. Water service pipe 150 mm in diameter and larger shall be PVC conforming to AWWA C900. No piping between 50 mm and 150 mm in diameter shall be used.

9.4.2 Corporation stops shall be Mueller A220, or equal, without thaw out connection.

9.4.3 Curb stops shall be Mueller, Oriseal Mark II H15204, without drains, or equal.

9.4.4 Service boxes shall be extension type for maximum extension of 3 metres and of corrosion resistant construction. Service rod shall be stainless steel 304 rod attached to a manganese bronze clevis with a brass or stainless steel rivet.

9.4.5 Service clamps shall be bronze double strap conforming to Smith Blair 323, or equal.

9.4.6 Where Kitec Municipal Tubing is used, jointing of the pipe to brass fittings shall be made using compression couplings designed specifically for use with Kitec pipe. Approved suppliers are Mueller and Cambridge Brass. Other manufacturers of brass fittings shall not be used without written approval of the Town of Morinville.

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9.5 Service Connections - Installation Requirements

- 9.5.1 Where the water service is 50 mm in diameter or smaller, the water and sanitary service shall be installed in a common trench.
- 9.5.2 "Single" services shall be installed so that, when facing the lot being served, the water service is to the right of the sanitary service.
- 9.5.3 All service lines shall be installed to provide a minimum depth of cover of 2.75 metres at the property line.
- 9.5.4 Where the sewer services are required to connect to mains in excess of 4.5 metres deep, risers shall be installed to within 3.0 metres of the final finished surface.
- 9.5.5 A corporation stop shall be provided at the main for each water service. Main stop taps shall be a minimum of 600 mm apart and no less than 300 mm from a coupling or collar.
- 9.5.6 Copper service pipe shall be one continuous piece, unless the length exceeds 20.0 metres.
- 9.5.7 A curb stop shall be provided with each service connection. It shall be placed 300 mm back of the gas easement, in the private property. A 50 mm x 200 mm x 300 mm concrete block shall be installed under each curb stop.
- 9.5.8 Where gas servicing is planned in the front yard, water, sanitary sewer and sump pump collector services shall be extended beyond the gas line and sump pump collector main and terminate a minimum of 0.15 m from the back of the easement line. All services shall be properly capped.
- 9.5.9 Curb stops shall be located such that they do not conflict with driveway locations. They shall not be placed in concrete sidewalks or driveways.
- 9.5.10 Where a copper service is installed, there shall be a minimum of one gooseneck near the corporation stop. An additional gooseneck shall be provided at each sewer crossing.
- 9.5.11 Service boxes shall be set plumb over the centre of the curb stop with the top 300 mm above the sidewalk elevation when the service box is in the extended position.
- 9.5.12 Inline tee or wye fittings shall be installed during sewer main construction at all service connection locations. Saddles shall only be permitted for connections to existing mains. Tee fitting connections for sanitary service shall discharge into the top half of the main.
- 9.5.13 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.
- 9.5.14 Red painted stakes of size 50 mm x 100 mm shall be extended from the invert of the service connections to a minimum of 0.50 metres above the ground level.

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- 9.5.15 In wet areas, crushed gravel bedding shall be installed within 1.5 metres of the termination of the service.
- 9.5.16 Under no circumstances will roof, surface drainage or subsurface (weeping tile) drainage from buildings be permitted into the service connections of the sanitary sewer system.
- 9.5.17 Sewer services may be installed either as "single" or as "dual" services, in accordance with the following:

.1 "Single" Services

"Single" servicing shall be installed in a location where adequate separation to other services, including driveways, can be achieved. Adequate separation shall be considered as having been given if there is at least 1.5 metres horizontal clearance between the utility and the curb stop.

The preferred location of a "single" service line is such that it bisects the lot at a point 7.5 metres from the street side of the property line, as shown on Typical Detail Drawing No. 6.01 entitled "Service Connection Locations" in Appendix B. Separation requirements shall take precedence.

A "single" service may be installed by augering or by open cut methods. Where services are open cut, the trench shall be made sufficiently wide to accommodate standard compaction equipment and trenches shall be compacted in strict accordance with Article 6.5.3 of these Standards.

.2 "Dual" Services

"Dual" servicing shall only be permitted where adequate separation to other services, including driveways, can be achieved. Adequate separation shall be considered as having been given if there is at least 1.5 metres horizontal clearance between the utility and the curb stop.

Should the Developer wish to install "dual" services, a compiled plan shall be submitted for approval showing the proposed location of the proposed services, the proposed driveway location and the location of all other utility services, including the franchise utility services. "Dual" services shall not be installed until such plan has been approved by the Town.

Where "dual" services have been installed, the Developer shall ensure that all lot purchasers are aware of the approved location of the driveway for each individual lot.

"Dual" services may be installed in a common trench as shown on Typical Detail Drawing No. 6.03 entitled "Double Service" in Appendix B.

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Where the "dual" servicing method is selected, the trench shall be made sufficiently wide to accommodate standard compaction equipment and trenches shall be compacted in strict accordance with Article 6.5.3 of these Standards.

- 9.5.19 The Developer shall supply, on a construction report form approved by the Town, accurate survey record information on elevations and locations of water, sanitary and sump pump collector service connections with respect to property line locations and streets and avenues. A typical sample form is included in Appendix B - Typical Details, Drawing No. 6.07.

Construction report forms with As-Built information shall be completed and the originals filed with the Town within 6 months of the date of issuance of the Construction Completion Certificate, or prior to first occupancy within the development, whichever shall first occur.

9.6 Service Connections and Main Line Extensions to Multi-Family Sites

- 9.6.1 Where services and main lines are required to be extended to service a multi-family site after the main subdivision servicing has been completed, all such connections and extensions shall be installed by augering under existing and proposed streets and sidewalks. Open cutting shall only be permitted where necessary to connect to the main service line, and the opening size shall be restricted to the minimum required to permit the safe connection to be made.
- 9.6.2 Open cut excavations in roadways shall be backfilled in accordance with Article 6.6.2 of these Standards.

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10.0 PUMPING STATIONS AND FORCEMAINS

10.1 General

10.1.1 Definitions for Pumping Stations

Permanent Pumping Station - A permanent pumping station is a definite part of the sewage collection system. This type will be constructed by the Developer and will be maintained by the Town following issuance of the Construction Completion certificate and following receipt of the Operating and Maintenance Manual for the pumping station.

10.2 Design and Construction Criteria for Permanent Pumping Stations

10.2.1 Pumping stations shall be of reinforced concrete construction and in conformance with standard engineering practice. They shall be of the "wet and dry well" configuration. The Town's Engineer shall approve the configuration of pumpwells used in individual cases.

10.2.2 Sewage lift stations must be so located so as to be readily accessible by road. Sufficient area is required immediately adjacent to the entrance for vehicle parking to facilitate the replacement and removal of large equipment.

10.2.3 When pumpwells are located entirely below grade, adequate ground slope is required to prevent ponding on or near the entrance. All roof opening covers must have sufficient overhang to prevent rain water from entering. Screens should be provided for the replacement of the regular roof covers while work crews are inside. "Air tight/water tight" sealed units are not acceptable as doors between wet and dry wells. Separate entrances must be provided.

10.2.4 For roof entry pumpwells, extension ladders are to be provided which must be sufficiently far away from the walls to be able to be pulled up through the opening and extended to a height at least one metre above the roof.

10.2.5 Water tight gates must be provided on the inlet to the wet well to permit cleaning and maintenance to the wet well piping, bar screens, etc. Whenever possible, an overflow should be built in conjunction with this gate to prevent excessive head.

10.2.6 Suitable and safe means of access must be provided to all dry wells and all wet wells. All ladders, platforms, etc. shall comply with WCB Safety Regulations and provided such that pumping and related equipment and piping accessories can be removed.

10.2.7 Two or more pumps must be provided in each pumpwell and provision shall be made to alternate automatically between pumps. The control panel must be so located that it cannot be flooded under any circumstance. All pumps must be capable of handling 75 mm solids and shall be of a "non-clog" type. They shall be placed to work under a positive suction head. For safety reasons, the motors must be placed as far as possible above the overflow point of the wet well. Where only two pumping units are provided, they shall have the same capacity. Each shall be capable of handling flows in excess of the expected maximum flow, designed in accordance with established engineering practice. Where practical, the pumping cycle shall be long enough to ensure that all sewage in the forcemain will be replaced during one cycle. Where three or more pumps are provided, they should be designed to fit actual flow conditions and must be of such capacity that with any one pump out of service, the remaining units will have capacity to handle maximum sewage flows. Each pump shall have its own individual intake and all piping shall be at least 100 mm in diameter and 900 Kpa pressure rating. Shut-off valves shall be placed on both suction and discharge lines of each pump.

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Additionally, a check valve must be placed on the discharge line between each pump and the shut-off valve. Each check valve shall be equipped with an outside lever to provide visual indication of valve operation. Pressure gauges shall be provided on each pump discharge flange. Each gauge shall be equipped with a shut off cock and a diaphragm seal. All pump venting requirements shall be met.

- 10.2.8 The effective capacity of the wet well shall provide a holding capacity equivalent to the volume of the downstream forcemain. Holding time shall be minimized. The wet well floor shall be sloped to prevent build-up of solids and grit.
- 10.2.9 Wherever possible, the wet well shall have provision of an overflow outlet in case of electrical or mechanical failure. Where no outlet is provided, a standby system must be provided. Where a standby engine or engine generator is installed, adequate provision shall be made for the discharge of exhaust fumes to the atmosphere. The ventilation system shall be equipped with an air flow sensing switch to shut off the engine in the event that the ventilation system is not functioning.
- 10.2.10 The dry well must be equipped with a sump pump which will discharge into the wet well 300 mm above the top of the overflow. The sump pump must have its own discharge pipe complete with at least two check valves mounted in series. The pump discharge must enter the wet well at a point above the overflow.
- 10.2.11 A water supply with fittings and hose shall be provided for washing down purposes. The water supply shall comply fully with the requirements of Alberta Environmental Protection.
- 10.2.12 A minimum of 1.2 metres of clearance all around is required as the working area to do repairs and maintenance to each pump.
- 10.2.13 Suppliers for all pumping, electrical, mechanical and associated materials and equipment shall be locally represented (within Alberta) for parts and service. Three sets of operations and maintenance manuals must be provided with each new pump station.
- 10.2.14 All electrical work shall be in accordance with the Canadian Electrical Code and the Provincial and Municipal amendments thereto. Permanent lighting and no fault plug shall be provided on each floor and around each pump and motor. Adequate ventilation shall be provided to prevent excessive moisture build-up in control panels. Part wind motors are required on all pumps larger than 55 KW. Each pump shall be equipped with two "stop - lockout switches", to prevent pump operation during maintenance. The first switch shall be located within sight of the electric motor. The second switch shall be located adjacent to the pump.
- 10.2.15 Continuous mechanical ventilation is required for all dry wells, in accordance with Alberta Environmental Protection standards. Multiple air inlets shall be provided on all pits over 7 metres deep. Provision for heating of cold air shall be made. Fresh air inlets shall be kept remote from control equipment. All heating, ventilation and electrical equipment shall be in accordance with Department of Environment Standards for non-hazardous locations.
- 10.2.16 Monitoring equipment shall be installed in each pumping station. Elapsed time meters shall be installed on each motor or engine. Information on pump running times and flows shall be recorded on a 7 day circular chart. Flows from the pumping station shall be metered and a totalizer installed, to indicate flow volumes.

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10.2.17 An alarm system shall be installed at each pumping station. Provision shall be made for transmission of alarms to a remote location, as directed by the Town's Engineer.

10.3 Design and Construction Criteria for Force Mains

10.3.1 A system head curve shall be provided for each force main. Supplementary information shall be provided with the curves including population estimates, area served, plan and profile of line, friction coefficients, line head losses and any other relevant information.

10.3.2 Minimum permissible velocity in forcemains shall be 0.90 metres per second. Where velocities in excess of 3 metres per second are attained, special provisions shall be made as required by the Engineer. At high points in the line, gas relief shall be provided.

10.3.3 Forcemains shall be constructed of polyethylene pipe or PVC pipe. Materials and fitting specifications shall be in accordance with design pressures and shall be subject to the Engineer's approval. Testing of all forcemains shall be in accordance with the requirements for pressure testing of watermains.

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11.0 STORM DRAINAGE SYSTEM

11.1 General

11.1.1 Underground storm sewer systems shall be used wherever possible. Surface drainage systems may be incorporated into a residential development area only where it is not feasible, in the opinion of the Town, to use an underground storm system.

11.1.2 The design of the overall drainage system shall incorporate provision for both the minor and major storm drainage systems. The minor system is designed for drainage and the major system is designed for flood control.

11.1.3 Roof leaders shall not be connected to the sump pump collector system. Roof leaders shall discharge on to a concrete splash pad which is permanently affixed to the building foundation, which shall then discharge on to the natural ground surface. The splash pad shall be not less than 300 mm wide and 1500 mm long.

11.1.4 Foundation drains (weeping tile) shall drain to an internal sump. Discharge from the sumps shall be to a sump pump collector system that is designed as an integral part of the minor storm drainage system. Discharge from the sump shall be by pumping unless otherwise approved in writing by the Town.

11.1.5 Retention pond, detention pond and constructed wetland development shall conform with the standards set out in this section of the Standards as well as the Landscape standards in Section 20.0 of these standards.

11.2 Design Criteria

11.2.1 The minor system shall be designed to accommodate the runoff from a 1 in 5 year design storm event, or greater, plus the flows from the sump pump collection system.

11.2.2 Minor system elements serving drainage areas of 30 ha or less shall be designed to accommodate the rate of runoff which would occur in a 1 in 5 year return period rainfall event:

- a) without surcharge of sewer pipes;
- b) with ponding of water to a depth no greater than 150 mm at depressions and at drainage inlets;
- c) with depths of flow and ponding on roadways such that no over-topping of curbs occurs on local roadways, a width equivalent to one traffic lane remains open on collector roads and one traffic lane in each travel direction remains free from inundation on arterial roads.

11.2.3 Minor system elements serving drainage areas greater than 30 uncontrolled ha shall be designed with a reserve of capacity to account for unanticipated changes in land use and runoff and to ensure downstream trunk sewers do not surcharge in advance of the upstream lateral sewers.

To achieve this objective, the subject sewers shall be designed to accommodate, without surcharge, 1.25 times the rate of flow which would occur in a 5-year return period rainfall event.

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- 11.2.4 In cases where the storm sewer trunk will receive both uncontrolled flow from areas 30 ha or larger and controlled discharges from stormwater management facilities, the sewer shall be designed to accommodate, without surcharge, 1.25 times the 5-year design flow from the uncontrolled lands plus the maximum design stormwater management facility outflow rate.
- 11.2.5 The rational method shall be used for the design of storm systems serving areas smaller than 65 hectares (ha.) as follows:

$$Q = \frac{CIA}{360}, \text{ where:}$$

- Q = the quantity of runoff, in cubic metres per second,
 C = the runoff coefficient (dimensionless).
 I = the intensity of rainfall, in millimetres per hour, and
 A = the contributing area, in hectares.

Computer modelling shall be required for the design of a stormwater system servicing areas greater than 65 hectares.

- 11.2.6 Design rainfall intensity shall be selected from the following intensity duration frequency (idf) Table 11.1, with a duration chosen to coincide with the time of concentration t_c .

The time of concentration for runoff flow is the time required for runoff flow to become established and reach the design location from the farthest point within the contributing catchment area.

Table 11.1

IDF Curves - Intensity Table

IDF Intensity (mm/hr)

Time minutes (t_c)	Rainfall Intensity (mm) - Return Frequency		
	5-year	25-year	100-year
1	182	275	351
2	147	221	282
3	125	187	239
4	109	164	209
5	98.2	147	187
6	89.5	134	171
7	82.5	123	157
8	76.7	115	146
9	71.9	107	137
10	67.8	101	129
11	64.2	95.8	122
12	61.0	91.0	116
13	58.3	86.9	110
14	55.8	83.1	106
15	53.6	79.8	101

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Time minutes (t _c)	Rainfall Intensity (mm) - Return Frequency		
	5-year	25-year	100-year
16	51.5	76.8	97.6
17	49.7	74.0	94.0
18	48.0	71.5	90.8
19	46.5	69.2	87.9
20	45.1	67.0	85.2
21	43.7	65.1	82.6
22	42.5	63.2	80.3
23	41.4	61.5	78.1
24	40.3	59.9	76.1
25	39.3	58.4	74.2
26	38.4	57.0	72.4
27	37.5	55.7	70.7
28	36.7	54.4	69.1
29	35.9	53.3	67.6
30	35.1	52.1	66.2
31	34.4	51.1	64.8
32	33.7	50.1	63.5
33	33.1	49.1	62.3
34	32.5	48.2	61.2
35	31.9	47.3	60.0
36	31.3	46.5	59.0
37	30.8	45.7	58.0
38	30.3	44.9	57.0
39	29.8	44.2	56.1
40	29.3	43.5	55.2
41	28.9	42.8	54.3
42	28.4	42.2	53.5
43	28.0	41.5	52.7
44	27.6	40.9	51.9
45	27.2	40.3	51.2
46	26.9	39.8	50.5
47	26.5	39.2	49.8
48	26.1	38.7	49.1
49	25.8	38.2	48.4
50	25.5	37.7	47.8
51	25.2	37.2	47.2
52	24.8	36.8	46.6
53	24.6	36.3	46.1
54	24.3	35.9	45.5

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55	24.0	35.5	45.0
56	23.7	35.1	44.5
57	23.4	34.7	44.0
58	23.2	34.3	43.5
59	22.9	33.9	43.0
60	22.7	33.6	42.5

Time minutes (t)	Rainfall Intensity (mm) - Return Frequency		
	5-year	25-year	100-year
65	21.6	31.9	40.4
70	20.6	30.4	38.5
75	19.7	29.1	36.8
80	18.9	27.9	35.3
85	18.2	26.8	34.0
90	17.5	25.8	32.7
120	14.5	21.4	27.1
180	11.2	16.5	20.8
240	9.28	13.6	17.2

11.2.8 For a 1 in 5 year analysis, the following runoff coefficients shall be used in accordance with the nature of the development, as follows:

<u>Land Use</u>	<u>Runoff Coefficient (C)</u>
Parks, reserves and school grounds	0.15
Residential:	
Single family	0.40
Multi family	0.65
High Density	Must be calculated
Commercial	Must be calculated
Industrial	Must be calculated

Where the runoff coefficient must be calculated, the following formula shall be used:

$$C = \frac{(0.95 \times \text{Impervious area}) + 0.10(\text{Total area} - \text{Impervious area})}{\text{Total area}}$$

11.2.9 Maximum inlet time of 12 minutes shall be used for residential areas. Shorter inlet times shall

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be used for commercial, industrial or high density residential areas, where the percent impervious area is higher.

11.2.10 Pipe sizing shall be determined by utilizing the Manning formula, with an "n" value of 0.013, to accommodate the design flow in free flow (unsurcharged) conditions. Minimum pipe sizing shall be:

a)	Storm sewer main	300 mm
b)	Catch basin lead	250 mm
c)	F51 Catch basin lead	375 mm

11.2.11 Minimum velocity within storm sewer mains shall be 0.6 metres per second. Where velocities in excess of 3.0 metres per second are attained, special provisions shall be made to protect against displacement by erosion or impact.

11.2.12 Storm sewer service shall be provided to all commercial and industrial lots.

11.2.13 Design of the major system shall conform to the requirements of Section 11.10 of these Standards.

11.3 Storm Sewer Mains - Materials

11.3.1 Pipe

- .1 Pipe for storm sewer mains and catch basin leads shall be either concrete or PVC pipe. PVC pipe shall be used for leads and mains 300 mm in diameter or smaller. Either PVC pipe or concrete pipe shall be used for mains ranging in size from 375 mm in diameter to 900 mm in diameter.

Ultra Rib PVC or approved equal may also be used in the 200 mm to 600 mm size range. Ultra Rib pipe shall conform to CSA B182.4 and ASTM F794 with a minimum stiffness of 320 kPa.

Concrete pipe shall be used for mains larger than 900 mm in diameter.

Concrete pipe shall be used for storm systems in industrial areas and along arterial roads that are dangerous goods routes.

In areas of retrofit or where directional drilling is required, high density polyethylene pipe (HDPE) may be used, subject to the approval of the materials and installation specifications by the Town's Engineer.

- .2 PVC pipe shall conform to the requirements as set out in Section 8.3.1.2 of these Standards.

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- .3 Concrete pipe shall conform to the requirements as set out in Section 8.3.1.3 of these Standards.

11.3.2 Manholes

- .1 Refer to Section 8.3.2 (Sanitary Sewer).

11.3.3 Catchbasins

- .1 Catch basin barrels with precast base and precast top slab shall be either:
 - .1 525 mm I. D. pipe barrel conforming to A.S.T.M. C14, or
 - .2 900 mm I. D. pipe barrel conforming to A.S.T.M. C478.
- .2 All catch basins shall be constructed with a sump having a depth not less than 600 mm.

11.3.4 Catch basin Frames and Covers

- .1 Catch basin frames and covers shall be cast iron complying with the same Standard as manhole frames and covers and shall provide adequate inlet capacity. Standard models shall be as follows:
 - .1 Top inlet standard round top catchbasins equal to Norwood F38 or Norwood F39,
 - .2 Standard side inlet for 190 mm straight face curb and gutter equal to Norwood F36,
 - .3 Standard side inlet for rolled face curb and gutter equal to Norwood K7 or DK7, or
 - .4 Standard frame, grate and side inlet for use with 900 mm barrel, equal to Norwood F51.
- .2 Catch basin steps shall be standard safety type, of hot dipped galvanized iron or aluminum.

11.4 Sewermain Installation and Location

- 11.4.1 Mains shall be located within the roadway in accordance with the applicable Roadway Cross Section Standard Drawings.
- 11.4.2 Mains shall be at a depth adequate to provide the minimum depth of cover over sump pump discharge collection service connections and catch basin leads. In other areas, mains shall be installed to provide a minimum depth of cover of 1.5 metres below final finished grade at the surface.
- 11.4.3 Mains shall be located at least 2.5 m horizontally from any water main and at least 1.8 m horizontally from any gas main.

11.5 Manhole Installation and Location

- 11.5.1 Refer to Section 8.5 (Sanitary Sewer).

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11.6 Catch basins

- 11.6.1 Catch basins shall be provided to intercept surface runoff and minimize surface runoff along the street to 250 lineal metres. If flow along the street is less than 0.07 cubic metres per second, then the maximum runoff distance may be extended to 365 metres.
- 11.6.2 Spacing and capacity of catch basins shall be such that no ponding shall occur on the street during a 1 in 5 year storm. Hydraulic calculations shall be submitted to justify the size and spacing of catch basins and of lead sizes.
- 11.6.3 Catch basin installations shall be installed to intercept all flows, including overland flows, upstream of any street crosswalks. On curb returns, catch basins shall be installed on the uphill side of the cross walk.
- 11.6.4 Where water from an existing ditch is to enter into a storm sewer, the ditch shall terminate in a grillage intake of approved design.
- 11.6.5 Catch basin manholes shall only be used at the beginning of the storm main or, in place of a catch basin where the lead exceeds 30 metres in length.
- 11.6.6 The minimum grade on a catch basin lead shall be 1%.
- 11.6.7 Concrete swales crossing roadways shall not be permitted.

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11.7 Curved Sewers

11.7.1 Refer to Section 8.6 (Sanitary Sewer).

11.8 Testing of Sewers

11.8.1 Refer to Section 8.7 (Sanitary Sewer).

11.9 Storm Sewer Service Connections

11.9.1 Non-residential, apartment and multi-family service connections shall be sized according to anticipated site requirements.

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

11.9.3 All proposed school sites shall be provided with a storm sewer service. The size of the service shall be determined in consultation with the Town Engineer.

11.10 Design of the Major Drainage System

11.10.1 General

- .1 The system of roadway gutters and enclosed conduits has previously been referred to herein as the minor or convenience system. At certain times, the capacity of the minor system will be exceeded. The characteristics of the surface drainage route or network which operates when the capacity of the minor system is exceeded must be considered. This system is referred to herein as the major system.
- .2 Major system conveyance elements shall be designed to accommodate runoff rates and volumes for a 100-year return rainfall event such that:
 - a) the depth of peak flows and ponding in developed area streets, conveyance channels and swales shall be limited such that major system flows will not constitute a hazard to the public, nor result in erosion or other property damage.
 - b) the maximum water surface level of surface flows and ponding shall be not less than 300 mm below the lowest anticipated landscape grade or opening of any adjacent buildings.
 - c) depths of flow or ponding in roadways and other public rights-of-way shall not exceed 300 mm.
 - d) for arterial roadways, the water depth at the crown of the road shall not exceed 150 mm.

11.10.2 Flood Control Objectives and Criteria

- .1 The objective of urban storm drainage is the elimination or minimizing of flood damage and hazard under long-term storm conditions, and the control of street surface flows under short term return conditions to the extent required to provide a reasonable level and frequency of convenience and safety for pedestrian and traffic use.

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11.10.3 Lot Grading

- .1 A critical component of the major drainage system is the overall lot grading design and implementation of same within the development areas. The Developer shall be responsible to ensure that the full requirements as outlined in Section 5.0 - Lot Grading of these Standards are followed in their entirety.

11.10.4 Storm Water Management Design

- .1 The design of the proposed storm water management system shall be based on determining the most critical volume for the 1:100 year event from the following listing:
 - a) 1:100 year, 24 hour synthetic design event.
 - b) The July 14-15, 1937 storm event.
 - c) The July 10-11, 1978 storm event.
 - d) The July 5-6, 1988 storm event.

.2 The default requirement for the retention volume to be provided shall be the equivalent of 120 mm of water over the total catchment area draining to the facility.

.3 The stored volume in the facility shall drain as quickly as possible, considering the receiving stream's capabilities.

.4 A high level emergency overflow shall be provided where feasible.

Where a high level emergency overflow is provided to a safe outlet, a minimum freeboard provision of 300 mm shall be provided from the design high water level to the lowest anticipated landscape grade or opening to any adjacent buildings.

Where no emergency overflow is provided, the freeboard shall be not less than 0.5 m, measured as described above.

11.11 Stormwater Management Facilities

11.11.1 Components of the major system to be considered may include some trunk sewers, open channels, main culverts, natural streams and main ponding facilities. On-site storage as well as pipe storage in the minor system reduces stormwater peak outflows and the effect of such storage should be examined when deriving flows for the major system.

11.11.2 Detention or retention ponds and parkways or constructed wetland facilities shall be incorporated into the storm drainage design so as to control the rate of storm runoff to the receiving stream. The maximum rate of discharge from the detention or retention pond shall not exceed the rate of discharge from the drainage basin as permitted by the Provincial guidelines.

11.11.3 The stormwater management facilities shall be sized to provide the level of protection described in Section 11.10.4.

11.11.4 Small scale storm water management shall also be provided for commercial, industrial and high density residential developments.

11.11.5 Design Standards for Lakes and Retention Ponds

- .1 The land required shall be designated a Public Utility Lot (PUL).
- .2 Storm water quality best management practices shall be reflected in the design.
- .3 Land that is adjacent to a lake which is subject to flooding as per the design standard established, but which is part of a developed parcel, will carry easements in favour of the Town to allow for the flooding and to give Town forces right of access through their lands to the water's edge to carry out normal maintenance operations and to limit improvements down to an elevation approved by the Town. The easement document shall be prepared in format approved by the Town.
- .4 A minimum distance of 6 metres shall be maintained from any basement wall to the high water level.
- .5 The minimum surface area of any lake shall be 2.0 hectares.
- .6 The annual volume exchange shall be at least twice (2) times per year at average annual precipitation rates.
- .7 Maximum side slopes shall be 7:1 to 1.5 metres below normal water level.
- .8 The minimum depth from normal water level to lake bottom shall be 2.5 metres.
- .9 Submerged inlets and outlets are preferred and shall be constructed to be at least 1.0 metres below normal water level to crown of pipe and the invert should be 0.15 metres above lake bottom.
- .10 Inlets and outlets that are not submerged shall be set above normal water level and fencing shall be provided along the shoreline for 6 metres in both directions from the pipe centreline.
- .11 Exposed inlets and outlets shall be equipped with a removable galvanized steel grate fixed to the structure. Maximum opening size shall be 100 mm x 100 mm.
- .12 The lake bottom and side slopes shall be composed of impervious material.
- .13 No dead bay areas are permitted unless special circulatory provisions are made.
- .14 The first manhole in the minor system, the connecting or interconnecting pipe system shall have an invert which is at or above the normal water level and outlet shall be above the maximum water level in a one in five year storm.
- .15 The lake design shall include an approved sedimentation removal process for control of heavy solids to the lake during the development of the basin.
- .16 A sedimentation datum shall be included for the recording of siltation during the long term performance of the lake.
- .17 The lake and perimeter area design shall allow for vehicle access to inlets, outlets and any other facilities requiring maintenance.
- .18 The edge treatment or shore protection shall be compatible with adjacent land use. The

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standard used shall meet the criteria of low maintenance, safety and allow ease of access to water edge. The shoreline treatment shall be such that erosion does not occur.

11.11.6 Design Standards for Dry Ponds

- .1 The land required shall be designated as Public Utility Lot.
- .2 All dry ponds shall be off-line storage areas designed to temporarily detain runoff in excess of the permitted outflow.
- .3 Storm water quality best management practices shall be reflected in the design.
- .4 The maximum depth of storage in a dry pond for a one in twenty-five year rainfall event shall be one metre.
- .5 The dry pond shall be graded to properly drain all areas after its operations. Unless the area is a joint use with a park or recreation facility, a longitudinal drainage swale shall be constructed of either concrete or asphalt, having a minimum grade of 0.8%, to ensure positive drainage.
- .6 Where the area is jointly used as a park or recreational facility, hard surfaced swales are not permitted.
- .7 Grassed areas shall have a minimum slope of 2.0%.
- .8 Landscaping plans shall be submitted for all dry ponds.
- .9 All inlet and outlet structures associated with the dry pond shall have grates over their openings to prevent unauthorized entry and shall be designed for a hydraulic capacity of twice the required capacity to allow for possible plugging.

11.11.7 Design Standards for Constructed Wetlands

- .1 The land required shall be designated as Public Utility Lot.
- .2 A constructed wetland may be accepted as an alternative to a wet pond for storm water management and the Town shall consider proposals for their use on an individual basis.
- .3 The following sections provide guidance in the design of constructed stormwater wetlands. The guidelines emphasize features that enhance water quality improvements while providing a sustainable wetland system. The guidelines are based on available literature and experience in other jurisdictions; however, the use of wetlands is relatively new and the understanding of wetland processes is evolving and improving. Consideration of site-specific conditions is an important part of the approval process.
- .4 The intent is that the design of a constructed wetland shall comply with the following standards:

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- a) Draft Guidelines for Constructed Stormwater Wetlands, by City of Edmonton Drainage Services, dated May, 2000;
- b) Guidelines for the Approval and Design of Natural and Constructed Treatment Wetlands for Water Quality Improvement, by Alberta Environment, dated March, 2000; and
- c) Stormwater Management Guidelines for the Province of Alberta, by Alberta Environmental Protection, dated January, 1999.

.5 The Developer shall retain the services of a design team of consultants experienced in the design and construction of wetland facilities for stormwater management, to prepare a wetlands concept proposal for review by the Town. Following approval of the design concept, a detailed landscaping plan for the wetlands shall be prepared by a landscape architect.

.6 Wetland areas shall be fenced where required by the Town. Where fencing is required, fencing materials shall be selected to conform with the overall landscape concept.

.7 Public viewing areas shall be incorporated into the wetland concept where possible.

11.11.8 A special soils investigation shall be undertaken by an independent testing agency for all SWM facilities. This report shall be submitted to the Town together with the detailed design drawings for the SWM facility.

11.11.9 Inflow/outflow hydrographs, stage-storage and stage-discharge curves shall be provided to the Town for all SWM facilities proposed.

11.12 Storm Water Management Facility Inlets, Outlets and Outfall Structures

11.12.1 Obverts of outfall pipes shall be above the 5 year flood level of receiving streams.

11.12.2 Inverts shall be located to be above winter ice or the pipe shall be submerged with the crown of the pipe being 1 metre below normal water level.

11.12.3 All structures shall be designed to blend harmoniously into the landscape design.

11.12.4 Drop structures and energy dissipators shall be used where necessary to prevent erosion at structures and in the downstream water course. Rip-rap and other protective treatments shall be provided as necessary.

11.12.5 Removable galvanized grates shall be provided to restrict access.

11.12.6 Outfall piping shall be bedded in concrete. Clay stops shall be used at regular intervals to prevent migration of water through the pipe zone.

11.12.7 All outlet structures shall be provided with a key or cutoff wall to prevent undermining of the structure. Outlet structures shall have weeping tile installed to allow drainage beneath the structure.

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11.13 Sump Pump Discharge Collection System

11.13.1 General

- .1 The sump pump discharge collection system shall be a component of the storm drainage system to be installed in all new developments within the Town.
- .2 Unless otherwise approved in writing by the Town, sump pump discharge collection services shall be provided to the service point of each newly developed single family lot or to each multi-family unit. Services shall be installed in common trench with the water and sanitary services as depicted on the Standard Detail Drawings.
- .3 This system shall be dedicated to the collection of discharge from sump pumps which are required to be installed in all buildings with basements and weeping tiles (foundation drains).
- .4 For single family lots and multi-family units, discharge from downspouts and rain water leaders shall not be connected to this collection system.
- .5 A prime objective shall be to provide collection mains and services at sufficient depth to afford frost protection, with connection to a storm sewer system also installed at sufficient depth to afford frost protection.
- .6 In areas where the collection system cannot be installed at adequate depth to give frost protection due to insufficient depth of an existing storm sewer, the design of the collection system shall include alternate methods to minimize the effects of freezing and blockage of the mains and/or services.

11.13.2 Estimating Weeping Tile Flows

- .1 The Developer's Engineer shall estimate weeping tile flows as a component of the detailed geotechnical/hydrogeological investigation.
- .2 This investigation shall assess the predevelopment subsurface soil, groundwater, and other conditions, and the anticipated post development conditions, estimate weeping tile flows, and define any special design and construction measures to be taken for foundations or other infrastructure that may be impacted by weeping tile flows.
- .3 Where significant flows are anticipated from the collection system during the summer, these flows shall be added to the flows used to size the storm sewers to ensure that the level of service provided by the storm system is not affected by these extraneous flows.
- .4 Where high flows are expected such that sump pumps will be required to pump continuously, or run excessively, then the

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Developer shall present alternatives and a recommended solution to the Town.

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11.13.3 Alignments and Locations of Mains

- .1 Where adequate depth to provide frost protection can be achieved, sump pump discharge collection services shall be connected to a storm sewer fronting on to the lots, or to a separate collector main installed along the normal storm sewer alignment where no storm sewer exists, or within the 3.0 m easement provided at the front of all lots with service branches.
- .2 Where there is insufficient depth to provide frost protection, sump pump discharge collection mains shall be installed in the 3.0 m easement at the front of all lots with service branches.
- .3 The collector mains shall be connected to storm sewer system manholes or to deep catch basins with lead sizes designed to accommodate the additional flows from the sump pump discharges.
- .4 Connection of the collection main to either a catch basin or a manhole shall be made by coring.

11.13.4 Pipe Sizing

- .1 Minimum pipe size for mains shall be 150 mm diameter in single family residential areas.
- .2 Pipe sizing shall be determined by the Manning Formula using an "n" factor of 0.013.
- .3 Minimum grade on collector mains shall be 0.6 % .

11.13.5 Cleanouts

- .1 Cleanouts shall be provided in a similar fashion and at locations similar to the requirements for manholes.
- .2 Mid line cleanouts shall be connected to the mains using prefabricated tees to allow cleaning of the main both upstream and downstream from the cleanout.

11.13.6 Sump Pump Discharge Service Connection:

- .1 A separate service line shall be provided to each single lot or multi-family unit.
- .2 The minimum size of sump collector service to a single lot or multi-family unit shall be 100 mm diameter.
- .3 The minimum grade on any service line shall be two percent (2%).
- .4 Services shall be located such that they do not conflict with driveway locations.

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12.0 ELECTRIC POWER SERVICE

12.1 General

12.1.1 Power services to be installed by the power company shall be underground.

12.2 Rights-of-Way

12.2.1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy the power company.

12.2.2 All easements shall be registered in the name of the Town of Morinville.

12.3 Installation

12.3.1 The Developer and the power company shall determine the method and by whom the trenches for power cables shall be dug.

12.3.2 Utility trenches shall be backfilled with compacted material in strict accordance with Articles 6.5.3 and 6.6.2.

12.3.3 The Developer shall coordinate the location of power service boxes and transformers to ensure that they do not end up in driveways or interfere with other utilities.

12.4 Costs

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

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13.0 TELEPHONE SERVICE

13.1 General

13.1.1 Telephone services to be installed by the telephone company shall be underground.

13.2 Rights-of-Way

13.2.1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy the telephone company.

13.2.2 All easements shall be registered in the name of the Town of Morinville.

13.3 Installation

13.3.1 The Developer and the telephone company shall determine the method and by whom the trenches for telephone cables shall be dug.

13.3.2 Utility trenches shall be backfilled with compacted material in strict accordance with Articles 6.5.3 and 6.6.2.

13.3.3 The Developer shall coordinate the location of telephone service boxes to ensure that they do not end up in driveways or interfere with other utilities.

13.4 Costs

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

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14.0 GAS SERVICE

14.1 Rights-of-Way

14.1.1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy the gas company.

14.1.2 All easements shall be registered in the name of the Town of Morinville.

14.2 Installation

14.2.1 The Developer and the gas company shall determine the method and by whom the trenches for gas lines shall be dug.

14.2.2 Utility trenches shall be backfilled with compacted material in strict accordance with Article 6.5.3 and 6.6.2.

14.2.3 The Developer shall coordinate the location of gas services to ensure that they do not interfere with other utilities.

14.2.4 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 same side of the dwelling unit as the driveway.

14.2.5 Gas meters shall not be permitted at the front of the dwelling unit.

14.3 Costs

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

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

15.0 CABLE TELEVISION

15.1 General

15.1.1 Cable television services to be installed shall be underground.

15.1.2 All easements shall be registered in the name of the Town of Morinville.

15.2 Rights-of-way

15.2.1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy the

15.3 Installation

15.3.1 The Developer and the cable television company shall determine the method and by whom the trenches for the cable television shall be dug.

15.3.2 Utility trenches shall be backfilled with compacted material in strict accordance with Article 6.5.3 and 6.6.2.

15.3.3 The Developer shall coordinate the location of cable television services to ensure that they do not interfere with other utilities.

15.4 Costs

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

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

16.0 STREET LIGHTING

16.1 General

16.1.1 The following standards are applicable to all types of development in the Town of Morinville except for industrial developments. Standards for industrial development shall be determined by the Town during the initial planning stages of the proposed development.

16.1.2 All street lighting cables shall be installed underground.

16.2 Design

16.2.1 Street lighting posts with fixtures shall be steel posts comparable to the existing posts within the Town for the several types of streets. Proposals for alternative lighting (i.e. decorative lamps) will be considered on an individual basis.

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

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

16.2.3 Street lighting fixtures shall be high pressure sodium type.

16.3 Location

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

16.3.2 The face of posts shall be at least one (1) metre away from the back of the curb, or 300 mm away from the back of the sidewalk.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

16.3.3 Street lights shall be provided for each internal park area that does not abut onto a lighted street. Street lights shall be provided continuously along walkways throughout the park area, with lighting levels equal or better than the "Lane - Residential" standards as set out in Section 16.2.2. Lighting fixtures shall be selected from the "Post Top Luminaires" series as manufactured by McGraw-Edison, or approved equal, with the style to be approved by the Town.

16.3.4 All street light standards shall be painted in a manner comparable to the existing standards within the Town, unless approved otherwise.

16.4 Costs

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

16.4.2 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.

TOWN OF MORRISVILLE MUNICIPAL ENGINEERING STANDARDS

17.0 TRAFFIC SIGNS, TRAFFIC CONTROL DEVICES AND STREET NAME SIGNS

17.1 General

17.1.1 The Developer, or his Engineer, shall prepare an overall plan of the subdivision on which is shown proposed traffic signs, traffic control devices and street name signs. This plan shall be submitted to the Town for review with the detail design drawings.

17.2 Installation

17.2.1 Standard traffic signs and traffic control devices shall be installed by the Developer and shall be in accordance with the Manual of Uniform Traffic Control Devices of the Transportation Association of Canada.

17.2.2 Reflectorized street name signs, of a size, type and colour satisfactory to the Town, shall be installed by the Developer as per the Approved Traffic Signs, Traffic Control Devices and Street Name Signs drawing. Reflectorized material shall be "High Intensity" grade.

17.2.3 All traffic and street signs shall be mounted and installed on 12 gauge "Telespar" posts, or on an equivalent post type approved by the Town Public Works Department.

17.2.4 The Developer shall coordinate the sign installation with the Town Public Works Department to ensure final placement of the signs is in accordance with normal Town practice.

17.3 Costs

17.3.1 All costs associated with the supply and installation of traffic signs, traffic control devices and street name signs shall be borne by the Developer.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

18.0 MULTIPLE RESIDENCES

18.1 General

18.1.1 This section supplements these minimum Design Standards for all apartment, condominium, townhouse, institutional and other multiple residence developments.

18.1.2 All ties to Town mains between the property line and the main service lines will be carried out under the Town's direction, at the Developer's expense.

18.2 Special Provisions for Multiple Residence Developments

18.2.1 Roadways

.1 Roadways designated for fire fighting purposes and access to garbage pick up shall:

- .1 have a clear width of not less than 8 metres;
- .2 have a centreline radius of not less than 13.5 metres;
- .3 have an overhead clearance of not less than 5 metres;
- .4 have a change of gradient of not more than 1 in 12.5 over a minimum distance of 15 metres;
- .5 be designed to support the expected loads imposed by fire fighting equipment;
- .6 have turnaround facilities for any dead-end portion of the access route;
- .7 be connected with a public thoroughfare;
- .8 no parking shall be permitted on any roadway designated for fire fighting purposes at any time. Proper signage regarding parking restrictions shall be provided throughout the development; and
- .9 conform with other standards as set out in Section 3.0 of these standards.

.2 Adequate off street parking shall be provided in accordance with the Land Use Bylaw of the Town of Morinville.

.3 Entrances shall be sufficiently wide to accommodate both in and out traffic, in accordance with the Land Use Bylaw of the Town of Morinville.

18.2.2 Water Distribution System

.1 Fire protection shall be designed in accordance with Section 7.2.2 of these standards.

.2 Fire hydrants shall have sufficient valves to isolate them from the domestic flow.

.3 All water piping between the Town's main and the water meter shall be designed and constructed in accordance with Section 7.0 of these Standards, and shall pass the pressure and disinfection tests. Copies of the approved pressure and disinfection tests shall be provided to the Town.

.4 Either a master meter or individual meters shall be provided including meters on irrigation lines. Where separate meters are provided, each service shall be constructed with a separate curb stop at a location approved by the Town. Curb stops shall be located at least 1.0 metres from a foundation. As built location tie-ins to the curb stop shall be provided from two corners of the building.

.5 Two ties to the Town's mains shall be provided to effect a loop system to all fire

TOWN OF MORRISVILLE - MUNICIPAL ENGINEERING STANDARDS

hydrants. All ties shall have a valve on the public right-of-way side at the subdivision property line.

18.2.3 Sanitary Sewer System

- .1 All sanitary sewer mains shall be designed and constructed in accordance with Section 8.0 of these Standards, shall be inspected with CCTV equipment, and shall pass the infiltration or exfiltration test, as may be required.

18.2.4 Storm Sewer System

- .1 Multiple residence sites shall be provided with storm sewer service lines as part of the overall design of the subdivision.
- .2 All storm water runoff from the site shall be contained within the site and shall be drained to the internal storm sewer system.
- .3 Storm sewers shall be designed and constructed in accordance with Section 11.0 of these Standards.

18.2.5 Sump Pump Collector System

- .1 Multiple residence sites shall be provided with a sump pump collector system and sump pump collector services as part of the overall design of the subdivision.
- .2 The sump pump collector system shall be designed and constructed in accordance with Section 11.0 of these Standards.

18.2.6 Landscaping

- .1 A plan for landscaping shall be submitted to the Town for approval.
- .2 Landscaping shall conform to the minimum requirements as set out in Section 20.0 of these Standards.

18.2.7 Uniform Fencing

- .1 All multiple residence sites shall be fenced with uniform fencing in accordance with Section 21.0 of these Standards.
- .2 A plan showing the extent of and details for the uniform fencing shall be submitted to the Town for approval.

18.2.8 Other Improvements

- .1 Plans for all other services shall be provided including but not limited to gas, power, telephone, cable television, lighting, fences, signs, traffic signs, traffic control devices and street name signs shall be included in the submission for approval by the Town.
- .2 All other services required for multiple residences shall conform to the applicable requirements as set out in the appropriate sections of these Standards.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

18.2.9 As-Built Drawings

- .1 As-built drawings of the utility servicing shall be provided in accordance with Article 2.3.3 of these Standards.
- .2 Drawings shall be submitted within thirty days of completion of the site servicing and shall show the name of the contractors and completion dates for each utility service.

19.0 COMMERCIAL DEVELOPMENTS

19.1 General

19.1.1 This section supplements these minimum Design Standards for all commercial developments.

19.2 Special Provisions for Commercial Developments

19.2.1 Roadways

- .1 Roadways designated for fire fighting purposes and access to garbage pick up shall:
 - .1 have a clear width of not less than 8 metres;
 - .2 have a centreline radius of not less than 13.5 metres;
 - .3 have an overhead clearance of not less than 5 metres;
 - .4 have a change of gradient of not more than 1 in 12.5 over a minimum distance of 15 metres;
 - .5 be designed to support the expected loads imposed by fire fighting equipment;
 - .6 have turnaround facilities for any dead-end portion of the access route;
 - .7 be connected with a public thoroughfare; and
 - .8 no parking shall be permitted on any roadway designated for fire fighting purposes at any time. Proper signage regarding parking restrictions shall be provided throughout the development; and
 - .9 conform with other standards as set out in Section 3.0 of these standards.
- .2 Adequate off street parking shall be provided in accordance with the Land Use Bylaw of the Town of Morinville.
- .3 Entrances shall be sufficiently wide to accommodate both in and out traffic in accordance with the Land Use Bylaw of the Town of Morinville.

19.2.2 Water Distribution System

- .1 Fire protection shall be designated in accordance with Section 7.2.2 of these standards.
- .2 Fire hydrants shall have sufficient valves to isolate them from the business flow.
- .3 All piping between the Town's main and the water meter shall be designed and constructed in accordance with Section 7.0 of these standards, and shall pass the pressure and disinfection tests.
- .4 Either a master meter or individual meters shall be provided. Where individual meters are to be provided, each service line shall be constructed with a separate curb stop at a location approved by the Town.
- .5 Two ties to the Town's mains shall be provided to effect a loop system to all fire

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

hydrants. All ties shall have a valve at the development property line.

19.2.3 Sanitary Sewer System

- .1 All sanitary sewer mains shall be designed and constructed in accordance with Section 8.0 of these standards and shall pass the infiltration, exfiltration or low pressure air test.

19.2.4 Storm Sewer System

- .1 Storm water generated by commercial developments shall be conveyed within the Town storm sewer system.
- .2 Commercial sites shall be provided with storm sewer service lines as part of the overall design of the subdivision.
- .3 Storm sewer systems shall be constructed in strict accordance with section 11.0 of these standards.
- .4 Where directed by the Town, runoff from commercial sites shall be limited to a controlled rate of flow. Adequate on-site storage shall be provided in such case.

19.2.5 Sump Pump Collector System

- .1 Commercial developments shall be provided with a sump pump collector system and sump pump collector services as part of the overall design of the subdivision.
- .2 The sump pump collector system shall be designed and constructed in accordance with Section 11.0 of these Standards.

19.2.6 Landscaping

- .1 A plan for landscaping shall be submitted to the Town for approval.
- .2 Landscaping shall conform to the minimum requirements as set out in Section 20.0 of these Standards.

19.2.7 Uniform Fencing

- .1 All commercial developments shall be fenced with uniform fencing in accordance with Section 21.0 of these Standards.
- .2 A plan showing the extent and details for uniform fencing shall be submitted to the Town for approval.

19.2.8 Other Improvements

- .1 Plans for all other services shall be provided including but not limited to gas, power, telephone, cable television, lighting, fences, signs, traffic signs, traffic control devices and street name signs shall be included in the submission for approval by the Town.
- .2 All other services required for multiple residences shall conform to the applicable requirements as set out in the appropriate sections of these Standards.

19.2.9 As-Built Drawings

- .1 As-built drawings of the utility servicing shall be provided in accordance with Article 2.3.3 of these Standards.
- .2 Drawings shall be submitted within thirty days of completion of the site servicing and shall show the name of the contractors and completion dates for each utility service.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

20.0 LANDSCAPING

20.1 General

- 20.1.1 The Developer's Landscape Architect shall prepare an overall plan of the subdivision on which is shown the proposed landscaping. This plan shall be submitted to the Town for review with the detail design drawings.
- 20.1.2 The areas to be landscaped shall include all boulevards, buffer strips, drainage parkways, retention and detention ponds, walkways, parks, playgrounds, municipal reserves and school reserves, and public utility lots.
- 20.1.3 Landscaping shall include the final grading of the area, the placing and spreading of topsoil, the cultivation of the area and planting it to grass.
- 20.1.4 The planting of trees, shrubs and flower beds shall be in accordance with the Approved landscaping plans and comply with all sections of "The Canadian Standard for Nursery Stock", 6th Edition (1996) of Canadian Nursery Trades Association, referring to size and development of plant material and root systems. It should be noted that feature areas are expected to exceed general landscaping standards. They shall include, but are not limited to, traffic islands, subdivision entries, park and recreation amenities, signage and individual neighbourhood identity features.
- 20.1.5 Materials proposed to be used for topsoil shall be tested for suitability for use by an independent testing agency. Results of the testing shall be submitted to the Town for review not less than seven (7) days prior to the proposed use of the material. Should the material not be suitable for use in its present form, the Developer shall either modify the existing material or provide suitable material from an alternate source, at the Developer's expense.

20.2 Grades

- 20.2.1 The cross slope across boulevards shall be a minimum of 2%.
- 20.2.2 All areas to be landscaped shall be graded to drain into street gutters, into catchbasins, or into adjacent drainage parkways. Under no circumstances shall an area be designed, built or landscaped to drain from public property onto private property.

20.3 Design

- 20.3.1 Landscaping shall be designed by a member of the Alberta Association of Landscape Architects or equivalent.
- 20.3.2 All areas to be landscaped shall be filled to final grade with a minimum of 100 mm of natural, fertile, agricultural soil typical of locality, capable of sustaining vigorous plant growth, not less than 6% organic matter and pH value of 5.9. to 7.0, reasonably free from subsoil, slag, clay, stones, lumps, live plants and their roots, quackgrass, noxious weeds and foreign matter.
- 20.3.3 Where landscaping is provided on a site in any multiple Residential, Commercial or Industrial project, quantities shall be determined on the basis of a minimum of one tree or three shrubs

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

for each 60 m2 of any required yard, setback at grade or open space.

- a) The ratio of deciduous to evergreen trees shall be approximately 60:40 unless approved otherwise.
- b) Size shall be at least 50 mm caliper for deciduous trees and at least 2 metres in height for evergreen trees.
- c) Shrub material, if deciduous, to have a minimum height of 600 mm when planted and coniferous to have a minimum spread of 400 mm.
- d) Trees shall be planted on all street boulevards and buffers. Street tree and boulevard tree spacing are minimums and may vary if the Director of Parks and Recreation requires modified spacing. Native, fast growing trees shall be incorporated into the landscaping of major arterial roadway buffers.

Distance between species:

<u>Species</u>	<u>Minimum Spacing</u> <u>(metres)</u>
American Elm	13.0
Green Ash	13.0
Black Ash	9.0
Manchurian Elm	9.0
Lindens	9.0
Birch	9.0
Mountain Ash	9.0
Mayday	9.0
Spruce/Pine	Cluster Planting

20.3.4 Berms or elevated contours shall be utilized for sound abatement as required by the Town in the buffer strip along arterial roadways or railways. Such features shall not exceed a 4:1 slope.

20.3.5 Grass areas shall be seeded at the rate of 1 kg per 50 square metres with Canada No. 1 seed mixed to the following proportion by weight: 60% Creeping Red Fescue; 30% Kentucky Blue Grass; and 10% Crested Wheat Grass.

20.3.6 Maintenance

1. Fertilize seeded areas eight weeks after seeding with 20-14-0 fertilizer, with an application rate of 1 kg per 50 square meters. Fertilizer must be watered in after application. In the event that the requirement for fertilizing should occur after August 15 of the current year the fertilizer shall not be applied until the following spring.

2. Maintenance shall include all measures necessary to establish and maintain all seeded areas in a healthy, vigorous growing condition, including but not limited to:

- a) first cutting shall occur when the grass is a minimum of 75 mm high and

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

- covers 100% of the seeded area. Mow at regular intervals as required to maintain the grass at a minimum height of 65 mm;
 - b) watering, when required, and with sufficient amounts to ensure germination and to prevent grass and underlying soil from drying out;
 - c) fertilizing, including supplementary fertilizer applications as necessary to establish a vigorous, growing stand of grass;
 - d) weed control shall be carried out when required to keep the landscaped areas reasonably free from weeds; and
 - e) re-seeding shall be carried out for areas which show deterioration, bare spots or are thin.
- .3 Plant material shall be guaranteed for two (2) years after the date of the "Construction Completion Certificate".

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21.0 FENCE

21.1 General

21.1.1 Uniform fencing shall be provided along the perimeter of the subdivision, along the rear or side lot line for those lots adjacent to arterial roadways, along the perimeter of buffer strips, the stormwater retention or detention ponds, along both sides of walkways, along the perimeter of municipal and school reserves and public utility lots, and at any other location that may be required by the Town in accordance with the Approved fencing drawings.

21.1.2 The Developer, or his Engineer, shall prepare an overall plan of the subdivision on which is shown proposed fencing. This plan shall be submitted to the Town for review with the detail design drawings.

21.2 Design

21.2.1 The fence shall be of sturdy construction, a minimum of 1.8 metres high and of a type that requires a minimum of maintenance.

21.2.2 The fence shall be of a design suitable for sound abatement where required along arterials, railways and other noisy areas.

21.2.3 Decorative fences, such as brick or stone shall be approved on an individual basis.

21.3 Construction

21.3.1 Fences shall be constructed so that the entire fence lies not less than 50 mm within private property. None of the fence shall overhang or project on to public property.

21.3.2 A post shall be placed at each lot corner to facilitate extension of the fence down the common property line.

21.3.3 Where uniform fencing is constructed along the rear lot line of lots backing on to a municipal reserve, each lot shall be provided with a gate constructed in accordance with the appropriate Typical Detail Drawing.

21.3.4 All gates shall open in to the lot.

TOWN OF MORINVILLE - MUNICIPAL ENGINEERING STANDARDS

22.0 PARK DEVELOPMENT

22.1 General

22.1.1 Parks shall be landscaped in accordance with Section 20.0 of these standards.

22.1.2 Park features and landscaping shall be integrated with major drainage parkways, detention ponds and retention ponds.

22.2 Park Development

22.2.1 The Developer, his Consultant or Landscape Architect, shall prepare plans of the park(s) on which are shown the location, primary functions, adjoining land uses and proposed park development. These plans shall be submitted to the Town for review with the detailed design drawings.

22.2.2 Park development shall include the following items:

- a) Shrubs and trees;
- b) Playground equipment for active parks;
- c) Sports fields;
- d) Fences;
- e) Walkways;
- f) Restrooms;
- g) Lighting;
- h) Site furniture;
- i) Waste receptacles;
- j) Services.

22.2.3 All park sites shall be provided with water and sewer service connections to a location approved by the Town. Minimum size of service shall be:

- a) Water service connection - 50 mm
- b) Sanitary service connection - 150 mm

Water service connections shall terminate in a box hydrant unless otherwise approved by the Town.

22.2.4 All ponds in park areas shall be designed with a maximum 7:1 slopes.

22.2.5 Stockpiling of soil or construction materials on park reserves shall be prohibited without the written permission of the Town of Morinville.

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APPENDIX A - PLAN STANDARDS
to
TOWN OF MORINVILLE
MUNICIPAL ENGINEERING STANDARDS

1.0 PLAN STANDARDS

1.1 General Requirements for Detailed Engineering and Landscaping Plans

All detailed engineering plans submitted to the Town of Morinville for review and approval must comply with the following requirements:

1.1.1 Plan Size

The standard size of all plans shall be metric sheet size "A-1" (841 mm by 594 mm).

1.1.2 Cover Sheet

This sheet must show the name of the project or subdivision, stage of development and the names of the developer and the consultants.

1.1.3 General Legend and Abbreviations Plan

This plan shall indicate and define all symbols and abbreviations used in the remainder of the drawings.

Alternatively, the general legend and abbreviations may be shown on all individual drawings as may be required.

All abbreviations and drawing symbols used in detailed engineering plans shall conform to those specified in the City of Edmonton's Servicing Standards Manual, latest edition thereof.

1.1.4 Index Plan

This plan will be prepared on a scale of 1 to 1000, or a reduction thereof, to fit the standard size sheet. This plan will be a copy of the Legal Plan, or Preliminary Legal Plan, and will indicate that portion of a street which relates to a particular Plan/Profile Sheet. Ties to the Alberta Survey Control System monuments shall also be shown on this plan.

This plan shall list each drawing included in the drawing set. Drawing names shall be listed sequentially by drawing number.

1.1.5 Legal, Easement and Land Use Plan

This plan should be prepared to the same scale as the Index Plan and will indicate the proposed land uses within the project and the existing and/or proposed land uses on adjacent parcels.

All legal and easement information shall be shown on this plan.

A 3.0 m wide utility easement shall be provided at the front of all lots. Flankage utility easements on corner lots shall be provided as required. Flankage utility easements shall be minimum 3.0 m wide.

Public Utility Lot widths shall be minimum 4.0 m wide for single services and 6.0 m wide for two services.

APPENDIX A - PLAN STANDARDS

1.1.6 Road, Sidewalk and Walkway Plans

This plan shall be drawn to a scale of 1 to 1000 and will indicate all walks, lanes and carriageway widths and alignments. Catch basins will also be shown, but dimensions need not be included.

Included also, should be the alignments and widths of all existing and proposed immediately-surrounding streets, lanes, walks, ditches and other pertinent topographical features, plus the limits of the contract. Road grades need not be shown on this plan. Temporary access connections, if required, will be shown.

The plan shall indicate the two access points into the proposed subdivision.

1.1.7 Lot Grading Plans

This plan shall be drawn to a scale of 1 to 1000 and will indicate the proposed finished lot corner elevations, the proposed finished grade of the building, the direction of flow of surface drainage on the lots, the original ground contours, proposed curb alignments and any required scales. Building elevations may be shown. Sanitary sewer service and sump pump collector service inverts at the property line shall be shown.

Bench marks used in the construction of the project shall be shown on the plan.

Existing contours shall be shown on a 0.5 m interval in a screened format.

This plan shall show the direction of flow of the overland major drainage system and ponding areas and flow depths resulting from a 1:100 year storm.

Typical details of the various lot grading types used shall be shown in three dimensional detail. Each lot shall be labelled to identify the applicable lot grading type.

This plan shall include notes dealing with roof leader discharge and either downspout or splash pad extension requirements, the requirement for a sump and sump pump in each house, and reference to the appropriate details for connection to the sump pump collector system.

1.1.8 Sanitary, Storm and Water Main Overall Plans

This plan shall be drawn to the same scale as the Index Plan and will show the alignments of sanitary, storm and water mains and service connections, their sizes, grades and direction of flow; location of appurtenances; and a Table presenting the criteria used and the hydraulic calculations for the sanitary sewer system.

Local drainage areas which contribute to the storm sewers shown will be outlined on this plan also. The plan shall include a Table(s) showing the design criteria and hydraulic design for the storm sewer system, sump pump collector system, catch basins and catch basin leads.

1.1.9 Telephone, Gas, Power and Cablevision Plan

This plan must indicate the alignments of all telephone, gas, power and cablevision utilities and will be drawn to the same scale as the Index Plan. Any surface encumbrances such as power poles, transformers and pedestal shall be shown on the plan.

Driveway locations for each lot must also be shown on this plan.

The plan shall show the location of conduit placement for new road construction. Existing road crossings shall be made by augering or similar method.

Gas pipes shall have a minimum depth of bury of 0.8 m.

Primary cables, secondary cables and service drops shall have a minimum 1.2 m bury.

1.1.10 Street Hardware Plan

This plan shall be drawn to the same scale as the Index Plan and will show the location of all street furniture. This plan shall be used to identify and avoid conflicts between the street furniture and future driveways. A scale of 1:500 may be used if necessary for clarity.

The plan shall show the location and type of each traffic sign to be installed on the project.

All surface infrastructure and other features such as hydrants, light poles, power transformers, telephone and cable boxes, and curb boxes shall be shown.

The plan shall show permitted driveway locations for each lot with a standard detail showing the allowable driveway offset from the property line.

There shall be a minimum clearance of 1.5 m between the edge of driveway and any surface obstruction.

1.1.11 Detailed Road Plans

These plans will be drawn to a scale of 1 to 500 horizontal and 1 to 50 vertical, and will show the following:

- .1 legal subdivision;
- .2 street and walkway name and numbers;
- .3 road, lane and sidewalk alignments;
- .4 walkway connections;
- .5 alignments of immediately adjacent existing and proposed streets, walks, lanes, roads, ditches, and interim access connections, alignment data;
- .6 chainage or property line ties to correlate plan and profile;
- .7 existing ground profile;
- .8 proposed curb top and lane grade and crown elevation for all intersecting roadways;
- .9 grade of proposed and field established elevations of existing local improvements affecting proposed design;
- .10 curb elevations; 10' catch basins; beginning and end of corner radii, horizontal curves; and vertical curves, and where a break in grade takes place;
- .11 centreline grade shall be shown on the profile.

The cross-section should be shown on a separate plan, be cross referenced and show the road and sidewalk, walkway and lane alignment, temporary access connection and specifications for roadway construction.

The title should specify the exact portion of the roadway covered by each sheet.

APPENDIX A - PLAN STANDARDS

1.1.12 Detailed Utility Plans and Profiles for Streets and Lanes

This plan shall be drawn to a scale of 1 to 500 horizontal and 1 to 50 vertical and will show the following:

- .1 legal subdivision;
- .2 street and walkway name and numbers;
- .3 the roadway and sidewalk alignment;
- .4 existing ground profile, profile of proposed top of curb and/or lane grade, chainage or property line ties to correlate plan and profile;
- .5 existing and proposed utility alignments;
- .6 grade and profile of all utility installations;
- .7 a typical cross-section showing the road and sidewalk alignment as well as utility placement. The cross-section may be shown on a separate plan and cross-referenced.

The drawings as described in 1.1.11 and 1.1.12 may be combined into one drawing at the sole discretion of the Town Engineer, having regard for legibility and clarity.

1.1.13 Detailed Plan and Profiles for Walkways

This plan shall be drawn to a scale of 1 to 500 horizontal and 1 to 50 vertical and will show the following:

- .1 legal subdivision;
- .2 street and walkway name and numbers;
- .3 alignment of walk and immediately surrounding roads and sidewalks;
- .4 alignment and grade data on existing and proposed walks;
- .5 chainage or property line ties to correlate plan and profile;
- .6 proposed edge of walk grade;
- .7 walk elevations should be shown at walk intersections, drainage locations, and street intersections;
- .8 existing and proposed utility alignments;
- .9 grade and profile of all utility installations;
- .10 berm grading and drainage and back of lot elevations for adjacent subdivision;
- .11 typical cross-section showing walk type, construction details as well as utility placement. The cross-section could be shown on a separate plan and cross-referenced.

The title should specify the exact portion of the walkway covered by each sheet.

1.1.14 Planting Plan

This plan shall show the following:

- .1 legal subdivision;
- .2 street and walkway name and numbers;
- .3 walk alignment;
- .4 utility alignments;
- .5 the alignments of immediately adjacent existing and proposed streets, walks, roads and ditches;
- .6 berm location;
- .7 fence locations;

APPENDIX A - PLAN STANDARDS

- .8 selection, size, quantity, condition and installation specification of trees and shrubs;
- .9 location of walkway furniture;
- .10 location of waste receptacles and street lighting.

A Table shall be provided showing distance requirements between trees and shrubs and surface components of deep and shallow utility systems.

1.1.15 Lettering Size

All lettering must be clearly legible, a minimum of 2 mm in height, well spaced and proportioned.

1.1.16 Line Weight

Lines shall be uniform in weight and density.

1.1.17 Computer Assisted Drawings

Drawings shall be prepared in a format that is compatible with the Town's AutoCAD system. The Town has installed AutoCAD 2002 into its computer system.

1.2 General Requirements for As-Built Drawings

As-built drawings shall be submitted in digital format, suitable for use in the Town's AutoCAD system. Additionally, three (3) sets of prints of the as-built drawings shall be submitted to the Town, at least one (1) copy of which shall be on clear reproducible mylar. The drawings shall be professionally restamped, signed and dated to indicate As-built information.

1.2.1 As-built Requirements for Surface Improvements

- a) All data shown on the construction drawings shall be changed to as-built information.
 - i) As-built elevations shall be shown on the catch basins and curb returns on the plan and profile plans, as well as any grade changes which exceed the design grade by more than 0.01 metres.
 - ii) As-built radii, distances from back of walk to property line and sidewalk widths shall be as shown on plan and profile plans.
- b) As-built type of sidewalk, vertical or rolled face or vertical faced curbs or rolled face curbs shall be as shown on the overall plan together with a legend.
- c) Elevations shown shall be identified as either top of curb or gutter elevations.
- d) If the cross-sectional design has been changed in width or structure, then this shall be changed to as-built on the typical section plan.
- e) The month and year of completion and name of the contractor shall be shown on each plan.

1.2.2 As-built Requirements for Underground Improvements

- a) Any revisions made to construction drawings to create as-built plans will be made on all plans which indicate the area of the revision. Revisions shown on detail plans and profiles will be shown also on overlapping detail drawings where they appear, as well as on composite plans.
- b) The pipe manufacturer, material and the class of pipe installed shall be noted on all plans.
- c) The overall layout plans for water, storm and sanitary sewers shall show the sizing

APPENDIX A - PLAN STANDARDS

- d) of mains.
All hydrants, valves, plugs, bends, crosses, tees, reducers, manholes, catch basins and other fittings shall be noted and dimensioned, with ties to property lines.
- e) Rim elevations for manholes and elevations of all inverts, including previous construction shall be shown.
- f) The name of the contractor and the month and year of construction shall be shown on each plan.

1.2.3 As-built Requirements for Water and Sanitary Service Connections

- a) The pipe manufacturer, material and the class of pipe installed shall be noted on all plans.
- b) A table on each plan/profile drawing shall be prepared giving the following information with respect to service connections:
 - i) Lot number;
 - ii) distance of service saddle from the downstream manhole; and
 - iii) invert elevation of the sanitary sewer service, the sump pump collector service, and the top of pipe of the water service.
- c) The service connection provided to each lot shall be shown on the plan and the location shall be referenced to the property lot corner.
- d) Where the lot is on a curve, the end of the services shall be tied to both front lot corners.
- e) Riser connections shall be shown on the profile portion of the plan/profile drawing.

1.2.4 Standard Details

Standard detail drawings shall be revised to reflect as built information.

1.2.5 Street Address Numbers

Street address numbers shall be supplied by the Town and shall be added to the Legal Plan at the record stage.

1.2.6 Municipal Infrastructure Management System (MIMS)

The Town of Morinville is currently conducting a pilot project with the Province to input all municipal utility servicing data into a Municipal Infrastructure Management System. Ultimately the intent will be to add record information on all new projects directly into the Town's MIMS database.

The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud. The document also notes that records should be kept for a sufficient period to allow for a thorough audit.

The second part of the document outlines the specific requirements for record-keeping. It states that all transactions must be recorded in a clear and concise manner, and that the records must be accessible to all authorized personnel. The document also requires that records be kept in a secure and protected environment to prevent unauthorized access or destruction.

The third part of the document discusses the role of the auditor in verifying the accuracy of the records. It states that the auditor must conduct a thorough review of the records to ensure that they are complete and accurate. The document also notes that the auditor must report any discrepancies or irregularities to the appropriate authorities.

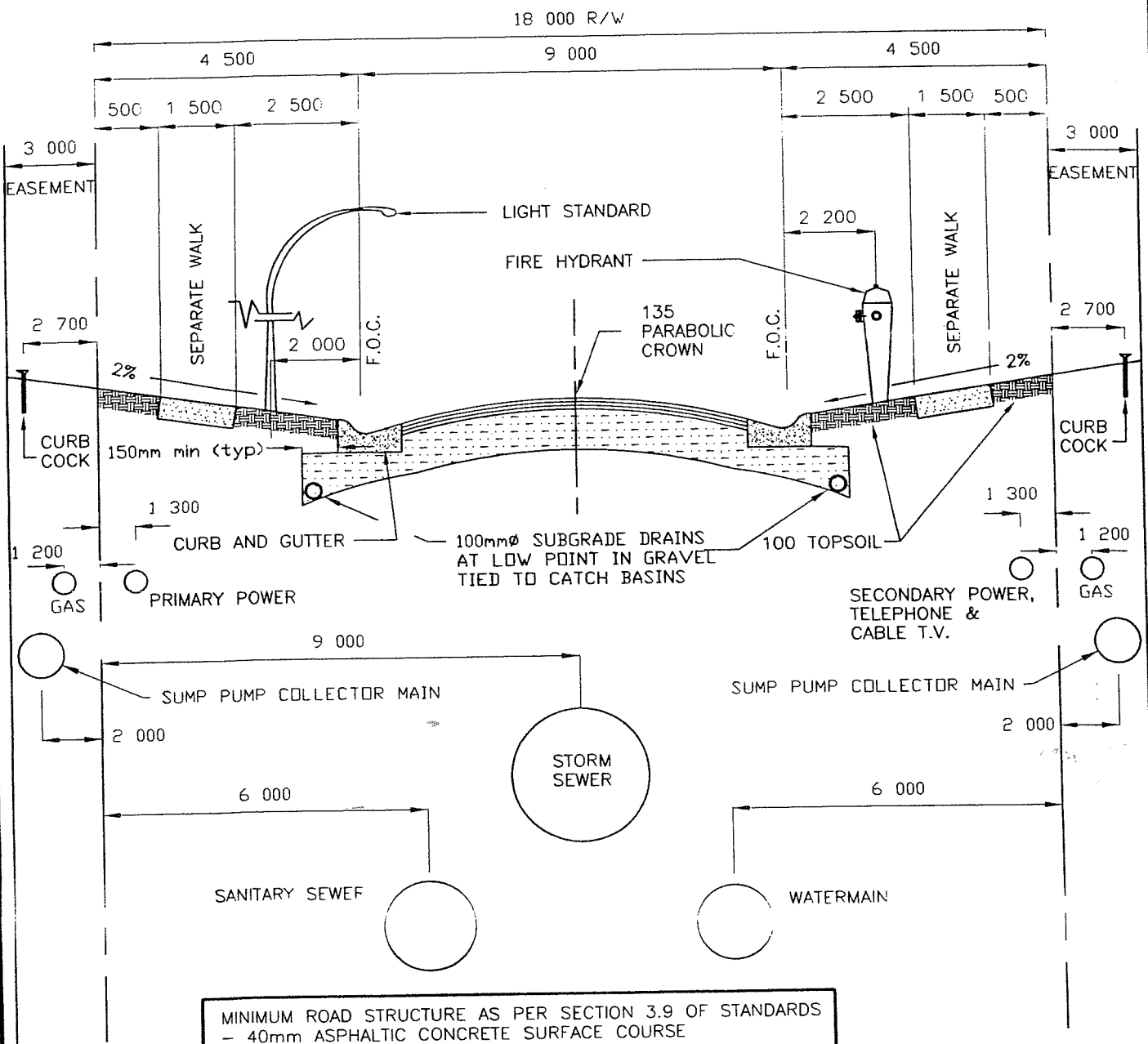
The fourth part of the document discusses the consequences of non-compliance with the record-keeping requirements. It states that failure to maintain accurate records can result in severe penalties, including fines and imprisonment. The document also notes that non-compliance can damage the reputation of the organization and lead to a loss of trust from stakeholders.

The fifth part of the document discusses the importance of training and education for all personnel involved in the financial system. It states that all personnel must be trained in the proper record-keeping procedures and must understand the importance of maintaining accurate records. The document also notes that training should be provided regularly to ensure that personnel are up-to-date on the latest requirements.

The sixth part of the document discusses the importance of internal controls in preventing fraud and ensuring the accuracy of the records. It states that internal controls should be designed to minimize the risk of error and to detect any irregularities. The document also notes that internal controls should be reviewed and updated regularly to ensure that they remain effective.

The seventh part of the document discusses the importance of transparency and accountability in the financial system. It states that all transactions should be recorded and reported in a clear and concise manner, and that the results of the financial system should be made available to all stakeholders. The document also notes that transparency and accountability are essential for building trust and for the long-term success of the organization.

The eighth part of the document discusses the importance of ongoing monitoring and evaluation of the financial system. It states that the financial system should be monitored and evaluated regularly to ensure that it remains effective and efficient. The document also notes that monitoring and evaluation should be conducted in a transparent and accountable manner.



MINIMUM ROAD STRUCTURE AS PER SECTION 3.9 OF STANDARDS

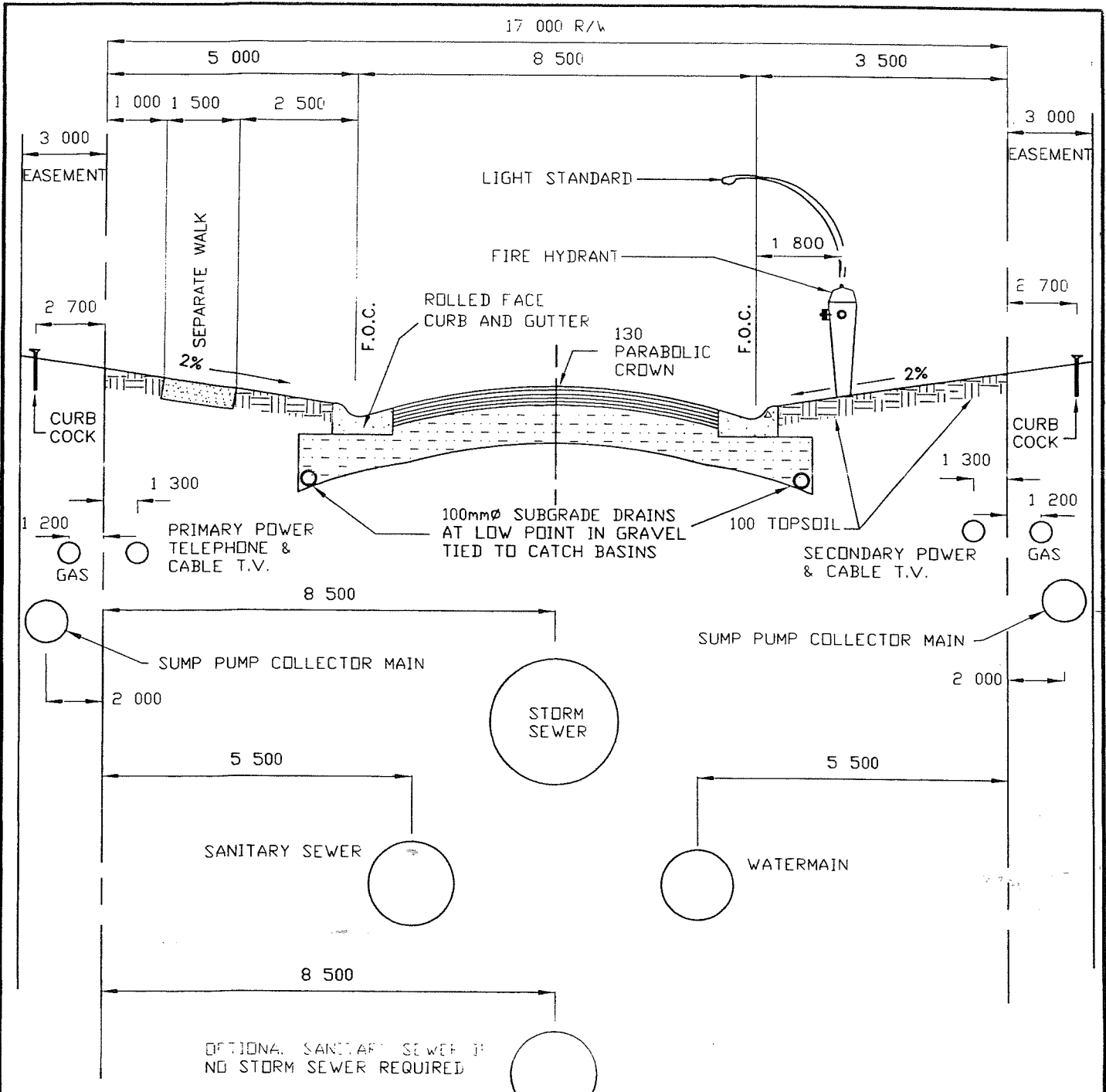
- 40mm ASPHALTIC CONCRETE SURFACE COURSE
- 75mm ASPHALTIC CONCRETE BASE COURSE
- 200mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

9 METRE LOCAL ROADWAY



TOWN OF VILLE DE
MORINVILLE

REVISIONS			
		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	1.01




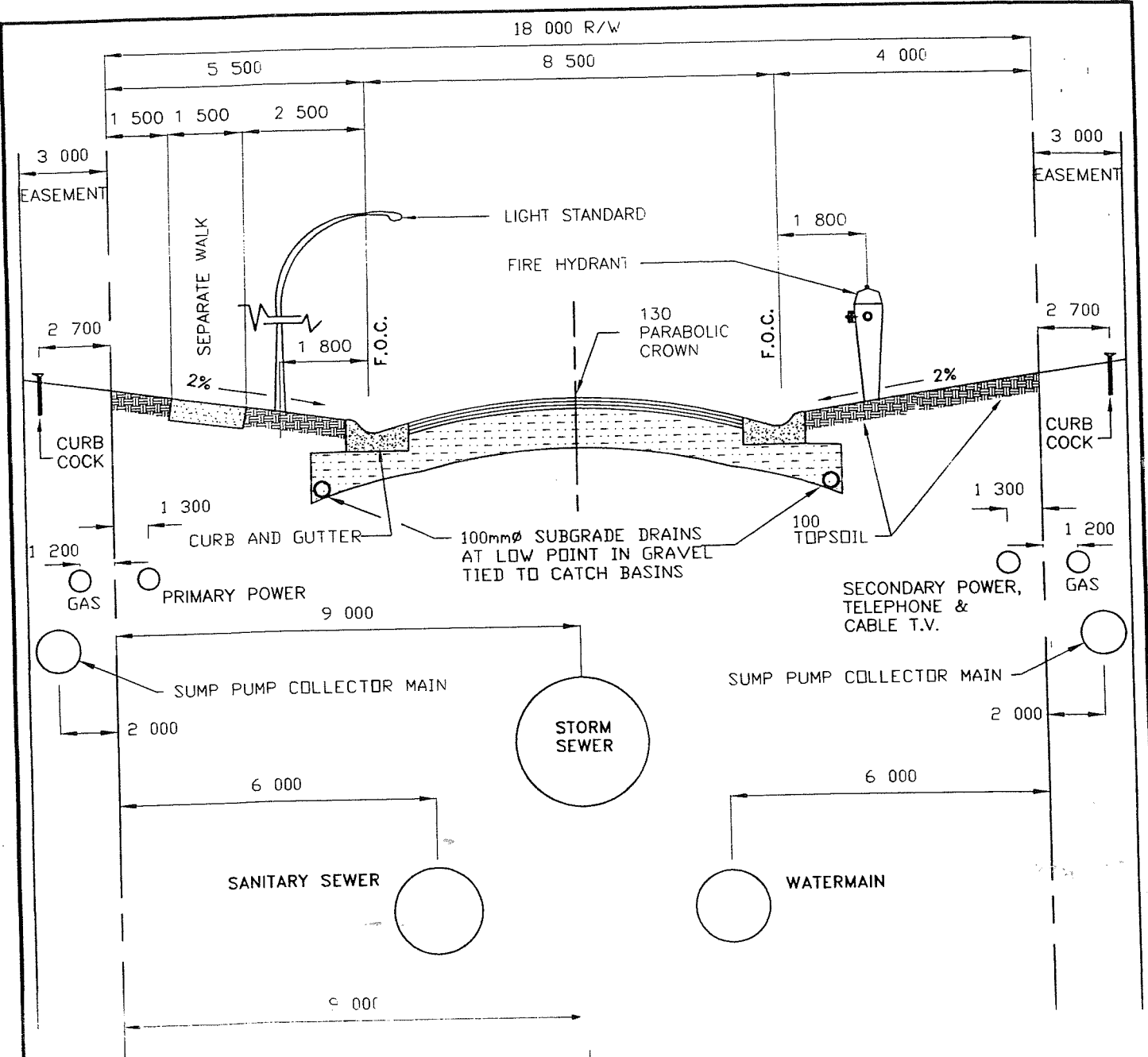
MINIMUM ROAD STRUCTURE AS PER SECTION 3.9 OF STANDARDS

- 40mm ASPHALTIC CONCRETE SURFACE COURSE
- 75mm ASPHALTIC CONCRETE BASE COURSE
- 200mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

NOTE :
THIS SECTION TO BE USED ON CULS-DE-SAC
LESS THAN 120 METRES IN LENGTH.

8.5 METRE SHORT CUL DE SAC ON 17 METRE RIGHT-OF-WAY

 <p>TOWN OF VILLE DE MORINVILLE</p>	REVISIONS			
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	1.02



MINIMUM ROAD STRUCTURE AS PER SECTION 3.9 OF STANDARDS

- 40mm ASPHALTIC CONCRETE SURFACE COURSE
- 75mm ASPHALTIC CONCRETE BASE COURSE
- 200mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

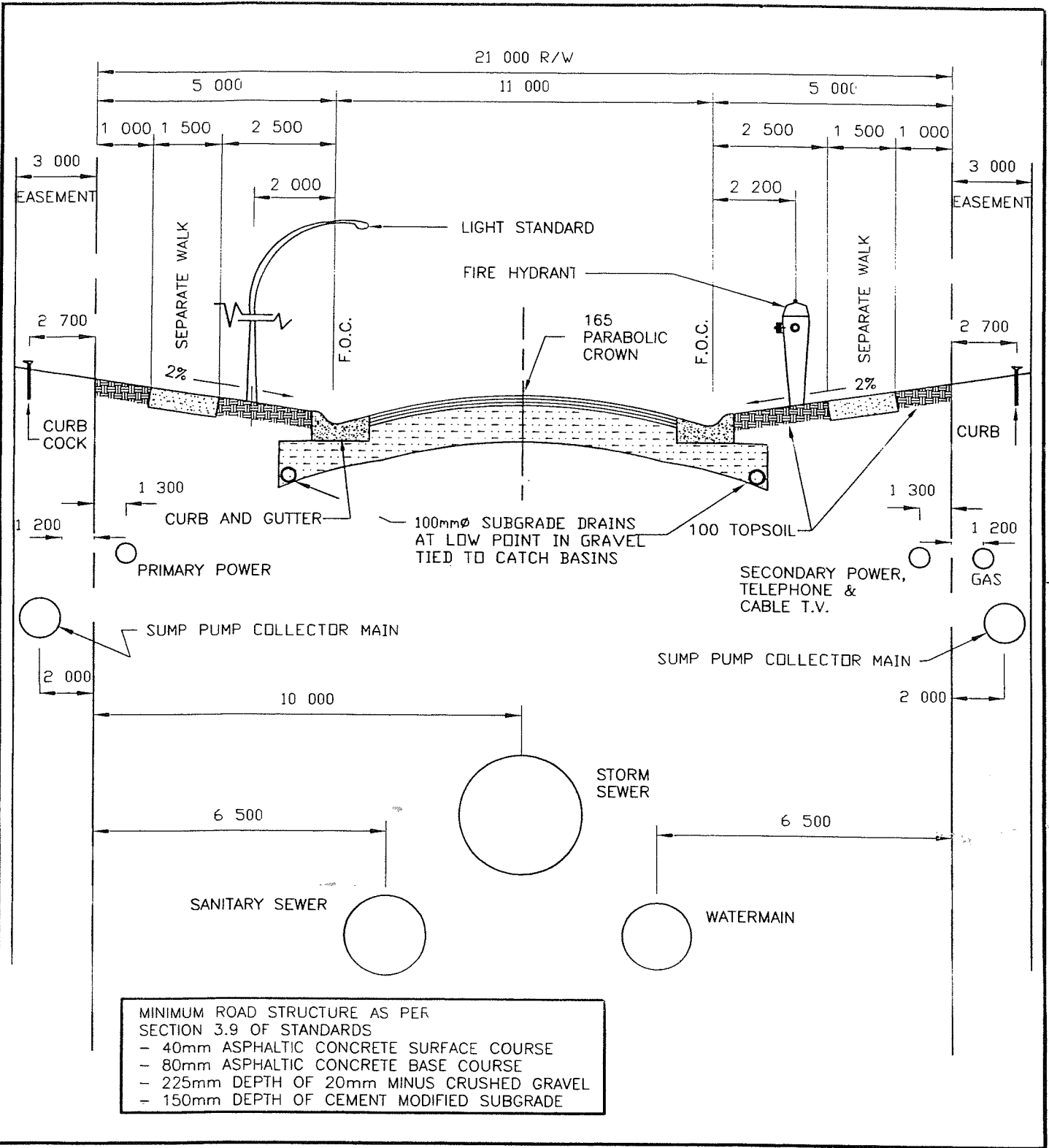
NOTE : THIS SECTION TO BE USED ON LONG CULS-DE-SAC 120 METRES IN LENGTH OR LONGER.

8.5 METRE LONG CUL DE SAC ON 18 METRE RIGHT-OF-WAY




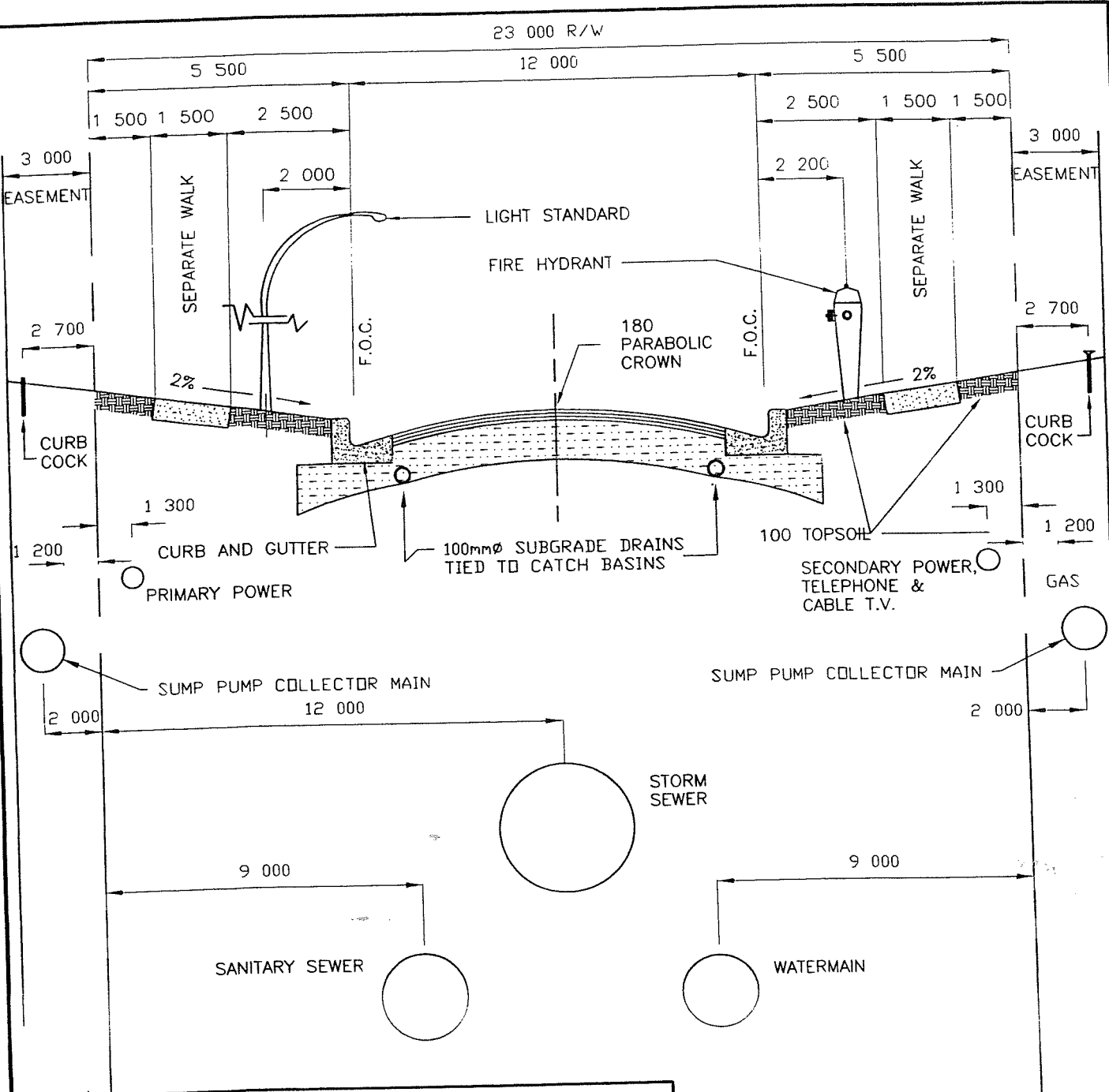
TOWN OF VILLE DE
MORINVILLE

REVISIONS			
		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	1.03



11 METRE MINOR COLLECTOR


	TOWN OF · VILLE DE MORINVILLE	REVISIONS <hr/> <hr/>		
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	1.04

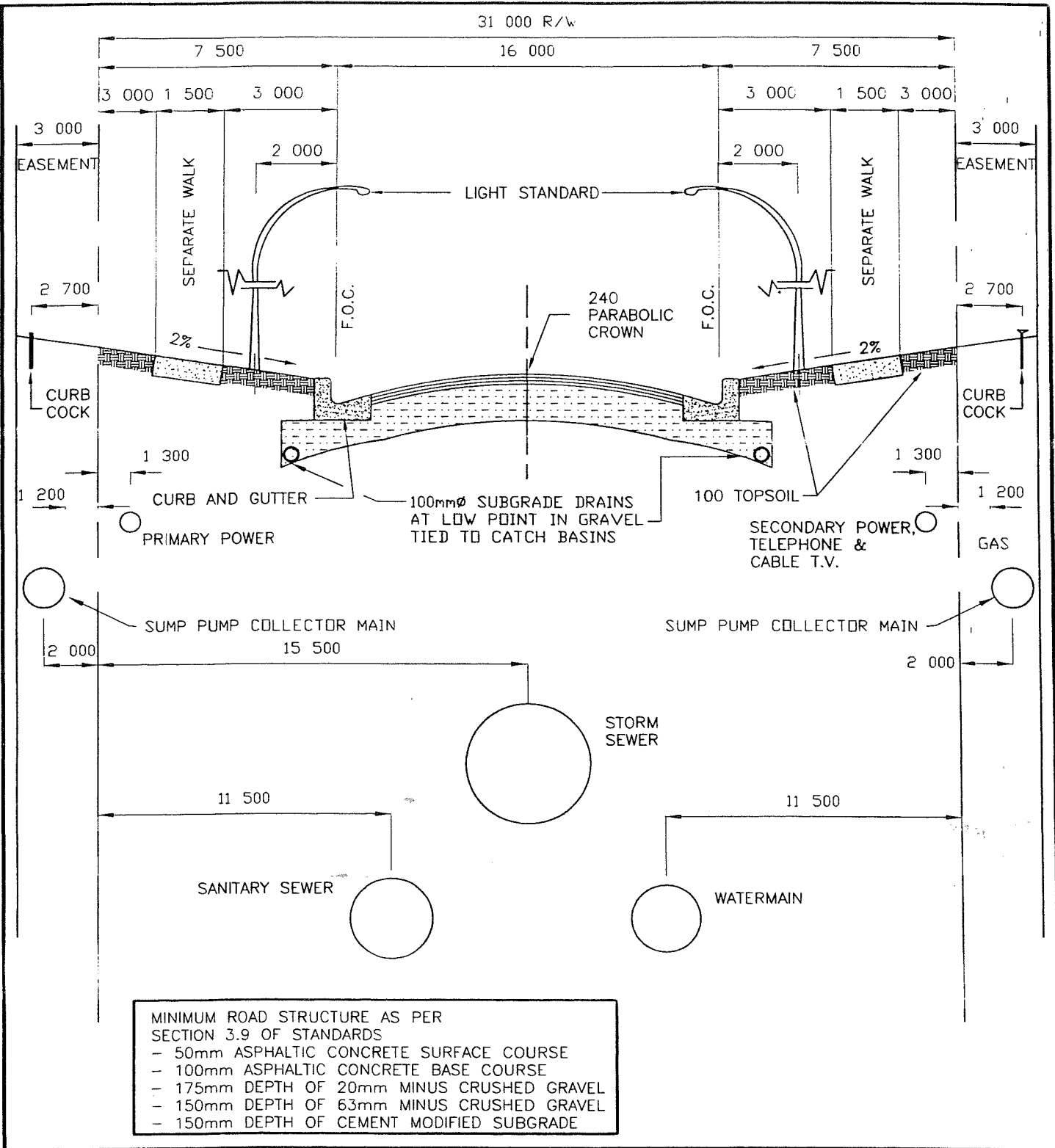


MINIMUM ROAD STRUCTURE AS PER SECTION 3.96 OF STANDARDS

- 40mm ASPHALTIC CONCRETE SURFACE COURSE
- 80mm ASPHALTIC CONCRETE BASE COURSE
- 225mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

12 METRE MAJOR COLLECTOR


 <p>TOWN OF · VILLE DE MORINVILLE</p>	REVISIONS			
	DESIGNED/DRAWN	GRM/WLJC	APPROVED	
	SCALE	N.T.S.	DATE	DECEMBER, 2003.
			DRAWING NO.	1.05

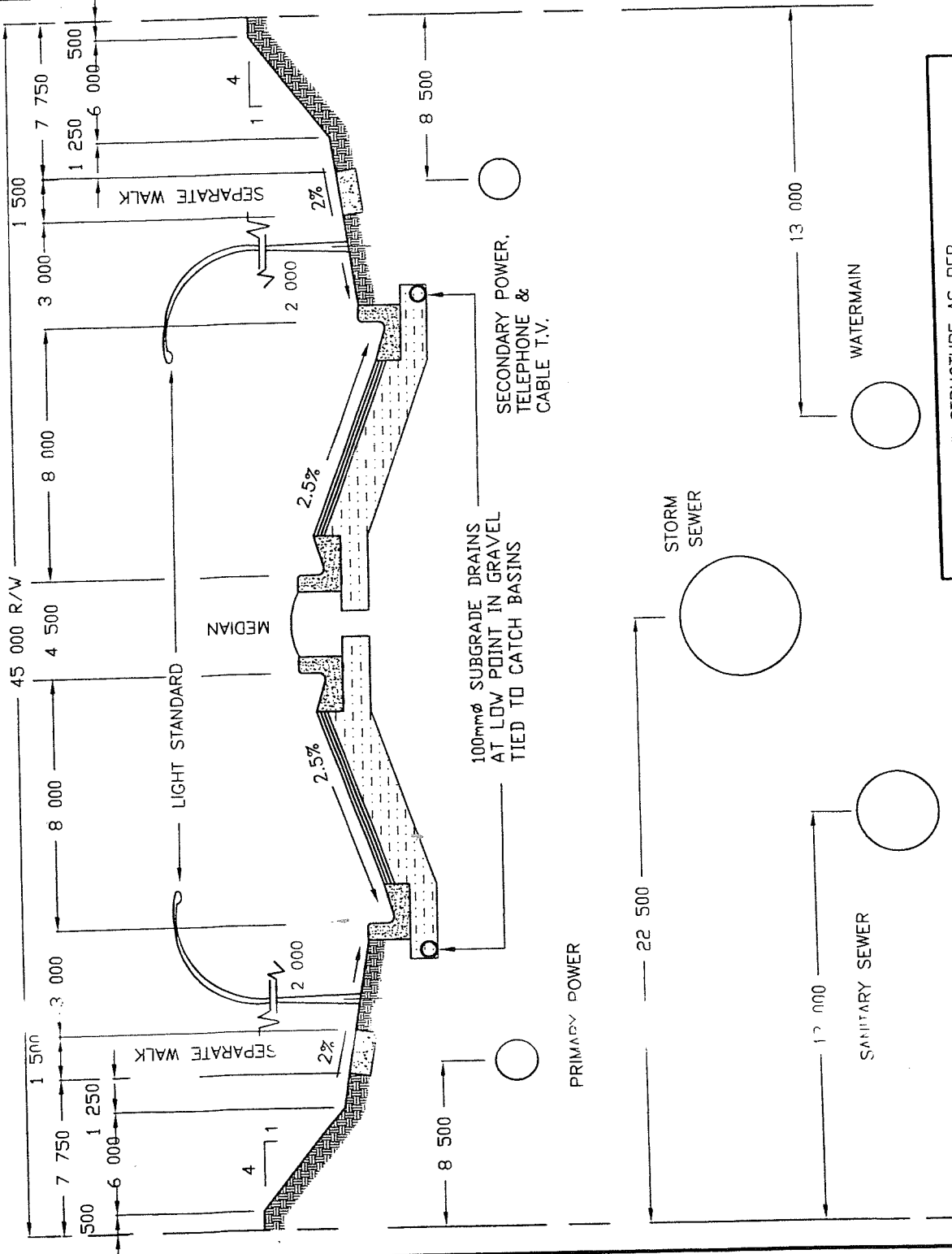


MINIMUM ROAD STRUCTURE AS PER SECTION 3.9 OF STANDARDS

- 50mm ASPHALTIC CONCRETE SURFACE COURSE
- 100mm ASPHALTIC CONCRETE BASE COURSE
- 175mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF 63mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

16 METRE UNDIVIDED ARTERIAL

 TOWN OF VILLE DE MORINVILLE	REVISIONS			
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	1.06



MINIMUM ROAD STRUCTURE AS PER SECTION 3.9 OF STANDARDS

- 50mm ASPHALTIC CONCRETE SURFACE COURSE
- 100mm ASPHALTIC CONCRETE BASE COURSE
- 175mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF 63mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

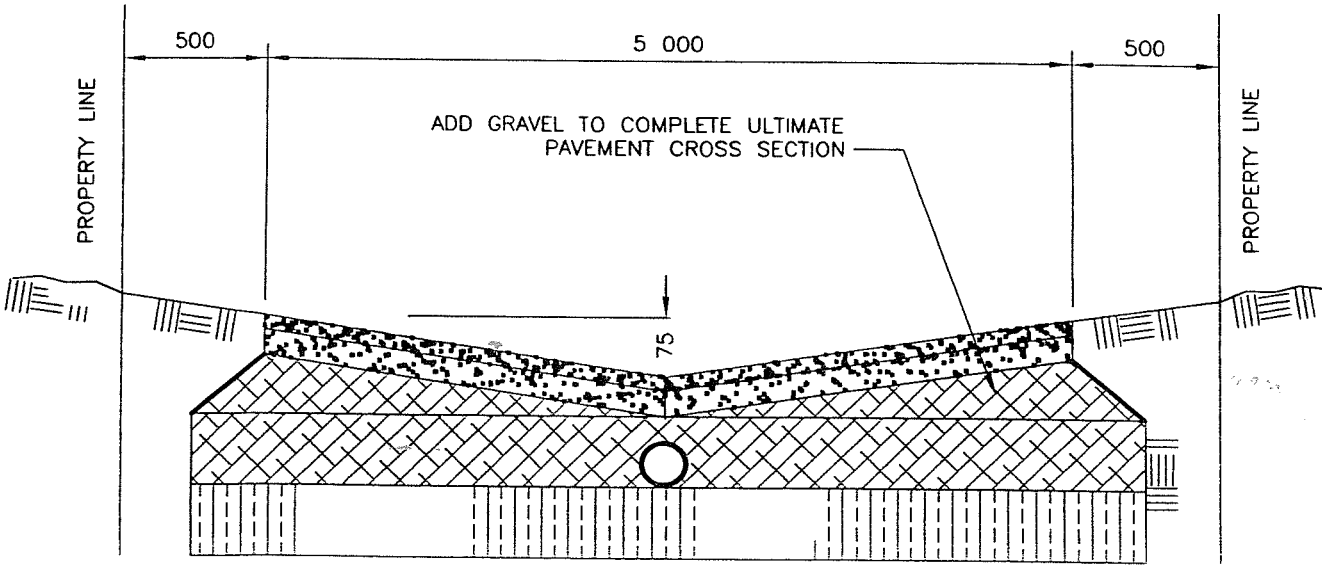
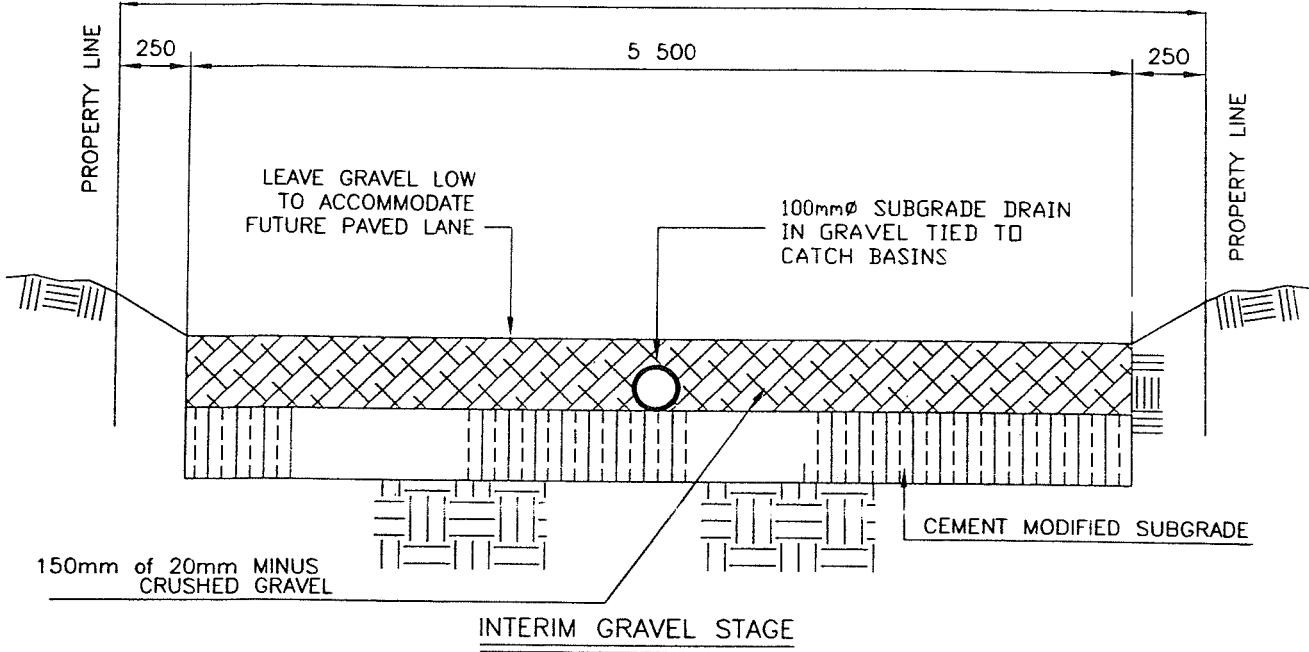
20.5 METRE DIVIDED ARTERIAL



TOWN OF VILLE DE
MORINVILLE

REVISIONS			
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DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	1.07

6 000 RIGHT OF WAY



NOTE :
 IN LANE CONSTRUCTION, THE SAG POINT
 MAY BE OFF CENTRED AND/OR THE CROSSFALL VARIED
 TO MATCH EXISTING GRADES ALONG THE LANE EDGES
 AND EDGES OF DRIVEWAYS.

- 35mm ASPHALTIC CONCRETE SURFACE COURSE
- 65mm ASPHALTIC CONCRETE BASE COURSE
- 150mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
- 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

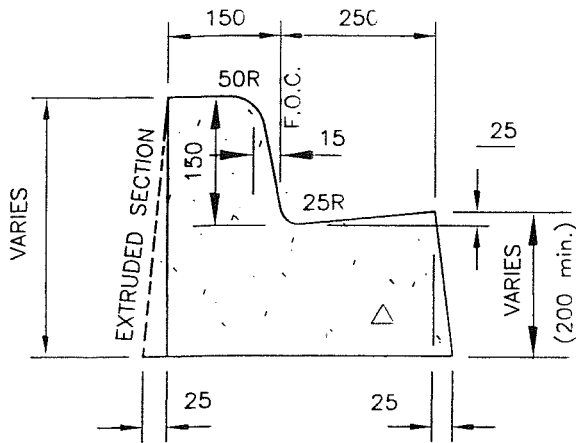
COMPLETED PAVEMENT

RESIDENTIAL LANEWAY

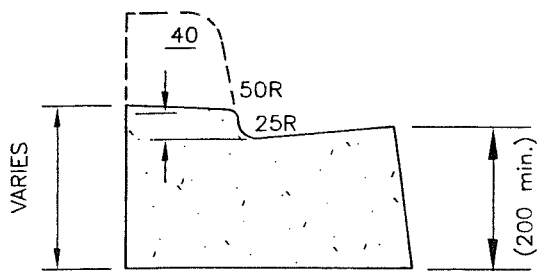


TOWN OF VILLE DE
MORINVILLE

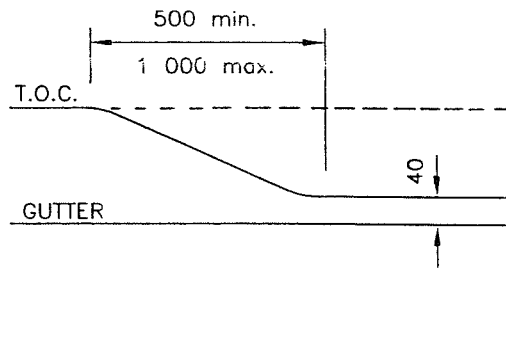
REVISIONS		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	1.08



STANDARD CURB AND GUTTER

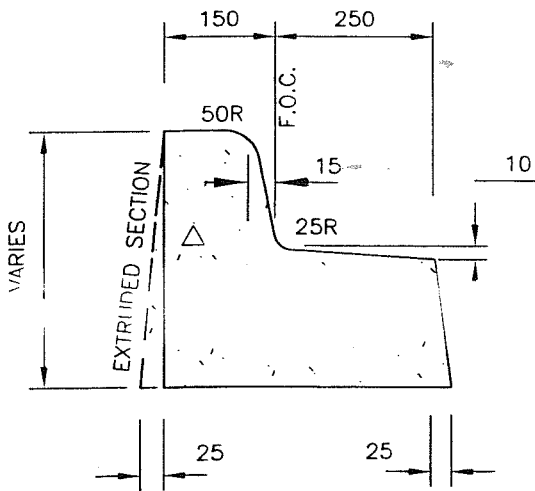


SECTION



ELEVATION

DEPRESSED CURB



NOTES :

- GUTTER FACE DEPTH TO MATCH ROAD STRUCTURE DEPTH
- CONCRETE TO BE 30 MPa
- SUBGRADE TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY AND SHALL BE EXTENDED TO 150mm BEHIND BACK OF CURB
- GRAVEL UNDER CURB TO 150mm min BEHIND BACK OF CURB
- SEE DRAWINGS 1.01 TO 1.07 FOR ROADWAY STRUCTURE AND SUBGRADE DRAIN LOCATIONS

CURB AND REVERSED GUTTER

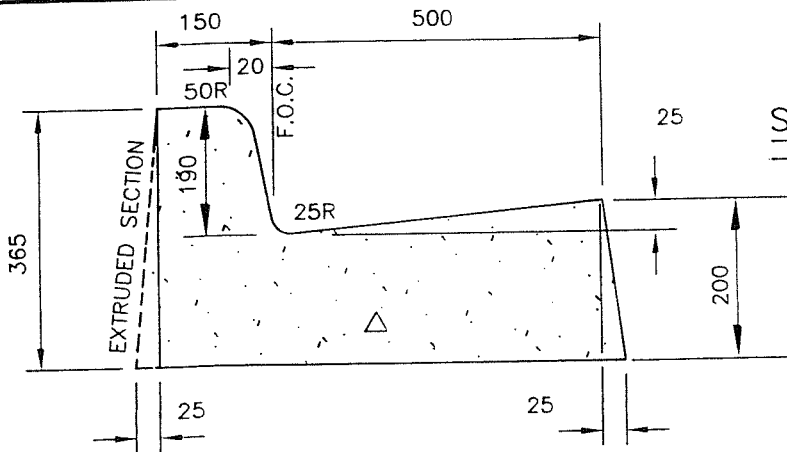
VERTICAL FACE 150mm CURB AND 250mm GUTTER



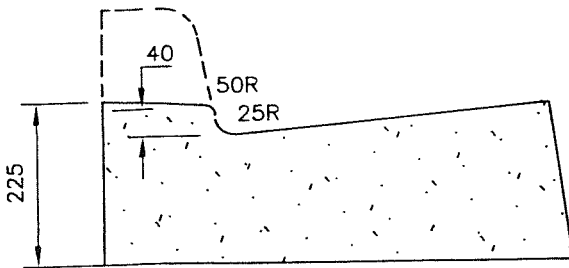
TOWN OF *VILLE DE*
MORINVILLE

REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

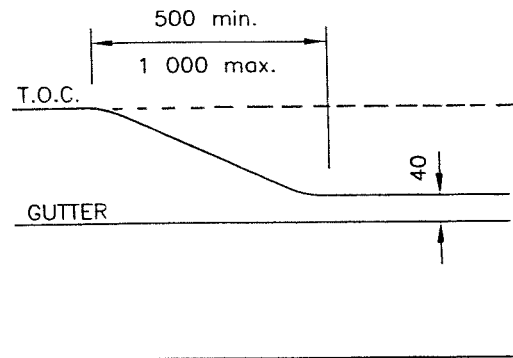
APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	2.02



STANDARD CURB AND GUTTER

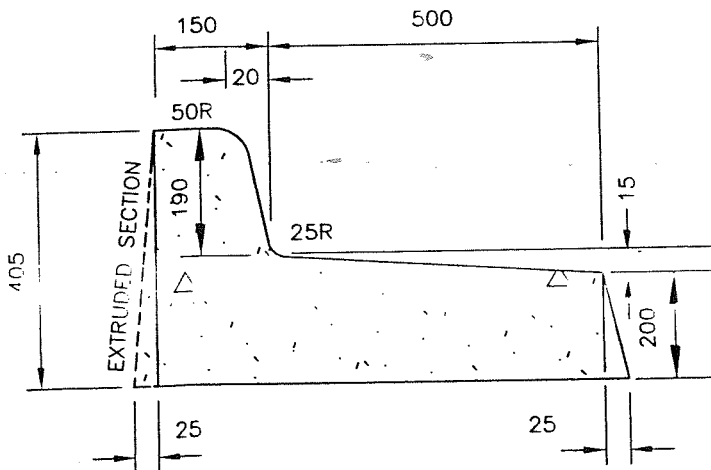


SECTION



ELEVATION

DEPRESSED CURB



CURB AND REVERSED GUTTER

NOTES :

- CONCRETE TO BE 30 MPc
- SUBGRADE TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY AND EXTENDED TO 150mm BACK OF CURB
- GRAVEL UNDER CURB TO 150mm min BACK OF CURB
- SEE DRAWINGS 1.01 TO 1.07 FOR ROADWAY STRUCTURE AND SUBGRADE DRAIN LOCATIONS

VERTICAL FACE 190mm CURB AND 500mm GUTTER



TOWN OF VILLE DE
MORINVILLE

REVISIONS

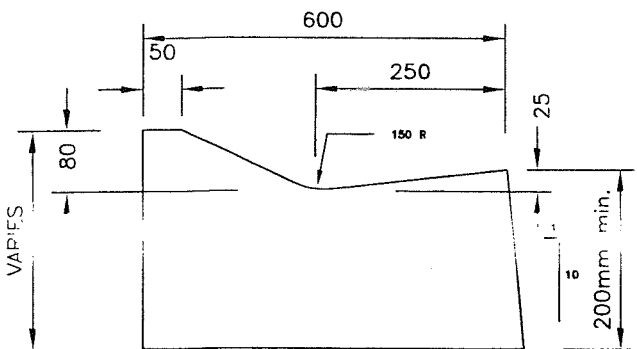
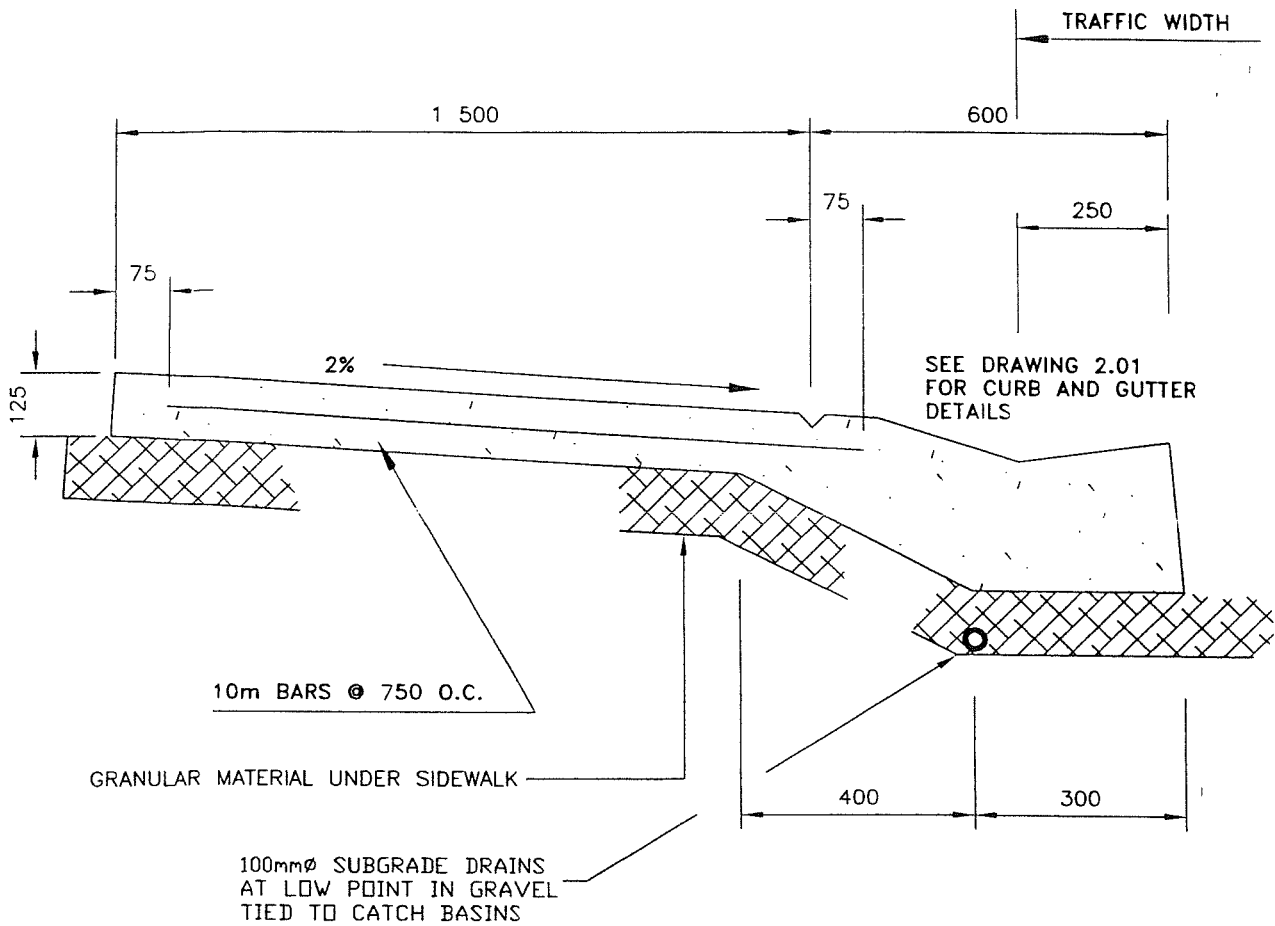
DESIGNED/DRAWN GRM/WLJC

SCALE N.T.S.

APPROVED

DATE DECEMBER, 2003.

DRAWING NO. 2.03



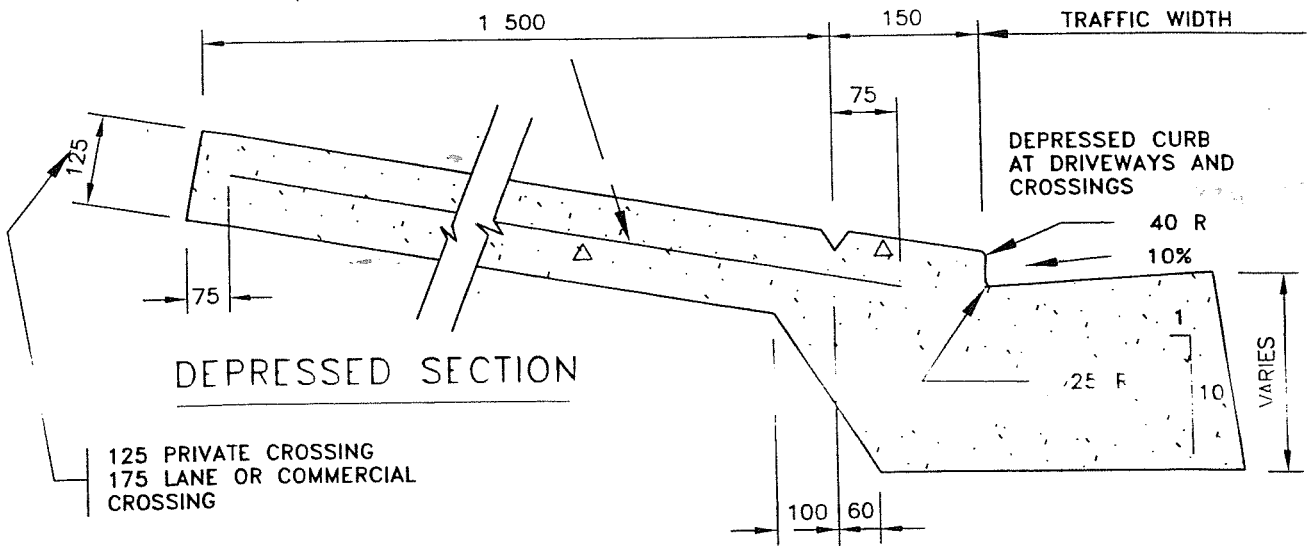
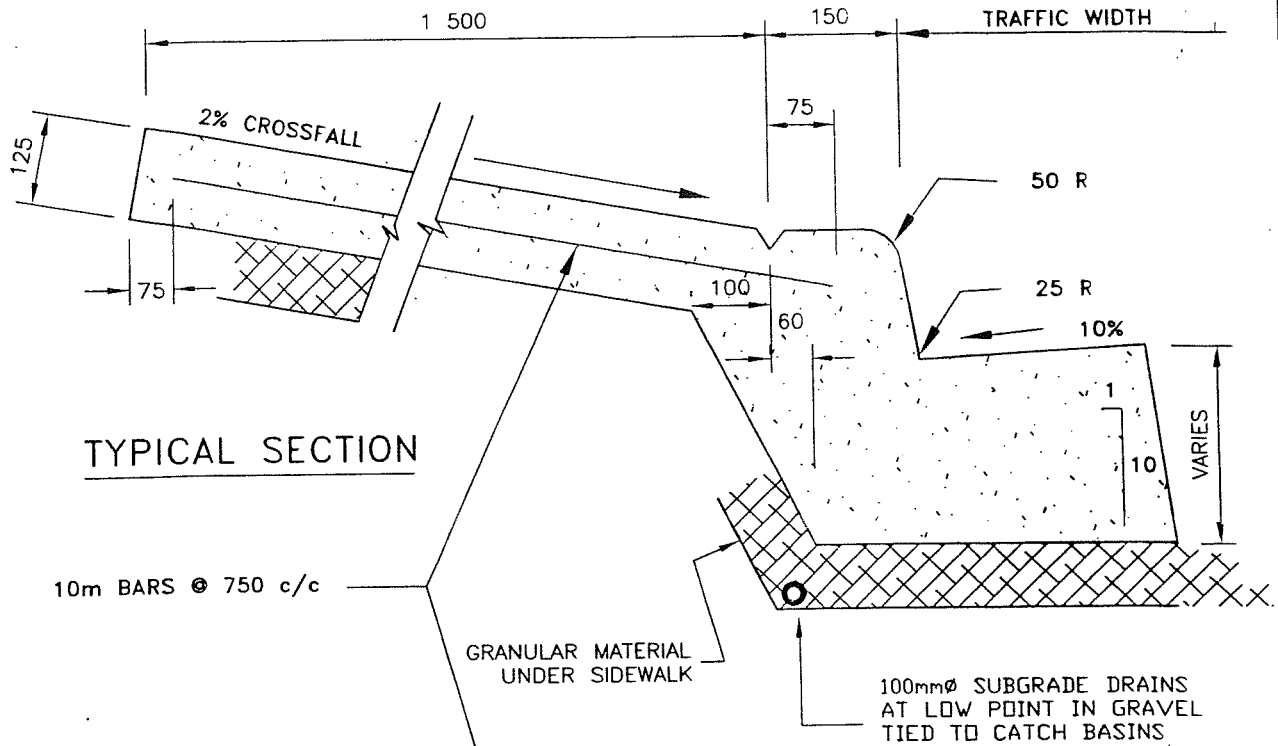
CURB AND GUTTER DIMENSIONS

MONOLITHIC ROLLED FACE CURB, GUTTER & SIDEWALK



TOWN OF VILLE DE
MORINVILLE

REVISIONS			
		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	2.04



SEE DRAWING NO. 2.02 FOR 150 CURB AND 250 GUTTER
AND DRAWING NO. 2.03 FOR 190 CURB AND 500 GUTTER
- CONCRETE TO BE 30MP_a
- SUBGRADE TO BE COMPACTED TO 100 % STANDARD PROCTOR DENSITY

MONOLITHIC VERTICAL FACE CURB, GUTTER AND SIDEWALK



TOWN OF VILLE DE
MORINVILLE

REVISIONS

DESIGNED/DRAWN

GRM/WLJC

SCALE

N.T.S.

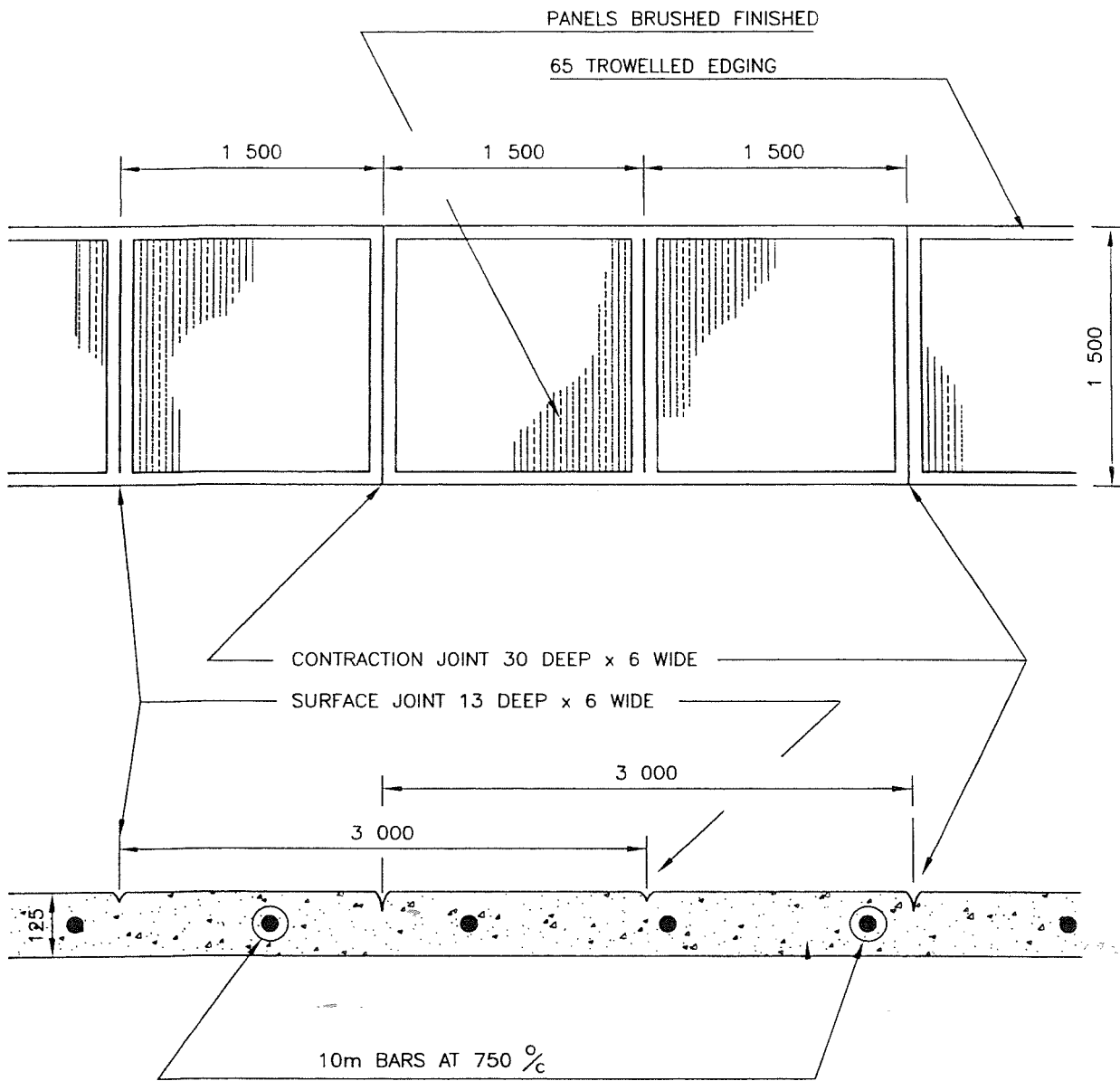
APPROVED

DATE

DECEMBER, 2003.

DRAWING NO.

2.05



- CONCRETE TO BE 30 MP_a
- SUBGRADE TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY

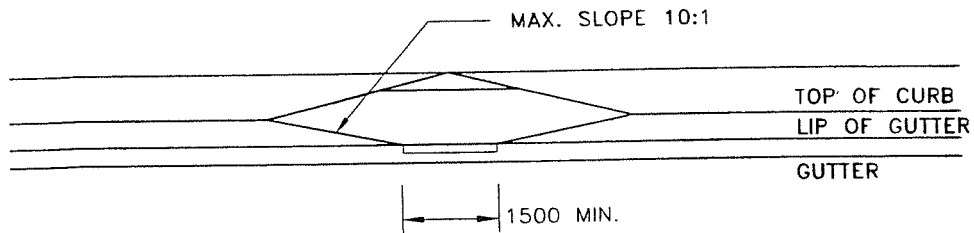
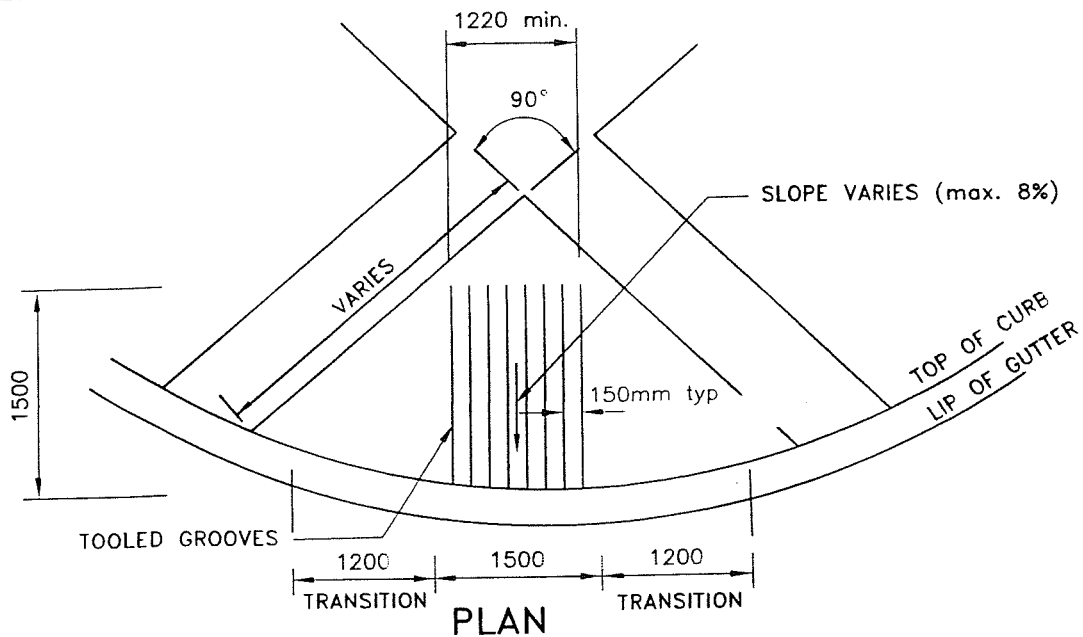
SEPARATE SIDEWALK



TOWN OF VILLE DE
MORINVILLE

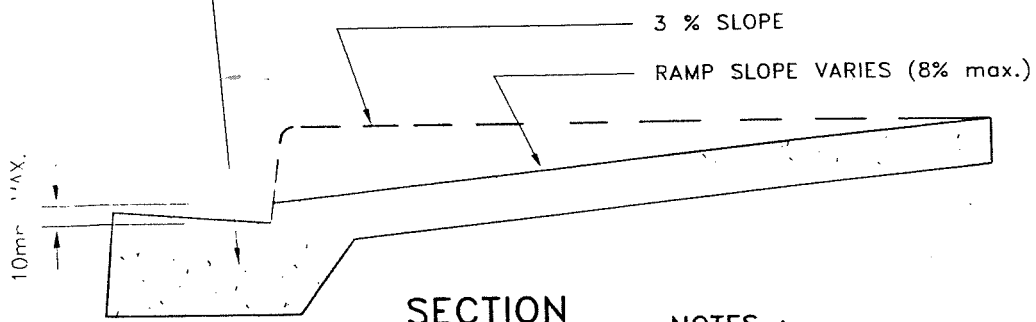
REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	2.06



SEE STD. DWG. 2.01, 2.02
OR 2.03 FOR CURB
& GUTTER DETAILS


ELEVATION

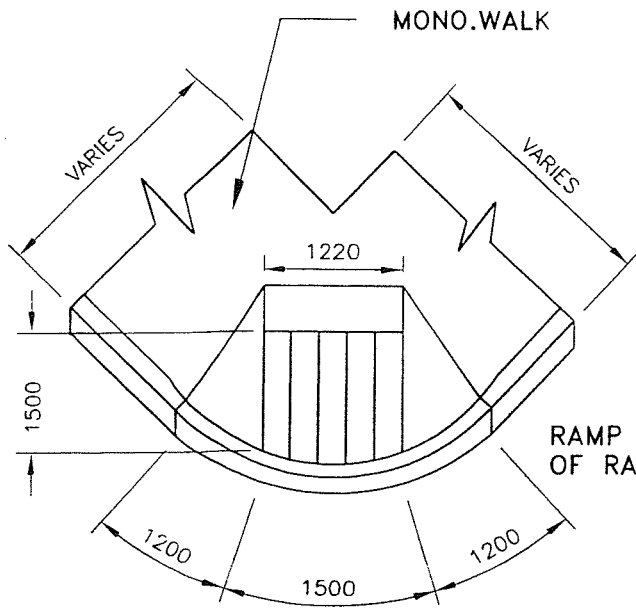


NOTES :

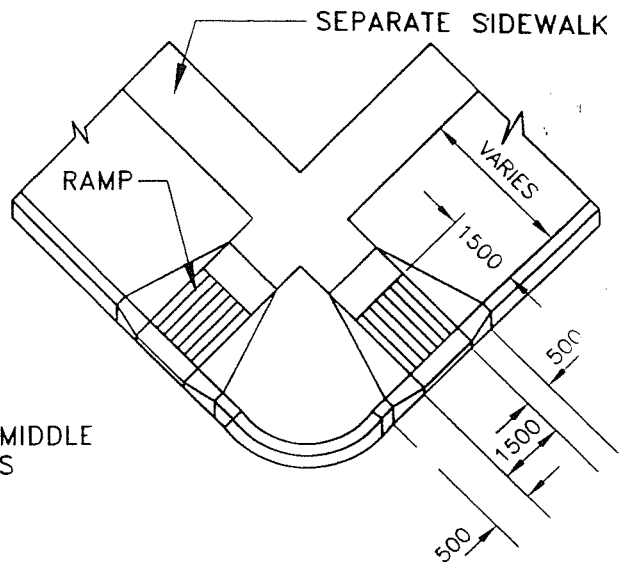
- LOCATE RAMP IN CENTRE OF CORNER UNLESS CONFLICT WITH CATCH BASIN.
- MINIMUM WIDTH OF RAMP 1.500 metres.
- MAXIMUM SLOPE OF RAMP 8%
- RAMP SURFACE TO BE BROOM FINISHED.

WHEELCHAIR / BIKE RAMP

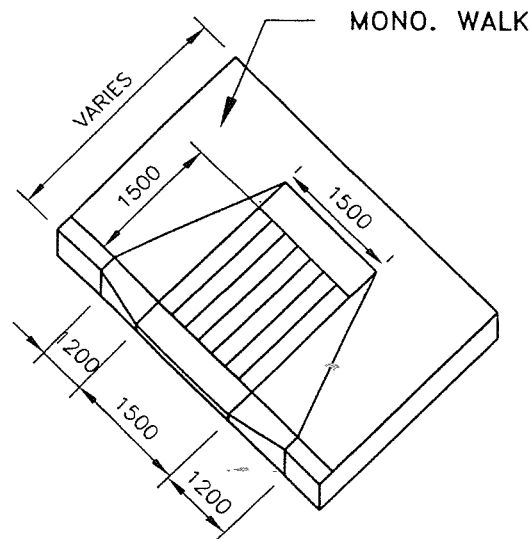
 TOWN OF VILLE DE MORINVILLE	REVISIONS			
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	2.07



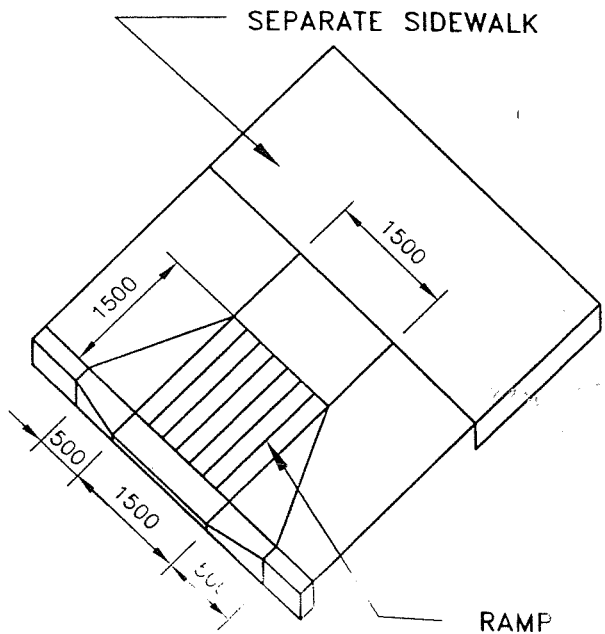
TYPE A



TYPE B



TYPE C




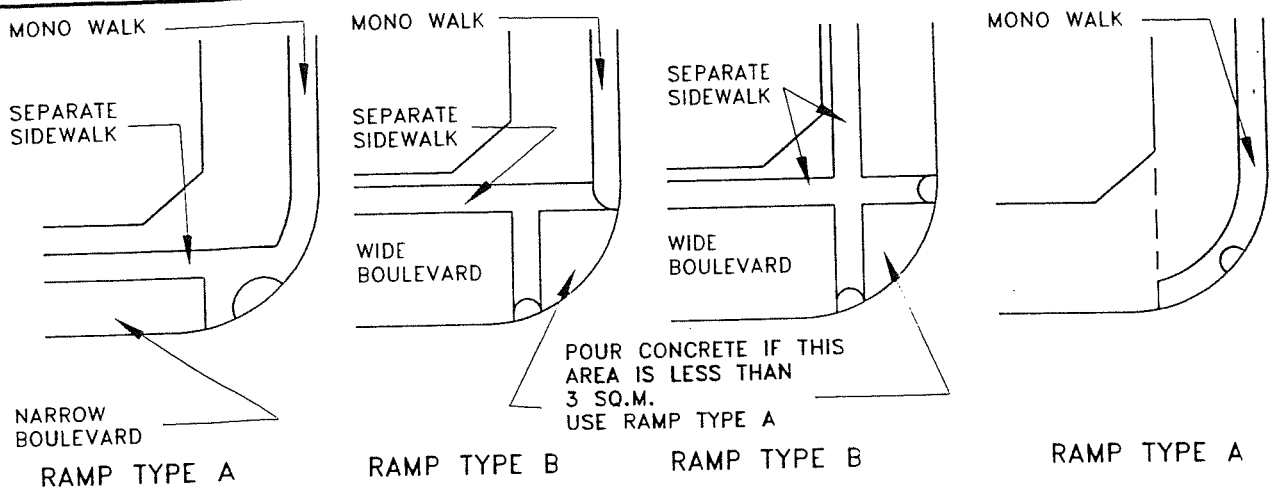
TYPE D

NOTES :

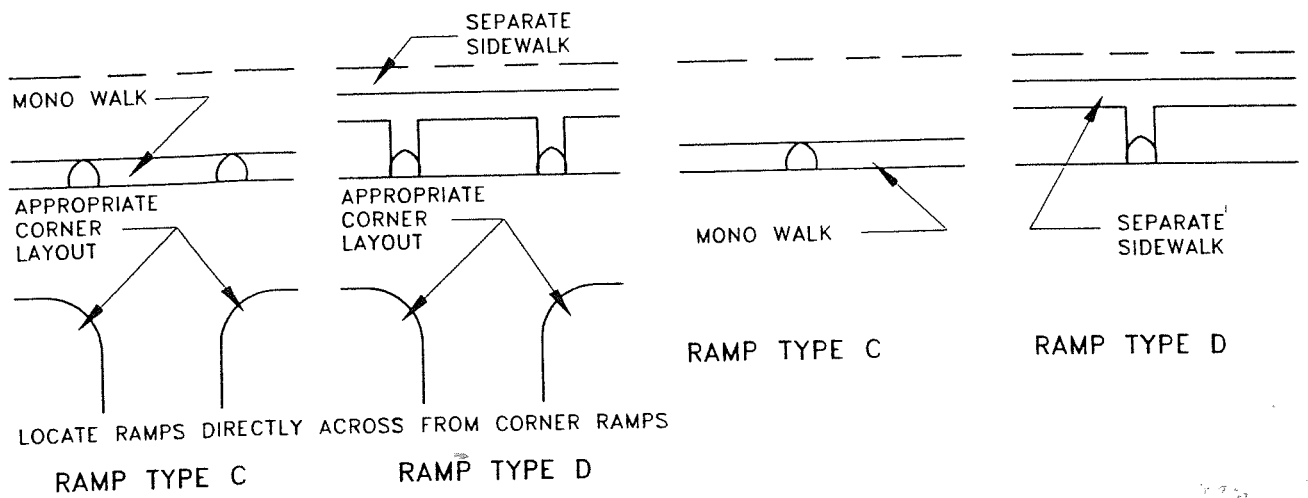
1. TOOLED GROOVES 5mm WIDE x 10mm DEEP AND 150mm O.C. BROOM FINISH SURFACE.
2. WHERE RAMP IS TO BE USED AS A TRANSITION, USE THE CENTRE OF THE 1500mm RAMP AS THE CENTRE OF THE TRANSITION.
3. WHERE MONO CURB FACE IS 190mm FLARE TO BE 1800mm, WHERE SEPARATE CURB FACE IS 190mm FLARE TO BE 900mm.
4. CURB AND RAMPS TO BE POURED MONOLITHICALLY.
5. RAMP SLOPE TO BE A MAXIMUM OF 10%. DROP BACK OF WALK WHERE SLOPE IS ABOVE 8%.
6. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
7. LIP OF GUTTER MAXIMUM HEIGHT 15mm THROUGH RAMP.

TYPES OF WHEELCHAIR/BIKE RAMPS

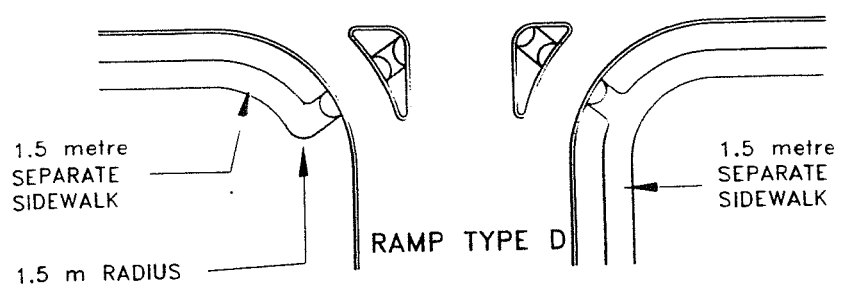
 <p>TOWN OF VILLE DE MORINVILLE</p>	REVISIONS			
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	2.08



CORNER LAYOUT



TANGENT LAYOUT



INTERSECTION LAYOUT

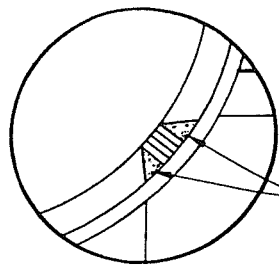
WHEELCHAIR/BIKE RAMP LOCATIONS



TOWN OF VILLE DE
MORINVILLE

REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	2.09



DETAIL RAMP
TYPE A

1.5m SIDEWALK

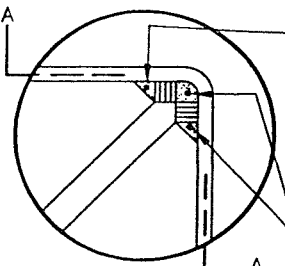
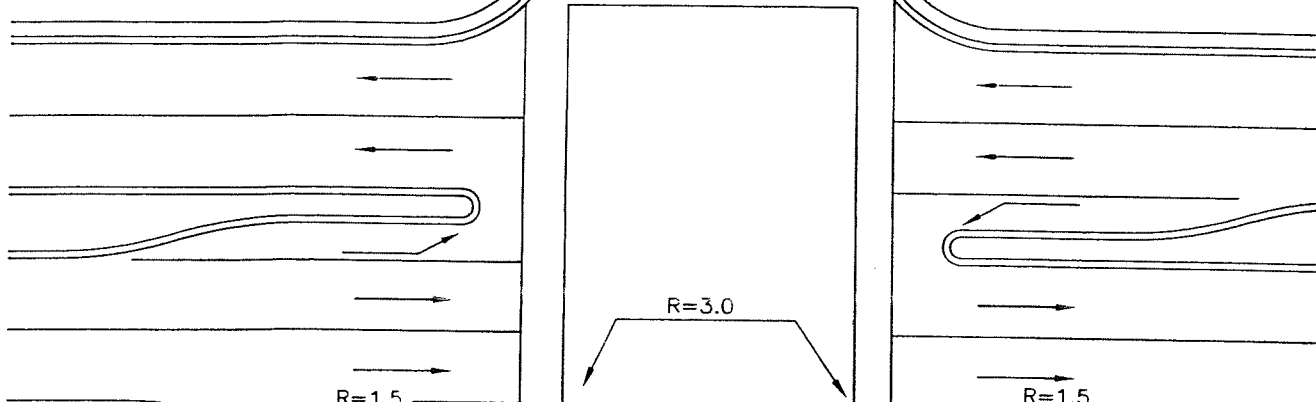
SLOPED SURFACE

R=12

1.5m SIDEWALK

R=12

* TYPE 1 RAMP
≠ TYPE 2 RAMP



SLOPED SURFACE
8% max.

R=60

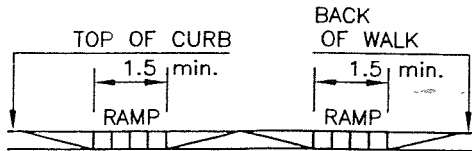
R=1.5

R=1.5

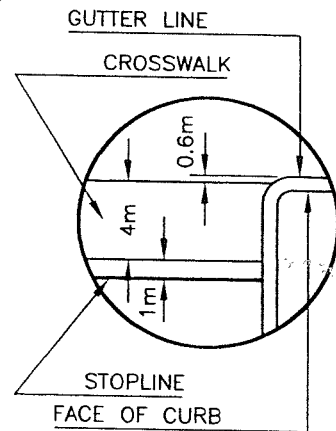
R=60

1.5 SIDEWALK

* DETAIL RAMP TYPE 1



SECTION A - A



CROSSWALK DETAIL

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. SIDEWALK RAMP MUST PROVIDE ACCESS DIRECTLY TO CROSSWALKS.
3. THE SELECTION OF RAMP TYPE IS DEPENDANT ON THE LOCATION OF THE CROSSWALK, RELATIVE TO THE CURB FACE. WHERE THE CURB RETURN RADIUS IS 4.0m OR GREATER, USE ONE (1) TYPE A RAMP. WHERE THE CURB RETURN RADIUS IS LESS THAN 4.0m, USE TWO (2) TYPE B RAMP.
4. WHERE CROSSWALKS ARE CONTROLLED BY SIGNALS WITH A PUSH BUTTON SYSTEM, THE PUSH BUTTON MUST BE ACCESSIBLE BY WHEELCHAIR.
5. WHERE TWO (2) TYPE B RAMP ARE USED, THE SLOPE ON THE FLARED AREAS BETWEEN THE RAMP CAN BE LESS THAN THE 8% max. SHOWN, PROVIDING A SMOOTHER TRANSITION ON THE SIDEWALK THROUGH THE RAMP AREA.

CROSSWALKS AND RAMPS AT URBAN INTERSECTIONS



TOWN OF VILLE DE
MORINVILLE

REVISIONS

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DESIGNED/DRAWN

GRM/WLJC

DATE

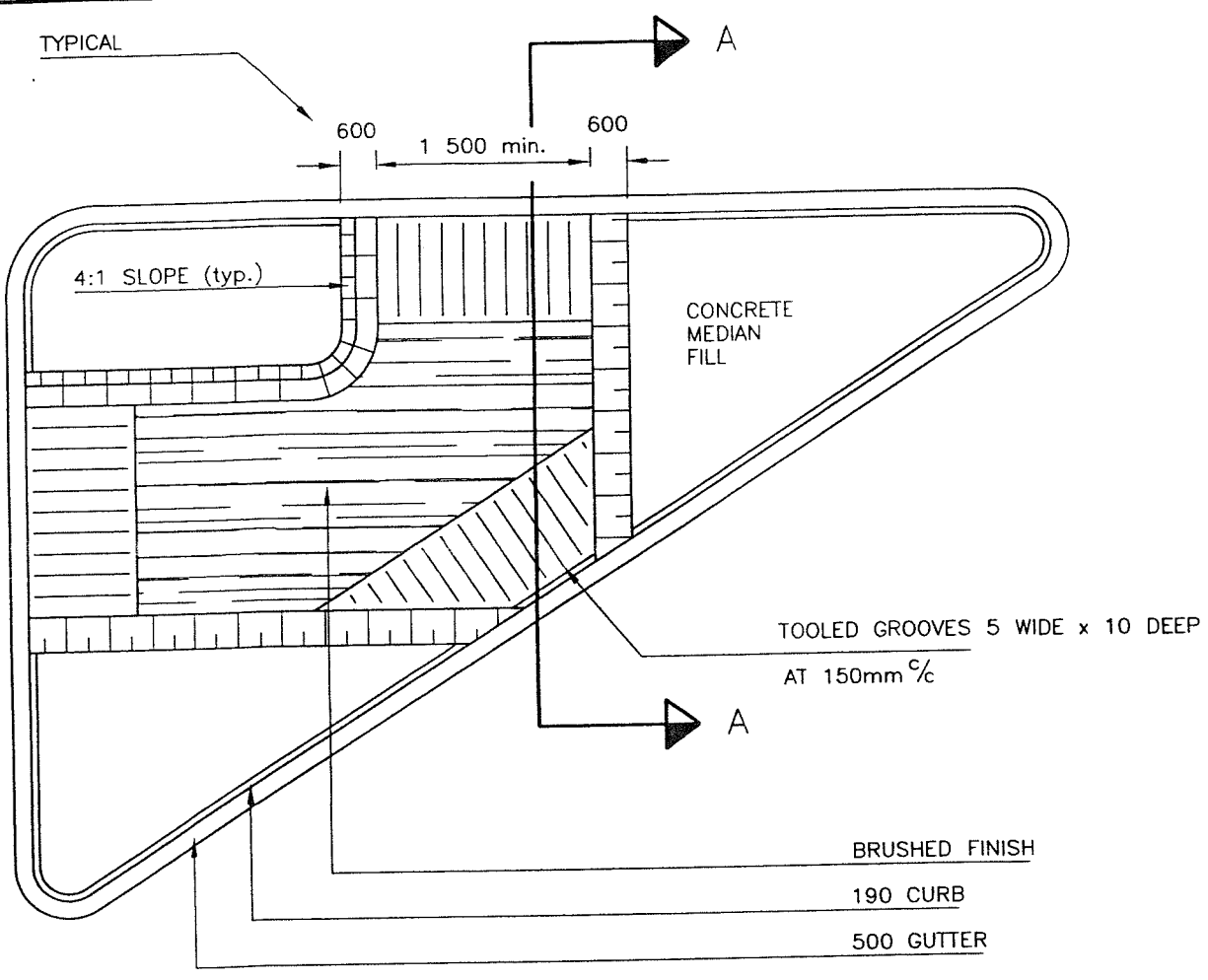
DECEMBER, 2003.

SCALE

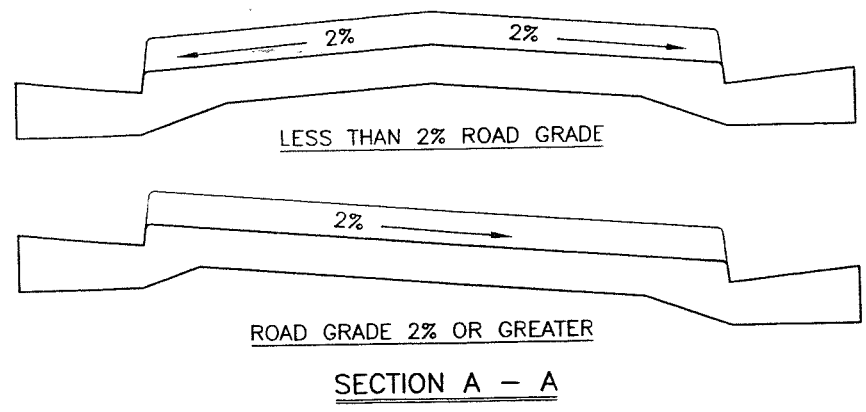
N.T.S.

DRAWING NO.


2.10

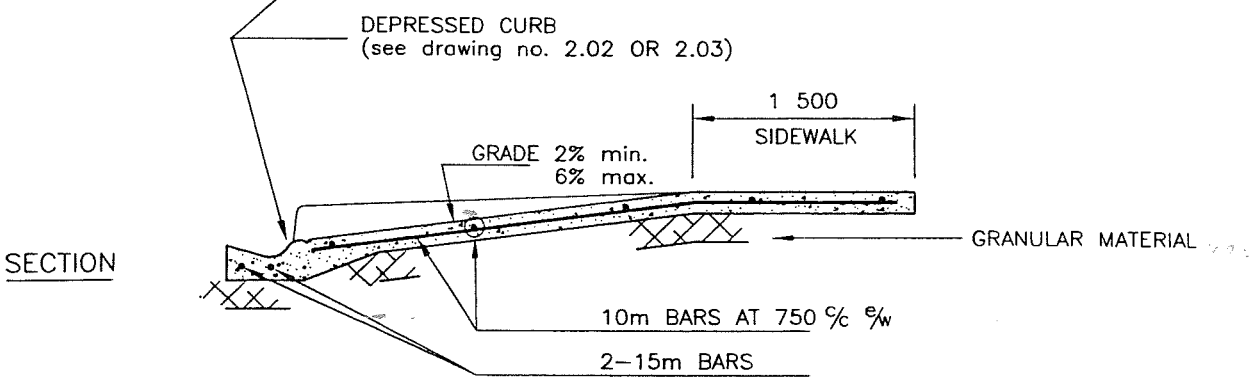
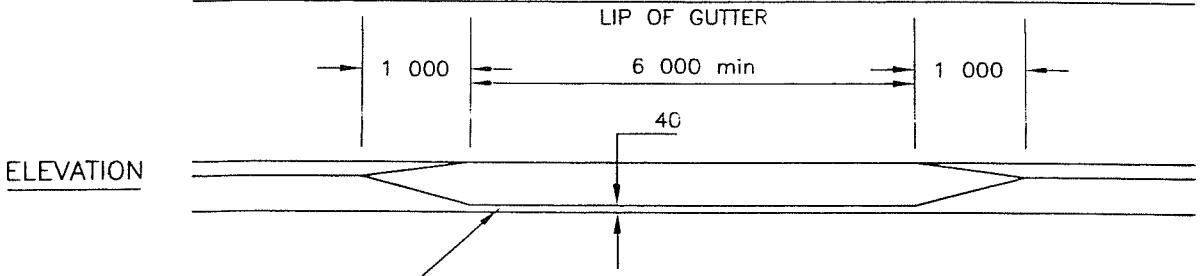
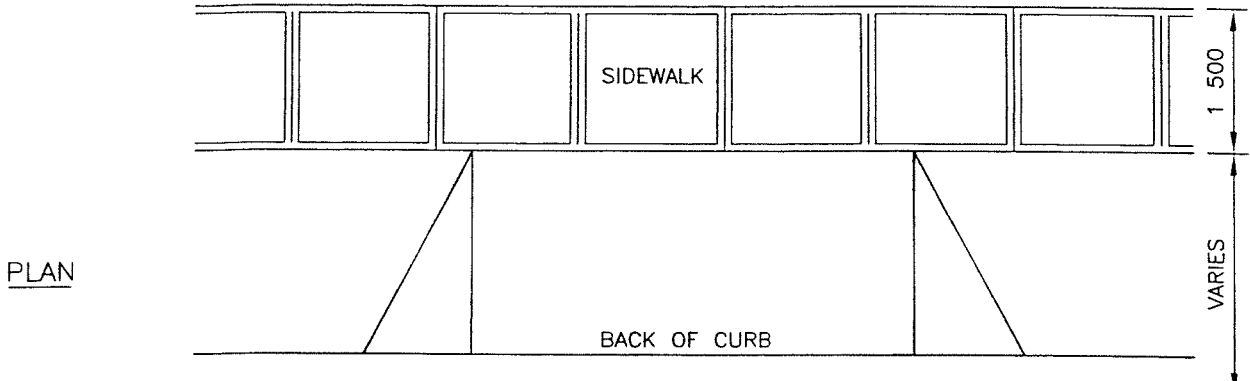


PLAN




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

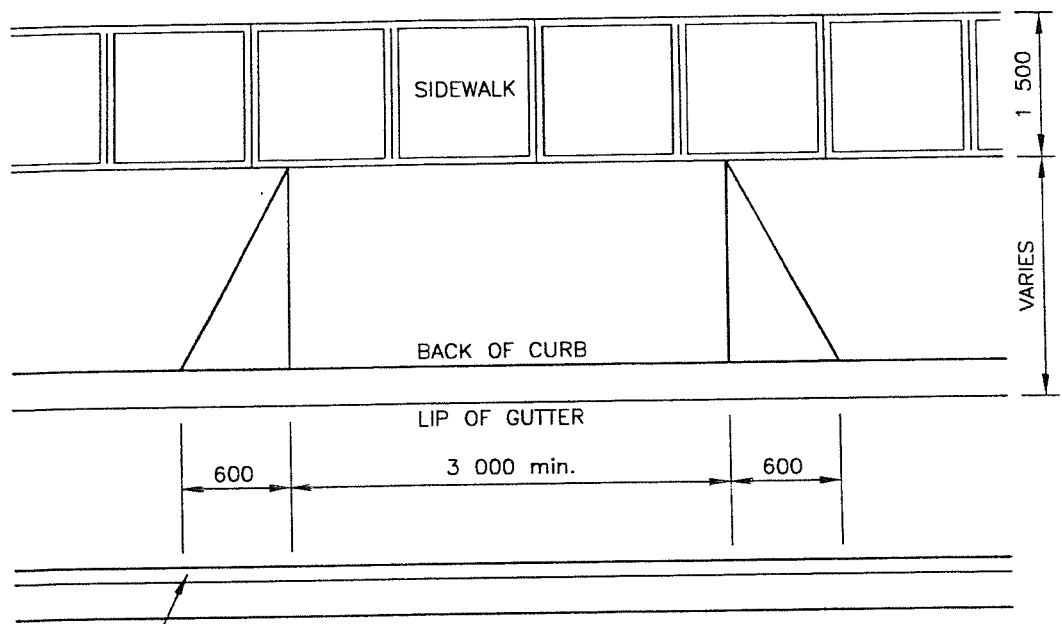
 <p>TOWN OF VILLE DE MORINVILLE</p>	REVISIONS		APPROVED
	DESIGNED/DRAWN	GRM/WLJC	DATE DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO. 2.11



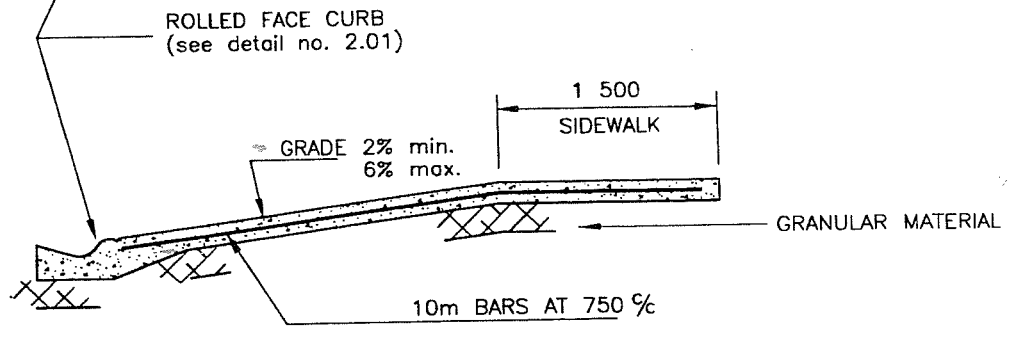
- CONCRETE TO BE 30MPc
- SUBGRADE TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY

LANE OR COMMERCIAL CROSSING

	TOWN OF · VILLE DE MORINVILLE	REVISIONS		
			APPROVED	
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	SCALE	N.T.S.	DRAWING NO.	2.12



ELEVATION



SECTION

- CONCRETE TO BE 30MPa
- SUBGRADE TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY

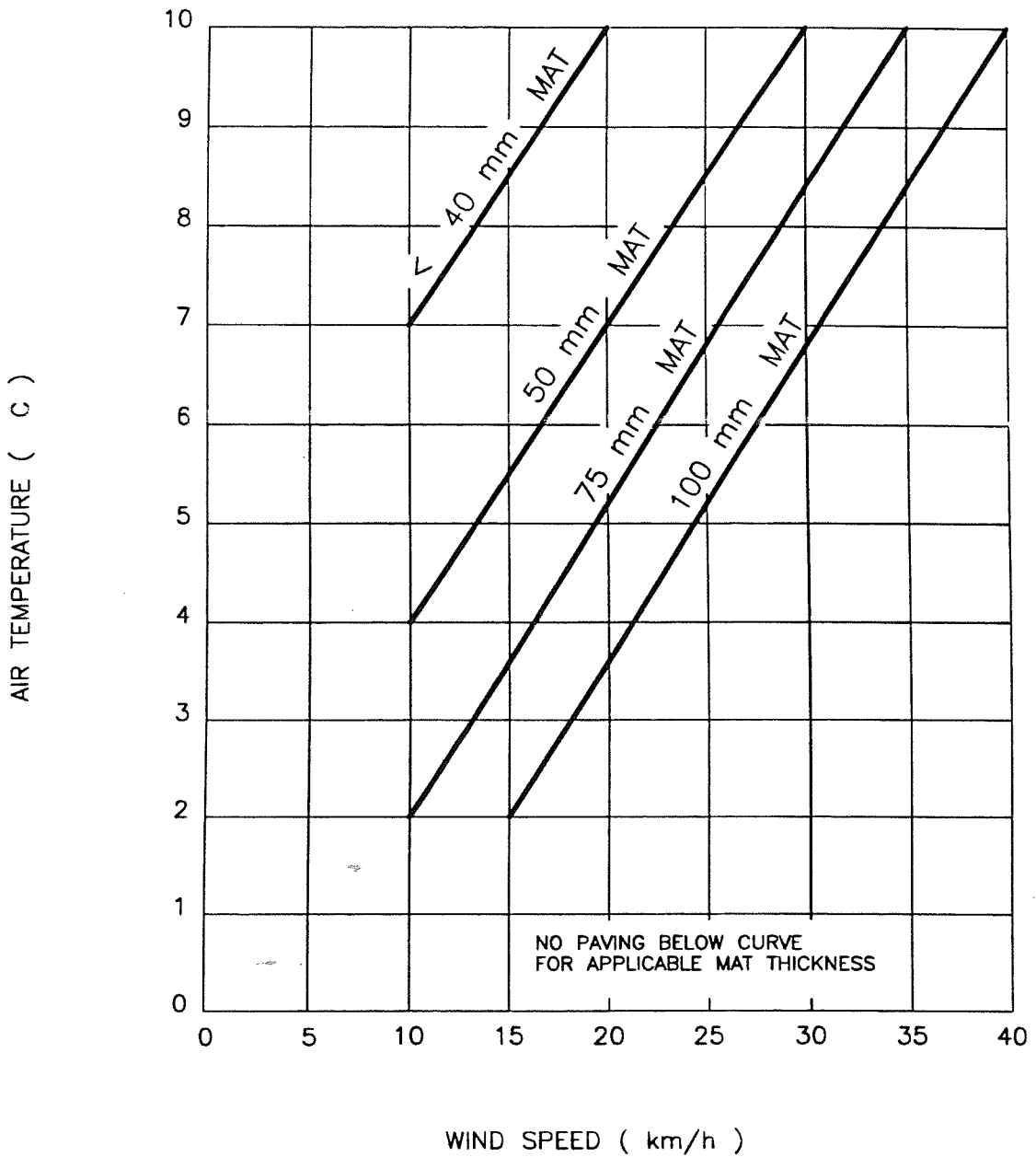
RESIDENTIAL CROSSING



TOWN OF VILLE DE
MORINVILLE

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APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	2.13

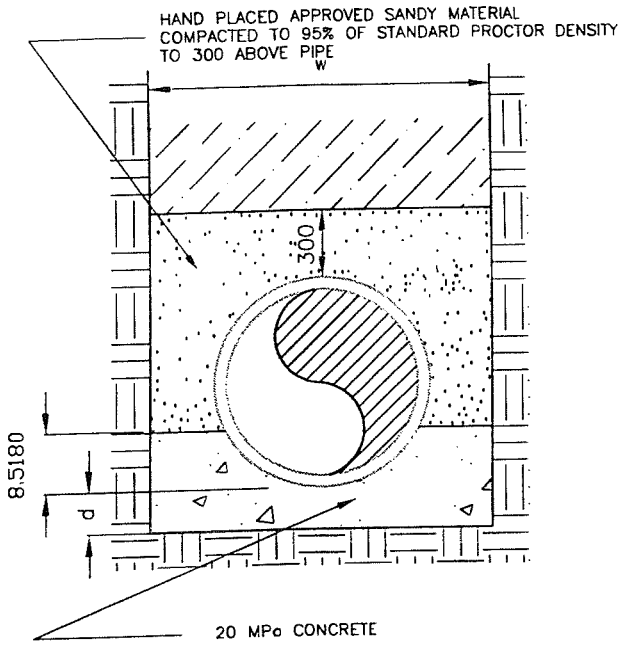


AIR TEMPERATURE AND WIND LIMITATIONS ON PAVING

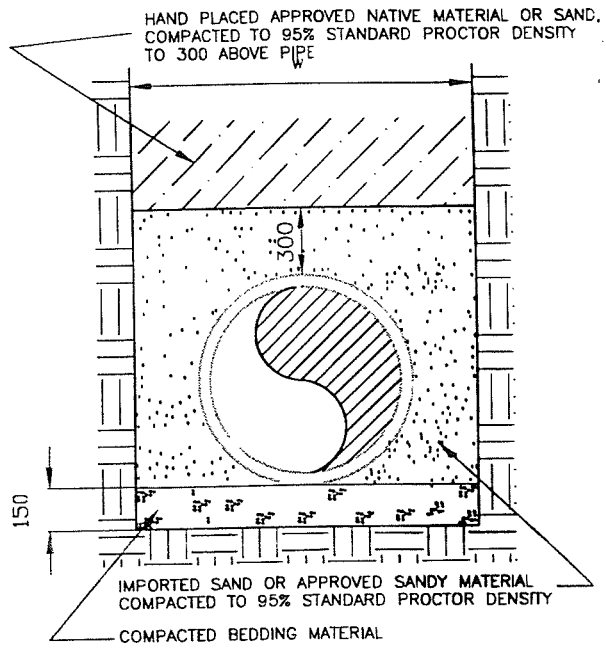


TOWN OF VILLE DE
MORINVILLE

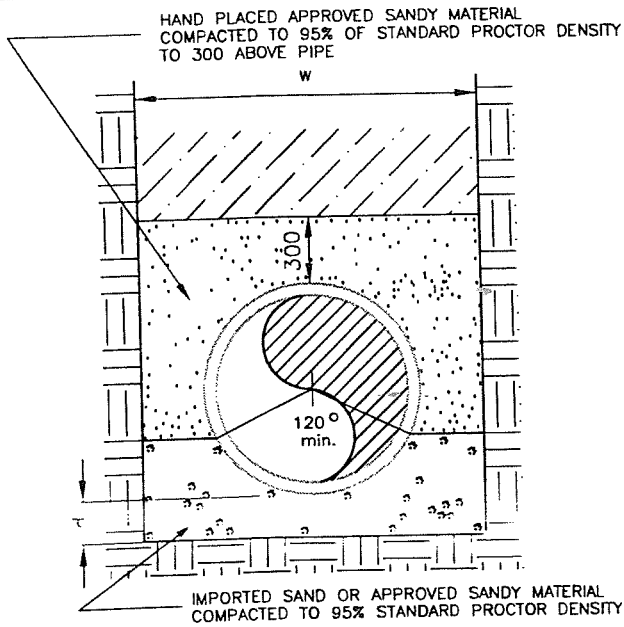
REVISIONS		APPROVED	
DESIGNED/DRAWN GRM/WLJC		DATE DECEMBER, 2003.	
SCALE N.T.S.		DRAWING NO. 2.14	



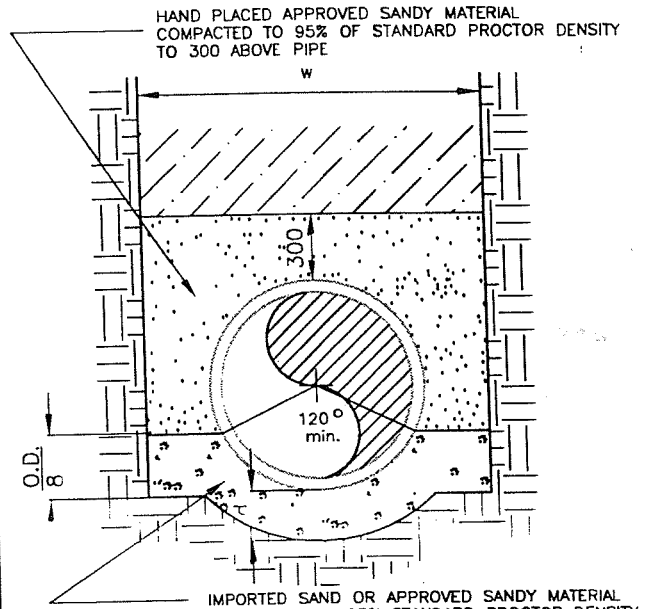
CLASS "A" BEDDING
L_f = 2.8



CLASS "B" BEDDING
L_f = 1.9



CLASS "C" BEDDING
L_f = 1.5



CLASS "B" BEDDING
(ALTERNATE) L_f = 1.9

w = TRENCH WIDTH
900 OR SMALLER DIA. W = O.D. + 1 200
O.D. = OUTSIDE DIAMETER OF PIPE
I.D. = INSIDE DIAMETER OF PIPE
L_f = LOAD FACTOR

d = DEPTH OF BEDDING BELOW PIPE
I.D. = 675 OR SMALLER - d = 75
I.D. = 750 TO 1 500 - d = 100 minimum
I.D. = 1 650 OR LARGER - d = 150 minimum

City of Leduc TYPES OF TRENCH BEDDING



TOWN OF MORINVILLE

Civic Centre #1 Alexander Park

REVISIONS

DESIGNED/DRAWN

SCALE

GRM/WLJC

N.T.S.

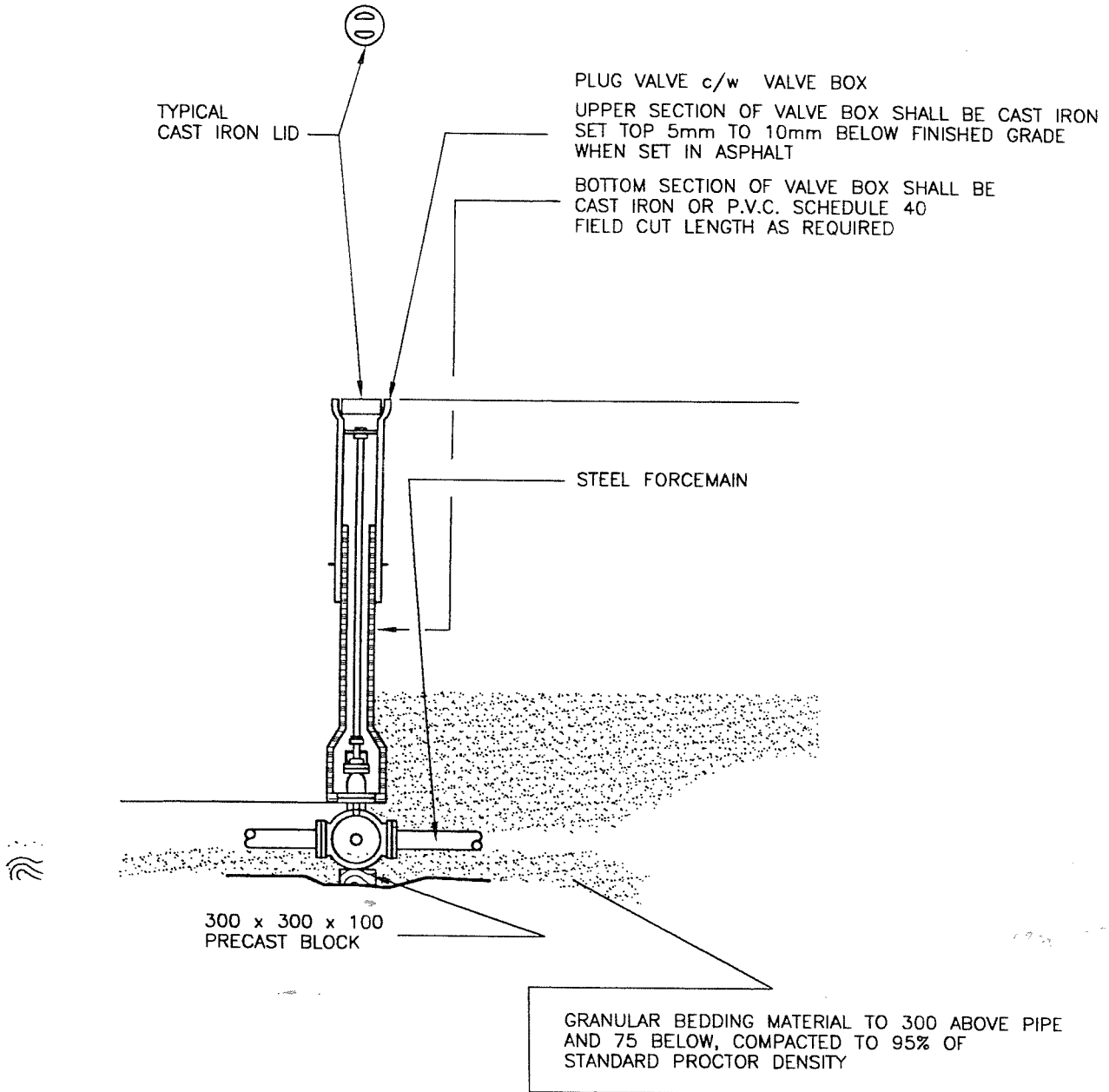
APPROVED

DATE

DRAWING NO.


DECEMBER, 2003.

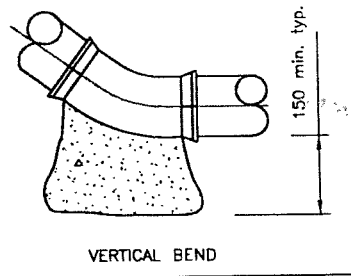
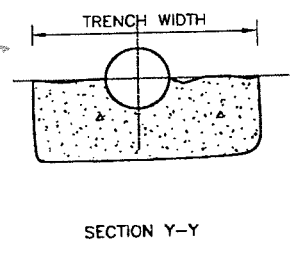
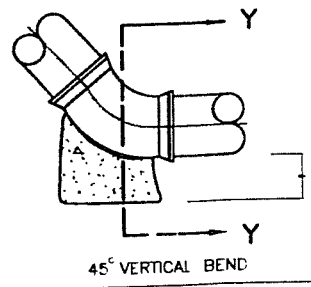
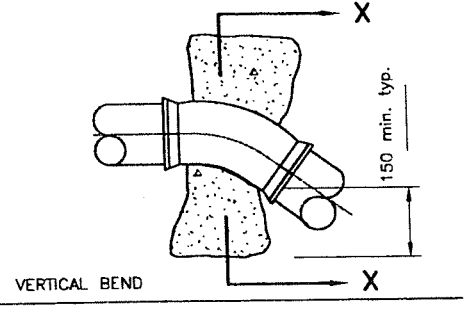
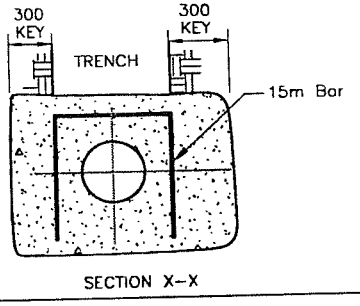
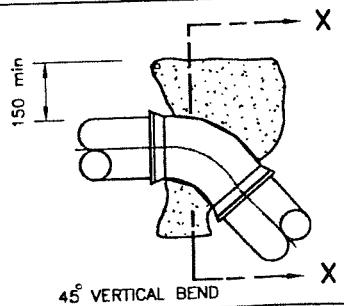
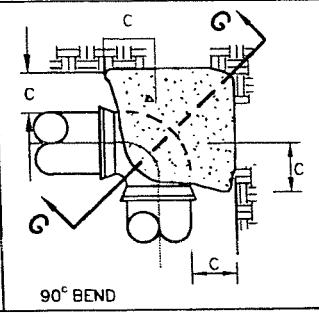
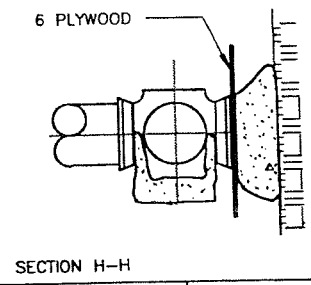
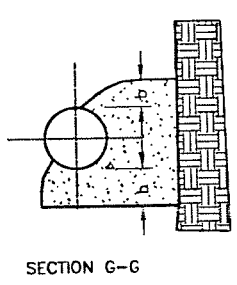
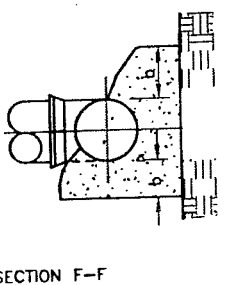
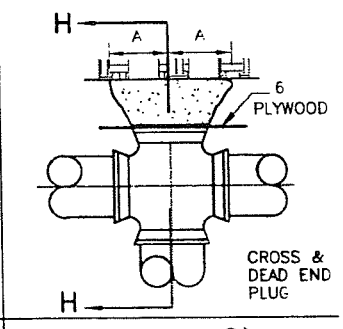
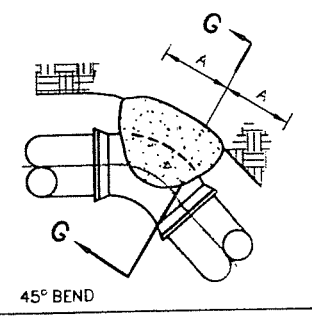
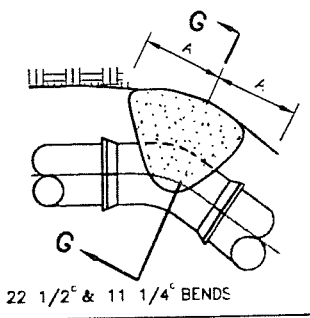
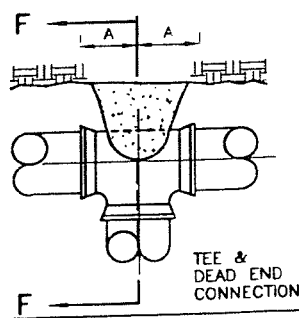
3.01



FOR SACRIFICIAL ANODES
REFER TO DRAWINGS 3.05 AND 3.06

PLUG VALVE AND BOX

 TOWN OF · VILLE DE MORINVILLE	REVISIONS			
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	JANUARY, 2004.
	SCALE	N.T.S.	DRAWING NO.	2262-D-4



	TEE	BRANCH & CROSS				22 1/2° & 11 1/4° BENDS					45° BENDS					90° BENDS				
DIA.	350	300	250	200	150	350	300	250	200	150	350	300	250	200	150	350	300	250	200	150
A	950	800	700	550	400	550	475	400	325	250	700	600	500	400	300					
B	200	175	150	125	100	175	150	125	100	75	175	150	125	100	75	600	500	400	300	200
C																650	575	500	425	350
AREA Sq.m	1.400	1.025	0.750	0.475	0.275	1.000	0.775	0.400	0.250	0.150	1.025	0.800	0.550	0.375	0.225	2.000	1.475	1.025	0.700	0.400

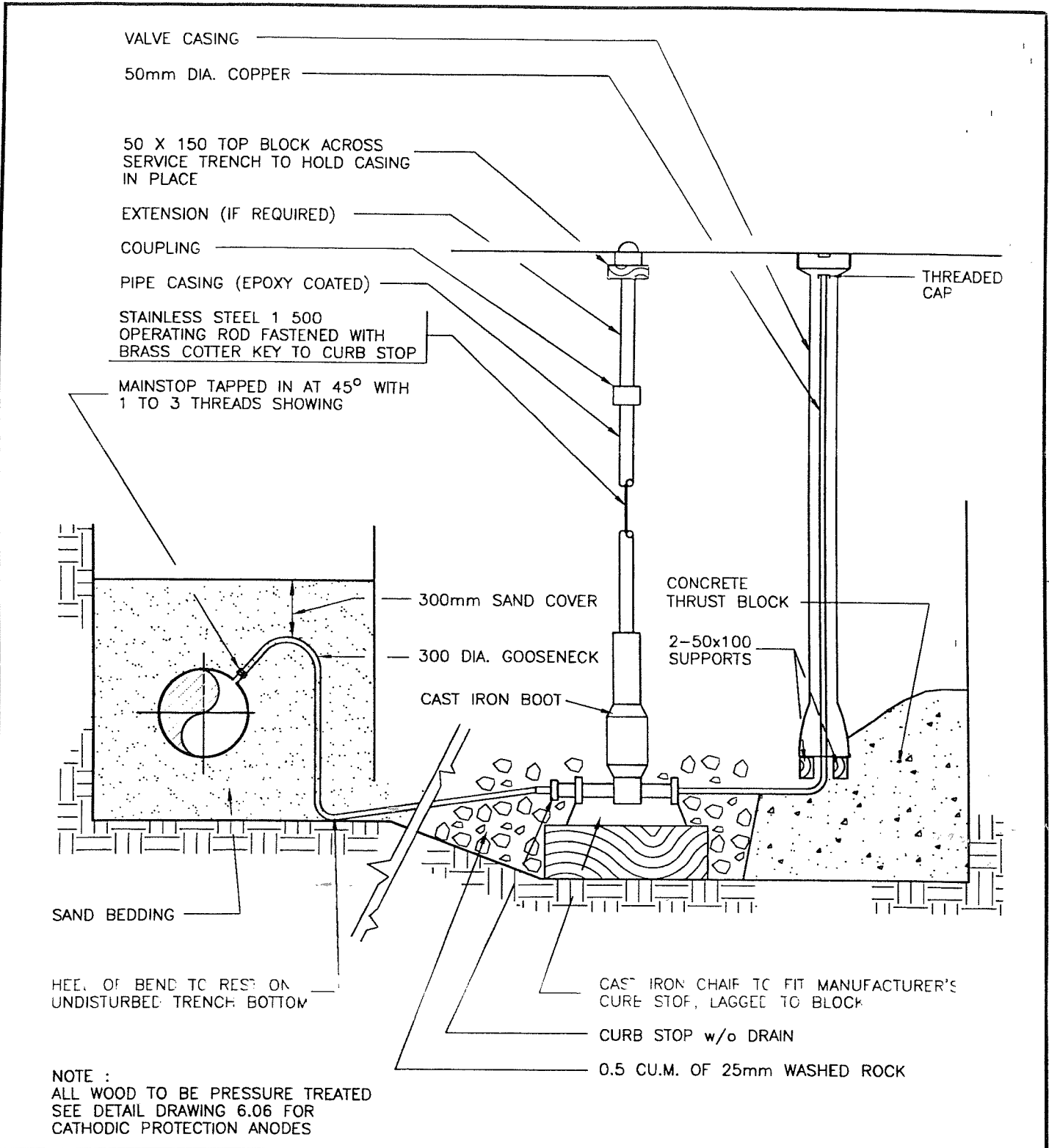
CONCRETE THRUST BLOCK DETAILS FOR WATERMAINS



TOWN OF VILLE DE
MORINVILLE

REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	3.03

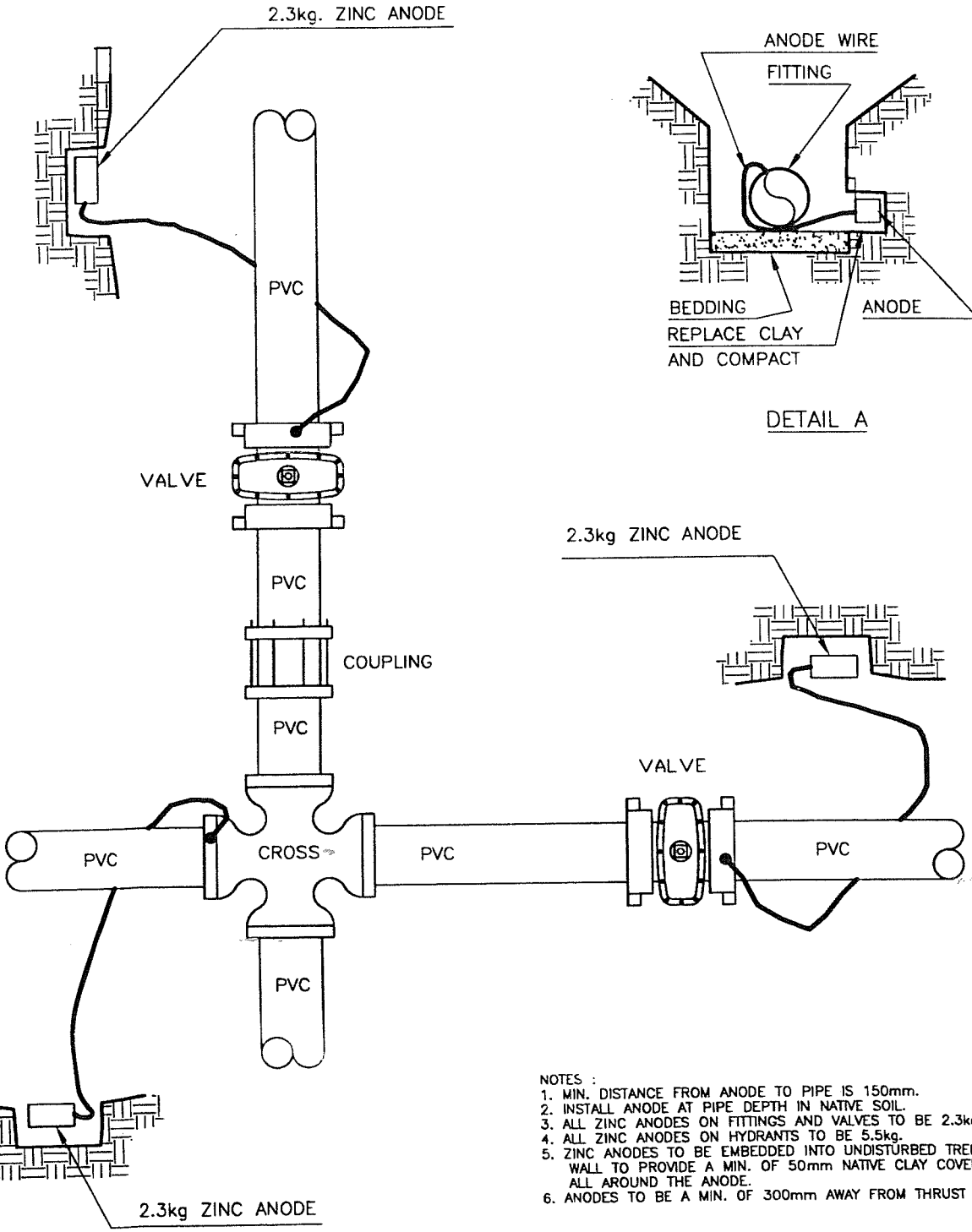


TYPICAL BLOW OFF DETAIL



TOWN OF VILLE DE
MORINVILLE

REVISIONS			
		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	3.04



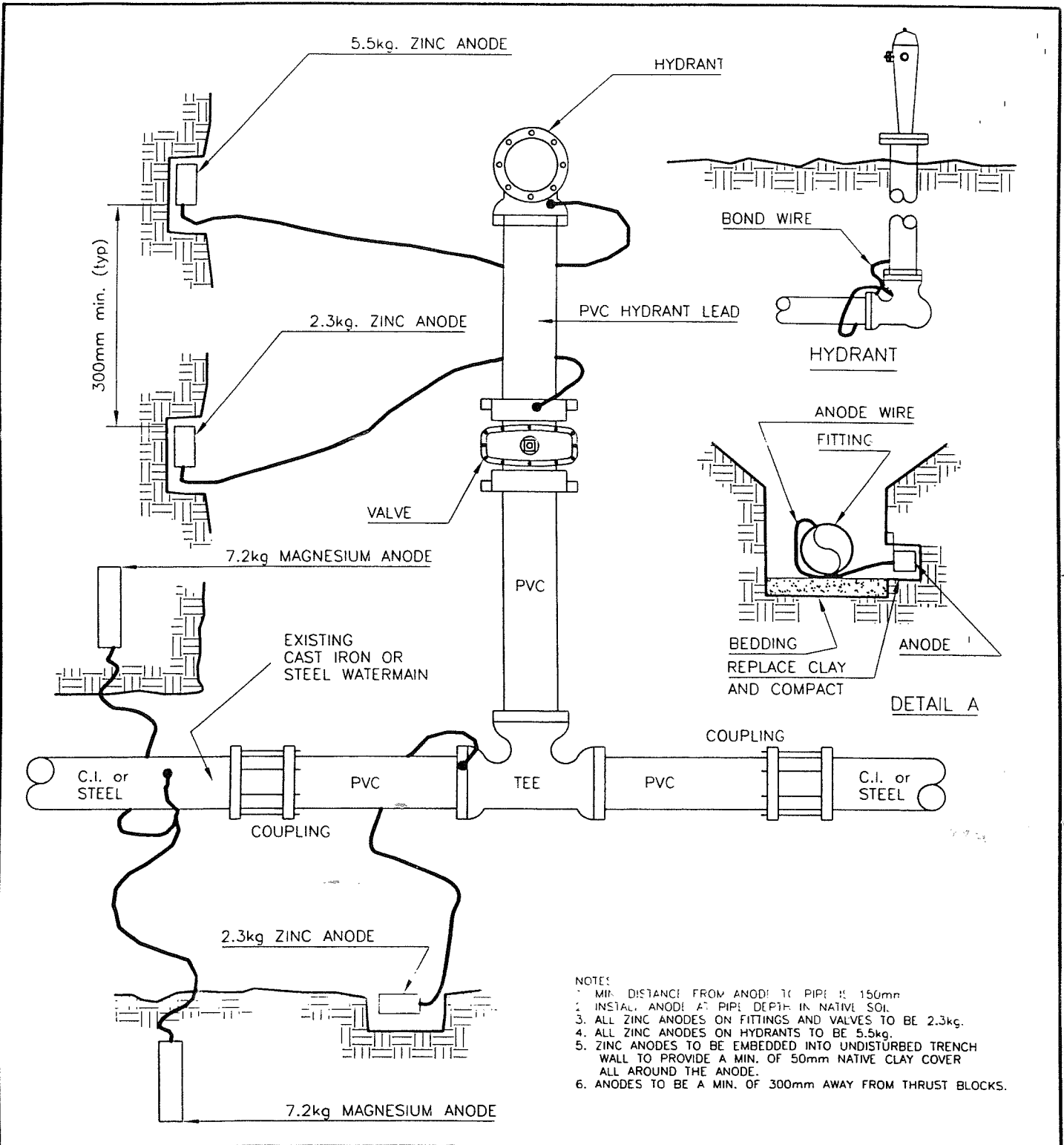
- NOTES :
1. MIN. DISTANCE FROM ANODE TO PIPE IS 150mm.
 2. INSTALL ANODE AT PIPE DEPTH IN NATIVE SOIL.
 3. ALL ZINC ANODES ON FITTINGS AND VALVES TO BE 2.3kg.
 4. ALL ZINC ANODES ON HYDRANTS TO BE 5.5kg.
 5. ZINC ANODES TO BE EMBEDDED INTO UNDISTURBED TRENCH WALL TO PROVIDE A MIN. OF 50mm NATIVE CLAY COVER ALL AROUND THE ANODE.
 6. ANODES TO BE A MIN. OF 300mm AWAY FROM THRUST BLOCKS.

TYPICAL ANODE INSTALLATION AT STEEL OR IRON FITTINGS USED WITH PVC WATERMAINS




TOWN OF VILLE DE
MORINVILLE

REVISIONS			
		APPROVED	
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ANODE INSTALLATION AT HYDRANT & AT CONNECTION TO CAST IRON OR STEEL WATERMAINS

	TOWN OF . VILLE DE MORINVILLE	REVISIONS		
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	3.06



TOWN OF · VILLE DE
MORINVILLE

HYDRANT REPORT

HYDRANT NUMBER : _____

CADASTRAL : _____

HYDRANT LOCATION : STREET _____ AVENUE _____

HYDRANT ALIGNMENT : _____

WATER MAIN INFORMATION :

ALIGNMENT : _____

SIZE : _____ mm TYPE : _____ MAKE : _____

HYDRANT INFORMATION :

MAKE : _____ CAP COLOUR _____

TYPE : COMP BARREL SIZE : 152 STEAMER : YES HOSE CONNECTIONS : 2
S.G. 184 NO 4
C.A.P. 203 DRAIN HOLES : PLUGGED
NOT PLUGGED

PROTECTION POSTS : _____ INSTALLED _____

HYDRANT LEAD INFORMATION : CONTROL VALVE NUMBER : _____

LEAD ALIGNMENT _____

LEAD SIZE : _____ mm TYPE : _____ MAKE : _____

CONTROL VALVE POSITION FROM HYDRANT : _____

CONNECTION POSITION FROM HYDRANT : _____

METHOD OF CONNECTION : TEE T.V.S.

CATHODIC PROTECTION :

ANODES : TYPE : _____ SIZE : _____ NO. OF ANODES : _____

LEAD WIRES : YES NO DATE OF INSTALLATION _____ 20____

CONTRACTOR _____ DATE _____ 20____

CONSULTANT _____ SIGNED _____ DATE _____ 20____

REMARKS :

FIELD SKETCH

PLEASE
INCLUDE
COUPLINGS,
FITTINGS,
CHAMBER,
PROP. LINES,
CURBLINE,
SIDEWALK ETC.





TOWN OF · VILLE DE
MORINVILLE

VALVE REPORT

VALVE NUMBER :

CADASTRAL :

VALVE LOCATION :

STREET : _____ AVENUE : _____

VALVE ALIGNMENT : _____

WATER MAIN HYDRANT LEAD SERVICE LEAD INFORMATION :

ALIGNMENT : _____

SIZE : _____ mm TYPE : _____ MAKE : _____

VALVE INFORMATION :

VALVE SIZE : _____ mm TYPE : _____ MAKE : _____

MODEL : _____ CLASS : _____

VALVE PURPOSE	MAIN CONTROL	<input type="checkbox"/>	GEARED :	YES	<input type="checkbox"/>
	HYDRANT CONTROL	<input type="checkbox"/>		NO	<input type="checkbox"/>
	SERVICE CONTROL	<input type="checkbox"/>		OTHER	<input type="checkbox"/>

VALVE STATUS : OPEN CLOSE STOP OTHER _____

KEYWAY : CAST IRON
ENCASED IN P.V.C. VALVE INSTALLATION DATE _____ 20 _____

CONTRACTOR _____ DATE _____ 20 _____

IN SERVICE DATE : _____ 20 _____ APPLICATION NO. _____

CONSULTANT _____ SIGNED _____ DATE _____ 20 _____

CATHODIC PROTECTION :

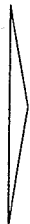
ANODES : TYPE : _____ SIZE : _____ NO.OF ANODES : _____

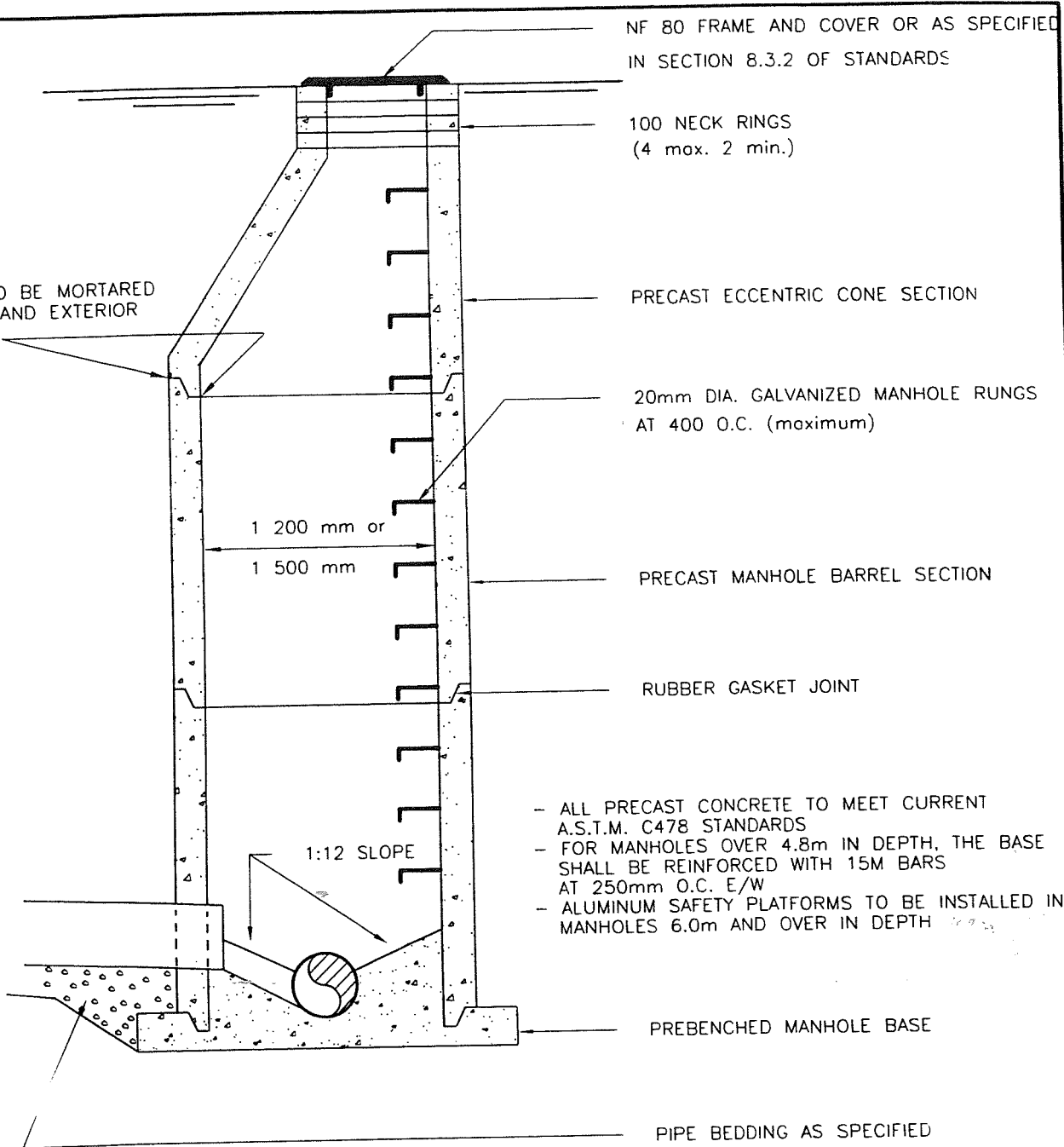
LEAD WIRES : YES NO DATE OF INSTALLATION : _____ 20 _____

REMARKS :

FIELD SKETCH

PLEASE
INCLUDE
COUPLINGS,
FITTINGS,
CHAMBER,
PROP. LINES,
CURBLINE,
SIDEWALK ETC.



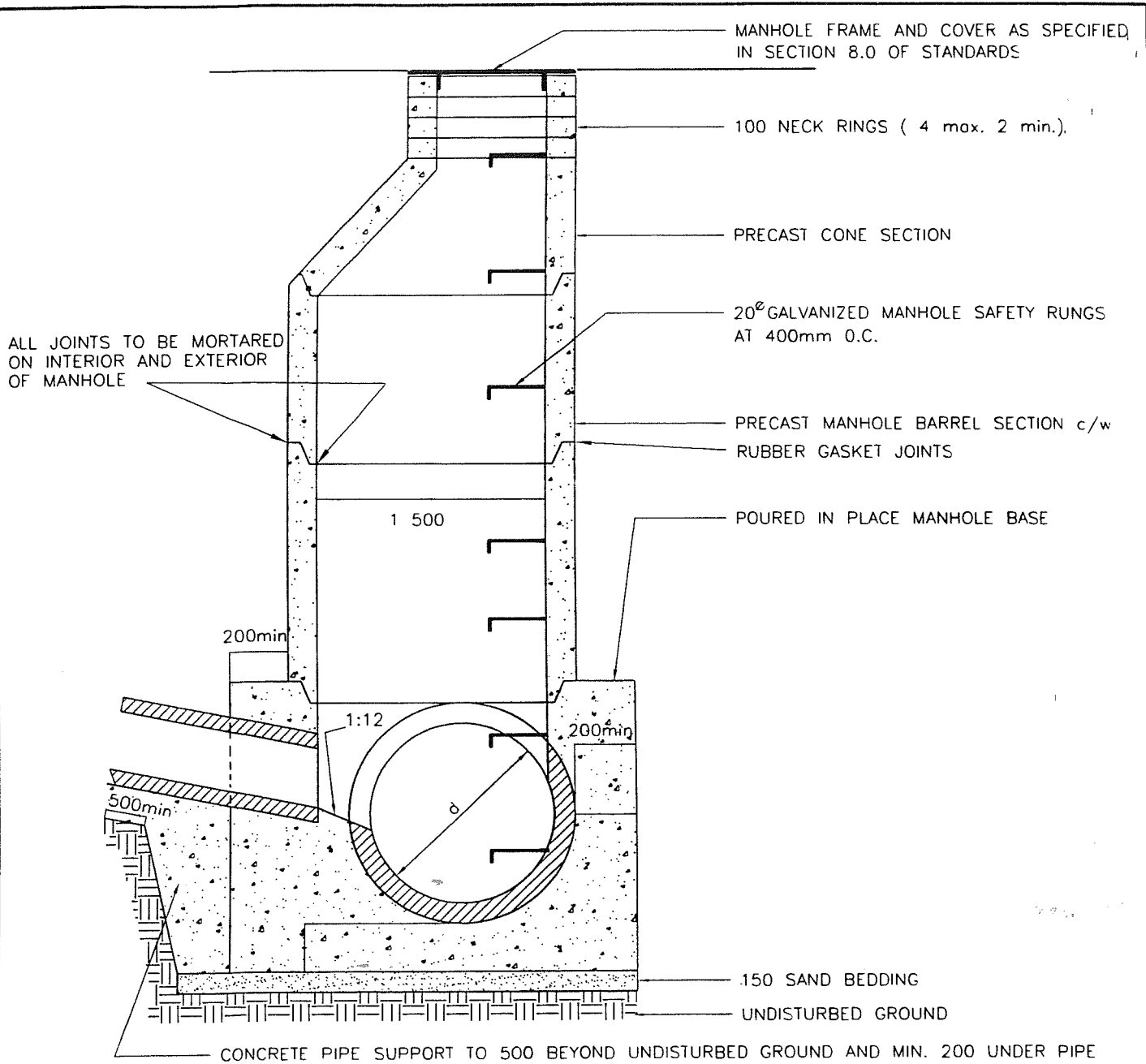


STANDARD MANHOLE 1200mm DIAMETER




TOWN OF - VILLE DE
MORINVILLE

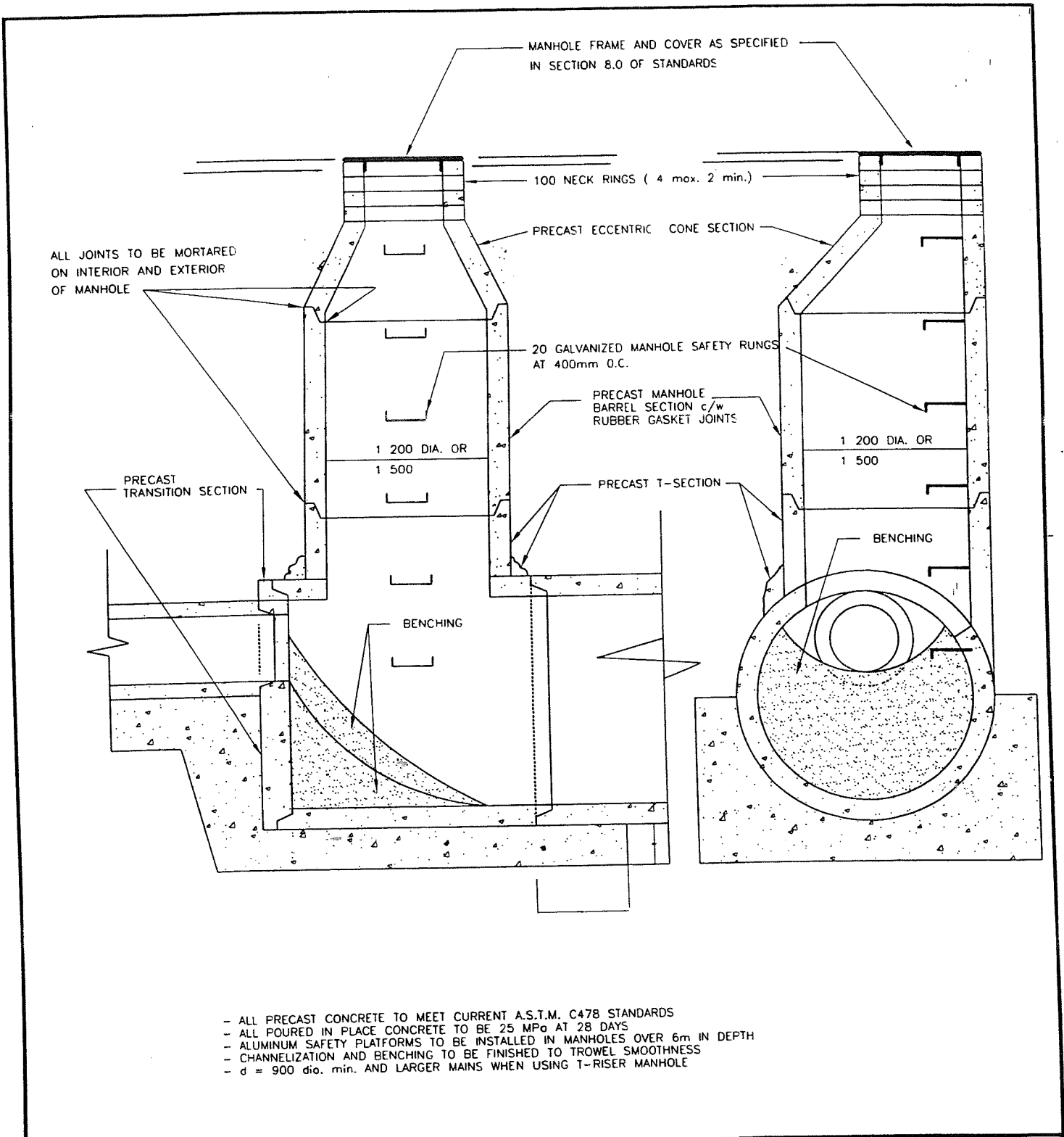
REVISIONS			
		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	4.01



- ALL PRECAST CONCRETE TO MEET CURRENT A.S.T.M. C478 STANDARDS
- ALL POURED IN PLACE CONCRETE TO BE 25 MPa AT 28 DAYS
- ALUMINUM SAFETY PLATFORMS TO BE INSTALLED IN MANHOLES OVER 6m IN DEPTH
- CHANNELIZATION AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS
- d = 600 DIAMETER MIN. AND 1200 DIAMETER MAX. WHEN USING PERCHED MANHOLE BASE

TYPICAL PERCHED MANHOLE

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	SCALE	N.T.S.	DECEMBER, 2003.
			DRAWING NO.
			4.02



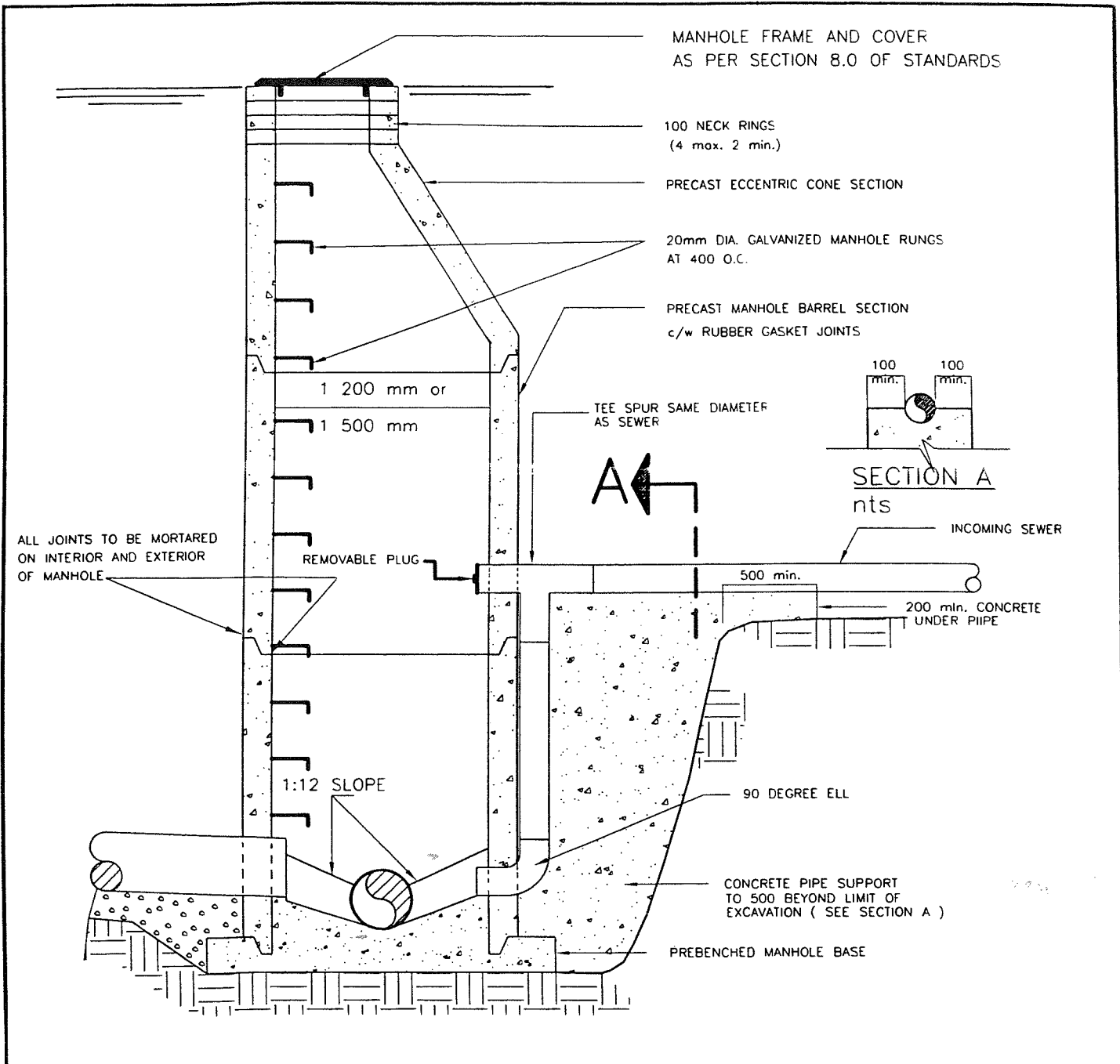
TYPICAL T-RISER MANHOLE



TOWN OF VILLE DE
MORINVILLE

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APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	4.03



MANHOLE FRAME AND COVER
AS PER SECTION 8.0 OF STANDARDS

100 NECK RINGS
(4 max. 2 min.)

PRECAST ECCENTRIC CONE SECTION

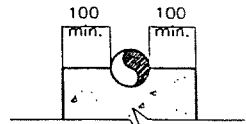
20mm DIA. GALVANIZED MANHOLE RUNGS
AT 400 O.C.

PRECAST MANHOLE BARREL SECTION
c/w RUBBER GASKET JOINTS

1 200 mm or

1 500 mm

TEE SPUR SAME DIAMETER
AS SEWER



SECTION A
nts

INCOMING SEWER

ALL JOINTS TO BE MORTARED
ON INTERIOR AND EXTERIOR
OF MANHOLE

REMOVABLE PLUG

500 min.

200 min. CONCRETE
UNDER PIPE

1:12 SLOPE

90 DEGREE ELL

CONCRETE PIPE SUPPORT
TO 500 BEYOND LIMIT OF
EXCAVATION (SEE SECTION A)

PREBENCHED MANHOLE BASE

- ALL PRECAST CONCRETE TO MEET CURRENT A.S.T.M. C478 STANDARDS
- FOR MANHOLES OVER 4.8m IN DEPTH, THE BASE SHALL BE REINFORCED WITH 13M BARS AT 250mm O.C. E/W
- ALUMINUM SAFETY PLATFORMS TO BE INSTALLED IN MANHOLES 6.0m AND OVER IN DEPTH
- CHANNELIZATION AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS

MANHOLE WITH EXTERNAL DROP CONNECTION



TOWN OF - VILLE DE
MORINVILLE

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DATE

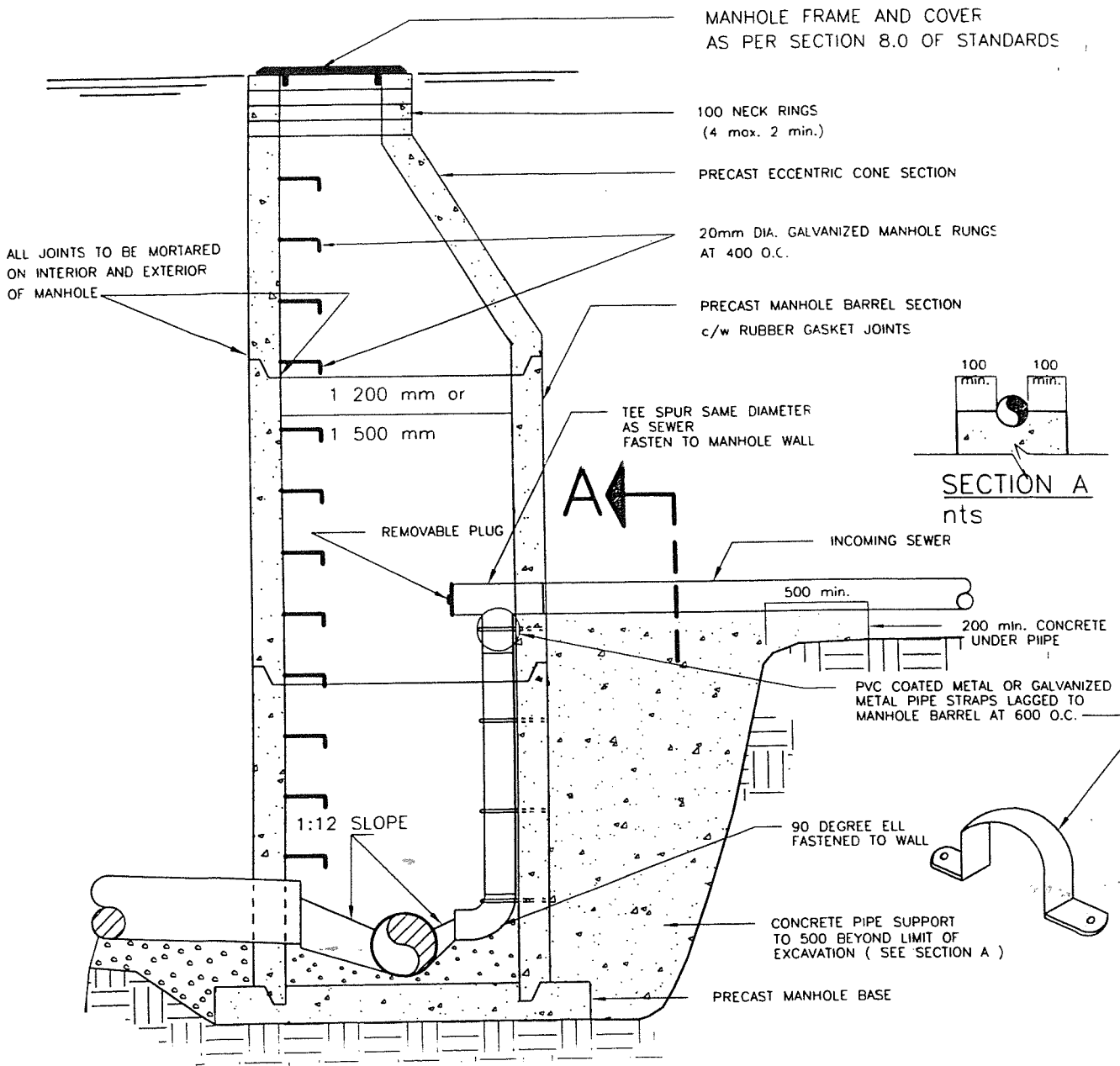
DECEMBER, 2003.

SCALE

N.T.S.

DRAWING NO.

4.04



MANHOLE FRAME AND COVER
AS PER SECTION 8.0 OF STANDARDS

100 NECK RINGS
(4 max. 2 min.)

PRECAST ECCENTRIC CONE SECTION

20mm DIA. GALVANIZED MANHOLE RUNGS
AT 400 O.C.

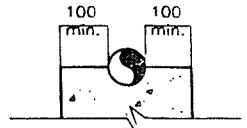
PRECAST MANHOLE BARREL SECTION
c/w RUBBER GASKET JOINTS

ALL JOINTS TO BE MORTARED
ON INTERIOR AND EXTERIOR
OF MANHOLE

1 200 mm or

1 500 mm

TEE SPUR SAME DIAMETER
AS SEWER
FASTEN TO MANHOLE WALL



SECTION A
nts

REMOVABLE PLUG

INCOMING SEWER

500 min.

200 min. CONCRETE
UNDER PIPE

PVC COATED METAL OR GALVANIZED
METAL PIPE STRAPS LAGGED TO
MANHOLE BARREL AT 600 O.C.

1:12 SLOPE

90 DEGREE ELL
FASTENED TO WALL

CONCRETE PIPE SUPPORT
TO 500 BEYOND LIMIT OF
EXCAVATION (SEE SECTION A)

PRECAST MANHOLE BASE

- ALL PRECAST CONCRETE TO MEET CURRENT A.S.T.M. C478 STANDARDS
- FOR MANHOLES OVER 4.8m IN DEPTH, THE BASE SHALL BE REINFORCED WITH 15M BARS AT 250mm O.C. E/W
- ALUMINUM SAFETY PLATFORMS TO BE INSTALLED IN MANHOLES 6.0m AND OVER IN DEPTH
- CHANNELIZATION AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS

MANHOLE WITH INTERNAL DROP STRUCTURE



TOWN OF - VILLE DE
MORINVILLE

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		DRAWING NO.	4.05

FRAME AND GRATE
AS SPECIFIED IN SECTION 11.3 OF STANDARDS

GRADE RINGS AS REQUIRED

MORTAR ALL JOINTS

PRECAST SLAB TOP

BACKFILL AS SPECIFIED

PRECAST CATCH BASIN BARREL SECTION

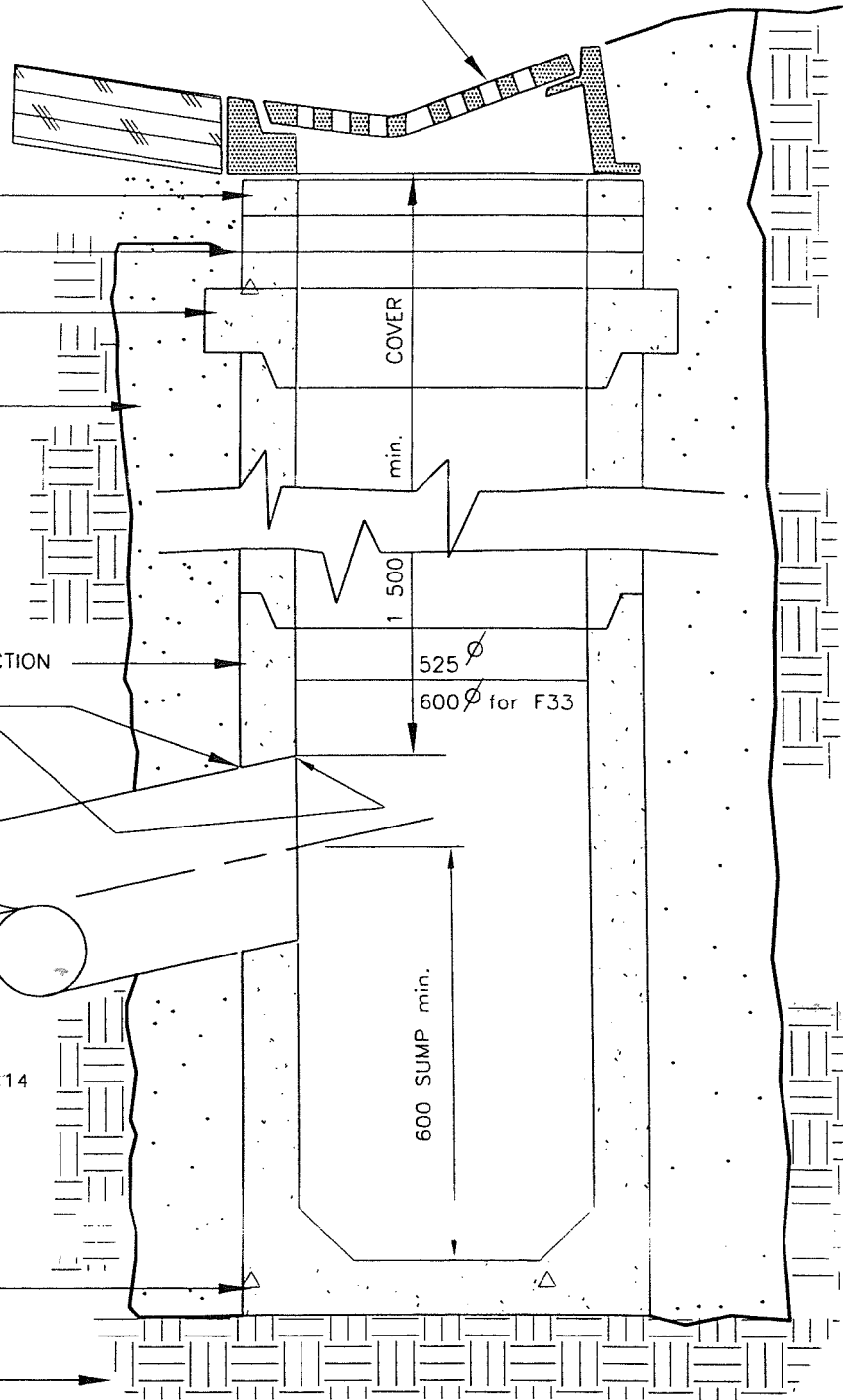
MORTAR ALL JOINTS,
ON EXTERIOR AND INTERIOR OF
CATCH BASIN BARREL

250 min. CATCH BASIN LEAD
@ min. SLOPE OF 1% (USE
FULL LENGTH OF PIPE AT
CATCH BASIN)

- ALL PRECAST CONCRETE
SHALL MEET CURRENT A.S.T.M. C14
STANDARDS

MONOLITHIC FLOOR

UNDISTURBED GROUND



TYPICAL 525mm AND 600mm DIAMETER CATCH BASINS



TOWN OF · VILLE DE
MORINVILLE

REVISIONS

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GRM/WLJC

DATE

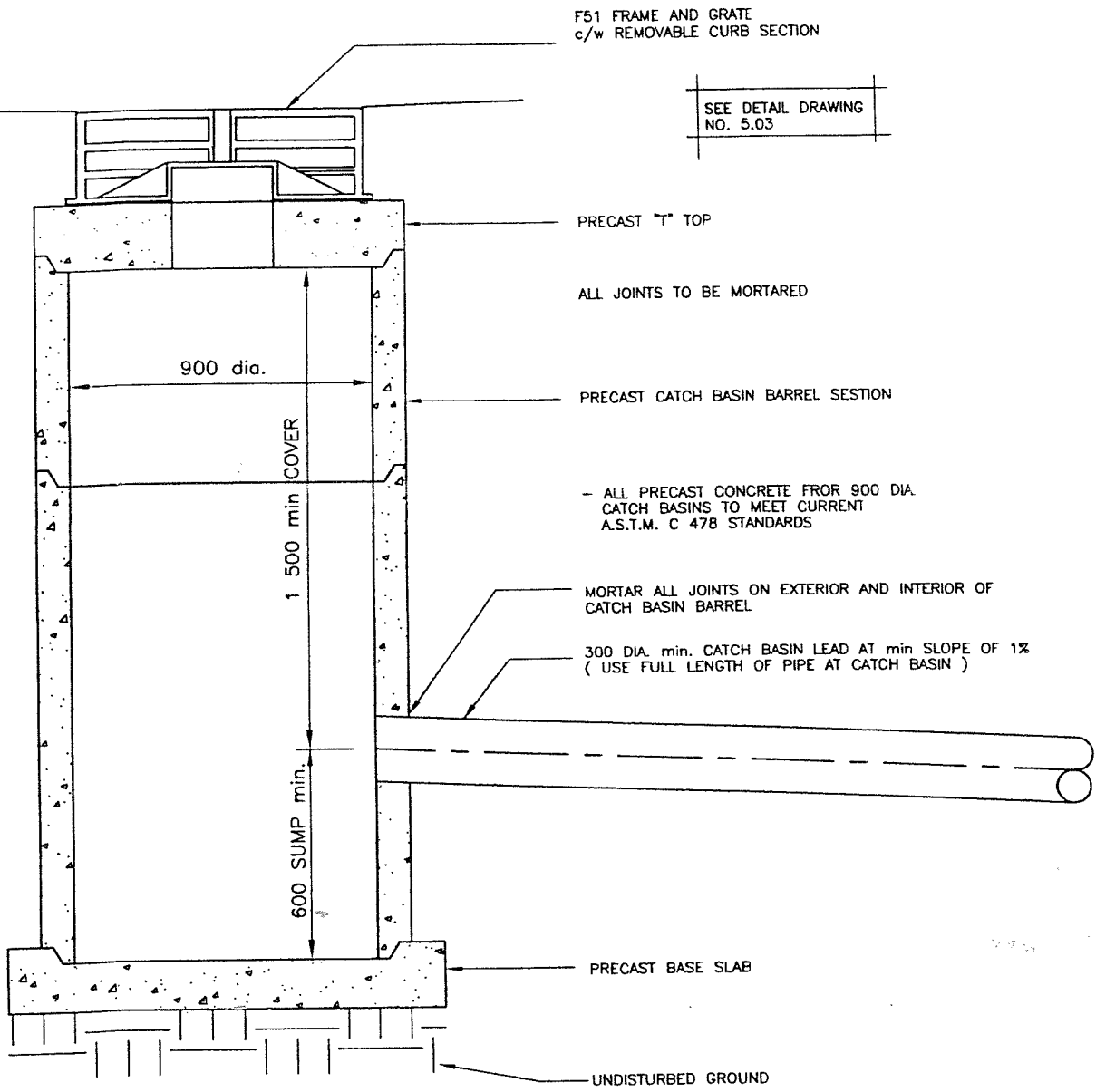
DECEMBER, 2003.

SCALE

N.T.S.

DRAWING NO.

5.01

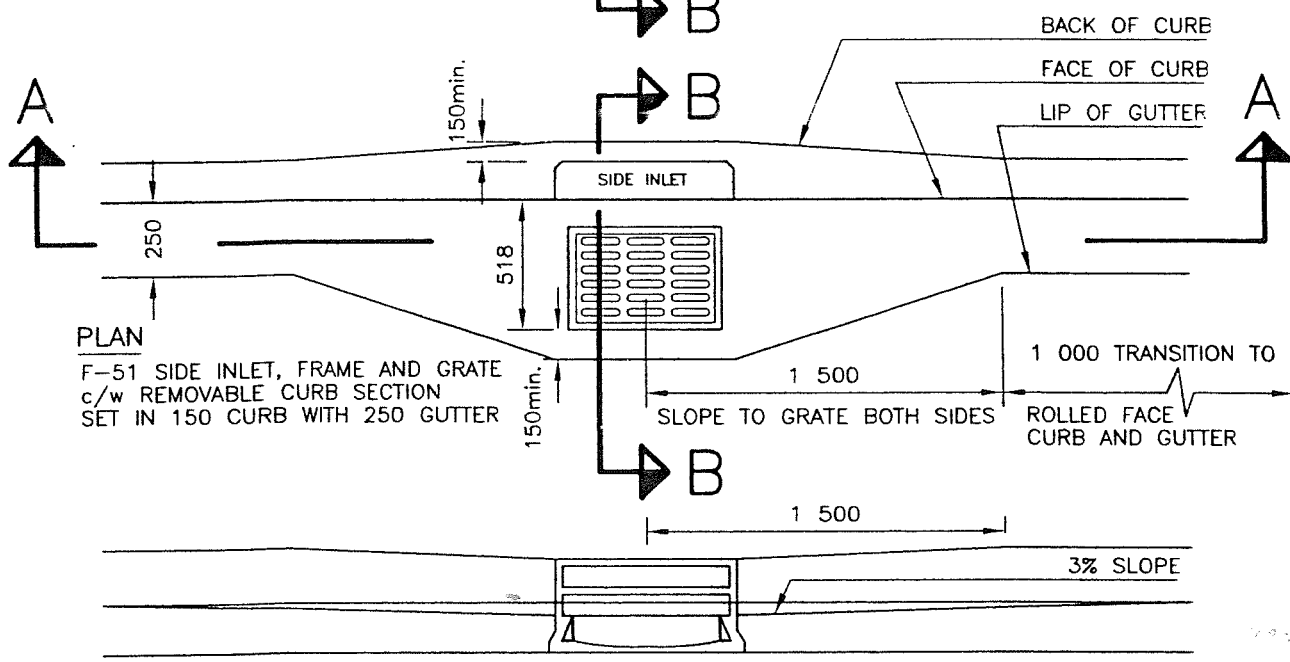
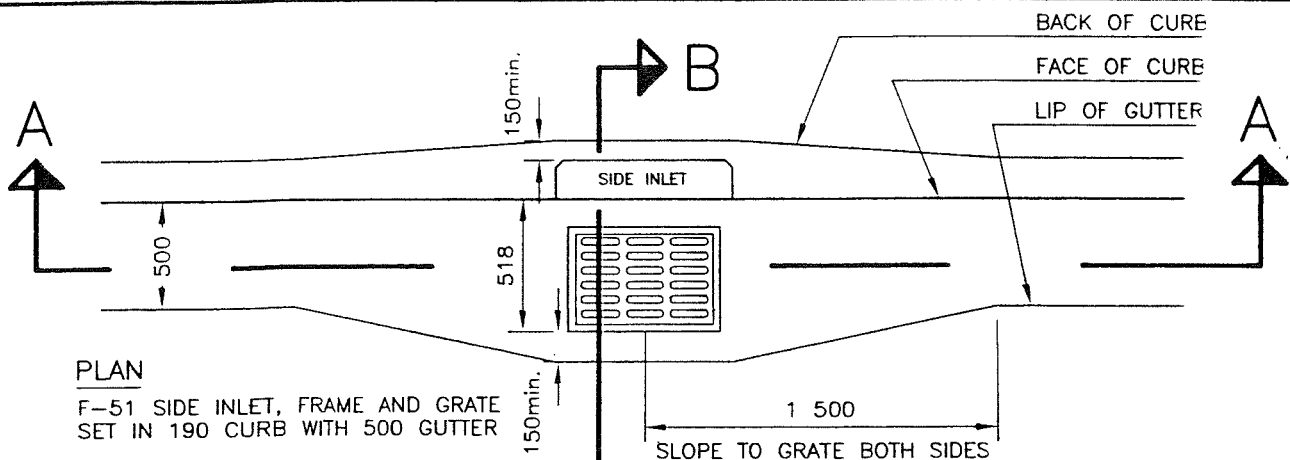


TYPICAL 900mm DIAMETER CATCH BASIN

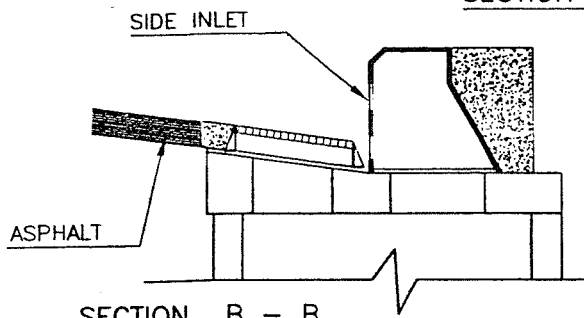


TOWN OF VILLE DE
MORINVILLE

REVISIONS		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	5.02




SECTION A - A



TO BE READ IN CONJUNCTION
WITH DRAWINGS 5.02 & 2.05
OR 2.02 & 2.03

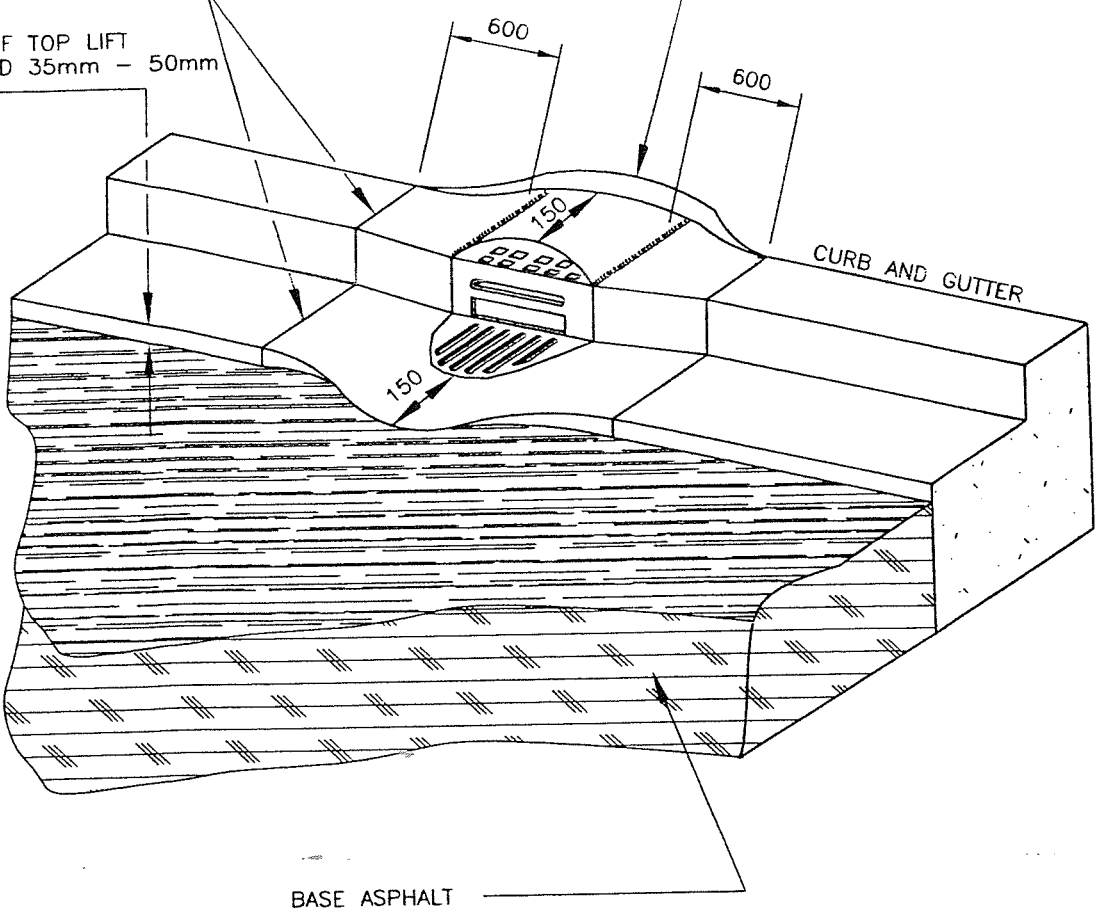
TYPICAL INSTALLATIONS FOR F-51 CATCH BASIN FRAME AND GRATE

 <p>TOWN OF . VILLE DE MORINVILLE</p>	REVISIONS			
			APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	5.03

DEEP CUTS AT THESE LOCATIONS
TO FACILITATE FUTURE BREAKOUT

DEPTH OF TOP LIFT
DEFERRED 35mm - 50mm

ULTIMATE HEIGHT OF
CURB TOP



TYPICAL CURB AND GUTTER TREATMENT AT CATCH BASINS WHEN
ASPHALT TOP LIFT IS DEFERRED.

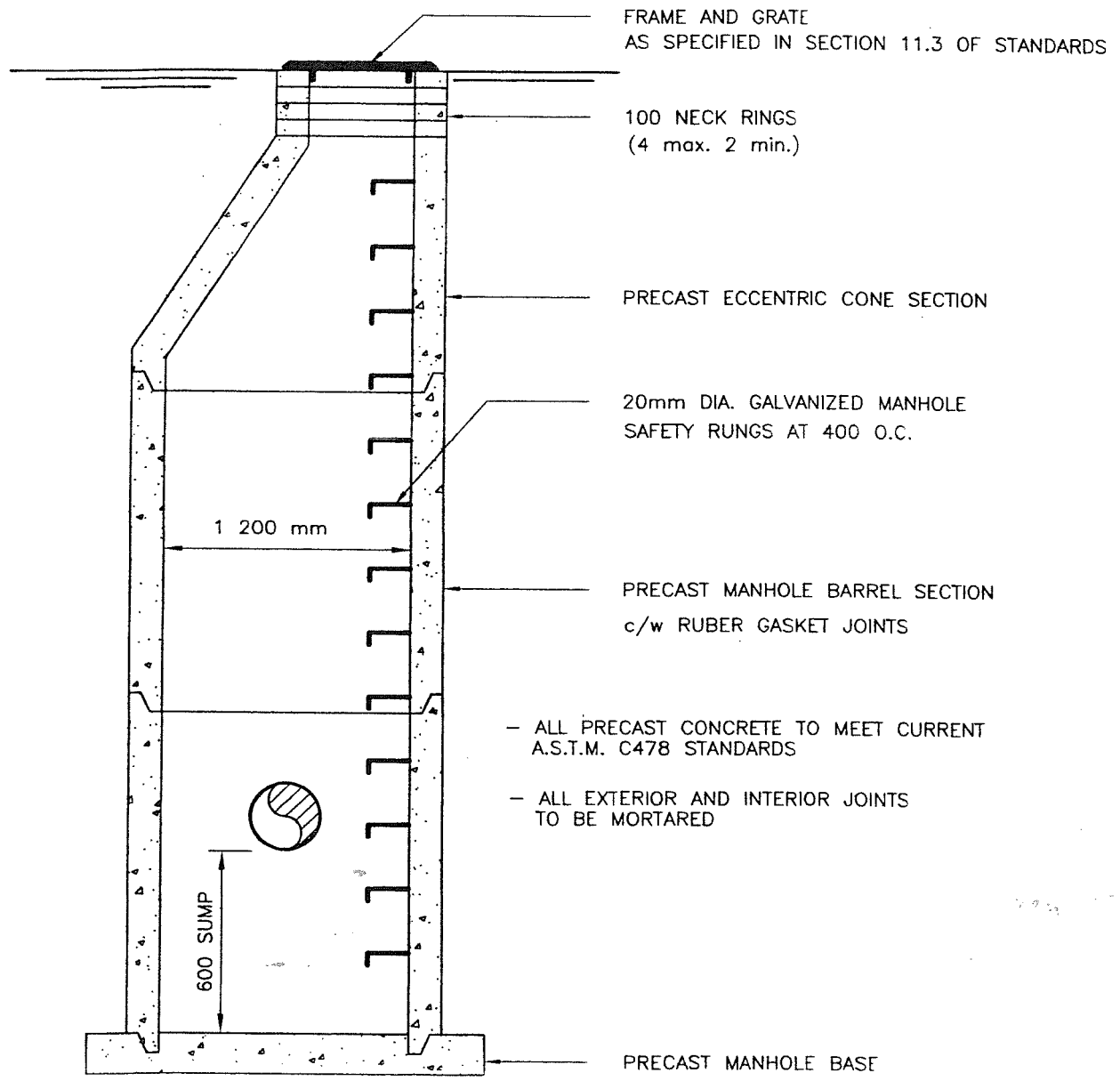
**TYPICAL DROPPED GUTTER LIP AT CATCH BASINS
FOR USE DURING INTERIM STAGE OF CONSTRUCTION**



TOWN OF VILLE DE
MORINVILLE

REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	5.04

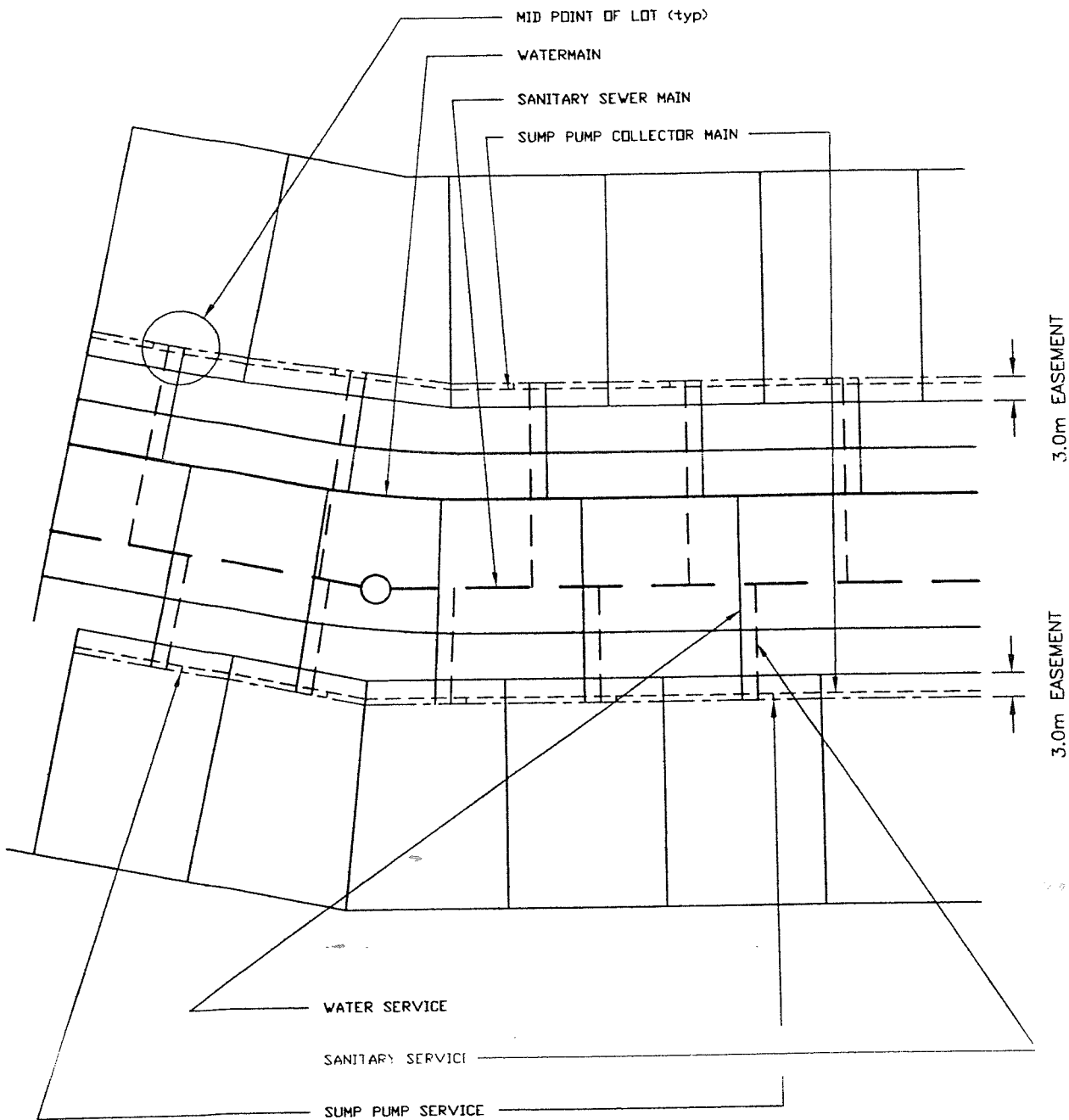


STANDARD 1200mm DIAMETER CATCH BASIN MANHOLE



TOWN OF VILLE DE
MORINVILLE

REVISIONS			
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	5.05
		APPROVED	



NOTE: FOR SINGLE SERVICE CONNECTIONS, THE WATER SHALL BE ON THE RIGHT WHEN FACING LOT FROM THE STREET.

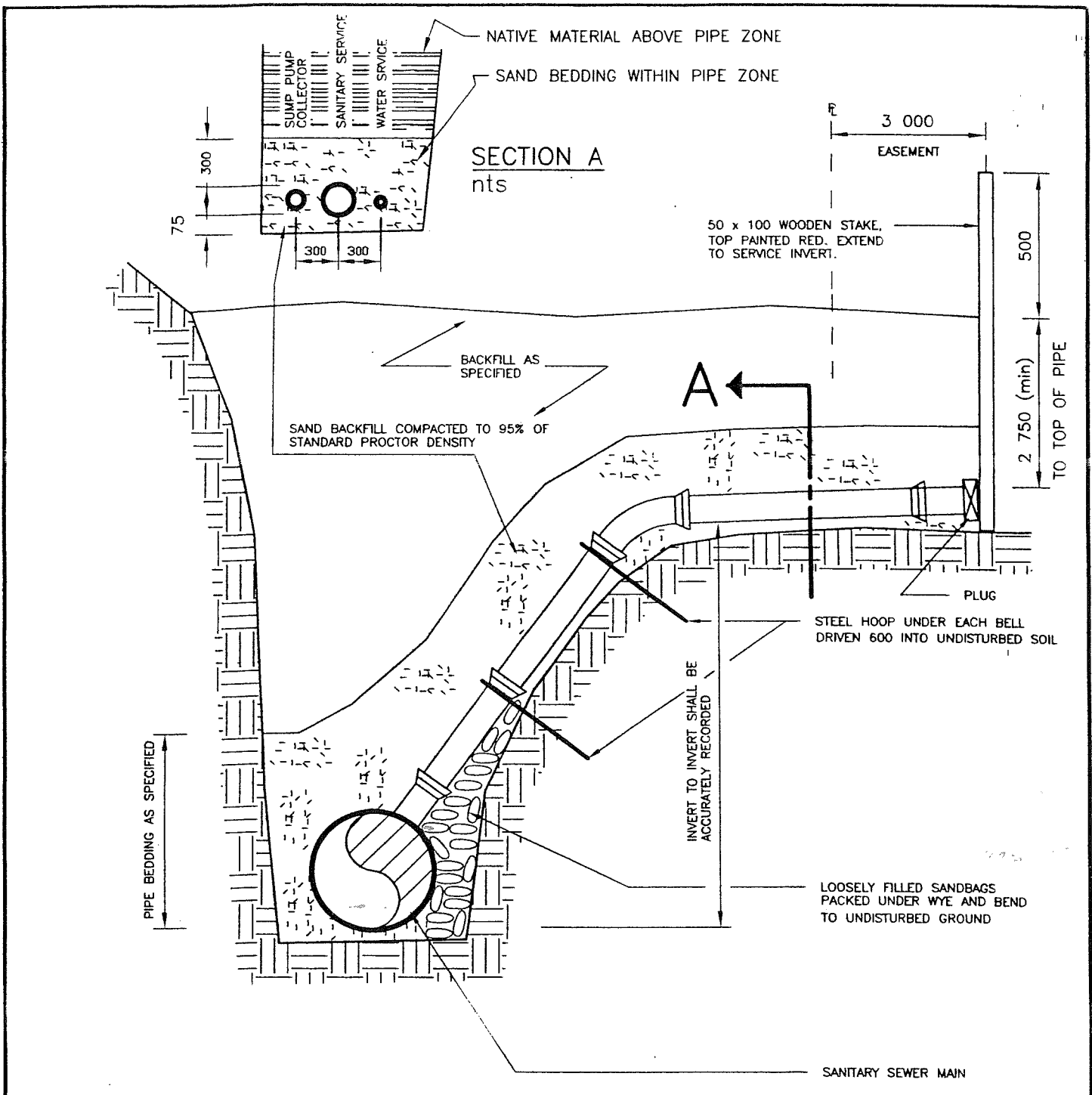
SERVICE CONNECTION LOCATIONS



TOWN OF VILLE DE
MORINVILLE

REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	6.01



- SANITARY SERVICES TO BE 100mm DIAMETER.
- MINIMUM SLOPE FOR 100 DIA. AND 150 DIA. SERVICES IS 2%

SANITARY SEWER SERVICE CONNECTION

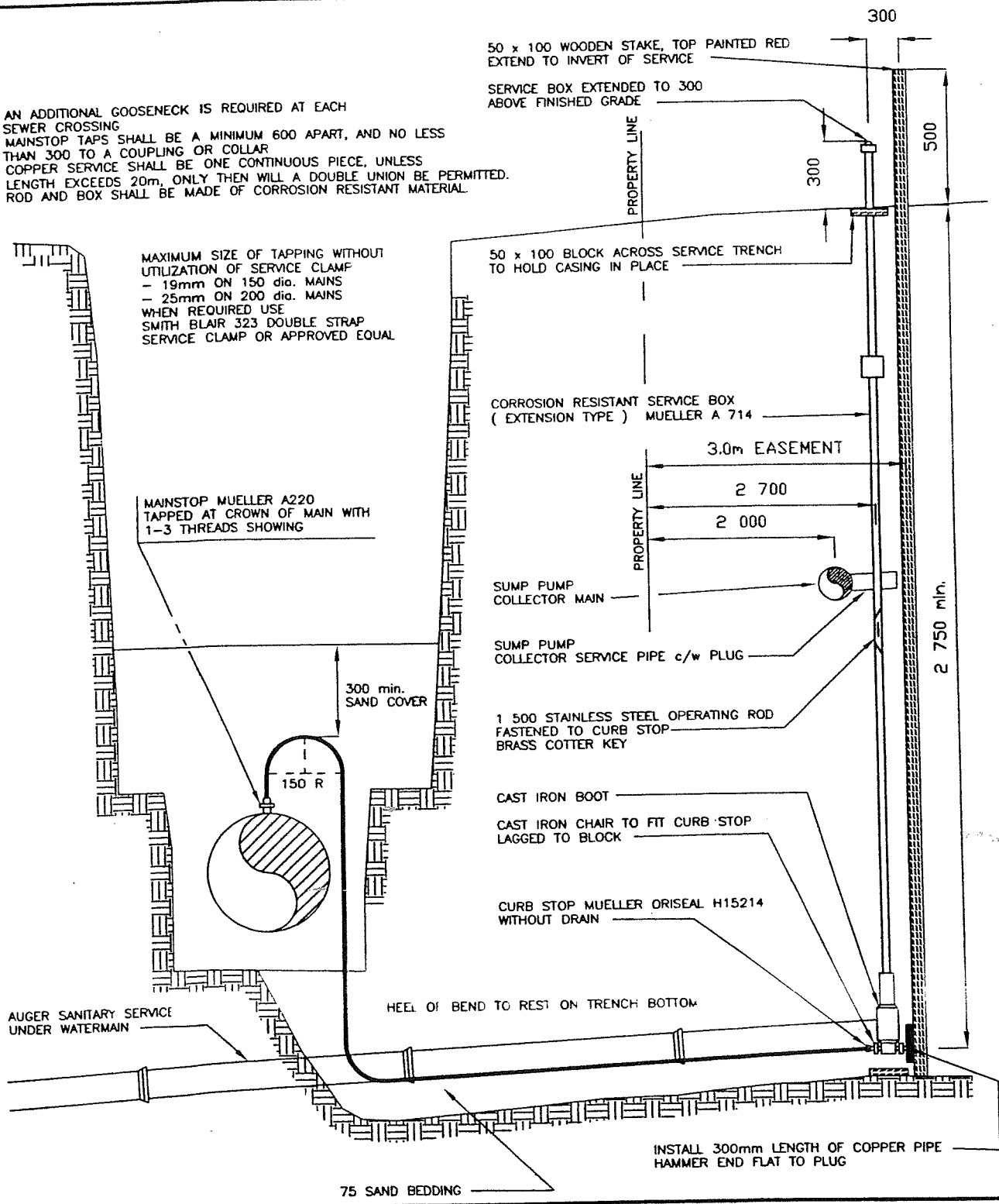


TOWN OF . VILLE DE
MORINVILLE

REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	6.02

- AN ADDITIONAL GOOSENECK IS REQUIRED AT EACH SEWER CROSSING
- MAINSTOP TAPS SHALL BE A MINIMUM 600 APART, AND NO LESS THAN 300 TO A COUPLING OR COLLAR
- COPPER SERVICE SHALL BE ONE CONTINUOUS PIECE, UNLESS LENGTH EXCEEDS 20m, ONLY THEN WILL A DOUBLE UNION BE PERMITTED.
- ROD AND BOX SHALL BE MADE OF CORROSION RESISTANT MATERIAL



TYPICAL 50mm AND SMALLER WATER SERVICE



TOWN OF VILLE DE
MORINVILLE

REVISIONS

DESIGNED/DRAWN

GRM/WLJC

SCALE

N.T.S.

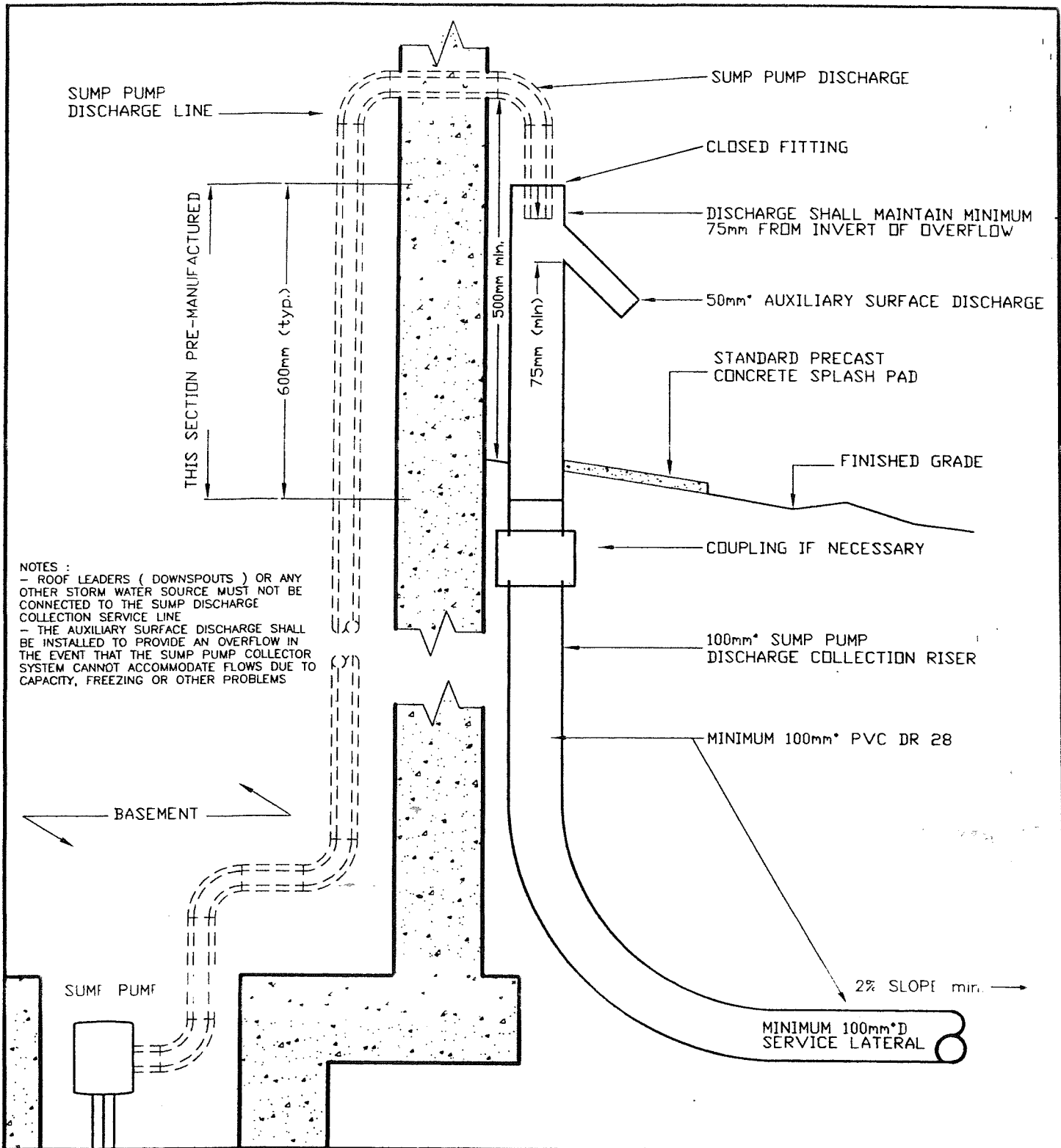
APPROVED

DATE

DECEMBER, 2003.

DRAWING NO.


6.03

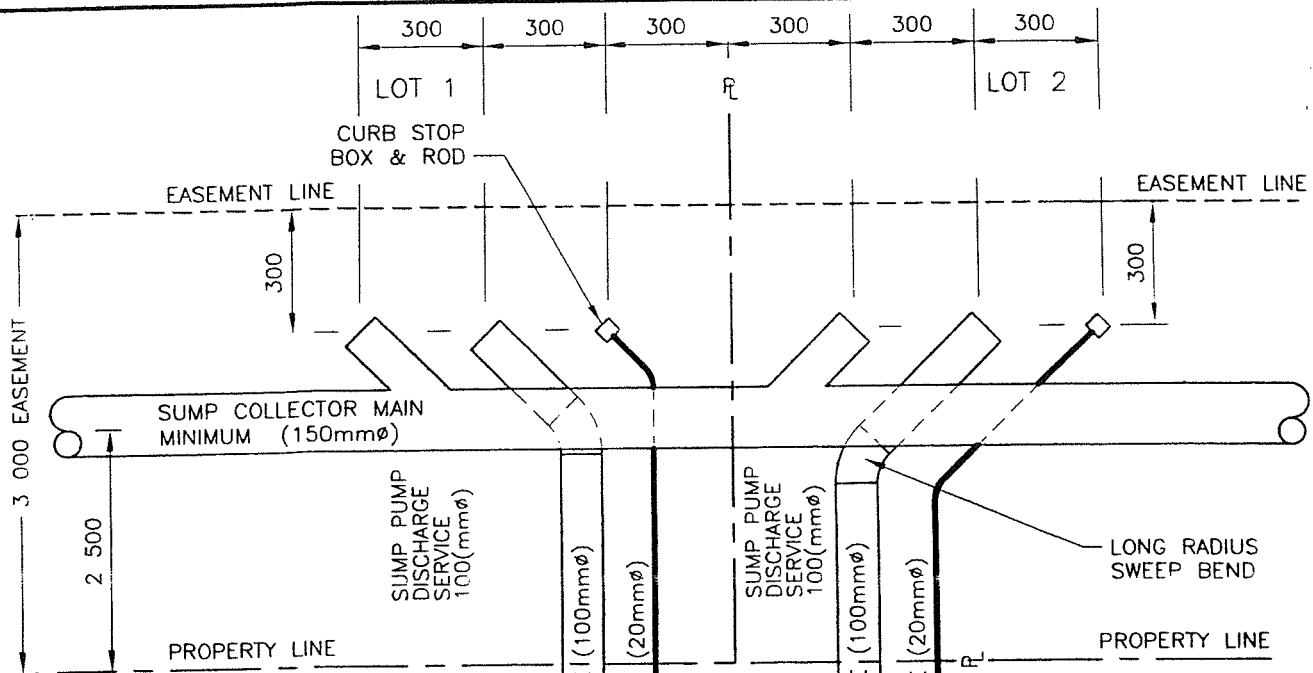


NOTES :

- ROOF LEADERS (DOWNSPOUTS) OR ANY OTHER STORM WATER SOURCE MUST NOT BE CONNECTED TO THE SUMP DISCHARGE COLLECTION SERVICE LINE
- THE AUXILIARY SURFACE DISCHARGE SHALL BE INSTALLED TO PROVIDE AN OVERFLOW IN THE EVENT THAT THE SUMP PUMP COLLECTOR SYSTEM CANNOT ACCOMMODATE FLOWS DUE TO CAPACITY, FREEZING OR OTHER PROBLEMS

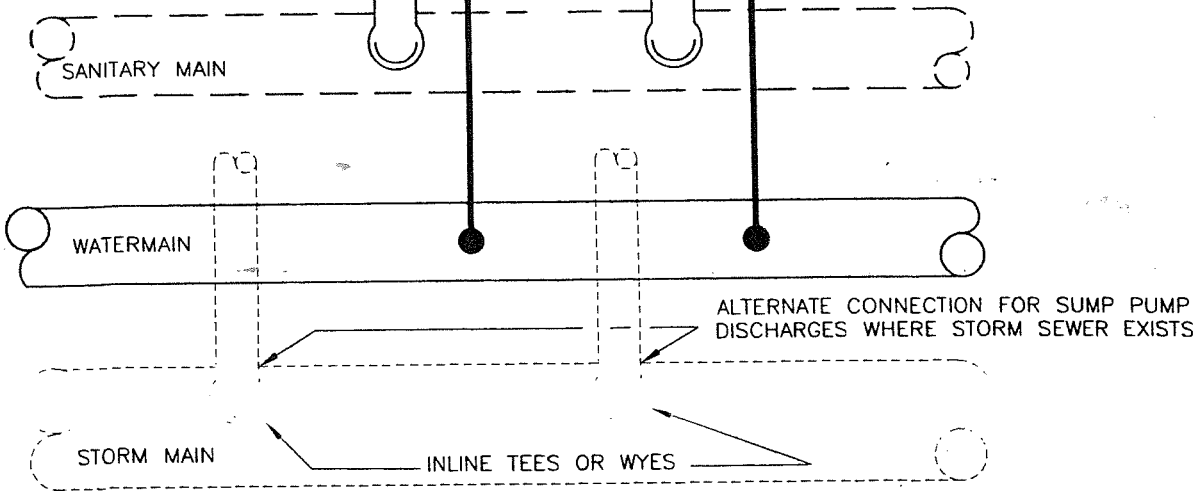
TYPICAL SUMP PUMP DISCHARGE CONNECTION AT HOUSE

 <p>TOWN OF VILLE DE MORINVILLE</p>	REVISIONS		APPROVED	
	DESIGNED/DRAWN GRM/WLJC		DATE DECEMBER, 2003.	
	SCALE N.T.S.		DRAWING NO. 6.04	



Note :

- SUMP PUMP DISCHARGE SERVICE PIPE TO BE 100mmØ PVC DR 28
- SANITARY SERVICE PIPE TO BE 100mmØ PVC DR 35



NOTES:

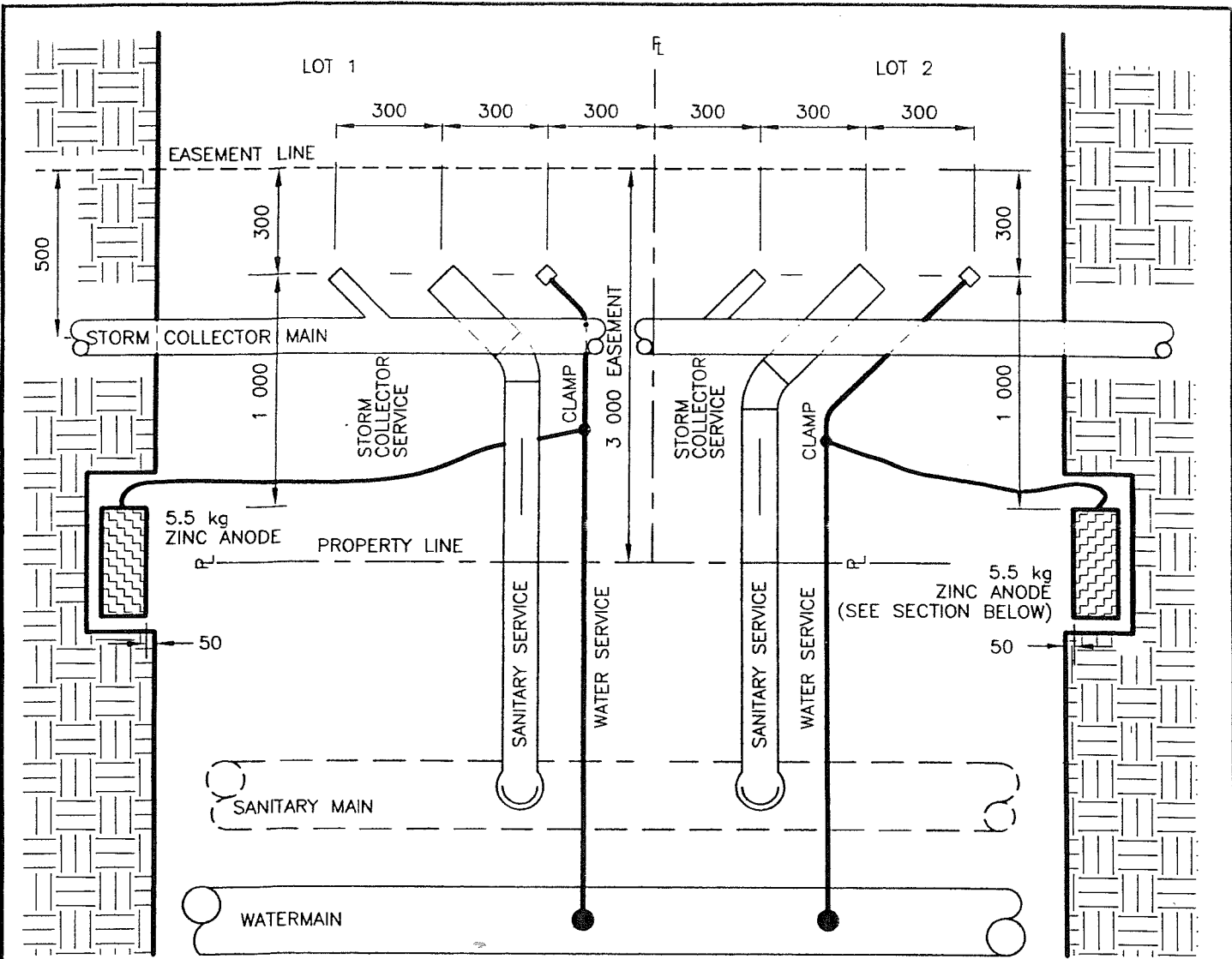
1. FOR SERVICES TO LOTS ON THE OPPOSITE SIDE OF THE STREET, THE SAME GENERAL ARRANGEMENT IS REQUIRED.
2. FOR SECTION VIEWS AND ADDITIONAL NOTES, SEE DRAWINGS 6.01, 6.02, 6.03, 6.04, 6.06 & 6.07
3. SUMP PUMPS ARE REQUIRED IN ALL HOUSES. THE REQUIRED SUMP PUMP AND DISCHARGE PIPING ARRANGEMENT IS SHOWN ON DWG NO. 6.04. THE DIRECT CONNECTION OF WEEPING TILE DRAINAGE SYSTEMS TO THE SANITARY MAINS IS NOT PERMITTED.
4. AUGERED INSTALLATION IS REQUIRED UNDER EXISTING STREETS AND SIDEWALKS.
5. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

DOUBLE SERVICE

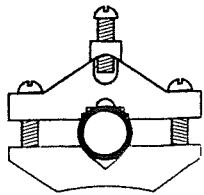


TOWN OF VILLE DE MORINVILLE

REVISIONS		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	6.05



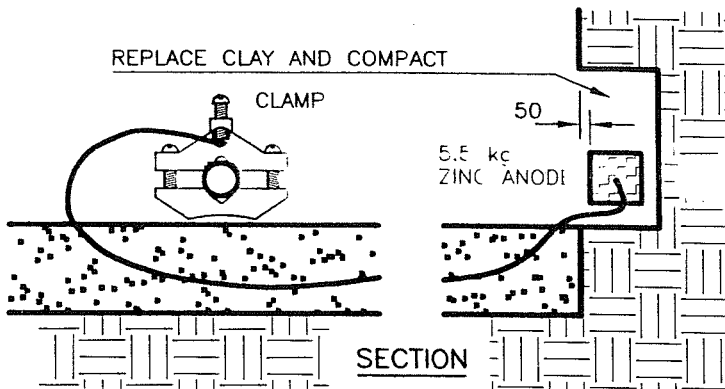
PLAN



TYPICAL PIPE CLAMP

NOTES :

- PIPE CLAMP TO BE ALL BRASS OR APPROVED EQUAL.
- ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE A MIN. 50mm COMPACTED NATIVE CLAY COVER.



SECTION

ANODE ON 50mm AND SMALLER COPPER WATER SERVICE



TOWN OF VILLE DE
MORINVILLE

REVISIONS

APPROVED

DESIGNED/DRAWN GRM/WLJC

DATE DECEMBER, 2003.

SCALE N.T.S.

DRAWING NO. 6.06



TOWN OF · VILLE DE
MORINVILLE

SERVICE CONNECTION REPORT

Municipal Address : _____ Date Installed : _____

Lot : _____ Block : _____ Plan : _____ Subdivision : _____

SANTARY SEWER SERVICE :

Design Invert at Property Line : _____ Pipe Diameter (mm) and (Type) : _____

Length (m) : _____ Saddle (Type) : _____ Bends : _____ Riser (Vertical m) : _____

WATER SERVICE :

Pipe Diameter (mm) : _____ Pipe (Type) : _____ Length (m) : _____

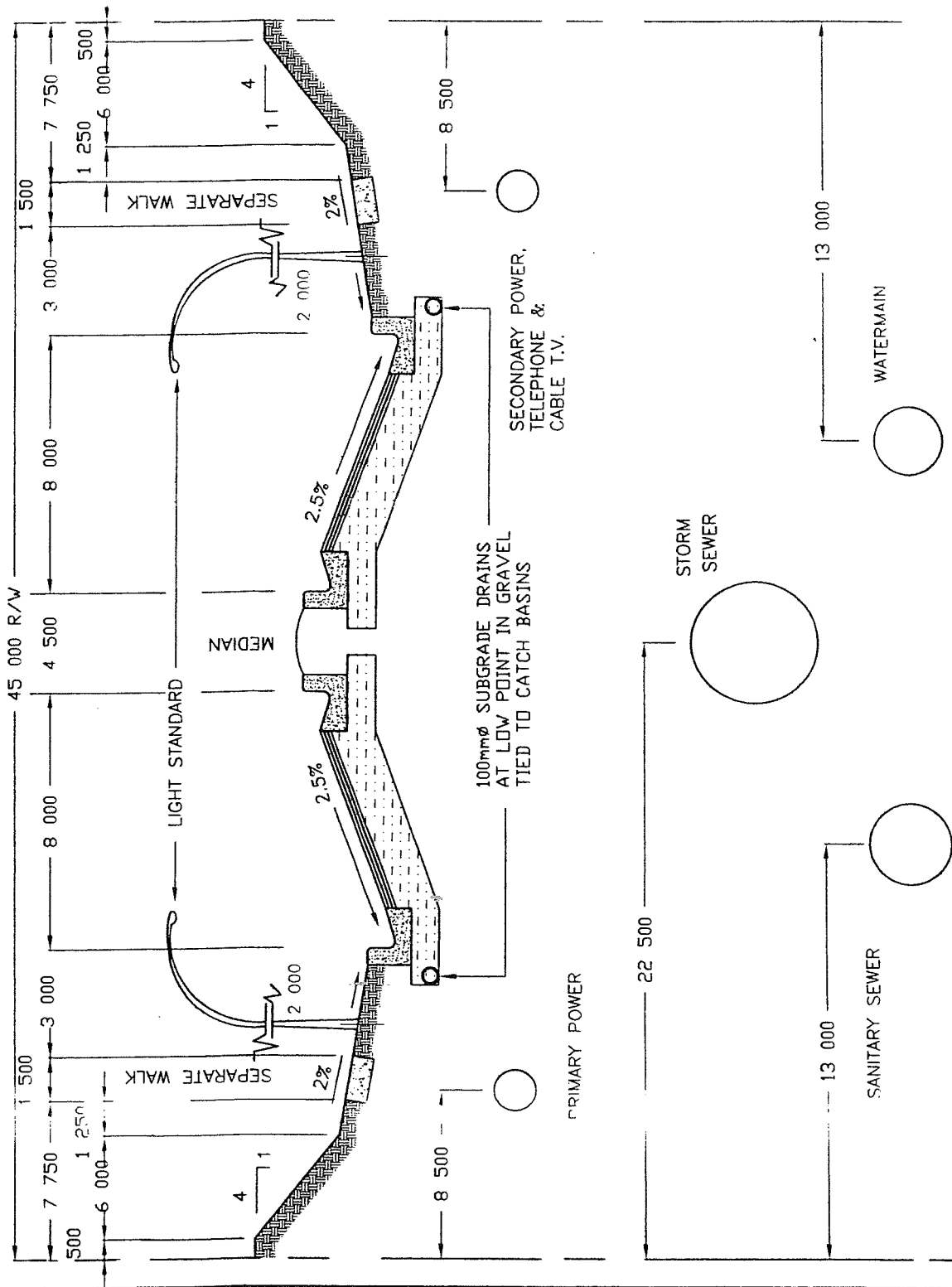
Fittings Size (mm) : _____ Clamp (Type) : _____ Corp. (Type) : _____

Curb Stop (Type) : _____ Specials : _____ Service Box Design El. : _____

Note : Where (Type) is indicated, information to be inserted includes Manufacturer and Model No.

RECORD ELEVATIONS	STATION	B.S.	H.I.	F.S.	ELEV.
B.M. No.					
T.P. No.					
San. Main Inv.					
San. Serv. Inv. at Main					
San. Serv. Inv. at P/L					
Top of Watermain					
Service Box					
T.P. No.					
B.M. No.					

Sketch



- MINIMUM ROAD STRUCTURE AS DRAWING 1.0 OF STANDARDS
- 50mm ASPHALTIC CONCRETE SURFACE COURSE
 - 100mm ASPHALTIC CONCRETE BASE COURSE
 - 175mm DEPTH OF 20mm MINUS CRUSHED GRAVEL
 - 150mm DEPTH OF 63mm MINUS CRUSHED GRAVEL
 - 150mm DEPTH OF CEMENT MODIFIED SUBGRADE

20.5 METRE DIVIDED ARTERIAL



TOWN OF VILLE DE
MORINVILLE

REVISIONS

APPROVED

DESIGNED/DRAWN

GRM/WLJC

DATE

2003

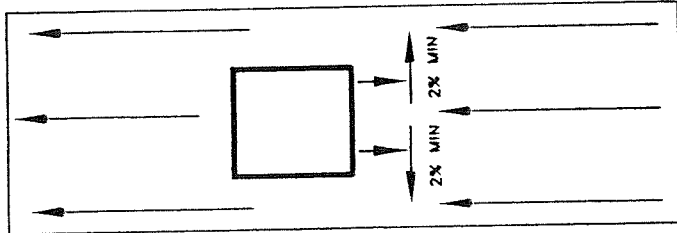
SCALE

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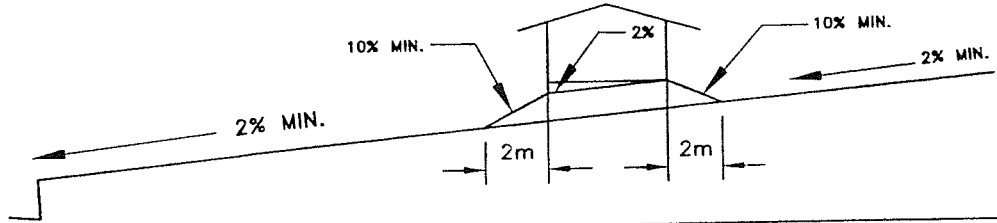
DRAWING NO.

7.0

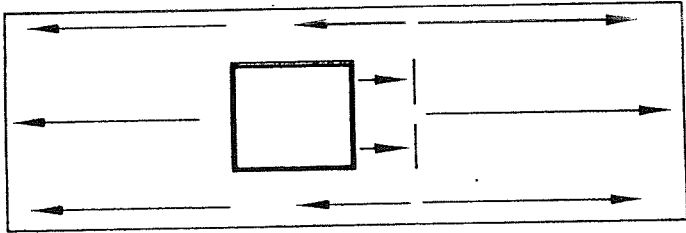
CURB



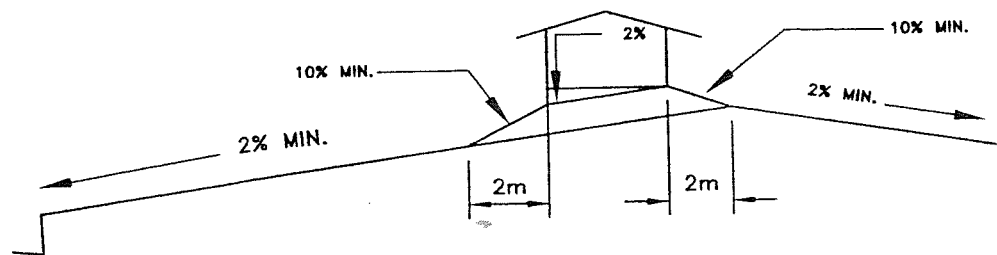
TYPE A LOT DRAINAGE



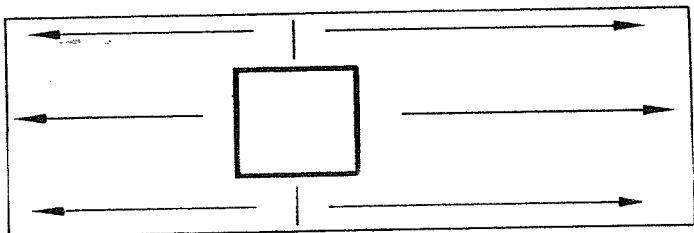
CURB



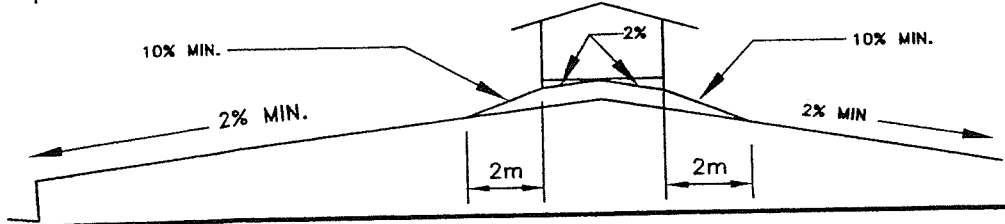
TYPE B LOT DRAINAGE



CURB



TYPE C LOT DRAINAGE

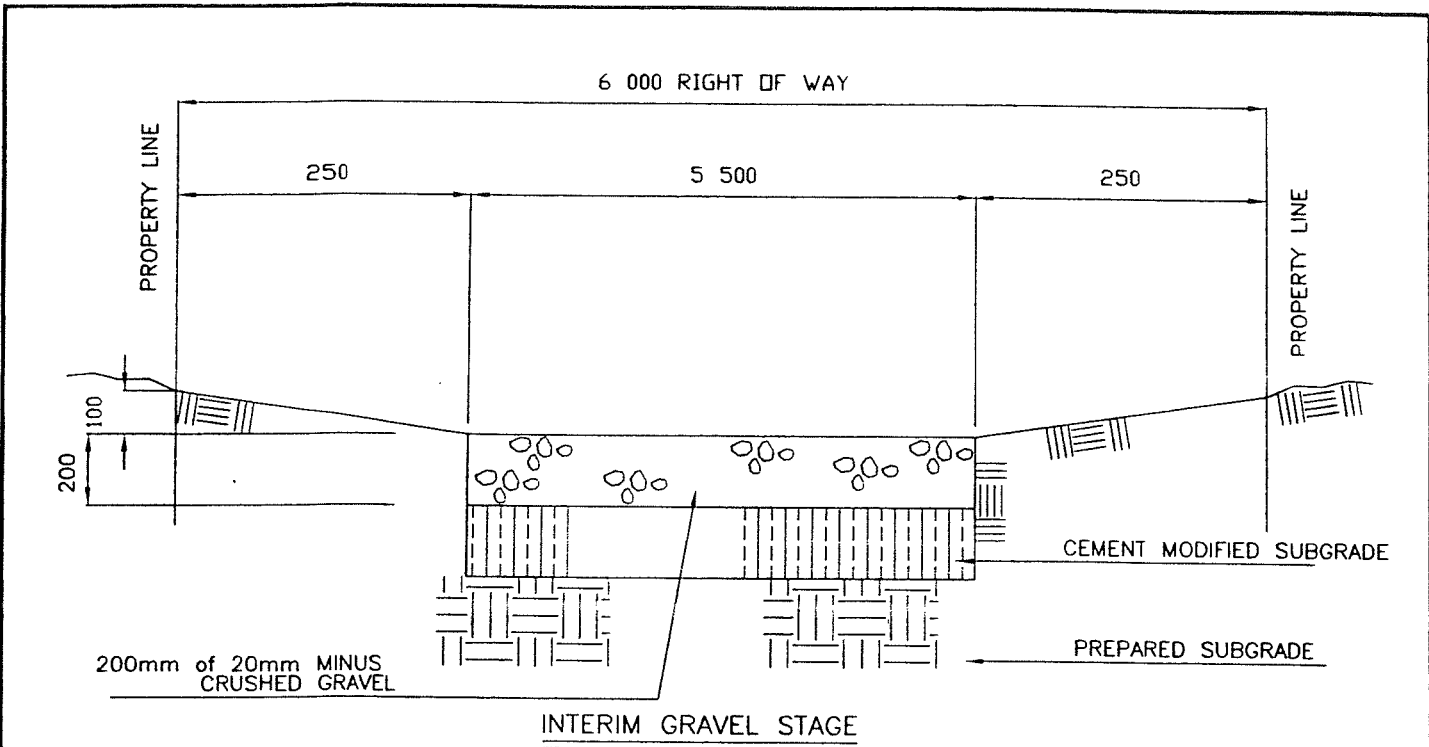


TYPICAL LOT GRADING DETAILS

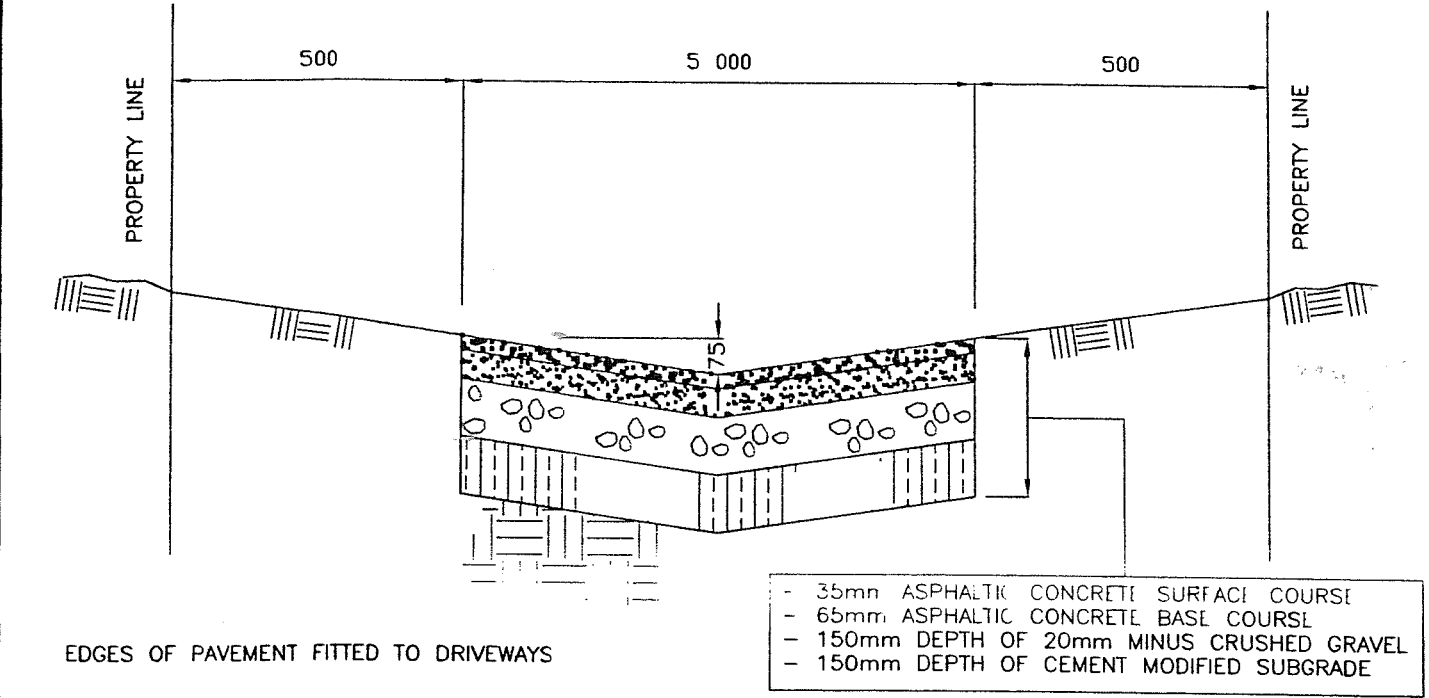


TOWN OF . VILLE DE
MORINVILLE

REVISIONS			
		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	7.01



INTERIM GRAVEL STAGE



COMPLETED PAVEMENT

RESIDENTIAL LANEWAY

TOWN OF . VILLE DE MORINVILLE	REVISIONS		APPROVED	
	DESIGNED/DRAWN	GRM/WLJC	DATE	2003
	SCALE	N.T.S.	DRAWING NO.	8.0



TOWN OF VILLE DE
MORINVILLE

CONSTRUCTION COMPLETION CERTIFICATE

Development Area : _____

Developer : _____

Contractor : _____

Municipal Improvement : _____

Location of Municipal Improvement referred to herein is as shown, outlined in red, on the plan on the reverse hereof, (Or see attached).

Date of Application : _____

PURSUANT TO THE DEVELOPMENT AGREEMENT, I _____ OF THE FIRM
"CONSULTING ENGINEERS", HEREBY CERTIFY THAT AS OF THE ABOVE
DATE, THE SAID MUNICIPAL IMPROVEMENT IS COMPLETE AND CONSTRUCTED IN ACCORDANCE WITH THE
SERVICING STANDARDS AS SET OUT IN THE DEVELOPMENT AGREEMENT, AND I HEREBY RECOMMEND THIS
MUNICIPAL IMPROVEMENT FOR APPROVAL.

Project Engineer (Consulting Engineering Firm) Date : _____

Signing Officer (Consulting Engineering Firm) Date : _____

Authorized Town Inspector Date : _____

Approved on : _____
Town Engineer

Conditional Approval _____
Town Engineer

Conditions (See attached report) _____

Rejected on _____
Town Engineer

Reason for rejection : (See attached report) _____

I HEREBY CERTIFY THAT THE ITEMS LISTED AS REASONS FOR CONDITIONAL APPROVAL OR FOR REJECTION HAVE BEEN CORRECTED.

Project Engineer (Consulting Engineering Firm) Date : _____

Approved : _____
Town Engineer Date : _____

Date Maintenance Period to Start : _____

Date Maintenance Period to Expire : _____



TOWN OF · VILLE DE
MORINVILLE

FINAL
ACCEPTANCE
CERTIFICATE

Development Area : _____

Developer : _____

Contractor : _____

Municipal Improvement : _____

Location of Municipal Improvement referred to herein is as shown, outlined in red, on the plan on the reverse hereof, (Or see attached).

Date of Application : _____

Maintenance Expiry Date : _____

PURSUANT TO THE DEVELOPMENT AGREEMENT, I _____ OF THE FIRM
"CONSULTING ENGINEERS", HEREBY CERTIFY THAT AS OF THE ABOVE
DATE, THE SAID MUNICIPAL IMPROVEMENT MEETS ALL THE REQUIREMENTS FOR FINAL ACCEPTANCE AS
SPECIFIED BY DEVELOPMENT AGREEMENT, AND I HEREBY RECOMMEND THIS MUNICIPAL IMPROVEMENT FOR
FINAL ACCEPTANCE.

Project Engineer (Consulting Engineering Firm) Date : _____

Signing Officer (Consulting Engineering Firm) Date : _____

Authorized Town Inspector Date : _____

Approved on : _____
Town Engineer

Rejected on : _____
Town Engineer

Reason for rejection : (See attached report) _____

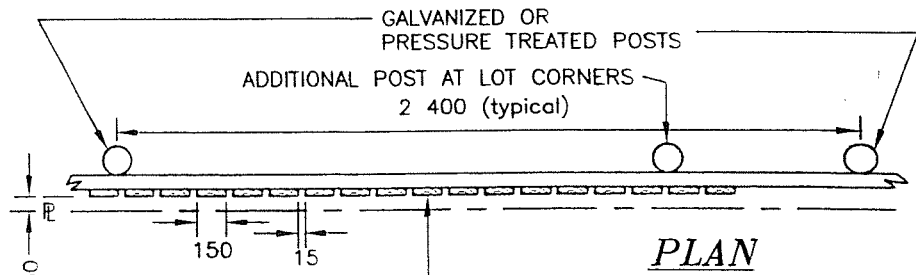
I HEREBY CERTIFY THAT THE ITEMS LISTED AS REASONS FOR REJECTION HAVE BEEN CORRECTED.

Project Engineer (Consulting Engineering Firm) Date : _____

Approved : _____
Town Engineer Date : _____

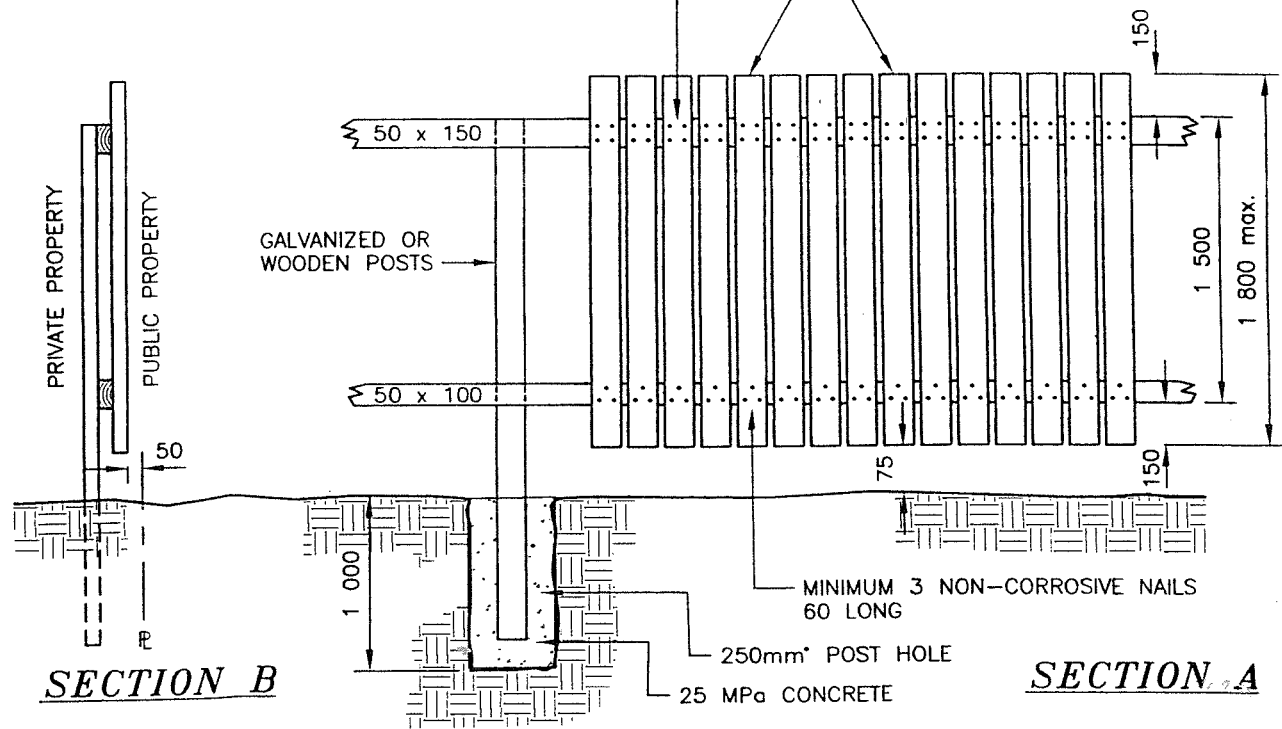
Date Maintenance Period to Expire : _____

- POSTS :**
- WOODEN POSTS TO BE PRESSURE TREATED 150mm x 150mm
 - GALVANIZED LINE POSTS TO BE 60mm ϕ (2-3/8" ϕ) SCHED 40
 - GALVANIZED CORNER AND GATE POSTS TO BE 75mm ϕ (2-7/8" ϕ) SCHED 40

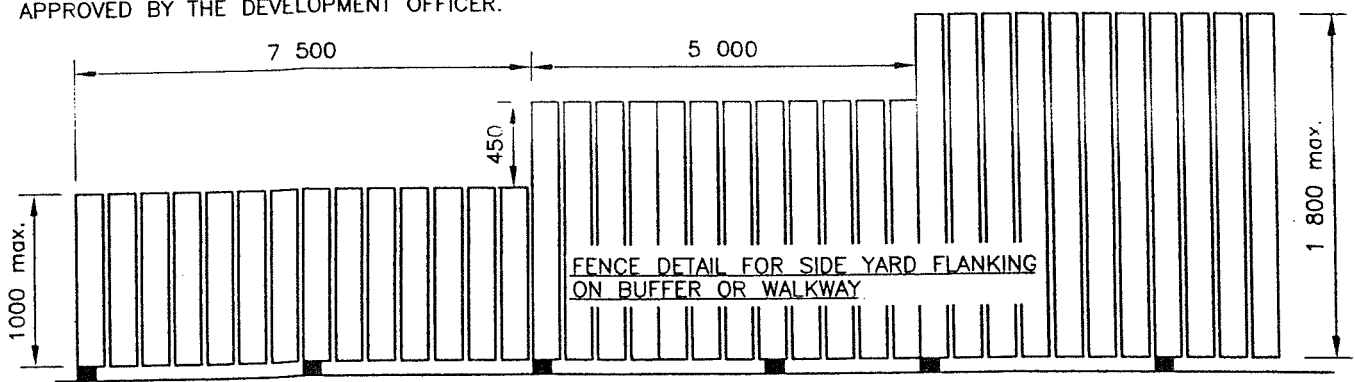


MINIMUM 4 NON-CORROSIVE NAILS
60mm LONG


25 x 150 BOARDS

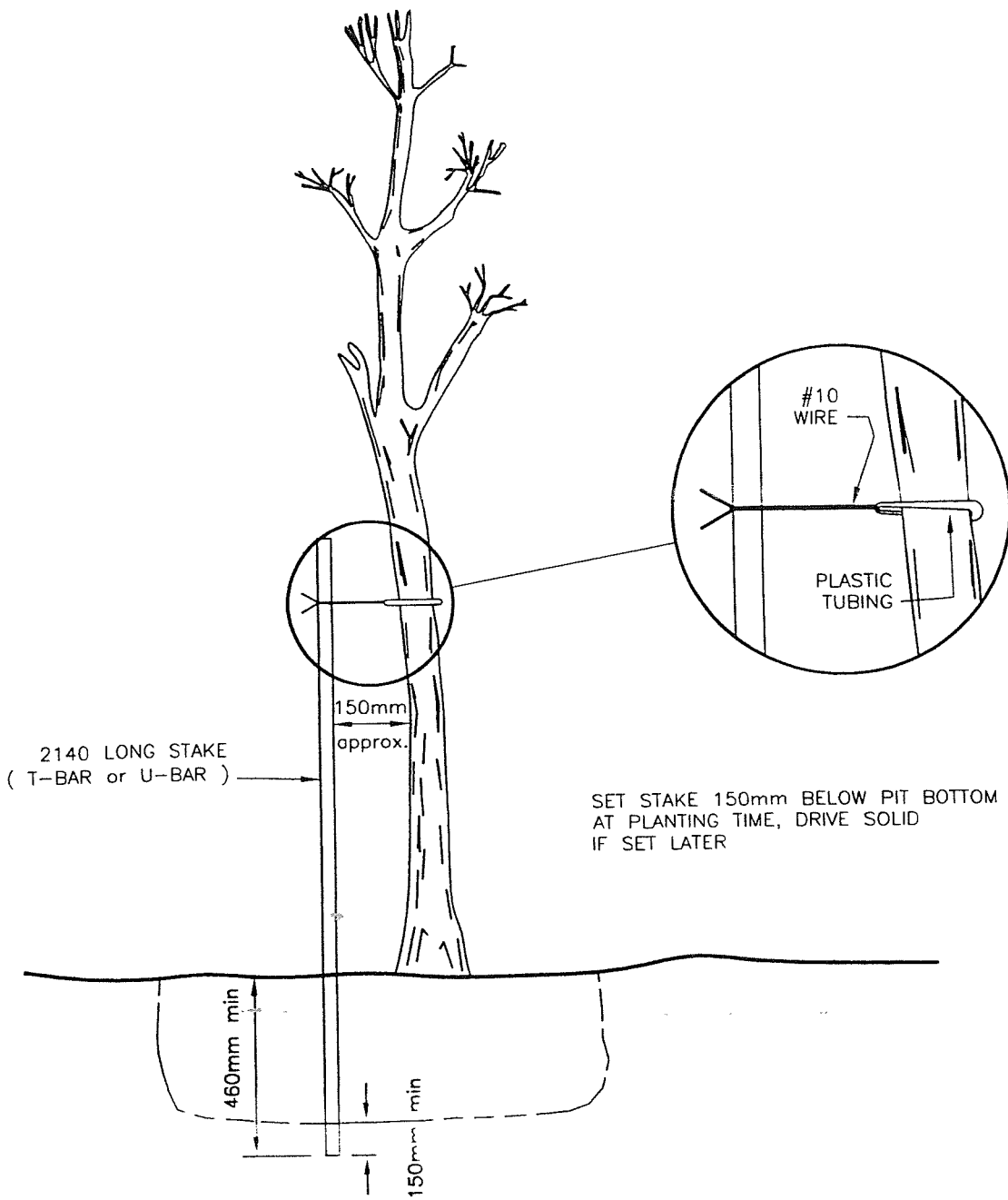


- COLOUR AND TYPE OF STAIN TO BE APPROVED BY THE DEVELOPMENT OFFICER.



UNIFORM WOOD FENCING

 <p>TOWN OF VILLE DE MORINVILLE</p>	REVISIONS	APPROVED		
	DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
	SCALE	N.T.S.	DRAWING NO.	9.01

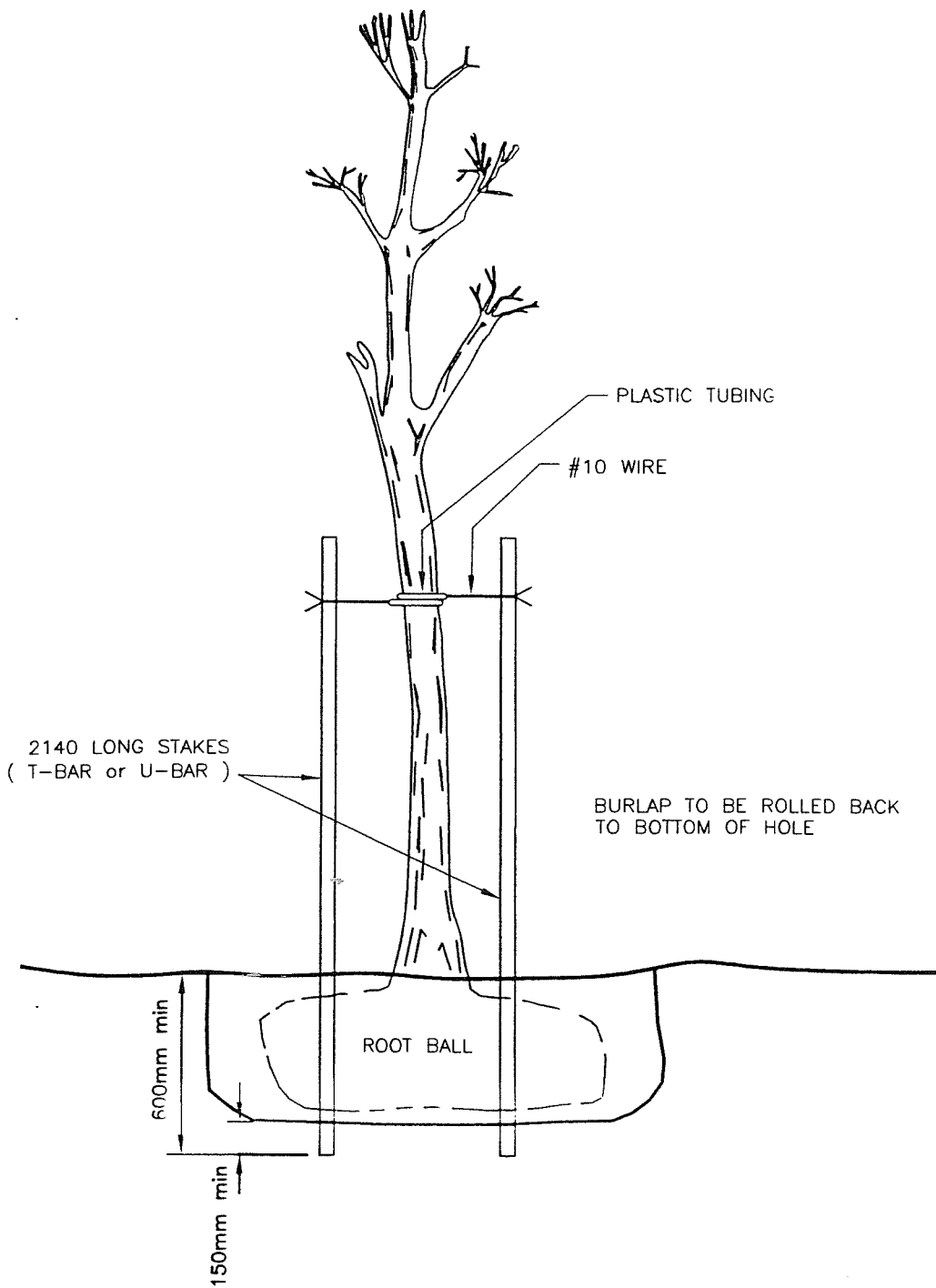


STAKING OF DECIDUOUS TREES



TOWN OF VILLE DE
MORINVILLE

REVISIONS			
		APPROVED	
DESIGNED/DRAWN	GRM/WLJC	DATE	DECEMBER, 2003.
SCALE	N.T.S.	DRAWING NO.	10.01



STAKING OF DECIDUOUS AND CONIFEROUS TREES WITH ROOT BALL

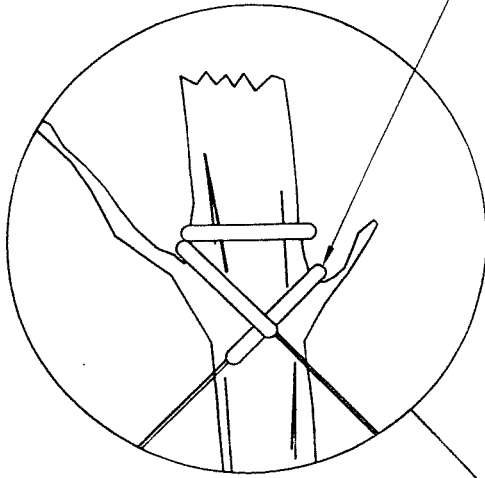


TOWN OF . VILLE DE
MORINVILLE

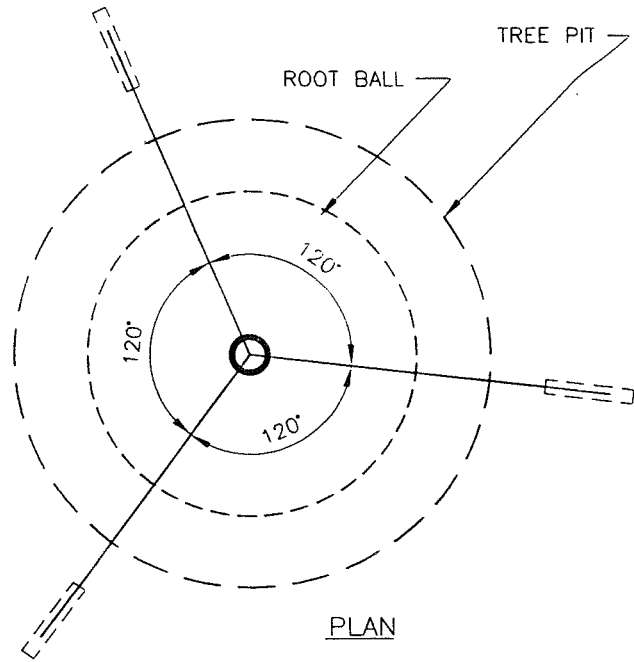
REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	10.02

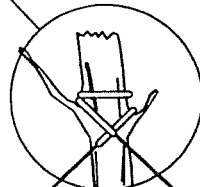
REINFORCED RUBBER HOSE
OR PLASTIC TUBING



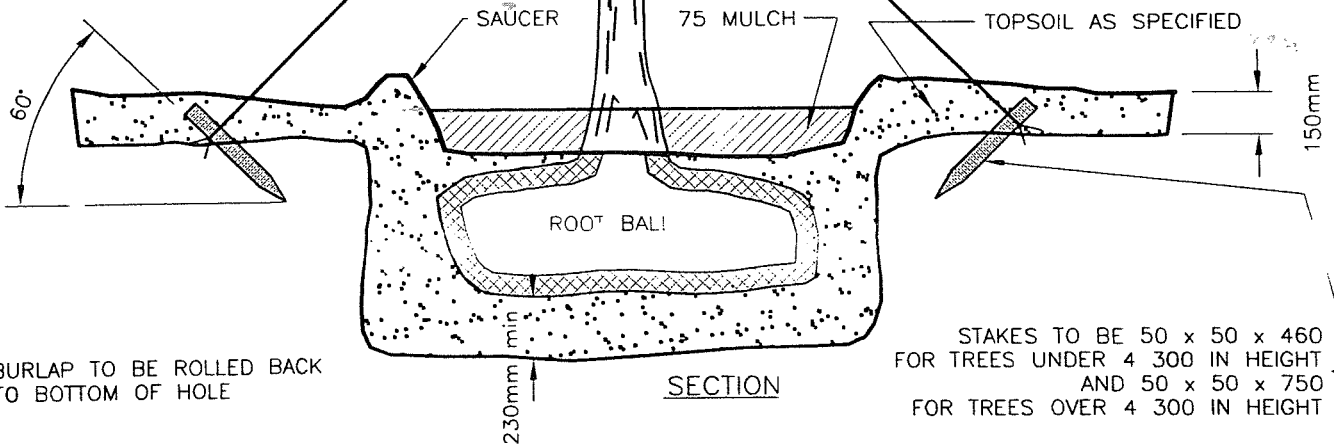
DETAIL



PLAN



DOUBLE STRAND # 9 WIRE, TWISTED



SECTION

BURLAP TO BE ROLLED BACK
TO BOTTOM OF HOLE

STAKES TO BE 50 x 50 x 460
FOR TREES UNDER 4 300 IN HEIGHT
AND 50 x 50 x 750
FOR TREES OVER 4 300 IN HEIGHT

GUYING OF DECIDUOUS AND CONIFEROUS TREES



TOWN OF VILLE DE
MORINVILLE

REVISIONS	
DESIGNED/DRAWN	GRM/WLJC
SCALE	N.T.S.

APPROVED	
DATE	DECEMBER, 2003.
DRAWING NO.	10.03

CERTIFICATION OF AS-BUILT GRADES
TOWN OF MORINVILLE

• DENOTES ELEVATIONS WHICH MAY CAUSE CONFLICTS

This document does not release the Builder/Owner from any additional work required to insure proper drainage

Elevations shown are referred to geodetic datum.

SURFACE CONDITIONS :

NOTES :

ALL DISTANCES SHOWN ARE IN _____ AND DECIMALS THEREOF.
DESIGN GRADES ARE SHOWN THUS (999.99).
CONFORMS FOR THE PURPOSE OF THIS DOCUMENT MEANS THAT THE AS-BUILT ELEVATIONS SHOWN ON THIS CERTIFICATION ARE WITHIN THE GRADING TOLERANCES PERMITTED BY THE TOWN OF MORINVILLE AND THAT THE ELEVATIONS SHOWN ALLOW FOR POSITIVE DRAINAGE AWAY FROM THE HOUSE.

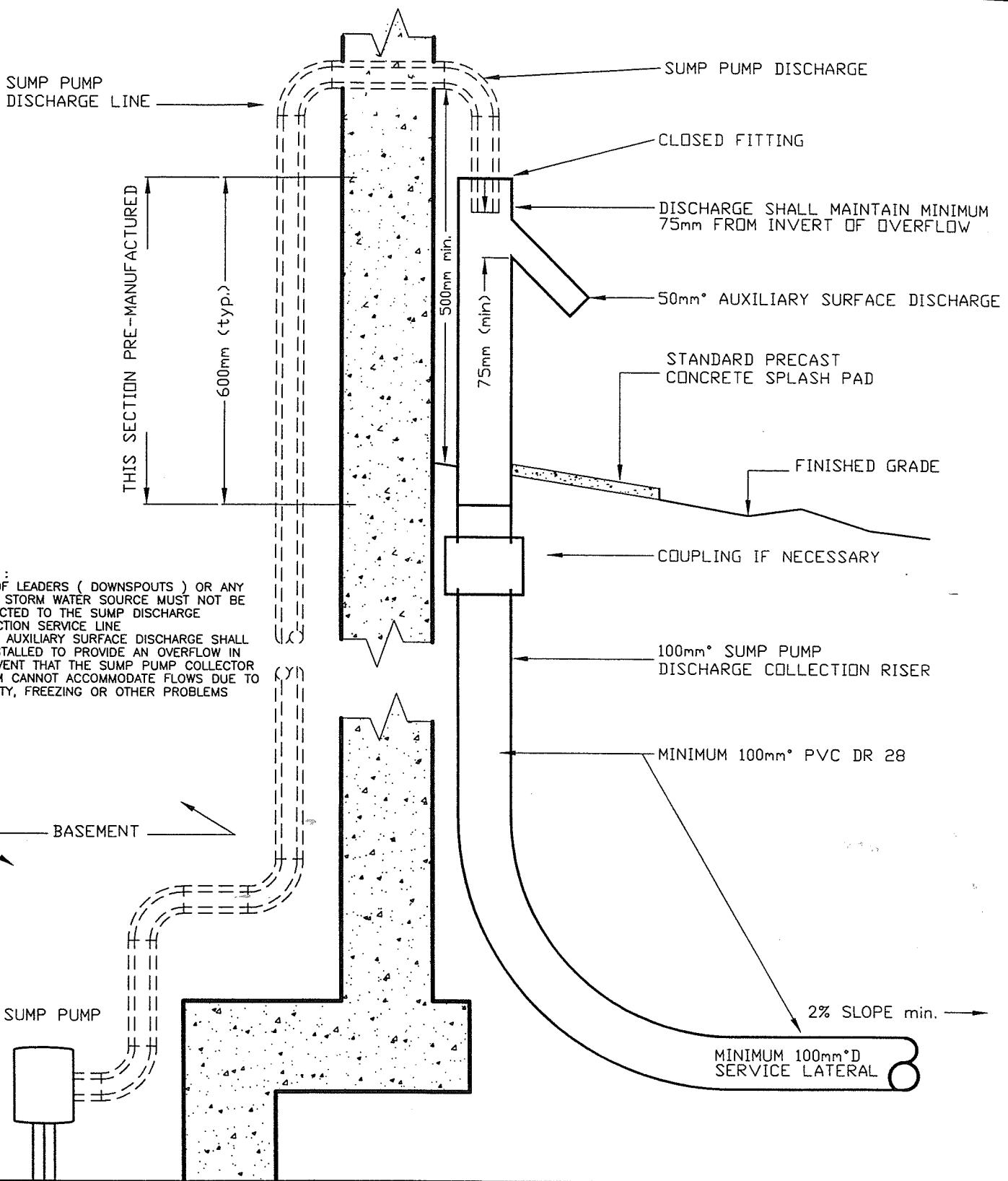
THIS IS TO CERTIFY THAT

LOT GRADES SHOWN ON THE ABOVE PLAN ARE AS-BUILT ELEVATIONS RECORDED ON : _____

ALBERTA LAND SURVEYOR

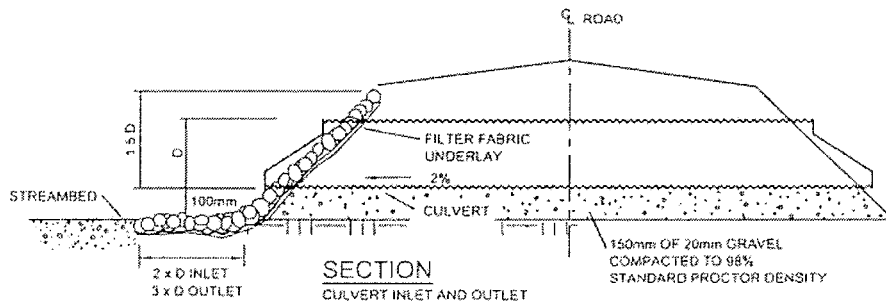
SCALE :

DATE :



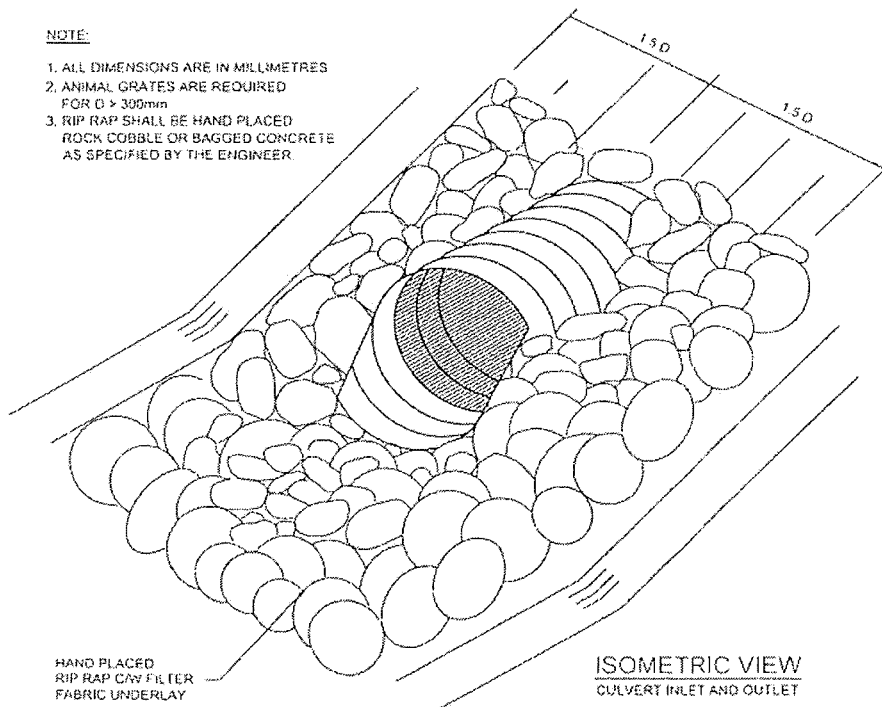
NOTES:
 - ROOF LEADERS (DOWNSPOUTS) OR ANY OTHER STORM WATER SOURCE MUST NOT BE CONNECTED TO THE SUMP DISCHARGE COLLECTION SERVICE LINE
 - THE AUXILIARY SURFACE DISCHARGE SHALL BE INSTALLED TO PROVIDE AN OVERFLOW IN THE EVENT THAT THE SUMP PUMP COLLECTOR SYSTEM CANNOT ACCOMMODATE FLOWS DUE TO CAPACITY, FREEZING OR OTHER PROBLEMS

TYPICAL SUMP PUMP DISCHARGE CONNECTION AT HOUSE



NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. ANIMAL GRATES ARE REQUIRED FOR $G > 300\text{mm}$
3. RIP RAP SHALL BE HAND PLACED ROCK COBBLE OR BAGGED CONCRETE AS SPECIFIED BY THE ENGINEER



CULVERT DETAIL

SCALE N.T.S.