ENGINEERING GUIDELINES

&

MINIMUM SERVICING STANDARDS

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September 2019

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1. GENERAL

1.1 DESIGN STANDARDS AND INTENTION

This document is intended for the use of Developers, Planners, Engineers, Contractors, County Residents or others who may provide municipal engineering services, construction municipal engineering works or local improvements in Lethbridge County.

This document forms an appendix to the Lethbridge County's Development Agreement, with clauses in the Development Agreement modifying or providing clarification of design and construction requirements on a "site specific" basis.

Deviations from the requirements of this document are not permitted without the previous written acceptance of the Director of Municipal Services for Lethbridge County.

This document provides minimum standards for typical development components. Nothing in this document releases a Developer, Contractor, Consultant or County Resident from their obligation to design and perform their work consistent with acceptable and acknowledged industry standards, and a Developer, Contractor, Consultant or County Resident must be fully responsible to rectify any deficiencies in the performance of their work, regardless of whether it meets the minimum standards provided herein, or for work not specifically referenced in this document.

1.2 DEFINITIONS

The following words will have the meaning hereinafter assigned to them:

"Applicant" or "Developer"

will mean a person or persons who have applied for approval of a proposed subdivision, or to service an existing or proposed parcel of land, whether as the owner or the owner's agent of the land included therein.

"Building Permit"

will mean such authorization to proceed with building construction on a particular lot issued by an Agency authorized by Alberta Labor to issue Permits and provide compliance monitoring.

"Capital Project"

will mean a project that has been awarded by Lethbridge County under the Capital Project Program.

"Consulting Engineer" or **"Engineer"**

will mean a professional engineer, licensed to practice Engineering in Alberta, retained by the applicant, responsible for the design, layout and supervision of installation, recording of as-built (record) information and performing those duties in connection with the provision of Municipal services as set out in these design standards.

"Contractor"

will mean any person, persons or corporation, which will undertake the installation of Municipal Services on behalf of either the Applicant or the Municipality.

"County" or **"Municipal"** or **"Municipality"**

will refer to Lethbridge County, in the Province of Alberta and/or person or persons working on its behalf.

“County’s Engineer” or “Owner’s Engineer”

will refer to The Engineer or Engineering Firm working on behalf of Lethbridge County.

“Development” or Development Project

will mean the development of land related to a project undertaken by a Landowner or Developer

“Development Agreement”

will mean documents outlining the general requirements and conditions of the agreement between Lethbridge County and the applicant. Such an agreement will be in place prior to construction and installation of municipal services in the development.

“Development Officer”

will mean person or persons appointed and acting on behalf of Lethbridge County to regulate the orderly development of subdivisions and properties.

“Development Permit”

will mean such authorization as issued by Lethbridge County to the Applicant to proceed with construction and installation of municipal services in the development.

"Director”, or “Director, Municipal Services"

will mean the Director of Municipal Services of Lethbridge County, or the Director’s authorized representative, who is responsible for the supervision and approval of all tasks related to the provision of engineering, and other duties for the provision of Municipal services.

“Landowner”

will mean the legal owner of a section(s) or lot(s) of land within Lethbridge County.

"Prime Contractor”

Is as defined by Occupational Health and Safety.

“Record Drawings”

will mean drawings up-dated to accurately show utility and municipal improvements as constructed in the field. Such drawings will be stamped and signed by the Consulting Engineer.

“Rural Development” or “Country Residential Development”

will mean development of low density, low level of service, located in a rural setting, as defined by Lethbridge County.

“Urban Development”

will mean development of high density, high level of service, located in an urban setting, as defined by Lethbridge County.

"Work”

will mean any undertaking of the Applicant which alters the existing lands proposed for improvement, including but not limited to, moving soil, vegetation and existing buildings or structures.

1.3 REFERENCE DOCUMENTS

Where Acts, Bylaws and Standards are referred to, they will be the current amended and updated issues of such.

1.4 PROCEDURE

1.4.1 ENGINEERING DESIGN

The Applicant will retain a Professional Engineer who is licensed to practice in the Province of Alberta and who is a member of The Association of Professional Engineers and Geoscientists of Alberta, who will be responsible for the design and preparation of drawings and specifications for all services as required within Lethbridge County in accordance with the County Engineering Guidelines and Minimum Servicing Standards, and sound engineering principles.

If Landscaping plans are deemed required by the County the landscape plans will be prepared and stamped by a Landscape Architect or Professional Engineer as required by Provincial Legislation.

All drawings will identify the Applicant's and the Applicant's Engineer, and will be stamped, signed and sealed by the Engineer.

The Design Drawings will display all existing and proposed services. It will be the Engineer's responsibility to coordinate with the utility companies to establish the location of the existing and proposed services, and the specifications for their installation.

The Applicant's Engineer shall be responsible for carrying out all surveys and investigations necessary to prepare the design. It shall further be the responsibility of the Applicant's Engineer to identify the need for any easements or additional right-of-way required. The plans and related documents shall be prepared by a qualified licensed Alberta Land Surveyor at the Applicant's expense.

While the Applicant's Engineer may arrange to have certain portions of the work carried out by other qualified persons, the responsibility shall remain with the Applicant's Engineer for the coordination of the work and certification of its quality and accuracy.

1.4.1.1 Capital Projects

For capital projects all drawings will identify the Owner and the Owner's Engineer, and will be stamped and sealed by the Engineer.

The Design Drawings will display all existing and proposed services. It will be the Engineer's responsibility to coordinate with the utility companies to establish the location of the existing and proposed services, and the specifications for their installation.

The Engineer shall be responsible for carrying out all surveys and investigations necessary to prepare the design. It shall further be the responsibility of the Engineer to identify the need for any easements or additional right-of-way required. The plans and related documents shall be prepared by a qualified licensed Alberta Land Surveyor at the Applicant's expense.

While the Engineer may arrange to have certain portions of the work carried out by other qualified persons, the responsibility shall remain with the Engineer for the coordination of the work and certification of its quality and accuracy.

1.4.2 SUBMISSION & REVIEW OF ENGINEERING DESIGN

Three (3) complete sets of plans and specifications for the proposed subject will be submitted to the Planning Department, Lethbridge County. Plans, drawings and specifications are to be in conformance with the requirements of this document.

Only County approved names for streets and subdivisions, will be labeled on the drawings.

All design drawings, specifications and relevant data will be reviewed by Lethbridge County and all necessary revisions will be incorporated by the Applicant's Engineer in the final design drawings. Such revisions will in no way lessen the responsibility of the Applicant and their Engineer for the work.

Upon completion of all revisions, the Applicant's Engineer will submit three (3) sets of Contract Drawings to the Planning Department for approval by the Director of Municipal Services or designate. Following approval, the County will provide written authorization to the Consulting Engineer.

1.4.2.1 Capital Projects

Three (3) complete sets of plans and specifications for the proposed subject will be submitted to the Director of Municipal Services or designate. Plans, drawings and specifications are to be in conformance with the requirements of this document.

All design drawings, specifications and relevant data will be reviewed by Lethbridge County and all necessary revisions will be incorporated by the Engineer in the final design drawings.

Upon completion of all revisions, the Engineer will submit three (3) sets of Contract Drawings to the Director of Municipal Services or designate for approval. Following approval, the County will provide written authorization to the Engineer.

1.4.3 APPROVAL TO PROCEED

No work will commence until the County has reviewed the Engineering Documents, Design Drawings and Plans, and written authorization has been issued. The exception to this is general stripping work, which may be carried out based on prior written approval from Lethbridge County, and with the understanding that such work is carried out solely at the Applicant's own risk. The County will not be responsible for any costs incurred by the Applicant for work commenced prior to written authorization from the County.

The Applicant will give at least 2 business days advanced notice to the County before commencement of work, changes in work schedules, or working hours in order to coordinate adequate County inspection staff.

A copy of all approved drawings and specifications will be maintained at the construction site during the installation of these services.

Underground services will not be permitted to operate until the respective services have been inspected, tested in accordance with sections 2.0 Stormwater Drainage Systems, 3.0 Wastewater Collection Systems, 4.0 Water Distribution System and 5.0 Service Connections and approved in writing by the County.

1.4.4 ENGINEERING DESIGN APPROVAL PROCESS

1.4.4.1 In Conjunction with Area Structure Plans:

Two copies of the following information must be submitted:

1. The results of a Geotechnical/Hydrogeological study completed by a qualified Geotechnical Engineering firm. The level of detail must be to an extent sufficient to allow the Engineer to generally assess the site geotechnical/hydrogeological conditions and their effect on the development and to identify any evidence of site contamination. The report must outline their findings and any general recommendations.

   A Geotechnical Study will be required for all developments that are near slopes greater than 15% and over 2m in vertical height.

2. An Environmental Site Assessment of the development area completed in accordance with the applicable Canada Standards Association and other Standards.

3. Overall plans of the water and sanitary sewer servicing and stormwater management strategy, together with a discussion of the proposed strategy, particularly addressing confirmation that capacity is available in existing County systems and/or the local Irrigation District's system to accommodate the flows required or generated by the development. Supporting calculations are required.

1.4.4.2 In Conjunction with a Subdivision Application:

Two copies of the following information must be submitted prior to the submission of a subdivision application for the first stage of development in an approved Area Structure Plan area:

1. An engineering Design Report for the Area Structure Plan area will include but not limited to:

   i) Overall plans of the proposed water and sanitary sewer systems showing sizes and locations of all lines including network analysis and calculations to demonstrate that the systems will provide the required level of service.

   ii) Overall road layout of local roads, collector roads, road right-of-way widths, cross-sections, and if deemed necessary by the County a Traffic Impact Assessment.

   iii) A stormwater management analysis presenting the proposed scheme; an overall plan depicting the storage facility location, it's drainage basin, and the downstream receiving stream; supporting detailed hydrology and hydraulic calculations for the facility and including an analysis of the capacity of the downstream receiving channel; the upstream channel, preliminary facility cross-sections and details of inlets and the outfall control structure; description of stormwater quality improvement methods to be incorporated and erosion and sedimentation control works proposed.

   iv) Developable land area above the localized 1:100 year flood level.

   v) The staging method if development is to be staged.

1.4.4.3 Detailed Engineering Design:

The following will be submitted as part of the application for detailed design approval:

1. A cover letter stating the subject and purpose of the application, an estimated construction starting date and the proposed schedule for site meetings.

2. Three (3) complete sets of the engineering drawings, signed and sealed by the Consulting Engineer.

3. Two (2) set of specifications, complete with tender form or unit price schedule and project quantities.

4. Two (2) copies of a Geotechnical/Hydrogeological Report presenting the results of a field investigation completed by a qualified geotechnical engineering firm.

   A Geotechnical Report will be required for all developments that are near slopes greater than 15% and over 2m in vertical height.

At this stage, the level of detail of this investigation, analysis, and report must be much more extensive than at the Area Structure Plan stage and address the following:

i) Identify areas of high groundwater tables.

ii) Identify conditions that will require special design considerations.

iii) Provide detailed recommendations for design and construction of roadways, pavement structure designs, deep and shallow utilities, site grading, stormwater management facilities, and buildings.

iv) Clearly identify the limits of any site contamination and outline the site remediation to be completed.

v) Soil alkalinity (sulfate levels) and resistivity test results, and recommendations regarding concrete to be used and corrosion protection.

vi) Identify any conditions that will have special operation and/or maintenance implications.

vii) Top of bank setbacks.

5. Three (3) copies of an Engineering Design Summary for the stage of development clearly demonstrating that the designs of the infrastructure systems for the stage fit into the overall development systems designs presented in the Engineering Design Report for the Area Structure Plan area. A water network analysis must be included to demonstrate that the system for the isolated stage of the development will provide the necessary fire flows. The details of any interim stormwater management or staged servicing schemes or temporary facilities (emergency access, construction access, etc.) must also be presented.
6. An estimated construction schedule outlining the sequence of construction to be followed and applicable critical dates.
7. Additional technical detail as required by the County to satisfy the conditions of subdivision approval.
8. A cost estimate for each proposed improvement.
9. Copies of all letters of application for all applicable approvals, permits, licenses, or agreement from Provincial, Federal or private agencies, including, but not limited to, Alberta Environmental Protection and Alberta Transportation.
10. Copies of the formal approvals, permits, licenses or agreements must be received by the Lethbridge County before construction commencement.

1.4.4.4 Responsibilities:

The Applicant will be responsible for complying with the requirements outlined in these Standards and all other applicable legislation, regulations, codes, standards, agreements, permits, and licenses. Additional information may be requested by the County as deemed necessary.

The Applicant will be responsible for placing building restrictions on each building lot to ensure the top of footings are a minimum of 300 mm above the localized 1:100 year flood level.

Prior to subdivision approval being granted, the Applicant will arrange and negotiate any and all easements across private lands, private utility crossing agreements and other similar agreements which may be needed with land owners in the area.

The County will, on request, supply all available information on existing utilities including available capacities, locations, restrictions and limitations; however, the applicant must confirm the information provided, in the field, as the County does not guarantee the accuracy or completeness of any information provided.

Nothing in these Standards relieves either the County or the Applicant of any of the obligations contained in the Development Agreement.

1.4.5 Land Acquisition and Agreements for Offsite Construction

Land Acquisition - Prior to commencing any negotiations, the County will require that the Applicant enters into a Development Agreement with the County for the proposed Development. Upon execution of the Agreement, the Applicant will thereby agree to be responsible for all land costs, the acquisition costs, and the costs of relocating or repairing fences and any other costs which are required in the initial negotiation. The Applicant, subject to the terms and conditions of the Development Agreement will be bound to all the terms and conditions negotiated on behalf of the Development by the County.

Borrow Areas - where borrow areas are required for the construction or reconstruction of a County road, or other municipal improvements, borrow pit agreements, agreeable to the County, will be entered into between the Applicant and the landowners. All damage costs such as crop damage and removal of trees created due to the removal of the borrow material will be paid by the Applicant to the landowner at the rates and in the amounts indicated in the signed agreements. In some cases the costs will include a payment to the landowner for the volume of material removed.

The Applicant is responsible (own cost and expense), for acquiring lands where required that are outside the boundaries of the proposed development. All easements that are attributable to the proposed development will be registered in the name of Lethbridge County and the costs incurred in negotiating, preparing and executing the respective easements will be borne by the Applicant.

1.4.5.1 Capital Projects

Backsloping agreement - in cases where the acquisition of lands for road upgrades is not possible or where large cuts or fills are encountered, a backsloping agreement with the adjacent landowner that is agreeable to the County will need to be secured. A backsloping agreement entitles the County to extend ditch and/or back slopes into the affected property to the slopes and conditions outlined in the signed agreement. All damage costs, such as crop damage and removal of trees resulting from the construction of backsloping upon private property will be paid to the landowner at the rates and in the amounts indicated in the signed agreements.

1.4.6 Right of Way and Easements

Where easement or right of way documents are deemed necessary, they will be prepared by a registered Alberta Land Surveyor at the Applicant's expense. Right of way and/or easements will be provided for all utilities not located on streets, lanes or utility lots, including right of way for ditches or water courses accommodating surface runoff. Right of way shall be registered in the name of the County or, as appropriate, in the name of the utility company. Ownership to be confirmed with the County.

1.4.6.1 Capital Projects

Where easement or right of way documents are deemed necessary, they will be prepared by a registered Alberta Land Surveyor. Right of way and/or easements will be provided for all utilities not located on streets, lanes or utility lots, including right of way for ditches or water courses accommodating surface runoff. Right of way shall be registered in the name of the County or, as appropriate, in the name of the utility company. Ownership to be confirmed with the County.

1.4.7 ENGINEERING AND SUPERVISION

Where the Development Agreement requires that the Applicant construct local improvements, the Applicant will appoint an accredited Engineer to carry out preliminary surveys, prepare and submit design drawings for approval, supply construction survey layout and supervision during construction, certify acceptable completion of the work, and submit as-built (record) drawings of all work performed.

The Applicant will be responsible to have the necessary construction layout carried out to ensure the finished construction conforms to the lines and grades shown on the approved design drawings.

The Applicant's Engineer will carry out the necessary construction supervision to ensure all construction is carried in conformance with the standards specified by Lethbridge County and the requirements of the approved plans and specifications. Upon completion of the work, the Applicant's Engineer will provide a written and sealed construction completion certificate (CCC) attesting to the acceptable completion of the work. The wording of the CCC will be to the satisfaction of the County.

The Applicant will appoint an accredited materials testing firm to carry out any testing as per the Engineering Guidelines & Minimum Serving Standards or as deemed necessary by the County to determine whether all workmanship and materials incorporated into the work meet the specified requirements.

1.4.7.1 Capital Projects

The Engineer will carry out preliminary surveys, prepare and submit design drawings for approval, supply construction survey layout and supervision during construction, certify acceptable completion of the work, and submit as-built (record) drawings of all work performed.

The Engineer will carry out construction supervision as part of the Quality Assurance to confirm the Contractor is constructing the work in conformance with the standards specified by Lethbridge County and the requirements of the approved plans and specifications. Upon completion of the work, the Engineer will provide a construction completion certificate (CCC) for the County.

The Engineer will complete Quality Assurance materials testing as per the Engineering Guidelines & Minimum Serving Standards or per the Contract documents.

1.4.8 TESTING

It will be the responsibility of the Applicant's Engineer to ensure that all improvements are tested and found to conform to the County standards for such improvements prior to acceptance by the County. Copies of all test results must be forwarded to the County, Municipal Services.

1.4.8.1 Capital Projects

It will be the responsibility of the Engineer to provide Quality Assurance testing is completed throughout the work to ensure that all work is found to conform to the County standards or the Contract. Copies of all test results must be forwarded to the County, Municipal Services.

1.4.9 AS-BUILT (RECORD) DRAWINGS

Within four (4) months of the completion of all of the services to be installed, the Applicant's Engineer will deliver "as-built" (record) drawings: two sets of bound prints and one set of digitized drawing files (in a shape file and .dwg) to the County.

Where construction of a development or capital project with underground and road work has been separated into stages the follow allowances for as-built delivery can be made. The underground as-builts can be submitted with the road work as-builts if the road work is completed within 1 year of the underground work. If the road work is going to be phased longer than one year the underground as-builts must be submitted within four (4) months of the underground completion. Deviation from this delivery schedule for as-builts must be approved by the County.

1.4.10 MUNICIPAL ACCEPTANCE

There will be no building construction on any lot within the Development until all local improvements and utilities are in place and accepted by the Municipality, and a Construction Completion Certificate has been issued.

1.4.10.1 Maintenance and Warranty Period

The Applicant will, for a period of two years after the acceptance of a Construction Completion Certificate for a Development by the County, be responsible for regular maintenance and all repairs and replacements to any local improvements that, in the opinion of the County, become necessary for any cause whatsoever. Regular grading or snow clearing will be the responsibility of the County upon issuance of the Construction Completion Certificate.

The Applicant will provide for the duration of the Maintenance and Warranty Period an Irrevocable Letter of Credit as required by the County. In the amount specified in the development agreement.

1.4.10.1.1 Capital Projects

Upon competition of the project, the Contractor shall warrant the Work to be free from any defects or failure and to withstand climatic, maintenance and normal operational conditions. Generally, the warranty period shall be two years for bridges and one year for other works. Unless otherwise specified, warranty periods shall commence on the date of the issuance of the Construction Completion Certificate by the County.

1.4.10.2 Final Inspections and Acceptance

Upon completion of all servicing requirements, and at the close of the warranty period, the applicant will arrange for the Applicant's consultant to complete an inspection of all local improvements and note all deficiencies on the construction drawings and itemized on a list of deficiencies. Once this is complete the Applicant will give notice to the County and arrange for an inspection. All deficiencies will be rectified to the satisfaction of the County prior to the acceptance of local improvements, with a Final Acceptance Certificate issued.

Where staged construction has been approved by the County, the County may issue separate Construction Completion or Final Acceptance Certificates for distinct components of the development, with separate warranty periods as appropriate. Separation of the project into components will be at the sole discretion of the County.

1.4.10.2.1 Capital Projects

Upon completion of the project, and at the close of the warranty period, the County's Engineer will arrange an inspection. All deficiencies will be rectified to the satisfaction of the County prior to the acceptance of municipal services, with a Final Acceptance Certificate issued to the Contractor.

Where staged construction has been approved by the County, the County may issue separate Construction Completion or Final Acceptance Certificates for distinct components of the work,

with separate warranty periods as appropriate. Separation of the project into components will be at the sole discretion of the County.

1.4.11 ENVIRONMENTAL

1.4.11.1 Alberta Environment - Letter of Authorization/Approvals

Extensions or replacements of watermains, sanitary sewers and/or storm sewers require Written Notification **to** and where necessary a Letter of Authorization **from** Alberta Environmental Protection **before** construction can commence.

For projects that include **new** stormwater management facilities and/or outfall(s) to a water body or drainage course, the Applicant or their Engineer must also obtain an approval or have the County wastewater approval amended as required by the Environmental Protection and Enhancement Act and its associated regulations. The Applicant or their consultant must also note that a separate application under the Water Act may also be required for projects involving stormwater management facilities and/or outfall(s).

The Applicant is responsible to obtain all other approvals appropriate to the specific requirements of the project, prior to commencing construction, and to ensure sufficient time in their development schedule to allow for all necessary review and approvals. The County will not be responsible for any costs associated with delays in the approval process, nor will the County circumvent any approval process to maintain a development schedule.

1.4.11.2 Environmental Concerns

The Applicant will conduct their operations in accordance with all current environmental sustainability legislation.

It will be the Applicant's responsibility to familiarize themselves with applicable legislation and regulations and obtain the necessary permits and/or approvals for their operations.

The Applicant will immediately advise the County and applicable agencies of an environmental incident or infraction.

1.4.11.3 Capital Projects

For projects that require approvals, the Engineer will work with the County to obtain any required approvals on behalf of the County as required by the Environmental Protection and Enhancement Act and its associated regulations.

The Engineer will work with the County to obtain all other approvals appropriate to the specific requirements of the project, prior to commencing construction.

1.4.12 EXISTING UTILITY PRECAUTIONS

The Applicant or the Applicant's Contractor will take all precautionary measures as may be necessary when working over or adjacent to utilities, whether above or below ground, and will control their equipment and method of construction to prevent any damage to the utility and/or appurtenances.

The Applicant will be responsible to secure an appropriate crossing agreement with the utility company, and provide proof of such an agreement to the County prior to construction.

Under no circumstances will any construction operations be carried out over or adjacent to any utility line until the required adjustments and protection required for the proposed construction

have been completed. The Applicant is responsible to act in full compliance with the conditions of the crossing agreement with the utility company

The Applicant/Contractor will work in close liaison with utility companies and, if required, ensure that a representative of the affected utility companies is present at all times during active equipment operations. The Applicant/Contractor will ensure that no equipment crosses or operates over any pipeline at locations other than where protection has specifically been provided.

The Applicant of the proposed subdivision is responsible for all arrangements with the utility companies as to the locating and moving of all existing utilities such as power poles, pipelines, communication system, buried cables, or any other utility as may be required.

1.4.12.1 Capital Projects

The Engineer will ensure that the Contractor takes all precautionary measures as may be necessary when working over or adjacent to utilities, whether above or below ground, and will control their equipment and method of construction to prevent any damage to the utility and/or appurtenances.

The Engineer will with the County to secure an appropriate crossing agreement with the utility company prior to construction.

Under no circumstances will any construction operations be carried out over or adjacent to any utility line until the required adjustments and protection required for the proposed construction have been completed. The Engineer will ensure that the Contractor acts in full compliance with the conditions of the crossing agreement with the utility company

The Engineer shall ensure the Contractor will work in close liaison with utility companies and, if required, ensure that a representative of the affected utility companies is present at all times during active equipment operations. The Engineer shall ensure the Contractor has procedures in place that will ensure that no equipment crosses or operates over any pipeline at locations other than where protection has specifically been provided.

1.4.13 New Utility Precautions

The Applicant will be responsible for the installation of power, natural gas and communication services in the subdivision. Any other utilities that may be required will be provided at the sole expense of the Applicant.

Gas, power and communication system location plans will be submitted to the County for approval prior to installation. Approval will be given in writing once the plans have been approved. The Applicant will be responsible for payment of all costs related to these local improvements.

If lines cannot be installed in the streets or lanes of the subdivision, the Applicant will provide registered easements or rights-of-way in the name of Lethbridge County to accommodate the utility services. The required easements or rights-of-way will be registered on each individual lot prior to the sale of any lot in the development area.

1.4.14 Suitability of Lots for Development – Rural

This section deals with suitability of rural or “Country Residential” lots: lots in a rural development setting and meeting the minimum size requirement for Country Residential designation.

The development of lots must meet the Alberta Subdivision and Development Regulations.

It is recommended that the Applicant consult with a planner at Oldman River Regionals Services Commission (ORRSC) or the County prior to submitting a subdivision application. ORRSC then prepares the subdivision information and presents this to the County Council who will render the final decision.

The Applicant is responsible to adhere to any conditions attached to the approved subdivision. All conditions of the subdivision approval have to me met prior to the subdivision being endorsed and registered with Land Titles.

1.4.15 SAFETY

The Applicant is responsible for all aspects of site safety, including traffic control and signage. With respect to site safety, the Applicant will be considered to be acting as the Prime Consultant, and will save harmless Lethbridge County, its employees and agents, from all actions arising from issues of safety.

1.4.15.1 Accommodation of Traffic

The Applicant is solely responsible for safety on the site. Nothing contained herein removes, lessens or transfers this responsibility. Signage, accommodation of traffic and other related issues will conform to industry standards.

The Applicant will submit a Traffic Accommodation Strategy (TAS) to the County for approval 7 day prior to scheduled work, Work cannot commence until the TAS has been approved in writing by the County and if applicable by other stakeholders including but not limited to Alberta Transportation or the City of Lethbridge.

The Applicant or the Applicant's Contractor will (own expense), make suitable provisions to accommodate all traffic, whether pedestrian or vehicular, over or around any part of the project upon which work is being performed, and will supply and maintain such signs, barriers, fences, lights, and flagpersons as may be required for this purpose. Where the traffic is required to use a route over or around the work which is of a lower standard than was available before the work commenced, the Contractor will (own expense), continuously provide assistance to traffic as required on a 24 hour per day and 7 day per week basis, particularly during periods of inclement weather.

The Contractor will provide dust control for the safety of the traveling public. Efforts to maintain dust control shall include, but not limited to, the application of water by distributor truck with spray system onto the site soils and roadways. The frequency of application shall be competed so that the production of dust is at a level that doesn't impede safe travel of traffic.

Flagpersons will be certified in the proper traffic control procedures for the work and will be dressed and equipped in a manner consistent with Alberta Transportation requirements. All Flagpersons must have their certification card with them during work.

When work is not in progress and on days such as holidays and Sundays, the Contractor will remove or cover all regulatory or construction signs not essential for the protection of the public, in order to reduce inconvenience to a minimum.

All signs and guide posts encountered that must be removed in the prosecution of the work will be carefully salvaged by the Contractor. Certain signs, such as those marking railroad crossings, intersection warning or stop signs, will be maintained on the work for the protection of traffic using the highway.

Where the project is closed to the public and traffic diverted entirely off the right-of-way, the Contractor will (own expense), provide and maintain such signs, barriers, lights, and flagpersons as may be necessary to direct the traveling public over the detour.

Traffic must be controlled by flagperson and sufficient warning signs to ensure the safety of the public when any traveled roadway is being entered or crossed by hauling equipment to the satisfaction of the County.

Road closures and detours must be submitted to and approved by the County a minimum of 48 hrs prior to scheduled work.

Haul routes must be kept clear and free from dust by grading and applying dust control. No grading will be allowed on Calcium Base Stabilized roads, the County must be contracted regarding maintenance of Calcium Base Stabilized roads. Trucks must be loaded and or covered in such a manner that no material leaves the truck during transport.

Where, in the opinion of Lethbridge County, additional warning signs or other safety devices are required on the work, the Contractor will supply, erect and maintain the additional signage and/or safety devices requested at the Contractor's sole expense.

1.4.15.2 Minimum Construction Signing

Where required, construction signing will be installed in accordance with Alberta Transportation – Traffic Accommodation in Work Zones, Latest edition. The minimum signing will be in the order below:

A 120 cm x 120 cm	Construction Ahead sign (WD-101)
A 120 cm x 120 c	Men working (WD-A-41)
A 60 cm x 75 cm	Reduce Speed sign (RB-5)
A 60 cm x 60 cm	No Passing sign (RB-31)
A 60 cm x 75 cm	Maximum Speed sign (RB-1)

Where required for public safety, additional signs will be used. Signage and sign placement will be consistent with Alberta Transportation – Traffic Accommodation in Work Zones, Latest edition.

1.4.15.3 FIRE PROTECTION – Rural

Where pressurized systems are available for commercial and industrial developments hydrant systems shall be used and are to be designed by a Professional Engineer and conform to equipment available for firefighting purposes within the County.

1.4.16 SUBDIVISION SIGN

Where required, the subdivision sign will be erected to the following standards:

The subdivision display sign will include the lot layout and subdivision name. The sign must be coated with a weatherproof finish. The sign is to be set on a minimum 200 mm x 200 mm square post or minimum 200 mm diameter round post.

The size and design of the subdivision sign is to be approved by the County, prior to construction or installation. The location of the sign is to be approved by the County Director of Municipal Services prior to installation. The Applicant will be responsible for the maintenance of the sign for a period of two years following the County acceptance of the construction completion of the sign. After Two Years the Applicant shall completely remove the sign.

1.5 ENGINEERING PLANS & DRAWINGS

1.5.1 GENERAL

All detailed engineering plans submitted to Lethbridge County for review and approval must comply with the following standards and specifications or a pre-approved project specific standard submitted by the Consulting Engineer. Regardless of standards used all drawings must be legible and contain sufficient information to the satisfaction of the County to permit a full review of the proposed work and survey lay-out in the field.

1.5.2 DRAWING SIZE, MATERIAL & LAYOUT:

A standard ANSI D drawing size of 22” x 34” (559 mm x 864 mm) will be used, with the profile located at the bottom of the sheet. The plan will not extend onto the profile section and the profiles must be shown only on the profile section. Originals will be prepared in ink on paper and a digital (pdf) version, with the County being provided with a digital AutoCAD copy as required by the County.

1.5.3 SCALES

Type	Scale	
Overall Plans	1:1250, 1:2500, 1:5000	
Plan / Profile	Horizontal 1:2500	Vertical 1:100
Cross Sections	Horizontal 1:200	Vertical 1:100

Any drawings that require deviation from the above scales require approval from the County.

1.5.4 DIMENSIONS:

Dimensions must be given from an iron pin, lot line, chainage station, a center line or any other reference that can be readily established. All dimensions and elevations will be in the metric system with the default unit as metres.

1.5.5 DRAWING TECHNIQUE:

Points of drawing technology that are significant to the preparation of drawings and plans are:

- Care in ensuring a balanced distribution of detail throughout the drawing;
- Legible letters and figures, two (2) mm (0.08") size or larger, well spread, properly formed and proportioned (Leroy or equivalent); and
- Lines will be uniform in colour density and thickness.
- Any plans scaled to 11” x 17” (279 mm x 432mm) must be clearly legible.

1.5.6 GENERAL REQUIREMENTS OF ALL DRAWINGS

A north arrow (oriented towards the top of the plan where possible), adjacent lots and plan numbers, street names and the legal description of the parcel being developed will be shown on all drawings submitted.

All elevations will be relative to a Geodetic Datum, with all reference benchmarks and elevations clearly identified on the drawing.

An Engineer’s stamp and Permit to Practice stamp, signed by an Engineer registered in the Province of Alberta will be shown on the engineering drawings.

1.5.7 DESIGN DRAWINGS

1.5.7.1 General:

All engineering plans submitted for review and approval must comply with the specifications herein stated.

1. Street names and subdivision names approved by the County must appear on the drawings.
2. Clarity and legibility will be the governing criteria when preparing drawings.
3. All plans will show the legal subdivision, including lot and block numbers.
4. All plan sets will be bound along the left hand margin.
5. All drawings must clearly show the following in the title block:
    - Applicant /owner's name;
    - Applicant's Engineer or consulting engineering name;
    - subdivision name, including staging and/or phasing;
    - drawing name;
    - drawing number and job number if applicable;
    - revision number and description;
    - Drawing scale, horizontal and vertical scales;
    - space for signature of the designer, draftsperson, checker and approving authority;
    - space for the number, date, description, designer and approving authority for all revisions and drawings issued including preliminary, approval, tender, construction and record drawings;
    - space for professional stamps, permit stamps and preliminary acceptance for construction stamp;
    - date issued;
    - legend; and
    - notes.
6. The number and type of drawings required will depend on the type of development and the nature of the local improvements. Requirements must be confirmed with the County.

1.5.7.2 Cover Sheet and Index Sheet:

A cover sheet and index sheet may be combined at the discretion of the Consultant. The information provided will include:

- Subdivision or project name;
- Applicant /owner's name;
- consultant's name;
- a drawing index;
- project location plan (key plan) with Legal Description;
- drawing legend; and
- list of symbols and abbreviations.

1.5.7.3 Overall Plans:

Separate overall plans will be submitted for each of the following, as applicable:

- roads, sidewalks and walkways;
- sanitary sewer, storm sewer and water mains;
- franchise utilities;
- overland drainage plan;
- lot grading plan; and
- Signage plan

1.5.7.4 Roads, Sidewalks and Walkways Plan:

This plan will include the following:

- base plan including easements;
- whole site and proposed roadway system;
- access onto existing roadway system;
- road names where required, existing and proposed;
- approaches;
- drainage easements, utility right-of-way, lot configuration;
- sidewalks, curbs and walkways;
- roadway and right-of-way alignment with dimensions;
- roadway traffic signing;
- easements with dimensions; and
- drainage features including waterways, lakes, ponds, canals, swales, ditches and culverts, noting direction of flows.

1.5.7.5 Sanitary Sewer, Storm Sewer and Water Main:

This plan will include the following:

- legal base plan;
- easements/right-of-way, streets and lanes;
- sewer mains and water mains;
- crossings, hydrant locations, valve locations, plugs and other appurtenances;
- manhole locations;
- service to each lot, including inspection chambers;
- special details, such as inverted siphons, weirs, protection for high velocities, etc;
- off-site connections; and
- service details.

1.5.7.6 Franchise Utilities Plan:

This plan will include the following:

- typical line assignments within utility right-of-way;
- off-site connections;
- easements required; and
- Drawings for crossing permits for any oil, power, gas or other transmission lines or railways.

1.5.7.7 Overland Drainage Plan:

This plan will include the following:

- legal base plan including easements;
- original contours at 1 m intervals;
- proposed roadway system;
- drainage easements;
- proposed retention ponds;
- culverts;
- major drainage system;
- proposed site grading contours and elevations; and
- direction of proposed drainage.

1.5.7.8 Lot Grading Plan:

This plan will include the following:

- legal base plan including easements;
- original contours at 1 m intervals;
- proposed lot elevations and building grades;
- direction of proposed drainage; and
- Subdivision or Hamlet name, Lot, Block, Plan

A Lot Grading Plan is a requirement for any commercial / industrial development or Urban Development. For Rural Developments, a lot grading plan is required for any structure larger than 2.40m (7.87 ft) in height and 10.00 sq. m (107.64 sq. ft) in area.

1.5.7.9 Signage Plan:

This plan will include the following:

- legal base plan including easements;
- All residential, commercial and industrial lots
- Approved street layout and street names, if available.
- Streets, lanes and sidewalks
- Types of parks, including open space linkages, walkways, etc.
- Stormwater management ponds; and
- Environmentally sensitive areas

- Traffic Signs

A Signage Plan is a requirement for all subdivision applications.

1.5.7.10 Plan/Profile Drawings

1.5.7.10.1 Plan Portion

- The following information will be shown on the plan portion of the drawing:
- all of the items listed for the Overall Plans are applicable with some additional details and dimensions;
- locations and dimensions of lot approaches and culverts;
- station location and dimension of road culverts;
- direction of storm drainage flow and location of control feature such as ditch blocks and swales;
- horizontal curve data including chainages of BC and EC, delta angle, radius and arc length for centerline;
- alignment and dimensions of sewer mains and water mains, lot services, manholes, hydrants, valves and water system facilities;
- indicate edge of pavement line assignment where curbs are not proposed;
- dimension all corner radii;
- indicate all tie-ins to existing utilities;
- bench marks;
- right-of-way width;
- utility right-of-way/easements;
- road drainage patterns;
- existing buildings;
- road names; and
- overland drainage swales.

1.5.7.10.2 Profile Portion

The following information will be shown on the profile portion of the drawing:

- a vertical scale indexing the survey datum;
- a horizontal scale of the project chainage;
- profile chainage must be aligned with the plan view;
- existing ground profiles along centerline and both property lines;
- proposed design profiles for centerline and ditches including all slope grades;
- vertical curve data, including chainage and elevations of BVC, PVI, and EVC; length of curve; k values;
- approach locations;
- location of all culverts complete with dimensions and invert elevations;

- ditch checks;
- sewer main and water main profiles;
- size, type and class of sewer main and water main pipe as well as class of bedding;
- consistent stationing (i.e. 0+900 m); and
- stationing must start from 0+000 for each new section of roadway.

1.5.7.11 Legal Plans:

The following plans will be provided:

- plan of survey;
- utility right-of-way/easements;
- drainage easement plan; and
- plan showing access easements, walkways, mutual drives, fences.

1.5.8 Details & Typical Sections

1.5.8.1 Standard Details:

Standard detail drawings may include typical road cross-sections, trenching details, pipe bedding, valves, hydrants, pavement structure, etc. The details will be included on a standard A-1 size sheet or may be bound into project specifications on letter size (8 ½ " x 11") sheets. The scale of individual details will be commensurate with the amount of information to be shown, along with clarity and legibility.

1.5.8.2 Typical Cross-sections:

A minimum of one typical roadway cross-section will be included within the standard detail drawings. Additional cross-sections will be provided for roadway sections requiring over 1.0 m of cut or 2.0 m of fill. Details on the cross sections will include:

- width of right-of-way;
- finished width of roadway surface;
- width of subgrade;
- slope ratios of side slope and back slope;
- depth of ditches;
- surface crown slope;
- pavement structure details including depth, class, designation and grade of materials; and
- Record Information

1.5.9 Record Information

1.5.9.1 Record Drawings:

Within one (1) month of issuance of a Construction Completion Certificate, the Applicant will include two complete sets of record drawings for review. The plans will show the "as-constructed" locations, profiles and details of the constructed utilities and surface improvements. All record drawings must be received by the County prior to issuance of a Final Acceptance Certificate. Once the drawings are approved, the Applicant will submit two bound sets drawings, and the

digital files, as stipulated by in Section 1 - General. Holdback retained by the County will not be released until the Record Drawings are received and accepted by the County

Record drawings must be signed and sealed by a Professional Engineer registered in Alberta.

1.5.9.2 Digital File Specifications:

The digital file will be in AutoCAD 2010 or later and NAD83, geo-referenced. This method of data storage is required by the County. Digital file specifications are to be confirmed with the County.

1.5.9.3 Information Requirements:

Record drawings must contain, at a minimum, the information contained on the project design drawings. They will also include:

- All hydrant, valve, plugs, bends, crosses, tees, reducers, manholes, and other fittings dimensioned in two directions.
- Completion date of all mains noted on each plan profile.
- Detailed description of all fittings.
- Any revisions made to construction drawings to create record plans will be made on all plans that indicate the area of the revision. (i.e. revisions shown on detail plans and profiles, will be shown also on overlapping detail drawings where they appear, as well as on the composite plan).
- The pipe manufacturer, material and the class of pipe installed.
- All streets and avenues will be identified according to the name or number shown on the registered plan of that particular subdivision. Lanes shown on detail plans where there is no identifying avenue and/or street shown on the detail, will be identified as the lane east or west of a street, or as the lane north or south of an avenue, (i.e. L.W. 103 Street and/or L.N. 99 Avenue).

1.5.10 ABBREVIATIONS

The following abbreviations may be used in this document:

ABBREVIATIONS

Term	Abbreviation	Term	Abbreviation
Abandoned	AB	Hectare	ha
Alberta Survey Control Monument	ASCM	Horizontal	Hor.
Asphaltic Concrete Pavement	ACP	Hydrant	Hyd.
Asphaltic Stabilized Base Course	ASBC	Inside Diameter	ID
Back of Curb	BOC	Invert	Inv.
Back of Walk	BOW	Iron Pin	I.P.
Begin Curve	BC	Length of Curve	LC
Begin Vertical Curve	BVC	Manhole	MH
Bench Mark	BM	Not to Scale	NTS
Block	Blk	On Centre	OC
Boundary	BDY	Outside Diameter	OD
Cast Iron	CI	Point of Intersection	PI
Catch Basin	CB	Point of Intersection Vertical Curve	PIVC
Catch Basin Manhole	CBMH	Polyethylene	PE
Centre Line	CL	Polyvinyl Chloride	PVC
Class	Cl.	Property Line	PL
Closed Circuit Television	CCTV	Radius	R
Concrete	Conc	Right-of-way	R.O.W.
Construction Completion Certificate	CCC	Sanitary	San.
Corrugated Steel Pipe	CSP	Sprinkler	Spr.
Cubic metre	m3	Standard Proctor Density	SPD
Culvert	Culv	Station	Sta.
Curb Stop (Curb Cock)	CC	Steel	Stl.
Curb & Gutter	C&G	Storm	ST.
Drawing	Dwg	Street	St.
Elevation	Elev.	Tangent	Tan.
End Curve	EC	Test Hole	TH
End Vertical Curve	EVC	Typical	Typ
Existing Ground	EG	Vertical	Vert.
Face of Curb	FOC	Vertical Curve	VC
Final Acceptance Certificate	FAC		

Other abbreviations may be used or defined elsewhere in this document. Where undefined, an abbreviation shall carry a meaning consistent with industry standards. Ascertaining the meaning of a word or abbreviation in context is the responsibility of the user.

2. STORMWATER DRAINAGE SYSTEMS

2.1 GENERAL

2.1.1 REFERENCES

Design details and/or procedures which are not explicitly specified in their sections shall be in accordance with the following reference standards:

1. Alberta Environment and Parks
   i) Stormwater management guidelines for the Province of Alberta (Current version).
   ii) Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems (Current version).
2. Alberta Transportation
   i) Design Guidelines for Erosion Control and Sediment Control for Highways (Current version).
   ii) Standard Specifications for Highway Construction (Current version)
   iii) Standard Specification for Bridge Construction (Current Version)
3. City of Lethbridge
   i) Design Standards (Current version)
4. Lethbridge County
   i) Stormwater Management Plans (Current versions).
   ii) Stormwater Master Plans (Current versions)
      a Malloy Drain Master Drainage Plan
      b Tiffin Drain – Master Drainage Plan

2.1.2 DEFINITIONS

Minor System: The network of sewer, inlets, and gutters which are designed to rapidly convey stormwater runoff from minor rainfall events. In regards to these standards the minor rainfall event is defined as a storm having a 1 in 5 year return period as recommended by Alberta Environment and Parks Stormwater Management Guidelines.

Major System: Is comprised of overland flow routes, swales, roadways, watercourses, storage facilities and outfalls into planned/designed and/or natural watercourses or storage facilities. Is incorporated as part of the urban infrastructure to convey runoff from major rainfall events. In regards to these standards a major rainfall event is defined as a storm having a 1 in 100 year return period as recommended by Alberta Environment Stormwater Management Guidelines.

Return Period: The return period of a rainfall event is the inverse of the statistical chance that a storm of a given size will occur in any given year based on the historical data.

Rural System: Is stormwater facilities associated with a rural road cross section comprising of ditches/swales, culverts and storage facilities.

SWMF: Stormwater Management Facilities

SWMP: Stromwater Management Plan

Urban System: is stormwater facilities associated with a urban road cross section comprising of curb and cutter, manholes, catchbasins, outfall structures, etc.

2.1.3 STORMWATER MANAGEMENT

The specific requirements of the stormwater system will depend on whether the development is defined as a rural or urban development. In either case, the intent of the stormwater management system is to prevent any negative downstream effects as a result of the development.

Detailed design of the stormwater system will be consistent with a stormwater management plan to be submitted by the Applicant and approved by the County. Deviation from the intent of the stormwater management plan must be approved by the County and supported by engineering analysis.

For both rural and urban development, the stormwater system will either be designed based upon a “net-zero” impact (runoff rates for a 24 hour duration, 1:100 year post development design storm will not exceed rates for the same design storm under pre-development conditions) or on the available capacity of the receiving stream and appropriate area contributions.

If these standards and specifications do not cover an area of drainage concern, the onus will be upon the Applicant to present alternative corrective measures and recommend proposed drainage standards to be used, based on sound economic, engineering, environmental, maintenance and operational criteria for approval by the County. The system will meet the recommended standards of Alberta Environmental Protection and the Plumbing and Drainage Act of Alberta.

The Applicant will provide rights-of-way or easements for drainage and have them registered in the name of the County so that future maintenance may be provided.

The Applicant will be responsible not only for the drainage within the development, but also for drainage in the adjoining properties that would be affected by this development.

Any type of drainage diversion will be approved and licensed by Alberta Environment and Parks. Drainages diversion will include the constructions of ditches, berms, ditch checks, the installations of culverts, rip-raps and other means of erosion control. It is the responsibility of the Applicant to obtain all permits and approvals which are to be provided to Lethbridge county.

2.1.3.1 Stormwater Management Plan

Stormwater management plan requirements will be required under the following circumstances.

Area Structure Plans should include a Stormwater Management Masterplan that analyzes pre-development runoff and provides a plan to manage post-development runoff to pre-development rates through attenuation and Stormwater management design best management practices.

Development Sites over 2Ha (yard and building coverage) should be required to prepare a Stormwater Management Plan. This can be presented on a drawing that shows post-development drainage patterns and facilities to manage runoff to pre-development rates. Yard areas included materials that are fairly impervious.

Development Sites Under 2Ha in Building and yard coverage should be required to submit a drainage plan showing design drainage of the site and discharge point(s).

2.1.3.2 Stormwater Pond Minimum Sizes

Stormwater dry and wet ponds shall be in accordance with Alberta Environment and Parks Stormwater Management Guidelines (current edition)

2.1.4 URBAN SYSTEMS:

The stormwater system will be designed as a separate system from that of the sanitary system. Pipes and their appurtenances (manholes, catchbasins, outfall structures, etc.) will comprise the minor system. This system will convey runoff from snow melt and rainfall events without sustaining any surface ponding or excessive surface flows from a 1-in-5 year event. The road system, detention/retention facilities, parkland and other land will comprise the major system. The major system will convey runoff from up to a 1-in-100 year event and will be sufficient to prevent any significant property damage (e.g.: flooding of buildings).

2.1.5 RURAL SYSTEMS:

For developments with a rural type street cross section, both the minor and major systems consist of roadside ditches/swales, culverts and storage facilities.

It is expected that a rural system will be comprised primarily of swales, ditches, culverts and similar open flow components. The system will convey runoff from snowmelt and rainfall events consistent with the stormwater management plan. The system will be considered the major system, and will convey runoff for the design storm sufficient to prevent property damage.

2.1.6 INDUSTRIAL / COMMERCIAL SYSTEMS:

For Industrial or Commercial developments located within in an Industrial Park development an SWMF is required.

Industrial or commercial developments that are not part of an Industrial Park with a SWMF will require an SWMP to be completed prior to development.

2.2 DESIGN CRITERIA

2.2.1 SYSTEM DESIGN:

1. The Rational Method may be used for analysis of minor drainage systems up to a maximum catchment area of 50 hectares. Computer simulation methods must be used for analysis of major drainage systems (catchment areas greater than 50 ha) and is recommended for all final analysis and detailed designs.

   The Rational formula is expressed as Q=CIA/360 where:

Q	=	runoff discharge in cubic meters per second;
C	=	dimensionless runoff coefficient;
I	=	rainfall intensity in millimeters per hour; and
A	=	catchment area in hectares.

2. The runoff coefficient, C, must be consistent with the following guidelines and based on sound engineering and best management practice:

Description	Storm Frequency	
	1:5 year	1:100 year
Undeveloped Farm Land	0.10	0.20
Lawns, Parks, Playgrounds	0.20	0.30
Residential (Urban)	0.35	0.60
Commercial (Urban)	0.60	0.80
Apartments (Urban)	0.70	0.80
Paved Surfaces	0.90	0.95
Gravel Surfaces	0.30	0.70

These values may be further modified based upon the specific development proposed. In rural developments or where a mixture of land uses or surface characteristics are proposed, the weighted average of pervious and impervious area runoff coefficients will be used.

3. Rainfall intensity, I, will be determined using rainfall distribution information within the County. The maximum inlet time will be 15 minutes unless approved otherwise by the County.

Tabular Design Storms
1:100 year 24 Hour Rainfall Distribution

Hour	Depth (mm)	Hour	Depth (mm)	Hour	Depth (mm)
1	0.1	9	6.2	17	2.8
2	0.2	10	37.0	18	1.7
3	0.3	11	21.8	19	0.0
4	0.4	12	15.7	20	0.0
5	0.6	13	9.0	21	0.0
6	0.8	14	5.6	22	0.0
7	0.9	15	4.5	23	0.0
8	1.1	16	3.4	24	0.0

Tabular Design Storms
1:100 Year 2-Day Rainfall Distribution

Hour	Depth (mm)	Hour	Depth (mm)	Hour	Depth (mm)
1	0.1	17	5.3	33	1.6
2	0.1	18	5.6	34	1.3
3	0.1	19	5.9	35	0.6
4	0.1	20	6.3	36	0.6
5	0.4	21	7.5	37	0.5
6	0.9	22	17.3	38	0.5
7	1.0	23	7.7	39	0.5
8	1.1	24	5.0	40	0.4
9	1.3	25	4.7	41	0.3
10	1.9	26	4.4	42	0.2
11	2.5	27	3.8	43	0.1
12	3.1	28	3.4	44	0.1
13	4.4	29	3.1	45	0.0
14	4.7	30	2.5	46	0.0
15	5.0	31	2.2	47	0.0
16	5.2	32	1.9	48	0.0

4. Effluent from sanitary sewers and any drainage from industrial, agricultural or commercial operations that may potentially be contaminated will not be discharged into the storm sewer system.
5. Roof drainage from one-family and two-family dwellings will discharge to grassed or pervious areas. The point of discharge will be a sufficient distance to ensure the water flows away from the building. Roof drainage from apartment buildings, commercial areas and industrial areas will also be discharged to the surface drainage system.
6. Best management practices will be provided to minimize sediment discharge to the storm sewers. This will be in the form of properly graded and surfaced streets and lanes, landscaping, catchbasin sumps, sediment control structures at pond and lake inlets, or other means where appropriate.

2.2.2 PIPE:

1. Storm sewer pipe will be designed to convey the design flow when flowing full with the hydraulic gradeline at the pipe crown. All pipe crown elevations will match at manhole junctions.
2. Storm sewer pipe hydraulics will be calculated using Manning's equation. The minimum Manning's "n" value will be 0.013 for smooth-walled pipes. For corrugated steel and open channels the values suggested in "Modern Sewer Design", latest edition, will be used but will not be less than 0.013.
3. Storm sewer velocities will not be less than 0.60 m/s when flowing full. When the flow velocity exceeds 3.0 m/s, special consideration will be given to minor losses in the system and bedding requirements.
4. Storm sewers 900 mm diameter and smaller will be PVC SDR 35 or Ultra Rib PVC storm sewer pipe, provided that manufacturer recommended pipe loadings are not exceeded. Storm sewers greater than 900 mm diameter will be of concrete pipe unless approved otherwise by the County. Concrete pipe will be of sulfate resistant concrete with a gasketed jointing system.
5. The minimum inside diameter for storm sewers will be 300 mm. The minimum inside diameter for catchbasin leads will be 250 mm.
6. The Applicant is responsible for providing the engineering expertise relating to the structural design of storm sewers, providing all test results and the quality control of all materials proposed to be used. All storm sewers will be designed to prevent damage from superimposed loads. Notwithstanding information contained herein, all materials and loading calculation will be consistent with current ASTM and CSA standards.
    i) For rigid pipes a 0.025 cm crack will be determined as exceeding the working strength and the pipe rejected. For flexible pipe, when deflection greater than seven and one-half percent (7 ½%) of the original diameter is reached, then the pipe will be considered to have exceeded the limit of serviceability and will be rejected.
    ii) Proper allowances will be made with regard to the class of bedding and the trench dimensions (width, depth) when determining the loadings on pipes. The recommended unit weight of soil is 2100 kg/m3 metre.
    iii) The minimum depth of cover to pipe crown will be 1.20 m, or 2.6 m to invert, whichever is greater.
    iv) The "Marston Theory" is to be used in analyzing loadings in the single trench applications for rigid pipe. For flexible pipe, the modified Iowa formula will be used.

7. Concrete pipe specified under ASTM C655 may have combinations of circular and elliptical reinforcement with minimum steel requirements at all outer and inner points as specified under ASTM C76. The Applicant will specify the horizontal and structural strength of all pipe.
8. Changes in flow direction at a manhole will not exceed 90 degrees in pipes greater than 600 mm diameter.
9. Curved sewers - It is recommended that sewers 600 mm inside diameter or less be installed with straight alignment between manholes, but curved sewers will be permitted providing that the following requirements are met:
   i) Permissible joint deflections will be in accordance with the manufacture's guidelines;
   ii) Manholes are to be located at the beginning and end of curve;
   iii) The curve will run parallel to the street centerline; and
   iv) The minimum grade for curved sewers will be fifty percent (50%) greater than the minimum grade required for straight runs.

2.2.3 MANHOLES:

1. The maximum spacing of manholes will be 150 m. Manholes will be located at the upstream end of each line, at changes in size or alignment and at all junctions. The downstream invert in a manhole at a change in direction will be a minimum of 30 mm lower than the lowest upstream invert.
2. Manholes will be a minimum of 1200 mm in diameter. Precast (Type 50) reinforced concrete manhole barrels conforming to ASTM C478 will be used. The base will be constructed of 25 Mpa sulphate resistant (Type 50) concrete. Galvanized iron safety steps are required.

2.2.4 CATCHBASINS:

1. For urban design, surface water will not be permitted to run a distance greater than 300 m along roadways without provision for interception by a catchbasin, except in lanes or walkways where 200 m in either direction may be permitted.
2. Surface water will be intercepted with a number of catchbasins such that the combined inlet capacity is sufficient to receive the design stormwater flow.
3. Minimum gutter grade will be 0.40% except in cul-de-sacs and around curb returns where minimum gutter grade will be 0.70%.
4. All catchbasin bodies will be 900 mm pre-cast sulfate resistant concrete sections. The body will be constructed to provide a minimum 600 mm sump unless otherwise approved.
5. All catchbasin leads will discharge directly into storm sewer manholes. The minimum catchbasin lead size will be 250 mm with a minimum slope of 1% and a maximum length of 30 meters. For leads of greater length or for those from a CBMH to a manhole the minimum lead size will be 300 mm.

2.3 CONSTRUCTION

2.3.1 MATERIALS:

The requirements for this section will also apply to sanitary sewers as appropriate.

All materials used for storm sewer mains will be of the approved standards as listed herein or the latest revision thereof:

1. Non-Reinforced Concrete Pipe - The non-reinforced concrete pipe will conform to CAN/CSA-A259.1 class 3, designated for flexible rubber gasket joints to CAN/CSA-A257.3.
2. Reinforced Concrete Pipe - Reinforced concrete pipe will conform to ASTM C76-70, CSA-A257.2-M92, designed for flexible rubber gasket joints to CAN/CSA-A257.3.
3. Polyvinyl Chloride (PVC) Pipe - PVC pipe will conform to the Standard Specification for "Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings (ASTM D3034)", CSA–B182.1 and CSA-B182.2 - minimum Class SDR 35, separate gasket and intergraded bell system. Joints will meet the Standard Specification "Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals (ASTM D3212)." Pipe may be any colour except blue.
4. Ultra-Rib PVC Pipe - Will conform to ASTM F794 and Uni-bell B-9, and fittings will conform to CSA-B182.4 specifications. Pipe may be any colour except blue.
5. Cement – Cement will be sulfate resisting Portland cement for all concrete pipe, meeting Type 50 CSA-A5.
6. Manhole and Catchbasin Barrels, Cones & Rings - Manhole and catchbasin sections will conform to the Standard Specification for "Precast Reinforced Concrete Manhole Sections (ASTM C478)". All manhole barrels will be a minimum of 1200 mm inside diameter and all cones will be eccentric. Reducing rings or slabs may be used.
7. Manhole Frames & Covers - Manhole frames and covers will be of cast iron conforming to Class 20, ASTM C48 and have at least four (4) lift holes.
    i) Manhole frames and covers will be of cast iron. Grated or standard manhole covers will be used as required.
        a Norwood NF - 49 or approved equal frame and cover must be used on manholes located in roadways and an appropriate locking manhole frame and cover must be used on manholes located in parkland areas.
    ii) Catchbasin frames and covers will be combination precast iron inlet type.
        a Norwood F41 & F51, Trojan K2 or approved equal will be used with 900 mm concrete sections.
8. Manhole Steps - Manhole steps will be standard safety type of hot dipped 20 mm (3/4") galvanized iron spaced at 400 mm (maximum) distance.
9. Manhole Bases - Manhole bases will be reinforced precast slabs, vault or precast tees (reinforced). The concrete base is to be of a minimum of 150 mm in thickness constructed on compacted granular material or undisturbed native material. Perched manhole bases will be a minimum of 200 mm in thickness.
10. Catchbasin leads - corrugated steel pipe, 1.6 mm wall thickness conforming to CAN 3-6401 with watertight couplers with rubber gaskets conforming to ASTM C361M, or ultra-rib PVC pipe and fittings meeting CSA B182.4, ASTM F794 and uni-bell Uni B-9, with a minimum pipe stiffness of 320 kPa as measured in accordance with ASTM D2412.

2.3.2 AGGREGATES:

Note: The requirements for this section will also apply to sanitary sewers, watermains and other utility pipe installation.

1. Bedding Sand - All bedding sand must be clean and meet the following requirements:

Sieve Size	% Passing, By Mass
9.5 mm	100
4.75 mm	90 – 100
150 µm	20 max.

2. Pipe Bedding – All pipe bedding to be well graded sand and gravel within the limits specified and must conform to CAN/CGSB-8.1-87.

Sieve Size	% Passing, By Mass
19 mm	100
12.5 mm	65 – 90
4.75 mm	35 – 55
425 µm	10 – 25
75 µm	0 - 8

3. Mortar Sand - All mortar sand will be clean, contain no deleterious material and conform to CAN 3-AS-M, Sulphate resistant (type 50).
4. Washed Rock - Washed rock must be washed and will contain no deleterious materials or other impurities and will meet the following grading requirements:

Sieve Size	% Passing, By Mass
25 mm	100
5mm	10
80 µm	2

5. Backfill Sand & Gravel - Sand and gravel used for backfill will be well graded and approved by the County before use.
6. Concrete - Concrete will meet the specifications outlined in Section 6 - Transportation and other applicable sections of these standards. Sulfate resistant cement will be used unless otherwise approved.
7. Applicant 's Responsibility for Material - Only approved materials are to be incorporated into the Work. The Applicant will be responsible for all materials furnished by them and will produce certification by an independent testing authority that the materials used conform to the standards. The Applicant will be responsible for the safe transit, delivery and storage of all materials, and any found to be unsatisfactory will be promptly replaced. Unapproved materials will be removed and replaced with acceptable materials, all at the Applicant 's expense.

2.3.3 EXCAVATION:

Note: The requirements for this section will also apply to sanitary sewers, watermains and other utility pipe installation.

1. The trench will be excavated to the line and grade stipulated on the Contract/Design drawings to a depth necessary to accommodate the bedding. The base under each bell must be hollowed sufficiently to allow bearing throughout its entire length. Where the trench has been excavated, it must be properly refilled to the correct level with approved material, properly compacted. The Contractor will not use blocks or any other such items to raise the pipe to the required elevation, unless concrete bedding is being used and with the approval of the County. The trench will be braced and drained when necessary. Adjacent property will be protected at all times.
2. Trench walls will be vertical to 300 mm above the top of pipe.

3. The maximum trench width for single pipe will be:

Pipe Diameter	Max. Trench Width
Less than 750 mm diameter	O.D. + 450 mm
750 mm diameter or larger	O.D. + 600 mm

2.3.4 BEDDING:

Note: The requirements for this section will also apply to sanitary sewers, watermains and other utility pipe installation.

1. The pipe will be laid in the class of bedding shown on the plans as specified herein.
   i) Class "A" - Method of bedding on which the lower part of the pipe exterior is set in concrete of suitable thickness to encase at least one quarter of the pipe diameter for the full trench width. Compacted sand or gravel will be placed to a minimum depth of 300 mm above the top of the pipe.
   ii) Class "B" - Method of bedding in which the pipe is set in compacted sand or gravel, as specified, on a trench bottom shaped to fit the pipe. The pipe is entirely encased with sand to a minimum of 300 mm above its top in layers not exceeding 150 mm in thickness. Depth of bedding below the pipe to be a minimum of 150 mm.
   iii) Class "C" - Method of bedding in which the pipe is set in compacted sand or gravel, as specified, on a trench bottom shaped to fit the pipe. The compacted bedding shall encase at least one quarter of the pipe diameter for the full trench width. The remainder of the pipe is encased in compacted select native material to a height of at least 300 mm above the top of pipe. Depth of bedding below the pipe to be a minimum of 100 mm.
   iv) Class "D" – Method of bedding in which the pipe is placed on an earth foundation shaped to fit the lower part of the pipe. The remainder of the pipe is encased in select native material.

2.3.5 PIPE LAYING:

Note: The requirements for this section will also apply to sanitary sewers, watermains and other utility pipe installation.

1. Install pipe to the prescribed grade in accordance with manufacturer's standard instructions and specifications.
2. Pipe will not be deflected either vertically or horizontally in excess of that recommended by the manufacturer.
3. All jointing will be made between clean pipe ends
4. The trench must be kept dry during pipe laying operations and no water will be allowed to drain through the newly laid pipe for at least two hours where mortar joints have been used.
5. When pipe laying is not in progress, the open ends of installed pipe will be closed by an approved plug or cap to prevent entrance of trench water and/or any foreign or other material into the line.
6. Adequate backfill will be placed on the pipe to prevent floating. Any pipe which has floated will be removed from the trench and be re-laid as directed by the County.
7. No pipe will be laid in wet trench conditions that preclude proper bedding or on frozen trench bottom or when, in the opinion of the Engineer, the trench conditions or the weather are unsuitable for proper installation.

8. Each cast iron valve, hydrant, or fitting, will have a bell with an inside profile such that a seal can be made between the machined pipe end and the bell with a rubber ring. Fittings used with PVC pipe will be manufactured with a TYTON joint.
9. Before laying valves, hydrants or fittings, all lumps, blisters, and excess coating will be removed from the bell. The inside of the bell will then be wire-brushed and both the inside of the bell and the spigot end of the pipe wiped clean and dry. All surfaces to be joined will be kept clean until joints are made.
10. All bell and spigot joints will be sealed with rubber rings, unless otherwise approved in writing by the County. All defective joints will be cut out and entirely replaced with new material.
11. The cutting of pipe for closure to fittings, valves and other reasons will be done in a neat and workmanlike manner, without damage to the pipe and so as to leave a smooth end at right angles to the axis of the pipe. Pipe cutting for valves and fittings will be done accurately so as to bring all valves and fittings to their correct positions. Cut standard pipe used with rubber gasket joints will be field machined and chamfered as required by the manufacturer's instructions.
12. Upon completion, the storm sewer must be thoroughly cleaned.

2.3.6 BACKFILLING & COMPACTION:

Note: The requirements for this section will also apply to sanitary sewers, watermains and other utility pipe installation.

1. General - Backfill material will be the soil excavated from the ditch or trench although sand or gravel may be substituted for poor existing soils. All backfill material will be subject to approval by the County. If possible, the excavated material will be placed back in the ditch in the vertical and horizontal order in which it was excavated. Backfill will be placed in uniform lifts not exceeding 300 mm loose depth. Where clay is used as backfill material, its moisture content will not exceed the Plastic Limit by more than fifteen percent (15%).

   Under no circumstances will backfill material within roadways contain ice, snow, straw, organic or frozen or other deleterious material be used.

2. Densities

   Prior to Street Construction - All excavations under proposed roadways, sidewalks, street lights or other similar surface structures will be backfilled and compacted to minimum density of not less than 98% of the maximum standard Proctor Density or as otherwise approved by the County. Backfill will be placed in uniform lifts not exceeding 300 mm loose depth. A minimum of two density tests per 100 lineal meters of trench per 1.5 m of compacted backfill depth will be taken. Additional tests may be called for as deemed necessary. Any free water in a trench will be removed prior to placing additional lifts.

   Under existing roadways - All excavations under existing roadways, sidewalks, lanes or other similar surface structures will be backfilled to meet the following specifications:

   a 300mm or more below final grade - compaction in this zone will be compacted to minimum density of not less than 98% of the maximum standard Proctor Density.
   b 0 - 300 mm below final grade - compaction in this zone will be to a minimum of 100% of the maximum standard Proctor Density and based on a minimum of two field tests per 100 lineal meters of trench of compacted backfill. Backfill will be placed in uniform lifts not exceeding 150 mm compacted depth.

3. Adjacent to existing roadways - All material 300 mm below the finished grade will be compacted to a density not less than 95% of the maximum density of a five point Standard Proctor Compaction Test and based on a minimum of one field test per 150 lineal meters of trench for each 1.5 meters of compacted vertical backfill.
4. Sand or gravel backfill - Sand or gravel backfill will be compacted to meet the following density requirements:

   300 mm or more below grade - the minimum acceptable density will be 98% of the maximum standard Proctor Density.

   0 - 300 mm below grade - all sand or gravel in this zone will compact to 100% of the maximum standard Proctor Density.
5. Water flushing - Water flushing will be permitted only under special circumstances, as approved in writing by the County.
6. Testing - For all density tests indicating insufficient compaction, two more density tests, proportionately representative of the ditch length tested, will be taken at that depth. If the average of the three tests is below the required density, the area of deficient density will be re-excavated and re-compacted to meet the specified density. Densities greater than 100% will be deemed to be at 100% for calculating the average of the three tests.

2.3.7 INSPECTION

Note: The requirements for this section will also apply to sanitary sewers, watermains and other utility pipe installation.

2.3.7.1 General:

All excavating, laying, joining of pipes, backfilling and completion of all works will be subject to inspection by Lethbridge County authorized representatives. Unsatisfactory conditions will be remedied at the Applicant 's expense. All equipment, tools and labor for testing will also be provided by the Applicant at their expense.

2.3.7.2 Video Sewer Inspection:

Prior to the Construction Completion Certificate Inspection, televising of all storm sewers will be completed. A video tape and written report will be submitted to the County's Operations Department. A written report indicating any deficiencies and recommending repair measures will be prepared within sixty (60) calendar days from the date of issuance of a Construction Completion Certificate.

2.3.8 CULVERTS, STORMWATER MANAGEMENT FACILITIES & SPECIAL STRUCTURES

2.3.8.1 Culverts:

1. Culverts will be placed so that the minimum distance from the finished grade of the roadway to the top of the pipe will be not less than one-half the diameter of the pipe or a minimum of 300 mm, whichever is greater, unless approved otherwise.
2. A trench will be excavated to the required depth and grade with the bottom shaped to conform to the bottom of the pipe to afford a firm and uniform bearing over the entire length of the culvert. If the material in the bottom of the excavation is unsuitable, the trench will be dug 100 mm below the grade as ordered, and backfilled with approved granular material and thoroughly tamped, or otherwise compacted, to ensure an unyielding foundation.
3. Where the trench is in solid rock or other hard material, it will be excavated to a depth of at least 100 mm below the grade established for the bottom of the pipe, and this additional

excavation will be backfilled with suitable material in such manner as to ensure a uniform bearing for the length of the culvert.

4. Selected backfilling material, free from stones, frozen lumps, and other deleterious material, will be placed under and around the pipe and thoroughly tamped or otherwise compacted in place. The trench will be completely filled and the pipe covered to a depth of at least 300 mm with hand placed and properly compacted material before the construction of the embankment over the culvert proceeds.
5. If a trench is not required, the culvert pipe will be laid true to line and grade, on a bed that is uniformly firm throughout its entire length, and the backfilling, a minimum 100 mm granular over the pipe, will be completed as specified in the preceding paragraph.
6. When using corrugated pipe, the pipe will be laid in the trench with the separate sections firmly joined together and with outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. Corrugated pipe will be so handled as to prevent bruising and scaling. In no case will pipe culverts be dragged on the ground.
7. All drainage culverts will be rip-rapped at both inlet and outlet. The size and type of rip-rap will conform to good engineering practice and acceptable to the County. Refer to Section 2.3.9 Rip Rap.
8. Minimum size of roadway culvert will be 600 mm (wall thickness 1.6 mm or as required by the loading criteria).
9. Minimum size of entrance culvert will be 500 mm (wall thickness 1.6 mm or as required by the loading criteria).

2.3.8.2 Stormwater Management Facilities (SWMF):

1. Detention facilities will be designed as part of both the minor and the major drainage systems. They must control the peak runoff conditions for events up to the 1-in-100 year return period.
2. Detention facilities become municipal property. The need for a specific detention facility will require the approval of the County. In assessing the need for specific detention facilities, the engineer must consider the impacts of uncontrolled drainage.
3. The ratio of land area for open space use around the pond will be twice the area of the water surface for the 1-in-100 year runoff event, unless approved otherwise.
4. Soils investigations specific to the detention facility will be undertaken to determine appropriate design factors. Where the facility is sited above a shallow aquifer or high water table, the potential for groundwater contamination must be minimized.
5. Wet pond detention facilities must be constructed in impervious soils to minimize water losses during dry weather periods. Intruding silt, sand or gravel seams must be sealed off.
6. Where a detention facility is to have multiple functions, its design must consider the aesthetic implications of shape, grading, landscape features and use.
7. An emergency overflow system will drain to a receiving watercourse, irrigation canal or outlet acceptable to the County, for storms greater than the 1:100 year event.
8. The effects of the maximum pond water levels will be considered in the design of the minor system and lot grading. The crown elevations of the pipes in the first manhole upstream of a facility will be at or above the maximum detention pond level during the 1-in-5 year storm event.

9. The maximum water level fluctuations for detention ponds in residential areas during the 1-in-100 year storm event will be 2.0 m. All inhabited building space, including basements, will be constructed above the 100 year flood level.

10. In design, wet ponds (retention) will:

    i) be located at local low points or adjacent to an existing water course;

    ii) have a minimum depth of 2.4m at normal water level;

    iii) have side slopes no steeper than 3:1 from the bottom of the pond to one and one-half meter below normal water level; from here to 5m (horizontal) beyond the 100 year flood level the side slopes will be no steeper than 7:1 (a slope of 4:1 will be considered if appropriate slope protection is constructed, slope protection shall include rip rap armor or an approved equivalent) ;

    iv) Any SWMF with slopes greater than 7:1 require 6' tall chain link fencing surrounding the facility.

    v) have inorganic shoreline treatment for 1.5m horizontal below and 3.0m horizontal above the normal water level (the edge treatment will be compatible with adjacent land use and consider safety, maintenance, access and erosion reduction);

    vi) have inlets and outlets submerged below ice level and above the level of anticipated sediment accumulation (the invert will be at least 1.0m below normal water level);

    vii) have provision for sediment accumulation at the points of inflow, and for the later removal of the sediment;

    viii) address all safety issues;

    ix) have no dead bay areas;

    x) have an annual volume exchange at least twice per year; and

    xi) have an inspection manhole located no greater than 18m from shore on both the inlet and outlet lines;

    xii) the pond's perimeter may require fencing in a manner approved by the County;

    xiii) have a 0.3m freeboard between the 1:100 year water level and area basements.

11. In design dry ponds (detention) will:

    i) be off-line storage areas designed to temporarily detain excess runoff and thereby reduce the peak outflow rates when a greater than 1-in-5 year rainfall event occurs;

    ii) have a low flow bypass for flows from minor events and be designed to meet current Alberta Environment and Parks guidelines. The maximum depth of storage in a dry pond for a 1-in-100 year rainfall event will be 1.5 m;

    iii) have a pond bottom graded to a minimum grade of 1.0% and will properly drain all areas after its operation;

    iv) be designed to have a maximum side slope of 5:1 (vertical) unless otherwise approved by the County;

    v) all inlet and outlet structures of the pond will have grates and accompanying hardware of corrosive resistant metal over their openings to preclude access by children and animals. These structures will be designed for a hydraulic capacity of twice the required capacity and address all safety and maintenance issues (particularly during operation);

    vi) roadways can be considered as a temporary storage facility for major storm events as long as the ponding does not cause flooding of adjoining properties;

vii) the Applicant will provide equipment and documentation as required by the County for the maintenance of the stormwater management facilities;

viii) the pond's perimeter may require fencing in a manner approved by the County;

ix) have a 0.3m freeboard between the 1:100 year water level and area basements.

2.3.8.3 Outfalls:

1. Obverts of outfall pipes will be at least 150 mm above the 1-in-5 year flood level in the receiving watercourse. Inverts of outfall pipes will be above the winter ice level. Otherwise, outfall pipes will be submerged below the bottom of ice level. In addition, outfalls will be located to avoid damage from moving ice during breakup.
2. Drop structures, slope protection material and energy dissipaters will be used where necessary to prevent erosion.
3. Facilities must be provided which will prevent entry by the public, wildlife and animals.

2.3.8.4 Receiving Waters:

1. Measures must be incorporated in new developments to prevent any increase in the amount of downstream erosion.
2. If a development causes downstream erosion despite the use of on-site peak runoff rate controls, appropriate mitigating measures are to be taken in the downstream areas.
3. Preservation of watercourse aesthetics and wildlife habitat must be considered in erosion and bank stability work.

2.3.9 RIP RAP

When required by the plans, or as ordered by the Engineer, embankments, the ends of culverts and ditch bottoms will be protected by rip-rap in accordance with Alberta Transportation Standard Specifications for Highway Construction, Section 2.5 and Standard Specifications for Bridge Construction, Section 10.

This item consists of supplying materials and constructing a protective covering of approved stone on an earth bed, granular filter blanket or filter fabric in accordance with these specifications. Rip-rap will be constructed at the locations and in conformity with the lines and grades shown on the plans or as designated by the Engineer.

The Applicant will supply all rip-rap materials including filter fabrics. The materials supplied will be subject to the approval of the County.

The County reserves the right to select an independent testing firm to conduct visual inspections and testing, and compile its own data during or after the construction period. Any costs associated with inspections and testing conducted by the County for areas that fail initial testing will be borne by the Applicant and taken from the security held by the County. These results will be made available to the Applicant and Engineer. This quality assurance testing program does not relieve the Applicant of their responsibility to conduct their own quality control testing program.

2.3.9.1 Type of Rip-Rap:

1. Heavy Rock Rip-Rap - materials will consist of sound, hard and dense stones, boulders or quarry rocks resistant to the action of air and water and free from seams, cracks or other structural defects. The particles will be generally of equal dimensions in all directions, with a minimum of flat and/or elongated particles. The minimum acceptable unit weight of the rock is 2.5t/m^3 or as specified for the intended use.

i) Heavy Rock rip-rap used for corrugated steel pipe culverts, ditch checks and ditch blocks will meet the requirements of class 1 Rock Rip rap.

ii) Heavy Rock rip-rap materials used for corrugated structural plate pipe culverts, bridges, and major stream bank protection will meet the requirements for Class 2.

The Heavy Rock rip-rap shall meet the following requirements:

Gradation		Heavy Rock Riprap Class			
Required Properties	Units	1M	1	2	3
Nominal Mass	kg	7	40	200	700
Nominal Diameter	mm	175	300	500	800
None greater than:	kg	40	130	700	1800
	mm	300	450	800	1100
20% to 50%	kg	10	70	300	1100
	mm	200	350	600	900
50% to 80%	kg	7	40	200	700
	mm	175	300	500	800
100% greater than	kg	3	10	40	200
	mm	125	200	300	500

Percentages are by mass. Sizes are equivalent spherical diameters, and are for guidance only.

2. Hand Laid Rip-Rap - Hand laid rip-rap will be sound, durable stones and in no case measure less than 150 mm. The stones will be placed with their beds at right angles to the slope, with larger stones used in the bottom courses, and the smaller stones at the top. They will be laid in close contact so as to break joints, and in such manner that the weight of the stone is carried by the earth and not by the adjacent stones. The spaces between the larger stones will be filled with spalls, securely rammed into place. The finished work will present an even, tight, and reasonably plain surface, varying not more than 75 mm from the required contour.

3. Random Rip-Rap - Random rip-rap, graded so that the smaller stone is uniformly distributed throughout the mass, will be dumped randomly over the areas until the required depth is attained. The occasional manual handling of rocks or stones will in no manner be construed to transform the classification of random rip-rap into that of hand laid rip-rap.

2.3.9.2 Construction:

1. Preparation of foundation: Aprons and slopes to be rip-rapped will be excavated as shown on the Plans or as designated by the County. The foundation bed will be fine graded to form a uniform and even surface. Granular filter blankets or filter fabrics when required by the County will be placed as specified by the County. A thin lift of fine grained material will be placed over filter fabric to prevent damage to the fabric by the stones.

2. Hand placed rip-rap: The stones, boulders or quarry rocks will be placed by hand to conform to the lines and grades as shown on the Plans or designated by the County. The stones will be firmly bedded into the bed and against adjoining stones and smaller stones used to fill in the voids. Hand placing will generally be designated for Normal Stone Rip-Rap.

3. Machine placed rip-rap: The stones, boulders or quarry rocks will be sorted and placed by machine to produce a uniform blanket or rip-rap conforming to the lines and grades shown on the Plans or designated by the County. The equipment used will be capable of handling and positioning individual rip-rap particles. Machine placing will generally be designated for Heavy Stone Rip-Rap and Armour Stone Rip-Rap.

4. Random rip-rap: The stones, boulders or quarry rock will be dumped onto the surface to be rip-rapped and sufficient hand and/or machine work will be done to produce a uniform mat conforming with the lines and grades shown on the Plans or designated by the County. Random placing may be designated for all types of stone rip-rap.

2.3.10 DITCHES

2.3.10.1 Cross Section Elements for Ditches

1. Sideslope and backslope of channels or ditches will be 3:1 minimum.
2. For a flat bottom ditch, the minimum width will be 1 metre for local and collector roads and a minimum of 3 meters for arterials, unless otherwise approved by the County.
3. Minimum depth of ditch will be 1.0 meter.
4. All drainage channels will be topsoil and seeded. In channels, ditches and slopes that are highly susceptible to erosion, sodding will be provided, or other erosion treatments as recommended by the Engineer and approved by the County.

2.3.10.2 Ditch Checks

1. Ditch checks are required for any ditch that has a 4% or greater grade. This ditch check will be considered as part of the design of the subdivision and addressed in the stormwater management plan.
2. Ditch checks will be of a permanent nature and will be maintained by the Applicant until final acceptance of the subdivision of the Municipality. The distance between ditch checks will be a minimum of 5 m from any culvert invert; and have a maximum spacing of 20 m.
3. Ditches with grades exceeding 3% must include erosion control design measures.

2.3.11 GRADING

2.3.11.1 General:

The intent is to achieve a proper relationship and balance between the street elevation, building grade elevation, surrounding development and existing topography. Basic to the grading design of lots is the selection of the proper building plan to meet and complement the land it is situated on.

Site grading will be done to ensure proper drainage of private property and to establish an adequate drainage system for the entire development.

The criteria recommended for the major system are:

1. provide a level of protection for the 1-in-100 year frequency;
2. no damage to structures due to flooding;
3. continuous road grades or overflow easements to open areas.

2.3.11.2 Design:

1. Lot Grading
   i) The finished grade elevation at buildings are to be based upon the City of Lethbridge Design Standards found under Section 9.1 "Lot Grading and Drainage".
   ii) Back-to-front drainage must be the standard practice in laneless subdivisions. They must be graded to achieve a minimum slope of 2% or greater away from buildings and along the lot lines. Provisions must be made to keep the runoff at least 3 meters away from buildings where practical.

iii) Split drainage or front-to-back drainage may be allowed when a road, lane or public right-of-way exists at both the front and back of the lot, or as approved otherwise by the County.

iv) Reserves and public lands will be graded to drain towards developed roadway, lanes and/or the storm drainage system according to a specific landscape or site plan submitted by the Applicant and approved by the County.

v) The construction of all overland drainage control will be completed to the satisfaction of the County, in accordance with approved plans, prior to the issuance of the construction completion certificate for storm sewer mains.

vi) For subdivisions with more than 3 lots, all lots must be pre-graded to ensure proper drainage of the overall subdivision

2.3.12 PLANS

2.3.12.1 General:

All construction plans will conform to the standards outlined in Section 1 - General of this Manual.

2.3.12.2 Plan Submission:

A description of existing and proposed stormwater facilities and areas served must be submitted, including the following information as required:

1. Soils Reports
2. Stormwater Management Design Report
3. Storm Flow Computations (including catchment areas) using the Rational Method and/or computer modeling analysis
4. Approved drawings for all crossings

Prior to the issuance of the Final Acceptance Certificate, the following will be submitted:

1. Record Drawings
2. Maintenance & Operations Manuals
3. Video Inspection Reports
4. Registered easements and caveats

2.3.12.3 Detail Plans:

At least four (4) copies of the Plans as amended pursuant to the requirement of the County will be supplied to the County after final approval, before any construction work will be authorized. Plans and profiles will show:

1. Location of streets and storm sewers within same.
2. Details of all storm sewer appurtenances (special manholes or junctions, inspection chambers, inverted siphons, sampling devices, weirs, etc.)
3. Details of special protection for pipe where high velocities are encountered.
4. Drawings for crossing permits for any oil, power, gas or other transmission lines or railways.

3. WASTEWATER COLLECTION SYSTEM

3.1 GENERAL

The specific requirements of the sanitary sewage system will depend on whether the development is defined as a rural or urban development. Regardless, the intent of the sanitary system design is to properly convey sewage generated from the development to an appropriate treatment system. The conveyance and treatment systems are to be approved by the County and must meet current design standards.

The Applicant is responsible to confirm adequate capacity in any existing downstream collection or treatment system, if such information is not readily available from the system owner.

Generally, rural systems will involve individual disposal fields on each lot, or a collection system and communal treatment/disposal component. The selected system must meet Alberta Environment and Parks requirements. Site suitability for disposal fields is to be documented in the Geotechnical/Hydrogeological Report for the site.

The requirements for urban Sanitary Sewerage Systems will be dependent upon the existing and proposed population numbers, the site suitability, the establishment of contributing sanitary basins or benefiting sanitary areas, existing system capacities and flows, and future growth areas. If this specification does not cover an area of sanitary sewerage system concern, the onus will be upon the Applicant to make recommendations and present alternative corrective measures based on sound economic, engineering, environmental, and operational and maintenance criteria for approval by the County. The system will meet the recommended standards of Alberta Environment and Parks Standards and Guidelines for Municipal Water Supply, Wastewater & Storm Drainage Facilities.

Weeping tile or storm run-off connections, or any stormwater contribution to the sanitary system, will not be permitted.

3.1.1 REFERENCES

Design details and/or procedures which are not explicitly specified in their sections shall be in accordance with the following reference standards:

1. Alberta Environment and Parks
    i) Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems (Current version).
2. City of Lethbridge
    i) Design Standards (Current version)

3.2 GUIDELINES FOR URBAN SANITARY SEWER DESIGN

The sanitary sewer system will be designed to include all of the total tributary area intended to be serviced by the sewer main at any particular point including any proposed future development areas as outlined in the Area Structure Plan. All specifications and standards listed herein will refer to the latest revision thereof.

3.2.1 DESIGN FLOW:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:

3.2.2 PIPE DESIGN:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:

3.2.3 SEWER MAIN INSTALLATION & LOCATION:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:

3.2.4 MANHOLES:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:

3.3 MATERIALS:

All materials for main lines and manholes will be to the approved standards listed herein or as provided in Section 2 – Stormwater Drainage Systems. Unapproved material will be removed and replaced with acceptable materials at the Applicant 's expense. Manhole tops will be grey iron castings, NF 39 or equal.

3.3.1 PIPE & JOINTS -

Lay and join pipe as accordance with manufacturer’s recommendations.

When no pipe laying is occurring, the open end of the pipe is to be securely closed. No water will be allowed to drain through a newly laid pipe. Upon completion, the sewer must be thoroughly cleaned and camera inspected. One copy of the video and report will be forwarded to the County.

All jointing will be made between clean pipe ends, as recommended by the pipe manufacturer. Pipe will not be deflected either vertically or horizontally in excess of that recommended by the manufacturer or as noted in these specifications.

3.3.2 APPLICANT'S RESPONSIBILITY FOR MATERIAL –

Only approved materials are to be incorporated into the Work. The Applicant will be responsible for all materials furnished by them and will produce certification by an independent testing authority that the materials used conform to the standards. The Applicant will be responsible for the safe transit, delivery and storage of all materials and any found to be unsatisfactory, will be promptly replaced. Unapproved materials will be removed and replaced with acceptable materials, all at the Applicant 's expense.

All materials are to be approved by the County in order to ensure consistency and compatibility with materials currently in use.

3.4 CONSTRUCTION:

3.4.1 EXCAVATION/PIPELAYING

See Excavation and Pipe Laying Requirements as provided in Section 2 – Stormwater Drainage Systems.

3.4.1.1 Inspection:

1. General:

   See Section 2.3.7 – Stormwater Drainage Systems.

2. Mechanical & Electrical Equipment:

   All lift stations, valves, control structures or other sewer appurtenances will have operating manuals prepared for them by the Applicant. A manual will include, but not be limited to, the following: All manufacturers' literature, parts listings, suppliers' addresses, special and normal maintenance requirements and schedules, proper operating sequence and as-built plans. A minimum of two (2) copies of all such manuals will be provided to the County.

3.5 LOW PRESSURE SEWERAGE SYSTEMS

The requirements listed herein include components to be installed on private property and public rights-of-way. The limits of responsibility must be determined by the Applicant at the commencement of the planning and design stage.

1. Septic tanks and pumps - all properties to be serviced will have an adequately sized two-compartment septic tank. The pump will have an open impeller design suitable for handling septic tank effluent.
2. Sewer mains will be either PVC pressure class 150 or polyethylene Series 100, and will be capable of operating at a continuous pressure level of 875 kpa at 23°C. The minimum pipe size for sewer mains will be 50 mm I.D.
3. Service pipes will be 37.5mm (1 ½ inch) series 160 polyethylene or polybutylene tubing.
4. Fittings and joints - PVC fittings for use with PVC pipe will be a rubber gasket joint manufactured for the type of pipe used in the mains. Polyethylene pipe will be jointed by the butt fusion method and connected to fittings as recommended by the pipe manufacturer.
5. Fittings will be PVC polyethylene or cast iron conforming to CAN3-B137.3, CAN-B137.1 or CAN3-B131.9 as appropriate. Fittings will be designed for a working pressure of 900 kpa. Where flanged joints are used the bolts will be manufactured from stainless steel.
6. Service tees for use on 50 mm diameter mains will be tapped to accept 37 mm or adapters. Only bronze reducing bushings will be used to decrease the size of threaded opening in PVC tees down to 37 mm.

   Service tees on pipes 75 mm diameter or larger will be made using Smith Blair Service Saddles as follows:

   i) Smith Blair Style 342 for 75 mm and 100 mm mains.

   ii) Smith Blair Style 352 for 150 mm and larger mains.

   Only bronze reducing bushings will be used to reduce the opening in the service saddle to 37 mm.
7. Corporation stops for plastic service tubing will have a compression joint. Stainless steel stiffeners of the correct size will be used at all compression joints on polyethylene and polybutylene service tubing.

8. Curb stops for plastic pipe will have a compression type joint. The curb stop will be of the ball valve type. Curb stops will be equipped with an extension type valve box suitable for 3.0 meters bury in the extended position. Stainless steel stiffeners of the correct size will be used at all compression joints on polyethylene or polybutylene pipe.
9. Valves - ball valve curb stops will be used as valves on 50 mm diameter pipe and will be supplied with an extension type valve box suitable for 3 meter bury. Valve boxes will be protected against damage. Joints will be of the compression type for both outlets.

   For 75 mm and larger pipe, valves will be Epoxy lined water works gate valves conforming to A.W.W.A. specification C500.
10. Valve boxes for 75 mm and larger valves will be Norwood Foundry Type A or approved equivalent.
11. Testing - the low pressure sewerage system will be subjected to, and pass, a leakage test for 1hour at 875 kpa pressure. The allowable leakage will not exceed the pipe manufacturers recommended allowance.
12. The use of repair clamps will not be permitted when making repairs to the pipe of the low pressure sewerage system. Regardless of the pipe being used, the bedding will be placed to provide a minimum of 150 mm of sand bedding over the pipe.

3.6 FORCE MAINS

1. General - A "system-head" curve will be provided for each force main. Supplementary information to be provided with the curves will include but not be limited to, population estimates, area served, plan and profile of line, friction coefficients and line head losses.
2. Design Criteria - The minimum permissible velocity will be 0.60 m/sec. Where velocities in excess of 3.00 m/sec are attained, special provisions will be made as required by the Engineer. At each high point in line, gas relief will be provided.
3. Force mains will be constructed of HDPE pipe unless otherwise approved by the County.
4. Sewage force mains will be adequately sized to carry the anticipated peak hourly sewage flow. Pressure rating of the pipe will be at least twice the normal operating pressure of the pipe.

   Surge pressures during starting and stopping of the pumps will not exceed the safe operating capacity of the force main.

   If necessary the force main will be oversized to serve areas outside the development area. A gate valve will be provided at both ends of the sewage force main.

3.7 RURAL SYSTEM CONSIDERATIONS

3.7.1 WATER TABLE:

Water table shall be determined for the design of a private sewage disposal system as per Alberta Private Sewage Systems Standards.

3.7.2 SUBSURFACE SOILS ASSESSMENT:

If a proposed subdivision is not to be served by a municipal wastewater system, the Applicant will be required to submit a report confirming the acceptability of the subsurface characteristics of the land for an on-site sewage disposal system:

Each report will include all pertinent information and recommendations of a qualified professional engineer. This report will contain:

- proposed septic field sites;
- accurate location of the above;
- location of any existing septic fields;
- any water wells and their locations;
- methodology of investigation;
- soils analysis;
- results;
- conclusions and recommendations;

Sealed sewer holding tanks are not accepted unless in extra ordinary circumstances and the system is approved.

3.8 PLANS AND SUBMISSIONS

3.8.1 GENERAL:

All construction plans will conform to the standards outlined in Section 1.5 – Engineering Plans & Drawings of this Manual.

3.8.2 PLAN SUBMISSION:

A description of existing and proposed sewer facilities and areas served must be submitted, including the following information as required:

- Soils Reports
- Approved drawings for all crossings

Prior to the issuance of the Final Acceptance Certificate, the following will be submitted:

- As-built Plans
- Maintenance & Operations Manuals
- Video Inspection Reports
- Exfiltration and Infiltration Reports
- Registered easements and caveats

4. WATER DISTRIBUTION SYSTEM

4.1 GENERAL

The specific requirements of the water distribution system will depend on whether the development is defined as a rural or urban development. Regardless, the intent of the water distribution system design is to properly distribute potable water throughout the development, including appropriate supply and treatment systems as necessary. The supply, treatment and distribution systems are to be approved by the County and must meet current design standards.

The Applicant is responsible to confirm adequate capacity in any existing system to be extended into the development area, if such information is not readily available from the system owner.

Generally, rural systems will involve individual wells on each lot, or a communal well and treatment system, with appropriate distribution or a Water Coop. All systems must meet Alberta Environment and Parks requirements. Suitability of the existing aquifer to sustain the development demand with no adverse impact on existing wells is to be documented in the Geotechnical/Hydrogeological Report for the site.

Where the Applicant's proposal includes a high-pressure pipeline or other such crossings, the Applicant will be fully responsible for the preparation and submission of drawings, to the owner(s) and/or proper authorities, and for obtaining the necessary permission to enter upon, cross over, or construct under any gas or oil transmission lines or other structures. The Applicant will bear the full responsibility for any works, extra costs, damage claims or insurance costs related to any of the above-mentioned crossings. Submission of documentary evidence that such permits have been obtained at the time of the Applicant’s initial submission of drawings to the County will also be required.

The Applicant will ensure that application is made to the Department of the Environment for a permit to construct the work as required by the Clean Water Act (latest revision) of the Province of Alberta.

Where a Water Co-operative exists in the vicinity of the proposed development, the Applicant must connect to the water co-operative if capacity exists. Deviation from utilizing another water source other than the water co-operative must be approved by the County prior to connection. Proof of water units must be supplied to the County.

4.1.1 REFERENCES

Design details and/or procedures which are not explicitly specified in their sections shall be in accordance with the following reference standards:

1. Alberta Environment and Parks
   - i) Water Act.
   - ii) Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems (Current version).
2. City of Lethbridge
   - i) Design Standards (Current version)
3. American Water Works Association (AWWA) (Current versions)

4.2 GUIDELINES FOR URBAN WATER DISTRIBUTION SYSTEM DESIGN

4.2.1 PIPE:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:

4.2.2 WATERMAINS:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:

4.2.3 CONSUMPTION:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:

4.2.4 VALVES

1. Location - Valves will be located such that during a shutdown:
   i) No more than three valves are required to effect a shutdown;
   ii) No more than one hydrant is taken out of service; and
   iii) No more than twenty residential units are taken out of service.
2. Position - All valves will be set in a vertical position and valve boxes must be adjustable. The top of valve boxes are to be set to grade in unpaved areas and 5 to 10 mm below grade within paved areas.

4.2.5 HYDRANTS:

1. Hydrants will be AVK Series or Canada Valve, of the same style and make as presently exist in the County, and will be complete with:
   i) Two (2) 65 mm hose nozzles at 180°;
   ii) One (1) 115 mm pumper connection; and
   iii) Threads on hose and pumper connections conforming to the Alberta Mutual Aid Standards.
2. Location - Hydrants will be installed on the distribution mains at the projection of property lines wherever possible.
3. Fire Hydrants must be located as follows:

   Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines:
4. Valves - Valves will be of the same style and make as presently existing in the County. There will be a gate valve in the lead to each hydrant. This valve will conform to the grade of the surrounding area.
5. If a mechanically bolted fire hydrant, valve and tee assembly is specified, it will include stainless steel hardware wrapped with denso tape.

6. The National Fire Protection Association (NFPA) standard 1142 " Standard on Water Supplies for Suburban and Rural Fire Fighting" is to be used as a design guideline.

4.2.6 THRUST BLOCKS:

Thrust blocks will be installed at all fittings between solid ground and the fitting to be anchored so that the pipe and fitting joints are accessible for repair. Metal harnesses of corrosive resistant tie rods and pipe clamps will be used to prevent movement when requested by the County.

4.3 MATERIALS

All materials used for the water distribution system will meet the latest applicable CSA, AWWA or ASTM Standards, or as approved by the County, and will be supplied by the Applicant. If other than approved materials are incorporated in the works, such materials will be removed and replaced with approved materials, all at the Applicant's expense and to the satisfaction of the County. The Applicant may be required to produce certification by an independent testing authority to confirm that the material conform to the specified standards at any time.

4.3.1 PIPE & JOINTS:

All pipe and jointing material will comply with the appropriate AWWA Specification or as otherwise approved to by the County in writing:

1. Polyvinyl Chloride (PVC) Pressure Pipe - PVC Pipe will conform to CAN 3-B.137.3 and the Standard Specification for Class 150 AWWA Specification C-900 or C-905 as applicable, SDR 18 colored blue. Joints will be flexible Elastomeric Seals designed for use in pressurized pipes or as otherwise approved in writing by the County.
2. Reinforced concrete cylindrical pipes (Hyprescon) - Reinforced concrete cylindrical pipe will comply with AWWA Specifications C301 and C303 latest revision thereof.

4.3.2 VALVES:

Gate Valves - Gate valves will conform to AWWA Specification C500-571, latest revision thereof, and will meet the following supplementary requirements:

1. Operating pressure will be 1034 kPa;
2. Bronze mounted, resistant to de-zincification under high pH water;
3. Resilient seat assembly;
4. "O" - ring type stem seal;
5. Non-rising stem type;
6. 50 mm square operating nut turning counter clock-wise to open;
7. Type 304 stainless steel stem; and
8. Valve Boxes - Valve boxes will be a two section cast iron, asphalt coated, of the sliding type (Type "A") and of sufficient length to provide for adjustments of 300 mm. The internal extension spindle will be at least 6 feet long and will include a rock disk and operating nut. The valve box will have a minimum of 300 mm overlap in the installed position. The operating nut will be no closer than 300 mm from the finished ground surface nor more than 600 mm below the finished ground surface.

4.3.3 HYDRANTS:

Fire hydrants will be the compression-type, closing with pressure and conforming to AWWA Specification C502, latest revision thereof, and meet the following requirements:

1. Designed for a working pressure of 1033 kPa;
2. Number 6 three-sided operating nut, opening left (counter- clockwise);
3. Bottom connection with drip valve;
4. Come with a minimum 300 mm extension
5. Minimum flange to bonnet distance of 600 mm; and

Hydrants will be set plumb with the larger pumper nozzle at right angles (90o) to the road alignment. The bottom of ground flanges will be set to an elevation 50 mm above finished grade. Hydrants will be located to provide complete accessibility and to minimize possibility of damage from vehicles or injury to pedestrians. Unless otherwise approved, the location of the hydrant will conform to the Approved Plans.

4.3.4 FITTINGS:

All fittings will be coated cast iron conforming to AWWA C110 or PVC Injected Moulded to CSA 137B for 150 mm and 200 mm sizes with compatible rubber joints and belled ends for the pipe or as otherwise approved by the County in writing.

4.3.5 AGGREGATES:

All bedding sand must be clean and meet the requirements noted in Section 2 – Stormwater Drainage Systems.

4.3.6 FLUSH VALVES:

Flush valves will be installed at all high points and dead ends of the main, except where the hydrants are located within 15 m of a dead end, unless approved otherwise by the County.

4.3.7 CATHODIC PROTECTION:

All buried metallic fittings and valves will be cathodically protected with 2.3 kg zinc anodes and all hydrants will be cathodically protected with a 5.5 kg zinc anode.

1. Zinc anodes will conform to ASTM B418-73 Type II.
2. Lead Wires No. 10A WG/7, two metres long.
3. Wire shall be connected to fittings with cadweld.
4. A minimum of 3 Litres of water is to be poured on each Anode to initiate the Anode's operation.

4.4 CONSTRUCTION

4.4.1 EXCAVATION/PIPELAYING

See Excavation and pipelaying requirements as provided in Section 2 – Stormwater Drainage Systems.

4.4.2 FITTINGS:

Bends, tees, crosses, valves and reducers will be lowered into the trench, inspected and cleaned as specified. Thrust blocks will be placed at all fittings. Where a metal harness of tie rods and pipe clamps are used they will be corrosive protected. All underground nuts and bolts on valves, hydrants and water main appurtenances will be stainless steel.

4.4.3 HYDRANTS:

Hydrants will be thoroughly cleaned of dirt or other foreign matter before setting.

All hydrants will stand plumb +/- 10 mm from Centre at top of hydrant. The larger pumper nozzle will be at right angles to and facing the roadway. Bottom of ground flanges will be set to an elevation of 50 mm above finished grade.

Hydrants are to be placed on a seat completely treated rough fir on undisturbed ground. An area 1 sq. metre and 300 mm (minimum) above the drainage outlet will be filled with 25 mm washed rock and covered with a single 150 micro-metre layer of polyethylene film.

Where the water table is above the hydrant drain, the hydrant may require plugging. The County is to be consulted to determine drain plugging requirements.

4.4.4 VALVES & VALVE CASINGS:

All valves will be set in a vertical position and a sliding Type A valve casing will be installed vertically over each valve. The valve casing bonnets will be set on 2 or more layers of 50 x 200 x 600 mm treated timber blocks and centered over the operating nut.

The top of the operating stem of the valve will be 300 mm - 600 mm from final grade. The top part of the assembly will be in such a position that the plug over it is flush with the adjacent surface.

4.4.5 DEAD ENDS:

Standard plugs will be inserted into the bells of all dead end fittings and plain ends of pipe. A concrete thrust block will then be placed behind this plug backing onto undisturbed material. A valve will be placed within a distance of two (2) full pipe lengths (12 m typical) from the end of the pipe or between the plug and fitting, as required.

4.4.6 BACKFILLING & COMPACTION:

1. Work will conform to the requirements provided in Section 2 – Stormwater Drainage Systems.
2. Water Flushing - Water flushing will be permitted under special circumstances, as approved in writing by the County.
3. Testing - For all density tests indicating insufficient compaction, two more density tests, proportionately representative of the ditch length tested, will be taken at that depth. If the average of the three tests is below the required density, the area of deficient density will be re-excavated and re-compacted to meet the specified density. Densities greater than 100% will be deemed to be at 100% for calculating the average of the three tests.
4. Augering - All service connections into multi-family sites will be installed by augering under existing streets and sidewalks except where augering is not feasible due to adverse soil conditions. Open trenching may be permitted subject to the County's acceptance of the need and acceptance of the backfill material.

   Backfill of auger pit excavation over 300 mm above the pipe will be compacted in lifts not to exceed 150 mm in depth, to a minimum of 98% Standard Proctor Density within the road right-of-way and 95% outside the road right-of-way.

4.4.7 MUNICIPAL WATER SYSTEM TIE-IN

The Applicant/Contractor may be required to tie into a municipal water system or to shut off system valves to undertake the proposed Work. When this is required, the Applicant/Contractor shall:

1. Give the County sufficient notice of the proposed Work and schedule so proper planning and approvals can take place.
2. Supply all water necessary for the Work and obtain written permission from the County prior to using any hydrants.
3. Obtain written permission prior to operating any of the County's valves and/or hydrants. The Applicant/Contractor shall be held responsible for any damage done to the hydrants or surrounding area. The County may require their own personnel to operate their valves and/or hydrants.
4. Make an agreement with the County for payment of water used.
5. Be responsible for the supply of all water necessary for the Work.
6. Provide 24 hours notice to any property owner affected by water service disruption.
7. Supply an alternative water service if the water disruption is longer than 4 hours.
8. For establishments relying on an uninterrupted water source for their operations, an alternative water source shall be provided.
9. The above noted requirements shall be done at the Applicant/Contractor's cost.

4.5 GUIDELINES FOR RURAL WATER DISTRIBUTION SYSTEM DESIGN

The guidelines developed by Lethbridge County are intended to be consistent with the Water Act, it's regulations and any related guidelines developed by Alberta Environment and Parks (AEP). Where any discrepancy exists, Alberta Environment and Parks requirements will apply.

This section provides information on the use of groundwater for proposed subdivisions. It may not be feasible to connect a proposed residential subdivision to a waterworks system that supplies Municipal standard water.

4.5.1 GROUNDWATER:

1. Groundwater Supply:

   There are two basic groundwater supply alternatives in rural areas of Alberta, these include:

   i) A private groundwater supply system (based upon a central well with a piped water distribution systems), or

   ii) the use of privately owned household water supply systems where each lot has its own system.

   For alternative i) the applicant must submit an application under the Water Act to the appropriate regional office of the Water Administration Branch of Alberta Environment and Parks (AEP). The direction and evaluation of aquifer testing for wells requiring a license under this Act will require the assistance of a person competent in groundwater evaluations and who is a member of the Association of Professional Engineers and Geoscientists of Alberta.

   Alberta Environment and Parks, Standards and Guidelines Branch recommends that the groundwater potential be evaluated when:

i) the number of unserviced residential parcels per quarter section, or per river lot, both existing and proposed, using the underlying groundwater resource is six or more; or

ii) whenever there is a possibility that each proposed parcel will not have access to an adequate long term supply of potable groundwater using a privately owned household well (potable means suitable for drinking).

2. Well Drilling:

   Wells used for water supply must be drilled by Alberta licensed water well drillers.

3. Groundwater Specialist:

   If the subdivision authority decides that these guidelines apply, a Groundwater Supply Evaluation Report must be prepared by a groundwater geologist (hydrogeologist) or professional engineer whose area of competence encompasses groundwater evaluations, and who is member in good standing with APEGA. The household groundwater supply potential must be evaluated by using the following five criteria:

   i) The potential of one or more aquifers, if present, to provide a sufficient supply of groundwater to meet the needs of any existing development and proposed unserviced residential subdivision within a quarter section during peak demand periods and over the long term (an aquifer is a water bearing formation which is capable of transmitting and yielding water in usable quantities).

   ii) The extent to which each aquifer is continuous beneath the proposed development area (if discontinuous, each proposed parcel may not be able to have a privately owned household well).

   iii) The potability of each aquifer's water in its current state considering its natural quality and possible existing anthropogenic contamination (anthropogenic refers to the impact of man on nature; existing contamination may be from agricultural, industrial activities, etc.; refer to the Local Health Unit's criteria for potable water).

   iv) Feasibility of treating groundwater if needed.

   v) The susceptibility of each aquifer to potential contamination taking into account aquifer depth, overlaying low permeability layers such as clay and shale, and the presence of fractures, fissures or cracks in these fine textured layers. Each parcel within an unserviced residential subdivision is serviced by on site private sewage disposal system, therefore, the potential for contamination by sewage effluent is of primary concern.

4. Quantity of Water:

   A central well must be capable of meeting the household requirements of all the existing and proposed lots within a quarter section, calculated based on an average meter consumption of 1250 m3/year/household (0.523 igpm/household). These requirements do not provide for fire protection, irrigation, livestock, or any other use.

5. Groundwater Supply Evaluation Report must include, but not be limited to, the following:

   i) COLLECTION AND SUMMARY OF EXISTING LOCAL GROUNDWATER DATA - the Groundwater Supply Evaluation Report must be prepared by a groundwater geologist (hydrogeologist) or professional engineer whose area of competence lies within the groundwater field, and who is a member in good standing with APEGA. The consultant must collect and summarize in the report existing local groundwater data for an area termed the Evaluation Area which includes the proposed subdivision and surrounding land within a minimum of 3.2 km (2 miles) from the subdivision boundary.

   ii) ASSESSMENT OF EXISTING INFORMATION - Using the information collected, the consultant must assess with respect to each of the groundwater supply evaluation

criteria, whether there is sufficient existing hydrogeological information to confidently estimate the groundwater supply potential in the vicinity of the proposed subdivision. This assessment must be presented in the report.

iii) AQUIFER TESTING IF EXISTING INFORMATION INSUFFICIENT – Any testing of aquifer capacity will be carried out in strict accordance with AEP guidelines, with the Applicant responsible for all necessary licensing.

iv) DETERMINATION OF THE ADEQUACY OF THE GROUNDWATER SUPPLY - Using the above information in the groundwater water supply evaluation criteria, the consultant must determine whether the groundwater supply is adequate to meet the needs of any existing development and the proposed subdivision. Discussion and findings must be presented in the report.

v) CONCLUSION - In the conclusion of the report, the consultant must clearly state that there is an adequate groundwater supply potential to meet the needs of any existing development and the domestic requirements of the proposed residential subdivision.

In addition, the consultant must state in the conclusion whether the evaluation was performed in conformance with these guidelines. If the report does not contain a recommendation on the groundwater supply potential and/or statement of conformance to these guidelines the subdivision approved authority must identify this as a major deficiency and not proceed with the application until this has been remedied and:

vi) RECOMMENDATIONS - The Consultant must recommend appropriate ongoing monitoring and well maintenance schedules, any water servicing devices or any other means to protect the ground water source. Copies of the report must be submitted to the subdivision approving authority for circulation to the municipality (if applicable) and the Local Health Unit, and sent to the Groundwater Information Centre.

6. Sources of Existing Groundwater Data:

The collection and summary of the existing groundwater data must be performed by a groundwater geologist (hydrogeologist) or professional engineer whose area of competence lies within the groundwater field, and who is a member in good standing with APEGA.

4.6 INSPECTION

4.6.1 HYDROSTATIC PRESSURE TESTING

1. Before acceptance of the work, the entire water system will be subjected to a hydrostatic pressure test under the direction of the Applicant's engineer and in the presence of the County representative. The Applicant will provide all necessary labor, materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plugs, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and leakage losses. Testing procedures must follow AWWA C605 standards.

i) The Applicant will provide evidence that the gauges used are accurate.

ii) The water distribution systems may only be charged through one valve. Only one valve may be operated during pressure and leakage testing as well.

iii) The Applicant will be required to give a minimum of 1 day notice to the County representative.

iv) The system will be filled with water slowly and air bled off at each hydrant within the area being tested. If there are sections that cannot be bled from hydrants, due to the profile of the main, the Applicant may be required to tap the main at high points and install

temporary bleeder valves at the ends of each tested area. At the completion of testing, these taps will be satisfactorily plugged at the Applicant's expense.

v) When the line has been filled and most of the air expelled, time must be allowed for the remaining air and water to reach a constant temperature.

vi) The test section may be pressured through a hydrant or a tap may be installed in the line. After testing, the pipe will be plugged at the Applicant's expense.

vii) The mains or section of mains will be subject to a pressure of not less than 1035 kPa. Test sections will not exceed 450 m of main.

2. Leakage tests will be made only after completion of services, partial or complete backfill, and a minimum of 24 hours after the pipe has been filled with water. No test will be applied until at least 36 hours after the last concrete reaction or thrust block has been cast with high early strength cement, or at least 7 days after the last concrete reaction or thrust block has been cast with standard cement. The duration of each test will be two (2) hours.

   The allowable leakage will be determined by the following formula from AWWA Manual M23 (PVC Pipe – Design and Installation:

$$L = \frac{ND\sqrt{P}}{128300}$$

Where:	L	=	allowable leakage, L/h
	N	=	total number of joints
	D	=	pipe diameter in mm
	P	=	test pressure in kPa

   Leakage allowance for new construction for materials of other than PVC or ductile iron will be in accordance with the applicable AWWA standard.

   No mains will be charged and no pressure and leakage tests will be permitted between October 15th to April 15th inclusive, unless approved by the County.

   Each section between valves will be brought to test pressures with the valves closed, to test the valves under pressure. Test pressure will be held without loss for two (2) minutes before opening the valve and releasing the pressure into the next section.

3. Prior to issuance of the Construction Completion Certificate, hydrants flow testing will be conducted by the Applicant's consulting engineer to verify that the flows and pressures identified in the design calculations are being provided in the field. The Applicant's consulting engineer will coordinate the testing with the County representative to ensure he is present for all testing. Results of the testing will be compiled by the Applicant's consulting engineer and submitted to the County representative with a comparison of the actual flows and design flows for the same hydrant. Where the actual flows do not meet the minimum fire and service requirements all hydrants in the project must be tested and the Applicant must advise the corrective action he will be taking to provide the necessary service level. The location and extent of initial testing will be as required by the County representative.

4.6.2 DISINFECTION

1. All water mains will be disinfected in accordance with AWWA specification C651 "Disinfecting Water Mains", latest revision.

2. Prior to the initial acceptance of the water system, water mains are to be disinfected in accordance with AWWA C651 continuous feed method. Procedural method of disinfection including chlorine concentration calculations and contact times are to be submitted to the

County representative for acceptance. Upon completion of the disinfection and of the waterlines flushed, one bacteria sample will be submitted for each 300 linear metres of water main installed. The water main is to remain valved off until such time as the bacteria sample results are approved.

3. Prior to initial acceptance of the water system and the system put into service, bacteriological testing will be carried out on all water mains and acceptable test results achieved.
4. On completion of Disinfection of the mains, the Applicant shall set the system in operation as directed by the Engineer.
5. Under Alberta Environmental Protection standards and regulations, super chlorinated water used for disinfection of the system cannot be directed into a storm sewer or open water body. Dechlorination will be required prior to being discharged into the environment.

4.7 RECORD DRAWINGS

Record drawings will be made according to the requirements outlined in Section 1 – General.

5. SERVICE CONNECTIONS

5.1 GENERAL

The sizes and locations of all services will be subject to the approval of the County. The scope of the work described herein pertains only to that portion from the connection at the main to the property line.

If this specification does not cover an area of concern regarding sewer and water services, the onus will be upon the Applicant to make recommendations and present alternative corrective measures based on sound economic, engineering, environmental, operational and maintenance criteria for approval by the County. All specifications and standards noted herein will refer to the latest revision thereof.

5.2 SPECIFICATIONS FOR SEWER & WATER SERVICE CONNECTIONS

5.2.1 MINIMUM REQUIREMENTS:

1. Size of Service - The minimum diameter of service connections to a single family dwelling will be as follows:

   i) Sanitary Service 100 mm

   ii) Water Service 25 mm

   Services of sizes larger than these will be required where deemed necessary by the County as the length of service pipe (> 20 meters) or other conditions warrant. Where more than one service is required, the sizes and locations must be approved by the County.

   No water service exceeding 50 mm in diameter will be permitted unless approved otherwise.

2. Grade - The minimum grade on a water and/or sanitary sewer service will be 2.0%, unless approved otherwise.

3. Tie-in to Main - The sewer connection will be by means of a tapped service saddle (full wrap) at the top quadrant of the main on existing mains. In-line tees may be used with prior approval of the County. For water services size 50 mm and smaller, the tapping shall be at the 2 to 3 o'clock position on the distribution main.

   All tapping shall be under pressure.

4. Bends - The long radius type or a combination of 22 ½ degree bends and straight pipe will be used when bends are required.

5. Materials – Water service connections sizes 20 mm to 50 mm diameter, pipe to be Copper tubing, Municipex or IPEX Blue 904 Pex. Sewer service connections PVC pipe.

5.2.2 SEWER SERVICE:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines.

5.2.3 WATER SERVICE:

Unless specified otherwise in the Development Agreement the minimum design standards and guidelines will be in accordance with the City of Lethbridge Design Standards and Alberta Environment and Parks Standards and Guidelines.

5.3 CONSTRUCTION

See Construction Requirements as provided in Section 2 – Stormwater Drainage Systems.

5.3.1 INSTALLATION REQUIREMENTS:

1. Location - Where the water service is 50 mm or smaller in size (continuous length), it will be laid in the same trench as the sanitary service to the right of the sanitary service when facing the property. Water services 100 mm or larger in size, will be laid in a separate trench and at a minimum separation of 3.0 m from any sewer service (typical) and 1.800 m from any other utility.
2. Depth - The minimum depth of cover at the property line will be 2.70 m. Where services are required to connect to mains in excess of 4.25 m in depth, risers will be installed and firmly supported and anchored to the trench wall.
3. Bedding - Class "B" - Method of bedding in which the pipe is set in compacted sand or gravel, as specified, on a trench bottom shaped to fit the pipe. The pipe is entirely encased with sand to a minimum of 300 mm above its top in layers not exceeding 150 mm in thickness. Depth of bedding below the pipe to be a minimum of 150 mm.
4. Backfill - Sand bedding is to be placed over the full width of the trench and tamped in maximum compacted lifts of 150 mm to a level 300 mm above the crown of the highest service point in the trench. The balance of the backfill will be machine placed native or imported material in maximum compacted lifts of 300 mm. The backfilling around curb stops will be done by hand tamping to the finished grade.
5. Marker Post - A red painted stake 50 x l00 x 1200 mm in size with 600 mm protruding above ground will be placed directly behind the curb stop and/or sanitary stub.
6. Tapping - The utmost care will be exercised in tapping the mains for the connection of services. Watermains will be drilled and tapped under pressure by means of a tapping machine and the corporation main stop threaded in by a tapping machine. The minimum allowable distance between adjacent main stops will be 600 mm and the minimum allowable distance between a main stop and an adjacent coupling or collar will be 300 mm.
7. Bends - On sanitary services long radius type bends or a combination of 22 ½ degree bends and straight pipe will be used. This is to facilitate rodding in case of blockage. The circular cross-section of the pipe is to be maintained.
8. Curb stops - All residential service valves to pre-serviced residential lots will be installed 300 mm back from the property line (or easement line), complete with curb stop, box, rod. Curb stops are to be placed according to the indicated direction of flow. Curb stop and valve casings will be placed plumb over the curb stop and a check will be made after backfilling that the curb stop is operational. Caps for the casings will be placed so as to be flush with the finished grade.

5.3.2 RECORD DRAWINGS:

Legible grade sheets for service connections will be provided to the County prior to the commencement of work. Accurate as-built records of survey information of the elevations and locations of the service pipe, fittings, curb and main stops with respect to property lines and street locations will be provided upon completion of the work.

A table providing information on each service will be placed on the plan profile drawing of the respective service as required in Section 1.5 - Engineering Plans & Drawings.

6. TRANSPORTATION

6.1 GENERAL

This section is intended to provide design and construction information for roadways constructed as part of an urban or rural subdivision development, or the access road connecting such a development to the County road system.

Unless approved otherwise by the County access to the County road system for a subdivision is to be channeled to a single location. For subdivisions consisting of two (2) lots one common approach is to be used, with three (3) or more lots a connecting service road is to be constructed. When a service road is to be connected to a paved roadway the service road must be paved.

Road classification and designation will be in accordance with the classification system outlined in the Transportation Association of Canada (TAC) Manual – Geometric Design Standards for Canadian Roads and Streets and the Urban Supplement to the Geometric Design Guide for Canadian Roads, and/or Alberta Transportation Highway Geometric Design Guide.

Designations of a development as “rural” or “urban”, and individual street classification within the development, are to be based on functional use established by the Municipal Services Department.

The guidelines provided herein represent the minimum requirement under general conditions. The Applicant and the Applicant’s Consultant are responsible to ensure that the roadway infrastructure is designed and constructed to achieve design life expectations consistent with good design and construction practice. The Applicant, through their Consultant, is responsible to confirm whether minimum standards are appropriate for the specific proposed development.

6.1.1 REFERENCES

Design details, specifications and/or procedures which are not explicitly specified in their sections shall be in accordance with the following reference standards:

1. Transportation Association of Canada
   i) Geometric Design Standards for Canadian Roads and Streets
   ii) Urban Supplement to Geometric Design Standards for Canadian Roads and Streets.
   iii) Guide for Design of Roadway Lighting
2. Alberta Transportation
   i) Standard Specifications for Highway Construction (Current Edition)
   ii) Highway Geometric Design Guide
   iii) Pavement Design Manual (1997)
   iv) Roadside Design Guide (Current Edition)
3. City of Lethbridge
   i) Construction Specifications (Current Edition)
   ii) Design Standards (Current Edition)

6.1.2 SURVEY CONTROL

Applicant is responsible for full restoration to Alberta Environment and Parks standards of all survey control markers and legal pins removed or disturbed during construction.

6.1.3 TRAFFIC ANALYSIS/TRAFFIC IMPACT ASSESSMENTS:

The Applicant is responsible to carry out a traffic impact assessment when required by the County.

This traffic assessment must include, but is not limited to the following:

1. Volume of daily traffic generated by the development at full development. If the planned development is staged, then the assessment will also include daily traffic volumes at the end of each consecutive development stage.
2. Layout of the internal road system of the proposed development with the accesses clearly marked.
3. Location of the proposed access points.
4. Sight distance assessments at the proposed access points.
5. Full review of the proposed access points using Alberta Transportation Design Guidelines, establishing whether or not intersectional improvements are required.
6. Traffic signal warrant and pedestrian accommodation at major intersections for urban developments.

6.2 ROAD DESIGN

6.2.1 STREET CLASSIFICATION:

1. The County is the final arbiter of whether a development is rural or urban, the street classification, and of the requirement for on-street parking.
2. For rural applications the Alberta Transportation Highway Geometric Design Guide is to be incorporated.
   i) Rural road widths shall be:
      a Arterials, Collectors and Haul roads shall be 8m wide
      b Local roads shall be 8m wide.
      c Industrial roads shall be 10m wide
   ii) Road standards are provided in Drawing G-117.
3. For urban applications the City of Lethbridge design standards are to be incorporated.

6.2.2 VERTICAL ALIGNMENT:

1. The minimum grade for Urban applications will be 0.5% along all gutters, 0.7% around curb returns and 0.8% on lanes.
2. The minimum grade for Rural applications will be 0.6% on roadways.
3. A maximum gradient of 4% for a distance of 30 m from the curb return for all roadways connecting to any intersection.

6.2.2.1 Vertical Curves:

1. Vertical curves will be calculated according to TAC Geometric Design Guide.

2. The minimum length of a vertical curve will be 30 m on local roads as long as TAC standards are met, and greater than or equal to the design speed in km/h on collector and arterial roads.

6.2.3 HORIZONTAL ALIGNMENT:

1. The minimum degree of curvature of the centerline of the roadway is dependent on the road classification and its design speed.
2. All horizontal curves will be designed to meet TAC design guides.

6.2.4 GRAVEL ROAD STANDARDS:

Gravel roads require the specific approval of the County. Roads are to be built by a qualified road construction company to the following specifications:

1. Sub-Grade – 1 m of acceptable material (clay/sand) with no organic material i.e. black dirt.
2. Crown – 4.5% +/-0.5%

6.2.5 APPROACHES:

An Access Management Plan is to be developed for new construction and road reconstruction.

Approach permits must be obtained prior to new approach construction.

All rural residential subdivision lots and private properties, accessed by local and collector roadways, will require one approach constructed to the property from the accessing roadway according to the requirements and specifications.

6.2.5.1 Approach geometric requirements

1. Rural
   i) Residential – 6m
   ii) Field Access – 8m
   iii) Joint Field Access – 10m
2. Urban
   i) Residential – 6m
   ii) Industrial/commercial – 8m

   Note: Larger size access maybe approved by the County.

Rural approaches are allowed a maximum of one field access per quarter and where residential access is required 1 residential access will be allowed per quarter. Additional approaches may be permitted where property is physically severed (canal, rail).

Residential approaches will have a width at property line of 6m and minimum radii of 5m. Industrial approaches will be constructed to the same requirements and specifications as private approaches, with the exception that the width of the approach may be increased to accommodate the type of development with approval by the County.

Road approaches will be located and designed to access the parcel's most desirable building location. For rural developments, approach locations along through roads will meet minimum site distance requirements as outlined in TAC guidelines & Alberta Transportation Highway Geometric Design Guide.

Approaches deviating from the above geometric requirements will require approval by the County prior to construction.

6.2.5.2 Culverts

The following minimum culvert sizes and minimum specifications for approaches will be used:

- Residential Approach Culvert 500 mm diameter
- Roadway Cross Culvert 600 mm diameter
- Industrial Approach Culvert 600 mm diameter

Culverts will be corrugated steel pipe (C.S.P.), alternative pipe material must be approved by the County prior to installation. Only new culvert material shall be installed.

Depth of cover will meet manufacturer's requirements, with a minimum of 300 mm.

Rock rip-rap to be provided at the inlet and outlet of all approach and road culverts.

The Applicant will also confirm that culvert sizing is consistent with the stormwater management plan for the development, increasing the size as necessary to meet flow requirements.

6.3 GRADING

All grading work shall be in accordance with Alberta Transportation Standard Specifications.

6.3.1 CLEARING AND GRUBBING

All work will be done within the limits of rights-of-way, permanent and working easements, and will include the complete disposal of all buildings, fences, vegetation and other debris. All work will be in accordance with existing Provincial and County fire and public safety regulations and laws and be done in accordance with the "approved" drawings and specifications.

6.3.2 EARTHWORK

6.3.2.1 Topsoil Stripping and Stockpiling:

Topsoil will be stripped to its full depth on all road rights-of-way and excavation areas, and stockpiled for use in final grading and/or landscaping purposes.

6.3.2.2 Common Excavation:

All excavations will be done within the limits of the proposed work, to the lines, grades and dimensions as shown on the contract drawings, noted in the contract documents or specifically approved otherwise. Surplus or unsuitable material will be disposed of as determined by the Engineer and approved by the County. Subsoil stripped is to be stockpiled in a topsoil-free area to eliminate the potential for contamination.

6.3.2.3 Embankment Construction:

Material will be placed in maximum 300 mm (loose) successive uniform layers, each compacted to a minimum of 98% Standard Proctor Density within 2%+/- of the optimum moisture content, unless stated otherwise. Only "approved" native or imported material will be used.

6.3.2.4 Equipment:

All proposed routes for hauling equipment must be approved by the County prior to commencement of the work. Rubber-tired motor scrapers will not be used to haul over improved streets.

6.3.2.5 Borrow:

Where sufficient quantity of suitable fill material is not available from excavation on the site, additional fill may be borrowed from other sources. The Applicant will be responsible for securing borrow sites, and all associated environmental approvals.

6.3.2.6 Reclamation:

All borrow sites will be reclaimed to the satisfaction of the County meeting all the specifications required.

6.3.3 SUBGRADE CONSTRUCTION

6.3.3.1 Excavated Areas:

The areas excavated to subgrade elevations will be scarified to a minimum depth of 300 mm below the surface and compacted to a minimum of 100% of Standard Proctor Density at +/- 1% of optimum moisture content. The cut will conform to the lines, grades and dimensions required.

6.3.3.2 Embankment Areas:

That portion of any fill more than 300 mm below the top of subgrade will be placed in successive horizontal layers not exceeding 300 mm loose depth and compacted to a minimum density of 98% of Standard Proctor within +/- 3% of optimum moisture content. The top 300 mm will be placed in two 150 mm compacted lifts and compacted to a minimum density of 100% of Standard Proctor within +1% to –2% of optimum moisture content.

6.3.3.3 Drainage Working Areas:

All work will be carried out by the Applicant so that excavated areas will drain to catch basins, manholes, or to a natural drainage course during construction.

6.4 GRANULAR BASE COURSE

Granular materials are to conform to section 3.2 and 3.6 of Alberta Transportation Standard Specifications for Highway Construction (Current Edition).

6.4.1 MATERIALS:

The size and gradation will conform to the following standards outlined below:

Designation		2		2	
Class		20		25	
		Min.	Max.	Min.	Max.
% Passing	25,000	-	-	100	-
	20,000	100	-	82	97
	16,000	84	94	70	94
	10,000	63	86	52	79
	5,000	40	67	35	64
	1,250	20	43	18	43
	630	14	34	12	34
	315	9	26	8	26
	160	5	18	5	18
	80	2	10	2	10
Plasticity Index (PI)		NP	6	NP	6
% Fracture by Weight (2 Faces)		60+		60+	

6.4.2 CONSTRUCTION – GENERAL:

1. Surface Preparation - The subgrade will be finished to conform to the required section, grade and density prior to the placement of base course material.
2. Placement - The material will be placed on the subgrade or preceding course in a uniform manner to ensure the ultimate planned compacted thickness. Crushed gravel will be mixed and placed in horizontal layers of not less than 100 mm and not more than 200 mm compacted thickness.
3. Water - If the material requires water to attain the specified density, water will be added and the material bladed continually until a uniform mixture is obtained. If the gravel contains an excessive amount of moisture, it is to be scarified and aerated. Moisture condition of granular base course to be within plus of minus 3 percent of the optimum moisture content of the material.
4. Compaction - Compaction will be reached by the use of pneumatic tire rollers, vibrating drum packers or other approved types of compaction equipment. Compact to a density not less than 98% of the maximum dry density in accordance with ASTM D698.
5. Testing and Inspection

    i) Densities - Field density tests will be carried out for each 2,000 square meters (per layer) of granular base course with a minimum of one test per day of placing operations.

    ii) Grade - The surface will be such that when tested with a straight edge, the maximum deviation of the surface from the edge of the straight edge will nowhere exceed 13 mm.

    iii) Appearance - No segregation of rock or fines material will exist in the completed base. The gravel base will be free of all loose or deleterious material.

    iv) Thickness - Areas suspected of being deficient or excessive in thickness will be confirmed at 3 locations per 1000 square meters.

6.5 ROAD GRAVELLING

6.5.1 SURFACING GRAVEL

Upon the County approval of the roadway construction, the Applicant will supply and place the first lift of gravel in accordance with the specified gradation and rate of application. No gravelling will be permitted on the finished subgrade until the subgrade has been tested, inspected and approved.

6.5.1.1 Material

The stockpile source of gravel will be approved by the County. The size and gradation will conform to the following standards outline below:

Designation		2	
Class		25	
		Min.	Max.
% Passing	25,000	100	-
	20,000	82	97
	16,000	70	94
	10,000	52	79
	5,000	35	64
	1,250	18	43
	630	12	34
	315	8	26
	160	5	18
	80	2	10
Plasticity Index (PI)		NP	6
% Fracture by Weight (2 Faces)		60+	

6.5.1.2 Application:

Surfacing gravel will be applied to the completed road bed surface at the rates as outlined below. These application rates may be increased or otherwise varied by the Engineer as required to suit the roadbed conditions.

The following chart has been developed to assist in the design of first course gravel surfacing quantities:

Subgrade Width (m)	Spread Rate (m3/km)	Subgrade Width (m)	Spread Rate (m3/km)
7	350	13	650
8	400	14	700
9	450	15	750
10	500	16	800
11	550	17	850
12	600	18	900

The spread rates provided apply to general application only for gravel roadways. The condition of the subgrade may affect the actual gravel requirements. Gravel required for Calcium Chloride Stabilization can be found in Section 6.5.2.

All entrances to lots will be graveled at a rate of 8 cubic metres per entrance, as measured from the shoulder of the road to the lot property line.

6.5.2 CALCIUM CHLORIDE STABILIZATION

6.5.2.1 Aggregate Material

The stockpile source of gravel will be approved by the County. The size and gradation will conform to the following standards outline below:

Modified Des. 2 Cl. 20			
		Min.	Max.
% Passing	25,000	-	-
	20,000	100	-
	16,000	84	94
	10,000	63	86
	5,000	40	67
	1,250	20	43
	630	14	34
	315	10	28
	160	8	21
	80	8	16
Plasticity Index (PI)		5	20
% Fracture by Weight (2 Faces)		75+	

Note: Dependent on gravel sources the County may adjust the gradation of the Aggregate Material to better meet the requirements for Calcium Chloride Stabilization.

6.5.2.2 Calcium Chloride Material

The Calcium Chloride Material used for stabilization shall be dry pellet with a concentration of 94% to 97%.

6.5.2.3 Bentonite

Bentonite may be required to be mixed with the aggregate material to meet the Plasticity Index requirements.

6.5.2.4 Aggregate Placement

Surfacing gravel used for Calcium Chloride Stabilization will be applied to the completed road bed surface at a thickness of 100mm. The thickness of gravel applied may be adjusted by the County as required to suit the roadbed conditions.

6.5.2.5 Calcium Chloride Stabilization

1. Calcium Chloride Stabilization will be completed utilizing at Mill Razor™ or County approved equivalent.
2. Calcium Chloride placement shall not be done in the rain or if rain is forecasted within 24 hrs.
3. Stabilization shall be completed when temperatures are above 10°C, and shall not be competed on frozen ground.
4. During stabilization 1.0% of Calcium Chloride by weight will be placed on the gravel and shall be moisture controlled to the optimum moisture content prior to or during mixing.
5. Once mixing is completed, compaction of the surfacing gravel is required to meet 98% SPD.

6.5.2.6 Testing and Inspection

1. Quality Control Sieve and Atterberg limits analysis shall be completed daily on all gravel produced.
2. The County may complete Quality Assurance testing on the gravel produced, Access will be given to the County Representative to acquire any require material for Quality Assurance testing.

6.6 ASPHALTIC CONCRETE PAVEMENT

6.6.1 PAVEMENT DESIGN:

The AASHTO method of pavement design (most current edition), outlined in the Alberta Transportation's Pavement Design Manual (1997), along with applicable Design Bulletins issued from time to time, will be utilized for designing flexible pavement. For the purpose of pavement design, the Alberta Transportation's Pavement Design Manual dated 1997 will be referred as Pavement Design Manual throughout this section. Pertinent input/output files demonstrating procedures, parameters and criteria used to arrive at the recommended pavement structure must be submitted to the County for review and approval, as part of the pavement design report.

All design parameters, including, but not limited to, traffic count, percentage of types of vehicles, California Bearing Ratio (CBR) are to be provided to the County by the Applicant's Consultant.

Asphalt concrete mix designs will be Marshall mix designs and prepared by a recognized testing laboratory. Mix designs will be forwarded to the County for approval.

6.6.1.1 Traffic and EASL Loading

The estimation of average annual daily traffic (AADT) for pavement design shall be based on the following:

- Manual or approved automated counts which have been statistically adjusted to obtain representative AADT. The AADT information will also show traffic composition as percentage of passenger vehicle (PV), single unit trucks (SUT), tractor trailer combinations (TTC) and buses. This information will be provided to the County for review. The applicant is responsible for confirming the information used for the design prior to carrying out the pavement design. This methodology is restricted to the existing roadways where no development is anticipated in the near future.
- Combined AADT established as per the above and anticipated future traffic in cases where land development is expected to result in to increased traffic volumes will be used to calculate the AADT.

ESAL factors for pavement design will be based on Pavement Design Manual and all applicable amendments issued as Design Bulletins. To account for potential overloaded axles, the daily design ESALs will be multiplied by a factor of 1.15. In addition, the pavement designer shall evaluate and consider seasonal/periodic unusual traffic loading, for example silage hauls, in the project area and adjust the design EASLs accordingly.

6.6.1.2 Other Design in-put Parameters

All other design input/parameters such as drainage, subgrade support (resilient modulus), reliability, serviceability, design period, traffic growth rate, layer coefficients, etc. shall be as per Alberta Transportation practices.

6.6.1.3 Stage Paving Construction

There are instances where staged paving, which essentially necessitates the deferral placement of asphalt concrete top lift, will be beneficial to the County. These instances may be due to either limited annual capital budget or technical reasons requiring a newly constructed roadway to undergo and complete short-term settlement.

Where staged paving construction is desirable, the full depth of granular base course, in accordance with the design, shall be placed. The thickness of the first stage asphalt concrete shall meet the requirements of Pavement Design Manual and applicable Design Bulletins for staged pavements. Final paving should be carried within three years of the initial construction. To protect the integrity of a staged pavement, weight restriction should be placed until the final asphalt concrete lift is placed.

6.6.1.4 Rehabilitation of Existing Pavements

Rehabilitation design of the existing pavements shall be carried out in accordance with Alberta Transportation Guidelines and/or as directed by the County.

6.6.1.5 Minimum Pavement Structure for New Construction and Base/Pave of Existing Gravel Roads

Pavement structural requirements for any roadway is site specific and is dependent on factors related to subsurface conditions, environment and traffic type/loading. These variables have major impact on pavement's serviceability as well as future maintenance requirements. In addition, considerations to material properties (gradation and top size) for constructability and the need to limit stresses/strains (pavement deformation) at various pavement layers interface is a key to satisfactory pavement performance.

In consideration of the above rational, the minimum layer thickness shown in the table below have been established based on 20-year design ESALs criteria and a minimum of 30mpa subgrade.

Estimated 20 Year Design ESALs	Minimum Pavement Layers		Total Thickness (mm)	Typical Potential Use[1]
	Asphalt Concrete Pavement[3] (mm)	Granular Base Course[3] (mm)		
< 0.3 Million	120	300	420	Local/Residential Roads
> 0.3 and < 1.0 Million	150	300	450	Arterial/Collectors
> 1.0 and < 2.0 Million	160	350	510	
> 2.0 and < 3.0 Million	170	400	570	Major Arterial/Collectors/Haul Routes/Industrial Accesses
> 3.0 Million	See Note[2]	See Note[2]	See Note[2]	Heavy Traffic Roadways

Note: [1]Pavement structure thickness is governed by the design ESALs and not roadway class
[2]Minimum pavement structure thickness shall be developed in accordance with the requirements set in this guideline.
[3] Asphalt concrete mix type and granular base course material type in accordance the guidelines.

The minimum individual pavement layers shown in the table above are unstaged and only acceptable to the County provided they exceed those derived from the pavement design. In the

event the design indicates layer thickness exceeding these minimum values, then the thicker design value shall govern.

6.6.2 MATERIALS:

Asphaltic concrete pavements (surface and base courses) will consist of mineral aggregate, filler and asphaltic binder, and will be laid and compacted to the specified thickness, conforming to the approved lines, grades and typical cross-sections.

1. Blended Aggregate Requirements

   i) Aggregate Gradation Requirements, including RAP, to meet the following gradation:

Sieve Size (µm)	Cumulative % by Weight Passing					
	Type I		Type II		Type III	
	Surface Course		Base Course		Surface Course	
	Min.	Max.	Min.	Max.	Min.	Max.
25,000	-	-	100	100	-	-
20,000	100	-	85	95	-	-
16,000	97	100	77	88	100	-
12,500	85	95	65	80	90	100
10,000	70	85	57	72	75	90
5,000	50	65	40	55	60	75
2,500	40	50	30	42	45	60
1,250	30	40	23	33	30	45
630	20	30	17	27	22	36
315	15	23	12	22	15	27
160	6	16	6	15	6	18
80	4.0	8.0	4.0	8.0	4.0	10.0

   ii) Coarse Aggregate Fracture: The percentage of particles retained on the 5 000 µm sieve size with two (2) or more fractured faces shall be by mass:

      a Mix Type I – 80% minimum

      b Mix Type II – 60% minimum

      c Mix Type III – 80% minimum

   iii) Flat and Elongated Particles: The percentage of particles retained on the 5 000 µm sieve size of flat and elongated greater than a 5:1 ratio shall be by mass less than 10%.

   iv) Manufactured Sand: The percentage of manufactured sand passing the 5 000 µm sieve size shall be by mass:

      a Mix Type I – 70% minimum

      b Mix Type II – 50% minimum

      c Mix Type III – 50% minimum

   v) Rap – The maximum RAP portion shall be by mass:

      a Mix Type I – 15% maximum

      b Mix Type II – 15% maximum

      c Mix Type III – 20% maximum

6.6.3 COMPOSITION AND PROPORTIONING:

1. Mix Design

   i) A mix design will be required for each Asphalt type used on the project, the mix design will be performed by an accredited testing agency and will be submitted to the County for approval at least one (1) week prior to the commencement of field paving.

   ii) A mix design will be based on the Marshall Method and will conform to the following criteria, depending on traffic loading and mix type:

	Type I	Type II	Type III
Marshall Stability N (min)	10,000	10,000	5,400
No. of Blows	75	75	50
Marshall Flow Value	2 – 3.5	2 – 3.75	2 – 3.5
% Air Voids	3.8 – 4.2	4.3 – 4.7	2.8 – 3.2
% Voids in the Mineral Aggregate (VMA)	13.5 – 15.0	12.5 - 14.0	14.0 – 16.0
% Voids Filled with Asphalt (VFA)	65 – 75	60 – 70	70 – 80
Retained Stability % (min)	70	70	70
Theoretical Film Thickness (µm)	7.0 – 8.5	6.0 – 8.0	7.0 min
Asphalt Cement Grade	PG 58-28	PG 58-28	PG 58-28

   iii) A separate and complete mix design will be required for any change in the nature of the source of the material.

2. Adjustments to Job Mix Formula

   i) Once established, no alterations to the Job Mix Formula will be permitted unless the Applicant submits a new Job Mix Formula that is approved by the County.

3. Tolerances

   i) The amount of bituminous material designated for the job will be within 0.3 percentage points.

   ii) The temperature of asphaltic mixtures will not vary from those specified by more than 9°C.

   iii) Hot plant-mix bituminous surfaces will be placed with sufficient time remaining so that compaction will be completed during daylight hours, when the air temperature is above 2°C and rising, and the road surface is dry.

   iv) Thickness - A minimum compacted thickness of 50 mm of hot mix asphalt concrete will be placed on all streets unless specified otherwise.

   Asphalt pavement with excess thickness may be accepted if surface, grade tolerances and textures are met. No additional payment will be made.

   In areas suspect to be deficient in asphalt pavement thickness, two cores must be taken from each 1000 m^2 of applicable mat and the average thickness of the two cores will represent that area.

   v) The complete pavement will have a tightly knit structure and be free from segregation and surface cracking.

6.6.4 CONSTRUCTION METHODS:

1. Weather Limitations - Mixture will not be placed:

i) When air temperature is 2°C or cooler, except in specific situations where, in the opinion of the County, conditions warrant the risk involved.

ii) No surface lift asphalt shall be placed regardless of air temperature until the road surface is 5°C or higher.

2. Base Preparation - The prepared base will be dry and clean of all loose or foreign materials.

   Where tack coat or prime coat is applied, it will be thoroughly cured prior to placing the mixture.

   Where existing pavements are to be overlaid, a leveling course of hot mix asphaltic concrete will be required prior to placing the surface course.

3. Transportation of Mixture - The mixture will be transported in vehicles equipped with protective covers and clean, tight, smooth-sided boxes. The inside surface of the box may be lubricated with a light coating of soap or detergent solution; petroleum derivatives will not be permitted.

   Any accumulation of asphaltic material which has collected in the box will be thoroughly cleaned before loading with hot mix.

   Trucks will be maintained perfectly clean of mud or any substance which could contaminate the working area.

4. No paving will be allowed until the subgrade and base course has been tested, inspected and approved by the County.

5. Asphalt materials, mixing, spreading and rolling will conform to good construction practice.

6.6.5 TESTING AND INSPECTION:

The following tests will be carried out for each 500 tonnes of asphalt pavement, to a minimum of two sets of tests during each placing shift:

1. Sieve Analysis (ASTM C136 & C117)
2. Bulk Specific Gravity (ASTM D2726)
3. Bitumen Content (ASTM D2172)
4. % Voids in the Mineral Aggregate (VMA) (ASTM D2726)
5. Air Voids (ASTM D3203)
6. Core Densities (1 per 2000 m2)

6.7 PRIME, TACK AND FOG COATS

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

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

"Fog coats" will be the application of bituminous material on an existing bituminous surface.

"MC" – Medium Cure Liquid Asphalt

"RC" – Rapid Cure Liquid Asphalt

"MS" – Medium Setting Emulsified Asphalt

"SS" – Slow Setting Emulsified Asphalt

6.7.1 MATERIALS

All emulsified asphalts must be homogeneous and uniform in character throughout and meet the requirements indicated in Alberta Transportation's Standard Specifications for Highway Construction (Current Edition), section 5.7 Supply of Asphalt. In the case of a discrepancy between this Section and Section 5.7 Supply of Asphalt this section will govern.

The types and grades of liquid asphalts for prime coat, tack coat, fog coat and seal coat shall be as follows:

6.7.1.1 Prime Coat:

The asphalt types may vary from SEP-1, SEP-2 or SS-1 for applications through August 31 each season. For applications after August 31 of each season MC-30, SEP-1, SEP-2 or SS-1 maybe used.

6.7.1.2 Tack Coat (Over Asphalt Base):

The asphalt types may vary from SS-1 or MS-1 for application through the construction season. RC-30 or RC-70 maybe used after August 31 of each season.

6.7.1.3 Fog Coat

SS-1 can be used for application through the construction season. MC-30 maybe used after August 31 of each season.

6.7.2 APPLICATION:

6.7.2.1 Prime Coat

Asphalt Material – The selected bituminous material will be uniformly applied on the properly prepared surfaces at a rate from 1.0 to 1.5 Litres/square metre.

6.7.2.2 Tack Coat

Sweeping - All dust, dirt and foreign matter will be carefully swept from the surface of the pavement, for the full width to be seal-coated, immediately prior to the application of the binder.

Asphalt Material – The selected bituminous material will be uniformly applied on the properly prepared surfaces at a rate from 0.2 to 0.9 Litres/square metre.

6.7.2.3 Fog Coat

Sweeping - All dust, dirt and foreign matter will be carefully swept from the surface of the pavement, for the full width to be seal-coated, immediately prior to the application of the binder.

Asphalt Material – The selected bituminous material will be uniformly applied on the properly prepared surfaces at a rate from 0.23 to 0.7 Litres/square metre.

6.7.3 SAMPLING AND TESTING

All Sampling and Testing will be per Alberta Transportation's Standard Specifications for Highway Construction, Section 5.7 Supply of Asphalt

6.8 SEAL COAT

"Seal coats" will consist of a surface treatment composed of a single application of bituminous material on an existing bituminous surface immediately followed by covering with aggregate.

6.8.1 SEAL COAT

Seal coats will be applied during daylight hours when the shade temperature is 10°C or higher. No bituminous material will be applied when the roadway surface is damp or wet, or when weather conditions are such that the bitumen will become chilled before the cover aggregate can be spread and rolled. Work will not be started without consent of the County and will be promptly terminated in the event of unfavorable road or weather conditions.

1. Sweeping - All dust, dirt and foreign matter will be carefully swept from the surface of the pavement, for the full width to be seal-coated, immediately prior to the application of the binder.
2. Asphalt Material - The selected bituminous material will be uniformly applied on the properly prepared surfaces at a rate from 0.23 to 0.7 Litres/square metre.
   i) Sand Seal - 0.5 to 1.4 Litres/square metre.
   ii) Chip Seal - 0.9 to 1.8 Litres/square metre.
   iii) Graded aggregate seal - 1.2 to 2.5 kg/square metre

6.8.2 MATERIALS:

1. Bituminous Material:

   The liquid asphalt used for seal coating will be a cationic, rapid set binder or high float type emulsion binder in accordance with Alberta Transportation standard specifications, section 5.7 Supply of Asphalt. The actual grade and type will be determined to suit the surface condition and will be approved by the County.

2. Mineral Aggregate
   i) Chip Seal - Chip seal aggregate will be free from soft shale, organic or other deleterious matter and a minimum of 75% fracture on 2 sides and 100% fracture on one face +5000 material.
   ii) When tested by means of laboratory sieves, it will meet the following gradation:

Sieve Size	% Passing by Weight
12.5 mm	100
10.0 mm	85 – 100
5.0 mm	0 – 10
80 µm	0 – 0.3

   iii) The maximum amount of moisture content in the chips will be 3% for an R.S. asphalt.
   iv) Sand Seal - When tested by means of laboratory sieves, it will meet the following gradation:

Sieve Size	% Passing by Weight
5.0 mm	100
315 µm	0 - 15
80 µm	Less than 2

   v) The maximum amount of moisture content in the sand will be 5% for an R.S. asphalt.
   vi) Graded Aggregate Seal Coat - when tested by means of laboratory sieves, it will meet the following grade:

Sieve Size	% Passing by Weight
12.5 mm	100
10.0 mm	70 – 93
5.0 mm	30 – 60
1.25 mm	9 – 28
315 µm	0 – 15
160 µm	0 – 11
80 µm	0 – 8

and a minimum of 60% fracture on 2 sides for material retained on the 5000 sieves.

vii) Application of Mineral Aggregates - The application of bituminous material will not proceed until a supply of aggregate is immediately available sufficient to allow covering of the entire bitumen area in less than five (5) minutes. The bitumen area will be promptly covered with specified mineral aggregate at a rate of 5.5 to 11.0 kg/m2 for sand, from 8.0 to 16.0 kg/m2 for chips, and from 20 kg/m2 to 30 kg/m2 for graded aggregate.

Special care must be taken in the spreading of mineral aggregates in order that the uniformity of cover will be secured. If, in the opinion of the Engineer, uniform distribution of the aggregate is not being obtained, the cover aggregate will be alternately drag broomed and rolled until it is uniformly bonded over the full width of the application.

Longitudinal laps may be from 150 to 250 mm in width, but there will be no overlap at the end junction of the applications. In order to prevent lapping at transverse junctions, building paper or metal sheets will be spread over the treated surface for sufficient distance back from the joint, on cover aggregate, so that sprayers are operating at full force upon reaching the surface to which application is to be made. The bitumen application will be stopped or shut-off on paper or metal sheets. Any paper used for covering joints will be removed and destroyed.

viii) Rolling - Immediately after the mineral aggregate has been applied, the road surface will be rolled sufficiently so that the maximum amount of cover aggregate will be "keyed".

Rollers of a weight that crushes the mineral aggregate will not be used. The Applicant may use steel wheel, pneumatic-tired or vibratory rollers. The minimum number of five (5) complete coverings by the rollers will be carried out within thirty (30) minutes of the application of the bituminous material. The speed of the rollers will be such that the suction of the tire will not lift the aggregate from the sealed surface, or eight (8) kilometers/hour, whichever is less.

ix) Traffic - No traffic will be permitted on the sealed roadway until after the rolling has been completed and the bituminous material has set to a degree satisfactory to the County. In no case will traffic be permitted on the sealed roadway until at least twenty-four (24) hours after the application of the bituminous material.

6.9 CONCRETE AND REINFORCED CONCRETE

6.9.1 DESCRIPTION:

This specification covers the manufacture and placing of concrete, reinforced concrete and related work for the construction of curbs, gutters, sidewalks, catch basins, duct lines, sewers and other ancillary structures associated with roadway construction; but not including bridges.

6.9.2 MATERIALS:

1. Portland Cement:

Portland Cement will conform to the CSA Standard Specifications for Portland Cement (CSA A23.1), and will be of the following types:

i) Normal Type GU
ii) High Early Strength Type HE
iii) Sulfate Resistant Type MS, HS
iv) Heat of Hydration Type MH, LH

2. Concrete Aggregates:

Concrete aggregates will conform to the CSA Standard Specifications for Concrete Aggregates (A 23.1).

3. Air Entraining Agent:

Air entraining agents will conform to ASTM Standard Specification C260.

4. Calcium Chloride:

Calcium Chloride will conform to ASTM Standard Specification D098.

5. Water:

Water used in mixing concrete will be clean and free from injurious amounts of oils, acids, alkalis, organic materials or other deleterious substances.

6. Metal Reinforcement:

Reinforcing bars will be deformed bars in accordance with CSA Standard Specification G30.12.

7. Cold Drawn Wire:

Cold drawn wire or welded wire fabric for concrete reinforcement will conform to the requirements CSA Standard Specification G30.5.

8. Curing Compound:

Resin base impervious curing compound will conform to ASTM Standard Specification compound will conform to ASTM Standard Specification C309 Type ID - Type B. The curing compound will contain white fugitive dye.

9. Retarding Admixtures:

Retarding admixtures will conform to ASTM Standard Specification C494.

6.9.3 COMPOSITION AND PROPORTIONING:

The design of the structure is based upon the assumption that concrete will develop the specified compressive or flexural strength at twenty-eight (28) days and a seven (7) day test resulting in approximately seventy percent (70%) of the 28-day strength.

1. Storage:

Cement and aggregate will be stored in such a manner as to prevent deterioration or intrusion of foreign matter; any material that has deteriorated or that has been damaged will not be used for concrete.

2. Batching Materials:

i) Cement - Cement will be measured by weight and will be weighed on a scale separate from those used for other materials.

ii) Aggregate - Aggregate will be measured by weight. Batch weights will be based upon dry materials and will be required weights of dry material plus the total weight of moisture (both absorbed and surface) contained in the aggregate.

iii) Water - Water will be measured by volume or by weight. The device for the measurement of the water will be readily adjustable and, under all operation conditions, will have an accuracy within one percent (1%) of the quantity of water required for the batch. The device will be so arranged that the measurement will not be affected by variable pressures in the water supply line. Measuring tanks will be equipped with outside taps and valves to provide for checking their calibration, unless other means are provided for readily determining the amount of water in the tank.

iv) Admixtures - Powdered admixtures will be measured by weight and paste, or liquid admixtures by weight or volume, within a limit of accuracy of three percent (3%) of the required weight. All air entraining agents, or other admixtures, will be introduced to the mix at the batching plant during the initial batching cycle. No admixtures will be added at the job site.

6.9.4 CONCRETE CLASSES:

Unless otherwise specified, all concrete used in roadway construction will be one of the following classes:

Class	Min. 28 Day Compressive Strength (MPa)	Slump (mm)	Entrained Air Limits (%)	Max. Agg. Size (mm)
A- Exposed pavement	30	60+/-10	5.5-8	28
B- Pavement base or unexposed use	30	60+/-20	5.5-8	28
C- Exposed road associated works	30	60+/-20	5.5 Up	28
D- General Unexposed use	25	60+/-20	5.5-8	28
E- Filler	10	80+/-20	5.5-7	28

No subscript will be used when Normal Portland Cement is required.

A subscript **30** attached to any of the above classes will indicate that High Early Cement is specified.

A subscript **50** attached to any of the above classes will indicate that Sulfate Resistant cement is specified.

Any concrete placed after September 30 will not be accepted unless its specified 28-day minimum compressive strength is attained in 7 days.

6.9.5 EQUIPMENT:

All equipment used for batching, mixing and hauling concrete will conform to ASTM Standard Specification C 94.

1. Hauling:

i) Delivery Time - When hauling equipment is used, concrete will be delivered to the site and discharged into the work within one and one-half (1 1/2) hours after introduction of the mixing water to the cement and aggregate.

ii) Rotating Drum Type Haulers - All concrete will be hauled using drum-type haulers capable of agitating or mixing the concrete within speed tolerances as specified by the equipment manufacturer. Haulers will not be overloaded.

6.9.6 FORMS:

Forms, either of steel or wood, will conform to the shape, lines and dimensions of the concrete as called for on the Plans. Lumber used in forms for exposed surfaces will be dressed to a uniform thickness and will be free from loose knots or other defects. Joints in forms will be horizontal or vertical. For unexposed surfaces and rough work, undressed lumber will be used. Lumber once used in forms will have nails withdrawn and surfaces in contact with the concrete are to be thoroughly cleaned before being used again.

1. Design:

Forms will be substantial and sufficiently tight to prevent leakage. They will be properly braced or tied together so as to maintain position and shape. If adequate foundation for shores cannot be secured, trussed supports will be provided.

2. Workmanship:

Bolts and rods will be used for internal ties. They will be so arranged that when the forms are removed, no metal will be within 25 mm of any surface. Wire ties will be permitted only on light work. They will not be used through surfaces where discoloration would be objectionable. Forms will be set to line and grade, and so constructed and fastened as to produce true lines. Special care will be used to prevent bulging.

3. Oiling:

The inside of forms will be coated with non-sustaining mineral oil or other approved material, or thoroughly wetted (except in freezing weather). Where oil is used, it will be applied before the reinforcement is placed.

4. Removal:

Forms will not be disturbed until the concrete has adequately hardened. Shoring will not be removed until the member has acquired sufficient strength to safely support its weight and the load upon it.

5. Concrete Backfill

In the case of sidewalks, monolithic curbs, gutters and walks, the Contractor will backfill with 15 Mpa concrete between pavement and walk edges as soon as possible after the removal of forms. The backfill will be left 60 mm low to allow for bituminous asphaltic infill, as approved by the County.

6.9.7 PLACING CONCRETE:

1. Handling:

Concrete will be handled from the mixer to the place of final deposit as rapidly as practicable, by methods that will prevent the separation or loss of the ingredients. It will be deposited in the forms as nearly as practicable in its final position to avoid rehandling.

The sequence of concrete placement will be arranged so that concrete which has partially hardened will not be subjected to injurious vibration.

2. Free Fall:

The vertical height of free fall of concrete will not exceed 1 m. For falls greater than 1 m, chutes or tremies will be used.

3. Compaction:

During placement, concrete will be sufficiently tamped and vibrated with suitable equipment to secure close bond with the reinforcement, eliminate entrapped air voids, and ensure a homogeneous structure with adequate consolidation. Particular care will be given to placing and tamping along the faces of the forms to ensure a dense smooth surface.

i) Vibrators and Screeds - Vibrations will be of sufficient duration to thoroughly compact the concrete, but the duration will not be long enough to cause segregation. Vibrators will not be used for moving concrete.

ii) Initial Set - After the initial set of the concrete, the forms or concrete structure will not be jarred and no strain will be placed on the ends of projecting reinforcement.

4. Machine Placement:

Submit specifications of the proposed concrete slipform/extrusion equipment to the County for review prior to use.

The approved slipform/extrusion machine will be so designed as to place, spread, consolidate, screed and finish the concrete in one complete pass in such a manner that the minimum of hand finishing will be necessary to provide a dense and homogeneous concrete section. The machine will shape, vibrate and/or extrude the concrete for the full width and depth of the concrete section being placed. The operation of the machine will be continuous until a section or scheduled pour is completed. The interval between successive loading of the concrete hopper will not exceed 30 minutes. If the operations are delayed, or if the section is to be continued later, the machine will be emptied and a joint constructed as outlined herein. A similar joint will be constructed at the beginning of the extruded section. Excess concrete that has passed through the machine will not be re-used.

6.9.8 REINFORCING

Lane crossings and commercial crossings will be reinforced. Dowels will be provided where concrete swales meet sidewalks, where concrete sidewalks are poured separately from the curb and gutter or when the pouring of concrete is suspended by more than 30 minutes. Dowelled joints will contain one 10M reinforcing bar for every 300 mm of width of the structure, and the bars will extend a minimum of 600 mm into both sides of the joint.

Where necessary, additional reinforcing steel will be installed as directed by the County, at no additional cost to the County.

6.9.9 FINISHING:

Working of the surface in the finishing operations will be the minimum necessary to produce the specified finish. The finished surface will have a fine granular or sandy texture without exposed aggregate or entrapped air holes.

1. Surface Water:

If there is evidence of excess water on the concrete surface, finishing will be delayed until the excess water has evaporated to the satisfaction of the County.

2. Brush Finish:

A nylon bristle brush of an approved type will be required. Surface grooves made by the broom will not be more than 3 mm deep. Before brushing, all surplus water will be removed from the brush.

3. Burlap Finish:

A burlap finish will be formed by dragging longitudinally in the direction of concrete placement a multiple ply burlap drag equal in length to the width of the slab and having at least 1m in contact with the concrete. The dragging will be carefully done so as to produce a finished granular or sandy texture without disfiguring marks.

4. Mortar Finish:

Where approved by the County, mortar consisting of cement and fine sand, mixed in the proportions used in the concrete, may be applied to extruded concrete to fill irregularities in the surface. This mortar will not be applied after the concrete has attained its initial set, and at no time will excess mortar be applied to cover the concrete surface.

6.9.10 CURING:

Exposed concrete surfaces will be protected by using a resin base impervious membrane, unless otherwise specified.

1. Resin Base Impervious Membrane Curing:

The curing compound will be applied under pressure, with a spray nozzle, in such a manner as to cover the entire surface thoroughly and completely with a uniform film at a rate that will depend on the roughness of the surface of the concrete, but in no case will be less than 0.25 liters/m2 of concrete surface.

2. Moist Curing:

If specified in Special Conditions, moist curing will be carried out according to the following requirements:

i) After the concrete has set sufficiently, the exposed surfaces of the concrete will be kept continuously moist using wet burlap or polyethylene film in contact with the concrete for at least seven (7) consecutive days after placing, when normal or sulfate resistant Portland Cements are used, and for at least three (3) consecutive days when High Early Strength Cement is used.

6.9.11 SURFACE SEALING:

Two applications of an approved sealing solution will be sprayed on all exposed concrete. The concrete will be dry and swept clean when the solution is applied. The first application will be made within seven (7) days after placing the concrete. The second will be made immediately after the first has been absorbed and regains its dry appearance. The first application will give a coverage of not more than 9 m2/liter. The second application will give a coverage of not more than 12 m2/liter.

6.9.12 JOINTS:

Contraction, construction and longitudinal joints will be constructed where required as shown on the Plans, or as specified.

1. Stress Relieving Joints:

Where specified, stress relieving joints will be constructed either by sawing or by installation of polyethylene separators.

i) Sawn Joints - Sawn joints will be cut as late as possible following concrete finishing, without permitting cracking to develop in the concrete slab. The time at which such saw cutting is to be undertaken will be determined by the Contractor. The

contractor will be wholly responsible for all concrete defects arising from the cutting operation.

ii) Polyethylene Formed Joints - As an alternative to sawing, stress relieving joints may be formed by equipment capable of inserting polyethylene film into the fresh concrete in a straight line and to the depth specified.

2. Contraction Joints:

i) Contraction joints will be formed to fully control cracking. Surface joints will not exceed 12 mm in depth.

ii) Sawn Contraction Joints - Where specified, sawn joints will be cut in such a manner that the edges are smooth and no aggregate is removed from the surface of the concrete.

iii) Formed Contraction Joints - Formed contraction joints will be constructed with plates penetrating the concrete to specified depth. The joint edges will be finished with a 6 mm radius in both edges when the plates are removed.

iv) Tooled Joints - Joints in extruded concrete will be formed to depth specified and finished to a 6 mm radius on both edges. The construction method will be at the option of the Contractor, but will be subject to approval by the County. The construction method used will not affect the line and grade of the extruded section.

v) Surface Joints - A surface or dummy joint will be constructed to the depth specified and finished to a 6 mm radius on both edges.

vi) Construction Joints - Construction joints will be constructed with a formed Keyway or "Vee" as shown on the drawings. Edges will be finished to a 6 mm radius. This joint is to be formed at a 10 mm depth.

vii) Expansion Joints **-** When required, expansion joints will be shown on the Plans or detailed in Special Conditions.

6.9.13 CONSTRUCTION:

1. Subgrade - The subgrade elevation will be the bottom of the concrete section to be placed, that has been compacted to the specified density for a minimum depth of 150 mm below the finished grade within 25 mm of the proposed subgrade elevation. No more than 25 mm of cushion material will be placed on the subgrade.
2. Forming - Curbs with a radius less than 40m will be constructed with flexible forms, well staked and braced to the established line and grade.
3. Placing Concrete - Concrete will be placed only after the sub-base and forming have been inspected and approved by the County. The concrete will be deposited in a manner to prevent segregation and as close to the final point of deposit as possible. The interval between placing successive batches will not exceed 50 minutes. If a section is to be continued at a later date, a construction joint will be made with three 10 mm diameter reinforcing rods (equally spaced in the sidewalk, and in the curb and gutter sections) extending a minimum of one-half (1/2) metre into both the existing and future pour. Vibration will be done by pencil vibrators and/or a vibrating screen, and will be of sufficient duration only to prevent honeycombing.
4. Finishing - Working the surface during finishing will be the minimum amount necessary to produce the specified finish, with no exposed aggregate or entrapped air. The brush finish will be done with an approved nylon bristle brush lengthwise along the curb and gutter, and transversely across the sidewalk. There is to be no excess water on the concrete surface.

5. Joints - Contraction, construction and longitudinal joints will be constructed where required as shown on the plans, or as specified. Generally, transverse contraction joints will be formed every 3 m. Transverse surface joints will be formed every 3 m alternating with the contraction joint.

6. Cold Weather Concrete:

i) Concrete Strength - After September 30th, all concrete will attain the specified strength in seven (7) days.

ii) Base Condition - No concrete will be placed on frozen sub-grade or sub-base.

iii) Concrete Temperature - When the ambient temperature is less than 5°C, concrete delivered to the site will have a temperature not less than 15°C. For concrete placed when the ambient temperature is expected to fall below 2°C, the Contractor will completely cover the concrete and forms, maintaining an adequate air cushion between the concrete and cover, using straw, insulation or other approved insulating material. If a temperature of 18°C cannot be maintained for 72 hours after placing using insulation, then concreting will cease.

7. Hot Weather Concrete:

i) Hot weather will an air temperature in the shade of 23°C or above.

ii) The concrete temperature at the time of placing in hot weather will not exceed 30°C. In the event that this limit is exceeded, the concrete operations will be suspended until the constituent materials of the concrete are cooled.

iii) Retarding admixtures will be approved by the County prior to use in the concrete.

8. Testing and Inspections

i) Slump, air content and compressive strength tests will be made on the concrete for each 150 cubic meters placed for each class of concrete, with at least one test for each day of placing concrete.

ii) Sampling and testing will be performed in accordance with the following:

a Compression Test Specimens: Standard method of "Making and Curing Concrete Test Specimens in the Field" in accordance with CSA 23.2-3C.

b Compression Test: Standard Method of "Test for Compressive Strength of Cylindrical Concrete Specimens" in accordance with CSA 23.2-9C.

c Air Content: Standard Method of "Test for Air Content of Freshly Mixed Concrete by the Pressure Method" in accordance with CSA 23.2-4C.

d Slump: Standard Method of "Test of Slump of Portland Cement Concrete" in accordance with CSA 23.2-5C.

e Sampling Fresh Concrete: Standard Method of "Sampling Fresh Concrete" in accordance with CSA 23.2-1C.

6.10 ASPHALT PATHWAYS

The asphalt materials, mixing, spreading and compaction will conform to Lethbridge County Standards and Specifications, as outlined under Section 6.6 Asphalt Concrete Pavement, for all of the work required.

6.11 BOULEVARD GRASSING

The work will include the placing of topsoil, seeding, watering and at least two successive cuttings of all grassed areas indicated on the plans or as called for under the contract documents.

6.11.1 MATERIALS:

All materials used in these specifications are subject to inspection testing and approval by the County.

1. Topsoil - Topsoil will be of a natural, fertile agricultural soil of the "A" horizon layer, capable of sustaining plant growth. It will be free of subsoil, clay lumps, stones, live plants or any other extraneous matter, organic or inorganic, which may be detrimental to the lawn. Topsoil will contain no toxic materials and the pH will be 6.0 - 7.5.
2. Seed Mixture – The seed mixture shall be confirmed with the County prior to application. All seed mixtures shall be free of all noxious weeds in accordance with the Alberta Weed Act.
3. Sod – The Sod mix type hall be confirmed by the County prior to application.

Sod will be:

i) a minimum of eighteen (18) months old.

ii) free of noxious weeds.

iii) minimum 20-25 mm in thickness.

iv) healthy with a thick growth.

v) sufficiently moist to prevent burning at the edges,

vi) first cut.

4. Fertilizer - Fertilizer will conform to the following:
   i) Root Fertilizer:
      a granular water soluble fertilizer 10-6-4 Super phosphate
      b granular water soluble fertilizer 5-20-10 or equivalent
   ii) Supplementary Fertilizer:
      a organic fertilizer 14-7-6
      b even 35%
5. Peat Moss - Peat moss will be mixed with topsoil and meet the following specifications:
   i) have a pH value of 5.0 - 7.0,
   ii) have a water holding capacity of 1100% by weight,
   iii) be free of toxic material, live plants, live roots or seeds,
   iv) be delivered in a pulverized condition.

6.11.2 CONSTRUCTION

The contractor will be responsible for the control of weed growth until the final acceptance of the contract.

1. Subsoil Preparation - All rocks larger than 50 mm in diameter, roots and other foreign matter will be removed. The subsoil will be mechanically loosened to a depth of not less than 50 mm immediately prior to placing the topsoil.

2. Topsoil Placement - The topsoil will be uniformly spread on the prepared areas to a minimum compacted depth of 150 mm, measured after the area is readied with the soil seed equipment. If organic material is required to meet the organic material specification for topsoil, peat moss in pulverized condition will be added in the field and mixed with cultivation equipment. The area will then be disked, harrowed and floated thoroughly to a depth of 75 mm, leaving the soil in a good viable condition and true to grade.
3. Fertilizing **-** After the topsoil has been properly prepared, a uniform application of granular water soluble root fertilizer will be placed at the rate of 5 kg/l00 square meters using a mechanical spreader. The fertilizer will be thoroughly and evenly mixed with the soil to a maximum depth of 75 mm. Approximately six (6) weeks after germination, supplementary application of an organic fertilizer, such as 10-6-4 or equivalent, will be applied at a rate of 5 kg/100 square meters.
4. Seeding - Grass seed will be sown at a rate of 2.5 kg/100 square meters by one or more of the following methods:
    i) Hand application with a cyclone type seeder capable of distributing seed in two directions in equal amounts. Hand application will require a 6 mm top dressing or mulch of pulverized peat moss.
    ii) Mechanical application with a calibrated grass seeder complete with compaction roller
    iii) Hydro-seeding by applying an approved turf-fiber at a rate of 0.135 kg of dry matter/square metre.
5. Watering - To avoid washing, the area will receive light watering with a fine spray to a penetration of not less than 25 mm, after the seeding operations are completed. In areas where seed fails to germinate for whatever reason, the Contractor will re cultivate and re-seed until germination occurs.
6. Repairs and Maintenance - At the time of the supplementary fertilizing, the following repairs will be carried out by the Contractor:
    i) Top Dressing - repair ruts, unevenness and erosion problems
    ii) Over-seeding - dried out areas will be cultivated and re-seeded.
    iii) Weed Spraying - an application of an approved weed killer will be applied one (1) week after the fertilizer has been applied.

    The first and second grass cutting will be done by the Contractor when the grass is approximately 100 mm in height. Cut height will be 50 mm.
7. Sodding - Sodding will be done on all areas where slopes are two horizontal to one vertical or greater, and staked. Sod may be substituted for grass seeding on all other areas.
    i) Sod Laying - The sod will be closely butted together and laid evenly, in staggered rows, with all newly-laid sod matched to the existing grade of other landscaped or cultivated areas as specified. The sod will be top dressed and rolled with a medium weight roller (90-120 kg) to a smooth and even surface.
    ii) Watering - After placement, the sod will be continuously watered for one (1) week or until significant root growth has occurred.
    iii) Fertilizing - Approximately four (4) weeks after placement, and following the initial cutting, an organic fertilizer will be applied at the rate of 5 kg/100 square meters.
8. Growing Season:
    i) Grass Planting - Grass seed will not be planted before May 15 or after October 15.

ii) Sod Laying - Sod will not be laid before May 15 or after September 1. Sod laying on slopes 3:1 or steeper will not be done when the temperature is above 23°C.

iii) Tree Planting - Within one (1) year after the issuance of a Construction Completion Certification for paved roads, the Applicant will sod and plant boulevard trees on all roads. Deciduous trees must be placed in a uniform lineal manner. The Applicant will be responsible for full maintenance and tree replacement for one (1) calendar year after installation.

6.12 TRAFFIC CONTROL DEVICES

A traffic control device is a sign, signal, marking, barrier or other device, placed upon, over or adjacent to a roadway, that is intended to regulate, warn, or guide the road user. All such traffic control devices will be installed in accordance with the "Uniform Traffic Control Devices for Canada" manual, latest revision thereof, distributed by the Roads & Transportation Association of Canada, and with the new "Alberta Highway Signing Policy Manual", latest revision thereof.

All traffic control devices must be authorized and approved by the County prior to placement. No traffic control device, nor its support, will bear any commercial advertising.

It is the intent that these devices be kept serviceable year-round for the safe movement of traffic in both daylight and darkness.

A Signage Plan must be submitted to the County for any project where signage is required.

6.12.1 TRAFFIC SIGNS:

Signs inform road users of traffic regulations, warn of roadway characteristics and road hazards, and provide information necessary for route selection. Simplicity in design, care in placement and a standard of maintenance are essential. Signs are to be used only when necessary and justified. All sign materials will conform to the Canadian Standards Association (CSA) specifications.

All traffic control signing erected within County and subdivision road allowances will be according to the latest edition of the manual “Uniform Traffic Control Devices for Canada”. All sign posts will be located horizontally 3 meters from the shoulder of the adjacent road and the bottom of the sign will be 1.5 meters above the shoulder elevation of the road. Stop signs and yield signs will be positioned in line with the near property line of the intersecting road allowance.

1. Materials:

   i) Signs - Signs made of treated ferrous and non-ferrous metal and waterproof resin bonded plywood are suitable for use in permanent signs (certain wood fibrous materials, when properly fabricated, are also acceptable). Wooden boards may be used for large signs and for temporary and seasonal signs.

   ii) Sign Panels - Information signs will be constructed with high intensity reflective panels. Regulatory and Hazard signs will be constructed with high intensity grade reflective panels.

   iii) Sign Posts - Where applicable, it is encouraged that all signs be placed on existing supports used for other purposes, such as traffic signals or street lights. If sign posts are required, they will be made of galvanized metal (schedule 40), 60 mm in diameter, 3.65 m in length and a quick fix breakaway coupling installed 50 mm from ground level.

   iv) Fasteners - Stainless steel fasteners will be used to attach signs to their supports.

2. Installation & Maintenance**:**

Signs are to be placed with the posts vertical and the signs level. The bottom of the sign must be a minimum of 2.0 meters above the level of the nearest travel lane or existing grades. Signs are to be positioned with best possible road visibility in mind. All signs will be kept clean, in proper position and legible. Damaged signs are to be repaired or replaced as soon as possible. No vegetation, construction materials snow or other items or materials are to be allowed to obscure any sign.

6.12.2 PAVEMENT MARKINGS:

Pavement markings are traffic control devices placed on roadway surfaces to delineate and clarify traffic and pedestrian movement by regulating, warning and conveying information to individuals without diverting attention from the roadway.

The glass beads, paint and durable marking materials are to be supplied from the Alberta Transportation's Product List, found on Alberta Transportations website. It is the Contractors responsibility for ensuring that the quality of the materials supplied meet the requirements specified.

Traffic marking materials will be either industrial traffic marking paint or thermoplastic material, as dictated by the County.

The following information prior to commencing the Work:

- Names and mailing addresses of the Suppliers and Manufactures;
- Formulation to be supplied;
- Written confirmation from the Manufacturer that the materials to be supplied meet all specified requirements.

Pavement markings will conform to the following:

1. Colour - Yellow (solid) lines must be used to delineate the separation of opposing traffic flows. White lines delineate the separation of traffic flows in the same direction - all lateral pavement markings are to be white in colour.
2. Pattern - Broken longitudinal lines are to indicate that lane changing is permitted and solid longitudinal lines indicate that lane changing is not permitted. Lateral pavement marking may be parallel or "zebra" lines, and are to be used to indicate the limits of the driver's right-of-way concerning stopping, pedestrian crosswalks, no parking areas and similar requirements.

   Refer to the "Uniform Traffic Control Devices for Canada" manual for pavement marking details.

   No paint formulation shall be diluted or mixed with a different formulation or with any other material, without the specific approval.

6.12.2.1 Sampling and Testing

The Contractor shall supply the County with quality assurance samples and the Manufacturer's quality control test results. Quality control results shall include a minimum of Specific Gravity, Hiding Power, Dry to Traffic and Viscosity results.

A minimum of one quality assurance sample per batch shall be taken for glass beads, sampling methods shall be in accordance with Alberta Transportation TLT-601, Sampling Glass Beads.

A minimum of one quality assurance sample per colour per batch shall be taken for paint, sampling methods shall be in accordance with Alberta Transportation TLT-636. Sampling Traffic Paint.

All materials shall be subject to further inspection and sampling by the County, and the Contractor shall provide safe, convenient access, acceptable to the County, for inspection and sampling of the materials, and shall co-operate in the inspection and sampling process when requested to do so.

6.12.3 TEMPORARY SIGNAGE:

Temporary signage and devices will be located as to provide motorist and pedestrians with adequate warning of construction or unusual conditions. A plan showing signage location, spacing and types will be submitted to the County for approval a minimum of 72 hours prior to disruption. Refer to "Uniform Traffic Control Devices for Canada" manual Section D.

6.13 STREET LIGHTING

6.13.1 GENERAL

All street lighting layout, and location of the buried and the overhead lines, will be approved by the County. The location, type and frequency of street lights will be such as to provide the minimum lighting levels in conformance with the current edition of the Transportation Association of Canada (TAC) Guide for the Design of Roadway Lighting.

Any Consulting Engineer undertaking lighting and electrical designs must be qualified and that is registered with the Association of Professional Engineers and Geoscientists of Alberta with a permit to practice.

Wherever possible, street light cables will be installed underground. Cables crossing all roadways or driveways will be placed in direct-burial type rigid plastic pipe using one pipe per individual cable unless noted otherwise. Deviation from underground cable installation requires approval by the County prior to construction.

Corrosive resistant street light poles complete with fixtures and concrete pedestals only will be used unless approved otherwise.

Street lights will be so located as to not interfere with proposed driveways, lanes and motorist's lines of vision, and will be located in line with the extension of common property lines wherever possible.

All street lights shall be LED.

6.13.2 STREET LIGHT POLE SPACING

Street light poles are to be spaced as per the TAC Guide for Design of Roadway Lighting:

6.14 VEHICULAR BARRIERS

All vehicular barriers shall be designed in accordance with Alberta Transportations Roadside Design Guide (Current version).

All materials are to conform to the standards and specifications contained in Section 6 – Transportation of this Manual, unless otherwise approved by the County in writing.

Vehicular barriers must be constructed at the following locations:

1. across the end of a walkway that terminates in a lane;
2. across the end of a lane cul-de-sac that abuts a roadway;
3. along a lane that parallels an adjacent roadway;
4. near permanent bodies of water;
5. at areas showing a large difference in grade separation;
6. bridge abutments;
7. retaining walls; or
8. as a longitudinal divider on narrow medians.

While vehicular barriers are designed to reduce the hazard of errant vehicles leaving the road surface, they themselves must also be considered as hazards. Installation is warranted only where the severity of an accident is greater than the hazard presented by with the traffic barrier. Their purpose is to shield those hazards that cannot be eliminated.

6.15 BACKFILLING UTILITY TRENCHES ON COUNTY RIGHT-OF-WAY

All ditches, trenches and cuts on County rights-of-way (adjacent to roadway) will be done with a minimal amount of disturbance. The backfill must be with an approved material placed in uniform lifts not exceeding 300 mm of loose depths, to a density of not less than 96% of the maximum density of a Standard Proctor. No excavation will be closed until compaction has been approved by the County.

APPENDIX

Standard Forms

Standard Drawing Details

COUNTY OF LETHBRIDGE

MUNICIPAL SERVICES

#100, 905 4TH AVENUE SOUTH

CONSTRUCTION COMPLETION CERTIFICATE

FORM A-101

Development Application No: _____

Developer: _____

Contractor: _____

Municipal Improvement: _____

Location of Municipal Improvement: _____
(Or see attached location plan)

Date of Application for Construction Completion: _____

PURSUANT TO THE DEVELOPMENT AGREEMENT, I _____ OF THE FIRM _____ "CONSULTING ENGINEERS", HEREBY CERTIFY COMPLIANCE WITH THE SERVICING STANDARDS AS SET OUT IN THE DEVELOPMENT AGREEMENT, AND I HEREBY RECOMMEND APPROVAL FOR THE MUNICIPAL IMPROVEMENTS.

_____ _____
Project Engineer (Consulting Engineering Firm) Date

_____ _____
Signing Officer (Consulting Engineering Firm) Date

_____ _____
Authorized County Inspector Date

_____ _____
Date Approved Director of Municipal Services

_____ _____
Date Conditionally Approved Director of Municipal Services

Reason for conditional approval: (see attached report) _____
_____

_____ _____
Date Rejected Director of Municipal Services

Reason for rejection: (see attached report _____
_____

I HEREBY CERTIFY THAT THE ITEMS LISTED AS REASONS FOR CONDITIONAL APPROVAL OR FOR REJECTION HAVE BEEN CORRECTED.

_____ _____
Project Engineer (Consulting Engineering Firm) Date

Approved: _____ _____
Director of Municipal Services Date

Date Maintenance Period to Start: _____ Scheduled Maintenance Expiry Date: _____

COUNTY OF LETHBRIDGE

MUNICIPAL SERVICES

#100, 905 4TH AVENUE SOUTH

FINAL ACCEPTANCE CERTIFICATE

FORM A-102

Development Application No: _____

Developer: _____

Contractor: _____

Municipal Improvement: _____

Location of Municipal Improvement: _____
(Or see attached location plan)

Date of Application for Final Acceptance: _____

Scheduled Maintenance Expiry Date: _____

PURSUANT TO THE DEVELOPMENT AGREEMENT, I _____ OF THE FIRM _____ "CONSULTING ENGINEERS", HEREBY CERTIFY THAT AS OF THE ABOVE DATE, THE SAID MUNICIPAL IMPROVEMENT MEETS ALL THE REQUIREMENTS FOR FINAL ACCEPTANCE AS SPECIFIED BY DEVELOPMENT AGREEMENT, AND I HEREBY RECOMMEND THIS MUNICIPAL IMPROVEMENT FOR FINAL ACCEPTANCE.

_____ _____
Project Engineer (Consulting Engineering Firm) Date

_____ _____
Signing Officer (Consulting Engineering Firm) Date

_____ _____
Authorized County Inspector Date

_____ _____
Date Approved Director of Municipal Services

_____ _____
Date Rejected Director of Municipal Services

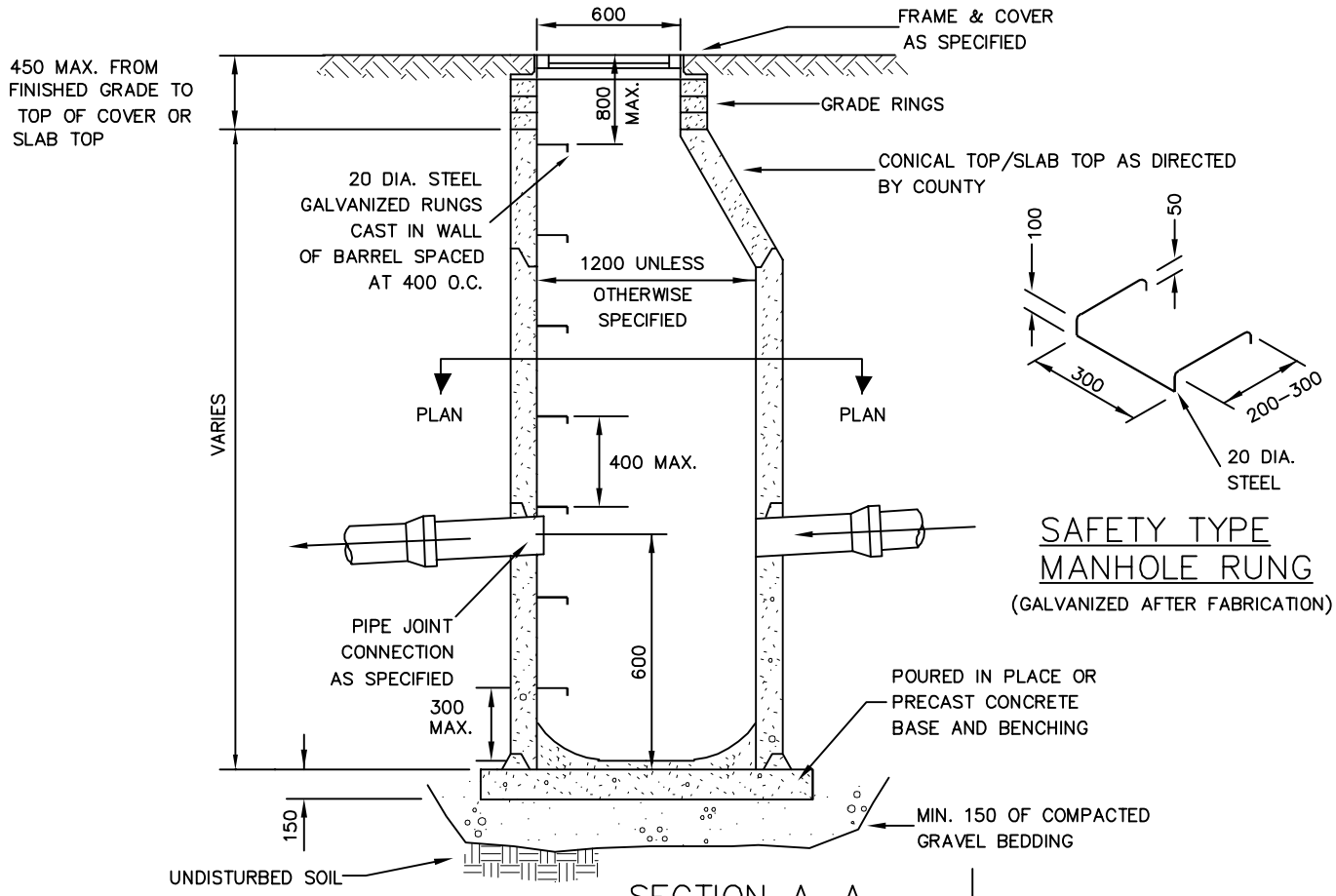
Reason for rejection: (see attached report) _____
_____

I HEREBY CERTIFY THAT THE ITEMS LISTED AS REASONS FOR REJECTION HAVE BEEN CORRECTED.

_____ _____
Project Engineer (Consulting Engineering Firm) Date

Approved: _____ _____
Director of Municipal Services Date

Date Maintenance Period to Expire: _____

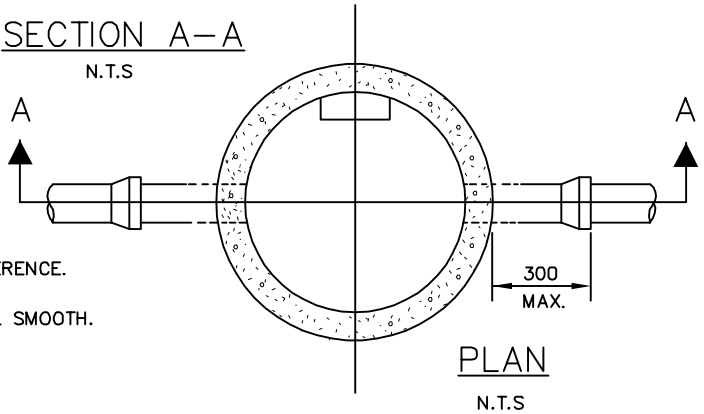


SAFETY TYPE MANHOLE RUNG

(GALVANIZED AFTER FABRICATION)

SECTION A–A

N.T.S



PLAN

N.T.S

NOTES:

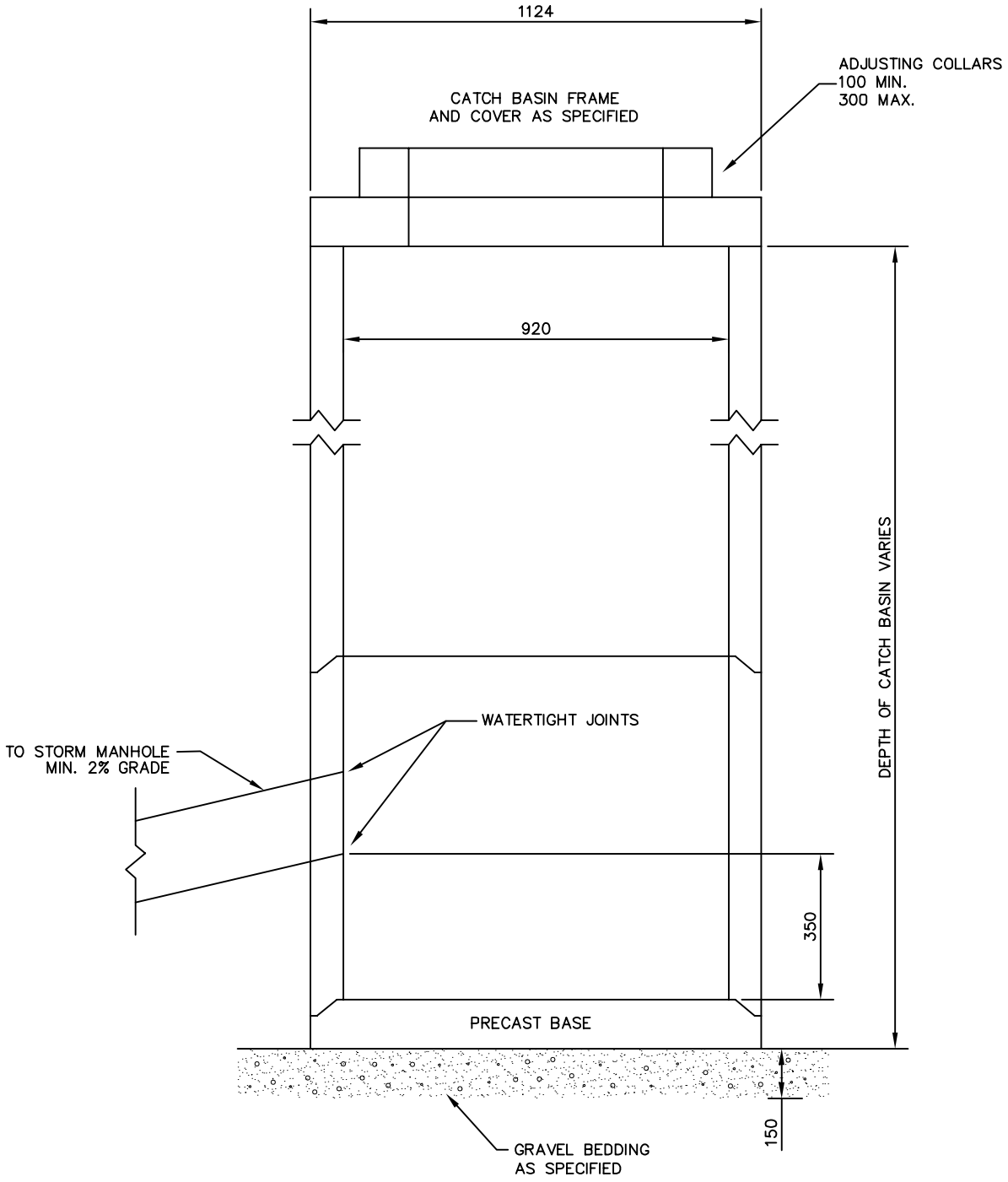
1. ALL PRE–CAST MANHOLES MUST CONFORM TO A.S.T.M. SPECIFICATIONS C478.
2. POURED–IN–PLACE CONCRETE SHALL HAVE A 28 DAYS COMPRESSIVE STRENGTH OF AT LEAST 25 MPa.
3. ALL JOINTS TO BE SET WITH RUBBER GASKETS AND SET WITH NON–SHRINK GROUT, INSIDE AND OUT, FOR THE FULL CIRCUMFERENCE.
4. FORM FLOW TROUGH IN PARTIALLY SET CONCRETE AND TROWEL SMOOTH.
5. PIPES TO BE FLUSH WITH WALL.
6. MAX. DIST. FROM RIM TO TOP RUNG IS 800 mm.
7. BACKFILL AROUND MH. WITH SELECT NATIVE MATERIAL AND COMPACT AS PER BACKFILL SPECIFICATIONS..
8. FLAT TOP SECTION TO BE USED FOR MANHOLES UP TO 1.8 m BURY.
9. ALL JOINTS TO BE WATERTIGHT. METHODS TO BE CONSISTENT WITH SITE CONDITIONS.
10. FOR MANHOLES 5.0 m IN DEPTH OR GREATER, A SAFETY PLATFORM SHALL BE INSTALLED.
11. MANHOLES TO MEET REQUIREMENTS OF MANHOLE DETAILS AND SPECIFICATIONS.
12. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
13. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
14. SAFETY STEPS TO BE PROVIDED, SPACED AT 400 MAX. FIRST STEP 150 MAX. BELOW FRAME, LAST STEP 300 MAX. ABOVE BASE.

LETHBRIDGE COUNTY

TITLE:

CATCH BASIN MANHOLE

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	C–101
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



NOTES:

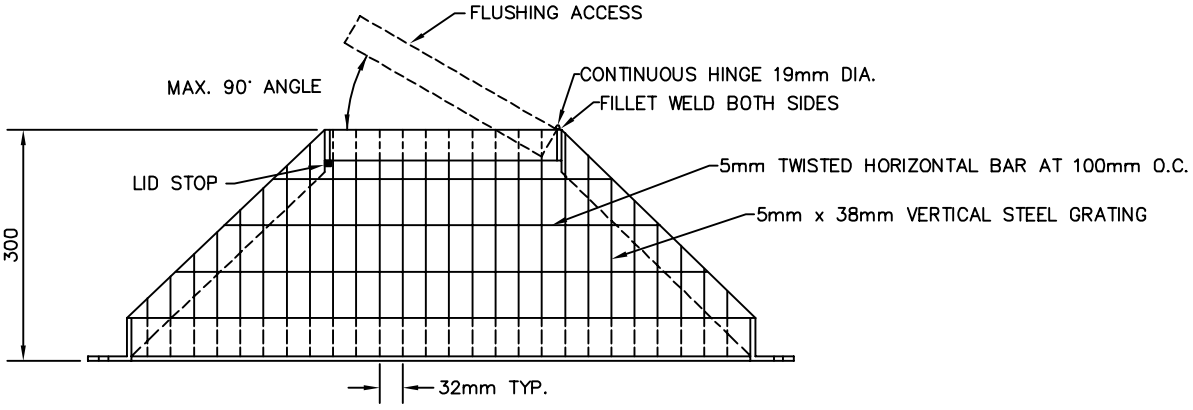
1. SAFETY STEPS TO BE PROVIDED, SPACED AT 400 MAX. FIRST STEP 150 MAX. BELOW FRAME; LAST STEP 300 MAX. ABOVE BASE.
2. PRE-CAST CONCRETE COMPONENTS MUST CONFORM TO A.S.T.M. SPECIFICATIONS C478.
3. POURED-IN-PLACE CONCRETE SHALL HAVE A 28 DAYS COMPRESSIVE STRENGTH OF AT LEAST 25 MPa.
4. ALL JOINTS TO BE SET WITH RUBBER GASKETS AND NON-SHRINK GROUT, INSIDE AND OUT, FOR THE FULL CIRCUMFERENCE.
5. ALL DIMENSIONS IN MILLIMETRES, UNLESS OTHERWISE STATED.
6. ALL JOINTS TO BE WATERTIGHT. METHODS TO BE CONSISTENT WITH SITE CONDITIONS.

LETHBRIDGE COUNTY

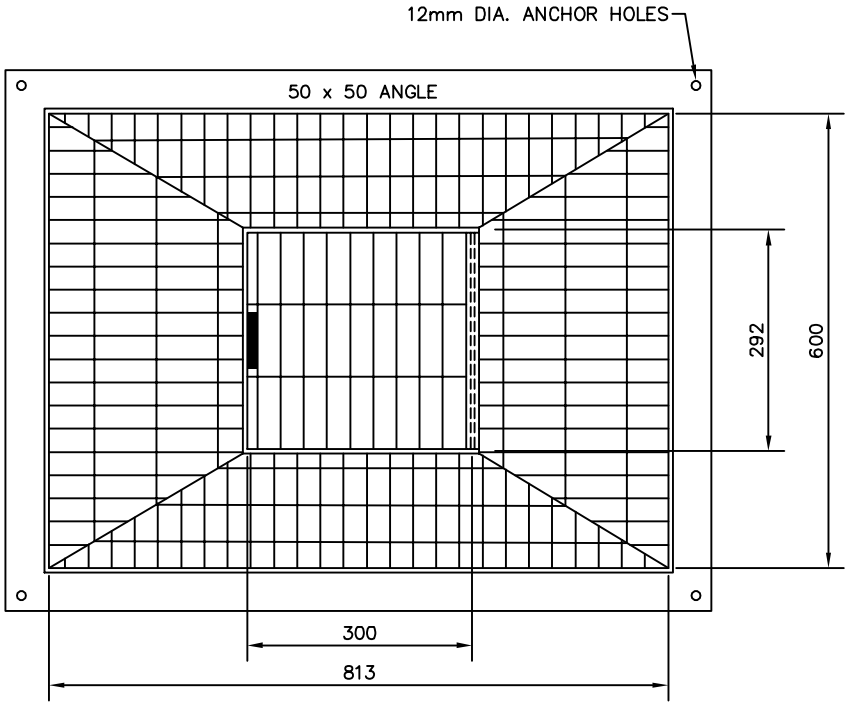
TITLE:

STORM CATCH BASIN ASSEMBLY c/w 350mm SUMP

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	C-102
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



PROFILE



PLAN VIEW

NOTES:

1. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.

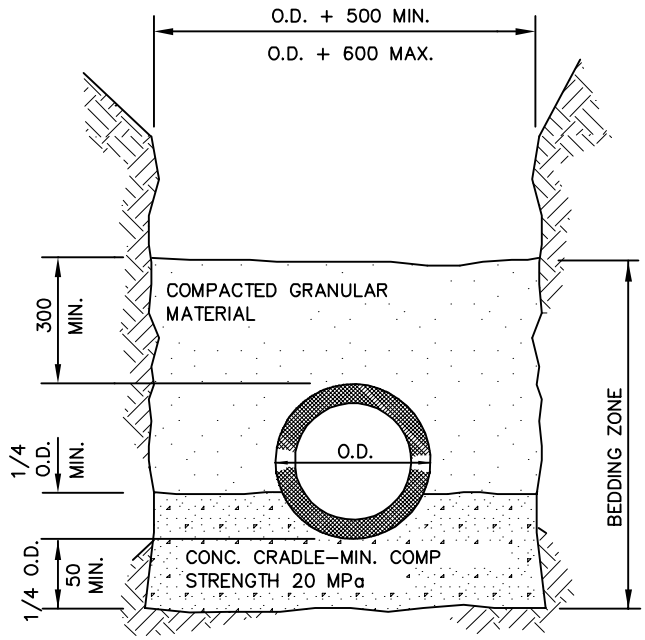
LETHBRIDGE COUNTY

TITLE:

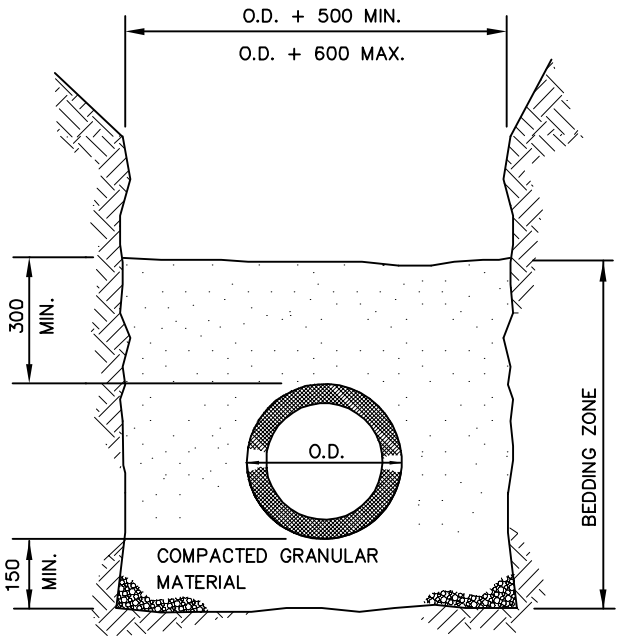
TRASH GRATE INLET

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	C-103
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES

CLASS 'A' BEDDING



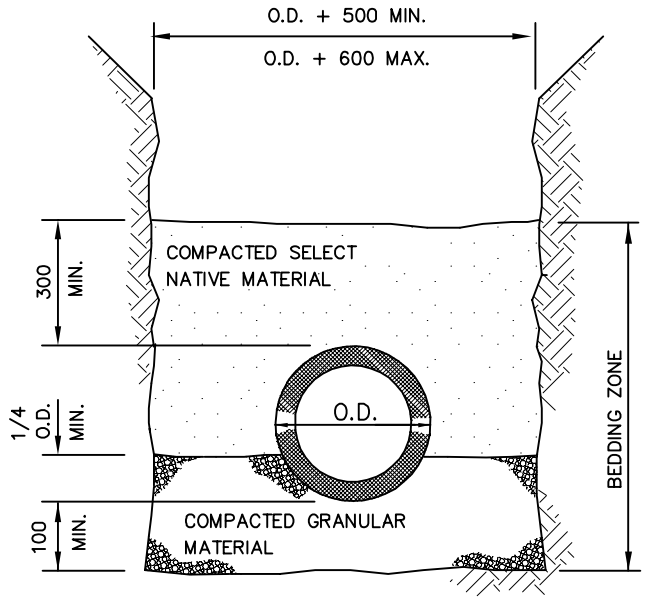
CLASS 'B' BEDDING



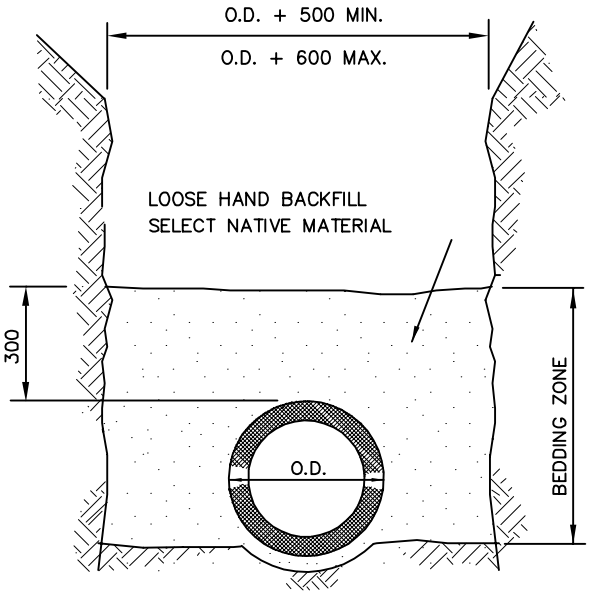
NOTE:

1. COMPACTION OF BEDDING ZONE SHALL BE AS PER BACKFILL SPECIFICATIONS.
2. ALL DIMENSIONS ARE GIVEN IN MILLIMETRES UNLESS OTHERWISE STATED.
3. BACKFILL COMPACTION REQUIREMENTS WILL VARY. BACKFILL ABOVE PIPE ZONE TO BE APPROVED MATERIAL.
4. TRENCH SIDE SLOPES TO BE CONSISTENT WITH OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS

CLASS 'C' BEDDING



CLASS 'D' BEDDING

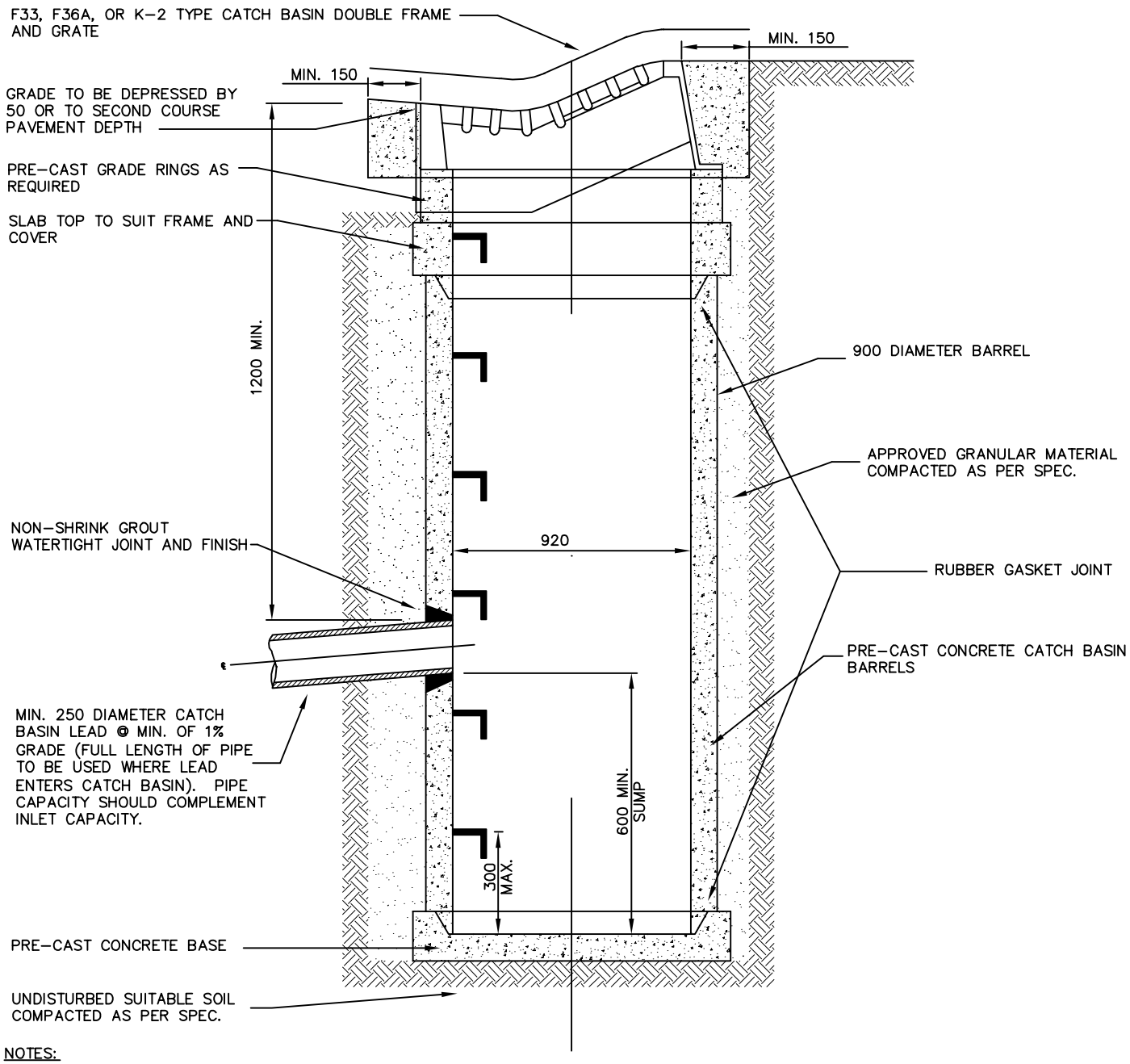


LETHBRIDGE COUNTY

TITLE:

PIPE BEDDING DETAILS

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	C–104
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



NOTES:

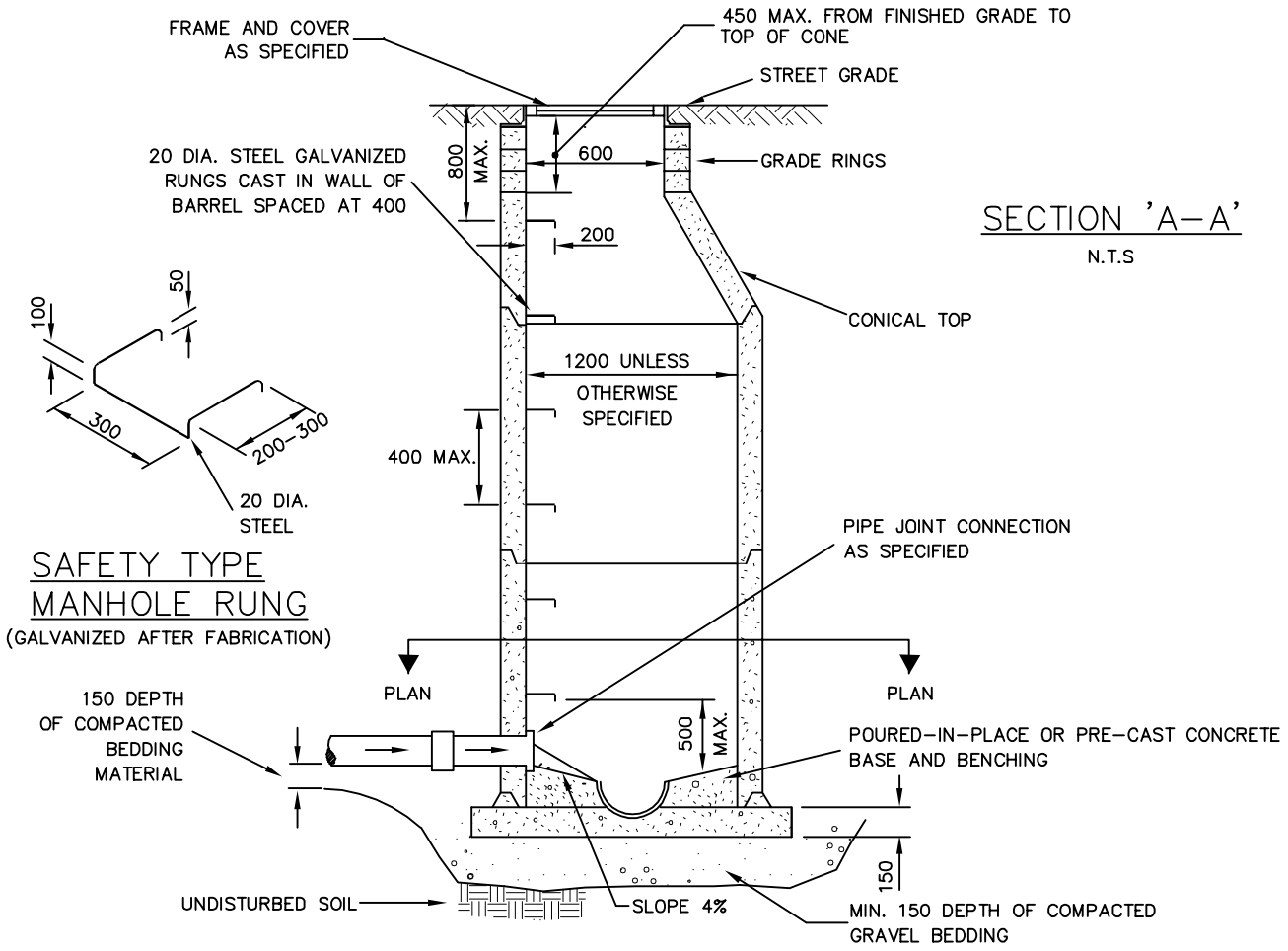
1. SAFETY STEPS TO BE SPACED AT 400 MAX. FIRST STEP 150 MAX. BELOW FRAME, LAST STEP 300 MAX. ABOVE BENCHING.
2. PRE-CAST CONCRETE COMPONENTS TO MEET CURRENT A.S.T.M. C478 STANDARDS.
3. CAST-IN-PLACE- CONCRETE TO BE 25 MPa AT 28 DAYS.
4. ALL JOINTS TO BE WATERTIGHT; SET WITH RUBBER GASKET WITH NON-SHRINK GROUT INSIDE AND OUTSIDE FOR THE FULL CIRCUMFERENCE. THIS INCLUDES JOINTS BETWEEN GRADE RINGS, GRADE RINGS AND FRAMES, AND BETWEEN GRADE RINGS AND SLAB TOPS.
5. PRE-CAST CONCRETE BASE THICKNESS AND REINFORCEMENT MUST BE DESIGNED FOR THE SPECIFIC CATCHBASIN DEPTH ANS SOIL CONDITIONS.
6. JOINTS BETWEEN GRADE RINGS, GRADE RINGS AND CONES, AND RINGS AND FRAMES MUST BE WATERTIGHT. RAM NECK MATERIAL FINISHED MATERIAL FINISHED WITH NON-SHRINK GROUT MAY BE USED IF WATERTIGHT JOINTS CAN BE ACHEIVED.
7. WICK DRAINS TO CONNECT TO CATCH BASIN SUCH AS TO ENSURE WATERTIGHT JOINTS.
8. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.

LETHBRIDGE COUNTY

TITLE:

CATCH BASIN MANHOLE TYPICAL 900mm

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	C-105
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES

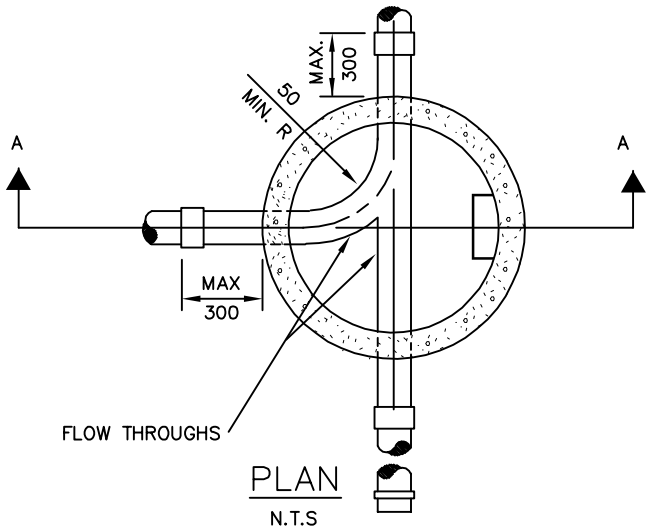


SECTION 'A-A'

N.T.S

SAFETY TYPE MANHOLE RUNG

(GALVANIZED AFTER FABRICATION)



PLAN

N.T.S

NOTES:

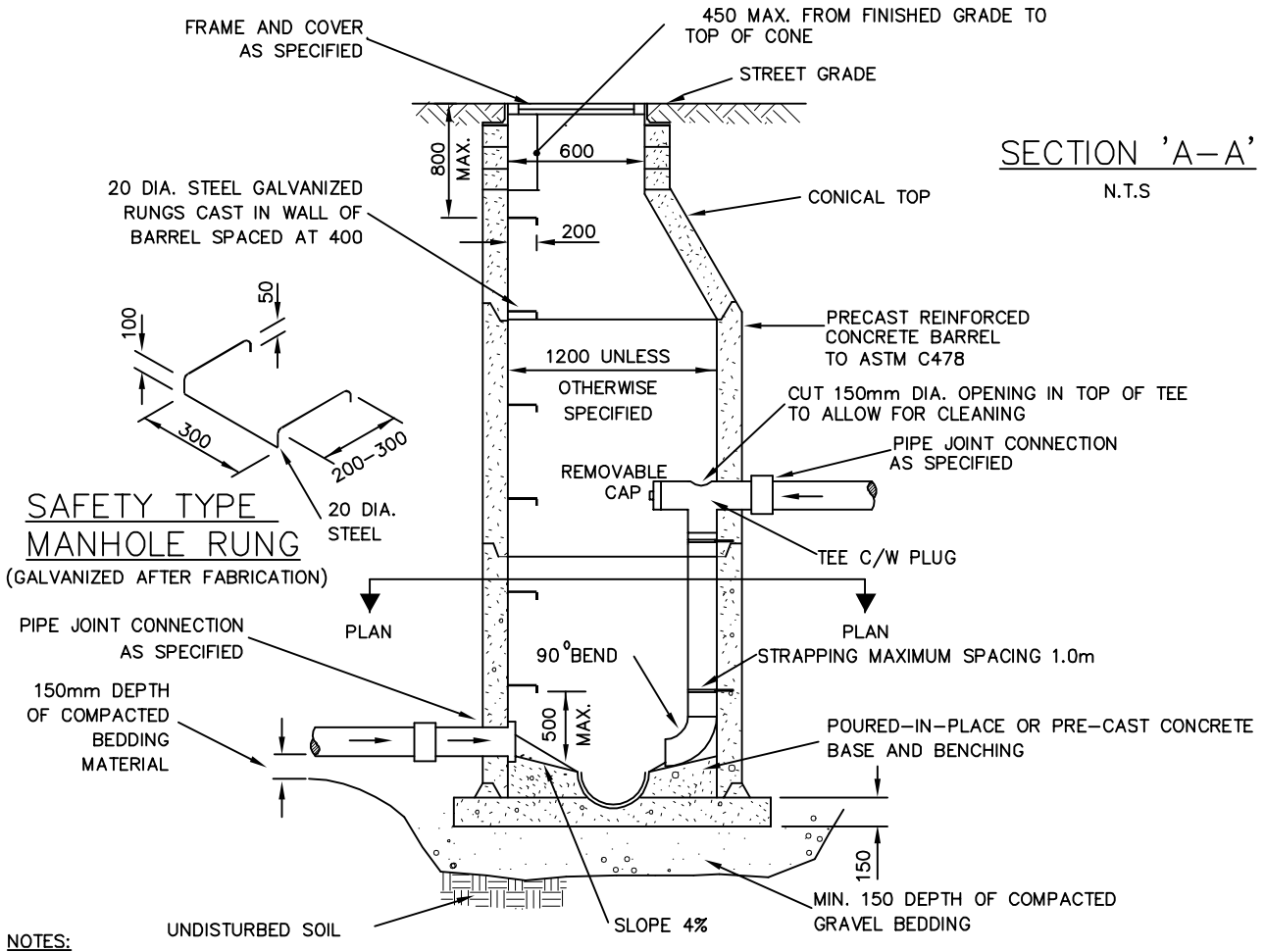
1. ALL PRE-CAST MANHOLES MUST CONFORM TO A.S.T.M. SPECIFICATIONS C478.
2. POURED-IN-PLACE CONCRETE SHALL HAVE 28 DAYS COMPRESSIVE STRENGTH OF AT LEAST 25 MPa.
3. ALL JOINTS TO BE SET WITH RUBBER GASKET AND SET WITH NON-SHRINK GROUT, INSIDE AND OUT, FOR THE FULL CIRCUMFERENCE.
4. FORM FLOW TROUGH IN PARTIALLY SET CONCRETE AND TROWEL SMOOTH.
5. ALL DIMENSIONS GIVEN IN MILLIMETRES UNLESS OTHERWISE STATED.
6. MAX. DIST. FROM RIM TO TOP RUNG IS 800 mm.
7. BACKFILL AROUND MH. WITH SELECT NATIVE MATERIAL. COMPACT TO STANDARD SPECIFICATIONS.
8. FLAT TOP SECTION TO BE USED FOR MANHOLES UP TO 1.8 m BURY.
9. ALL JOINTS TO BE WATERTIGHT. METHODS TO BE CONSISTENT WITH SITE CONDITIONS.
10. FOR MANHOLES 5.0 m IN DEPTH OR GREATER, A SAFETY PLATFORM SHALL BE INSTALLED.
11. MANHOLES TO MEET REQUIREMENTS OF MANHOLE DETAILS AND SPECIFICATIONS.
12. SAFETY STEPS TO BE PROVIDED, SPACED AT 400 MAX. FIRST STEP 150 MAX. BELOW FRAME, LAST STEP 300 MAX. ABOVE BASE.

LETHBRIDGE COUNTY

TITLE:

MANHOLE DETAIL TYPE 5A PRE-CAST

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	D-101
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



SECTION 'A–A'

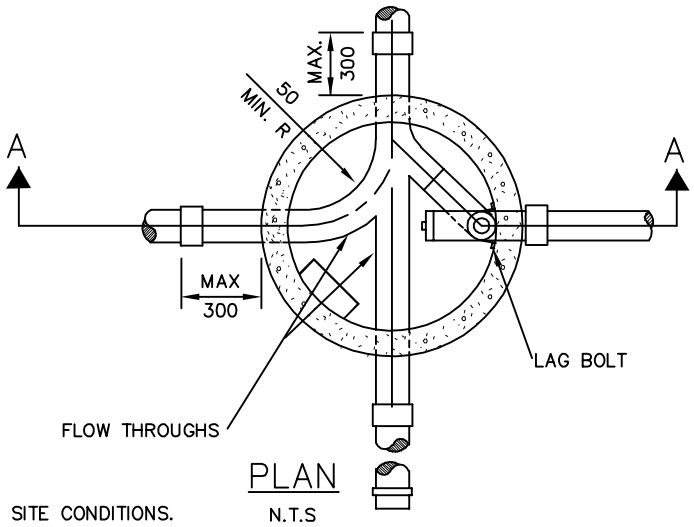
N.T.S

SAFETY TYPE MANHOLE RUNG

(GALVANIZED AFTER FABRICATION)

NOTES:

1. ALL PRE–CAST MANHOLES MUST CONFORM TO A.S.T.M. SPECIFICATIONS C478.
2. POURED–IN–PLACE CONCRETE SHALL HAVE 28 DAYS COMPRESSIVE STRENGTH OF AT LEAST 25 MPa.
3. ALL JOINTS TO BE SET WITH RUBBER GASKET AND SET WITH NON–SHRINK GROUT, INSIDE AND OUT, FOR THE FULL CIRCUMFERENCE.
4. FORM FLOW THROUGH IN PARTIALLY SET CONCRETE AND TROWEL SMOOTH.
5. ALL DIMENSIONS ARE GIVEN IN MILLIMETRES UNLESS OTHERWISE STATED.
6. MAX. DIST. FROM RIM TO TOP RUNG IS 800 mm.
7. BACKFILL AROUND MH. WITH SELECT NATIVE MATERIAL AND COMPACT AS PER STANDARD BACKFILL SPECIFICATIONS.
8. FLAT TOP SECTION TO BE USED FOR MANHOLES UP TO 1.8 m BURY.



PLAN

N.T.S

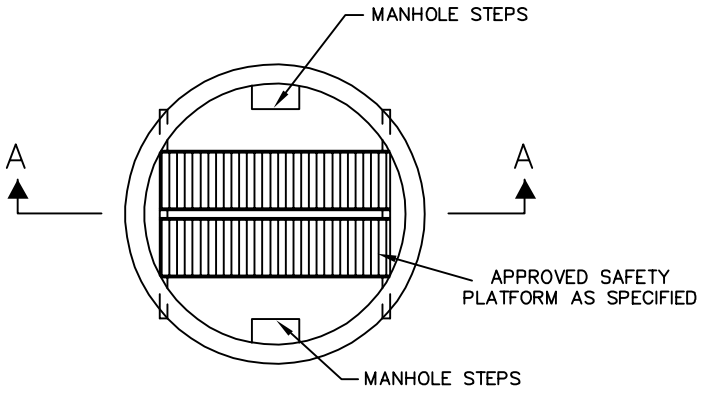
9. ALL JOINTS TO BE WATERTIGHT. METHODS TO BE CONSISTENT WITH SITE CONDITIONS.
10. FOR MANHOLES 5.0 m IN DEPTH AND GREATER, A SAFETY PLATFORM SHALL BE INSTALLED.
11. MANHOLES TO MEET REQUIREMENTS OF MANHOLE DETAILS AND SPECIFICATIONS.
12. LAG BOLTS AND STRAPPING ARE TO BE INSTALLED IMMEDIATELY BELOW THE TEE AND A CONTINUAL 1.0 m VERTICAL SPACING TO THE BASE.
13. DIAMETER, SIZE, AND TYPE OF VERTICAL PIPE TO MATCH INLET PIPE.
14. SAFETY STEPS TO BE PROVIDED, SPACED AT 400 MAX. FIRST STEP 150 MAX. BELOW FRAME, LAST STEP 300 MAX. ABOVE BASE.

LETHBRIDGE COUNTY

TITLE:

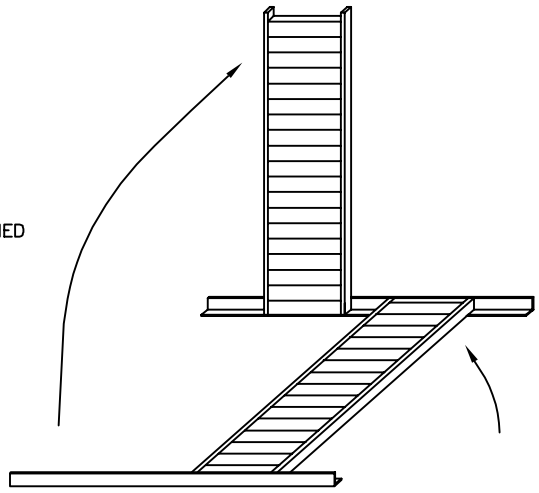
INTERIOR DROP MANHOLE DETAIL

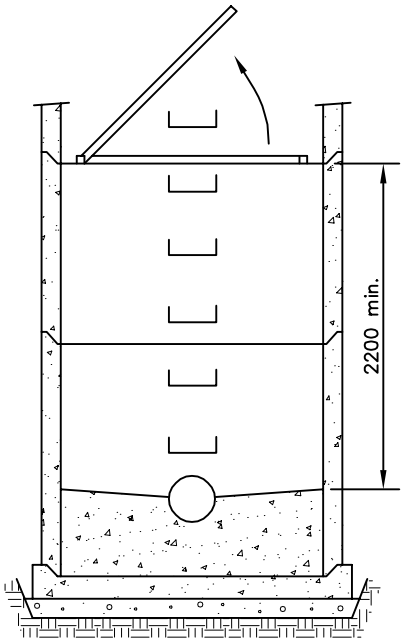
SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	D–102
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



PLAN VIEW

N.T.S





SECTION 'A–A'

N.T.S

NOTES:

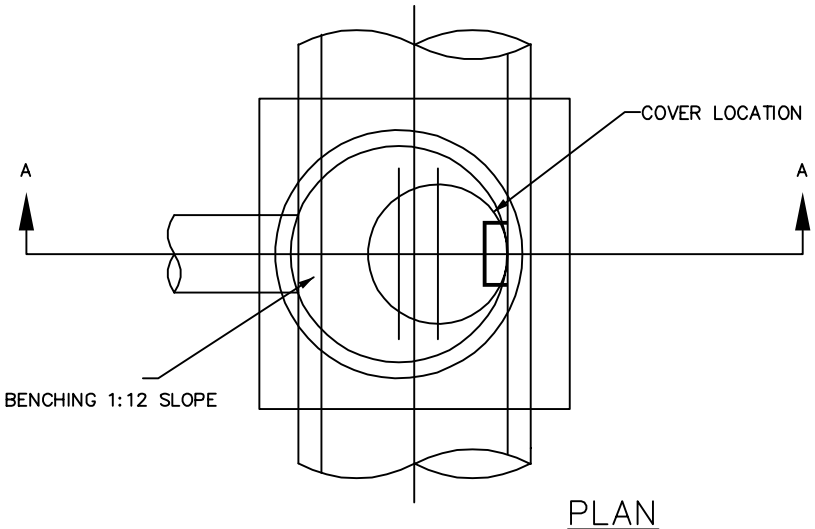
1. TO BE INSTALLED ON MANHOLES GREATER THAN 5.0m DEEP.
2. MAXIMUM SPACING BETWEEN PLATFORMS TO BE 5.0m.
3. ALUMINUM GRATES TO BE MSU MISSISSAUGA OR APPROVED EQUAL.
4. TO BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

LETHBRIDGE COUNTY

TITLE:

MANHOLE SAFETY PLATFORM

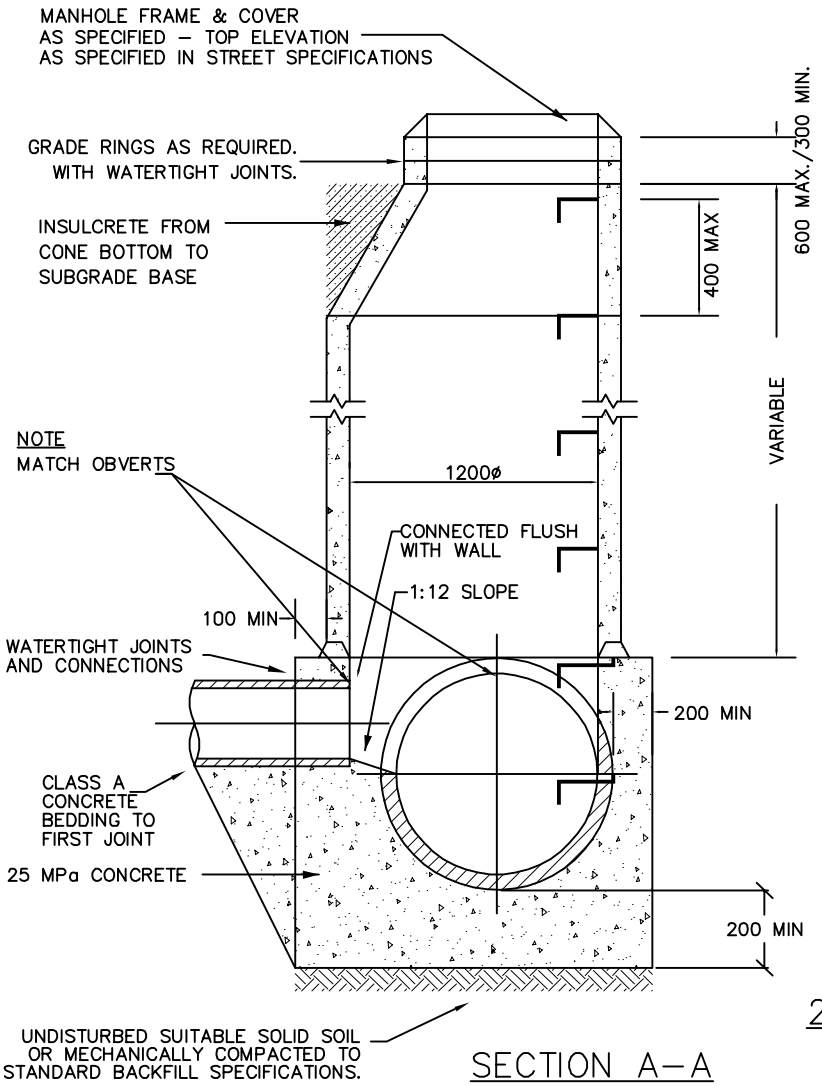
SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	D–103
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



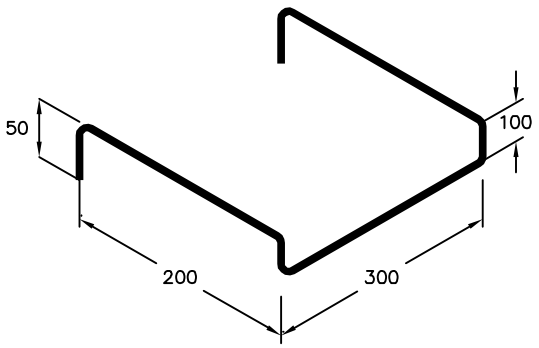
PLAN

NOTES:

1. PRE-CAST CONCRETE COMPONENTS MUST CONFORM TO A.S.T.M. SPECIFICATIONS C478.
2. POURED-IN-PLACE CONCRETE TO HAVE 28 DAYS COMPRESSIVE STRENGTH OF AT LEAST 25 MPa.
3. ALL JOINTS TO BE SET WITH RUBBER GASKET AND FINISHED WITH NON-SHRINK GROUT, INSIDE AND OUTSIDE, FOR THE FULL CIRCUMFERENCE.
4. FORM FLOW TROUGH IN PARTIALLY SET CONCRETE AND TROWEL SMOOTH.
5. ALL DIMENSIONS GIVEN IN MILLIMETRES UNLESS OTHERWISE STATED.
6. MAX. DIST. FROM RIM TO TOP RUNG IS 800 mm.
7. BACKFILL AROUND MH. WITH SELECT NATIVE MATERIAL COMPACT TO STANDARD BACKFILL SPEC.
8. FLAT TOP SECTION TO BE USED FOR MANHOLES UP TO 1.8 m BURY.
9. ALL JOINTS TO BE WATERTIGHT. METHODS TO BE CONSISTENT WITH SITE CONDITIONS.
10. FOR MANHOLES 5.0 m IN DEPTH OR GREATER, A SAFETY PLATFORM SHALL BE INSTALLED.
11. MANHOLES TO MEET REQUIREMENTS OF MANHOLE DETAILS AND SPECIFICATIONS.
12. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCE. FIRST STEP TO BE 150 MAX. BELOW FRAME, LAST STEP TO BE 300 MAX. ABOVE BENCHING.
13. CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.



SECTION A-A



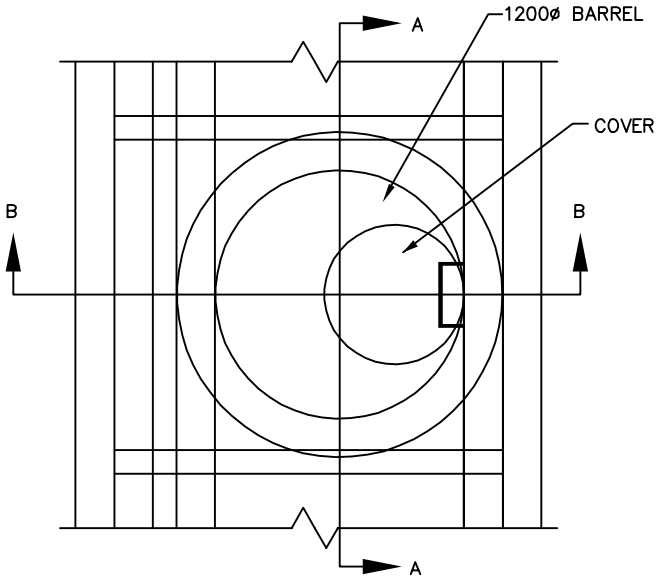
20ø GALVANIZED IRON MANHOLE SAFETY STEPS

LETHBRIDGE COUNTY

TITLE:

TYPICAL PERCHED MANHOLE FOR 600 TO 1500mm DIAMETER PIPES

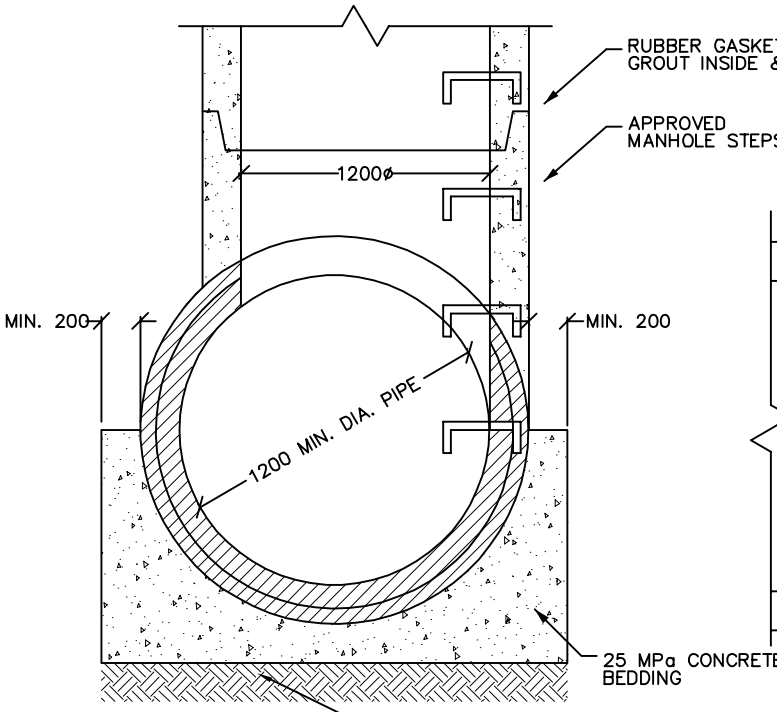
SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	D-104
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



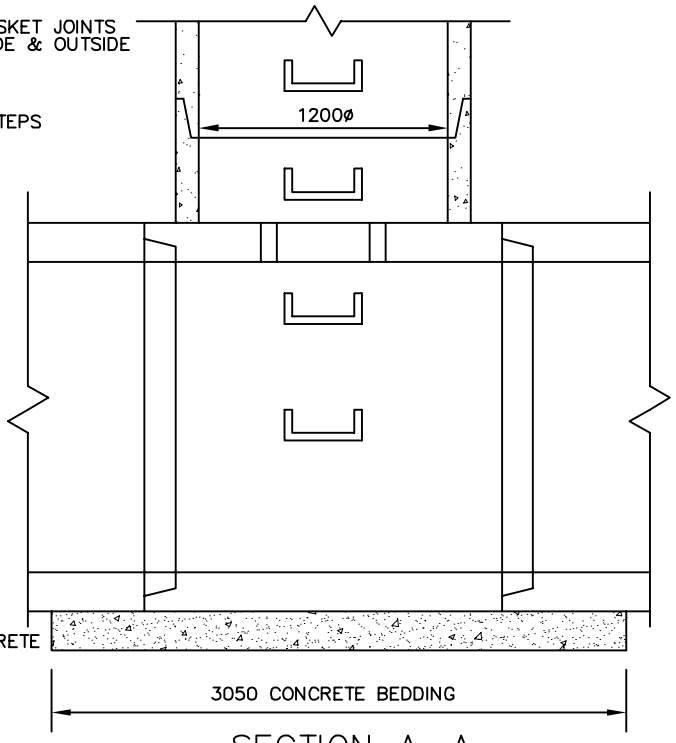
PLAN

NOTES:

1. THIS TYPE OF MANHOLE IS TO BE BUILT ONLY ON MAINS OF 1200 mm DIAMETER OR LARGER AND WHERE THERE IS NO CHANGE IN DIRECTION OF FLOW.
2. ALL PRE-CAST MANHOLES MUST CONFORM TO A.S.T.M. SPECIFICATIONS C478.
3. POURED-IN-PLACE CONCRETE SHALL HAVE A 28 DAYS COMPRESSIVE STRENGTH OF AT LEAST 25 MPa.
4. ALL JOINTS TO BE SET WITH RUBBER GASKETS AND SET WITH NON-SHRINK GROUT, INSIDE AND OUT, FOR THE FULL CIRCUMFERENCE.
5. FORM FLOW TROUGH IN PARTIALLY SET CONCRETE AND TROWEL SMOOTH.
6. ALL DIMENSIONS GIVEN IN MILLIMETRES UNLESS OTHERWISE STATED.
7. MAX. DIST. FROM RIM TO TOP RUNG IS 800 mm.
8. BACKFILL AROUND MH. WITH SELECT NATIVE MATERIALS AND COMPACT TO STANDARD BACKFILL SPEC.
9. ALL JOINTS TO BE WATERTIGHT. METHODS TO BE CONSISTENT WITH SITE CONDITIONS.
10. FOR MANHOLES 5.0 m IN DEPTH OR GREATER, A SAFETY PLATFORM SHALL BE INSTALLED.
11. MANHOLES TO MEET REQUIREMENTS OF MANHOLE DETAILS AND SPECIFICATIONS.
12. SEE DETAIL C-4 FOR TOP OF MANHOLE AND STEP DETAILS.
13. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCE. FIRST STEP TO BE 150 MAX. BELOW FRAME, LAST STEP TO BE MAX. 300 ABOVE BENCHING.



SECTION B-B



SECTION A-A

LETHBRIDGE COUNTY

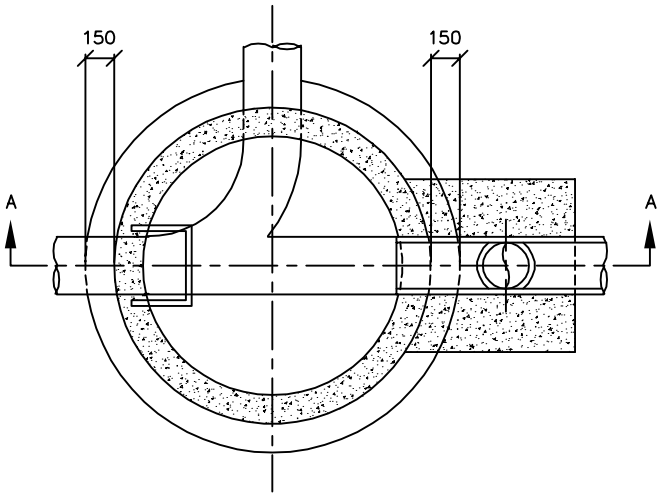
TITLE:

T-RISER MANHOLE FOR PIPES 1200mm AND LARGER

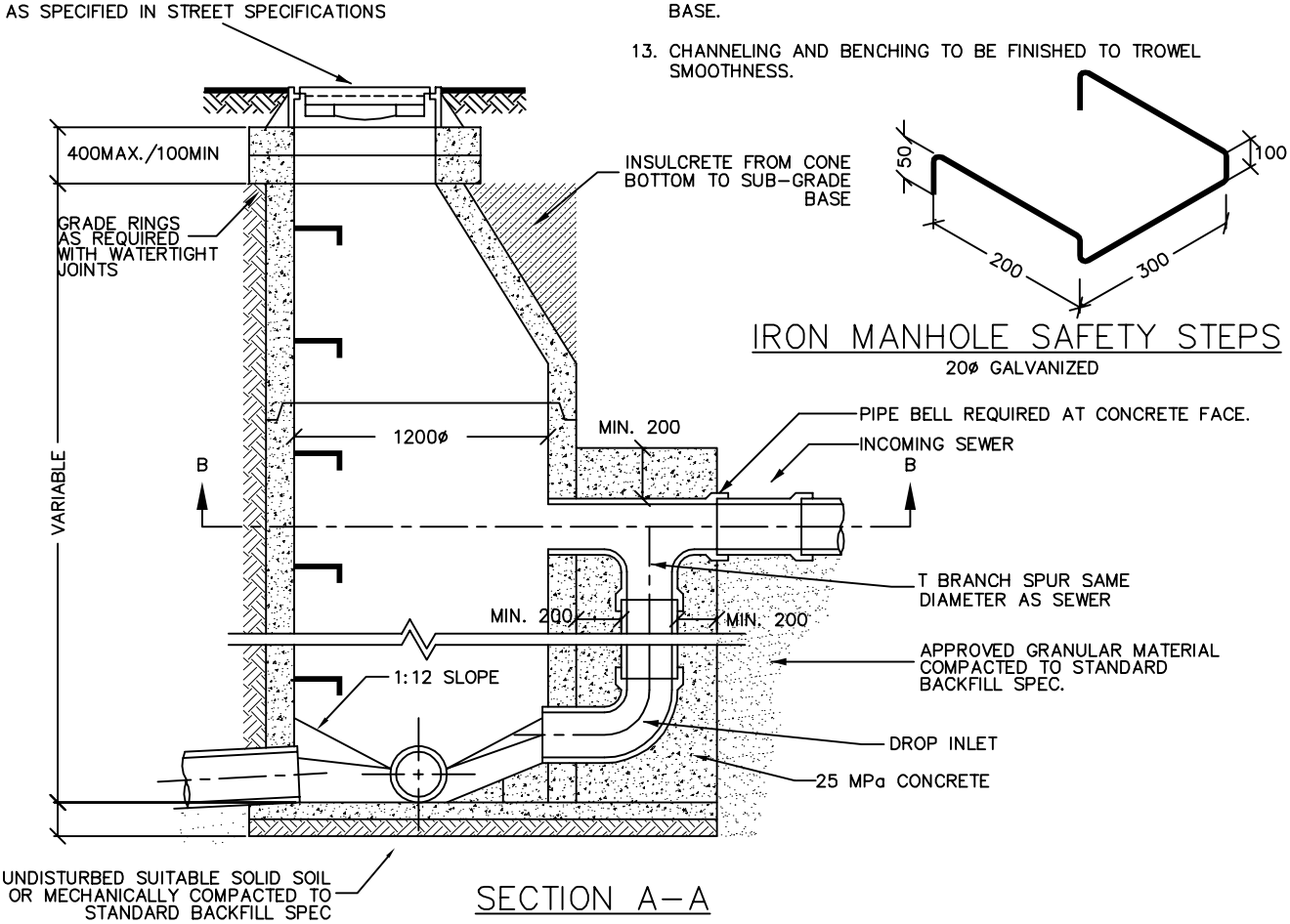
SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	D-105
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES

NOTES:

1. ALL PRE-CAST MANHOLES MUST CONFORM TO A.S.T.M. SPECIFICATIONS C478
2. POURED-IN-PLACE CONCRETE SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF AT LEAST 25 MPa.
3. ALL JOINTS TO BE SET WITH RUBBER GASKET AND SET WITH NON-SHRINK GROUT, INSIDE AND OUT, AROUND FULL CIRCUMFERENCE.
4. FORM FLOW TROUGH IN PARTIALLY SET CONCRETE AND TROWEL SMOOTH.
5. ALL DIMENSIONS GIVEN IN MILLIMETRES.
6. MAX. DIST. FROM RIM TO TOP RUNG IS 800 mm.
7. BACKFILL AROUND MH. WITH SELECT NATIVE MATERIAL COMPACT TO STANDARD BACKFILL SPEC.
8. FLAT TOP SECTION TO BE USED FOR MANHOLES UP TO 1.8 m BURY.
9. ALL JOINTS TO BE WATERTIGHT. METHODS TO BE CONSISTENT WITH SITE CONDITIONS.
10. FOR MANHOLES 5.0 m IN DEPTH OR GREATER, A SAFETY PLATFORM SHALL BE INSTALLED.
11. MANHOLES TO MEET REQUIREMENTS OF MANHOLE DETAILS AND SPECIFICATIONS.
12. SAFETY STEPS TO BE PROVIDED, SPACED AT 400 MAX. FIRST STEP 150 MAX. BELOW FRAME, LAST STEP 300 MAX. ABOVE BASE.
13. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.



PLAN SECTION B-B

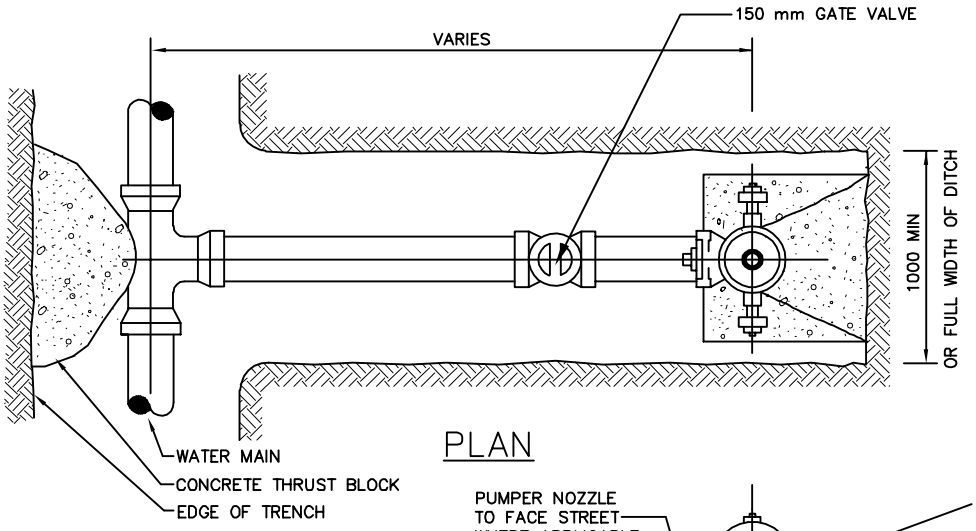


SECTION A-A

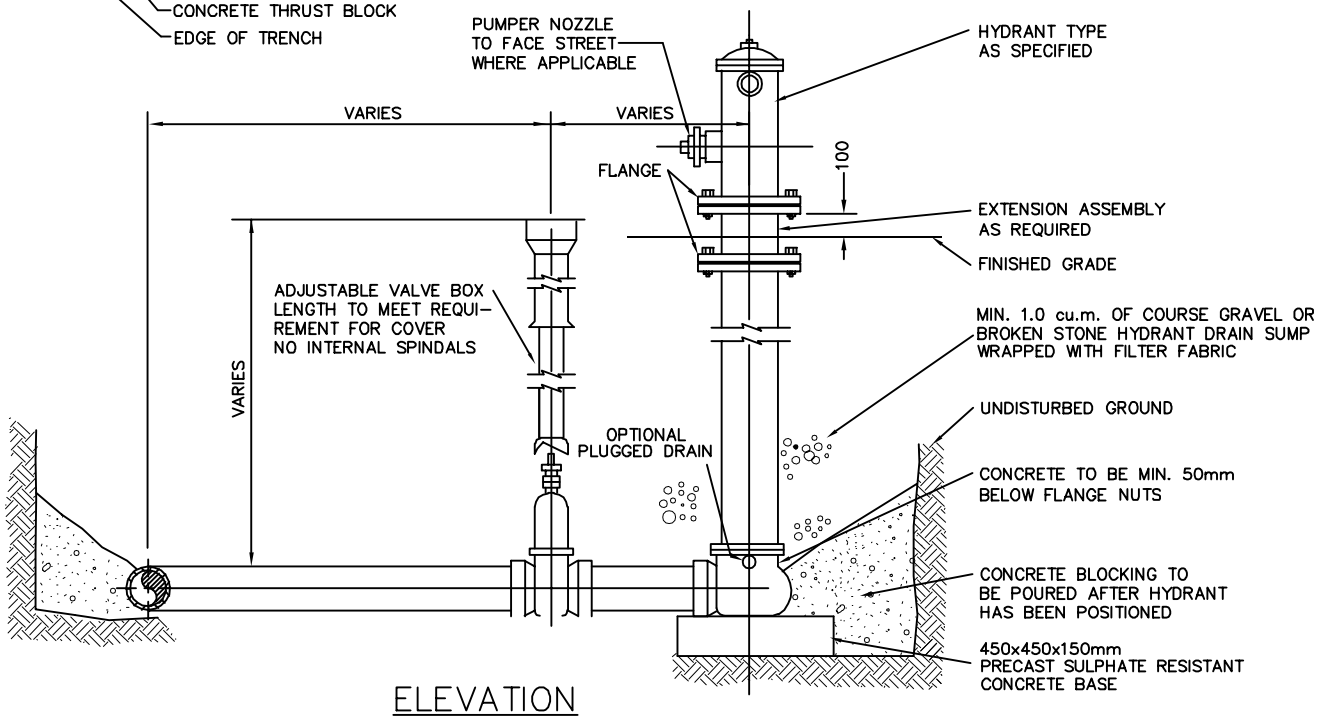
IRON MANHOLE SAFETY STEPS

20ø GALVANIZED

LETHBRIDGE COUNTY	TITLE: EXTERNAL DROP MANHOLE	SCALE: N.T.S DATE: JANUARY 2019 STD. DWG NO. D-106 APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES



PLAN



ELEVATION

NOTES:

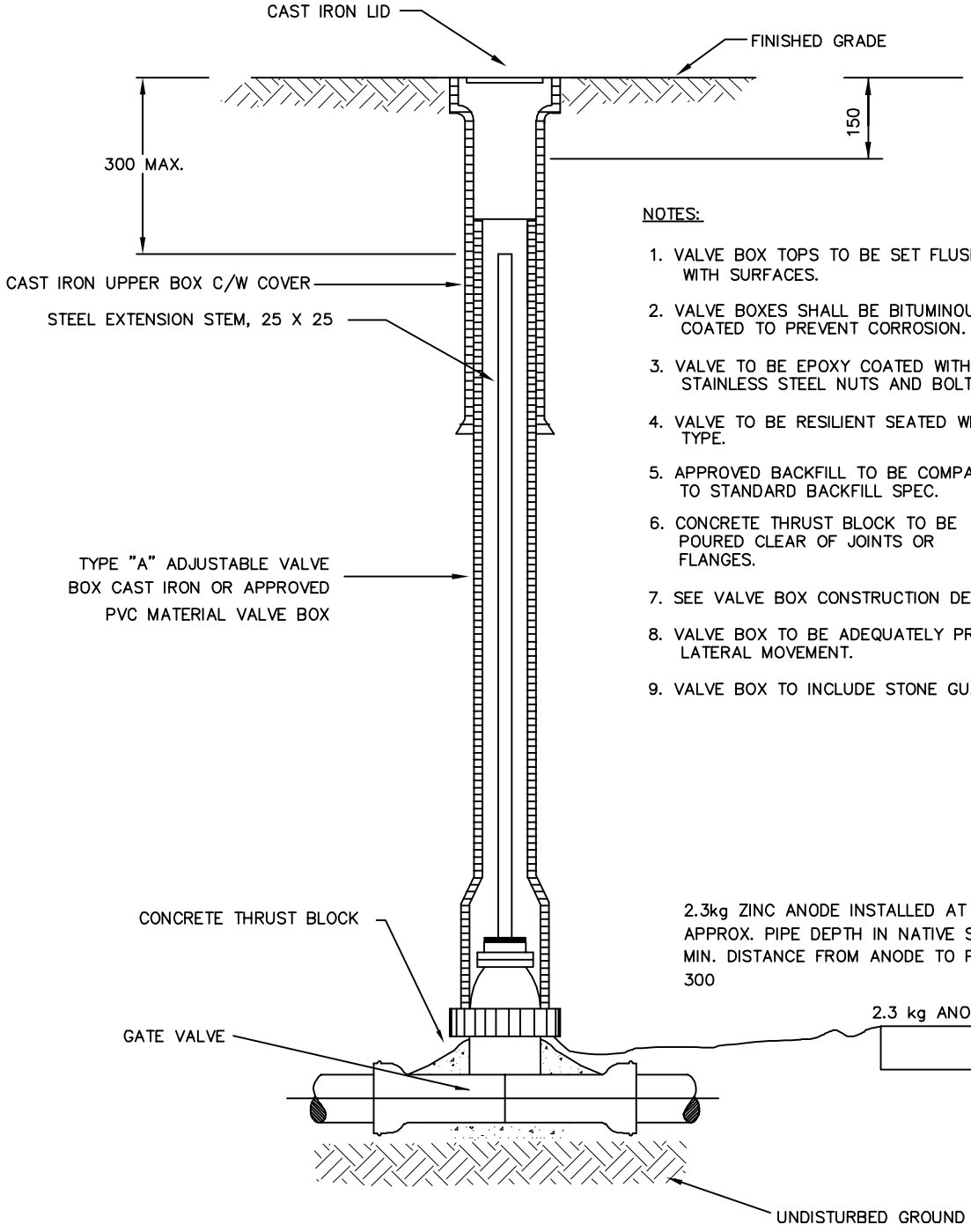
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. CONCRETE TO BE 25 MPa @ 28 DAYS.
3. HYDRANTS SHALL BE COMPRESSION TYPE CONFORMING TO AWWA C502 COMPLETE WITH OPTIONAL PLUGGED DRAINS, STAINLESS STEEL BOLTS AND ASPHALTIC COATED HYDRANT COMPONENTS.
4. PROVIDE CATHODIC PROTECTION AS SHOWN ON STD. DWG. NO. A–110
5. THRUST BLOCKS TO BE PLACED AGAINST UNDISTURBED GROUND HAVING A MINIMUM BEARING OF 7300 kg/m²
6. CONCRETE TO BE POURED CLEAR OF ALL FLANGES, JOINTS, AND HYDRANT DRAIN.
7. APPROVED BACKFILL TO BE COMPACTED TO STANDARD BACKFILL SPEC.
8. DO NOT ALLOW PONDING OR STANDING WATER AROUND HYDRANT
9. PLACEMENT OF HYDRANT AND ORIENTATION OF PUMPER NOZZLE TO BE APPROVED.

LETHBRIDGE COUNTY

TITLE:

OFF–LINE HYDRANT DETAIL

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	E–101
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



NOTES:

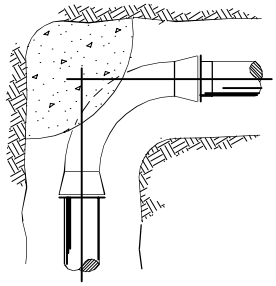
1. VALVE BOX TOPS TO BE SET FLUSH WITH SURFACES.
2. VALVE BOXES SHALL BE BITUMINOUS COATED TO PREVENT CORROSION.
3. VALVE TO BE EPOXY COATED WITH STAINLESS STEEL NUTS AND BOLTS.
4. VALVE TO BE RESILIENT SEATED WEDGE TYPE.
5. APPROVED BACKFILL TO BE COMPACTED TO STANDARD BACKFILL SPEC.
6. CONCRETE THRUST BLOCK TO BE POURED CLEAR OF JOINTS OR FLANGES.
7. SEE VALVE BOX CONSTRUCTION DETAIL.
8. VALVE BOX TO BE ADEQUATELY PROTECTED AGAINST LATERAL MOVEMENT.
9. VALVE BOX TO INCLUDE STONE GUARD.

LETHBRIDGE COUNTY

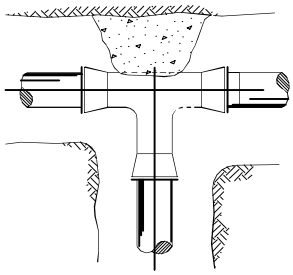
TITLE:

MAIN VALVE CASTING DETAIL

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	E–102
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



HORIZONTAL 90° BEND



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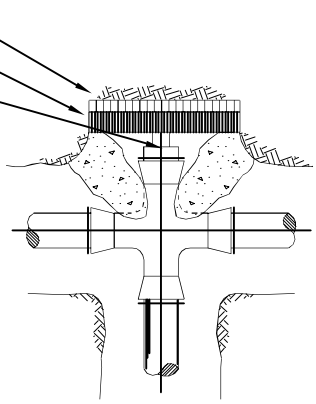
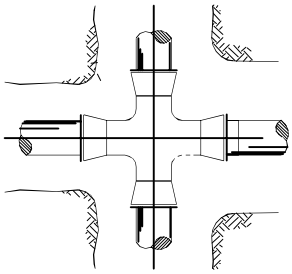
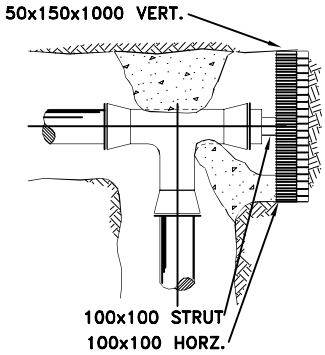


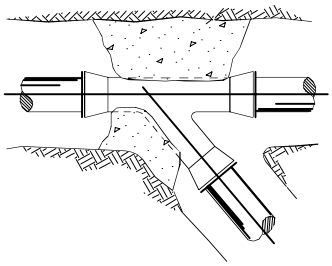
CROSS WITH PLUG



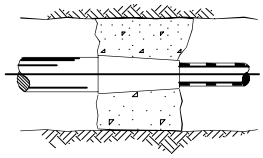
CROSS



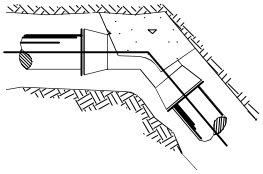
TEE WITH PLUG



WYE



REDUCER



HORIZONTAL BENDS

NOTES:

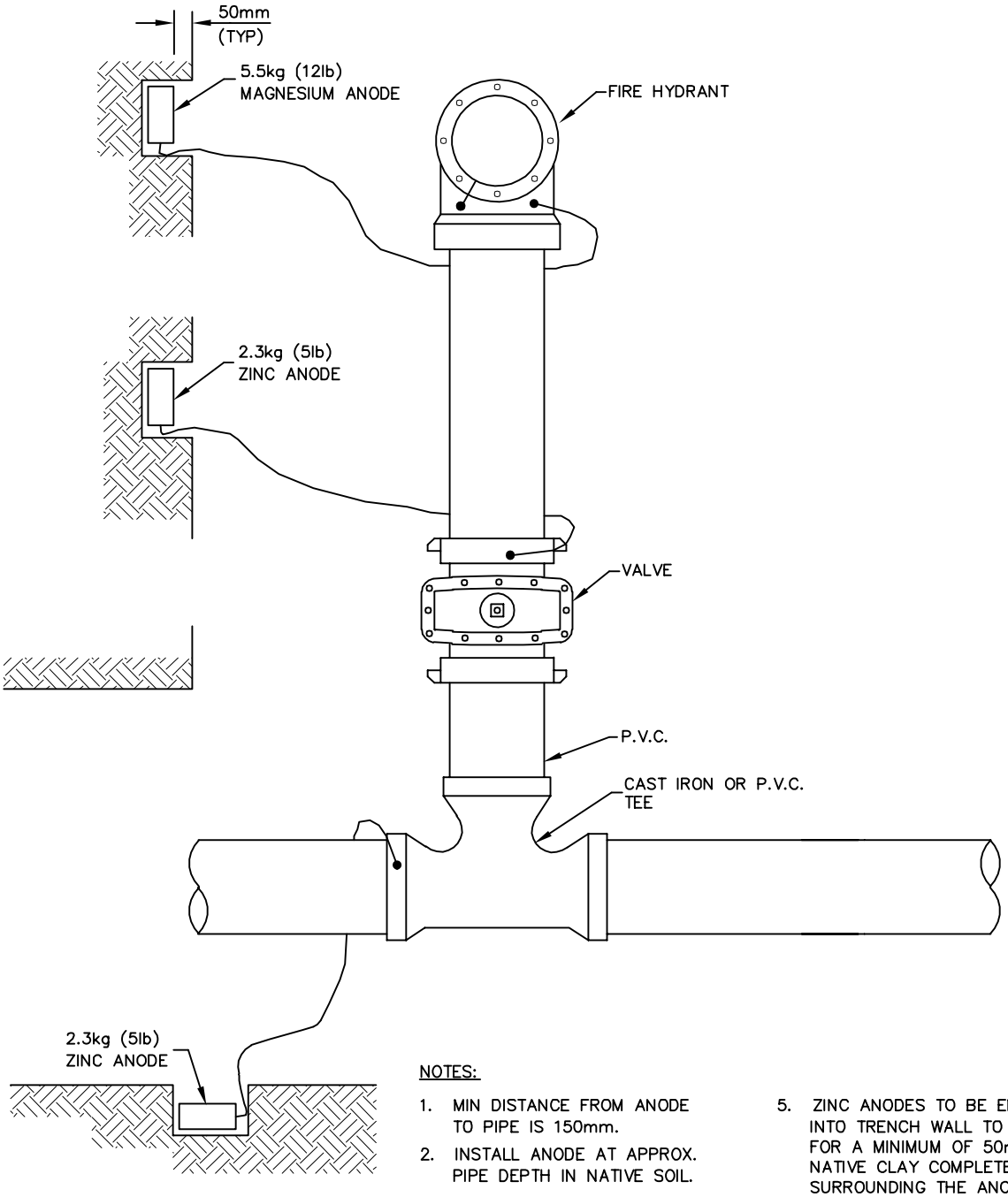
1. ALL DIMENSIONS IN MILLIMETRES.
2. ALL FITTINGS TO BE WRAPPED IN 6 ML POLYETHYLENE PRIOR TO POURING CONCRETE.
3. ALL CONCRETE TO BE MIN. 28 MPa @ 28 DAYS.
4. THE REQUIRED BEARING AREA SHALL BE DETERMINED BY THE CONTRACTOR TO SUIT SOIL CONDITIONS.

LETHBRIDGE COUNTY

TITLE:

THRUST BLOCK DETAILS

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	E-103
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



NOTES:

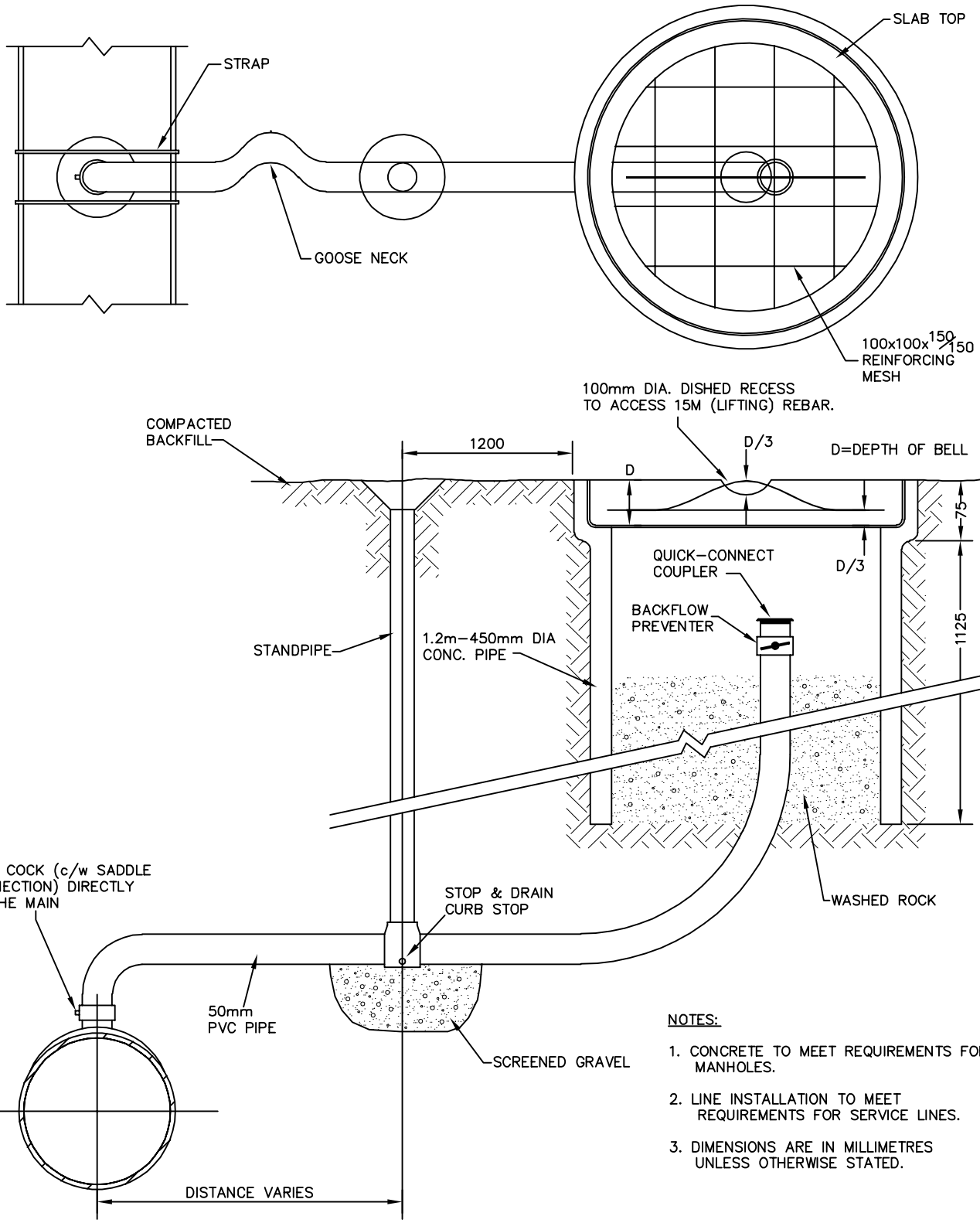
1. MIN DISTANCE FROM ANODE TO PIPE IS 150mm.
2. INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL.
3. ALL ZINC ANODES ON FITTINGS AND VALVES ARE 2.3 kg (5lb).
4. ALL ZINC ANODES ON HYDRANTS ARE 5.5 kg (12lb).
5. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
6. ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCK.
7. REPLACE CLAY OVER ANODES AND COMPACT.

LETHBRIDGE COUNTY

TITLE:

TYPICAL ANODE INSTALLATION AT VALVES IRON FITTINGS & HYDRANTS

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	E-104
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



NOTES:

1. CONCRETE TO MEET REQUIREMENTS FOR MANHOLES.
2. LINE INSTALLATION TO MEET REQUIREMENTS FOR SERVICE LINES.
3. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.

LETHBRIDGE COUNTY

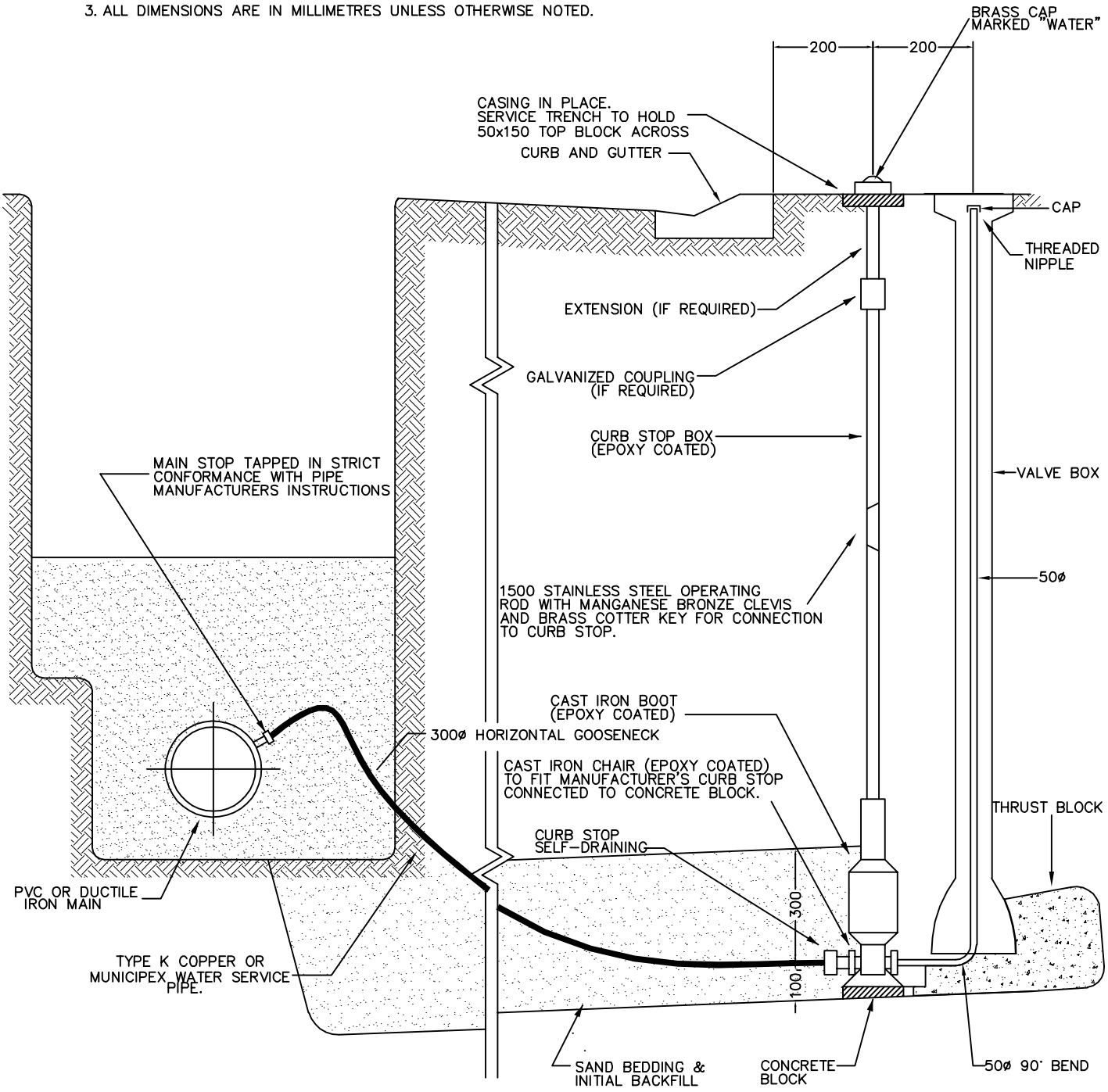
TITLE:

AIR RELIEF VALVE AND FLUSHING CHAMBER

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	E-105
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES

NOTES:

1. COPPER LINE SHALL BE ONE CONTINUOUS PIECE, UNLESS LENGTH EXCEEDS 30m MIN. AND ONLY THEN WILL A DOUBLE UNION BE ALLOWED.
2. INVERT ELEVATION SHALL BE 3.0m BELOW ESTABLISHED FINISHED GRADE,
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

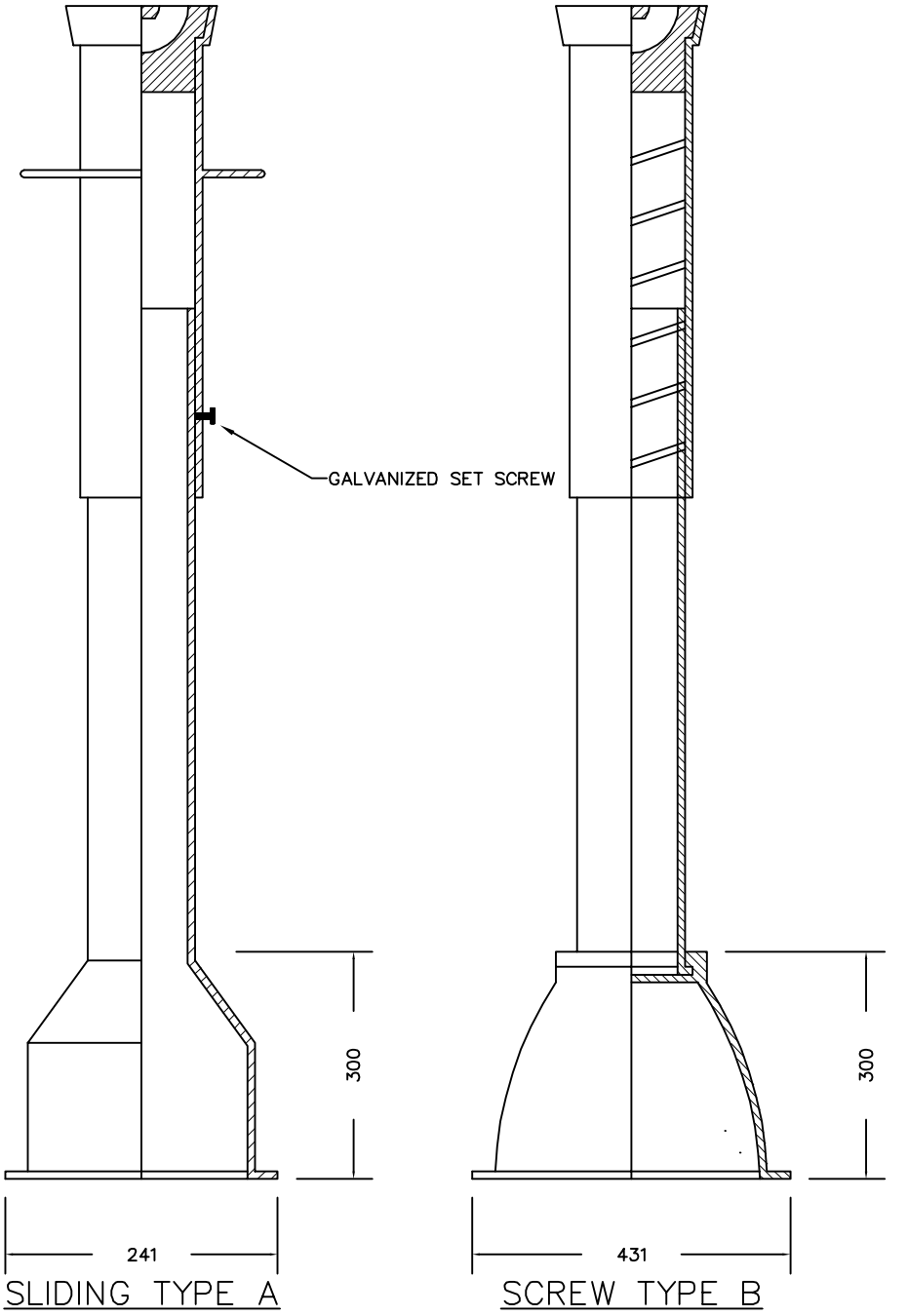


LETHBRIDGE COUNTY	TITLE: BLOW-OFF VALVE	SCALE: N.T.S DATE: JANUARY 2019 STD. DWG NO. E-106 APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES

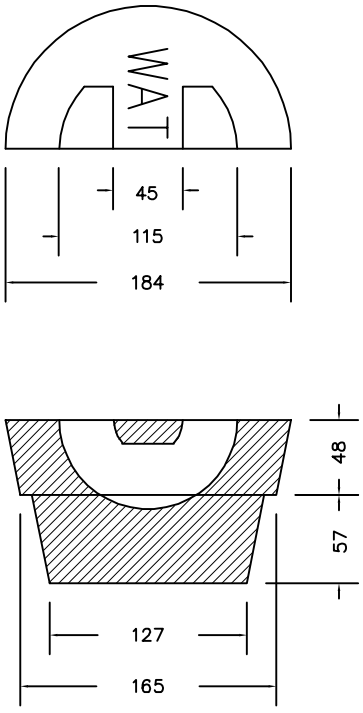
STANDARD VALVE PLUG

NOTES:

1. VALVE BOXES SHALL BE EXTERNALLY AND INTERNALLY COATED WITH ASPHALTIC OR EPOXY COATING.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.



PLUG C/W CORED HANDHOLES AND MARKED 'WATER'

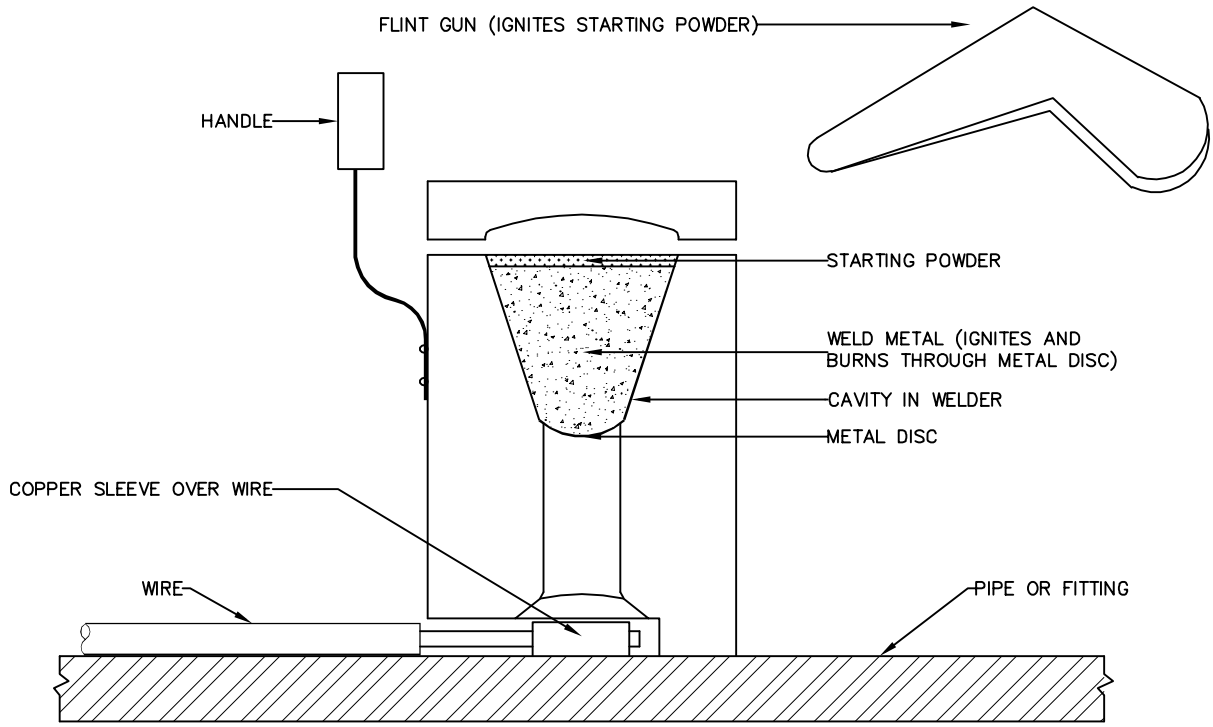


LETHBRIDGE COUNTY

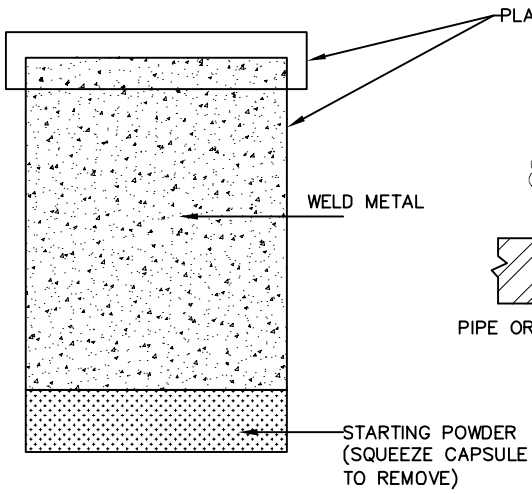
TITLE:

VALVE BOX DETAIL SLIDING TYPE A AND SCREW TYPE B

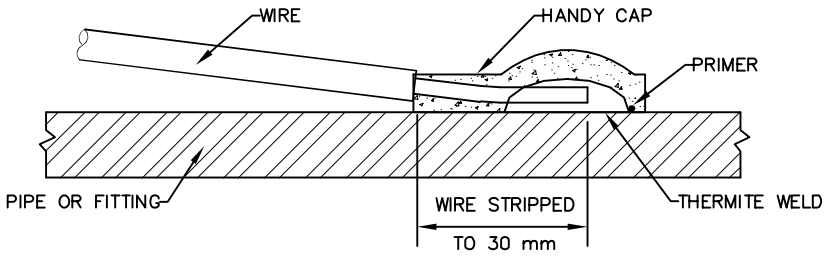
SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	E–107
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



CADWELD



WELD METAL CAPSULE



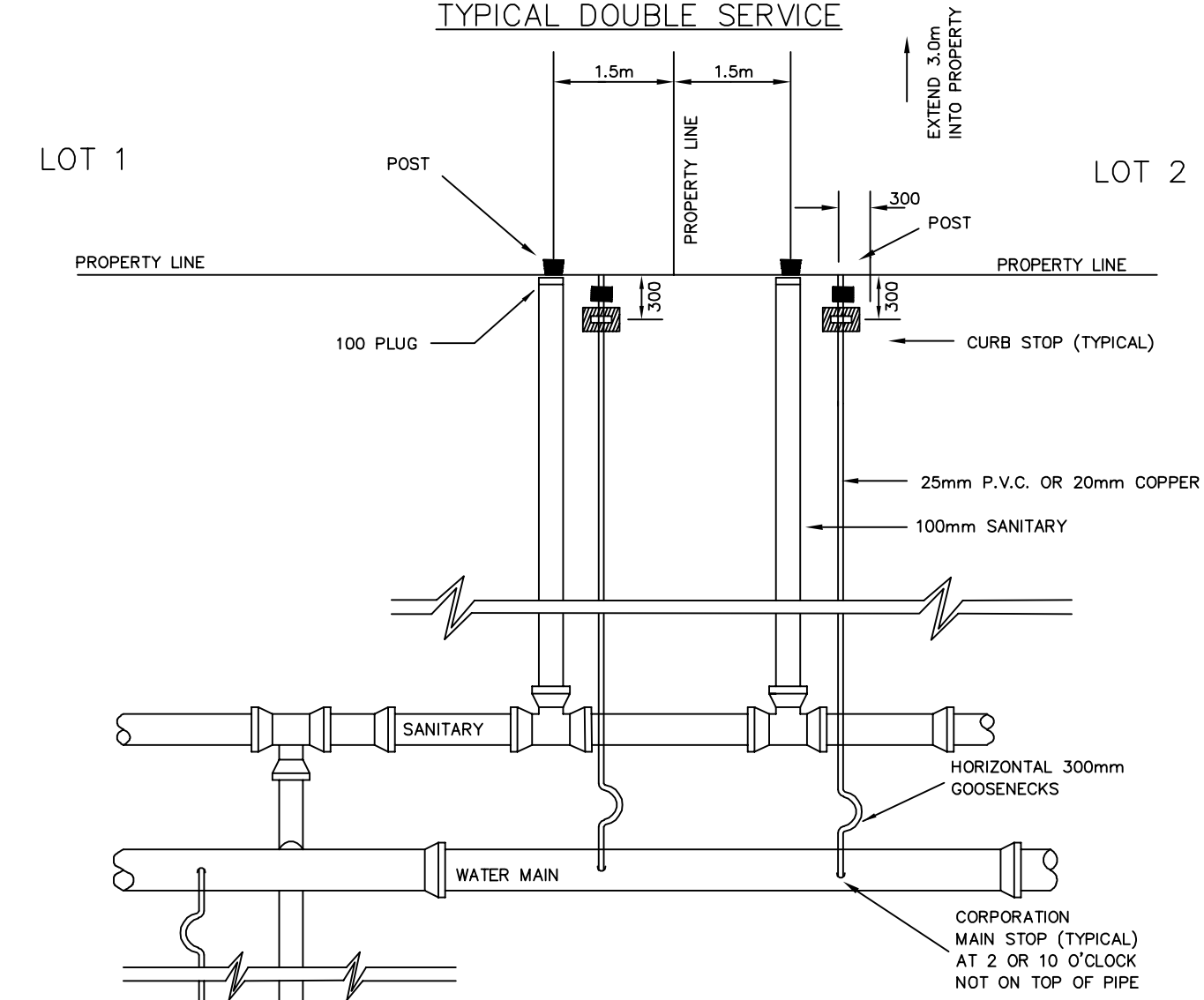
FINISHED WELD

NOTES:

1. CADWELD TO BE PERFORMED AS PER MANUFACTURERS SPECIFICATIONS

LETHBRIDGE COUNTY	TITLE: ANODE INSTALLATION CADWELD	SCALE: N.T.S DATE: JANUARY 2019 STD. DWG NO. E-108 APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES

TYPICAL DOUBLE SERVICE



LOT 24

TYPICAL SINGLE SERVICE

℄ OF LOT

NOTES:

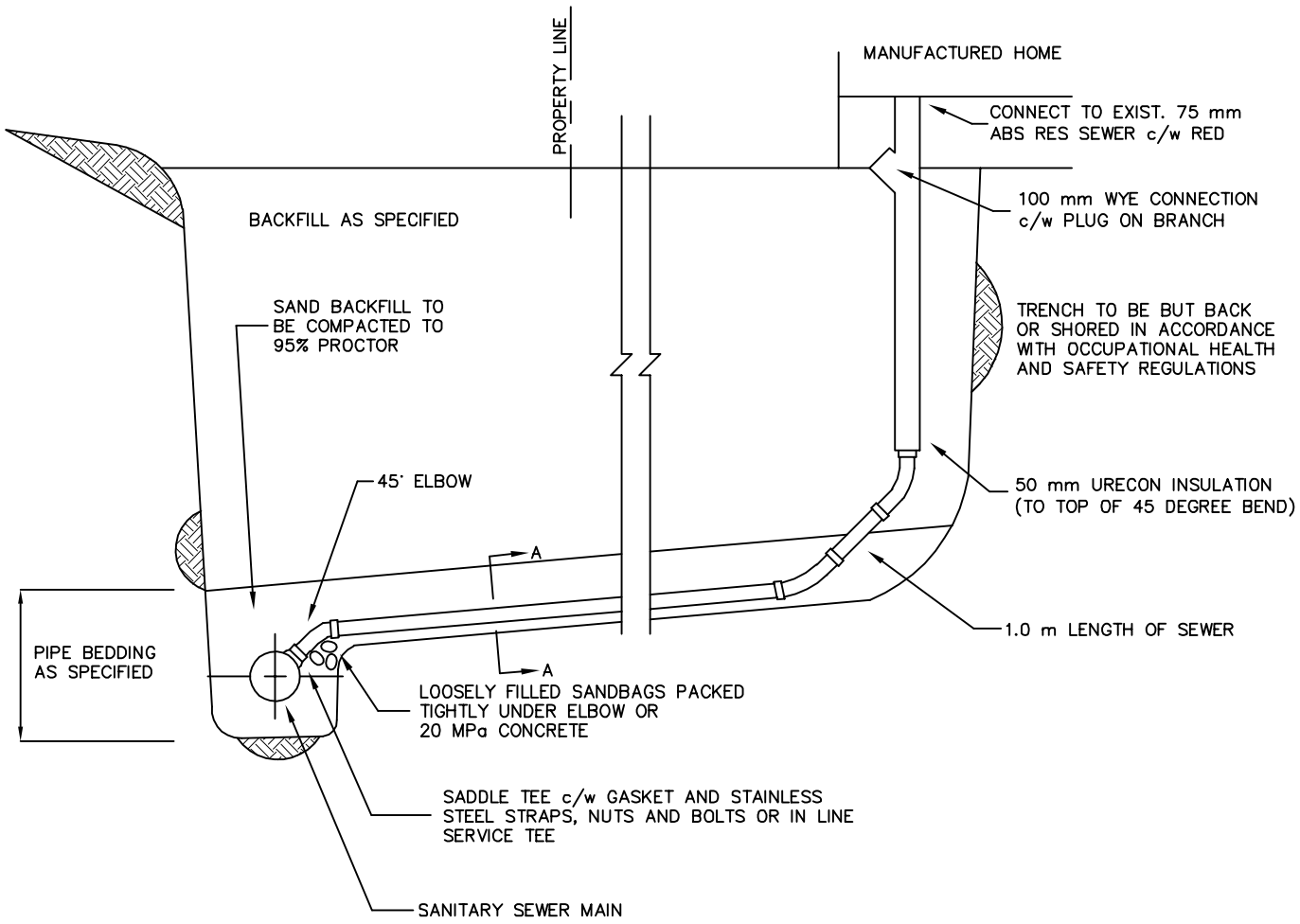
1. THE COUNTY IS NOT RESPONSIBLE FOR OWNERSHIP OR MAINTENANCE OF SERVICES ON PRIVATE PROPERTY.
2. ENDS OF SERVICES TO BE MARKED WITH A 50mm x 100mm STAKE PROTRUDING 700mm ABOVE GROUND PAINTED AS FOLLOWS:
   A. CURBSTOP – BLUE
   B. END OF SERVICE IN SEPERATE TRENCH – GREEN
   C. END OF WATER SERVICE INSIDE PRIVATE PROPERTY – BLUE
3. WHERE STORM SEWER SERVICE IS TO BE INSTALLED, PLACE 0.3m FROM SANITARY ON FAR SIDE FROM WATER.
4. SEWER SERVICES MUST BE PROPERLY CAPPED.
5. ALL DIMENSIONS GIVEN IN MILLIMETRES UNLESS OTHERWISE STATED.
6. THE COUNTY MAY REQUIRE ALTERNATE PLACEMENT OF CURB STOP.

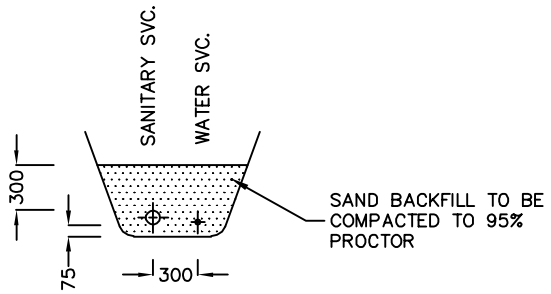
LETHBRIDGE COUNTY

TITLE:

SINGLE AND DOUBLE SERVICE LAYOUT

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	F–101
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES





SECTION A

NOTES:

1. MIN. SLOPE FOR 100 mm DIA. PIPE IS 2%.
2. SERVICE CONNECTIONS SHALL BE 100 mm UNLESS SPECIFICALLY SHOWN ON THE DRAWINGS.
3. 50 mm URECON INSULATION WILL BE REQUIRED.
4. TRENCH TO BE CUT BACK OR SHORED IN ACCORDANCE WITH OCCUPATIONAL HEALTH AND SAFETY REGULATIONS.

LETHBRIDGE COUNTY

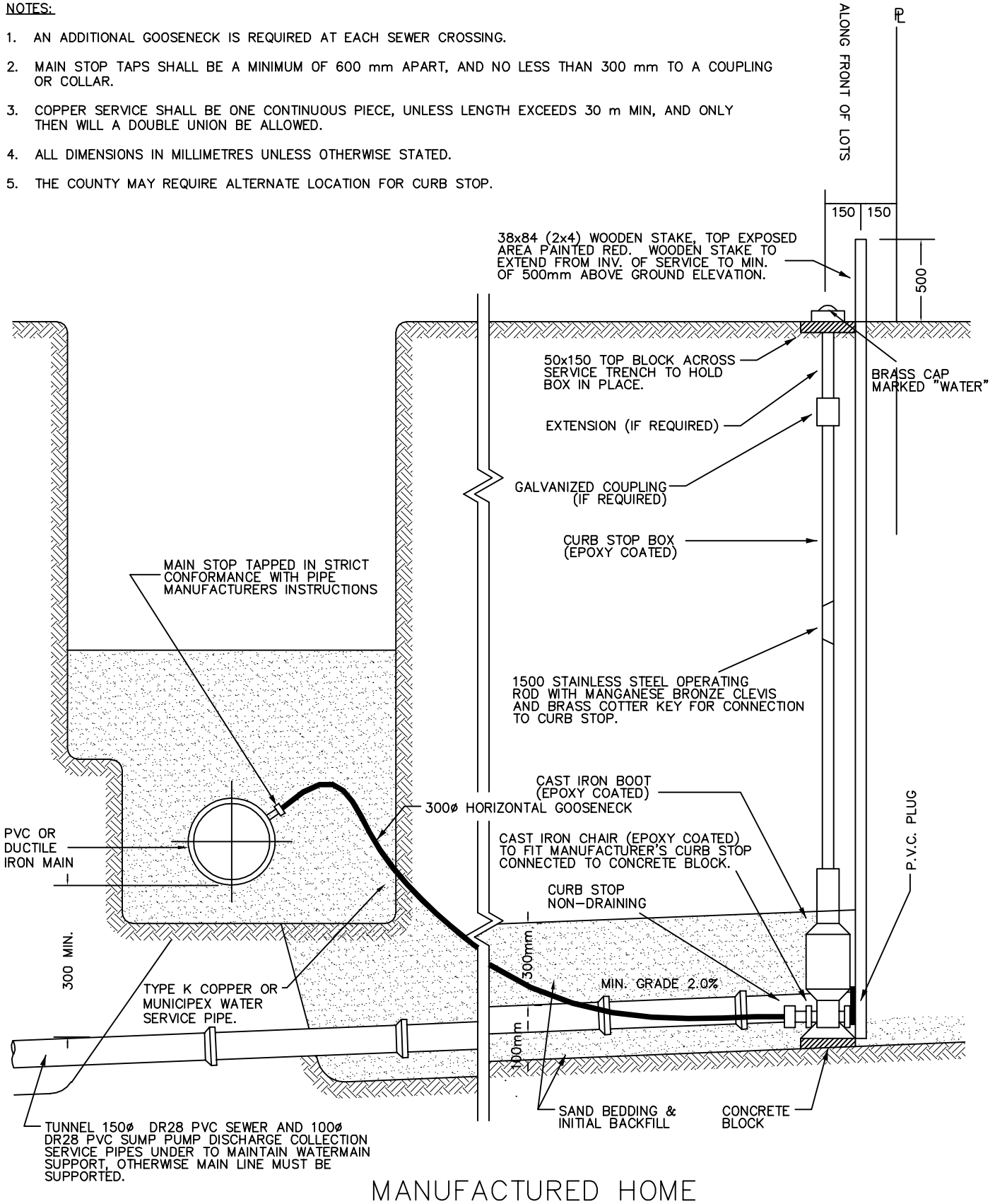
TITLE:

SANITARY SERVICE CONNECTION MANUFACTURED HOME

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	F–102
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES

NOTES:

1. AN ADDITIONAL GOOSENECK IS REQUIRED AT EACH SEWER CROSSING.
2. MAIN STOP TAPS SHALL BE A MINIMUM OF 600 mm APART, AND NO LESS THAN 300 mm TO A COUPLING OR COLLAR.
3. COPPER SERVICE SHALL BE ONE CONTINUOUS PIECE, UNLESS LENGTH EXCEEDS 30 m MIN, AND ONLY THEN WILL A DOUBLE UNION BE ALLOWED.
4. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.
5. THE COUNTY MAY REQUIRE ALTERNATE LOCATION FOR CURB STOP.



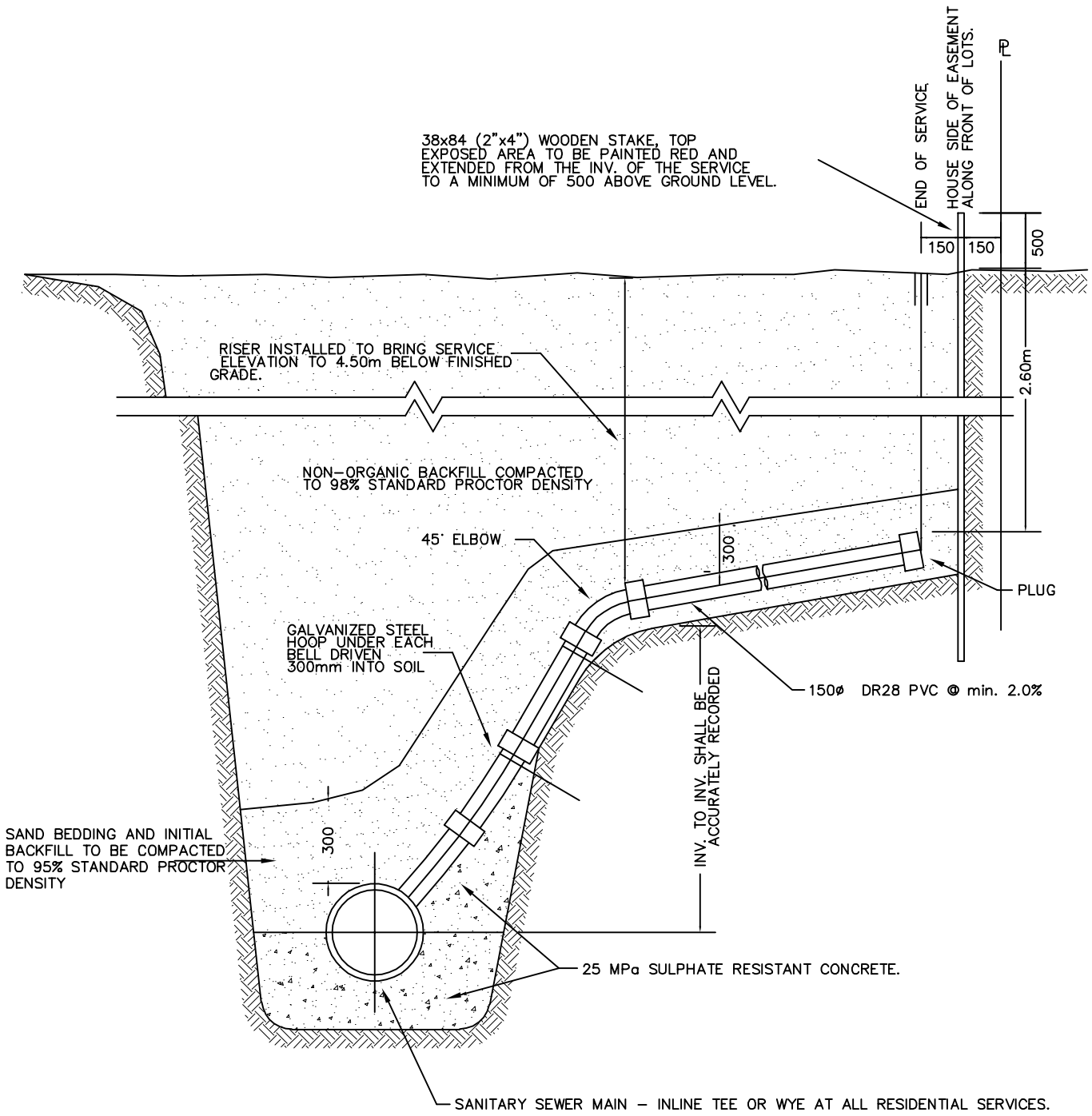
LETHBRIDGE COUNTY

TITLE: TYPICAL 50 mm AND SMALLER RESIDENTIAL WATER, 150 mm SANITARY SEWER AND 100 mm SUMP PUMP DISCHARGE COLLECTOR SYSTEM

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	F-103
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES

NOTES:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

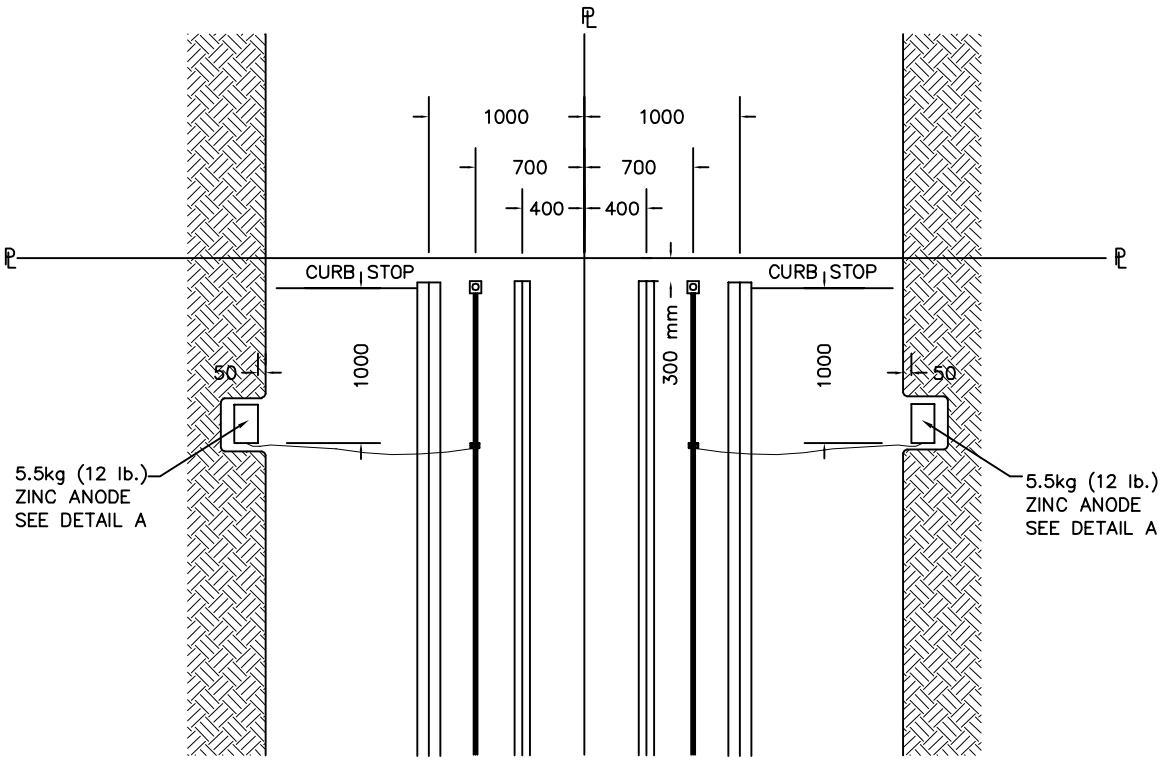


LETHBRIDGE COUNTY

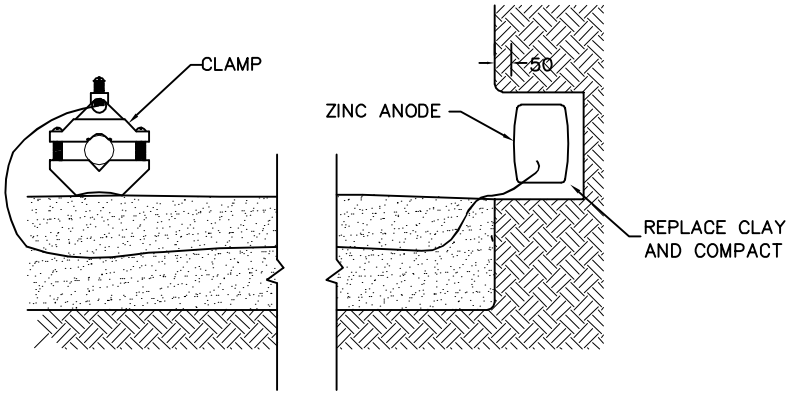
TITLE:

RESIDENTIAL SANITARY SEWER SERVICE RISER CONNECTION

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	F–104
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



PLAN VIEW
SCALE: 1:50



DETAIL A

NOTES:

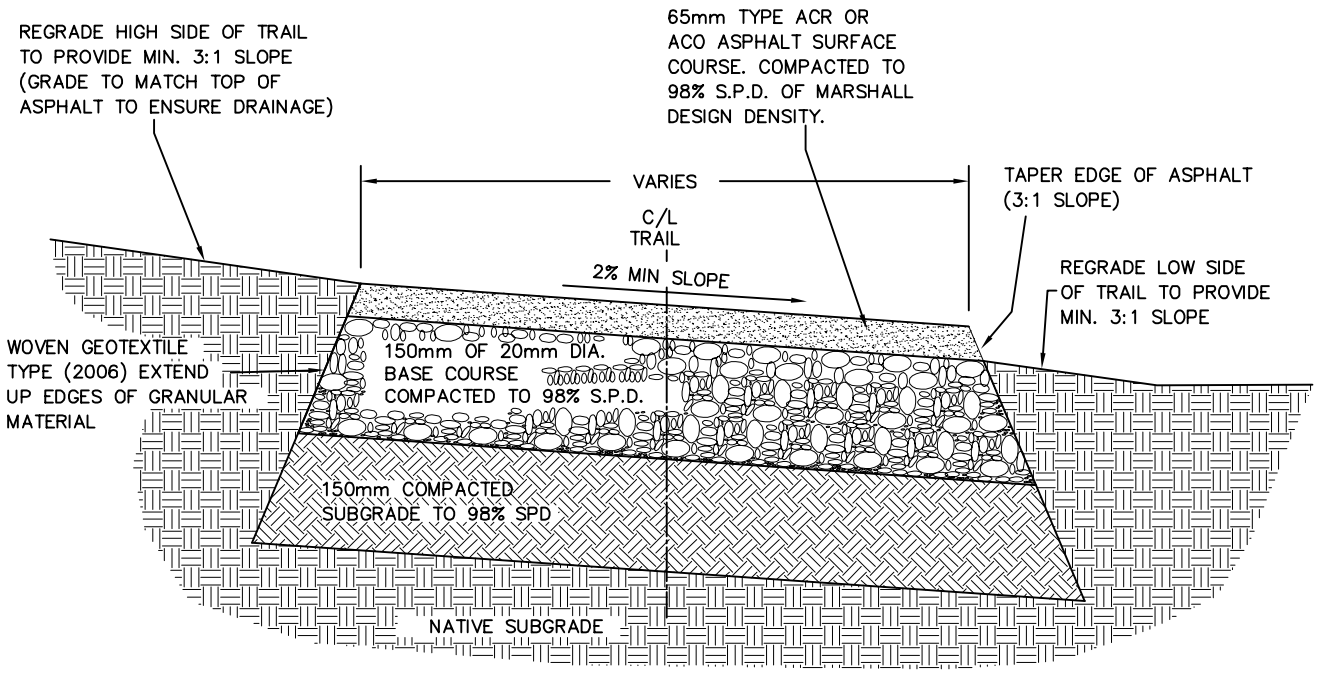
1. PIPE CLAMP TO BE ALL BRASS OR APPROVED EQUIVALENT
2. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm COMPACTED SOIL COMPLETELY AROUND ANODES.
3. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

LETHBRIDGE COUNTY

TITLE:

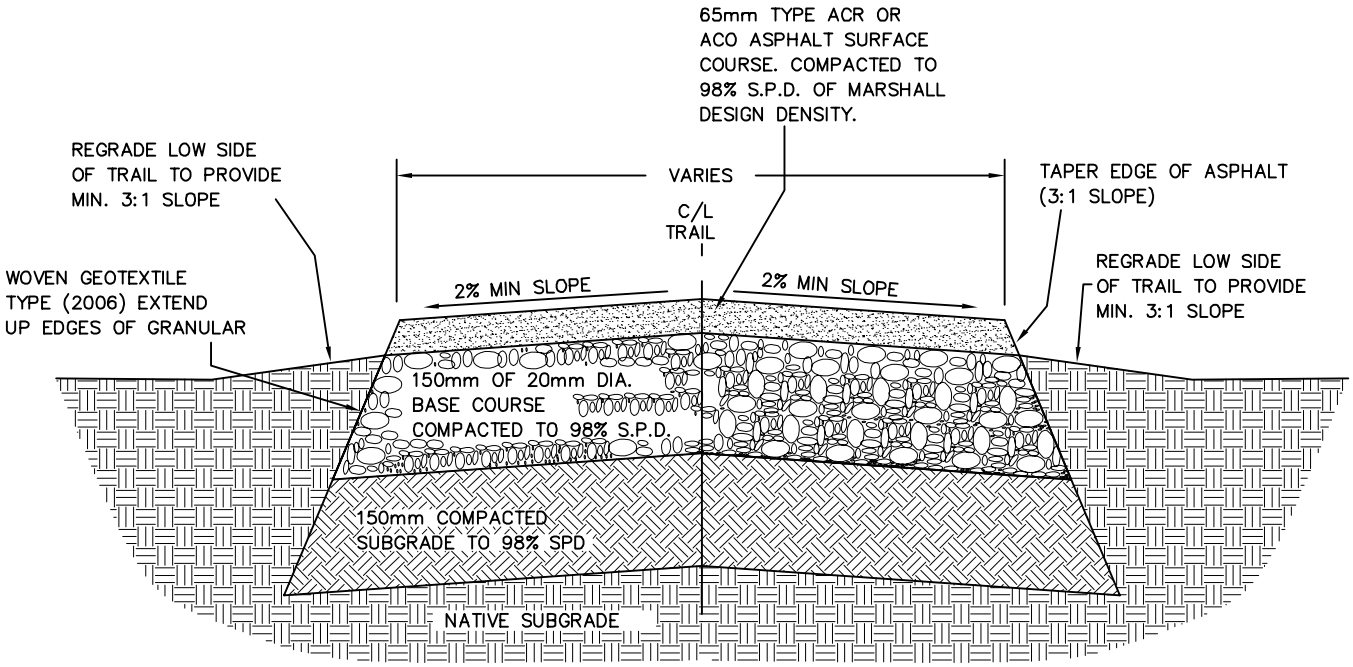
ANODE ON 50 mm AND SMALLER COPPER WATER SERVICE

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	F–105
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



TYPICAL TRAIL SECTION – CROSSFALL

NTS



TYPICAL TRAIL SECTION – CROWN

NTS

NOTES:

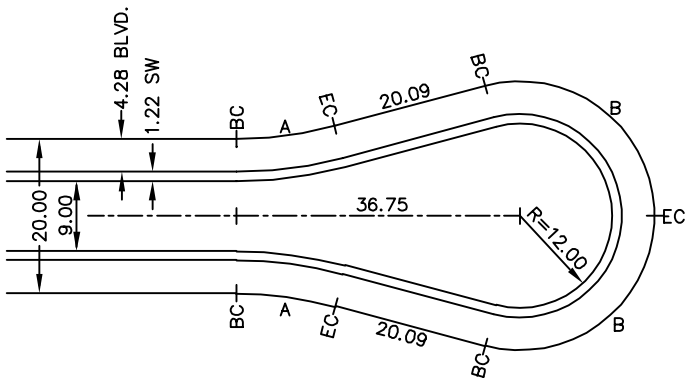
1. ALL DIMENSIONS ARE IN MILLIMETRES
2. MAKE ALL JOINTS WITH EXISTING VEGETATION SMOOTH AND CONTINUOUS, WHERE NECESSARY TRIM BACK ROOTS AND CLEAR DEBRIS
3. WHERE THE COUNTY CHOOSES TO DELETE ASPHALT, INCREASE GRAVEL THICKNESS ACCORDINGLY. MAINTAIN GRADE AS SHOWN.

LETHBRIDGE COUNTY

TITLE:

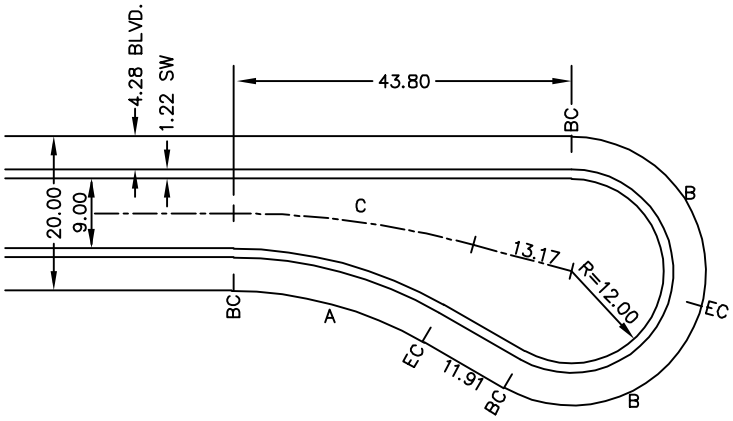
TYPICAL TRAIL CROSS–SECTIONS

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–101
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



CURVE "A"
Δ = 15°00'00"
R = 50.00
ARC = 13.09
TAN = 6.58
(at property line)

CURVE "B"
Δ = 105°00'00"
R = 17.5
ARC = 32.07
TAN = 22.81
(at property line)



CURVE "A"
Δ = 30°00'00"
R = 50.00
ARC = 26.18
TAN = 13.40
(at property line)

CURVE "B"
Δ = 105°00'00"
R = 17.5
ARC = 32.03
TAN = 22.81
(at property line)

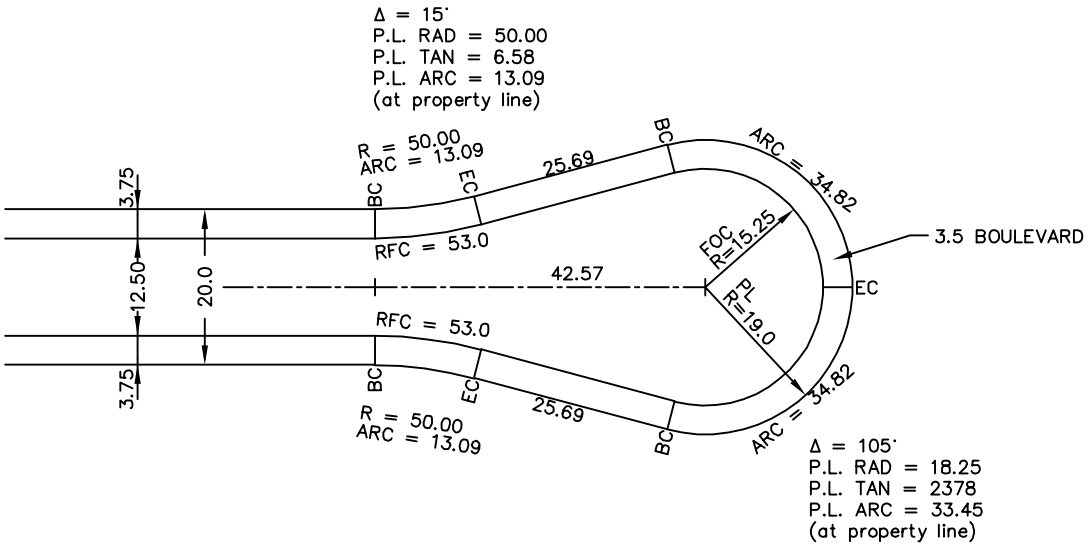
CURVE "C"
Δ = 15°00'00"
R = 120.09
ARC = 31.44
TAN = 15.81

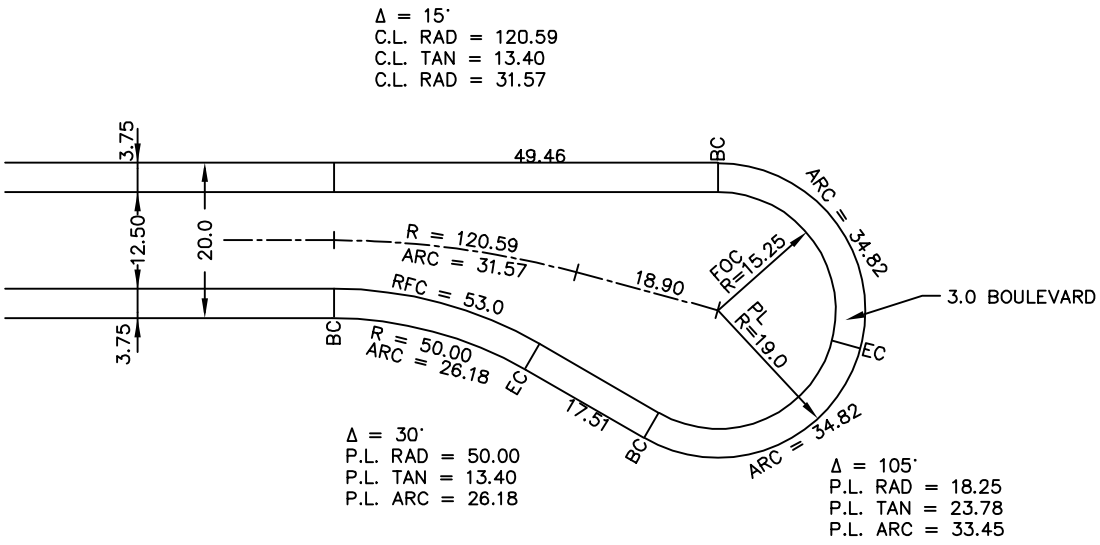
LETHBRIDGE COUNTY

TITLE:

RURAL RESIDENTIAL CUL-DE-SAC

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G-102
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



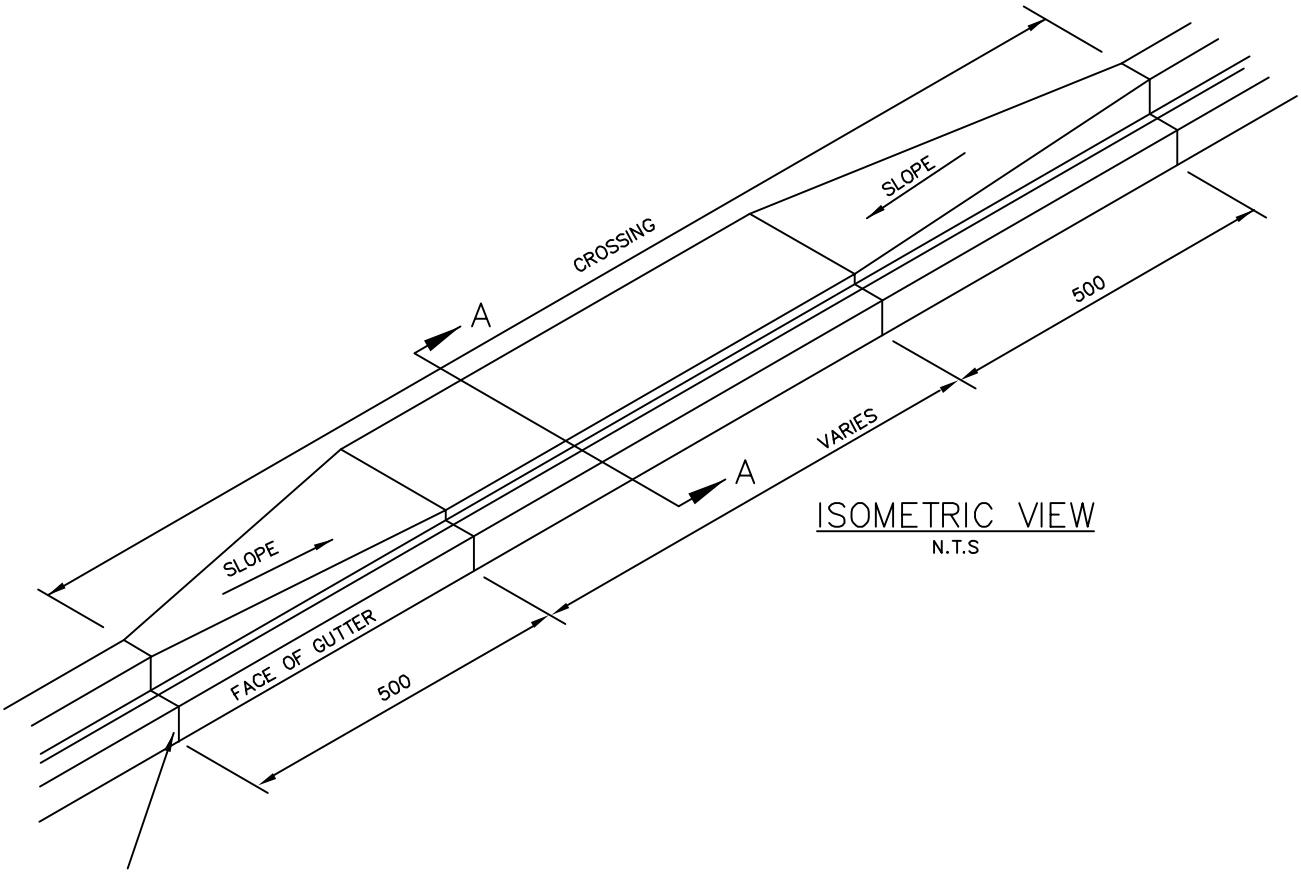


LETHBRIDGE COUNTY

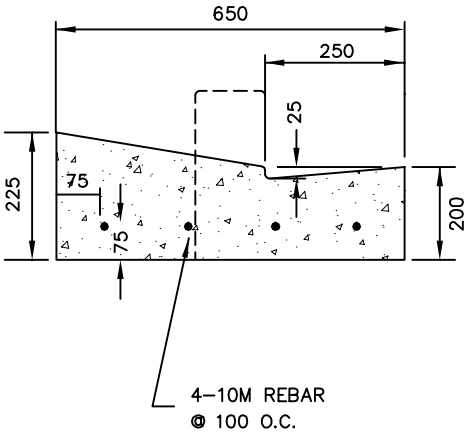
TITLE:

LOCAL INDUSTRIAL/COMMERCIAL CUL-DE-SAC

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G-103
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



ISOMETRIC VIEW
N.T.S



SECTION A – A

NOTES:

1. MAINTAIN THICKENED DEPTH THROUGHOUT.
2. ALL DIMENSIONS ARE IN MILLIMETRES

LETHBRIDGE COUNTY

TITLE:

INDUSTRIAL / COMMERCIAL CURB & GUTTER CROSSING

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–104
BY:	DIRECTOR OF MUNICIPAL SERVICES

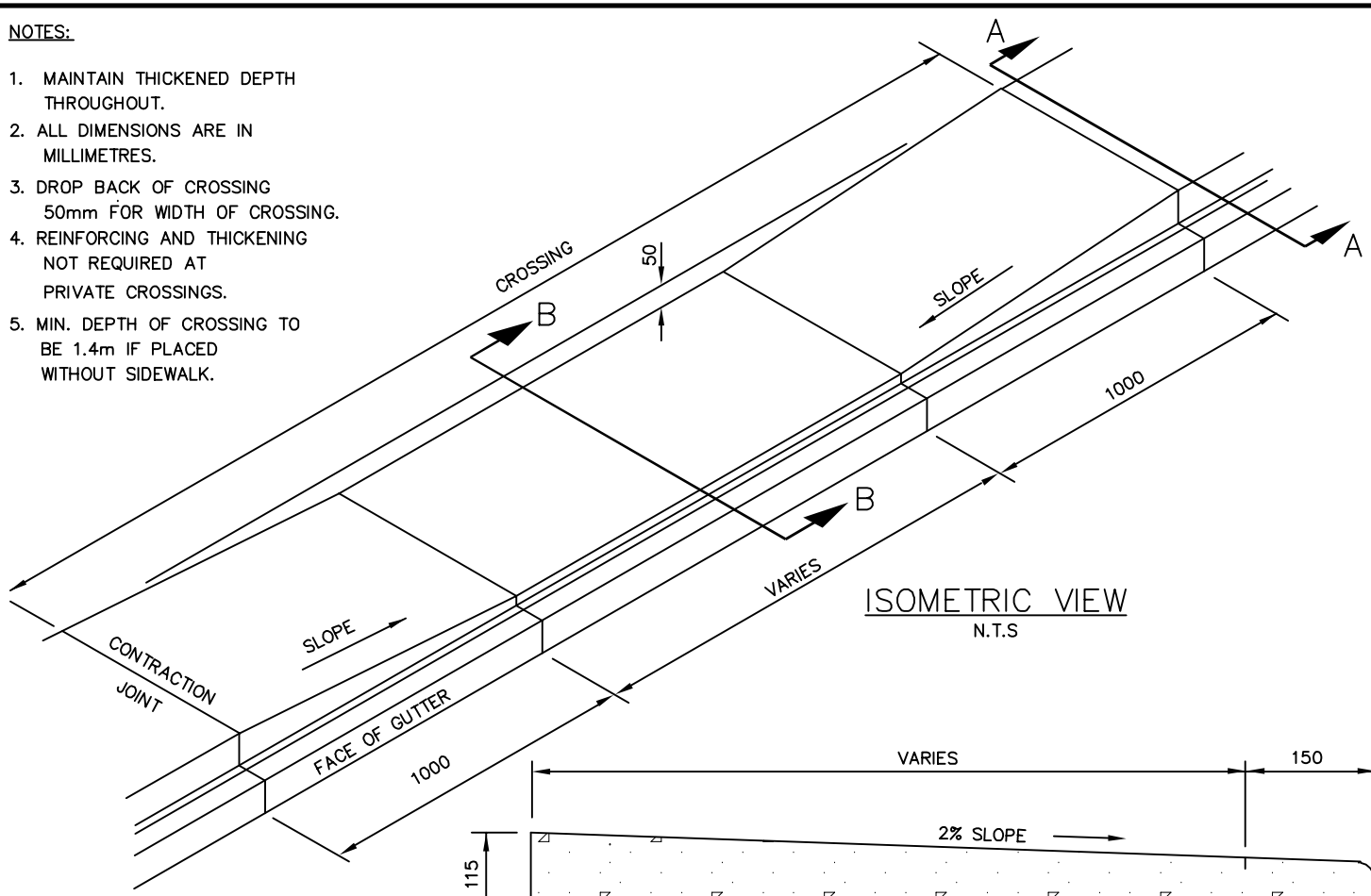
LETHBRIDGE COUNTY

TITLE:

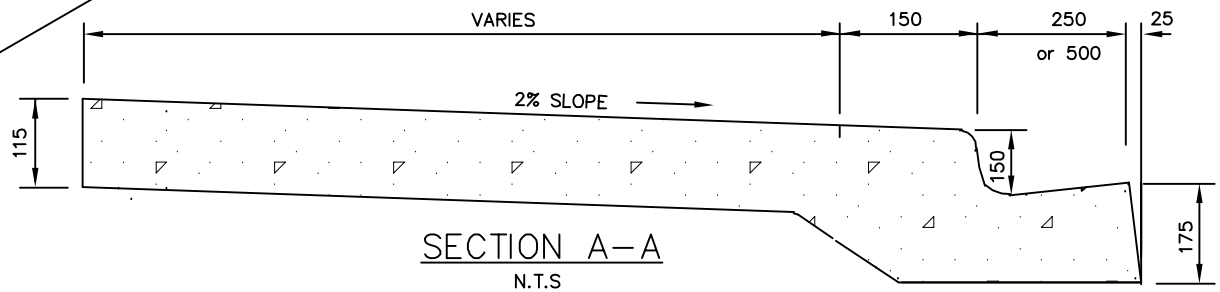
SINGLE AND DOUBLE SERVICE LAYOUT CROSSING

NOTES:

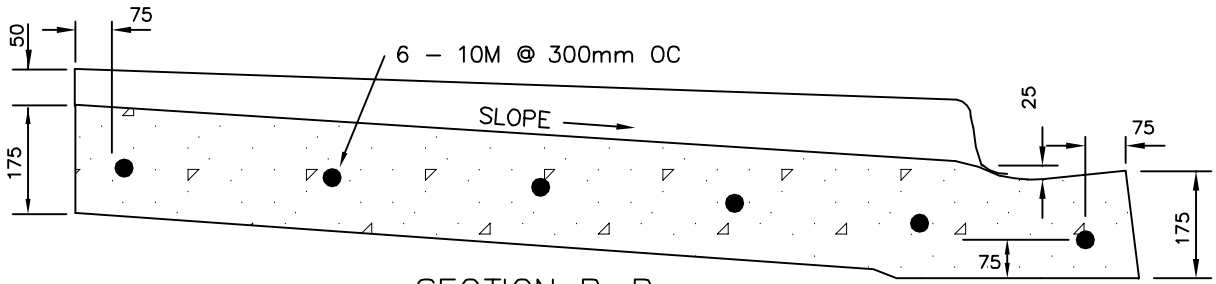
1. MAINTAIN THICKENED DEPTH THROUGHOUT.
2. ALL DIMENSIONS ARE IN MILLIMETRES.
3. DROP BACK OF CROSSING 50mm FOR WIDTH OF CROSSING.
4. REINFORCING AND THICKENING NOT REQUIRED AT PRIVATE CROSSINGS.
5. MIN. DEPTH OF CROSSING TO BE 1.4m IF PLACED WITHOUT SIDEWALK.



ISOMETRIC VIEW
N.T.S



SECTION A–A
N.T.S



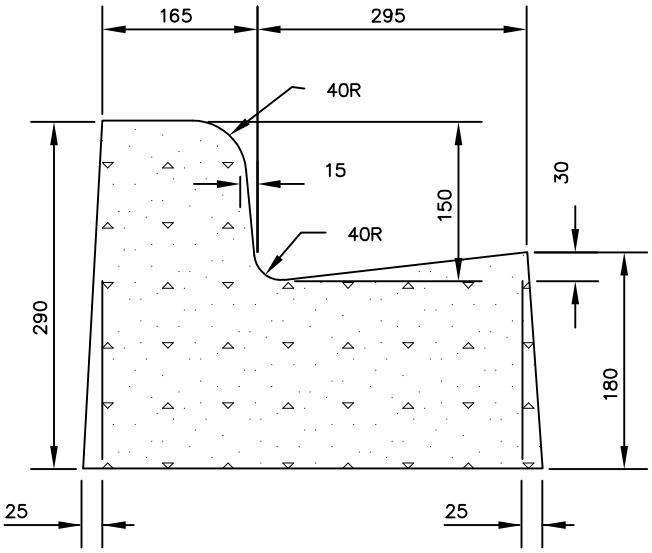
SECTION B–B
N.T.S

SCALE: N.T.S

DATE: JANUARY 2019

STD. DWG NO. G–105

APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES



NOTES:

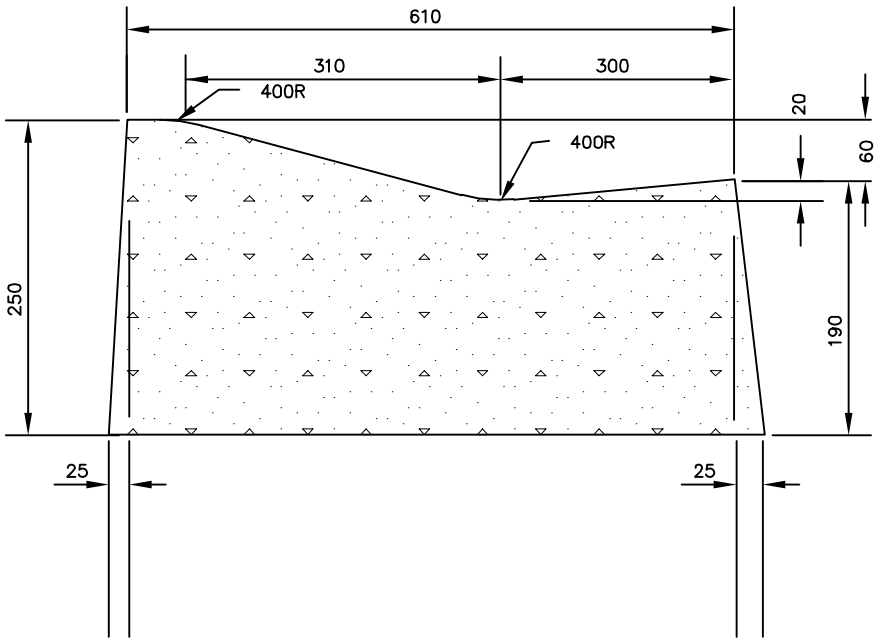
1. 25 mm BATTER NOT REQUIRED FOR HANDFORMED.
2. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

LETHBRIDGE COUNTY

TITLE:

250 mm STANDARD CURB & GUTTER

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–106
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



NOTES:

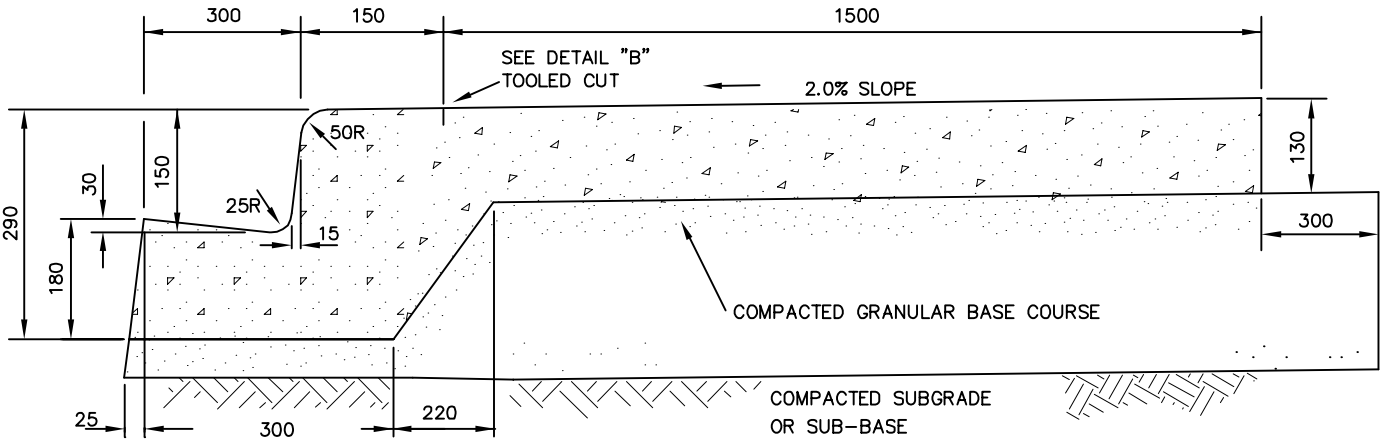
1. 25 mm BATTER NOT REQUIRED FOR HANDFORMED.
2. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

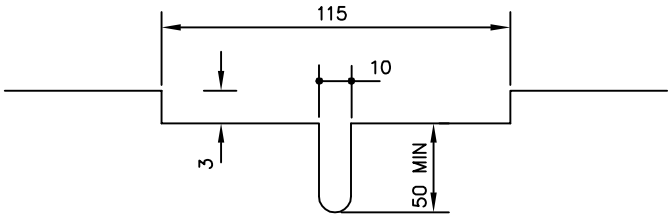
LETHBRIDGE COUNTY

TITLE:

300 mm ROLLED CURB AND GUTTER

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–107
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



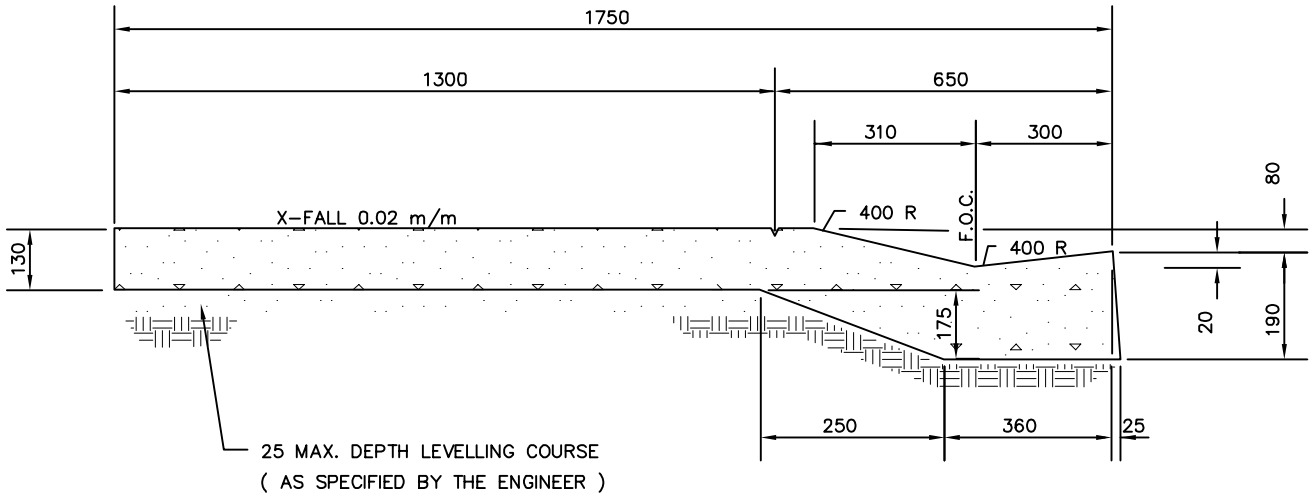


DETAIL "B"

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES.

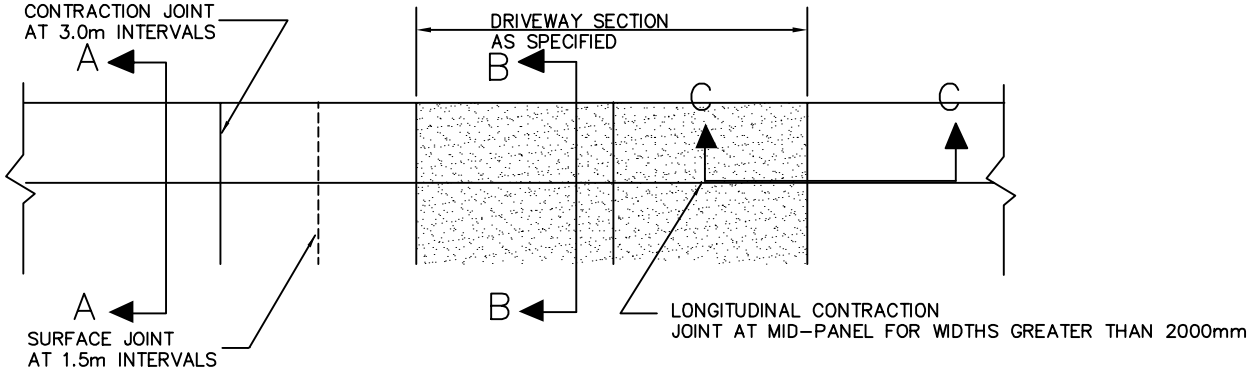
LETHBRIDGE COUNTY	TITLE: 1.50 m STANDARD MONOLITHIC SIDEWALK	SCALE: N.T.S DATE: JANUARY 2019 STD. DWG NO. G–108 APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES

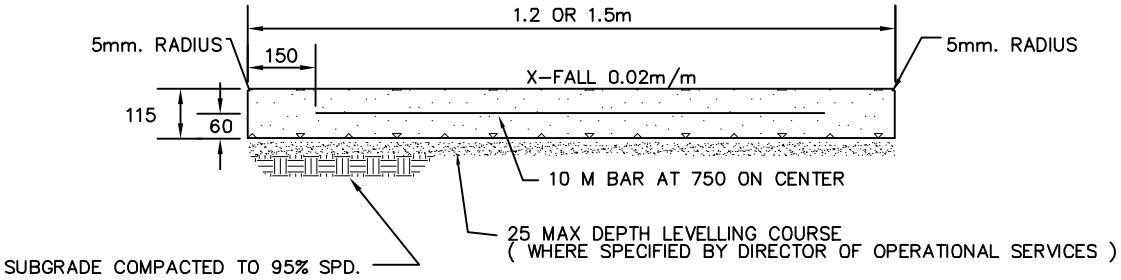


NOTES:

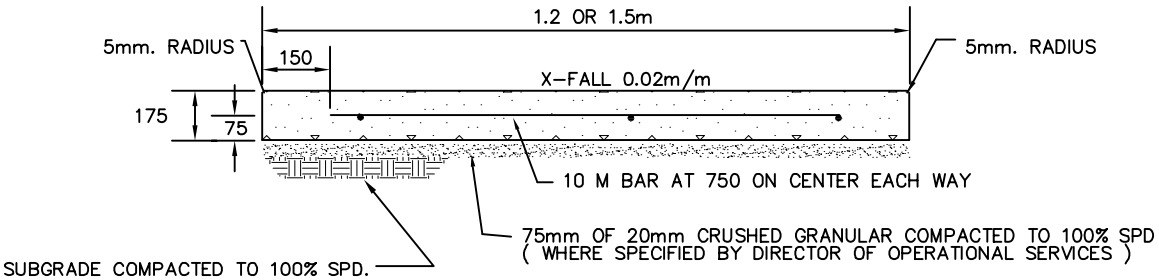
1. 25 mm BATTER NOT REQUIRED FOR HANDFORMED
2. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

LETHBRIDGE COUNTY	TITLE: 1.50 m ROLLED MONOLITHIC SIDEWALK	SCALE: N.T.S DATE: JANUARY 2019 STD. DWG NO. G–109 APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES

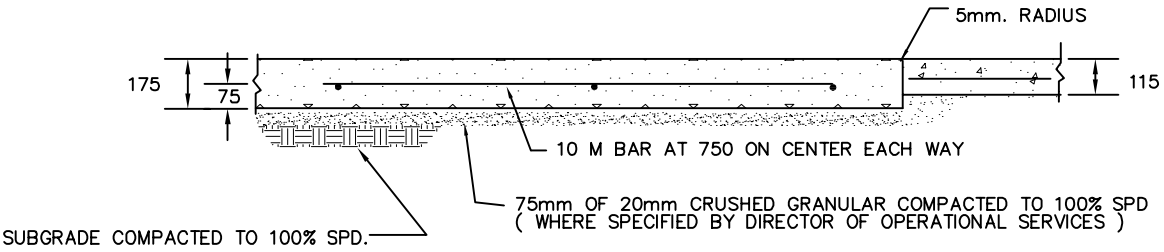




SECTION A-A...STANDARD SIDEWALK



SECTION B-B...DRIVEWAY SECTION

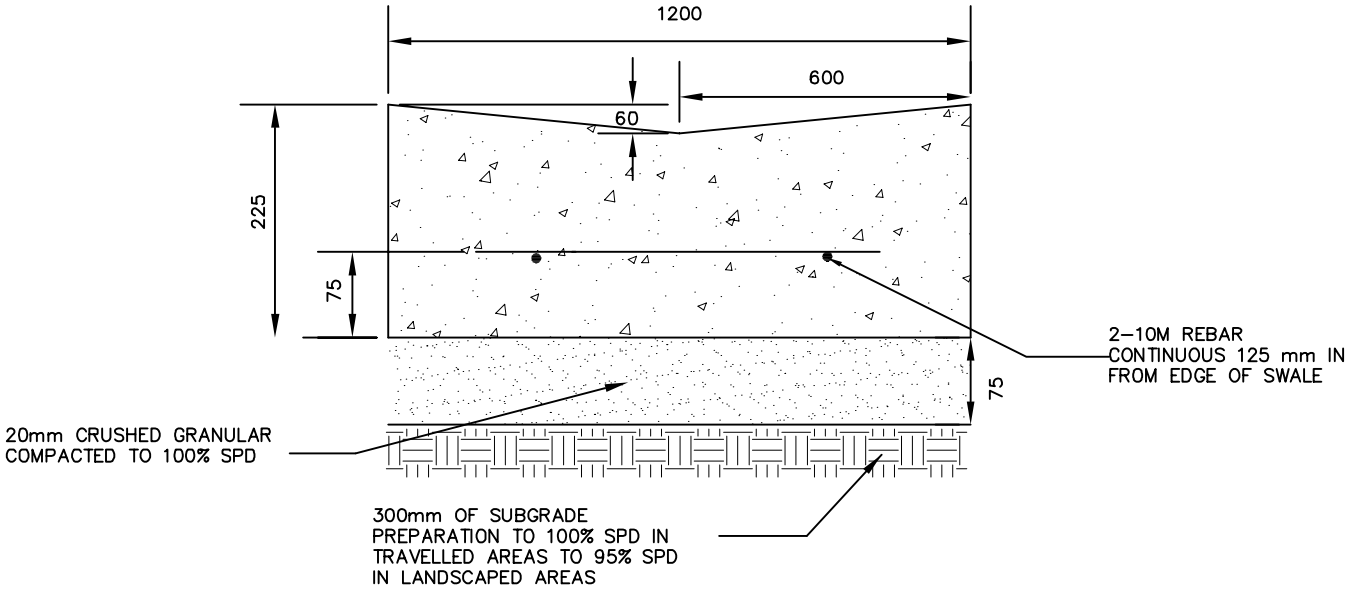


SECTION C-C...TRANSITION

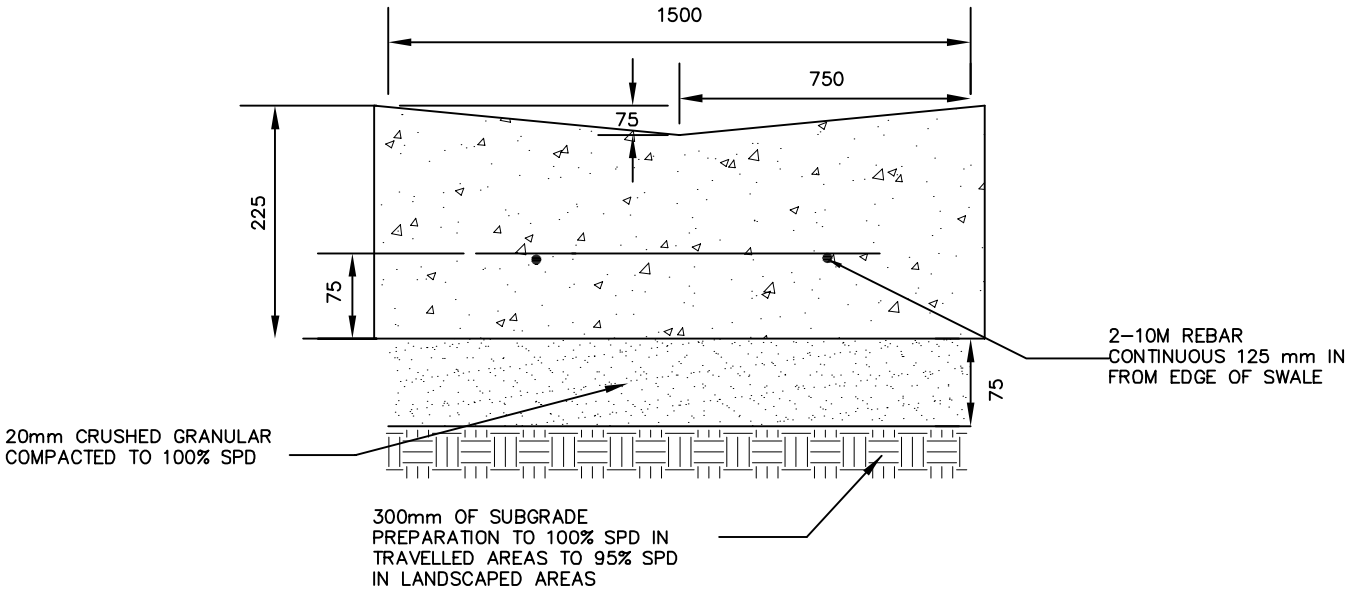
NOTE:

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

LETHBRIDGE COUNTY	TITLE: **1.2 m OR 1.50 m SEPARATE SIDEWALK**	SCALE: N.T.S DATE: JANUARY 2019 STD. DWG NO. G-110 APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES



1200mm CONCRETE SWALE



1500mm CONCRETE SWALE

NOTE:

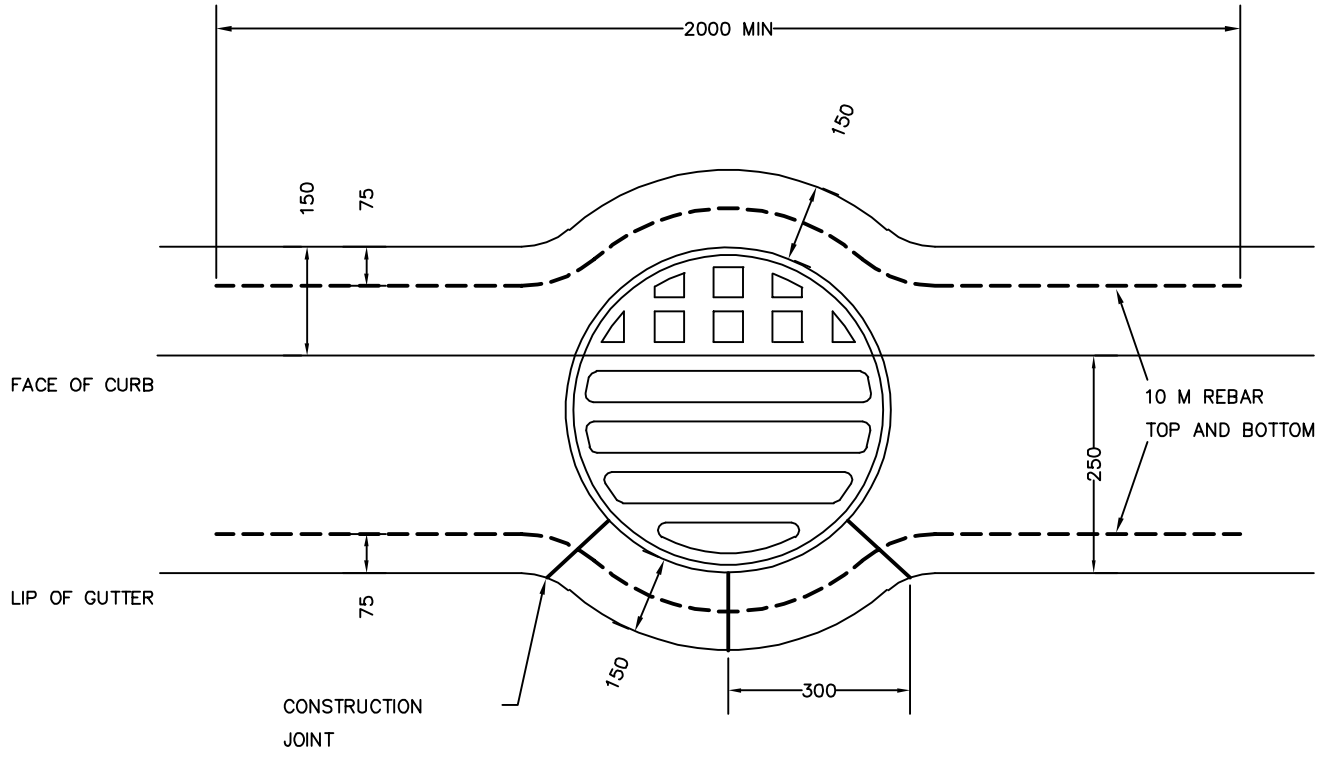
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

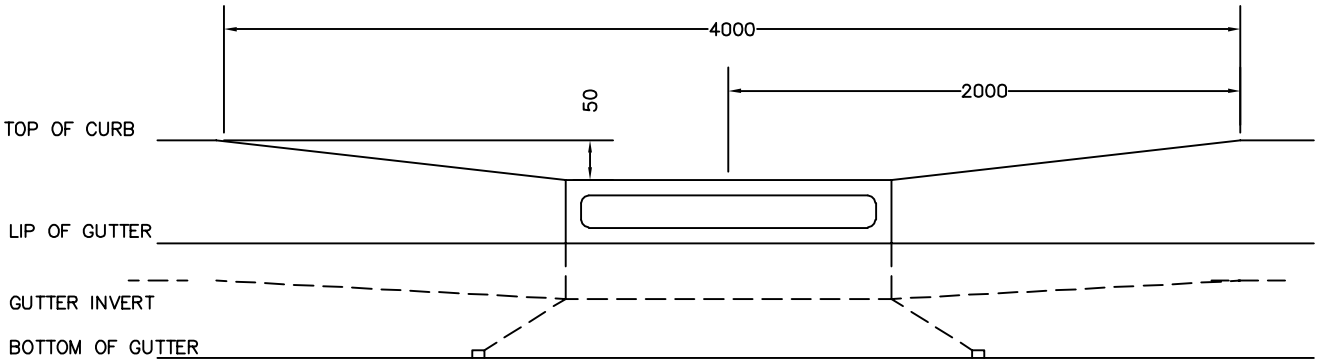
LETHBRIDGE COUNTY

TITLE:

CONCRETE DRAINAGE SWALES

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–111
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES





NOTES:

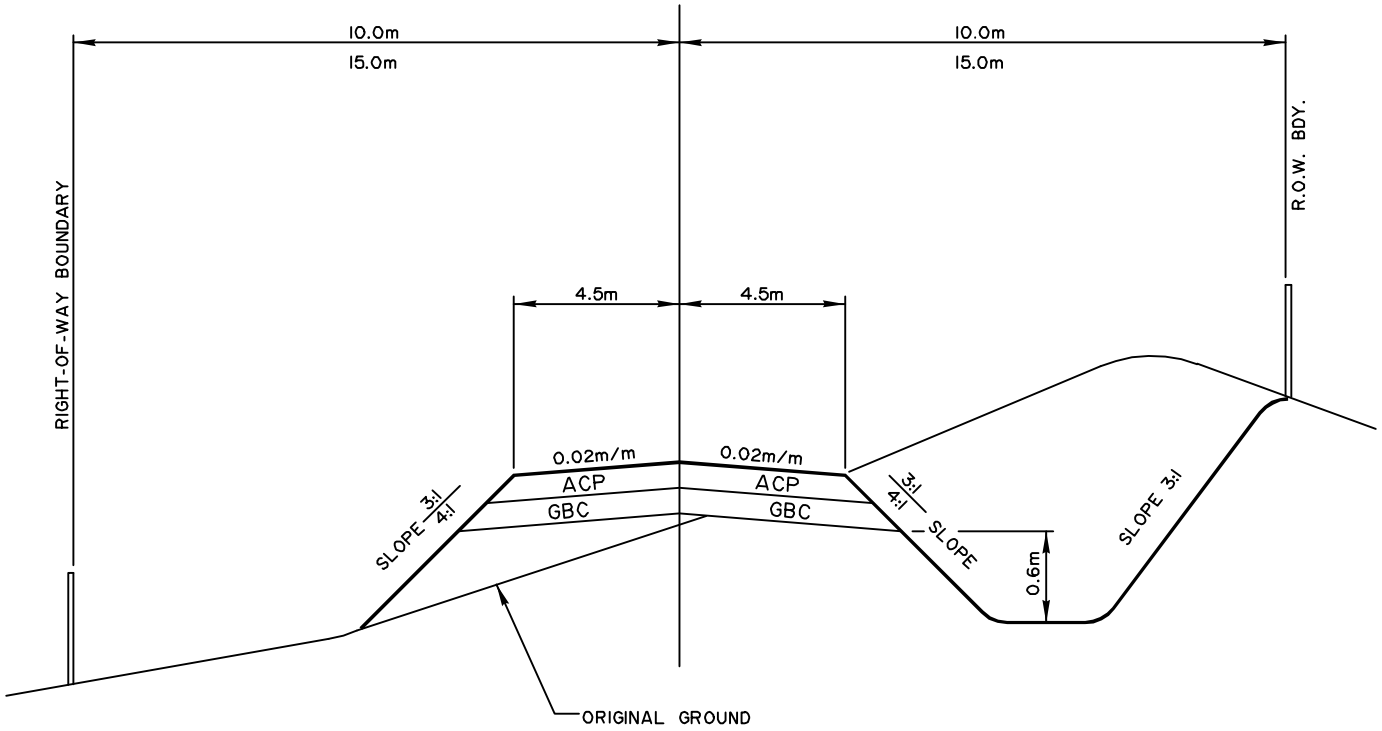
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

LETHBRIDGE COUNTY

TITLE:

TYPICAL CATCH BASIN INSTALLATION
150 mm CURB & 250 mm GUTTER

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–112
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	NORMAL SIDE SLOPE	MAXIMUM SIDE SLOPE	NORMAL BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
9.0	20.0 - 30.0	4:1	3:1	3:1	3:1	300	0.06	7.0

NOTES:

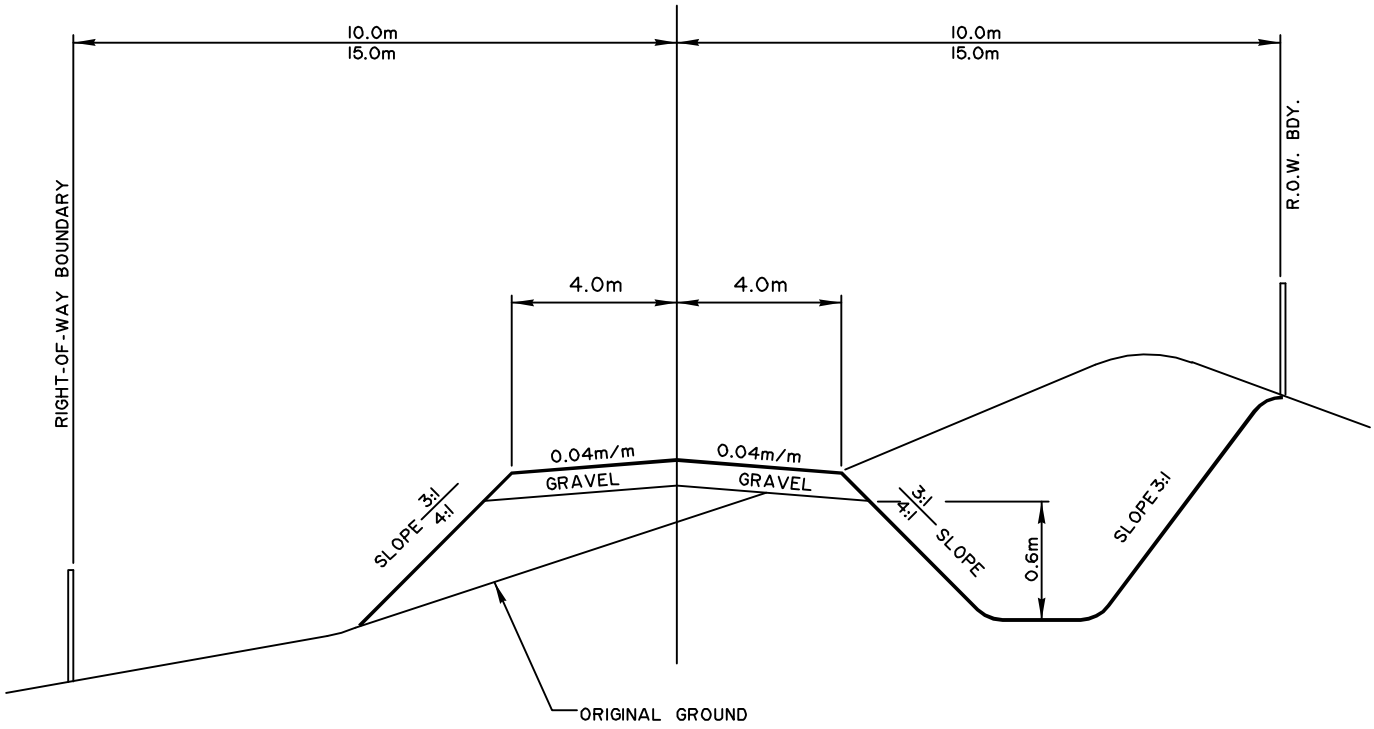
1. IF ADDITIONAL RIGHT-OF-WAY IS REQUIRED, TRY TO OBTAIN BY BACKSLOPING AGREEMENT OTHERWISE PURCHASE.

LETHBRIDGE COUNTY

TITLE:

PAVED ROAD
STANDARD CROSS-SECTION
WITHIN A SUBDIVISION DEVELOPMENT

SCALE:	N.T.S
DATE:	SEPTEMBER 2019
STD. DWG NO.	G-113
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	NORMAL SIDE SLOPE	MAXIMUM SIDE SLOPE	NORMAL BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
8.0	20.0 - 30.0	4:1	3:1	3:1	3:1	300	0.08	7.0

NOTES:

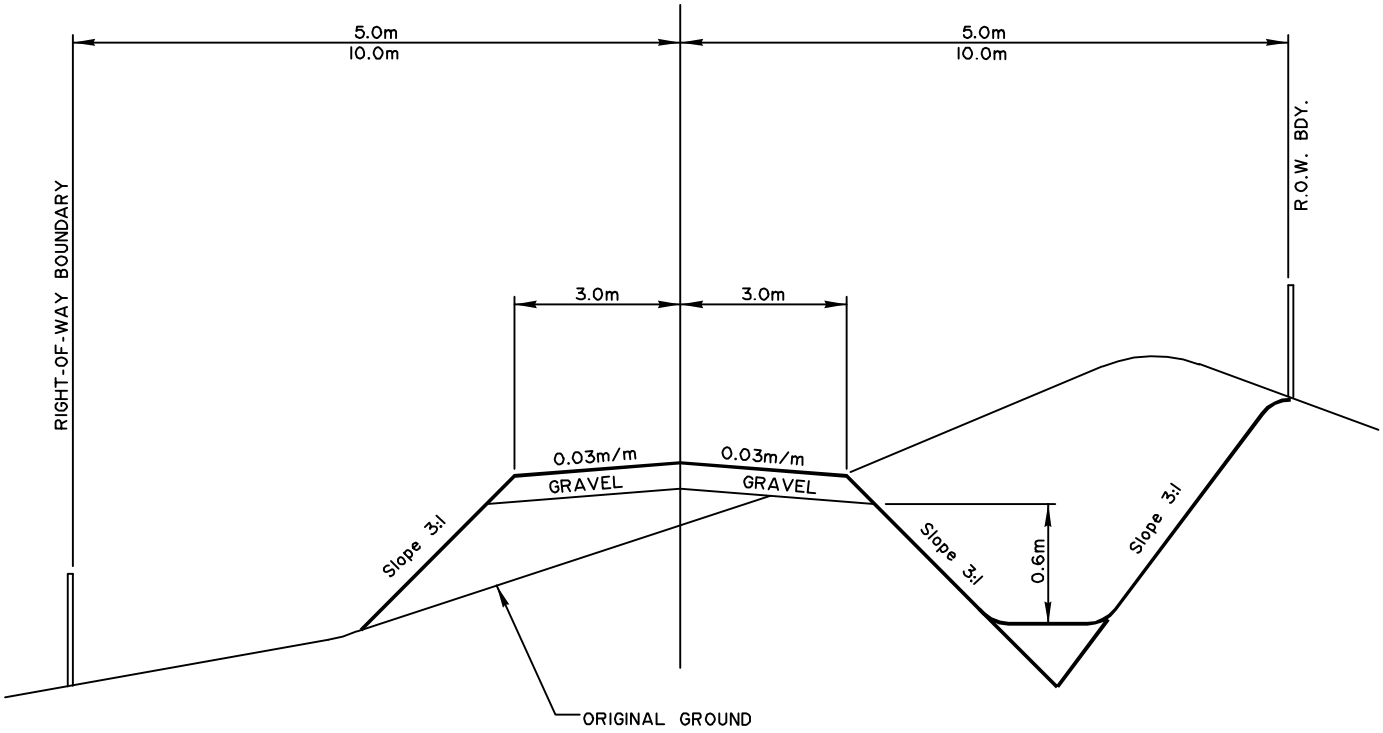
1. IF ADDITIONAL RIGHT-OF-WAY IS REQUIRED, TRY TO OBTAIN BY BACKSLOPING AGREEMENT, OTHERWISE PURCHASE.

LETHBRIDGE COUNTY

TITLE:

GRAVEL ROAD
STANDARD CROSS-SECTION
WITHIN A SUBDIVISION DEVELOPMENT

SCALE:	N.T.S
DATE:	SEPTEMBER 2019
STD. DWG NO.	G-114
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



ROAD DESIGNATION

UNITS OF MEASURE	SURFACE WIDTH METERS	R.O.W. REQUIRED METERS	NORMAL SIDE SLOPE RATIO	NORMAL BACK SLOPE RATIO	SNOW PLOW DECISION	MINIMUM RADII METERS	MINIMUM GRADIENT CROWN PERCENT	MAXIMUM GRADIENT PERCENT	MINIMUM HEIGHT OF DITCH PERCENT	GRAVEL SPREAD RATE METERS	GRAVEL SPREAD RATE m^3/KM
	6	10-20	3:1	3:1	NO	170	3	0.2	9.0	0.6	300

LETHBRIDGE COUNTY

TITLE:

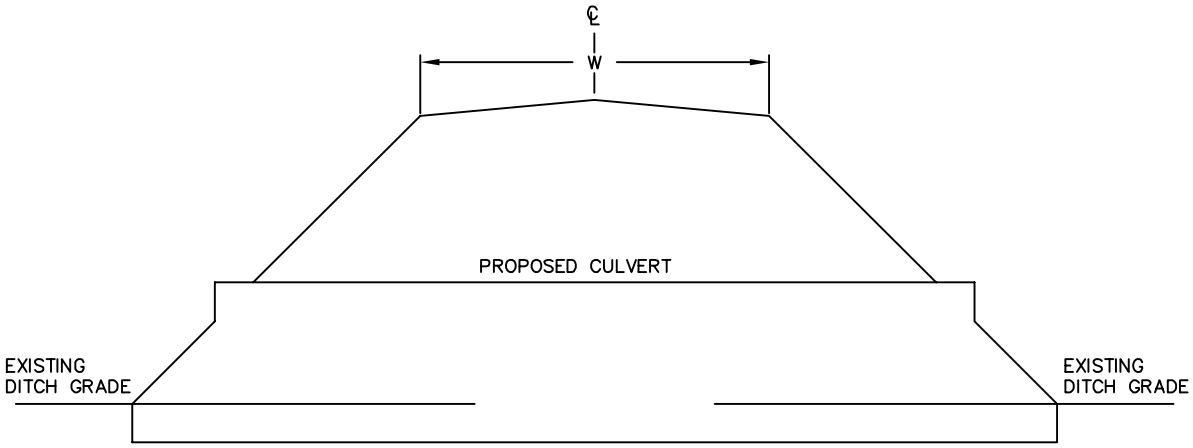
MAINTENANCE ACCESS ROAD STANDARD CROSS-SECTION WITHIN A SUBDIVISION DEVELOPMENT

SCALE: N.T.S

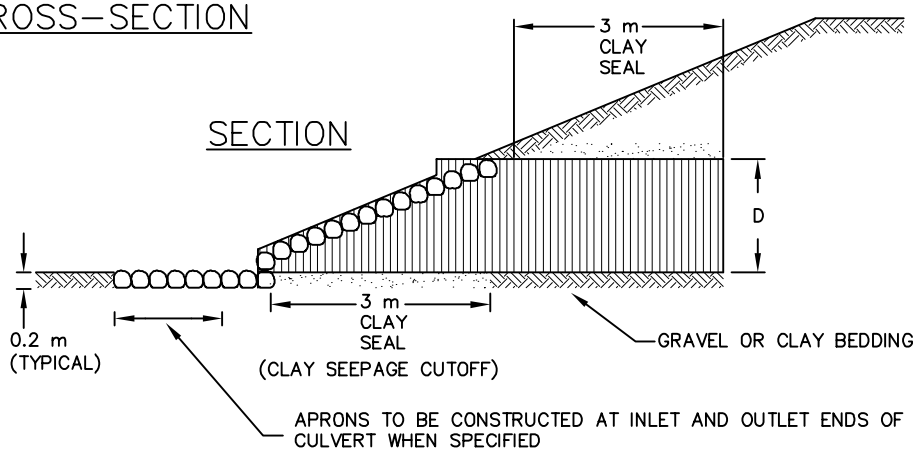
DATE: SEPTEMBER 2019

STD. DWG NO. G-115

APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES

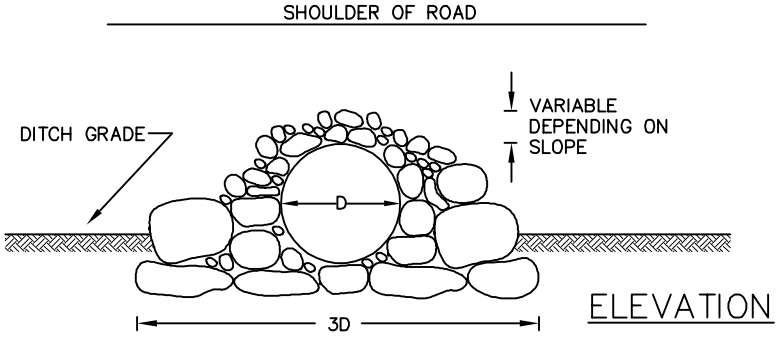


APPROACH CROSS–SECTION



NOTES:

1. THE SIDE SLOPES OF THE APPROACH SHALL BE A MINIMUM OF 6:1 ON APPROACHES TO ALL COUNTY ROADS.
2. THE MINIMUM ALLOWABLE CULVERT DIAMETER IS 600 mm, UNLESS SPECIFIC WRITTEN APPROVAL FROM THE DIRECTOR OF OPERATIONAL SERVICES, OR DESIGNATE.
3. THE CULVERT SHALL BE ALIGNED WITH THE BACK OF THE DITCH BOTTOM. THE CULVERT IS TO BE COUNTERSUNK 1/4 OF THE PIPE DIAMETER BELOW THE DITCH BOTTOM.
4. THE CULVERT SHALL BE OF SUCH LENTH AS TO PROVIDE A NEAT, FINISHED APPEARANCE, WITHOUT EXCESS EXPOSED PIPE.
5. STRAIGHT END CULVERTS ARE NOT ACCEPTABLE. ALL CULVERTS SHALL HAVE A 3:1 SLOPE END UNLESS SPECIFIC WRITTEN APPROVAL IS OBTAINED FROM THE DIRECTOR OF OPERATIONAL SERVICES, OR DESIGNATE.
6. ROCK RIP–RAP SHALL BE HAND LAID AT BOTH ENDS OF THE CULVERT IN ACCORDANCE WITH THE ACCOMPANYING DRAWING.



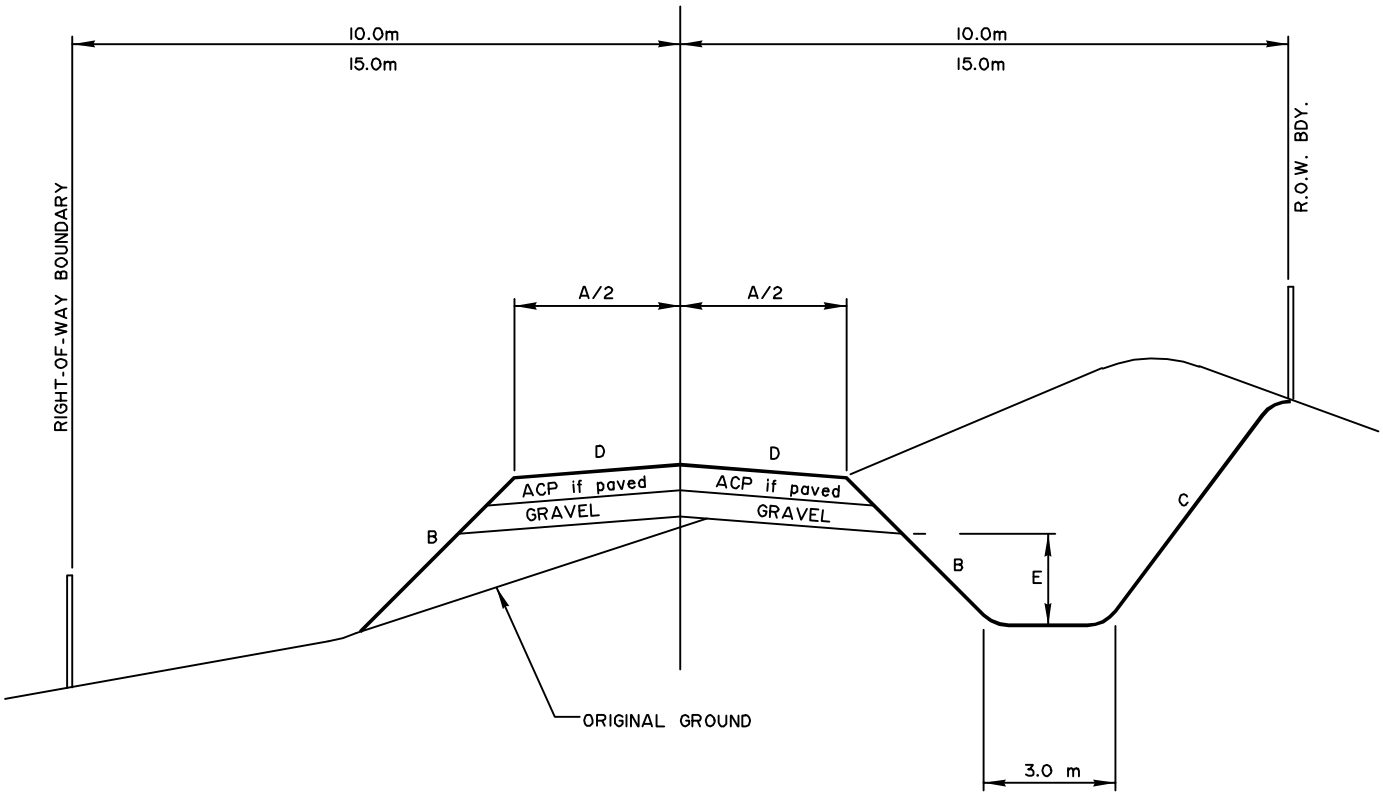
7. THE COUNTY USES THE EXPECTED TRAFFIC TYPE AND VOLUME TO DETERMINE THE MINIMUM WIDTH OF THE DRIVING SURFACE OF THE APPROACH.
8. 300 mm DEPTH OF COVER OVER C.S.P. IS PREFERRED.
9. APPROACH SURFACE TO BE AS DESIGNATED BY THE M.D.
10. RIP–RAP SHALL BE PLACED WITH THEIR BEDS AT RIGHT ANGLES TO THE SLOPE, THE LARGER STONES BEING USED IN THE BOTTOM COURSES AND THE SMALLER STONES AT TOP.
11. RIP–RAP SHALL BE LAID IN CLOSE CONTACT SO AS TO BREAK JOINTS AND IN SUCH A MANNER THAT THE WEIGHT OF THE STONE IS CARRIED BY THE EARTH AND NOT BY THE ADJACENT STONES.

LETHBRIDGE COUNTY

TITLE:

ACCESS INSTALLATION

SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–116
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



NOTES:

1. IF ADDITIONAL RIGHT-OF-WAY IS REQUIRED, TRY TO OBTAIN BY BACKSLOPING AGREEMENT OTHERWISE PURCHASE.
2. ACP WILL HAVE A DESIGNED THICKNESS ACCORDING TO REQUIREMENTS OF APPLICATION.

ROAD DESIGNATION	A SURFACE WIDTH	B DESIGN SPEED/POSTED SPEED	C NORMAL SIDE SLOPE	NORMAL BACK SLOPE	D SNOW PLOW	MINIMUM RADII	CROWN	MINIMUM GRADIENT	MAXIMUM GRADIENT	E AVG HEIGHT OF FILL	PRIVATE APPROACH RADIUS	GRAVEL SPREAD RATE
UNITS OF MEASURE	METERS	KM/H	RATIO	RATIO	DECISION	METERS	PERCENT	PERCENT	PERCENT	METERS	METERS	m^3/KM
PAVED ROAD (GEATER THAN 400 AADT)	9	110/80	5:1	4:1	YES	600	2	0.6	5.0	N/A	15	N/A
HAUL ROUTE	8	90/80	4:1	3:1	YES	600	3-5	0.6	5.0	1.0+	15	940
LOCAL ROAD - HIGH VOLUME (250 AADT-400 AADT)	8	90/80	4:1	3:1	YES	600	4	0.6	5.0	1.0+	15	500
LOCAL ROAD - MEDIUM VOLUME (LESS THAN 250 AADT)	8	90/80	4:1	3:1	YES	300	4	0.5	8.0	0.6	15	400

LETHBRIDGE COUNTY

TITLE:

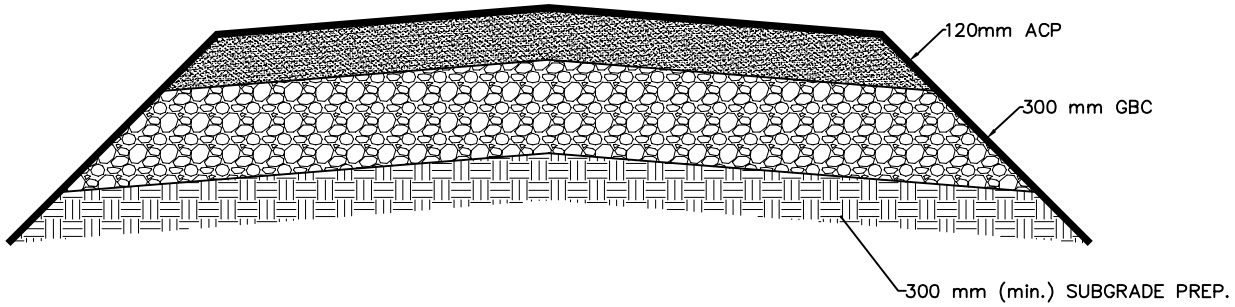
RURAL ROAD STANDARD CROSS-SECTION

SCALE: N.T.S

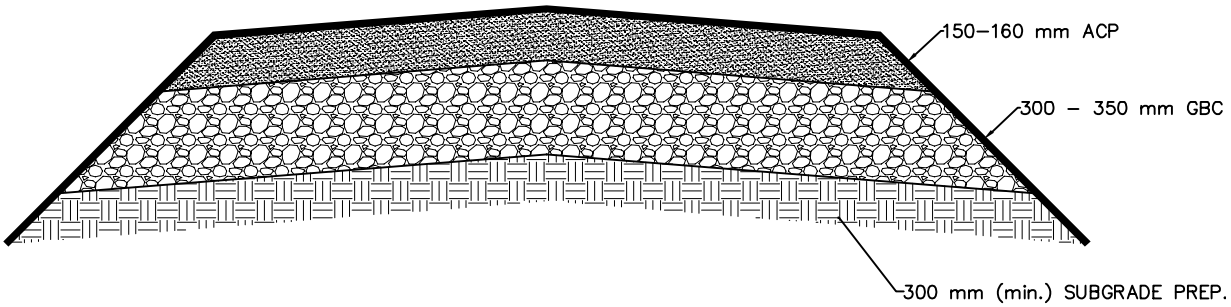
DATE: SEPTEMBER 2019

STD. DWG NO. G-117

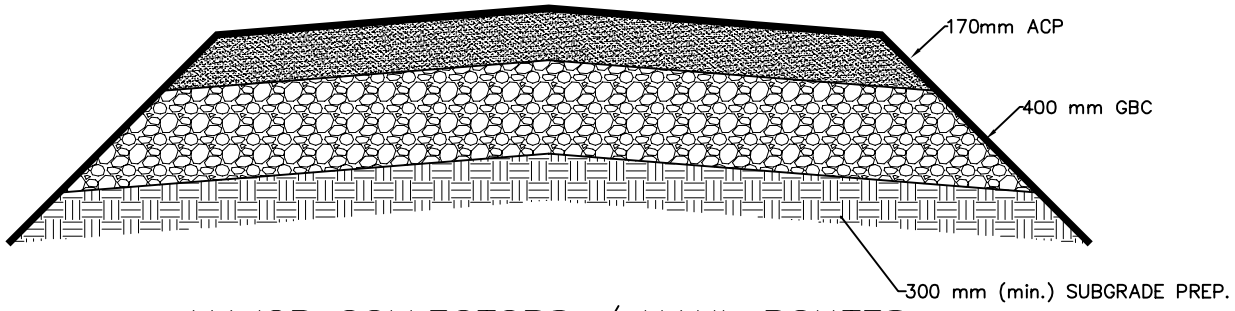
APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES



LOCAL/RESIDENTIAL



ARTERIAL / COLLECTOR



MAJOR COLLECTORS / HAUL ROUTES
INDUSTRIAL ACCESSES

NOTES:

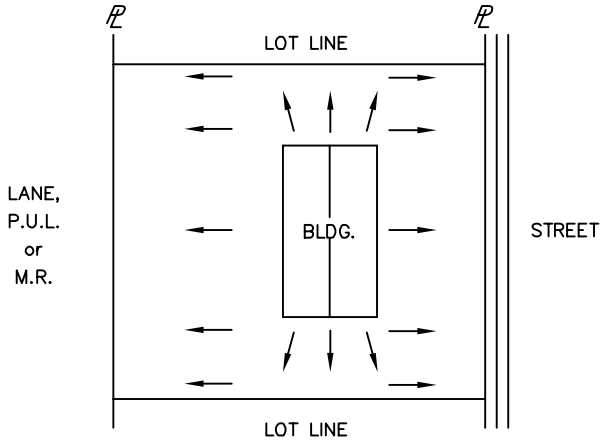
1. ALL DIMENSIONS GIVEN IN MILLIMETRES UNLESS OTHERWISE STATED.

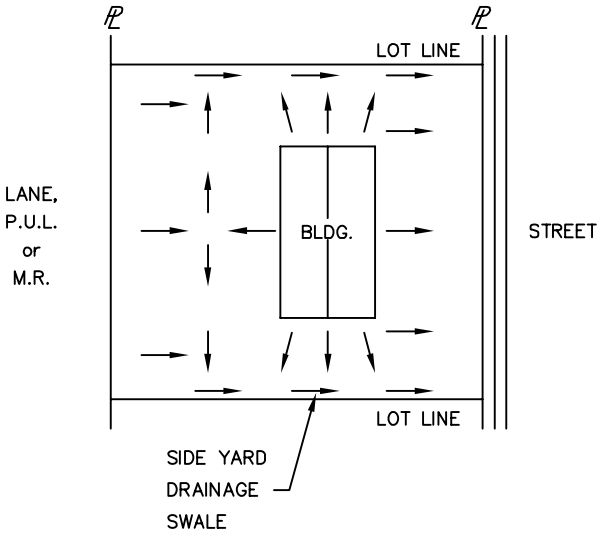
LETHBRIDGE COUNTY

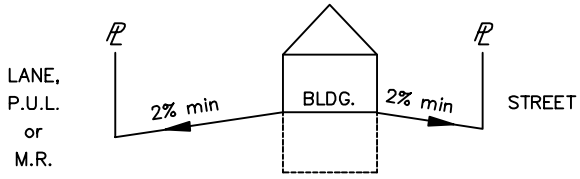
TITLE:

PAVEMENT STRUCTURES

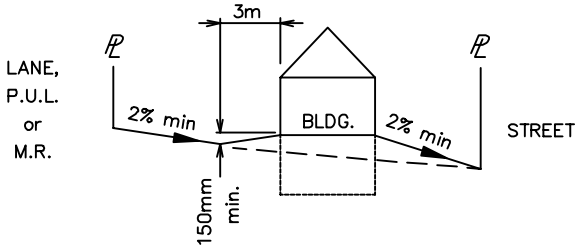
SCALE:	N.T.S
DATE:	JANUARY 2019
STD. DWG NO.	G–118
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES



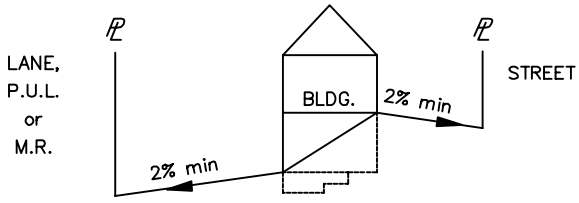




SPLIT DRAINAGE

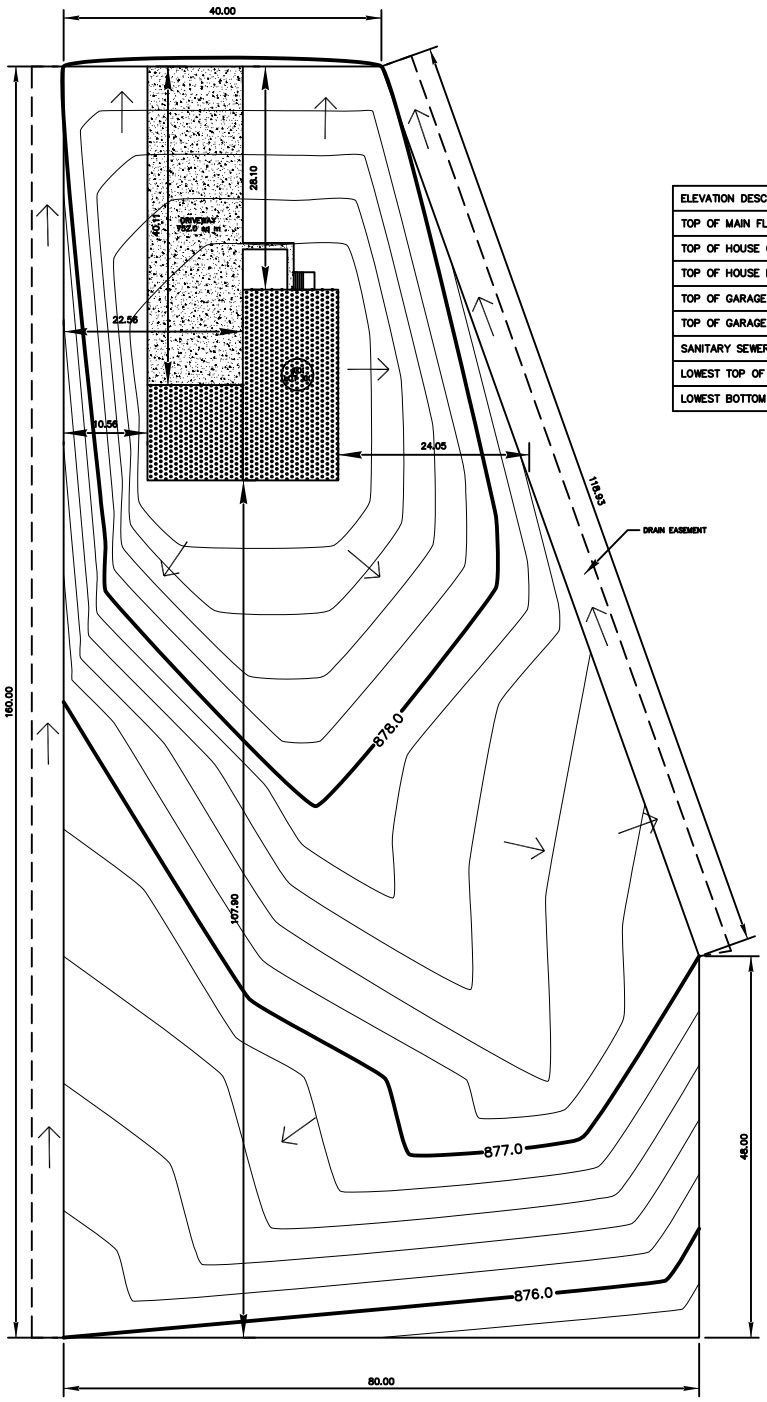


BACK TO FRONT DRAINAGE



REARYARD BASEMENT WALKOUT SPLIT DRAINAGE

LETHBRIDGE COUNTY	TITLE: TYPICAL LOT GRADING	SCALE: N.T.S DATE: JANUARY 2019 STD. DWG NO. M–101 APPROVED BY: DIRECTOR OF MUNICIPAL SERVICES



ELEVATION DESCRIPTION	ELEVATION
TOP OF MAIN FLOOR	1003.37
TOP OF HOUSE CONC. WALL	1002.25
TOP OF HOUSE FOOTING (FRONT)	1000.36
TOP OF GARAGE CONC. WALL	N/A
TOP OF GARAGE FOOTING (FRONT)	N/A
SANITARY SEWER INVERT	999.02
LOWEST TOP OF FOOTING	999.82
LOWEST BOTTOM OF FOOTING	N/A

LETHBRIDGE COUNTY

#	DATE	PAGE

REVISIONS

OWNER:
123 XYZ INC.
HOME BUILDERS

JOB #:
191–XXXXX–00

PROJECT:
THE SUBURBS

PROJECT DESCRIPTION:
123 45TH STREET NORTH
LETHBRIDGE, AB
LOT XX BLOCK XX
THE SUBURBS AB–C

AREA TOTAL:
1200 sq.m

SCALE:
1:750

DATE:
5/24/2019

DESIGNED BY:
J. SMITH

SHEET NO.:
1 OF 1

LETHBRIDGE COUNTY

TITLE:

LOT GRADING PLAN EXAMPLE

SCALE:	N.T.S
DATE:	SEPTEMBER 2019
STD. DWG NO.	M–102
APPROVED BY:	DIRECTOR OF MUNICIPAL SERVICES