Cypress County

DESIGN GUIDELINES

February 2021

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The following abbreviations may be used in this document:

BC	-	Beginning of curve
BOW	-	Back of walk
BVC	-	Beginning of vertical Curve
CCC	-	Construction Completion Certificate
EC	-	End of Curve
EVC	-	End of vertical Curve
FAC	-	Final Acceptance Certificate
FOW	-	Face of walk
ha	-	Hectare
ID	-	Inside diameter
Kg	-	Kilogram
lcd	-	Litres per capita per day
m3	-	meter cubed
OC	-	On centre
OD	-	Outside diameter
PVI	-	Point of vertical intersection
l/s	-	Litres per second
m/s	-	Metres per second
ACP	-	Asphaltic Concrete Pavement
ASBC	-	Asphalt Stabilized Base Course
SPD	-	Standard Proctor Density
CD	-	Compact Disc
DVD	-	Digital Video Disc
CCTV	-	Closed Circuit Television
PW	-	Public Works

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

1. FORWARD

This manual, passed by resolution 2021/051 of Cypress County Council on February 2, 2021, is intended to provide an information guide to set standards governing design, preparation and submission of plans and specifications for construction of municipal improvements in Cypress County. It is intended for use by Developers, Engineering Consultants, Utility Companies and County Services. These standards are provided to set out the "minimum" allowable levels to which the requisite improvements are to be built. In instances where the standards do not cover a particular situation or occurrence, good engineering judgment shall be used. All development shall comply with the requirements of Cypress County and Cypress County policies, all applicable Land Use Bylaws and Provincial and Federal legislation. This document is to be used in conjunction with the Cypress County Construction Standards, latest edition.

No departure from these standards shall be permitted without the written approval of the Development Officer of the County. The Municipal Planning Commission recognizes the importance of this document and shall reference it in decision making. Cypress County Council shall be the final authority on any disputed plans. Minor revisions may be given verbal approval by the County or other approved authority, but a change order shall be issued to record such revisions.

Generally, these guidelines and standards will not apply to County local collector or arterial roads and highways. Alberta Transportation Standard Specifications for Highway Construction, latest edition, shall be used.

All completed plans, records and documents shall be submitted a minimum of 30 days prior to final design acceptance by the County.

No construction shall commence until all designs have been accepted by the County and the following has been submitted:

a) Design drawings

b) Letters of Credit

c) Authority Contacts

d) Authority Approvals

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2. DEVELOPMENT PROCESS

2.1 GENERAL

2.1.1 Development Process

Cypress County has implemented processes for development within the County. The County will provide information detailing the steps required to obtain development permits, land use amendments, and subdivisions to interested parties upon request. The Developer/Applicant should be familiar with all stakeholders, committees and boards that are involved in the approvals process.

2.1.2 Municipal Development Plan and Tri - Area Inter-Municipal Development Plan

Cypress County has prepared a Municipal Development Plan that applies to all lands within the corporate boundary of Cypress County. The Municipal Development Plan outlines land use policies for both multi-parcel country residential and industrial/light industrial subdivisions and/or development.

As of April 1, 2018, the Municipal Government Act requires that all municipalities that share a common border are required to adopt an inter-municipal development plan. Cypress County, The City of Medicine Hat, and The Town of Redcliff have adopted the Tri-Area Inter-municipal Development Plan (Tri-Area IDP). The purpose of the Tri-Area IDP is to establish a regional framework for attracting economic opportunities and managing land use, subdivision, and land development in the IDP Tri-Area IDP area.

Cypress County will be adopting Intermunicipal development plans with other neighboring rural municipalities as a result of provincial legislation requirements. Developers should familiarize themselves with both the County's Municipal Development Plans and the Tri-Area IDP, and recognize their goals, objectives, and policies.

3. GENERAL CONDITIONS AND ENGINEERING PROCEDURES FOR MUNICIPAL DEVELOPMENT

3.1 GENERAL CONDITIONS

3.1.1 Scope

These design standards shall apply to the design and installation of the municipal infrastructure for new subdivisions and developments in Cypress County. They apply to the design and installation of storm and sanitary sewers, water mains, roads and sidewalks, together with their respective connections and appurtenances, and any other services that are required to be designed and/or installed.

These design standards also apply to the installation of water, sanitary sewer, and storm sewer services to existing properties, including surface reconstruction; the installation or alterations to roads, sidewalks, curb and gutter adjacent to existing properties; and the surface drainage of commercial, industrial, institutional and multi-family developments within Cypress County.

These design standards do not cover the design or installation of street lighting, ornamental lighting, power, gas and communication services. The location of such services, as shown in Appendix B of the Construction Standards, must be approved by the Development Officer.

The Standard Drawings, as referred to in various sections, will form an integral part of these design standards.

No departure from these design standards will be permitted except with written approval of the Development Officer. The Development Officer may give verbal approval to revisions that are considered being sufficiently minor. A Change Order shall be issued recording such revision.

3.1.2 Definitions

In these design standards, unless the context otherwise indicates, the following words shall have the meaning hereinafter assigned to them.

“Applicant”/ “Developer” shall mean a person who has applied for the subdivision, development or installation to serve an existing parcel of land, whether as the owner or an agent for the owner of the land included therein.

“Asbuilt Drawings” prepared by the engineer to reflect the work that was completed.

“Boulevard” The area on a developed roadway (urban) between the back of walk and back of curb.

“Contractor” will mean any person, persons or corporations that shall undertake the installation of Municipal Services on behalf of either the Applicant or the County.

“Council” means members of the municipal council of Cypress County.

“Country Residential” means lots in a rural development setting meeting the minimum size requirements for Country Residential Designation.

“County’s Engineer” means the Engineer or Engineering Firm working on behalf of Cypress County.

“County” shall mean or refer to Cypress County, in the Province of Alberta and/or person or persons working on its behalf.

“Developer’s Engineer” shall mean a qualified Professional Engineer registered and licensed to practice in the Province of Alberta, who is appointed or engaged by the Developer to be responsible for the design and preparation of drawings and specifications and provision of engineering supervision during the construction of the municipal improvements for the development area.

“Development Officer” means the Development Officer of Cypress County or assigned designate.

"Municipal Improvements" or "infrastructure" may also mean "Local Improvements" and shall mean both underground and surface structures including, but not necessarily limited to, watermains, sewer systems, storm drainage systems, roadways, walkways, park areas, shallow utilities, signage, fencing, street lighting, and other improvements as required by the County, all of which shall become the property of the County to operate and maintain.

"Prime Contractor" is as defined by Occupational Health and Safety.

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

3.2 PROCEDURE

3.2.1 Engineering Design

The Applicant shall retain the services of a Professional Engineer, registered and licensed to practice in the Province of Alberta, who shall be responsible for the design and preparation of drawings and specifications for all infrastructure (except lighting, telephone and power) to be constructed within and/or related to the proposed development area, as required, within Cypress County. The Applicant's Engineer is responsible for coordination of all shallow utility (i.e. electricity, streetlighting, natural gas, etc.) design and construction for the development. All required municipal improvements shall be designed in accordance with accepted engineering practices and shall meet or exceed Cypress County Design Guidelines and Construction Standards as set out herein. If landscaping plans are deemed required by the Development Officer the landscape plans will be prepared and stamped by a Landscape Architect or a Professional Engineer as required by Provincial Legislation.

For the installation of services or municipal infrastructure to serve an existing property, the applicant shall make application in writing on the appropriate form in conjunction with the development permit application as provided by the County. These applications do not necessarily require engineer design; however, the applicant must provide proof that the installation will conform to these design standards. If the Development Officer deems it necessary that the installation be monitored by a professional engineer, the applicant shall pay all costs for the monitoring.

The design drawings must show all existing and proposed services. It shall be the responsibility of the Developer's Engineer to coordinate with the utility companies to establish the location of their existing and proposed services.

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

The Developer's Engineer shall bring to the attention of the Applicant and the County the need for any right-of-way requirement outside the subdivision. The applicant shall provide proof of right-of-way to the County prior to the installation of services on such properties. Right-of-ways shall be assigned in the name of the County or, as applicable, the utility company. The applicant is to pay all costs associated with registering the right-of-way and fulfil all terms and conditions associated with establishing right-of-way.

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

3.2.2 Country Residential Lot Development

This section applies where such lots will not be serviced for sewage disposal and/or potable water supply by a County system or other County approved licensed sources and means. In addition to criteria provided here, such developments must conform to other section of these standards.

The Developer will provide a hydrogeological report, prepared by a Consultant competent in the field, showing that an adequate aquifer exists to accommodate the individual wells required for the development and that the development will not have an adverse effect on the aquifer or adjacent wells.

The County will require that each Country Residential lot will have adequate developable area for a building site. The Developer therefore, prior to the registration of Subdivision Plan, identify on a separate plan a suitable Building Site and Sewage Disposal Ground on each proposed lot.

To determine the water table level for the design of a Private Sewage Disposal system, Alberta Environmental Protection provides instruction on how to carry out a Water Table Test Hole drilling, sampling and monitoring program.

Guidelines for test hole excavation and logging soil textures were published by Alberta Environmental Protection Standards and Guidelines Branch.

Based upon the preliminary evaluation supplemented by the water table test hole program, the high water table areas must be delineated on a Base Map. This map must also outline major vegetation types and show the location of all water table and percolation test holes. In addition, the stabilized water table level within each water table test hole must be included. If bedrock is encountered within 2.4 m of the ground surface, it must be delineated on the Base Map and its lithology described.

The lands that have a water table less than two (2) 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 change the classification to Developable. Alternate sewage treatment and disposal systems may be considered. This type of approach to reclassify land will require prior approval of Council.

Each lot will have tests performed for water table levels and soil classification.

When the tests are completed, the Developer will 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 soil classification at the proposed Sewage Disposal Site.

For single parcel country residential development, a cistern (or other on-site water storage system) is acceptable.

3.2.3 Geotechnical Report

As part of the Subdivision application, the Developer shall submit a Geotechnical Engineering Report, prepared by a qualified Professional Geotechnical Engineer that identifies and evaluates the subsurface ground characteristics of the subdivision development area.

Those Applicants subdividing an existing home from a quarter section/parcel will not have to provide a geotechnical report.

Such report shall identify soil types and conditions, including frost susceptibility, soil stability, and water table elevations, as well as any potential difficulties that could be encountered during the construction of the municipal improvements.

At the requirement of the County, additional geotechnical information may be requested outlining recommended design and construction requirements and techniques that may have to be followed to satisfactorily develop the subdivision, particularly related to water and sewer main construction and roadway structures.

3.2.4 Submission of Engineering Design

Upon completion of the design drawings, the Developer's Engineer will submit to the County, two (2) complete sets of stamped and signed drawings and specifications of the proposed works, including the following:

a) Calculations of sanitary and storm sewer capacity, as shown on the overall sewer and water plan, and pipe loading, where these services are to be installed. To be on a separate page or in letter format.

b) Water distribution analysis as specified in Water Distribution Systems.

c) A print of the registerable plan of the subdivision (if not already supplied by the Applicant).

d) A copy of the soils investigation report, judged by the County to be pertinent to the stage of subdivision.

e) A copy of the Contract Documents proposed for construction purposes.

All proposed streets should be named on the drawings. All street names are to be approved by the Development Officer.

3.2.5 Design Review

All design drawings, specifications, and relevant data will be examined by the County or County's Engineer, and any revisions directed to the Developer's Engineer and/or marked on the prints during the review shall be incorporated in the final design drawings.

3.2.6 Design Approval

Upon completion of all revisions, the Developer's Engineer shall submit two (2) complete sets of Contract Drawings and Specifications to the County in hard copy as well as electronic PDF/DWG.

When the design is approved, the County shall return one set of the drawings to the Developer's Engineer, and issue a letter advising that the design is accepted and listing any conditions of acceptance.

No work will be commenced within any new parcel of land or any of the services to be provided by the Applicant until the County or County's Engineer has examined and approved any revised Construction Drawings.

3.2.7 Rights-of-Way and Easements

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

3.2.8 Construction Approval

Upon receipt of "Approved for Construction" drawings and specifications, the Applicant may proceed to install Municipal services subject to:

a) Satisfactory execution of a Development Agreement pertaining to the development or subdivision.

b) "Letter of Authorization" from Alberta Environment, through the Developer's Engineer, and a copy received by the County.

c) A list of materials that are being installed and a construction schedule submitted to the Development Officer.

A copy of all approved drawings and specifications will be maintained by the applicant at the construction site during the installation of services and be made readily available to County representatives.

Underground subdivision services will not be permitted to operate as part of existing Municipal services until the respective subdivision services have been inspected, tested by the Developer's Engineer and the test results have been approved in writing by the Development Officer.

3.2.9 Engineering Supervision

The applicant shall retain the services of an Engineer who shall be responsible for the layout to ensure finished construction conforms to the lines and grades shown on the approved plans for inspection and approval of all materials to be used, and for supervision of installation of all services, that are the responsibility of the Applicant. The Developer's Engineer, or his authorized representative, shall be available at all times to visit the site during the installation of services.

The Developer's Engineer will be responsible for maintaining field surveys and recording of all "as-built" drawings.

In addition to supervision carried out by the Developer's Engineer, the County, or it's agent, may periodically inspect any work being completed. The County will bring the use of any unacceptable materials or practices to the attention of the Contractor and/or the Developer's Engineer. If remedial action is not taken to the satisfaction of the County, it may be ordered the work cease until such time as the corrective action has been taken.

If the Developer's Engineer wishes to make any changes in the design, either before or during the execution of the work, he will first submit a marked print, showing proposed revisions, to the County. If approval is granted for revision, the original drawing will be immediately revised, and new prints issued.

3.2.10 Testing

It will be the responsibility of the Developer's Engineer to ensure that testing of all materials called for in the specifications is carried out by an accredited testing firm. Copies of all test results shall be forwarded to the County as soon as possible after completing the tests. The costs of the tests shall be borne by the Developer.

3.2.11 As-Built Drawings

Within four weeks of the Construction Completion Certificate of the underground improvements, the Developer's Engineer shall deliver to the County "as-built" prints indicating the service connections, tie-ins, invert charts on plan/profiles, and service invert elevations on lot grading plans. All as-built plans must also be submitted in digital format compatible with the County's latest version of AutoCAD, and PDF.

No development permits or building permits will be processed until the County receives a set of as-built prints, including completed design building grades for each lot. As an exception, one show home may be constructed with the written approval by the Development Officer, provided the subdivision design grades have been submitted and approved.

Within two months of completion of roadway base course asphalt, the Developer's Engineer will deliver "as-built" drawings; one complete set of prints and a digital copy (in the County's latest AutoCAD software version and PDF) of the as-built records to the County.

3.2.12 Municipal Acceptance and Maintenance Period

The Developer shall apply for a Construction Completion Certificate for each group of improvements for each stage of development. A Construction Completion Certificate will be required by the Developer from the County for each group of the following improvements to be constructed and installed by the Developer; namely:

a) Sanitary and storm sewers, and water distribution system, including service connections for water and sewer.

b) Sidewalks, curbs and gutters, catch basins, concrete walkways, and paved and graveled lanes.

c) Paved Roads.

d) Landscaping, including boulevards, parks and playgrounds, uniform fencing, and subdivision signage.

The Developer shall make application to the County for the issuance of a Construction Completion Certificate. No such application will be considered by the County unless it is requested in respect of all of the Development Area or one or more approved stages of development.

The County may issue a Construction Completion Certificate, issue a Conditional Construction Completion Certificate or provide a list of deficiencies that must be corrected in order to obtain a Construction Completion Certificate. The details of the process will be outlined in the development agreement.

The Developer shall maintain all Municipal Improvements constructed pursuant to this Agreement to the standard to which they were constructed, reasonable wear and tear excepted, for the period commencing upon the issuance of a Construction Completion Certificate and continuing for the periods as stated in the table below:

Table for Maintenance Period

Underground Services and Utilities	24 months
Roads and Sidewalks	24 months
Uniform Fencing, grass and sod for landscape areas	24 months

Upon completion of the Maintenance Period, and after final inspection and correction of all deficiencies thereof, a Final Acceptance Certificate will be issued by the County.

3.2.13 Development Permits

No Development Permits or building permits will be issued until the subdivision plan is registered, all essential services have been provided as specified in the Development Agreement, underground utility service as-built

prints have been submitted and accepted by the County, and the Construction Completion Certificate has been issued (i.e. all paving is complete and accepted).

3.2.14 Existing Utilities

Prior to connecting to existing utilities, the County's Utilities Department shall be given a minimum of two (2) working days notification of the work being done.

Once operational, hydrants or main line valves shall only be operated by County staff.

No sanitary sewers will be used to discharge storm water

3.2.15 Road Closures and Construction within Road Rights-of-Way

In the event that a road must be partially or fully closed due to construction activity, the party causing this event will provide all detours, signs, flag persons, barricades, and other safety requirements necessary to provide for the orderly control of traffic around the construction area.

Temporary traffic control shall be prepared in accordance with the following:

1. Alberta Transportation – Traffic Accommodation in Work Zones;
2. City of Medicine Hat – Temporary Traffic Control Manual

Temporary Traffic Control must be approved by the Engineer of Record and Cypress County.

3.2.16 Survey Control System

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

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

Cypress County	CONSTRUCTION COMPLETION CERTIFICATE- SAMPLE

Development Area: _____ Development Name: _____

Developer: _____ _____

Contractor: _____

Municipal Improvement: _____

Location of Municipal Improvement referred to herein is as shown, outlined in red, on the plan on the reverse hereof, (Or see attached).

Date of Application: _____

PURSUANT TO THE DEVELOPMENT AGREEMENT, I _____ OF THE FIRM "DEVELOPER'S ENGINEERS", HEREBY CERTIFY THAT AS OF THE ABOVE DATE, THE SAID MUNICIPAL IMPROVEMENT IS COMPLETE AND CONSTRUCTED IN ACCORDANCE WITH THE SERVICING STANDARDS AS SET OUT IN THE DEVELOPMENT AGREEMENT, AND I HEREBY RECOMMEND THIS MUNICIPAL IMPROVEMENT FOR APPROVAL.

Project Engineer (seal) (Developer's Engineering Firm) Date: _____

Signing Officer (Developer's Engineering Firm) Date: _____

Authorized Inspector Date: _____

Approved on (date): _____ Engineer: _____

Conditional Approval (date): _____ Engineer: _____

Conditions: (See attached report) _____ Engineer: _____

Rejected on (date): _____

Reason for rejection: (See attached report) _____

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

Approved:_____ Date:_____

County Representative

Date Maintenance Period to Start: _____

Date Maintenance Period to Expire: _____

Cypress County	FINAL ACCEPTANCE CERTIFICATE-SAMPLE

Development or Subdivision : _____ Permit or Subdivision #_____

Developer: _____

Contractor: _____

Municipal Improvement: _____

Location of Municipal Improvement referred to herein is as shown, outlined in red, on the plan on the reverse hereof, (Or see attached).

Date of Application: _____

Maintenance Expiry Date: _____

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

Date: _____

Project Engineer (Developer's Engineering Firm)

Date: _____

Signing Officer (Developer's Engineering Firm)

Date: _____

Authorized County Representative

Approved on (date): _____ County Representative: _____

Rejected on (date): _____ County Representative: _____

Reason for rejection: (See attached report) _____

_____

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

Date: _____

_____
Project Engineer (Developer's Engineering Firm)

Approved: _____ Date: _____

County Representative

4. PREPARATION OF ENGINEERING DRAWINGS

4.1 DESIGN DRAWINGS

4.1.1 Scope

The following specifications will govern the preparation of Engineering Drawings for all Municipal Developments.

4.1.2 Drawing Size, Material

The Standard Drawing A-1 drawing size (560 mm x 864 mm) will be used.

Originals will be prepared in ink on bond with a digital (pdf) version.

4.1.3 Scales

Urban Residential/Industrial and Rural Industrial drawings shall be prepared using the following scales:

Overall Plans	1:1000; 1:500; 1:1250
Plan/Profile	Horizontal 1:500 Vertical 1:50
Cross-Sections	Horizontal 1:100 Vertical 1:50

Rural Residential drawings with approval may be prepared using the following scales:

Overall Plans	1:2000
Plan/Profile	Horizontal 1:1000 Vertical 1:50
Cross-Sections	Horizontal 1:1000 Vertical 1:50

4.1.4 Drawing Technique

Points of drawing technique that are significant to the preparation of drawings are as follows:

a) Care in ensuring balanced distribution of detail throughout the drawing.

b) Letters and figures shall be clearly legible, well spaced, properly formed and proportioned;

c) Lines shall be uniform in weight and density;

d) Dimensioning shall be in the metric system. Dimensioning of a drawing is extremely important and should be such that it will not be misinterpreted. Dimensions should be given from an iron pin, lot line, a centerline or any other reference that can be readily established. Wherever possible, all dimensions shall be provided to a minimum of two (2) property lines;

e) 11 x 17 Plans with readable print must be provided to Cypress County

4.1.5 Title Block

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

a) Developer's / Owner's Name.

b) Developer's Engineer or consulting engineering name.

c) Subdivision name, including staging and / or phasing.

d) Drawing name, number and issue date.

e) Drawing scale, including horizontal and vertical axis.

f) Space for dates and signature of the designer, draftsperson, reviewer or checker, and approving professional or principal.

g) Space for professional stamps and permits.

h) Space for revisions, including number, date, description, and approved signature.

4.1.6 General Requirements for All Drawings

Elevations will be relative to the Geodetic datum. The reference bench marks and elevations will be shown on the design drawings.

A north arrow, the name of the subdivision and, where appropriate, phase as included in the Development Agreement, adjacent lots and plan numbers, street names and the legal description of the parcel being subdivided, will all be shown on the drawing. In general, the north arrows should be orientated toward the top of the plan.

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

4.1.7 Required Engineering Drawings

The following plans will form a part of the design drawings set as applicable to urban, rural, commercial, or industrial developments:

Cover Sheet:

This will show the name of the subdivision, stage of development, location plan, County logo, and names of the Developer and Developer's Engineer. Space permitting, the index plan may be included here. A key plan of Cypress County, or a significant portion thereof, shall be included, illustrating the location of the development or project.

Index Plan:

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

Contour Plan:

This plan will be drawn at scaled indicated and will indicate the existing contours at 1.0 metre intervals (rural developments) and 0.5 metre intervals (urban developments), the proposed land use and all significant above ground features, such as buildings, structures, trees, utilities and water bodies.

Sanitary Sewer, Storm Sewer and Water Main Overall Plan:

This plan will be drawn to scales indicated and will indicate the alignments and locations of mains, size of mains, valves, hydrants, manholes, catch basins, storm catchment areas with areas labeled in hectares, direction of sewer main flows and locations of appurtenances.

Road, Sidewalk and Walkway Plan:

This plan will be drawn to scales indicated and will show all locations and widths of roads, lanes, sidewalks, walkways, and right-of-way widths and alignment, and the storm drainage system including the local drainage areas, catch basins, pipe and culvert locations, sizes, inverts, direction of flow, as well as all proposed approaches.

Lot Grading Plan:

This plan will be drawn to scales indicated and will indicate the original contours at 0.5 m intervals (shown in screened format), proposed areas of grading, finished lot corner elevations, grades and direction of finished surface drainage flows.

Shallow Utilities Plan - Power, Gas, Telephone and Cable:

This plan will indicate the alignments of power, gas, telephone and cable, and shall be drawn to scales indicated. Existing infrastructure and other relevant features shall also be shown in detail.

Detailed Plan/Profile drawings:

Plan/Profile drawings shall be drawn to a scale of 1:500. The profile portion shall have a 10 times vertical exaggeration.

4.1.8 Detailed Plan/Profile

Generally, all underground services and surface improvement profiles are shown on the same drawing. The plan portion of the sheet shall be at the top, and the title blocks, revisions, legends, company stamps, and similar features will be placed along the bottom of the sheet.

The following information will be included on the detailed plan/profile drawings:

Requirements for Sanitary and Storm Sewer:

The following information will be shown on the profile:

a) Size, type, depth, class of pipe and class of bedding.

b) Length and percent grades between manholes.

c) Invert elevations at both inlet and outlet of manholes.

d) Rim elevations at finished grade.

e) Storm Water Management calculations; including but not limited to:

   a. Weighted runoff coefficients;

   b. Pipe design and sizing calculations

   c. Ponding and storm water retention calculations.

The following information will be shown on the plan:

a) Tie location of manholes, cleanouts, and other appurtenances to property lines.

b) Pipe offsets from property line.

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

a) Manholes shall be numbered.

b) Where the sanitary sewer or water and storm drain are to be installed in a common trench, detail a typical cross-section showing distance between pipes, class of pipe and bedding.

Requirements for Water:

a) Tie the location of hydrants and other appurtenances to the nearest property pin.

b) Show the offset of the main from the property line and locate the end of the main to the nearest property pin.

c) Indicate extent of work required in making the connection to the existing water main.

d) Indicate the size, type, class of pipe, bedding and CSA specification number on the plan.

Requirements for Roads:

a) Both plan and profile must be tied to a property pin, preferably near or at 0 + 00 chainage.

b) Show the road width and the curb offsets measured from the property line to the curb face.

c) Chainages of the BC and EC of horizontal curves will be shown together with the delta angle, radius, tangent length and arc length for each curb.

d) The percent grade, to two decimal places, shall be shown on the profile, together with the following information on vertical curves:

1) The chainage and elevations of BVC, EVC and PVI.

2) The external value, “e”;

3) The length of vertical curve.

4) The elevation and chainage of the low spot of sag curves or the high spot of crest curves.

e) Road profiles will show the or Lip-of-Gutter elevations, identifying which has been used

f) The profile will be shown at true centreline length and projected above the plan in as close a relationship as possible.

g) Locate catch basins (using road chainage) and show leads between the catch basin and manhole.

h) Label limits of construction.

4.1.9 Lot Grading Plan Requirements

This plan will include:

a) Invert and location of sewer and water services.

b) Proposed top-of-curb or back-of-walk elevations.

c) Existing and proposed contours at 0.5m intervals.

d) Proposed finished lot corner elevations.

e) Proposed finished lot elevations on each property line at ¼, ½, ¾ intervals of the property line length and any grade changes.

f) Distances from a property pin to the proposed grade break points on property lines that divide properties.

g) Proposed finished lot elevations at grade break points.

h) Standard detailed drawings shall govern the lot grading design, and critical swales elevations will be calculated as per the types shown.

i) The lot grading plan will have the following note: “The surveyor shall design and stake out the house elevations and finished grades at house to meet the building code slope requirements for proper drainage to critical swales”.

j) The grading plan will identify lots with weak subsoil conditions and have a notation indicating the requirement for a geotechnical engineer’s footing design.

k) The grading plan will identify all lots with areas of 1.0 m of fill or greater, with these lots shaded a different colour.

l) Direction of surface drainage and swale elevations on side property lines.

m) The lot grading plan will have the following note: "The Developer will be responsible to ensure all footing checks have been reviewed and approved by the Developer's Engineer prior to the pouring of the footing concrete. The footing check grade slip shall indicate the proposed and actual field surveyed geodetic grades of the footing. The Developer's Engineer will submit the approved footing check/grade slip to the County before the Development Officer will issue any development permits."

4.1.10 Power, Gas, Telephone and Cable Utility Plan Requirements

This plan will include:

a) Street Light Locations.

b) Dimension of all Easements.

c) Location of pedestals, transformers, cabinets, and other hardware.

d) Lot Numbers.

4.2 SUBMITTALS

4.2.1 General

The Developer is required to provide the following submittals to the County in paper hardcopy and electronic AutoCAD and PDF:

a) Two (2) County approved sets of Drainage/Storm Water Management Plans (to be submitted prior to any other construction plans for the Development Area).

b) Two (2) copies of the Registered Plan of Subdivision (prior to or concurrent with the Preliminary Plans).

c) Two (2) sets of Preliminary Plans and Profiles (one of which to be returned to the Developer showing any amendments the County requires be made).

d) Two (2) sets of Construction Plans and Profiles for final approval and before any work will be authorized.

e) Two (2) sets of Construction Plans and Profiles that illustrate any deviations from the original set of Construction Plans and Profiles. The Developer may not proceed with construction until written approval is obtained from the Development Officer.

4.3 AS-BUILT DRAWINGS

4.3.1 Scope

This procedure pertains to the as-built drawings of the following services:

a) Storm and sanitary sewers, watermains, roads, curbs, sidewalks, culverts and other miscellaneous permanent structures.

4.3.2 General

The as-built drawings shall be affixed with the stamp and seal of a Professional Engineer who, by signing, is certifying the information to be accurate and correct.

The as-built drawings will clearly show the locations of all services, curb cocks, valves, hydrants and manholes, using right angle measurement from survey pins.

Red line as-built drawings are to be submitted for review, indicating changes.

The as-built drawings are to be submitted to the County on high quality bond within three months of the installations.

The as-built drawings referred to in this section will also be submitted to the County in digital format, as per the following requirements:

a) Must be compatible with the County version of AutoCAD.

b) Accompanied by a layer list and description.

c) Will conform to layering and symbol standards as established by the County or their Consultant.

d) Include PDF files.

e) Be submitted on USB Memory Stick.

On as-built drawings submitted to the County, the following information will be included on each drawing:

a) Date of completion.

b) Name of the contractor.

c) Date on which “as-built” details were added.

4.3.3 Storm and Sanitary Sewer

The following information will be included for storm and sanitary sewer systems:

a) Size, pipe material, pipe class, bedding and location of mains.

b) Location of manholes, and other appurtenances.

c) Grades, lengths, inverts of mains and rim elevation.

d) Profile of pipe top and bottom.

e) Corrected flow calculations.

4.3.4 Water

The following information will be included for water systems:

a) Size, type and location of pipe.

b) Location of valves, tees, hydrants and other appurtenances.

c) Profile of pipe top and invert.

4.3.5 Road, Curb, Sidewalks

The following information will be included for roads, curbs, and sidewalk:

a) Location of curbs, sidewalks and elevations of tops-of-curb or lip-of-gutter.

b) Top-of-curb or lip-of-the gutter for each curb.

c) End of curb, sidewalks and pavement.

d) Type of road structure on overall road plan and each plan profile.

e) A typical cross-section referencing the above and representing all conditions.

4.3.6 Water, Sanitary, and Storm Service Connections

A table on each plan/profile drawing will be prepared giving the following information with respect to service connections:

a) Lot number.

b) Distance of service saddle from the downstream manhole.

c) Invert elevation at the end of sanitary and storm service.

The service connection provided to each lot will be shown on the plan and the location triangulated to the property lot corners.

The typical location of the curb stop will be identified on each plan/profile, (i.e. 0.3 m F.O.W., 2.65 m B.O.W.) by means of a table chart.

4.3.7 Mechanical Systems

Where the subdivision includes mechanical systems, such as lift stations, SPVR, PRV, Booster Pump, the Developer will provide detailed drawings of the facility, as well as operation/maintenance manuals, including the make and model of all equipment, to the satisfaction of the County.

4.3.8 Building Grade Certificates

Prior to issuance of a Construction Completion Certificate for water, sanitary, and storm services, the Developer shall provide to the County the relevant Building Grade Certificate for each lot in the Development.

As outlined in the Development Agreement, Development Permits or building permits will not be released until all of the conditions outlined in the Development Agreement are met.

Building Grade Information

The following information shall be shown on a Building Grade Certificate form which can be found at the end of this section:

a) Water, sanitary, and/or storm services location and inverts at property line or easement line.

b) Power, telephone, and cable television service location.

c) Sidewalk and boulevard width.

d) Easements.

e) Lot corner surface elevations.

f) Landscape elevations at front of house.

g) Lot drainage pattern.

h) Streetlights, hydrants, etc.

i) The lot grading plan will have the following note: “The Developer will be responsible to ensure all footing checks have been reviewed and approved by the Developer’s Engineer prior to the

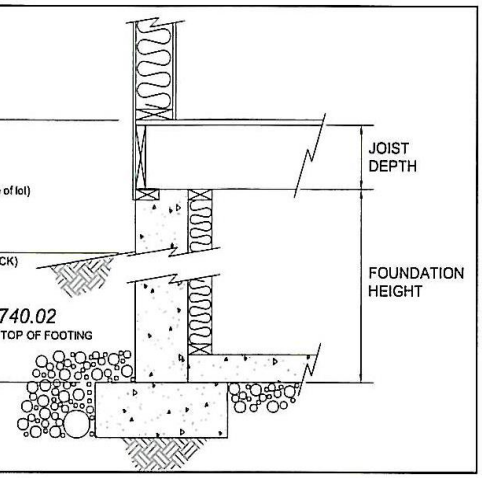
pouring of the footing concrete. The footing check grade slip shall indicate the proposed and actual field surveyed geodetic grades of the footing. The Developer's Engineer will submit the approved footing check/grade slip to the County before the Development Officer will issue any development permits."

CYPRESS COUNTY
816 - 2nd Avenue
DUNMORE, AB T1B 0K3
(403) 526-2888

BUILDING GRADE FORM

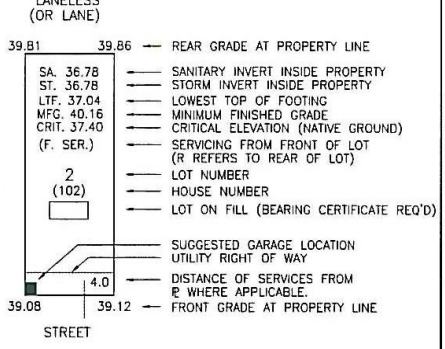
GRADE SLIP NO.	0001-1-A
JOB NO.	1234567
ADDRESS	100 - 1 AVENUE
SUBDIVISION	ABC - PHASE 1
LOT 1 / BLOCK A / REG'D PLAN NO.	012 3456
DEVELOPER	DEF DEVELOPMENTS
CONSULTANT	XYZ CONSULTANT
BUILDER	
REPRESENTATIVE	
ADDRESS	
PHONE NO.	

PROPOSED BUILDING GRADES



ALL ELEVATIONS ARE: METRIC GEODETIC

LEGEND



ADDITIONAL REQUIREMENTS

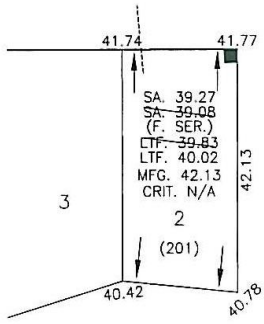
	FRONT	REAR	CENTERED	REFER TO PLAN	SIZE	TYPE
SANITARY	☑	☐	☐	☑	100mm	PVC
STORM (WTD)	☐	☐	☐	☐		
WATER	☑	☐	☐	☑	25mm	CU

BUILDING SETBACKS 6m FRONT 6m BACK 1.5m SIDE

	YES	NO
GROUND WATER DRAIN WITH BACKFLOW PREVENTER TO SEWER REQUIRED (WTD)	☑	☐
GROUND WATER DRAIN TO SUMP PUMP REQUIRED	☐	☑
WATER PRESSURE REDUCING VALVE REQUIRED (PRV)	☐	☑
SERVICE INSTALLED 3.50m INSIDE OF PROPERTY	☑	☐
HIGH SULFATE CONCENTRATIONS PRESENT IN THE SOIL SULPHATE RESISTANT CEMENT (TYPE 50) REQUIRED	☑	☐
ADDITIONAL SULPHATE REQUIREMENTS (SEE NOTE BELOW)	☐	☑
FOUNDATION SOIL BEARING INVESTIGATION AND CERTIFICATION REQUIRED (SEE NOTE BELOW)	☐	☑
GEOTECHNICAL RESTRICTIONS APPLY (SEE GEOTECHNICAL REPORT)	☑	☐
UTILITY EASEMENTS	☑	☐
FOOTING ELEVATION CHECK REQUIRED PRIOR TO POURING (MAX. 100MM DEVIATION) (NOTIFY ENGINEER 48 HOURS IN ADVANCE - COST COVERED BY THE TOWN OF REDCLIFF)	☑	☐
MINIMUM GRADE CHECK REQUIRED PRIOR TO POURING (MAX. 100MM DEVIATION) (NOTIFY ENGINEER 48 HOURS IN ADVANCE - COST COVERED BY THE TOWN OF REDCLIFF)	☑	☐

1. IT IS THE RESPONSIBILITY OF THE BUILDER TO ENSURE THE FOOTINGS ARE PLACED ON A PROPER BASE THAT IS FREE FROM FROST, EXCESSIVE MOISTURE AND DELETERIOUS MATERIALS AND HAVE APPROPRIATE FROST PROTECTION WHEN COMPLETE.
2. LIST OTHER CONSTRAINTS BELOW.
3. NOTES: * *COSTS OF ANY UNEXPECTED FILL MATERIAL ENCOUNTERED AFTER EXCAVATION IS COMPLETED INCLUDING ANY ADDITIONAL EXCAVATION OR DESIGN SHALL BE AT THE COST OF THE PROPERTY OWNER.*

PLAN



I CERTIFY THAT THE FINAL HOUSE PLANS PROVIDED, IN THE BUILDING PERMIT APPLICATION, ARE THE SAME AS PROCESSES UNDER THIS GRADE SLIP AND THAT I UNDERSTAND THE INFORMATION AND THE REQUIREMENTS CONTAINED HEREIN AND WILL BUILD ACCORDINGLY.

AUTHORIZED BUILDER'S REPRESENTATIVE

SIGNATURE _____ DATE _____

THE INFORMATION CONTAINED HEREIN IS BASED ON THE APPROVED BUILDING GRADE PLAN FOR THIS SUBDIVISION.

ISSUED BY AUTHORIZED CONSULTANT'S REPRESENTATIVE

SIGNATURE _____ DATE _____

5. WATER DISTRIBUTION SYSTEM

5.1 GENERAL

The design of the water system shall conform to the "Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems in Alberta", as published by Alberta Environment and as amended by these Guidelines and Standard Details.

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

The Developer is responsible to confirm adequate capacity in an existing water distribution system to be extended into the new development area.

Rural systems will involve individual wells for each lot, or a communal well with a treatment and distribution system. Systems must meet Alberta Environment requirements. An investigation of the aquifer and it's capability to sustain new development with no adverse affects on existing wells shall be included in the Geotechnical/Hydrogeological Report for the site.

Rural systems may also utilize irrigation water as the source of supply, in which a domestic supply water agreement will have to be executed with the local irrigation district, and a copy of the agreement is to be provided to the County. An adequately sized dugout will be required for each lot for the purposes of storing water year round, and is to be shown on a County approved site plan which complies with all development setback requirements.

If domestic water is to be acquired through a local water co-op, then the Developer is to provide a water connection agreement or verification from the co-op for each parcel requiring water within the development.

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

The Developer will ensure that application is made to Alberta Environment for a permit to construct the work as required.

5.1.1 Urban Distribution Water System

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

a) Give the County sufficient notice of the proposed work and schedule so proper planning and approvals can take place.

b) Supply all water necessary for the work and obtain written permission from the County prior to using any hydrants.

c) Obtain written permission prior to operating any of the County's valves and/or hydrants. The Contractor shall be held responsible for any damage done to the hydrants or surrounding area. The County may require their own personnel to operate their valves and/or hydrants.

d) Make an agreement with the County for payment of water used.

e) Be responsible for the supply of all water necessary for the Work.

f) Provide 24 hours notice to any property owner affected by water service disruption.

g) Supply an alternative water service if the water disruption is longer than 4 hours.

h) For establishments relying on an uninterrupted water source for their operations, an alternative water source shall be provided.

i) The above noted requirements shall be done at the Contractor's cost.

5.1.2 Rural Water Distribution System

The guidelines developed by Cypress County are intended to be consistent with the Water Act, its regulations and any related guidelines developed by Alberta Environment (AE). Where any discrepancy exists, Alberta Environment requirements will apply.

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

Groundwater

Groundwater Supply:

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

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

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

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

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

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

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

Well Drilling:

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

Groundwater Specialist:

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

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

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

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

d) Feasibility of treating groundwater if needed.

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

Quantity of Water:

A central well must be capable of meeting the household requirements of all the existing and proposed lots within a quarter section, calculated based on an average meter consumption of 1250 m^3/year/household (0.523 igpm/household). These requirements do not provide for fire protection, irrigation, livestock, or any other use.

Groundwater Supply Evaluation Report must include, but be limited to, the following:

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

b) **Assessment of existing information** - Using the information collected, the Consultant must assess with respect to each of the groundwater supply evaluation criteria, whether there is sufficient existing hydrogeological information to confidently estimate the groundwater supply potential in the vicinity of the proposed subdivision. This assessment must be presented in the report.

c) **Aquifer testing if existing information insufficient** – Any testing of aquifer capacity will be carried out in strict accordance with AEP guidelines, with the Developer responsible for all necessary licensing.

d) **Determination of the adequacy of the groundwater supply** - Using the above information in the groundwater water supply evaluation criteria, the Consultant must determine whether the groundwater supply is adequate to meet the needs of any existing development and the proposed subdivision. Discussion and findings must be presented in the report.

e) **CONCLUSION** -In the conclusion of the report, the Consultant must clearly state that there is an adequate groundwater supply potential to meet the needs of any existing development and the domestic requirements of the proposed residential subdivision. In addition, the Consultant must state in the conclusion whether the evaluation was performed in conformance with these guidelines. If the report does not contain a recommendation on the groundwater supply potential and/or statement of conformance to these guidelines the subdivision approved authority must identify this as a major deficiency and not proceed with the application until this has been remedied; and

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

Sources of Existing Groundwater Data:

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

5.2 DESIGN REQUIREMENTS

The minimum size of distribution main shall be 150 mm diameter for residential, 200 mm diameter for commercial and 300 mm diameter for industrial.

PVC pipe shall be used and the value of "C" in the Hazen-Williams formula shall be 120 for all types of pipes.

Residential per capita consumption shall be:

Average Daily Demand	-	1000 Litres per capita per day
Maximum Daily Demand	-	2600 litres per capita per day
Peak Hourly Demand	-	3100 litres per capita per day

The design population shall be the ultimate for the area under consideration.

For non-residential developments, the minimum water consumption rate shall be equal to 0.2 litres per second per hectare. The applied peaking factor shall be $Pf = 10Q^{-0.45}$ to a maximum of 25 and a minimum of 2.5, Q being in litres per second. Where possible, water demand shall be based upon site specific requirements for identified uses. Fire flow requirements are to be included in all calculations.

An analysis will be made for Peak Hour Demand, and mains shall be sized such that there will be a minimum residual pressure of 276 kPa (40 psi) at ground level at any location in the system.

Separate analysis shall be made for Maximum Demand plus Fire Flow. The residual pressure at any location at the ground level shall not be less than 140 kPa (20 psi).

Fire flow requirements shall be in accordance with the Fire Underwriters Survey publication entitled "Water Supply for Public Fire Protection – a Guide to Recommended Practice", latest revision thereof. Generally, these are: for single family residential 60 l/second, for multi-family residential 90 l/sec, for Institutional 90 l/sec, commercial 190 l/sec, and light industrial 230 l/sec.

All new developments are to be designed with the assumption that fire flows are available.

Where the size of the area to be developed warrants, or if required by the County, a network analysis will be carried out and all relevant information will be submitted with the design documents.

Water main looping will be required where the number of lots exceed 20 lots and also for urban cul-de-sacs exceeding 150m in length.

5.2.1 Water Main - Location and Installation

Mains shall be installed to provide a minimum depth of cover of 2.7 metres (minimum) below the final finished surface grade. Maximum depth of cover shall be 3.5 m unless authorized in writing by the County. Additional depth may be required under roadways.

A minimum of a 3.0 m horizontal separation shall be maintained between a water main and any sewer main.

The minimum requirement for pipe bedding shall be Class "B" bedding.

Water main installation shall be in accordance with manufacturer's requirements and these Specifications.

5.2.2 Hydrant - Location and Installation

The maximum allowable spacing between fire hydrants shall be 150 m in single-family residential areas and 120 m in multiple-family residential, school, and 100 metres in industrial/commercial areas.

Hydrant locations shall be such that the distance to any building shall be no greater than 75 m. For the case of multi-family and/or commercial buildings with standpipes, the distance shall be 45 m unobstructed driving distances, between hydrant and standpipe.

Hydrants on the distribution main will be installed at the projection of property lines, except:

a) Where the hydrants are installed at the intersections, they shall be installed adjacent to the cut-off corners of the lot.

b) Where the hydrants are installed in a cul-de-sac, they will not be installed within the turning circle but shall be located at the tangent points.

c) Where a hydrant and sanitary manhole fall on the same property line projection, the manhole will be moved a minimum of 5 metres away from a hydrant.

Hydrants shall be located to conform to curb and sidewalk design and shall be installed as follows:

a) The center of the barrel is to be 2 m back of face-of-curb or 0.5 m back of walk. With rural cross-sections, install hydrants 1.0 m from property line.

b) The maximum distance from the face of the curb to the hydrant shall be 3.5 metres.

c) Shall be installed in accordance with the Standard Drawing and the Engineering Specifications outlined in these documents.

d) Hydrants shall be plugged or draining depending on the site conditions (high ground water or poor soil drainage);

e) A gate valve will be provided on each hydrant lead;

f) Cathodic protection to be installed as per Appendix B of the Construction Standards.

g) All bolts to be stainless steel.

h) All barrels to be epoxy coated.

Additional hydrants shall be installed at high value properties if deemed necessary by the County. If required, specific requirements of these hydrants will be determined at the development permit stage.

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

5.2.3 Valve - Location and Installation

All valve boxes located in streets shall be left flush with the base course asphalt. Immediately prior to the final lift of asphalt being placed, these valve boxes shall be raised to 1 cm below final grade.

Valves on the distribution mains will be installed:

a) At the projection of a property line at intersections or in mid-block, for urban sections. One meter from property line for rural sections.

b) With two valves at a tee and three valves at a cross.

5.2.4 Valve Box

Valve box shall be Norwood Foundry Type A, PVC or Cast. Valve box shall consist of a cast iron bonnet of sufficient size to fit over the valve, and an adjustable cast iron top box with lid.

Valve boxes shall be of suitable length for depth of bury specified for mains, with possible adjustment of 300 mm up or down from this length.

Valve box extensions shall be cast iron suitable for use with the valve box to be installed.

All cast iron surfaces to have a bituminous coating for corrosion resistance.

Distribution main valves shall be located such that during a shutdown:

a) No more than one hydrant is taken out of service;

b) No more than four valves are required to affect a shutdown;

c) No more than twenty residential units are taken out of service by a shutdown, including cul-de-sacs; and

d) Valves shall be installed in accordance with the Contract Specifications for the project and as per the Standard Drawing.

5.3 THRUST BLOCK

At all hydrants, plugs, tees, crosses, bends, and all other points of concentrated thrust, provide reaction blocking (thrust blocks), as detailed, to prevent movement. Place reaction blocking against solid undisturbed ground. Details provided herein are intended to be general, and are based upon soil load values of 7300 kg/m2 or more. Where soil will not provide this load value, provide additional bands and clamps, or provide more substantial

reaction blocking, as required to take the anticipated reaction. Place blocking to provide access to pipe and fittings for repairs or future extensions of the line.

Thrust blocks will be provided as per the Standard Drawings in the Construction Standards. Thrust blocking shall be Type 50 sulfate resistant concrete having a minimum compressive strength of 28 MPa at 28 days.

Pipe restraint devices shall be used in conjunction with thrust blocks, where identified as being required, and shall be in accordance with the manufacturer's recommendation. All restraint devices shall be stainless steel or suitable, resistant to corrosion, to the satisfaction of the County.

5.4 HYDROSTATIC PRESSURE TESTING

Tests shall be made only after completion of services, partial or complete backfill, and a minimum of 24 hours after the pipe has been filled with water. No test will be applied until at least 36 hours after the last concrete reaction or thrust block has been cast with high early strength cement, or at least seven days after the last concrete reaction or thrust block has been cast with sulfate resistant cement. The duration of each test shall be two (2) hours. Test pressure will be 2.0 times the normal system operating pressures or 1,035 kPa, whichever is greater. Test pipeline in sections not exceeding 365 meters in length.

5.4.1 Disinfection

All water mains will be disinfected in accordance with AWWA specification C651, latest revision.

Before being placed in service, and before certification of completion by the Engineer, all installed mains will be disinfected according to the AWWA Standard C651-99 "Disinfecting Water Mains" and tested for bacterial content and chlorine residual.

On completing the chlorination of the mains, the Contractor shall set the system in operation as directed by the Engineer.

Dechlorination of the chlorinated water may be required in some circumstances before discharging the water to the environment, in order to meet the regulatory requirements of Cypress County or Alberta Environmental Protection. Dechlorination, if required, is to be performed by adding neutralizing chemicals (AWWA C651-86, Appendix B) to the chlorinated water as it is flushed from the system and before it enters the receiving environment.

5.4.2 Cathodic Protection

Cathodic protection shall only be used if the proposed fitting is not epoxy coated or the epoxy coating is damaged. All buried fittings and valves shall be cathodically protected with a 2.3 kg Zinc Anode, and all hydrants shall be cathodically protected with a 5.5 kg Zinc Anode., per Standard Detail 4-400.

Zinc Anodes shall conform to ASTM B418-73, Type II.

Lead Wires No. 10A WG/7, two metres long.

Wire shall be connected to fittings with a cadweld.

A minimum of three litres of water shall be poured on each Anode to initiate the Anode's operation.

5.4.3 Flushing of Existing and New Water Mains

Prior to flushing of any watermains, Cypress County Public Works Department will receive a minimum of two working days' notice. Only County personnel will operate existing valves.

5.4.4 Usage of County Water

The Developer's Engineer shall be responsible for calculating the water used for flushing of mains. This calculation shall be submitted to the County at the time of the Construction Completion Certificate (CCC). The Developer shall be responsible for the cost of the water used to flush the mains and shall be invoiced accordingly. The cost of this water shall be calculated using the current charges, as may be amended from time to time, as outlined in the Water Rates Bylaw.

5.5 RURAL FIRE PROTECTION

5.5.1 General

All commercial and industrial development must have adequate water available for fire protection, typically this can be provided for by the installation of a fire pond. The exact volume of water required will vary based on the type of use and density. The National Fire Protection Association (NFPA) standard 1142 (Standard on Water Supplies for Suburban and Rural Fire Fighting" is to be used as a design guideline. Final acceptance of the proposed facilities for fire fighting are to be determined under the Alberta Safety Codes Act.

In addition to providing the required water (which must be available for use at all times) the Developer will be required to provide access to it: this may require the construction of an approach, the installation of one or more fire hydrants, and/or the installation of one or more staging areas. If the water is stored in an area where it may be a hazard, the Developer may be required to provide safety measures such as a berm or fencing at the County discretion. The size, location, and type of fire protection must be included as part of any Area Structure Plan.

Where required, fire ponds and dry hydrant systems are to be designed by a Professional Engineer and conform to equipment available for fire-fighting purposes within the County.

5.5.2 Fire Ponds

For details regarding the design of fire ponds consult Alberta Environment's wet pond standards in the publication entitled "Storm Water Management Guidelines for the Province of Alberta". Some general design parameters to consider for fire ponds are:

a) Pond to be located on County property (i.e. Public Utility Lot)

b) minimum water surface area of 2 ha.

c) maximum 4:1 to 5:1 side slopes above active storage zone.

d) maximum 5:1 to 7:1 interior side slopes in active storage zone.

e) maximum 3:1 exterior side slopes.

f) permanent depth to be a maximum of 3.0 m and a minimum of 2.0 m.

g) maximum water level should be below adjacent house basement footings.

Fire ponds are to be chainlink fenced (minimum 2.0 m high with barb wire upper portion) as required by the County to prevent any unauthorized access, with one (1) 4.0 m vehicle access gate and one (1) man gate. An all-weather access road to the site, as well as, vehicle turn-around shall be constructed.

5.5.3 Dry Hydrant and Pipe Design

Sufficient supply of year-round usable water will depend on the type and size of structure, exposures and occupancy, and fire load/contents. The quantity shall not be less than what is required under Section 3.2.5

"Provisions for Fire Fighting" of the Alberta Building Code. It is recommended that the calculations under ISO (Insurance Services Office) in conjunction with The Fire Underwriters Survey – "Water for Public Fire Protection" and/or NFPA 1231 Standard on Water Supplies for Suburban and Rural Fire Fighting. See also NFPA 1142 Standard on Water Supplies for Suburban and Rural Fire Fighting.

Dry hydrants require a 100 mm (4 in) hard suction pipe run. All installations should be a minimum of 150 mm (6 in) pipe. Longer lateral runs and higher volume flow may require larger pipe sizes. Avoid long pipe runs as to prevent drafting capabilities.

Pipe to be suitable for year-round operation. Pipe shall be PVC DR18 minimum. No more than two (2) 90° elbows shall be used for the system.

Priming shall not exceed thirty (30) seconds. See NFPA (National Fire Protection Association) 1231 B-5 for further design criteria.

Distance from the pumper connection to the roadway shall not be excessive. Recommended distance shall be 3.05 m (10 ft) or less. The pumper connection shall not be obstructed, but does require protection from mechanical damage. Pumper connection shall be clearly signed "No Parking – Fire Department Use Only". Sign shall be reflective aluminium type, 0.30 cm (12 in) by 0.40 cm (16 in) in seize. See NFPA 1231 Figure B-5.3(b). Pumper connection shall be located in an area that provides year round access. All roads or accesses to the connection shall be built to accommodate heavy loads (i.e. fire engines). See NFPA 1231 Table 6-6.2.

Silt and debris strainer is required on the intake end to prevent sand and small rocks from being sucked up the hard suction pipe. A gravel or concrete bed below the strainer shall be installed. The strainer should be elevated off of the bottom of the bed.

The intake to be installed below water freezing level. A minimum of 0.60 m (2 ft) is required at all times above the top of the suction strainer. The intake is to be low enough so there is sufficient year-round usable water above the intake in adequate quantity to meet Alberta Building Code requirements.

The recommended lift shall be 4.5m - maximum lift shall not be more that 7.6 m.

5.6 STANDARDS DRAWINGS – WATER DISTRIBUTION SYSTEM

Standard Details can be found in Appendix B of the Construction Standards.

END OF SECTION

6. SANITARY SEWERAGE SYSTEM

6.1 GENERAL

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

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

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

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

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

6.2 RURAL DESIGN CRITERIA

Refer to Section 3.2.2, Country Residential Lot Development.

6.2.1 Subsurface Soils Assessment

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

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

a) proposed septic field sites;

b) accurate location of the above;

c) location of any existing septic fields;

d) any water wells and their locations;

e) methodology of investigation;

f) soils analysis;

g) results;

h) conclusions and recommendations;

6.3 URBAN DESIGN CRITERIA

The sanitary sewerage system shall be of sufficient capacity to carry peak flows plus infiltration. Foundation weeping tile and roof leaders shall **not** be connected for discharge into the sanitary sewer system. The following factors shall be used in design of sanitary sewerage systems:

a) Residential

Population estimates for the purpose of system design shall be based upon the actual lots proposed for the development and a persons/dwelling estimate of not less than 4.0.

The County reserves the right to require additional system capacity to accommodate potential future subdividing of larger lots.

In the absence of existing data, the peak residential flows are to be calculated as follows:

$$Qpwd = (G \times P \times P_f) / 86.4$$

Where:

Qpwd = peak design flow rates (litres/sec)

G= Design contribution population in the thousands.

P_f = Harmons Peaking Factor

Harmons Peaking Factor - $1 + 14/ (4 + p^{0.5})$

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

Infiltration - 0.20 L/s/ha

b) Commercial, Industrial and Institutional:

Average Sewage Flow	-	Commercial: 40,000 l/ha/d
		Industrial: 20,000 l/ha/d
Peak Flow	-	3.0 x Average Flow
Infiltration	-	0.28 l/s/ha (24,000 l/ha/d)
Minimum Velocity	-	0.61 m/s

Pipe sizing shall be determined by using the Manning's Formula with an "N" value of 0.013.

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

Minimum pipe slopes shall be as recommended by Alberta Environment.

Sanitary sewers may have to be oversized to conform to the County's Sanitary Sewer planning.

6.4 SEWER MAIN INSTALLATION AND LOCATION

Mains shall be installed to provide a minimum depth of 2.5 m from top of pipe to final finished grade at the surface.

Mains shall be installed to provide adequate sewer service connection depth at the property line.

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

Pipe bedding shall be provided for all mains in accordance with the Standard Drawings.

6.5 MANHOLE INSTALLATION AND LOCATION

Manholes shall be located at the end of each line, at all changes in pipe size, grade or alignment, at all junctions, and at intervals no greater than 120 m along the length of the sewer.

Inverts in manholes at changes in direction shall have at least 50 mm fall across manhole. To maintain a continuous energy gradient through manholes, the obvert (crown) elevation of the lowest upstream pipe shall be equal to, or higher than, the obvert of the downstream pipe.

Manholes shall be installed as shown on Standard Drawings. Manhole bases shall be pre-cast slabs, concrete poured bases, vaults or pre-cast tees. Pre-benched manholes shall be used when possible. All manholes shall be 1200 mm inside diameter for all pipe 900 mm diameter and less. For pipe exceeding 900 mm diameter, manhole diameter shall be pipe diameter plus 600 mm, or a Tee-Riser shall be used.

Manhole frames and covers to be Type F-39 in landscaped areas, Type NF-80 in paved areas and Type NF-90 gasket in sags. All manhole covers are to be clearly stamped “Sanitary Sewer”.

An interior drop manhole shall be used where invert levels of inlet and outlet pipes differ by more than 750 mm.

Exterior drop manholes shall be used when inverts differ by more than 750mm and connection to an existing sanitary sewer is being completed.

All joints shall be watertight.

Safety platforms at intermediate levels are required for manholes greater than 5.0 m in depth when measured from the top of the frame to the lowest invert.

6.6 CURVED SEWERS

Curved sewers will be permitted, with the following restrictions:

a) The sewer shall be laid as a simple curve, with a radius equal to or greater than 90 m or the manufacturer’s minimum recommended radius, whichever is larger.

b) Manholes shall be located at the beginning and end of the curve.

c) Manholes shall be located at intervals not greater than 90 m along the curve.

d) The main shall run parallel to the curb or street centreline.

e) The minimum grade for sewers on curve shall be 50% greater than the minimum grade required for straight runs of sewers.

6.7 INSPECTION AND TESTING

Prior to issuance of the Construction Completion Certificate of the project, all sewer mains shall be tested as follows:

a) Closed Circuit Television Inspection

All sections of sanitary sewers shall be inspected with closed circuit television camera equipment prior to C.C.C. A written report and a colour video tape, in DVD format, shall be submitted to the County for their approval and records.

Please refer to the Construction Standards for further information on inspection and testing of sewer mains.

6.8 STANDARDS DRAWINGS – SANITARY SEWERAGE SYSTEM

Standard Details are available in Appendix B of the Construction Standards.

END OF SECTION

7. STORM DRAINAGE SYSTEM

7.1 REFERENCES

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

a. Cypress County, Dunmore Master Stormwater Management Plan (2016) applicable within the Hamlet of Dunmore.

b. Alberta Environment

   1. Storm water management guidelines for the Province of Alberta
   2. Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems
   3. Applicable Drainage Basin Water Management Plans.

c. Alberta Transportation, Design Guidelines for Erosion Control and Sediment Control for Highways

d. Any applicable Area Structure Plans, or Functional Servicing Reports.

7.2 DEFINITIONS

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

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

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

7.3 MODIFIED RATIONAL METHOD

The Modified Rational Method may be used for the design of drainage systems when the specified storm return period is in excess of 10 years. This includes the design of overland drainage and on-site storage systems for site developments. The modified Rational Methods includes a modifier to increase the runoff coefficients for larger events to account of the inherent inaccuracy of the Rational Method when completing computations for these events. The runoff coefficient shall be increased by the follow factors, up to a maximum of 1.00.

25 Year add 10 %

50 Year add 20 %

100 Year add 25%

7.3.1 Stormwater Management

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

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

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

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

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

Detention facilities become municipal property. The need for a specific detention facility will require the approval of the County. In assessing the need for specific detention facilities, the engineer must consider the impacts of uncontrolled drainage.

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

Any type of drainage diversion will be approved and licensed by Alberta Environment and Parks. Drainage diversion will include the construction of ditches, berms, ditch checks, the installations of culverts, rip-rap and other means of erosion control suggested by the Developer's Engineer and approved by the County. It is the responsibility of the Engineer of Record to obtain all permits and approvals which are to be provided to Cypress County.

7.3.2 Urban Systems

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

7.3.3 Rural Systems

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

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

7.4 DESIGN CRITERIA

The storm sewers or storm drainage system shall be designed as a separate system and shall be of sufficient capacity to carry storm runoff from the ultimate development the area is zoned for. The storm system should be designed considering both the minor and major drainage systems.

The minor system comprises of piping, manholes, catch basins and outfall structures. The minor system shall convey runoff from snowmelt and rainfall events to an adequate receiving water body (river, stream, lake or pond) without sustaining any surface ponding or excessive surface flows for events up to and including a 1-in-5-year return period. Where required by the County, high value commercial areas shall have their minor systems designed to accommodate a 1-in-10-year return period event.

The major system comprises the roadway system, detention facilities, parkland and any other land required to convey runoff from events up to and including a 1-in-100 year return period to the receiving water. The major system shall be evaluated in a manner sufficient to determine that no flooding that may cause significant property damage (e.g. flooding of buildings) occurs during the 100 year event.

Effluent from sanitary sewers and any drainage from industrial, agricultural or commercial operations that may potentially be contaminated shall not be discharged to the storm sewers.

Roof leaders of residential buildings shall be splashed on the surface and shall not be connected to the storm sewer system. Roof drainage from one-family and two-family dwellings shall discharge to grassed or pervious areas. The point of discharge shall be a sufficient distance (i.e. at least 1.0 m) to ensure the water flows away from the building. Roof drainage from apartment buildings, commercial areas, and industrial areas may discharge to the storm sewer, without the drainage crossing a sidewalk, if approved in writing by the County.

In the case of high water table storm services to residential properties may be permitted at the discretion of Cypress County.

Should existing discharge rates not be available then, the post development runoffs rates from properties shall not exceed the existing pre-development runoff rates being discharged to the storm drainage system, thus resulting in a no net increase to the storm drainage system.

Where pre-development runoff rates are considered excessive for the existing drainage system, the Developer shall consider alternatives to reduce the existing runoff to a level acceptable by the County.

The Developer shall provide all designs and calculations to Cypress County for approval.

Ponding of runoff on roofs, parking lots or landscaped areas to reduce runoff release rates must be considered.

Where required, developments shall provide sump pumps to discharge weeping tile water to grassed surface areas or splash pad. Splash pads are required to insure positive drainage away from the building. Should the Geotechnical Report indicate a high water table, the County may request other alternatives to surface discharge of weeping tile.

No sump pump connections to the storm system are allowed unless approved in writing by the County.

Control shall be provided to minimize sediment discharge to the storm sewers. This shall be in the form of properly graded and surfaced streets and lanes, landscaping, sediment control structures at pond and lake inlets, or other means where appropriate.

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

a) For areas less than 65 ha, the Rational Method shall be used to design the storm sewer system:

$$Q=2.78\ CIA$$

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

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

A = the contributing area in hectares

C = the runoff coefficient

b) Rainfall Intensity-Duration-Frequency Curves used are to be City of Medicine Hat included in the Dunmore Master Storm Water Management Plan.

c) The following runoff coefficients shall be used for the 1-in-5 year analysis:

Parks	=	0.15
Residential	=	0.40
Industrial	=	0.70
Commercial	=	0.70
Multiple Family	=	0.70
Pavement, Concrete and Roofs	=	0.90
Compacted Gravel	=	0.60
Landscape Gravel	=	0.25

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

$C = (Cp*Ap + Ci*Ai) / (Ap+Ai)$

In these standards, where the subscripts “p” and “i” indicate the pervious and impervious surfaces, respectively, Cp = 0.15 and Ci = 0.90.

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

For areas greater than 65 ha:

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

b) The selection of an appropriate computer model shall be based on an understanding of the principles, assumptions and limitations in relation to the system being designed.

c) Wherever possible, the computer model shall be calibrated. In all analyses, the parameters used, the drainage boundaries, the pipe network and its connectivity shall be clearly identified on an overall drawing, computer printouts and a design summary report.

d) The critical design rainfall hyetograph shall be selected. Both the AES Distribution (for long duration) and the Chicago Distribution (for short duration) will be evaluated.

e) The storm duration of an event is critical for the system being designed and shall be used to determine pipe sizes. The 5 year 4-hour Chicago Distribution event shall be selected. For systems involving storage design, both short duration and longer duration events such as the AES 24-hour event should be evaluated.

The minimum velocity within a piped system shall be 1 m/s. Where greater velocities in excess of 1 m/s are attained, special provisions shall be made to protect against displacement by erosion or impact.

Pipe sizing shall be determined by utilizing the Manning's Formula, using an "N" value of 0.013.

Storm sewer pipe shall be designed to convey the design flow when flowing full, with the hydraulic grade line at the pipe crown. All obvert elevations shall match at manhole junctions.

Surface water shall not be permitted to run a distance greater than 250 m along gutters without provision of interception by the first catch basin. Within the piped drainage system, or on Collector or Arterial roadways, surface runoff shall not run a distance greater than 120 m without interception.

Minimum gutter grade shall be 0.50%. Cul-de-sacs and curb returns are minimum 0.8% to 1%.

Roadway ditches and swales will efficiently convey run-off through the storm drainage system. Roadway ditches and swales will not be used for stormwater detention or retention.

7.5 STORM SEWER MAINS

Sewer Mains

The minimum size of storm sewer mains shall be 300 mm diameter.

Pipe classes shall be determined to withstand subsequent superimposed loadings.

Various factors affecting the pipe class shall be taken into account, and pipe class shall be evaluated as per standard engineering practice.

Catch Basins

a) Catch basin barrels with pre-cast base and pre-cast slab top shall be:

   1) 900mm I.D. pipe barrel conforming to CSA-A257 2. Joints to be confined O-ring to CSA-A 257.3 using rubber gasket.

   2) Catch basin manholes shall be 1200 mm in diameter.

   3) Catch basin manholes shall be used in place of a catch basin when the lead exceeds 30 m in length or one catch basin discharges into another.

   4) Catch basins are to have 300 mm deep sumps.

   5) Length of Catch Basin Leads shall not exceed 20m.

b) Catch basin frames and covers shall be:

   1) Standard frame, grate and 2 piece side inlet curb component for use with 900 mm barrel equal to Norwood F-51 for straight faced curb and gutter.

   2) Top inlet standard round top equal to Norwood F-38 for swales or lanes.

3) Top inlet standard round top equal to Norwood F-39 grate for landscaped areas.

c) Catch basin leads:

1) The minimum size of catch basin leads shall be 250 mm diameter with a minimum grade of 2.0%.

2) The minimum grade on a 300 mm catch basin lead shall be 2.0%.

3) Two catch basins may be connected in series. The catch basin lead connecting to the storm sewer manhole shall be 300 mm at a minimum slope of 2.0%.

4) The maximum length of a catch basin lead shall be 20 m.

5) If a lead of over 20 m in length is required, a catch basin manhole shall be installed at the upper end.

6) Catch basin leads shall have a minimum cover of 1.2 m to obvert.

7.6 STORM SEWER INSTALLATION AND LOCATION

Mains shall be installed to provide a minimum depth to pipe obvert of 1.50 m below final finished grade.

Pipe bedding shall be provided for all mains in accordance with the Standard Drawings.

7.7 MANHOLE INSTALLATION AND LOCATION

Manhole spacing on storm sewers greater than 750 mm in diameter may exceed 120 m if approved by the County.

Benching in manholes shall be provided to minimize hydraulic losses. The downstream invert in a manhole shall be a minimum of 25 mm lower than the lowest upstream invert. At a change in direction, the drop shall be at least 50 mm. If an influent pipe diameter is greater than 525 mm and the bend is greater than 45 degrees or if the outflow pipe velocity exceeds 1.5 m/s, then minor losses shall be considered.

Tee riser manholes may be utilized on lines 900 mm diameter and larger. Tee riser manholes must be bedded in concrete to the springline of the pipe.

7.8 CONNECTIONS TO STORM SEWERS

Only catch basins shall be connected to a storm sewer.

7.9 CURVED SEWERS

Curved sewers will be permitted, with the following restrictions:

a) The sewer shall be laid as a simple curve, with a radius equal to or greater than 90 m or the manufacturer's minimum recommended radius, whichever is larger.

b) Manholes shall be located at the beginning and end of the curve.

c) Manholes shall be located at intervals not greater than 90 m along the curve.

d) The main shall run parallel to the curb or street centreline.

e) The minimum grade for sewers on curve shall be 50% greater than the minimum grade required for straight runs of sewers.

7.10 INSPECTION AND TESTING

Prior to issuance of the Construction Completion Certificate of the project, all sewer mains shall be tested as follows:

a) Closed Circuit Television Inspection

All sections of sanitary sewers shall be inspected with closed circuit television camera equipment prior to C.C.C. A written report and a colour video in a common file format, shall be submitted to the County for their approval and records.

Please refer to Section 9.3.4 Testing of the Storm Water Mains in the Construction Standards for further information on inspection and testing of sewer mains.

7.11 STORMWATER MANAGEMENT FACILITIES

Design Requirements Common to Stormwater Management Storage Facilities

a) General

The use of stormwater facilities may be required to reduce peak flow rates to downstream sewer systems and/or watercourses, or to provide a temporary receiving area for peak major drainage flows. Their approximate location and size must be identified at the time of the Subdivision Outline Plan approval to avoid conflicts with adjacent land uses. The effects of the maximum pond water levels shall be considered in the design of the minor system and lot grading. If possible, the crown elevations of the pipes in the first manhole upstream of a pond shall be at or above the maximum pond level during the five-year storm event.

b) Geotechnical Considerations

Soils investigation specific to the detention facility shall be undertaken to determine the soil's permeability and salinity (or other potential contaminants), and the height of the groundwater table. Where the facility is sited above a shallow aquifer the potential for groundwater contamination must be minimized. Where the pond bottom is below the water table, weeping tile systems may be required to keep the pond bottom dry enough to support grass growth and maintenance equipment traffic.

c) Sediment Control

A sediment control plan is required as a part of the Stormwater Management Study to define measures that must be taken for the control of sediment into the pond and into the receiving stream.

7.12 MASTER DRAINAGE PLAN

The Master Drainage Plan shall be prepared and used in developing and comparing alternatives, and to select the optimum storage and drainage solution for a development area. This Master Plan should provide, as a minimum, the following information:

1) Detailed description of the development area, including proposed street layout, locations of parks, direction of overland flow, natural storage and drainage sub-catchment boundaries, etc.

2) Identify and quantify the amount of upstream drainage entering onto the proposed development lands, including all points of entry.

3) Identify the impact of the proposed development on the watershed.

4) Identify all existing flow channels, drainage patterns or routes, and containment areas.

5) Identify the point(s) of discharge from the lands, as well as the type and calculated capacity of the receiving drainage facility(s), whether natural, man-made, or a combination of both.

6) Provide details of water quality enhancement facilities.

7) Identify all licensing requirements as may be required by Alberta Environment.

8) Post-development hydrographs for the 5-year and 100-year events to be determined at key points in the system.

9) Delineation of flood lines for the 100-year design storm for creeks or watercourses.

10) Description and discussion of storage alternatives. All alternative storage and runoff control methods shall be reviewed and shall include, but not be limited to:

    -retention storage;

    -detention storage;

    -off-line stream storage;

    -channel storage;

    -on-line storage; and

    -wet ponds (retention storage) or dry ponds (detention storage).

    In reviewing the alternatives, the optimum number and location of the stormwater facilities shall be determined, bearing in mind the total system.

11) Detailed description of the selected alternatives.

7.13 DESIGN STANDARDS WET PONDS

The following are the design standards for constructing new stormwater management lakes and wet ponds:

a) Land that is adjacent to a lake that is subject to flooding, as per the design standard established, but is part of the development parcel, will carry easements to allow the County right of access though the lands to the waters edge to carry out normal maintenance operations.

b) Public land that is permanently under water shall be designated P.U.L. (Public Service Lot). Private land that is subject to flooding due to the operation of the lake shall carry a flooding easement up to the 1:100 year storm level.

c) The storage capacity shall be determined at the Master Drainage Plan stage along with the hydraulic performance criteria.

d) The minimum surface area of any lake or combination thereof shall be 2.0 hectares.

e) The annual volume exchange shall be twice per year.

f) Side slopes shall be designated as shown in the detail drawings.

g) Maximum water fluctuation for a one-in-five year storm event should not exceed one metre.

h) The minimum depth from normal water level to lake bottom should be 2.5 metres.

i) The inlets and outlets are to be fully submerged at least one metre below normal water level to crown of pipe.

j) The lake bed is to be composed of impervious material.

k) No dead bay areas shall be permitted unless special circulatory provisions are made.

l) The first manhole in the minor system, the connecting or interconnecting pipe system, shall have an invert that is at or above the normal water level.

m) The lake design shall include an approved sedimentation removal process for control of heavy solids to the lake during the development of the basin.

n) A sedimentation measurement system shall be included for control and recording of siltation during long term performance of the lake.

o) The edge treatment or shore protection required shall be compatible with adjacent land use. The standard used shall meet the criteria of low maintenance, safety and ease of access to the water edge. The recommended guideline is approved rip-rap rock material varying in size from 50 to 100 mm, for a thickness of 0.3 metres and extending in a vertical distance of 0.6 metres below and above the normal water level, and encased in Gabion baskets.

p) Lake design must provide for vehicular access for maintenance and emergency purposes.

q) Approved lighting shall be provided at the interface between the lake high water levels and any adjacent public lands.

r) Approved fencing will be required where necessary for safety purposes.

s) Approved signage shall be installed 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 County.

t) An approved fresh water well system is required to maintain the lake water levels during extended dry hot periods.

7.14 EMERGENCY SPILLWAY PROVISIONS

The feasibility of an emergency overflow spillway is to be evaluated for each storage facility (wet or dry) design, and, where feasible, such provisions are to be incorporated in the pond design.

As part of the pond design process, the probable frequency of operation of the spillway should be determined. Where it is not possible to provide an emergency spillway route, the design is to include an analysis of the impact of over-topping the pond and a significant freeboard above the 100-year level.

The functional requirements of the spillway, and the impact analysis for the absence of one, are to consider the possible consequences of blockage of the system outlet or overloading due to the run-off events, such that the storage capacity of the facility may be partially or completely unavailable at the beginning of a run-off event.

7.15 DRY DETENTION PONDS

Dry pond (detention) storage is the storm water management method where the storm run-off is collected and the excess run-off is temporarily detained for a short period of time, and released after the storm run-off from the contributing area has ended. Generally, low flows do not enter the pond.

Dry ponds should have gentle side slopes and be aesthetically contoured and landscaped to provide an attractive feature for the subdivision. Where possible, and as agreed by the County, they should be associated with municipal reserve areas to take advantage of the joint use ability of the facilities (e.g. extension of sport fields or passive park uses into the detention pond). Active park uses should not be located adjacent to the inlet/outlet facilities nor in areas that flood frequently (more than twice per year on average). The County should be contacted to provide input to the design of detention facilities from the concept stage through to detailed design and construction.

7.15.1 Safety Provisions at Inlets and Outlets

All inlet and outlet structures associated with dry ponds shall have grates provided over their openings to restrict access and prevent entry into the sewers by unauthorized persons. A maximum clear bar space of 150mm shall be used for gratings.

Grated outlet structures are to be designed with a hydraulic capacity of at least twice the required capacity to allow for possible plugging. Further, the velocity of the flow passing through the grating should not exceed 1.0 m/sec. Appropriate fencing and guard rails are to be provided to restrict access and reduce the hazard presented by the structure head and wingwalls.

7.15.2 Design Parameters

The following general design parameters should be considered for a dry pond in a residential subdivision:

a) Storage capacity for up to the 100-year storm event.

b) Detention time to be determined based on downstream capacity; recommended maximum detention time is 24 hours.

c) Maximum active retention storage depth of 1.5m. The maximum water level should be below adjacent house basement footings (a greater freeboard may be required if an emergency overflow route cannot be provided).

d) Maximum interior sideslopes of 5:1 (7:1 is recommended).

e) Maximum exterior sideslopes of 3.5:1.

f) Minimum freeboard of 0.6m above 1:100 year high water level (a greater freeboard may be required if an emergency overflow route cannot be provided).

g) Maximum 4:1 ratio of effective length to effective width measured at 100 year high water level.

h) Dimensions must be acceptable to the County when the bottom of the pond is to be used for recreational facilities.

i) Minimum lateral slope in the bottom of the pond of 1.0% (2.0% is preferred) and a minimum longitudinal slope of 0.5% (1.0% is preferred),

j) Low flow bypass for flows from minor events to be provided.

k) French drains are to be provided within pond bottom where water table is near pond bottom.

l) Address all safety issues (particularly during operation).

7.16 WET DETENTION PONDS (RESIDENTIAL SUBDIVISION)

Wet pond (retention) storage functions the same as dry pond detention except that a portion of the stormwater is permanently retained.

If approved, the Developer will be responsible for all construction costs in excess of the cost to construct the original dry pond facility. The Developer will also be required to provide maintenance of the pond through the warranty period.

Design of a wet pond is to be in accordance with the Alberta Environment publication entitled "Stormwater Management Guidelines for The Province of Alberta". Some general design parameters to consider are:

a) 2.0 ha minimum water surface area.

b) Maximum sideslopes of 7:1 between the high water level and 1.0 m below normal water level.

c) Minimum permanent pool depth of 2.0 m

d) Maximum 1:100 year storage depth of 1.5 m

e) Sediment forebays required at each inlet.

f) Hard edge treatment required along lake perimeter.

g) Minimum freeboard depth of 0.6 m. House footings must be above freeboard elevation.

h) Water recirculation and make-up system required.

i) Provide access for maintenance and emergency equipment.

j) Design of outlet control structure to be capable of maintaining permanent pool depth and capable of draining the permanent pool for maintenance purposes.

7.17 OUTFALLS

Outfall structures shall be placed at the end of all storm sewers discharging to an open channel, watercourse, creek, river or other receiving water body such as a lake. The purpose of the structure is to reduce velocities and prevent erosion. All outfall structures must be approved by Alberta Environment. It is the responsibility of the Developer to obtain the necessary approvals and permits from the above mentioned Authorities.

The outfall structure may be a chute, spillway drop structures and energy dissipaters, stilling basin or plunge pool with head wall. A cut off wall is required at the end of the outfall apron to prevent undermining of the structure.

Obverts of outfall pipes shall be at least 150 mm above the 5-year flood level in the receiving stream. Inverts of outfall pipes shall be above winter ice level, otherwise outfall pipes shall be submerged below the bottom of ice level. In addition, outfalls shall be located to avoid damage from moving ice during breakup. If the downstream channel is relatively flat, the apron shall be 150 mm to 225 mm above the channel invert to prevent collection of debris on the apron.

Rip-rap and a filter layer shall be placed downstream of the outfall structure, where required to prevent erosion. Where erosion control or bank stability work must be done, preservation of watercourse aesthetics and wildlife habitat must be considered.

Weeping tile shall be placed under the structure to reduce any water pressure behind the head wall.

Grills or trash bars shall be placed over all storm sewer outlets to prevent access.

Railings shall be placed along the head wall and wingwalls of the outfall structure.

Outfalls shall be landscaped designed with low maintenance, to aesthetically blend in with surrounding areas.

Measures, such as detention ponds, should be incorporated in new developments to prevent any increase in the amount of erosion and downstream flooding to existing receiving streams.

7.18 STANDARDS DRAWINGS – STORM DRAINAGE SYSTEM

Standard Drawings can be found in Appendix B of the Construction Standards.

END OF SECTION

8. SEWER AND WATER SERVICE CONNECTIONS

8.1 SERVICE CONNECTIONS – MINIMUM REQUIREMENTS

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

Residential Sanitary Sewer	100 mm diameter
Water Service	25 mm diameter

Commercial/Industrial Water and/or Sanitary Service size may vary. The minimum grade on a 100 mm sewer service shall be 2.0% and on a 150 mm service shall be 1.0%.

Connection to a main sewer line shall be by means of a tapped service saddle (full wrap) at the top quadrant of the main on existing mains. In-line tees may be used with prior approval of the County.

Where bends are utilized, the long radius type or a combination of 22½ degree bends and straight pipe shall be used.

For water services sized 50 mm and smaller, the tapping shall be at the 2 to 3 o'clock position on the distribution main.

Water mains shall be tapped under pressure.

All water services to be direct tapped or utilize service saddle.

8.2 SANITARY SEWER SERVICE

Service pipe shall be PVC SDR 35 (minimum) building service pipe.

Service fittings shall be either in-line tees or saddle tees, complete with gasket and stainless steel straps and nuts.

8.3 WATER SERVICE

Water services shall be municipex for services 75mm of less. Larger services are to be DR18 or C900 PVC.

8.4 SERVICE CONNECTIONS – INSTALLATION REQUIREMENTS

Where the water service is 50 mm or smaller in size, the water and sanitary services shall be installed in a common trench.

The services shall be installed so that, when facing the lot being served, the water service is on the right of the sanitary service.

Where two services are installed in a common trench, they shall be installed per the Standard Drawing found in Appendix B of the Construction Standards.

The minimum depth of cover over the water and sanitary services at the property line shall be 2.7 m and the maximum shall be 3.5 m.

Where the sewer services are required to connect to mains in excess of 4.50 m deep, risers shall be installed to within 3.60 m of finished surface.

Corporation main stops and curb stops (stops & drain) shall be installed in accordance with the Standard Drawing found in Appendix B of the Construction Standards.

Service box for residential service to have adjustable sliding top section, standard block iron pipe with threaded top. Top section to be 600 mm in length, with a minimum ID of 35 mm and a 10 mm set screw. The service box shall be adjustable from 2.5 to 3.5 m bury. The threaded steel cap shall have a slotted top with a 19 mm pentagon brass plug.

The casing shall be standard block iron pipe with an OD of 33.5 mm. The rod should be T-304 stainless steel, 12.5 mm diameter by 2.2 m long, complete with standard pig tail for 25 mm ID pipe and welded bottom bracket with an 8 mm cored hole. Rod to be complete with a 6 mm diameter cotter pin of sufficient length. Cotter pin or key to be stainless steel or brass.

Box bottom boot to be cast or ductile iron, factory coated, with a clear opening to allow curb stop access. The boot is to attach to the casing by means of a threaded joint.

Curb stops shall be installed at property or easement lines as shown on the Standard Drawing and shall be stop and drain unless approved otherwise based on site conditions.

Sewer services shall be installed at property or easement lines as shown on the Standard Drawing, and shall be properly capped or plugged to prevent the entry of earth, water or deleterious material into the pipe.

All services shall be laid on 75 mm of granular bedding, and the bedding material shall be placed up to a level of 300 mm above the crown of the highest service in the trench.

Painted stakes of 50 mm x 100 mm size shall be extended from the end of the service connections to a minimum of 0.70 m above the ground level, per the Standard Drawing.

8.5 SERVICE CONNECTION REPORT

The Developer's Engineer shall provide detailed as-built drawings for all installed service connections, with such drawings providing information related to pipe dimensions, invert elevations, depth of service lines, location of services relative to property line(s), manholes and/or watermain valves.

8.6 STANDARDS DRAWINGS – SEWER AND WATER SERVICE CONNECTIONS

Standard Drawings can be found in Appendix B of the Construction Standards.

END OF SECTION

9. ROADWAYS

9.1 GENERAL

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

Unless approved otherwise access to the County road system for a subdivision is to be channeled to a single location. For subdivisions consisting of two (2) lots or more lots, the service road must be paved.

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

The guidelines provided herein represent the minimum requirement under general conditions. The Developer and the Developer’s Consultant are responsible to ensure that the roadway infrastructure is designed and constructed to achieve design life expectations consistent with good design and construction practice. The Developer, through their Consultant, is responsible to confirm whether minimum standards are appropriate for the specific proposed development. For issues not referenced herein, the current TAC, Alberta Environment (AEP) or Alberta Transportation (AT) standards will be used.

The County will make the determination of whether a development is rural or urban, the street classification, and the requirement for on-street parking.

Cypress County may require the developer to enter into a Road Use Agreement to ensure the roads affected by the development are adequately maintained. In conjunction with the Road Use Agreement the developer will be required to provide security in the form of a performance bond to meet their obligations under the agreement.

9.2 TRAFFIC ANALYSIS

The Developer shall carry out a traffic impact assessment when required by the Development Officer. Analysis will be required in cases where post development traffic volume and traffic type may adversely affect adjacent roadways and intersections.

As the Development authority the County reserves the right to require a TIA to qualify an application for land use reclassification/subdivision/development permit approval, where impacts to the adjacent road network by the addition of new, or changes to existing developments, need to be studied.

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

a) Volume of daily traffic generated by the development at full development. If the planned development is staged, then the assessment will also include daily traffic volumes at the end of each consecutive development stage.

b) Layout of the internal road system of the proposed development with the accesses clearly marked.

c) Location of the proposed access points.

d) Sight distance assessments at the proposed access points.

e) Full review of the proposed access points using Alberta Transportation Design Guidelines, establishing whether or not intersectional improvements are required.

f) Traffic signal warrant and pedestrian accommodation at major intersections for urban developments.

g) 3R/4R review of the proposed access points using Alberta Transportation Design Guidelines establishing whether or not intersectional improvements are required.

9.3 GEOMETRIC DESIGN STANDARDS

Street classification and designation shall be in accordance with the classification system outlined in:

- The Transportation Association of Canada (TAC) Manual - Geometric Design Standards for Canadian Roads and Streets latest edition.
- Alberta Infrastructure Highway Geometric Design Guide.

The following are general minimum requirements and shall be used in the design of streets.

Street cross-sections shall be as defined by Standard Drawings and design standards specified above. Curb and gutter will be required for all new development, within all Hamlets located in Cypress County. Written approval from the Development Officer will be required for any new development proposing to use roadside ditch and culvert for the conveyance of stormwater runoff within a proposed development. Developer will be required to prepare a Design Memo addressed to the County outlining existing conditions both upstream and downstream of the subject site that will impact the functionality of the stormwater runoff of the development. The Design Memo will need to prove through best engineering design and practice to be the most suitable solution for the development area. Proposed alterations to the requirement for curb and gutter will be assessed on a case by case basis, and the County will use discretion when determining whether the solution will be acceptable to the County.

Rolled faced curb and gutter shall be constructed on all streets, in accordance with the design Drawings. By motion of Council, straight faced curb and gutter may be constructed in accordance with the drawings.

Separate Sidewalks shall be preferred, although conditions requiring monolithic sidewalks may occur. Separate sidewalks shall be 1.5 m wide and shall be constructed in accordance with the Standard Drawing. Monolithic curb, gutter and sidewalks may be constructed in accordance with the Standard Drawing. Sidewalks shall be clear of all obstructions including surface utilities. Sidewalk locations shall be in accordance with the Standard Roadway Drawings. Wider sidewalks may be required in areas of high pedestrian activity, as determined by the County.

Rear lanes (alleys) shall have a surfaced width of 5.5 m within a 6.0 m right-of-way. Where rear lane traffic activity is expected to be high, such as certain commercial developments, a wider surfaced width and right-of-way may be required as determined by the County.

All driveways shall be constructed to give a minimum of 1.5 m clearance from any structure, (e.g. hydrants, light standards, service pedestals), and shall be constructed in accordance with the Standard Drawing.

Curb ramps shall be constructed in accordance with Standard Drawing.

9.4 VERTICAL ALIGNMENT

Minimum gutter grades around all curves and along all tangents shall not be less than 0.5%. Minimum gutter grades on curb returns shall be 0.8%.

Maximum gutter grades shall not exceed those defined by Table 9.1.

All roadways shall be crowned or shall have a crossfall as shown on the applicable standard drawings. The standard crossfall rate is 2.0%.

The grades at intersections for all roadway classifications shall not exceed 3% for a minimum distance of thirty (30) metres, measured from the shoulder edge of the receiving road.

All vertical curves shall be designed to meet or exceed the Alberta Infrastructure Highway Geometric Design Guide Standards. Refer to Table B.4.4.

Rear lanes (alleys) shall have a minimum longitudinal grade of 0.6%. If gravel-surfaced, the lane shall be cross sloped to one side at 3.0%. If paved, the lane shall be cross sloped to one side at 2.0%. Paved lanes that have a centre swale must be approved in writing by the County and shall have cross slopes of 2.0%.

9.5 HORIZONTAL ALIGNMENT

The minimum radius is relative to the Road Classification, the design speed and the maximum superelevation.

All horizontal curves shall be designed to meet the minimum design requirements for the specified design speed.

Minimum edge of pavement radius for cul-de-sacs is 12.0m in residential areas and 15.0m in industrial areas.

Flares at intersecting roadways shall have the following minimum radius from shoulder to shoulder:

- Residential access and local 10.0 metres
- Residential collector 15.0 metres
- Industrial local and collector 15.0 metres

9.5.1 Concrete Curb Returns

Curb returns at residential local street intersections shall be constructed to a radius of 8.0m at face of curb.

Curb returns at residential collector street intersections shall be constructed to a radius of 12.5m at face of curb.

In industrial/commercial areas the face of curb radius should be 15.0m to accommodate truck turning movements.

For arterial street intersections the curb returns shall be designed in consideration of the type and volume of the turning traffic. Two and three centred curves, with or without islands, may be required.

Curb ramps are required at all intersections which have sidewalks.

9.6 CUL-DE-SACS

9.6.1 Urban Design

The maximum length of a cul-de-sac is one hundred fifty (150) metres from the entrance at property line of the intersecting road to the center of the cul-de-sac.

The minimum radius for cul-de-sacs is 13.0 metres to face of curb in residential areas and 15.25 metres for industrial/commercial developments.

9.6.2 Rural Design

There is no maximum length for a cul-de-sac in the rural setting. The minimum radius for cul-de-sacs is 16.0 metres to face of curb.

9.7 CULVERTS AND DRAINAGE

a) The minimum allowable ditch grade shall be 1.0%. Ditch grades in excess of 2.0% shall be protected against erosion through silt fences, Enviroberm fences and/or erosion control blankets.

b) Ditch side slopes shall normally be 4:1 but shall not be steeper than 3:1.

c) Ditch back slopes shall normally be 3:1 but shall not be steeper than 2:1.

d) The minimum ditch bottom width shall be 3.0 metres along arterial roads and 1.0 m along the collector and local roadways, sloping away from the roadway at a minimum of 5.0%. (Dependent on available roadway)

e) Culvert size requirements shall be determined through the storm water drainage analysis; however, the minimum size culverts shall be as follows:

- Roadway cross culvert 500 mm (20 inch)
- Residential approach culvert 500 mm (20 inch)
- Industrial approach culvert 500 mm (20 inch)

f) Culverts shall be new galvanized corrugated steel pipe (C.S.P.) with a minimum wall thickness of 1.6 mm, or as required by the loading criteria.

g) All culverts shall be installed in accordance with the manufacturer's recommendations.

h) All culverts shall be installed to provide a minimum depth of cover of 500 mm or one-half the culverts diameter, whichever is greater. This should be measured from the finished shoulder grade of the roadway to the top of the culvert as shown on the Standard Detail Drawing.

In urban developments, all culverts shall be installed with bevelled end sections on both the inlet and outlet sides, with the invert extended to the toe of the side slope. No rip rap is permitted in urban developments.

In rural developments, rip rap shall be placed around the inlet and outlet of each culvert, extending a minimum of 1.0m beyond the end of the culvert.

9.8 ROAD APPROACHES – RURAL DEVELOPMENT

This sub-section outlines the requirements respecting the design and construction of approaches within subdivision developments.

a) Residential approaches shall typically be located as follows:

- For low density residential, the approach shall typically be located to provide the best and most direct access to the building site on the lot.
- For internal high-density residential lots, the approach shall typically be centered on the lot frontage.

b) All residential as well as industrial approaches shall not exceed eighteen (18.0) metres in width. Any deviation from these maximum widths requires the approval of Council.

c) All approaches shall be constructed to the same structure as the adjoining roadways, with asphalt surfacing extending to the following limits:

- Low-density residential 1.5 m past road shoulder,

- High-density residential 6.0 m past road shoulder,
- Industrial/commercial to property line.

d) All residential subdivision development shall require the Developer to construct one approach to each lot, consistent with the standard outlined herein.

e) Approaches to rural industrial/commercial lots are required to be constructed by the Developer where the access locations are known. Where access locations cannot reasonably be determined, the County may choose to have the Developer provide materials and/or securities to permit future construction of the approaches.

f) The Developer is required to obtain a permit from Cypress County prior to the installation of any type of approach.

9.9 ROAD SURFACE FINISHES

a) The required road surfacing is determined by the development size, including future development potential, area structure plans etc.

1. All urban residential subdivisions – Asphalt surfacing with curb and gutter.
2. All rural residential subdivisions of ultimate 2 or more lots – Asphalt surfacing.
3. Industrial subdivisions of ultimate 2 or more lots – Asphalt surfacing.
4. Single lot industrial, commercial or agricultural developments may be required to provide road surface finishes that adequately address the anticipated traffic volumes and traffic types. The road surface finish will be determined by the development authority in consultation with the County's consulting engineer.

    i. Road Surfaces may include, but are not limited to the following; Asphalt, Calcium Chloride Stabilization (or equivalent), Oil, Gravel.

b) Should a gravelled surface be approved, even for an interim period, the surface gravel shall be a minimum compacted layer of 50 mm depth of 20 mm crushed gravel. All approaches shall be similarly treated.

9.10 CALCIUM CHLORIDE STABILIZATION

a) Aggregate Material

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

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

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

b) Calcium Chloride Material

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

c) Bentonite

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

d) Aggregate Placement

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

e) Calcium Chloride Stabilization

a. Calcium Chloride Stabilization will be completed utilizing a rotary mixer.

b. Calcium Chloride placement shall not be done in the rain or if rain is forecasted within 24 hrs.

c. Stabilization shall be completed when temperatures are above 10°C, and shall not be completed on frozen ground.

d. During stabilization 1.0% of Calcium Chloride by weight will be placed on the gravel and shall be moisture controlled to the optimum moisture content prior to or during mixing.

e. Once mixing is completed, compaction of the surfacing gravel is required to meet 98% SPD.

f) Testing and Inspection

a. Quality Control Sieve and Atterberg limits analysis shall be completed daily on all gravel produced.

b. The County may complete Quality Assurance testing on the gravel produced, Access will be given to the County Representative to acquire any require material for Quality Assurance testing.

9.11 PAVEMENT STRUCTURE

All roadways other than rear lanes (alleys) shall be paved with hot mix asphalt. A geotechnical report with recommended pavement designs shall be conducted by a Professional Engineer and submitted to the County for review.

Paved roadways shall be designed in accordance with the Asphalt Institute Method of pavement design, using minimum design loadings of 8,165 kg (18,000 pound) axle loads. The design parameters, such as traffic count, percentage of trucks, California Bearing Ratio (CBR), are to be outlined to the County. The County reserves the right to request the Developer to engage an engineering firm to carry out tests, prior to paving, to confirm adequacy of design.

The following are the minimum pavement structure requirements. An independent pavement design is required for all developments. Additional pavement structure strengths and/or materials may be required in areas with poor subgrade materials, pending the results of the geotechnical investigation.

Street	**Residential Land Use**	**Industrial/Commercial Land Use**
Local, Collector, and Arterial	150 mm Subgrade Prep. to 100% SPD 150 mm Aggregate Sub Base Course (50mm minus gradation) 75mm Aggregate Base Course (20mm minus gradation) 75mm Type B1 Asphaltic Concrete Base Course 50mm Type S2 Asphaltic Concrete Wearing Course	150 mm Subgrade Prep. to 100% SPD 250 mm Aggregate Sub Base Course (50mm minus gradation) 100mm Aggregate Base Course (20mm minus gradation) 80mm Type B1 Asphaltic Concrete Base Course 50mm Type S1 Asphaltic Concrete Wearing Course

Note: Pavement road structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum pavement structure. Arterial road structure shall be as determined by the geotechnical study for the specific roadway section but no less than the structure of a Collector roadway.

Gravel surfacing is permitted on rear lanes (alleys). Aggregate base material shall be used to a minimum depth of 200 mm, with 150 mm placed during initial construction and 50 mm placed during the final year of the maintenance period.

9.12 RIGHT-OF-WAY PREPARATORY REQUIREMENTS

The entire road right-of-way (R.O.W.) shall be cleared of all vegetation (trees, shrubs, brush, etc.) including removal of all tree roots and stumps. All such material shall be removed from the site for disposal at approved locations. No burying of this material, or any portion thereof, shall be permitted within the R.O.W.

Organic soil and material are not acceptable as subgrade materials and shall be stripped within the roadway, ditch and back slope portion of the new construction. Organic soils (horizon A) shall be stockpiled in approved locations for the re-spreading on the ditches and backslopes after completion of the roadway construction.

9.13 BOULEVARD TREATMENT WITHIN URBAN DEVELOPMENTS

Boulevard areas include the land within the legal road Right-of-Way from the edge of the roadway to the property line of the adjacent property. Required maintenance of this Boulevard areas within Urban Developments shall be the responsibility of the adjacent landowner. Should landscape rock be selected as the landowner's choice of surface treatment, safe placement of such material shall be conducted to avoid any potential for slipping or tripping of the public and any workers required to work within the road Right-of-Way. Control of weeds and the removal of any encroaching vegetation such as trees or grasses must also be completed by the adjacent landowner.

The following requirements must be met in order to obtain approval from the Development Officer to install landscape rock surface treatment within the Boulevard.

- A minimum 0.3 metre buffer must be maintained between the edge of road and the placement of rock material for ease of snow removal and street cleaning operations;
- Rock must be screened so that the gradation of the rock is such that 100% of the material passes through a 75mm screen, and 0% passes through a 25mm screen; and
- Rock material must be free from coatings of silt, clay, organic matter, or other deleterious materials that may impact the stormwater conveyance function within the Boulevard area.

Where culverts in an Urban Development are required to be installed, with prior approval from the County via Road Approach Application, the same requirements stipulated in Standard Drawing 7-302 will be required. However, the requirement specified above for the size of the rock must also be used for the end treatment of the culvert within the Boulevard of Urban Developments.

TABLE 9.1

SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR URBAN SUBDIVISION STREETS (CURB AND GUTTER INSTALLATIONS)

Classification	Traffic Volumes (vpd)	Design Speed[a](km/h)	Right-of-Way Width (m)	Pavement Widths (m)	Travel Lanes[c]	Shoulder/Parking Lanes	Maximum Gradients (%)	Maximum Superelevation (m/m)
Undivided Arterial	10,000 – 30,000	60 - 70	30.0	15.4	4 - 3.7 m	none	5	.04 - .06
Major Collector	5,000 – 10,000	60 - 70	24.0	14.0	2 – 3.7 m	2 – 3.3m	6	.025
Minor Collector	1,000 - 5,000	60	20.0	11.0	2 – 3.0 m	2 - 2.5 m	6	.025 - .04
Local Residential	Up to 1,000	60	20.0	10	2 – 3.0 m	2 – 2.0 m	6	.025

Classification	Minimum Radius of Curvature (m)	Minimum Intersection Spacing (m)	Minimum Corner Cuts at Intersections	Sidewalks	Lighting Poles and Other Obstructions	Parking	Access
Undivided Arterial	170	300	30 m Radius	Separate, 2 sides	3.1 m min. From lip of gutter or behind sidewalk	Restricted	Restricted[e]
Major Collector	150	60 / 120	10 m	Separate, 2 sides	1.75 m min. From lip of gutter	Optional	Some Restrictions
Minor Collector	150	60	10 m	Both sides	2.3 m min. From lip of gutter	Permitted	Permitted[f]
Local Residential	90	60	6 m	Both sides	1.75 m min. From lip of gutter	Permitted	Permitted

Notes:
a. Posted speed to be 10 km/h less than design speed.
b. Land for noise attenuation will be in addition to the road right-of-way requirement.
c. Additional travel lane width may be required to accommodate cyclists, e.g. on arterials the outside lanes are 4.2 m wide.
d. Additional right-of-way required where rural roadway cross-section is used for initial stage.
e. Prohibited for residential land uses.
f. Rear lane (alley) access preferred.

9.15 STANDARDS DRAWINGS - ROADWAYS

Standard Drawings are located in Appendix B of the Construction Standards.

END OF SECTION

10. TRAFFIC CONTROL DEVICES, STREET NAME SIGNS & PAVEMENT MARKINGS

Plans shall be provided to the County that depicts the locations and details of all traffic control devices (traffic signs and traffic signals), street name signs and pavement markings.

All traffic control devices and pavement markings shall be designed and installed in accordance with the manual "Uniform Traffic Control Devices for Canada" as issued and revised from time to time by the Transportation Association of Canada (formerly RTAC).

Guide and information signing shall be designed and installed in accordance with the "Urban Guide and Information Sign Manual" as issued by the Alberta Government.

Street signing shall be standard aluminum, white on blue, with a minimum vertical dimension of 150 mm.

10.1 SIGN MATERIALS:

All signs shall utilize High Intensity reflectorized material to ASTM-D4956, Type III.

All sign posts shall be U Channel, galvanized Schedule 40 steel unless otherwise approved in writing by the County.

10.2 PAVEMENT MARKINGS:

Pavement marking type will be at the discretion of the County, based on the project specific requirements. However, generally along arterial streets and at arterial street intersections, pavement markings shall be of a "permanent" type, thermoplastic. Painted markings are acceptable elsewhere.

10.3 INSTALLATION

All traffic control signs shall be mounted to provide 2.0 m vertical clearance to the lowest portion of the sign, unless otherwise approved by the County.

All signs shall be mounted to provide a minimum of 0.3 m of horizontal clearance from back of curb or back of walk. Where there is no curb or walk within the right-of-way, the sign location is to be approved by the County.

END OF SECTION

11. STREET LIGHTING

11.1 GENERAL

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

All street lighting cables in new subdivisions shall be installed underground. Additional street lights in neighbourhoods with overhead cabling may be installed if approved by the County.

11.2 DESIGN

Street lighting posts with fixtures shall be steel posts, comparable to the existing posts within the neighbourhood, for the several types of streets. Wooden Poles may be permitted in existing neighbourhoods were additional lighting is being added and wooden poles presently exist.

The location and density of street lights shall provide the following minimum lighting levels:

a) Street lighting fixtures LED.

b) Street lighting design shall be approved or provided by electric utility provider.

11.3 LOCATION

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

Street lights shall be offset from roadways and sidewalks in accordance with Table 9.1.

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

All street light standards shall be galvanized in a manner comparable to the existing standards within the County.

11.4 COSTS

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

END OF SECTION

12. LOT GRADING

12.1 DESIGN

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

Reserves and public lands shall be graded to drain towards developed streets and/or storm water catch basins or drainage channels.

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

Commercial and industrial lots shall be graded to drain to on-site storm water catch basins.

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

Where drainage swales are provided on rear property lines in laneless subdivisions, the Developer shall provide an approved concrete drainage swale. The drainage swale shall be provided on one side of the property line and be placed in a drainage easement.

The maximum slope draining towards property lines shall not exceed 10% within 1.5 metres of the property line. The slope away from buildings shall meet the minimum requirements of the Alberta Building Code. Downspouts from eavestroughs and discharges hoses from sump pumps shall not discharge within 0.6 metres from the property line.

It is the Developer's responsibility to ensure that in urban subdivisions, the Developer's Engineer will provide verification/confirmation to the County that the dwelling is being constructed at the design elevation through a footing check by a qualified Alberta Land Surveyor. Lot grading slips to be prepared for each lot.

12.2 RETAINING WALLS

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

12.3 STANDARDS DRAWINGS - LOT GRADING

Standard Drawings can be found in Appendix B of the Construction Standards.

END OF SECTION

13. LANDSCAPING

13.1 STORM WATER MANAGEMENT FACILITIES

Dry pond and areas surrounding new storm water management lake facilities must be graded, topsoiled, seeded or sodded, and landscaped by the Developer to the satisfaction of the County.

Plant materials will be selected to respect hydrological and soil saturation characteristics of the facility.

Public lands within the facility must be planted with a minimum of 30 trees per landscaped acre above normal water line, and designed and massed into major groupings. Minimum deciduous tree caliper 60 mm, minimum coniferous tree height 2.5 metres. Tree mix 60% coniferous and 40% deciduous suggested.

Shrubs may be substituted for trees at a rate of five shrubs for one tree, to a minimum of 15 trees per landscaped area, with approval from the County.

Shrubs to be massed within large planting beds above the 1:5 year flood line to create major focal areas on the slopes of the dry pond. Minimum shrub size to be five gallon pot planted 1 m o.c. or appropriate to species. Minimum shrub height and spread 600 mm, subject to availability. Suggest trees be positioned within planting beds.

Planting bed layouts will provide a minimum width of turf areas between planting beds of 2.0 m. Landscape edging may be required in formal shrub beds.

Planting beds shall be designed complete with weed liners. Use of weed liners for planting beds located in flood prone areas is strongly recommended.

Major storm water outlets/inlets should be landscaped with plant materials and large rockery to provide visual screening and security buffering for pedestrians and dry pond users.

Where possible, relatively flat open areas should be designed to encourage active recreational use.

Approved furniture may be provided by the Developer and placed at strategic locations within the dry pond.

Lighting, if provided, to be to the satisfaction of the County.

Special or unique features, such as recreational facilities, bridges and architectural and structural features will be designed and sealed by recognized accredited professionals.

13.2 NATURAL AREAS

Existing natural and naturalized areas impacted by the proposed improvements that cannot be protected during construction must be re-naturalized with native plant materials having regard for the surrounding environment, new drainage patterns, soil conditions, and ecological rehabilitation.

The Developer will determine the level of restoration to be completed in consultation with the County.

The Developer will design an appropriate mix of native trees, shrubs, ground covers and wild seed mixes to rehabilitate impacted naturalized areas.

The Developer will design any required subsurface drainage, surface drainage and erosion control measures in the rehabilitation area.

The Developer shall, if required, coordinate this rehabilitation with other Consultants to implement geotechnical, structural and bioengineering principles and recommendations.

The landscape drawings will identify all plant communities to be established and all other information necessary to implement the proposed improvements.

The Developer will specify all tree, shrub and ground cover sizes. No minimum or maximum sizes are specified. Tree mix to match natural setting.

Forestry stock, seedlings, deciduous tree whips, and propagated and rooted cuttings are acceptable for use.

All plant materials to be nursery stock or obtained from Provincial Government sources.

The Landscape Architect will identify appropriate planting installation specifications and detailing on landscape drawings.

"Round-Up" or other approved herbicides may be used to eradicate natural slopes prior to planting of trees and shrubs. Herbicide shall be applied by a licensed applicator.

13.3 MAINTENANCE PERIOD

The maintenance period for all planted material shall be two (2) years from the date of issuance of a Completion Certificate.

Any plant that is dead, not true to name or size as specified, or not in satisfactory growth, as determined by the County, shall be removed from the site. In case of any question regarding the condition and satisfactory establishment of a rejected plant, the Contractor may elect to allow such a plant to remain through another complete growing season, at which time the rejected plant, if found to be dead or in an unhealthy or badly impaired condition, shall be replaced by the Contractor.

The applicant shall be responsible for, and at his own expense to remedy, any defect, fault or deficiency in the completed works during the maintenance period.

END OF SECTION

14. UTILITY COMPANIES

The following guidelines apply to all Developers for the construction of municipal improvements, as well as Utility companies wishing to repair, replace or otherwise modify their existing services, within Cypress County.

14.1 ELECTRICAL POWER, TELEPHONE, GAS, AND CABLE TV SERVICES

14.1.1 General

Private Utility Companies provide Electrical Power service, Gas Service, Telephone service, and Cable TV service, fibre-optic for broadband internet.

14.1.2 Rights-of-Way

Where required, the Developer shall provide right-of-way and easements of sufficient size and location to satisfy the above-mentioned Utility Companies.

Utilities shall be located according to the Standard Drawings, or as directed in writing by the County.

All utility easements on Private/Public Lands property shall be registered.

14.1.3 Installation

An approval must be obtained from Cypress County for any excavation on County property.

All distribution cables shall be installed in one common trench, a minimum of 300 mm wide, at the required alignment. All power and communication cable trenches on the road allowance shall be at a minimum of 1.5 m below finished grade level. The trench bottom shall be free of stones, loose earth and sharp objects.

All gas trenches on the road allowance shall be at a minimum of 1.0 m below finished grade level. Trenches shall be a minimum of 300 mm wide. The trench bottom shall be free of stones, loose earth and sharp objects.

Gas lines shall be installed in a separate trench from cable installations, and shall maintain a minimum distance of 3.0 m from any valve, hydrant, catch basin, manhole, vault and sanitary and storm water lines. A minimum 3.0 m clearance is required to any water lines.

Power, telephone, or cable TV cables shall maintain a minimum distance of 3.0 m from any valve, hydrant, catch basin, manhole, vault, watermains, sanitary mains, and storm water line. A minimum clearance of 0.3 m in all directions is to be maintained when crossing gas service lines.

Extreme care must be taken when backfilling so as not to disturb any Legal survey pins. Any survey pins disturbed during installation shall be replaced at the Utility Company's expense.

Trenches shall not be left open, with cables or gas line exposed, longer than forty-eight (48) hours without permission of the County. In such cases, the open trenches shall be properly marked and barricades with flashers provided by the Developer. In locations where flooding of the trenches may occur, or the open trench creates a public hazard, the County may, at its discretion, require the excavation to be appropriately covered.

The use of trench digging machinery will be permitted, except where its operations will cause damage to trees, buildings, fences, or other existing structures or municipal infrastructure above or below the ground. At such locations, hand digging shall be employed to avoid damage.

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, warning lights and guards, as required, shall be placed. Whenever required, watchmen shall be provided to prevent accidents.

Backfill material shall be native soil material excavated from the ditch/trench or Fillcrete, at the discretion of the County. Sand must be substituted for poor existing soils. Poor existing soils are defined as organic soils, peat, black loam, sod, clay that has hardened and stones. Backfill material shall be compacted to 95% density of the maximum density of a standard proctor compaction test within boulevards and 98% within streets under concrete, asphalt structures or lanes. All backfill material may be subject to the approval of the County.

Augering, in some instances, may be required. In cases where augering is necessary, the diameter of the augered hole shall not be over 50 mm greater than the diameter of the duct to be installed.

14.1.4 Costs

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

END OF SECTION

15. TESTING

Testing expected on all new developments shall follow the following tables.

TABLE 9.2

TEST FREQUENCY

Specification	Type of Test	Recommended Test Frequency	Remark:
Trenching, Backfilling and Compaction for sewers, catch basins leads, watermains and hydrants sewer and water service connections, shallow utilities, and for Electrical Installation	Density Test: -Trench longer than 15 m -Trench shorter than 15 m	2 tests per 600 mm of depth for every 100 m of trench length 3 tests per trench	Testing will vary with location of project and consequences of trench settlement.
Roadway Excavation, Backfill and Compaction	Grading/Fill Compaction: Subgrade Preparation Proof Rolling:	1 density test per 2000 sq.m of compacted lift 1 density test per 1000 sq.m of compacted subgrade lift Entire project	
Aggregate: General Granular Sub-base Granular Base	Source Sampling: Compaction: Proof Rolling:	1 sieve analysis per 500 tonnes of asphalt aggregate for crushing control 1 sieve analysis per 2500 tonnes of base and subbase aggregate 1 density test per 1500 sq.m of compacted granular lift of road Entire project	Required 2 weeks prior to commencing work
Stabilization: Lime	Source Sampling: Test Area: Proof Rolling:	400 sq.m to establish and demonstrate work methods and timing At completion of curing period	Required 2 weeks prior to commencing work
Soil Cement	Source Sampling (aggregate): Mix Design: Thickness Test: Compaction Test: Strength Test:	1 sieve analysis per 2500 tonnes 1 core sample per 1000 sq.m of soil cement in place 1 density test per 1000 sq.m of soil cement in place 1 7-day compressive strength test per 1000 tonne of soil cement	Required 2 weeks prior to commencing work Required 2 weeks prior to commencing work Areas suspected to have inadequate thickness
Topsoil	Topsoil Analysis: -On-site Sources -Contractor Supplied	1 analysis report for each topsoil source Contractor to supply 1 litre sample of each topsoil type for testing	Required 4 weeks prior to commencing work

TABLE 9.2

TEST FREQUENCY

Specification	Type of Test	Recommended Test Frequency	Remark:
Asphaltic Concrete Paving	Mix Design: Density/Thickness Test: Mix Proportions:	3 cores per 600 tonnes of asphalt pavement 1 Marshall per 600 tonnes of mix, with a minimum of 1 test from each full day's production	Required 2 weeks prior to commencing work
Water Main	Hydrostatic/ leakage test* Bacteria/Chlorine Test *	Test section not to exceed 365 m in length	Provide County at least 24 hours notice
Storm Sewer Sanitary Sewer	Television and Photographic Inspections:	Upon completion of sewer installation, after backfilling	Performed by Contractor
Force Mains	Hydrostatic/ leakage tests *	Test section not to exceed 365 m in length	Provide County at least 24 hours notice
Concrete Curbs and Gutters, Walks, Medians, Driveways and Swales General Concrete Slip Formed Concrete	Mix Design: Slump Test: Air Content Test: Strength Test:	1 per 20 cu.m for each class of concrete poured, min. 1 per day 1 per 20 cu.m for each class of concrete poured, min. 1 per day 1 per 20 cu.m for each class of concrete poured, min. 1 per day	Required 2 weeks prior to commencing work Every truck until consistency is established Every truck until consistency is established
*Tests to be witnessed by County			

END OF SECTION