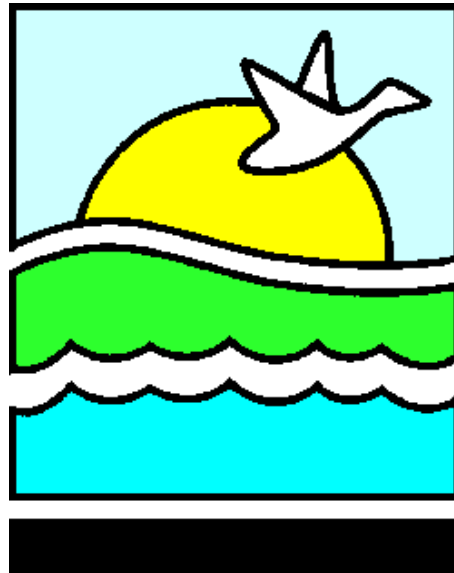


TOWN OF BONNYVILLE

Subdivision and Development Servicing Standards



*Town of Bonnyville
"It's Multi-Natural"*

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1.0 DEFINITIONS

Unless the context requires otherwise:

"Act" means *Municipal Government Act*, *Land Titles Act*, and any other *Act* named herein and found in the Statutes of Alberta, as amended from time to time both before and after the date of this document.

"Applicant" means a person applying for the approval of a subdivision, pursuant to the provision of the *Municipal Government Act*, or a person applying for development other than subdivision, whether as the Owner of the property proposed to be subdivided or developed or as agent for the Owner or his contractor.

"Approval, Preliminary Layout" means written notification of a review of information presented to the Subdivision Authority previous to submission of a subdivision plan for final approval.

"Arterial Street" means a highway with the primary function of carrying all types of through traffic from one area to another and a secondary function of providing access to adjacent parcels of land.

"Boulevard" means that portion of a highway between the curb lines or the lateral boundary lines of a roadway and the adjoining property or between curbs on median strips or islands, but does not include curbs, sidewalks, ditches, or driveways.

"Collector Street" means a highway with equal priority functions of distributing traffic between arterials and lower classifications of roads such as other collectors and local roads and providing access to adjacent parcels of land.

"Community Sewer System" means a sanitary sewer or a system of sewage disposal works which is owned, operated and maintained by the Municipality.

"Community Water System" means a waterworks system, which is owned, operated and maintained by the Municipality.

"Construction Completion Certificate" means the certificate issued by the Town of Bonnyville certifying the completion of the municipal improvements, or a portion thereof, once the municipal improvements have been constructed and installed by the Owner/Applicant to the satisfaction of the Municipality without defects or deficiencies.

"Council" means the Council of the Town of Bonnyville.

"Cul-de-sac" means a local street that is connected to the remainder of the road network at only one point and that terminates in a vehicle-turning area.

"Design Engineer" means the Professional Engineer engaged by the Owner/Applicant to design and prepare drawings for construction of works in a subdivision or development, or his authorized representative.

"Development" shall be interpreted as defined in the *Municipal Government Act*.

"District" means an area created by the Town of Bonnyville Land Use Bylaw No. 1262-05 as amended or as replaced from time to time both before and after the effective date of this document.

"Drainage System" means a system of works designed and constructed to control the flow of storm water and/or ground water.

"Final Acceptance Certificate" means a written acceptance issued by the Town of Bonnyville for the municipal improvement, or a portion thereof, upon the completion of any repairs for defects or deficiencies, and the expiration of the Maintenance period.

"Frontage" means the length of a lot boundary which immediately adjoins a highway other than a lane or a walkway.

"Highway" includes a street, road, lane, walkway, bridge, viaduct, and any other way open to public use. The width of a highway is measured from lot line to lot line. A highway does not include private easements on private property.

"Industrial Street" means a local street that provides access to adjacent parcels districted for industrial use.

"Lane" means a roadway which provides utility access and access for municipal services and is generally located at the rear of the property.

"Local Street" means a highway with the primary function of providing direct access to adjacent parcels of land and generally connects to other local roads and collector roads.

"Lot" means a quarter section; a part of a parcel where the boundaries of the part are separately described in a certificate of title other than by reference to a legal subdivision; or in part of a parcel where the boundaries of the part are described in a certificate of title by reference to a Plan of Subdivision.

"Lot Depth" means the average horizontal distance between the front and rear lot lines.

"Lot Line, Front" means the property line of a lot abutting a public roadway other than a lane. In the case of a corner lot, the front lot line is the shorter of the property lines abutting a public roadway.

"Lot Line, Rear" means either the property line of a lot which is furthest from and opposite the front lot line, or where there is no such property line, the point of intersection of any property lines other than a front lot line which is farthest from and opposite the front lot line.

"Lot Line, Side" means the property line of a lot other than front lot line or rear lot line.

"Lot Width" means the horizontal distance between side lot lines of the site measured at a distance from the front lot line equal to the minimum required front yard.

"Medical Officer of Health" means the Medical Officer of Health appointed under the *Public Health Act*.

"Municipality" means the Town of Bonnyville or the area within the municipal boundaries thereof as the context may require.

"Owner" shall be interpreted as defined in the *Municipal Government Act*.

"Panhandle Parcel" means any parcel which is serviced and gains highway frontage through the use of a narrow strip of land which is an integral part of the parcel (hereinafter called the "Access Strip").

"Parcel" means the aggregate of the one or more areas of land described in a Certificate of Title or described in a Certificate of Title by reference to a plan filed or registered in a Land Titles Office.

"Pathway" means a path which follows routes independent of motor vehicle roadways, sidewalks and bike lanes, intended for use by pedestrians and other non-motorized modes of travel.

"Potable Water" means water which is approved for drinking purposes by the Medical Officer of Health.

"Professional Engineer" means a person who is registered or duly licensed as such with the Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA).

"Proven Supply" means that a supply of potable water is available and proven with respect to volume, delivery and continuity of supply from an on-site groundwater system, a source requiring a water license from Alberta Environment or a community water system.

"Roadway" means the portion of the highway that is improved, designed or ordinarily used for vehicular traffic.

"Service Level" means the standard of municipal services required for development of subdivisions under the provisions of this document.

"Site" means any combination of lots or titled areas for which application is made for a Development Permit.

"Street" means a highway except a lane, trail or walkway.

"Subdivision" means the division of land into two or more parcels by plan or apt descriptive words.

"Subdivision Authority" means any person duly authorized by the Municipal Council to act as Subdivision Authority Officer pursuant to the provisions of the *Municipal Government Act*.

"Substantial Completion Certificate" means the certificate issued by the Town of Bonnyville certifying the completion of the municipal improvements to 97% and that the improvements are ready to use and for the purpose intended.

"Top of Slope, Embankment or Escarpment" means the natural defined top edge of a slope, embankment or escarpment; or, where a gradual steepening exists, the point at which the slope exceeds 30% grade.

"Town Engineer" means the Engineer, or his designate, as appointed by the Council of the Town of Bonnyville.

"Watercourse" means any natural or man-made drainage course or source of water, whether usually containing water or not, and includes any lake, river, creek, spring, ravine, swamp, gulch, or source of groundwater, whether enclosed in a conduit or not.

2.0 SUBDIVISION AND DEVELOPMENT REQUIREMENTS AND REGULATIONS

2.1 COMPLIANCE

No person shall subdivide or develop land in the Town of Bonnyville except in compliance with the provisions of this document.

2.2 GENERAL REQUIREMENTS FOR DESIGN OF SUBDIVISIONS

No subdivision of land shall be approved which:

- a) is not suited to the configuration of land being subdivided;
- b) is not suited to the use to which it is intended; or
- c) will make impracticable the future subdivision of the land within the proposed subdivision or of any adjacent land.

2.3 AREA, SHAPE AND DIMENSIONS OF LOTS

- a) No subdivision shall be created in any district so that any lot created by the subdivision has an area in square metres or hectares or a width in metres less than those set out for the district in which it is located as set out in the Town of Bonnyville Land Use Bylaw No. 1265-05, as amended from time to time.
- b) The side lines of parcels to be created by the subdivision shall be as close as practicable at right angles or radial to street lines and the Subdivision Authority shall ensure that the parcels to be created are logical in shape and dimension for the use intended.

3.0 PROVISION OF SERVICES IN SUBDIVISIONS AND DEVELOPMENTS

3.1 LEVEL OF SERVICE

Unless otherwise approved by the Subdivision Authority, all subdivisions and developments shall be provided with services as prescribed in Schedule B of this document and the level of services required may be different for different districts as established by the Town of Bonnyville Land Use Bylaw No. 1262-05 in accordance with the provisions of Schedule A of this document.

3.2 EXPENSE OF SERVICE TO BE BORNE BY THE OWNER/APPLICANT

The following expenses are to be borne solely by the Owner/Applicant:

- a) All reasonable and justifiable charges or accounts rendered to the Town of Bonnyville by Consulting Engineers that may be engaged by the Town of Bonnyville from the time plans are submitted until final acceptance of all municipal improvements.
- b) All reasonable and justifiable legal charges or accounts rendered to the Town of Bonnyville by solicitors from the time of application for subdivision until final acceptance of all municipal improvements.
- c) Cost of additional work performed or of work repaired or redone by reason of orders and direction by the Town's Engineer under the terms of the Development Agreement.
- d) Cost of providing the security and insurance required to be provided by the Owner/Applicant under the terms of the Development Agreement.
- e) Cost of preparation of an easement or utility right-of-way document(s) to be provided by the Owner/Applicant including cost of registration of the same.
- f) Cost of land title registrations of the Development Agreement.

3.3 INDEMNITY AND INSURANCE

The Owner/Applicant shall indemnify and save harmless the Town of Bonnyville from any and all losses, costs, damages, actions, causes of action, suits, claims and demands, resulting from anything done or omitted to be done by the Developer in pursuance or purported pursuance of this Agreement.

The Owner/Applicant must provide and maintain, at the Owner/Applicant's expense, at all times until the Certificate of Final Acceptance is issued, Comprehensive General Liability Insurance coverage, covering premises and operations liability, contingency liability with respect to the

operations of contractors and sub-contractors, completed operations liability, contractual liability and automobile liability for owned, non-owned and hired units.

The limits of liability must be not less than \$5,000,000 for each occurrence for bodily injury, death and damage to property. Each policy must provide that it can not be cancelled, lapsed, or materially altered without a minimum thirty (30) days notice in writing to the Town by registered mail, must name the Town and its officials and employees as an additional insured, and must contain a cross-liability clause.

The insurance coverage required to be provided by the Owner/Applicant may be embodied in a blanket insurance policy obtained by the Owner/Applicant. The Owner/Applicant must deliver a copy of each insurance policy to the Town prior to the commencement of Construction of the Works and Services. If the Owner/Applicant fails to obtain and maintain the said insurance or deliver the said policy or policies to the Town, the Town may but will not be obliged to obtain and maintain such insurance at the expense of the Owner/Applicant.

3.4 TRAFFIC IMPACT ANALYSIS

Depending on the nature of the development, the surrounding neighbourhood and the adjacent transportation system, the Town of Bonnyville may require that the Owner/Applicant submit a Traffic Impact Study completed by a qualified professional engineer(s).

The cost for the preparation and submission of the Traffic Impact Study will be entirely borne by the Owner/Applicant.

3.5 OFFSITE UTILITIES IMPACT ANALYSIS

Depending on the nature of the development, the surrounding neighbourhood and the adjacent offsite utilities systems, the Town of Bonnyville may require that the Owner/Applicant submit an Offsite Utilities Impact Analysis, completed by a qualified professional engineer(s). The Offsite Utilities Impact Analysis will discuss the impacts of the proposed development on the Town's water, sanitary and storm sewer systems.

The cost for the preparation and submission of the Offsite Utilities Impact Analysis will be entirely borne by the Owner/Applicant.

3.6 EXCESS OR EXTENDED CAPACITY

Pursuant to Section 651(1) of the *Municipal Government Act*, the Town may require that the Owner/Applicant provide excess or extended services to provide access to or service land other than the land being subdivided or developed.

3.7 COST OF EXCESS OR EXTENDED CAPACITY

The cost of providing excess capacity shall be derived by the following formula:

Cost of excess capacity = cost of installing system with excess capacity minus cost of installing system to service the proposed subdivision only or the minimum permitted for the size of line in the Town minimum design standards, as amended, whichever is greater.

The determination of cost of excess capacity shall be based on estimates prepared by a professional engineer representing the Owner/Applicant of the land being subdivided, agreed to by the Town Engineer and approved by the Subdivision Authority.

3.8 PAYMENT OF COST OF EXCESS CAPACITY

Where the Town requires the provision of excess capacity under Section 3.6, the cost of the excess capacity will be paid for by:

- a) the Town of Bonnyville, or
- b) the Owner/Applicant of the land being subdivided, where the Town considers that its costs to provide the excess capacity in whole or in part are excessive.

3.9 COST RECOVERY BY THE TOWN OF BONNYVILLE

Where the Town pays for the cost of providing excess capacity under Section 3.6 and 3.8 (a), it may recover the costs by:

- a) an off-site charge levied in accordance with the *Municipal Government Act*, or
- b) a rate tax or charge as provided for in Section 655 of the *Municipal Government Act*.

3.10 ENDEAVOR TO ASSIST FOR EXCESS CAPACITY

The Town may, as a condition of an Owner/Applicant connecting to works and services where excess capacity has been provided under 3.8 (b), impose a charge and the charge shall be calculated as a proportion of the cost of providing excess capacity as determined under Section 3.7. The proportion of costs to be imposed on an Owner/Applicant shall be derived on the basis of the capacity of the system to be utilized by the Owner/Applicant in relation to the total excess capacity provided.

In calculating the charge to be imposed on the Owner/Applicant who wishes to connect, there shall be included in the total cost of providing excess capacity, interest calculated annually at the current Bank of Canada prime rate plus 2% payable for the period commencing when the work

or service providing the excess capacity was completed, up to the date that the connection is made.

3.11 COST RECOVERY BY THE OWNER/APPLICANT

Where the Owner/Applicant of land being subdivided pays for the cost of providing excess capacity under Section 3.8 (b), the Town may impose a charge under Section 3.10 and shall pay to that land owner all the charges collected during the period beginning after the works or services were completed and ending on a date to be agreed upon by the land owner and the Town and failing agreement, to be determined pursuant to the International Commercial Arbitration Act, but no charges are payable beyond 10 years from the date service is completed and a final acceptance certificate is issued.

3.12 OFF-SITE SERVICES

The Owner/Applicant shall be required to contribute towards the cost of upgrading or upsizing of off-site roads and utilities.

3.13 RIGHT-OF-WAY AGREEMENT

Pursuant to Sections 648, 651 and 655 of the *Municipal Government Act*, where the provisions of this document require an Owner/Applicant to grant a utility or drainage right-of-way to the Town of Bonnyville, the Owner/Applicant shall be required to enter into a development agreement and shall pay all associated costs.

3.14 SUBDIVISION APPROVAL PRIOR TO COMPLETION OF WORKS AND SERVICES

Endorsement of a subdivision must be granted prior to the construction and installation of any and all works and services as prescribed in Schedules A to H hereto at the expense of the Owner/Applicant to serve said subdivision.

Construction and installation of the required works and services may begin prior to endorsement of the plan of subdivision where the Owner/Applicant deposits a bond with the Town of Bonnyville in the amount of One Hundred Percent (100%) of the cost of installing and paying for all the works and services required as estimated by the Owner/Applicant's Engineer and approved by the Town's Engineer.

3.15 SITE PREPARATION

- a) The Owner/Applicant shall erect fencing and provide other measures satisfactory to the Town to ensure the stripping and grading does not encroach into Environmental Reserve land where applicable.

- b) The Owner/Applicant, at no expense to the Town, shall erect "Private Property" and "No Trespassing" signs on the perimeter of the lands, stating the Owner/Applicant's name and the telephone number of a representative.
- c) The Owner/Applicant shall submit to the Town for approval, proposed access routes identifying streets for site preparation and general construction.
- d) The Owner/Applicant shall be responsible for controlling noxious weeds and excessive vegetative growth within the Development Area.
- e) No grading, filling or excavation is permitted within utility and road rights-of-way, under any overhead utility lines, or over any underground utilities, unless prior written authorization has been obtained from the utility agencies concerned.
- f) If, during stripping and grading operations or any other construction within the Development Area, the Owner/Applicant or any of their agents or contractors becomes aware of any contamination, the person discovering such contamination shall forthwith report the contamination to Alberta Environmental Protection, Aspen Regional Health Authority and the Town of Bonnyville.
- g) In the event the Owner/Applicant encroaches into the adjacent land during the stripping and grading operations, the Owner/Applicant, at its sole expense, shall rehabilitate the adjacent lands to the satisfaction of the land owners immediately after completion of the stripping and rough grading of the adjacent lands.
- h) The Owner/Applicant, at its sole expense, and to the satisfaction of the Engineer, shall rehabilitate in a timely manner any offsite areas or operations, storm water runoff, soil erosion, soil instability, sedimentation, dust or other problems which may arise from the stripping and grading, and shall employ the use of gravel pads to curb dirt, mud or other debris from being tracked out onto any streets located within and adjacent to the Development Area and reduce or stop activity when the site has excessive dust emissions.

3.16 DUST CONTROL

During construction of works and services, the Owner/Applicant shall be responsible for providing for and maintaining dust control at all times wherever:

- a) the operation of any equipment causes dust that becomes a nuisance to property land owners and residents in the area;
- b) bare soil conditions are created in performing work;

Should the Owner/Applicant not implement dust control procedures as required or as directed by the Town's Engineer, the Town will undertake the dust control procedures and back charge the Owner/Applicant to recover all costs incurred including such things as engineering and administration costs, wages, equipment costs, etc.

3.17 CLEAN-UP

During construction of works and services within the subdivision or development, the Owner/Applicant shall be responsible for ensuring that the construction area shall be maintained free of accumulation of excess waste material and debris.

The disposal of waste materials and rubbish by burning or burial on the site will not be permitted. The disposal of volatile wastes such as mineral spirits, oil, gasoline or paint thinner into storm or sanitary sewer drains will not be permitted.

During and after construction of works and services, the Applicant shall be responsible for ensuring that all access streets into the subdivision or development are maintained free of accumulation of excess waste material and debris. The Town reserves the right to carry out the maintenance of such access streets and charge the cost of such work to the Owner/Applicant, if the Owner/Applicant fails to restore the street(s) to normal levels within one week of being notified in writing by the Town.

3.18 SUBSTANTIAL COMPLETION

Upon receipt of a written notice from the Design Engineer stating that the Work is substantially complete and ready for inspection (accompanied by a list of the known deficiencies), the Town Engineer shall make the required inspection within 10 days after receipt of the Design Engineer's written request. A "Certificate of Substantial Completion" will be issued by the Town of Bonnyville when the works are 97% complete and the work is ready for use and for the purpose intended.

Should the Work not be deemed as Substantially Complete by the Town Engineer, then a written notice will be given to the Design Engineer stating the deficiency corrections required for Substantial Completion.

3.19 CONSTRUCTION COMPLETION

Upon 100% completion of the works, the Design Engineer must schedule a field inspection with the Town Engineer. Upon verification by the Town Engineer that 100% Construction Completion of all Works and Services has been achieved, the Owner/Applicant must provide the Town with:

- a) a confirmation of Professional Assurance in the form specified in Schedule G;
- b) confirmation in writing from an Alberta Land Surveyor (A.L.S.) that all survey pins have been installed on the Parcel;

- c) as-built drawings of the Works and Services in the form specified in Schedule D;
- d) all copies of required manuals, videos, testing reports and results in the form specified in Schedule A; and
- e) completed Service Connection Reports in the form specified in Schedule H.

Upon receipt of the above, the Town will issue the Construction Completion Certificate.

3.20 MAINTENANCE

Where the Owner/Applicant of land is required to construct and install works and services in accordance with the provisions of this Document, the Owner/Applicant shall be responsible to:

- a) provide the Town with a two (2) year maintenance bond to the value of 50% of the constructed works as security against unsatisfactory operation and maintenance of the works and services during the maintenance periods specified in the Development Agreement.
- b) pay the Town the inspection fees as specified in the Development Agreement.

3.21 CERTIFICATE OF FINAL ACCEPTANCE

Upon the expiration of all Maintenance Periods, receipt from the Owner/Applicant of a Statutory Declaration and verification by the Town Engineer that all information, documents, agreements, covenants, and fees required from the Owner/Applicant and Design Engineer pursuant to this Document have been provided to the Town, the Town will:

- a) provide the Owner/Applicant with a Final Acceptance Certificate of all Works and Services; and
- b) release to the Owner/Applicant the balance of the Maintenance Bond.

4.0 SERVICING REQUIREMENTS FOR SUBDIVISIONS UNDER THE *MUNICIPAL GOVERNMENT ACT*

4.1 HIGHWAYS

All highways created by plan of subdivision, including the widening of highways, shall comply with regulations as directed by Alberta Infrastructure and Transportation.

4.2 MINIMUM DESIGN GUIDELINES

All infrastructure, including surface and sub-surface, and franchise utilities created by plan of subdivision shall comply with minimum design guidelines set out in Schedule C.

5.0 ADMINISTRATION AND ENFORCEMENT

5.1 APPLICATION FEE

An Application for Subdivision Approval will not be accepted by the Town of Bonnyville unless accompanied by the application a fee in the amount prescribed by Schedule B of the Town of Bonnyville Land Use Bylaw No. 1262-05 as amended from time to time.

5.2 INSPECTION FEES

The Development Agreement sets out inspection fees for constructing utilities and roads required for the new subdivision.

5.3 AUTHORIZATION TO ENTER LANDS BEING SUBDIVIDED

Officers of the Town of Bonnyville, or their designates, are authorized to enter, at all reasonable times, upon the lands for which application to subdivide has been made, in order to ascertain whether the provisions of this Document are being met.

5.4 VIOLATION

Every person who:

- a) violates any of the provisions of this Document;
- b) causes or permits any act or thing to be done in contravention or violation of any of the provisions of this Document;
- c) neglects or omits to do anything required under this Document;
- d) carries out, causes or permits to be carried out any development in a manner prohibited by or contrary to any of the provisions of this Document;
- e) fails to comply with an order, direction or notice given under this Document;
- f) prevents or obstructs or attempts to prevent or obstruct the authorized entry of an officer on property under Section 5.3;

shall be deemed to be guilty upon summary conviction of an offence under this Document.

5.5 OFFENCE

Each day's continuance of an offence under Section 5.4 constitutes a new and distinct offence.

5.6 PENALTY

Any person who violates any of the provisions of this Document shall, on summary conviction, be liable to a penalty not exceeding \$10,000 plus the cost of prosecution for each offence.

5.7 COMPLETION

Should any person fail to construct or install any works or services required under this Document, the Municipality, its agents or servants may construct or install the works and services at the expense of the person in default, and the expense thereof, with interest at the Bank of Canada prime rate plus two percent (2%) per annum with costs, may be recovered in like manner as municipal taxes as provided under the provisions of the *Municipal Government Act*, Section 553, and may in addition to any other remedy available to the Town, be collected in the same manner and with the like remedies as ordinary taxes upon Land and improvements are collected under the said Act.

5.8 SEVERABILITY

If any section, subsection, sentence, clause or phrase of this Document is for any reason deemed to be invalid by the decision of any court of competent jurisdiction, the invalid portion shall be severed and the decision that it is invalid shall not affect the validity of the remainder of this Document.

5.9 SCHEDULES FORM PART OF DOCUMENT

Schedules "A" through "H" are attached to and form part of this Document.

SCHEDULE A

SUBDIVISION AND DEVELOPMENT REQUIREMENTS

1.0 GENERAL REQUIREMENTS

Development of new areas requires the planning and subdivision of land in accordance with procedures and requirements set out in the *Municipal Government Act*, and the Subdivision and Development Regulation pursuant to that Act.

In the course of development, the following items shall be submitted to and approved by the Town of Bonnyville:

1. Area Structure Plan
2. Land Use Bylaw Amendment
3. Preliminary Layout Review
4. Approval of Subdivision Plan
5. Development Brief
6. Acceptance of Final Detailed Plans and Specifications
7. Development Agreement
8. Endorsement and Registration of Plan of Subdivision
9. Development Permit
10. Following Construction

2.0 AREA STRUCTURE PLAN

If the area does not have an approved Area Structure Plan (ASP) in place, the Owner is required to develop and provide one where deemed necessary by the Town of Bonnyville to their satisfaction.

The Area Structure Plan outlines a general vision and policy framework for the development, as well as more specific servicing and phasing information. The Area Structure Plan must be in conformance with the Town of Bonnyville's Municipal Development Plan.

The Area Structure Plan will address the following specific items, in accordance with Section 633 of the *Municipal Government Act*.

- a) the sequence of development proposed for the area;
- b) the land uses and densities proposed for the area;
- c) the impact of the proposed development on adjacent land uses and the environment;
- d) how the development's transportation network will connect with the Town's transportation network – this will include analysis of on-site and off-site traffic impacts and an estimate of roadway upgrading that may be required as a result of the development;

- e) how the proposed development will retain trees, environmental features such as watercourses, wetlands, wildlife corridors, and historical resources;
- f) measures that will be taken to address natural and man-made hazards that may impact the development. Hazards may include soils, landfill sites, sewage lagoons, flood plains, high water tables, water courses susceptible to flooding, sour gas sites, high pressure pipelines, rail rights-of-way, steep slopes (e.g. over 20%), unstable slopes and others;
- g) identifying and proving how water and sewer servicing will be safely and cost-effectively provided;
- h) stormwater management;
- i) identifying what will be required to extend telephone, cable, electricity and gas services to the site;
- j) provisions for Municipal and/or Environmental Reserves;
- k) provisions for buffering from agricultural land uses, railways, major roadways, industrial and commercial development and any other incompatible land uses; and
- l) any other matters identified as being necessary by the Town.

If the area has an approved Area Structure Plan in place, any development applications with respect to the land must comply with the Plan. If the proposal does not comply, the Owner is required to either submit an application to amend the Plan or adjust the development so that it is in compliance with the Area Structure Plan, in order for development to proceed.

3.0 LAND USE BYLAW AMENDMENT

If any development proposal does not conform to the Town's Land Use Bylaw, a Land Use Bylaw amendment application must be undertaken to ensure conformity. This amendment shall reflect to the most compatible districts with respect the proposed uses, and shall match the proposed or existing Area Structure Plan. A Land Use Bylaw amendment process may be undertaken in conjunction with an Area Structure Plan adoption or amendment process.

4.0 PRELIMINARY LAYOUT REVIEW

4.1 Requirements for Design of Development

The proposed development shall be designed in accordance with the Town's Municipal Development Plan, relevant Area Structure Plan, Land Use Bylaw, Municipal Servicing Report and Minimum Design Standards.

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 proposed local improvements into existing developments shall not create overloads on existing services.

The inclusion of oversize services to provide sufficient capacity for future developments shall be carried out at the expense of the Owner and as agreed to by Council, through an Endeavour to Assist agreement.

Subdivisions requiring curves on roadways shall reflect right-of-way boundaries with the same curves or sufficient size corner cut-offs to accommodate the curves.

Easements and/or right-of-ways shall be provided for all local improvements not located on streets, lanes, or utility lots, including right-of-ways for ditches or watercourses accommodating surface runoff.

4.2 Layout Review

Prior to making an Application for Subdivision Approval, an Owner who wishes to subdivide land must provide the Town with Preliminary Layout Review Information and non-refundable fees in connection therewith. Provision of Preliminary Review Layout information by the Owner, will not constitute an Application for Subdivision Approval under this Document or the *Municipal Government Act*.

Following receipt of the Preliminary Layout Review Information, the Subdivision Authority will provide the Owner with a Preliminary Layout Review Letter advising of the Subdivision Authority's preliminary determination. The Subdivision Authority's response, whether in the form of a Preliminary Layout Review Letter or otherwise, will not constitute approval, conditional or otherwise, of an application for Subdivision Approval under this Document or the *Municipal Government Act*, or require the Subdivision Authority to approve an Application for Subdivision Approval.

5.0 APPROVAL OF SUBDIVISION PLAN

Following preliminary layout review, an application for subdivision may be made to the Town's Subdivision Authority. Part 1 of the *Subdivision and Development Regulation* requires the following:

- (2) *A complete application for subdivision consists of*
 - (a) *a completed application for subdivision in the form set out in the Subdivision and Development Forms Regulation,*
 - (b) *a proposed plan of subdivision or other instrument that effects a subdivision,*
 - (c) *the required fee,*
 - (d) *a copy of the current land title for the land that is the subject of an application, and*

-
- (e) at the discretion of the subdivision authority, the information required under subsections (3) and (4).*
- (3) The applicant must submit the number of sketches or plans of the proposed subdivision that the subdivision authority requires, drawn to the scale that the subdivision authority requires,*
- (a) showing the location, dimensions and boundaries of*
 - i. the land that is the subject of the application,*
 - ii. each new lot to be created,*
 - iii. any reserve land,*
 - iv. existing rights of way of each public utility, and*
 - v. other rights of way,*
 - (b) clearly outlining the land that the applicant wishes to register in a land titles office,*
 - (c) showing the location, use and dimensions of buildings on the land that is the subject of the application and specifying those buildings that are proposed to be demolished or moved,*
 - (d) showing the approximate location and boundaries of the bed and shore of any river, stream, watercourse, lake or other body of water that is contained within or bounds the proposed parcel of land,*
 - (e) if the proposed lots or the remainder of the titled area are to be served by individual wells and private sewage disposal systems, showing*
 - i. the location of any existing or proposed wells, and*
 - ii. the location and type of any existing or proposed private sewage disposal systems; and the distance from these to existing or proposed buildings and property lines, and*
 - (f) showing the existing and proposed access to the proposed parcels and the remainder of the titled area.*
- (4) The applicant must submit*
- (a) if a proposed subdivision is not to be served by a water distribution system, a report that meets the requirements of section 23(3)(a) of the Water Act,*
 - (b) an assessment of subsurface characteristics of the land that is to be subdivided including but not limited to susceptibility to slumping or subsidence, depth to water table and suitability for any proposed on site sewage disposal system,*
 - (c) if a proposed subdivision is not to be served by a wastewater collection system, information supported by the report of a person qualified to make it respecting the intended method of providing sewage disposal facilities to each lot in the proposed subdivision, including the suitability and viability of that method, and*

- (d) *a description of the use or uses proposed for the land that is the subject of the application.*
- (5) *The subdivision authority may require an applicant for subdivision to submit, in addition to a complete application for subdivision, all or any of the following:*
- (a) *a map of the land that is the subject of the application showing topographic contours at not greater than 1.5 metre intervals and related to the geodetic datum, where practicable;*
 - (b) *if the land that is the subject of an application is located in a potential flood plain and flood plain mapping is available, a map showing the 1:100 flood;*
 - (c) *information respecting the land use and land surface characteristics of land within 0.8 kilometres of the land that is the subject of the application;*
 - (d) *if any portion of the parcel of land that is the subject of the application is situated within 1.5 kilometres of a sour gas facility, information provided by the AEUB regarding the location of the sour gas facility;*
 - (e) *a conceptual scheme that relates the application to future subdivision and development of adjacent areas;*
 - (f) *any additional information required by the subdivision authority to determine whether the application meets the requirements of Section 654 of the Act*

The Town of Bonnyville may waive requirements where deemed necessary. The application will be circulated, considered, and a decision will be made in compliance with Sections 653 and 654 of the *Municipal Government Act*. If approved, the development process will proceed as documented below. If the application is refused, an appeal may be considered by the Owner under Section 678 of the *Municipal Government Act*.

6.0 DEVELOPMENT BRIEF

Following the approval of the Area Structure Plan and Subdivision Plan and prior to negotiation of a Development Agreement, the Owner is requested to present a Development Brief to the Town so that it can be reviewed, commented on and approved in principle prior to commencement of detailed design.

The Development Brief shall be prepared to support the proposed subdivision development and may require the following information or make reference to information previously submitted:

- Area Structure Plan
- Land Use Bylaw Amendment as required
- Preliminary layout
- Subdivision Application
- Development Agreement

6.1 Development Proposal

The Owner shall submit a statement indicating the type of development proposed, an indication of how the proposed development accommodates the Town's Municipal Development Plan or natural growth directions, specific land use, proposed total subdivision area, area of dedicated reserves and public right-of-ways, total developable acreage, applicable densities, and total number of saleable lots.

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

6.2 Servicing Plan

The Owner shall submit a Servicing Plan(s) of development to the Town. The plan(s) shall 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 Servicing Plan shall be in accordance with the Town's existing Municipal Servicing Study or existing municipal servicing concepts.

The 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:

- contours of existing land surface relative to geodetic elevation datum
- extent and size of water mains
- extent, size, and critical elevations of sanitary sewer mains
- extent, size, and critical elevations of storm drainage systems
- roadway types, widths and initial intersection elevations
- any other information that the Owner considers necessary to aid the Town in assessing and considering the proposed development

6.3 Geotechnical Report

The Owner shall submit a Geotechnical Engineering Report prepared by a qualified geotechnical engineer, of sufficient detail to establish the suitability of the proposed subdivision for the type of development proposed in the development brief.

In the event that the geotechnical investigation reveals areas of high water table and/or unstable soils conditions, the report will recommend special techniques to insure the stability of any of the proposed local improvements which may be affected by these unstable conditions.

7.0 ACCEPTANCE OF FINAL DETAILED PLANS AND SPECIFICATIONS

The Town will sign off on all final detailed design plans and specifications as a condition in the Development Agreement.

8.0 DEVELOPMENT AGREEMENT

Once the Development Brief has been approved by the Subdivision Authority, the Owner will be required to enter into a "Development Agreement" with the Town. All re-development and off site levies, development conditions, and cost sharing shall be paid to the Town in accordance with the conditions of the Development Agreement.

8.1 General Requirements

The Owner shall engage:

- a) a qualified professional engineer(s) to undertake all phases of engineering, including coordination of all subconsultants, design, construction inspection, and as-built recording for the proposed development.
- b) a qualified professional architect to undertake all phases of architecturally related work for the proposed development. All plans are to be submitted in accordance with Schedule D.
- c) a qualified professional planner(s) and landscape architect(s) to undertake all phases of site planning and landscaping for the proposed development.

The Owner's Engineer shall submit one preliminary set of plans to the Town Engineer for review and comment regarding the acceptance of the design concept.

The Owner's Engineer shall submit to the Town Engineers, four (4) complete sets of plans and specifications of all local improvements proposed a minimum of 30 days before any construction commences. The Town's Engineer will recommend for approval the plans and specifications for the Town's approval.

The Owner's Engineer shall supervise and inspect all construction; obtain as-built data; and submit as-built plans in accordance with Schedule D.

8.2 As-Built Information

The Owner shall provide "As Built Drawings" to the Town as per Schedule D. The as-built drawings shall show any changes made from the approved drawings and shall include the following information.

a) Underground Utilities

- location and size of all waterlines, fittings, valves and hydrants.
- location, size and grade of all sanitary and storm sewers including manhole and catch basin locations and inverts of all pipes into and out of manholes.
- location, size and elevation of all water and sewer service connections at the property line.

b) Surface Improvements

- location, widths, grades and key elevations of all roads, curb and gutter, sidewalks, ditches, culverts, and any additional major surface feature within the dedicated right-of-ways or easements.

c) Franchise Utilities

- the Owner shall insure that all franchise utilities forward as-built drawings in both printed and digital AutoCAD and .pdf formats, of any franchise utilities installed in the development.

8.3 Operations and Maintenance Manuals

Not less than two (2) weeks prior to application for a Construction Completion Certificate, submit to the Town's Engineer four (4) copies of operating and maintenance manuals containing information required by the specifications. All instructions in the manuals shall be in simple language to guide in the proper operation and maintenance of the installation.

Bind contents in a three-ring, hard covered, plastic jacketed binder. Organize contents into applicable sections of work, parallel to specifications breakdown. The name of the facility is to be embossed onto the binder cover.

In addition to information called for in the specifications, include the following:

- title sheet, labeled "Operation and Maintenance Instructions", and containing project name and date
- list of contents
- reviewed shop drawings of all equipment
- as-built drawings of all mechanical, electrical, control, and alarm installations
- full description of entire mechanical, electrical, control, and alarm system and operation
- names, addresses and telephone numbers of all major Subcontractors and Suppliers
- operating instructions for all equipment
- maintenance instructions for all equipment, including frequency of maintenance tasks

- equipment parts lists
- emergency operating procedures
- certified head/capacity curves for pumps

Each section shall be separated from the preceding section with a plasticized cardboard divider with a tab denoting contents of the section.

8.4 Legal Survey Requirements

All legal survey control and elevations shall be tied into Alberta Survey Control Monuments. The Owner shall be responsible to see that the survey control network is extended into the Development Area.

The Owner shall employ a qualified Alberta Land Surveyor to undertake to install survey evidence (survey pins), prepare the necessary plans and acquire the necessary approvals as required by Alberta Infrastructure and Transportation and the Town to install the survey control network. Alberta Infrastructure and Transportation shall be provided with survey measurements to first and second order necessary to calculate coordinate values and elevations for these monuments.

The Owner shall be responsible to preserve all existing and new monuments and if necessary, replace such monuments as may be destroyed, damaged or removed by the operation of the Owner in carrying out the construction and installation of local improvements.

The Owner's Engineer shall provide full time inspection of all construction and provide sufficient tests to ensure that construction is in accordance with the Minimum Design Standards.

The franchise holder or their agent shall install franchise utilities with the Owner providing coordination of their installation.

Any of the services to be installed by the Owner shall be installed in such a manner as to least interfere with existing services. Any additional costs incurred by the Town as a result of the installation of services by the Owner shall be charged to the Owner who will reimburse the Town promptly for such additional expenditures incurred.

Approval shall be obtained from the Town a minimum of 48 hours prior to closing developed streets or shutting off existing utility service when required for construction.

In the event that a road must be partially or fully closed for a crossing or connection, the Owner shall provide all detours, signs, flagmen, barricades, in accordance with Roads and Transportation Association of Canada Standards.

Developed roads shall be returned to their original condition. Where it is necessary to excavate along or across an existing road or lane (for a water or sewer main, gas main, telephone cable, etc.), such excavations must be backfilled with compacted sand and/or gravel material and restored to pre-construction condition or better.

Approval shall be obtained from the Town to use the Town's water distribution system during construction. Access to the existing system shall be through a temporary metered bypass service of ¾" (19 mm) maximum diameter. 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.

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 (i.e. soils, debris, etc.) from entering the Town's existing system during construction, cleanup and testing procedures. Prior to commissioning, the manholes shall be completed to the same standard as others in the subdivision.

The Owner shall protect and preserve existing vegetation, bodies of water and or existing slopes when these have been designated for protection by the Town.

9.0 ENDORSEMENT AND REGISTRATION OF PLAN OF SUBDIVISION

Following approval of the subdivision plan and signing of the Development Agreement by all parties, the Owner/Applicant must submit a legal plan provided by a registered land surveyor in the Province of Alberta, as per section 657 of the *Municipal Government Act* to the Town of Bonnyville. The legal plan must be accompanied by documentation that all conditions of the subdivision have been met.

Following endorsement by the Town of Bonnyville, the subdivision plan must then be registered by the Owner with Alberta Land Titles.

10.0 FOLLOWING CONSTRUCTION

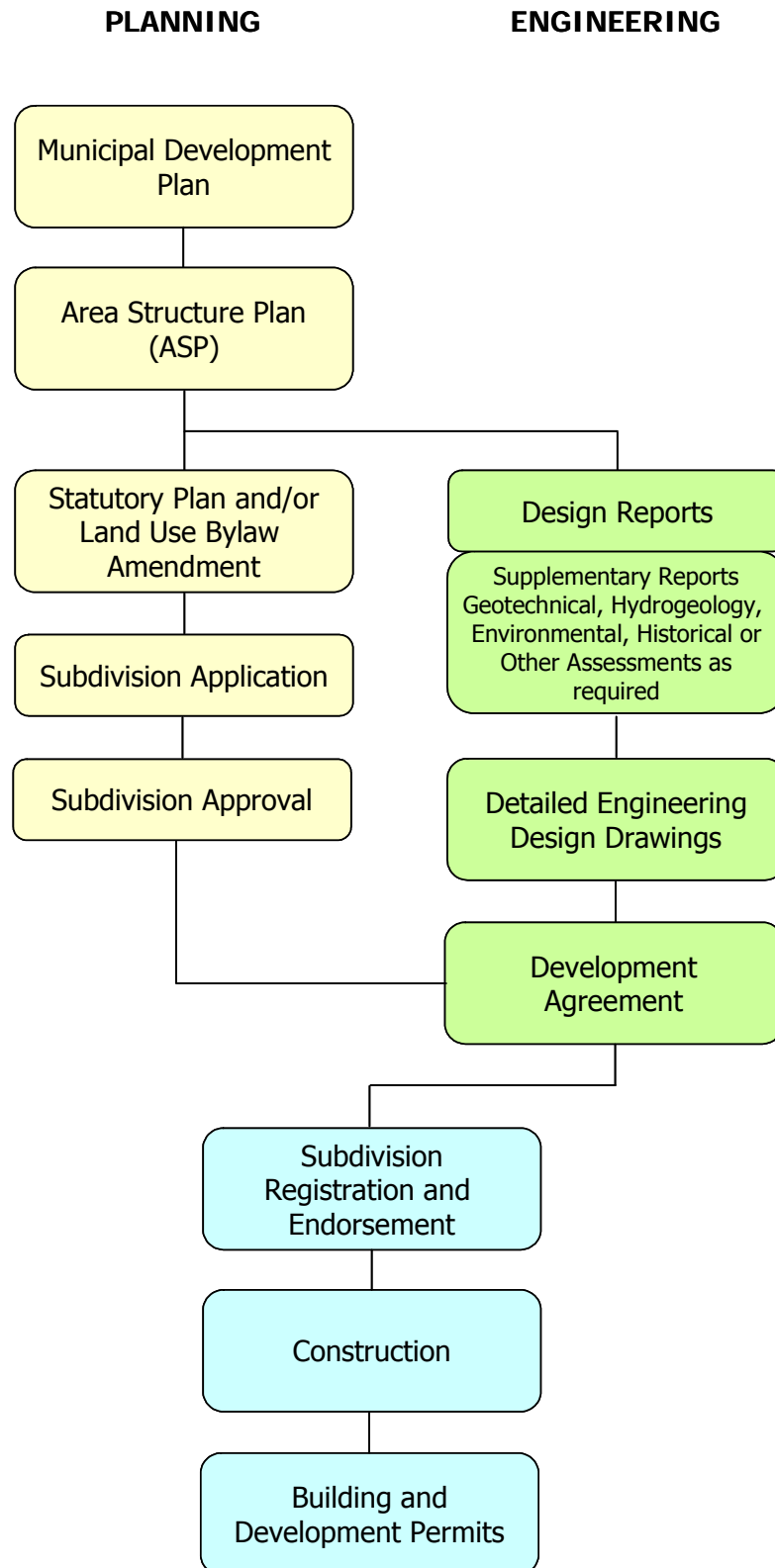
Prior to final acceptance of the development by the Town, the following conditions and procedures shall be completed:

- a) Prior to the start of the "Maintenance Period", all work must be completed, all deficiencies corrected, and a "Construction Completion Certificate" issued to the Owner by the Town. The length of the Maintenance Period is given in the Development Agreement.
- b) As-built drawings and operating manuals, if applicable, shall be submitted to the Town Engineer within sixty (60) days of issuance of the "Construction Completion Certificate" on each phase of the construction.
- c) Following repair and replacement of any deficiencies found prior to the end of the Maintenance Period, the Town will issue a "Final Acceptance Certificate" of the work in writing to the Owner, and thus assume actual take-over of the subdivision.

11.0 BUILDING AND DEVELOPMENT PERMITS

Refer to the Town of Bonnyville Land Use Bylaw for requirements regarding development and building permits related to physical structures and uses of the land.

**TOWN OF BONNYVILLE
SUBDIVISION DEVELOPMENT PROCESS**



SCHEDULE B

LEVEL OF SERVICE

Within the Town of Bonnyville, different service levels will be required for new subdivisions and developments in different areas of the Town. The area to which each service level is to be applied is delineated on Map B-1 which forms part of this Schedule B.

1.0 SERVICE LEVEL 1 - RESIDENTIAL

Service Level 1A – New Residential Subdivision

- asphaltic concrete paving on roadways
- gravel lanes
- curb, gutter and sidewalk
- underground power, gas, telephone and cablevision
- ornamental street lighting unless non-ornamental street lighting is approved in writing by the Town Engineer
- water distribution system and connection to community water system
- sanitary sewer collection system and connection to community sanitary sewer system
- storm water drainage in accordance with the Town of Bonnyville storm water design standards

Service Level 1B – Residential Estate Lots

- asphaltic concrete paving on roadways
- underground power, telephone and cablevision as approved by the Town Engineer
- streetlighting
- water distribution system and connection to community water system
- on-site sanitary sewage disposal system designed and approved by a professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta
- surface storm water drainage in accordance with the Town of Bonnyville storm water design standards

2.0 SERVICE LEVEL 2 – COMMERCIAL/INDUSTRIAL

Service Level 2A – Downtown Commercial

- asphaltic concrete paving on roadways and lanes
- curb, gutter and sidewalk
- underground power, gas, telephone and cablevision as approved by the Town Engineer
- streetlighting
- water distribution system and connection to community water system
- sanitary sewer collection system and connection to community sanitary sewer system
- storm water drainage in accordance with the Town of Bonnyville storm water design standards

Service Level 2B – Highway Commercial

- asphaltic concrete paving on roadways and as applicable on lanes
- underground power, gas, telephone and cablevision as approved by the Town Engineer
- streetlighting
- water distribution system and connection to community water system
- sanitary sewer collection system and connection to community sanitary sewer system
- storm water drainage in accordance with the Town of Bonnyville storm water design standards

Service Level 2C – Fringe Commercial

- asphaltic concrete paving on roadways and lanes
- underground power, gas, telephone and cablevision as approved by the Town Engineer
- streetlighting
- water distribution system and connection to community water system
- sanitary sewer collection system and connection to community sanitary sewer system
- storm water drainage in accordance with the Town of Bonnyville storm water design standards

3.0 SERVICE LEVEL 3 – INDUSTRIAL

- roadways may be construction to a gravel standard or as approved by the Town Engineer
- lanes are not permitted
- underground power, gas, telephone and cablevision as approved by the Town Engineer
- streetlighting
- water distribution system and connection to community water system
- sanitary sewer collection system and connection to community sanitary sewer system
- surface storm water drainage in accordance with the Town of Bonnyville storm water design standards

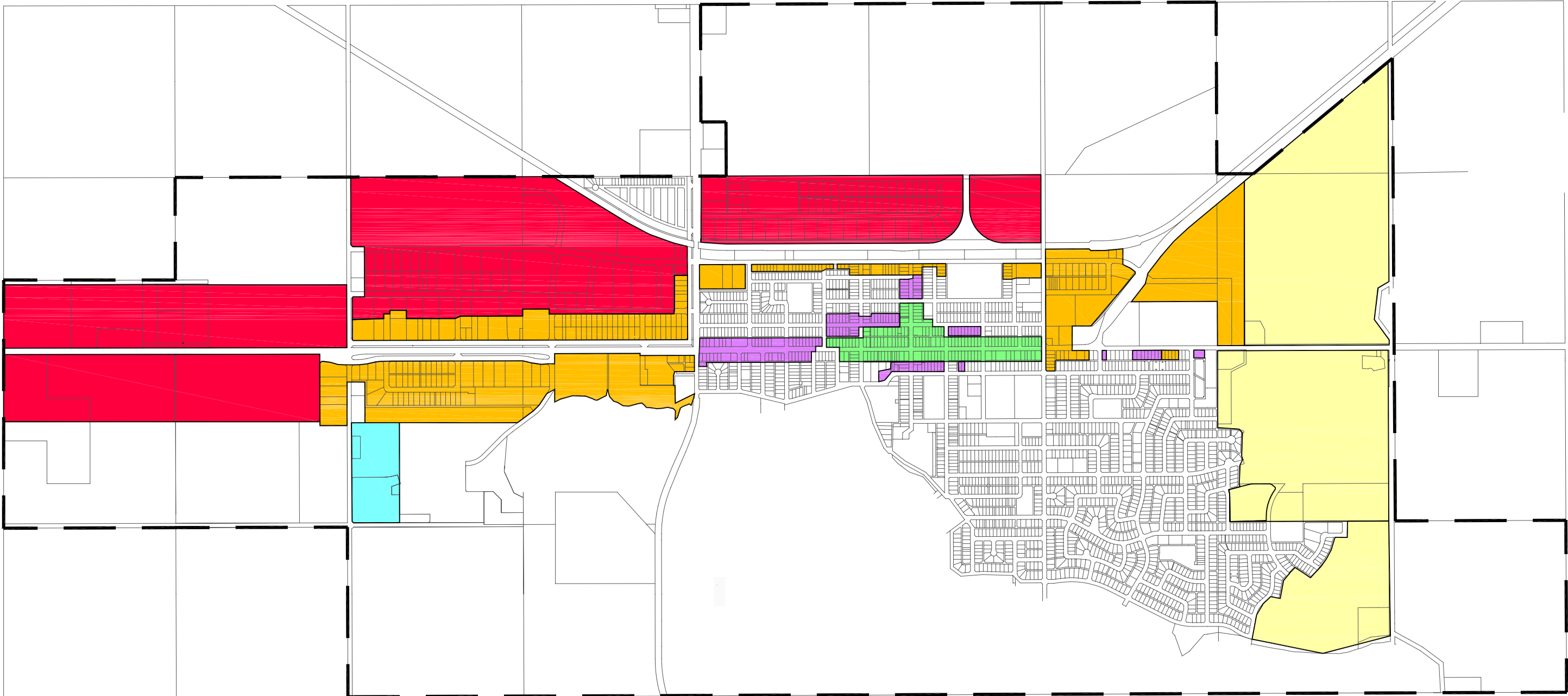
4.0 “URBAN RESERVE” AREAS

“Urban Reserve” areas have a land use district description which does not permit the subdivision of land prior to a Land Use Bylaw amendment. The service level for each Reserve area will be established at the time of redistricting. Refer to the Town of Bonnyville Land Use Bylaw.

5.0 SPECIAL CIRCUMSTANCES

There are some areas of Bonnyville where the roads and services presently constructed exceed the standards set out in the various service level areas. The Town may require that this higher standard be continued to adjacent developments for the sake of continuity and the Owner will be so advised when applications are reviewed by the Town.

The Owner is responsible for the cost of providing this higher level of service within the various service level areas.



- Level of Service**
- 1A - New Residential Subdivision
 - 1B - Residential Estates Lots
 - 2A - Downtown Commercial
 - 2B - Highway Commercial
 - 2C - Fringe Commercial
 - 3A - Industrial

level of service

SCHEDULE C

MINIMUM DESIGN STANDARDS

1.0 GENERAL

This Infrastructure Design Standards Manual was prepared to provide a standardized set of guidelines to be adopted by The Town of Bonnyville for those involved with design and construction of municipal infrastructure. Users of this manual shall note the following:

- Alternative criteria relating to such things as field conditions, climate, development standards and development density have been included in this manual where practical.
- Design criteria variations may be adopted from time to time in the form of Supplementary Design Guidelines which will supersede the guidelines contained in this manual.
- The contents of this manual are intended to complement the Town of Bonnyville Specifications and Standard Detailed Drawings.

This manual is not intended to be a substitute for sound engineering knowledge and experience. It is the designer's responsibility to exercise professional judgment on technical matters in the best interests of the owners and the public. Standards contained herein are provided to assist in making these judgments, but shall not be used as a substitute. The standards do not, and can not, cover all particular cases.

2.0 GENERAL DESIGN CONSIDERATIONS

2.1 Sustainability and Asset Management

Development of appropriate design standards for municipal infrastructure involves consideration of the principles of sustainability and asset management. These principles include the following:

- enhancement of quality of life
- environmental protection
- financial economies
- preventative maintenance
- life-cycle costs.

A balanced approach to design of municipal infrastructure requires careful consideration of all of the above principles.

2.2 Independent Utilities

Independent utilities are those not normally supplied by municipal or regional authorities and are not included in these standards. Independent utilities include:

- electrical power
- communications (telephone and cable)
- gas.

Design of municipal infrastructure must include consideration of the above utilities. Design of these utilities is normally carried out by the utility owner and coordinated by the municipal designer and/or the Town of Bonnyville.

In new urban developments, all wiring is generally to be underground. See Schedule B Level of Service Standards for all other developments.

2.3 Utility Rights-of-Way

Utility right-of-way (ROW) locations shall be selected to avoid environmentally sensitive areas such as watercourses, wetlands and wildlife migration corridors and forested areas.

Where location of a municipal utility in a statutory right-of-way is approved by the Town of Bonnyville, the minimum right-of-way widths are as follows:

- Single Service – ROW width to be equal to twice the depth from surface to the crown of the pipe (4.5 m minimum width)
- Two Services Within the Same Trench – ROW width to be equal to twice the depth from surface to the crown of the deeper pipe (5.5 m minimum width)
- Two or More Services Adjacent to One Another But In Separate Trenches – ROW width to be equal to the cumulative widths for single services PLUS any differences to provide the required separation (6.0 m minimum width)

- When the service is within a road allowance, and the distance from the property line to the centre of the service is less than one half of the width indicated above for a single service, the difference shall be provided as right-of-way on the adjacent property.

In all cases, the width of right-of-way shall be sufficient to permit an open excavation with side slopes in accordance with the WCB regulations, without impacting on or endangering adjacent structures.

Where required, sanitary trunk and interceptor sewers shall have rights-of-way wide enough for future widening and/or twinning. The width of the right-of-way shall be the required separation between pipe centerlines plus two (2) times the depth to the crown of the deeper sewer.

The designer shall provide cross sections indicating the minimum safe distances to adjacent building footings based on a safe angle of repose from the limits of the excavation.

Where a utility is located within a right-of-way, and valves, valve chambers, manholes or other appurtenances which require maintenance are located within the right-of-way, provide road access from a public road. The maintenance access must be sufficiently wide and structurally adequate to support the maintenance vehicles for which the access is intended.

2.4 Utility Separation

Requirements for separation of sanitary or storm sewers from water mains are as follows, unless otherwise indicated by the local public health authority.

2.4.1 Horizontal Separation

At least 3.0 m horizontal separation shall be maintained between a water main and either a sanitary sewer or storm sewer.

In special circumstances separation less than 3.0 m may be permitted provided that:

- The sewer main and water main are installed in separate trenches and the water main invert is at least 0.5 m above the crown of the sanitary sewer or storm sewer and the joints are wrapped with heat shrink wrap (or similar) or packed with compound and wrapped with petrolatum tape in accordance with the latest version of AWWA Standards C217, and C214 or C209; or
- The pipes are installed in the same trench with the water main located at one side on a bench of undisturbed soil at least 0.5 m above the crown of the sanitary sewer or the storm sewer and the joints of the water main are wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

2.4.2 Vertical Separation

Where a sanitary sewer or storm sewer crosses a water main, the sewer shall be below the water main with a minimum clearance of 0.5 m and the joints of the water main, over a length extending 3.0 m either side of the sewer main, are to be wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

Where it is not possible to obtain the vertical separation indicated above, and subject to Town of Bonnyville approval, the following details may be used:

- The water pipe joints shall be wrapped as indicated above; and
- The sewer shall be constructed of pressure pipe such as high density polyethylene (HDPE) or PVC with fused joints and pressure tested to assure it is watertight.

2.4.3 Sewers in Common Trench

Storm and sanitary sewers may be installed in a common trench, provided that the design has taken into account:

- interference with service connections
- stability of the benched portion of the trench
- conflict with manholes and appurtenances

The horizontal clearance between sewer pipes shall be no less than 1.0 m and the horizontal clearance between manholes shall be no less than 0.3 m.

2.5 **Trenchless Technologies**

Installation or rehabilitation of pipelines by trenchless methods is frequently mandatory or desirable.

Circumstances favouring trenchless installation include:

- installation or rehabilitation in heavily built-up areas
- stream crossings
- railway crossings
- highway crossings.

Available technologies include the following:

- slip-lining
- cured-in-place pipe (CIPP)
- pipe bursting
- horizontal directional drilling (HDD)
- microtunnelling
- pipe jacking.

3.0 WATER DISTRIBUTION

3.1 General

These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Water distribution system designs shall be prepared under the direction of a design professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

3.2 Metering

With the exception of fire hydrants, blow-offs and blow-downs within public right-of-ways, provision shall be made for metering of all water connections. Large private fire protection systems shall have metered connections which include separate metering of domestic use.

3.3 Demand

According to water consumption records, use the following per capita demands:

average annual daily demand (A)	500 litres per capita per day (L/c/d)
maximum day demand (D)	1,200 litres per capita per day
peak hour demand (H)	1,800 litres per capita per day

Residential, commercial, industrial and institutional demands shall be determined using specific data related to the development or zoning. In the absence of such data, use the above residential per capita demands and the following equivalent population factors. The equivalents apply to the average annual daily demand (A). For maximum day (D) and peak hour (H) use the following ratios indicated for per capita demands $D=2A$ and $H=1.5D$.

<u>Land Use</u>	<u>Equivalent Population/Hectare (gross)</u>
Single Family Residential	40 people/ha
Single Family Small Lot Residential	50 people/ha
Multi-Family Low Density	35 people/ha
Medium Density	50 people/ha
High Density	275 people/ha
Commercial	75 people/ha
Institutional	40 people/ha
Industrial	80 people/ha

For identified commercial and institutional facilities, the average annual daily demands (A) shown in Figure 3.1 subject to Town of Bonnyville approval.

FIGURE 3.1
Typical Average Annual Daily Water Demands for
Commercial and Institutional Facilities

FACILITY	UNIT	TYPICAL DEMAND L/(person or unit)/d
Assembly Hall	Seat	8
Automobile Dealer/Renter	Hectare ^a	30,000
Automobile: Service Station	Set of Pumps	2,000
Car Wash	Vehicles Served	5,000
Bed and Breakfast	Patron	150
Bowling Alley	Lane	800
Camp: Children's, Central Toilet and Bath	Person	180
Day, no meals	Person	50
Campground	Site	600
Curling Club	Lane	8,500
Golf Course	Hectare ^a	1,500
Greenhouse	Hectare ^a	27,000
Hospital	Bed	1,000
Hotel	Patron	300
Ice Arena	Rink	85,000
Motel	Patron	500
Office	Employee	50
Picnic Park with Flush Toilets	Visitor	30
Restaurant: Conventional	Seat	150
24 Hour	Seat	200
Tavern	Seat	80
School Day with Cafeteria or Lunchroom	Student	60
Day with Cafeteria and Showers	Student	70
Boarding	Student	400
Self-Service Laundry	Washer	2,000
Shopping Centre	m ^{2b}	0.10
Swimming Pool with Toilet and Shower	Patron	50
Theatre	Seat	15

NOTE: ^a Hectares = Gross Lot Area

^b Gross Building Area

3.4 Fire Flows

Fire Flows shall be determined in accordance with the requirements of the current edition of "Water Supply for Public Fire Protection – A Guide to Recommended Practice", published by Fire Underwriters Survey.

Fire flows are also subject to the following minimum requirements:

<u>Developments (without sprinklers)</u>	<u>Minimum Fire Flow</u>
Single Family Residential	60 L/s
Apartments, Townhouses	90 L/s
Commercial	150 L/s
Institutional	150 L/s
Industrial	225 L/s

3.5 Design Flows

Unless otherwise indicated by the Town of Bonnyville, system design flows shall be based on the ultimate population and fully developed non-residential land as anticipated in the Municipal Development Plan (MDP).

Equivalent populations for non-residential flows can be estimated using the established non-residential demands and the Maximum Day per capita demand.

Total design flows (Q_{design}) are to be the greater of the following:

$Q_{\text{design}} = D + F$ Maximum Day Demand for the population or equivalent population plus the Fire Flow, or

$Q_{\text{design}} = H$ Peak Hour Demand for the population or equivalent population

3.6 Water Pressure

Maximum allowable pressure 850 kPa

Minimum pressure at Peak Hour Demand (H) 300 kPa

Minimum pressure in system during design Fire Flow and Maximum Day Demand (D+F) 140 kPa

Where the maximum pressure exceeds 515 kPa, service connections must be individually protected by pressure reducing valves located in the buildings being served.

3.7 Hydraulic Design

The Developer will provide the "Request for Water Network Analysis" Microsoft Excel spreadsheet to the Town of Bonnyville in digital format (available from the Town upon request). The Town will run the water model and size the pipes based on proposed demands and fire flows. The results will be returned to the Developer.

3.8 Minimum Pipe Diameter

Distribution Mains: Residential	150 mm
Commercial	250 mm
Industrial	250 mm
Fire Hydrant Connections	150 mm
Service Connections Residential	20 mm
With Fire Sprinklers	50 mm
Industrial	100 mm

Main sizes may be increased as considered necessary by the Town Engineer to accommodate future development.

Pipes 300 mm diameter and smaller shall be PVC pressure pipe in accordance with the latest version of AWWA Standard C900 unless otherwise approved in writing by the Town Engineer.

Pipe for water mains greater than 300 mm diameter shall be PVC pressure pipe in accordance with the latest version of AWWA Standard C905 unless otherwise approved in writing by the Town Engineer.

Disinfection, flushing and bacteriological testing shall be carried out in accordance with AWWA standards and practices.

3.9 Dead Ends

Water mains must be looped wherever possible. Where dead ends are unavoidable, and approved by the Town of Bonnyville, blow-offs, blow-downs or fire hydrants shall be provided. Blow-off and blow-down sizes are:

- 50 mm diameter for 150 mm diameter water mains
- 100 mm diameter for 200 mm diameter and larger water mains

Where practical, and approved by the Town of Bonnyville, hydrants may serve a secondary role as a blow-off.

3.10 Minimum Depth of Cover

Water mains and services must be of sufficient depth to clear other underground utilities and prevent freezing. Soil type and groundwater levels shall be considered. Minimum depth of cover to be 3.0 m from finished design grade to the top of pipe.

Insulation is required for frost and mechanical protection in cases where minimum depths can not be attained or to the satisfaction of the Town Engineer.

3.11 Grade

Grades shall be straight lines between defined deflection points. Elevations shall be recorded.

Where possible, the minimum grade of water mains shall be 0.1%. Grading shall be designed to minimize the number of high points.

When the slope equals or exceeds 20%, provide anchorage, joints restraints, trench dams and trench drainage. Provide geotechnical engineering report where appropriate.

3.12 Corrosion Protection

A geotechnical corrosion analysis on the alignment of any proposed water main shall be conducted to determine the corrosiveness of the native soils. All hydrants and hydrant fittings, service connections, valves, fitting and metallic appurtenances shall have corrosion protection.

3.13 Valves

In general, valves shall be located as follows:

- in intersections either in a cluster at the pipe intersection or at projected property lines to avoid conflicts with curbs and sidewalks:
 - 4 valves at "X" intersection
 - 3 valves at "T" intersection
- not more than 200 m apart
- not more than two (2) hydrant isolated
- not more than 20 service connections isolated in new developments or to the satisfaction of the Town Engineer

Gate valves are required on mains smaller than 450 mm diameter, for larger lines, butterfly valves shall be used.

3.14 Hydrants

All areas shall have hydrants installed in locations and at spacing convenient for Fire Department use along streets and in other areas including private developments, where fire apparatus may go. Fire hydrants will be located on the right hand side of the street when entering dead ends or cul-de-sacs. General distribution of hydrants shall include spacing between hydrants measured in any direction along street frontage of:

- 140 m for residential protection
- 120 m for commercial, institutional and industrial

or as specified by Fire Underwriters Survey "Water Supply for Public Fire Protection", whichever is less.

Hydrants shall be located to conform with the sidewalk and/or the curb and gutter and driveway design as follows:

- | | |
|-----------------------|--|
| Residential | <ul style="list-style-type: none">▪ 0.3 m clear back of monolithic sidewalk curb and gutter▪ 1.0 m from face of curb where there is no sidewalk▪ 1.0 m from face of curb if separate sidewalk curb and gutter. |
| Commercial/Industrial | <ul style="list-style-type: none">▪ 1.0 m from face of curb▪ 1.0 m off property line if there is no curb. |

Hydrants shall be located on the projection of lot lines or at the beginning or end of curb returns with adjustments made so as not to conflict with catchbasins.

In areas with "rural" roadway cross-sections, hydrants shall be located on special "pads" extending perpendicular to roadway centre lines and a minimum of 3.0 m from the edge of the proposed road surface and be accessible from the roadway. The elevation of the "pads" shall be no more than 0.3 m below the crown of the road at that point.

Hydrants type and manufacturers to be Canada Valve complete with:

- two (2) 65 mm threaded connections to Alberta Mutual Aid Thread specifications
- one (1) 100 mm internal lug quick connect connection to CAN4-5543-M84 specifications, oriented to the street
- operating nut, #1 – 1 ¼ inch 5 sided pentagon
- all bolts and nuts shall be stainless steel
- 300 mm extension on top with breakaway flange
- all hydrant bodies shall be painted chrome yellow in colour; private hydrants may be red
- Hydrants may serve a secondary role as a blow-off, where practical and approved by the Town of Bonnyville.

Hydrants that are susceptible to vehicle damage shall be protected with bollards or similar devices as required by the Town of Bonnyville Director of Public Works.

3.15 Air Valves

Combination air valves shall be installed at the summits of all mains of 200 mm diameter and larger, except as follows:

- where the difference in elevation between the summit and valley is less than 600 mm
- where it can be shown that air pockets will be carried by typical flows
- where active service connections are suitably located to dissipate entrapped air.

Typical air valve sizes, subject to design analysis, are as follows:

<u>Water Main Size</u>	<u>Valve Size</u>
250 mm to 300 mm	25 mm
350 mm to 600 mm	50 mm
larger than 600 mm	special design

Air valves must be vented to an appropriate above-grade location to eliminate any potential for cross connection in a flooded or contaminated chamber.

Where practical, and approved by the Town of Bonnyville, a hydrant may serve a secondary role as a blow-off.

3.16 Thrust Restraint

Concrete thrust blocking and/or adequate joint restraining devices complete with corrosion protection must be provided at bends, tees, wyes, reducers, plugs, caps, valves, hydrants and blow-offs.

The restraint system must take into account potential future excavations in the vicinity of the water main. Design calculations must be based on fitting type, water pressure and soil conditions as per the charts shown in the design drawings section.

3.17 Chambers

Chambers or manholes containing valves, blow-offs, meters or other appurtenances shall allow adequate room for maintenance, including headroom and side room. Access openings must be suitable for removing valves and equipment. The chamber is to be provided with a drain to a storm sewer or ditch, complete with backflow prevention, to prevent flooding of the chamber. Rock pits may be considered subject to suitable soil and ground water conditions. A pumping system may be required for drainage.

Adequate venting shall be provided. The Town of Bonnyville may require provision of forced ventilation, lighting, heating and dehumidification. Access and ventilation details must comply with WCB regulations.

Insulation to prevent freezing shall be provided where necessary.

3.18 Service Connections

Minimum size 20 mm diameter for domestic requirements, 30 mm maximum length from main to the house. Minimum size 150 mm diameter to convey fire flow requirements.

No pipe sizes between 50 mm diameter and 100 mm diameter will be allowed.

Corporation stop to be provided at the mains. Service saddles are to be used at all main connections as per manufacturer's recommendations.

Service pipe shall be of type K copper AWWA C800.

All sizes 25mm diameter and under, the pipe shall be conform to AWWA C903-02, Q-Line pipe to ASTM F1282 complete with the appropriate Cambridge Brass or Mueller Brass Water Service Fittings.

Should the IPEX Q-Line product be chosen it is with the condition that the contractor arrange with IPEX to conduct on-site training and on-going technical field support for the contractor's staff in the proper installation procedures.

The Town of Bonnyville reserves the right to withdraw this approval at any time should the product:

- no longer meet the current requirements
- receive numerous documented complaints from contractors or staff, or
- be found to be below the standard of similar products that are readily available.

For pipe sizes up to 50mm, pipe shall conform to CAN3-B137.1 Polyethylene municipal tubing, PE 3406 Series 160.

Tracer wire (#14-1C AWG FT1 solid white with polyethylene insulation) shall be fastened to the Main Stop and continuously wrapped around the service pipe to the curb cock and on up to terminate at the top of the service box.

For service size 100 mm diameter or greater use PVC water main.

All service lines shall be installed to provide a minimum depth of 3.0 m of cover (including "horizontal goose neck" or bend off the main).

Service saddles shall be all bronze or stainless steel and double strapped.

For industrial requirements, service connections shall not be installed until the servicing requirements are known and a permit, approving the installation, is issued by the Town Engineer.

Each service shall have a shut-off with Type 304 stainless steel extension rods located within 300 mm of the property line on the public side. When a gas easement occurs adjacent to the property line the service shall be stubbed 300mm beyond easement limits. Each connection of 100 mm diameter or larger require an approved backflow prevention device at the property side of the shut-off.

All service connections shall have provisions for metering.

3.19 Alignments and Corridors

On straight roads, water mains shall have straight alignments with uniform offsets between intersections. Curved alignments, parallel to property lines, may be used. Design joint deflections shall be limited to half the maximum deflection specified by the pipe manufacturer. Locations of short lengths, or field cut pipes, must be recorded during construction.

Mains shall be located such that each property served has at least one side facing the water main.

Where a water main crosses private land, right-of-way requirements are as indicated in Section 2.0 General Design Considerations.

Clearance from sewers is as indicated in Section 2.0 General Design Considerations.

3.20 Cleaning and Preliminary Flushing

Before flushing and testing, ensure waterworks system is completely finished except tie-ins to existing watermains and services and make arrangements with Engineer for scheduling of testing and disinfection of mains.

Isolation of existing water system where required will be performed by Municipality. Do not operate any valves without Engineer's authorization.

Contractor may obtain water from Municipal fire hydrants upon application for a Hydrant Use Permit and presentation of valid test certificate for reduced pressure principle backflow prevention device conforming to AWWA C511.

Remove foreign material from pipe and related appurtenances by flushing with water. Main is to be flushed at water velocities as high as can be obtained from available water sources. Minimum velocity is to be 1.0 m/s and in accordance with AWWA C651. Flushing water is to be discharged to storm sewer, water courses or ditches that have sufficient capacity to carry flow. Flushing to continue at least until flow from most distant point has reached discharge point and until water discharged is clean and clear.

3.21 Testing Procedure

Upon completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, make section ready for testing.

Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Submit pipeline to a test of 1.5 x working pressure applied at highest elevation in each section, with a minimum of 1380 kPa applied at lowest point of test section. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 litres per millimetre diameter of pipe per kilometre per 24 hour period. Minimum duration of test period to be 2 hours. Maximum test pressures should not exceed those specified in CSA B137.3 – Table 9.

Perform pressure and leakage testing of ductile iron piping to AWWA C600 and AWWA M41.

Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23 and AWWA C605.

Perform testing of welded steel piping to AWWA C206; no leakage allowed.

Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirements is achieved.

3.22 Disinfection, General

After Engineer has certified that pipes and appurtenances have passed all specified tests, flush and disinfect pipes and appurtenances.

Disinfect, flush, and bacteriological test in accordance with AWWA C651 and the following.

3.23 General Disinfection and Flushing Procedures

Disinfection and Flushing procedures shall be witnessed by the Engineer and a representative of the Town of Bonnyville. Notify the Engineer and Town representative at least 24 hours before the proposed date when disinfection will commence.

Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least 5 days after placing concrete or 2 days if high early strength concrete is used.

Do not use granular hypochlorite for disinfection of PVC pipe with solvent welded joints, due to explosive reaction potential.

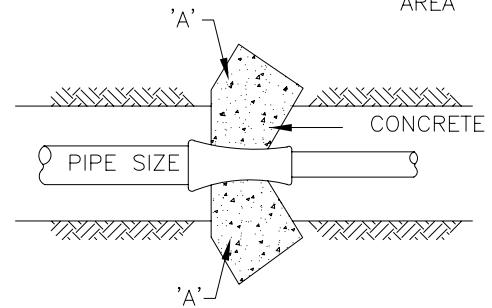
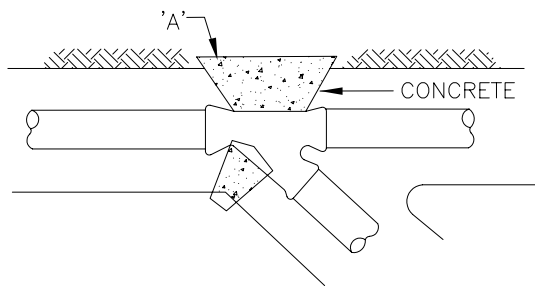
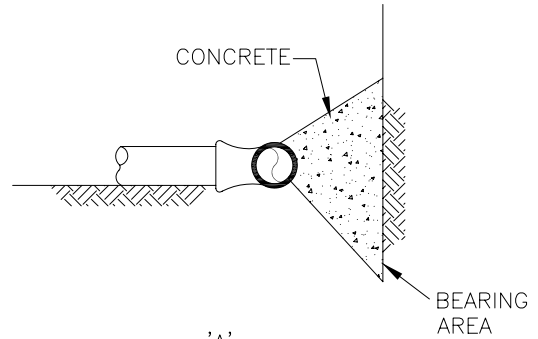
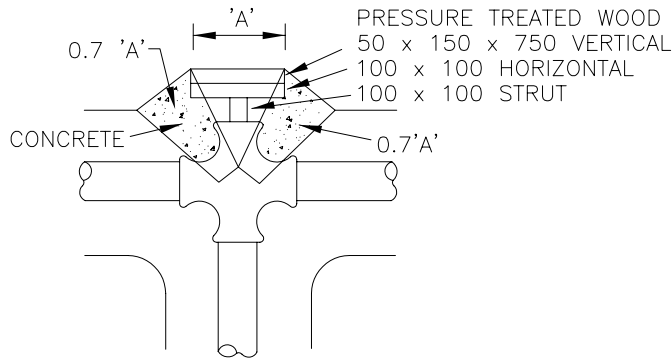
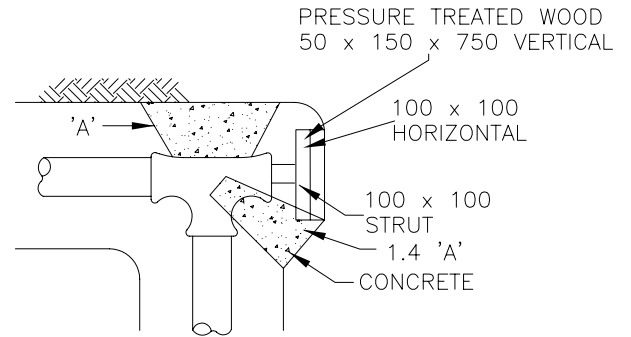
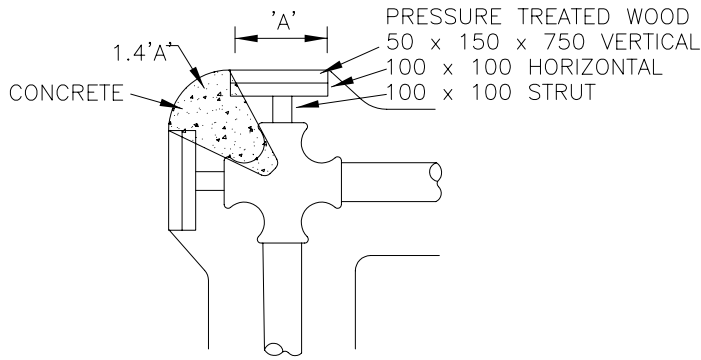
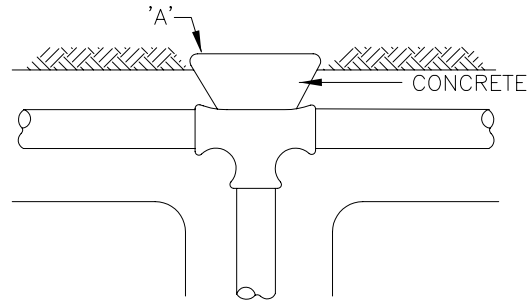
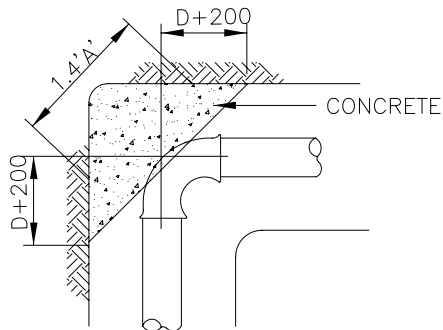
Retain water containing not less than 25 mg/L free chlorine in water system for a period of at least 24 hours, in accordance with AWWA C651, Continuous Feed Method.

After completion of chlorination, flush chlorinated water from system, hydrants and services until chlorine concentration in remaining water is less than 0.3 mg/L chlorine residual. Water with a chlorine concentration greater than 1 mg/L shall not be discharged to a recognized water course without the approval of the Ministry of Environment.

At a point not more than 3m downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. To assure that this concentration is provided, measure the chlorine concentration at regular intervals as specified in AWWA C651.

After final flushing and before the new water main is connected to the distribution system, two consecutive sets of water samples taken at least 24 hours apart, shall be collected from the new main. Samples shall be taken at a minimum interval of 370m, plus one set from the end of the line and at least one set from each branch. Samples shall be tested at the Contractor's expense for total and fecal coliforms and background bacteria by a laboratory approved by the Engineer. Sampling and analysis shall be done in accordance with *Standard Methods for the Examination of Water and Wastewater*. The presence of total or fecal coliform bacteria and/or background bacteria greater than 200 CFU per 100 ml shall constitute a failed test.

Following successful bacteriological testing, the results of the bacteriological tests shall be delivered or faxed to the Town of Bonnyville, Water Treatment Plant stating that the water is free from contamination. Once satisfactory water quality and bacteriological test results have been confirmed, the Town will notify the Contractor to proceed. Contractor shall remove test and bleed out apparatus and shall backfill and complete any work required to commission the waterworks systems. Final connections to existing mains and services shall be swab disinfected with 1% - 5% chlorine in accordance with AWWA C651, Section 4.6. Disinfection and final connections shall be witnessed by the Engineer and a representative of the Town of Bonnyville.



THRUST BLOCK DESIGN IS BASED ON:

1. 1050kPa MAX. SYSTEM PRESSURE OR 700kPa OPERATING PRESSURE PLUS A SURGE ALLOWANCE OF 345kPa (2fps SURGE ALLOWANCE AT 25psi/fps)
2. THRUST BLOCK DESIGN ASSUMES A MIN. VERTICAL SOIL BEARING OF 100kPa.
3. THRUST BLOCK BEARING AREA BASED ON PVC PIPE (AWWA C900 AND C905 DR18).
4. CONCRETE 20MPa TYPE 50 CEMENT.

FOR CALCULATION OF BASIC THRUST BLOCK BEARING AREA 'A'

PIPE SIZE	150	200	250	300	350	400	450
'A' (m ²)	0.40	0.68	1.06	1.54	2.08	2.72	3.44

BEND DEFLECTION

90°	1.4A
45°	0.7A
22 1/2°	0.35A
11 1/4°	0.18A

Town of Bonnyville



SCALE:

NOT TO SCALE

DATE DRAWN:

JANUARY 2007

LATEST REVISION

DATE:
JANUARY 2007

APPROVED BY:

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TITLE:

HORIZONTAL THRUST BLOCK

WATER

REVISION No.

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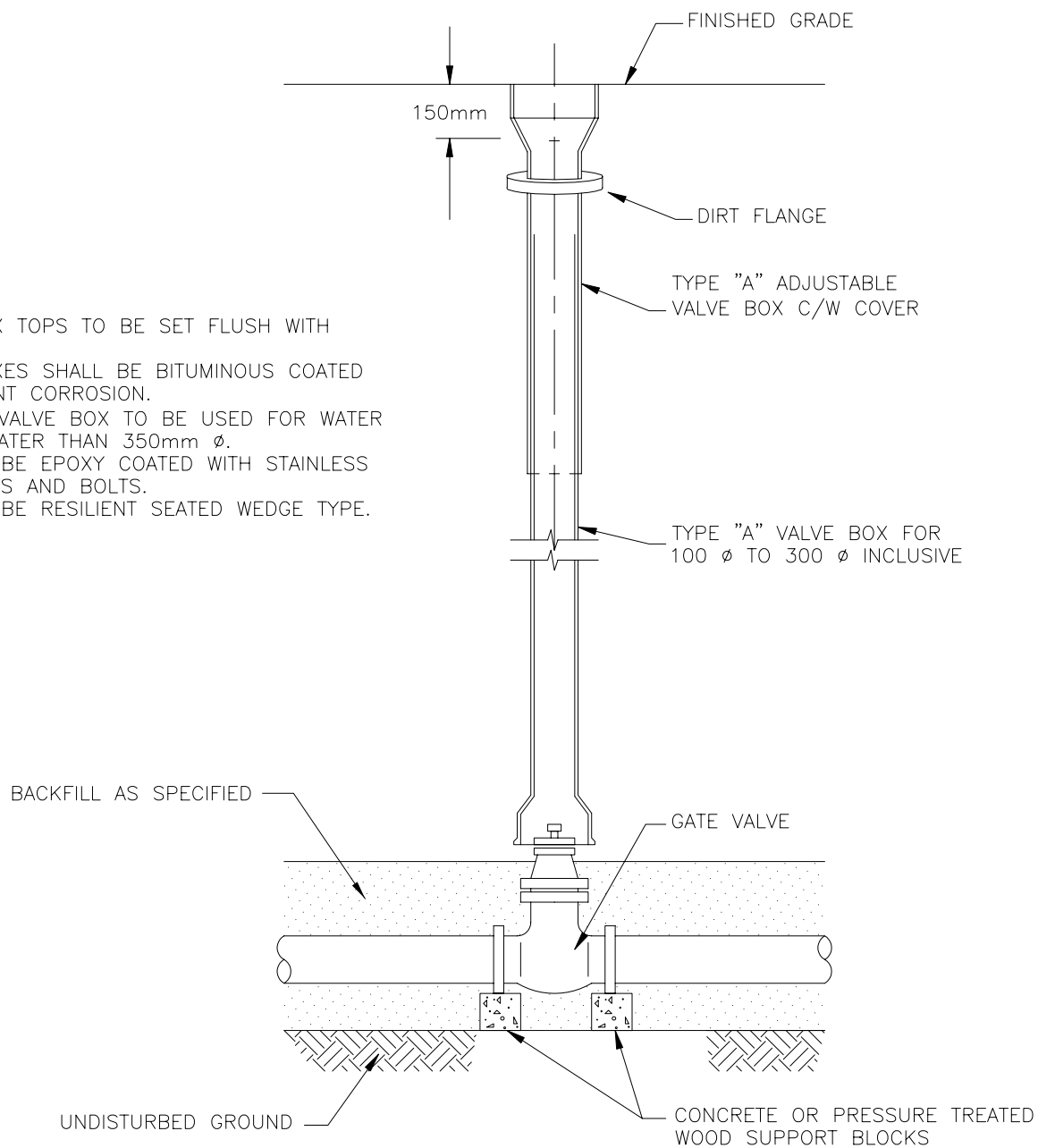
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W001

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NOTES:

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



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TITLE:

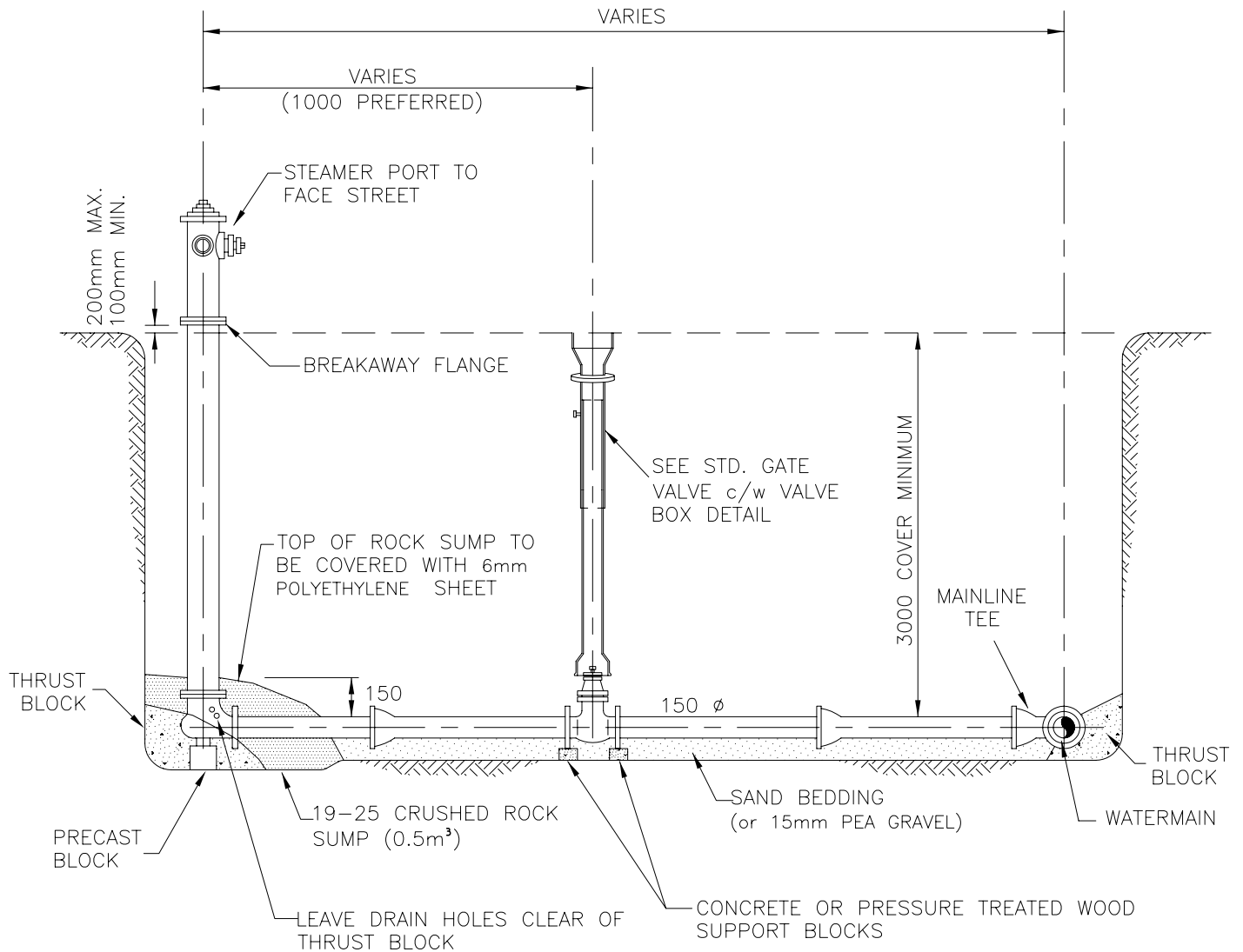
BURIED VALVE DETAIL

WATER

REVISION No.

DWG.No.

W002



NOTES:

1. HYDRANT TO BE CATHODICALLY PROTECTED WITH A 5.5KG (12.1LB) ZINC ANODE; VALVE WITH A 2.3KG (5LB) ZINC ANODE.
2. HYDRANT TO BE CHROME YELLOW WITH TOPS AND CAPS COLORED IN ACCORDANCE WITH NFPA GUIDELINES.
3. ALL NUTS AND BOLTS TO BE STAINLESS STEEL.
4. HYDRANT MUST NOT RESTRICT SIDEWALK.
5. OPERATOR NUT TO BE 1-1.25 INCH 5 SIDED PENTAGON.
6. HYDRANT SHOULD BE LOCATED SO STEAMER PORT FACES THE ROAD OR MOST ACCESSIBLE SPOT FOR A FIRE TRUCK TO CONNECT.
7. ALL HOSE CONNECTIONS TO BE 65mm THREADED CONNECTIONS TO ALBERTA MUTUAL AID THREAD SPECIFICATIONS.

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DATE:
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TITLE:

STANDARD HYDRANT CONNECTION

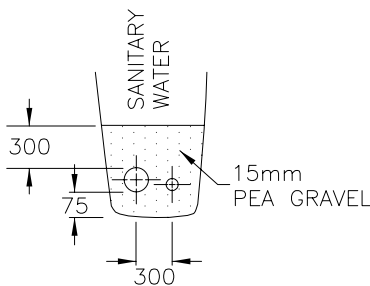
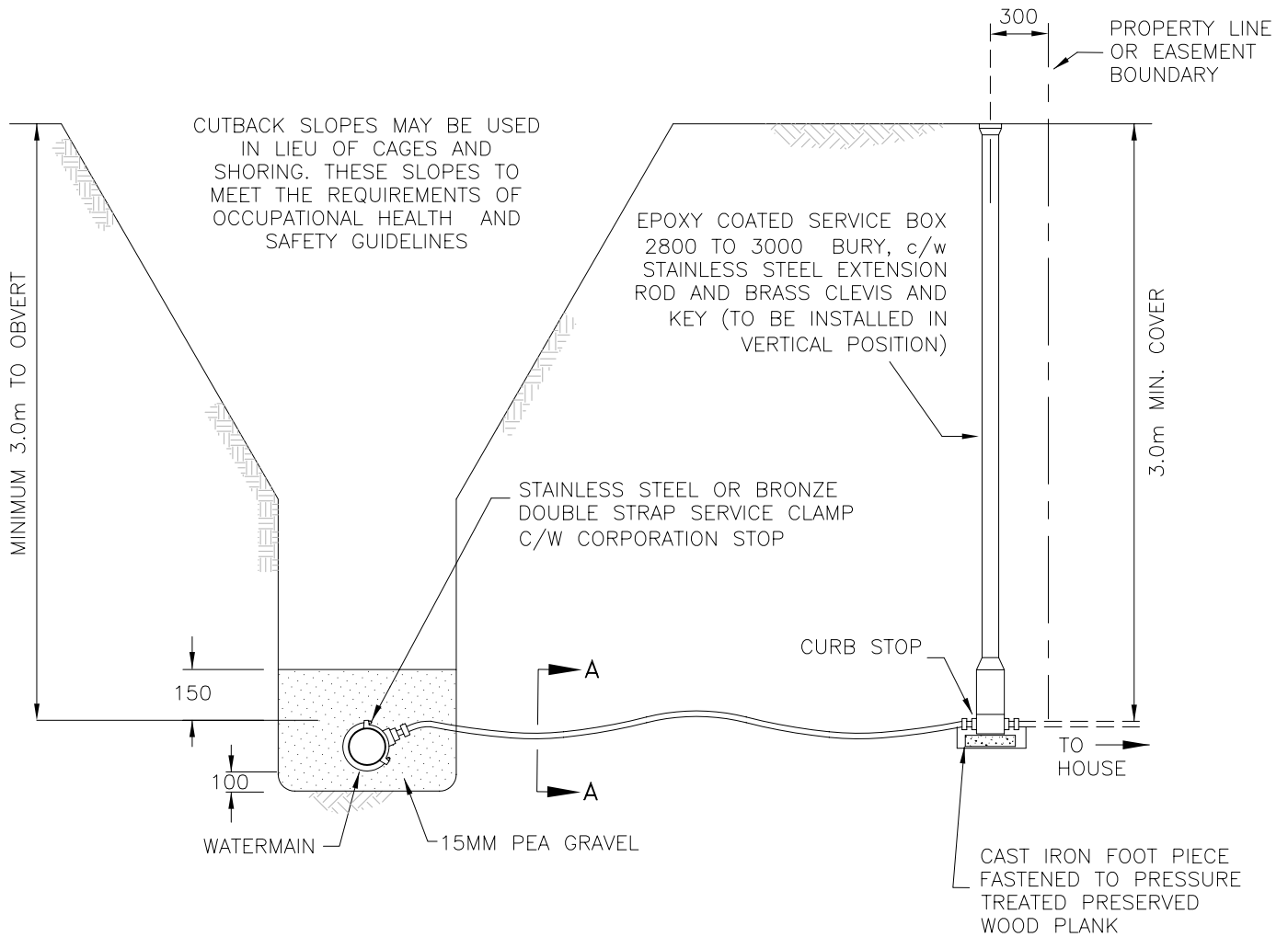
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REVISION No.

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DWG.No.

W003

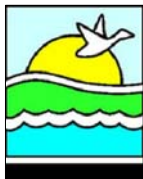


SECTION A
(FACING PROPERTY)

NOTES:

1. WATER SERVICE TO BE TAPPED AT THE 2 TO 3 O'CLOCK POSITION.
2. WATER SERVICE:
25mm AND SMALLER TO BE TYPE Q LINE
UP TO 50mm TO BE TYPE K COPPER.
3. WATER SERVICE TO BE SNAKED IN THE TRENCH.
4. WATER SERVICE IS TO INCLUDE A HORIZONTAL GOOSENECK AT THE CORPORATION STOP.
5. CORPORATION STOP AND CURB STOP TO BE CATHODICALLY PROTECTED WITH 2.3kg (5lb) ZINC ANODES.
6. ALL FITTINGS TO BE PACKER NUT TYPE, NOT GRIPPER NUT.
7. WHEN A GAS EASEMENT OCCURS ADJACENT TO THE P/L THE WATER SERVICE SHALL BE STUBBED 300mm BEYOND EASEMENT LIMITS.

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DATE:
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TITLE:

**STANDARD WATER
SERVICE CONNECTION**

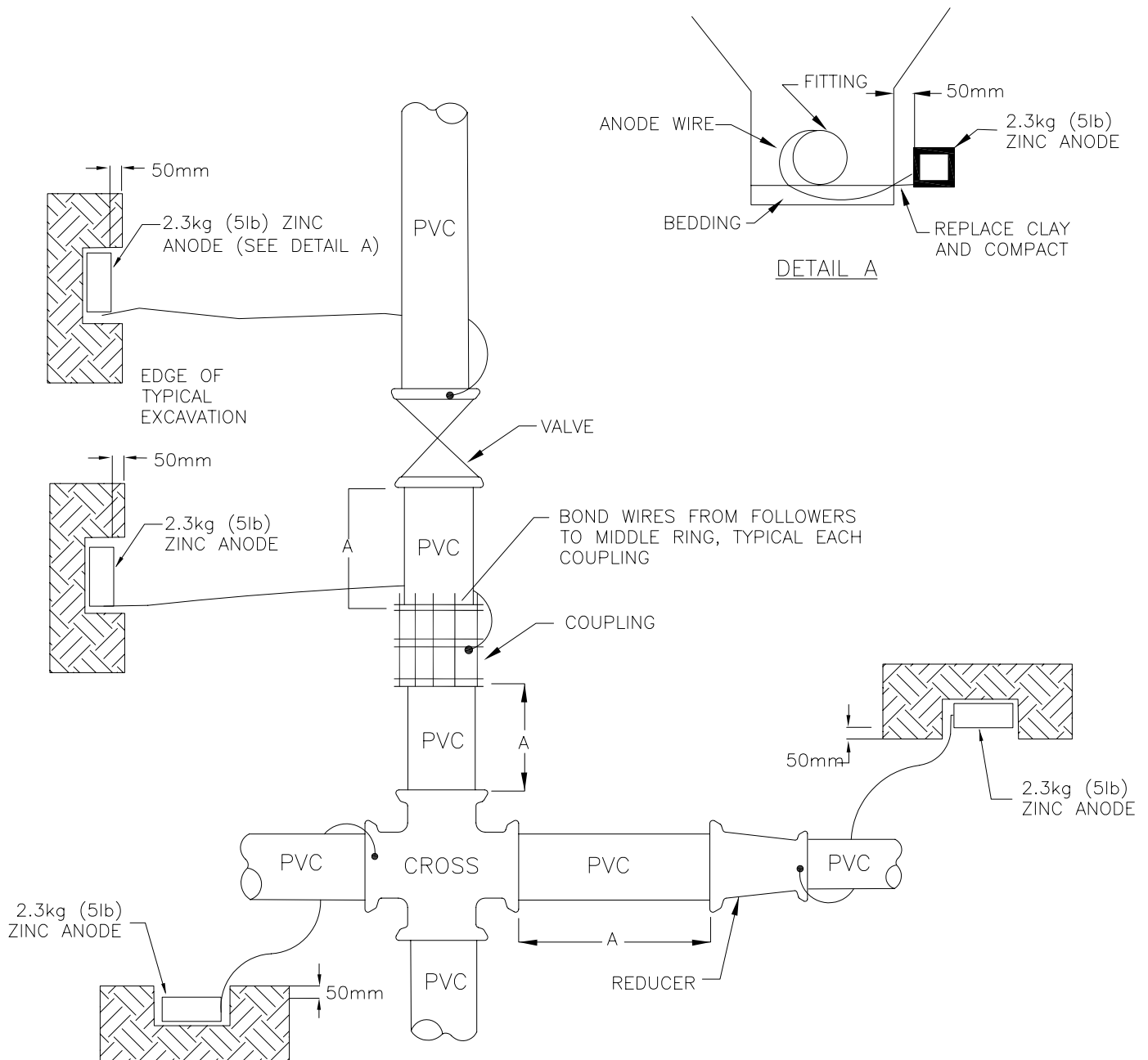
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REVISION No.

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DWG.No.

W004



NOTES:

1. MINIMUM DISTANCE FROM ANODE TO PIPE FITTING, VALVE, OR HYDRANT IS 150mm.
2. INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL.
3. ALL ZINC ANODES ON HYDRANTS ARE 5.5kg (12.1lb).
4. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO BE PROVIDED FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
5. ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCK

Town of Bonnyville



SCALE:

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DATE DRAWN:

JANUARY 2007

LATEST REVISION

DATE:
JANUARY 2007

APPROVED BY:

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TITLE:

TYPICAL ANODE INSTALLATION

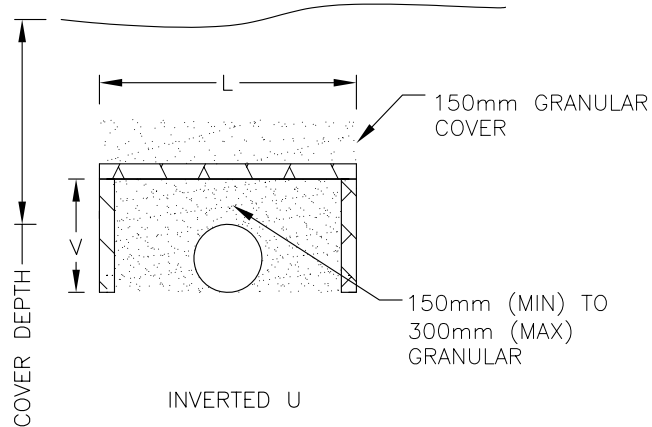
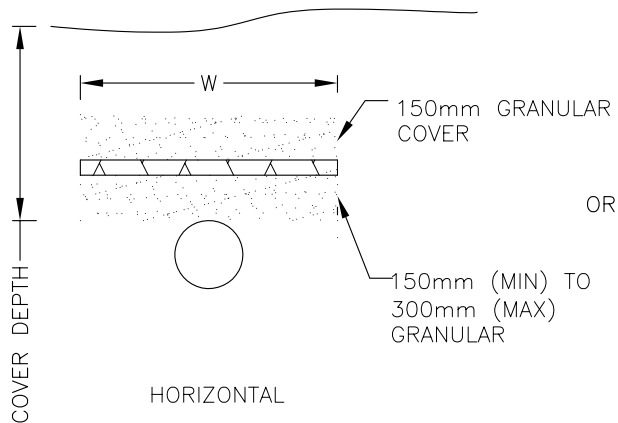
WATER

REVISION No.

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DWG.No.

W005



$$W = L + 2V$$

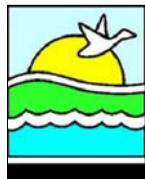
$$V \text{ TO BE } \leq W$$

COVER DEPTH m	THICKNESS mm (IN)	WIDTH (W) m
1.1–1.4	90 (3.5)	3.4
1.4–1.7	75 (3.0)	2.8
1.7–2.0	75 (3.0)	2.2
2.0–2.3	50 (2.0)	1.6
2.3–2.6	40 (1.5)	1.0
2.6–2.9	40 (1.5)	0.4
BELOW 2.9	—	—

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
- APPLICABLE WHEN USING:
 - FILLCRETE OR GRANULAR BACKFILL
 - CLAY BACKFILL FOR DEPTHS < 2.0m
- USE DOW HI-40 STYROFOAM BOARD.

Town of Bonnyville



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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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TITLE:

**INSULATION REQUIREMENTS FOR
WATER MAINS/SERVICES**

WATER

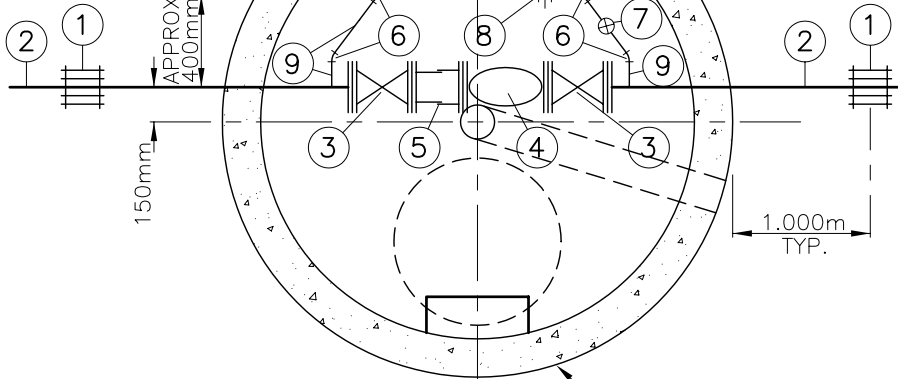
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DWG.No.

W006

25mm PVC CONDUIT
FOR REMOTE READOUT



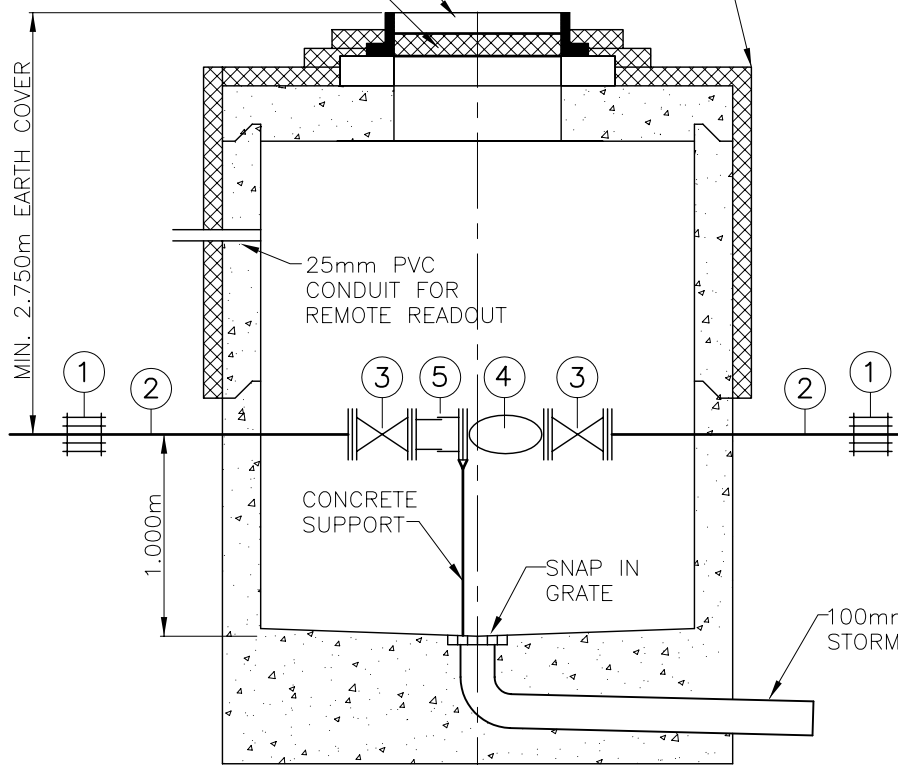
PLAN

DOBNEY FOUNDRY CAST
IRON C-18 FRAME &
COVER

1800mm PRECAST *
CHAMBER ON 100mm
AND 150mm MAINS

50mm STYROFOAM PLUG
BETWEEN 2 PIECES OF
12mm PLYWOOD. FRICTION
FIT INSULATION.

50mm STYROFOAM
INSULATION. TO
MIN. 1.2m COVER



ELEVATION

SCHEDULE OF QUANTITIES

ITEM	DESCRIPTION
1	PVCxSTL TRANSITION COUPLING
2	PEXF SCH40 STEEL SPOOL c/w WELD-O-LET FOR BYPASS PIPE
3	FxF R.S. GATE VALVE WITH INDICATOR
4	NEPTUNE TRU/FLO COMPOUND WATER METER c/w REMOTE READOUT
5	VIKING JOHNSON DISMANTLING JOINT
6	BRASS 45° ELBOWS
7	BRASS BALL VALVE (WATTS SERIES B OR EQUAL) TO BE SEALED BY CITY
8	UNION
9	BRASS NIPPLES—LENGTHS TO SUIT

* A LARGER CHAMBER WILL BE REQUIRED
FOR 150mm AND LARGER MAINS,
HOWEVER, THE PIPING/FITTING
CONFIGURATION WILL REMAIN THE SAME

NOTES:

1. ALL INTERIOR & EXTERIOR PIPING
SURFACES SHALL BE PAINTED WITH
2 COATS OF COAL TAR EPOXY.
2. BYPASS PIPING SIZE MAY VARY TO
MEET FLOW REQUIREMENT OF THE
DEVELOPMENT BEING SERVICED.
3. PROVIDE REMOTE READOUT TERMINAL
WITHIN 10m OF CHAMBER.
4. A ONE SIZE SMALLER DIAMETER
WATERMETER MAY BE INSTALLED IN
THE CHAMBER

Town of Bonnyville



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DATE:
JANUARY 2007

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TITLE:

TYPICAL METER CHAMBER FOR
INDUSTRIAL APPLICATIONS c/w BYPASS
FOR 100mm AND SMALLER SERVICE

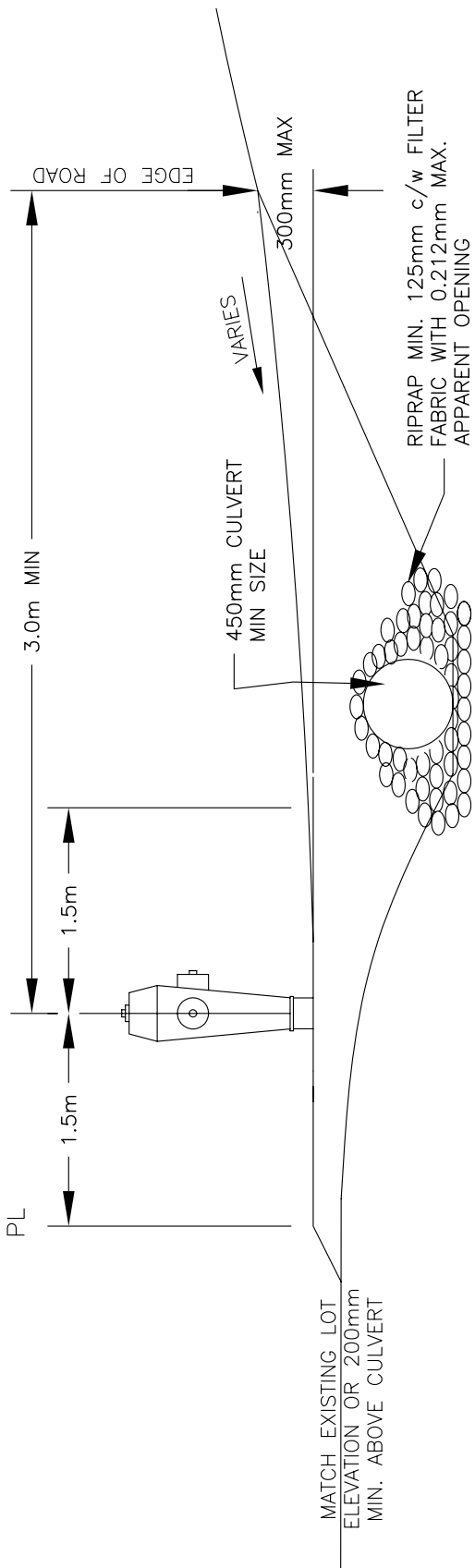
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REVISION No.

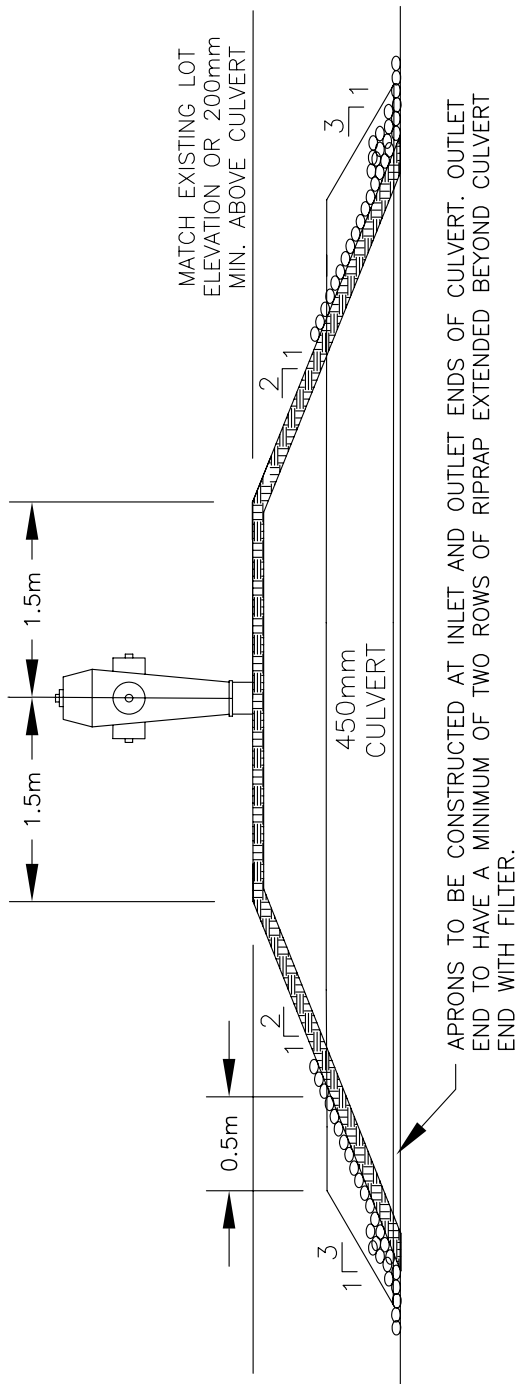
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W007



FIRE HYDRANT CROSSING SECTION



FIRE HYDRANT CROSS SECTION



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JAN. 2007

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DATE:

DATE:

APPROVED BY:

TITLE:

HYDRANT CROSSING FOR RURAL CROSS SECTION

WATER

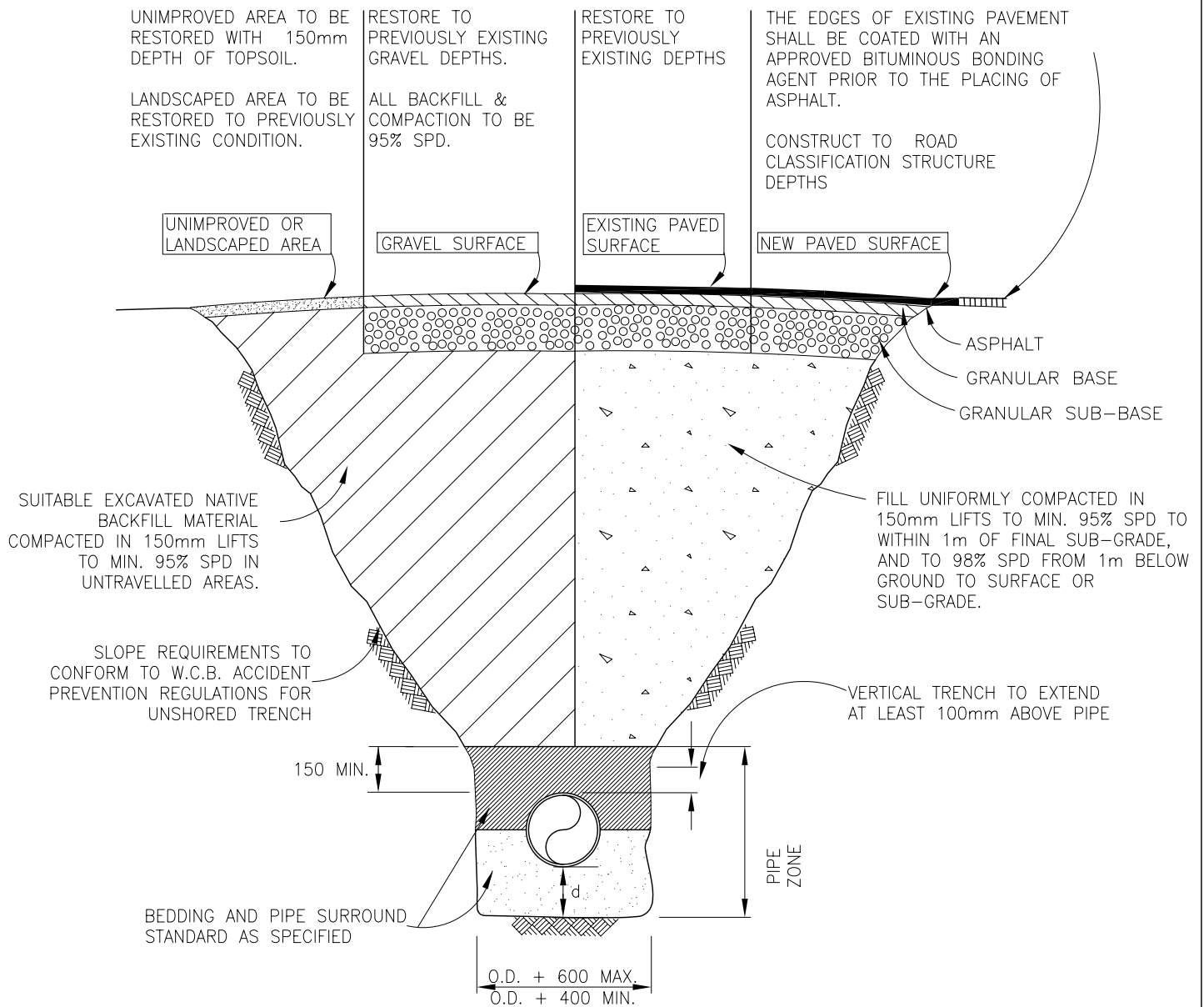
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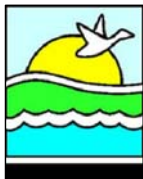
W008

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d = 100mm MIN. DEPTH OF BEDDING BELOW PIPE

Town of Bonnyville



SCALE:

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JAN. 2007

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DATE:

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TITLE:

**TYPICAL TRENCH SECTION
FOR UNDERGROUND
UTILITY INSTALLATION**

WATER

REVISION No.

—

DWG.No.

W009

4.0 SANITARY SEWERS

4.1 General

These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Sanitary sewer system designs shall be prepared under the direction of a design professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

Sanitary sewers are intended to convey wastewater only. This includes standard domestic plumbing fixtures, floor drains, approved industrial and commercial wastes and unavoidable infiltration. Sanitary sewer systems are intended to exclude stormwater, roof drains, footing drains and groundwater.

All urban or suburban residential, commercial and industrial development shall be provided with sanitary sewer service. For large rural parcels, on-site sewage disposal may be permitted, subject to approval by the Town of Bonnyville and regional and/or provincial health authorities.

4.2 Flow

Sanitary sewer system design shall be based on an average daily dry weather flow (ADWF) of 300 litres per day per capita (L/d/c).

Average dry weather flows (ADWF) shall be based on specific data related to the development or zoning. In the absence of such data or local regulations, use the above residential per capita flow and the following equivalent population factors:

<u>Land Use</u>	<u>Equivalent Population/Hectare (gross)</u>
Single Family Residential	40 people/ha
Single Family Small Lot Residential	50 people/ha
Multi-Family Low Density	35 people/ha
Medium Density	50 people/ha
High Density	275 people/ha
Commercial	75 people/ha
Institutional	40 people/ha
Industrial	80 people/ha

For identified commercial and institutional facilities, the average annual daily water demand shown in Figure 3.1 Typical Average Annual Daily Water Demands for Commercial and Institutional Facilities may be used as an estimate of ADWF, subject to Town of Bonnyville approval.

4.3 Peaking Factor

The peaking factor is the ratio of peak dry weather flow (PDWF) to the average dry weather flow (ADWF). Where possible, the peaking factor shall be based on locally recorded flow data from similar developments. In the absence of such data, the peaking factor shall be the larger of either 2.5 or the calculation using the design residential population and non-residential equivalent population to a maximum of 3.5, with the following formula:

$$PF = 1 + \frac{14}{4 + P^{0.5}} \quad \text{Where} \quad \begin{array}{l} PF = \text{Peaking Factor} \\ P = \text{Population and Equivalent (in thousands)} \end{array}$$

4.4 Infiltration

Design flow shall include an infiltration allowance to cover groundwater infiltration and system inflows. Irrespective of the land use classification, the allowance shall be based on the gross tributary area and the following:

$$\text{Infiltration allowance} = 0.28 \text{ L/s/ha}$$

For low density areas with large lots (>90 m frontage), or spaces between developed areas, the infiltration allowance shall be based on the total sewer system pipe sizes and lengths, including sewer mains, service connections and building sewers, and the following:

$$\text{Infiltration allowance} = 0.2 \text{ m}^3 \text{ per cm pipe diameter per kilometer per day}$$

Sanitary manholes are to be located away from roadway sags and low areas where surface runoff might pond. When this is unavoidable or the possibility of inundation by major drainage flows exists, the sanitary design peak flow rate shall be increased by 0.4 L/s for each manhole. For new construction, all sanitary manholes in sag locations are to be waterproofed.

Extraneous Flows: the weeping tile and the roof leaders shall not be connected to the sanitary sewer system.

4.5 Pipe Flow Formulas

4.5.1 Gravity Sewers

Use Manning's formula:

$$Q = \frac{AR^{0.667}S^{0.5}}{n} \quad \text{Where:} \quad \begin{array}{l} Q = \text{design flow in m}^3/\text{s} \\ A = \text{cross sectional area in m}^2 \\ R = \text{hydraulic radius (area/wetted perimeter) in m} \\ S = \text{slope of hydraulic grade line in m/m} \\ n = \text{roughness coefficient} = 0.013 \text{ for all pipe} \end{array}$$

Sanitary sewers are to be designed to carry the design flow at flow depth of 80% of the sewer diameter. This results in a flow rate approximately 86% of the sewer's full flow capacity.

4.5.2 Sewage Force Mains

Use Hazen- Williams formula:

$$Q = \frac{CD^{2.63}S^{0.54}}{278780}$$

Where: Q = rate of flow in L/s
D = internal pipe diameter in mm
S = slope of hydraulic grade line in m/m
C = friction coefficient = 120 for all pipe

4.6 Minimum Flow Velocities

Minimum design velocities:

- gravity sewers at 0.60 m/s
- force mains at 0.75 m/s

4.7 Alignment

Except as indicated for curved sewers, horizontal and vertical alignments shall be straight lines between manholes for gravity sewers, and between defined deflection points for force mains. Elevations are to be recorded.

Force main line and grade requirements are as indicated for water mains. Air release valves are required at high points.

4.8 Minimum Pipe Diameter

Collector Sewers	200 mm
Service Connections	100 mm
Sewage Force Mains	100 mm

Pipe material shall be PVC pipe – ASTM D3034 SRD35 (maximum 600 mm diameter). Larger pipe diameters shall be submitted for approvals by the Town of Bonnyville.

Installation is to comply with manufacturers recommendations.

4.9 Minimum Grade

Minimum grades of gravity sewers are as required to obtain the minimum velocity of 0.60 m/s except for the upstream section of a residential sewer serving a design population of 25 or less in which case the minimum grade is 0.6%, unless otherwise approved by the Town of Bonnyville.

Minimum slopes permitted for various sewer sizes are as follows:

<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%

Force main grades are as indicated for Water Distribution.

4.10 Curved Sewers

Horizontal and vertical curves may be formed using pipe joint deflections as follows:

- minimum radius = 60 m
- constant radius throughout curve
- joint deflection not to exceed 75% of maximum recommended by pipe manufacturer
- minimum design velocity = 0.9 m/s
- continuous curves between manholes

Minimum slopes permitted for various curved sewer sizes are as follows:

<u>Sewer Size</u>	<u>Minimum Slope</u>
200 mm	0.40%
250 mm	0.31%
300 mm	0.25%
375 mm	0.18%
450 mm	0.15%
525 mm	0.13%
600 mm	0.10%

4.11 Depth

Sewers shall be of sufficient depth to:

- permit gravity service connections to basements
- prevent freezing – provide insulation where minimum depth can not be attained
- clear other underground utilities
- prevent damage from surface loading
- minimum depth of cover 3.0 m to top of pipe measured from finished design grade
- maximum depth of cover 4.5 m, except under special circumstances with approval in writing from the Town Engineer

4.12 Manholes

4.12.1 Design Features

Manholes shall be precast concrete with a minimum 1200 mm inside diameter in the main portion of the structure and shall conform to the latest version of ASTM C478. All concrete shall be sulfate resistant.

Sanitary Sewer Pipes \leq 600 mm	1200 mm Manhole
Sanitary Sewer Pipes $+600$ mm	1500 mm Manhole

Frames and covers shall be of cast iron and capable of withstanding H - 20 loading. The words "Sanitary Sewer" shall be permanently embossed on the cover.

All joints shall be designed and constructed to be water tight using a bitumastick watertight sealant.

PVC mains shall be connected to manholes using either a manhole adaptor or an approved pre-benched manhole base.

The maximum change in the direction of flow in any sanitary sewer manhole shall be 90°.

The maximum drop allowed across a manhole is 0.5 m. If the design of the sewer system is such that the difference in elevation between the manhole inlet and outlet exceeds 0.5 m, a manhole drop structure as shown on the standard detail drawings will be required.

Safety grates shall be required in manholes deeper than 4.5 m, constructed in accordance with the Alberta Occupational Health and Safety Standards.

4.12.2 Required Locations

Manholes are required at the following locations:

- every change of pipe size
- every change in grade, except as indicated in the Curved Sewers section
- every change in direction, except as indicated in the Curved Sewers section
- downstream end of curved sewers
- every pipe intersection except for 100 mm and 150 mm service connections and junctions with trunk sewers 900 mm diameter and larger
- upstream end of every sewer line
- every future pipe intersection
- 120 m maximum spacing.

4.12.3 Hydraulic Details

Crown elevations of inlet sewers not lower than crown elevation of outlet sewer.

Minimum drop in invert elevations across manholes:

Straight run	5 mm drop
Deflections up to 45°	20 mm drop
Deflections 45° to 90°	30 mm drop

Drop manhole and ramp structures shall be avoided where possible by steep-ending inlet sewers. Where necessary, provide drop structures as follows:

<u>Invert Difference</u>	<u>Structure</u>
Up to 0.25 m	Inside Ramp
0.25 to 0.90 m	Outside Ramp ¹
Greater than 0.90 m	Outside Drop ¹²

¹ For tie-ins to existing manholes

² Inside drop may be used if specifically approved by the Town of Bonnyville.

Force main discharges shall be directed into the receiving manhole outflow pipe. Manhole benching shall be extended a minimum 200 mm above the force main crown. If a manhole drop can not be avoided, an inside drop pipe is required.

4.13 **Service Connections**

Every legal lot and each unit of a residential duplex shall be provided with a separate service connection.

Unless otherwise approved by the Town of Bonnyville, connections are to serve all plumbing by gravity. Drawings to provide service invert at property line and minimum service elevation at building setback location.

4.13.1 Size

Pipe size is to accommodate peak design flow. Minimum pipe size is 100 mm diameter.

4.13.2 Location and Depth

Connections to large lots are to be located at the lower portion of each lot. For residential developments, locate connections in accordance with detailed drawings.

Depth requirements are as indicated for sewer mains.

4.13.3 Grade

Minimum grade from property line to sewer main is

100 mm diameter pipe	1.50 %
150 mm diameter pipe	1.00 %
Larger Sizes	Grade based on minimum velocity of 0.75 m/s

4.13.4 Details

Use standard wye fittings for connections to new mains. For connections to existing mains, use wye saddles or, if approved, insertable tees. The service connection centerline must not be below the sewer main centerline.

Double stainless steel strapped PVC saddles shall be used on all sewer service connections at the main.

Service connections may be permitted into manholes if:

- the connection is not oriented against the flow in the main
- manhole hydraulic requirements are met.

Inspection chambers are required on residential connections unless the service is less than 2.5 m long and connects to a manhole.

Control inspection manholes are required on all industrial and commercial connections or on a service connection larger than 150 mm diameter.

Connections exceeding 30 m in length shall be treated as mains.

All 100 mm, sanitary sewer service pipes shall be polyvinyl chloride (PVC) with a minimum SDR of 28, other sizes to be PVC, SDR 35.

All sanitary sewer service lines must have a 200 mm vertical inspection chamber complete with cast iron security cover at final lot grade located within 300 mm of the property line on the public side. When a gas easement occurs adjacent to the property line the service shall be stubbed 300mm beyond easement limits.

4.14 **Testing of Sewers**

4.14.1 Water Leakage Test

In areas where the ground water table rises up to the sewer pipe invert or higher, each section of sewer mains and service connections shall be tested for water tightness by an infiltration test. In all other situations, an exfiltration test may be required after review of the camera inspection report.

Maximum allowable leakage for an exfiltration test of a sewer pipe while subjected to a minimum 0.6 m hydrostatic head of water is 40 l/d/mm of diameter/km of PVC Pipe.

Tests shall be undertaken on each section of sewer main and the results recorded.

4.14.2 Camera

All sections of sewer shall be inspected with closed circuit television camera equipment. An inspection report, photos and DVD or video cassette shall be submitted to the Town for their records.

4.15 **Locations and Corridors**

Sewers shall be located within roadways as shown on the applicable municipal standard drawings. Servicing from roadways is required unless a depth greater than 4.5 m would be required to provide gravity service. Rear yard sewers and pumped connections are to be avoided, and advance approval is required.

Where a sewer crosses private land, right-of-way requirements are as indicated in Section 2.0 General Design Considerations.

Clearance from water mains is as indicated in Section 2.0 General Design Considerations.

4.16 **Pump Stations**

The use of pump stations shall be avoided where possible. Any proposed use of pump stations must receive prior written approval from the Town Engineer. Preliminary design must be approved before detailed design proceeds.

4.16.1 Preliminary Design Requirements

System Layout:	Select location(s) to minimize long-term total number of pump stations
Location:	Within right-of-way adjacent to road
Capacity:	Dependent upon the development and catchment area - designs must consider short, intermediate and long-term future flows
Configuration:	Submersible duplex pump system unless otherwise approved in advance

Other basic criteria include:

- construction dewatering requirements
- access for construction and maintenance
- aesthetics, noise, odour control and landscaping
- security against vandalism and theft
- flood elevations and station uplift design
- proximity of receiving sewers, water mains and power supply
- minimizing energy requirements
- types of controls to be PLC or relays, ultrasonic or float controls and SCADA connection or capability

- standby power, emergency backup power or emergency storage
- soils – subsurface investigations must be undertaken prior to site approval
- convenience of operation and maintenance
- safety for operators and public
- capital costs and operation and maintenance costs.

4.16.2 Design Features

Pump stations shall be designed with a minimum of two pumps, capable of handling the maximum flow condition with any one pump off line. A mixer shall be provided, or one pump equipped with an automatic flush valve.

Pump requirements are as follows:

- capable of passing solids up to 75 mm in size - for small flows (<10 l/s) recessed impeller type pumps with 50 mm solids capability may be considered, subject to approval by the Town Engineer
- maximum motor speed of 1750 RPM – for small flows (<10 l/s) 3,500 RPM may be considered
- explosion proof
- 600 volt three (3) phase electrical power – lower voltage (208 volt, three (3) phase) may be considered depending upon service voltage available from the power company
- easily removed for maintenance
- able to operate alternately and independently of each other
- able to meet maximum flow condition with one pump in failure mode
- sized so that each motor does not cycle more than six (6) times in one (1) hour under normal operating conditions.

Check valves and plug valves required on each pump discharge.

Gate valve required on influent line outside pump station.

Regardless of the type of emergency standby system provided, a riser from the forcemain with rapid connection capabilities and appropriate valving shall be provided for lift stations to hook up portable pumps.

Minimum wet well size of 2.4 m diameter.

Wet well bottom to be benched to direct solids to pump suction.

Pump station lids to be waterproof and provided with locks. Covers may be either aluminum or fiberglass. Fasteners to be 316 stainless steel. Lids to be 300 mm above ground level.

Station access to be by aluminum ladder. Ladder to be located to avoid interference with removal and installation of pumps. Ladder to be provided with extension and lock at least 600 mm above station lid. Fibreglass grating platform to be provided above high water level for wet well access. Access, ladder and platform to meet OH&S standards.

Access to be located above 200 year flood level or 1.0 m above highest recorded flood elevation.

Metal stations are not permitted.

Steel and fiberglass surfaces to receive minimum two (2) coats of two (2) component white epoxy enamel. Concrete stations to be designed to prevent sulphide attack.

Auxiliary equipment and control panels to be housed in weatherproof kiosk adjacent to station. Kiosk to be located not less than 2.0 m and not more than 4.0 m from station lid.

Kiosk to contain separate compartment for pump station ventilation fan.

Explosion proof intake fan, activated by a manual switch and of sufficiently capacity to exchange the total volume of air inside the station with fresh air within three (3) minutes. Fans to be located in kiosk. Intake duct to terminate near maximum water level. Exhaust vent to be provided in top of pump station.

Wiring in station and fan compartment to be explosion proof, Class 1, Division 2. Electrical design and installation subject to approval by Provincial Safety Inspector.

Power and control cables to be continuous from within the pump station to within the kiosk.

Levels to be controlled by ultrasonic level transmitter, plus emergency high and low level floats.

Unless otherwise approved, controls to be PLC based and connected to the Town SCADA system.

Station to be complete with an Uninterruptible Power Supply (UPS) to serve alarms and controls.

Control panel to include hour meter and ammeter for each pump.

Station to include magnetic flow meter with totalizer and connection to SCADA.

Pump control panel to incorporate operator interface with indicator lamps.

Control kiosk to be designed to contain control and SCADA equipment on front panel and power equipment on rear panel. Concrete base to be minimum 75 mm above finished grade.

Stations to include automatic generator sets for standby power in case of power failure or, with approval, a transfer switch to connect to portable standby power. Provision for SCADA system to be included. Generator set enclosures to be weatherproof and to include noise control. For small pump stations, emergency storage may be considered in place of standby power. Emergency storage is to be based on eight (8) hours of average day flows plus infiltration. Regardless of the type of emergency standby system

provided, a riser from the forcemain with rapid connection capabilities and appropriate valving shall be provided for lift stations to hook up portable pumps.

A minimum 50 mm water connection with standpipe and cross-connection protection must be provided on site for cleaning purposes.

Area around station and related equipment or building is to be graded, graveled with 200 mm of 20 mm crushed grave and fenced. Size of area to be determined by maintenance requirements and minimum 1.2 m clearance to structures with doors opened. Layout of structures and gates is to provide for clearances for pump removal by hoist truck.

Odour control is required.

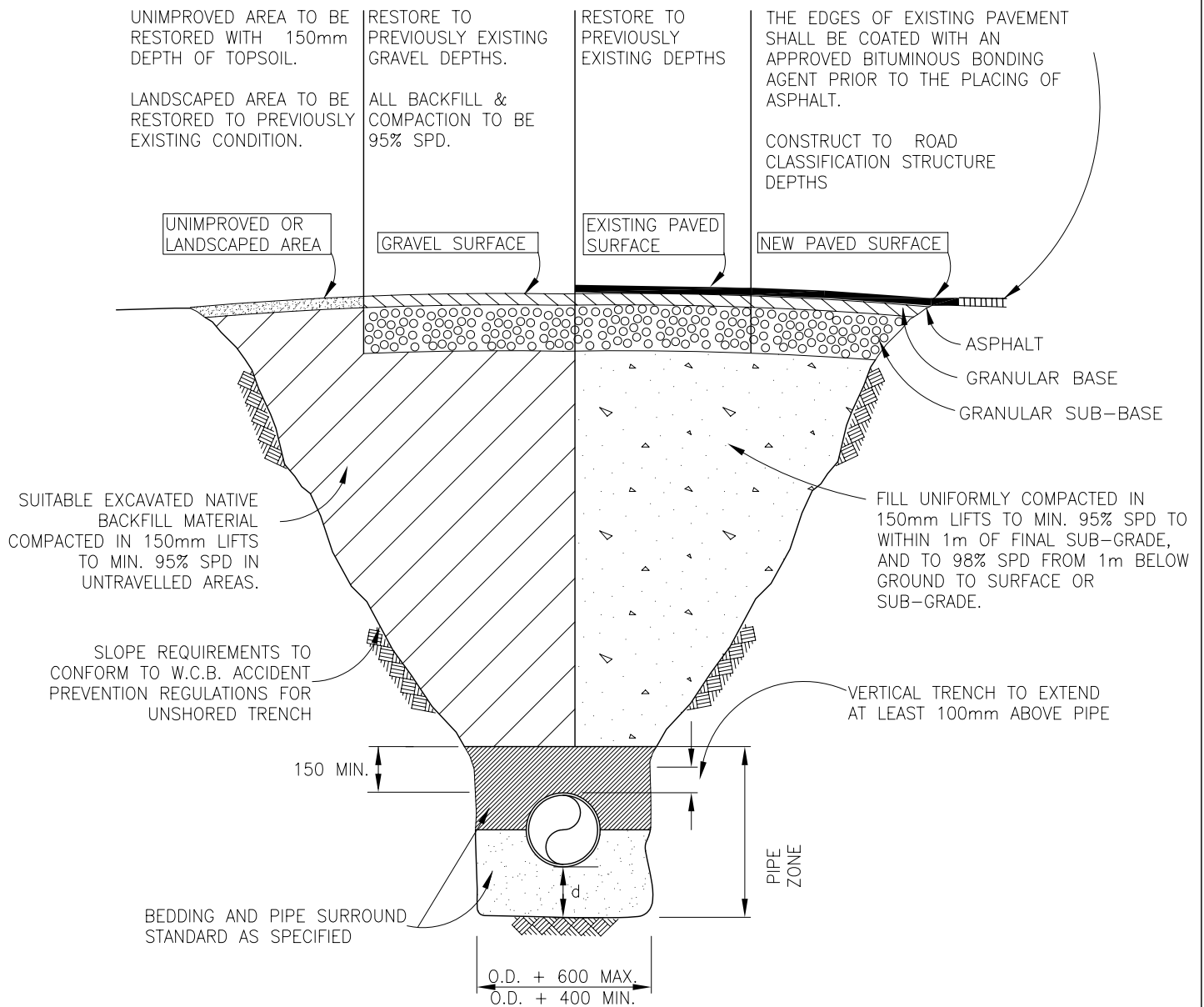
Design in accordance with appropriate seismic standards.

Equipment to be CSA approved and have minimum one (1) year guarantee on parts and labour. All equipment must be tested prior to acceptance.

Designer is to provide three (3) copies of a comprehensive Operating and Maintenance Manual.

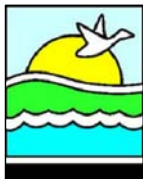
Final selection of process and mechanical equipment shall be reviewed by the Town for approval in an effort to standardize equipment throughout the Town's facilities.

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d = 150mm MIN. DEPTH OF BEDDING BELOW PIPE

Town of Bonnyville



SCALE:

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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

**TYPICAL TRENCH SECTION
FOR UNDERGROUND
UTILITY INSTALLATION**

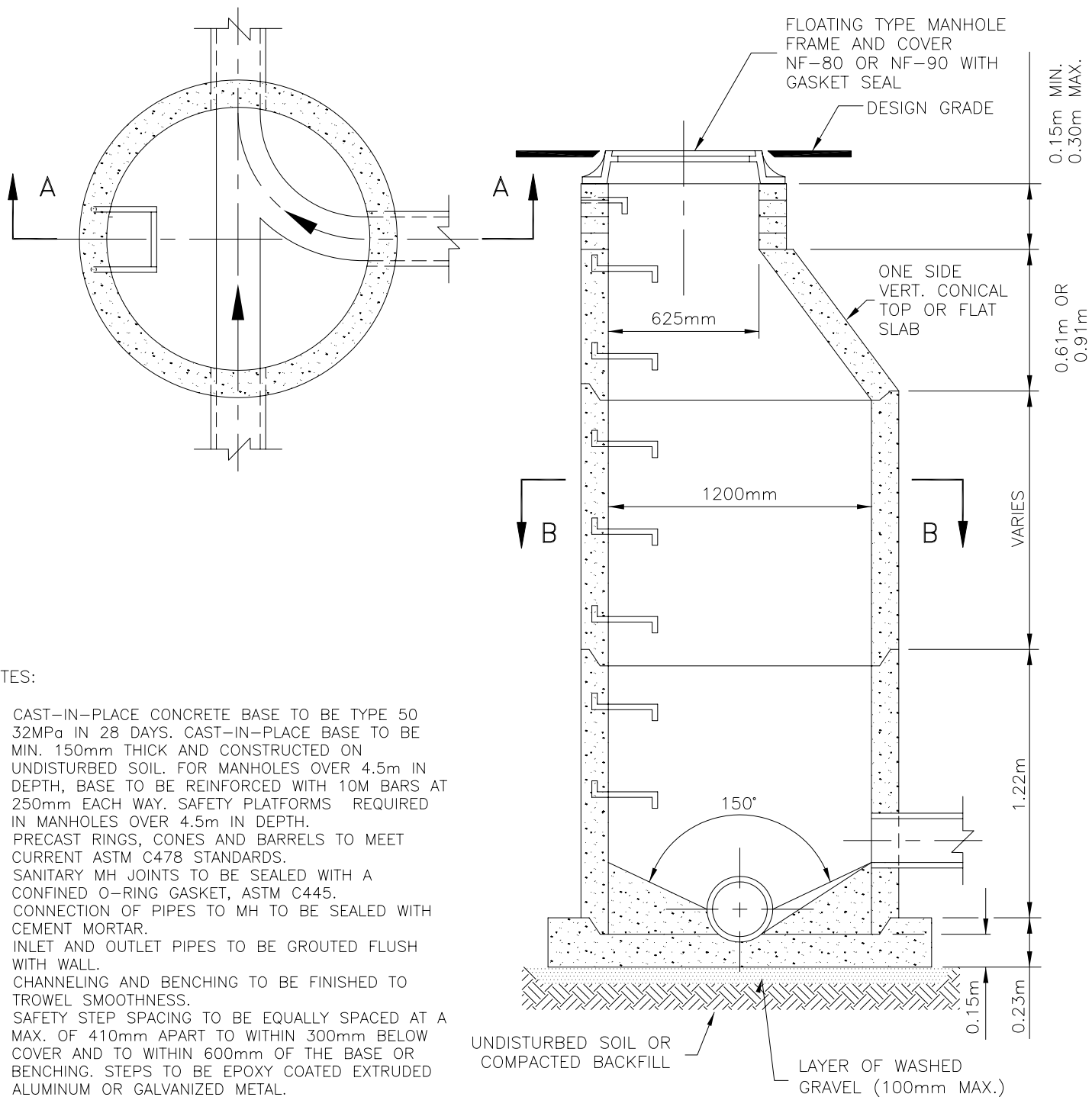
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REVISION No.

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DWG.No.

S001



NOTES:

1. CAST-IN-PLACE CONCRETE BASE TO BE TYPE 50 32MPa IN 28 DAYS. CAST-IN-PLACE BASE TO BE MIN. 150mm THICK AND CONSTRUCTED ON UNDISTURBED SOIL. FOR MANHOLES OVER 4.5m IN DEPTH, BASE TO BE REINFORCED WITH 10M BARS AT 250mm EACH WAY. SAFETY PLATFORMS REQUIRED IN MANHOLES OVER 4.5m IN DEPTH.
2. PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT ASTM C478 STANDARDS.
3. SANITARY MH JOINTS TO BE SEALED WITH A CONFINED O-RING GASKET, ASTM C445.
4. CONNECTION OF PIPES TO MH TO BE SEALED WITH CEMENT MORTAR.
5. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
6. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
7. SAFETY STEP SPACING TO BE EQUALLY SPACED AT A MAX. OF 410mm APART TO WITHIN 300mm BELOW COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING. STEPS TO BE EPOXY COATED EXTRUDED ALUMINUM OR GALVANIZED METAL.
8. COMPACT BACKFILL AROUND MH TO A MIN. OF 95% STANDARD PROCTOR DENSITY.
9. 1500mm MANHOLE SHALL BE USED FOR PIPING OF 750mm, 900mm, AND 1050mm DIAMETER. FOR PIPES 1200mm Ø AND LARGER MANHOLE TEE RISERS SHALL BE USED.

SECTION A - A

Town of Bonnyville



SCALE:

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JANUARY 2007

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DATE: JANUARY 2007

APPROVED BY:

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TITLE:

STANDARD 1200mm MANHOLE
(PIPING UP TO 600mm DIAMETER)

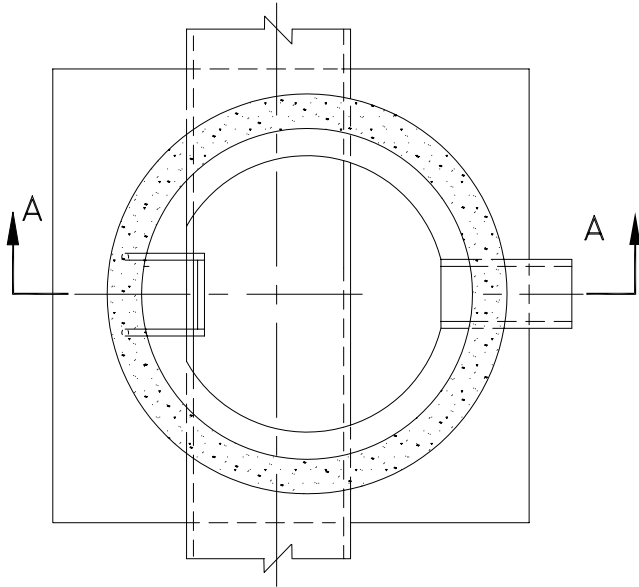
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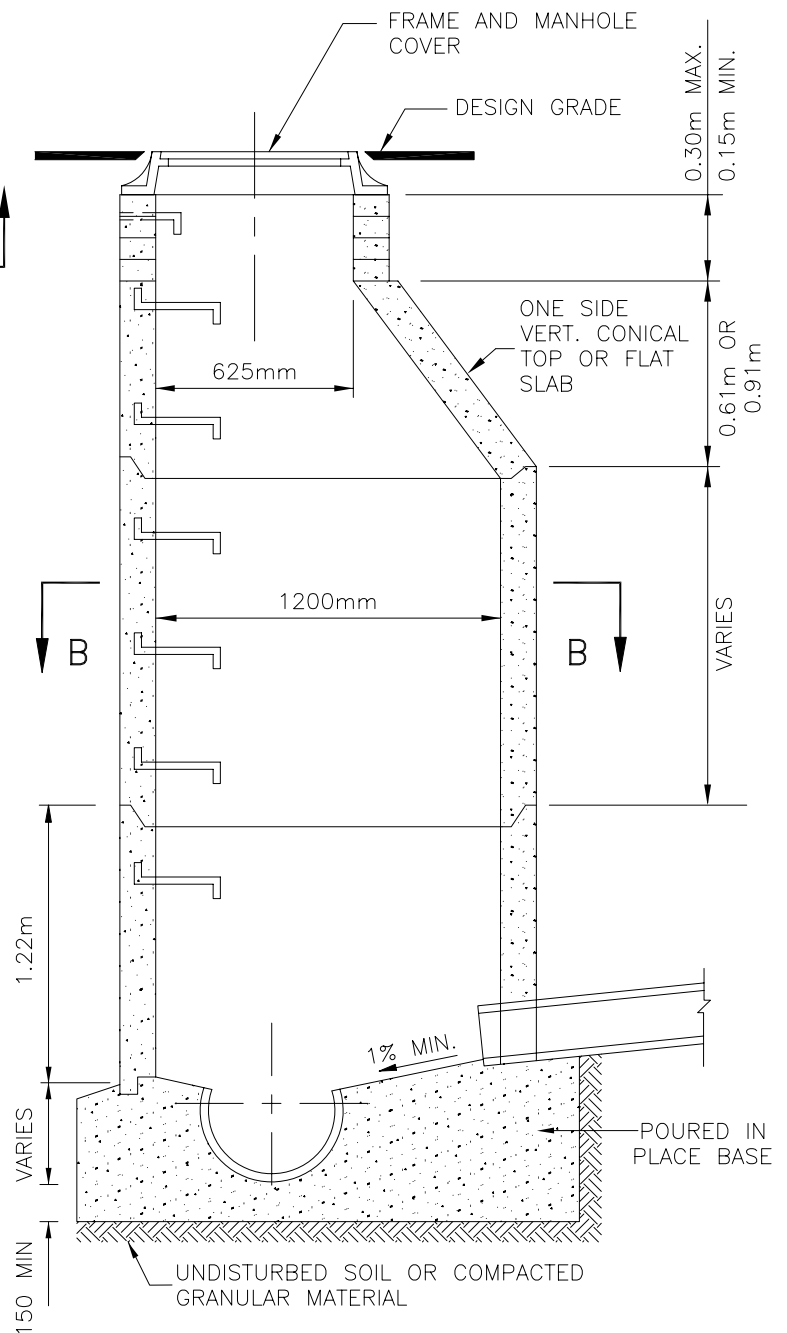
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SECTION B - B

NOTES:

1. CAST-IN-PLACE CONCRETE BASE TO BE TYPE 50 32MPa IN 28 DAYS. CAST-IN-PLACE BASE TO BE MIN. 150mm THICK AND CONSTRUCTED ON UNDISTURBED SOIL. FOR MANHOLES OVER 4.5m IN DEPTH, BASE TO BE REINFORCED WITH 10M BARS AT 250mm EACH WAY. SAFETY PLATFORMS REQUIRED IN MANHOLES OVER 4.5m IN DEPTH.
2. PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT ASTM C478 STANDARDS.
3. SANITARY MH JOINTS TO BE SEALED WITH A CONFINED O-RING GASKET, ASTM C445.
4. CONNECTION OF PIPES TO MH TO BE SEALED WITH CEMENT MORTAR.
5. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
6. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
7. SAFETY STEP SPACING TO BE EQUALLY SPACED AT A MAX. OF 410mm APART TO WITHIN 300mm BELOW COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING. STEPS TO BE EPOXY COATED EXTRUDED ALUMINUM OR GALVANIZED METAL.
8. COMPACT BACKFILL AROUND MH TO A MIN. OF 95% STANDARD PROCTOR DENSITY.



SECTION A - A

Town of Bonnyville



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JANUARY 2007

LATEST REVISION

DATE:
JANUARY 2007

APPROVED BY:

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TITLE:

**STANDARD 1200mm
PERCHED MANHOLE**

SANITARY

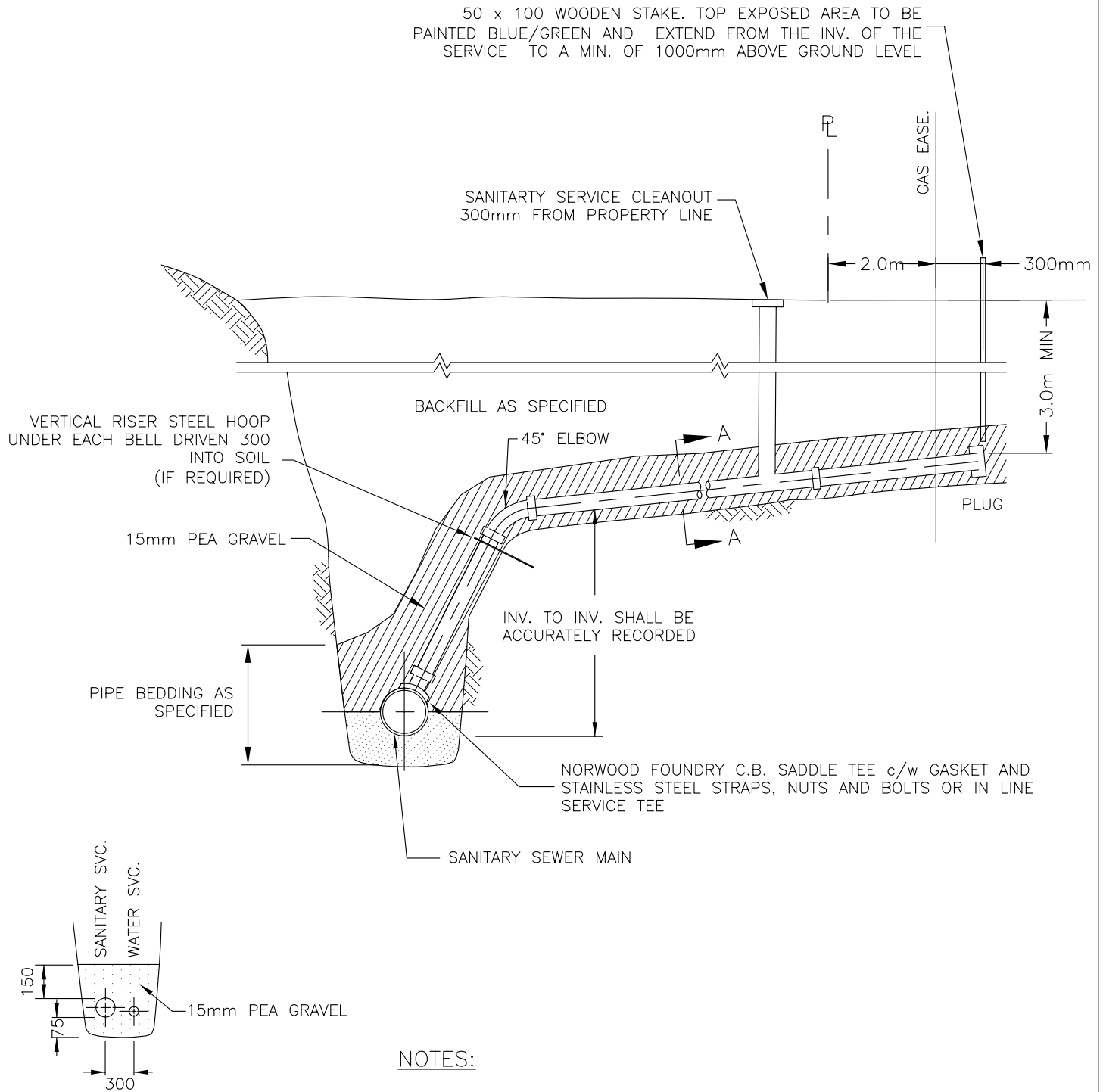
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S003

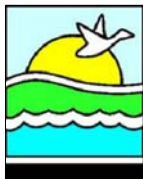
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NOTES:

1. MIN SLOPE FOR 100mmØ PIPE IS 1.5%; 150mm Ø PIPE IS 1%.
2. SERVICE CONNECTIONS SHALL BE MINIMUM 100mm Ø SDR 35 PVC.
3. TOWN TO INSPECT ALL RISER INSTALLATIONS PRIOR TO BACKFILLING.
4. WHEN A GAS EASEMENT OCCURS ADJACENT TO THE P/L THE SANITARY SERVICE SHALL BE STUBBED 300mm BEYOND EASEMENT LIMITS.

Town of Bonnyville



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DATE DRAWN:

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LATEST REVISION

DATE:
JANUARY 2007

APPROVED BY:

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TITLE:

STANDARD SANITARY
SERVICE CONNECTION

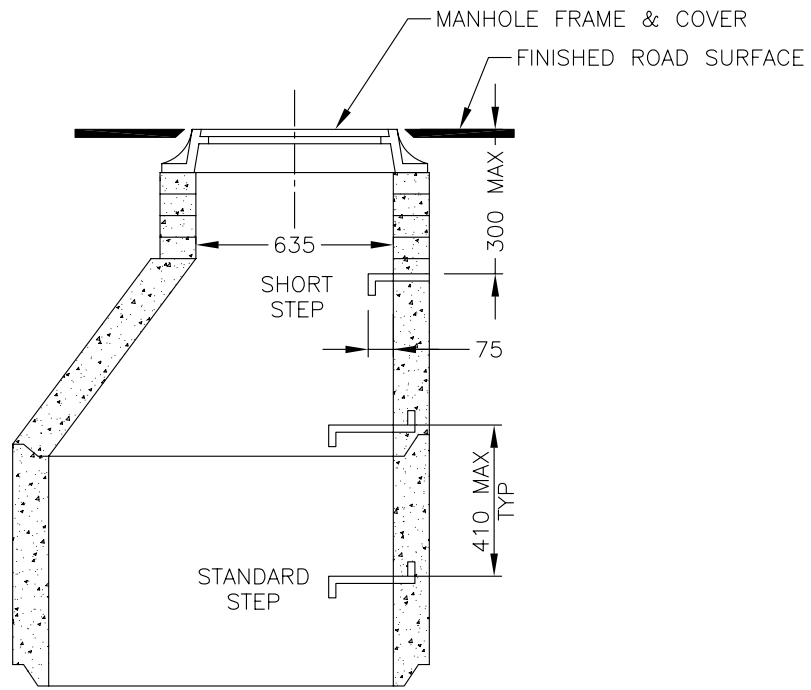
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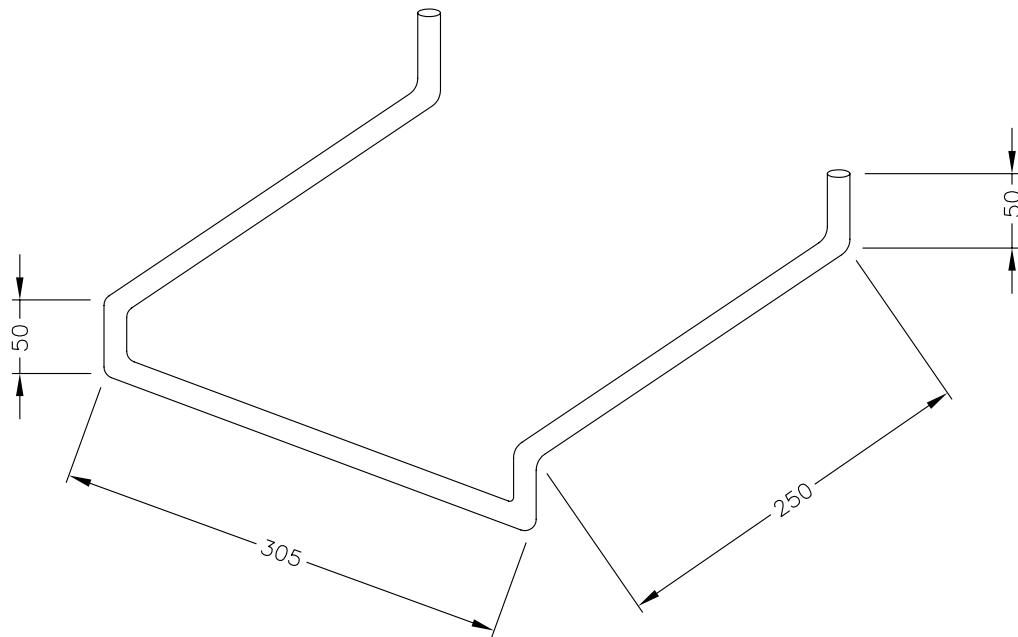
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DWG.No.

S004



TYPICAL MANHOLE SECTION



SAFETY STEP ISOMETRIC VIEW
(CAST IN PLACE OPTION)

Town of Bonnyville



SCALE:

NOT TO SCALE

DATE DRAWN:

JANUARY 2007

LATEST REVISION

DATE:
JANUARY 2007

APPROVED BY:

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TITLE:

SAFETY STEPS
FOR MANHOLE

SANITARY

REVISION No.

—

DWG.No.

S005

5.0 STORM DRAINAGE

5.1 General

These guidelines are not intended to be a substitute for sound engineering knowledge and experience. Drainage designs shall be prepared under the direction of a design professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

These guidelines are intended to cover only minimum requirements. Drainage designs must conform to local government bylaws, regulations, guidelines and policies plus federal and provincial statutes and guidelines. These include but are not limited to the following:

- Supplementary Design Guidelines
- Subdivision and Development Control Bylaws
- Master Drainage Plan or Watershed Drainage Plan
- Municipal Government Act
- Fisheries Act
- Water Act
- Navigable Waters Protection Act
- Wildlife Act
- Migratory Birds Convention Act
- Dyking Act
- Land Development Guidelines for the Protection of Aquatic Habitat (Canada)
- Stormwater Management Guidelines for the Province of Alberta
- National Guide to Sustainable Municipal Infrastructure (Canada)

5.2 Storm Water Management

Storm water management involves the planning and design necessary to mitigate the hydrological impacts of land development or land use changes. Adverse hydrological impacts include such things as increased peak storm water flows, erosion, sedimentation, flooding, reduced surface infiltration, reduced minimum groundwater levels and stream flows, water quality deterioration and degradation of aquatic and wildlife habitats. Mitigation measures include but are not limited to the following:

- appropriate sizing and routing of pipes and channels
- major flow path routing
- detention storage
- sediment removal
- biofiltration
- landscaping
- source control
- erosion protection
- groundwater infiltration
- subsurface disposal
- lot grading.

5.3 Integrated Storm Water Management Plan

Unless otherwise indicated an Integrated Storm Water Management Plan is required for all developments larger than 3.0 ha, except those in rural or agricultural areas where lots are larger than 0.4 ha. The storm water management plan shall include the following:

1. Tributary areas in the catchment with existing and potential land uses.
2. Details indicating how the local catchment area relates to the boundaries in the Master Drainage Plan or Watershed Drainage Plan, if such plan has been developed by the Town of Bonnyville.
3. Contours at 0.5 m elevation intervals.
4. Existing watercourses and wetlands, including environmental classifications and/or fish presence information, if available.
5. Layouts of existing and proposed drainage systems.
6. Major flow paths.
7. Conceptual lot grading patterns.
8. Proposed source control and/or quality treatment facilities, if appropriate.
9. Locations, sizes and hydraulic grade line (HGL) elevations of proposed detention facilities, if appropriate.
10. Other proposed mitigation measures, if appropriate.
11. Proposed minimum building elevations (MBE) and 100 year HGL of major flowpath.
12. Construction sedimentation control plan.
13. Pre and post development flows, with and without the mitigation measures.
14. Current and future upstream and downstream flows and system capabilities.

5.4 Minor and Major Systems

Each drainage system consists of the following components:

5.4.1 The Minor System

The minor system consists of pipes, manholes, gutters, catch basins, driveway culverts, open channels, and watercourses outfall structure. The minor system shall convey runoff from snowmelt and rainfall events less than or equal to 1 in 5 year storm event without any surface ponding or excessive surface flow.

The pipes are to be sized to convey the design flow (1 in 5 year peak flow) when flowing full with the hydraulic gradeline at the pipe crown.

Where a storm sewer discharges into a watercourse, provide riprap bank protection and if necessary, energy dissipation facilities. Avoid discharge perpendicular to stream flow.

5.4.2 The Major System

Consists of surface flood paths, roadways, roadway culverts, watercourses and storm water management facilities designed to carry runoff from events up to and including 1 in 100 year storm event.

If required to accommodate low building elevations, and if approved, a piped minor system may be enlarged or supplemented to accommodate major flows.

5.5 **Runoff Analysis**

Storm drainage design shall be carried out using one or both of the following methods as indicated below. Calculations are to be submitted with designs.

- Rational Method: applicable to preliminary design and to detailed design of minor drainage systems in urban areas where detention or other runoff controls are not required. Use of the Rational Method should be limited to areas less than 65 ha.
- Rainfall-Runoff Simulation Method: applicable to design of complex minor drainage systems and all storage calculations and major drainage systems. The computer program proposed for use is subject to approval by the Town of Bonnyville.

5.6 **Rational Method**

The Rational Method for calculation of peak flows for use as indicated in the Runoff Analysis section is as follows:

$$Q = CAI/360 \quad \text{Where:} \quad \begin{array}{l} Q = \text{peak flow in cubic m}^3/\text{s} \\ C = \text{runoff coefficient} \\ I = \text{intensity of rainfall in mm per hour} \\ A = \text{area of catchment in hectares (h)} \end{array}$$

Factors for use in the Rational Formula are indicated below:

5.6.1 Runoff Coefficients

The following runoff coefficients are for use with the Rational Formula. These coefficients are for general application only. Design values are subject to verification by the designer and approval by the Town Engineer.

Higher values may be applicable in consideration of rainfall during the winter when the ground is frozen. These values may reach 0.80 to 0.95.

Land Use	Percent Impervious	Runoff Coefficient	
		5/10 Year Storm	100 Year Storm
Suburban Residential (Lots > 0.4 ha)	20	0.35	0.40
Low Density Residential	40	0.50	0.55
Medium Density Residential	65	0.60	0.65
High Density Residential	78	0.70	0.75
Commercial	90	0.80	0.85
Industrial	90	0.80	0.85
Institutional (eg. Schools)	80	0.75	0.80
Parks/Grasslands	20	0.20	0.30
Cultivated Fields	30	0.30	0.40
Woodlands/Agricultural	5	0.10	0.30

5.6.2 Rainfall Intensity Duration Frequency (IDF) Data

As Bonnyville has no IDF data, the rainfall intensity for the Rational Method shall be determined using Cold Lake rainfall IDF curve with the duration equal to the Time of Concentration (T_c) calculated as indicated in Section 5.6.3. Cold Lake IDF data is indicated in the table below. (Based on AES data at Cold Lake Airport, Cold Lake, AB for period 1966 to 1990. Latitude: 5425 and Longitude: 11017 and Elevation 539 m).

Rainfall Intensity Duration Frequency (IDF)						
<u>Duration</u>	<u>2 Year</u>	<u>5 Year</u>	<u>10 Year</u>	<u>25 Year</u>	<u>50 Year</u>	<u>100 Year</u>
5 min	72.0	101.9	121.7	146.7	165.3	183.7
10 min	54.9	79.4	95.6	116.0	131.1	146.2
15 min	44.2	65.5	79.7	97.6	110.9	124.1
30 min	27.5	42.4	52.3	64.8	74.1	83.3
1 hour	16.4	25.0	30.8	38.0	43.4	48.7
2 hours	9.7	14.1	17.0	20.8	23.5	26.2
6 hours	4.4	5.8	6.7	7.9	8.8	9.7
12 hours	2.7	3.7	4.3	5.1	5.6	6.2
24 hours	1.6	2.2	2.7	3.2	3.5	3.9

5.6.3 Time of Concentration

The time of concentration is the time required for runoff to flow from the most remote part of the catchment area under consideration to the design node. The time of concentration can be calculated using the following formula:

$$T_c = T_i + T_t \quad \text{Where:} \quad \begin{array}{l} T_c = \text{time of concentration (minutes)} \\ T_i = \text{inlet or overland flow time (minutes)} \\ T_t = \text{travel time in sewers, ditches, channels or} \\ \quad \text{watercourses (minutes).} \end{array}$$

5.6.4 Inlet or Overland Flow Time (T_i)

Typical inlet times for urban areas should not exceed 10 minutes.

The inlet time for larger areas can be calculated using the "Airport Method" as follows:

$$T_i = \frac{3.26 (1.1 - C) L^{0.5}}{S^{0.33}} \quad \text{Where:} \quad \begin{array}{l} T_i = \text{inlet time (minutes)} \\ C = \text{runoff coefficient (see above)} \\ L = \text{travel distance (m) - max length} = 300 \text{ m} \\ S = \text{slope of travel path (\%)} \end{array}$$

5.6.5 Design Summary Sheet

Rational Method design calculations are to be tabulated and submitted.

5.7 **Simulation Method**

For storm water Systems servicing areas greater than 65 ha and all storm water systems with storage facilities, computer modeling and simulation techniques will be used.

5.7.1 Model Selection

Selection of computer programs requires review of the historical application of each program in watersheds similar to those under consideration. Town approval of computer program selection shall be obtained before design is commenced.

The OTHYMO or SWMM models are recommended to be used in the design of dual (major and minor) drainage systems; however other suitable programs may be used as approved by the Town Engineer.

5.7.2 Modelling Procedures

Whenever possible, modeling results shall be calibrated using observed rainfall and flow data from the design watershed or a similar watershed. Sensitivity of the model predictions to variations of key parameters shall be tested and the findings used to develop realistic and conservative models.

5.7.3 Storm Duration

The IDF curve and rainfall distribution curves from Atmospheric Environmental Services (AES) and the US Soil Conservation Service (SCS) should be used to develop rainfall hyetographs with different durations. Details of the selection and interpolation procedure are to be documented and submitted to the Town of Bonnyville for approval.

For small urban areas (up to 50 ha), a storm duration of 1.0 hour is suitable. For larger areas and urban areas with detention facilities, the design storm with durations of 2, 6, 12 and 24 hours should be considered for simulation. A different range of storm durations may be appropriate, subject to Town approval. This will identify the critical storm event to be used in designing the system component. Note that the storm durations that generate the critical peak flow may be different from the durations that generate the critical storage volume. Systems with a number of interconnected ponds or with restricted outlet flow capacity may require analysis for sequential storm events or modeling with a continuous rainfall record.

Detailed designs shall include maximum hydraulic gradelines (HGLs) of the minor and major systems plotted on profiles of the minor system components and compared with minimum building elevations (MBE) to demonstrate flood protection.

5.7.4 Submission of Modelling Results

Modeling results are to be submitted to the Town in a report containing at least the following information:

- plans showing catchment and subcatchment boundaries, slopes, soil conditions, land uses and flow control facilities;
- name and version of modeling program(s)
- parameters and simulation assumptions
- design storm details
- pre-development and post-development flow calculations

5.8 **Discharge Rates and Quality**

Drainage systems shall be designed to control post-development runoff so that it does not exceed 1 in 100 year peak flow in pre development conditions.

Runoff quality treatment shall be considered for flows up to 50% of the two (2) year post-development peak flow or the five (5) year pre-development peak flow, whichever is greater. Quality treatment facilities include, but are not limited to, oil/grit separators for service stations, silt traps, detention storage facilities, grassed swales and constructed wetlands. Designs are to comply with the requirements of the Town, federal, provincial and regional statutes and guidelines as noted above.

Treatment facilities shall include provisions for maintenance equipment access.

5.9 Site and Lot Grading

Grading is to comply with the Alberta Building Code and the following:

- grade lots to drain to a municipal minor or major drainage system, natural drainage path or roadway - use 1% minimum grade
- avoid drainage across adjacent lots – if cross-lot drainage is unavoidable, provide a swale to divert runoff away from the lower lots
- grade areas around buildings away from foundations
- where lots are lower than the adjacent roadways, direct road runoff away from buildings and driveways and into a municipal drainage system
- set building elevations above the hydraulic grade line (HGL) of the major drainage system – see Minimum Building Elevations (MBE) guidelines.

In general, the lots shall be graded to achieve a minimum slope of 2% (preferably 4%) away from the building and a minimum slope along the lot lines of 1% or as approved in writing by the Town Engineer.

In cases where the backyard slopes towards the building, provisions are required to keep the runoff at least three (3) m away from the rear of the building with the possibility of draining the surface water along the lot lines into the storm sewer drainage system.

Reserves and public lands shall be graded to drain toward developed streets, lanes and/or the storm sewer drainage system.

Lots shall be pre-graded to design grade or 300 mm below design grade.

Plans submitted by the Design Engineer shall indicate the following information:

- existing contours and proposed corner grades showing drainage to roadway and not across adjacent property
- minimum ground elevation at the building
- invert of sanitary sewer service
- location of water, sanitary sewer and storm sewer connections
- direction of drainage showing lot grading away from buildings and on to public roadway only
- actual elevation of the top of the sidewalk at the corner of the property
- the proposed and existing grades for the Public lands (reserves, buffers and boulevards).

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

5.10 Minimum Building Elevations (MBE)

The MBE applies to the elevation of the lowest floor slab in a building or the underside of the floor joists where the lowest floor is constructed over a crawl space. Crawl space is defined as the space between a floor and the underlying ground having a maximum height of 1.2 m to the underside of the joists and not used for the storage of goods or equipment damageable by floodwaters.

The MBE is to be at least 0.60 m above the storm sewer service connection invert and 0.30 m above the major drainage system hydraulic gradeline (HGL).

For sites near a watercourse for which a floodplain elevation has been established, the MBE is 0.30 m above the 200 year period instantaneous flood elevation.

5.11 Storm Sewer Mains - Materials

Pipe material shall be to the latest version of:

Concrete Pipe	ASTM C76 or C655, sulfate resistant
PVC Pipe	ASTM D3034 SDR 35 (maximum 375 mm diameter)
PVC Pipe <u>(Ultra-Rib)</u>	ASTM F 794-83 and CSA B 182.4 (450 mm to 750 mm diameter)

Storm water pipe inlets and outfalls shall be constructed such that ground erosion is minimized. To meet this requirement head walls, end walls, nursery sod, rip rap, gabions or other approved structures may be required in constructing the inlets and outfalls.

5.11.1 Ditch Inlets

Ditch inlets to storm sewers shall include safety grills for pipes larger than 600 mm diameter. A maximum clear bar spacing of 150mm shall be used for gratings.

5.11.2 Alignment

Except as indicated for Curved Sewers, horizontal and vertical alignments are to be straight lines between manholes. Elevations are to be recorded.

5.11.3 Minimum Pipe Diameter

Storm Sewers	300 mm
Culverts	
▪ Crossing Roads	450 mm
▪ Crossing Driveways	300 mm
Catch Basin Leads	250 mm

Downstream pipe sizes are not to be reduced unless the downstream pipe is 600 mm diameter or larger and increased grade ensures adequate capacity. Detailed hydraulic analysis is required. The maximum reduction is two (2) pipe sizes.

5.11.4 Minimum and Maximum Grade

The slope of the storm sewers should be designed so that the minimum pipe velocity is 0.6 m/s when flowing full. For catch basin leads and service connections, minimum grades are as indicated in the following sections.

Where steep grades result in velocities exceeding 6 m/s, appropriate measures shall be designed and implemented to prevent pipe bedding erosion and movement.

5.11.5 Curved Sewers

Horizontal and vertical curves may be formed using pipe joint deflections as follows:

- joint deflection not to exceed 75% of maximum recommended by pipe manufacturer or minimum radius of 60 m; whichever is greater
- constant radius throughout curve
- minimum design velocity of 0.9 m/s
- joint locations to be recorded.

Subject to Town approval, sewers larger than 600 mm diameter may include deflections formed by mitred bends, with minimum 1.25 m straight sections and maximum 45° mitres.

5.11.6 Depth

Storm sewers shall be of sufficient depth to:

- permit gravity service to all tributary areas
- prevent freezing – minimum cover depth of 1.5 m
- clear other underground utilities by a minimum separation of 100 mm
- prevent damage from surface loading
- minimum cover without concrete encasement or detailed analysis of 1.0 m
- maximum cover depth of 4.5 m except under special circumstances and with Town of Bonnyville approval.

5.11.7 Pipe Joints

Use watertight joints except where storm sewers are part of a subsurface collection/disposal system.

5.11.8 Groundwater Infiltration

In low areas where groundwater concentration may cause surface ponding, reduced soil stability, or cause submergence of other utilities, screened and filtered manhole inlets or perforated and filtered sections of storm sewer pipe should be provided.

5.11.9 Manhole Design Features

Manholes shall be precast concrete with a minimum 1.05 metre inside diameter in the main portion of the structure and shall conform to the latest version of ASTM C478. All concrete shall be sulfate resistant.

Storm Sewer Pipes \leq 600 mm	1050 mm Manhole
Storm Sewer Pipes $>$ 600 mm	1200 mm Manhole

Frames and covers shall be of cast iron and capable of withstanding H-20 loading. The words "Storm Sewer" shall be permanently embossed on the cover.

All joints shall be designed and constructed to be water tight using a bitumastic watertight sealant.

PVC mains shall be connected to manholes using either a manhole adaptor or an approved pre-benched manhole base.

The maximum change in the direction of flow in any sanitary sewer manhole shall be 90°.

The maximum drop allowed across a manhole is 0.5 m. If the design of the sewer system is such that the difference in elevation between the manhole inlet and outlet exceeds 0.5 m, a manhole drop structure as shown on the standard detail drawings will be required.

Safety grates shall be required in manholes deeper than 4.5 m, constructed in accordance with the Alberta Occupational Health and Safety Standards.

5.11.10 Manhole Locations

Manholes are required at the following locations:

- every change of pipe size
- every change in grade, except as indicated in the Curved Sewers section
- every change in direction, except as indicated in the Curved Sewers section
- downstream end of curved sewers
- every pipe intersection except for 100 mm and 150 mm service connections, catch basin connections and junctions with trunk sewers 900 mm diameter and larger
- upstream end of every sewer main
- every pipe intersection
- 150 m maximum spacing

5.11.11 Manhole Hydraulic Details

Crown elevations of inlet sewers not lower than crown elevation of outlet sewer.

Minimum drop of invert elevations across manholes

Straight Run	30 mm drop
Deflections	60 mm drop

Drop manhole and ramp structures shall be avoided where possible by steepening inlet sewers. Where necessary, provide drop structures as follows:

<u>Invert Difference</u>	<u>Structure</u>
Up to 0.25 m	Inside Ramp
0.25 to 0.90 m	Outside Ramp
Greater Than 0.90 m	Outside Drop*

* Inside drop may be used if specifically approved by the Town of Bonnyville

Hydraulic losses are to be calculated for manholes with significant change of grade or alignment. For high velocity flows or large pipes (> 600 mm diameter) detailed analysis is required. For low velocities and smaller pipes, use the following formula:

$$H_L = k \frac{V^2}{2g}$$

Where:

- H_L = head loss (m)
- V = outlet flow velocity (m/s)
- g = gravitational acceleration (9.81 m/s²)
- k = head loss coefficient (1.0 for channeled 90° bends and tees, to 1.5 without channelized benching)

5.11.12 Catch Basins

Catch basins shall be of sufficient number, have sufficient inlet capacities and adequate catch basin leads to receive and convey the calculated storm water flow. Minimum size for catch basin leads is 250 mm.

The maximum distance between catch basins is 150 meters to intercept surface runoff and minimize surface runoff flow length along the roads.

All catch basin bodies shall be a minimum 900 mm diameter precast concrete sections conforming to the latest version of ASTM C478, and constructed so as to provide a sump to trap rocks and gravel. All concrete is to be sulfate resistant.

<u>Catch Basin</u>	<u>Type of Inlet</u>
F-33	Grated for monolithic curb and gutter
F-36	Combination for rectangular curb
F-38	Grated for lane
K-2	Grated for rolled curb and gutter

The capacity of a single catch basin can be calculated using the orifice formula:

$$Q = kCA\sqrt{2gh}$$

Where:

- Q = inlet capacity (l/s)
- k = clogging factor
- C = orifice coefficient (0.006)
- A = open area (cm²)
- g = gravitational acceleration (9.81 m/s²)
- h = depth of ponding (cm)

The inlet capacities for the catch basins in a sump condition are given below. Due to the geometry of these inlets, flow through each individual opening of each grate or curb may act as flow through an orifice or flow across a weir depending on the assumed depth of ponding. Capacity of each inlet is based on the combined capacity of each opening calculated separately.

<u>Depth of Ponding (cm)</u>	<u>Capacity (l/s) for Inlet Type</u>			
	<u>F-33</u>	<u>F-36</u>	<u>F-38</u>	<u>K-2</u>
2.54	26.3	15.6	44.2	46.1
5.08	44.3	27.9	62.5	71.0
7.62	61.8	46.3	76.5	93.8
10.16	73.7	55.6	88.3	121.9
12.70	83.7	66.3	98.8	146.2
15.24	92.7	76.2	108.2	157.2
17.78	100.8	83.9	116.8	172.1
20.32	108.4	90.6	124.9	185.7
22.86	115.4	97.3	132.5	198.2
25.40	122.0	103.3	139.6	210.0

In order to intercept the clogging factor for the catch basin inlets, the inlet capacity reduction factors shown below are to be applied to the theoretical inlet capacities presented above. The reduction factors are used to compensate for effects which decrease the capacity of the inlet such as debris plugging, pavement overlaying and variations in design assumptions. The reduction factors to be applied to inlets in sump conditions are:

<u>Inlet Type</u>	<u>% of Theoretical Capacity</u>
Curb Opening	80%
Grated	50%
Combination	65%

For Open Area, measured in cm²:

<u>Inlet Type</u>	<u>Grate</u>	<u>Curb</u>	<u>Total</u>
F-33	935		935
F-36	363	288	651
F-38	1043		1043
K-2	1634		1634

Catch basins are required at regular intervals along roadways, at intersections and at low points.

Lawn basins are required on boulevards and private properties where necessary to prevent ponding or flooding of sidewalks, boulevards, driveways, buildings and yards.

Catch basin spacing is to provide sufficient inlet capacity to collect the entire minor flow or major flow, if required, into the pipe system.

Other spacing requirements include:

- prevent overflow to driveways, boulevards, sidewalks and private property
- avoid interference with crosswalks
- catch basin leads to discharge into manholes where possible

Catch basin leads shall be installed to provide a minimum depth of cover, from design finished grade of 1.5 m unless otherwise approved.

All catch basin leads shall discharge directly into storm sewer manholes.

Minimum grade of catch basin leads is 1.0%.

5.11.13 Service Connections

Storm water service connections are not required in the Town of Bonnyville. Storm water from perimeter (foundation) drains of buildings is to be pumped to the surface, the method and location of which is to be approved by the Town of Bonnyville.

Roof drains are to discharge to splash pads on landscaped areas.

5.11.14 Locations and Corridors

Storm sewers shall be located within roadways as shown on the Town of Bonnyville standard drawings. Servicing from roadways is required unless a depth greater than 4.5 m would be required to provide gravity service. Rear yard sewers and pumped connections are to be avoided, and advance approval is required.

Where a storm sewer crosses private land, right-of-way requirements are as indicated in Section 2.0 General Design Considerations.

Clearance from water mains is as indicated in Section 2.0 General Design Considerations.

5.12 **Major System Design**

5.12.1 General

The major drainage system is to convey flows in excess of the capacity of the minor system. The major system generally includes surface flow paths such as swales and roadways, plus roadway culverts and watercourses. The major system layout, HGL and other details are to be indicated in the Storm Water Management Plan.

5.12.2 Surface Flow Routing

All surface flows shall have specially designed routes that are preserved and protected by right-of-ways and are accessible for maintenance. Design criteria includes:

- maximum flow depth on roadways to be 150 mm
- where a roadway is used as a major flow path, the road grades are to be designed to accommodate and control the flow at intersections
- flooding is not permitted on private property except in flow channels in municipal rights-of-way
- overflow routes are required at all sags and low points in roadways and other surface flow routes
- major flood routes are required at down-slope cul-de-sacs.

5.12.3 Surface Flow Capacity

Flow capacity of road surfaces and swales can be calculated using the Manning formula, which is presented in Section 4.5.1. Typical values of the Manning Roughness Coefficient “n” are:

- 0.018 for paved roadway
- 0.03 for grassed boulevards and swales
- 0.04 to 0.10 for irregular or treed channels

Design detail is to include consideration of flow velocities and the potential requirement for erosion control measures.

5.12.4 Piped System

In special circumstances, or to accommodate lower building elevations, the minor drainage system may be enlarged or supplemented to accommodate major flows. System details shall be included in the Storm Water Management Plan. Design considerations include:

- provision of adequate inlets to accommodate major flows
- the requirement for surface overflow routes at potential surface ponding locations
- design in accordance with minor drainage system guidelines

5.12.5 Culverts and Bridges

Culverts located in natural watercourses or road crossings shall be designed to convey the major flow or greater.

Aquatic habitat protection requirements must be considered for culverts in natural channels. Approvals are required under the Alberta Water Act and the federal Fisheries Act.

Culvert design is to be in accordance with the procedures outlined in an applicable design manual including but not limited to:

- American Concrete Pipe Association – Concrete Pipe Design Manual
- Corrugated Steel Pipe Institute – Handbook of Steel Drainage and Highway Construction Products

Inlet and outlet structures are required for all major system culverts. Design considerations are to include inlet control and outlet control conditions, energy dissipation and erosion control.

Culverts and channels under bridges for arterial and collector roads are to be designed to convey the 1 in 200 year peak flow.

5.12.6 Watercourses

Watercourses, including flood plains, are to be preserved and/or designed to sustain habitat for aquatic and other wildlife as well as to convey storm runoff.

Designers must consider the federal, provincial and municipal laws, regulations and guidelines noted above and must obtain comments and approvals from the appropriate agencies.

5.13 **Runoff Controls**

Runoff controls are required to meet the objectives indicated herein under sections **5.2 Storm Water Management** and **5.8 Discharge Rates and Quality**.

Location and maintenance options for control facilities include:

On site – i.e. on multi-family or non-residential development sites. Registered covenants are required to ensure appropriate maintenance by the property owners.

Off site – i.e. on public lands, common right-of-ways or parks. Maintenance is to be carried out by local authorities.

5.14 **Stormwater Management Facilities**

Stormwater Management Facilities shall be designed to control peak flows and limit the discharge rate to the receiving water body to the maximum allowable rate. They shall be designed to accommodate the volume of runoff associated with storm events up to and including 1 in 100 year frequency with at least 12 hours storm duration. These facilities can be:

On line, where the flow path is within the storage facility.

Off line, where the storage facility is separate from the normal flow path and is filled by overflow during severe storms.

Access to all facilities is required for maintenance purposes. Example storage facilities are described below:

5.14.1 Parking Lot Storage

Requires detailed lot grading design to ensure proper drainage, pedestrian safety and convenience and major flow paths for storms exceeding the design frequency. Ponding is to be located in remote areas of the parking lot, or in grass medians and maximum ponding depth is 150 mm.

Control structures shall be in accordance with current technologies as outlined in Land Development Guidelines for the Protection of Aquatic Habitat (Canada), Stormwater Management Guidelines for the Province of Alberta and related documents.

5.14.2 Underground Storage

These facilities include tanks and oversized pipes with outlet controls and may be on-line or off-line. Cross sections and inlet and outlet locations shall be designed to minimize maintenance requirements.

Traffic loads and groundwater pressure should be considered in the structural design of these facilities. Maintenance access provisions are required.

5.14.3 Dry Detention Ponds

Dry ponds are storage areas designed to temporarily detain excess runoff and limit the peak outflow rate to the maximum allowable.. Designs that propose containment of runoff due to events more frequent than 1 in 2 years are to include special provisions to facilitate clean up, i.e. provide base structure to allow for maintenance equipment. Dry ponds may accommodate recreational uses.

Design details, unless indicated otherwise and other than discharge rates, shall be in accordance with current technologies as outlined in the Land Development Guidelines for Protection of Aquatic Habitat (Canada), and Stormwater Management Guidelines for the Province of Alberta and related documents.

In the event of a major storm event, the high water level in the dry pond shall have a free board of 300 mm below the minimum basement elevation, when walkouts are provided.

Inlet and outlet structures (larger than 500mm) associated with dry ponds shall have grates provided over their openings to restrict access. A maximum clear bar spacing of 150mm shall be used for gratings.

5.14.4 Wet Detention Ponds

The purpose of wet ponds is to temporarily store stormwater runoff in order to promote the settlement of runoff pollutants and to attenuate peak flows to reduce downstream impacts, flooding and erosion potentials.

Design details, unless indicated otherwise and other than discharge rates, shall be in accordance with current technologies as outlined in the Land Development Guidelines for Protection of Aquatic Habitat (Canada), and Stormwater Management Guidelines for the Province of Alberta and related documents.

When a choice is necessary between using one large pond as an alternative to two or more smaller facilities, one of which would have an area of less than 2 ha at normal water level, then one pond is to be used. This is to discourage proliferation of large numbers of small ponds and higher maintenance costs.

The minimum depth from normal water level to pond bottom shall be 2.0 meters. Inlets and outlets are to be fully submerged, with the crown of the pipe at least 1.0 meter below normal water level. Inlet and outlet pipe inverts are to be a minimum 100 mm above the lake bottom.

The inlet and outlet shall be distanced as far as possible from each other to avoid hydraulic short-circuiting.

In the event of a major storm event, the high water level in the wet pond shall have a free board of 300 mm below the minimum basement elevation, when walkouts are provided.

5.14.5 Outlet Controls

Outlet controls for storage facilities may be designed using the standard orifice and weir equations:

Orifice Equation:

$$Q = CA(2gh)^{0.5}$$

Where:

- Q = release rate (m^3/s)
- C = orifice coefficient (0.62 for sharp or square edge)
- A = area of orifice (m^2)
- g = gravitational acceleration (9.81 m/s^2)
- h = net head on orifice (m)

Weir Equation:

$$Q = CLH^{1.5}$$

Where:

- Q = release rate (m^3/s)
- C = weir coefficient
- L = effective length of weir crest (m)
- H = net head on weir crest (m)

Large storage facilities are to include provisions for discharges at rates greater than the design release rate. Rapid drawdown of the water level may be necessary for emergency purposes or to restore the available storage to accommodate subsequent storm events.

Provisions to accommodate higher discharges will involve oversizing the fixed openings and sewers connected to the control structure. Adjustable mechanisms such as slide gates or removable orifice plates can be used to regulate design release rates. The extent of the oversizing will depend on the capacity of the downstream drainage system.

Design of inlet and outlet structures is to include consideration of energy dissipation and erosion control. Safety grates are required over all inlet and outlet openings 500 mm or larger. Locks for access hatches are required.

Grated outlet structures are to be designed with a hydraulic capacity of at least twice the required capacity to allow for possible plugging. Further, the arrangement of the structures and the location to the grating shall be such that the velocity of the flow passing through the grating will not exceed 1.0 m/s.

5.14.6 Biofiltration Swales and Constructed Wetlands

These facilities are intended to provide biofiltration and sediment removal and may be designed to provide detention storage as well as treatment to improve stormwater quality.

Design details, unless indicated otherwise and other than discharge rates, shall be in accordance with current technologies as outlined in the Land Development Guidelines for Protection of Aquatic Habitat (Canada), and Stormwater Management Guidelines for the Province of Alberta and related documents.

They must be designed by a qualified professional and must take into consideration site suitability and growth environment for vegetation.

5.14.7 Oil and Grit Separators

These facilities are required for sites with parking space for 50 or more vehicles and are generally located on-site. May be swirl concentrator or equivalent including proprietary systems such as Stormceptor and Vortechs.

Design details to be provided by supplier of proprietary system or by designer of equivalent and should be stamped by a Professional Engineer.

5.14.8 Oil/Water Separators

These facilities are required for gas stations, vehicle service areas and storage areas for highway vehicles and construction equipment. Coalescing plate separator is required.

Design details should be in accordance with current technologies as outlined in Surface Water Quality Guidelines for Alberta and related documents and stamped by a Professional Engineer.

5.14.9 Erosion and Sediment Control

These facilities are required for land development activities such as clearing, grading, road construction, excavation and stockpiling of excavation and backfill materials.

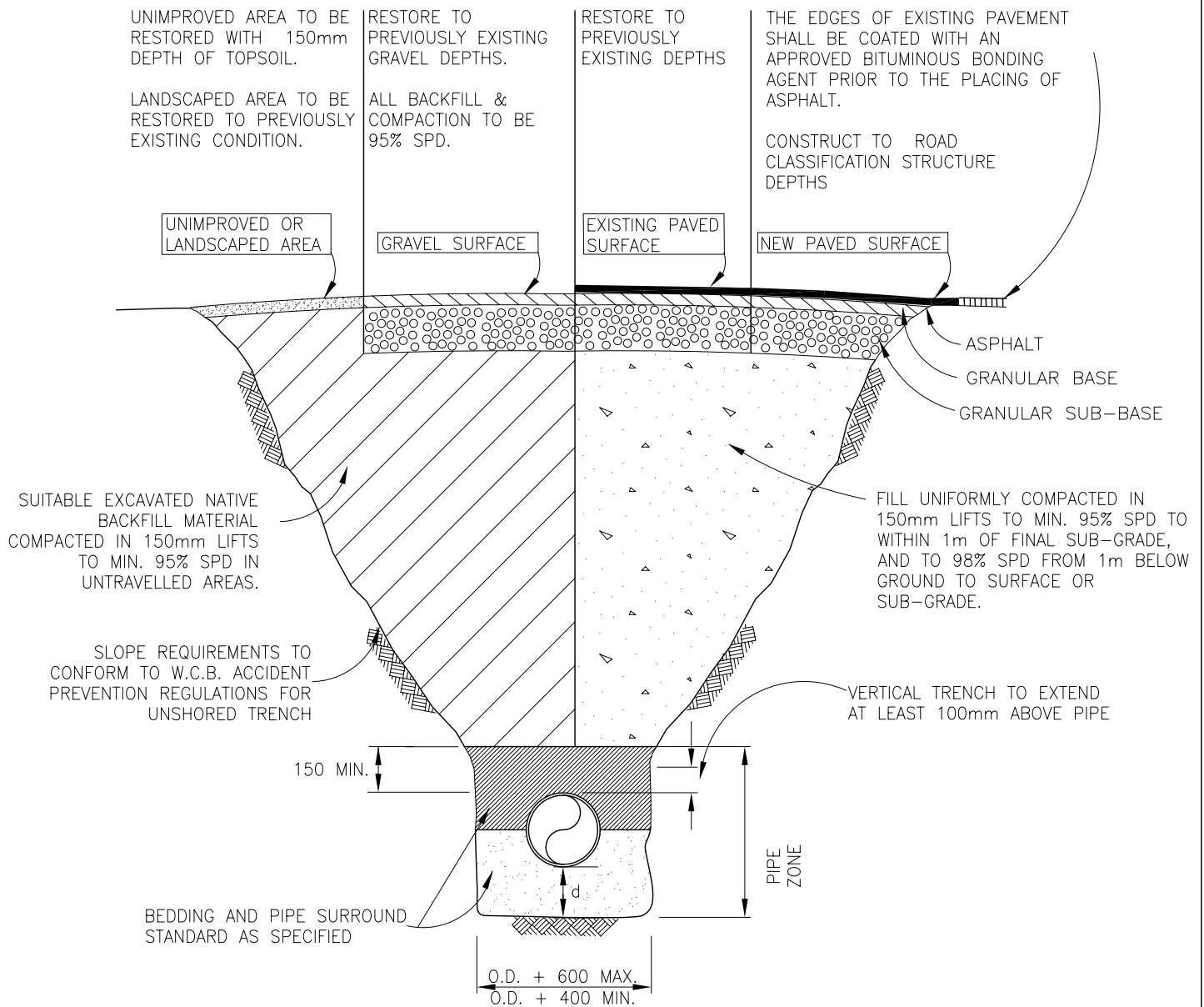
Design details to be in accordance with current technologies as outlined in Surface Water Quality Guidelines for Alberta and related documents.

5.15 **Drainage Pump Stations**

Drainage pump station guidelines are not included in this manual.

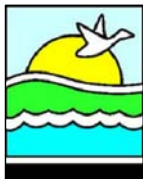
Where drainage pumping is required, the designer must review the design concept and proposed guidelines with the Town Engineer, submit a pre-design report and obtain approval before proceeding with the design.

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d = 100mm MIN. DEPTH OF BEDDING BELOW PIPE

Town of Bonnyville



SCALE:

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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

TYPICAL TRENCH SECTION
FOR UNDERGROUND
UTILITY INSTALLATION

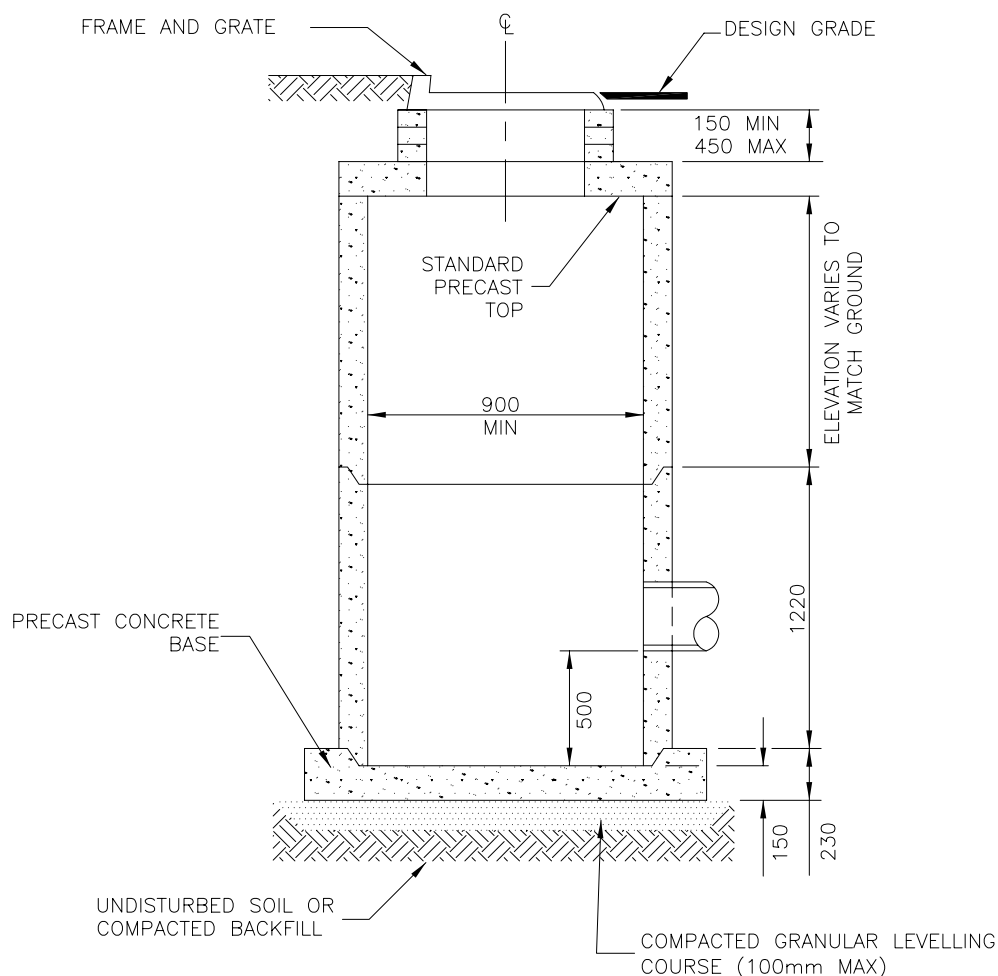
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D001



NOTES:

1. CAST-IN-PLACE CONC. BASE MAY BE USED, FLUSH WITH WALL. CAST-IN-PLACE CONC. TO BE TYPE 50 32MPa IN 28 DAYS. CAST-IN-PLACE CONC. BASE TO BE MIN. 150mm THICK AND CONSTRUCTED ON UNDISTURBED SOIL.
2. PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT ASTM C478 STANDARDS.
3. STORM CATCH BASIN JOINTS TO BE SEALED WITH CEMENT MORTAR OR CONFINED O-RING GASKET.
4. CONNECTION OF PIPES TO CATCH BASIN TO BE SEALED WITH CEMENT MORTAR.
5. INLET AND OUTLET PIPES TO BE GROUTED
6. BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
7. COMPACT BACKFILL AROUND CB TO A MIN. OF 95% STANDARD PROCTOR DENSITY.
8. 0.5m SUMP REQUIRED IN CATCHBASIN.

Town of Bonnyville



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DATE DRAWN:

JANUARY 2007

LATEST REVISION

DATE:
JANUARY 2007

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TITLE:

STANDARD 900mm CATCHBASIN

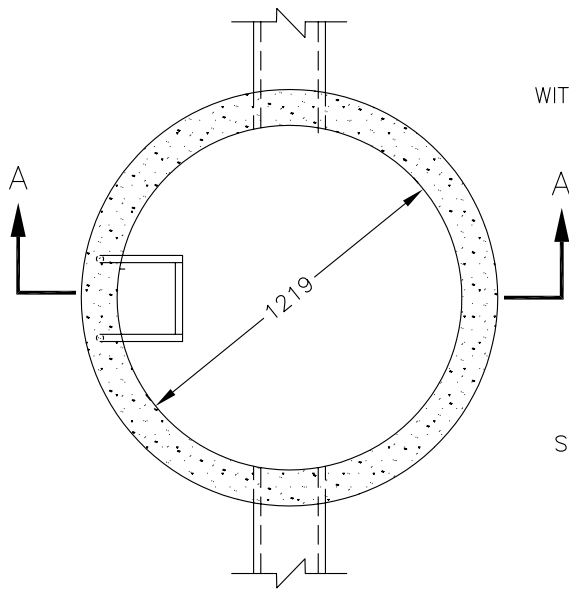
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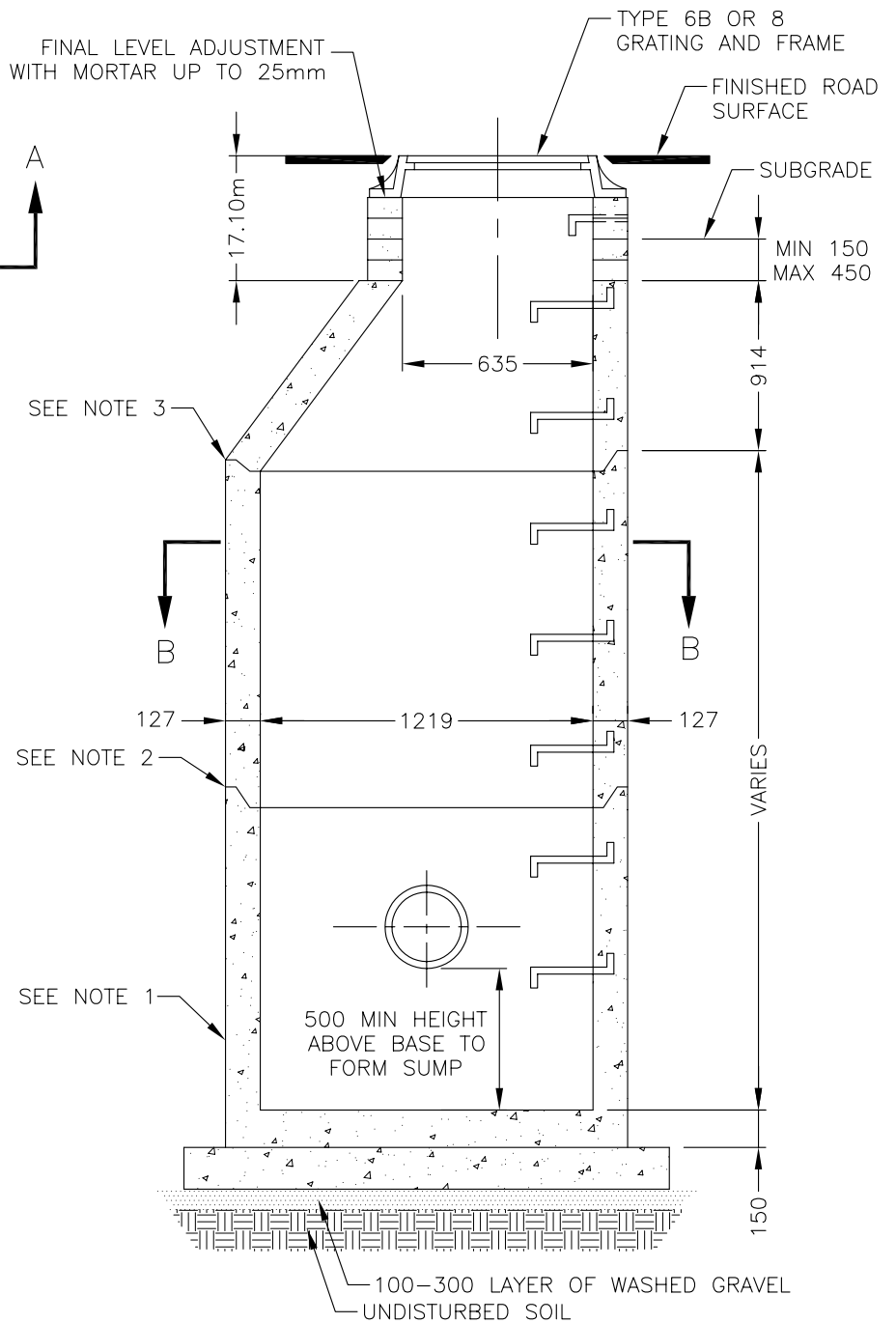
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D002



SECTION B - B



SECTION A - A

NOTES:

1. CAST-IN-PLACE CONCRETE BASE TO BE TYPE 50 UNIT COULD BE MADE UP FROM TWO ITEMS (BASE AND BARREL).
2. OPPOSITE ORIENTATION OF JOINTS IS ACCEPTABLE.
3. 1200x635 SLAB COULD BE USED INSTEAD OF CONE IN SHALLOW BURY INSTALLATION.
4. ALL UNITS IN mm.

Town of Bonnyville



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DATE DRAWN:

JANUARY 2007

LATEST REVISION

DATE:
JANUARY 2007

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TITLE:

STANDARD 1200mm
CB MANHOLE

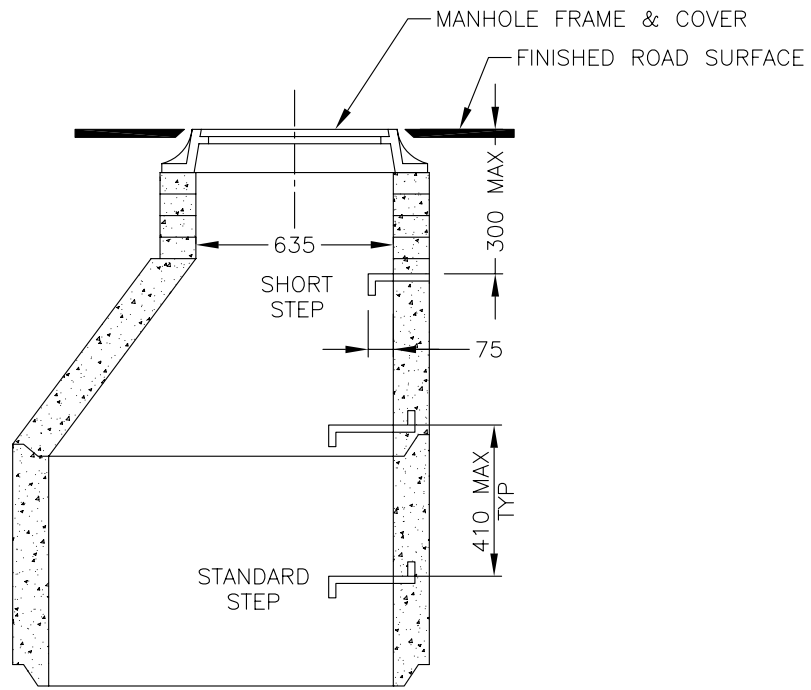
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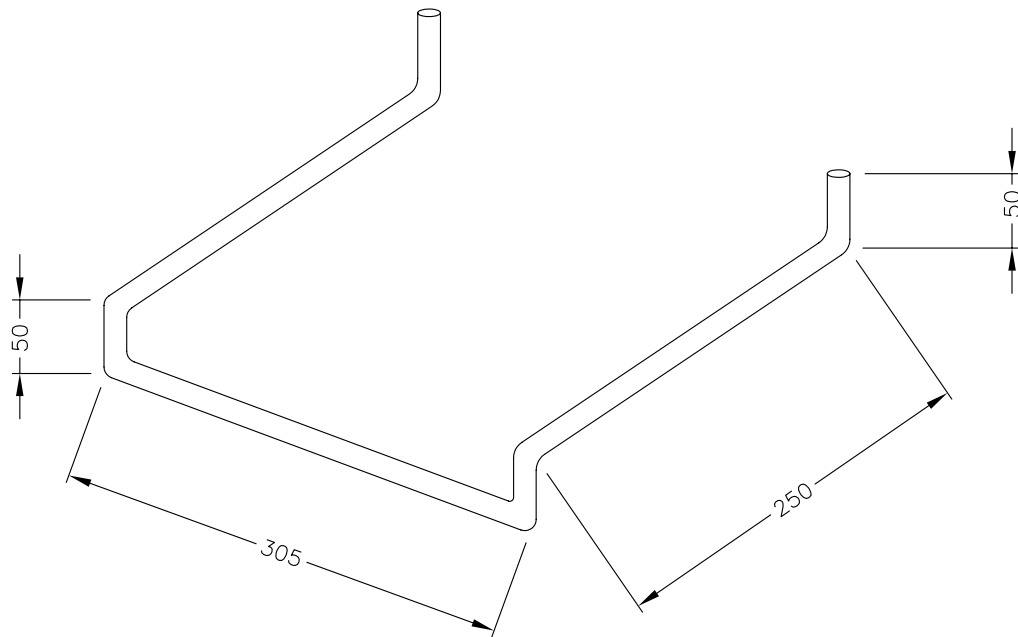
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D003



TYPICAL MANHOLE SECTION



SAFETY STEP ISOMETRIC VIEW
(CAST IN PLACE OPTION)

Town of Bonnyville



SCALE:

NOT TO SCALE

TITLE:

SAFETY STEPS
FOR MANHOLE

DATE DRAWN:

JANUARY 2007

LATEST REVISION

DATE:
JANUARY 2007

APPROVED BY:

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STORM

REVISION No.

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DWG.No.

D004

6.0 ROADS

6.1 General

These standards are not intended to be a substitute for sound engineering knowledge and experience. Road designs shall be prepared under the direction of a design professional who has the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

These road design guidelines refer to roadways, lanes, walkways and bikeways.

In addition to these guidelines, road designs shall conform to the following guidelines, regulations and legislations:

- TAC (Transportation Association of Canada) Geometric Design Guide for Canadian Roads
- TAC Pavement Design and Management Guide
- TAC Manual of Uniform Traffic Control Devices for Canada (MUTCD)
- TAC Canadian Guide to Neighbourhood Traffic Calming
- Town of Bonnyville and regional bylaws
- Municipal Government Act (AB)
- Motor Vehicle Act (AB)
- Alberta Transportation Manual of Standard Signs and Pavement Markings

General road locations, layouts and standards shall conform to applicable community plans.

Road layouts in subdivisions shall provide for the continuation or projection of existing roads in the surrounding areas unless topographical conditions and/or neighbourhood planning objectives make such continuation or projection impractical.

Local residential roads shall be aligned such that low-speed traffic will be encouraged and road use by through traffic will be discouraged. Traffic calming measures shall be included where required by the Town of Bonnyville.

The road design process shall include one or more road safety audits done in accordance with TAC Canadian Road Safety Audit Guide.

6.2 Road Classifications

Road classifications are generally in accordance with the TAC design classification system. Freeway and expressway classifications are not used in these guidelines. The primary classification divisions are as follows:

- Arterial – the primary function of an arterial roadway is to carry through traffic from one area to another with as little interference as possible from adjacent land uses. An arterial road may provide direct access to property as a secondary function when alternate access is not available.

- Collector –the primary function of a collector roadway is to distribute traffic between arterial, other collector and local roads within an area. A collector road may also provide direct access to properties.
- Local –the primary function of a local roadway is to provide direct access to the properties. Local roads normally connect to other local roads or to collector roads.

The above classifications are further divided into urban and rural classifications. The urban classifications are further divided according to land use. Arterial and collector designations may be further divided into primary and secondary.

Road classifications also include the following:

- Lane – a lane (also called a public lane or alley) is a roadway with the primary function of providing land access, typically at the rear of abutting properties. Lanes are not intended to carry through traffic. For properties fronting collector or arterial roads, rear lanes can eliminate the need for front driveways.
- Walkway and Bikeway – walkways and bikeways are paths which follow routes independent from motor vehicle roadways, sidewalks and bike lanes.

6.3 Road Rights-of-Way and Carriageway Widths

Rights-of-way shall be of adequate width to accommodate the carriageway, sidewalks, boulevards, underground utilities, street lighting, etc. in an acceptable manner. Easements will be as required. Right-of-way and Carriageway may be amended by mutual agreement. See standard detailed drawings for typical cross-sections.

Minimum requirements are as follows:

Type	Right-of-Way	Carriageway
Walkway	3.0 m	1.5 m
Lane		
▪ Residential	6.0 m	4.0 m
▪ Commercial/Industrial	9.0 m	7.0 m
Utility Lot		
▪ Surface Drainage	6.0 m	n/a
▪ Other	3.0 m	n/a
Cul-de-Sac		
▪ Residential	15 m	9.0 m
▪ Commercial/Industrial	PRESENTLY NOT ALLOWED	
Local Street		
▪ Residential	15 m	9.0 m
▪ Commercial/Industrial	24 m	9.0 m*
Minor Collector Street		
▪ Residential	20 m	11 m
▪ Commercial/Industrial	24 m	11 m

<u>Type</u>	<u>Right-of-Way</u>	<u>Carriageway</u>
Major Collector Street		
▪ Residential	22 m	13 m
▪ Commercial/Industrial	30 m	13 m
Arterial Streets – all	30 m	13 m

- * No on-street parking allowed
Minimum curb return radii: 15 m
Intended usage must be identified and approved by the Town of Bonnyville

If the right-of-way and carriageway widths are not specified in the Area Structure Plan or elsewhere, default to the Major Collector Street.

6.3.1 Rural Cross-Section Design

The design of the “rural” roadway cross-section within the right-of-way shall be so designed to allow conversion of the roadway section to an “urban” cross section at a future date. Cross-section design shall be subject to the approval of the Town of Bonnyville.

6.3.2 Vertical Curves

Vertical curve limits are defined by the “K-Value” which is the ratio of the curve length in m to the algebraic difference in percent grades. Use of K-values below the desirable limits shall be restricted to cases justified by topographical constraints and subject to approval by the Town Engineer.

<u>Classification</u>	<u>Roadway K-Values</u>						
	<u>Design Speed (km/hr)</u>	<u>Minimum Radius (m)</u>	<u>Maximum Grade¹</u>	<u>Crest Curves</u>		<u>Sag Curves</u>	
				<u>Minimum</u>	<u>Desirable</u>	<u>Minimum</u>	<u>Desirable</u>
Arterial	60	225 ³	5%	4	6	4	6
Collector	50	150 ³	6%				
Local	50	75	10%	2	4	2	4

¹ Maximum grades approaching intersections 2% less than indicated. Reduction applies for length equal to Stopping Sight Distance.

At intersections, providing the minor intersection street is marked as a STOP, the following K-values may be used for the minor street:

<u>Classification</u>	<u>Intersection K-Values</u>			
	<u>Crest Curves</u>		<u>Sag Curves</u>	
	<u>Minimum</u>	<u>Desirable</u>	<u>Minimum</u>	<u>Desirable</u>
Arterial or Collector	4	6	4	6
Local	2	4	2	4

6.4 Geometric Design

Roads shall be designed in accordance with the geometric design standards outlined in the latest edition of the "Geometric Design Standards for Canadian Roads and Streets", Roads and Transportation Association of Canada (RTAC).

6.4.1 Standards Table

Roads shall be designed in accordance with the following geometric design standards:

	<u>Local Roads</u>	<u>Collector Roads</u>	<u>Arterial Roads</u>
Minimum Design Speed (km/hr)	50	50	60
Minimum Crown (mm)	150	200	200
Minimum Pavement Width (m)	9.0	11.0	2 at 6.5
Minimum Radius (m)	75	150	225
Super Elevation	No	Optional 6% Maximum	Yes 6% Maximum
Maximum Gradient	7%	6%	5%
Minimum Gradient*	0.5%	0.5%	0.5%
Minimum Tangent Section Lengths (m)	30	60	150
Minimum Intersection Spacing (m)	60	60	400
Minimum Curb Return Radii (m)**	10	15	18

* Minimum gradient on curb radii of 23 m or less shall be 0.8%. All paved roads shall be crowned at a minimum slope of 2.0%, maximum 4.0%. All graveled roads shall be crowned between 4.0% and 6.0%.

** Where two types of roads intersect, use the higher minimum curb radii required of the two roads.

6.4.2 Corner Cuts

Corner cuts shall be sufficient to provide a minimum of 4.0 m distance from curb face to property line. Minimum corner cuts are as follows:

<u>Intersection Type</u>	<u>Corner Cut</u>
Arterial and Collector	5.0 m x 5.0 m
All Other Roadway Intersections	3.0 m x 3.0 m
Lane to Lane	5.5 m x 5.5 m
Lane to Arterial	3.0 m x 3.0 m
Residential Lane to all Other Roads	Not Required
Commercial/Industrial Lane to Any Road	3.0 m x 3.0 m

6.4.3 Left Turn Channelization

Warrants for, and details of, left turn channelization are in accordance with the TAC Geometrics Design Guide. Left turn bays shall be "opposing".

6.4.4 Site Distances

In addition to the site distance limits shown elsewhere for vertical curves, intersection site distance must be provided for both the approach and the departure cases at an intersection. Design in accordance with TAC Geometric Design Guide.

6.4.5 Curb Extensions

Curb extensions, also known as bulges and bulbs, shall be considered for speed reduction, reduced pedestrian crossing distance and improved pedestrian visibility. Design in accordance with TAC Canadian Guide to Neighbourhood Traffic Calming.

6.4.6 Turn Delineation

Guiding lines shall be used in intersections with multiple turn lanes or skewed legs.

6.5 **Traffic Control Devices**

Standard traffic signs and traffic control devices shall be installed by the Owner and shall be in accordance with the Manual of Uniform Traffic Control Devices of the Roads and Transportation Association of Canada and be approved by the Town Engineer.

6.6 **Street Name Signs**

Reflective street name signs, of the type and colour satisfactory to the Town of Bonnyville, mounted on 38 mm x 38 mm, Util-Mate sign support system complete with 45 mm penetrator and 50 mm sleeve, shall be installed by the Owner as per "Approved" Traffic and Street Signs drawing.

6.7 **Cul-de-Sac**

The maximum road length for a cul-de-sac, as measured from the edge of the intersecting through road to the centre of the cul-de-sac bulb is 200 m.

Details to be in accordance with the TAC Geometric Design Guide. Unless otherwise approved, turnaround areas are to be circular.

6.8 **Traffic Barriers**

Traffic barriers shall be placed where warrants exist in accordance with the Roadside Safety section of the TAC Geometric Design Guide. Details shall be as indicated in the TAC guide.

6.9 **Sidewalks and Walkways**

6.9.1 Requirement

See below for requirements on the placement of sidewalks for permitted use with monolithic construction.

Lane aprons shall be provided between separate curb and gutters and sidewalks at all lane intersections with street carriageways.

Minimum requirements are:

	<u>Sides of the Street</u>		<u>Type of Sidewalk</u>
	<u>One</u>	<u>Both</u>	
Cul-de-sacs <ul style="list-style-type: none">▪ Residential (< five properties)▪ Residential(≥five properties)	Optional Required	-- Optional	Monolithic Monolithic
Local Street <ul style="list-style-type: none">▪ Residential▪ Commercial▪ Industrial	Required -- --	Optional Required --	Monolithic Monolithic
Collector Street <ul style="list-style-type: none">▪ Residential▪ Commercial▪ Industrial	-- -- --	Required Required --	Boulevard Boulevard
Arterial Streets <ul style="list-style-type: none">▪ Residential▪ Commercial▪ Industrial	-- -- --	Required -- --	Boulevard

6.9.2 Dimensions

Sidewalks shall be a minimum width of 1.25 m. Normal thickness shall be a minimum of 120 mm as shown in the standard detail drawings.

All lanes and commercial, public or institutional crossings shall be a minimum of 180 mm thick and reinforced with steel rebar. Control joints shall be marked at intervals of 1.5 m.

Where a sidewalk is to be constructed on only one side of a roadway, the sidewalk shall be on the side of the road that contains the larger number of fronting lots. If the number of fronting lots is equal, then ease of sidewalk connection to existing or other sidewalks and/or walkways shall govern.

6.9.3 Concrete

Concrete shall be minimum 32 MPa, 28 day compressive strength, 5% to 8% air entrained. When the atmosphere has a temperature lower than 5° C, high early-strength concrete shall be used.

Sidewalks shall be edged and brush finished.

6.9.4 Grades

Grades shall be provided by the design engineer.

Sidewalk cross-slope down to the curb shall be consistent within 2% minimum except at lanes and crossings.

6.9.5 Base

Subgrade shall be graded or filled to the required grade and cross section of sidewalk.

Where fill is required, it shall consist of approved material compacted to a minimum of 95% Standard Proctor Density (SPD).

6.9.6 Wheelchair Ramps

Wheelchair ramps from sidewalks, medians and traffic islands to crosswalks shall be provided at intersections and walkways. Location and details of ramps and related pedestrian safety features shall be in accordance with Standard Detail Drawings and the TAC Geometric Design Guide.

6.10 **Driveways**

6.10.1 Residential Access to Arterial Roads

Residential driveway access to an arterial road is not permitted unless alternate access is not possible. Wherever physically possible, alternate local road access shall be dedicated to preclude residential driveways accessing directly onto arterial roads.

6.10.2 Number of Driveways

Urban Residential Zones

- one (1) driveway per road frontage
- second driveway may be permitted for corner lot if driveway not on an arterial road and is approved by the Public Works Director
- where a residential lot abuts roads of different classifications, the principal driveway shall access the road of the lower classification

Suburban, Rural, Commercial, Industrial, Institutional, Comprehensive and Multi-Family Developments:

- upon demonstrated need, the Town may approve more than one access

6.10.3 Driveway Location and Width

Residential Zones:

- driveways located on corner lots shall be at least 5.0 m from the lot corner nearest the intersection
- provision of adequate sight distance shall be considered in accordance with TAC Geometric Design Guidelines

- minimum and maximum widths of urban residential driveways are 4.0 m and 7.5 m respectively

Commercial, Industrial, Institutional, Comprehensive and Multi-Family Developments

- driveways to corner lots shall be located no closer than 12 m from the property line of the adjoining road
- provision of adequate sight distance shall be considered in accordance with TAC Geometric Design Guidelines

6.10.4 Driveway Grades

Driveway access grades are to be designed to permit the appropriate vehicular access for the zone, without "bottoming-out" or "hanging-up". From edge of pavement to property line, the driveway shall follow proper boulevard slope to drain towards the road.

6.10.5 Driveway Letdown and Curb Return

At the discretion of the Town Engineer, access to large parking areas, commercial, industrial and multi-family developments may be by curb returns rather than a driveway letdown.

Deceleration and acceleration lanes may be required for access off major roads for safety reasons and to minimize disruption to traffic flows. Design for such access is to be in accordance with the TAC Geometric Design Guide.

6.10.6 Access Management

In addition to the above driveway guidelines, access management techniques, including driveway consolidation, medians and turn restrictions shall be applied in accordance with the Access section of the TAC Geometric Design Guidelines.

6.10.7 Queuing Storage

Minimum queuing storage at parking lot driveways, measured from driveway exit to the closest parking stall or aisle shall be as follows:

<u>Number of Parking Stalls</u>	<u>Length of Storage (m)</u>
0 – 100	6
101 – 150	12
151 – 200	18
Over 200	24

6.11 Underground Utility Locations

Underground utility locations within a road right-of-way will vary with the road cross section. See standard detail drawings. General guidelines include the following:

- manholes and valve boxes clear of wheel paths
- all utilities clear of curbs
- sanitary sewers at pavement centre line
- storm sewer 1.0 clearance m from sanitary sewer
- electrical, telephone, gas, cable and streetlights in boulevard

6.12 Pavement Design

A pavement thickness design prepared by a geotechnical engineer may be required for submission to the Town Engineer for each local, collector and arterial system of roadways within the development.

The Owner shall engage a soils testing firm to carry out CBR tests on the completed subgrade and confirm adequacy of pavement design.

6.12.1 General

Pavement design shall be based on one of the following methods:

- past history of successful pavements in adjacent similar areas
- any design method covered in the TAC Pavement Design and Management Guide

Pavement design is to include consideration of the subgrade soil type, frost susceptibility, moisture conditions and subgrade drainage provisions.

Minimum design life for all classifications of roads is 20 years.

6.12.2 Base Course Construction

Where a geotechnical investigation has not been prepared the base course shall not be less than the equivalent to that given below.

	<u>Residential</u>	<u>Commercial/Industrial</u>
Crushed Gravel	300 mm	500 mm
Asphalt	100 mm ₁	120 mm ₂

¹ Asphalt to be applied in two lifts. First lift at 60 mm depth during initial construction and the second lift at 40 mm depth two years from construction completion.

² Asphalt to be applied in three lifts. The first two lifts to 80 mm depth during initial construction and the third lift at 40 mm depth two years from construction completion.

A geotechnical design for the road structure to an alternate standard for the appropriate road usage may be submitted for approval.

6.12.3 Asphalt Surface

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

Asphalt materials, mixing, spreading and rolling shall conform to good practice.

The hot mix concrete asphalt pavement shall meet the following test requirements based on the 75 Blow Marshall Method (50 Blow Marshall Method is acceptable for minor and local residential roads):

Test	Minimum	Maximum	Units
Marshall Stability	4.5	--	kN
Flow	8	16	units of 0.25 mm
% Voids Total Mix			
▪ 75 Blow	3	5	--
▪ 50 Blow	2	4	--
% Voids in Mineral Aggregate	14	--	--

6.12.4 Subgrade Soil Classification

Soils are characterized according to the Unified Soil Classification System (USCS) which uses symbols such as GW to classify soils according to particle sizes and distribution and plasticities. Details of USCS are contained in the TAC Pavement Design and Management Guide and other publications.

6.12.5 Pavement Deflections

Pavement deflections are commonly measured with a Benkelman Beam (see TAC Pavement Design and Management Guide). Maximum Benkelman Beam deflections (mean plus two (2) standard deviations) for design of new roads and overlays, and for confirming acceptability of complete roads are as follows:

Local	1.7 mm
Collector	1.3 mm
Arterial	1.0 mm

Design of arterial roads shall include consideration of the number of Equivalent Single Axle Loads per Lane per Year (ESAL).

6.12.6 Lanes

Back lanes shall be provided for all subdivisions unless excluded by the Area Structure Plan or by Subdivision Authority approval.

Where back lanes are provided, lanes shall be graded as outlined for subgrade construction.

Lanes shall be gravel surfaced as listed below spread over prepared subgrade with a 4.0 m wide driving surface.

	<u>Residential</u>	<u>Commercial</u>
Crushed Gravel	150 mm	300 mm
Asphalt	75 mm	100 mm

6.12.7 Minimum Asphaltic Concrete Pavement Overlay

Where existing pavements are to be overlaid, the minimum overlay thickness is two (2) times the maximum aggregate size, but in no case less than the following:

<u>Classification</u>	<u>Minimum Asphaltic Concrete Overlay Thickness</u>
Local	50mm
Collector	50 mm
Arterial	75 mm

6.13 **Curbs and Gutters**

6.13.1 Type and Location

Curb and gutter shall be constructed on both sides of the roadway as follows:
(refer to 6.9.1 Requirements)

	<u>Minimum Requirements</u>
Cul-de-sacs	
▪ Residential	1.2 m Roll Face
Local Street	
▪ Residential	1.2 m Roll Face
▪ Commercial	1.2 m Straight Face
▪ Industrial	Straight Face Curb and Gutter
Collector Street	
▪ Minor Residential	Roll Face
▪ Major Residential	Straight Face
▪ Commercial	Straight Face
▪ Industrial	Straight Face Curb and Gutter
Arterial Streets	
▪ Residential	Straight Face
▪ Commercial	Straight Face Curb and Gutter
▪ Industrial	Straight Face Curb and Gutter

6.13.2 Concrete

Concrete shall be minimum 32 MPa, 28 day compressive strength, 5% to 8% air entrained.

Reinforcing steel shall be installed in the concrete where the curb and gutter and/or sidewalk cross over underground service trenches.

6.13.3 Swale Gutters

The use of swale gutters shall be limited to minor and residential streets, and require approval from the Town Engineer.

Swale gutter cross-section shall be a minimum of 1.0 m wide and 200 mm thick with steel reinforcing.

6.14 **General Roadwork**

6.14.1 Clearing and Grubbing

Clearing and grubbing along street and lane rights-of-way shall be limited to the working area required to install the proposed local improvements.

Any clearing undertaken shall be in accordance with "Approved" landscape drawings for the entire subdivision.

6.14.2 Stripping Topsoil

Topsoil shall be stripped off road rights-of-way and trenching area to its full depth.

Topsoil from these areas shall be used on public lands or boulevards as required. Any remaining topsoil shall be stockpiled at approved locations and shall become the property of the Town.

The topsoil, when used as fill, shall be placed such as to add to existing topsoil thereby utilizing it for landscaping purposes.

6.14.3 Right-of-Way Grading

The grading of the streets and lanes shall be compatible with the overall grading of the lots and public lands within the subdivision.

The area between the back of the curb or sidewalk and property line shall be graded to provide a uniform slope (2% minimum) from top of concrete up to finished grade at the property line as established on the lot grading plan.

6.14.4 Subgrade Construction

The subgrade shall be excavated or filled to the required grade over the full width of the roadway. Where earth fill is required, it shall be placed in 150mm lifts and thoroughly compacted to a minimum of 95% of Standard Proctor Density (SPD) to within 1 meter of finished sub-grade and to 98% of Standard Proctor Density (SPD) upwards to sub-grade or as approved by the Geotechnical Engineer.

The subgrade shall be graded to conform to the required longitudinal grade and crown of the roadway and the top 150 mm depth shall be compacted to 100% SPD.

Rocks or boulders in excess of 200 mm shall be removed from the public right-of-way and disposed of in an area or manner approved by the Town of Bonnyville.

6.15 Landscaping

6.15.1 Areas

Areas within the subdivision to be landscaped are buffer strips, drainage parkways, reserves and boulevards.

6.15.2 Scope

Landscaping shall be the final grading of the areas to comply with the Lot Grading plan; the placing and spreading of topsoil; the cultivation of the area and planting it to grass; the planting of shrubs, trees and flower beds all in accordance with the "Approved" landscaping plans.

6.15.3 Grades

Boulevards and buffer strips shall be graded to drain over the curbs into the street gutters.

Reserves shall be graded to drain over the adjacent curbs into the street gutters or into catch basins within the reserve, or into adjacent Drainage Parkways.

6.15.4 Seeding

Designated areas within the subdivision area shall be pre-graded, filled to final grade to provide a minimum of 100 mm of topsoil, and seeded to a variety of approved grass.

6.15.5 Sound Abatement

Berms or elevated contoured embankments shall be utilized for sound abatement along arterial roads and/or highways as required by the Town.

The subdivision side of the embankments shall be with gentle slopes, a minimum of 4:1.

6.15.6 Utility Service

One sanitary sewer and water service, complete with surface connection, shall be installed at an approved location to each designated reserve area involving playground or public use.

One water service only, complete with surface connection for irrigation purposes is required for ornamental parks.

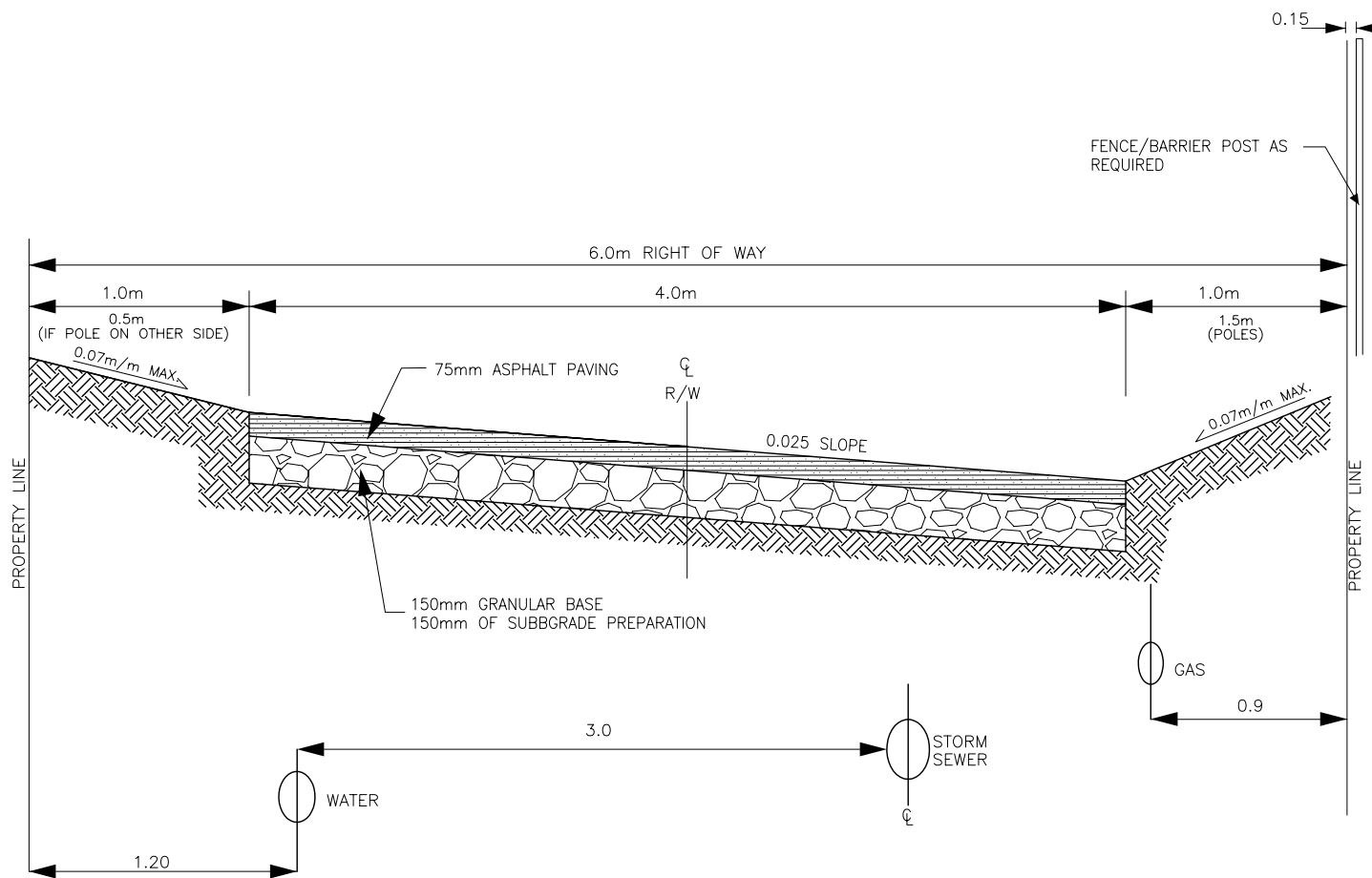
Water service is to be a minimum of 19 mm in diameter and one (1) service per hectare.

6.15.7 Perimeter Fences

A fence shall be provided along the perimeter of the subdivision adjacent to arterial roads, highways and railroads.

The fence shall be of sturdy construction, minimum of 1.5 m high, of a design suitable for sound abatement and a type that requires minimum maintenance and approved by the Town Engineer.

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NOTES:

1. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m.
2. EDGE OF PAVEMENT TO MATCH DRIVEWAYS.
3. ALLEY IS CENTERED IN R/W UNLESS THERE ARE POLES.
4. IF ASPHALT PAVING IS OMITTED, ASPHALT THICKNESS NEEDS TO BE SUBSTITUTED WITH GRANULAR MATERIALS.

Town of Bonnyville



SCALE:

NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION
DATE:

APPROVED BY:

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TITLE:

RESIDENTIAL LANE — PAVED

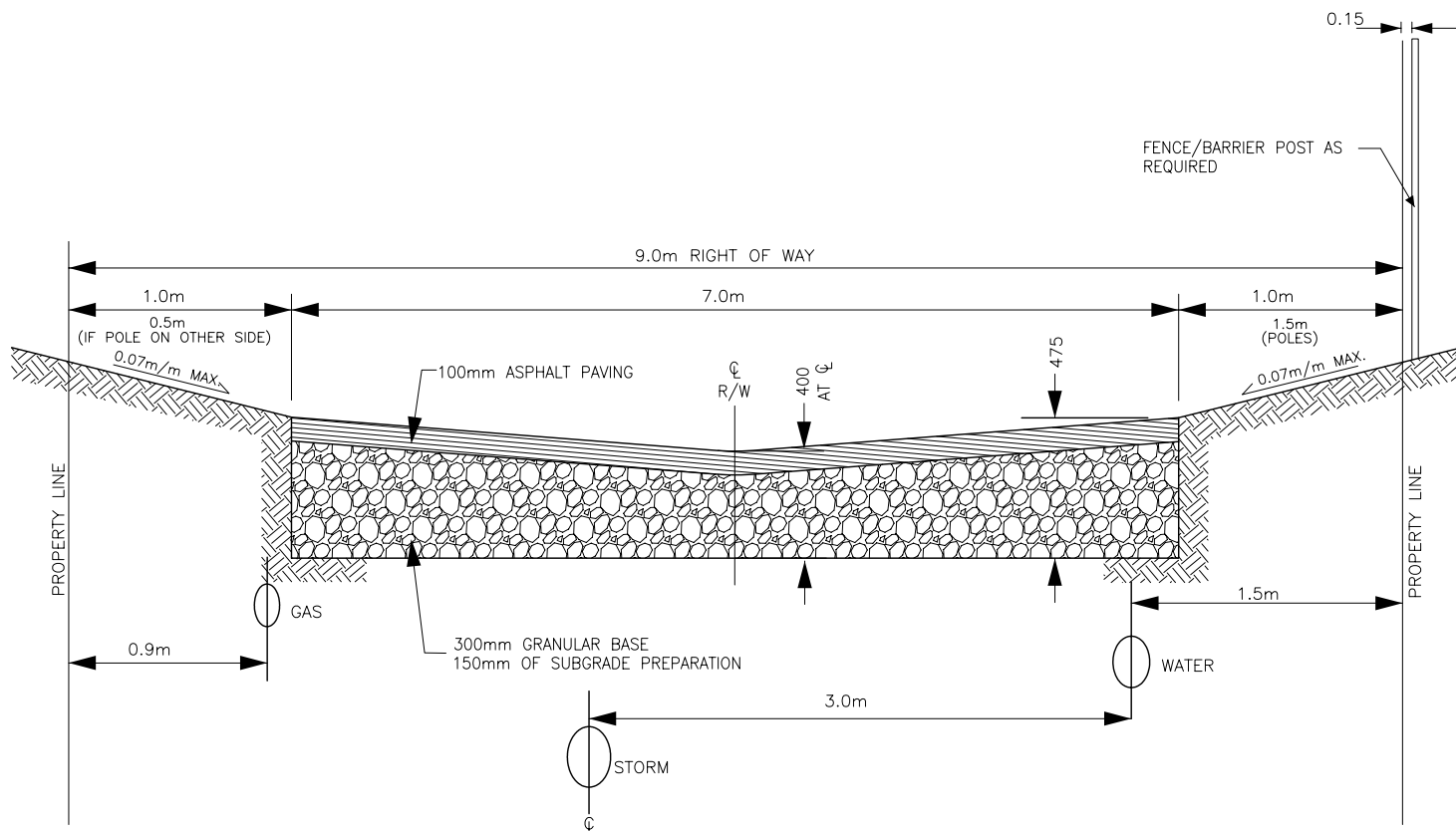
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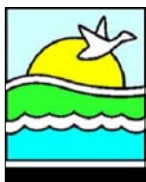
R001



NOTES:

1. REDUCE CENTRELINE "V" TO 50mm AT THE TIE-IN TO BACK OF BOULEVARD WALK TO FACILITATE DRAINAGE AS REQUIRED
2. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m.
3. EDGE OF PAVEMENT TO MATCH DRIVEWAYS.
4. ALLEY IS CENTERED IN R/W UNLESS THERE ARE POLES.
5. IF ASPHALT IS OMITTED, ASPHALT THICKNESS NEEDS TO BE SUBSTITUTED WITH GRANULAR MATERIALS.

Town of Bonnyville



NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE: —

APPROVED BY:

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TITLE:

COMMERCIAL LANE PAVED

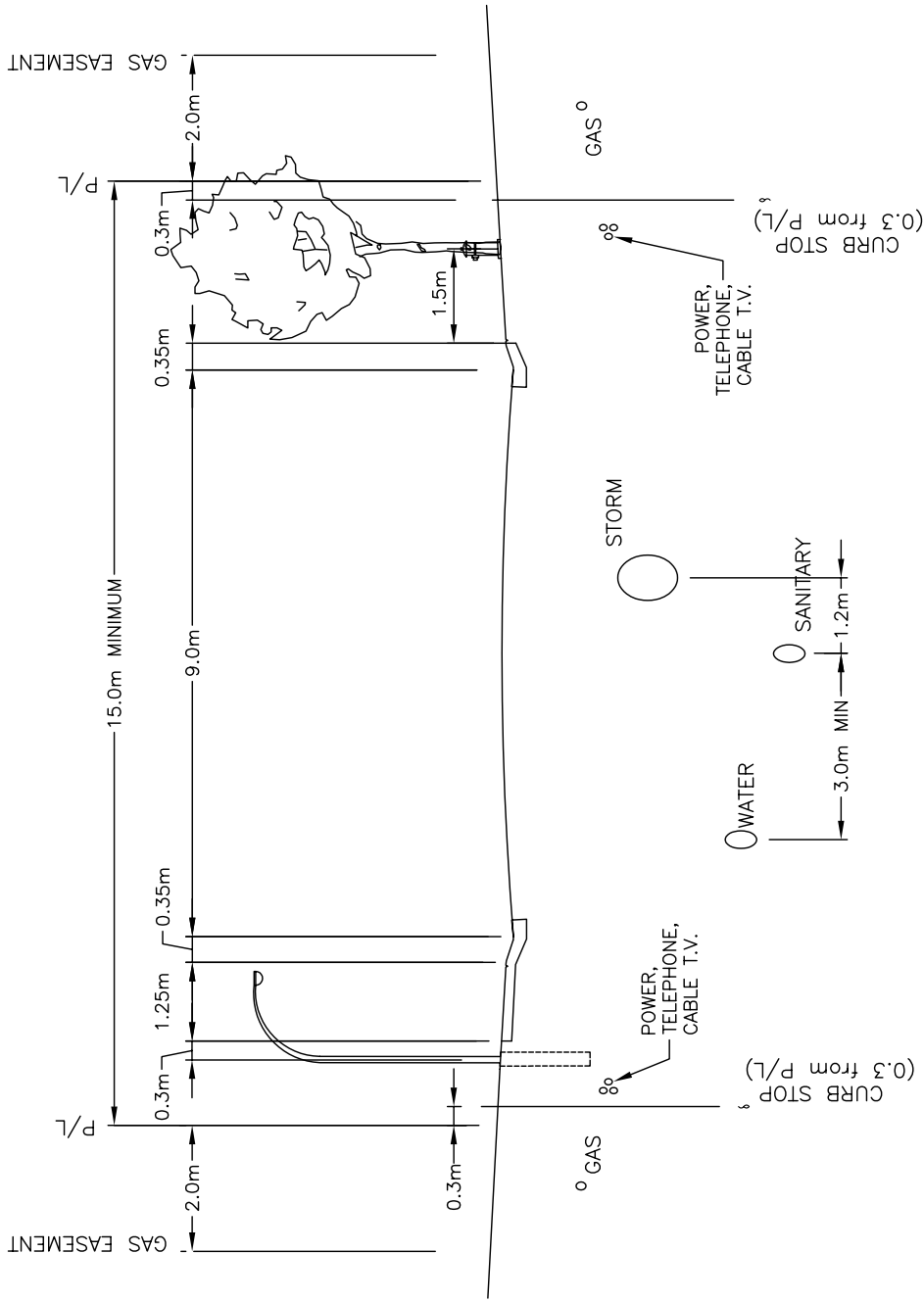
ROADS

REVISION No.

—

DWG.No.

R002



NOTES:

1. WATER TO BE ON OPPOSITE SIDE OF MAIN POWER.
2. PIPE SIZES AND DEPTH VARY.
3. DEPTH OF MAIN POWER, TELEPHONE, STREET LIGHT AND CABLE T.V. TRENCH TO BE MINIMUM 0.9m
4. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m WITHIN ROAD R/W.
5. GAS MAIN LOCATED ON EASEMENTS.
6. PLACE CLAY PLUG IF LANDSCAPING NOT UNDERTAKEN BY ROAD CONTRACTOR.
7. MINIMUM TREE OFFSET = 1.5m FROM CURB FACE (NO WALK) OR BOULEVARD WALK; SAME ALIGNMENT AS STREET LIGHT WHERE APPLICABLE.
8. CROWNS ARE MEASURED FROM LIP OF GUTTER.

Town of Bonnyville



NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

—

APPROVED BY:

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TITLE:

UTILITIES LOCATION PLAN 9.0m
LOCAL/CUL-DE-SAC RESIDENTIAL

ROADS

REVISION No.

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DWG.No.

R003



NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION

LATES
DATE:

APPROVED BY:

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TITLE:

UTILITIES LOCATION PLAN 9.0m
LOCAL COMMERCIAL/INDUSTRIAL

ROADS

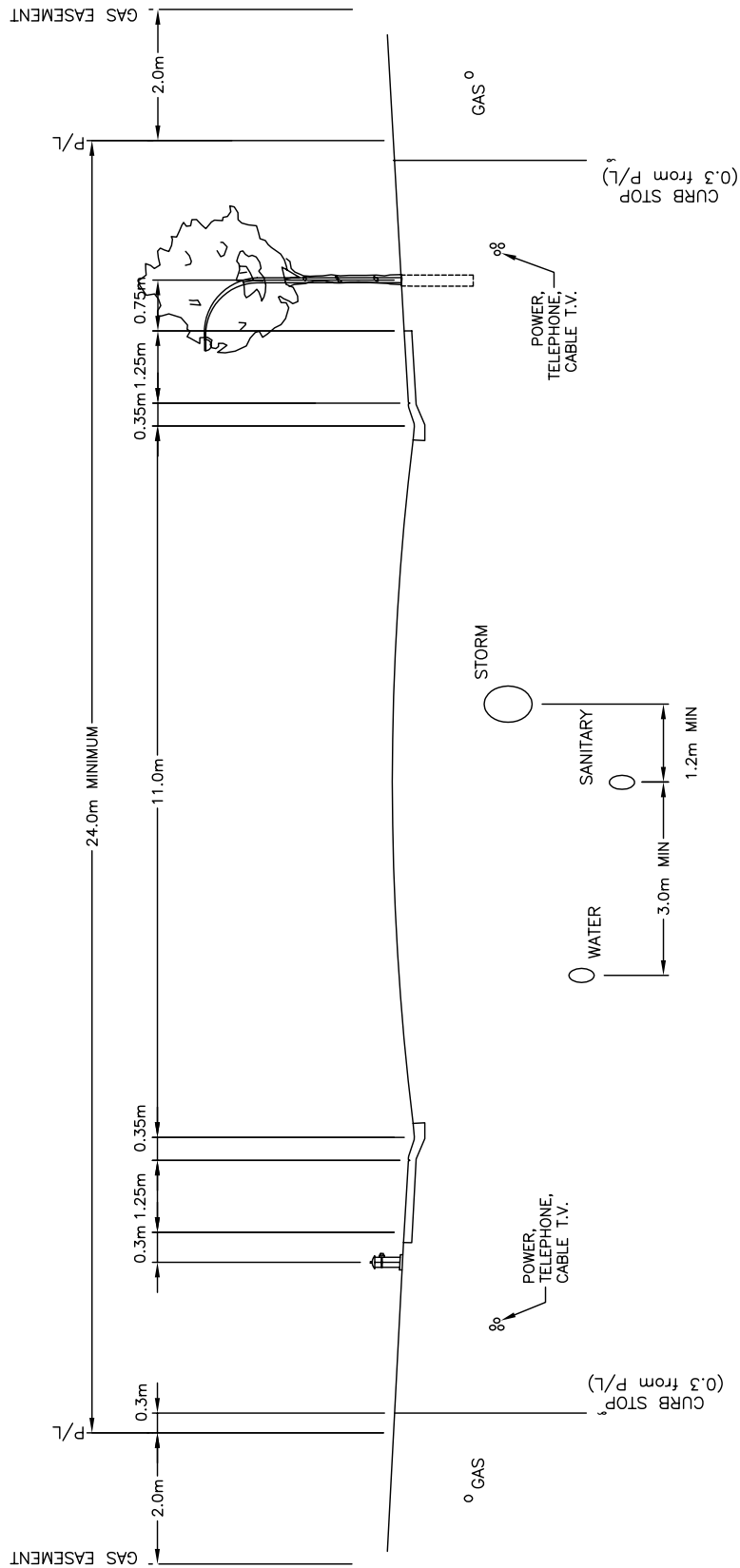
REVISION No.

DWG.No.

R004

NOTES:

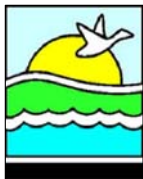
1. WATER TO BE ON OPPOSITE SIDE OF MAIN POWER.
2. PIPE SIZES AND DEPTH VARY.
3. DEPTH OF MAIN POWER, TELEPHONE, STREET LIGHT, AND CABLE T.V. TRENCH TO BE MINIMUM 0.9m
4. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m WITHIN ROAD R/W.
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6. PLACE CLAY PLUG IF LANDSCAPING NOT UNDERTAKEN BY ROAD CONTRACTOR.
7. MINIMUM TREE OFFSET = 1.5m FROM CURB FACE (NO WALK) OR BOULEVARD WALK; SAME ALIGNMENT AS STREET LIGHT WHERE APPLICABLE.
8. CROWNS ARE MEASURED FROM LIP OF GUTTER.



NOTES:

1. WATER TO BE ON OPPOSITE SIDE OF MAIN POWER.
2. PIPE SIZES AND DEPTH VARY.
3. DEPTH OF MAIN POWER, TELEPHONE, STREET LIGHT, AND CABLE T.V. TRENCH TO BE MINIMUM 0.9m
4. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m WITHIN ROAD R/W.
5. GAS MAIN LOCATED ON EASEMENTS.
6. PLACE CLAY PLUG IF LANDSCAPING NOT UNDERTAKEN BY ROAD CONTRACTOR.
7. MINIMUM TREE OFFSET = 1.5m FROM CURB FACE (NO WALK) OR BOULEVARD WALK; SAME ALIGNMENT AS STREET LIGHT WHERE APPLICABLE.
8. CROWNS ARE MEASURED FROM LIP OF GUTTER.

Town of Bonnyville



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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

UTILITIES LOCATION PLAN 11.0m
MINOR COLLECTOR COMM./IND.

ROADS

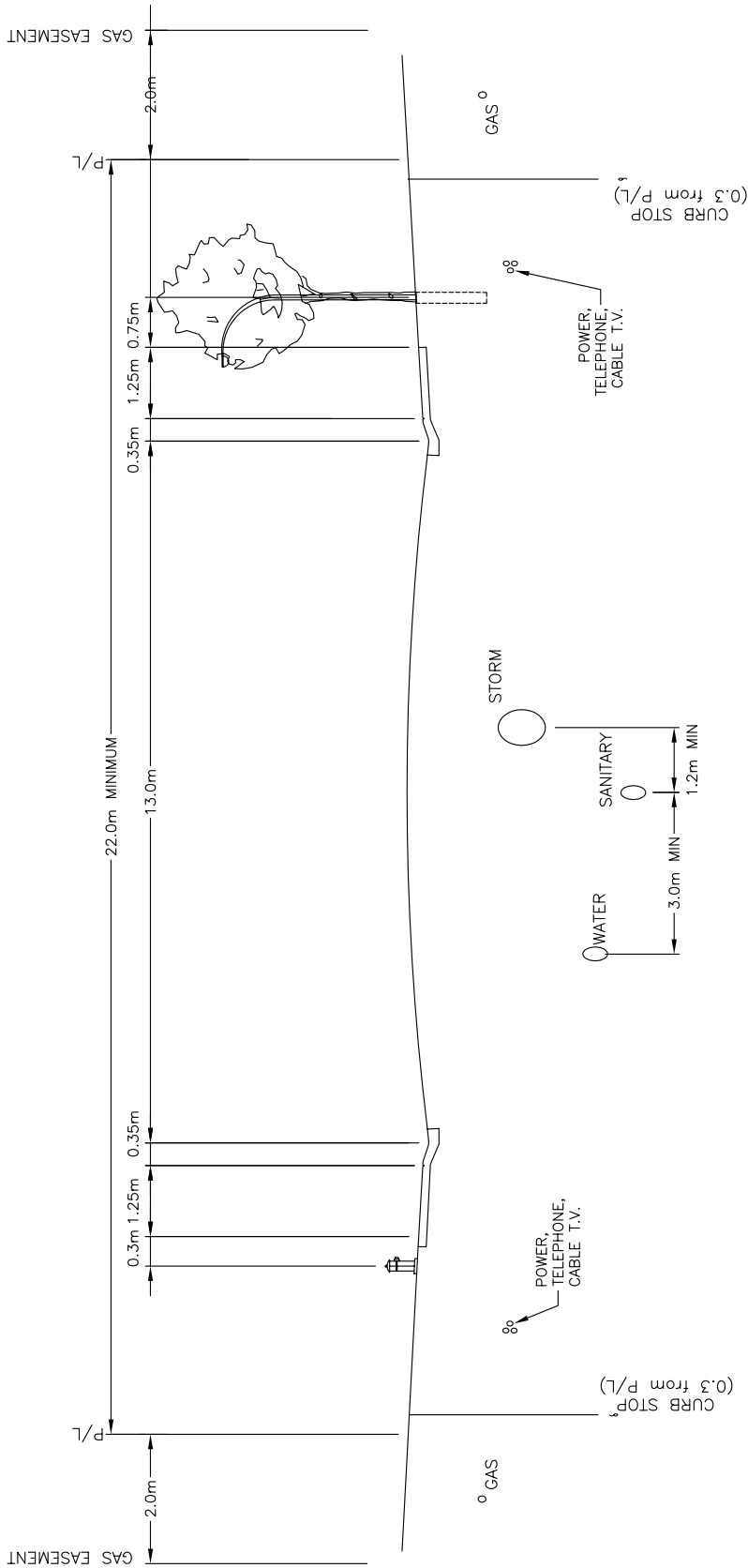
REVISION No.

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DWG.No.

R005

R006



NOTES:

1. WATER TO BE ON OPPOSITE SIDE OF MAIN POWER.
2. PIPE SIZES AND DEPTH VARY.
3. DEPTH OF MAIN POWER, TELEPHONE, STREET LIGHT, AND CABLE T.V. TRENCH TO BE MINIMUM 0.9m
4. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m WITHIN ROAD R/W.
5. GAS MAIN LOCATED ON EASEMENTS.
6. PLACE CLAY PLUG IF LANDSCAPING NOT UNDERTAKEN BY ROAD CONTRACTOR.
7. MINIMUM TREE OFFSET = 1.5m FROM CURB FACE (NO WALK) OR BOULEVARD WALK; SAME ALIGNMENT AS STREET LIGHT WHERE APPLICABLE.
8. CROWNS ARE MEASURED FROM LIP OF GUTTER.

Town of Bonnyville



NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

**UTILITIES LOCATION PLAN
13.0m COLLECTOR RESIDENTIAL
(MAJOR)**

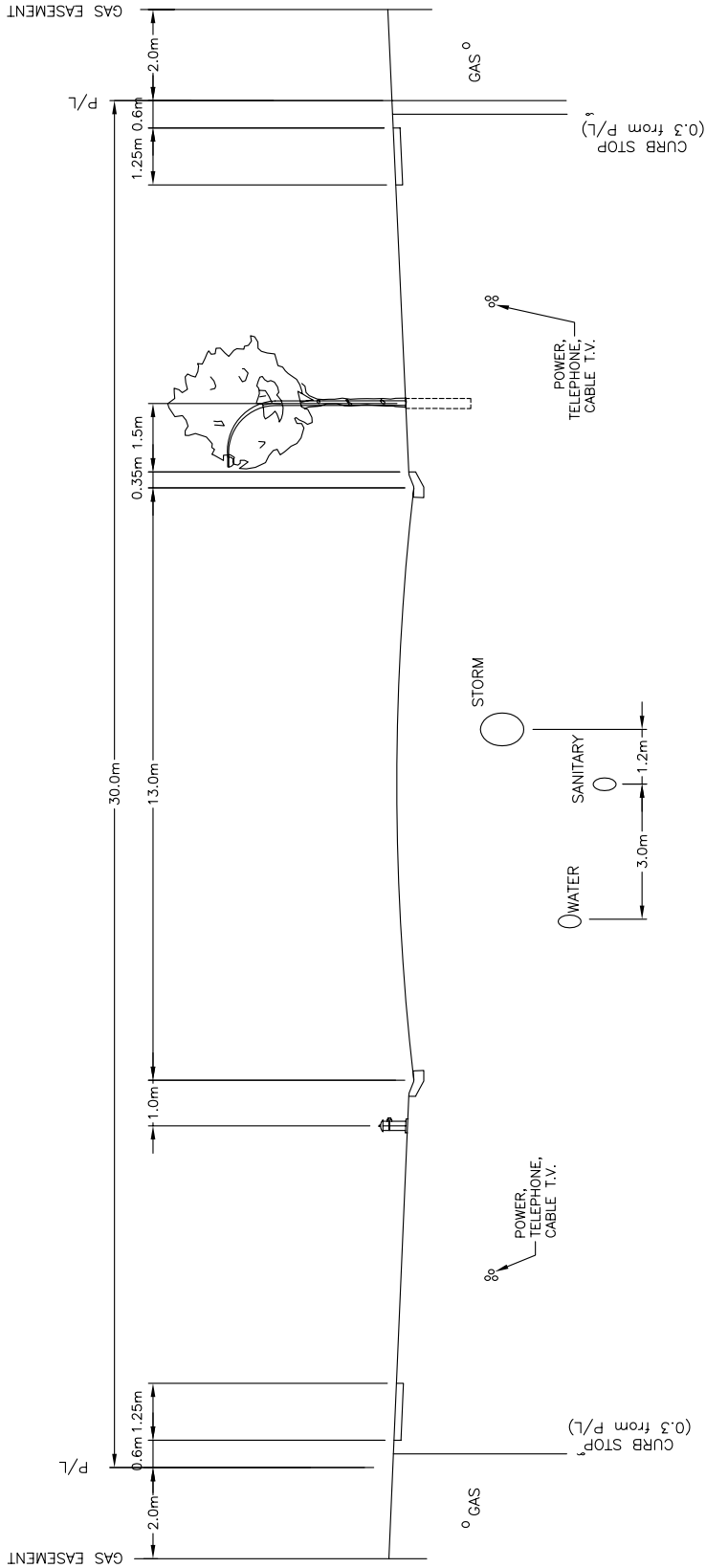
ROADS

REVISION No.

—

DWG.No.

R007



NOTES:

1. WATER TO BE ON OPPOSITE SIDE OF MAIN POWER.
2. PIPE SIZES AND DEPTH VARY.
3. DEPTH OF MAIN POWER, TELEPHONE, STREET LIGHT, AND CABLE T.V. TRENCH TO BE MINIMUM 0.9m
4. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m WITHIN ROAD R/W.
5. GAS MAIN LOCATED ON EASEMENTS.
6. PLACE CLAY PLUG IF LANDSCAPING NOT UNDERTAKEN BY ROAD CONTRACTOR.
7. MINIMUM TREE OFFSET = 1.5m FROM CURB FACE (NO WALK) OR BOULEVARD WALK; SAME ALIGNMENT AS STREET LIGHT WHERE APPLICABLE.
8. CROWNS ARE MEASURED FROM LIP OF GUTTER.

Town of Bonnyville



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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

—

APPROVED BY:

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TITLE:

UTILITIES LOCATION PLAN 13.0m
MAJOR COLLECTOR COMM./IND.

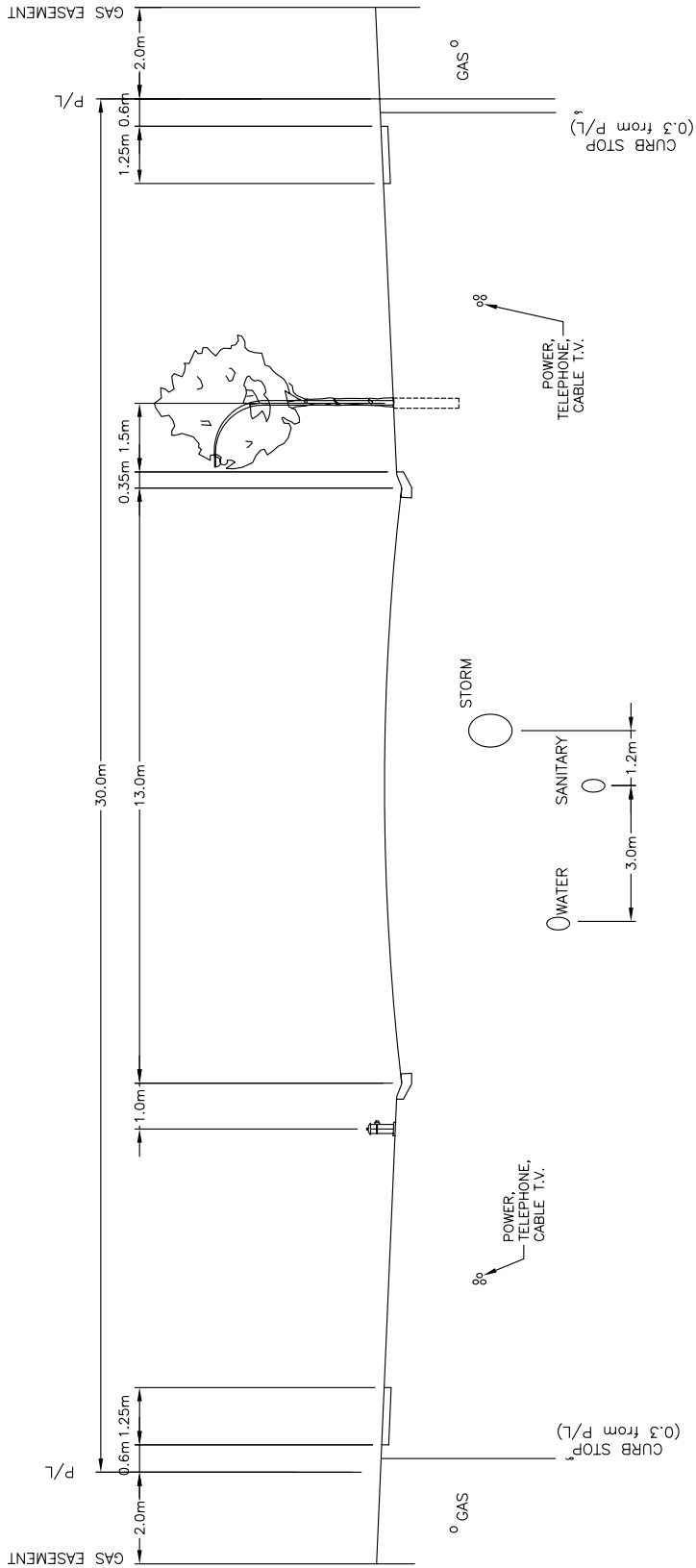
ROADS

REVISION No.

—

DWG.No.

R008



NOTES:

1. WATER TO BE ON OPPOSITE SIDE OF MAIN POWER.
2. PIPE SIZES AND DEPTH VARY.
3. DEPTH OF MAIN POWER, TELEPHONE, STREET LIGHTS, AND CABLE T.V. TRENCH TO BE MINIMUM 0.9m
4. DEPTH OF GAS TRENCH TO BE MINIMUM 1.1m WITHIN ROAD R/W.
5. GAS MAIN LOCATED ON EASEMENTS.
6. PLACE CLAY PLUG IF LANDSCAPING NOT UNDERTAKEN BY ROAD CONTRACTOR.
7. MINIMUM TREE OFFSET = 1.5m FROM CURB FACE (NO WALK) OR BOULEVARD WALK; SAME ALIGNMENT AS STREET LIGHT WHERE APPLICABLE.
8. CROWNS ARE MEASURED FROM LIP OF GUTTER.

Town of Bonnyville



NOT TO SCALE

DATE DRAWN:
JAN. 2007

LATEST REVISION
DATE: -

APPROVED BY:
-

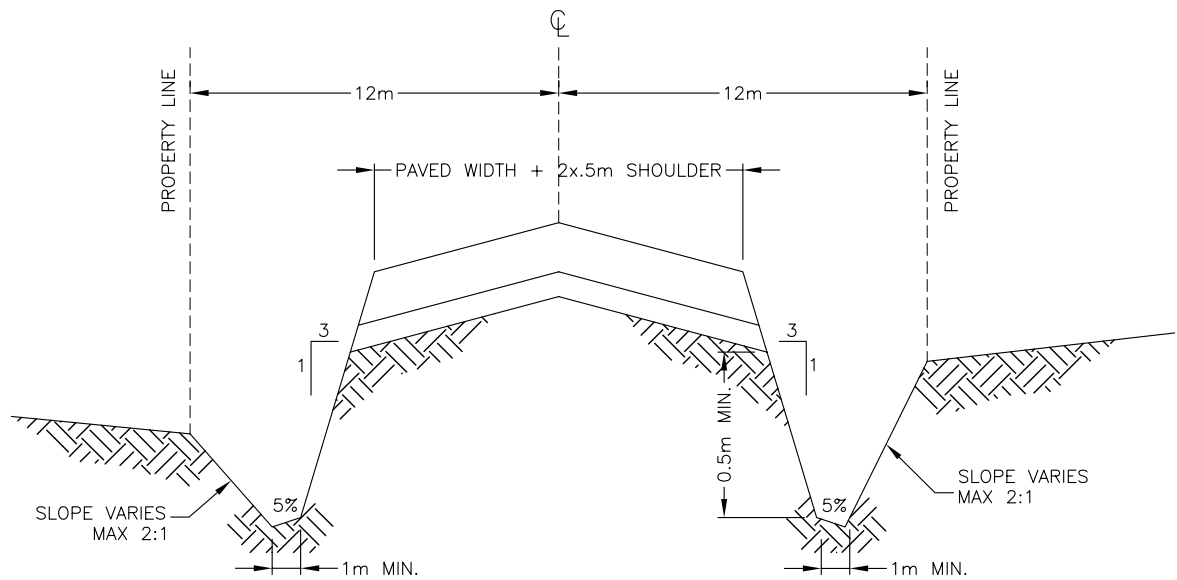
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UTILITIES LOCATION PLAN
13.0m ARTERIAL

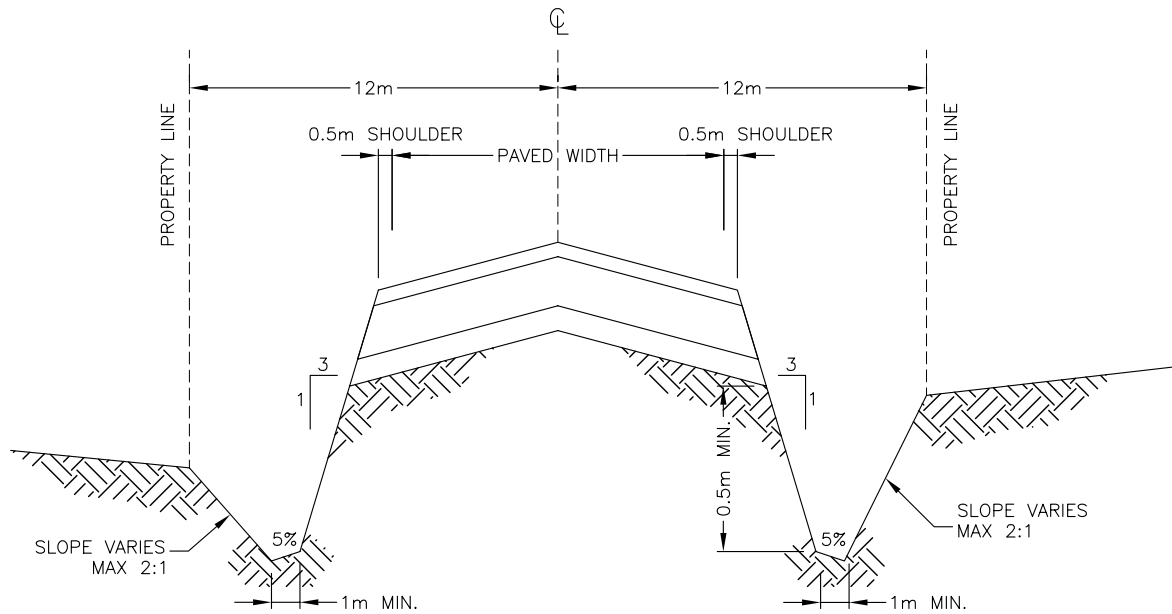
ROADS

REVISION No.
-

DWG.No.
R009



INTERIM SECTION



PAVED SECTION

NOTES:

1. ENGINEERING FABRIC TO BE PLACED BETWEEN SUBGRADE AND WHEN A WET SUBGRADE IS ENCOUNTERED, AS DIRECTED BY THE ENGINEER.
2. SIDESLOPE DEPENDS ON DESIGN SPEED AND TRAFFIC VOLUME, REFER TO TAC GUIDELINES.

Town of Bonnyville



SCALE:

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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

TWO LANE
RURAL
CROSS SECTION

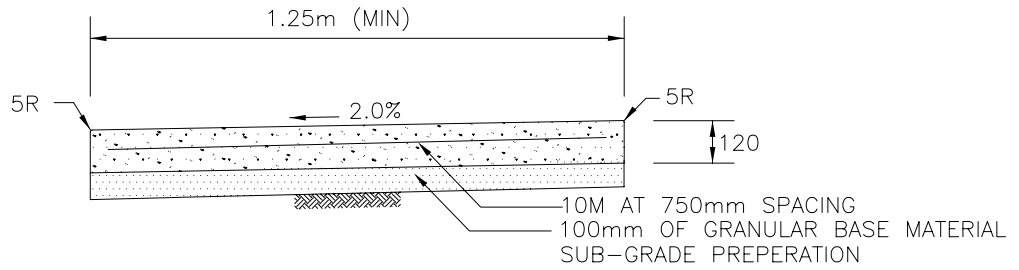
ROADS

REVISION No.

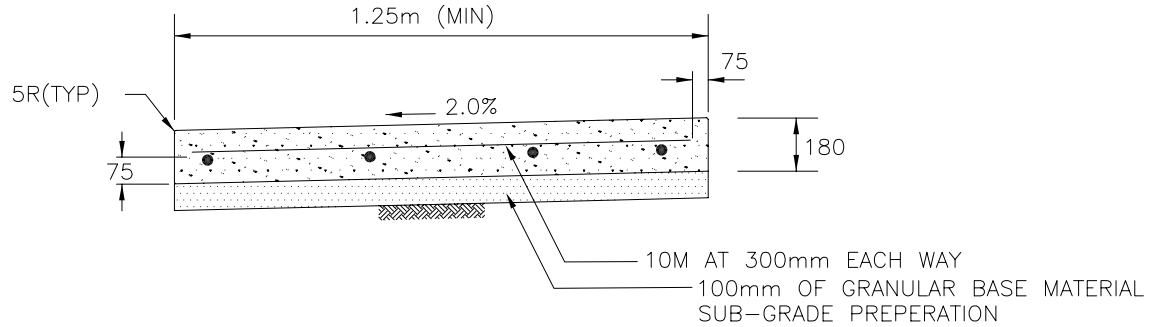
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DWG.No.

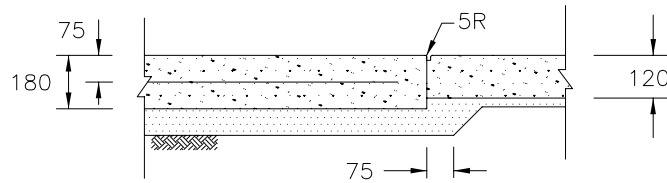
R010



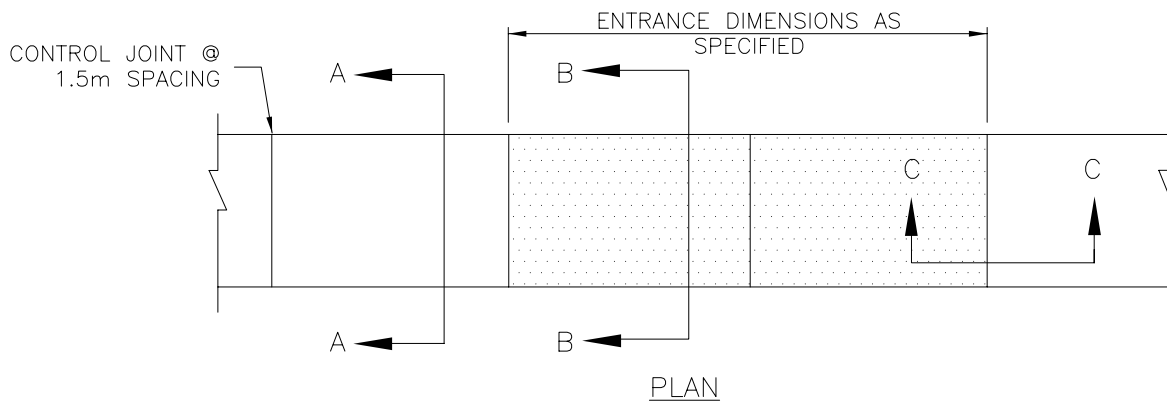
SECTION A-A
STANDARD SIDEWALK



SECTION B-B DRIVEWAY
SECTION



SECTION C-C
TRANSITION



Town of Bonnyville



SCALE:

NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

SEPARATE WALK AND
DRIVEWAY ACCESS

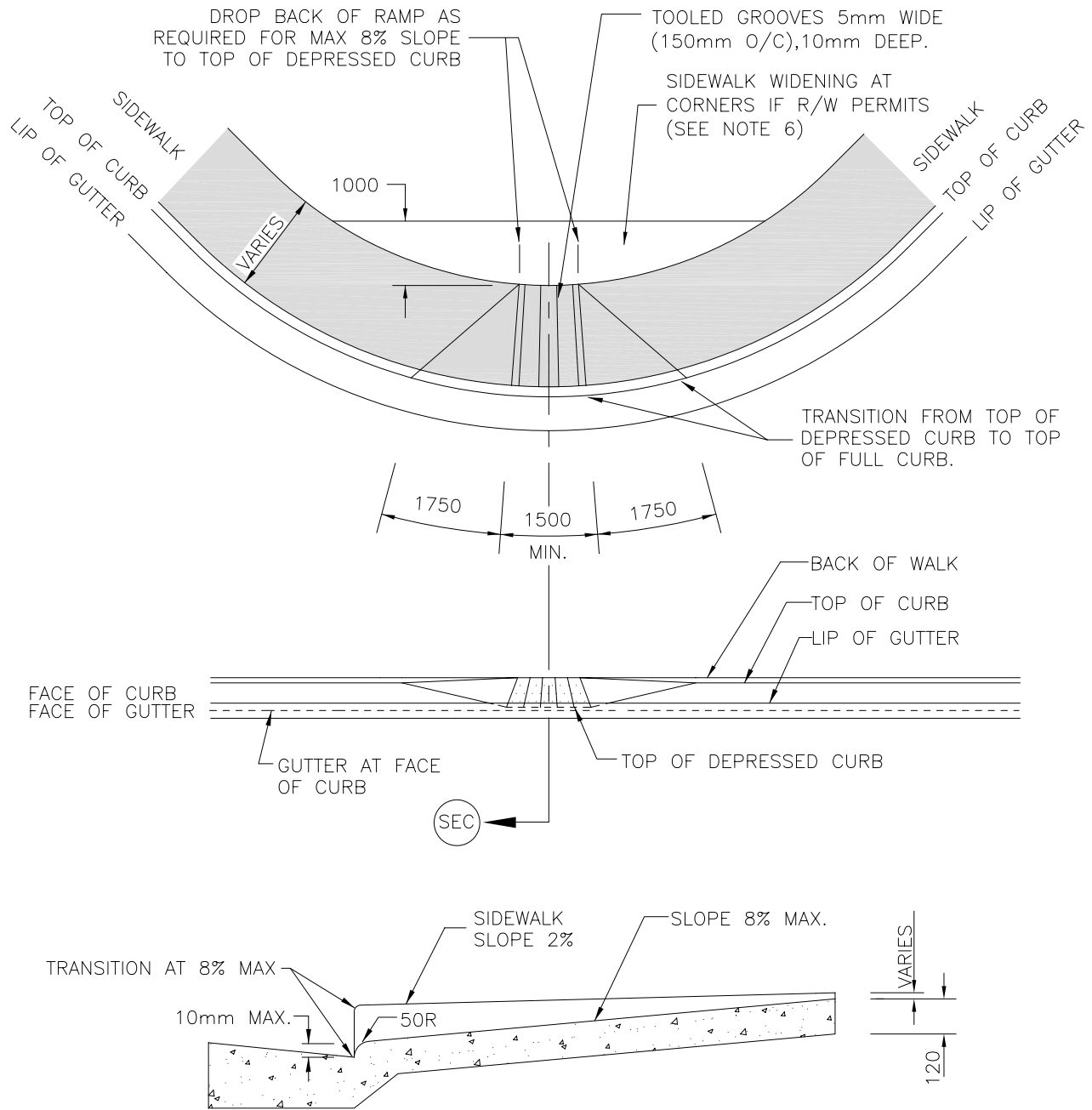
ROADS

REVISION No.

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DWG.No.

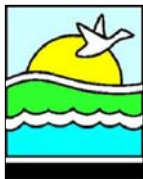
R011



NOTES:

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

Town of Bonnyville



SCALE:

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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

PARAPLEGIC RAMP

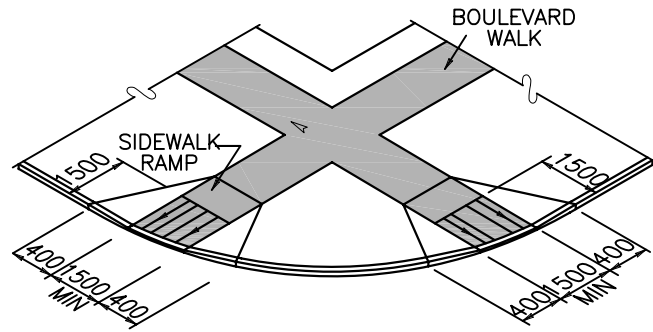
ROADS

REVISION No.

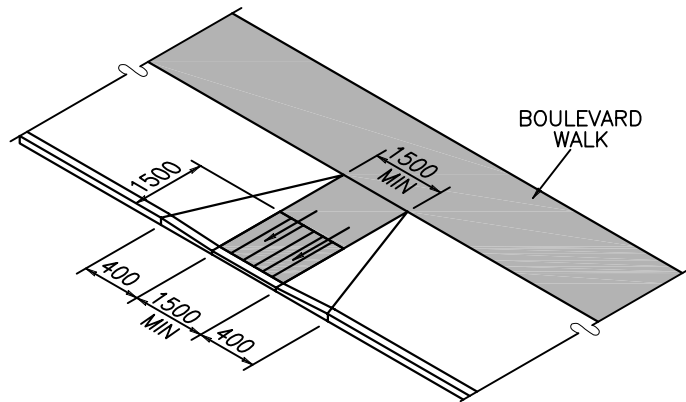
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DWG.No.

R012



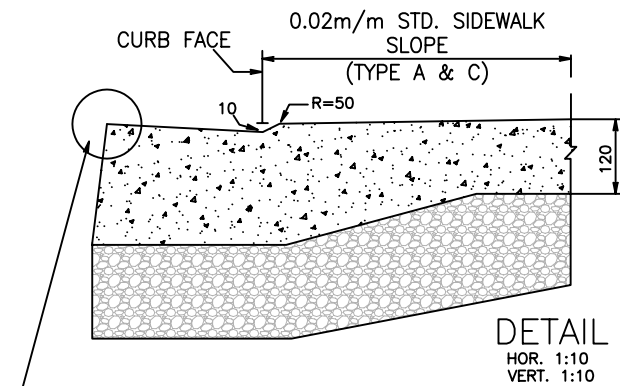
TYPE B



TYPE D

NOTES:

1. TOOLED GROOVES 5mm WIDE X 10mm DEEP, BROOM FINISH GROOVE SPACING 150mm O.C. ADJACENT TO CURB.
2. WHERE RAMP IS TO BE USED AS A TRANSITION, USE THE CENTER OF THE 1500 MIN. RAMP AS THE CENTER OF THE TRANSITION.
3. CURBS AND RAMPS TO BE POURED MONOLITHICALLY.
4. WIDTH OF RAMP MUST EQUAL WIDTH OF WALK (MIN 1.5m, MAX 3.0m).



- A. MATCH ASPHALT SURFACE TO GUTTER LIP WITHIN 3mm
- B. IF ASPHALT TOPLIFT IS DEFERRED, PLACE ASPHALT RAMP FOR THE WIDTH OF CURB RAMP, AND EXTENDING MINIMUM 1.0m INTO ROAD.

Town of Bonnyville



SCALE:

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DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

CURB RAMP

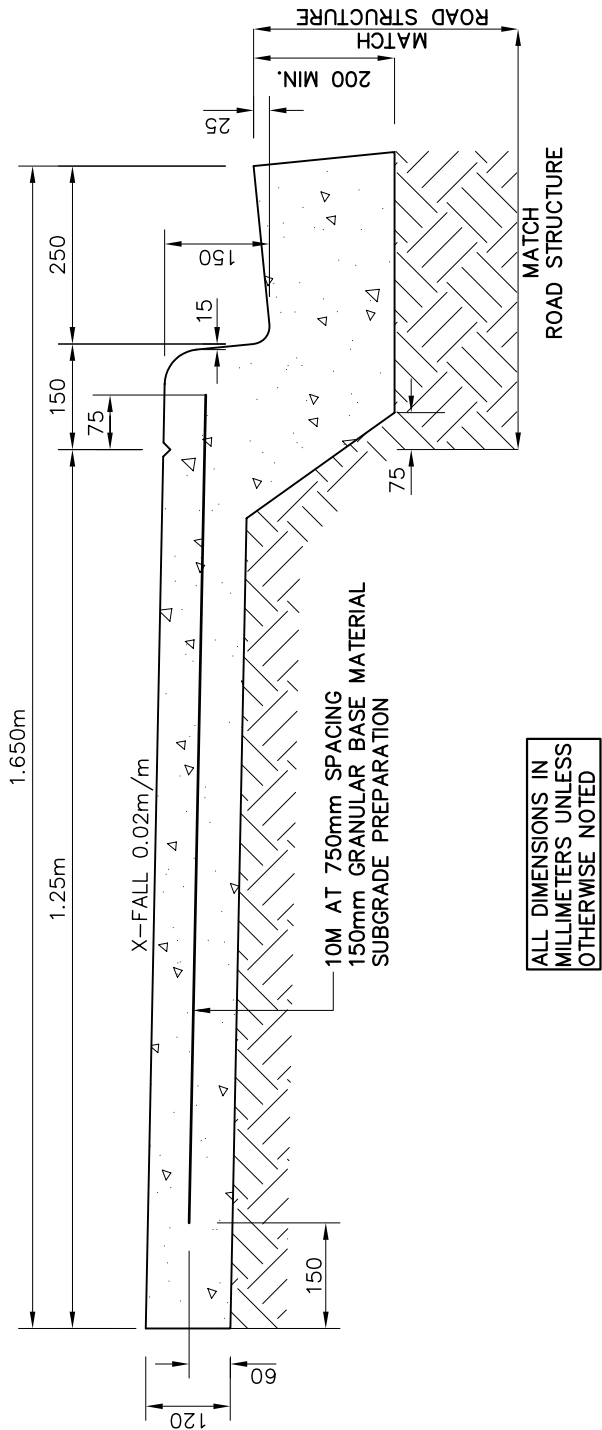
ROADS

REVISION No.

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DWG.No.

R013



Town of Bonnyville



SCALE:

NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

STRAIGHT FACED MONOLITHIC
150 CURB AND 250 GUTTER

ROADS

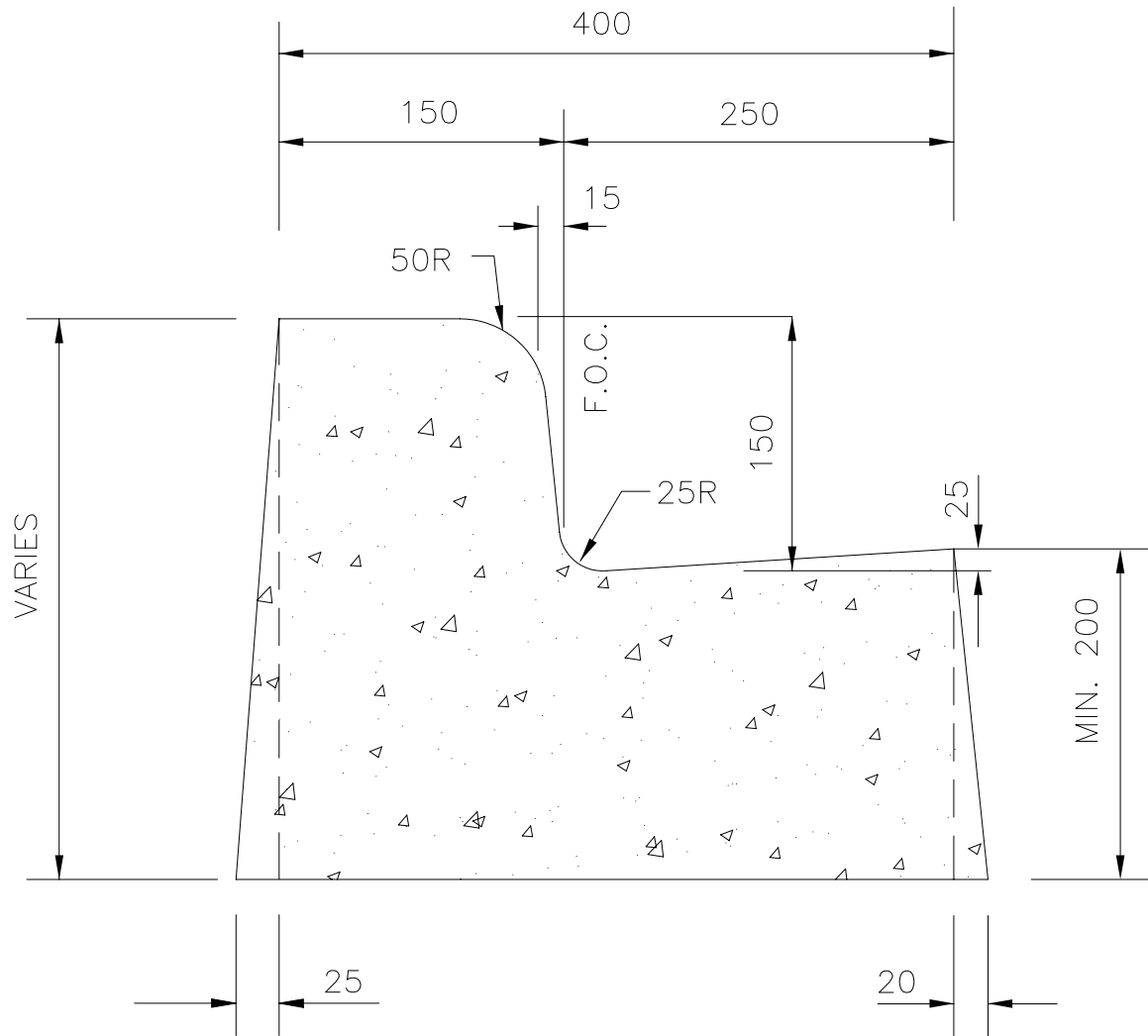
REVISION No.

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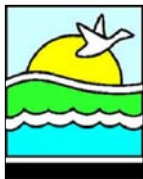
DWG.No.

R014

U:\Projects_EDM\2408\0018\011\0-Drafting-Design-Analysis\CADD\dwgs\Checked Details\Final Details\R015-Straight Faced 150 curb and 250 gutter.dwg Jan 19, 2007 - 9:02am



Town of Bonnyville



SCALE:

NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION

DATE:

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APPROVED BY:

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TITLE:

STRAIGHT FACED
150 CURB WITH 250 GUTTER

ROADS

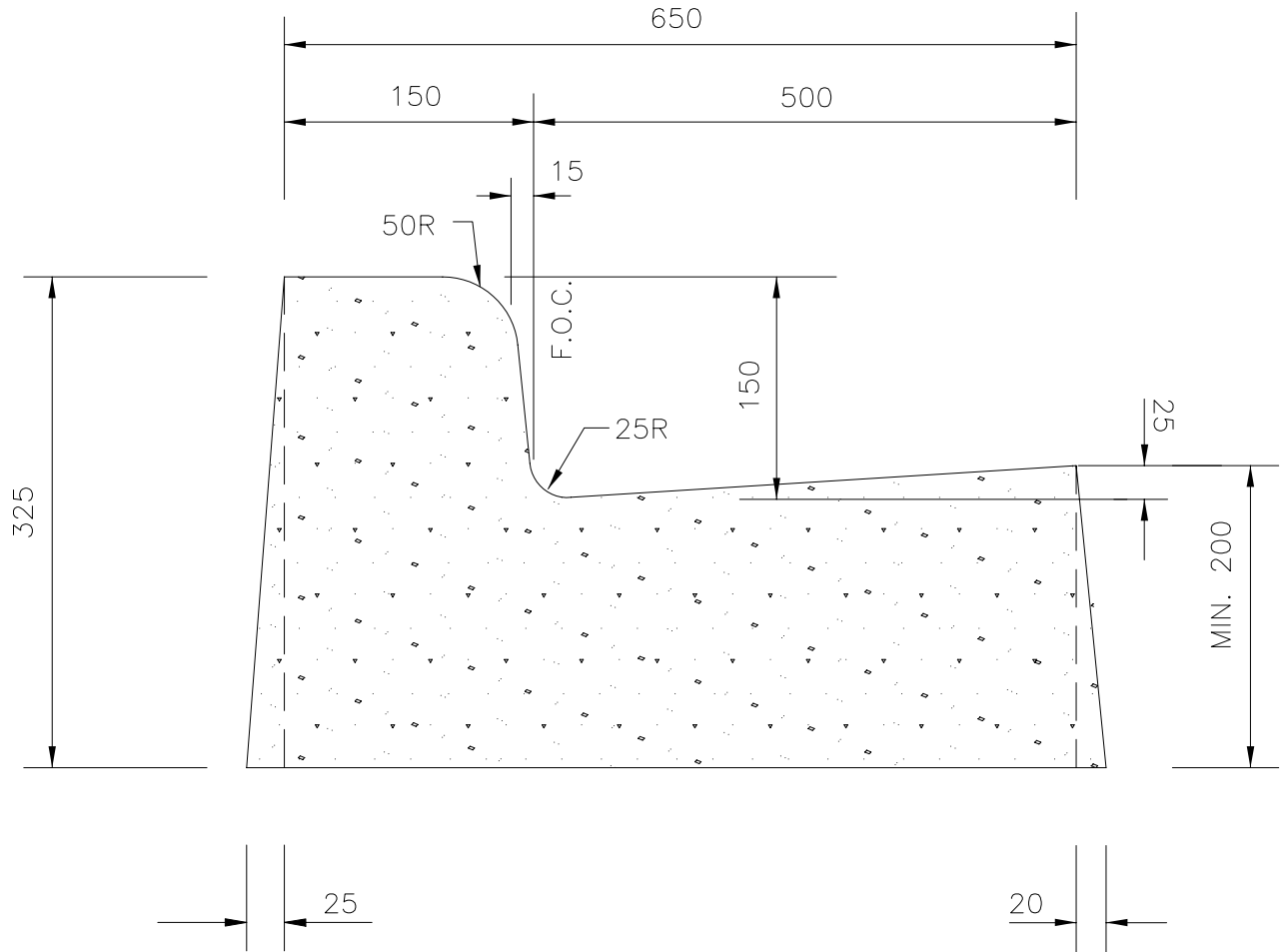
REVISION No.

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DWG.No.

R015

U:\Projects_EDM\2408\0018\011\Drafting-Design-Analysis\CADD\dwgs\Checked Details\Final Details\R016-Straight Faced 150 curb and 500 gutter.dwg Jan 19, 2007 - 9:04am



Town of Bonnyville



SCALE:

NOT TO SCALE

DATE DRAWN:

JAN. 2007

LATEST REVISION
DATE:

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APPROVED BY:

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TITLE:

STRAIGHT FACED
150 CURB WITH 500 GUTTER

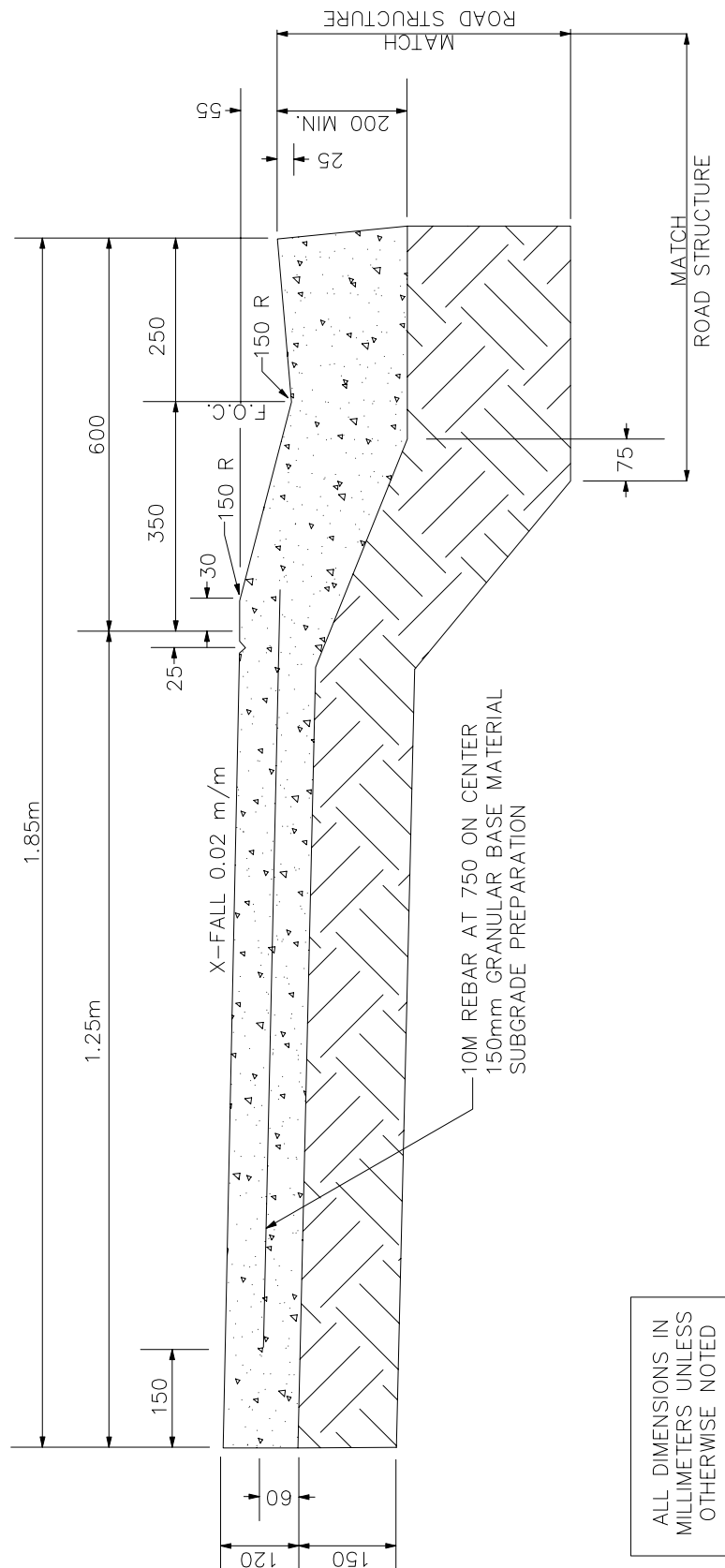
ROADS

REVISION No.

DWG.No.

R016

R017



7.0 ROADWAY LIGHTING

7.1 General

Roadway lighting refers to lighting of roads, walkways, lanes and bikeways. Lighting is generally required in all urban and suburban areas. In other areas, lighting requirements are in accordance with warrants as indicated in the TAC Guide for the Design of Roadway Lighting.

These standards are not intended to be a substitute for sound engineering knowledge and experience. Roadway lighting designs shall be prepared under the direction of a design professional with the appropriate experience and is registered with the Association of Professional Engineers and Geoscientists of Alberta.

7.2 Codes, Rules, Standards and Permits

Roadway lighting systems are to be designed in general conformance with the following:

7.2.1 Codes

Canadian Electrical Code, latest edition, and bulletins issued by the Electrical Safety Branch of Alberta.

7.2.2 Rules

- Workers Compensation Board
- Canadian Standards Association
- Utilities companies
- Regulations issued by Town, provincial and federal authorities

7.2.3 Standards

- ANSI/IES Standard RP-8, American National Standard for Roadway Lighting
- IES-DG-5 Recommended Lighting for Walkways and Class 1 Bikeways
- TAC – Guide for the Design of Roadway Lighting 1983
- TAC – Illumination of Rural Intersections
- AASHTO – Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals
- CAN/CSA-S6-00 Canadian Highway Bridge Design Code
- CAN3-CSA22.3 No. 7 Underground Systems
- CAN3-CSA22.3 No. 1 Overhead Systems

7.2.4 Permits

Electrical permits as required by provincial and/or Town inspection authorities.

7.3 Roadway Classifications

Roadway classifications for lighting purposes are in accordance with ANSI/IES RP-8. The following three (3) basic classifications are covered by these standards.

- Arterial – serves a continuous route primarily for inter-community through traffic, the equivalent terms under TAC guidelines is “arterial”
- Collector – performs the dual function for traffic of land access and movement between major and local roads
- Local – provides direct land access and is not intended to carry through traffic
- Walkways and Bikeways – adjacent to or independent from roadways

7.4 Design Methods

While the below design methods are all acceptable as indicated, the illuminance method is currently the only one for which the actual lighting level can be readily verified in the field using economical measurement equipment and procedures. The designer shall obtain approval by the Town Engineer of the design method before proceeding with detailed design.

7.4.1 Illuminance

Illuminance refers to the average maintained horizontal illumination level measured in lux. Recommended levels are related to pavement types as detailed in RP-8. Additional design criteria include uniformity ratio and veiling luminance (disability glare).

The illuminance method of design is suitable for all roadway classifications, particularly collector and local roads and bikeways and lanes.

7.4.2 Luminance

Luminance refers to the average light intensity reflected off the roadway measured in candelas per square metre (cd/m^2). Uniformity ratios and veiling luminance are also included in the design criteria.

The luminance design method is suitable for most roadway classifications, particularly arterial roads, freeways and parkways. Recommended luminance levels have not been established for walkways and bikeways.

7.4.3 Small Target Visibility (STV)

Small target visibility design was introduced in the 2000 edition of RP-8.

The STV design method determines the visibility of an array of targets on the roadway considering the following factors:

- luminance of the targets
- luminance of the immediate background
- adaptation level of the adjacent surroundings
- disability glare

The weighted average of the visibility level (VL) of the targets results in the STV.

The uniformity ratio is also considered. Suitability of the STV design method is similar to that of the luminance method.

7.5 Light Sources

Use High Pressure Sodium lamps. These lamps have been accepted as giving the best lumen/watt ratio, which translates to lower operating costs. Typically 100, 150 and 250 Watt lamps are used.

Specialty lighting in designated areas may use Metal Halide lamps, or other light sources as approved on a case by case basis.

7.6 Light Loss Factor (LLF)

The Light Loss Factor is a combination of several factors representing deterioration of the lamp and luminaire over their life-spans. These factors include environmental conditions as well as operating factors. Ambient environmental conditions range from 1 – Very Clean to 2 – Clean, 4 – Moderate, 8 – Dirty and 16 – Very Dirty.

Use the table below for Recommended Light Loss Factors. Use Ambient Category 2 and a Cleaning Interval of five (5) years:

Lamp Type	Ambient Category	Cleaning Interval in Years		
		1.25	2.5	5
Clear HPS (150 – 1000 W)	1	0.71	0.70	0.69
	2	0.69	0.68	0.66
	4	0.66	0.64	0.61
	8	0.60	0.56	0.50
	16	0.48	0.43	0.32

7.7 Pavement Surface Classifications

The IES has identified four (4) pavement classifications which define the surface reflectance characteristics of common pavements.

Typically R3 is representative of the most common pavement (asphaltic concrete) type used in Canada. Pavement reflectance is required when calculating Roadway Illuminance. Refer to the standards (RP-8-00) for definitions of roadway surface classifications.

7.8 Installation

Street lighting shall be arranged for and coordinated by the Owner. All street lights shall be High Pressure Sodium lights complete with an acceptable type of steel street light posts complete with fixture as approved by the Town.

The location and density of street lights shall be such to provide the following minimum lighting levels and as approved by the Town:

<u>Road Type</u>	<u>Commercial & Business District</u>	<u>Industrial & Rural</u>	<u>Residential</u>	<u>Uniformity</u>	<u>Max:Min</u>
Arterial	22	22	12	3:1	6:1
Collector	17	12	10	3:1	6:1
Local	12	9	6	6:1	12:1

Street lighting layout and location of the buried and overhead lines shall be subject to the approval of the Town of Bonnyville.

7.9 Intersection Lighting

Increased lighting levels are required at intersections. Intersection lighting design criteria is as follows:

Illuminance Criteria – Class R3 Road Surface				
Functional Classification	Average Maintained Illumination at Pavement by Pedestrian Area Classification (Lux)			Uniformity Eavg/Emin
	High	Medium	Low	
Major/Major	34	26	18	3:1
Major/Collector	29	22	15	3:1
Major/Local	26	20	13	3:1
Collector/Collector	24	18	12	4:1
Collector/Local	21	16	10	4:1
Local/Local	18	14	8	6:1

7.10 Calculations

7.10.1 Lighting System

Lighting system design generally requires a computer model which uses RP-8 calculation methods. Example of a suitable computer programs is LUMEN MICRO and AG132.

Manual calculations may be approved by the Town of Bonnyville for small systems.

7.10.2 Electrical Details

Design requirements include:

- maximum voltage drop in branch feeders of 3%
- allow for possibility of future extension circuits
- conductor sizes of maximum #6 RW90 and minimum #10 RW90
- circuit load not to exceed 80% of feeder breaker rating
- use single pole breakers
- use VA load of the luminaire ballast

- include loads for pole receptacles (300 W/receptacle), tree lights and traffic signal controllers

7.10.3 Submission of Design Details

When requested, calculation and design details are to be submitted to the Town on a completed design summary sheet and drawings are to include summary table and circuit loading schedule showing the following information:

- roadway classification
- lighting level (lux or cd/m²)
- uniformity ratio (ave/min)
- luminaire and lamp details
- phases
- lighting load in VA
- receptacle loads
- tree light loads
- main and branch breaker sizes
- number of luminaries on each circuit

7.11 **Poles**

7.11.1 Type and Details

Poles are to be davit type unless otherwise directed or approved by the Town of Bonnyville. Davit pole heights are to be 7.5 m, 9.0 m, 11 m or 13.5 m.

Pole details are to be in accordance with standard detail drawings and as follows:

- octagonal, tapered, unpainted, galvanized steel
- where poles are to be painted, the powder coating process is to be used
- davits to be 2.5 m with 60 mm diameter x 180 mm tenon
- pole shafts and davits are to be separate with bolted flange connections
- poles to have 100 mm x 175 mm hand hole with cover plate, bolt and backing bar

For industrial areas, if approved by the Town of Bonnyville and the power company, lights may be installed on power poles.

7.11.2 Location

Street lights and transformer pads, URD boxes, etc. shall be placed at locations not interfering with proposed driveways and in general shall be located in line with the extension of common property lines between two (2) lots.

The face of the street light posts shall be at least 1.5 m clear of the face of the curb or 0.3 m of the back of the sidewalk or as approved by the Town.

Street lights shall be provided for each internal park area that does not abut onto a lighted street. A street light shall be located at the point where each walkway opens onto the park area.

Poles are to be located at the outer edges, or in special circumstances, in the median of the roadway. Acceptable location patterns include staggered, opposite and one side arrangements, depending on the roadway classification and system design details. Streetlights are to be installed on the same side as a sidewalk, if applicable. Suitable pole arrangements are typically as follows:

- | | |
|------------|--|
| One Side: | <ul style="list-style-type: none">▪ Local Roads▪ Cul-de-sacs▪ Bike and Walkways▪ Urban Trails |
| Staggered: | <ul style="list-style-type: none">▪ Collector Roads▪ Arterial Roads |
| Opposite: | <ul style="list-style-type: none">▪ Arterial Roads with Medians |

Maintenance clearances from features and utilities as follows:

- 1.5 m – pole to curb return or driveway let-down
- 3.0 m – overhead electrical lines, dimension varies with the voltage – refer to power company for details

7.11.3 Offsets

Standard pole offsets for roadways with barrier curbs or other forms of protection of poles from vehicle traffic are as follows:

<u>Road Configuration</u>	<u>Pole Centreline to Curb Face Offset</u>
Width 14 m or more and sidewalk not adjoining curb	0.5 m
Width 11 m or less and sidewalk adjoining curb	2.0 m
Sidewalk separated from curb	1.5 m

7.12 **Luminaires**

Luminaires are to be energized at 120 Volt or 347 Volt.

Luminaires are to have a minimum Ingress protection Rating of 65.

Cobra head luminaires are to be either cutoff or semi-cutoff, with glass refractors or lenses and distribution as follows:

<u>Roadway</u>	<u>IES Distribution</u>
Width less than 14 m	Type II
Width 14 m or greater	Type III
Cul-de-sacs	Type IV
Urban trails or walkways in treed areas	Type V

Ballasts are to be as follows:

- Constant Wattage Isolated Winding (CWI) or Magnetic Regulator (Mag Reg) type, with grounded socket shell
- High Power Factor type

7.13 Power Supply and Distribution

Roadway lighting systems are typically serviced from a 120/240 Volt single phase three (3) wire system. Alternately, 120/208 Volt three (3) phase four (4) wire or 347/600 Volt systems may be used if necessary and if approved by the Town of Bonnyville.

Where new lighting systems are replacing existing lights on power poles, submit a list of the poles from which lights are to be removed.

Unmetered services are to have a minimum 60 Amp 2 or 3 Pole main breaker in a service base. A 100 Amp service is required where a traffic signal is also being serviced.

Services are to be underground dip type.

Power distribution requirements include:

- wiring to be installed in Rigid PVC conduit – minimum 32 MTD (metric trade designator)
- wiring to be stranded copper with RW90 insulation
- wiring to be colour coded per Canadian Electrical Code (CEC)
- conduit burial depth to be per the CEC
- a 78 MTD conduit may be required for future communication needs – confirm with the Town.

ROADWAY LIGHTING

Design Criteria – Roadway Lighting

Roadway	Pedestrian Conflict Area*	Maintained Luminance Criteria				Maintained Illuminance Criteria (R3 Pavement)				Small Target Visibility (Luminance)			
		Average	Uniformity Ratio (U/R)		Veiling Luminance (Lv)	Avg	Uniformity Ratio (U/R)		Veiling Luminance (LV)	Weighted Average	Median <7.3 m	Median ≥7.3 m	Uniformity Ratio (U/R)
		cd/m ²	Ave/Min (Max)	Max/Min (Max)	Lv max/ Lv avg	Lux	Ave/Min (Max)	Max/Min (Max)	Lv max/ Lv avg	Lv max/ Lv avg	Lav (cd/m ²)	Lav (cd/m ²)	Max/Min (Max)
Major	H	1.2	3:1	5:1	0.3	17	3:1	4:1	0.3	4.9	1.0	0.8	6.0
	M	0.9	3:1	5:1	0.3	13	3:1	6:1	0.3	4.0	0.8	0.7	6.0
	L	0.6	3.5:1	6:1	0.3	9	3:1	6:1	0.3	3.2	0.6	0.6	6.0
Collector	H	0.8	3:1	5:1	0.4	12	4:1	6:1	0.4	3.8	0.5	0.5	6.0
	M	0.6	3.5:1	6:1	0.4	9	4:1	6:1	0.4	3.2	0.4	0.4	6.0
	L	0.4	4:1	8:1	0.4	6	4:1	6:1	0.4	2.7	0.4	0.4	6.0
Locals	H	0.6	6:1	10:1	0.4	9	6:1	6:1	0.4	2.7	0.4	0.4	10.0
	M	0.5	6:1	10:1	0.4	7	6:1	12:1	0.4	2.2	0.3	0.3	10.0
	L	0.3	6:1	10:1	0.4	4	6:1	12:1	0.4	1.6	0.3	0.3	10.0
Walkways and Bikeways	H**					20	4:1						
	M					10	4:1						
						5	4:1						
						2	10:1						
	L***					3	6:1						
						4	4:1						

* H, M and L designations refer to High, Medium and Low levels of potential vehicle/pedestrian conflict. See Roadway Classifications section

** Upper number denotes Mixed Vehicle and Pedestrian (sidewalk adjacent to roadway)

Lower number denotes Pedestrian only

*** Upper number denotes Rural or Semi-Rural area

Middle number denotes Low Density Residential

Lower number denotes Medium Density Residential

Lighting Design Summary Sheet

Project Name:		Page _____ of _____	
Contract No.	Lighting Reference Drawing(s)		
Consultant	Project Number	Date	
SPECIFIC ROAD DESCRIPTION	From (Station or Block)	To (Station or Block)	
LIGHTING REQUIREMENTS			
Roadway Classification			
Pedestrian Conflict Area			
Roadway Design Speed			
LIGHTING DESIGN CRITERIA	Level	Uniformity	
	L_{avg} (Lux or cd/m^2)	$E_{avg/min}$	$E_{min/max}$
			Veiling Luminance L_{vmax}/L_{avg}
GENERAL CONFIGURATION			
Roadway Width (m)			
Median Width (m)			
Pole Offset of Classification (A,B,C)			
Pole Height (m)			
Pole Davit Length (m)			
Calculated Luminaire Mounting Height (m)			
Pole Arrangement			
Pole Cycle Distance			
LIGHTING CONFIGURATION			
Full Luminaire Description (with options)			
Complete Catalogue or ID Number			
Photometric File Number			
Light Loss Factor			
Luminaire Tilt or Spin (if applicable)			
Lamp Wattage			Type
PREDICTED LIGHTING PERFORMANCE	Level	Uniformity	
	L_{avg} (Lux or cd/m^2)	$E_{avg/min}$	$E_{min/max}$
			Veiling Luminance L_{vmax}/L_{avg}
ACTUAL LIGHTING PERFORMANCE (as measured in field at completion)	Level	Uniformity	
	L_{avg} (Lux or cd/m^2)	$E_{avg/min}$	$E_{min/max}$
			Veiling Luminance L_{vmax}/L_{avg}
NOTES AND COMMENTS			

8.0 GAS, POWER, TELEPHONE AND CABLE TV SERVICES

8.1 Installation

The gas, power, telephone and cable TV services to be installed shall be arranged and coordinated by the Owner with the respective utilities companies.

All layouts and installations shall be subject to the approval of the Town of Bonnyville.

In residential areas, all service connections, including power service connections shall be installed underground from the main lines to the buildings.

In commercial areas overhead power and telephone service shall be allowed at the discretion of the Town.

8.2 Right-of-Way

The Owner shall provide either registered rights-of-way or registered easements in the name of the Town for the purpose of accommodating the utility services. Rights-of-way shall be sufficient width and satisfactory to the utility companies.

Easements shall be registered on each individual lot prior to the sale of any lot in the development area.

SCHEDULE D

STANDARDS FOR THE PREPARATION OF ENGINEERING DRAWINGS

1.0 GENERAL REQUIREMENTS

These requirements pertain to the preparation of drawings for sanitary sewers, storm sewers, water, gas, underground power, telephone, cablevision, street lighting, roads, curbs and gutters, sidewalks, culverts, bridges, and other permanent structures.

Where no standard is defined in this Schedule, the standard for the preparation of a drawing to portray a particular service, structure or other items, instructions and requirements may be obtained by discussion with the Town Engineer.

As-built plans are to be completed as outlined in Schedule A and approved before securities are released.

As-built drawings are to be submitted prior to the issuance of the Construction Completion Certificate. The Design Engineer shall deliver as-built drawings as specified in this Schedule to the Town Engineer. These drawings shall be signed and sealed by the Owner's Engineer.

The as-built package shall contain all of the drawings approved as Final Detailed Plans and will include cover sheet, schedules, legends, index, overall plans, plan profiles, detail sheets, and all other related drawings. As-built submission shall be:

- 2 sets of full size paper prints
- 1 set digital AutoCAD files
- 1 set digital Adobe Acrobat (.pdf) files

2.0 DRAWING STANDARDS

2.1 Sheet Size

Pre-cut sheets to be 594 mm x 840 mm (A-1 sheet size). Drawings of other sizes will be accepted only with the prior approval of the Town Engineer.

2.2 Grid Standards

Grid standards will be 2 mm vertical x 10 mm horizontal.

2.3 Sheet Border

Border line width to be 1.0 mm. Top, bottom and right border to be 15 mm, respectively, from edge of sheet. Left border to be 42 mm from edge of sheet.

2.4 Title Block

The title block is to be located in the lower right hand corner of the sheet and shall describe the contents of the drawing (e.g. key plan, road works, etc.) and shall clearly indicate the location of the works by road name(s) and/or legal description.

The Engineer's seal is to be placed on the right hand side of the sheet adjacent to the right hand border.

3.0 PREPARATION OF DRAWINGS**3.1 Sheet Layout**

Maintain a minimum clearance of 40 mm from all borders.

Place north arrow close to the right hand side of the sheet whenever possible. In case of a fragmented view, place north arrow close to the right of each fragment when possible. North arrow shall point either towards the top of the page or towards the left hand edge of the page. The north arrow point may not be more than 60 mm from the right hand side of the page.

Show distances and location dimensions in metres.

Show pipe sizes in mm as per ASTM specifications using 1" = 25 mm.

3.2 Scales

Use metric scales:

Plan View Scale 1:500

Profile View Scale

- Horizontal 1:500
- Vertical 1:50

3.3 Plan View

Show the legal layout, dimensions, bearings, lot numbers, block numbers, legal plan numbers, street names, sidewalks with related data, and catch basin installations with elevations.

The plan views shall not be fragmented or broken due to slight curves in the road right-of-way however, they shall be fragmented or broken if the vertical alignment of the utilities in the profile section when shown at true length and when projected above to the utilities in the plan view can not be maintained in as close a relationship as possible without too much discrepancy.

All lots need not be numbered providing they are in sequence. Show first and second, and next to last and last lots. If not in sequence, all lots shall be numbered. All lot dimensions shall be given in metres and to three (3) decimal places. If the lots are of same dimensions and side by side, only the two (2) outside lots need have the dimensions shown, the remainder with ditto marks.

Show right-of-way widths and the actual roadway widths between curbs or between curbs and edge of pavement.

Curb information shall be shown and shall include radius, delta angle, tangent length, and arc length. Face of curb information must be complete (i.e. Rollover Face of Curb - RFC).

Show utility and utility access rights-of-way. Show all utilities such as sanitary and storm sewers including direction of flow, water, power, streetlights, telephone, gas, cable TV, manholes, valves, cleanouts, hydrants, service boxes, etc. Reference each utility to the nearest property line or boundaries of rights-of-way. Manholes in midblock shall be referenced to the nearest lot line. Lot services (sanitary, storm, water) shall be shown and referenced to the nearest or convenient lot line of said lot. Depth and invert elevation of each service shall be given at property line relative to the top of curb.

3.4 Profile View

The profile and related data are to be shown on the bottom half of the sheet. Establish 0+000 Station on accented vertical grid line.

The original ground line (centreline) and related data prior to construction shall be shown, along with date surveyed.

The profile shall be shown at true centreline length and projected above to the PLAN VIEW in as close a relationship as possible.

Show as constructed centreline for streets and lanes and date constructed.

Show centreline percent grade to two (2) decimal places, together with the following information on vertical curves:

- the chainage and elevations of BC, EC and VPI
- the external value "e"
- the length of vertical curve
- the chainage and elevation of the low spot of sag curves or high point of crest curves
- on superelevated curves and crossfall sections, percent crossfall, transition length and crown shall be noted.

Show profiles of invert and crown of pipes for sanitary, storm, and watermains, as well as length, size, type, grade, and class of pipe (e.g. 75 m - 200 mm SAN SDR 35 PVC). Show manholes with rim elevations, and invert elevations at both inlet and outlet. Crown of pipes shall be shown at all locations where there is the possibility of conflicts with other utilities. Bedding requirements shall be noted.

Show location type and elevation of all crossing utilities.

Elevations are placed at the right and left hand side of the profile and repeated when there is a break in the profile. Elevations are to be shown at every even metre graduation and placed on the heavy accented line. All elevations shall be relative to GEODETIC DATUM and in metric. Benchmark locations and elevations can be obtained from the Town's Engineer.

4.0 DRAFTING GUIDELINES

The format of the Technical Legend places the symbol as it appears on the drawing on the left hand side of the page with drafting guidelines on the right hand page.

The symbols presented in the Legend are sized for use on Plan Profile drawings. Dimensions used are given in millimetres.

SCHEDULE E

RIGHT-OF-WAY AGREEMENT

THIS INDENTURE made this ____ day of _____, 20__.

BETWEEN:

(hereinafter called the "Grantor")

OF THE FIRST PART

AND:

(hereinafter called the "Grantee")

OF THE SECOND PART

WHEREAS the Grantor is the registered Owner or is entitled to become the registered Owner of an estate in fee simple of ALL AND SINGULAR those certain parcels or tracts of land and premises situate, lying and being in the Town of Bonnyville, in the Province of Alberta, and being more particularly known and described as:

(hereinafter called the "Lands of the Grantor")

AND WHEREAS the Grantor and Grantee have agreed to enter into this agreement pursuant to Section 218 of the *Municipal Government Act* of Alberta;

AND WHEREAS it is necessary for the operation and maintenance of the Grantee's undertaking, hereinafter described, to install and maintain a system of sewerage works and/or water works and/or drainage works and/or gas works including all pipes, valves, fittings, buildings and facilities in connection therewith and/or electric works including all wires, poles, conduits and other facilities in connection therewith and/or communication works including all wires, poles, conduits and other facilities in connection therewith;

(hereinafter called the "Works")

The Grantor has agreed to permit the construction by the Grantee of the aforementioned works on a portion of the said Land and to grant for that purpose the right-of-way hereinafter described;

NOW THEREFORE THIS INDENTURE WITNESSETH that in consideration of the sum of _____ Dollars (\$ _____) of lawful money of Canada, now paid by the Grantee to the Grantor (the receipt and sufficiency of which is hereby acknowledged by the Grantor), and in consideration of the covenants and conditions hereinafter contained to be observed and performed by the Grantee and for other valuable consideration:

1.0 THE GRANTOR DOTH HEREBY:

- 1.1 Grant, convey, confirm and transfer, in perpetuity, unto the Grantee the full, free and uninterrupted right, licence, liberty, privilege, permission, and right-of-way to lay down, install, construct, entrench, operate, maintain, inspect, alter, remove, replace, bury, cleanse, string, and otherwise establish one or more systems of Works upon, over, under and across that part of the Land of the Grantor as shown outlined in heavy black on Right-of-Way Plan Number: _____ and designated as _____.

(hereinafter called the "Perpetual Right-of-Way")
- 1.2 Covenant and agree to and with the Grantee that for the purposes aforesaid and upon, over, under and across the Perpetual Right-of-Way the Grantee shall for itself and its servants, agents, workmen, machinery, vehicles, equipment, and materials be entitled at all time to enter, use, pass and repass, labour, construct, erect, install, dig, carry away soil or other surface or subsurface materials, clear of all trees, growth, buildings or obstruction now or hereafter in existence, as may be necessary, useful, or convenient in connection with the operations of the Grantee in relation to the Works;
- 1.3 Grant, convey, confirm, and transfer unto the Grantee for itself and its servants, agents, workmen, contractors, and all other licensees of the Grantee, together with machinery, vehicles, equipment, and materials the right at all reasonable times to enter upon and to pass and repass over such of the Lands of the Grantor as may reasonably be required for the purpose of ingress to and egress from the Perpetual Right-of-Way;
- 1.4 Grant, convey, confirm, and transfer unto the Grantee for itself and its servants, agents, workmen, contractors, and all other licensees of the Grantee, together with machinery, vehicles, equipment and materials for a period of _____ days only from the date of this Agreement, the full, free and uninterrupted right, licence, liberty, privilege, permission, and right-of-way to enter upon, pass and repass, clear, labour, and use for the purpose of ingress to and egress from the Perpetual Right-of-Way and for the purpose of storing machinery, equipment, material or supplies used or to be used in connection with the construction of the Works herein described, and for the purpose of placing or storing the surface or subsurface material to be excavated from the Perpetual Right-of-Way upon and over, but not under that part or parts of the Lands of the Grantor, shown outlined in green on Right-of-Way Plan Number: _____

(hereinafter called the "Working Right-of-Way")

Provided always, and it is hereby agreed that the Grantee shall only clear such trees and growth and interfere and disturb the surface of the Working Right-of-Way in a manner that is reasonably necessary in the conduct of its operations thereon;

**2.0 THE GRANTOR HEREBY COVENANTS TO AND AGREES WITH THE GRANTEE,
as follows:**

- 2.1 That the Grantor will not, nor permit any other person, to erect, place, install or maintain any building, structure, mobile home, concrete driveway or patio, pipe, wire or other conduit on, over or under any portion of the Perpetual Right-of-Way so that it in any way interferes with or damages or prevents access to, or is likely to cause harm to Works authorized hereby to be installed in or upon the Perpetual Right-of-Way;
- 2.2 That the Grantor will not do nor knowingly permit to be done, any act or thing which will interfere with or injure the said Works and in particular, will not carry out any blasting on or adjacent to the Perpetual Right-of-Way without the consent in writing of the Grantee, provided that such consent shall not be unreasonably withheld;
- 2.3 That the Grantor will not substantially diminish the soil cover over any of the Works installed in the Perpetual Right-of-Way, and in particular, without in any way limiting the generality of the foregoing, will not construct open drains or ditches along or across any Works installed in the Perpetual Right-of-Way;
- 2.4 That the Grantor will from time to time and at all times upon every reasonable request, and at the cost of the Grantee do and execute or cause to be made, done or executed all such further and other lawful acts, deeds, things, devices, conveyances, and assurances in law whatsoever for the better, assuring unto the Grantee of the rights hereby granted;

**3.0 THE GRANTEE HEREBY COVENANTS TO AND AGREES WITH THE GRANTOR,
as follows:**

- 3.1 That the Grantee will not bury any debris or rubbish of any kind in excavations or backfill, and will remove shoring and like temporary structures as backfilling proceeds;
- 3.2 That the Grantee will thoroughly clean all lands to which it has had access hereunder of all rubbish and construction debris created or placed thereon by the Grantee, and will leave such lands in a neat and clean condition;
- 3.3 That the Grantee will, as soon as weather and soil conditions permit, and so often as it may exercise its right of entry hereunder to any of the lands of the Grantor, replace the surface soil as

nearly as may be reasonably possible to the same condition as it was prior to such entry, in order to restore the natural drainage to such lands;

PROVIDED, HOWEVER, that nothing herein contained shall require the Grantee to restore any trees or other surface growth, but the Grantee shall leave such lands in a condition which, subject to the existence of the works, will not inhibit natural regeneration of such growth;

- 3.4 That the Grantee will, as far as reasonably possible, carry out all work in a proper and workmanlike manner so as to do as little injury to the Lands of the Grantor as possible;
- 3.5 That the Grantee will make good at its own expense all damage or disturbance which may be caused to the surface soil of the Lands of the Grantor in the exercise of its rights hereunder;
- 3.6 That the Grantee will, as far as reasonably possible, restore any fences, lawns and flower beds, at its costs as nearly as may be reasonably possible to the same condition that they were in prior to any entry by the Grantee upon the Lands.

4.0 THE PARTIES HERETO EACH HEREBY COVENANT TO AND AGREE WITH THE OTHER, as follows:

- 4.1 The said Works referred to above, together with all pipes, manholes, valves, conduits, wires, casings, fittings, lines, meters, appliances, facilities, attachments or devices used in connection therewith shall constitute the Works;
- 4.2 Notwithstanding any rule of law or equity to the contrary, the Works brought on to, set, constructed, laid, erected in, upon or under the Perpetual Right-of-Way by the Grantee shall at all times remain the property of the Grantee, notwithstanding that the same may be annexed or affixed to the freehold and shall at any time and from time to time be removable in whole or in part by the Grantee;
- 4.3 In the event that the Grantee abandons the Works or any part thereof the Grantee may, if it so elects, leave the whole or any part thereof in place;
- 4.4 That no part of the title in fee simple to the soil shall pass to or be vested in the Grantee under or by virtue of these presents and the Grantor may fully use and enjoy all of the Lands of the Grantor subject only to the rights and restrictions herein contained;
- 4.5 That the covenants herein contained shall be covenants running with the Land and that none of the covenants herein contained shall be personal or binding upon the parties hereto, save and except during the Grantor's seizing or land ownership of any interest in the Lands of the Grantor, and with respect only to that portion of the Lands of the Grantor of which the Grantor shall be seized or in which he shall have an interest, but that the Lands of the Grantor, nevertheless, be and remain at all times charged therewith;

-
- 4.6 If at the date hereof the Grantor is not the sole registered land owner of the Lands of the Grantor, this agreement shall nevertheless bind the Grantor to the full extent of his interest therein, and if he shall acquire a greater or the entire interest in fee simple, this Agreement shall likewise extend to such after-acquired interests;
- 4.7 Where the expression "Grantor" includes more than one person, all covenants herein on the part of the Grantor shall be construed as being several as well as joint;
- 4.8 This agreement shall endure to the benefit of and be binding upon the parties hereto and their respective heirs, administrators, executors, successors and assigns, as the case may be; and wherever the singular or masculine is used, it shall be construed as if the plural or the feminine or neuter, as the case may be, had been used; where the parties or the context hereto so require and the rest of the sentence shall be construed as if the grammatical and terminological changes thereby rendered necessary had been made.

CONSENT AND PRIORITY AGREEMENT

KNOW ALL MEN BY THESE PRESENT THAT _____ is the registered holder of a charge by way of _____ against the within-described property, which said charge is registered in the Land Title Office, Town of Bonnyville, under Numbers _____, for and in consideration of the sum of one dollar (\$1.00) paid by the Town of Bonnyville to the said chargeholder (the receipt whereof is hereby acknowledged), consent to the within Right-of-Way and agrees with the Town of Bonnyville, its successors and assigns, that the within Right-of-Way shall be an encumbrance upon the within-described property in priority to the said charge in the same manner and to the same effect as if it had been dated and registered prior to the said charge.

SCHEDULE F

CONFIRMATION OF COMMITMENT BY LAND OWNER

Note: To be submitted prior to commencement of construction

CONFIRMATION OF COMMITMENT BY LAND OWNER

The Town of Bonnyville
4917 – 49th Avenue
Bag 1006
BONNYVILLE, AB T9N 2J7

Attention: Town Engineer

Dear Sir:

Re: _____

(Description and Address) of Subdivision or Development

The undersigned has retained as his Professional Engineer, _____ (the "Consultant"), to undertake and/or coordinate and review all associated design criteria and "field reviews" required for this Project. It is understood that he will take all such steps as regulated under the Provincial Statute for his profession and by the definition of "field reviews" hereinafter set forth, to ascertain that the design will comply and construction of the project will substantially conform in all material respects with the provisions of the Town of Bonnyville Subdivision and Development Servicing document, and applicable Permits, Bylaws, Acts and Regulations which apply to the Project. This representative will ascertain that only qualified personnel are retained to carry out tests, inspect or carry out design work, detailing or "field reviews."

As used herein, "field reviews" shall mean such reviews of the work at the project site and at fabrication locations, where applicable, as the "Consultant", in his professional discretion, considers to be necessary in order to ascertain that the work substantially conforms in all material respects to the plans and supporting documents approved by the Town of Bonnyville. This will include keeping records of all site visits and any corrective actions taken as a result thereof.

The undersigned has given a contractual mandate to the "Consultant" to review reports of other testing and inspection agencies and disciplines where necessary, comment on their acceptability, determine the corrective action to take if unacceptable, and maintain a detailed record of every such report and comments. The "Consultant" will automatically submit a monthly summary progress report to the Town Engineer.

NOTE: The Owner will notify the Town Engineer in writing 30 days prior to any intended termination of or by the "Consultant". It is understood that work on the above project will cease as of the effective date of such termination, until such time as a new appointment is made, and a "Stop Work Order" shall be posted upon the said project by the Town.

Witness Name (Print)

Owner's Name (Print)

Witness Signature

By: _____
Owner(or Owner's Appointed Agent) Signature

Address (Print)

Date: _____

Occupation

Title of Agent (if applicable)

Address (Print)

The Corporate Seal of

was hereunto affixed in the presence of:

The above must be signed by the Owner or his appointed Agent. The signature must be witnessed. If the Owner is a company, the corporate seal of the company must be affixed to the document in the presence of its duly authorized officers. The officers must also sign, setting forth their positions in the company.

This "Consultant" acknowledges that he has been retained to ascertain that the design will comply and construction of the project will substantially conform in all material respects with Bylaws as set out above and will submit letters of Confirmation of Professional Design Assurance from others, as needed, for the approval of the subdivision. Furthermore, the "Consultant" hereby covenants that he or his firm presently carries liability insurance in the amount of _____.

Name of Professional (Print)

Signature of Professional

Date:_____

Mailing Address (Print)

Phone:_____

SCHEDULE G

CONFIRMATION OF PROFESSIONAL ASSURANCE

CONFIRMATION OF PROFESSIONAL ASSURANCE

The Town of Bonnyville
4917 – 49th Avenue
Bag 1006
BONNYVILLE, AB T9N 2J7

Attention: Town Engineer

Dear Sir:

Re: _____
(Description and Address of Project)

This is to advise that I am a Professional Engineer licensed to practice in the Province of Alberta and was retained by the Owner, _____ to undertake and coordinate all field reviews and inspections required with respect to this project and took all steps as regulated under The Engineers and Geoscientists Act of Alberta and required by good practices and by the definition of "field reviews" hereinafter set forth in order to issue the following certification.

As used herein, "field reviews" shall mean such reviews of the work at the project site and at fabrication locations where applicable as the Professional Engineer, in his professional discretion, considered to be necessary in order to ascertain that the work substantially conformed in all material aspects to the Approved Engineering Plans.

The following aspects have been reviewed by me or under my direction and have been found to comply with the Approved Engineering Plans.

1. Storm drainage system including, but not restricted to:

- the location, alignment, size and grade of all pipes and culverts
- the spacing of access vaults and catchbasins
- the construction of drywells
- materials used for pipes, culverts, access vaults, catchbasins, pipe and fitting joints and service connections
- the completion of erosion control measures
- materials used for pipe bedding and backfilling of trenches
- workmanship in the construction and installation of all materials

2. Sanitary sewer system including, but not restricted to:

- location, alignment, size and grade of all pipes
- spacing of access vaults and catchbasins
- materials used for pipes, access vaults, pipe and fitting joints, service connections
- materials used for pipe bedding and backfilling of trenches
- materials used for service inspection chambers
- workmanship in the construction and installation of all materials

3. Water distribution system including, but not restricted to:

- location, alignment, size and grade of all pipes
- spacing of hydrants and valves
- construction of pumping stations and reservoirs
- materials used for pipes, fittings, gate valves, valve boxes, hydrants, service connections, corporation stops, curb stop and boxes, air valves, stops and drains
- pressure testing and disinfection
- materials used for pipe bedding and backfill of trenches
- workmanship in the construction and installation of all materials

4. Roads including, but not restricted to:

- alignment, width and grade of all roads
- materials used for preparation of road bases and road surfaces
- materials testing data
- workmanship in the installation of materials

5. Curb, gutter, sidewalks and boulevards including, but not restricted to:

- width and grade of sidewalks and boulevards
- alignment and grade of curbs and gutters
- materials used for preparation of subgrades and surfaces
- materials testing data
- workmanship in the installation of materials

6. Streetlighting, electrical and communications wiring and gas installations including, but not restricted to:

- number and spacing of street light poles and luminaires
- materials used for street lighting, electrical and communications wiring and gas installations
- materials used for backfilling of trenches
- workmanship in the installation of materials

I certify that the foregoing areas substantially comply in all material respects with the Approved Engineering Plans and supporting documents, including all amendments thereto, which supported the application for subdivision approval File No. _____ which were approved by the Town of Bonnyville.

In addition, significant revisions to the Approved Engineering Plans and supporting documents have been submitted to the Town in order to depict, as nearly as possible, given my "field reviews" as defined herein, the services as finally designed and built.

(PROFESSIONAL
SEAL)

Name (Print) _____

Signed _____

Date _____

Address (Print) _____

Representing _____

Attached hereto you will find the appropriate "field review" assurance from each of the associated Professional consultants, who are registered in the Province of Alberta as members in good standing of the Association of Professional Engineers and Geoscientists of Alberta.

ASSURANCE OF "ENGINEERING" FIELD REVIEW

Re: _____ (Project Address)

This is to assure that I/We provided "field reviews" as defined herein of all engineering work outlined checklist items 1.0 to 6.0 inclusive, except as specifically noted below.

EXCEPTIONS

(PROFESSIONAL
SEAL)

Name (Print) _____

Signed _____

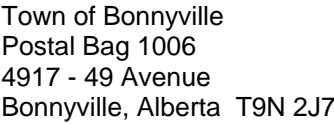
Date _____

Address (Print) _____

Representing _____

SCHEDULE H

STANDARD FORMS



PH: (780) 826-3496 FAX: (780) 826-4806
World Wide Web: www.bonnyville.ca
E-Mail: permits@town.bonnyville.ab.ca

APPLICATION FOR SUBDIVISION APPROVAL <input type="checkbox"/> By plan of subdivision <input type="checkbox"/> By other instrument Tick whichever applies.	FOR OFFICIAL USE ONLY	
	DATE of receipt of Form A as completed	FILE No.
	Fees Submitted:	

1.	Name of register owner of land to be subdivided	Address and Phone No.
	Name in block capitals	

2. Authorized person acting on behalf of registered owner	Address and Phone No.
Name in block capitals	

3. **LEGAL DESCRIPTION AND AREA OF LAND TO BE SUBDIVIDED**

All/part of the _____ 1/4 Sec. _____ Twp. _____ Range _____ West of _____ Meridian

Being all/parts of Lot _____ Block _____ Reg. Plan No. _____ C.O.T. No. _____

Area of the above parcel of land to be subdivided _____ hectares

Municipal address (if applicable) _____

4. LOCATION OF LAND TO BE SUBDIVIDED

a. The land is situated in the municipality of _____

b. Is the land situated immediately adjacent to the municipal boundary? Yes _____ No _____

If Ayes@, the adjoining municipality is _____

c. Is the land situated within 0.8 kilometers of the right-of-way of a Highway? Yes _____ No _____

If Ayes@, the Highway is No. _____, the Secondary Road is No. _____

d. Does the proposed parcel contain or is it bounded by a river, stream, lake or other body of water or by a drainage ditch or canal?

If Ayes@, state its name _____

e. Is the proposed parcel within 1.5 km. of a sour gas facility? Yes _____ No _____

5. EXISTING AND PROPOSED USE OF LAND TO BE SUBDIVIDED

Describe:

a. Existing use of the land _____

b. Proposed use of the land _____

c. The designated use of the land as classified under a land use bylaw or a zoning bylaw or a land use classification guide where applicable _____

6. PHYSICAL CHARACTERISTICS OF LAND TO BE SUBDIVIDED (WHERE APPROPRIATE)

a. Describe the nature of the topography of the land (flat, rolling, steep, mixed) _____

b. Describe the nature of the vegetation and water on the land (brush, shrubs, tree stands, woodlots, etc. - sloughs, creeks, etc.) _____

c. Describe the kind of soil on the land (sandy, loam, clay, etc.) _____

7. EXISTING BUILDINGS ON THE LAND PROPOSED TO BE SUBDIVIDED

Describe any buildings, historical or otherwise and any structures on the land and whether they are to be demolished or moved _____

8. WATER AND SEWER SERVICES

If the proposed subdivision is to be served by other than a water distribution system and a wastewater collection system, describe the manner of providing water and sewage disposal. _____

9. REGISTERED OWNER OR PERSON ACTING ON HIS BEHALF

I, _____ hereby certify that
(Full name in block capitals)

I am _____, And that the information given on this form is full and complete,
(the registered owner/am authorized to act on behalf of the registered owner)

And is, to the best of my knowledge, a true statement of the facts relating to his application for subdivision approval.

Address _____	Signature _____
Daytime Phone No. _____	Date _____

FURTHER INFORMATION MAY BE PROVIDED BY APPLICANT ON THE REVERSE OF THIS FORM.

SERVICE
CONNECTION
REPORT

SUBDIVISION: _____
STAGE: _____
JOB NO.: _____
DATE: _____
STREET NAME: _____
Block #: _____
LOT #: _____

WATER SERVICE

PIPE: Dia.: _____ Type: _____
LENGTH FROM C.C.: _____
LENGTH EXTENDED INTO LOT: _____

SEWER SERVICE

INVERT ELEVATION AT CLEANOUT: _____
PIPE: Dia.: _____ Type: _____
LENGTH FROM CLEANOUT: _____
LENGTH EXTENDED INTO LOT: _____

STORM SERVICE

INVERT ELEVATION AT CLEANOUT: _____
PIPE: Dia.: _____ Type: _____
LENGTH FROM CLEANOUT: _____
LENGTH EXTENDED INTO LOT: _____

(All Elevations are Metric Geodetic)

INSPECTOR: _____

LEGEND

PROPOSED LOT ELEVATION
AT PROPERTY LINE

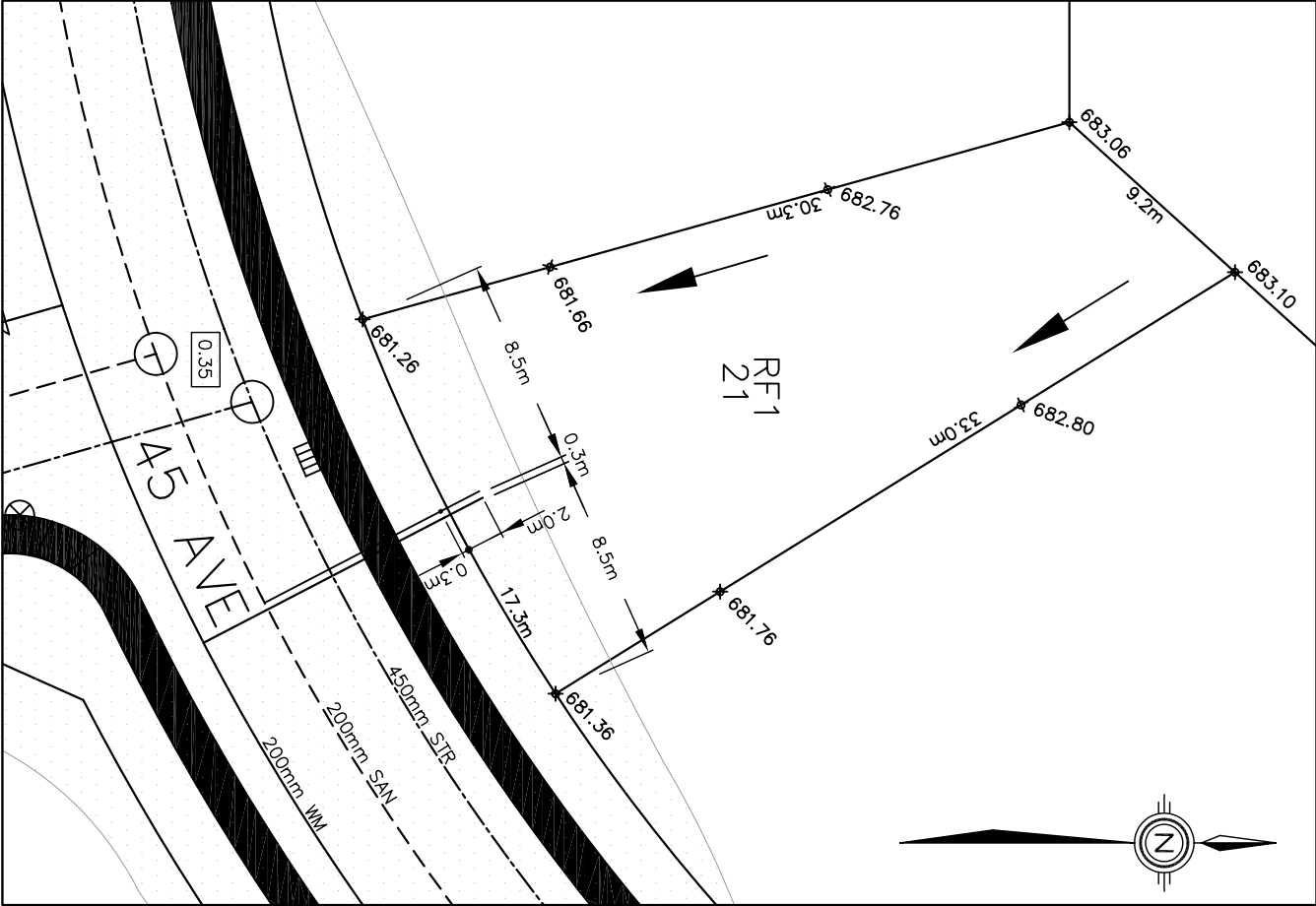
RF1
21
LOT #

DIRECTION OF LOT
DRAINAGE

MAXIMUM EXTENT OF
PONDING (1:100 YEAR
DEPTH (m)

0.35

MAX. POND
DEPTH (m)





THE TOWN OF BONNYVILLE **CONSTRUCTION COMPLETION CERTIFICATE**

Development Area _____

Developer _____

Development Agreement Dated _____

Contractor _____

Municipal Improvement _____

Date of Application _____

Pursuant to the Town of Bonnyville Development Agreement, I _____ of the firm _____ "Consulting Engineers", hereby certify that the municipal improvement work noted herein is complete as defined by the Development Agreement mentioned above, and constructed as far as can be practically ascertained according to the Town of Bonnyville Minimum Design Standards. I hereby recommend this municipal improvement for approval of this construction completion certificate.

Project Engineer (Consulting Engineering Firm) DATE _____

SEAL

Signing Officer (Consulting Engineering Firm) DATE _____

Authorized Town Representative DATE _____

Approved on _____, 20____
Town Engineer

Rejected on _____, 20____
Town Engineer

Cause(s) 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: _____ DATE _____
Town Engineer

Date Maintenance Period to Start: _____

Date Maintenance Period to Expire: _____



THE TOWN OF BONNYVILLE FINAL ACCEPTANCE CERTIFICATE

Development Area _____
Developer _____
Development Agreement Dated _____
Contractor _____
Municipal Improvement _____
Date of Application _____
Maintenance Expiry Date _____

Pursuant to the Town of Bonnyville 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 the Town of Bonnyville Development Agreement, and I hereby recommend this municipal improvement for final acceptance by the Town of Bonnyville.

SEAL _____ DATE _____
Project Engineer (Consulting Engineering Firm)

_____ DATE _____
Signing Officer (Consulting Engineering Firm)

_____ DATE _____
Authorized Town Representative

Approved on _____, 20____ Town Engineer _____

Rejected on _____, 20____ Town Engineer _____

Cause(s) for Rejection – (see attached report) _____

I hereby certify that the items listed as reasons for rejection have been corrected.

_____ DATE _____
Project Engineer (Consulting Engineering Firm)

Approved: _____ DATE _____
Town Engineer



TOWN OF BONNYVILLE REQUEST FOR WATER NETWORK ANALYSIS

Name of Proposed Development:

Name of Developer:

Information Provided by: (Name & Contact Info)

Date of Request:

Junction Name ¹	Northing ² (m)	Easting ² (m)	Elevation ^{2,3} (m)	Maximum Daily Demands ⁴ (L/s)	Peak Hourly Demands ⁴ (L/s)	Required Fire Flow ⁵ (L/s)

NOTES:

¹Junction Name: Junctions are to be located where two or more pipes meet and named using the first three (3) letters of the name of the proposed development and numbered accordingly

²All Northings, Eastings and Elevations are to be in 3TM (NAD 83) grid

³Elevation: Junction elevations are pipe inverts calculated based on the approximate ground elevation and required pipe cover

⁴Maximum Daily Demands and Peak Hourly Demands: Based on the Town of Bonnyville Minimum Design Standards

⁵Required Fire Flow: Based on the Town of Bonnyville Minimum Design Standards and proposed Land Use (Commercial, Residential or Industrial)

This form must be submitted digitally as a Microsoft Office Excel spreadsheet and must be accompanied by an AutoCAD Drawing showing proposed water main layout