LACOMBE COUNTY

Standards Manual

Prepared by Lacombe County

Edition 3

May 2017

LACOMBE COUNTY

Standards Manual Edition 3

Lacombe County Policy *OP(39) Standards Manual* is intended to develop a Standards Manual that is to be treated as a "guide" governing the engineering and design parameters, and the preparation and submission of plans and specifications for the orderly and satisfactory development of subdivisions and other municipal services within Lacombe County. Regulations 1 and 2 of this policy state:

1. *The Standards Manual will be updated periodically as needed.*

2. *The County Commissioner or designate is hereby authorized to make amendments to the standards manual as deemed necessary.*

The current version of the Lacombe County Standards Manual was adopted in January 2011. Since that time standards and legislation have changed and the need for an updated version of the *Standards Manual* has become necessary. The *Lacombe County Standards Manual Edition 3* has been completed to address these changes. A full list of changes is attached.

The *Lacombe County Standards Manual* is hereby amended to *Edition 3*

Terry Hager
County Commissioner

May 11, 2017
Date

POLICY

Department	Policy No.	Page
Operations	**OP(39)**	**1 of 2**
Policy Title	Date	Resolution No.
STANDARDS MANUAL	**February 28, 2019**	**C/75/19**

Policy Statement

Lacombe County has developed a Standards Manual that is to be treated as a “guide” governing the engineering and design parameters, and the preparation and submission of plans and specifications for the orderly and satisfactory development of subdivisions and other municipal services within Lacombe County.

These standards and specifications are intended to serve as the "minimum" allowable levels to which the improvements discussed are to be built, and to enable standardization within the County. Where questionable or complicated design situations arise, sound engineering methods and practices shall prevail.

The County reserves the right to deviate from these standards wherein, at the County’s sole discretion, it is determined that conditions warrant it.

No departure from these design standards and specifications shall be permitted without the written approval of the County.

Where Acts, Bylaws, Codes or other Standards are noted, they shall refer to the latest revision thereof.

Regulation

1. The Standards Manual will be updated periodically as needed.

2. The County Manager or designate is hereby authorized to make amendments to the Standards Manual as deemed necessary.

3. The use of the Standards Manual is intended for general information only, detailed specifications and guidelines for projects within Lacombe County will be determined by Lacombe County on a site specific basis at the time of development.

4. In the event of conflicting specifications the County Manager or his designate shall be the sole authority in determining all approved specifications.

5. All specifications contained in the manual are intended to meet or exceed Alberta Transportation standards and specifications.

6. The manual will address the following:

   a) General Conditions & Forward
   b) Engineering Plans and drawings
   c) Roads
   d) Erosion and Sediment Control
   e) Landscaping
   f) Fencing
   g) Communal Waste Water Systems
   h) Communal Water Systems
   i) Fire Protection
   j) Trails and Amenities
   k) Signage and Traffic Control
   l) Storm Water Management

Approved: January 27, 2011
Revised: July 6, 2017 June 27, 2013

LACOMBE COUNTY
STANDARDS MANUAL

THE USE OF THE FOLLOWING ROADS AND INFRASTRUCTURE MANUAL IS INTENDED FOR

GENERAL INFORMATION ONLY

DETAILED SPECIFICATIONS AND GUIDELINES FOR PROJECTS WITHIN LACOMBE COUNTY

WILL BE DETERMINED BY LACOMBE COUNTY

ON A SITE SPECIFIC BASIS AT THE TIME OF DEVELOPMENT

ALL SPECIFICATIONS CONTAINED WITHIN THIS MANUAL

ARE INTENDED TO MEET OR EXCEED

ALBERTA TRANSPORTATION AND UTILITIES STANDARDS AND SPECIFICATIONS

THE LATEST SPECIFICATIONS CAN BE OBTAINED IN DETAIL

FROM ALBERTA TRANSPORTATION & UTILITIES

#401, 4920 – 51 Street
Red Deer, AB T4N 6K8

Phone: (403) 340-5166

IN THE EVENT OF CONFLICTING SPECIFICATIONS

THE LACOMBE COUNTY PUBLIC WORKS SUPERVISOR

OR HIS REPRESENTATIVE SHALL BE THE SOLE AUTHORITY

IN DETERMINING ALL APPROVED SPECIFICATIONS

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A1. DESIGN STANDARDS

The following design standards sections shall apply to any or all of the respective services:

Section A: General Conditions

Section B: Engineering Plans & Drawings

Section C: Roads

Section D: Erosion and Sediment Control

Section E: Landscaping

Section F: Fencing

Section G: Communal Waste Water Systems

Section H: Communal Water Systems

Section I: Fire Protection

Section J: Trails & Amenities

Section K: Signage & Traffic Control

Section L: Stormwater Management

Typical Drawings

A2. DEFINITIONS

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

1. **"A.T."** refers to Alberta Transportation

2. **AADT – Average Annual Daily Traffic**

3. **"BMP"** shall mean Best Management Practices.

4. **"Contractor"** shall mean any person or persons, corporation, or legal entity which shall undertake the construction and installation of municipal improvements and utilities on behalf of either the Developer or the County.

5. **"County"** shall refer to Lacombe County.

6. **"Construction Drawings"** shall mean those Engineering Plans and Profiles prepared by the Consulting Engineer, showing the details of the installation of the various Municipal Improvements and utilities within the Development using

standard engineering symbols and forms, and conforming to the Standards Manual.

7. **"Developer"** shall mean such person or persons, corporation or legal entity developing a subdivision.

8. **"Development"** shall mean the area to be serviced, as determined by the County.

9. **"Development Agreement"** shall mean a document outlining the general requirements and conditions of which the Developer enters into agreement with the County prior to the construction and installation of municipal improvements and utilities in the development.

10. **"Development Officer and/or Planner"** shall mean the person or persons appointed and acting on behalf of the County to regulate the orderly development of land.

11. **"Development Permit"** shall mean such authorization as issued by the County to the Developer.

12. **"Engineer"** shall mean a professional engineer in good standing, licensed to practice Engineering in Alberta, retained by the Developer, responsible for the design, layout and supervision of installation, recording of as-built information, and performing those duties in connection with the construction and installation of municipal improvements and utilities as set out in the Standards Manual.

13. **"ESC Plan"** shall mean an Erosion and Sediment Control Plan.

14. **"Manual"** shall mean the "Lacombe County Standards Manual", latest edition and revisions thereof.

15. **"Manager of Operations"** shall mean the Manager of Operations of Lacombe County or an authorized representative, responsible for the supervision and approval of all work related to the provision of engineering and other duties for all municipal improvements and utilities.

16. **"Municipal Improvements"** shall mean those improvements that are required by the County to be constructed and developed within, upon, under or adjacent to the Subdivision Area, and which the County will assume ownership of upon their completion. The municipal improvements shall include the construction of the

internal subdivision roads, lot approaches and surface drainage works, as well as the construction of trails and other recreation facilities, landscaping, including tree planting, and other amenity features on designated reserves. All such municipal improvements shall be specifically detailed on the design plans that have been approved by the County pursuant to this Agreement.

17. **"Prime Coats"** shall mean the application of bituminous material to sub-grade or previously prepared gravel base course, prior to placing bituminous surfacing material.

18. **"Standards"** shall mean the specific features which practice or theory has shown to be appropriate, as contained in the Manual.

19. **"TAC"** refers to the Transportation Association of Canada.

20. **"Tack Coats"** shall mean the application of bituminous material to a previously constructed paving surface, of any type, in preparation for placing bituminous surfacing material.

21. **"Utilities"** means a communal water system, a communal wastewater system, underground power, natural gas, telephone and any other utility services as may be required by the County under this Agreement. All utilities shall be installed by the Developer at its sole cost and expense.

A3. DEVELOPER RESPONSIBILITIES

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

1. The Developer 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.

2. The County will, on written request, supply all available information on existing infrastructure. 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.***

3. Nothing in this Standards Manual relieves either the County or the Developer of any of the obligations contained in the Development Agreement.

A4. ENGINEERING DESIGN

The Developer shall 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, Geologists and Geophysicists, who shall be responsible for the design and preparation of drawings and specifications for all municipal improvements and water and waste water systems, as required within Lacombe County. These services shall be designed in accordance with the Standards Manual.

The design drawings shall display all existing and proposed municipal improvements collective and water and waste water systems, where required. It shall be the Engineers responsibility to coordinate with the utility companies to establish the location of their existing and proposed services, and the specifications for their installations.

A5. TESTING

It shall be the Engineer's responsibility to ensure that all improvements are tested and found to meet the County's minimum test standards for such improvements prior to requesting acceptance by the County. Copies of all test results must be forwarded to the Manager of Operations.

A6. ENGINEERING AND SUPERVISON

1. Where the Development Agreement requires that the Developer construct Municipal Improvements, the Developer shall retain an Engineer to carry out preliminary surveys, prepare and submit design drawings for approval, supply construction layout and supervision during construction, certify acceptable completion of the work, and submit as-built drawings of all work performed.

2. The Developer's Engineer shall carry out the necessary construction layout to ensure the finished construction conforms to the lines, grades and dimensions shown on the approved design drawings.

3. The Developer's Engineer shall carry out the necessary construction supervision to ensure all construction is carried out to meet standards specified by the County

and the requirements of the approved plans and specifications. Upon completion of the work, the Developer's Engineer shall provide a written Construction Completion Certificate attesting to the acceptable completion of the work.

4. The Developer shall appoint an accredited materials testing firm to carry out any testing deemed necessary by sound engineering practices or by the County to determine whether all workmanship and materials incorporated into the work meet the specified requirements.

A7. LAND ACQUISITION AND AGREEMENTS FOR OFFSITE CONSTRUCTION

1. **Land Acquisition** – The Developer is responsible, at his own cost and expense, for acquiring lands where required which are outside the boundaries of the development. The Developer must enter into a Development Agreement with the County for the proposed development. The Developer, subject to the terms and conditions of the Development Agreement, shall be bound to all the terms and conditions negotiated on behalf of the development with the County.

2. **Backsloping Agreement** – In cases where the acquisition of road widening is not possible or where large cuts or fills are encountered, every effort will be made to enter into a backsloping agreement with the affected landowner. A backsloping agreement entitles the County to extend ditch and/or fill 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 by the Developer at the rates and in the amounts indicated in the signed agreements.

3. **Borrow Areas** – Where borrow areas are required for the construction or reconstruction of a County road, borrow pit agreements will be entered into with the landowners. All damage costs such as crop damage and removal of trees due to the removal of the borrow material shall be paid by the Developer 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.

4. **Easements** – All easements which are attributable to the proposed development shall be registered in the name of the County and the costs incurred in negotiating, preparing and executing the respective easements, shall be borne by the Developer.

A8. PERMANENT GEODETIC BENCH MARKS

As required by the County:

1. The bench mark shall be a square drive, one piece, power installed foundation support 2400 mm in length with a 200 mm helix on the buried end.

2. The bench mark shall be installed with a power digging unit capable of drilling the top end of the support shaft down to a point flush with the surrounding ground.

3. The Developer shall supply and install a marker post to protect the permanent bench mark installation.

4. The marker post shall be a 2100 mm in length, 12 gauge galvanized flat section design post or a sign post of the equivalent design and quality.

5. The proposed use of an alternate marker post will require approval of the County.

A9. EXISTING UTILITY PRECAUTIONS

The Contractor shall take all precautionary measures necessary when working over or adjacent to utilities, whether above or below ground, and shall control his equipment and method of construction to prevent any damage to the utility and/or appurtenances.

Under no circumstances shall the Contractor carry out any construction operations over or adjacent to any pipeline until the required adjustments and protection required for the proposed construction have been completed. Additionally, the Contractor shall provide a minimum of forty-eight (48) hours' notice to the pipeline company in advance of commencing his construction operations in that area. Upon completion of the pipeline work, the Contractor shall continue to work in close liaison with the pipeline company and, if required, ensure that a representative of the affected utility company is present at all times during active equipment operations. The Contractor shall ensure that no equipment crosses or operates over any pipeline at locations other than where protection has specifically been provided. Extreme caution shall be exercised to ensure that the pipeline is not damaged as a result of the construction activity.

The Developer shall be responsible for the installation and associated coordination and costs of power, natural gas and telephone services in the subdivision. Any other utilities that may be required shall be provided at the sole expense of the Developer.

The Developer shall make arrangements with the utility companies to locate and remove any existing utilities, such as power poles, pipelines, telephone poles, buried cables, etc.

Gas, power and telephone location and/or relocation plans shall be submitted to the County for approval prior to installation. The Developer shall be responsible for the payment of all costs related to these utility installations.

The Developer shall provide registered easements in the name of the County to accommodate the utility services. All easements shall be registered on each individual lot concurrently with the registration of the Subdivision Plan.

A10. ENVIRONMENTAL CONCERNS

Lacombe County focuses on our internal operations in order to conserve, protect and enhance the environment in balance with social and economic needs and as such we require those who work in the County to do the same. In general the Contractor shall not dump, spill or dispose of any overburden, trees, brush, petroleum products, refuse or any other debris into any watercourse or other body of water, or into any area which may ultimately cause pollution to surface or ground water resources. The Contractor shall clean up any deposits of waste arising from his work which may cause subsequent pollution, and should the Contractor fail to do so, the County may, without further notice, arrange the clean-up of such deposits at the sole expense of the Developer.

The Contractor shall conduct his operations in accordance with the current legislation concerning pollution control, including the *Clean Air Act*, the *Environmental Enhancement and Protection Act* and any other related legislation. It shall be the Developer's responsibility to familiarize himself with the applicable legislation and regulations and obtain all necessary permits and approvals for his operations.

In regards to specific actions such as storm water management and erosion and sediment control contractors are asked to address these needs as specified in detail in the Standards Manual.

A11. DEVELOPMENT APPROVAL PROCESS

The Development approval process is a combination of administrative requirements and political procedure. For further details see the *Multi-Lot Development Proposals:*

Lacombe County's Guide to the Approval Process and contact the Planning and Development Department.

The developer must submit a minimum of three (3) copies of all documentation, drawings and plans relating to multi-lot subdivisions or re-designations to the Planning Department only.

A11.1 Pre-Application Meeting

The developer is requested to arrange a meeting with County staff to discuss the proposed development of the property. This meeting is designed to ensure the Developer is aware of County policies and requirements relevant to the proposed development.

A11.2 Concept Plan

The County will require the developer to prepare a concept plan that will provide the framework for the subsequent subdivision and development of the property.

As a general requirement, the concept plan must describe the land uses proposed for the property; the staging (or phasing) of the development, if applicable; the size of the lots proposed; and the location of proposed roads and other utility infrastructure (e.g. stormwater retention/detention ponds). A more detailed terms of reference for preparing a concept plan is included in *Lacombe County Multi-lot Development Proposals: A Guide to the Approval Process Appendix D*. These terms of reference may be varied depending on local conditions or other considerations.

In preparing the concept plan, the developer must demonstrate that the site is suitable for the proposed development, how the design relates to the site's features and that the impacts of the development on the surrounding area have been properly considered. This will generally involve more detailed investigations by qualified professionals of:

- groundwater supply availability;
- geotechnical considerations to assess what constraints exist for development;
- site drainage and stormwater management requirements;
- traffic impacts; and
- biophysical impacts.

A historical resource impact assessment may also be required pursuant to the *Alberta Historical Resources Act*. The developer is encouraged to contact the Alberta Culture and Tourism for further advice and direction.

The concept plan must show how the proposed development relates to existing and potential future use of surrounding lands, and any measures that have been taken to reduce potential conflicts (e.g. development adjacent to a railway, major road or a commercial/industrial site or other potentially conflicting land use).

Consultations are to be carried out with other government authorities during the preparation of the plan. County staff will advise which government authorities are to be contacted.

Site Development Guidelines are also an important component of multi-lot commercial and industrial developments within the County. All developers of commercial and industrial parks are required to create guidelines which outline requirements with regard to architectural controls, landscaping design, fencing style and lot layout for both the overall development and each individual lot. These guidelines are subject to County approval ensuring that there is a consistent standard and character of development within each individual park.

The County requires the developer to provide three (3) paper copies and one (1) electronic copy each of the concept plan and associated detailed investigations. These documents must be received by the County before staff will give the developer permission to present to County Council or the Municipal Planning Commission.

The County requires the Developer to prepare a Concept Plan that will provide the framework for the subsequent subdivision and development of the property.

The Developer must demonstrate that the site is suitable for the proposed development, how the design relates to the site's features and that the impact of the development on the surrounding area has been considered.

A11.3 Construction of Municipal Improvements

Before construction can begin, the Developer must sign the Development Agreement, receive Conditional Subdivision Approval, submit all required drawings, plans, specifications and securities and receive written approval to start construction.

The Developer must submit three (3) copies of all the required drawings, plans and specifications, which shall include:

1. **Covering letter** - the subject and purpose of the application, an estimated construction starting date and the proposed schedule for the site meeting.

2. **Estimated construction schedule** outlining the sequence of construction to be followed and applicable critical dates.

3. **Cost estimate for the proposed improvements**

4. **Road Design** - detailed proposals for road design and construction including:
   a. Overall road layout of all roads and rights-of-way widths, cross-sections, pavement structure designs and estimates of average daily two-way traffic.

   b. A detail schedule of the length of local roads (including cul-de-sacs) and cost per meter and the length of other roads and cost per meter.

   c. All proposed streets shall be named on the drawings, with the names approved by the County prior to the submission of drawings.

   d. Details of any temporary facilities (emergency access, construction access, etc.)

5. **Communal Water System** - detailed proposals for potable water:
   a. Water supply
   b. Water Treatment
   c. System Plan and Design
   d. System Materials
   e. Associated buildings and facilities

6. **Waste Water System** - detailed proposals for sanitary system
   a. Sewage Flows
   b. System Plan and Design
   c. System Materials
   d. Wastewater storage and handling
   e. Wastewater treatment
   f. Associated buildings and facilities

7. **Fire Protection** - system design that meets requirements of County, *Alberta Building Code* and NFPA standards.

8. **Stormwater Management** - detailed proposals for management facilities including:

a. Stormwater management plan and analysis.

b. An overall plan depicting any storage facility location, the drainage basin and the downstream receiving stream; supporting detailed hydrology and hydraulic calculations for all facilities including an analysis of the capacity of the downstream receiving channel; preliminary facility cross-sections and details of inlets and the outfall control structure; description of storm-water quality improvement methods to be incorporated and erosion and sedimentation control works proposed. If the implementation of the scheme is to be staged, the staging method should be presented.

c. The details of any interim storm-water management.

d. All designs must comply with the County's *Standards for Stormwater Management Facilities* and the County's *Municipal Development Plan.*

9. **Suitability of Lots for Development**

The lands which have a water table less than two meters below the ground surface will not be considered as developable, unless the Developer can satisfactorily fill the area and achieve the water table clearance necessary to make the site developable. Such work will require the prior approval of the County.
The ground water table if less than two meters below the ground surface, shall be located by hydrogeological survey.

Each lot shall have tests performed for water table levels and percolation rates. When the tests are completed, the Developer shall show on a separate plan the following:

a. The area of land within a proposed lot which is classified as developable.

b. In percentages the relationship of developable land to the rest of the lot area.

c. The relationship in elevation difference between the proposed building site and sewage disposal site.
d. The permeability or percolation of the soils and the types of soil at the proposed sewage disposal areas.

e. On a separate plan a suitable building site and sewage disposal area on each proposed lot.

10. **Easements and Right of Way**

    Where easement or rights-of-way documents and plans are deemed necessary, they shall be prepared by a licensed Alberta Land Surveyor and registered with Land Titles, at the Developer's expense.

    The Engineer shall bring to the attention of the Developer the need for any rights-of-way outside the area to be serviced.

11. **Additional Technical Detail** required to satisfy the conditions of subdivision approval.

12. **Approvals, Permits, Licenses or Agreements**

    a. Copies of all letters of application for all applicable approvals, permits, licenses, or agreements from Provincial, Federal or private agencies.

    b. Copies of the federal and/or provincial approvals, permits, licenses or agreements must be received before construction commencement.

13. The minimum following plans:

Plan Name	Reference
Construction Management Plan	B3.1
Environmental Construction Plan	B3.2
Traffic Impact Assessment	B3.3
Legal Plans	B3.4
Overall Plans	B3.5
Road Plan	B3.6
Franchise Utility Plan	B3.7
Overland Drainage Plan	B3.8
Lot Grading Plan	B3.9
Plan Profiles	B3.10
Trail Design Drawings	J2.1
Erosion and Sediment Control Plan	D6
Landscape Plan	E/F4.4/F5.1

Plan Name	Reference
Gas, Power, Telephone Location/Relocation Plan	A9
Floodplain Plan A11.2(e)	A11.2(e)
Community Mailbox Plan	A12.2
Stormwater Management Plan	L3
Plan for HDD (if required)	C20.4

The construction drawings, specifications and relevant data will be checked by the County and all necessary revisions shall be incorporated in the final design drawings.

Upon completion of all revisions, the Engineer shall submit three (3) sets of drawings to the County for approval. Following approval, the County will return one (1) approved set to the Engineer.

A copy of all approved drawings and specifications shall be maintained at the construction site during the installation of the Municipal Improvements.

A11.4 Construction Completion Certificate (CCC)

Following the completion of all of the Municipal Improvements, Collective Water and Wastewater Systems where required to be installed, the Engineer shall immediately deliver three (3) sets of Mylar "as-built" drawings, three (3) sets of bound prints and three (3) sets of digitized drawing files to the County in AutoCAD format. All of the County's infrastructure shall be incorporated on the reproducible copies of the County's overall drawings for each utility. As-built drawings are to be submitted and approved prior to the issuance of the Construction Completion Certificate (CCC).

1. Construction Completion Certificate (CCC)

Upon the satisfactory completion of the project, and after all of the deficiencies have been corrected, the Developer's Engineer shall submit a Construction Completion Certificate (CCC) to the County, requesting the acceptance of the work. The County will inspect the works and if acceptable will sign the CCC and state the duration of the maintenance period. The Developer shall be responsible for and, at his own expense, remedy any defect, fault or deficiency in the completed work during the maintenance period, in accordance with the terms and conditions of the Development Agreement.

2. CCC with Deficiencies Remaining

If the Developer's Engineer requests a CCC noting deficiencies remaining, the County may sign the CCC provided securities in the amount of 100% of the estimated remaining work is provided by the Developer to the County. Adequate security will also be required as warranty for the improvements that have been completed. The Developer will remain responsible for all maintenance until the deficiencies are completed and the Maintenance Warranty Period will start once all deficiencies are completed.

3. Final Subdivision Approval

After the final inspection and correction of all deficiencies thereof, a Final Acceptance Certificate (FAC) will be issued by the County. The Developer has one year from the date of final approval with which to have the subdivision plan registered in the Northern Alberta Land Titles Office.

A11.5 Maintenance and Warranty Period

The Developer shall, for a period of two (2) years after the acceptance of a Construction Completion Certificate without deficiencies for a development by the County, be responsible for regular maintenance and all repairs and replacements to any municipal improvements which in the opinion of the County become necessary for any cause whatsoever.

Repair work for which the Developer shall be responsible may include, but is not limited to the following:

a. Failure of or damage to any of the municipal improvements resulting from defective materials or improper installation.

b. Repairs and/or replacement of road surfaces and approaches; and

c. Re-grading of drainage courses, swales or ditches

d. Replacement of trees and plants if required

The Developer shall provide for the duration of the Maintenance and Warranty Period an Irrevocable Letter of Credit as required by the County for the amount stated within the Development Permit.

A11.6 Development Permit Application

A development permit will be required from the County to build a home and other buildings on any of the lots within the subdivision. There shall be no Development Permit issued for any construction on a particular lot within the development until all improvements and utilities are in place and accepted by the County.

A12. COMMUNITY MAILBOXES

A12.1 General

The Developer's Engineer shall submit a copy of the Concept Area and a copy of the current subdivision plan along with a request for mailbox locations to the Manager of Delivery Planning of Canada Post, Prairie Region.

A12.2 Location Criteria

Canada Post has prepared a document entitled *Delivery Planning Standards Manual for Builders and Developers* which is available through the Canada Post website.

Canada Post will determine the final location of community mailboxes based on various criteria, including the effect upon the ratepayer who is immediately adjacent to the scheduled community mailbox location.

Upon receipt of the mailbox location plan from Canada Post, the Developer's Engineer shall ensure that the community mailbox locations conform to the requirements noted in the *Delivery Planning Standards Manual for Builders and Developers* and the following County criteria – refer to section C17 for mailbox County design standards.

1. The location of the boxes shall not impede the pedestrian and vehicular sight distances.

2. Not too close to streetlight standards, street name poles or any raised utility boxes such as transformers.

3. Not on a utility easement or over a utility trench (deep or shallow)

4. No closer than ten (10) meters from a fire hydrant

5. Not along County major thoroughfares, since no parking is permitted on these roads

The Developer's Engineer, with prior approval from the County, shall advise Canada Post of the acceptability of the locations or suggest a revised location for consideration by Canada Post.

Following approval of the sites by Canada Post, the Developer shall prepare a dimensional drawing, similar to the Building Grade Certificate Drawing, and forward it to the Delivery Planning Manager at the above noted address.

The community mailbox locations must also be shown on all applicable drawings.

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B1. GENERAL

All detailed engineering plans submitted for review and approval must comply with the following standards and specifications and shall be submitted to the County a minimum of sixty (60) days before the start of construction.

B1.1 Changes to Design Drawings

For any reason, if changes to the design drawings must be made after they have been approved, three (3) prints of each of the original drawings affected shall be submitted with the proposed changed shown in red, accompanied by a letter outlining the reasons for the required changes. If the proposed changes meet with the County's approval, one copy will be signed and returned, accompanied by a letter authorizing the changes to be made on the original.

No work can proceed until approved by the County.

B1.2 Digital File Specifications

The digital file shall be in AutoCAD R14 or later and NAD83, geo-referenced or as approved by the County.

B1.3 Dimensions

Dimensions should be given from an iron pin, a lot line, a center line or any other reference that can be readily established.

B1.4 Elevations

All elevations shall be relative to a Geodetic Datum with all reference benchmarks and elevations shown on the drawing.

B2. DRAWING AND PLAN GUIDELINES

B2.1 General

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

1. Plan size shall be the standard A-1 drawing (594 mm x 841 mm) with the profile located at the bottom of the sheet. The plan shall not extend onto the profile section and the profiles must be shown only on the profile section.

2. Drawing details shall be in metric measure.

3. Clarity and legibility shall be the governing criteria when preparing drawings. Care must be taken to ensure a balanced distribution of detail throughout the drawing. Lines will be uniform in weight and density.

4. Letters and figures will be clearly legible, 2 mm size or larger, well spread, properly formed and proportioned.

5. Elevations shall be referenced to Geodetic Datum and be in metric measure. Locations and elevations of the permanent bench marks used must be clearly identified on the plans.

6. A north arrow shall be shown on each drawing, directed towards the top of the plan.

7. Plans shall be drawn to the following scales:

Type	Scale	
Overall Plans	1:1000	
Plan/Profile	Horizontal 1:500	Vertical 1:50
Cross Sections	Horizontal 1:100	Vertical 1:50

8. All plans shall show adjacent lots and plan numbers, legal description of the parcel being developed and all relevant registered plan numbers including lot and block numbers.

9. County approved street and subdivision names must appear on the drawings.

10. All plan sets shall be bound along the left hand margin.

11. All drawings must clearly show the following in the title block:

    a) Developer/owner's name
    b) Engineer's name
    c) Lacombe County
    d) Subdivision name including staging and/or phasing
    e) Drawing name

f) Drawing number and job number, if applicable

g) Revision number and description, if applicable

h) Horizontal and vertical scales

i) Space for signature of the designer, draftsperson, checker and approving authority

j) Space for the number, date, description, designer and approving authority for all revisions and drawings issued including preliminary, approval, tender, construction and record drawings

k) Space for professional stamps, permit stamps and preliminary acceptance for construction stamp

l) Date issued and revision number if applicable

m) Legend

n) Notes

B2.2 Standard Details

Standard detail drawings may include typical road cross-sections, trenching details, pavement structure, etc. The details shall be included on a standard A-1 size sheet. The scale of individual details will commensurate with the amount of information to be shown along with clarity and legibility.

B2.3 Cover Sheet

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

1. Subdivision's name
2. Developer/owner's name
3. Engineer's name
4. Lacombe County
5. A drawing index
6. Project location plan (key plan) with legal description
7. Drawing legend
8. List of symbols and abbreviations (refer to abbreviations table at B2.5)

B2.4 Typical Cross-sections

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

1. Width of rights-of-way
2. Finished width of roadway surface
3. Width of sub-grade
4. Slope ratio of side slopes and back slopes
5. Depth of ditches
6. Surface crown slope
7. Pavement structure details including depth, class, designation and grade of materials

B2.5 Abbreviations

Abbreviation	Term	Abbreviation	Term
Ab	Abandoned	LC	Length of Curve
AC	Asphaltic Concrete	NPL	North Property Line
BHC	Begin Horizontal Curve	NTS	Not to Scale
BVC	Begin Vertical Curve	PI	Point of Intersection
BM	Bench Mark	PIVC	Point of Intersection Vertical Curve
Blk	Block	PL	Property Line
Cl.	Class	R	Radius
Conc.	Concrete	R.O.W.	Right-of-Way
CSP	Corrugated Steel Pipe	SPL	South Property Line
DA	Deflection Angle	Sta.	Station
D of C	Degree of Curve	Stl.	Steel
EPL	East Property Line	St.	Street
Elev.	Elevation	SM	Survey Monument
EHC	End Horizon Curve	Tan.	Tangent
EVC	End Vertical Curve	TH	Test Hole
Hor.	Horizontal	Vert.	Vertical
Inv.	Invert	VC	Vertical Curve
I.P.	Iron Pin	WPL	West Property Line

B3 DRAWING AND PLAN TYPES

B3.1 Construction Management Plan

The Construction Management Plan is mandatory for all subdivision developments. Industry best practice should be adhered to. Below is a list of the minimum requirements:

1. Project legal land locations
2. Map of project location
3. Site map
4. Developer's name and contact numbers
5. Subdivision name
6. Consulting engineers name and contact numbers
7. Project Manager's name and contact numbers
8. Project boundaries
9. Equipment to be used
10. Proposed hours of operation
11. Contractors and subcontractors names and contact numbers for site personnel
12. Project schedule
13. Traffic accommodation plan
14. Signed road use agreement with the appropriate road authority
15. Verification that adjacent landowners have been contacted
16. Brief description of the works to be undertaken by the various contractors
17. Emergency plan and contact numbers (police, ambulance, etc.)
18. Proposed site works and emergency incident documentation
19. Nuisance minimization plan (dust, noise, etc.)
20. Other information as required or requested by the County

B3.2 Environmental Construction Operations (ECO) Plan

The ECO Plan is mandatory for all subdivision developments. All relevant federal and provincial legislation and industry best practices must be adhered to. This plan can be

combined with the Construction Management Plan if all the information is provided. Below is a list of the minimum requirements:

1. Project Setting and Site Activities
   a. Project Description- A brief description of the project and its legal land location, subdivision name and project boundaries.

   b. Project Contacts- Name and contact details for the Developer, Engineer, Project Manager, contractors, subcontractors and site personnel.

   c. Environmental Sensitivities- Site specific sensitive or protected features that could be impacted as a result of the Contractor's activities as described.

   d. Site Activities- A scope of work and a list of all construction or related activities to be undertaken during the project are provided, including:
      - Equipment to be used
      - Proposed hours of operation
      - Brief description of the works to be undertaken by the various contractors
      - Equipment maintenance and storage on site (fueling procedures and spill containment, etc.)

2. Project Schedule and Site Drawings
   a. Project Schedule- A project schedule is provided, including scheduled shut-downs and restricted work periods due to environmental requirements.

   b. Site Drawing(s)- One or more site drawings are provided, indicating:
      - Map of project location
      - Site map
      - Office and facilities placement
      - Erosion and sediment controls
      - Environmental sensitivities

3. Potential Environmental Impacts and Conflicts
   a. Permits, approvals, authorizations and notifications- List the file name, number and environmental conditions of all required project permits, approvals and notifications. Copies of all project permits, approvals, authorizations and notifications (and their associated applications, which referenced in approval) are appended to the ECO Plan.

b. Regulatory Compliance- Specific regulatory requirements (other than those listed in 3a) that directly impact or restrict this construction period are described.

c. Mitigation Strategies- Procedures, controls or best management practices (BMPs) to prevent or reduce adverse impacts on the environment are provided.

d. Erosion and Sediment Control- Controls provided as appropriate for the project.

e. Environmental construction practices for top soil and subsoil removal and replacement.

f. Reclamation plan.

4. Waste Management and Hazardous Materials

a. Waste management and hazardous materials- List hazardous materials that will be used/stored on site. Expected hazardous and non-hazardous waste materials along with proper handling, containment, storage, transportation, disposal and spill cleanup methods are listed. As appropriate for the project, estimated waste quantities and specific handling procedures are also provided.

5. ECO Plan Implementation

a. On-site Representative- Name and contact details for the person(s) who will be the onsite representative(s).

b. Training and Communication- Documentation of employee training for environmental emergencies.

c. Monitoring and Reporting- Monitoring inspection procedures including a schedule of monitoring activities and reporting procedures.

d. Documentation- Information and/or records that will be maintained relating to the ECO Plan and environmental matters on the project site are described. Documentation of environmental nonconformance, preventative and corrective actions.

e. ECO Plan Update- Provide ECO Plan review and update procedures and append a table summarizing all changes

6. Environmental Emergency Response Procedures
   a. Environmental Emergency Response Procedures- Potential adverse environmental impacts are identified and emergency response procedures to prevent and respond to incidents are provided. An emergency response contact list is provided.

B3.3 Traffic Impact Analysis

Information required in this plan is listed below

1. Methodology

2. Existing land use, existing roadway system, traffic growth history, current traffic volumes and conditions (AADT)

3. Trip generation from proposed development, trip distribution and assignment (AADT)

4. Intersectional analysis

5. Capacity analysis (levels of service) including adjacent road system and intersections

6. Recommendations and estimated costs for road and intersection improvements

B3.4 Legal Plans

The following plans shall be provided:

1. Plan of survey
2. Utility rights-of-way plan
3. Drainage easement plan
4. If an access easement is required, it is usually shown on a right-of-way plan showing rights-of-way for access and for utilities. The other features mentioned will appear on the plans referred to in B3.2

B3.5 Overall Plans

Separate overall plans shall be submitted for each of the following:

1. Roads
2. Franchise utilities
3. Overland drainage plan
4. Lot grading plan

5. County addresses
6. Reserve Improvements which shows trails (walkways) and other recreational facilities and amenities, as well as landscaping details

B3.6 Road Plan

This plan shall include the following:

1. Base plan with lot configuration
2. Proposed roadway system
3. Access onto existing roadway system
4. Road names where required, existing and proposed
5. Approaches
6. Utility rights-of-way with dimensions
7. Walkways
8. Roadway and rights-of way alignment with dimensions
9. Roadway traffic signing
10. Drainage features including waterways, lakes, ponds, canals, swales, ditches and culverts, noting direction of flows

B3.7 Franchise Utilities Plan

This plan shall include the following:

1. Typical line assignments within utility rights-of-way
2. Proposed assignments within utility rights-of-way
3. Off-site connections
4. Easements required

B3.8 Overland Drainage Plan

This plan shall include the following:

1. Legal base plan including easements
2. Original contours at 1 meter intervals
3. Proposed roadway system
4. Drainage easements
5. Proposed Stormwater Management Facilities
6. Culverts

7. Major drainage system
8. Proposed site grading contours and elevation
9. Direction of proposed drainage

B3.9 Lot Grading Plan

This plan shall include the following:

1. Legal base plan including easements
2. Original contours at 1 meter intervals
3. Proposed lot elevations and building grades
4. Direction of proposed drainage

B3.10 Landscaping Plan

This plan shall include the following:

1. Reserve Improvements which shows trails (walkways) and other recreational facilities and amenities, as well as landscaping details

B3.11 Plan Profiles

All of the items listed for the Overall Plans are applicable with some additional details and dimensions.

1. **Plan:**
   a) Locations and dimensions of lot approaches and culverts
   b) Station location and dimension of road culverts
   c) Direction of storm drainage flow and location of control feature such as ditch blocks and swales
   d) Horizontal curve data including chainages of BC and EC, delta angle, radius and arc length for centerline
   e) Edge of pavement line assignment
   f) Dimension all corner radii
   g) All tie-ins to existing utilities
   h) All traffic signage
   i) Bench marks
   j) Rights-of-way width

k) Utility rights-of-way

l) Road drainage patterns

m) Existing buildings

n) Overland drainage

2. **Profile:**

a) A vertical scale indexing the survey datum (metric)

b) A horizontal scale of the project chainage

c) Profile chainage must be aligned with the plan view

d) Existing ground profiles along centerline and both property lines

e) Proposed design profiles for centerline and ditches including all slope grades

f) Vertical curve data including chainage and elevations of BVC, PVI, and EVC, length of curve and k values

g) Approach locations

h) Location of all culverts complete with dimensions and invert elevations

i) Ditch checks

j) Consistent stationing (i.e. 0+900 meters)

k) Stationing should start from 0+000 for each new section of roadway

B3.12 Record Drawings

When submitting for a Construction Completion Certificate (CCC), the Developer shall include three complete sets of as-built drawings for review. The plans show the "as-constructed" locations, profiles and details of the constructed utilities and surface improvements necessary to ensure that the development has been constructed as designed. All record drawings must be received by the County prior to issuance of a CCC. Once the drawings are approved, the Developer shall submit one set of reproducible drawings and the digital files in a format acceptable to the County.

Any deviation between design drawings and as-built drawings must be highlighted in red, with the deviation detailed, on the as-built drawings submitted to the County.

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C1. GENERAL

Road classification and designation shall generally 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.

Generally, individual road classification is to be based on Lacombe County Standards as determined by the Operations Department. Utility lines will not be allowed in the road structure. Utility rights-of-way or utility easements adjacent to the road rights-of-way will normally be required.

The Developer and the Engineer must ensure that the roadway infrastructure is designed and constructed to achieve full design life expectations consistent with good engineering and construction practices.

C2. DESIGN

All design shall be based on Alberta Transportation's *Highway Geometric Design Guide* latest edition.
Developers are responsible for restoration and densification to Alberta Transportation standards for all survey control markers and legal pins removed or disturbed during construction.

C2.1 Traffic Analysis/Traffic Assessments

The Developer is responsible for a traffic assessment when required by the County. At a minimum, the traffic assessment **shall include the following**:

1. Amount of daily traffic generated by the development at the full development stages, and if the development is staged, then at the end of each consecutive development stage.

2. Layout of the internal road system.

3. Location of all proposed access points.

4. Sight distance assessments at the proposed access points.

5. Review of the proposed access points to determine whether or not intersectional improvements are required.

6. This traffic assessment will be used by the Engineer in addition to the County's minimum guidelines to establish a safe, viable access (es) and road system within the County rights-of-ways.

C2.2 Street Classification

Table C1-1 (following page) indicates the required road cross sections for each street/road classification.

C2.3 Vertical Alignment

1. The minimum grade shall be 0.6%.

2. The maximum grade shall be 6.0% and at intersections the maximum gradient shall be 2%.

3. All other requirements will be to current Alberta Transportation Standards.

C2.4 Vertical Curves

1. All vertical curves shall be designed per Alberta Transportation Standards.

2. The minimum length of a vertical curve shall be 30 meters on local roads and greater than or equal to the design speed in km/h on main roads.

3. Vertical curves are not required where the algebraic difference of the grades is less than 1.5.

ROAD CLASSIFICATION	MINIMUM DEEP STRENGTH PAVEMENT EQUIVALENT	MAXIMUM SIDESLOPE RATIO	GRADE SLOPE	MAXIMUM BACKSLOPE RATIO	MINIMUM RIGHT-OF WAY WIDTH (meters)	PAVED SURFACE (meters)	SIGHT DISTANCE (meters)
Main Asphalt Road Drawing C-1	500mm	4:1	4:1	6:1	40.23	9.4	200 meters
Industrial Subdivision Road Drawing C-2	500mm	4:1	4:1	6:1	40.23	9.4	150 meters
Residential Subdivision Main Access Road Drawing C-3	500mm	4:1	4:1	6:1	30.48	8.5	150 meters
Residential Subdivision Road Drawing C-4	450mm	4:1	4:1	6:1	30.48	8.5	150 meters
Local Roads Drawing C-5	N/A	4:1	4:1	4:1	20.12	8.0	150 meters
Access Roads Drawing C-6	N/A	3:1	3:1	3:1	20.12	7.0 (NOT PAVED)	150 meters
Farm Machinery Roads Drawing C-7	N/A	3:1	3:1	3:1 Preferred	20.12	6.1 (NOT PAVED)	150 meters

C2.5 Horizontal Alignment

Wherever possible the alignment should be as directional as possible and consistent with topography. The use of winding alignment should be avoided.

1. The minimum degree of curvature of the centerline of the roadway is dependent on the road classification and its design speed. The use of minimum radius of curvature should be avoided.

2. All horizontal curves shall be designed to meet the minimum design requirements as noted in the following chart:

Classification	Minimum Radius of Curve (meters)	Maximum Gradient %	Minimum Tangent Lengths (Meters)	Intersection Spacing (meters)
Local Road	300	6	30	60
County Main Road	450	5	60	400

3. See Alberta Transportation Highway Geometric Design Guide for super-elevation requirements

C3. APPROACHES

All country residential subdivision lots and private properties will require one approach constructed to the property from the accessing roadway according to the following requirements and specifications.

Industrial approaches shall be constructed to the same requirements and specifications as private approaches with the exception that the width of the approach must be increased to accommodate the type of development and anticipated traffic.

Road approaches shall be located and designed to access the parcel at most desirable building location. These specifications are the minimum standards to be followed. **The County must approve the final location and construction.**

Where a culvert is required the following minimum culvert sizes will be used:

Residential Approach Culvert	400 mm diameter
Roadway Cross Culvert	500 mm diameter
Industrial Approach Culvert	600 mm diameter

C3.1 Industrial Lot Entrances geometric requirements

1. Light Industry
   a) Minimum turning radius 12 – 15 meters
   b) Minimum road surface width 11.5 meters
   c) Gradient must be no greater than 2%

2. Heavy Industry
   a) Minimum turning radius 15 meters
   b) Minimum road surface width 15 meters
   c) Gradient must be no greater than 2%

C3.2 Residential Lot Entrances geometric requirements

1. Minimum turning radius 12 – 15 meters
2. Minimum road surface width 6 meters
3. Maximum road surface width 10 meters
4. Gradient must be no greater than 2%

C3.3 Residential Shared Lot Entrances geometric requirements

1. Minimum turning radius 12 – 15 meters
2. Minimum road surface width 9 meters
3. Maximum road surface width 10 meters
4. Gradient must be no greater than 2%

If pavement is required, all asphalt approaches must have a structure equivalent to that of the adjoining road with the width of the surface extending to the property line. Refer to County Policy OP (29) for additional information.

C4. CLEARING AND GRUBBING

All work shall be done within the limits of rights-of-way, permanent and working easements and shall include the complete disposal of all buildings, fences, vegetation and other debris. All work shall 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.

C5. EARTHWORK

C5.1 Topsoil Stripping and Stockpiling

Topsoil shall 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.

C5.2 Common Excavation

All excavation shall be done within the limits of the proposed work to the lines, grades and dimensions as shown on the engineering plans, noted in the plan documents or as specifically approved otherwise. Surplus or unsuitable material shall be disposed of as approved by the County.

C5.3 Embankment Construction

All material below 300 mm from the finished grade shall be placed in maximum 300 mm (loose) successive uniform layers, each compacted to a minimum of 98% Standard Proctor Density at +/- 1% of optimum moisture content unless stated otherwise. Material in the top 300 mm shall be constructed in two (2) 150 mm (compacted) lifts to a minimum of 100% Standard Proctor Density. Only “approved” native or imported material shall be used.

Side-slopes and back-slopes shall not be steeper than 4:1. Where, in the opinion of the Engineer, such slopes are not sufficient for the native soil condition; the Engineer shall provide a suitable slope acceptable by the County.

C5.4 Equipment

All proposed routes for hauling equipment other than trucks must be approved by the County prior to commencement of the work. Rubber-tired motor scrapers shall not be used to haul over improved streets. Traffic must be controlled by flagmen and sufficient warning signs to ensure the safety of the public. Any road closures and detours must be submitted to and approved by the County a minimum of forty-eight (48) hours prior to the scheduled work. Haul routes must be kept clear and free from dust by grading and watering. Trucks must be loaded in such a manner that no spillage occurs.

C5.5 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 Developer will be responsible in securing borrow sites.

C6. CULVERT SPECIFICATIONS

1. Culverts within the County will be constructed and installed as per Alberta Transportation Standard Specifications.

2. Unless otherwise approved by the County, roadway centerline culverts shall be a minimum diameter of 500 mm.

3. Unless otherwise approved by the County approach culverts shall be a minimum diameter of 400 mm.

4. Culvert material shall be constructed to produce a typical 4:1 sloped end section on each end of the pipe.

5. Culverts shall be installed 0.10 meters below elevation of drainage profile unless otherwise directed by the Engineer or the County.

C7. SUBGRADE CONSTRUCTION

C7.1 Excavated Areas

The areas excavated to sub-grade elevations shall be scarified to a minimum depth of 150 mm below the surface and compacted to a minimum of 100% of Standard Proctor Density. The cut shall conform to the lines, grades and dimensions required.

C7.2 Fill Areas

That portion of any fill more than 300 mm below the top of sub-grade shall be placed in successive horizontal layers not exceeding 300 mm loose depth and compacted to a minimum of 98% of Standard Proctor Density. The top 300 mm shall be placed in two (2) 150 mm compacted lifts and compacted to a minimum of 100% of Standard Proctor Density.

C7.3 Drainage Working Areas

All work shall be carried out by the Developer so that excavated areas will drain to a natural drainage course during construction or by pumping.

C8. GRANULAR BASE COURSE

C8.1 Materials

Granular material shall consist of crushed 20 mm gravel free from vegetation, clay or other extraneous material and meet Designation 2, Class 20 specifications.

C8.2 Construction

1. **Surface Preparation** – The sub-grade shall be finished to conform to the required section, grade and density prior to the placement of base course material.

2. **Placement** – The material shall be placed on the sub-grade or preceding course in a uniform manner to ensure the ultimate planned compacted thickness. Crushed gravel shall be mixed and placed in horizontal layers of not more than 150 mm compacted thickness. Pit run gravel (75 mm) shall be mixed and placed in uniform layers, not exceeding 150 mm in compacted thickness, without segregation.
3. **Water** – If the material requires water to attain the specified density, water shall 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 until the optimum moisture content specified is obtained.

4. **Composition** - Not less than 100% of maximum density shall be obtained in compaction tests. Compaction shall be reached by the use of pneumatic tire rollers, vibrating drum packers or other approved types of compaction equipment.

5. **Testing and Inspection – County Representative to be Present for Testing**
   a) **Densities** – Field density tests shall be carried out for each 2,000 m^2 (per layer) of granular base course or at least one test per day of placing operations

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

   c) **Appearance** – No segregation of rock or fines material shall exist in the completed base. The gravel base shall be free of all loose or deleterious material.

   d) **Thickness** – Areas suspected of being deficient or excessive in thickness shall be cored at the rate of three (3) cores per 1000 m^2.

e) **Base Course** – deficiencies in the base course less than 6 mm in thickness will not be penalized. Areas deficient by more than 6 mm but less than 20 mm shall be paid for at an adjusted rate; the ratio of the average thickness divided by the design thickness. **Areas deficient by more than 20 mm shall be refused.**

C9. ASPHALTIC CONCRETE PAVEMENT

C9.1 Pavement Design

The Asphalt Institute method of pavement design using maximum 8165-kg axle loads shall be employed in the design of all paved roadways. All design parameters [e.g. traffic counts, percentage of types of vehicles, California Bearing Ratio (CBR)] are to be provided to the County.

A geotechnical firm is to be engaged to perform testing on the completed roadway to confirm the adequacy of the pavement design. Asphalt materials, mixing, spreading and rolling shall conform to the Asphalt Institute Standards for methods of construction.
The pavement structure shall be designed to carry the anticipated loading and traffic capacity for a minimum twenty (20) year life. All roadways shall be paved with Full Depth Asphalt or a structure with an equivalent strength.
Asphalt concrete mix designs shall be prepared by a recognized testing laboratory. Mix designs shall be forwarded to the County for approval.

No paving shall be allowed until the sub-grade has been tested, inspected and approved by the County.

Stage construction for any asphalt work is an acceptable method of construction with the final lift of asphalt placed during the construction season prior to the FAC issuance.

C9.2 Materials

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

All materials are to meet current Alberta Transportation Standards and be approved by the County.

C9.3 Composition and Proportioning

All mix designs and tolerances are to meet current Alberta Transportation Standards and be approved by the County.

C9.4 Construction Methods

1. **Weather Limitations**
   Mixture shall not be placed during:
   a) Periods of rain or when there is an imminent danger of rain
   b) Excessive winds
   c) Air temperatures 2º C or cooler, except in specific situations where, in the opinion of the Engineer and with approval from the County, conditions warrant the risk involved.

2. **Base Preparation**
   The prepared base shall be dry and clean of all loose or foreign materials.
   Where tack coat or asphalt sealer is applied, it shall be thoroughly cured prior to placing the mixture.
   Where existing pavements are to be overlaid, a leveling course of hot mix asphaltic concrete shall be placed if required prior to placing the surface course. Unless otherwise approved by the Engineer and the County, this course shall be laid with a paver and shall meet all of the requirements of the Section.

3. **Transportation of Mixture**
   The mixture shall 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 shall not be permitted.

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

   Trucks shall have an easily accessible 12 mm hole in the side of the box at a distance of 300 mm from the bottom for the purpose of checking temperatures of the mixture.

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

4. **Spreading**

   Mixtures shall be spread at temperatures which, when measured in the hopper of the paver, are not lower that 125^{o} C or higher than 150^{o} C.

   Unless otherwise permitted by the County, the mixture shall be spread by a mechanical self-powered paver, with an automatic leveling device, capable of spreading the mix without segregation or tearing, in thicknesses varying from 12 mm to 100 mm and widths from 2.5 to 4.2 meters, and to true line, grade and cross-section as shown on the approved plans.

5. **Surface Requirements**

   The surface shall be checked prior to roller compaction and inequalities adjusted. Areas found to have fat spots; sandy accumulation, etc. shall be removed and replaced with satisfactory material.

   Irregularities in alignment and grade shall be corrected by the addition or removal of mixture before rolling. Before the addition of material to any mat, the surface shall be broken with the tines of a rake to ensure proper bonding.

   Edges against which additional pavement is to be placed shall be straight and approximately vertical. A lute or rake shall be used immediately behind the paver, when required, to obtain a true line and vertical face.

6. **Hand Spreading**

   In small areas where the use of mechanical finishing equipment is not practical, the mix may be spread and finished by hand, if so directed by the Engineer and approved by the County. Placing by hand shall be performed carefully with the material distributed uniformly to avoid segregation of the coarse and fine aggregates. Broadcasting of material shall not be permitted.

   During the spreading operation, all material shall be thoroughly loosened and uniformly distributed by lutes or rakes. Material that has formed into lumps and does not break down readily shall be rejected. Following placing and before rolling, the surface shall be checked with templates and straight edges and all irregularities corrected.

   Heating equipment used for keeping hand tools free from asphalt shall be provided. Caution shall be exercised to prevent high heating temperature, which may burn the material. The temperature of the tools, when used, shall not be greater than the temperature of the mix being placed.

7. **Joints**

The mixture shall be laid so that all longitudinal joints are made while the first mat of the two being laid is still hot.

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

Transverse joints shall be carefully constructed and thoroughly compacted to provide a smooth riding surface. Joints shall be straight-edged or string-lined to assure smoothness and true alignment and shall be offset at least one meter from joints of adjacent mats.

In order to ensure that the surface shall not cool prior to laying an adjacent "run", the spreader shall not advance beyond the limits shown in the following table:

Air Temperature ˚C	Maximum Length of Advancement (meters)
27	250
15 – 27	190
7 – 15	125
7	90

When the surface course is being laid and the air temperature is below 7º C, an infra-red generator shall be used in front of the spreader to heat the abutting joint.
The infra-red generator shall be used on both the longitudinal and transverse joints. The generator shall be located so as to heat 100 mm of the previously laid surface course and 100 mm of the new course. Output of the heat generator shall be at least 120,000 KJ per hour, with a minimum 850º C face temperature in one meter of exposed unit. The infra-red generators shall provide heat energy with the complete absence of flame. Oxidized or carbonized bituminous material shall not be accepted.

Transverse joints shall be similarly heated using a portable infra-red generator with an output of 60,000 KJ per hour with a minimum 850º C face temperature in 500 mm of exposed joint.

Where directed by the Engineer and agreed to by the County, joints shall be painted with hot asphalt cement or equivalent tack coat material.

Where previously laid asphalt is to be abutted, it shall be cut back to a point where the vertical face is the depth of the previously laid mat. The exposed edge of the existing pavement shall be painted with an approved bituminous material and the freshly laid mixture raked against it, tamped with hot tampers and rolled.

8. **Testing and Inspection**
   The following tests shall be carried out for **each 1000 tonnes of asphalt pavement** or at least once during each placing shift:

   a) Marshall Stability (ASTM D1559)
   b) Sieve Analysis (ASTM C136 & C117)
   c) Bulk Specific Gravity (ASTM D2716)
   d) Bitumen Content (ASTM D2172)
   e) % Voids in the Mineral Aggregate (VMA) (ASTM D 2726)
   f) Air Voids (ASTM D3203)

C10. PRIME COATS AND TACK COATS

a) Prime Coat (Over Sub-grade or Cement Stabilized Base)
The asphalt types may vary from M.C. 30 to M.C. 250; from SS-1 to SS-lh or an emulsified asphalt primer to suit the conditions of the base. The rate of application may vary from 0.50 to 1.50 l/m^2. The materials temperature at application shall fall within the following limits:

Medium Curing Asphalt	Emulsified Asphalt
M.C. 30 (50 – 70^o C)	S.S. 1 (24 – 54^o C)
M.C. 70 (75 – 90^o C)	S.S. Ih (24 – 54^o C)
M.C. 250 (100 – 110^o C)	Emulsified Asphalt Primer (15 – 50^o C)

b) Tack Coat (Over Asphalt Base):

The asphalt for the tack coat may vary from SS-1 to SSIh; from R.C. 30 to R.C. 250, depending on conditions to suit the base. The rate of application shall be 0.25 to 0.90 l/m^2. Temperatures of application shall fall within the following limits:

Rapid Curing Asphalts
R.C. 30 (50 – 70° C)
R.C. 70 (75 – 98° C)
R.C. 250 (100 – 110° C)

C11. SEAL COATS AND FOG COATS

Seal coats shall be applied during daylight hours when the shade temperature is 10° C or higher. No bituminous material shall 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 shall not be started without consent of the County or the Engineer and shall be promptly terminated in the event of unfavorable road or weather conditions.

When a seal coat is applied without cover then it shall be referred to as a "Fog Coat" a light application of slow-setting asphalt emulsion diluted with water.
Refer to current Alberta Transportation Standards for application rates and material specifications for all seal coating.

C12. RE-CYCLED ASPHALT

Any surface re-cycling must be approved by the County. For application rates and material specifications refer to current Alberta Transportation Standards.

C13. ROAD GRAVELLING

Upon the County and the Engineer's approval of the roadway construction, the Developer shall supply and place the first lift of gravel in accordance with the specified gradation and rate of application. No graveling shall be permitted on the finished sub-grade until the sub-grade has been tested, inspected and approved.

The stockpile source of gravel shall be approved by the County. The size and gradation shall conform to the recommended standards.

1. **Rate of Application**
   The rate of gravel application shall be as outlined below:

a) All entrances to lots shall be graveled at a minimum rate of 15t per entrance, as measured from the shoulder of the road to the property line.

	Local Industrial	Industrial Collector	Minor Arterial	Major Arterial
	RCU 80	**RCU 80**	**Rau 100**	**RAD 100**
Widths	11.5 m	13.5 m	17.0 m	21 m
1st Lift	600 mm	700 mm	900 mm	1100 mm
2nd Lift	500 mm	600 mm	800 mm	950 mm

2. **Surfacing Gravel**
Surfacing gravel shall be applied to the completed road bed surface at the rates as outlined below. These applications rates may be increased or otherwise varied by the County as required to suit the roadbed conditions:

Access Road	600 t/km
Local Road	850 t/km
Industrial Road	As determined by the County/Engineer at time of development
All Private Approaches	Minimum 15 t per approach

C14. TRAFFIC CONTROL DEVICES

A traffic control device is a sign, signal, marking, barrier or other device, placed upon, over or adjacent to a roadway which is intended to regulate, warn, or guide the road users. All such traffic control devices shall be installed in accordance with the "Uniform Traffic Control Devices for Canada" Manual, latest revision thereof, distributed by the Transportation Association of Canada (TAC) 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, shall bear any commercial advertising.

It is the intent that these devices be kept serviceable for the safe movement of traffic in daylight and darkness, 365 days per year.

C14.1 Traffic Signs

Signs inform road users of traffic regulations, 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 shall conform to the Canadian Standards Association (CSA) specifications.

1. **Materials:**
   a) 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.

   b) Sign Panels – information signs shall be constructed with high intensity (or better) reflective panels. Regulatory and Hazard signs shall be constructed with diamond grade reflective panels.

   c) Sign Posts – sign post shall be made of treated 4” x 4” (100mm x 100mm), 4” x 6” (100 mm x 150 mm), 6” x 6” (150 mm x 150 mm) or other approved dimensions, as required and approved by the County.

   d) Fasteners – Non corrosive fasteners shall be used to attach signs to their supports.

2. **Installation and Maintenance:**
   Signs are to be placed with the posts vertical and the signs level. All sign posts shall be located horizontally 3m from the shoulder of the adjacent road and the bottom of the sign shall be 1.5m above the shoulder elevation of the road. Stop signs or yield signs shall be positioned in line with the near property line of the intersecting road allowance or otherwise approved by the County. Signs are to be positioned with the best possible road visibility in mind. All signs shall 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 the sign.

C14.2 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.
All materials specifications are to meet with current Alberta Transportation standards and be approved by the County.

1. **Color –** yellow (solid) lines should be used to delineate the separation of opposing traffic flows. White lines delineate the separations of traffic flows in the same direction. All lateral pavement markings are to be white in color.

2. **Pattern –** broken longitudinal lines are to indicate that lane changing is permitted and solid longitudinal lines indicate that lane changing is not permitted. The line to gap ratio for separator lines is to be 3m:6m. Lateral pavement marking may be parallel or "zebra" lines and are to be used to indicate the limits of the drivers' right-of-way concerning stopping, pedestrian crosswalks, no parking areas and the like.

   Refer to the "Uniform Traffic Control Devices for Canada" Manual which details the requirements for pavement markings.

C14.3 Temporary Signage

Temporary signage and devices shall be located as to provide motorists and pedestrians with adequate warning of construction or unusual conditions. A plan showing signage location, spacing and types shall be submitted to the County for approval a minimum of seventy-two (72) hours prior to disruption. Refer to "Uniform Traffic Control Devices for Canada" manual, section 'D'.

C15. STREET LIGHTING

All street lighting layouts and location of the buried and the overhead lines shall be approved by the County. The location, type and frequency of street lights shall be such as to provide the minimum lighting levels in accordance with Lacombe County's *Guide to Dark Sky Principles.*

Unless otherwise approved by the County, street light cables shall be installed underground. Cables crossing all roadways or driveways shall be placed in direct-burial-type rigid plastic pipe using one pipe per individual cable unless noted otherwise by the County.

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

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

C16. MAILBOXES (Super-Mail Boxes)

Prior to the installation, erection, relocation or removal of any community or individual mailboxes within the County, approval shall be obtained from the County. Further approvals will have to come from Canada Post as outlined in **Section A12 – Community Mailboxes**.

Boxes shall be placed in the most aesthetic manner possible while addressing concerns of safety and municipal and franchise utility operations. They shall conform to the following criteria site selection:

C16.1 Design Criteria

Sighting considerations should minimize visual intrusion and address traffic and pedestrian conflicts, traffic lines of sight, buried services, proximity to intersections, access to abutting properties and site maintenance, including snow removal operations. Specific requirements for the Community Mailboxes are:

1. Refer to Drawing – C-12 Mailbox –Subdivision Pullout

2. All locations are to be shown on the appropriate Construction As-Built Drawings.

3. The access is to be a minimum of 3m wide with 4:1 side-slopes and have a structure equivalent to that of the adjoining road.

C16.2 Installation

All installations shall be accomplished as quickly and with the least amount of disruption as possible.

1. Sub-Grade Preparation – The sub-grade shall be finished to conform to the required section, grade and density prior to the placement of the pad.

2. Forming – All forms shall be well staked and braced to the established line and grade.

3. Placing Concrete – Concrete shall be placed only after the sub-base and forming have been inspected and approved by the County.

4. Precast Pads – Such pads shall be constructed to the sizes and dimensions shown on the approved drawings and conform to CSA standard A251 and contain reinforcing steel.

5. Leveling – The boxes shall be installed to the requirements noted in the drawings.

C16.3 Other

A toll free emergency telephone number for Canada Post is to be made available on a 24-hour basis

C17. VEHICULAR BARRIERS

All materials are to conform to the standards and specifications contained in this Manual unless otherwise approved by the County in writing.

Vehicular barriers should be constructed at the following locations:

1. Across the end of a walkway which terminates in a lane
2. Across the end of a lane cul-de-sac which abuts a roadway
3. Along a lane which 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
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 that with the traffic barrier. Their purpose is to shield those hazards which cannot be eliminated.

C18. BACKFILLING UTILITY TRENCHES ON COUNTY RIGHT-OF-WAYS

All utility installations shall conform to CSA S250 Mapping of Underground Utility Infrastructure standard.

All ditches, trenches and cuts on County rights-of-way (adjacent to the roadway) shall be done with a minimal amount of disturbance. The backfill must be with an approved material placed in uniform lifts not exceeding 150mm of loose depths to a density of not

less than 98% of the maximum density of a Standard Proctor. No excavation shall be closed until the compaction has been approved by the County.

C19. HORIZONTAL DIRECTIONAL DRILLING (HDD)

Directional drilling is the installation of a pipe by drilling a pilot bore from the entry pit to a pre-determined exit location. The drilling head is then replaced with a reamer and the drilling string is pulled back to the entry hole, enlarging the hole. One or more reaming passes may be completed to enlarge the hole to the required size prior to pulling the pipeline product into place

C19.1 Regulatory Requirements

1. The Contractor shall perform all work in accordance with all applicable Bylaws and with the laws and regulations of Canada and the Province of Alberta.

2. The Contractor shall abide by all regulatory agency restrictions/requirements.

3. In order to reduce the potential of the spread of Whirling Disease in fish, all equipment and machinery that has been used in the United States shall be washed clean of all mud and dirt before being used in any activities in or near streams in Alberta.

C19.2 Work Content

Include all Engineering Services, plant, labour, materials and services for the following:

1. Field locate and protect all utilities.

2. Confirm the minimum required site area and advise the Engineer if it is substantially different from that shown on the drawings.

3. Complete a detailed drilling plan including a contingency “frac-out” containment plan, if necessary.

4. Preparation of the site including removal of vegetation, excavation of entry, exit, and slurry containment pits and installation of conductor barrels.

5. Drill a horizontal bore and ream holes as needed.

6. Contain all drilling mud, if used, and ensure no spillage enters any water body.

7. Monitor horizontal and vertical location of the drill path.

8. Install carrier pipe as defined as economical for this installation.

9. Testing of installed sections and restoration of all affected surfaces to their preconstruction conditions or as outlined in the contract.

C19.3 Constraints

1. No mud drilling will be allowed unless approved by the Engineer

2. Existing gas mains parallel to pipe assembly area.

3. Traffic access must remain open throughout the duration of the contract. If road closures are required, detours must be provided.

4. Schedule work to minimize interruption to existing services and local traffic.

5. Abide by all permits and authorizations to carry out construction activities near or across all buried pipelines and conduits.

C19.4 Pre-Commencement

1. All utilities along and on either side of the proposed drill path are to be located. Notify owners of subsurface utilities along and on either side of the proposed drill path of the impending work through the one-call program.

2. All utility crossings shall be exposed using hydro-excavation, hand excavation or another approved method to confirm depth.

3. The proposed drill path shall be determined and documented, including its horizontal and vertical alignments and the location of buried utilities and substructures along the path.

C19.5 Execution

1. Only trained operators shall be permitted to operate the drilling equipment and manufacturer’s operating instructions and safety practices shall always be followed.

2. Drilling mud pressure in the borehole shall not exceed that which can be supported by the overburden to prevent heaving or hydraulic fracturing of the soil (“Frac-out”).

3. Entrance and exit angles of the drill string shall be as per the submitted methodology. Any deviation from these values shall first be approved by the Engineer.

4. If a drilled hole must be abandoned, the hole shall be filled with grout or bentonite to prevent future subsidence.

5. The Contractor shall maintain the site and surrounding properties in as clean a condition as possible during execution of the Work. The work area shall be organized and cleaned at the end of each working day.

C19.6 Cleanup and Material Disposal

1. The Contractor shall have available at the site containment equipment, such as silt fencing, pumps, geotextiles, etc., necessary to contain any inadvertent release of drilling fluid to the environment. The containment equipment shall be onsite at all times when work is ongoing. The Contractor shall be aware that the County may implement a monitoring program to monitor water quality in nearby watercourses.

2. Abide by requirements of statute, bylaw and regulations respecting disposal of wastes.

3. Disposal of drilling wastes shall be in accordance with all requirements of the Alberta Energy and Utilities Board.

4. Burying of rubbish and waste onsite shall not be permitted.

5. Disposal of waste, volatile materials or water containing silt in suspension into waterways, storm or sanitary sewers shall not be permitted.

6. All waste materials shall be removed and disposed by the Contractor at a disposal site located by the Contractor and approved by the Engineer. Obtain required permits for waste disposal. Provide copies to the County.

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D1. GENERAL

Permanent or temporary erosion and sediment control is required in all areas under construction. Method, application and duration to be determined as site conditions dictate based on approval of the Engineer and Lacombe County.

D2. OBJECTIVE

The main objective of erosion and sediment control is to prevent sediment pollution in the various watercourses and other bodies of water, excluding storm water management works. Secondarily, it is to prevent nuisance airborne dust or dirt tracked onto county roadways and surrounding areas. The majority of these concerns related to subdivision development are as result of construction activities. An Erosion and Sediment Control (ESC) Plan is to be approved by the County prior to the start of any site clearing and grading.

Erosion and sediment control techniques are part of Best Management Practices (BMPs). BMPs operate by trapping storm-water runoff and detaining it until unwanted pollutants, such as sediment, phosphorous and other harmful contaminants are allowed to settle out or be filtered through underlying soils. The trapped pollutants are then removed through regularly scheduled maintenance.

Therefore, any preventative measures that will reduce erosion and sedimentation are beneficial.

D3. REFERENCE MATERIAL

The following reference materials (current editions) have been used in preparing this section and should be referred to for further details:

1. *Alberta Transportation – Design Guidelines for Erosion and Sediment Control for Highways*

2. *Alberta Transportation – Fish Habitat Manual*

3. *Alberta Transportation – Navigable Water Protections Act Manual*

D4. REGULATORY REQUIREMENTS

Erosion from land surfaces can contribute large quantities of sediment to watercourses. There are a number of federal and provincial acts and regulations governing activities that cause, or can cause harm to the environment, including construction projects that

result in erosion and/or sedimentation. Regulatory agencies also publish codes of practice, guidelines and standards that set out requirements for undertaking certain types of activities. Most legislation and other types of regulatory tools make reference to preventing the release of harmful or deleterious substances, including silt, to the environment.

All applicable Federal and Provincial legislation must be adhered to at all time including, but not limited to, the *Navigable Water Protection Act,* and the *Fisheries Act,* the *Environmental Protection and Enhancement Act.*

D5. EROSION AND SEDIMENT CONTROL (ESC) PLANS

D5.1 Goals and Objectives

The main objective of erosion and sediment control is to protect our waterways and other bodies of water (e.g. lakes) from pollution, primarily sediment pollution.

Dust control reduces the disturbance to residents and is an effective aid in reducing sediment pollution in water bodies.

D5.2 Responsibility

Erosion and sediment control is the responsibility of the Developer.

D5.3 Elements of an Effective ESC Plan

The following elements are to be considered in the preparation of an effective ESC plan:

1. **Minimize needless clearing and grading**

   Some areas of a development site should never be cleared or graded, or these activities should be restricted. This includes stream buffers, wetlands, springs, highly erodible soils, steep slopes and environmental areas.

2. **Protect Waterways and Stabilize Drainage Ways**

   Streams and waterways are particularly susceptible to sedimentation. Clearing adjacent to a waterway should not be permitted. If works are located in close proximity to a waterbody a silt fence should be installed along the perimeter of the buffer. Existing drainage ways should be identified as these will likely be the major routes that eroded sediments will take to the reach streams, rivers, etc. Drainage ways are also prone to erosion due to the high velocity of runoff.

   AEP must be notified prior to disturbances along waterways or if waterways are damaged. Compensation through the AESRD Wetland Compensation Program must be carried out.

3. **Phase Construction to Limit Soil Exposure**
   Large areas of grading should be avoided since this maximizes erosion potential. Construction phasing, where only a portion of the site is disturbed at one time, minimizes sediment load potential. Dust suppression measures such as water application or dust suppressants should be used on all areas of exposed soil.

4. **Stabilize Exposed Soils Immediately**
   To provide soil stabilization, it is important to establish ground cover over the denuded area within a short period of time with the soils being exposed. Covers such as grass, mulch, erosion control blankets, hydro seeding and/or plastic sheeting can be used to achieve this.

5. **Protect Steep Slopes and Cuts**
   Steep slopes are the most highly erodible surfaces within construction sites. Steep slopes are generally defined as 6:1 or greater. Where possible, clearing and grading of steep slopes should be avoided. Special techniques, such as uphill flow diversion and silt fencing, should be used to prevent uphill runoff from flowing down the slopes.

6. **Install Perimeter Controls to Filter Sediment**
   Perimeter controls should be implemented at the edge of the construction site to retain or filter runoff before it leaves the site. Silt fences and earth dikes or diversion are two of the more common control methods.

7. **Employ Advance Sediment Settling Controls**
   Even when the best ESC measures are employed, high concentrations of sediment may be discharged during larger storms. Therefore, the ESC plan should include some sediment traps or basins to allow captured sediments to settle out. To improve the trapping efficiency, these basins should be designed to incorporate such features as larger storage volumes, use of baffles, skimmers and other outlet devices. Regular inspection and maintenance is also critical to the operation of these measures.

8. **Ensure Contractors are Trained on ESC Plan, Implementation, Inspection, Maintenance and Repairs**
   The most important element in the implementation of an ESC Plan is the training and experience of the contractors, as they are usually responsible for the installation and maintenance of the control mechanisms.

9. **Adjust the ESC Plan at the Construction Site**
   For an ESC Plan to be effective, it may have to be modified due to discrepancies between planned and as-constructed grades, weather conditions, altered drainage and unforeseen requirements. Regular inspections by the Engineer are needed to ensure the ESC controls are working properly. Inspections should be conducted every seven days and following heavy rainstorm or snowfall events. Any change must have the approval of the County prior to implementing.

D6. DESIGN OF AN EROSION AND SEDIMENT CONTROL PLAN

An ESC Plan must be prepared for all construction projects. Best Management Practices (BMPs) should be indicated on the construction drawings.

General principles should consider the following:

1. Prevent pollutant release. Source control BMPs should be selected as the first line of defense.

2. Erosion and sediment control measures, or other BMPs should be selected based on the site characteristics and the construction plan.

3. Site drainage and soil conditions should be reviewed to determine the most significant factors for the site and planned construction.

4. Runoff should be diverted away from exposed areas where possible.

5. Existing vegetation should be preserved.

6. The extent of clearing should be limited and phased construction implemented.

7. Natural drainage features should be incorporated when possible. Adequate buffers should be used to protect areas where flows enter the drainage system.

8. Minimize slope length and steepness.

9. Runoff velocities should be reduced to prevent channel erosion.

10. Prevent tracking of material off-site.

11. Select appropriate control measures for the control of pollutants other than sediment.

D7. CONCERNS

There are many erosion and sedimentation concerns that arise due to construction activities. These include, but are not limited to the following:

1. Mud tracking from construction sites onto adjacent roadways and properties.

2. Silt and debris washed into existing drainage systems.

3. Silt and debris transported to receiving watercourse by surface runoff.

4. Windblown dust.

D8. PRACTICES

Good maintenance practices will help to minimize erosion and sediment concerns, and should be considered when preparing the construction schedule. While some may be impractical under certain conditions, others should be considered based on suitability, practicality and cost effectiveness.

1. Stockpiles should be located away from watercourses, environmentally sensitive areas, drainage courses, and existing adjacent developments. The stockpiles should be stabilized against erosion immediately following stripping operations. Stabilization can include, but is not limited to, the establishment of a cover crop or hydro seed matrix consisting of seed, fiber bond and tackifier.

2. All construction traffic should leave the site at a designated point or points. Gravelling or paving (where practical) of frequently used access roads will help ensure that minimal material such as mud is tracked off-site. The access road should consist of a bed of non-erodible material (i.e. gravel) of sufficient length to ensure that a minimum of material (mud) is tracked off-site onto adjacent roadways. Internal haul roads and/or track packs can also be designated and maintained to help reduce off-site tracking.

3. Where on-site or downstream detention facilities are provided, use can be made of quality control facilities (through placing temporary weirs or check dams) for sediment control during construction. All temporary and permanent detention facilities must be constructed prior to the installation of any services to the site or the commencement of earth moving operations.

4. Dust control measures should be implemented to prevent wind transport of dust from disturbed soil surfaces. This may be accomplished several ways:

   a) Vegetate, hydro seed, or mulch areas that will not receive vehicular traffic.
   b) Construct windbreaks or screens.
   c) Site may be sprinkled with water or a chemical dust suppressant to control dust. Care must be taken to prevent tracking of mud that may result.
   d) A combination of the above noted methods.

5. All accumulated sediment and debris should be removed as required. Once construction activities are complete, all related materials and temporary structures must be removed and properly disposed of.

D9. BEST MANAGEMENT PRACTICES (BMPS)

Best Management Practices for erosion and sediment control are various methods that have been proven to work on past construction sites when they are properly planned and constructed.

These measures reduce erosion potential by stabilizing exposed soil or reducing surface runoff flow velocities. As well as minimizing the amount of sedimentation entering water flows.

BMPs are described in detail in Appendix C of the Alberta Transportation – Design Guidelines for Erosion and Sediment Control for Highways manual.

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E1. DESCRIPTION

This section specifies the requirements for placing topsoil, seeding, sodding, watering, fertilizing and cutting vegetation on all reserves, PUL's, Stormwater Management Facilities and road rights-of-way areas.

E2. Material

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

E2.1 Roadway Grassing

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

1. **Topsoil**
   a) Shall be of a natural, fertile agricultural soil of the "A" horizon layer capable of sustaining vigorous plant growth. It shall be best quality, free of subsoil, clay lumps, stones, live plants and their roots, sticks or other extraneous matter. Topsoil shall be placed as per Section C14.2 (2).

   b) The County may request a sample and an independent laboratory analysis of topsoil from each source to be used in the performance of this contract seven (7) calendar days in advance of delivery to the site. The laboratory analysis shall include tests for N, P, K, minor element values, soluble salt content, electrical conductivity, pH and physical values (sand, clay and organic material). If necessary, correct additions, e.g. bone meal, limestone, pesticides, phosphates, and sulfates shall be added as approved by the County.

   c) The chemical specifications for topsoil are that it shall:
      - contain no toxic materials
      - have an electrical conductivity of 3 – 4 ohms/cm^2
      - have a pH of 6.0 – 7.5

2. **Seed Mixture**

   The seed mixture shall be:

Creeping Red Fescue	70% by weight
Meadow Brome	10% by weight
Western Wheatgrass	10% by weight
Annual Ryegrass	10% by weight

The mixture shall comply with Federal and Provincial seed laws and have a minimum germination of 75% and a minimum purity of 97%. Bags of seed mixture shall be clearly tagged, showing the name of the supplier and the contents. All seed must have an accompanying Certificate of Compliance

3. **Sod –** Sod shall be No. 1 nursery-grown sod, consisting of a uniform mixture of:

Kentucky Blue Grass	60% by weight
Creeping Red Fescue	40% by weight

Sod shall be cut by approved methods in accordance with the recommendations of the Nursery Sod Growers Association of Alberta and shall be:

a) a minimum of eighteen months old
b) of a quality that satisfies weed tolerance rates as outlined by the Growers Assoc.
c) 20 – 25mm in thickness
d) cut in strips of uniform width
e) sufficiently moist so that no burning of the edges has occurred
f) shall have a thick healthy growth
g) wooden pegs where required per section E3.5(2) shall be minimum 250mm length and approximately 25mm x 25mm square, or approved equal.

4. **Fertilizer –** Fertilizer shall conform to the following:
   a) Root Fertilizer:
      - Granular water soluble fertilizer 10-6-4 super phosphate
      - Granular water soluble fertilizer 5-20-10 or equivalent

   b) Supplementary Fertilizer:
      - Organic fertilizer 14-7-6
      - Even 35%

5. **Peat Moss –** Peat moss shall be mixed with topsoil and meet the following specifications:
   a) Have a pH value of 5.0 – 7.0

b) Have a water holding capacity of 1100% by weight

c) Be free of toxic material, live plants, live roots or seeds

d) Be delivered in a pulverized condition

E2.2 Reserve and PUL Grassing

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

1. **Topsoil**

a) Shall be of a natural, fertile agricultural soil of the "A" horizon layer capable of sustaining vigorous plant growth. It shall be best quality, free of subsoil, clay lumps, stones, live plants and their roots, sticks or other extraneous matter. Topsoil shall be placed as per Section C14.2 (2).

b) The County may request a sample and an independent laboratory analysis of topsoil from each source to be used in the performance of this contract seven (7) calendar days in advance of delivery to the site. The laboratory analysis shall include tests for N, P, K, minor element values, soluble salt content, electrical conductivity, pH and physical values (sand, clay and organic material). If necessary, correct additions, e.g. bone meal, limestone, pesticides, phosphates, and sulfates shall be added as approved by the County.

c) The chemical specifications for topsoil are that it shall:

- contain no toxic materials
- have an electrical conductivity of 3 – 4 ohms/cm^2
- have a pH of 6.0 – 7.5

2. **Seed Mixture**

The seed mixture shall be:

Creeping Red Fescue	40%
Kentucky Blue Grass	30%
Crested Wheat Grass	15%
Timothy	15%

The mixture shall comply with Federal and Provincial seed laws and have a minimum germination of 75% and a minimum purity of 97%. Bags of seed mixture shall be clearly tagged, showing the name of the supplier and the contents. All seed must have an accompanying Certificate of Compliance

3. **Sod –** Sod shall be No. 1 nursery-grown sod, consisting of a uniform mixture of:

Kentucky Blue Grass	60% by weight
Creeping Red Fescue	40% by weight

Sod shall be cut by approved methods in accordance with the recommendations of the Nursery Sod Growers Association of Alberta and shall be:

a) a minimum of eighteen months old

b) of a quality that satisfies weed tolerance rates as outlined by the Growers Assoc.

c) 20 – 25mm in thickness

d) cut in strips of uniform width

e) sufficiently moist so that no burning of the edges has occurred

f) shall have a thick healthy growth

4. **Fertilizers**

a) Fertilizer shall be packed in standard containers, clearly marked with the name of the manufacturer, mass and analysis.

b) All fertilizer shall be stored in a weatherproof storage place and in such a manner that it will stay dry and its effectiveness is not impaired.

c) Root starter:
- granular water soluble fertilizer 10-6-4 or 20-20-20
- organic fertilizer 11-48-0
- ureaform or slow release ammonium nitrate if available

5. **Peat Moss**

If organic material is required to meet the organic material specifications for topsoil, peat moss shall be added in the field and thoroughly mixed with cultivation equipment. The peat moss shall meet the following specifications:

a) free of toxic material, live plants, live roots, seeds or other deleterious material

b) delivered in a pulverized condition

c) approved prior to mixing with topsoil

d) of a pH not less than 4.5 and not greater than 6.0

E2.3 Trees and Shrubs

1. **Species** –all species used in landscaping plan must be native to the local area, capable of healthy growth in Lacombe County and be resilient to specific site location factors present (i.e. Sun, excessive wind, shade, gravel and reasonable maintenance practices).

   On the advice of a qualified landscape architect or arborist only, species may be altered to suit unique site topography, soils or micro-climatic conditions. For a list of approved tree and shrub species please refer to Lacombe County's *Guide to Suitable Landscaping Species.*

2. **Stock** –shall be healthy (free from damage, disease and pests, eggs or larvae), well branched, densely foliated when in leaf with well-developed root systems and of the specified caliper and height. All undersized root systems will be rejected.

3. **Size specifications**:

Deciduous Trees	50mm caliper at trunk
Coniferous Trees	2.0m in height

4. **Substitutes** – substitutes will not be permitted unless approved in writing by the County.

5. **Bare Root Shrubs** – bare root shrubs shall be planted with adequate fibrous roots retained. The minimum size of root balls for trees shall be as specified below:

   a) **Deciduous Trees**

Caliper (mm)	Root Ball Diameter (mm)	Machine Ball Diameter (mm)
25	600	
50	750	1,100
75	900	1,400
100	1,100	1,700
125	1,400	1,700
150	1,400	2,300
200	1,800	2,300
250	2,300	2,300

Note: Deciduous trees larger than 75mm caliper shall be moved by machine (tree spade).

b) **Coniferous Trees**

Height (m)	Root Ball Diameter (mm)	Machine Ball Diameter (mm)
1.50 – 1.75	750	1,100
1.75 – 2.00	900	1,100
2.00 – 2.25	1,100	1,400
2.25 – 2.50	1,200	1,400
2.50 – 2.75	1,400	1,700

6. **Ball and Burlapped Plants** –plants shall be dug with firm natural balls of earth to sufficiently include most of the fibrous roots.

7. **Container Growth Stock** –stock shall be grown in a container long enough for the root system to have developed sufficiently to hold its soil together. No plants shall be loose in the container.

8. **Fertilizers** –shall be 8-24-24 delivered as specified in standard size, unopened containers, showing the weight, analysis and manufacturer's name.

9. **Tree stakes and Ties**
   a) Stakes shall be 2.0 – 2.5m in length and of steel "T" bar or "U" bar type.

   b) Tree ties shall be a number ten (10) gauge galvanized wire inserted into a 200mm length of 10mm diameter polyurethane plastic tubing. Wire for tree tying shall be a double strand number nine (9) gauge galvanized wire.

10. **Mulch** –mulching material shall be wood cellulose or approved equal, clean, dry and free of weeds and other foreign matter.

11. **Storage** –All materials shall be stored in a weatherproof place and handled in a professional manner.

E2.4 Stormwater Management Facility Planting

Stormwater Management Facilities are to be planted in accordance with Lacombe County's *Standards for Stormwater Management Facilities,* federal and provincial legislation and policies.

Landscaping for Stormwater Management Facilities will generally include mass plantings and naturalized shorelines mimicking natural wetlands typical of the Lacombe County Region, live topsoil's to be used whenever possible

E3. CONSTRUCTION

E3.1 Weed Control

The Contractor shall be responsible for the control of existing weeds and all subsequent weed growth within the contract site(s) as shown on the approved plans, or in the list of locations from the date the contract is awarded or the date that the location is made available until the completion certificate has been issued. The "Alberta Weed Control Act" shall govern.

E3.2 Subsoil Preparation

All weeds, roots, stones larger than 50mm in diameter and other foreign matter shall be removed from the surface of the subsoil. Immediately before placing topsoil, the subsoil shall be loosened to a depth of not less than 50mm by means of a disc, spike tooth harrow or other means satisfactory to the County and leveled to a firm, even surface. The final grade shall be 150mm (or as specified) below the adjacent top of curb and/or sub-grade and sloped so that no ponding or runoff onto adjacent private property occurs.

E3.3 Topsoil Placement and Cultivation

1. **Placing** – the topsoil shall be uniformly spread on the prepared subsoil to a minimum compacted depth of 150mm (or as approved otherwise). Topsoil shall not be placed when either the topsoil or subsoil is frozen, excessively wet, extremely dry or otherwise in a condition detrimental to proper grading, compaction or cultivation. The upper 50mm shall be of a fine texture and free of stones or lumps 6mm or larger. Allowances for settlement shall be provided where necessary.

   If required, lime shall be well worked into the soil before the application of any fertilizers to obtain a minimum pH value of 6.0.

2. **Cultivation** – after topsoil placement the area shall be thoroughly disked, harrowed and floated to a minimum depth of 75mm. All hard lumps shall be broken down and all stones larger than 50mm in diameter, roots, stumps and other foreign matter shall be removed and disposed of in a manner approved by the County.

3. **Fertilizing –** After the topsoil has been properly prepared, a uniform application of fertilizer, per Section E2, shall be placed at the rate of 250 kg/ha using a mechanical spreader. The fertilizer shall be thoroughly and evenly mixed with the soil to a maximum depth of 75 mm. Approximately six (6) weeks after germination, supplementary application of fertilizer, per Section E2, shall be applied at a rate of 250kg/ha.

4. **Compaction** – topsoil shall be compacted to 80 – 85% Standard Proctor density.

E3.4 Seeding

1. Grass seeding will be required on all roadway ditch bottoms, side-slopes, back-slopes and open areas disturbed during construction of County or subdivision roads, reserves, PUL's or Stormwater Management Facilities. Areas which do not have acceptable grass coverage or are weed infested will also require seeding.

2. Seeding shall not be carried out when wind velocities are above 8km/h.

3. Application
   a) The recommended rate of application of seed is 250kg/ha by mechanical applicator. An application of 112kg/ha of starter fertilizer is recommended at the time of seeding.

   b) Hand application with a cyclone type seeder capable of distributing seed in two directions in equal amounts. Hand application shall require a 6 mm topdressing of mulch of pulverized peat moss.

   c) Mechanical application with a calibrated grass seeder complete with compaction roller.

   d) Hydro-seeding by applying an approved turf-fiber at a rate of 0.135 kg of dry matter/m^2.

4. Seeding will be approved when there is a consistent cover of newly germinated grass on all areas seeded.

5. To avoid washing, the area shall receive light watering with a fine spray to a penetration of not less than 25 mm, after the seed operations are completed. In areas where seed fails to germinate for whatever reason, the Contractor shall re-cultivate and re-seed until germination occurs.

6. Approximately six (6) weeks after germination, the area shall receive a supplementary application of an organic fertilizer at rates determined by soil tests.

   Note: Any seed which fails to germinate for whatever reasons shall be re-cultivated and re-seeded until germination has taken place at the Developer's expense.

E3.5 Sodding

Sodding is required on slopes that are 2:1 or steeper, or where specified by the County.

1. **Subsoil Preparation** – on slopes less than 2:1, the subsoil shall be prepared as specified in Section E3.2.

2. **Sod Laying** – sod shall be laid evenly with staggered joints closely butted together and matched to the existing grades or surrounding areas. All areas shall be rolled with a medium roller (90 – 114 kg) to provide close contact between sod and topsoil and to produce a smooth and even surface. Sod shall be laid at right angles to the slope along the contours of the slope. On slopes of 2:1 or steeper, wooden pegs shall be driven full depth on intervals of 1m.

3. **Watering** – the sod shall be watered sufficiently to saturate the upper 75mm of soil immediately after installation. After sod and soil has dried sufficiently to prevent damage, the area shall be again rolled with a medium roller to ensure a good bond between sod and soil and to remove minor depressions and irregularities. Adequate watering shall again be applied immediately following rolling to saturate the upper 75mm of soil. Watering shall be carried out when required to prevent grass and underlying soil from drying out for a minimum period of fifteen (15) days after placement or until the sod is well rooted and established.

4. **Supplementary Fertilizer Application** – approximately four (4) weeks after sod laying and after the initial cutting, the sodded area shall receive an application of organic fertilizer, rates determined by soil tests.

5. **Workmanship** – the finished turf shall be smooth and even and there shall be no sudden irregularities in the final grade.

E3.6 Tree and Shrub Planting

1. **Layout** – the layout of trees and shrub planting shall be identified in the landscape plan as approved by the County.

2. **Water** – water shall be free of any impurities which would inhibit germination or otherwise adversely affect growth.

3. **Lime** – lime is to be used where the pH of the soil is less than 6.0 and shall be ground limestone containing not less than 80% of total carbonates combined. It shall be ground to such fineness that at least 50% will pass a 100-mesh sieve and at least 90% will pass a 20-mesh sieve. Where limestone is specified, it shall be stored in such a manner as to stay dray and free-flowing.

E3.7 Growing Season

1. **Grass Planting** – grass seed shall not be planted before May 1st or after September 15th.

2. **Sod Laying** – sod shall not be laid before May 1st or after September 30th. Sod laying on slopes 3:1 or steeper shall not be done when the temperature is above 23° C.

3. **Tree Planting** – Within one (1) year after the issuance of a Construction Completion Certification for paved roads, the Developer shall sod and plant boulevard trees on all roads as approved by the County. Deciduous trees should be placed in a uniform lineal manner. The Developer shall be responsible for full maintenance and tree replacement for one (1) calendar year after installation.

E4 Maintenance

Maintenance shall commence immediately after sodding or seeding and shall continue until the date of acceptance by the County. Such maintenance shall include all measures necessary to establish and maintain grass in a vigorous growing condition, including but not limited to:

1. **Mowing** – mowing shall be done as required to maintain the grass at a maximum height of 75mm, with not more than 1/3 of the blade cut at any one mowing. Heavy clippings shall be removed immediately after mowing.

2. **Top Dressing** – top dressing and rolling shall be done as required to repair ruts or erosion. Bare spots shall be repaired by either cultivation or re-seeding or by replacing the dead sod with new sod as required by this specification.

3. **Cleanup** – Cleanup shall be a continuous operation and at no time shall topsoil or debris of any kind be allowed to remain on roadways overnight.

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F1. BARBED WIRE FENCING

F1.1 Description

1. The following is to be taken as a minimum standard. All other designs are to be approved by the County prior to construction.

2. The posts shall be installed at a typical spacing of 3.65m (12 feet).

F1.2 Materials

All materials used are subject to inspection and approval by the County. Materials are to be protected from weather at all times.

1. All wooden fence material shall be pressure treated round 100 – 125mm diameter posts in 1.848 meter (6 feet), 2.134m (7 feet), or 2.43m (8 feet) lengths.

2. There will be 3 – 4 strands of barbed wire.

3. The barbed wire shall be 12.5 GA wire with 14 GA barbs.

F1.3 Workmanship

1. Posts shall be installed plumb and true to line. Spaces between line posts shall be uniform and shall not exceed 3.65m (12 feet).

2. Barbed wire shall be suitably tensioned and attached to posts with appropriate fasteners.

3. Gates shall be installed at locations shown on the drawings or as approved by the County.

F2. UNIFORM WOOD FENCING AND GATES

F2.1 Description

1. The following is to be taken as a minimum standard. All designs or alternate designs are to be approved by the County prior to construction.

2. All wooden fence material shall be pressure treated cedar or approved alternative and stained or painted with two (2) coats.

3. The Developer shall be responsible for and at his own expense, correcting any defect, deficiency or fault in the completed work prior to the end of the specified two (2) year maintenance period.

4. The work is to comply with the applicable requirements of the Alberta Building Code, latest revision thereof.

F2.2 Materials

All materials used are subject to inspection and approval by the County. Materials are to be protected from weather at all times.

1. **Lumber** – all lumber is to be graded to the Canadian Lumber Standards and marked with a recognized, visible grade stamp.

2. **Dimension Board Lumber** – graded to National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber and to CSA 0141-1970 and meet the following:
   a) Maximum 19% moisture content at time of installation
   b) Lumber to be rough sawn to sizes noted on the approved drawings.

3. **Hardware and Fastening Devices** – all hardware and fastening devices shall be non-corrosive, preferably galvanized and in accordance with the Alberta Building Code.

4. **Surface Applied Wood Preservative** – adhere to the following for preservatives:
   a) Surface applied Cuprinol-Clear stain or approved equal wood preservative to all wood components.
   b) Treat surface of components with wood preservative before installation.
   c) Wherever possible apply preservative after components have been cut and fitted to size.
   d) Apply preservative by dipping, or by brush or spray to completely saturate and maintain wet film on surface for a minimum three (3) minute soak on lumber.
   e) Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of surface applied wood preservative before installation.

5. **Installation** – see standard drawings.

6. **Wood Fence and Gate Components**
   a) All work to be fabricated and finished as shown on drawings.
   b) Members shall fit close and accurately together.
   c) Verify all dimensions on site prior to proceeding with fabrication.

d) Whenever possible, members shall be precut prior to treatment. Site cuts are to be treated with two (2) coats preservative brushed in.

e) Allow preservative to cure prior to erecting members.

f) Ensure all Ardox nails are installed flush to fence slats.

g) Fence post brackets to be cast in concrete footing as detailed so that final post alignment is plumb.

h) Supply all components required for anchoring fence posts to concrete footings.

i) The wood fence shall provide a firm continuous structure. Finished unit should not utilize any cracked or damaged timber panels or posts.

j) Height of fence panels to remain constant above grade.

k) Difference in height of fence panel in relation to next panel due to grade change to be taken up at fence post between panels.

7. **Concrete** – use Type 50 Sulfate Resistant with compressive strength of 25 MPa at twenty-eight (28) days.

F3. CHAIN LINK FENCING

F3.1 Description

The following is to be taken as a minimum standard. All designs or alternate designs are to be approved by the County prior to construction.

F3.2 Materials

1. **Pipe material** – pipe material used for fencing shall be hot-dipped, zinc-coated, butt-welded, Schedule 40 seamless steel pipe fabricated in conformance with ASTM A120. Zinc coating shall be not less than 0.61 kg/m^2 of total surface area.

a) The use of tubing, conduit, or open seam material will not be permitted.

b) Pipe material shall have the following minimum dimension:

Type of Post	Outside Diameter (mm)	Minimum Weight per Meter	Minimum Wall Thickness (mm)
Line Post	60	5.43	3.91
Terminal Post	90	11.3	5.49
Top Rail	42	3.4	3.56
Brace	42	3.4	3.56
Gate Post	100	13.6	5.74

2. **Line Posts** – line posts support fencing at points where fabric is continuous. In wet areas they are to be a minimum 3600mm length (see standard drawing). All posts are to be capped.

3. **Terminal Posts** – terminal posts are end posts, corner posts, straining posts, and gate posts, positioned where fencing or fabric is discontinuous and attached to posts by means of tension bars. Posts for barb wire overhang are to be 1050mm longer than fabric height.

4. **Top Rails** – top rails are horizontal pipes supporting the top selvage of fabric. Top rails shall be continuous at line posts and pass through holes in line post tops.

5. **Braces, Fittings** – Braces are horizontal galvanized 45mm CD pipes positioned at mid-height of fabric and shall extend from terminal posts to the nearest line post along each fabric attached to the terminal post. All fittings shall be galvanized steel or aluminum.

6. **Tension Bars** – Tension bars shall be 5 x 19mm and shall have a length equal to the height of the fabric.

7. **Tension Bands** – tension bands shall be not less than 9mm in width and shall be not less than 3.5mm in thickness.

8. **Couplings** – Couplings shall be an outside type, not less than 175mm in length, and shall have a material thickness of not less than 3.5mm.

9. **Extension Arms** – extension arms shall be malleable iron or cast iron and shall have provision to accommodate three (3) strands of barbed wire at 45^{o} angle overhand.
   The top strand of barbed wire shall be approximately 300mm above the fabric. Extension arms shall have holes for top rails.

10. **Post Tops** – post tops shall be of galvanized steel or aluminum. Line post tops shall have holes for top rails.

11. **Zinc Coating** – zinc coating shall be applied to tension bars, tension bands, fittings, and post tops which are not fabricated from corrosion-resistant material.
    Zinc coating shall be not less than 0.61 kg/m^2 of surface area and shall be applied by hot-dip in conformance with ASTM A123.

12. **Wire** – tension wire shall be not less than 4.8mm diameter, single strand, electro-galvanized wire that will withstand at least six (6) dips in conformance with ASTM A239. Fabric shall be double galvanized 150 x 150mm, 3.7 – 180mm high (see standard drawing).
    Tension wire shall have ultimate tensile strength at least equal to that specified for wire for chain link fabric, and shall have a corrosion protection system equal to that specified for fabric.
    Barbed wire galvanized 2mm thickness with 4 point barbs at 150mm centers in conformance with ASTM A121-77. Fastening clips galvanized to wire.

13. **Gates**
    a) Gates to be framed with steel pipe ASTM A120-77 standard galvanized. Use 45mm outside diameter pipe for outside frame and 40mm outside diameter pipe for bracing. Galvanize after welding.

    b) Gate posts to conform to the following:

Opening	Gate Post Outside Diameter
Single to 3.0 meters Double to 6.0 meters	90 mm 2 hinges per leaf
Single from 3.0 to 4.3 meters Double to 6.0 meters	114 mm 3 hinges per leaf Provide brace
Single from 4.3 to 7.6 meters Double from 8.5 to 12.2 meters	170 mm 3 hinges per leaf Provide brace

    c) Gate fabric to be 3.7mm galvanized chain Link with 50 x 50mm mesh.

    d) Gates shall be fabricated with electrically-welded joints, complete with galvanized, malleable iron hinges, lockable latch and latch catch.

    e) Gate latches shall be suitable for padlock which can be attached and operated from either side of the gate.

    f) Gate hinges shall permit a minimum 90^{o} swing both in and out.

    g) Double gates to have center rest with drop bolt for closed position and chain hold open for open position.

14. **Concrete**
    a) Use type 50 Sulfate Resistant Cement compressive strength 25 MPa at twenty-eight (28) days.

    b) Shop drawings of gates and related components shall be approved by the County prior to construction.

F3.3 Workmanship

1. **Grading**

   Remove debris and grade between posts to provide ground clearance between 40mm and 70mm.

2. **Concrete Footing**
    a) All posts shall be set in concrete and the concrete extended above ground (approximately 25mm) for drainage.

    b) Footings shall be of such size and shape as required to withstand any strain or shocks ordinarily brought to bear on the fence, but not less than indicated in the following table:

Post Type	Diameter of Concrete (mm)	Depth of Concrete (mm)
Line Post	300	1,100
Terminal Post	300	1,100
Gate Post	400	1,100
100 mm O.D.	300	1,100

    c) Concrete for footings shall be compacted by interval vibrator or by rodding, and shall be allowed to set sufficiently before cutting fence, a minimum of five (5) days.

    d) If forms are used, compact backfill to density of adjacent in-situ soil.

3. **Post Installation** (see standard drawing):
    a) Posts shall be set in concrete footings plumb and true to line.

    b) Spaces between line posts shall be uniform and shall not exceed 3.0m.

    c) Install straining posts where require.

4. **Fencing** (see standard drawing):
   a) Top rails shall be secured to terminal posts using receptacle fittings and shall be run through holes in the post tops and joined with couplings.

   b) Chain link fabric shall be suitably tensioned.

   c) Fabric shall be attached to terminal posts using tension bars and bands.

   d) Tension bars shall be threaded through fabric mesh and shall be connected to terminal posts by means of tension bands spaced not more than 375mm apart.

   e) Fabric shall be fastened with tie wire to line posts at approximately 300mm o/c, and to top rails, braces, and tension wire at approximately 450mm o/c.

   f) The bottom selvage of fabric shall be between 40mm and 70mm above finished grade.

   g) Bottom tension wire shall be strung along the bottom of the fabric, pulled taut and firmly attached to terminal posts with suitable fittings.

5. **Gate Installation**
   a) Gates shall be installed at locations shown on the drawings or as directed by the Engineer and approved by the County.

   b) Gates shall be hung to be level and 50mm above finished grade.

   c) Gates shall swing into the site 90^{o}.

   d) A gate “spot post” or other means shall be provided to hold the gate open.

   e) Gates shall be so constructed that they can be opened and closed smoothly with minimum effort.

6. **Clean up**
   Touch up damaged galvanizing by cleaning with wire brush and applying two (2) coats of galvanizing.

F4. SUBDIVISION FENCING

1. Wherever possible, fencing shall be designed to match or complement existing fencing on adjacent properties.

2. Fencing shall be designed to be maintenance free for a minimum of 15 years.

3. Fencing shall be located entirely within private property, including foundations.

4. A landscape plan shall be prepared by the Developer and submitted to the County showing the fence design including alignment, elevations, materials, foundations, coatings and dimensions. The plans shall include installation details.

5. Fencing shall comply with all setback and height requirements specified in the Lacombe County Land Use Bylaw.

Please note that further requirements and specification may be outlined in applicable Site Development Guidelines and Lacombe County's *Land Use Bylaw.*

F5. SOUND BARRIERS/LANDSCAPE BERMS

1. A landscape plan shall be prepared by the Developer showing the proposed berm design including alignment, elevation, dimensions and slopes. The plan must be approved by the County prior to construction.

2. Berms required for noise attenuation purposes shall be designed by a Professional Engineer or Landscape Architect. The Developer may be required to provide design information including projected traffic volumes and noise exposure.

3. Berm side slopes shall not be steeper than 4H:1V to facilitate maintenance.

4. Berms shall have a flat top not less than 1m wide.

5. Berms shall be top soiled and seeded according to specifications found in Section E.

Alternative sound barrier methods/materials will be considered provided detailed engineering drawings are prepared by the Developer and submitted to the County showing the design including alignment, elevations, materials, foundations, coatings and dimensions. The plans shall include installation details.

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G1. SANITARY SYSTEM DESIGN OVERVIEW

The developer and developer's consultant shall provide a proposal to Lacombe County for initial treatment and/or containment of wastewater effluent clearly addressing

1. Initial treatment
2. Final treatment
3. Containment of wastewater and/or treated effluent
4. Environmental and public health risks of wastewater and/or treated effluent

Any sanitary must meet and conform with *Alberta Private Sewage Systems – Standards of Practice, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Safety Codes Act: Private Sewage Disposal Systems Regulation* and *Minister of Justice: Wastewater Systems Effluent Regulations.*

G2. ESTIMATING AVERAGE SEWAGE FLOWS

1. In determining residential flows, a minimum of 2.5 persons per household shall be used unless otherwise agreed to by the County.

2. For gravity collection systems, an infiltration allowance of 0.28 L/s/ha shall be add to the design flow rates based on a sewage generation rate of 320 L/person/day.

3. For a low pressure sewer system, sewage generation rate of 320 L/person/day with no infiltration rate shall be used, unless otherwise agreed to by the County. The generation rate peaking factor will be dependent upon the disposal system capacity.

4. Harmon's peaking factor shall be used to determine the peak flow rate for design, but must be a minimum of 2.5 times the average daily flow rate.

G3. GRAVITY SANITARY SEWER SYSTEMS

All utility installation shall conform to CSA S250 Mapping of Underground Utility Infrastructure standard

G3.1 Pipe Sizing

1. A report from the Developer's Consultant must be prepared to ensure that pipe sizing is calculated in consideration with the topography of the serviced lands and the population projections. A flow velocity of not less than 0.6m/s, at the average flow rate, shall be used to determine pipe sizing.

2. Irrespective of calculated flow velocity:
   a) The minimum pipe diameter shall not be less than 200 mm without prior approval of the County.

   b) Pipe size shall be large enough that the pipe does not run more than 80% full at peak flow.

G3.2 System Materials

1. General
   a) The developer shall supply and install only new materials

   b) All materials shall be transported, handled and stored in accordance with the manufacturer's recommendations.

   c) All such materials which are defective in manufacture, damaged in transit, or have been damaged after delivery shall be replaced by the Developer at his expense.

   d) All Standards referred to mean the latest edition of that Standard.

   e) Where specific products are specified, it is intended that approved equals are also acceptable.

   f) The "approved as equal" must be obtained from the County before the equal product is used.

2. Polyvinylchloride (PVC) pipe
   a) PVC pipe, SDR 35, to ASTM3034, CSAB182.1 and B182.2 standards.

   b) Gravity mains to be a minimum of 200 mm diameter.

   c) All joints to use flexible elastomeric gaskets meeting ASTM standard 03212.

   d) Pipe age not to exceed two years at time of installation.

3. High Density Polyethylene (HDPE) Pipe
   a) The Engineer shall provide written certification that the properties of the selected pipe are suitable for the planned application and installation method and comply with all relevant standards, certifications and regulations. In particular: CGSB-41-GP-25M, CSA B137.0, CSA-B137.1, ASTM-D1248, ASTM-D2837; and ASTM F714.

b) The Contractor shall be a Contractor who has been trained and approved by the pipe manufacturer to install the manufacturer's pipe. The Contractor must employ personnel who have been trained and approved by the pipe manufacturer to install the manufacturer's pipe.

c) Shop only molded pipe fittings shall be used.

d) All joints are to be butt-fused. Each heat fusion joint made shall be inspected by a person other than the person making the joint. The Contractor shall submit to the Engineer written acceptance for each heat fusion joint made.

e) Mechanical service connections will not be allowed.

f) All components shall be made of corrosion resistant materials.

g) Pipe age not to exceed two years at time of installation.

G3.3 Fittings

1. PVC, SDR35, conforming to ASTM D3034 and CSA B182.1

2. High Density Polyethylene (HDPE), DR 15.5 conforming to ASTM F714 and CSA B137.1, shop molded fittings shall be used.

3. All HDPE molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electro-fusion type fittings.

4. Other fitting types only upon approval of the County.

G3.4 Alignment

1. In country residential subdivisions, the sewer main alignments shall be as approved by the County.

2. A minimum distance of 3.0m horizontal separation must be maintained between a sewer main and any water main unless otherwise approved by a Professional Engineer and Alberta Environment and the County.

3. A minimum distance of 2.0m horizontal separation must be maintained between a sewer main and any gas line.

4. A minimum vertical separation of 0.5m is required between a sewer main and a potable water main where a crossing of the two lines occurs.
5. Public Utility Lot (PUL) widths shall be a minimum of 5.0m. A minimum 1.0m easement is required on the lots on each side of a PUL.

G3.5 Slope

Maintain the following grades for Sanitary Mains.

Pipe Diameter (mm)	Minimum Grade
200	0.4%
250	0.28%
300	0.22%
375	0.15%
450	0.12%

G3.6 Installation

1. Mains shall be at a depth adequate to provide a minimum of 2.70m depth of cover from finished grade to top of pipe.

2. Auguring or directional drilling is required under all existing roads (see Roads Section C20).

3. **Trenches**

a) Trench walls shall be vertical to 300 mm above the top of the pipe and the width at this location shall not exceed the maximum.

b) Widths of trenches shall be such that pipes can be laid and joined properly and backfill placed and compacted properly.

- Trench Width - Single Pipe (see drawing G-7)
  - Pipe Diameter 200-500mm, minimum trench width OD + 500mm
  - Pipe Diameter 600mm and larger, minimum trench width OD x 1.5
- Trench Width - More than 1 Pipe in accordance with drawings.

c) Pipe Bedding- Prepare the pipe bedding in accordance with the drawings and the following specifications:

- Class B - Sand or approved gravel bedding material placed the full width of the trench and compacted to 98% of the maximum density as determined by the Standard Proctor Compaction Test.
- Class C - removal of rocks and debris from the trench bottom and shaping the trench bottom to provide support throughout the length of the pipe.
- Provide bell or coupling holes and support the pipe uniformly and continuously throughout its length.

d) Compaction of any trenches and auger pits within the road right-of-way is required to 98% Standard Proctor Density. The Developer is required to repair any settlement that occurs within two years.

4. **Pipe laying**

Pipe laying procedures including cutting, jointing and laying in the trench, as well as the tools and equipment used. All pipe laying procedures shall comply with manufacturer's recommendations. Any deviation from the manufacturer's recommendations shall require prior written approval of the Engineer.

Every precaution shall be taken to prevent foreign material from entering the pipe. When pipe laying is not in progress, the open end of the pipe must be closed to the satisfaction of the engineer.

5. **Jointing Methods**

All jointing methods must comply with manufacturer approved procedures. Any deviation must have prior written approval from the Engineer and County.

Approved jointing methods are as follows:

- Pipe to pipe joints must always be butt-fused
- Service connections between the main and the curb stop: electro fusion or butt fusion methods can only be used
- Service connections between the curb stop and the house, storage unit or treatment unit: electro fusion, butt fusion or mechanical connections can be used

6. **Backfilling in the Pipe Zone**

The pipe zone is defined as that part of the trench from the pipe bedding to 300 mm above the top of the pipe, or above the top of the highest pipe in a combined trench. Backfill with sand or with selected native soil deposited uniformly in the trench at both sides of the pipe for the full width of the trench. Compact in layers to 98% of the maximum density, as determined by the Standard Proctor Compaction Test, until the compacted backfill is 300 mm above the top of the pipe. Compact under and around pipe joints.

Frozen material shall not be used for backfill in the pipe zone.

7. **Hydrostatic Testing**

Hydrostatic tests shall be performed on the installed pipe to demonstrate the pipe is installed in accordance with the specifications. Testing shall be carried out in accordance with regulations of the Occupational Health and Safety Act, and in

accordance with Alberta Environment regulations. Test procedures shall comply with manufacturer's recommendations.

Testing shall not be done under winter conditions unless the line can be safely drained or immediately placed in operation.

8. **Flushing**
   Following installation and testing thoroughly flush all lines until clear of dirt and debris.

G3.7 Manholes

1. Precast concrete, 1200mm diameter, to ASTM C478M.

2. Manholes to be installed at:
   a) End of each line
   b) Any grade change, size change, or direction change
   c) All junctions
   d) Pipe lengths of not more than 120m between manholes

3. Use drop manholes where invert elevation difference of inlet and outlet is greater than 600 mm.

G4. LIFT STATIONS

1. Shall provide two (2) pumps each capable of passing particles 75mm in diameter with a minimum suction and discharge of 100mm. Pumps shall be the same specification. Each pump shall be capable of conveying the peak design flow.

2. Lift stations shall have backup power supply to pumps or emergency/standby engine and pump capable of conveying the peak design flow.

3. Lift stations shall have vehicle accessibility.

4. Design shall provide means to allow flushing of the force main (such as cam-lock and valve assembly).

5. Adequate ventilation shall be provided, where ventilation of lift station may result in odour complaints, steps to control odours shall be in place.

6. Suitable and safe means of access to dry and wet wells shall be provided for inspection and cleaning.

7. Lift station shall be designed to facilitate removing pumps, motors and other mechanical or electrical equipment.

8. Lift station suction lines shall not exceed 7.6m in total length.

9. Lift station structures, electrical components and mechanical equipment shall be protected from physical damage by a 1 in 100 year flood event.

10. There shall be no physical connection between any potable water supply and a wastewater lift station without a break tank, pressure pump and pressure tank provided. Water shall be discharged to the break tank through a 150mm air gap with signs posted at every outlet on the water system indicating water is not safe for drinking.

11. Lift stations shall have an alarm system that dials out:
    a. High and low levels
    b. Power failure
    c. Sump pump failure
    d. Unauthorized entry
    e. Any case of pump station malfunction that leads to risk of public health or environment

G5. FORCE MAINS

1. Force main lines should be sized to maintain at least 0.6 m/s in-line velocity at design flow rates.

2. Provide air relief valves at high points.

3. Where force main enters an existing gravity system, maintain the drop into the gravity main to no more than 600 mm.

G6. LOW PRESSURE SANITARY SYSTEMS

G6.1 General

1. The developer shall supply and install only new materials.

2. All such materials which are defective in manufacture, damaged in transit, or have been damaged after delivery shall be replaced by the Developer at his expense.
3. All Standards referred to mean the latest edition of that Standards Manual.

4. Where specific products are specified, it is intended that approved equals are also acceptable.

5. The "approved as equal" must be obtained from the County before the equal product is used.

G6.2 High Density Polyethylene (HDPE) Pipe

In addition to the requirements stated at G3.2(3), the following standards shall apply:

1. A report from the Developer's Consultant must be prepared to ensure that pipe sizing is calculated in consideration with the topography of the serviced lands and the population projections. A flow velocity of not less than 0.8 m/s, at the average flow rate shall be used to determine pipe sizing.

2. High Density Polyethylene (HDPE) pressure pipe suitable for low pressure sewer systems shall be conforming to CSA B137.1 and ASTM F714 Series 100 (DR 17) standard iron sized pipe.

3. Pipe sizes 150 mm or less shall meet HDPE Grade PE compound 3408.

G6.3 Fittings

1. High Density Polyethylene (HDPE), DR 15.5 conforming to ASTM F714 and CSA B137.1, shop molded fittings shall be used.

2. All HDPE molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electro-fusion type fittings.

G6.4 Alignment

1. In Country Residential Subdivisions, the sewer main alignments shall be as approved by the County.

2. A minimum distance of 3.0m horizontal separation must be maintained between a sewer main and any water main unless otherwise approved by a Professional Engineer, Alberta Environment and the County.

3. A minimum distance of 2.0m horizontal separation must be maintained between a sewer main and any gas line.

4. Public Utility Lot (PUL) widths shall be a minimum of 5.0m. A minimum 1.0m easement is required on the lots on each side of a PUL.
5. Marker posts shall be installed perpendicular to all valves, air release and flushing standpipe locations, adjacent to the property line. Warning signs and painted fence posts shall be installed at the edge of the road right-of-way where low pressure sewers cross roadways.

G6.5 Installation

In addition to the requirements stated at G3.6, the following standards apply:

1. A separate service line with a curb stop, marked “SEWER” at the property line is required for each lot.

2. Flushing pipes are required at the start of each collection main to facilitate removal of main line blockages.

3. Automatic air/vacuum relief valves are required at all high points for removal of hydrogen sulfide gases from anaerobic decomposition of organics.

G6.6 Valves

1. Gate valves for 75mm and larger shall be iron body, bronze mounted gate valves with a non-rising spindle, which open by turning in a counter clockwise direction. All valves shall conform to AWWA C500 for bronze mounted solid wedge gate valves or AWWA C509 for resilient seated gate valves. Interior to be factory coated with epoxy coating conforming to AWWA C550. Exterior to be factory applied epoxy coated. Corrosion reduction to be provided by installation of zinc sacrificial anode. Valves to be flanged for polyethylene pipe.

2. Brass inverted key-type curb stops shall be used for valves 50 mm and smaller conforming to ASTM B62 compression type. Curb stops to have adjustable bituminous or epoxy coated cast iron service base with stem to suit 3.0m depth of bury. Top of cast iron box to be marked “SEWER”. All curb stops shall incorporate 75mm long stainless steel sleeves for connections to polyethylene pipe.

3. Valve ends compatible with pipe joint type (Cast Iron Outside Diameter) to be used.

4. Cast iron valve boxes conforming to ASTM A48, Class 25 of the screw or sliding type shall be required on all valves. Coating inside and outside shall be an asphaltic coating or fusion bonded epoxy conforming to AWWA C213. Set screws to be galvanized. Top of box to be marked “SEWER”.

5. Extension stem to be 25mm square mild steel with 50 mm operating nut and flange suitable for 3.0m bury. A rock disk nut is required on all valves.
6. Schedule 40 PVC valve boxes for the bottom boot of Norwood Foundry Type A siding type valve boxes or approved equal are permitted in areas not exposed to vehicle loading.

G7. SERVICE CONNECTIONS

G7.1 General

1. Each lot must have a separate service

2. Install sanitary line in same trench as and to the left of water service (when facing the lot from the street/lane).

3. Minimum depth of cover shall be 2.70m from finished grade over top of pipe.

4. Mark locations of wastewater valves and other underground appurtenances with a stake painted green, 50 mm x 100 mm stakes 0.9 m long driven 0.6 m into the ground

G7.2 Gravity System Details

1. Minimum size of service is 150 mm diameter
2. Install a 150 mm x 100 mm diameter reducer at the property line.

G7.3 Low Pressure Systems

1. On low pressure systems: each lot shall utilize a positive displacement pump complete with an hour meter; and curb stops marked “SEWER” shall be installed 0.3m inside the utility right-of-way.

2. Sanitary sewer service pipe shall be 40 mm, DR 17 polyethylene pipe copper pipe size, Series 100 Municipal tubing.

3. Main connections shall be made by means of fused in-line tees or saddles. All fittings and joints must be assembled by electro fusion or butt fusion for HDPE piping. Services to be in one piece. No mechanical connections are permitted between main connection and the curb stop.

4. Curb stops shall be located such that they do not conflict with driveway locations.

G8. WASTEWATER STORAGE AND HANDLING

1. Reservoirs shall be designed to prevent damage from freezing, infiltration, exfiltration, anti-flotation measures required and ability of the tank to withstand structural stresses caused by hydrostatic pressure and buoyancy.
2. The total waste water storage requirements for a waste water collection system shall be calculated utilizing a sewage generation rate of 320 L/person/day with an average of 2.5 persons per residential unit, plus an infiltration allowance of 0.28 L/s/ha to be included for gravity systems.

3. An economical site selection will depend on the type of storage facility, but in general the major factors to consider are soils conditions, compatibility with future expansion requirements, site access and susceptibility of site flooding.

4. When planning the type of storage tank, the designer shall ensure that waste water is not stored or conveyed in a compartment adjacent to raw water supply or treated potable water. Storage tanks must be a minimum of 100m from any domestic water well, 1m from property line and 1m from a building.

5. Only concrete and fiberglass materials approved for use with waste water shall be used for storage tank facilities. All storage tanks shall be CSA approved and meet or exceed the CAN/CSA-B66. Design material and manufacturing requirements of prefabricated septic tanks and sewage holding tanks.

6. Storage tanks shall be sized to accommodate a minimum of three (3) day storage unless otherwise approved by the County. Tank shall include the capacity to store accumulating sludge and scum for a period of at least 3 years without reducing the hydraulic retention capacity to less than the designed daily peak flow.

7. Storage tanks shall be equipped with cam-loc fittings to allow for easy connections to the disposal vehicle. Perimeter fence (chain Link) and protective barriers shall be installed around the tanks. The cam-loc system shall be designed to facilitate easy vehicle access for the septage removal, service and maintenance.

8. Storage tanks shall be equipped with a level alarm and emergency dial-out.

9. Elevated tanks and standpipes shall be insulated and hot water re-circulated, or heat traced, to prevent problems associated with ice formation. Generally, they should be maintained at a temperature of 4^{o} C or greater.

10. Proposed storage tank locations shall be located and graded so as to limit possible contamination in the event leakage occurs. All access opening extensions shall be installed to ensure a water tight connection into the septic tank.

11. Access roads to the storage facility shall be designed to accommodate the turning movements of the disposal vehicles utilized for the site. For facilities handling less than 5000 lgal/day a SU-9 vehicle shall be accommodated. For facilities handling more than 5000 lgal/day, a WB-15 vehicle shall be accommodated. Where possible a drive-through system shall be utilized.

12. Access to the storage facility shall be constructed to at least a "Residential Subdivision – Main Access Road" standard, according to County guidelines Typical Drawings – Roads.

13. Wastewater system and/or containment tank shall be designed to not be fed by:
    a. Storm water
    b. Surface water
    c. Abattiot waste
    d. Sub-surface seepage water from weeping tile systems, foundation drains or subsoil foundations drainage pipes
    e. Clear water waste from a hot tub, spa or hydro massage bath that is not of the fill-and-drain design
    f. Clear water from a swimming pool
    g. Commercial or industrial process wastes
    h. Waste from water filter or other water treatment device where the on-site design has not been designed to handle discharge
    i. Wastes from an iron filter
    j. Other wastes not considered in the design of the system

G9. WASTEWATER TREATMENT

Waste water treatment will be reviewed on an individual project basis and will require the approval of the County and Alberta Environment.

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H1. WATER SYSTEM DESIGN OVERVIEW

All utility installation shall conform to CSA S250 Mapping of Underground Utility Infrastructure standard

The potable water system shall be of sufficient capacity to service the ultimate population projection of the development area. The flows and factors outlined in the following sections shall be used in the design of potable water systems.

The Developer and the developer's consultant shall provide a proposal for sustainable, uninterrupted, safe and clean supply of drinking water for development. Alberta Environment and Parks and Alberta Health Services in accordance with the following; *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Code of Practice for Waterworks Systems Using High Quality Groundwater, Code of Practice for Waterworks Systems Consisting Solely of a Distribution System, Water Act: Water Regulation and Environmental Public Health Field Manual for Private, Public and Communal Drinking Water Systems in Alberta.*

H1.1 Water System Proposals

System proposals must be in accordance with Alberta Environment regulations and guidelines. Plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to the County and Alberta Environment for review and approval prior to construction.

The letter report shall include the design parameters and design calculations for sizing the lines based on:

1. **Cistern System:** 9 L/Min restricted flow at minimum residual pressure of 150 kPa at ground level at a cistern (min 3.400 L capacity) on each lot

   or

   Pressure System: Minimum residual line pressure under peak hour flow conditions shall be 300 kPa at ground level

2. **Fire Protection:** Shall only be incorporated into a Rural Water System if accepted by the County, and if adequate flows are demonstrated for intended use

The letter report shall also include design parameters for raw water supply and metering, disinfection, residual chlorine monitoring, storage requirements and distribution pumping and metering requirements.

System design should take into consideration the potential for future integration with a Regional Water System. Factors requiring consideration would include:

a) Possible decommissioning of equipment made redundant by connection to Regional System.

b) Suitable connection point for Regional supply.

c) Decommissioning of wells that would cause “blended water” of well and regional supply.

H1.2 Cross Connection Control Devices

Cross connection control devices shall be installed at any location where a connection is made to an approved waterworks system for the purpose of serving a hamlet, municipal development, privately owned development or a truck fill station located outside the service boundary of the approved waterworks system. Cross connection control devices must be testable and of the Double Check Valve Assembly or Reduced Pressure type. See Figure G-19 for examples. Backflow preventers shall be installed in accordance with the latest edition of the Cross Connection Control Manual, published by AWWA (Western Canada Section).

H2. WATER SOURCES AND TREATMENT

H2.1 Capacity

1. In determining residential flows, a minimum of 2.5 persons per household shall be used unless otherwise determined by the County.

2. An average water supply rate of 375 L/person/day shall be used to design the system, unless otherwise determined by the County.

3. The maximum daily flow rate shall be at least 1.8 times the average daily flow. Raw water supply and treatment equipment shall be designed for 110% of the peak daily flow. Harmon’s peaking factor shall be used to determine the peak hourly flow rate for distribution, but must be a minimum of two (2) times the maximum daily flow rate.

H2.2 Sources

1. Groundwater:
   a) When establishing a location for a well, the following minimum setback shall be followed:
      - 100m from above ground fertilizer and pesticide storage containers
      - 100m from livestock yards, animal barns or manure storage
      - 100m from any existing leaching cesspool
      - 100m from a watertight septic tank
      - 100m from a sub-surface weeping tile effluent disposal field or evaporation mound
      - 100m from sewage effluent discharge to the ground
      - 100m from a sewage lagoon
      - 50m from above-ground storage tanks
      - 3.25m from existing buildings
      - 1.2m from the wall of a ground water well pump house
      - 2.0m from overhead power lines if the line conductors are insulated or weatherproofed and the line is operated at 750 volts or less
      - 6.0m from overhead power lines if the well does not have a pipe and sucker rod pumping system
      - Well casing sections no greater than 7.0m in length
      - 12.0m from overhead power lines for all other well constructions
      - 500m from a sanitary landfill, modified sanitary landfill, or dry waste sit

   b) Additionally, a ground water well shall have the following features:
      - Well casing shall be at a minimum 20cm above ground/floor with sloping away from well to prevent ponding around casing.
      - A well will need to be installed at a depth as specified from a test hole report completed by an experienced drilling contractor.
      - Have a PVC or non-conducting pipe pumping system
      - If housed in a building, the building may only contain the well and its pump
      - All wells shall be pitless.
      - If well casing cap is not water-proof it shall be 60cm above highest recorded flooding.

   c) A drilled well is constructed when the aquifer if found to be deeper than 30 meters. The drilled well may be completed with surface casing with slotted or perforated liner, sand screen with continuous slot openings, single string slotted, or perforated casing. The casing size must have an inside diameter of at least 102 mm.

2. Surface Water
   a) For surface water supply, the raw water intake must be designed to account for seasonal variation in water level.

   b) Adequate raw water storage must be installed that compensates for reductions in water availability. Minimum storage will be two cells that can be independently operated, each capable of storing 75% of the average annual water demand.

H2.3 Treatment

The Developer shall refer to Alberta Environment's current Codes of Practice and Design Guidelines for proper establishment of water supply, treatment, and distribution guidelines and procedures. The system shall be designed to produce water that meets or exceeds the American Water Works Association drinking water quality standards and minimum performance requirements as outlined in Alberta Environment's Water Performance Standards, and Alberta Environment's documents *Standards for Municipal Waterworks* and *Guidelines for Municipal Waterworks*.

1. Surface Water or Surface Water Influenced Groundwater Source Treatment

   The minimum treatment for surface water and surface influenced groundwater sources shall be filtration and disinfection. Acceptable filtration methods are:
   a) Chemically Assisted Rapid Sand Filtration: This is a multi-step treatment process that includes chemical mixing, coagulation and filtration. Filtration is usually preceded by flocculation and solids separation.

   b) Slow Sand Filtration: This process operates at very low filtration rates, and uses finer sand than is used for a rapid filter.

   c) Cartridge Filtration: Cartridge filters use a fibrous medium to remove particles larger than one (1) micron. When used in surface water treatment, it is usually preceded by a sand filtration step.

   d) Membrane Filtration: Membrane filters are non-fibrous materials that can remove particles larger than one (1) micron.

Disinfection may be compiled of entirely or partially of controlled chlorination addition into the system. Other additional methods of disinfection may include approved alternate chemicals such as fluoridation, chloramines, ozone, etc. and/or radiation such as ultra-violet radiation.

2. Groundwater Well Source Treatment
   a) The minimum level of treatment for ground water not classified as "ground water under the direct influence of surface water" should be continuous and effective chlorine disinfection.

      - Treatment design shall be such that the residual disinfectant concentration in the distribution system, measured as total chlorine, free chlorine, or combined chlorine shall be a minimum of 0.1 mg/L throughout the system and 0.2 mg/L at the water treatment plant.

      - Developments that are less than 15 service connections or 3 km of total water distribution system fall under the jurisdiction of Alberta Health Services and are governed by the *Environmental Public Health Field Manual.* Developments that are 15 or more service connections, greater than 3 km of water distribution system or have a well that falls under ground water under the influence of surface water are under the jurisdiction of an Albert Environment Code of Practice.

   b) Naturally occurring fluoride up to a concentration of 2.4 mg/L is acceptable by Alberta Environment, raw water with a concentration greater than 2.4 mg/L shall be treated to reduce the level of).8 mg/L, which is the optimum level for the control of dental cavities. Note: the *Guidelines for Canadian Drinking Water Quality* maximum allowable concentration for fluoride is 1.5 mg/L, if levels are over this concentration and under 2.4 mg/L yearly analysis shall be performed.

   c) Reverse osmosis may be used as an additional treatment process to purify water and remove salts and other impurities in order to improve the color or taste of the treated water.

   d) If aesthetic objectives such as the reduction of Iron and Manganese are desired, the Guidelines for Canadian Drinking Water Quality (GCDWQ) shall be used.

   e) At a minimum trihalomethanes shall be monitored four times, once every 3 years (spring, summer, fall, winter) in the waterworks system according to the requirements of Alberta Environment's Code of Practice for Waterworks Systems Using High Quality Groundwater.

H2.4 Water Storage and Handling

1. Reservoirs shall be designed to prevent damage from freezing.

2. The total water storage requirements for a given water supply system where the treatment plant is only capable of satisfying the maximum daily design flow may be calculated using the formula:

   S = A + B + (the greater of C or D)

   Where: S = total storage requirement, m^3
   A = fire storage, m^3
   B = equalization storage (approximately 25% of projected maximum daily design flow), m^3
   C = emergency storage (minimum 15% of projected average daily design flow), m^3
   D = disinfection contact time (T_{10}) storage to meet the CT requirements, m^3

   If fire flow is to be provided by the treated water system, fire storage is determined as follows:

   a) Allow for a minimum two hours fire flow at a minimum rate of 4,500 L/minute

   b) Where developments contain buildings other than single family dwellings, use fire flow guidelines of the Fire Underwriters Survey.

3. Provide at least two (2) reservoir cells to allow flexibility in maintenance and storage retention depending on water demand.

4. An economical site selection will depend on the type of reservoir, but in general the major factors to consider are soils conditions, compatibility with future expansion requirements, and site access.

5. When planning the type of reservoir, the designer shall ensure that treated water is not stored or conveyed in a compartment adjacent to untreated water. The type of material to be used for the reservoir is to be reinforced concrete if the reservoir is located above ground and reinforced concrete or fiberglass if the reservoir is located below ground.

6. Elevated tanks and standpipes shall be insulated and hot water re-circulated, or heat traced, to prevent problems associated with ice formation. Generally, they should be maintained at a temperature of 4^o C or greater.

7. Where subsurface locations for storage tanks are proposed, these locations shall be free from sources of possible contamination, having drainage for overland and ground waters, chemical spills, overflows and flooding.

8. Treated water storage reservoirs shall be disinfected and flushed before being put into service, in accordance with the current American Water Works Association Standard.

H3. DISTRIBUTION – WATER MAINS

H3.1 Alignment

In country residential subdivisions the water main alignments shall be as approved by the County. The following alignment features are expected:

1. Looping: Looping of main flow is of particular importance in smaller developments, where potential exists for extended periods of low flow, especially in recreational developments in off-season. Dead-end lines should be avoided. Where dead-end lines are unavoidable, they should end at a hydrant or other means of flushing.

2. Water recirculation: for small systems, in addition to looping within the development, there must be a return flow line back to the water treatment plant, upstream of the chlorination point. The return line should be located so as to prevent short circuiting (see Figure G-1) and be provided with a flushing point at the downstream point.

3. A minimum distance of 3.0m horizontal separation must be maintained between a water main and any sewer main unless otherwise approved by a Professional Engineer, Alberta Environmental Protection and the County.

4. A minimum distance of 2.0m horizontal separation must be maintained between a water main and any gas line.

5. Public Utility Lot (PUL) widths shall be a minimum of 5.0m. A minimum 1.0m easement is required on the lots on each side of a PUL.

6. A utility right-of-way is required to be registered on all lots.

H3.2 Installation

In addition to the requirements set out in Section G3.6, the following standards apply:

1. Mains shall be at a depth adequate to provide a minimum of 2.90m depth of cover from finished grade to top of pipe.

2. Air release valves are required at high points in the line and blow offs at the ends of lines.

3. Marker posts shall be installed perpendicular to all valve and appurtenances locations, adjacent to the property line. Warning signs and painted fence posts shall be installed at the edge of the road right-of-way where water mains cross roadways.

4. Mark locations of water valves and other underground appurtenances with a stake painted blue, 100mm in diameter, 1.8m long, driven 0.6m into the ground.

H3.3 System Materials

In addition to the requirements set out in Section G3.2, the following standards apply:

1. High Density Polyethylene (HDPE) Pipe

a) High Density Polyethylene pressure (HDPE) pipe suitable for potable water shall be conforming to CSA B137.1 and ASTM F714 Series 160 (DR 11) standard iron sized pipe.

b) Pipe sizes 50 mm to 300 mm shall meet HDPE Grade PE 3408.

c) Pipe age not to exceed two (2) years at time of installation.

2. Poly Vinyl Chloride (PVC) Pipe

a) Poly vinyl chloride (PVC) pipe shall be DR 18, Class 150, and (1035 kPa) cast iron outside diameter, with bell and spigot ends.

b) The pipe shall be supplied with integral wall thickened bell ends and continuous (joint-less) elastomeric gasket.

c) Gaskets shall be of a pressure actuated seal design.

d) PVC pipe shall be certified under CSA 137.3 – “Rigid Poly Vinyl Chloride Pipe for Pressure Applications”.

e) The interior of the pipe shall be clean and no debris or PVC shavings shall be trapped inside the pipe.

f) Pipe sizes 100 mm to 300mm shall also conform to the AWWA C900 Standard.

g) The pipe shall be manufactured from clean, 12454B PVC compound conforming to ASTM resin specification D1784.

h) PVC pipe shall not be installed in areas contaminated or potentially contaminated with organic compounds (organic solvents or petroleum products), i.e. near buried petroleum fuel tanks, abandoned gas stations, petroleum storage areas or petroleum refinery sites.

H3.4 Fittings

1. High Density Polyethylene (HDPE), DR 11 conforming to ASTM F714 and CANB 137.1, shop molded fitting shall be used.

2. All HDPE molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electro-fusion-type fittings.

3. Polyvinyl Chloride (PVC) injection-molded fittings Class 150 conforming to AWWA C907 shall be sued. Fittings shall be supplied with continuous (joint-less) elastomeric gaskets. All gaskets for PVC fittings shall be of a pressure actuated seal design.

4. PVC tees, elbows, tapped (AWWA thread) couplings and reducers sizes 100 – 200 mm shall conform to CSA B137.2.

5. Cast iron fittings shall comply with AWWA Specification C-110, C-111 and be supplied with Tyton Joints and require a zinc sacrificial anode as per County requirements. The exterior of all fittings shall be coated with asphaltic coating or a fusion bonded epoxy coating conforming to AWWA C213.

H3.5 Valves

1. Valves shall be iron body; bronze mounted gate valves with a non-rising spindle, which open by turning in a counter clockwise direction. All valves shall conform to AWWA C500 for bronze mounted solid wedge gate valves or AWWA C509 for resilient seated gate valves.

2. Interior to be factory coated with epoxy coating conforming to AWWA C550. Exterior to be factory applied epoxy coated. Corrosion reduction to be provided by installation of a zinc sacrificial anode.

3. Valve ends compatible with pipe joint type (Cast Iron Outside Diameter).

4. Cast iron valve boxes conforming to ASTM A48, Class 25 of the screw or sliding type shall be required on all valves. Coating inside and outside shall be an asphaltic coating or fusion bonded epoxy conforming to AWWA C213. Set screws to be galvanized. Top of box to be marked “WATER”.

5. Extension stem to be 25mm square mild steel with 50 mm operating nut and flange suitable for 3.0m bury. A rock disk nut is required on all valves.

6. All valves in roadways or sidewalks shall be Norwood Foundry Type B screw type valve boxes or an approved equal.

7. Schedule 40 PVC valve boxes for the bottom boot of Norwood Foundry Type ‘A’ siding type valve boxes or approved equal are permitted in areas not exposed to vehicle loading.

H3.6 Fire Hydrants

1. Where fire protection is being provided by the water system, hydrants shall be installed at a spacing of no more than 180m as measured along the pipeline.

2. The distance from a residence to the nearest hydrant shall not be greater than 100m.

3. The preferred location of hydrants is at an intersection.

H3.7 Service Connections

1. Each lot unit must have a separate service.

2. Water service pipe shall be minimum 25mm, Series 160 Municipal tubing certified potable water. Water service pipe shall conform to Series 160 Type “K” soft copper AWWA C800 c/w brass compression coupling, Kytec or approved equivalent.

3. Main connections shall be made by means of a tee saddle or tapping tee. All fittings and joints must be assembled by electro-fusion or butt-fusion for HDPE piping. Services to be in one piece, no mechanical connections permitted between main connection and meter chambers.

4. Curb stops shall be located such that they do not conflict with driveway locations.

5. Minimum depth of cover shall be 2.90m from finished grade over a vertical gooseneck and to the top of pipe.

H3.8 Pumping

1. A system pressure of at least 300 kPa must be provided throughout the system under peak flow conditions.

2. At least two (2) distribution pumps are required and the distribution system must be able to supply the maximum hourly flow rate at 300 kPa service pressure anywhere on the system, with the largest pump out of operation.

3. At least one (1) pump shall have variable speed drive to reduce pressure transients.

4. Provide back-up pumping in event of power failure, either by stand-by generation or gas or diesel engine-driven pump.

H4. INSTRUMENTATION, CONTROL, AND ALARMS

Small water systems will be expected to have sufficient instrumentation and controls to provide reliable water supply for extended periods unattended. Consult Section 2.3.6 of Alberta Environment *Standards and Guidelines* for further guidance.

As a minimum, the following features must be provided:

1. Remote monitoring for various treatment plant and water supply processes shall be supplied and installed as required by Alberta Environment or the County.

2. Any water treatment facility must include remote monitoring capabilities that allow County operators to operate and monitor the facility. Parameters to be monitored shall be determined by the Alberta Environment or Alberta Health Approval, and may any other parameter as required by Lacombe County.

3. Measurement Instrumentation:
   a) Raw water supply flow rate
   b) Treated water supply flow rate to distribution
   c) Treated water supply pressure
   d) Chlorine flow rate

e) Chlorine residual, shown as a daily minimum, maximum and average

f) Ground water well level

g) Treated water reservoir level

4. Alarms:
   a) Low well level
   b) Low reservoir level
   c) High reservoir level
   d) Low residual chlorine analysis
   e) Low distribution pressure
   f) Low building temperature
   g) Building smoke alarm

   Depending on the complexity of the treatment system, other parameters (for example high water turbidity or high filter pressure) may be warranted. Use Alberta Environment Standards and Guidelines for guidance.

5. Data Storage:
   a) Raw water flow
   b) Treated water flow
   c) Chlorine residual, shown as a daily minimum, maximum and average

H5. PUMP HOUSE

The pump house design shall be submitted at the same time as the construction drawings and no work shall take place until approved by Lacombe County.

The pump house shall incorporate the materials and design that will fit into the subdivision aesthetics and generally shall have exterior materials with long life and low maintenance in mind.

The pumphouse shall have an intrusion alarm.

Brick exterior siding is preferred.

The parking area around the pump house shall be paved to the same standard as the adjacent road.

The tank site will be fenced with chain link, include a locking gate, leveled and landscaped to prevent weeds.

H6. DOCUMENTATION

The developer or developer's consultant shall provide:

1. Water well drilling report

2. Complete water analysis by an accredited lab

3. Plan of record drawings of all water and wastewater

4. Standard Operating Procedures and Emergency Response Plan

5. Manufacturer specifications for maintenance

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I1 RURAL FIRE PROTECTION POLICY FOR MULTI-LOT SUBDIVISIONS

References:

1. Alberta Building Code 2006 (ABC)

2. NFPA Standard 1142, Water Supplies for Suburban and Rural Fire Fighting (NFPA 1142)

3. Fire Underwriters Survey, Water Supply for Public Fire Protection, 1996 Ed (FUS 1999)

4. Lacombe County Road and Infrastructure Standards Manual

I1.1 General

1. The purpose of this policy is to aid developers in meeting Lacombe County's rural fire protection needs through the proper construction and location of *"dry hydrant"* fire suppression facilities in rural areas and rural subdivisions not serviced by a pressurized municipal fire protection system. This policy adopts the above references as they may be amended time to time, with some variations specific to Lacombe County. The standards contained within this document are *minimums* only, and higher standards should be sought when practical. The County maintains its discretion to require higher standards where specifically required.

2. This is a summary policy document only and is not meant to be comprehensive. More specific details should be referenced directly in the reference documents.

3. The minimum water supplies required by ABC shall be established in, or transportable to, the designated area. If there are no provisions for natural or developed water sources for firefighting in the proposal, Lacombe County may require that the applicable fire department to conduct a water delivery trial to determine if sufficient water can be provided for a minimum of 30 minutes as required by FUS 1999.

4. The standards of this document are not required if:

   a) NFPA 13, 13D, or 13R are fully met to provide an adequate sprinkler system protecting a building; or

b) A pressurized municipal system is present which FUS 1999 considers as a piped communal system capable of 4500L/min flow for a minimum of 2 hours from fire hydrants at an adequate spacing.

5. Although a pressurized system is preferred, the County recognizes that such a system is not always practical due to high costs, low development densities, or specific land use policies. The County has therefore developed this policy to identify the level of fire protection that is to be maintained if a pressurized water system is not provided.

6. In general, this document is aimed at low-density "acreage" type country residential developments that are becoming more prevalent throughout the County. However, this policy and NFPA 1142 can also provide guidance for fire protection within commercial, institutional, and industrial developments, though more detailed and site-specific standards may have to be adopted. This document and NFPA 1142, have limitations due to their general focus. In very specialized or extremely hazardous situations, standards may be applied that exceed the standards set out in this document.

I1.2 Intent and Professional Involvement

1. These minimum requirements can be increased at the discretion of the local authority.

2. This policy document is provided for general reference only, for use by the development community, facility designers, and in the review and approval process by the County Manager of Planning Services, Manager of Operations and Lacombe Regional Fire Service (LRFS).

3. As part of the requirements of the Subdivision Conditions, Development Permit, and/or Development Agreement, a fire protection system may be required at the County's discretion. All calculations and design drawings for such a system must be prepared and stamped by a Professional Engineer registered to practice in the Province of Alberta (the "Engineer").

I1.3 Definitions

Minimum Water Supply (MWS) – The quantity of water required for fire control will be calculated in accordance with FUS 1999 Part II but in no case shall it be less than 2,000L/min. Pressurized water distribution systems with fire hydrants shall be installed in accordance with Section H2.4 of this manual.

Dry Hydrant – An arrangement of pipe permanently connected to a water source other than a piped, pressurized water supply system that provides a ready means of water supply for fire-fighting purposes and that utilizes the drafting (suction) capability of fire department pumpers.

I1.4 Water Supply Requirements

1. The following shall be addressed in the design of any fire protection system:
   a) Water source(s) shall be acceptable to the County, of suitable quality and be maintained and accessible on a year-round basis

   b) If the water is from a private source, a water use agreement acceptable to the County shall be required to ensure access to the water source. An example agreement is provided in NFPA 1142

   c) Adequate water source indicators (signs and/or painted indicators) acceptable to the County shall be provided, and shall take into account potential for snow depth accumulation and snow plowing operations

   d) Means of access to any required water supply or dry hydrant shall be constructed and maintained to meet the requirements of the Lacombe County Standards Manual

   e) Locations for and the immediate area around dry hydrants shall provide for fire fighter safety

   f) Dry hydrants shall be located to be accessible under all weather conditions

   g) System and site accessibility criteria shall ensure the dry hydrant can be reached with no more than 6 m of hard suction hose

   h) Dry hydrants shall have a minimum clearance of 6.1 m on each side and to be located a minimum of 30 m from any structure. Vehicle traffic shall not be impaired during the use of the dry hydrant

   i) Dry hydrants shall be protected from damage by vehicular and other perils, including freezing and damage from ice and other objects

   j) Dry hydrant locations shall be made visible from the main roadway during emergencies by reflective marking and signage approved by the authority having

jurisdiction. All identification signs shall be approved by the County and/or Alberta Infrastructure and Transportation prior to installation if they are to be located on the right-of-way or are subject to local or provincial laws

k) Vehicle access shall be designed and constructed to support the heaviest vehicle the County currently utilizes

l) Static lift should not exceed 3.1 m to 3.7 m. At design flow, head losses should be less than 6.1 m.

m) The hydrant shall be painted as needed in colors determined by the County, with reflective material to maintain visibility during emergencies.

2. The Minimum Water Supply volume shall be:

   a) Minimum of 7,600 L if there is no exposure hazard
   b) Minimum of 11,355 L if an exposure hazard is present. The County reserves the right, at its discretion, to require a larger minimum volume to provide a higher level of fire protection for multi-lot subdivisions; or
   c) As identified in the individual “In-Ground Open Storage Pond” and “Cistern” sections of this document.

3. If there is no developed or natural water sources contemplated in the proposal, the County may arrange a water delivery trial to determine if the fire department can deliver water to the site at the rates required by FUS 1999 for 30 minutes.

I1.5 Facility Planning Considerations

In addition to the requirements of NFPA 1142 and FUS 1999, the County has developed the following criteria.

1. The County recognizes that there are several methods for water supply storage. The preferred facility types are constructed in-ground storage tanks (cisterns) and open storage ponds.

2. The County will consider applications involving locations within a natural stream, lake, or other water body, as long as adequate measures are taken to address issues of seasonal fluctuations in water level, access restrictions, and environmental concerns.

3. The County will, where typical installations are not possible, provided satisfactory measures are taken to address concerns with freezing, construction, maintenance, and supply logistics accept the following installations in unusual circumstances:

   a) Shallow installations

   b) Shallow or seasonal ponds

   c) Above-ground storage tanks

   d) Bridge installations and/or facilities that include a roadway obstruction between the water source and the dry hydrant

4. Dry hydrants, including their required lands and water storage facilities, shall be zoned as Public Utility Lots.

5. There shall be no overhead utilities on the Public Utility Lot.

6. There shall be no underground utilities permitted on the Public Utility Lot where there may be interference with the operation of the dry hydrant and/or its water supply, or where the dry hydrant and/or the water supply operation could impede the utility.

7. As outlined in NFPA 1142, the need and locations for a dry hydrant depends on a number of factors, including but not limited to:

   a) Current and future population and building trends

   b) Property values being protected

   c) Potential for loss

   d) Proximity to structures (dry hydrant to be min. 30m from structure it is protecting)

   e) Fire history of the area protected

   f) Current water supply systems

   g) Potential water supply sources and reliability

   h) Cost of project

   i) Other factors of local concern (location of responding fire department, etc.)

8. The spacing and location of dry hydrants will remain within the discretion of the County, LRFS and the MPS, with input from engineering professionals and other agencies (i.e. Alberta Sustainable Resource Development). For any particular subdivision, many factors must be considered, such as nearest responding fire

department, proximity to existing lakes and ponds, proximity to forested areas, the nature of and value of proposed structures, setbacks, and other factors.

9. Provided an elevated fire hazard risk does not exist, and on approval by the County, dry hydrant requirements may be reduced where a proposed development is within a reasonable distance and response time from an existing hamlet or community with a pressurized municipal water system that has adequate capacity to provide fire water flow.

10. Shared dry hydrant systems may be considered by the County on a site-specific basis to reduce costs among proposed developments, or to improve fire protection in existing areas adjacent to proposed developments.

I1.6 General Design Considerations

1. The design of the dry hydrant, including miscellaneous materials and liners, shall be for a minimum life span of 25 years

2. The materials of construction shall be suitable to meet fire flow needs and shall be appropriate for the installation conditions. Buried pipe should be rated for suction conditions. Should rubber gasket PVC pipe be proposed, it shall meet AWWA C900 or C905 with a minimum Class 150 (DR18) rating and wall thickness. Should HDPE pipe be proposed, it shall be rated for a minimum 150 psi (DR11). Should steel pipe be considered, it shall be a minimum of Schedule 40, with corrosion protection and sacrificial anodes considered. Minimum size of suction and buried piping is 250 mm (10 inch) diameter. Above ground metal pipe shall be primed and painted

3. The dry hydrant shall be designed and constructed to provide a minimum flow of 3,800 L/min at draft.

4. The fire department connection shall consist of a 100 mm Storz type quick connect fitting steamer port. The protective cap on the connection shall be acceptable to the County and meet the requirements of NFPA 1963 *Standard for Fire Hose Connections*.

5. All pipe shall be adequately bedded and all trenches and excavations fully compacted to 98% SPD minimum. Pipe cover should consider the potential for frost penetration of at least 2.7 m.

6. The dry hydrant riser shall be primed and painted above ground in Chromium Yellow. Riser shall be protected from vehicular damage by a minimum of four bollards placed in square configuration at a distance of 1.2 to 2.0 m from the riser. Bollards shall be constructed of concrete-filled 100 mm diameter steel pipe also primed and painted Chromium Yellow.

7. Signage shall be provided at the dry hydrant location as follows:
   a) Minimum size 300 mm x 600 mm
   b) Mounted with standard Telespar post system
   c) Signage to read as follows, 65 mm red letters against a bright yellow background:

FIRE DEPARTMENT USE ONLY

8. System strainers and associated components shall be stainless steel. Manufactured PVC strainers may be considered on a site-specific basis.

9. A graveled approach shall be constructed with adequate gravel base (minimum 150 mm depth of 25 mm crush gravel on 300 mm compacted native material), culvert (minimum 400 mm diameter), and of sufficient length and width to allow the responding fire truck to pull fully out of traffic with a minimum 1.5 m clearance on all sides to allow for safety during filling operations.

10. Access to a dry hydrant location shall be designed as right-in/right-out, however, access to or from the opposite traffic direction shall not be inhibited by any type of barrier.

11. A reliable water source for filling and topping up the dry hydrant must be identified and approved by the County prior to approval of the development permit. The dry hydrant assembly, as well as the method of topping, up shall be approved by the County and any other provincial and/or federal approving agencies as required. Filling can be achieved by a dedicated well, stream access, or in the case of buried tank storage only, trucked in. For open ponds, topping up by *trucking in* is not acceptable due to the larger volumes typically stored within ponds, and the potential for larger losses due to seepage and evaporation when compared to buried tanks. Open ponds filled by storm water flows may be acceptable, provided adequate sedimentation traps are provided upstream of the fill location, and emergency overflow provisions are made. Storm water routes that flow adjacent to the facility, allowing off-stream filling, are preferred rather than routes that directly flow through the facility, which can have higher maintenance and potential for damage due to flood events.

12. The area within a distance of 3.0 m around the hydrant assembly shall be surfaced with gravel or similarly inert material to minimize growth of grass, brush, or other vegetation.

13. The County reserves the right to request, at its discretion, materials and geotechnical information relating to the design of roads, approaches, backfill,

bedding, foundations, material tests (i.e. concrete, liner materials, etc.) as required. All such information shall be provided by and stamped by a Professional Engineering firm registered in Alberta.

I1.7 In-Ground Open Storage Ponds - Design Considerations

1. When calculating the Minimum Water Supply volume, consideration shall be given to the practicality of constructing an open storage pond. Based upon the criteria outlined below, assuming a square pond with a 3 m x 3 m bottom, the minimum active Water Supply Volume (below the ice allowance and above the suction line intake) that can be provided by a constructed open pond is 182 m^3 (48,100 US gal/40,100 I).

The following design criteria should be considered:

a) Minimum 3H:1V sides lopes inside and outside

b) Minimum horizontal bottom dimension of 3.0 m

c) Minimum driving bank of 4.0 m width around pond

d) Fencing typically 2.0 m beyond driving bank.

e) Minimum depths are indicated in the following table:

	Depth	Volume
Minimum freeboard above ice	0.3 m	151,400 L (152 m^3)
Minimum ice depth allowance	1.0 m	371,687 L (372 m^3)
Minimum active storage depth	1.05 m	182,058 L (182 m^3)
Dead storage	1.15 m	52,422 L (53 m^3)
Minimum Total Pond Depth	3.5 m	758,324 L (758 m^3)

Note: 1 m^3 = 1,000 L

2. The above design criteria accommodate the minimum desired frost cover of 2.7 m above pipes. Vertical risers that may contain water within the frost zone and are thereby subject to freezing may require special treatment (i.e. heat trace, insulation, etc.) to prevent a frost plug from forming. See NFPA 1142 for examples. Satisfactory operation of the riser must be demonstrated over a period of two winters before final acceptance by the County, including necessary field proof tests witnessed by the County.

3. The minimum site area required is 30 m x 30 m, or approximately 0.09 ha based upon a square pond and the above criteria not including any allowance for an approach. Given this, plus the additional area required for an approach and other geometries, the minimum total site area required for an open pond dry hydrant

would be in the order of 0.2 ha. Larger areas may be required depending on site conditions.

4. Ponds shall only be considered in areas where water sources for topping up by means other than trucking in are readily available (i.e. wells, storm water routes, stream access).

5. The ponds must hold and maintain water on a continuous basis

   a) Where groundwater conditions merit it, the pond may be unlined to allow for replenishment by natural infiltration. If unlined, deepening of all or a portion of the pond should be considered to allow for anticipated fluctuations in water level.

   b) In all other situations, lining is required. Lining can be *in situ* native clay materials or synthetic liners. Both must be properly designed by a qualified geotechnical Engineer. Synthetic liners can include plastic (HDPE or PVC) and clay (bentonite) materials, or variations thereof. Generally plastic liners should be a minimum of 40 to 60 mil thickness (1.0 to 1.5 mm), with the HDPE on the thicker end of the range. Joints should be fused or similarly sealed. HDPE liners are generally more resistant to ultraviolet radiation from sunlight than PVC and can remain exposed on the surface. PVC and bentonite liners typically require a compacted clay or gravel armor cover. Gravel armor is also necessary to hold down a liner in areas subject to high water table. The minimum acceptable thickness for a compacted clay liner is 0.6 m. The minimum requirement for cover by a gravel armor is a 0.3 m thick layer containing at least 25% by weight material with a size range of 100 mm to 200 mm.

6. Should an exposed PVC or HDPE plastic liner be used, the side slopes can be slippery to maintenance personnel and animals, especially if wet. For safety, consideration should be given to roughening the liner surface to provide adequate traction, covering the exposed liner with clay or gravel to allow footing, and/or decreasing the side slopes. These measures should be applied to all sides of the liner. If the liner is left exposed, the pond must be fenced.

7. At ponds equipped with an exposed plastic liner, a 2.0 m high chain link fence complete with a top 3-wire barbed security attachment shall be provided around the exterior of the open storage pond and driving bank. The fence shall be located 2.0 m outside of the outside shoulder of the driving bank to allow adequate vehicular access around the entire perimeter of the pond. A sliding gate shall be provided so as to not block the entrance or gravel driving surface when open.

Preference should be given to locating the fire department connection outside of the gate.

8. Warning signage at open ponds shall meet the following requirements:

   a) Minimum of four signs, one on each corner of the pond, installed diagonally
   b) Minimum size 600 mm x 900 mm
   c) Mounted with a standard Telespar post system
   d) Signage to read as follows, against a bright yellow background:

   CAUTION (75 mm Red Letters)

   THIN ICE (65 mm Black Letters)

   DROWNING HAZARD (65 mm Black Letters)

9. At the County's discretion, consideration shall be given to allowing two trucks to fill simultaneously from the open pond dry hydrant.

10. A compacted gravel driving bank of similar construction to the approach in Section 6.0 shall be provided.

11. The pond shall be provided with a means to monitor water level, such as by staff gauge. The developer shall supply tables indicating storage volumes at various water levels.

I1.8 Storage Tanks/Cisterns - Design Considerations

1. Cisterns and buried underground tanks are acceptable storage facilities for dry hydrants. They are often preferred in rural subdivisions where open surface water sources are not readily available, where available land and/or top-up capabilities for open ponds are severely limited, where development densities and property values are high, or where a number of other factors and considerations make them more feasible. Cisterns and tanks should be sized based upon NFPA Minimum Water Supply calculations. Sizing shall be such that the Minimum Water Supply volume is provided as active storage, meaning the volume of water available to be pumped out of the tank or cistern, not including water below the suction pipe intake (i.e. dead storage).

2. Tanks shall be provided with an adequate dry hydrant head assembly, vent assembly, and fill assembly. Examples are provided in NFPA 1142.

3. For larger more intensive developments, large concrete cisterns illustrated in NFPA 1142 may be required by the County.

   Some specifics of the cisterns are as follows:

   a) Cisterns located no more than 671 m truck travel distance from the nearest lot line of the furthermost lot

   b) Minimum capacity of 113,560 L

   c) Concrete construction (fiberglass is an alternative)

   d) Suction system capable of 3,800 L/min for 75% of the cistern capacity

   e) Design includes suction connection, Siamese fill pipe, vent, and manhole access complete with ladder

   f) Access approach complete with protective bollards

I1.9. Fees and Development Levies

1. The County reserves the right to develop levies and fees for equitable distribution of costs for provision of rural fire protection facilities. Where warranted, the County will develop Endeavour to assist policies.

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J1. PLANNING GUIDELINES

The following list of Standards are intended to assist in the development of a high-quality and fully-integrated trail system that links residential development areas with community open spaces and other recreational lands. It includes legal requirements, official policies, established standards and practices, and desirable standards.

J1.1 Trail Classification

1. **Regional Trails**
   a) Provide external link from subdivisions to other amenities.

   b) Link together the main parks, recreational facilities, and reserve areas between subdivisions.

   c) Link together communities.

   d) Shown schematically in the Area Structure Plan, Outline Plan or other County approved plans.

   e) Required to be asphalt.

2. **Local Trails**
   a) Link to regional trails from subdivisions.
   b) Link to amenities within subdivisions.
   c) Required to be asphalt, unless otherwise approved by the County.

J1.2 Alignments

1. Ensure regional trail alignments correspond to Area Structure Plans, Outline Plans and other County approved plans and documents.

2. Design network of trails within and through a subdivision at the Concept Plan stage.

3. Trails are to be located in designated municipal reserves.

4. Ensure local trails link directly or indirectly to regional trails.

5. Avoid sections ‘on-road’ in order to maximize continuity of trail system.

6. Spacing from the back of residential lot should be a minimum of 1m. Trails should be used to delineate private land from public lands.

7. Trail right-of-way must be a minimum of 5m.

J1.3 Frontage

Avoid routing trails along the front of residential lots.

J1.4 Road Crossing

1. Route trail to road intersections where possible.

2. Mid-block crossings are discouraged and permitted on internal subdivision roads only. If mid-block crossings occur, appropriate signage as approved by the County will be required.

3. Adjust subdivision layout to minimize the number of crossings.

4. Line up trail entrances to ensure visual continuity.

J1.5 Play Equipment Sites

1. Regional trails should not be within a minimum of 5m from play area surfaces.

2. Provide links from play equipment sites to trails.

J1.6 Parking Lots

1. Route trail around parking lots unless approved by the County.

2. Provide links from parking lots to trails.

3. Locate trail entrances at road access.

4. One handicap parking space for every five additional spaces.

5. Refer to standard drawing for typical layout.

J1.7 Natural Areas

1. Minimize damage to environmental reserve parcels and sensitive areas by careful trail route selection.

2. The County may require confirmation from a qualified professional that damage to the natural area is minimized.

3. Where possible, utilize trails as a buffer from development or natural areas.

4. Back-sloping gradient to be 2:1 to minimize disturbance.

J1.8 Amenities

1. **Washroom Facilities**

   All locations and sizes to be approved by the County; to be constructed using the following minimum standards:

   a) Floor, walls, roof and tanks shall be of all concrete design

   b) Minimum 100mm wall thickness, 115mm roof thickness and 130mm floor thickness

   c) All wall to floor interior seams shall have a minimum 25mm radius coving made of high strength grout

   d) Designed to withstand a 350 pounds per square foot snow load

   e) Designed to withstand a 400 pounds per square foot floor load

   f) Designed to withstand the effects of a 250 km/h (3 second gust) wind exposure

   g) Meet a turning radius inside toilet room of 1.5m

   h) Contain grab bars, toilet paper dispensers, hand sanitizer dispensers, steel doors, non-locking door handles and dead bolts.

   i) Incorporate design elements to reduce or eliminate odour

   j) All concrete surfaces shall be finished with a clear acrylic anti-graffiti sealer

2. **Picnic Tables**
   Place one table per two parking stalls.
   Install at other locations deemed necessary by the County

3. **Park Benches**
   Placed at all bathroom facilities and recreation areas.
   Generally placed along trail every 500m.
   Other locations deemed necessary by the County.

4. **Waste Receptacles**
   Placed adjacent to all park benches.
   One receptacle per three picnic tables.
   Other locations deemed necessary by the County.

5. **Fish Cleaning Stations**
   May be required at boat launches.
   Other locations deemed necessary by the County.

J2. DESIGN GUIDELINES

The objective of the design standards is to produce a safe and enjoyable trail incorporating the needs of both pedestrian and bicycle users. The focus is on recreational rather than transportation use with straight alignments to be avoided. The nature of multiple uses requires stringent attention to design details.

J2.1 Design Drawings

Design drawings must be submitted to the County for approval for all local and regional trails.

J2.2 Surface Materials

1. All regional trails are to be asphalt and are intended to accommodate both pedestrians and cyclists.

2. Local trails and trails oriented to pedestrian traffic will normally be an asphalt surface unless otherwise approved by the County.

J2.3 Width

1. Right-of-way – minimum 5m.

2. Surface width of 2.5m minimum for local trails.

3. Surface width of 3.0m minimum for regional trails.

J2.4 Root Barriers

To protect pathway sections in the vicinity of aggressive rooting species, install root barriers along sections of trails that run through wooded areas that have species of the Poplar family (except Aspen) or Willow family located within a 5m setback of the trail. Refer to detailed drawings section. Root barriers will not necessarily run continuously through the wooded areas. They will only be installed where there are encroaching species.

J2.5 Safety Clearance / Setback Requirements

1. Provide 1.0m clear of all obstacles on both sides.

2. Provide 3.0m clear of all obstacles overhead.

3. Normally trails are to be located a minimum of 5.0m from the edge of the road.

J2.6 Safety Railings

1. Safety railings shall be installed when a trail is within 2.0m of the top of a bank with a 2:1 slope or steeper, and the slope is greater than or equal to 1.0m in depth.

2. Minimum railing height and design to be as per drawings detailed or to be an equivalent as approved by the County.

3. Chain-link fence is only acceptable when the metal is attached to, but not protruding above the top rail.

4. Wooden fences are not permitted.

J2.7 Trail Junctions

1. Where possible, ensure trails join at right angles.

2. Provide widening of trails with radius of 4.0m where trails join other trails.

J2.8 Trail Entrances / Wheel Chair Ramps

1. Minimum of three (3) bollards with the center bollard being removable are required at the entrance of each trail. The bollards will be placed at no less than 1.0m apart to accommodate wheel chairs and strollers. A square tubing fence will be attached to the bollards and run a minimum of 10m parallel to private property. Refer to the drawings.

2. Extend trail to road edge in all cases.

3. Ensure trail joins road at right angles.

4. Provide an asphalt wheel chair ramp complete with depressed concrete curb, as required, where the entrance to a trail is on a road or other entry point. Refer to the drawings.

J2.9 Sightlines

Where possible, ensure no obstructions such as trees, shrubs, utility boxes, fences, etc., restrict the visibility within 5.0m of a junction with other trails and roads.

J2.10 Design Criteria for Bicycles

1. Maximum grades

GRADE	ACTION
Over 8 percent	Re-route or provide stairs
5 – 8 percent	Not longer than 50m*
3 – 5 percent	Not longer than 200m
Under 3 percent	Acceptable

*keep bicycles and pedestrians separate and avoid curves and constrictions.

2. Design Speed

TERRAIN	SPEED
Flat	Not to exceed 35 km/hr
Downgrades	Not to exceed 50 km/hr

3. Super elevation – on curves minimum 2 percent; maximum 5 percent.

4. Stopping Sight Distances – as described below

Minimum SSD – $V^2/[255\ (f+g)] + 0.695v$

Where SSD = Stopping Sight Distance
v = bicycle design speed (typically 30 km/hr)
f = coefficient of friction = 0.25
g = grade m/m (rise of descent/run)

The following table may also be used to obtain appropriate stopping sight distances

Gradient	Level	Ascending		Descending	
	0%	2.5%	5%	2.5%	5%
SSD	35 m	33.5 m	32.5 m	36.5 m	38 m

Note – a stopping sight distance of 35m is considered a standard guideline

5. Minimum Design Curve Radii – minimum design curve radii is as follows

   Minimum $r = v^2/[127 (e+f)]$

   Where r = minimum radius
   f = coefficient of friction = 0.25
   e = super elevation
   v = bicycle design speed (typically 30 km/hr

   The following table may also be used to obtain the appropriate minimum radius for gravel trails with 2% banking

Speed	10 km/hr	15 km/hr	20 km/hr
Radius	2 m	5 m	9.5 m

Note – a minimum design curve radii of 5m is considered a standard guideline.

J2.11 Stairs

1. Where possible, avoid use within a trail network.
2. Stairway design is subject to the site but some general principles can be assigned.
3. Preference is given to metal handrails due to lower maintenance costs and increased longevity.
4. Consideration should be given to one set of stairs in each subdivision to be wheel chair accessible.
5. All wood shall be pressure treated.
6. Please refer to the Alberta Safety Code for maximum amount of treads allowed in a run.
7. Riser height – minimum of 6.5” and a of maximum 7.5”
8. Width of stairs – minimum - 2m wide.
9. Tread width - 11”

10. Tread will be two boards approximately 6” wide x 2” thick to allow for drainage. Gap between tread board on stairs and deck boards on landings must be no more than 1/16th of an inch.

11. Engineer will be required to make a recommendation on tread surface treatment to prevent slipping hazards.

12. Stringers are to be a minimum of 2’ x 12” and a maximum spacing of 36”

13. Riser height and tread depth shall be uniform within each flight of stairs, including any foundation structure used as one or more treads of the stairs. Variations in riser height or tread depth shall not be over 1/4-inch (0.6 cm) in any stairway system.

14. Stair-rails and the top rails of stair-rail systems shall be capable of withstanding, without failure, a force of at least 200 lbs (90.9 kg) applied within 2 inches (5 cm) of the top edge, in any downward or outward direction, at any point along the top edge.

15. The ends of stair-rail systems and handrails shall be constructed so as not to constitute a projection hazard.

16. Hand rail must be circular metal and generally continuous and approximately 30” to 34” high.

17. Metal rail must be painted with appropriate metal paint .The color should be generally non-intrusive to the surrounding area.

18. Interconnect railing and handrail members by butt welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

19. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

20. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required. The cylindrical cross section of pipe must be maintained throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

21. Close exposed ends of pipe by welding 3/16 inch thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.

22. Sandblast exposed surfaces smooth with pits, mill marks, nicks, and scratches filled and ground smooth so that no defects are visible from a distance of 6' after painting.

23. Conceal welds where possible. Where exposed, grind welds to small radius with uniform size cove. Welds shall be undetectable after painting.

24. Use only flat head countersunk bolts in exposed locations.

25. Install bicycle ramp along one side where stairs are unavoidable.

26. Any portion of stairs within 3m of a water body shall be installed on screw piles. Screw piles shall be a minimum size of 3" diameter pipe, 14" diameter helix and installed to a minimum depth of 6'.

27. County to approve all proposed stair locations.

28. Refer to standard drawings.

J2.12 Lighting

1. Provide on local and regional trails as required by the County.

J2.13 Pedestrian Bridges and Overpasses

1. Railing height as per Alberta Building Code.

2. Minimum deck width to be 3.0m between railings.

3. Submit concept drawings to the County, ensuring all drawings are stamped by a professional engineer and approved by the County.

J2.14 Vehicular Bridges and Overpasses

1. In general, ensure sidewalks for pedestrians and widened shoulder lanes for cyclists are provided along one side of the structure.

2. Where a bridge is part of the trail system, ensure that combined trail and sidewalks are provided along one side of the structure.

3. Railing height as per Alberta Building Code.

4. Minimum bridge or overpass width is to be 3.0m.

5. Submit concept drawings to the County, ensuring all drawings are stamped by a professional engineer and approved by the County.

J2.15 Pedestrian Underpasses

1. Minimum height of 3.0m and a minimum width of 3.0m.

2. Ensure drainage is kept in concrete swale along one side.

3. Ensure adequate lighting and if required must be approved by the County.

4. Maximum length of 50m. Provide break in underpass within median of divided roadways.

J2.16 Park and Playground Equipment

1. Park and Playground spaces should complement the area and provide benefit to the overall community.
2. All park and playground components, equipment and surfacing shall conform to *CSA Z614*, latest revision thereof.
3. All park and playground installation shall conform to *CSA Z614*, latest revision thereof.
4. After installation, prior to any use of equipment, and inspection completed by a Canadian Certified Playground Inspector shall be supplied to the County.

J2.17 Signage

1. Provide standard identification signs with trail name at trail entrances and trail junctions.

2. Provide standard hazard warning signs where appropriate.

J3. STANDARD SPECIFICATIONS

J3.1 Description / Quality Assurance

This section specifies the construction of functional and cost effective trails. The Contractor must have experience at performing the type and scale of work required by the County and be willing to provide proof of this experience.

J3.2 Inspections

1. The Contractor shall have an approved set of drawings and specifications available prior to calling the County for an inspection.

2. The Contractor shall provide documentation from a qualified professional of the trail alignment and sub-base and surface treatment (i.e. compaction test results and depth of gravel or asphalt).

J3.3 Materials

1. Gravel Surface Treatment Minimum of 10mm crushed gravel meeting at least 4:20 specifications.

2. Asphalt Surface Treatment S2 200-300A.

3. Bollards
   a) Refer to detailed drawings.
   b) Schedule 20 steel pipe minimum 140 mm outside diameter
   c) 1m height with 0.75m in ground in concrete
   d) Steel cap welded on
   e) Upper 200 mm painted red and lower 800 mm painted white
   f) All paint is to be powder-coated polyester
   g) The bollard will be removable where service vehicle access is required

4. Root Barriers
   a) 40 mm high density polyethylene
   b) Refer to detailed drawings.

J3.4 Installation

1. Refer to detailed drawings.

2. Compact surface treatment to 98% S.P.D. – asphalt surface shall be 75 mm of S2 200-300A – roll/tamp asphalt edges.

3. Compact sub-base and sub-grade to 98% S.P.D. The sub-base shall be 100 mm thick of 25 mm crushed gravel.

4. 2% cross-fall except where super-elevation required on a curve.

5. No trapped low areas on trail surface.

6. Ensure trails are not used as drainage swales. Use swales and culverts to ensure there is positive drainage away from the trail surface. Refer to detailed drawings.

7. Place good quality topsoil (raked and rolled) and sod, unless otherwise specified, on turf areas damaged by construction.

8. Ensure that the sod surface is flush with the trail edge.

J3.5 Maintenance

Developers will maintain trails and amenities from the time of installation until issuance of the Construction Completion Certificate by the County.

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K1. ACCOMMODATION OF TRAFFIC

The Contractor shall, at his 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 shall supply and maintain such signs, barriers, fences, lights, and flag persons 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 shall, at his own cost, continuously provide assistance to traffic as required on a twenty-four (24) hour per day and seven (7) day per week basis, particularly during periods of inclement weather. The Contractor shall provide dust control where considered necessary by the Engineer or County for the safety of the traveling public.

Flag persons shall be instructed in the proper traffic control procedures for the work and shall be dressed in fluorescent red-orange over-vest and armlets for maximum visibility and equipped with standard traffic control paddles.

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

All signs and guide posts which must be removed for the purpose of the work shall be carefully salvaged by the Contractor. Certain signs, such as those marking railroad crossings, intersection warning, or stop signs, shall be maintained for the protection of traffic using the roadway.

Where the project is closed and traffic diverted entirely off a road right-of-way, the Contractor shall, at his own expense, provide and maintain such signs, barriers, lights, and flag persons as may be necessary to direct the traveling public through the detour. Where, in the opinion of the County or the Engineer, additional warning signs or other safety devices are required for the work, the Contractor shall supply, erect and maintain the additional facilities requested.

K2. MINIMUM CONSTRUCTION SIGNING

1. Where required, the minimum construction signing shall be set so that the farthest sign from the work is a minimum of 300m to a maximum of 600m from the start of construction. There will be 90m separating each sign and 90m from the beginning of construction to the closest signs.

2. The **minimum signing** shall be in the order below:

A 120 cm x 120 cm	Construction Ahead Sign
A 60 cm x 75 cm	Reduce Speed Ahead Sign
A 60 cm x 75 cm	30 km/hr Maximum sign

3. Where deemed by the County or required for public safety, additional signs are to be used.

4. All signs must meet current Alberta Transportation standards.

K3. SUBDIVISION SIGNS

The location, size and design of the subdivision sign is to be approved by the Development Officer and/or Planner, prior to construction and installation. The location of the sign is to be approved by the County prior to installation. Subdivision signs shall be aesthetically pleasing, constructed of high quality materials, contain the subdivision name and the Lacombe County logo.

K4. TRAFFIC CONTROL DEVICES

A traffic control device is a sign, signal, marking, barrier or other device, placed upon, over or adjacent to a roadway which is intended to regulate, warn, or guide the road users. All such traffic control devices shall be installed in accordance with the *Manual of Uniform Traffic Control Devices for Canada* manual, latest revision thereof, distributed by the Transportation Association of Canada (TAC) 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, shall bear any commercial advertising.

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

K4.1 Traffic Signs Regulations

Signs inform road users of traffic regulations, 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 shall conform to the Canadian Standards Association (CSA) specifications.

All traffic control signing erected within the County shall be according to the latest edition of the *Manual of Uniform Traffic Control Devices for Canada*, latest revision thereof. All sign posts shall be located horizontally 3m from the shoulder of the adjacent road and the bottom of the sign shall be 1.5m above the shoulder elevation of the road. Stop signs or yield signs shall be positioned in line with the near property line of the intersecting road allowance or otherwise approved by the County. Refer to standard drawing.

K4.2 Materials

1. **Signs** – signs shall be 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.

2. **Sign Panels** – information signs shall be constructed with high intensity (or better) reflective panels. Regulatory and Hazard signs shall be constructed with diamond grade reflective panels.

3. **Sign Posts** – sign post shall be made of treated 100mm x 100mm, 100 mm x 150 mm, 150 mm x 150 mm or other approved dimensions, as required and approved by the County.

4. **Fasteners** – non corrosive fasteners shall be used to attach signs to their supports.

K4.3 Installation and Maintenance

Signs are to be placed with the posts vertical and the signs level. The bottom of the sign should be a minimum of 1.5m above the level of the nearest travel lane or existing grades. Signs are to be positioned with the best possible road visibility in mind. All signs shall 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 a sign. Refer to drawings.

K4.4 Pavement Markings

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

All materials specifications are to meet with current Alberta Transportation standards and be approved by the County.

1. **Color –** yellow (solid) lines should be used to delineate the separation of opposing traffic flows. White lines delineate the separations of traffic flows in the same direction. All lateral pavement markings are to be white in color.

2. **Pattern –** broken longitudinal lines are to indicate that lane changing is permitted and solid longitudinal lines indicate that lane changing is not permitted. The line to gap ratio for separator lines is to be 3m:6m. Lateral pavement marking may be parallel or "zebra" lines and are to be used to indicate the limits of the drivers' right-of-way concerning stopping, pedestrian crosswalks, no parking areas and the like.

Refer to the *Manual of Uniform Traffic Control Devices for Canada* which details the requirements for pavement markings.

K4.5 Temporary Signage

Temporary signage and devices shall be located as to provide motorists and pedestrians with adequate warning of construction or unusual conditions. A plan showing signage location, spacing and types shall be submitted to the County for approval a minimum of seventy-two (72) hours prior to disruption. *Refer to the Manual of Uniform Traffic Control Devices for Canada, section 'D'*.

K5. TRAIL SIGNS

1. Provide standard identification signs with trail name at trail entrances and trail junctions.

2. Provide standard hazard warning signs where appropriate.

3. Provide educational material regarding culturally or environmentally significant areas.

4. All signs types will meet Alberta Transportation standards

5. Refer to standard drawing for typical signs

6. All sign types and locations must be approved by the County before installation.

K6. RESERVE BOUNDARY SIGNS

1. Provide standard identification signs outlining the reserve type.

2. Reserve boundary signs will be installed where applicable (middle of lots adjacent to a reserve).

3. Refer to standard drawing specifications.

4. Refer to County policy RC (8) for further details

K7. RURAL ADDRESSING SIGNS

Every subdivision shall have all lots marked with a rural address sign

K7.1 General Rules & Guidelines

1. Addresses are based on access locations along Township Roads, Range Roads and Highways.

2. Each mile of Township Road, Range Road and Highway is divided into 16 address intervals. Each mile of Township Road, Range Road and Highway has 32 addresses.

3. Address numbers increase from South to North and from East to West.

4. Odd address interval numbers are on the South and East sides of the roads. Even address interval numbers are on the North and West sides of the roads.

5. Examples:
   a. **Single Structure off one Primary Access**
      40317 RGE RD 280 - The access location is on RGE RD 280. 403 is the intersecting TWP RD number to the South. 17 is the address interval number on the East side of RGE RD 280.

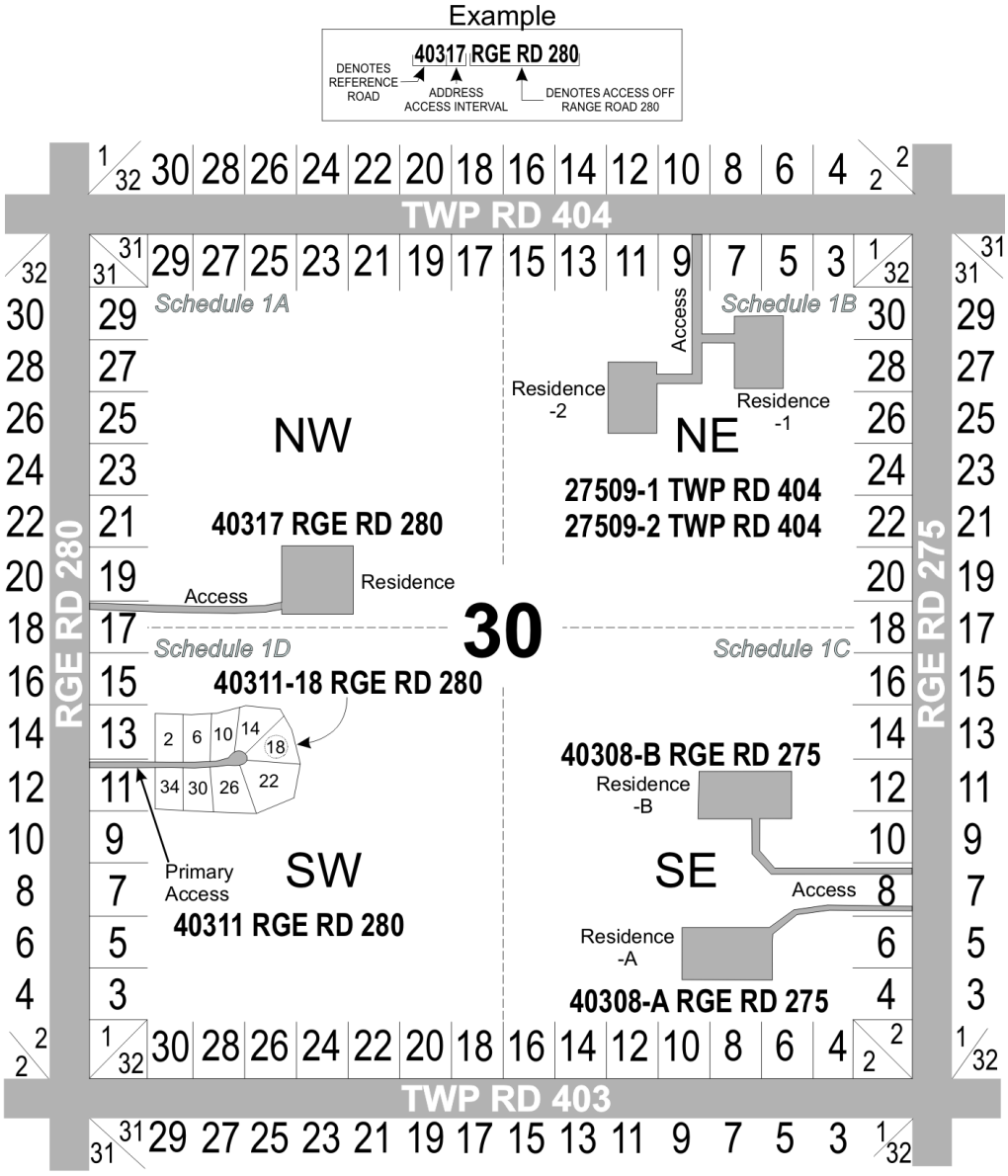
   b. **Two or more Structures off one Primary Access**
      27509-1 TWP RD 404 and 27509-2 TWP RD 404 - When two or more addresses on the same side of a road have the same access location, a numeric suffix is used to distinguish among the addresses.

c. **Two Primary Accesses in one address interval**

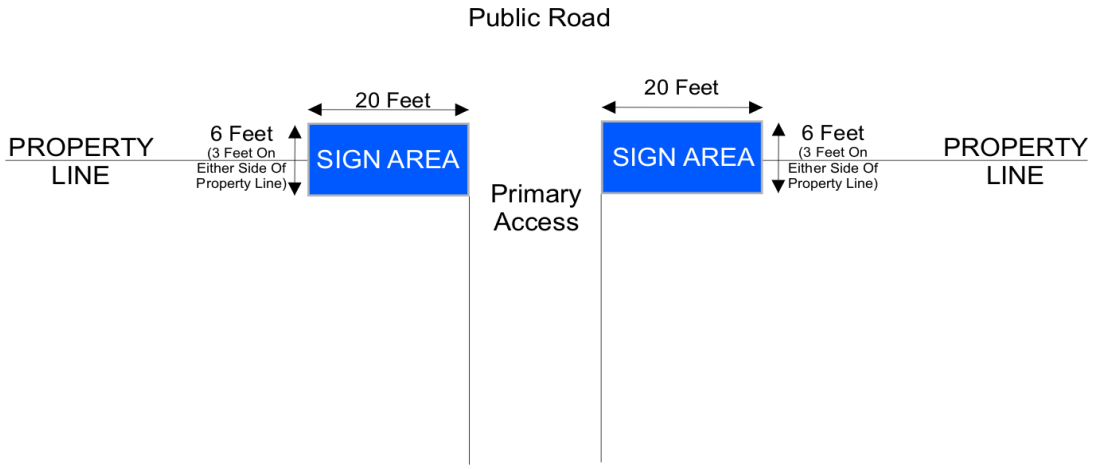
40308A RGE RD 275 and 40308B RGE RD 275 - When two or more access locations on the same side of a road fall within the same address interval, a letter suffix is used to distinguish among the addresses.

d. **Multi-lot Subdivisions**

40311-18 RGE RD 280 - Multi-lot subdivision addresses are based on the location on the intersection of the subdivision road with a Township Road, Range Road or Highway. Subdivision lots are treated as multiple addresses having the same access location.



K7.2 Rural Address and Lot Signs



1. **Sign Location**
   Signs shall be placed in a visible location within 20 feet (6.1m) of either side of the shoulder of the primary access (approach) and 3 feet (.91m) from the property boundary either inside the property or the road right-of-way.

2. **Sign Specifications**
   a. Sign Material: 5052-H38 Sign Grade Aluminum - 0.081” (2 mm) Thickness

   b. Sign Face: 3M High Intensity Grade Prismatic Reflective Sheeting

   c. Lettering: 4”

   d. Text Color: White

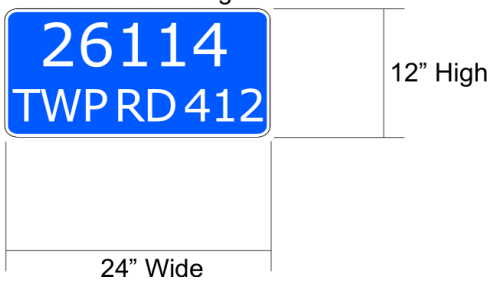
   e. Sign Background: Blue

   f. Sign Border: White - ½” around perimeter of sign

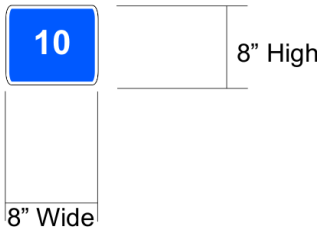
   g. Post: 1 U-Channel Post (pipeline post 1.12 lbs/ft x 7 feet)

   h. The sign shall be no lower than 3.3 feet (1.0m) from ground level (measured from bottom of sign) and no higher than 6.6 feet (2.0m) from ground level (measured from top of sign).

Rural Address Sign

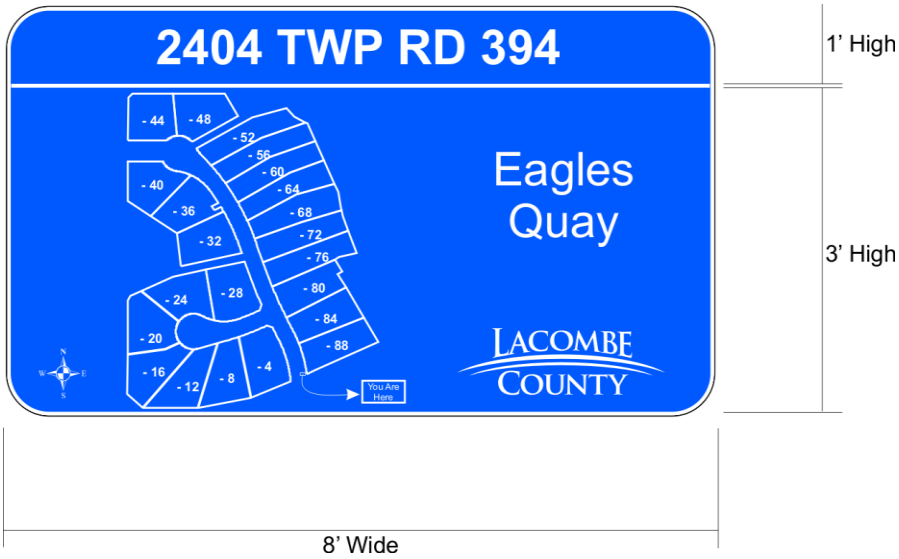


Lot Sign



K7.3 Multi-Lot Subdivision and Street Signs

1. Multi-Lot Subdivision Signs



Sign Location

Subdivision sign locations and dimensions are to be used as guidelines only. Actual locations and dimensions will be dependent on the subdivision layout and size.

a. Subdivision signs shall be placed in a visible location within 20 feet (6.1m) from the right shoulder of each primary access (approach) into the subdivision and no further than 50 feet (15.2m) inside the subdivision. The sign shall be no lower than 3 feet (.91m) from ground level (measured from bottom of sign) and no higher than 12 feet (3.7m) from ground level (measured from top of sign).

b. Sign Material: H-75 (¾”) Pressure Treated Plywood (sanded one-side).

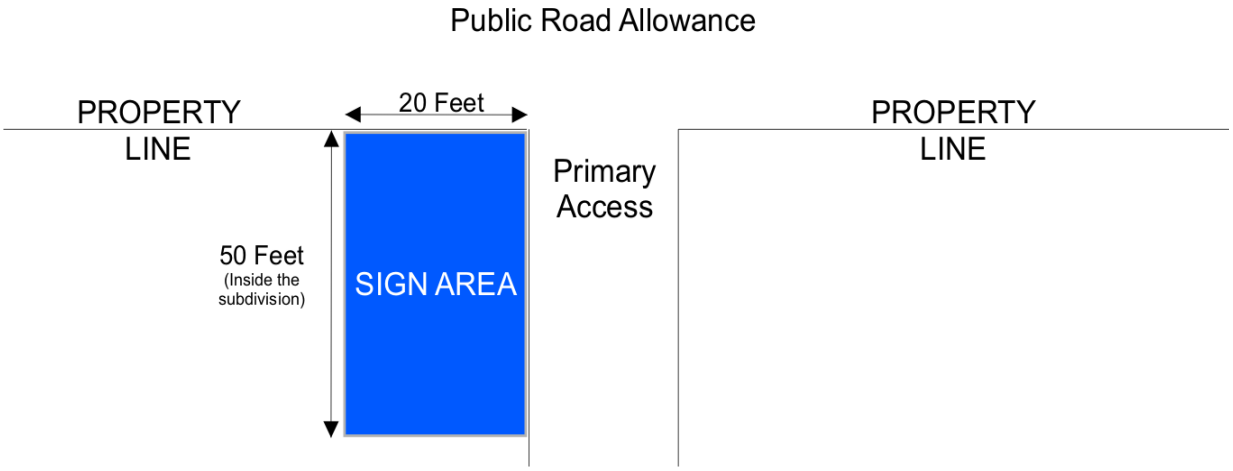
c. Sign Face: 3M High Intensity Grade Prismatic Reflective Sheeting

d. Text Color: White

e. Sign Background: Blue

f. Sign Border: White – ½" Around Perimeter of Sign

g. Post: 2 - 4" x 6" Pressure Treated or Steel Equivalent Posts



2. **Multi-Lot Subdivision Street Signs**

Sign Location

Street signs shall be placed at an appropriate location in the road right-of-way at the intersection of each street or cul-de-sac within a multi-lot subdivision. The sign shall be no lower than 8 feet (2.4m) from ground level (measured from the top of sign).

Sign Specifications

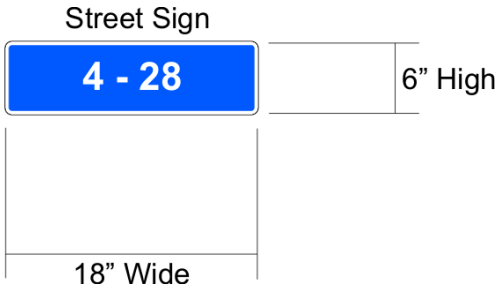
a. Sign Material: Extruded Aluminum Street Name Blade (double-sided)

b. Sign Face: 3M High Intensity Grade Prismatic Reflective Sheeting (double-sided)

c. Text Color: White

d. Sign Background: Blue

e. Post: 1 U-Channel Post (pipeline post – 1.12 lbs/ft x 8 feet) c/w U-Channel Sign Bracket and 1 - 42" Base Post



K8. LACOMBE COUNTY LOGO

Below are the color specifications for whenever the Lacombe County Logo is used. The County has final say whenever the logo is used.

QUICK REFERENCE GUIDE

Colour specifications

	CMYK	RGB	WEB
BLUE **PANTONE® 7470**	80 15 0 45	0 112 136	00 70 88
CHARCOAL **PANTONE® 445**	20 0 20 65	94 110 102	5E 6E 66
GREEN **PANTONE® 576**	49 0 100 39	92 135 39	5C 87 27

NOTE: Do not use this reproduction for colour matching. Please refer to the above colour mixes.

File Format Glossary

The following digital files of the brand signatures are availalble on the CD supplied with this guide. Different media applications will require specific file formats. The guide below will help you choose the appropriate format for your application. If you are unsure of which format you need or have misplaced your copy of the CD contact the Lacombe County Communications Coordinator.

File Formats

ai, eps	Preferred formats for printing presses and sign production.
emf, wmf	Internal documents (may perform better in Microsoft programs).
jpg	Internal documents, online use.
png	Online and PowerPoint.

Colour Formats

Pantone	Spot colour printing press applications.
CMYK	Full colour printing on external presses and most sign shops.
RGB	Preferred for on screen viewing and large format printing.
BW	Black & white applications, ie. newspaper.
Reverse	When the logo is used on a dark background or on a piece that does not allow the corporate colours to be used.

K9. DEVELOPMENT PERMIT INSTALLATION OF SIGN

No work is to begin on the construction and installation of the sign(s) until the County has issued a permit, unless exempt under the *Land Use Bylaw.*

A permit will also be required from Alberta Transportation for any sign to be located within 300m of a provincial highway right-of-way boundary or within 800m of an intersection of a provincial highway with another public road. For more information, contact Alberta Transportation (403) 340-5166.

Usually sign requirements for multi-parcel developments are considered within the rezoning and subdivision process. Contact the Planning and Development Department or refer to the *Land Use Bylaw.*

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L1. GENERAL

Stormwater management is regulated provincially under both the *Environmental Protection and Enhancement Act* and the *Water Act* and federally by the *Navigable Waters Protection Act*, *Fisheries Act* and the *Canadian Environmental Assessment Act*. The Developer is responsible to ensure that all stormwater facilities and infrastructure is designed and constructed in accordance with the requirements of all Provincial and Federal regulations.

Storm water management systems must be designed by a qualified professional to minimise the adverse environmental impact of developments locally, on water courses downstream of the site, drainage systems upstream of the development and on groundwater. The stormwater system must ensure that post-development runoff to adjacent properties will be no greater than pre-development rates and include the necessary mitigation measures to protect existing downstream drainage systems and/or receiving water bodies.

This section provides a summary of stormwater systems. Refer to the AEP publication *Stormwater Management Guidelines for the Province of Alberta* and Lacombe County's *Standards for Stormwater Management Facilities* for details. Additionally, these systems must comply with any local drainage study requirements i.e. the *Wolf Creek/Whelp Brook Master Drainage Plan.*

L2. ALIGNMENT

Storm water management facilities must be contained within a public utility lot. No storage will be permitted in a road right of way. Any drainage channel located outside of a road right of way or reserve must also be contained on land that is designated as a public utility lot.

Access must be incorporated into, or provided up to, any public utility lot that is part of the stormwater management system to facilitate maintenance.

L3. STORMWATER MANAGEMENT PLAN

A Stormwater Management analysis must be conducted by a qualified professional and the resulting Stormwater Management Plan must be submitted to the County.

The Stormwater Management plan must address the following:

1. Pre-development drainage systems and offsite catchments including rates of run-off and analysis of the downstream receiving channel.

2. The physical constraints of the site and how these factors influence the selection of the proposed stormwater system.

3. Clearly defined objectives for stormwater management (improved water quality, control rate of run-off, flood prevention, etc.).

4. Description of the proposed stormwater collection system including an explanation of how the proposed system best supplies the drainage requirements and meets the stormwater management objectives. This should also include supporting detailed hydrology and hydraulic calculations for all facilities.

5. An overall plan depicting the proposed stormwater collection system, the location of all facilities, emergency spillways, preliminary facility cross-sections and details of inlets and the outfall control structure. If the implementation of the scheme is to be staged, the staging method should be presented.

6. Description and plan of the interim storm water management system to be in place during construction

7. Description of what Stormwater Best Management Practices (BMPs) were followed in particular:
   a. lot-level BMPs
   b. conveyance system BMPs
   a. end-of-pipe BMPs
   b. Report which outlines the life-cycle cost of construction, operation, maintenance and replacement of each proposed BMP

L4. STORMWATER BEST MANAGEMENT PRACTICES (BMPS)

L4.1 General

Stormwater Best Management Practices (BMPs) are methods of managing stormwater drainage for adequate conveyance and flood control. These methods retain as much of the “natural” runoff characteristics and infiltration components of the undeveloped system as possible and reduce or prevent water quality degradation.

Storing the volume of runoff from a 25-mm storm over the contributing area is appropriate for stormwater quality control using detention devices such as constructed wetlands. A detention time of 24 hours should also be used for detention facilities.

Stormwater management facilities shall be designed for self-sustainability and to minimize maintenance.

L4.2 BMP Screening and Selection

1. Initial Screening

There are a range of stormwater BMP options available for most applications. The selection of an appropriate BMP or group of BMPs depends on the objectives for stormwater management defined for a particular catchment area, as well as the constraints placed on the feasibility of particular BMPs by physical site factors.

Once the objectives for stormwater management are well defined and the site constraints are understood individual BMPs can be evaluated in terms of their overall effectiveness as a stormwater control facilities. The evaluation of overall effectiveness must include both water quantity and water quality objectives.

2. Physical Constraints

Site characteristics may be the factor that will ultimately determine the applicability of individual or combinations of BMPs. Physical factors that need to be assessed in evaluating the suitability of BMPs include:

a. Topography
b. Soils stratification
c. Depth to bedrock
d. Depth to seasonably high water table
e. Drainage area

3. Final Screening

In the initial screening phase the options for BMPs were limited by particular disadvantages and site constraints. The list of BMP options that are still considered feasible are further screened by the application of specific objectives that must be met as part of the development including:

a. Water quality
b. Flooding
c. Erosion
d. Ground water recharge

L4.3 Lot Level BMPs

Important stormwater management criteria, such as the preservation of water quality, protection from erosion, and the maintenance of base flow can begin to be addressed at the lot level. Lot-level controls ought to be considered when planning the stormwater drainage system.

L4.4 Stormwater Conveyance System BMPs

Stormwater conveyance systems transport drainage from developed areas to storage facilities or a receiving water body.

Road runoff normally carries high levels of solids, oils, greases, metals and chlorides if road salt is applied during the winter months. Removal of these contaminants prior to end-of-pipe can enhance the performance of any storage or treatment facilities. In all cases deliberate discharge of storm water into the sanitary system must be prevented.

L4.5 End-of-Pipe Stormwater BMPs

End-of-pipe stormwater BMPs provide water quality enhancement to stormwater prior to discharge into a receiving water body. A number of end-of-pipe alternatives are available for application depending on the characteristics of the upstream catchment and the requirements for water quality enhancement. Generally, the County will only give approval for constructed wetlands.

L5 Signage

The design of stormwater management facilities shall include adequate provisions for the installation of signage to warn of anticipated water level fluctuations, with demarcation of maximum water levels to be expected for design conditions. Warning signs will be designed by the Developer and approved by the Engineer.

L6 Maintenance and Warranty

L6.1 Maintenance Plan

The engineer shall provide a detailed maintenance plan for all components of the stormwater management system including, but not limited to, vegetation management and forebay or catch basin cleanout.

L6.2 Maintenance and Warranty Period

In addition to the standards set out in A11.5 the developer shall be responsible for all maintenance of the stormwater management facilities for a period of two (2) years after the acceptance of a Construction Completion Certificate.

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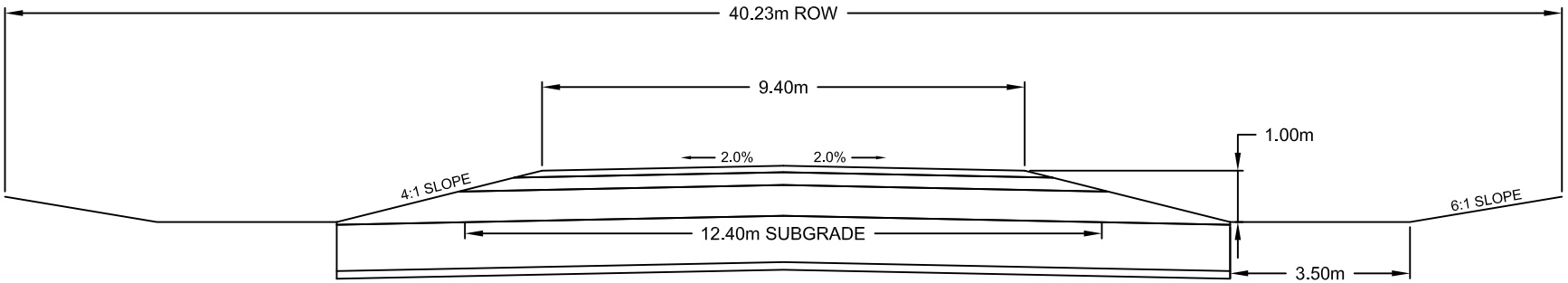
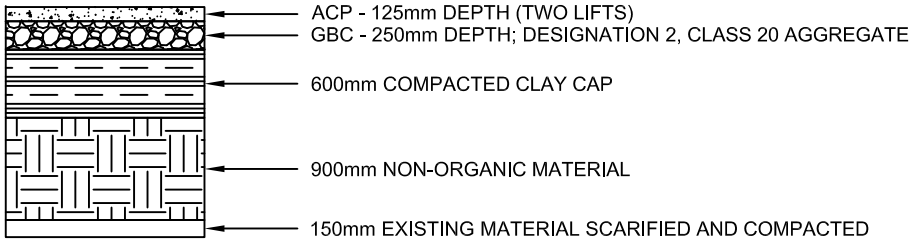


MINIMUM ROAD STRUCTURE



RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 40.23m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

GEOMETRIC REQUIREMENTS
MAXIMUM GRADIENT - 6%
MINIMUM CREST VERTICAL CURVATURE - K90
MINIMUM SAG VERTICAL CURVATURE - K50
MINIMUM HORIZONTAL CURVATURE - 600m RADIUS
MAXIMUM SUPER ELEVATION - 6%

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	01/03/17
REVISION	DATE

MAIN ASPHALT ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

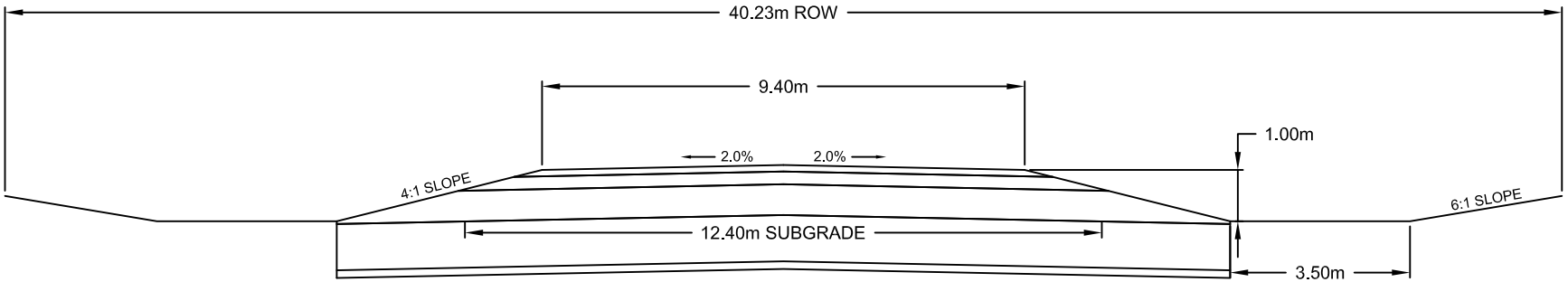
SCALE
NTS

DATE
MARCH 1, 2017

DRAWING NUMBER

C-1

LACOMBE COUNTY



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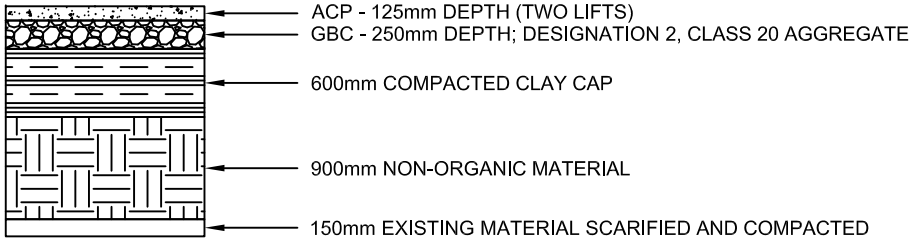


RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 40.23m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

GEOMETRIC REQUIREMENTS
MAXIMUM GRADIENT - 6%
MINIMUM CREST VERTICAL CURVATURE - K90
MINIMUM SAG VERTICAL CURVATURE - K50
MINIMUM HORIZONTAL CURVATURE - 600m RADIUS
MAXIMUM SUPER ELEVATION - 6%

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	01/03/17
REVISION	DATE

INDUSTRIAL SUBDIVISION ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

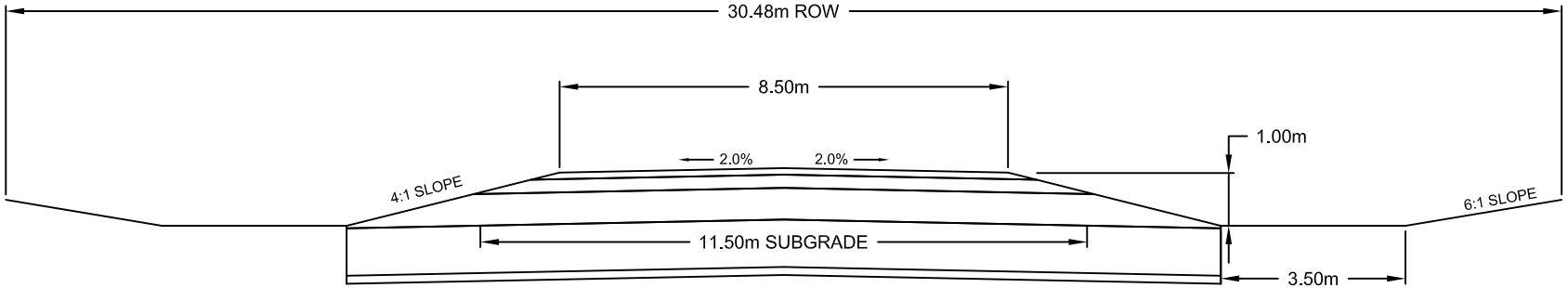
SCALE
NTS

DATE
MARCH 1, 2017

DRAWING NUMBER

C-2

LACOMBE COUNTY



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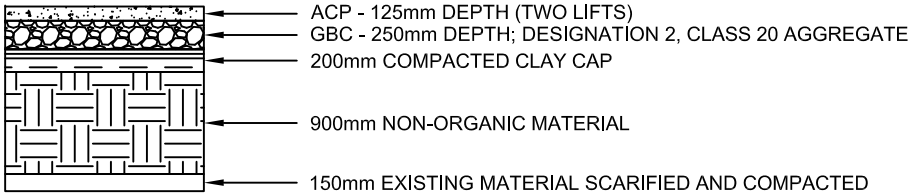


RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 30.48m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

GEOMETRIC REQUIREMENTS
MAXIMUM GRADIENT - 6%
MINIMUM CREST VERTICAL CURVATURE - K45
MINIMUM SAG VERTICAL CURVATURE - K30
MINIMUM HORIZONTAL CURVATURE - 90m RADIUS
MAXIMUM SUPER ELEVATION - 6%

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	01/03/17
REVISION	DATE

RESIDENTIAL SUBDIVISION MAIN ACCESS ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

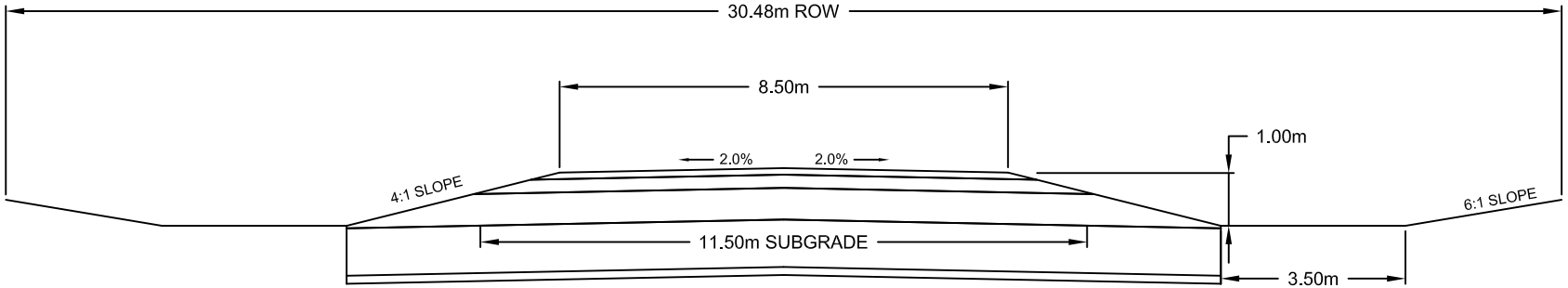
SCALE
NTS

DATE
MARCH 1, 2017

DRAWING NUMBER

C-3

LACOMBE COUNTY



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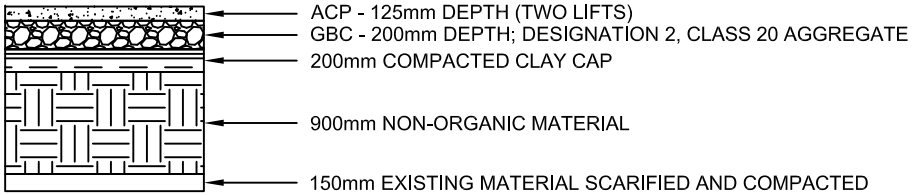


RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 30.48m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

GEOMETRIC REQUIREMENTS
MAXIMUM GRADIENT - 6%
MINIMUM CREST VERTICAL CURVATURE - K45
MINIMUM SAG VERTICAL CURVATURE - K30
MINIMUM HORIZONTAL CURVATURE - 90m RADIUS
MAXIMUM SUPER ELEVATION - 6%

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

NOTE: INTERNAL SUBDIVISION ROADS THAT WILL BE USED FOR WASTEWATER HAUL ROUTE WILL NEED TO BE CONSTRUCTED TO MAIN ACCESS ROAD STANDARD

1	01/03/17
REVISION	DATE

RESIDENTIAL SUBDIVISION ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

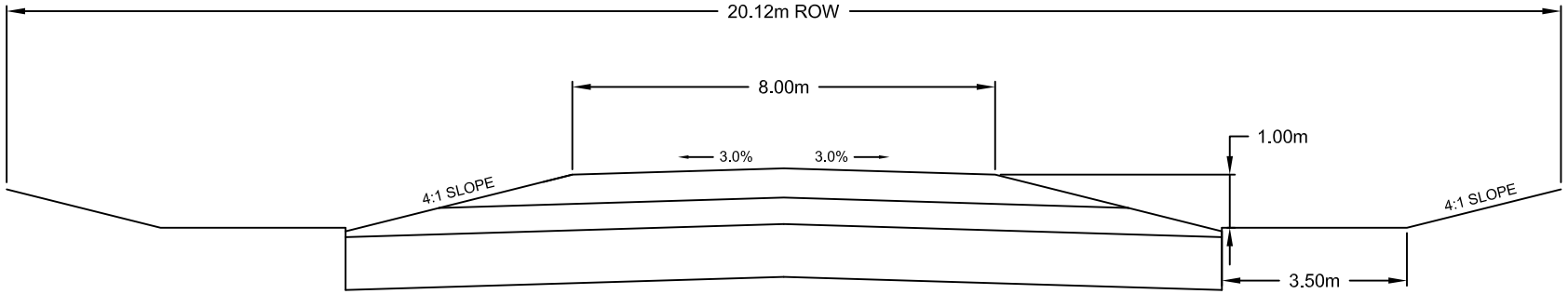
SCALE
NTS

DATE
MARCH 1, 2017

DRAWING NUMBER

C-4

LACOMBE COUNTY



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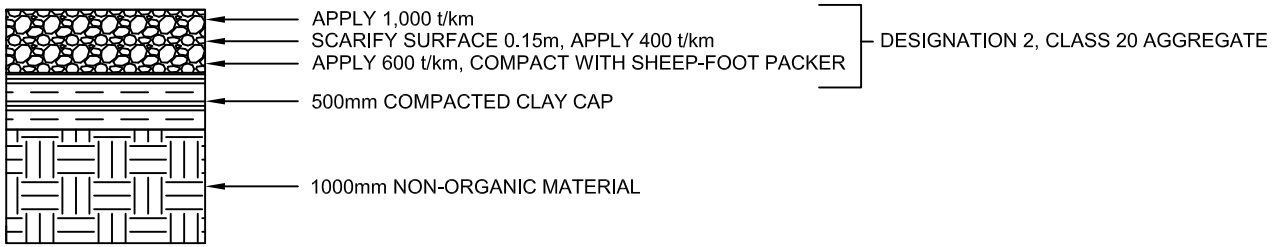


RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 30.48m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

GEOMETRIC REQUIREMENTS
MAXIMUM GRADIENT - 6%
MINIMUM CREST VERTICAL CURVATURE - K45
MINIMUM SAG VERTICAL CURVATURE - K30
MINIMUM HORIZONTAL CURVATURE - 300m RADIUS
MAXIMUM SUPER ELEVATION - 6%

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	28/03/17
REVISION	DATE

LOCAL ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

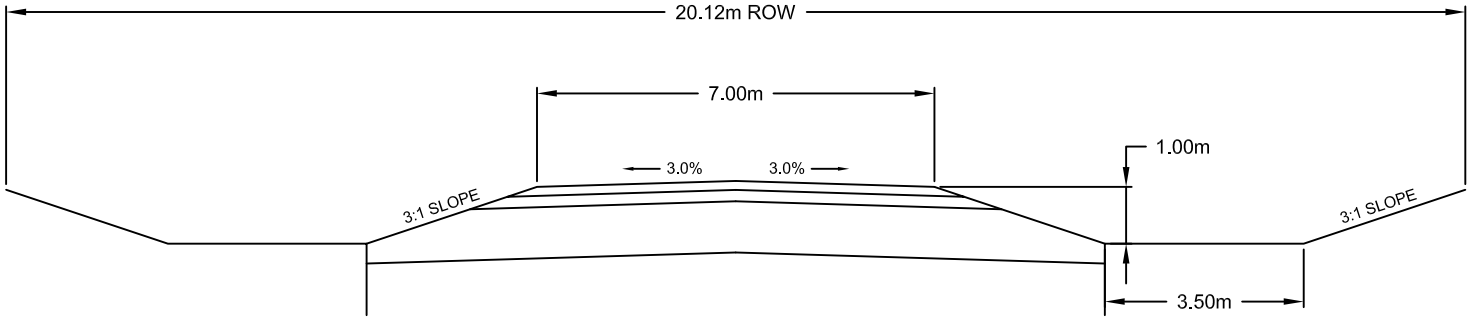
SCALE
NTS

DATE
MARCH 1, 2017

DRAWING NUMBER

C-5

LACOMBE COUNTY



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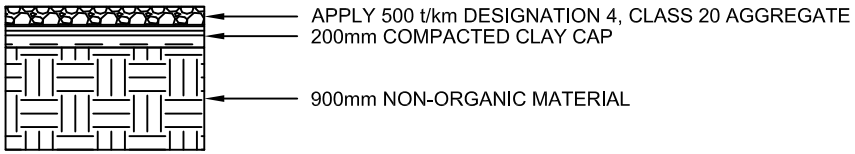


RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 20.12m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

GEOMETRIC REQUIREMENTS
MAXIMUM GRADIENT - 7%
MINIMUM CREST VERTICAL CURVATURE - K25
MINIMUM SAG VERTICAL CURVATURE - K25
MINIMUM HORIZONTAL CURVATURE - 300m RADIUS
MAXIMUM SUPER ELEVATION - 6%

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	28/03/17
REVISION	DATE

ACCESS ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

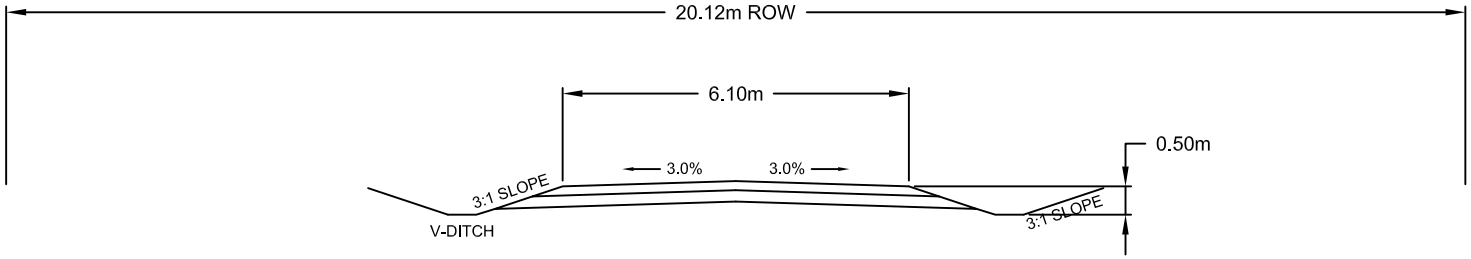
SCALE
NTS

DATE
MARCH 1, 2017

DRAWING NUMBER

C-6

LACOMBE COUNTY



MINIMUM ROAD STRUCTURE

RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 30.48m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

GEOMETRIC REQUIREMENTS
MAXIMUM GRADIENT - 7%
MINIMUM CREST VERTICAL CURVATURE - K25
MINIMUM SAG VERTICAL CURVATURE - K25
MINIMUM HORIZONTAL CURVATURE - 300m RADIUS
MAXIMUM SUPER ELEVATION - 6%

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	29/03/17
REVISION	DATE

FARM MACHINERY ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

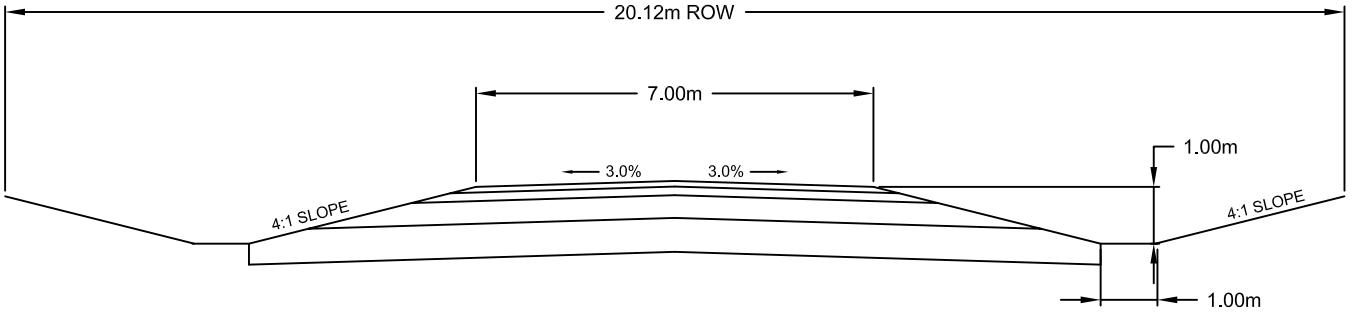
SCALE
NTS

DATE
MARCH 29, 2017

DRAWING NUMBER

C-7

LACOMBE COUNTY



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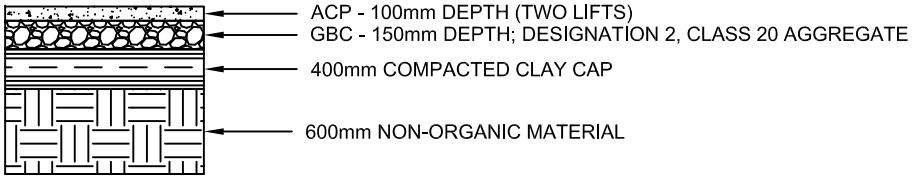


RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 20.12m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	01/03/17
REVISION	DATE

RV CAMPGROUND-PRIMARY ROAD

PROJECT NUMBER

DRAWN BY
BMAIER

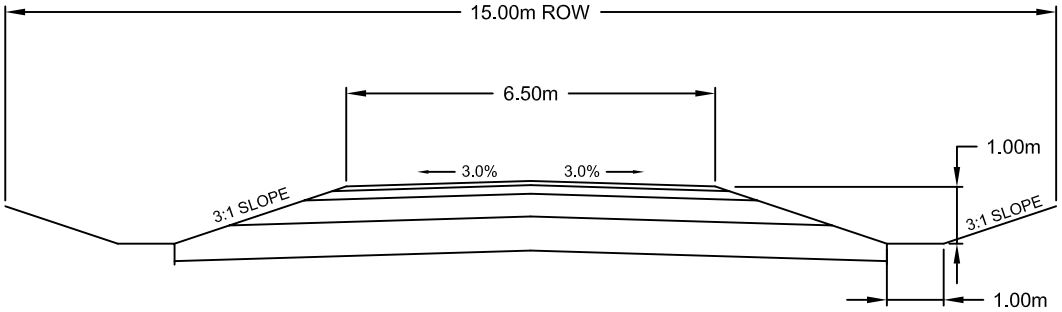
SCALE
NTS

DATE
MARCH 30, 2017

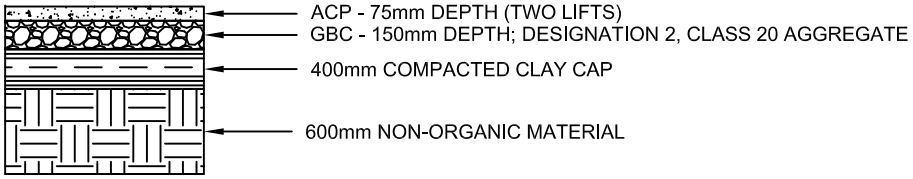
DRAWING NUMBER

C-8

LACOMBE COUNTY



MINIMUM ROAD STRUCTURE



RIGHT OF WAY REQUIREMENTS
RIGHT OF WAY WILL BE 15.00m WITH BACKSLOPING EASEMENTS FOR CONSTRUCTION

STRUCTURAL REQUIREMENTS
GRADE - UPPER 300mm 100% STANDARD PROCTOR DENSITY
GRADE - BELOW 300mm 98% STANDARD PROCTOR DENSITY

1	01/03/17
REVISION	DATE

RV CAMPGROUND-ARTERIAL, CUL-DE-SAC OR SINGLE ACCESS

PROJECT NUMBER

DRAWN BY
BMAIER

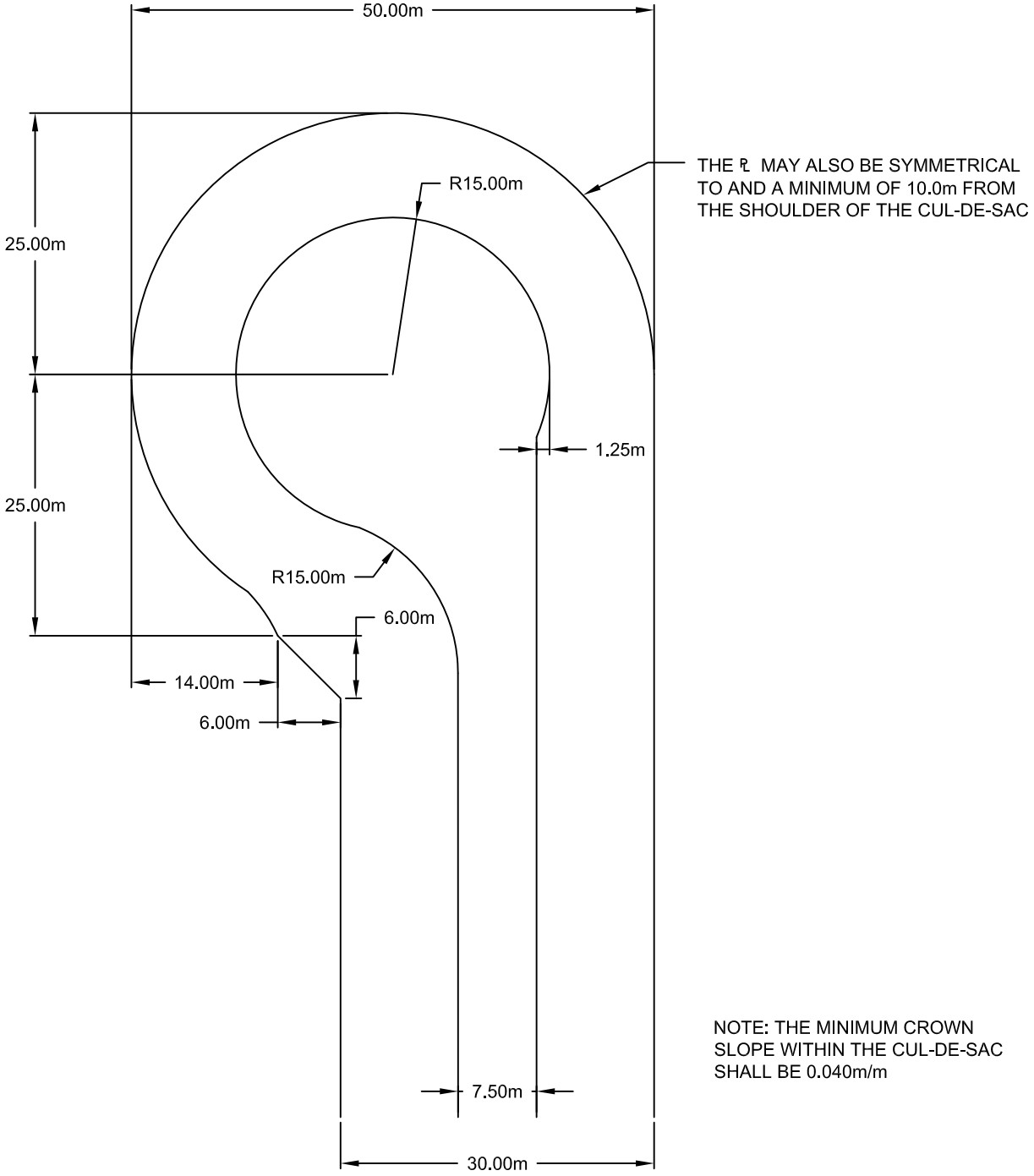
SCALE
NTS

DATE
MARCH 30, 2017

DRAWING NUMBER

C-9

LACOMBE COUNTY



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

1	01/03/17
REVISION	DATE

STANDARD CUL-DE-SAC 1

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

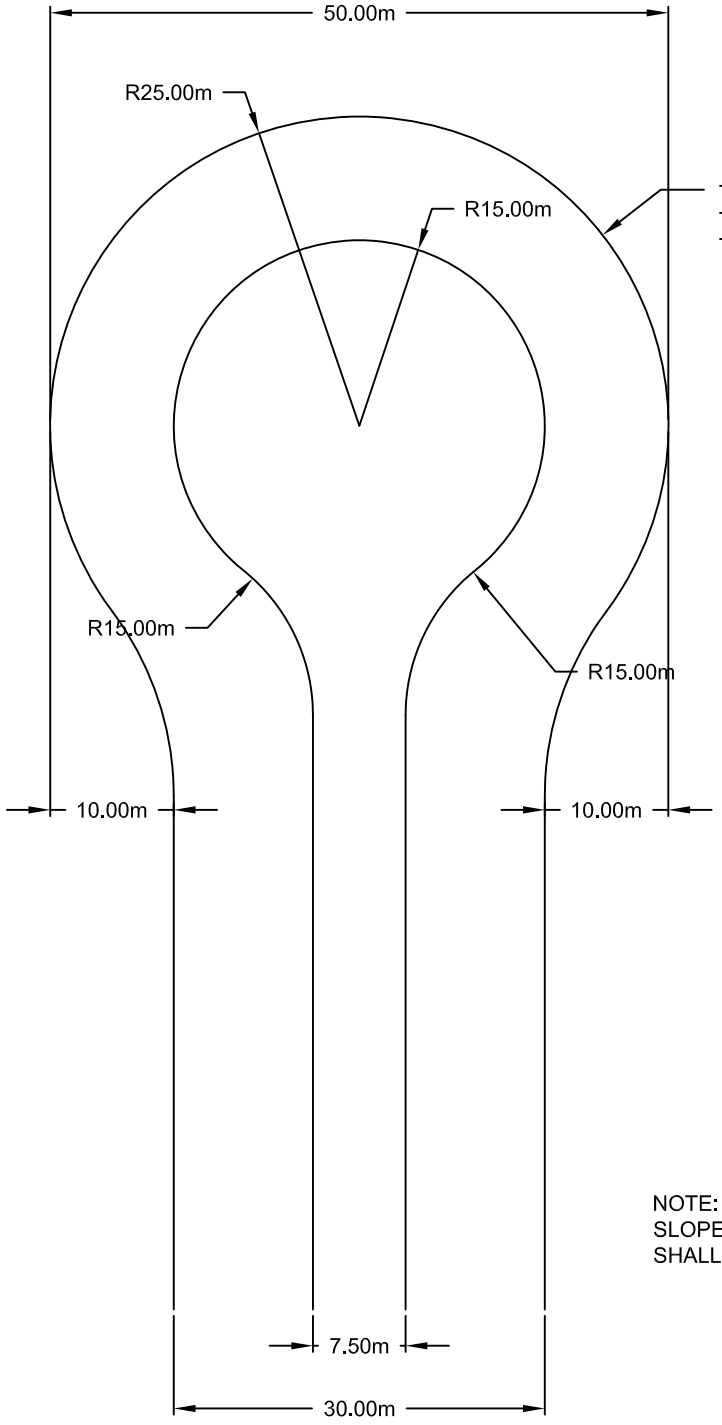
DATE

MARCH 30, 2017

DRAWING NUMBER

C-10

LACOMBE COUNTY



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

1	01/03/17
REVISION	DATE

STANDARD CUL-DE-SAC 2

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

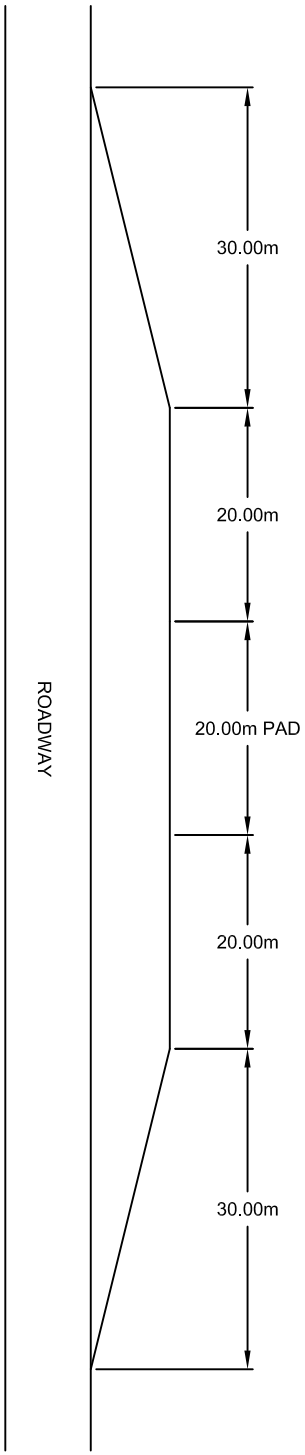
DATE

MARCH 30, 2017

DRAWING NUMBER

C-11

LACOMBE COUNTY



NOTES:

1. MAILBOX PULLOUT STRUCTURE TO MATCH ADJACENT ROADWAY STANDARD
2. DEVELOPER TO RECEIVE CANADA POST APPROVAL FOR MAILBOX
3. DEVELOPER TO RECEIVE LACOMBE COUNTY APPROVAL FOR SIGN LOCATION AND DESIGN

1	01/03/17
REVISION	DATE

MAILBOX PULLOUT

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

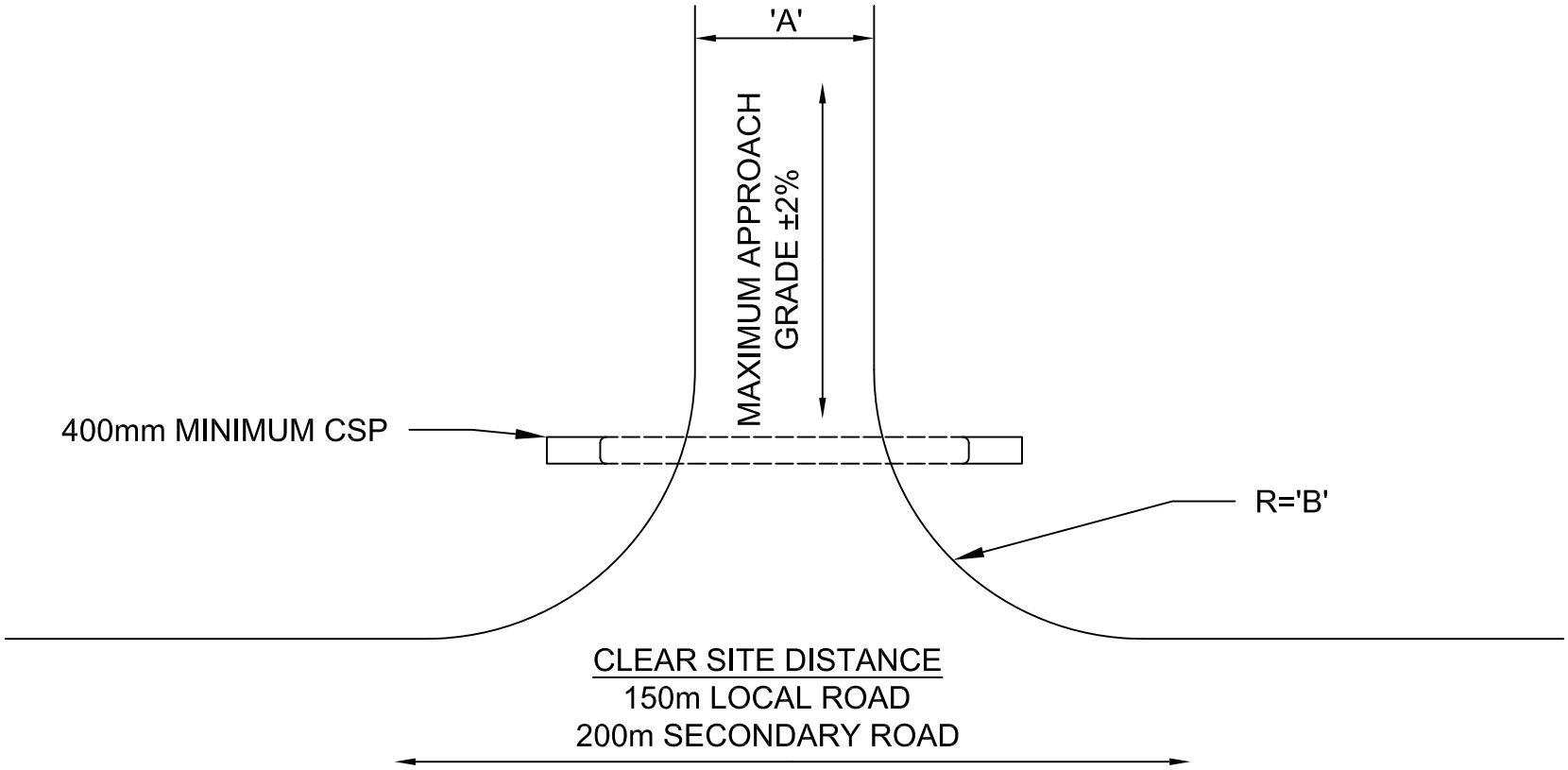
DATE

MARCH 30, 2017

DRAWING NUMBER

C-12

LACOMBE COUNTY



GEOMETRIC REQUIREMENTS

ENTRANCE TYPE	'A'	'B'
RESIDENTIAL SINGLE LOT ENTRANCE	MINIMUM - 6m MAXIMUM - 10m	12m - 15m
RESIDENTIAL SHARED LOT ENTRANCE	MINIMUM - 9m MAXIMUM - 10m	12m - 15m
LIGHT INDUSTRY	MINIMUM - 11.5m	12m - 15m
HEAVY INDUSTRY	MINIMUM - 15m	15m

NOTE: LOT ENTRANCE STRUCTURE TO MATCH STRUCTURE OF ADJACENT ROADWAY FOR FULL APPROACH WIDTH TO PROPERTY LINE

1	31/03/17
REVISION	DATE

LOT ENTRANCE PLAN

PROJECT NUMBER

DRAWN BY
BMAIER

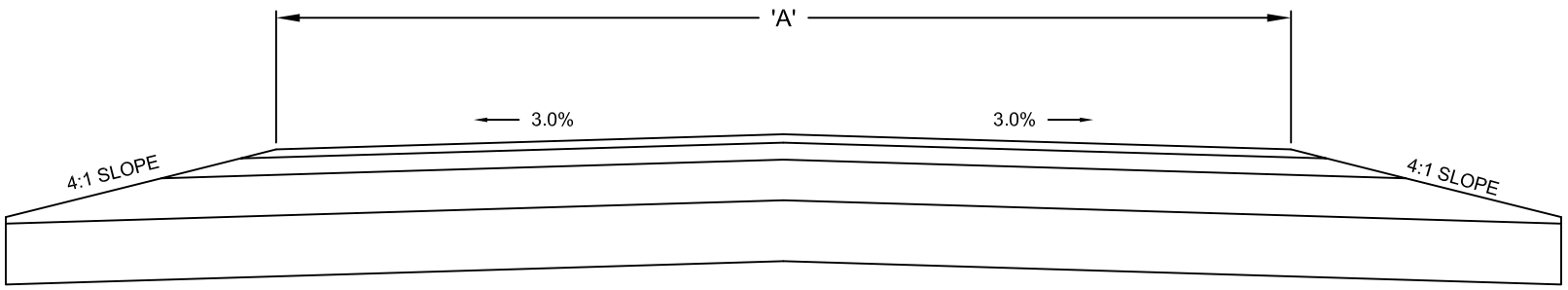
SCALE
NTS

DATE
MARCH 30, 2017

DRAWING NUMBER

C-13

LACOMBE COUNTY



GEOMETRIC REQUIREMENTS	
ENTRANCE TYPE	'A'
RESIDENTIAL SINGLE LOT ENTRANCE	MINIMUM - 6m MAXIMUM - 10m
RESIDENTIAL SHARED LOT ENTRANCE	MINIMUM - 9m MAXIMUM - 10m
LIGHT INDUSTRY	MINIMUM - 11.5m
HEAVY INDUSTRY	MINIMUM - 15m

NOTE: LOT ENTRANCE STRUCTURE TO MATCH STRUCTURE OF ADJACENT ROADWAY FOR FULL APPROACH WIDTH TO PROPERTY LINE

1	01/03/17
REVISION	DATE

LOT ENTRANCE SECTION

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

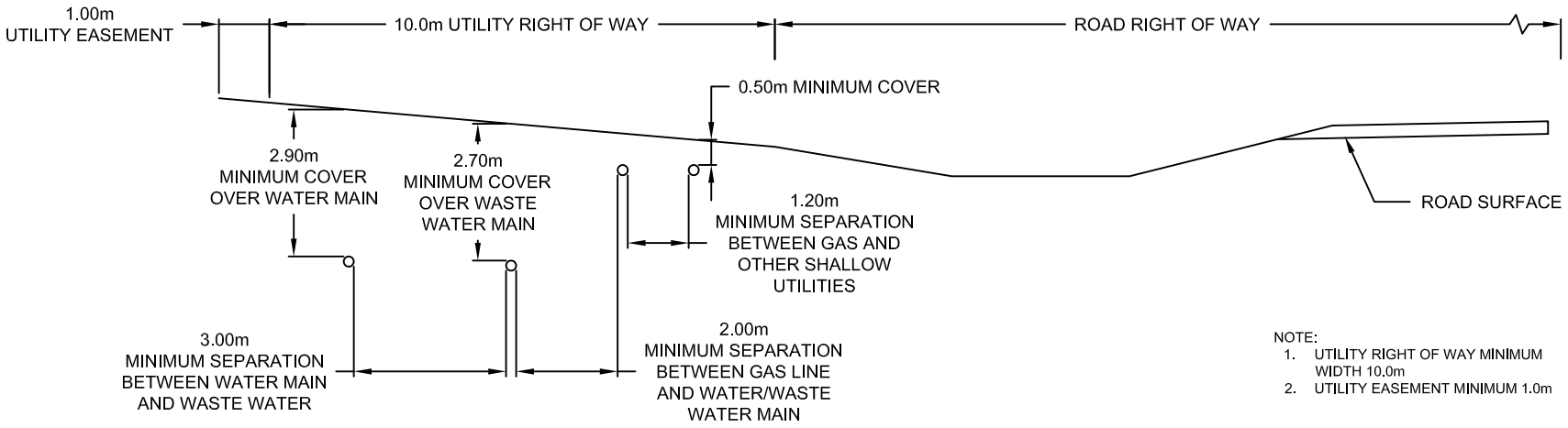
DATE

MARCH 30, 2017

DRAWING NUMBER

C-14

LACOMBE COUNTY



NOTE:
1. UTILITY RIGHT OF WAY MINIMUM WIDTH 10.0m
2. UTILITY EASEMENT MINIMUM 1.0m

1	31/03/17
REVISION	DATE

UTILITY RIGHT OF WAY

PROJECT NUMBER

DRAWN BY
BMAIER

SCALE
NTS

DATE
MARCH 31, 2017

DRAWING NUMBER

C-15

LACOMBE COUNTY

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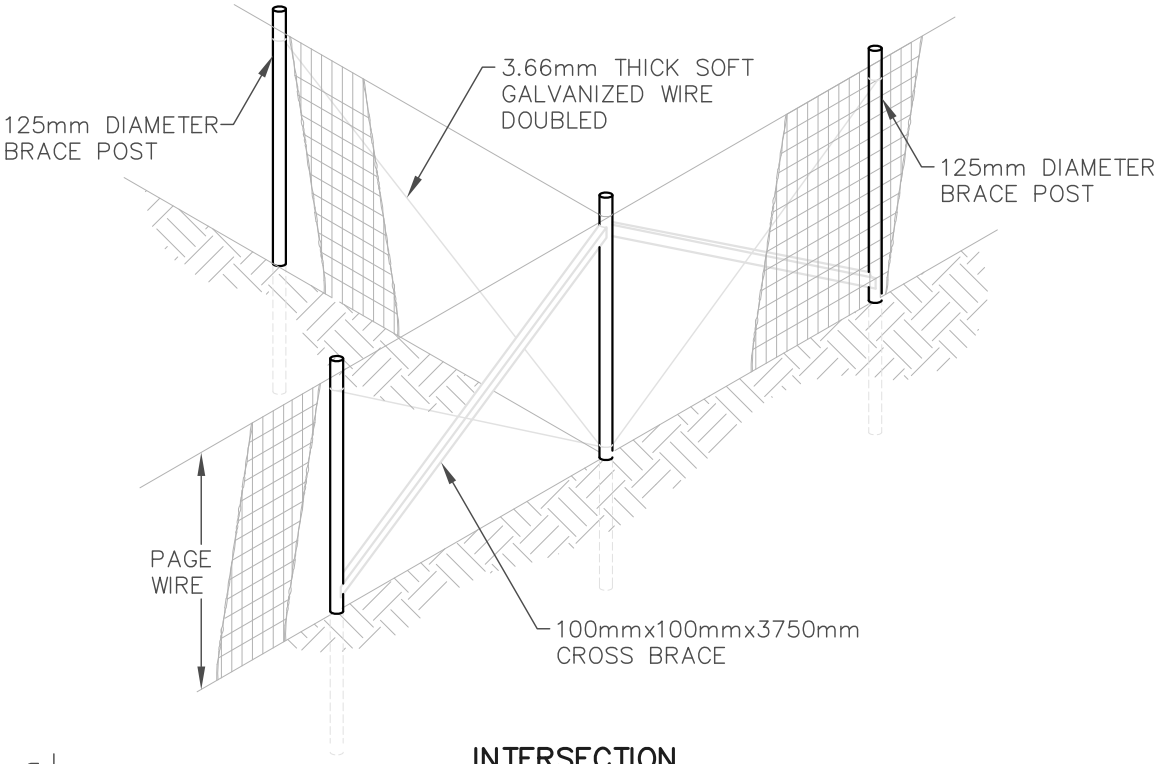

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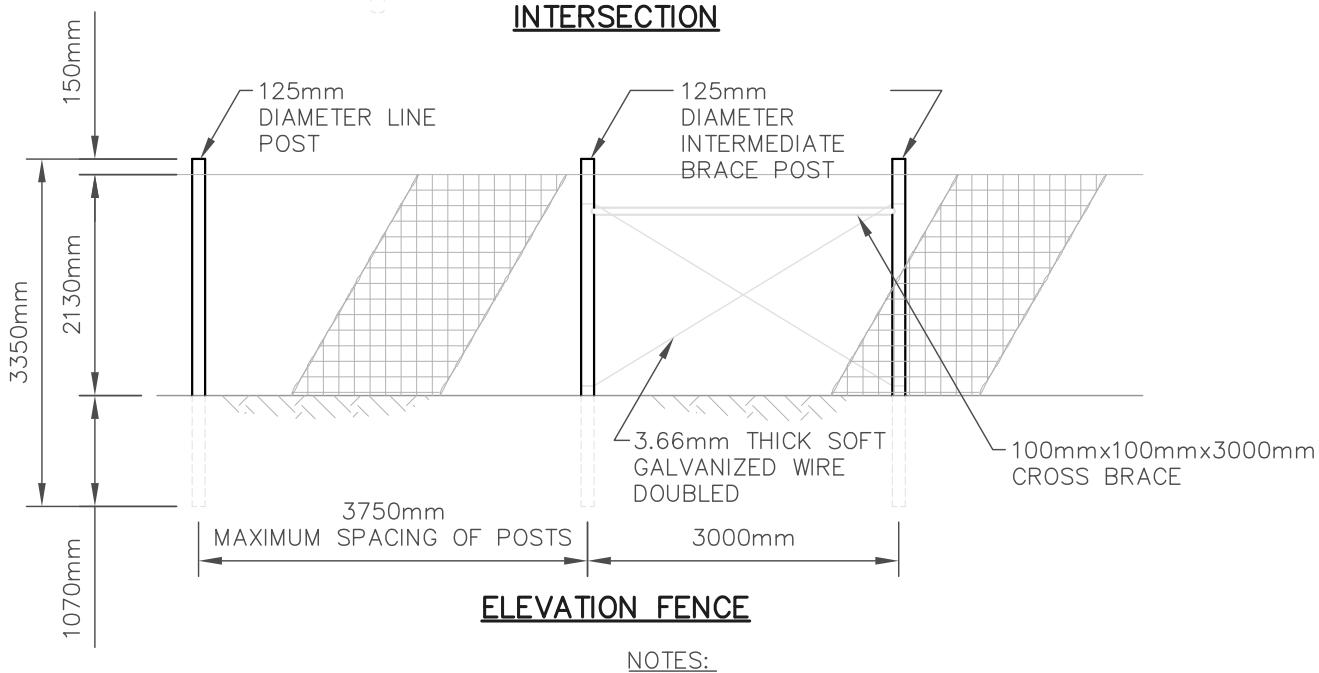
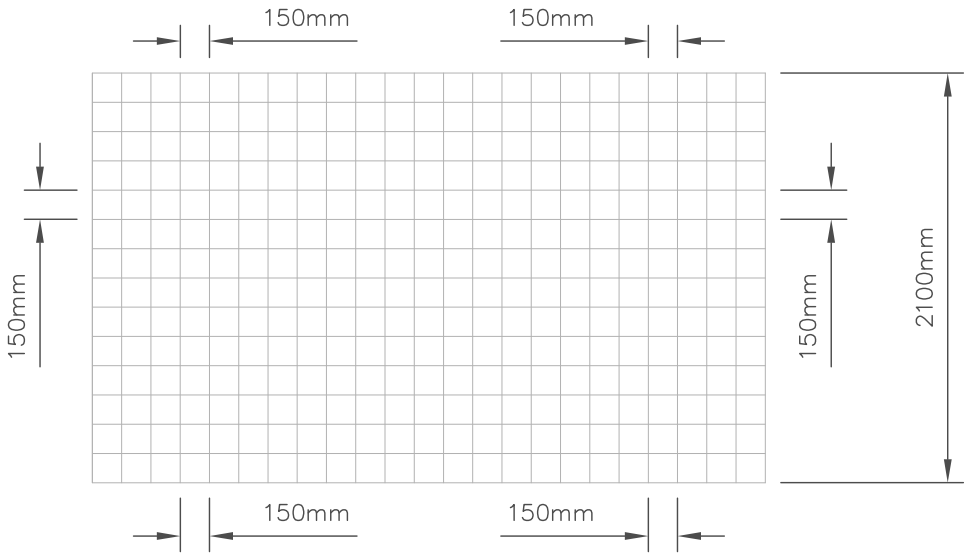


ELEVATION FENCE

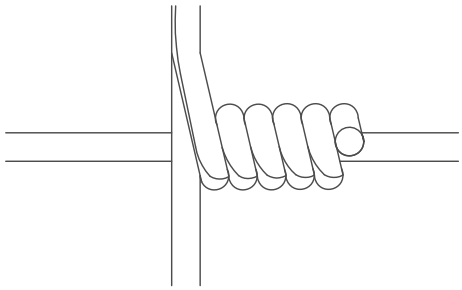
NOTES:

1. ALL FENCE POSTS SHALL BE PRESSURE TREATED.
2. BUTT ENDS OF POSTS SHALL BE PLACED DOWN.
3. ADJACENT ROLLS OF PAGE WIRE TO BE JOINED AT POST LOCATIONS.
4. 40mm STAPLES TO BE SPACED 152mm INTERVALS SO THAT EACH LINE WIRE IS FIRMLY ATTACHED TO THE FENCE POST.
5. NOMINAL DIMENSIONS FOR PAGE WIRE SHOWN.
6. SPACING OF BRACE ASSEMBLIES:
   ON TANGENT – 200m MAXIMUM
   ON CURVES – 100m MAXIMUM

		LACOMBE COUNTY	PAGE WIRE FENCE ELEVATION AND DETAILS		
			SCALE NTS	DRAWN BY BMaier	DRAWING NUMBER D-1
1	03/04/17		DATE APRIL 3, 2017		
REVISION	DATE				



PAGE WIRE FENCE SPACING



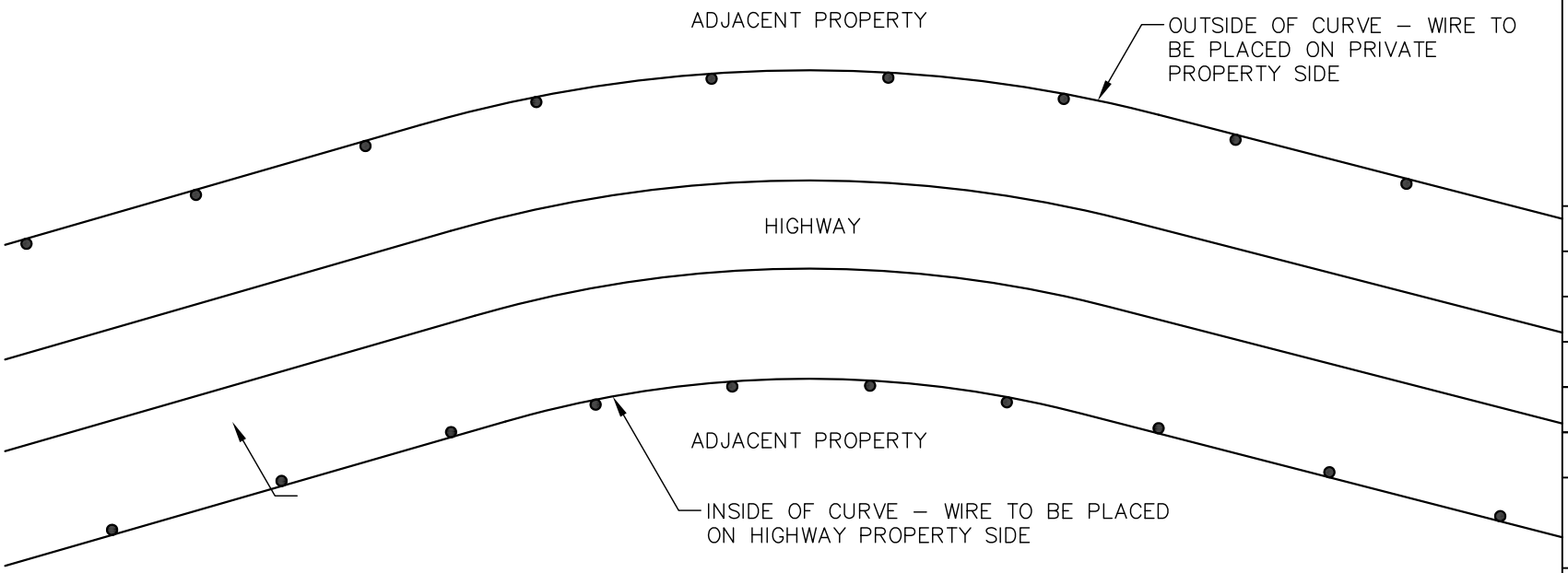
HINGE LOCK KNOT DETAIL

1:1

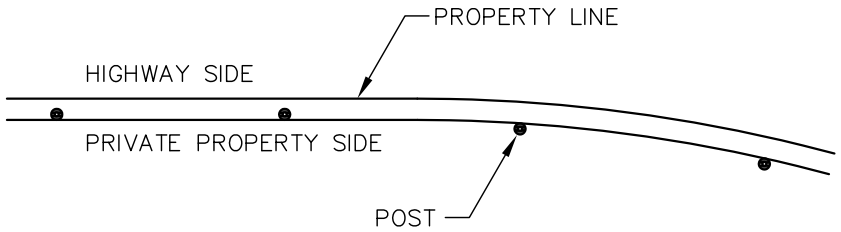
NOTES:

1. ALL FENCE POSTS SHALL BE PRESSURE TREATED.
2. BUTT ENDS OF POSTS SHALL BE PLACED DOWN.
3. PAGE WIRE FENCE WIRES TO BE SPACED AS SHOWN ABOVE WITH 3.66mm THICK GALVANIZED WIRE USED THROUGHOUT.
4. LINE AND STAY WIRES TO BE JOINED THROUGHOUT WITH HINGE–LOCK KNOT CONSTRUCTION (SEE DETAIL)
5. ADJACENT ROLLS OF PAGE WIRE TO BE JOINED AT POST LOCATIONS.
6. 40mm STAPLES TO BE SPACED 152mm INTERVALS SO THAT EACH LINE WIRE IS FIRMLY ATTACHED TO THE FENCE POST.
7. NOMINAL DIMENSIONS FOR PAGE WIRE SHOWN.
8. SPACING OF BRACE ASSEMBLIES:
   ON TANGENT – 200m MAXIMUM
   ON CURVES – 100m MAXIMUM

		LACOMBE COUNTY	PAGE WIRE FENCE SPACING AND DETAILS		
			SCALE NTS	DRAWN BY BMaier	DRAWING NUMBER D-2
1	03/04/17		DATE APRIL 3, 2017		
REVISION	DATE				



PLAN



FENCE POST DETAIL
SHOWING POSITION OF POSTS IN RELATION TO PROPERTY LINE

NOTE:
LEGAL SURVEY MONUMENTS ARE NOT TO BE DAMAGED OR RELOCATED TO ACCOMODATE FENCE INSTALLATION

1	03/04/17
REVISION	DATE

POSITION OF FENCE POSTS

PROJECT NUMBER

DRAWN BY
BMAIER

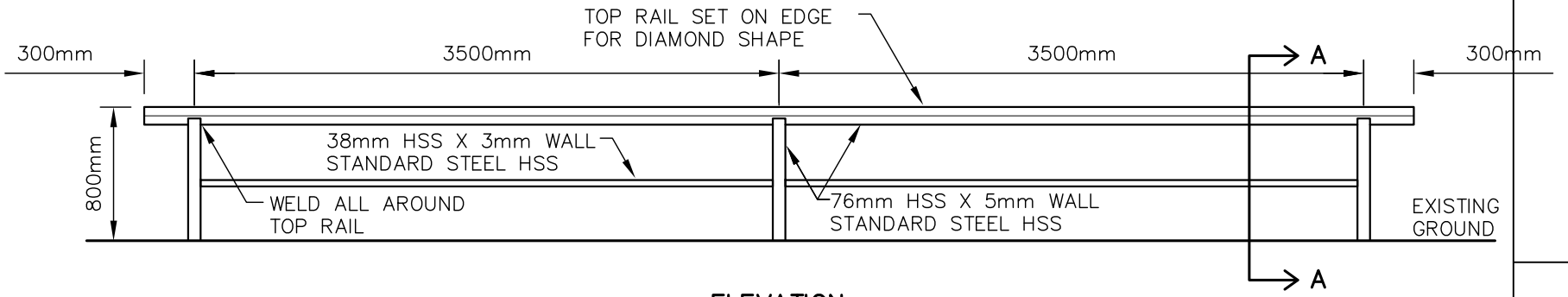
SCALE
NTS

DATE
APRIL 3, 2017

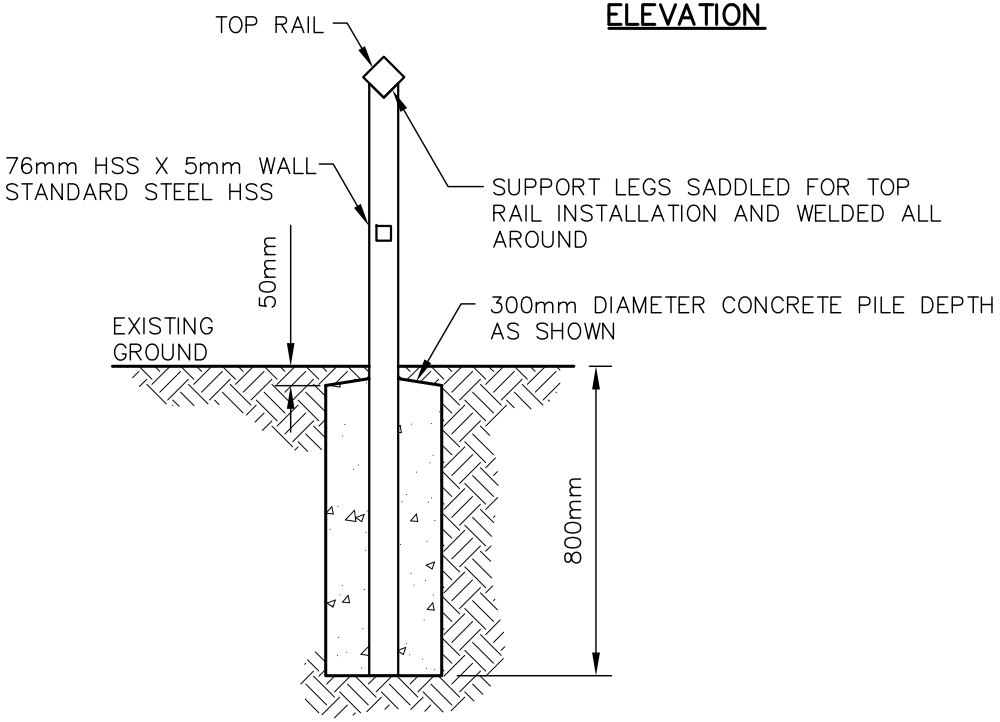
DRAWING NUMBER

D-3

LACOMBE COUNTY



ELEVATION



SECTION A–A

NOTES:

1. ALL WELDS TO BE GROUND SMOOTH.
2. PAINTING SHALL BE IN ACCORDANCE WITH THE C.P.C.A. (CANADIAN PAINTING CONTRACTORS ASSOCIATION) MANUAL FORMULA 12A.
3. ALL EXPOSED SURFACES ABOVE GRADE SHALL BE PRIMED BEFORE PAINTING.
4. ALL PAINT COLORS TO BE APPROVED BY THE COUNTY PRIOR TO APPLICATION.
5. ALL OPEN ENDS MUST BE CAPPED WITH 4.76mm PLATE.

REVISION	DATE

PIPE RAIL FENCE DETAILS

PROJECT NUMBER

DRAWN BY
BMAIER

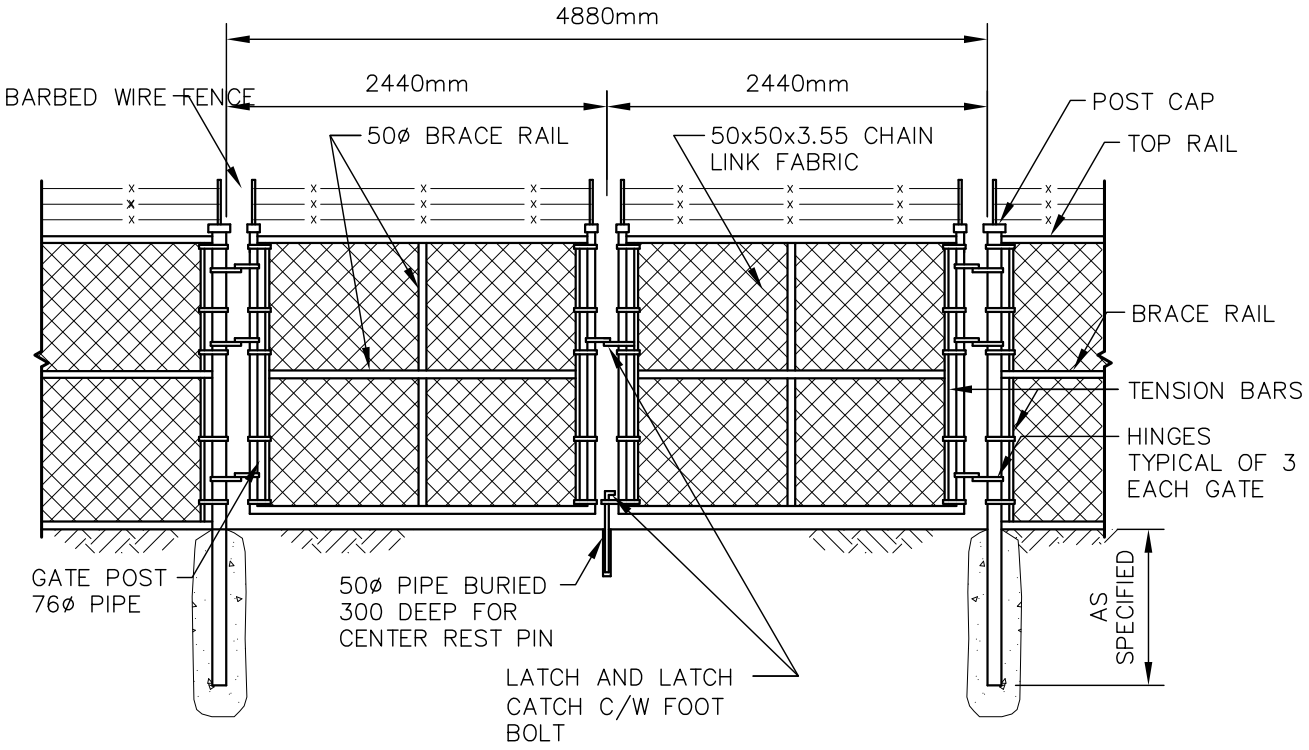
SCALE
NTS

DATE
APRIL 3, 2017

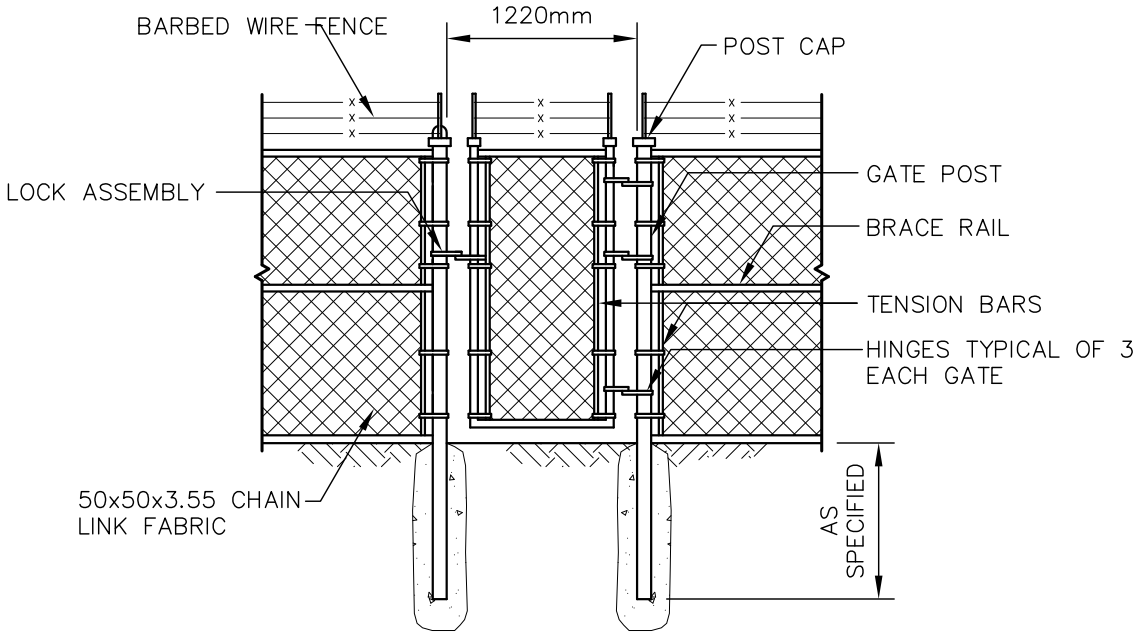
DRAWING NUMBER

D-4

LACOMBE COUNTY



CHAIN LINK FENCE VEHICLE GATE



CHAIN LINK FENCE PEDESTRIAN GATE

		LACOMBE COUNTY	TYPICAL CHAIN LINK FENCE GATE DETAILS	
			SCALE NTS / DRAWN BY BMAIER	DRAWING NUMBER D-5
1	03/04/17		DATE APRIL 4, 2017	
REVISION	DATE			

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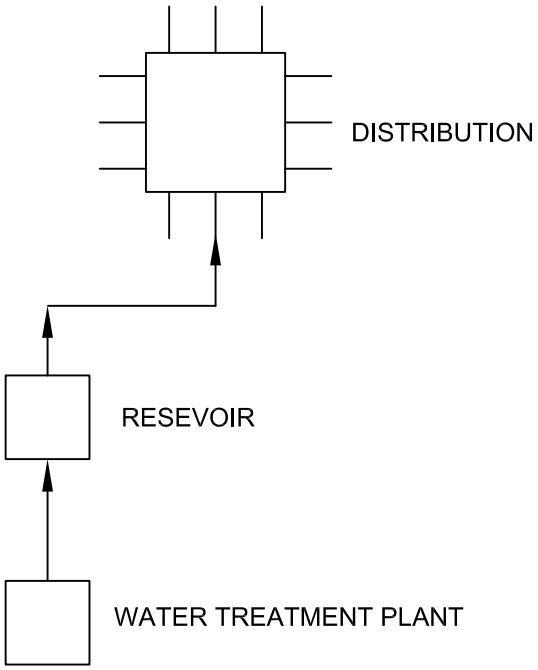
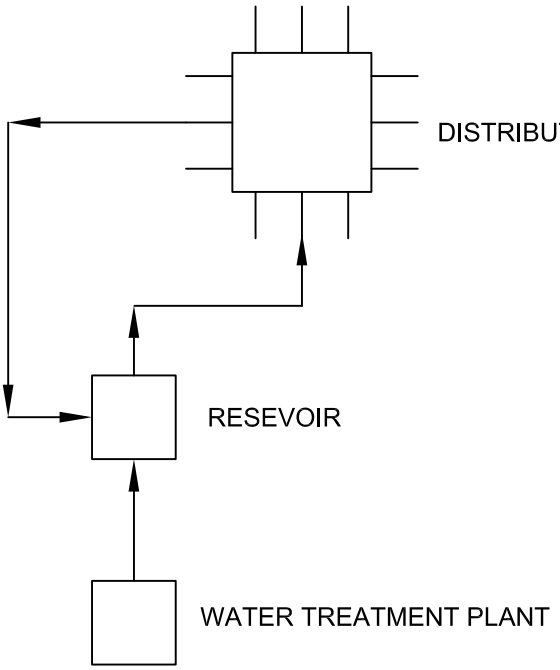
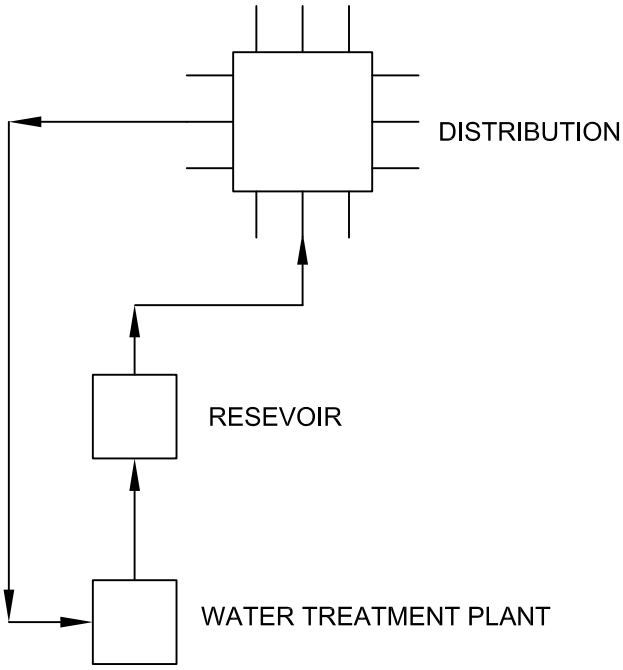


LOOPING WITHOUT
RETURN FLOW LINE
IS NOT ACCEPTABLE

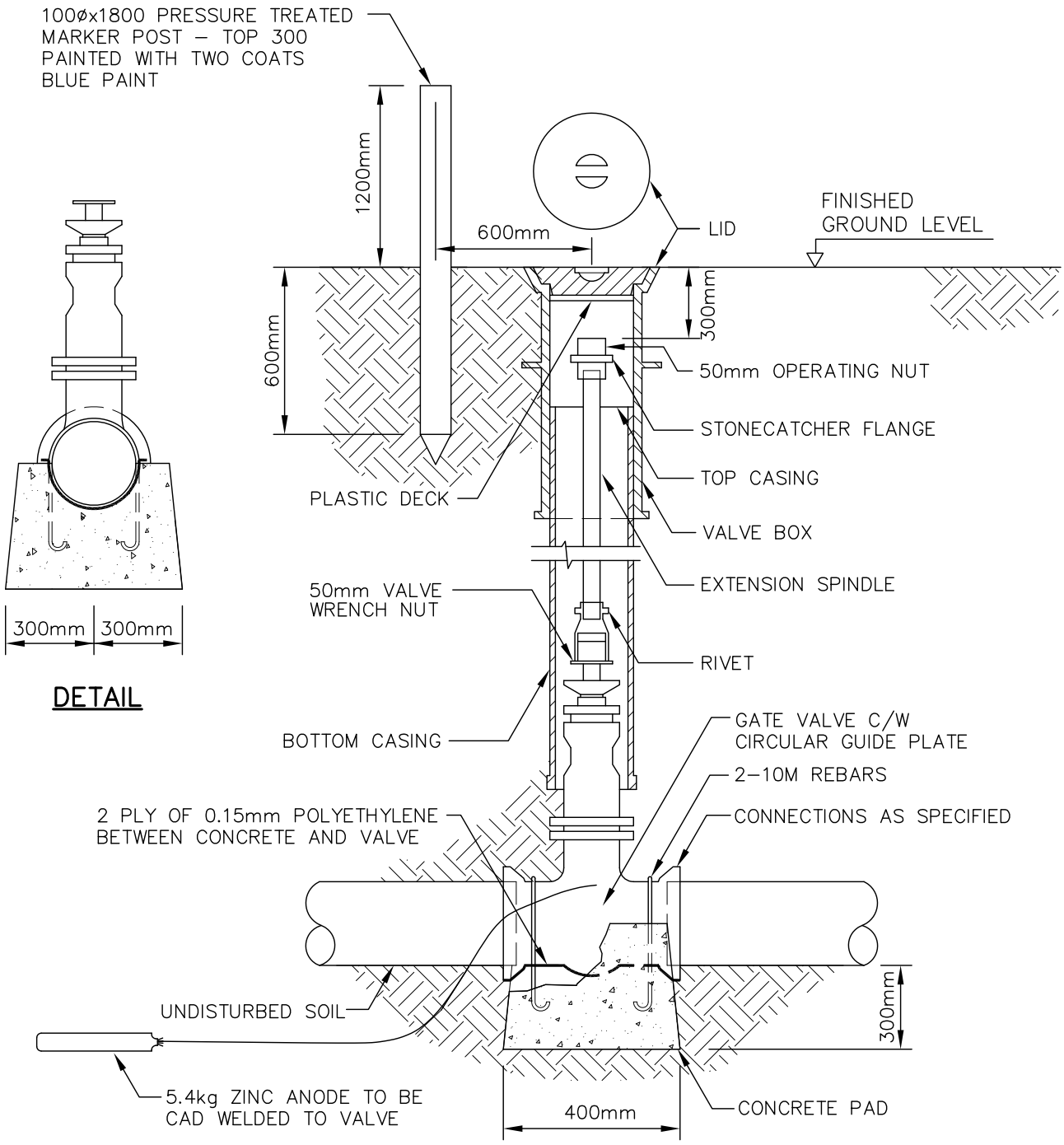


LOOPING WITH SHORT
CIRCUIT RETURN LINE
IS NOT ACCEPTABLE



LOOPING WITH ACCEPTABLE
RETURN FLOW LINE

		LACOMBE COUNTY	WATER DISTRIBUTION LOOPING
			SCALE NTS / DRAWN BY BMAIER / DRAWING NUMBER E-1
1	04/04/17		DATE APRIL 4, 2017
REVISION	DATE		

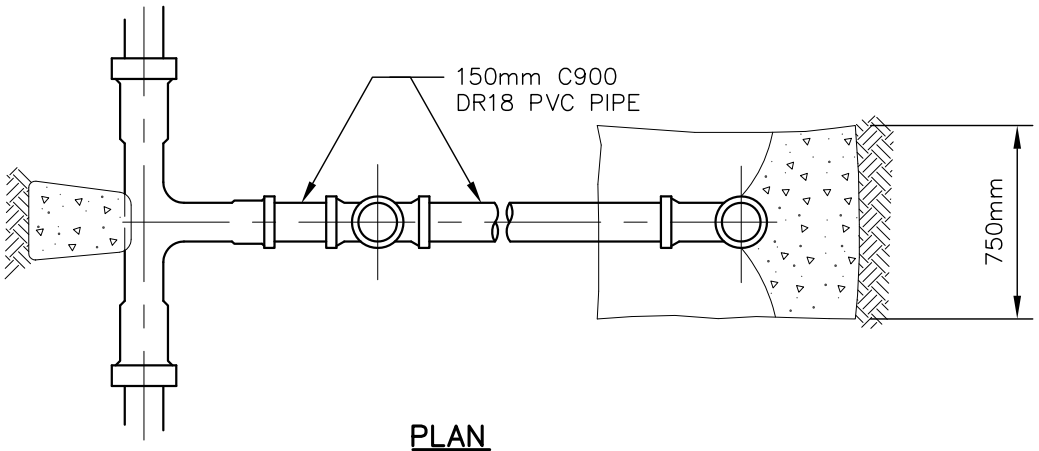


1	04/04/17
Revision	Date

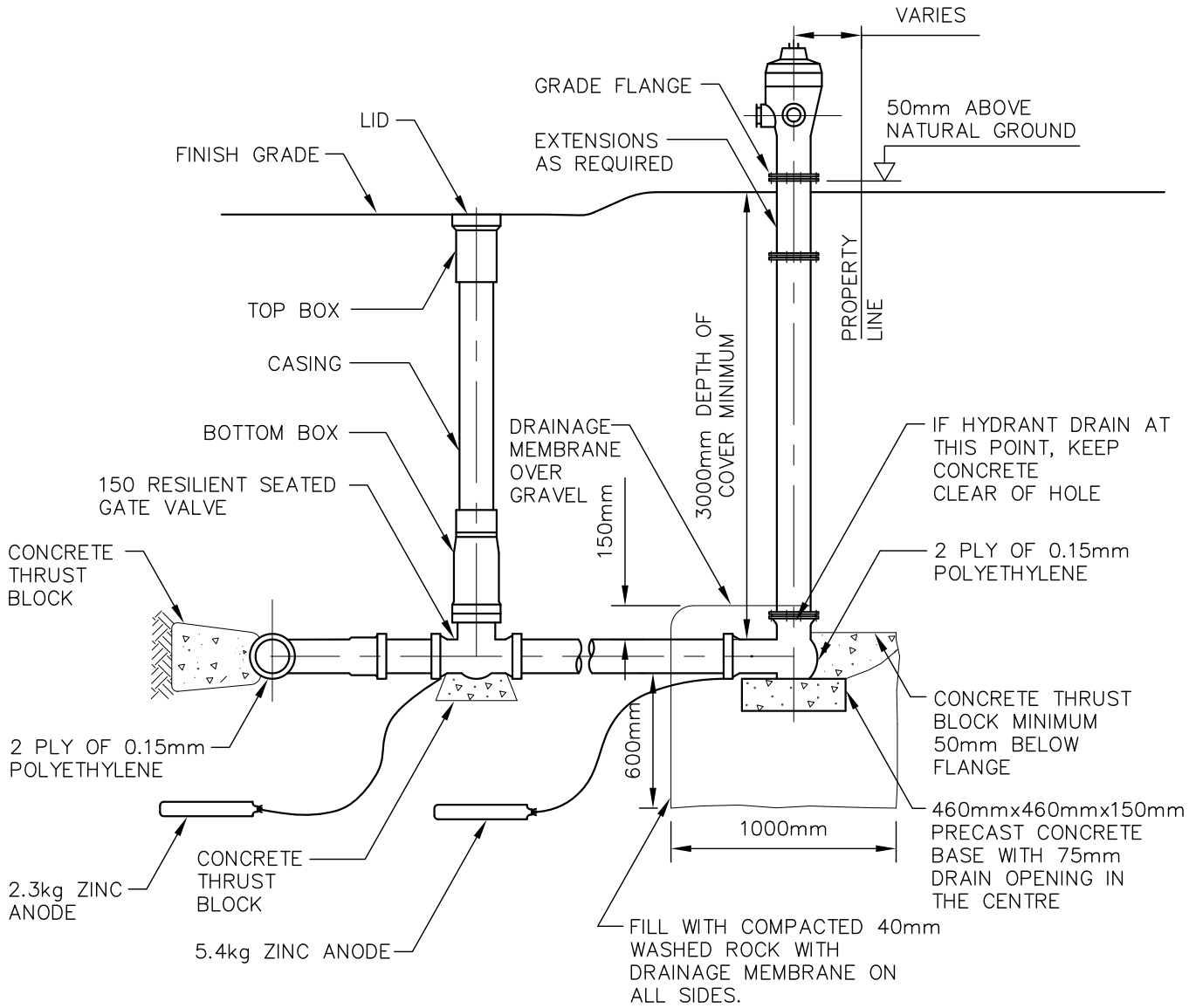
LACOMBE COUNTY

TYPICAL GATE VALVE INSTALLATION

Scale	Drawn By	Drawing Number
NTS	BMaier	E-2
Date	APRIL 4, 2017	



PLAN

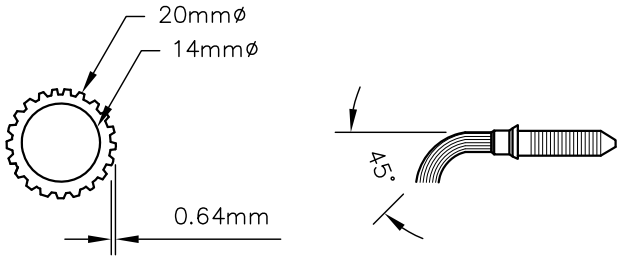


1	04/04/17
REVISION	DATE

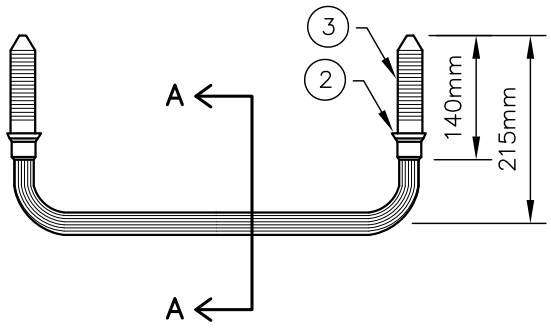
LACOMBE COUNTY

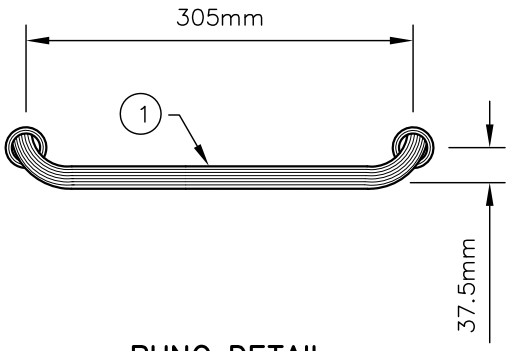
TYPICAL FIRE HYDRANT ASSEMBLY

SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	E-3
DATE	APRIL 4, 2017	

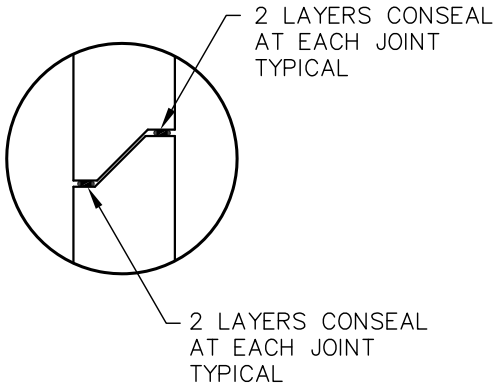


SECTION A–A





RUNG DETAIL



JOINT DETAIL

MATERIAL SPECIFICATIONS
ALUMINIUM TO CONFORM TO CAN3–S157–M83
STRENGTH DESIGN IN ALUMINIUM

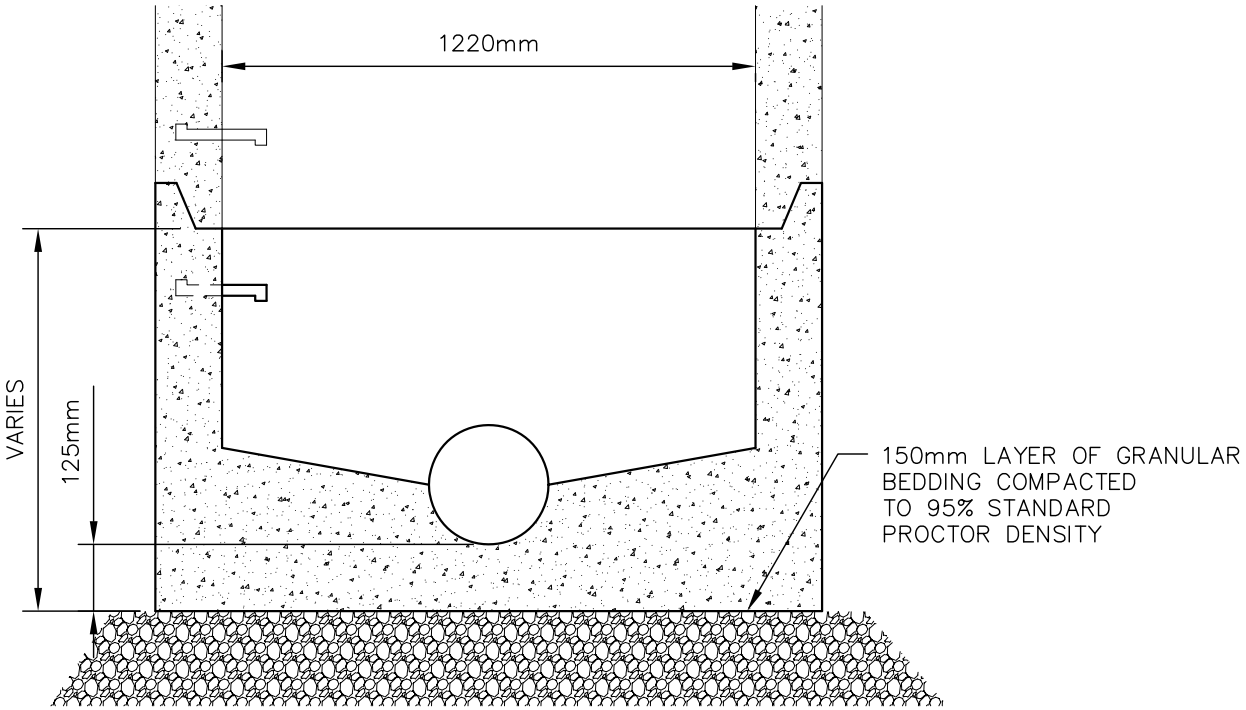
ITEM	QTY/ STEP	MATERIAL	DESCRIPTION
1	1	CS HA5 ALUM. 6351–T6	20 O.D. x 14 I.D. 6–8425 ALUMINIUM EXTRUSION
2	2	LOW DENSITY POLYETHYLENE	38.5 O.D. x 27.5 I.D. ADJUSTABLE COVERING ROSETTE
3	2	LOW DENSITY POLYETHYLENE	27.5 ø x 140 LG. ALL AROUND ANCHOR SLEEVE

1	05/04/17
REVISION	DATE

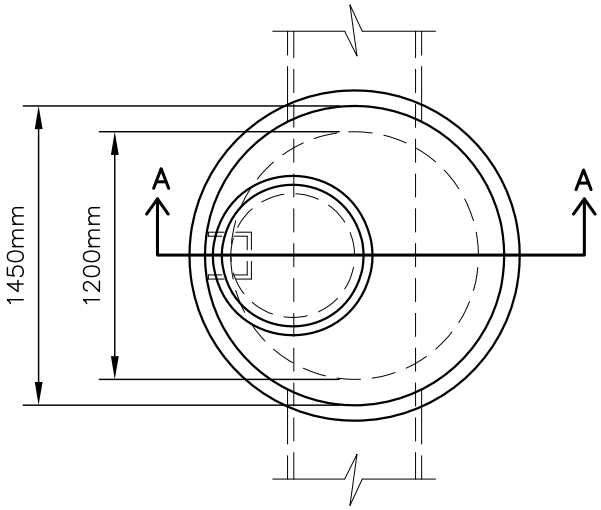
LACOMBE COUNTY

STANDARD TYPE 5A PRECAST MANHOLE DETAILS

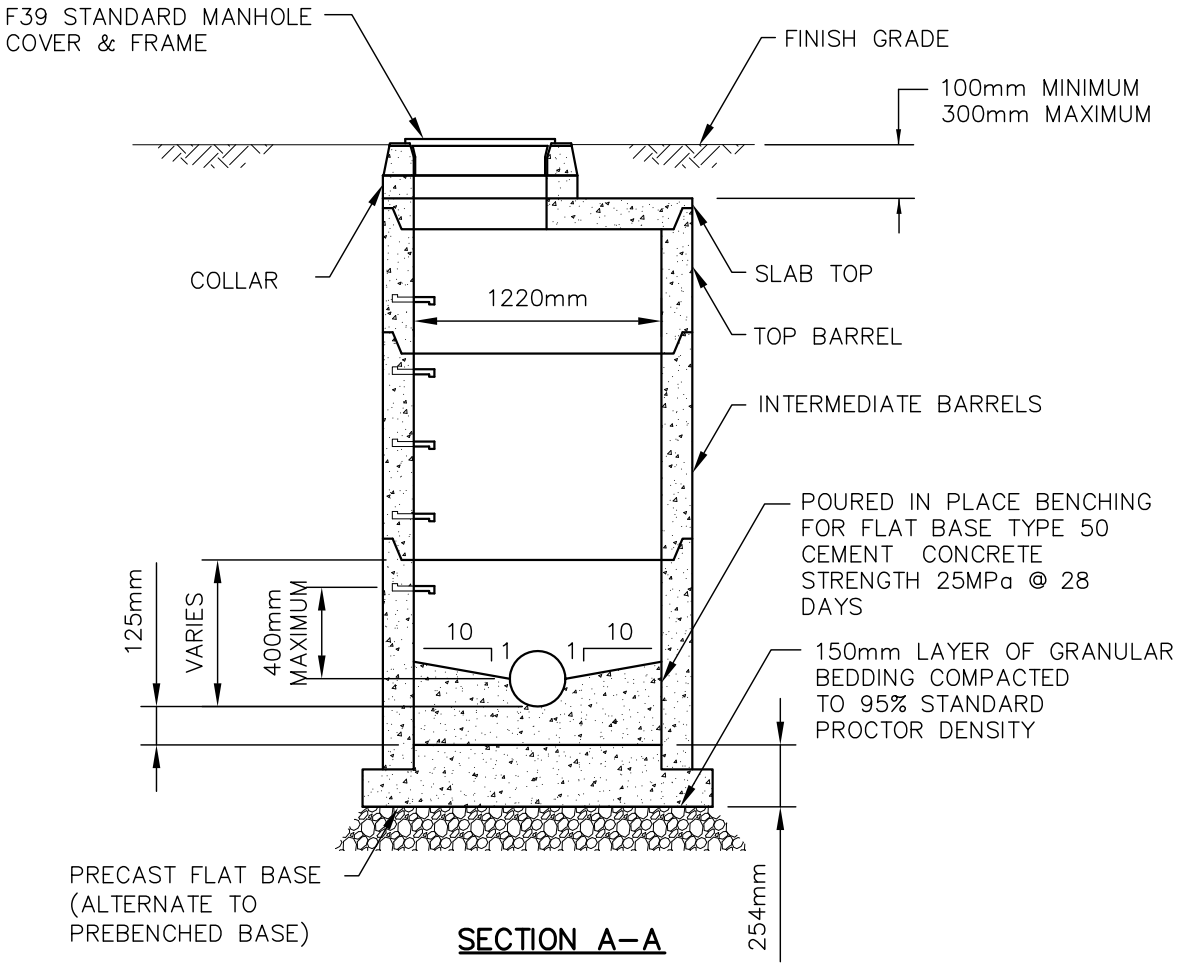
SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	E-4
DATE	APRIL 5, 2017	



		LACOMBE COUNTY	STANDARD TYPE 5A PRECAST MANHOLE PREBENCHED BASE FOR 1200mm ASSEMBLY		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER E-5
1	05/04/17		DATE APRIL 5, 2017		
REVISION	DATE				

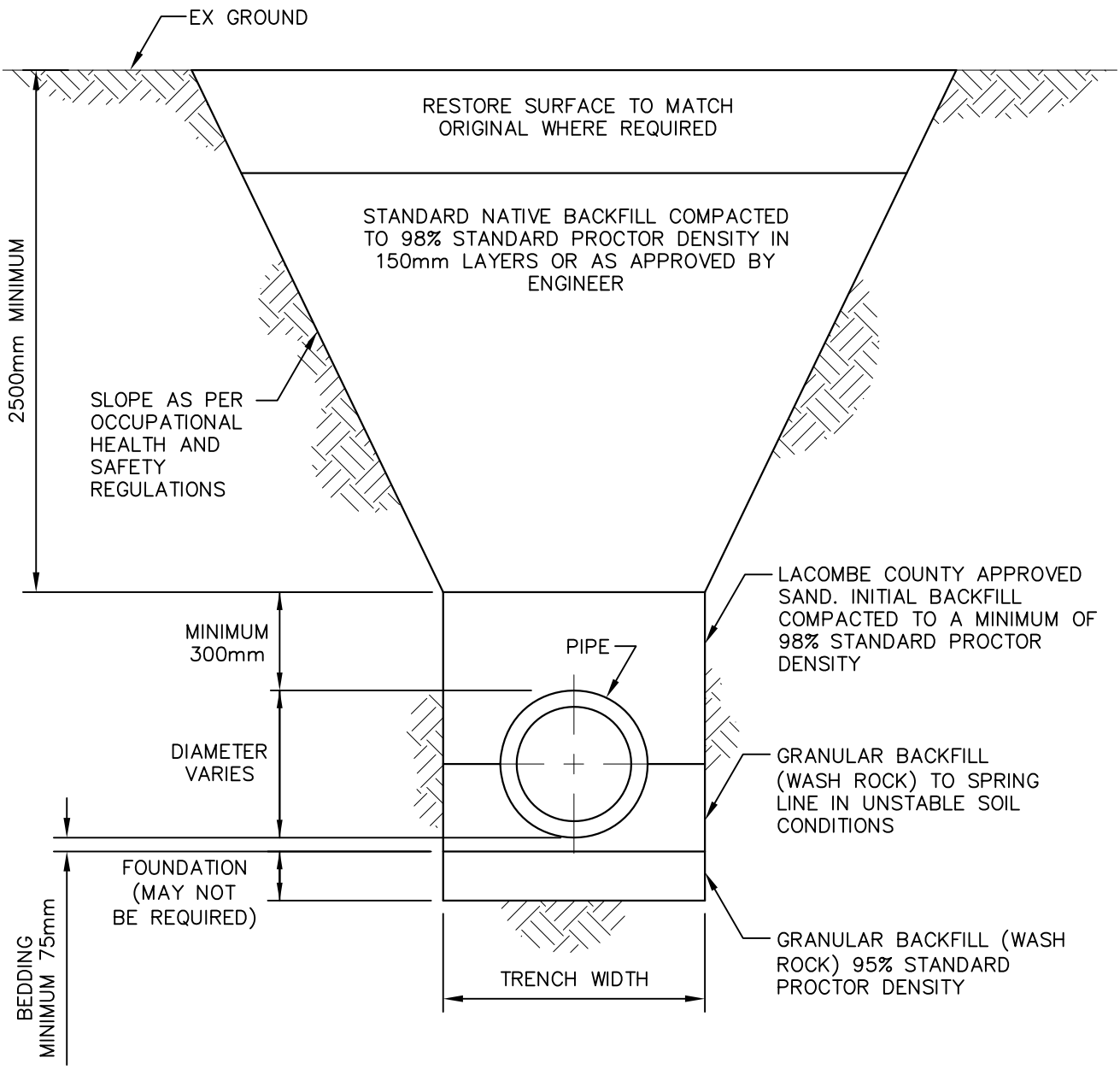


PLAN



SECTION A–A

		LACOMBE COUNTY	STANDARD TYPE 5A PRECAST MANHOLE PLAN AND SECTION	
			SCALE NTS / DRAWN BY BMAIER	DRAWING NUMBER E-6
1	05/04/17		DATE APRIL 5, 2017	
REVISION	DATE			



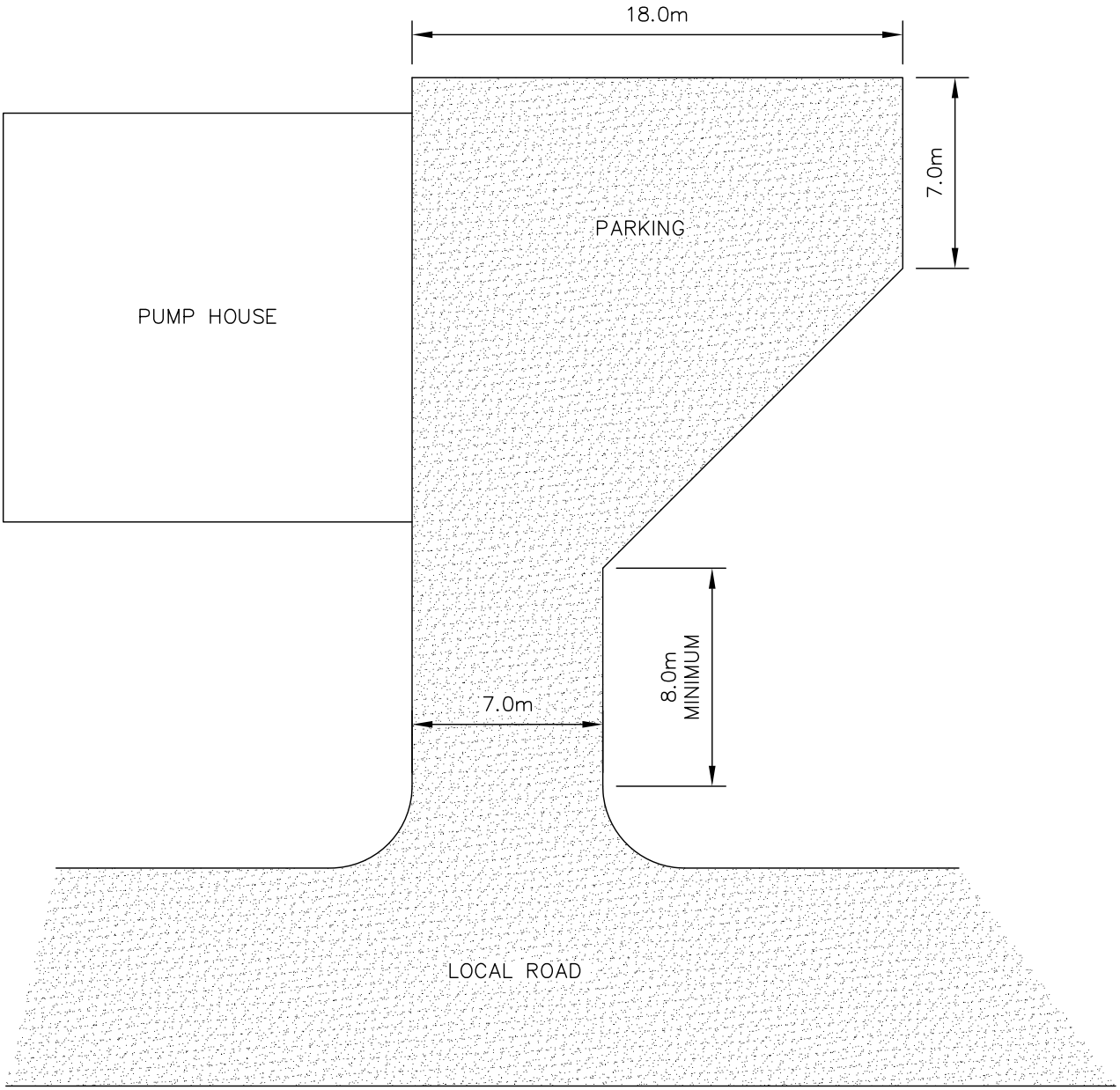
TRENCH WIDTH	
PIPE DIAMETER (mm)	MINIMUM TRENCH WIDTH
150 – 500 600 AND LARGER	OD + 500 OD x 1.5
OD = OUTSIDE DIAMETER	

1	06/04/17
REVISION	DATE

LACOMBE COUNTY

TYPICAL TRENCH BEDDING AND TRENCH BACKFILL

SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	E-7
DATE APRIL 6, 2017		

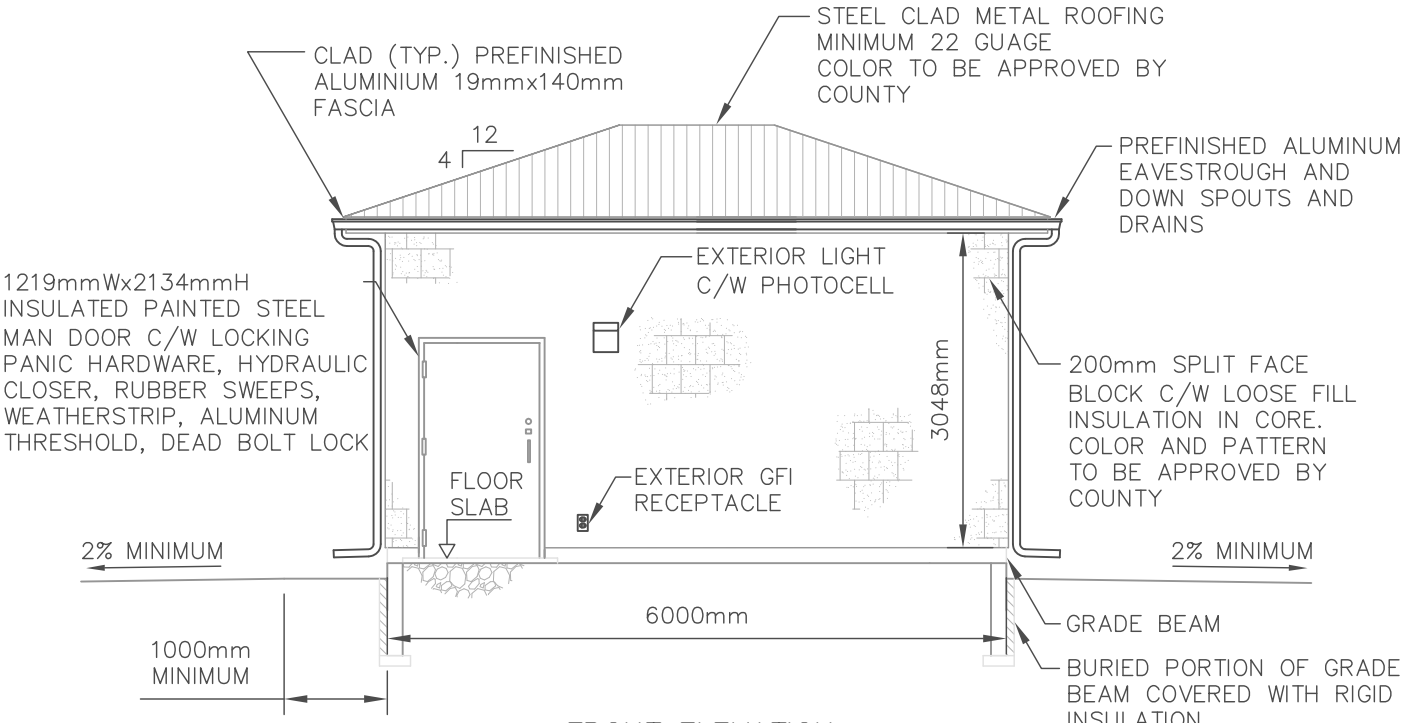


1	06/04/17
REVISION	DATE

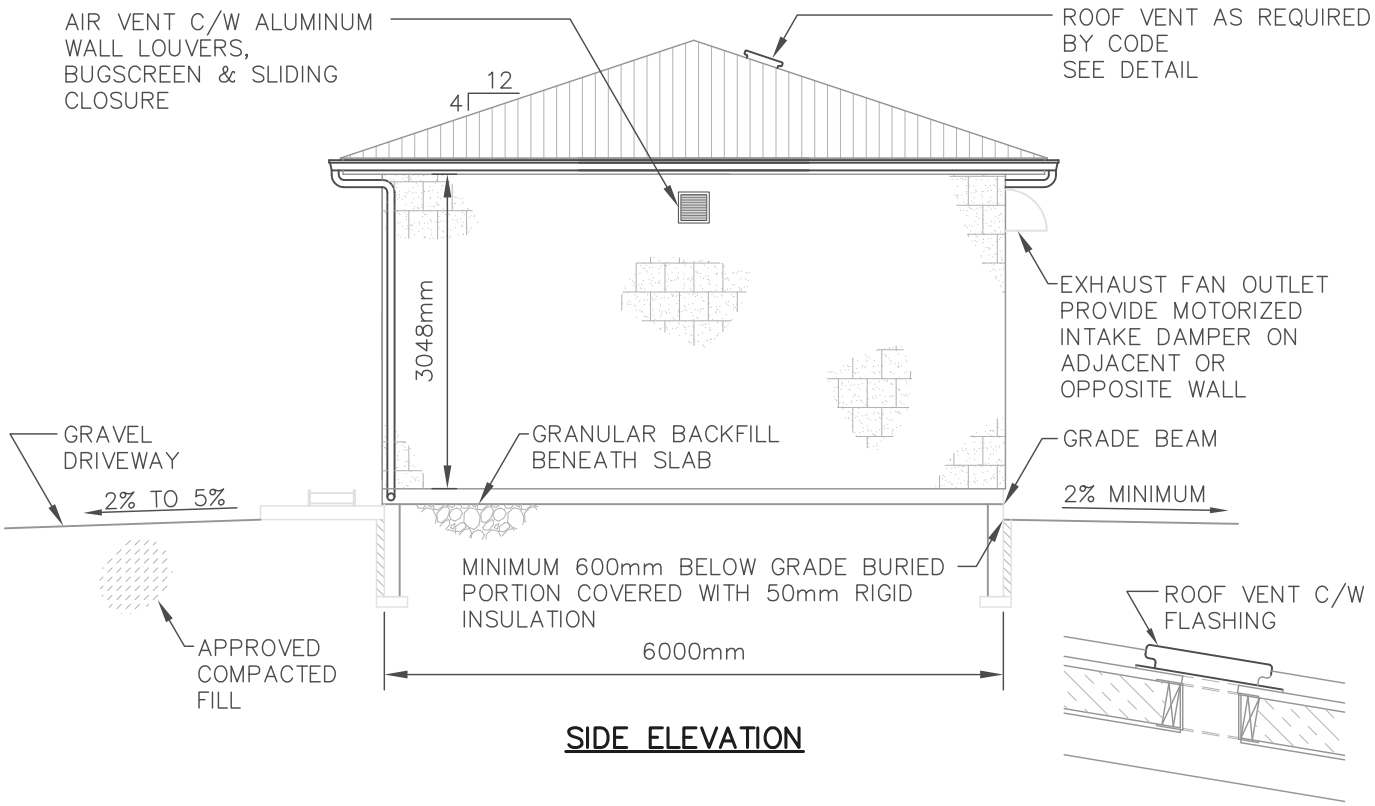
LACOMBE COUNTY

TYPICAL WATER PUMPHOUSE PARKING AREA

SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	E-8
DATE APRIL 6, 2017		



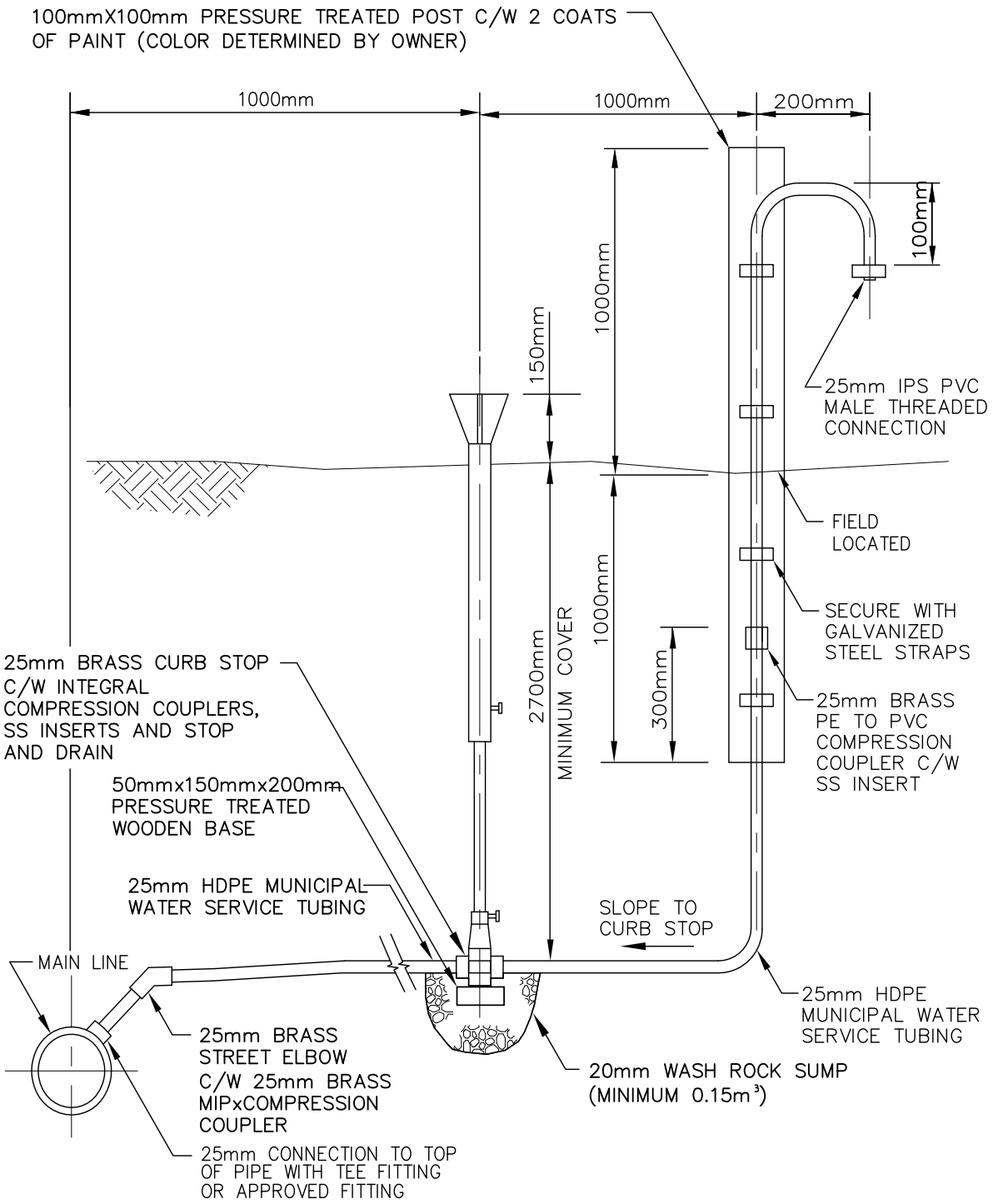
FRONT ELEVATION



SIDE ELEVATION

DETAIL

		LACOMBE COUNTY	TYPICAL WATER PUMPHOUSE BUILDING ELEVATIONS	
			SCALE NTS / DRAWN BY BMAIER	DRAWING NUMBER E-9
1	06/04/17		DATE APRIL 6, 2017	
REVISION	DATE			



NOTES:

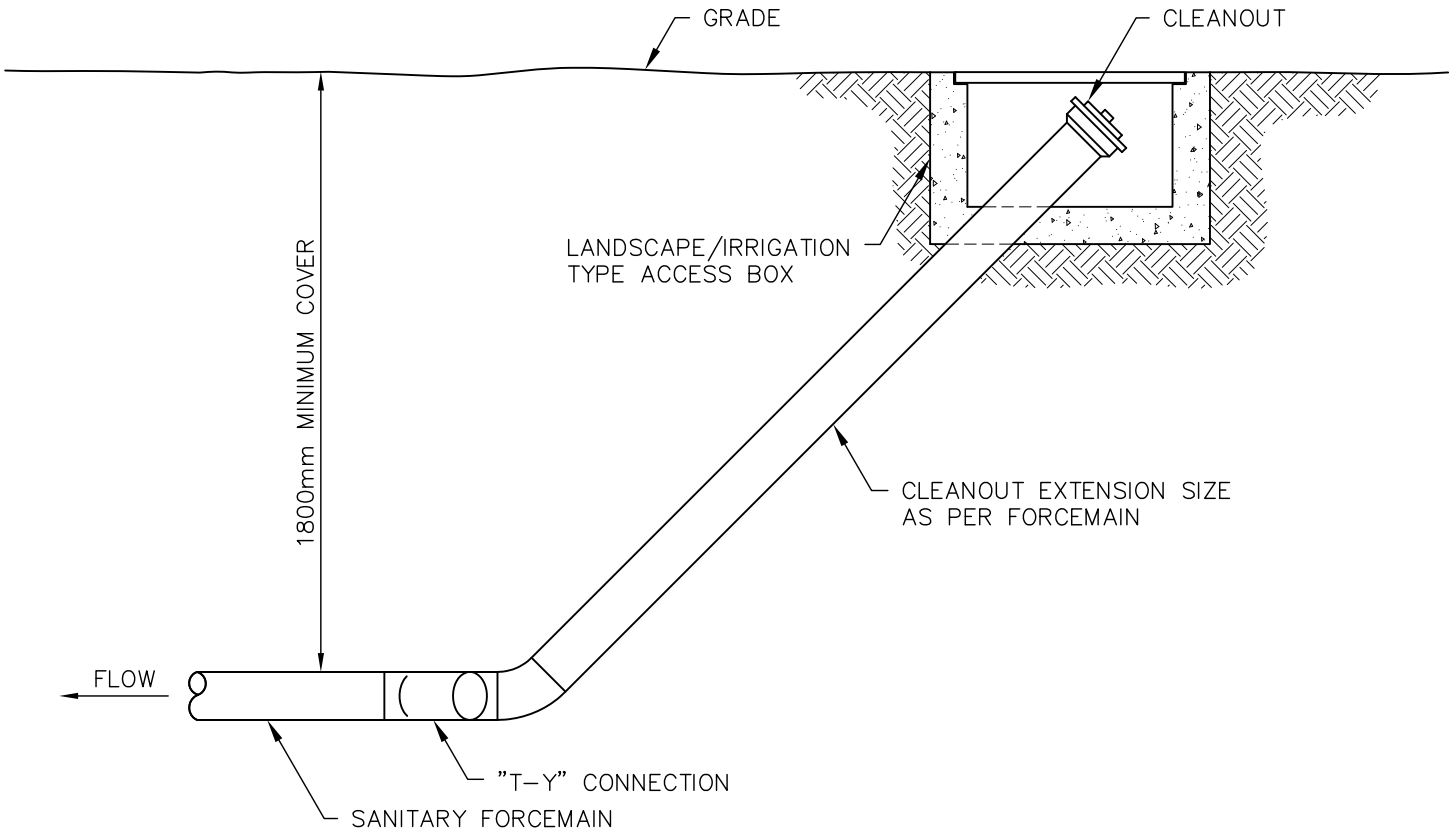
1. ABOVE GROUND PIPE TO BE SCHEDULE 40 PVC.
2. ALL FITTINGS AND PIPE TO MATCH OR EXCEED PRESSURE RATING OF MAIN LINE.

1	06/04/17
REVISION	DATE

LACOMBE COUNTY

FLUSHING ASSEMBLY DETAIL

SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	E-10
DATE	APRIL 6, 2017	



NOTES:

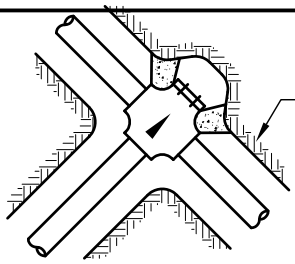
1. PROVIDE CLEANOUT AT EACH CHANGE IN THE FORCEMAIN AND ON ALL STRAIGHT RUNS OVER 30m.
2. PROVIDE THRUST BLOCKS AT EACH CHANGE IN DIRECTION AS PER DETAIL.

1	06/04/17
REVISION	DATE

LACOMBE COUNTY

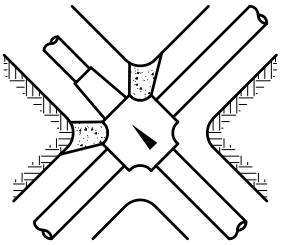
SANITARY FORCEMAIN CLEANOUT DETAIL

SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	E-11
DATE	APRIL 6, 2017	

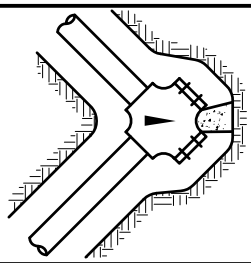


① CROSS

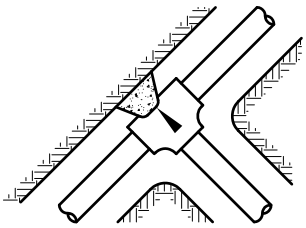
DENOTES UNDISTURBED GROUND – TYPICAL TO ALL



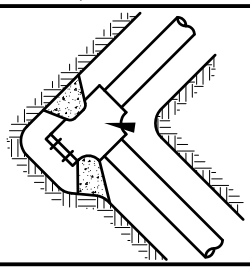
② REDUCER



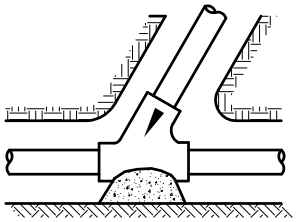
③ CROSS



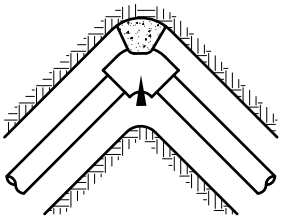
④ TEE



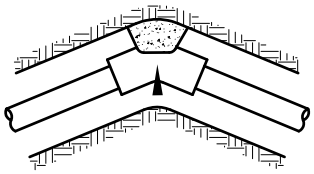
⑤ TEE



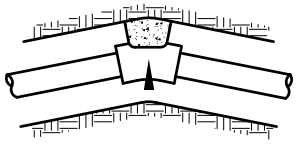
⑥ WYE



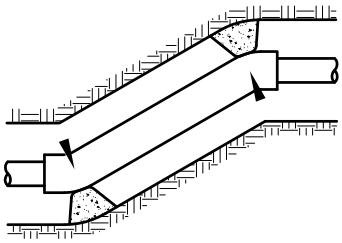
⑦ 90° BEND



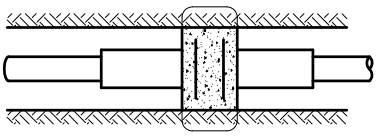
⑧ 45° BEND



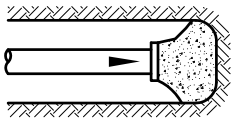
⑨ 22.5° BEND
11.25° BEND



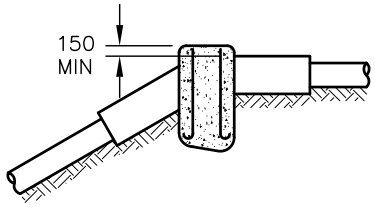
⑩ OFFSET BEND



⑫ VERTICAL BEND

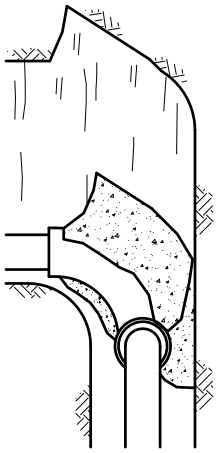


⑪ CAP



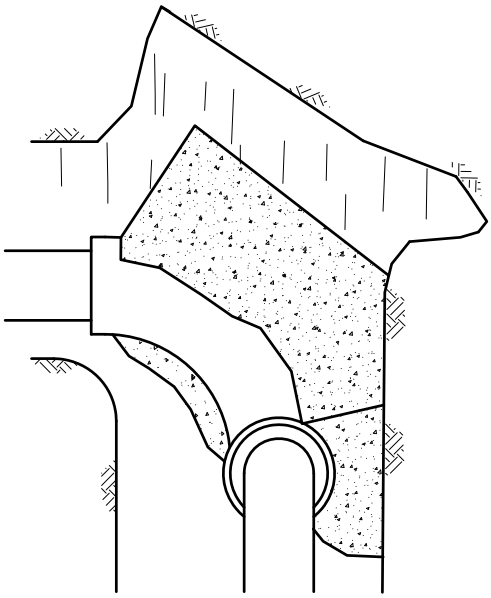
NOTE:
REFER TO THRUST BLOCK DATA DRAWING FOR THRUST BLOCK SIZES

		LACOMBE COUNTY	WATERMAIN THRUST BLOCK LOCATIONS	
			SCALE NTS / DRAWN BY BMAIER	DRAWING NUMBER E-12
1	07/04/17		DATE APRIL 7, 2017	
REVISION	DATE			



FOR SMALL PIPES

TABLE 'A'					
THRUST AT FITTINGS FOR 100 LBS PER SQ. IN.					
PIPE SIZE IMPERIAL	PIPE SIZE METRIC	DEAD END OR TEE	90° BEND	45° BEND	22.5° BEND
4"	100	1,400	2,030	1,100	600
6"	150	3,100	4,400	2,400	1,200
8"	200	5,300	7,500	4,100	2,100
10"	250	8,200	11,600	6,300	3,200
12"	300	11,600	16,300	8,800	4,500
14"	350	13,900	19,700	10,700	5,400
16"	400	18,200	25,700	13,900	7,100
18"	450	23,000	32,600	17,600	9,000
20"	500	28,400	40,200	21,800	11,100
24"	600	40,900	57,900	31,300	16,000



FOR LARGE PIPES

TABLE 'B'	
SOIL TYPE	SAFE BEARING LOAD LBS. PER SQ. FOOT
SOFT CLAY	1,000
FIRM CLAY	1,500
DENSE CLAY TILL	3,000
DENSE SILT	1,500
LOOSE SAND	1,000
DENSE SAND	2,000
GRAVEL	3,000
SHALE OR SANDSTONE BEDROCK	10,000

THE SAFE BEARING LOADS IN TABLE 'B' ARE FOR HORIZONTAL THRUSTS WHEN THE DEPTH OF COVER OVER THE PIPE EXCEEDS 2 FT. (600mm).

NOTE:

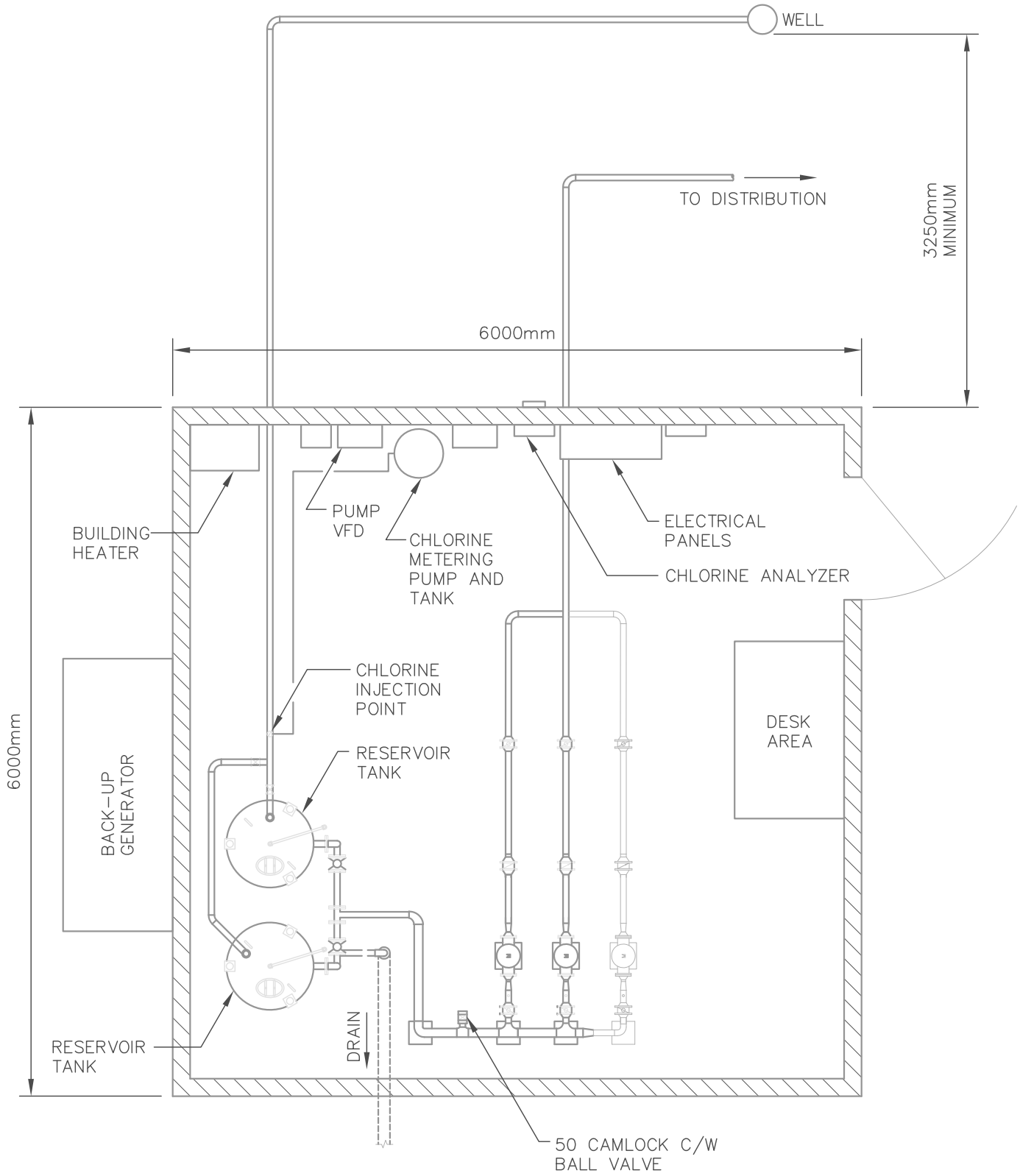
TO DETERMINE THE BEARING AREA FOR VARIOUS SOIL CONDITIONS DIVIDE THE VALUES FOUND IN TABLE 'A' BY THOSE IN TABLE 'B'

ie. A 6"–90° BEND TO BE LAID IN A FIRM CLAY TRENCH WILL REQUIRE A BEARING AREA THUS:

$$\frac{4,400}{1,500} = 2.9 \text{ SQ. FT.}$$

FOR PIPE SIZES LESS THAN 100mm, VALUES CALCULATED FOR 100mm PIPE SHALL BE USED.

		LACOMBE COUNTY	WATERMAIN THRUST BLOCK DATA	
1	07/04/17		SCALE NTS	DRAWN BY BMAIER
REVISION	DATE		DATE APRIL 7, 2017	DRAWING NUMBER E-13

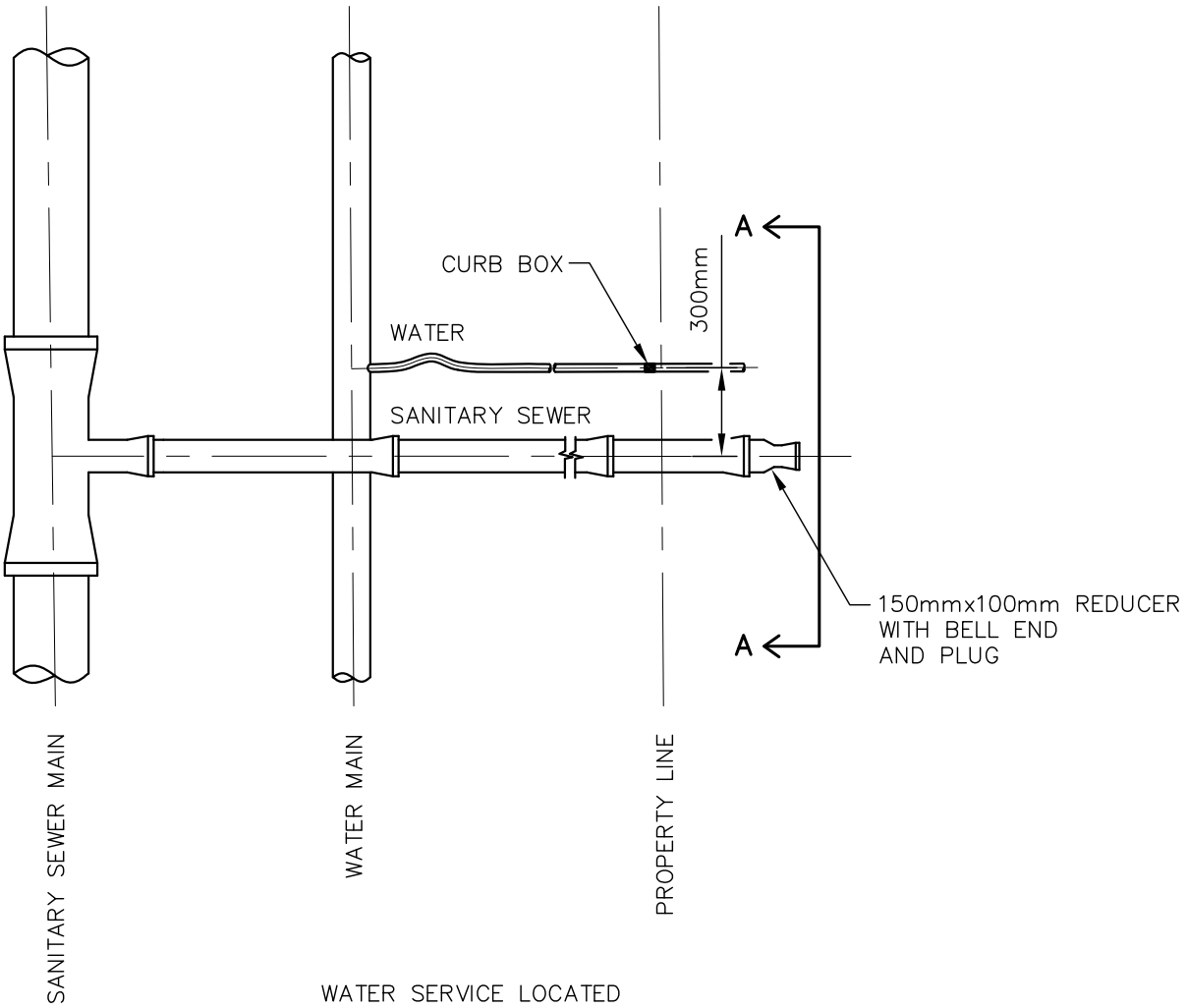


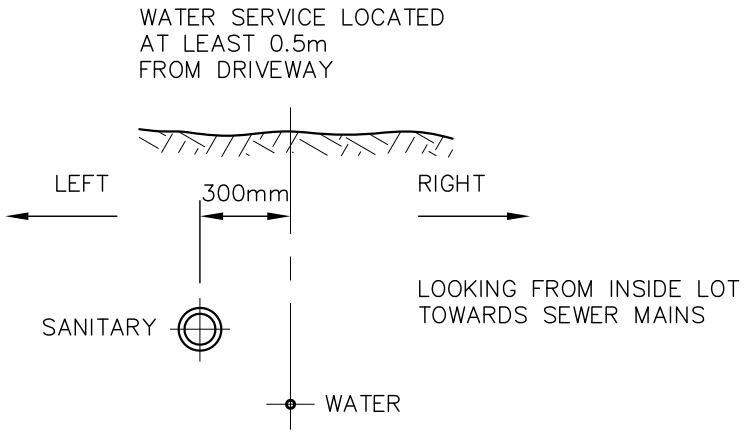
1	07/04/17
Revision	Date

LACOMBE COUNTY

TYPICAL WATER PUMPHOUSE LAYOUT

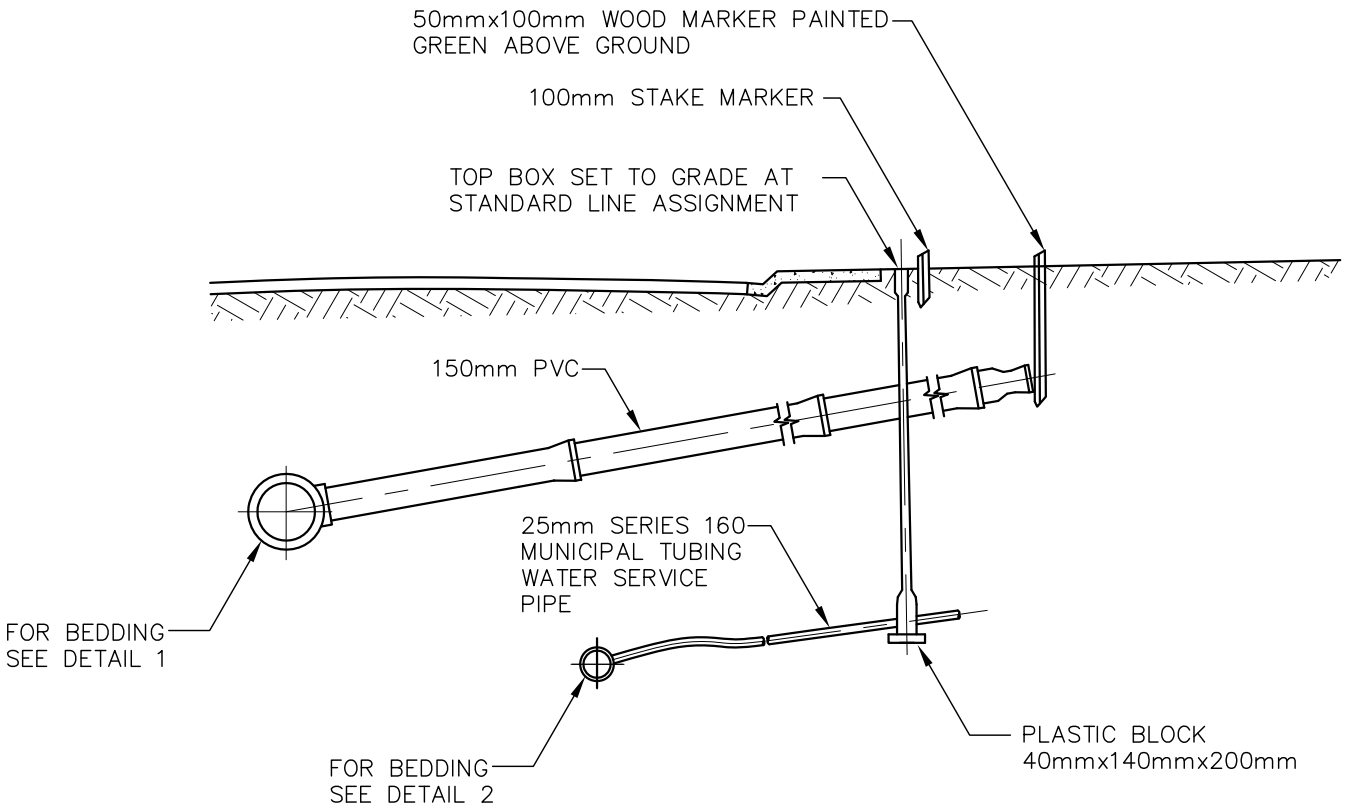
Scale	Drawn By	Drawing Number
NTS	BMaier	E-14
Date	APRIL 7, 2017	

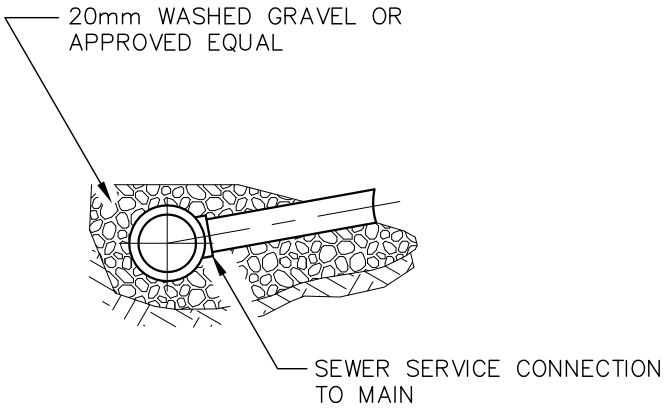




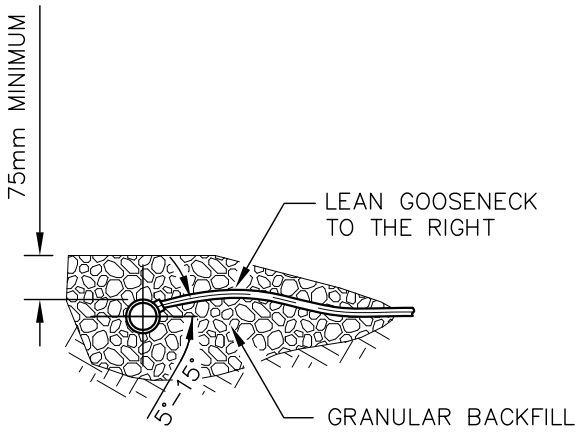
SECTION A–A

		LACOMBE COUNTY	SERVICE CONNECTION WITH GRAVITY SANITARY SYSTEM TYPICAL LAYOUT	
			SCALE NTS / DRAWN BY BMAIER	DRAWING NUMBER E-15
1	07/04/17		DATE APRIL 7, 2017	
REVISION	DATE			



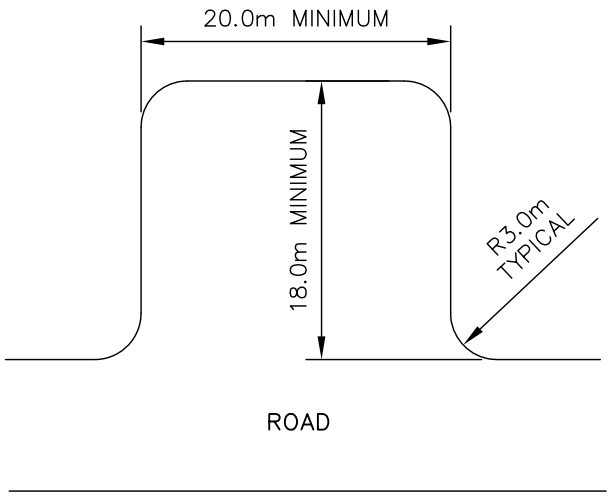


DETAIL 1

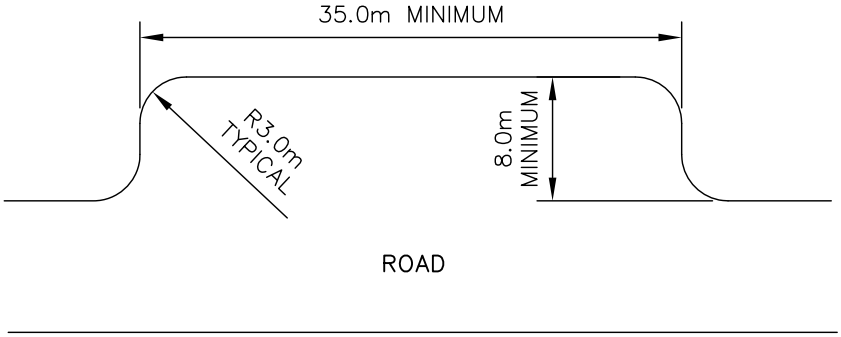


DETAIL 2

		LACOMBE COUNTY	SERVICE CONNECTION WITH GRAVITY SANITARY SYSTEM DETAILS		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER E-16
1	07/04/17		DATE APRIL 7, 2017		
REVISION	DATE				

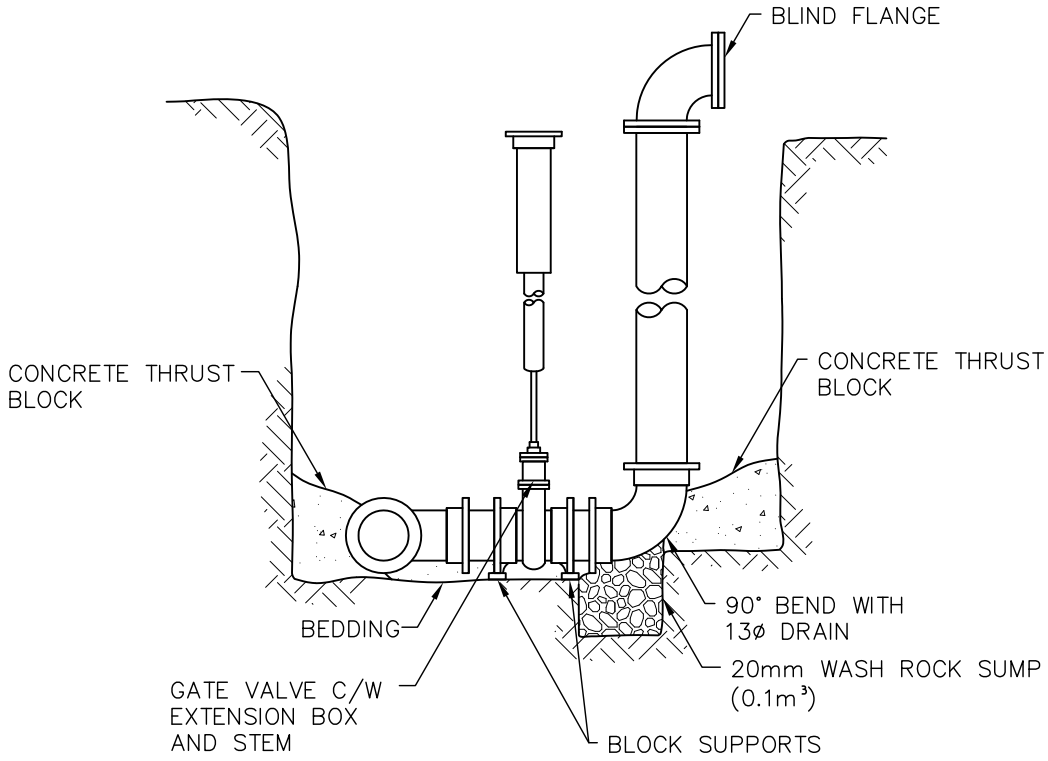


PULL–OUT AREA

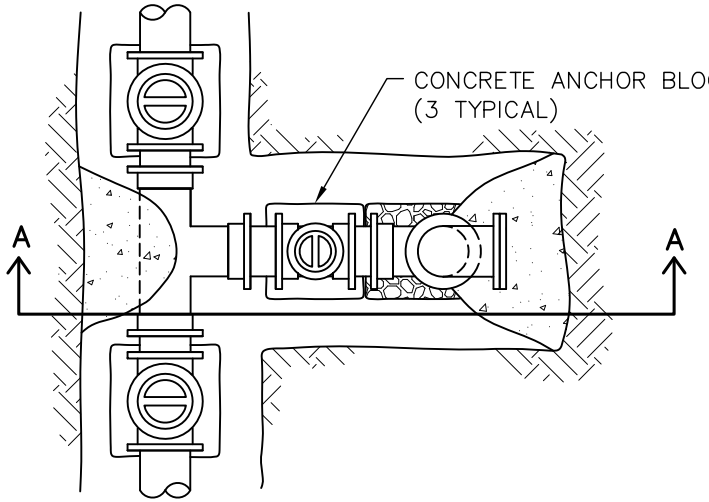


DRIVE–THROUGH AREA

		LACOMBE COUNTY	TYPICAL SANITARY LOADING AREA		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER E-17
1	07/04/17		DATE APRIL 7, 2017		
REVISION	DATE				



SECTION A–A



PLAN

1	07/14/17
REVISION	DATE

SEWAGE FORCEMAIN FLUSHOUT DETAILS

PROJECT NUMBER

DRAWN BY
BMAIER

SCALE
NTS

DATE
APRIL 7, 2017

DRAWING NUMBER

E-18

LACOMBE COUNTY

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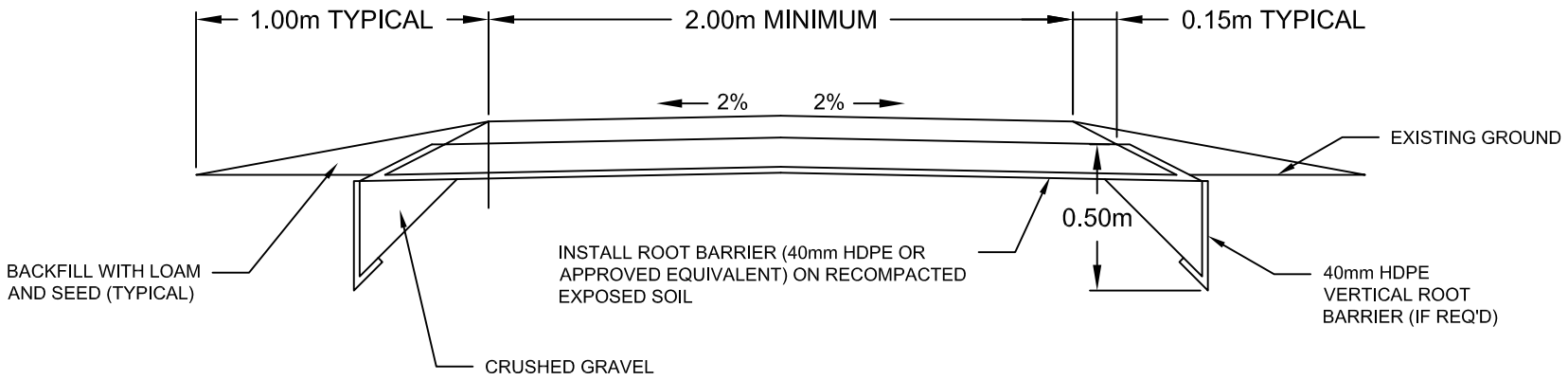


MINIMUM STRUCTURE

STRUCTURAL REQUIREMENTS

ACP - COMPACTED TO 98% STANDARD PROCTOR DENSITY

GBC - COMPACTED TO 98% STANDARD PROCTOR DENSITY

SUBBASE - REMOVE ORGANIC SOILS, RECOMPACT EXPOSED SOILS TO MINIMUM 95% STANDARD PROCTOR DENSITY, IF NECESSARY ADD GRANULAR FILL TO BRING BASE TO APPROPRIATE GRADE COMPACTED TO MINIMUM 95% STANDARD PROCTOR DENSITY

1	01/03/17
REVISION	DATE

LOCAL TRAIL

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

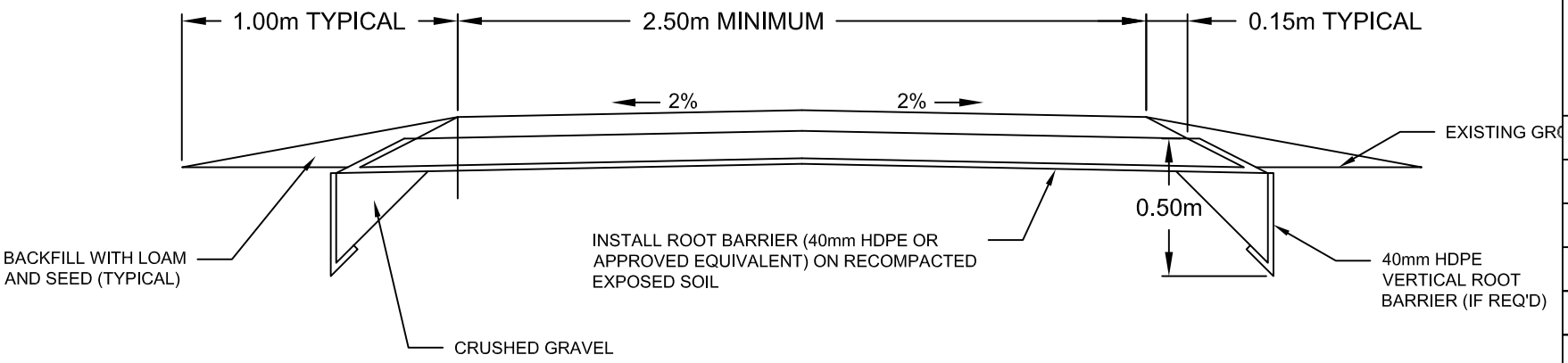
DATE

APRIL 7, 2017

DRAWING NUMBER

F-1

LACOMBE COUNTY



MINIMUM STRUCTURE

STRUCTURAL REQUIREMENTS

ACP - COMPACTED TO 98% STANDARD PROCTOR DENSITY
GBC - COMPACTED TO 98% STANDARD PROCTOR DENSITY
SUBBASE - REMOVE ORGANIC SOILS, RECOMPACT EXPOSED SOILS TO MINIMUM 95% STANDARD PROCTOR DENSITY, IF NECESSARY ADD GRANULAR FILL TO BRING BASE TO APPROPRIATE GRADE COMPACTED TO MINIMUM 95% STANDARD PROCTOR DENSITY

I	01/03/17
REVISION	DATE

REGIONAL TRAIL

PROJECT NUMBER

DRAWN BY
BMAIER

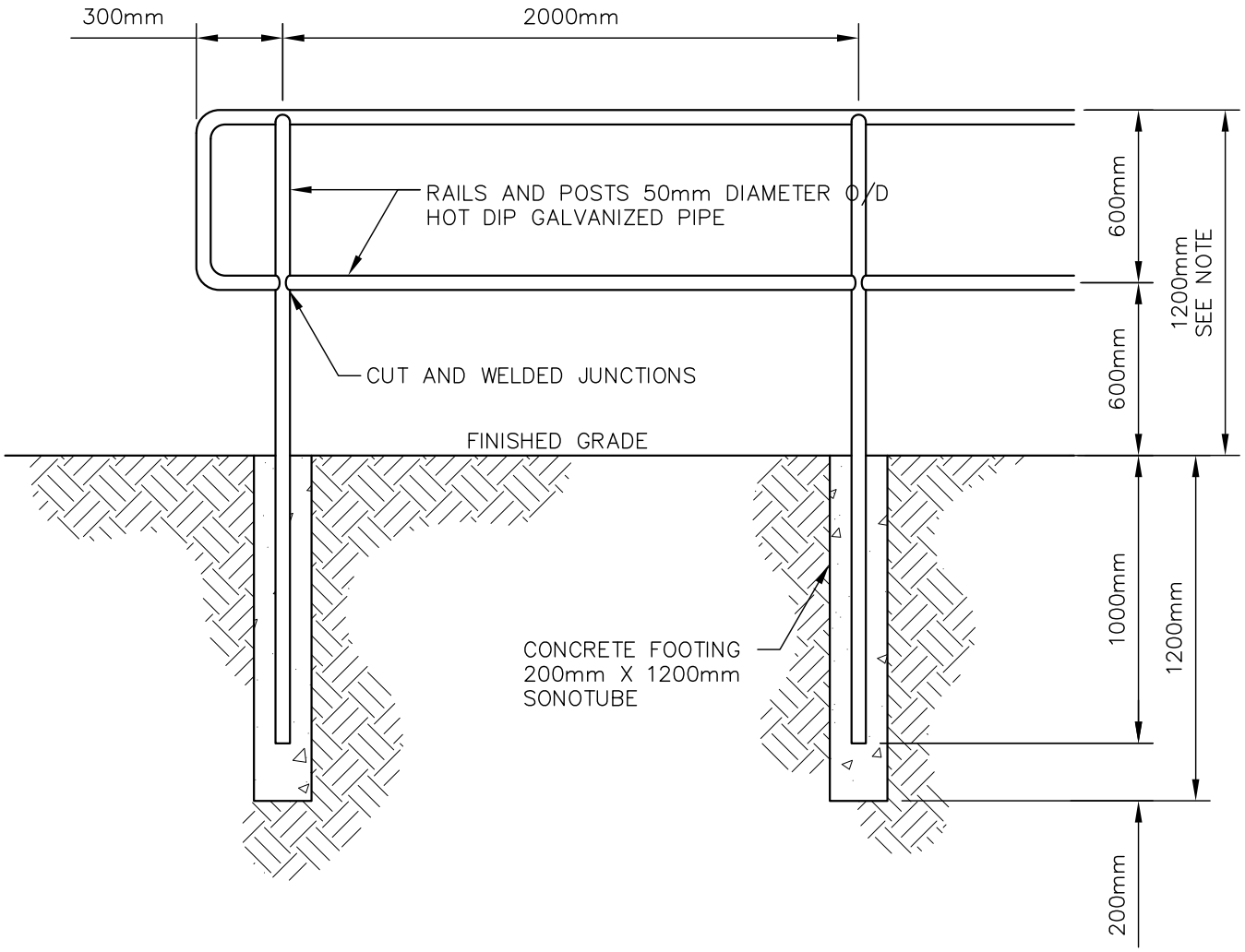
SCALE
NTS

DATE
APRIL 7, 2017

DRAWING NUMBER

F-2

LACOMBE COUNTY



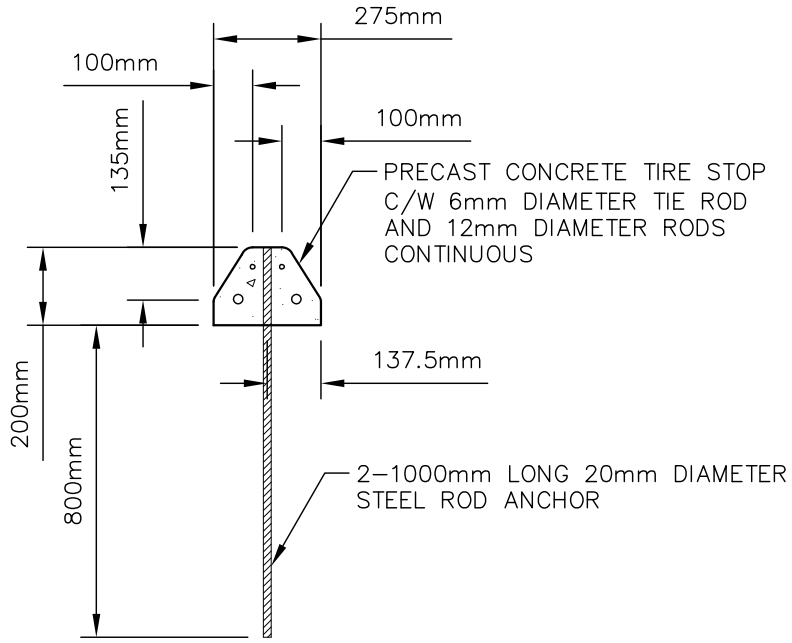
NOTE:
TOTAL RAILING HEIGHT INCREASES TO 1400mm WHEN REQUIRED ON A BRIDGE.

1	10/04/17
REVISION	DATE

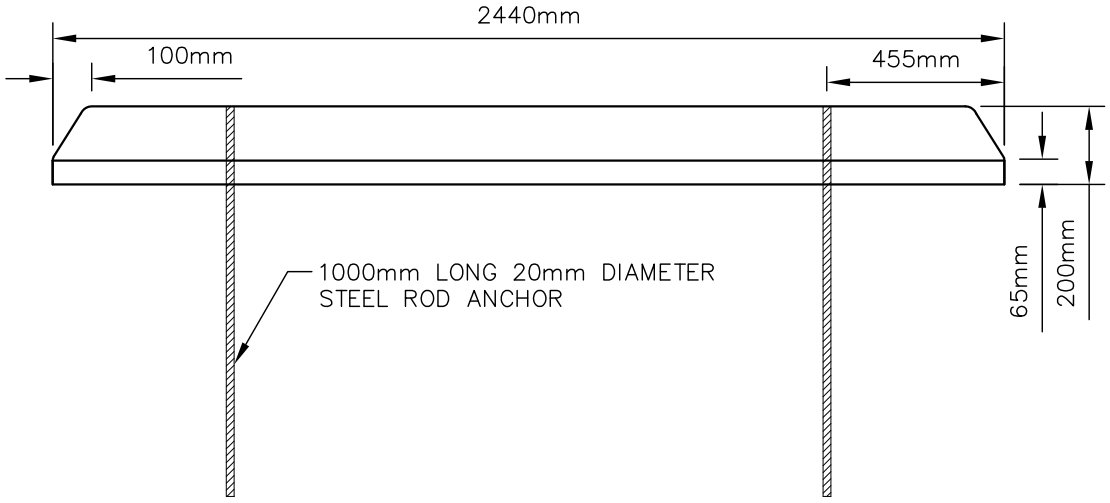
LACOMBE COUNTY

SAFETY RAILING

SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	F-3
DATE	APRIL 10, 2017	

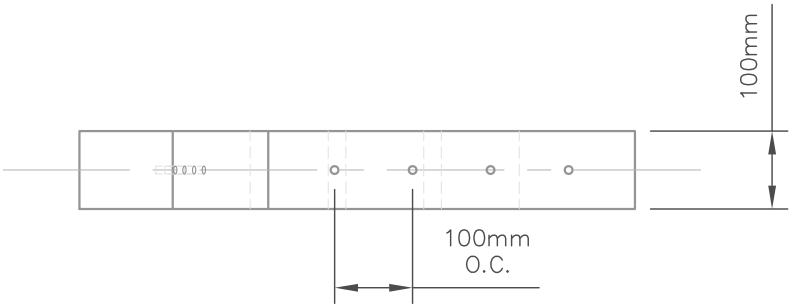


SIDE VIEW

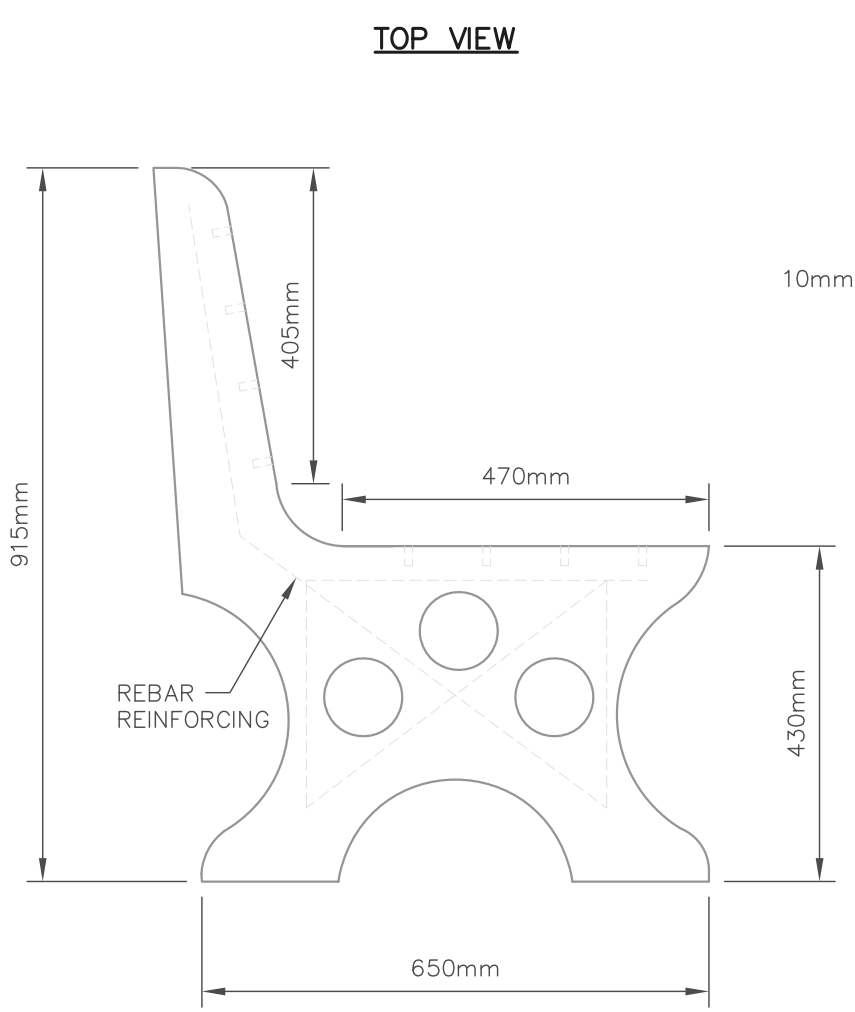


FRONT VIEW

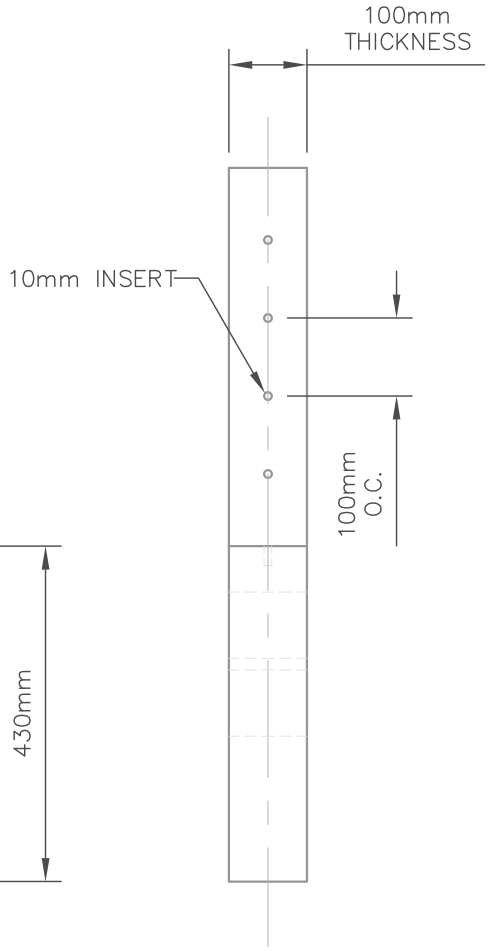
		LACOMBE COUNTY	PRECAST CONCRETE TIRE STOP		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER F-4
1	10/04/17		DATE APRIL 10, 2017		
REVISION	DATE				



TOP VIEW



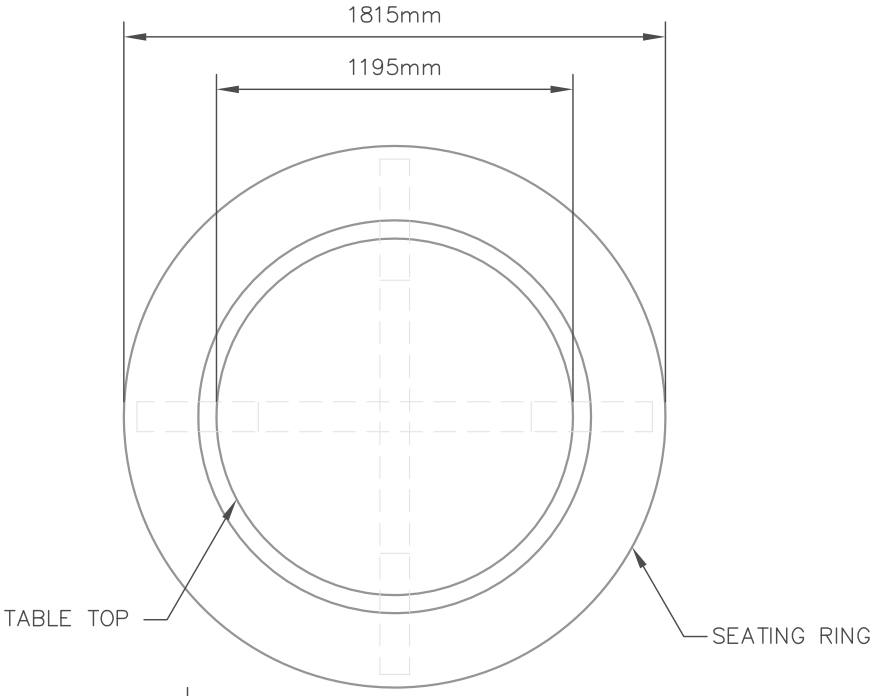
SIDE VIEW



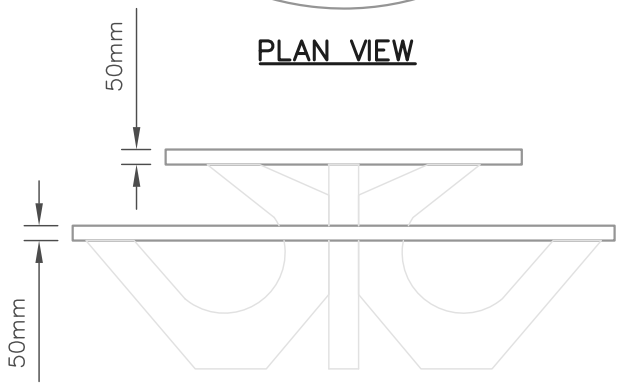
FRONT VIEW

SPECIFICATIONS:
54kg (118lbs)
EXPOSED AGGREGATE FINISH
SEAT AND BACK MADE FROM CONCRETE

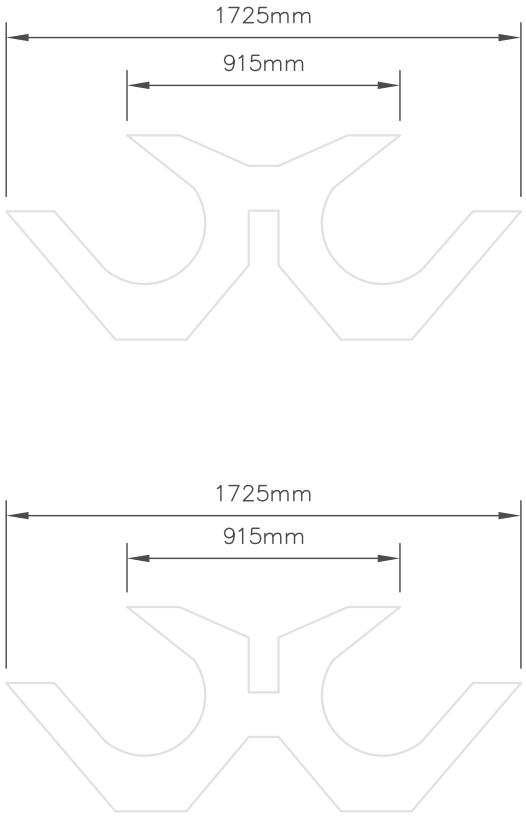
		LACOMBE COUNTY	CONCRETE BENCH		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER F-5
1	10/04/17		DATE APRIL 10, 2017		
REVISION	DATE				



PLAN VIEW



SIDE VIEW



LEG DETAILS

I	11/04/17
REVISION	DATE

CONCRETE PICNIC TABLE

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

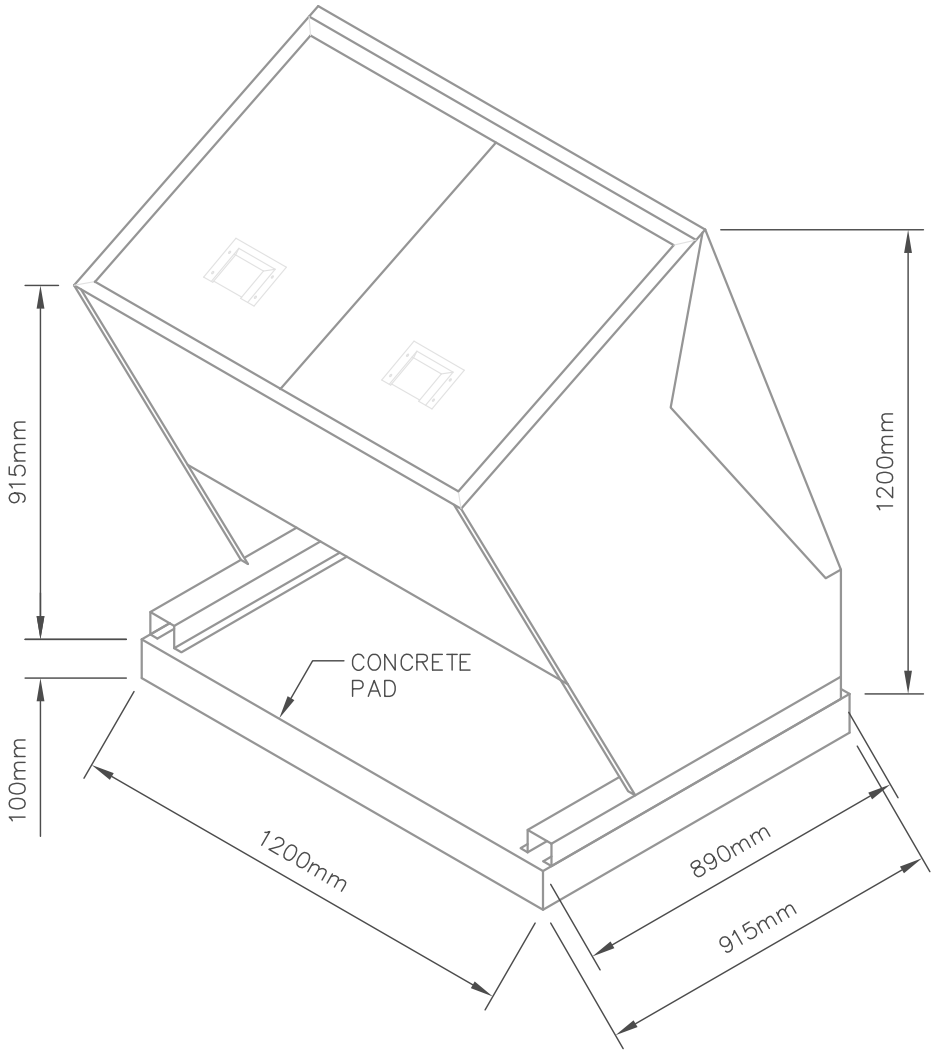
DATE

APRIL 11, 2017

DRAWING NUMBER

F-6

LACOMBE COUNTY



DIMENSIONS/CAPACITY:

WIDTH: 1200mm
DEPTH: 1070mm
HEIGHT: 1200mm
WEIGHT: 135kg
CAPACITY: 500L
SIZE OF GARBAGE BAGS: 1070mm X 1270mm
2 USER DOORS: 485mm X 560mm

CONTAINER SPECIFICATIONS:

- FRAME/HOUSING 12 GAUGE (2.6) GALVANNEAL STEEL
- DOORS 14 GAUGE (1.9) GALVANNEAL STEEL
- ANIMAL RESISTANT DESIGN
- FASTENERS AND HARDWARE ARE ZINC PLATED
- HINGES AND LATCHES ARE STAINLESS STEEL
- USER DOORS ARE DOUBLE BENT ON ALL EDGES AND HAVE A STAINLESS STEEL HANDLE. MAXIMUM GAP BETWEEN DOOR AND FRAME IS 3.2mm
- UNLOADING DOORS HAVE ONE STAINLESS STEEL GRAVITY LATCH
- LOADING DOORS HINGED SO THAT THEY WILL NOT STAY IN THE OPEN POSITION
- INTEGRAL HINGED FRAME FOR BAG SUPPORT AND SERVICING
- CONTAINER INCORPORATES WATER DEFLECTOR TO PREVENT ACCUMULATION IN BAG

PAINT/ASSEMBLY/LABEL SPECIFICATION

- ALL COMPONENTS DEGREASED AND PHOSPHATE ETCHED IN SUBMERSIBLE BATH
- CONTAINERS ASSEMBLED WITH RIVETS
- CONTAINERS TO BE POWDERCOATED BEFORE FINAL ASSEMBLY

MOUNTING PAD SPECIFICATIONS

- CONCRETE MOUNTING IS TYPE 30 CEMENT WITH A MINIMUM STRENGTH OF 30 MPA
- CONCRETE PAD DIMENSIONS: 915mm X 1220mm X 100mm THICK
- CONCRETE PAD WEIGHT: 270kg
- CONCRETE PAD TO BE SET ON A 100mm THICK COMPACTED GRAVEL BASE.

I	11/04/17
REVISION	DATE

WASTE RECEPTACLE

PROJECT NUMBER

DRAWN BY
BMAIER

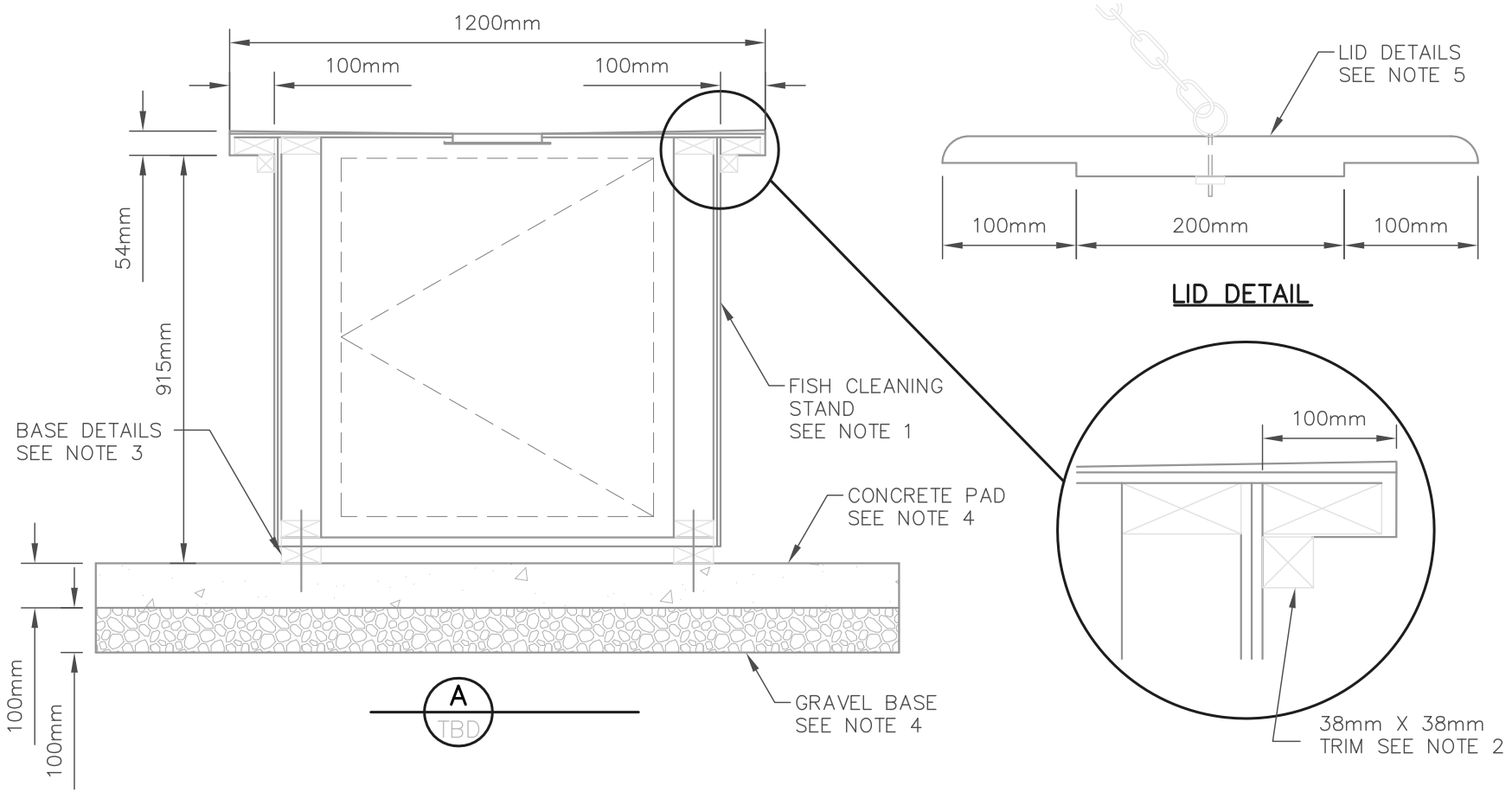
SCALE
NTS

DATE
APRIL 11, 2017

DRAWING NUMBER

F-7

LACOMBE COUNTY



NOTES:

1. FISH CLEANING STAND 38mm X 89mm FRAMING WITH 19mm Z 140mm VERTICAL CHANNEL SIDING ON 8mm PLYWOOD SHEETING
2. SHEET METAL TOP OVER 8mm PLYWOOD SHEETING AND 38mm X 89mm FRAME. SHEETING WRAPS AROUND LIP AND OPENING. SHEET METAL SECURED WITH SCREWS TO UNDERSIDE OF TOP (AND 38mm X 38mm TRIM). OPENING SIZE 200mm X 200mm
3. BASE FRAMING 39mm X 89mm WITH 8mm PLYWOOD BOTTOM BOLTED THROUGH (8mm DIAMETER ANCHOR BOLTS IN CONCRETE PAD
4. CONCRETE PAD 100mm THICK OVER 100mm COMPACTED GRAVEL BASE. 30MPA CONCRETE, 2% SLOPES, BROOM FINISH WITH TOOLED EDGES.
5. 300mm X 300mm X 19mm PLYWOOD LAMINATED TO 200mm X 200mm PLYWOOD X 19mm DIAMETER X 40mm EYE BOLT. CONNECT LID TO 900mm LENGTH OF CHAIN FROM EYE BOLT ON LID AND BACKSIDE OF STAND.

1	11/04/17
REVISION	DATE

FISH CLEANING STATION SECTION AND DETAILS

PROJECT NUMBER

DRAWN BY
BMAIER

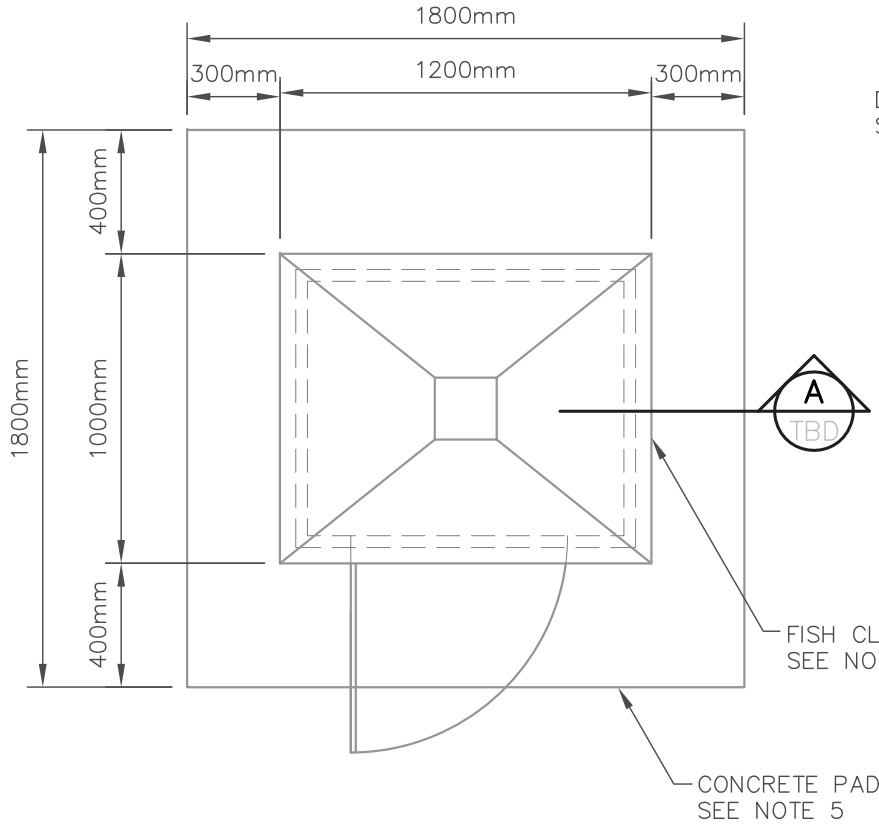
SCALE
NTS

DATE
APRIL 11, 2017

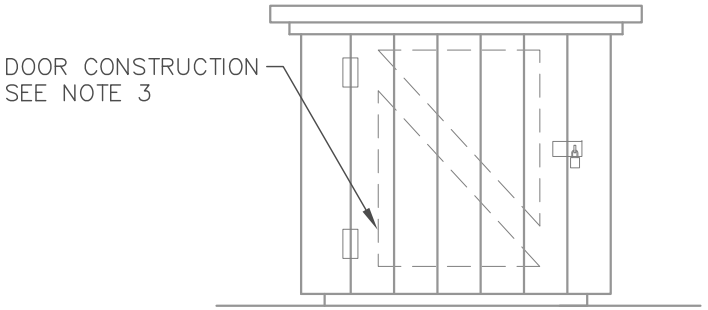
DRAWING NUMBER

F-8

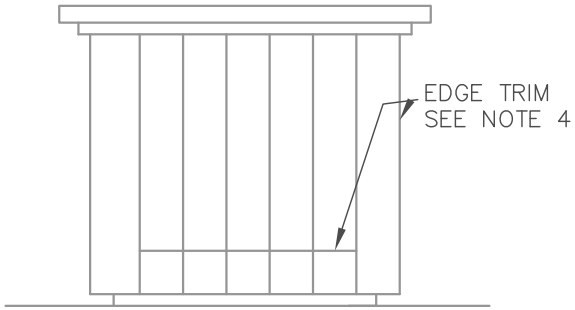
LACOMBE COUNTY



PLAN



FRONT ELEVATION



SIDE ELEVATION

NOTES:

1. FISH CLEANING STAND 38mm X 89mm FRAMING WITH 19mm Z 140mm VERTICAL CHANNEL SIDING ON 8mm PLYWOOD SHEETING
2. SHEET METAL TOP OVER 8mm PLYWOOD SHEETING AND 38mm X 89mm FRAME. SHEETING WRAPS AROUND LIP AND OPENING. SHEET METAL SECURED WITH SCREWS TO UNDERSIDE OF TOP (AND 38mm X 38mm TRIM). OPENING SIZE 200mm X 200mm
3. DOOR OPENING 720mm X 855mm HIGH, WITH 38mm X 89mm FRAMING TO THE INSIDE. TWO HEAVY DUTY HINGES BOLTED THROUGH DOOR AND JAMB SECTIONS. PROVIDE LATCH/HASP WITH PADLOCK.
4. 19mm X 140mm TRIM AT THE CORNERS AND BASE.
5. CONCRETE PAD 100mm THICK OVER 100mm COMPACTED GRAVEL BASE. 30MPA CONCRETE, 2% SLOPES, BROOM FINISH WITH TOOLED EDGES.

1	11/04/17
REVISION	DATE

FISH CLEANING STATION SECTION AND DETAILS

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

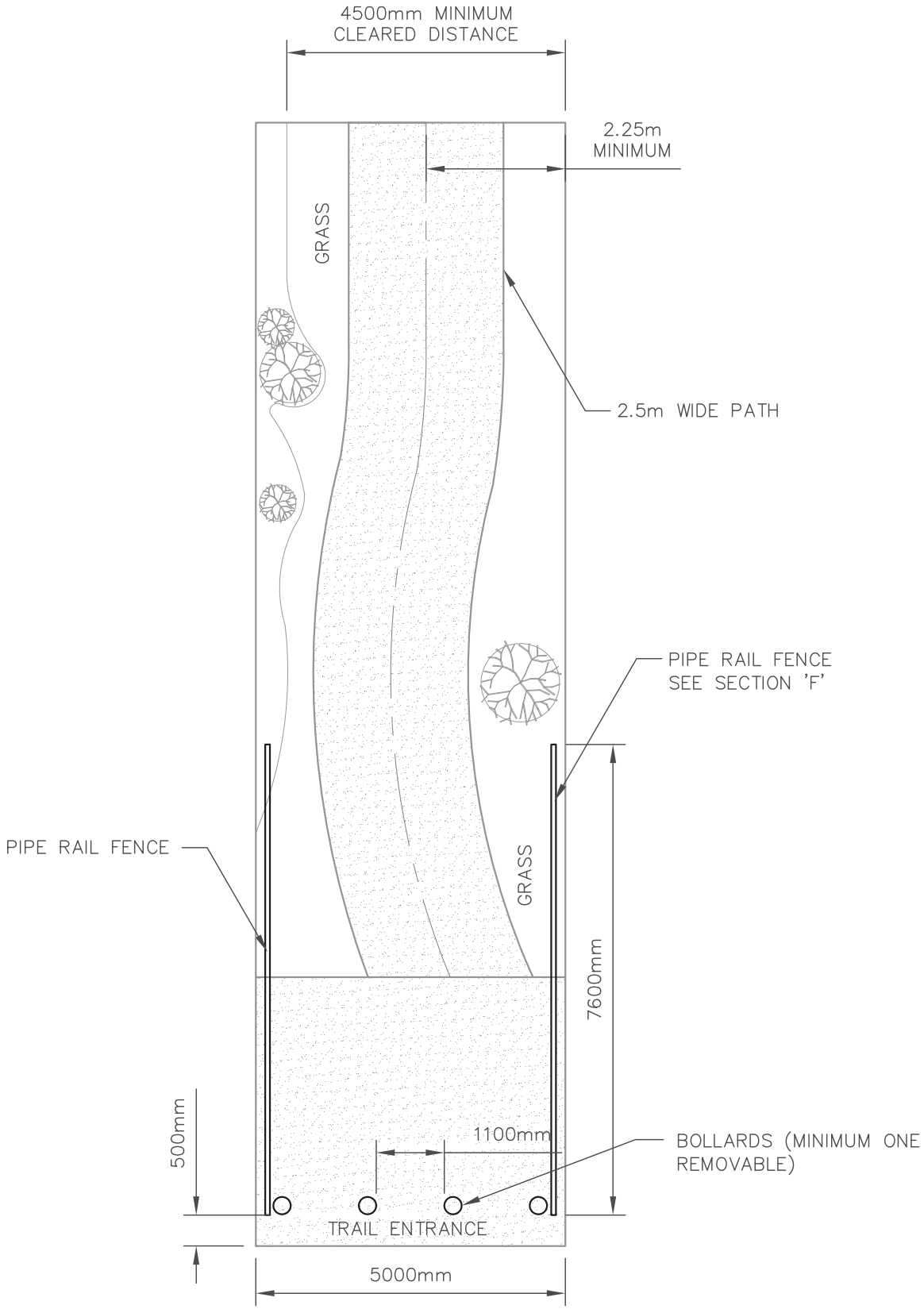
DATE

APRIL 11, 2017

DRAWING NUMBER

F-9

LACOMBE COUNTY

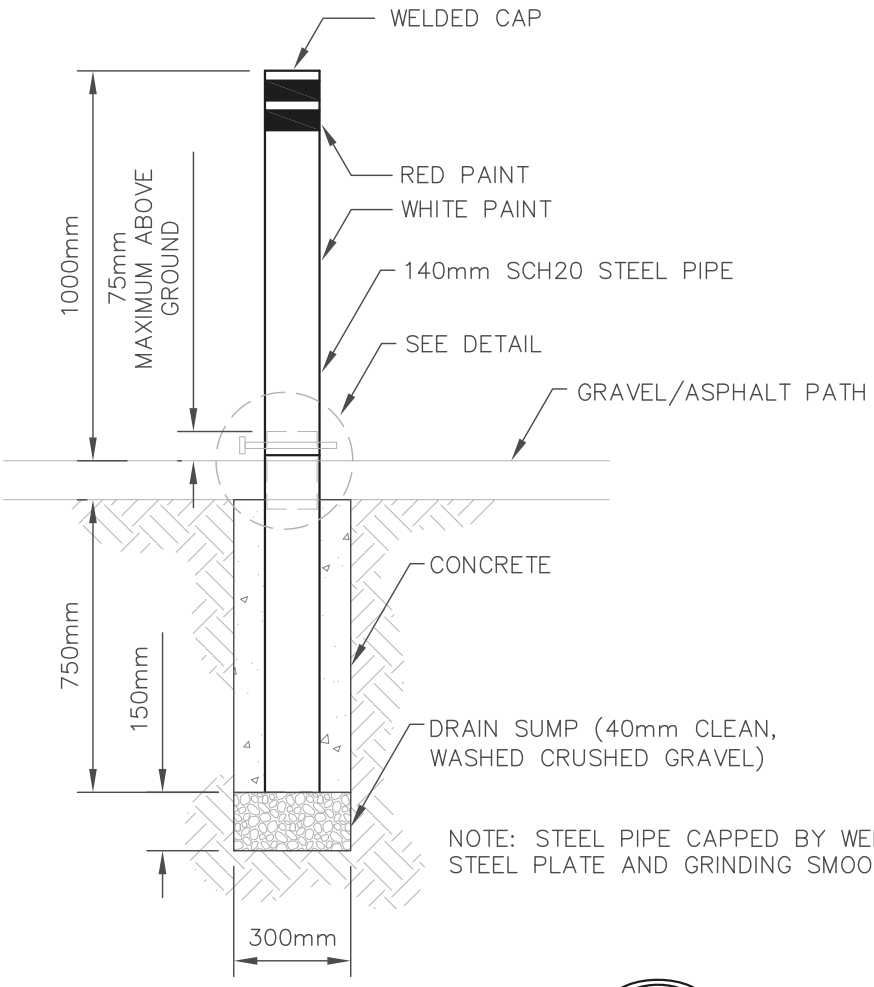


1	11/04/17
Revision	Date

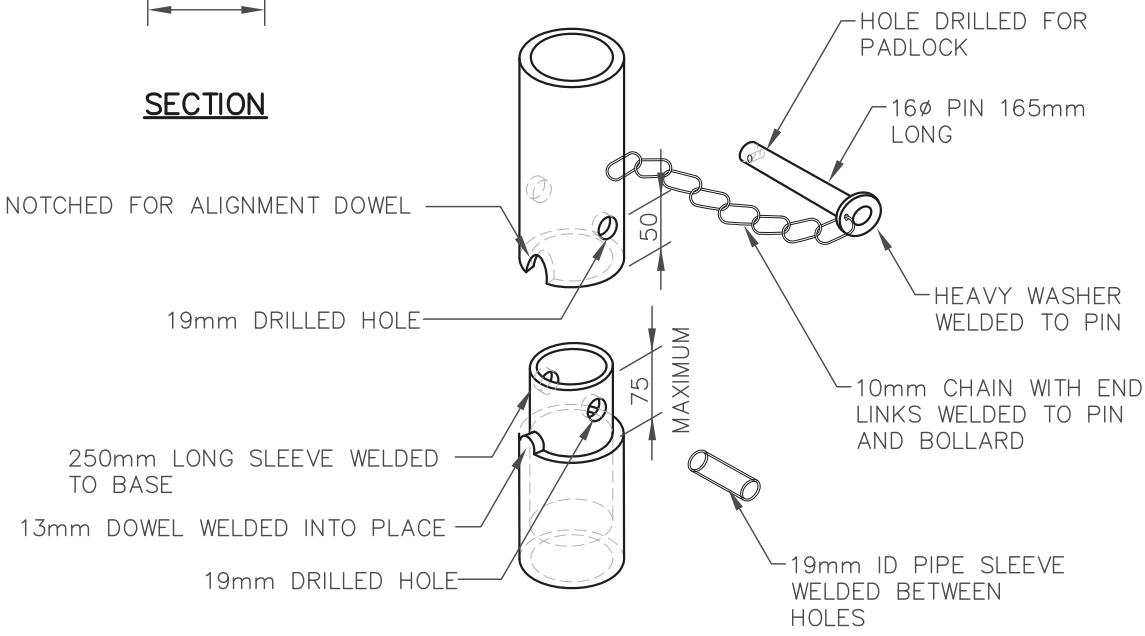
LACOMBE COUNTY

TRAIL ENTRANCE PLAN

Scale	Drawn By	Drawing Number
NTS	BMaier	F-10
Date	APRIL 11, 2017	

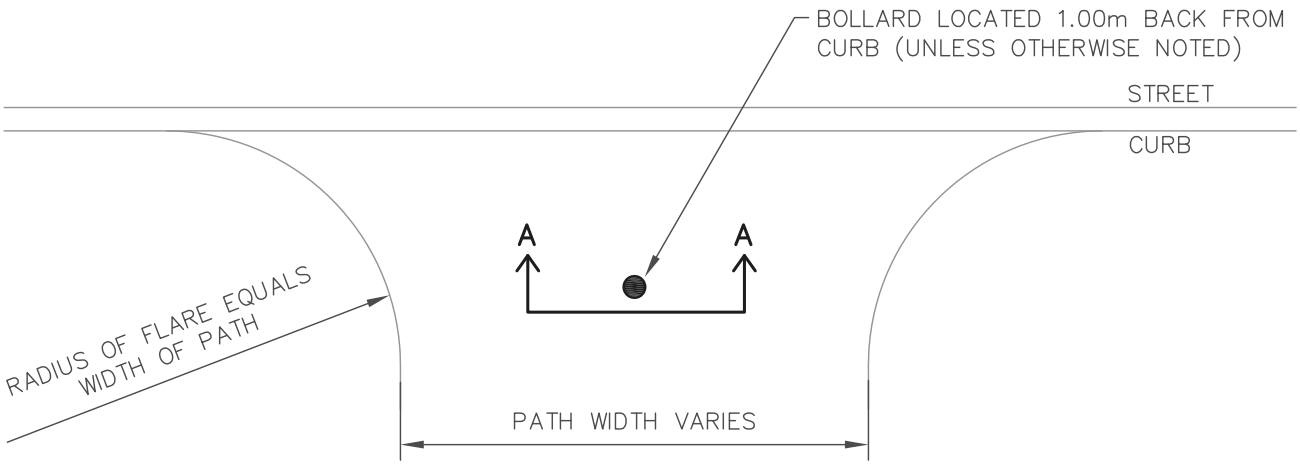


SECTION

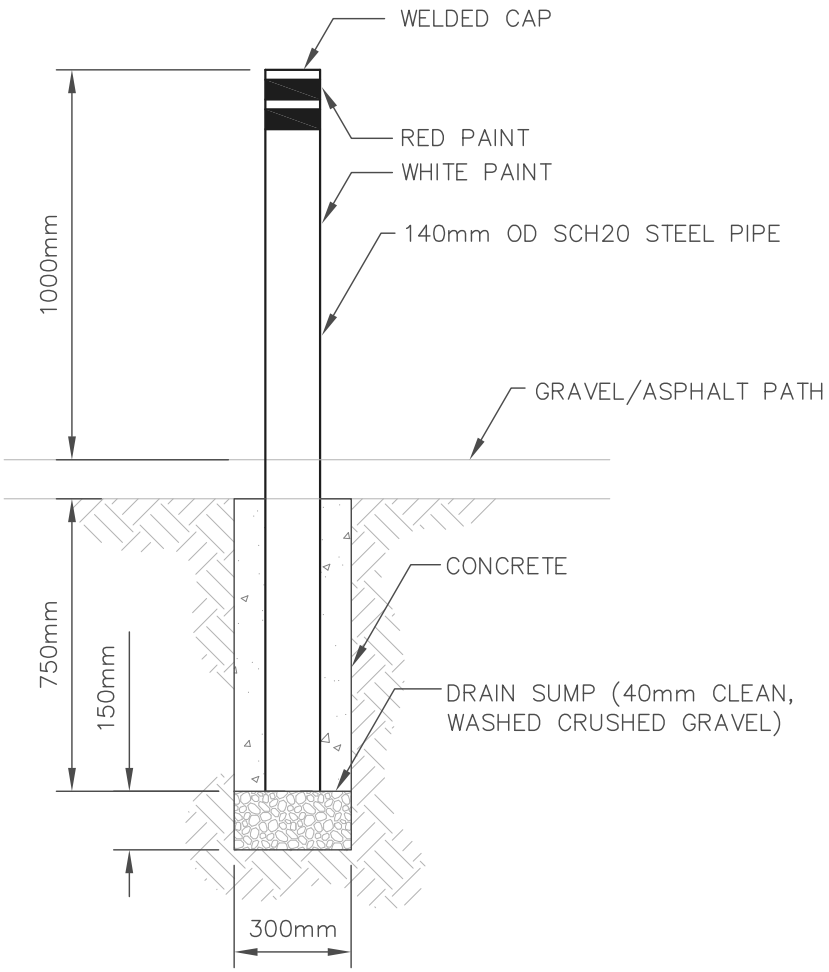


DETAIL

		LACOMBE COUNTY	REMOVABLE BOLLARD DETAILS	
			SCALE NTS / DRAWN BY BMAIER	DRAWING NUMBER F-11
1	11/04/17		DATE APRIL 11, 2017	
REVISION	DATE			



PLAN



SECTION A–A

		LACOMBE COUNTY	PERMANENT BOLLARD DETAILS		
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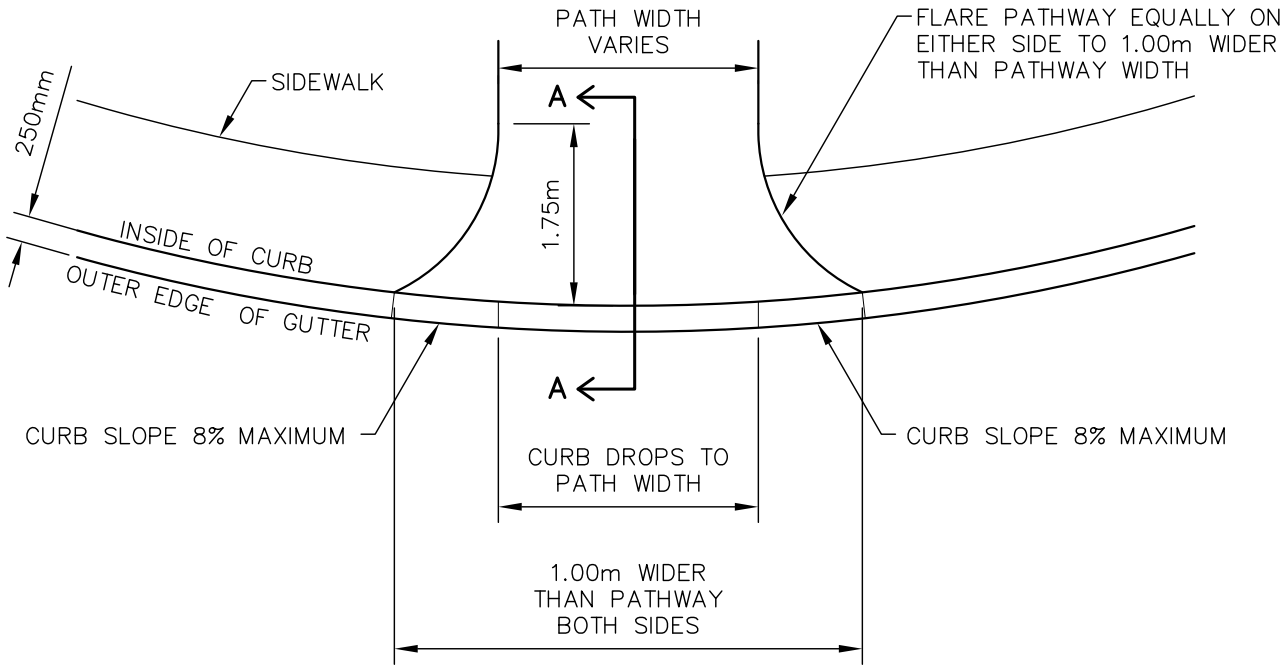
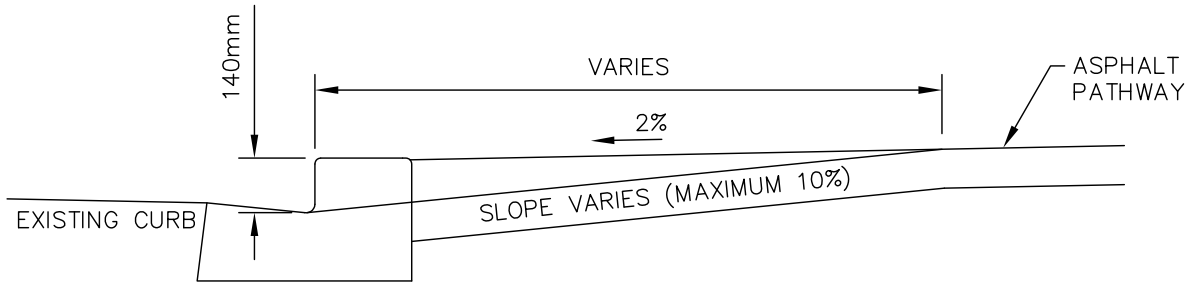
1	11/04/17		DATE APRIL 11, 2017		
REVISION	DATE				

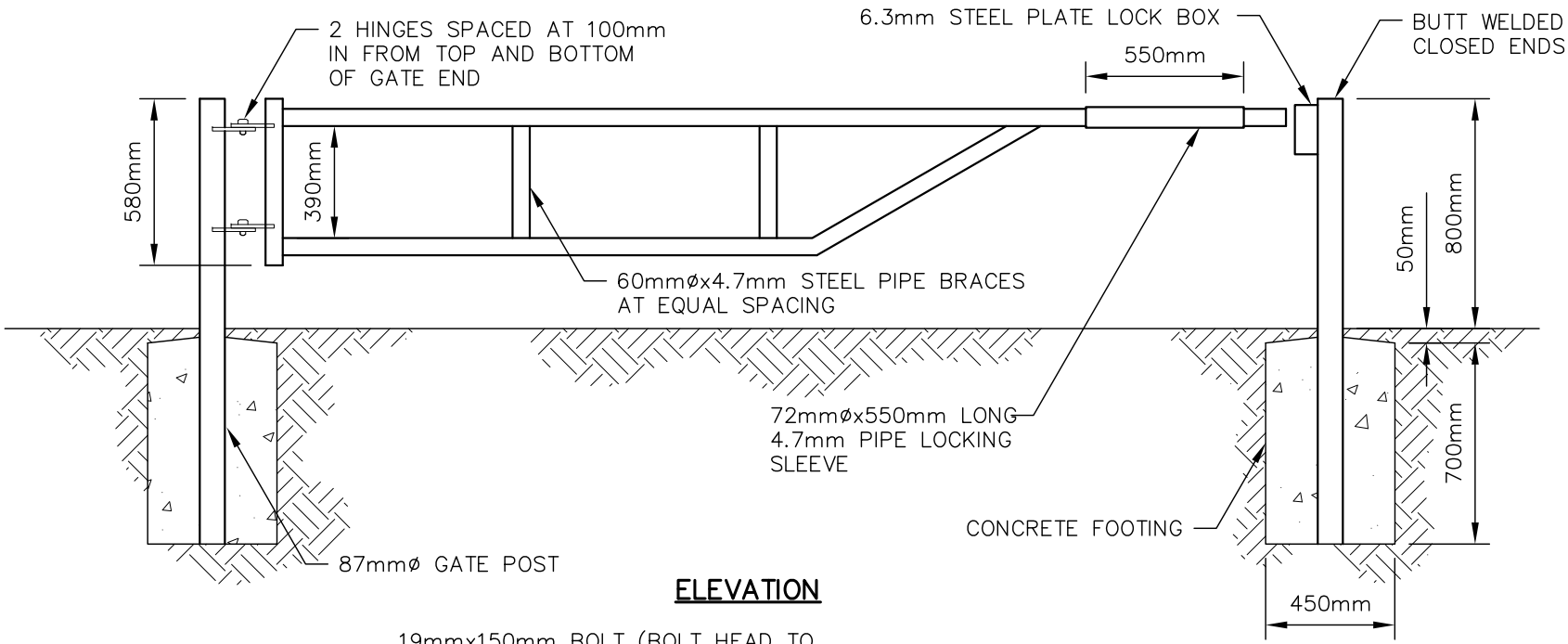


PLAN

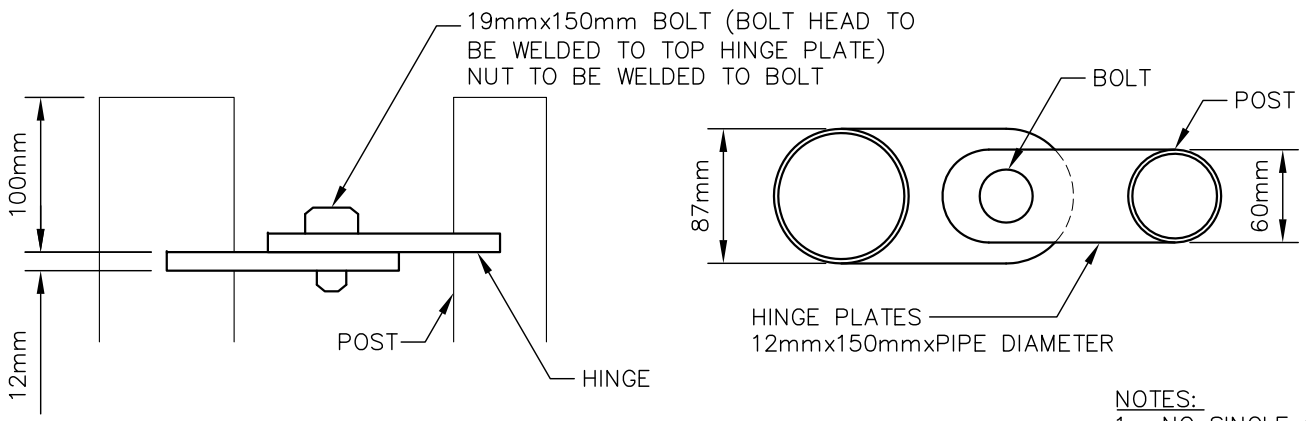


SECTION A–A

		LACOMBE COUNTY	ASPHALT WHEEL CHAIR RAMP		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER F-13
1	11/04/17		DATE APRIL 11, 2017		
REVISION	DATE				



ELEVATION



HINGE DETAILS

NOTES:

1. NO SINGLE GATE SPAN SHALL EXCEED 4.25m
2. GATE FINISH TO BE RED ALKYD SEMI-GLOSS PAINT.
3. ALL WELDS TO BE GROUND SMOOTH.
4. PAINTING SHALL BE IN ACCORDANCE WITH C.P.C.A. (CANADIAN PAINTING CONTRACTORS ASSOCIATION)
5. ALL DIMENSIONS ARE IN MILLIMETERS.

1	11/04/17
REVISION	DATE

STEEL PIPE GATE

PROJECT NUMBER

DRAWN BY
BMAIER

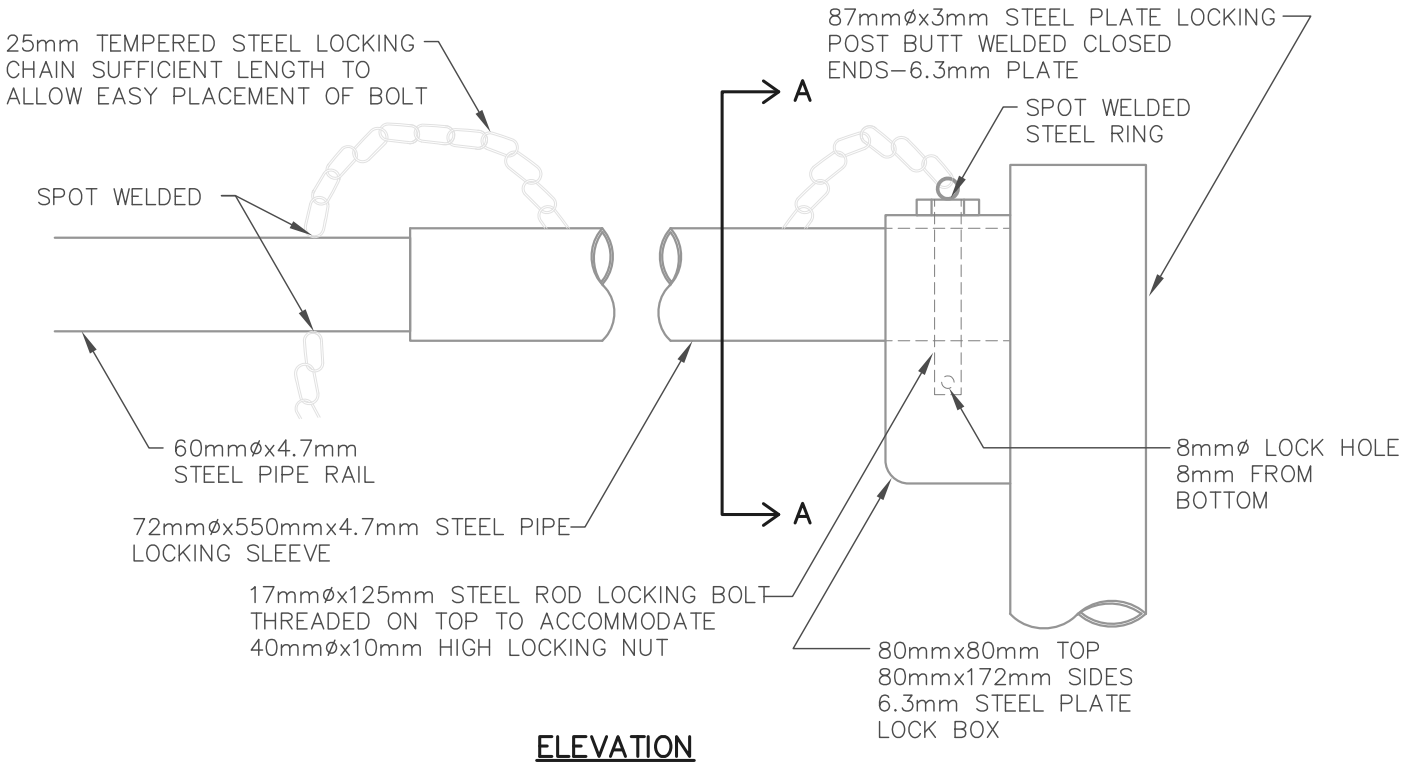
SCALE
NTS

DATE
APRIL 11, 2017

DRAWING NUMBER

F-14

LACOMBE COUNTY



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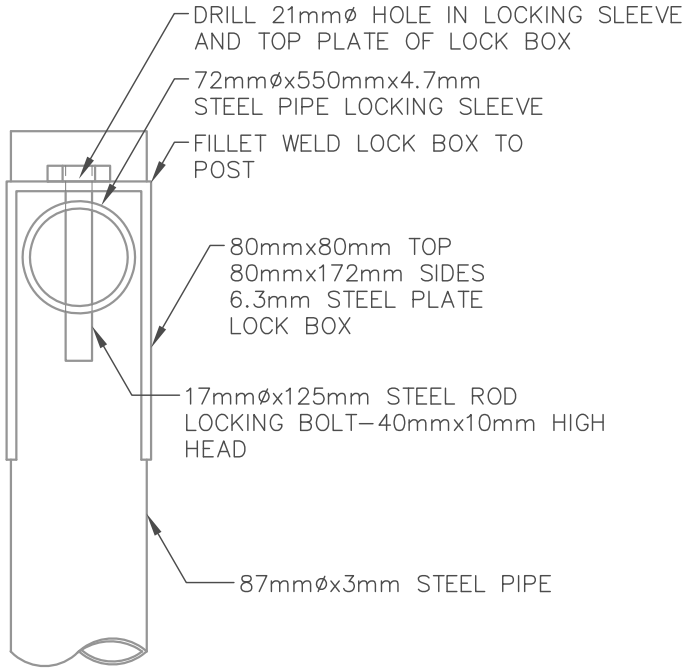

SECTION A–A

NOTES:
1. THE FINISH SHALL BE RED ALKYD SEMI–GLOSS PAINT.
2. ALL DIMENSIONS ARE IN MILLIMETERS

		LACOMBE COUNTY	STEEL PIPE GATE LOCKING SLEEVE DETAILS		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER F-15
1	12/04/17		DATE APRIL 12, 2017		
REVISION	DATE				

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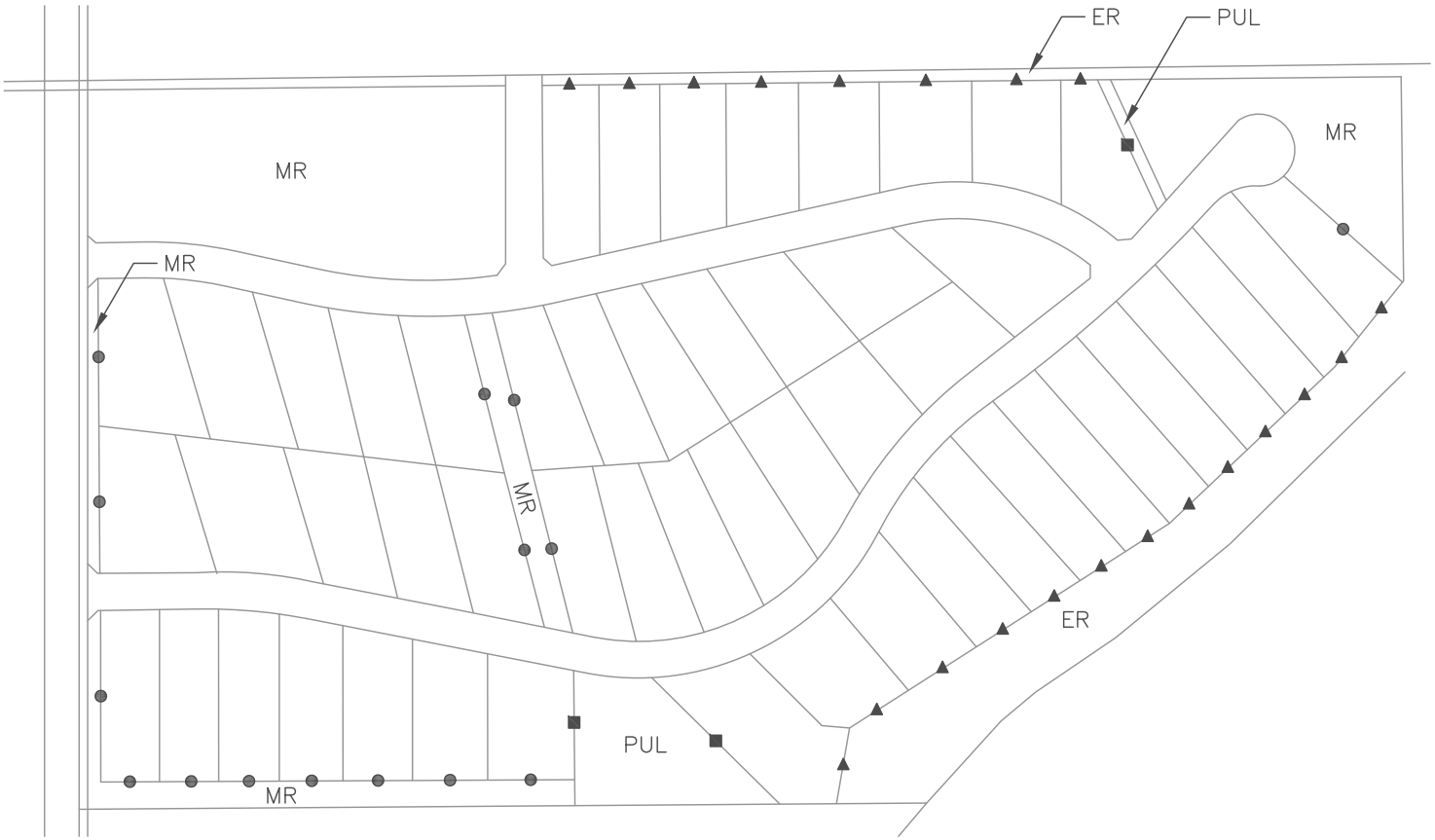

MARKER POST DESIGNATORS

- ● MUNICIPAL RESERVE MARKERS
- ▲ ENVIRONMENTAL RESERVE MARKERS
- ■ PUBLIC UTILITIES MARKER

NOTES:

1. APPROPRIATE SIGN TO BE LOCATED MIDWAY ON LOT BOUNDARY MEETING ANY RESERVE AREA.
2. EACH SIGN TO BE PLACED CLOSE TO BOUNDARY WITH RESERVE.
3. POST TO BE INSTALLED USING EQUIPMENT TO LEAST DISTURB NATURAL VEGETATION.
4. RECOMMENDED BURIAL DEPTH: 18–24 INCHES
5. MARKER POSTS WITH APPROPRIATE SIGNAGE TO BE PURCHASED FROM LACOMBE COUNTY.

1	12/04/17
REVISION	DATE

RESERVE MARKER LOCATIONS

PROJECT NUMBER

DRAWN BY

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SCALE

NTS

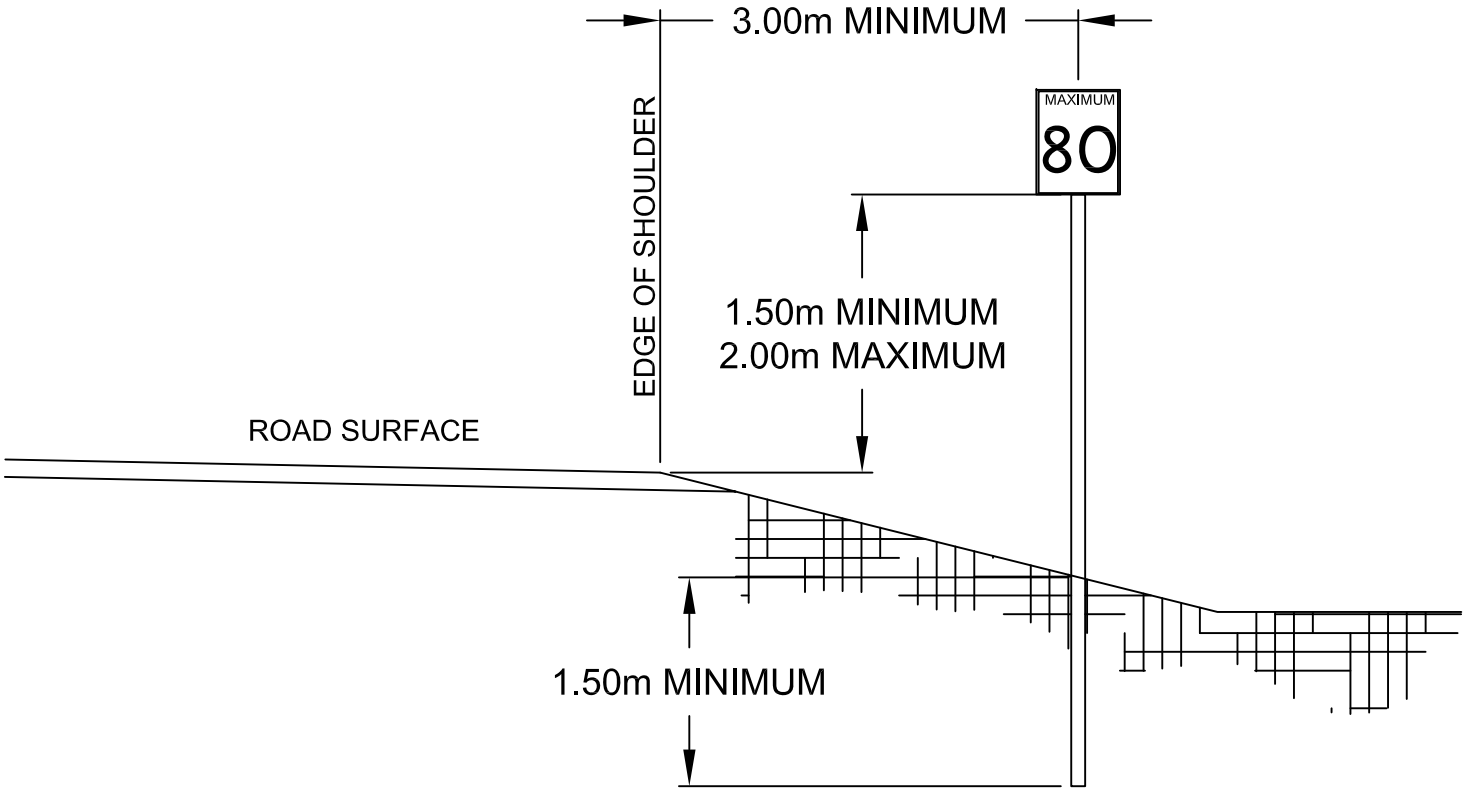
DATE

APRIL 12, 2017

DRAWING NUMBER

G-1

LACOMBE COUNTY



NOTES:

ALL SIGNS SHOULD BE MOUNTED AT APPROXIMATELY RIGHT ANGLES TO THE DIRECTION OF TRAFFIC

WHEN A SUPPLEMENTARY TAB SIGN IS MOUNTED BELOW THE PRINCIPLE SIGN, THE HEIGHT SHOULD BE MEASURED TO THE BOTTOM OF THE TAB SIGN

THE 3.00m HORIZONTAL OFFSET MAY BE REDUCED IN AREAS RESTRICTED BY PHYSICAL FEATURES SUCH AS CLIFFS OR STRUCTURAL FEATURES SUCH AS BRIDGE SUPPORTS

THE MINIMUM MOUNTING DEPTH IS 1.50m BELOW GROUND

1	12/04/17
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LATERAL SIGN PLACEMENT

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

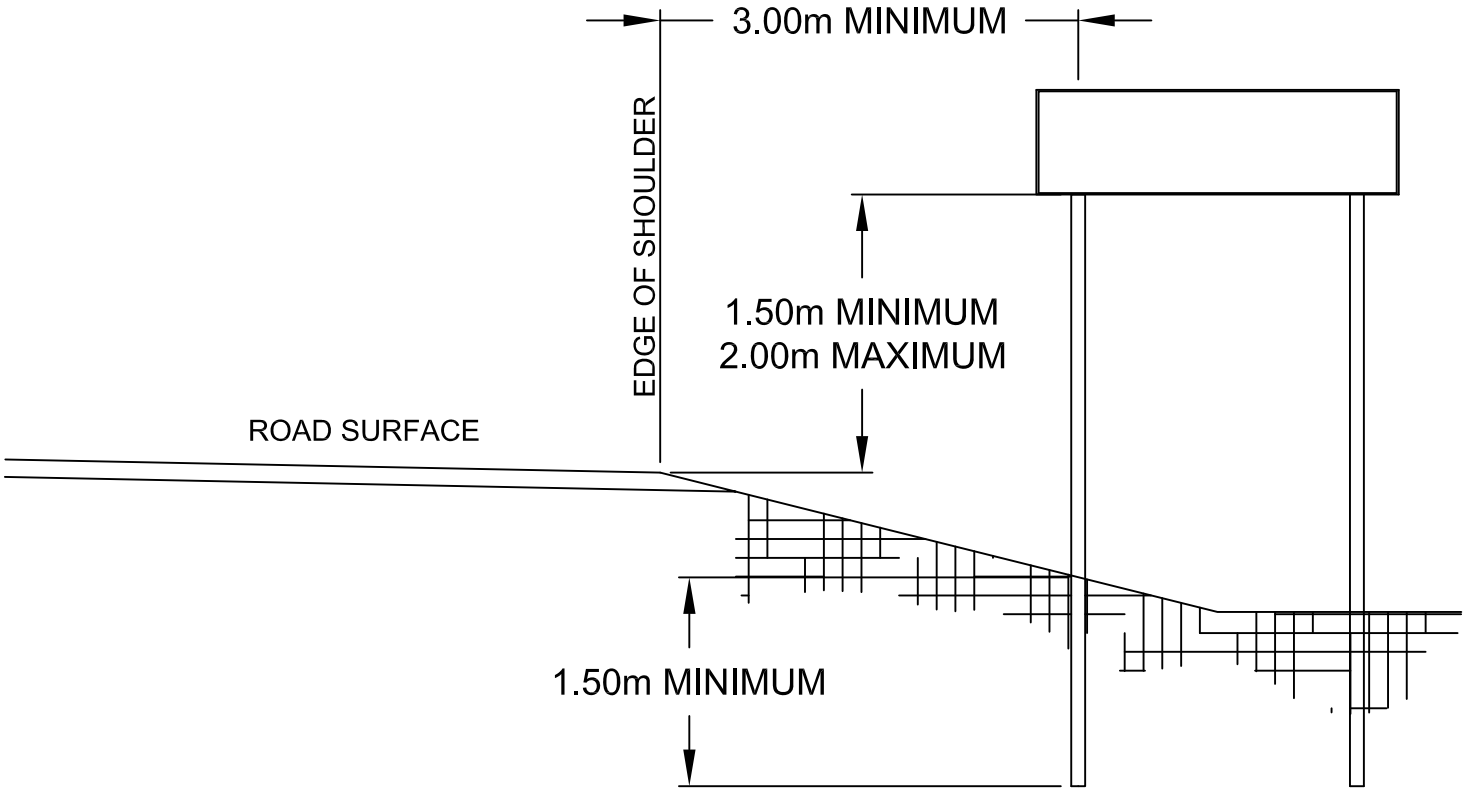
DATE

APRIL 12, 2017

DRAWING NUMBER

G2

LACOMBE COUNTY



NOTES:

ALL SIGNS SHOULD BE MOUNTED AT APPROXIMATELY RIGHT ANGLES TO THE DIRECTION OF TRAFFIC

THE 3.00m HORIZONTAL OFFSET MAY BE REDUCED IN AREAS RESTRICTED BY PHYSICAL FEATURES SUCH AS CLIFFS OR STRUCTURAL FEATURES SUCH AS BRIDGE SUPPORTS

THE MINIMUM MOUNTING DEPTH IS 1.50m BELOW GROUND

1	12/04/17
REVISION	DATE

LATERAL SIGN PLACEMENT - 2 POST

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

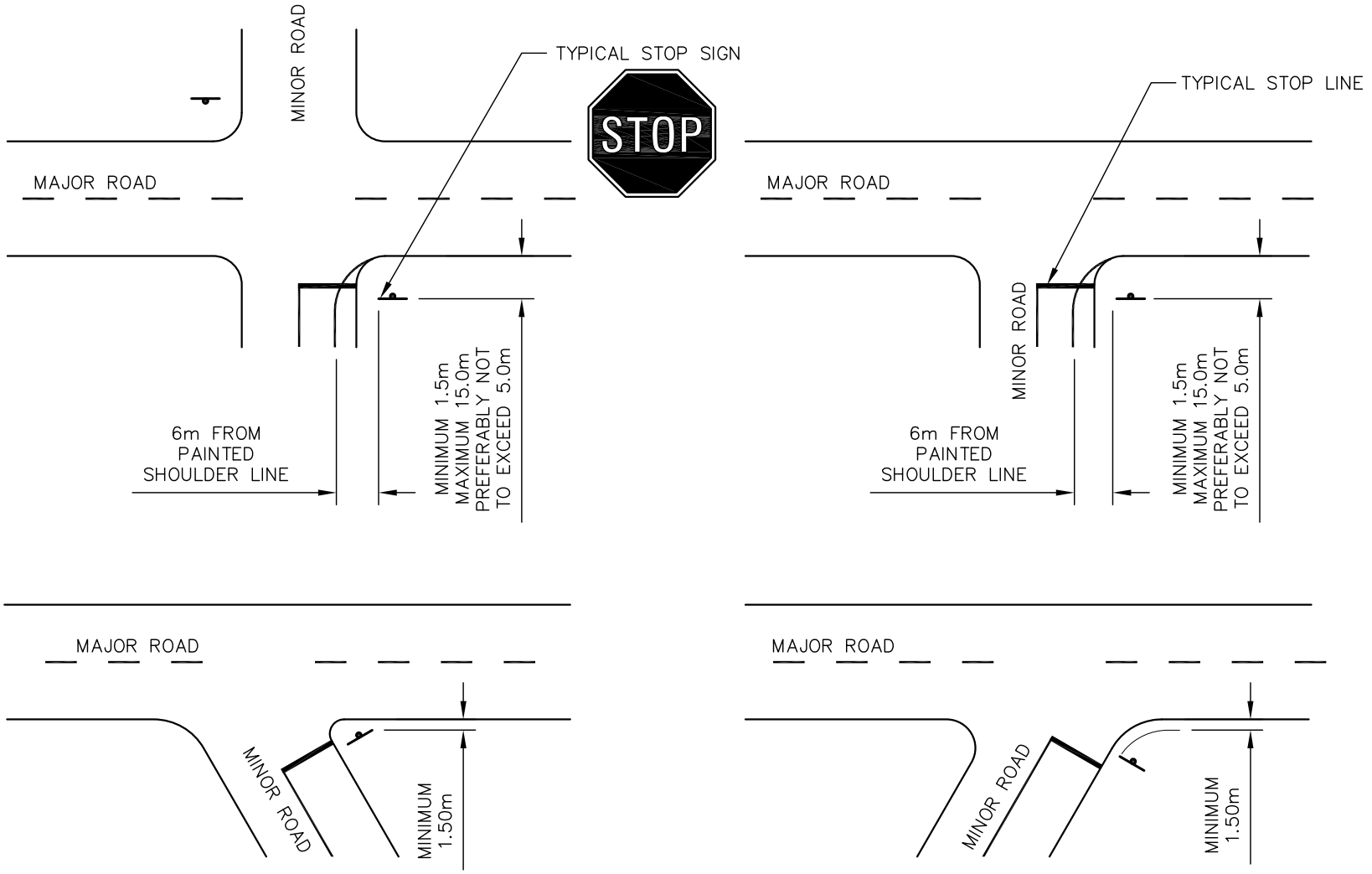
DATE

APRIL 12, 2017

DRAWING NUMBER

G3

LACOMBE COUNTY



1	12/04/17
REVISION	DATE

RURAL STOP SIGN PLACEMENT

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

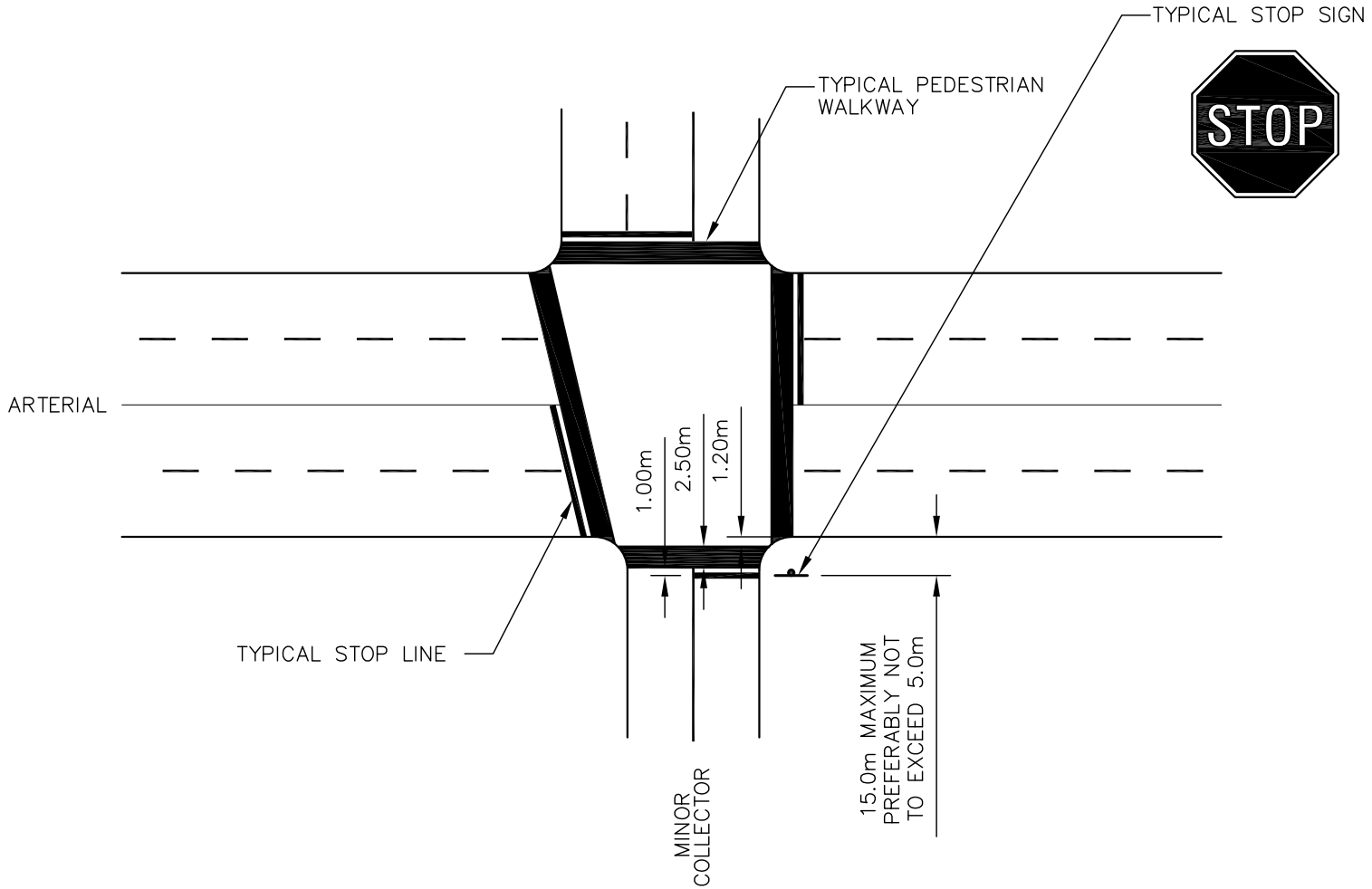
DATE

APRIL 12, 2017

DRAWING NUMBER

G-4

LACOMBE COUNTY



1	12/04/17
REVISION	DATE

URBAN STOP SIGN PLACEMENT

PROJECT NUMBER

DRAWN BY

BMAIER

SCALE

NTS

DATE

APRIL 12, 2017

DRAWING NUMBER

G-5

LACOMBE COUNTY

NOTES:

1. RESERVE SIGNS ARE 125mmx125mm WITH A 25mm STEEL CHANNEL POST.
2. SIGN TO BE INSTALLED 1220mm FROM GROUND TO BOTTOM OF SIGN, MINIMUM 450mm IN GROUND.
3. SIGN TO BE PLACED AT THE PROPERTY LINE IN THE MIDDLE OF EVERY LOT ADJACENT TO RESERVE LAND.
4. COLOR CODES TO MATCH THOSE OF LACOMBE COUNTY.

		LACOMBE COUNTY	ENVIRONMENTAL RESERVE BOUNDARY SIGN		
			SCALE NTS	DRAWN BY BMAIER	DRAWING NUMBER G-6
1	12/04/17		DATE APRIL 12, 2017		
REVISION	DATE				

MUNICIPAL RESERVE

Property of Lacombe County.
Please do not disturb or remove.

NOTES:
1. RESERVE SIGNS ARE 125mmx125mm WITH A 25mm STEEL CHANNEL POST.
2. SIGN TO BE INSTALLED 1220mm FROM GROUND TO BOTTOM OF SIGN, MINIMUM 450mm IN GROUND.
3. SIGN TO BE PLACED AT THE PROPERTY LINE IN THE MIDDLE OF EVERY LOT ADJACENT TO RESERVE LAND.
4. COLOR CODES TO MATCH THOSE OF LACOMBE COUNTY.

1	12/04/17
REVISION	DATE

MUNICIPAL RESERVE BOUNDARY SIGN

SCALE	DRAWN BY	DRAWING NUMBER
NTS	BMAIER	G-7
DATE APRIL 12, 2017		