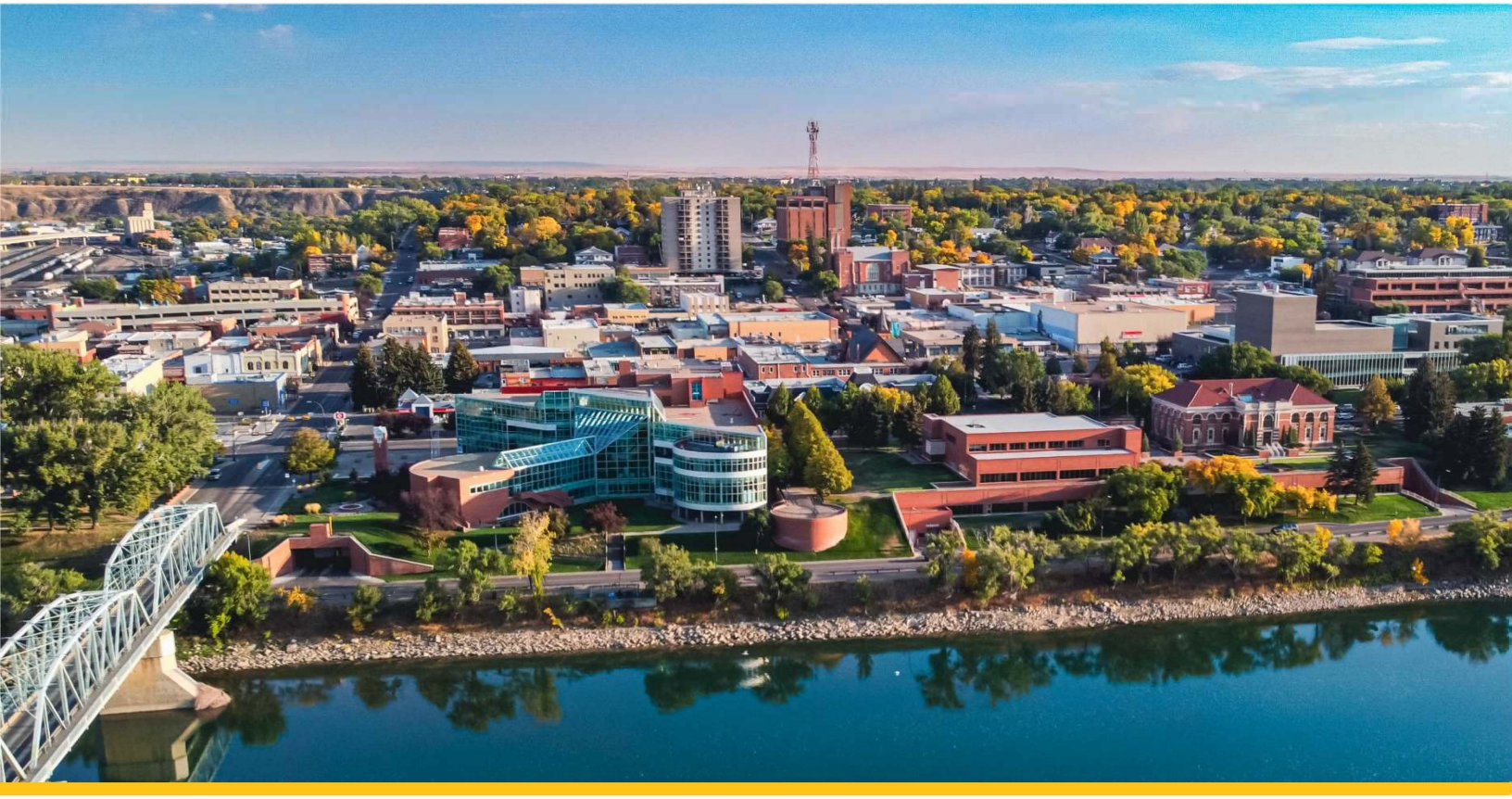
Medicine Hat



City of Medicine Hat

# Municipal Servicing Standards Manual

**FINALVERSION – 2025**

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# REVIEW AND APPROVALS

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# PART 1 – INTRODUCTION TO THE MUNICIPAL SERVICING STANDARDS

## 1. INTRODUCTION TO THE MUNICIPAL SERVICING STANDARDS

### 1.1 FORWARD

The purpose of the Municipal Servicing Standards Manual (MSSM) is to provide the Development Community with a set of Standards that outline the minimum expectations of Municipal staff when planning the development or redevelopment of lands and the construction of related municipal infrastructure. These Standards have been established for the benefit of Developers, Consulting Engineers, Contractors, and other interested parties to provide procedures and standards on the development of land and the construction of public infrastructure in the City of Medicine Hat (the City).

The MSSM defines the minimum expectation for public infrastructure. It is the responsibility of Developers, Consulting Engineers, and Contractors to apply sound engineering principles and industry best practices to provide an end product that is practical, economical, efficient, safe, and sustainable to be operated and maintained by the City.

It is not the intent of the MSSM to stifle innovation or discourage creative solutions, but to create a benchmark by which Municipal staff can objectively and consistently evaluate a development proposal and efficiently facilitate the necessary approvals.

The MSSM also serves as a guide for exploring and implementing viable and economic alternatives that meet the intent of the Standards. Proposed alternatives must be reviewed and approved to the satisfaction of the City prior to implementation. The Standards and criteria outlined in the MSSM are subject to review and modifications from time to time and as such, the responsibility lies with the proponents of any new project to apprise themselves of the current standards and criterion prior to proceeding beyond the Planning approval phase.

In most cases, the City will assume ownership and responsibility for the perpetual maintenance of this infrastructure, as such, it is important that a degree of quality control is incorporated at the design stage of the project. The City of Medicine Hat Gas and Electric Utilities at all times owns and maintains the rights to all gas and electric infrastructure up to the point of demarcation between the customer and the utility.

### 1.2 INTENT AND USE OF THIS DOCUMENT

The objective of these Standards is to provide a clear guiding framework for Developers, Consulting Engineers, and Contractors in the design of municipal infrastructure in the City.

These Standards are intended to ensure that new municipal infrastructure is acceptable to the City with regard to overall quality, safety and environmental considerations, functionality, operation and maintenance requirements, and life cycle costs.

## 1.3 SCOPE AND INTERPRETATION

These Standards apply to the design and installation of all municipal infrastructure for capital projects and private development within the City. These Standards do not cover the design or installation of street lighting, ornamental lighting, power, gas, telephone, and cable services. New development area street lighting shall be designed and constructed to conform to available City standards or the Transportation Association of Canada (TAC) Canadian Guide for the Design of Roadway Lighting. The Engineering Standard drawings, as referred to in various sections, shall form an integral part of these Standards. Engineering Standard Drawings Guidelines can be found in Part 10 herein. The City reserves the right to make the final decision regarding the interpretation of the intent of these Standards. The designer shall abide by the standards outlined within this document. All construction shall abide by the specifications outlined within this document. Where development is anticipated to be surrounded by existing infrastructure, the City may allow new development to match the standards/specifications of the existing boundary.

## 1.4 USE OF GENERAL DESIGN STANDARDS

These Standards define the minimum acceptable requirements to be satisfied in the planning, design, and construction of municipal infrastructure within the City. More stringent planning, design, and/or construction criteria should be applied by the Consultant as appropriate.

The City's acceptance of the design covers only compliance of the design with respect to these Standards and is not a warranty of the design. Notwithstanding the requirements of these Standards, the Developer and Consultant shall remain fully responsible for the design.

Where a departure from these Standards might achieve a better design with regard to infrastructure quality, safety, environmental considerations, functionality, operations and maintenance requirements, or life cycle costs, the Consultant is required to present a proposal to the City in accordance with Section 2.11.7 of this document or submit the request using the "Alternative Solution Request Form" found at Appendix C to this document.

## 1.5 STATUTORY REQUIREMENTS FOR APPROVALS BY OTHER AUTHORITIES

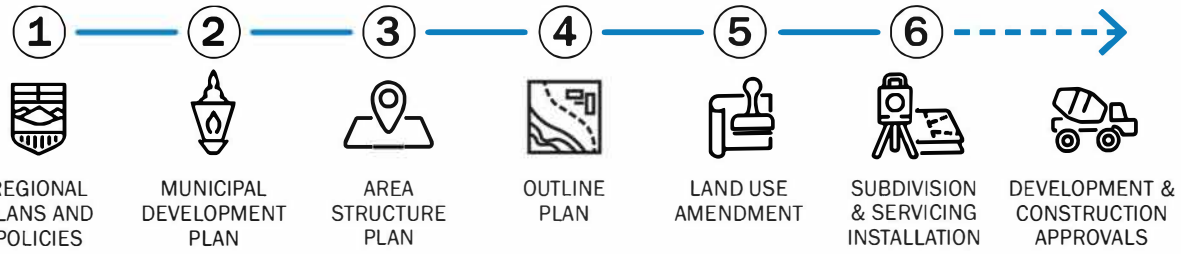
It is the responsibility of the designer to ensure the design conforms to all applicable statutes, laws, bylaws, regulations, ordinances, orders, directives, permits, licenses and requirements of governmental or other public authorities having jurisdiction, and all amendments thereto.

Wherever the standards of other authorities are referred to in these Standards, the current edition of such standards shall apply. Where two or more applicable standards govern the design, the more restrictive shall apply.

## 1.6 PLANNING AND LAND USE

Municipalities in Alberta derive legislative authority for regulating land use and development from Part 17 of the Municipal Government Act, as well as other provincial documents relating directly to land use and development include the Subdivision and Development Regulation and Provincial Land Use Policies.

The following chart identifies the hierarchy of plans governing the land development processes in Medicine Hat. The MSSM is an integral part of this process ensuring that the minimum standards are met for the infrastructure to be taken over by the City.




### 1.6.1 GUIDING DOCUMENTS

The following documents are high-level references used in the creation of these Standards, for general guidance or specific references.

Additional references in each of the subsequent sections of these Standards refer to specific technical guidelines or statutes that have been used.

- Municipal Government Act (MGA) current Edition, (*PART 17; Planning and Development*).

  https://kings-printer.alberta.ca/1266.cfm?page=m26.cfm&leg_type=Acts&isbncln=9780779848546&display=html

- Current Medicine Hat Municipal Development Plan (MDP).

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/MDP_myMH-Municipal-Development-Plan.pdf

- Current City of Medicine Hat Land Use Bylaw.

  https://www.medicinehat.ca/en/government-and-city-hall/resources/Documents/Bylaws/4168.pdf

- Alberta Environment and Natural Resource Development.

  https://www.alberta.ca/environment-and-protected-areas

- City of Medicine Hat Planning and Development Services Planning and Land Use Guidance.

  https://www.medicinehat.ca/en/business-and-development/planning-and-land-use.aspx#

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# PART 2 – GENERAL PROCESS FOR DEVELOPMENT

## 2. PLANNING AND DEVELOPMENT PROCESS INTRODUCTION:

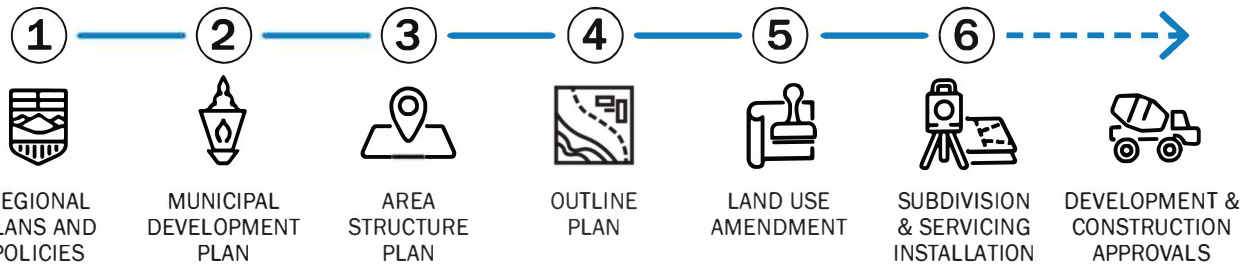
Municipalities in Alberta derive legislative authority for regulating land use and development from Part 17 of the Municipal Government Act. Other provincial documents relating directly to land use and development include the Subdivision and Development Regulation and Provincial Land Use Policies.

The purpose of Part 17 of the MGA is to provide a municipality with the means to prepare and adopt plans.

The hierarchy of local plans for developing a piece of property ready for building construction within the City of Medicine Hat includes the following:

- Tri-Area Intermunicipal Development Plan.
- Municipal Development Plan (MDP).
- Area Structure Plan (ASP)/Area Redevelopment Plan (ARP).
- Outline Plan.
- Land Use Bylaw.

Depending on the complexity of the proposed development, certain steps within the process may be combined. As previously identified, the following chart identifies the land development process in Medicine Hat.



## 2.1 SUBDIVISION AND DEVELOPMENT SERVICING: PRELIMINARY ENGINEERING APPROVALS AND ACCEPTANCE, PROCESS AND SUBMISSION REQUIREMENTS

Before an application, requesting municipal services to be extended to a site development, redevelopment or subdivision can be approved. The typical hierarchy of local plans and processes required to be followed within the City of Medicine Hat, includes the following:

- MDP, which must provide for a proposed development to be contained within the current approved planning and service area of municipal infrastructure and services.
- ASP's and associated supporting documents and reports for approved areas within the scope of the MDP, outlining the nature, intensity and layout of a proposed development and the associated preliminary engineering to establish the required servicing must receive municipal approval.
- The Developer is advised to meet with the Parks and Recreation Department, Planning Department, and the local School Boards during the initial stages of the preparation of an ASP.
- Outline Plan or preliminary engineering studies where an approved Outline Plan does not exist or is not deemed to be required due to the scale, intensity or location of a subdivision or development.
- Subdivision Approval.
- Detailed Engineering Design/Service or Development Agreement/Regulatory & Final Approvals.
- Plan Registration.

Depending on the complexity of the proposed development, certain steps within the process may be combined or omitted, as deemed expedient by the City, and the Developer advised accordingly.

## 2.2 FUNCTIONAL SERVICING REPORTS (FSR) AND PRELIMINARY ENGINEERING STUDIES

This Section focuses on the process and engineering requirements of the FSR or preliminary engineering studies. The planning documents (MDP, ASP, and Conceptual Scheme) are explained in other documents.

### INTRODUCTION

Unless approved otherwise, a developer will be required to complete a FSR (or preliminary engineering studies) to complement the accompanying planning documents when making application for the approval of an Outline Plan.

When making application for the approval of a subdivision or development where an approved FSR does not exist or the scale, intensity, or location of such a subdivision or development is deemed by the City, to not warrant a FSR, but to warrant specific preliminary engineering

studies, the Developer will be required to complete and submit such studies with the application.

The FSR or engineering studies are to be submitted concurrently with an Outline Plan, Subdivision or Development Permit as deemed appropriate by the City. The Reports are intended to identify all servicing requirements for the stages of the development and to summarize the following information as the basis for the detailed design of each phase of development:

- Area and Lot Grading.
- Roadways and Transportation System.
- Water Distribution System.
- Sanitary Sewage Collection System.
- Storm Sewer & Major Drainage System.
- Parks and Recreation Open Space System.
- Electric Distribution System.
- Gas Distribution System.
- Telecommunications system.

## 2.3 REPORTS, STUDIES, AND DRAWINGS

The base plans for the Reports should conform to the tentative legal plan or to the conceptual layout of lots, blocks or blocks and parcels, depending upon the level of detail deemed appropriate by the City for the nature of submission. The plans should be at a scale of sufficient visibility to identify important details.

The following plans shall be submitted as part of the Functional Servicing Report:

- Geotechnical Test-Hole Location Plan.
- Site Grading Plan.
- Traffic Assessment and Access Plans, Functional Roadways Plans, Transit Stops and Traffic Control Devices Plan.
- Water Network System Plan.
- Sanitary Sewer System Plan.
- Storm Sewer System Plan incorporating catchment areas, hydrologic characteristics, storm sewers of significance and appurtenances.
- Major Drainage System Plans incorporating catchment areas, hydrologic characteristics, major drainage conveyances and hydraulic characteristics, Functional SWMF Plans and Functional Outfall Plan.

- Open Space System Conceptual Landscaping Plan incorporating the following as applicable:
  - Municipal Reserve (MR)
  - School Reserve (SR)
  - Environmental Reserve (ER)
  - Conservation Reserve (CR)
  - Municipal School Reserve (MSR)
  - Public Utility Lot (PUL)
- Conceptual landscaping plans and other conceptual landscaping plans for any other parcels being developed by the Developer (i.e., Boulevards, Roads Rights of Way, PUL's, Storm Water Management Facilities).
- Gas Distribution System Plan showing existing infrastructure and identifying the gas main which will supply the area to be developed.
- Electrical Distribution System Plan showing existing infrastructure and identifying the electric feeder which will supply the area to be developed.
- The Developer shall contact and coordinate with the local telecommunications providers to include the necessary information in the FSR.
- All reports submitted as a part of the ASP, or Outline Plan (i.e. Biophysical Impact Assessment, Historic Resources, etc.) including mitigation plans for preservation or restoration of same.

### 2.3.1 GEOTECHNICAL INVESTIGATION

Geotechnical subsurface investigation will be required as part of the Outline Plan, FSR or preliminary engineering studies and shall conform to the following criteria:

- Borehole drilling spaced sufficiently to capture required geotechnical data to provide for design.
- Borehole drilling (150 metre maximum spacing grid) program to identify and characterize subsoil stratigraphy.
- Field and laboratory investigation program, with supplementary field and laboratory testing as required. The Report shall include:
  - Description of the area, site geomorphology and soil stratigraphy; at each borehole (depth = 2 metres below lowest depth of excavation, minimum depth = 10 metres); soil moisture at 1 metre intervals, Atterberg limits, Standard Proctor MDD/OMC for predominant soil types and classification, standard penetration tests/in-situ relative densities and consistency, soil bearing capacities, shear strength tests where necessary; ground water elevations,

- Pavement structure design for all roadway functional classifications in the proposed subdivision or development,
- Classification of each predominant soil type,
- Soil sulphate test results representative of the soils in contact with Portland cement concrete,
- Borehole location plan, soil logs, water table contour map based on seasonal high with contours at 0.5 m. intervals if projected seasonal high is within 4.0 metres of original ground, field test results, laboratory test results,
- Recommendations for site grading, stockpiling soil, utility trenching and trench backfill, pavement structure and materials design for roadways (subject to the City's minimum pavement structure), foundation design criteria for buildings (Part 9 Alberta Building Code), confirm soil suitability for City underground utility thrust blocks, general design criteria for residential retaining walls,
- Ground water influence and seepage control measures on utility trenches, slope stability, foundation, and other excavations (such as SWMF), road base stability and associated recommendations for design criteria and construction methods, and
- Report to include statement that weeping tile drains for foundations and Portland Cement HS for concrete in contact with soil is a standard City requirement, applicable to all areas. And HSb where Blended Hydraulic Cement is indicated.

#### 2.3.1.1 SPECIAL GEOTECHNICAL INVESTIGATIONS

Some development specific conditions may result in a requirement for the preparation and submission of special Geotechnical investigations, prepared in conformance with recognized current best practices:

- Slope Stability Study – 15% and steeper slopes.
- Countermeasures against slope failure – signs of incipient failure of an existing slope.
- Deep Fill Report (For fills within lot area's exceeding 1.5m and for embankments 2.0 metres and deeper).
- Hydro-geological Study – seasonal groundwater high within 1.0 metres of original ground surface.
- Or where there is an intent to use trenchless technology (Horizontal directional drilling (HDD), auger boring, jacking, ramming, etc.). Recommendations for the suitability of this type of activity will be required by a specialist in this field.

#### 2.3.1.2 GEOTECHNICAL REPORT LIMITATIONS

The City requires that all Geotechnical Reports submitted, pursuant to City approval (development, subdivision, land use or otherwise) must include the following:

- The Report addressed to "The City of Medicine Hat" in addition to the party that commissioned the Report on the cover and on the first page of the Report.
- State in the introduction (first section of the Report) that the "City of Medicine Hat" can use and rely on the information in the Report as it relates to the City Approval.
- Can include the Report in any City records or geotechnical database that the City may, at its discretion, keep to fully use and rely on this report as an addressee; including all attachments, drawings and schedules for the approval the Report was prepared for.
- The City shall be entitled to provide copies of the Report to City Council and City employees, City regulatory boards.
- The City is at all times entitled to provide copies of the Report to Alberta Environment and Protected Areas and any other governmental authorities and regulatory bodies having jurisdiction.
- The City may also contact the author or other parties to the Report to obtain further information respecting the Report or to discuss the Report further.

Where a report has been prepared and the City is not an addressee, a cover letter from the engineering company who prepared the Report, sealed by the same Engineer, may be supplied indicating the Report can be used by the City as specified above and that the letter takes precedent over any provision, disclaimer, or waiver in the Report to the contrary.

### 2.3.2 PAVEMENT DESIGN PROCEDURES

The AASHTO method of pavement design (most current edition), outlined in the Alberta Transportation and Economic Corridors (ATEC) "Pavement Design Manual" methodology, is to be followed and documented in a Pavement Design Report, for the submission of design proposals for flexible pavement applied to streets within the City of Medicine Hat, unless otherwise accepted by the City.

Input/output files from the use of the software program DARWin (or approved equal), is required to be included with the Pavement Design Report.

The Pavement Design Report, as a portion of the project's Geotechnical Report, shall also incorporate the procedures, parameters and criteria used to arrive at the recommended design as follows:

### 2.3.2.1 ENVIRONMENTAL CAPACITIES OF ROADWAYS BY FUNCTIONAL CLASS:

| Functional Class | Vehicles Per Day (vpd) |
|---|---|
| Local Residential | 3,000 vpd |
| Local Industrial/Commercial | 5,000 vpd |
| Minor Residential Collector = | 8,000 vpd |
| Major Residential & Industrial/Commercial Collector | 12,000 vpd |
| Minor Arterial, 4-lane (divided or undivided) | 20,000 vpd |
| Principal Arterial, 4-lane divided | 30,000 vpd |

Note: A 10 % increase in environmental capacity may be allowed where a 2WLTL (2 Way Left Turn Lane) is proposed or included in the analysis of an undivided section.

### 2.3.2.2 TRAFFIC AND ESAL LOADING:

1. Annual Average Daily Traffic (AADT) estimates shall be based upon:
   - Environmental capacity of the functional classification of roadway under consideration; or
   - 20-year travel demand forecast with an annual compounded growth rate of 3% for all Arterial traffic, 2% for all Collector traffic and 1% for Local traffic, if starting with current traffic volumes based on field counts; or
   - 20-year travel demand forecasts at area build-out conditions using approved methodology, procedures, current Traffic Impact Assessment Report excerpts or AADT estimates provided by the City.
   - If the travel demand forecast derived as described above is less than 75% of the roadway environmental capacity, use the traffic demand forecast (TDF) Volumes times X 1.25.
   - If the TDF derived as described above is greater than 75% of the roadway environmental capacity, use the environmental capacity as the basic traffic volume input into the pavement design procedure.
2. ESAL Factors shall be as follows:
   - Passenger (CAR) 0.0004
   - Single Unit Trucks (SUT) 1.0
   - Tractor Trailer Combinations (TTC) 2.0
   - Transit buses (BUS) 3.0

3. The Design ESALs (in terms of 80 kN single axle loads) shall be determined in accordance with the following:

   ESALs/day/direction =

   Design ESALs = ESALs/day/direction X 365 X Traffic Growth Factor (TGF)

$$\frac{AADT}{2}\left[\frac{\%CAR}{100} X\ 0.0004 + \frac{\%SUT}{100} X\ 1 + \frac{\%TTC}{100} X\ 2 + \frac{\%BUS}{100} X\ 3\right]$$

$$TGF = [1 + g)n - 1]/g$$

   Where: g = Growth Rate/100, and

   n = Design Period (years)

   The traffic composition shall be based on actual traffic counts and shall be reviewed and approved by the Municipal Works Department.

4. Traffic volumes are to be equally distributed among all through lanes with no adjustment, allowance for, or distribution to, auxiliary or turning lanes.

5. Overloads, the ESAL loads obtained above are to be multiplied by 1.15 to account for overloaded axles.

### 2.3.2.3 SERVICEABILITY:

Initial Index =4.2

Terminal Index =2.5 for all Arterials

=2.0 for Collectors and Local Roads

### 2.3.2.4 RELIABILITY:

| ESAL x 10**6 | Reliability % |
|---|---|
| > 10.0 | 95.0 |
| 5 - 10 | 90.0 |
| 0.1 - 5 | 85.0 |
| < 0.1 | 75.0 |

### 2.3.2.5 EQUIVALENCE OF CONSTITUENT PAVEMENT LAYERS:

Asphaltic concrete equivalency:

| | |
|---|---|
| 1.00 mm | Asphaltic concrete |
| 2.25 mm | of crushed gravel |

1.75 mm of soil cement

1.25 mm of asphalt treated processed gravel base

Granular Base equivalency (component layer material ratio)

1.00 mm crushed gravel

1.30 mm soil cement

1.80 mm asphalt treated gravel base

### 2.3.2.6 DESIGN LIFE:

A pavement life of 20 years is to be assumed for design and analysis.

### 2.3.2.7 OTHER DESIGN PROCEDURES AND FACTORS:

The ATEC's Pavement Design Manual and AASHTO guide are to be used for guidance in the selection and use of other design factors, such as drainage, frost susceptibility etc.

### 2.3.2.8 MINIMUM PAVEMENT STRUCTURE:

The design of a pavement structure for any functional classification of roadway is site or development specific to the extent that subsurface conditions and traffic loading are considered variables which are site or development specific and can have a major influence on the serviceability of that pavement, as can frost susceptibility of sub-soils, ground water conditions or climatic and other environmental factors.

To provide for the development and occupancy of housing or properties within a subdivision development, while still maintaining continuous vehicular access to such housing and properties which is dust free and trafficable by the type and mix of heavy construction and operational traffic, as well as to provide for the commencement of municipal services (including the operation of dedicated utilities and works) prior to the full completion and occupancy of the subdivision, the City has established a minimum pavement structure to be provided on roadways.

This minimum pavement structure also helps prevent permanent deformation of the roadway sub-grade or complete loss of serviceability during the first phase of staged construction due to loading from heavy construction and operational traffic like garbage trucks etc.

The minimum required pavement structure is comprised of:

- 50 mm Asphaltic Concrete wearing course.
- 80 mm Asphaltic Concrete base course.
- 250 mm Processed, crushed, untreated gravel base.

This minimum pavement structure applies to local residential roadways. This minimum pavement structure is not to be confused with that which is to be provided as a result of

analysis. The pavement structure derived as a result of analysis is the requirement, provided that it is not less than the minimum structure above, otherwise the minimum structure is deemed to govern.

This analysis (covering all functional classifications of roadways in the subdivision or development) is required to be submitted with the pavement design and Geotechnical Report for the subdivision or development.

### 2.3.3 SITE GRADING PLAN(S)

(refer to Part 4 of this document)

The Site Grading Plan is to indicate:

- Major drainage system routing to storm water management facilities and receiving watercourses.
- The coordination of depth, cover, and grades among grade dependent utilities.
- The existing contours and proposed grade points and proposed fills or cuts 2.0 metres or over.
- Geotechnical test hole locations.
- Existing natural or special site features.
- Groundwater contours if within 4.0 metres of original ground surface.
- Existing utility locations within the Site Grading Plan.

### 2.3.4 TRAFFIC AND ROADWAYS

#### 2.3.4.1 TRAFFIC IMPACT ASSESSMENT

A Traffic Impact Assessment (TIA) will be required in accordance with Part 8 of this document. In addition, the TIA is to:

- Analyze the location and design of roadway access points at adjoining roadways in accordance with the City's standards for all collector/arterial intersections complete with the requisite spacing of intersections, capacity analysis and traffic control devices.
- Analyze and assess the provision of noise abatement measures consistent with City standards for residential areas adjacent to arterial and higher classification roadways. All conceptual design, analysis and assessment information is to be accompanied with explanatory narrative, tabulations and functional drawings that describe the transportation-planning concept for the development area and high-volume traffic generators.

#### 2.3.4.2 ROADWAY PLAN(S)

The Roadway Plan is to:

- Conform to the road hierarchy and include cross-section geometry, road width, traveling lanes, parking lanes, overland drainage conveyances, intersection design, significant traffic control devices and right-of-way widths consistent with the TIA and functional detail as required.
- Confirm transportation routing consistent with the ASP.
- Propose and detail pedestrian related infrastructure including sidewalks, trails, walkways, and their accessibility.
- Provide and detail the proposed vertical alignment road, lane, walkway, and PUL grades, at intersections and point of intersecting (P.I.) grade elevations.
- Show the location of special entrance features.
- Show transit stop locations and shelters or bays, where applicable, as well as their accessibility.
- Show the proposed locations of boulevard trees according to the roadway cross sections (considerations for watering to be shown as well).
- Detail screening measures and design criteria where required.
- Detail temporary facilities required to support proposed phasing (if required).
- Show access management provisions for projected high-volume driveways. The detailed design criteria are included in Part 8 of this document.

### 2.3.5 WATER SUPPLY SYSTEM REQUIREMENTS

Submission requirements include:

- Network analysis to establish the size of grid mains required to service the development area, based upon boundary conditions established in accordance with the Environmental Utilities (EU) Department requirements, to include:
- Maximum hourly flows.
- Average daily flows.
- Maximum day plus fire flows at locations identified by the EU Department with criteria as outlined by the Fire Underwriters Association.
- Pressures.
- Elevations.
- Pipe sizes.
- Location of irrigation service(s) connections.

- Distribution system grid mains, valving and hydrant coverage.
- PRV vaults and other special installations as required.
- All design and analysis information are to be accompanied with sufficient explanatory notes, descriptions, summaries, and drawings that describe the overall servicing concept and details for the development area.
- Other design criteria and submission requirements specific to the development as identified by the EU Department.

#### 2.3.5.1 WATER SYSTEM PLAN(S)

The Water System Network Plan is to:

- Indicate water main sizes and alignments.
- Indicate preliminary hydrant, water valve, and PRV locations.
- Water line pressures at key locations within the development and near high water usage areas.
- Temporary facilities required to support proposed phasing (if required). The design criteria are included in Part 5 of this document.

### 2.3.6 SANITARY SEWER SYSTEM REQUIREMENT(S)

Submission Requirements include:

- Collection system trunks and mains, pump stations and force mains (if applicable), any special structures and appurtenances to include peak hour sewage flows for trunk lines.
- All design and analysis information are to be accompanied with sufficient explanatory notes, descriptions, summaries, and drawings that describe the overall servicing concept and details for the development area as well as over sizing requirements for the upstream portion of the basin and projected flows into the connection point(s) to the existing system.
- Other design criteria and submission requirements specific to the development as identified by the EU Department.

#### 2.3.6.1 SANITARY SEWER SYSTEM PLAN(S)

The Sanitary Sewer System Plan is to:

- Indicate the contributing sanitary service areas based on topographical considerations and downstream main capacities.
- Indicate line sizes considering future growth areas beyond (upstream) of the ASP limits (e.g. over sizing requirements through the development area).
- Identify proposed system capacities based on projected flows.

- Proposed sanitary manhole locations, manhole inverts, and grades between manholes.
- Location of the sanitary lift station, Force main size and alignment (if required).
- Temporary facilities required to support proposed phasing (if required). The design criteria are included in Part 6 of this document.

### 2.3.7 STORM DRAINAGE SYSTEM REQUIREMENTS

- Storm drainage planning is to be consistent with any existing or current area drainage planning.
- Storm drainage trunk sewer (minor) system designed for 1:5-year return frequency event, taking into account all tributary areas. Rational method is acceptable. Trapped lows shall be minimized but clearly identified. Analyze over sizing requirements for the upstream portion of the basin and projected flows into the connection point(s) to the existing system.
- Major system conveyances (roadways, channels) designed to convey and detain/store runoff from 1:100-year return frequency event. Computer simulation of runoff and system response to design storm events, may be submitted, although is not essential if a modified rational method has been used to develop runoff rates and check of capacity/flow depth/flow velocity at critical locations for roadways and channels is required with the Servicing Report.
- Accompanying support computations, to verify that the design conforms to City requirements.
- Storm Water Management Facilities (SWMF) designed to detain-store runoff from 1:100-year return frequency event prior to its release at an attenuated peak rate equal to or less than the runoff from a 1:5-year return frequency event, at pre-developed hydrologic condition of tributary catchment, to designated conveyances and outfalls at receiving watercourses.

SWMFs shall consist of hybrid ponds incorporating standard submerged inlet structures, sediment forebays complete with liner and overflow weir; a detention-storage/wetland zone complete with vegetation complexes and flow channels; a standard outlet structure, maintenance access, public amenity, and access features. Other design requirements are covered in Part 7 of this document.

- A drainage system treatment wetland proposed separately from dry detention storage ponds shall be designed as provided for in Part 7 and which may be accepted on a case-by-case basis.
- Erosion and sediment control measures, as required.

- Refer to Section 9.2.2 of this document for principles and guidelines for determining MR dedication credit in respect of SWMFs of the hybrid type depending upon degree of public access and public amenity value provided.
- Approved landscaping and recreational areas developed within the pond footprint.
- Drainage outfalls into receiving watercourses.
- The submission shall also include:
    - An explanatory narrative of the planned system,
    - ICD Characteristics,
    - Modelling analysis in hard copy and digital format with input/output program files including a description of computational methodology for major system design and summary tabulation,
    - SWMF design and summary tabulation,
    - Outfall design, and
    - Minor system trunk sewer design and tabulation.

#### 2.3.7.1 STORM DRAINAGE SYSTEM PLAN(S)

All storm drainage plans are to indicate the following at a functional level only, except where indicated otherwise:

- All associated land control requirements

##### 2.3.7.1.1 MINOR SYSTEM PLAN(S)

- The key hydrologic and hydraulic assumptions and results such as catchment areas at pre and post development and at any interim or staged conditions & hydrologic characteristics, associated times of concentration, slopes,
- Indicate future storm sewer system, line sizes, hydrology and hydraulics,
- Identify bottleneck locations, alternative routing possibilities, and solutions,
- Functional design of outfall including its hydraulics and operations,
- Identify temporary facilities required to support proposed phasing (if required),
- The design criteria are included in Part 7 of this document.

##### 2.3.7.1.2 MAJOR SYSTEM PLAN(S)

- The key hydrologic and hydraulic assumptions and results such as catchment areas at pre and post development and at any interim or staged conditions & hydrologic characteristics, associated times of concentration, slopes,
- Overland conveyance geometry and associated hydraulic characteristics,

- Indicate functional major drainage routing along proposed streets, lanes, and PUL's for the area contained within the ASP, including the hydraulic, capacities and velocities for overland conveyances at key points (downstream of confluences and significant inflows) within the drainage basin area,
- Functional design of outfall including its hydraulics and operations,
- Identify bottleneck locations, alternative routing possibilities, and solutions,
- Identify temporary facilities required to support proposed phasing (if required),
- The design criteria are included in Part 7 of this document.

#### 2.3.7.1.3 STORM WATER MANAGEMENT FACILITY PLAN(S)

The SWMF Plan is to include:

- Summary of hydrology, hydraulics, operating characteristics, freeboard, distance to building foundations & openings, cross-section geometry of SWMFs and associated control structures.
- Detention pond locations and sizes including volume, depth, area, and elevations, hydrology, and hydraulics.
- Functional design of outfall including its hydraulics and operations.
- Forecast sediment quantities, removal frequency.
- SWMF maintenance access, alignment and cross-section geometry.
- SWMF access control features.
- Identify temporary facilities required to support proposed phasing (if required).
- Temporary pumping and associated force main hydraulics and operating requirements.
- Conceptual Landscaping Plan.
- The design criteria are included in Part 7 of this document.

### 2.3.8 ELECTRIC UTILITY PLAN(S)

Prior to the preparation of the Electric Utility Plan the Developer will meet with the Electric Utility to discuss the proposed concept. The Electric Utility Plan will show:

- Existing infrastructure locations.
- Existing UROW(s).
- Proposed major utility corridors.
- Identification of the supply points or targeted supply points along the existing infrastructure.
- Refer to Part 11 of this document for further Electric Utility guidance.

### 2.3.9 GAS UTILITY PLAN(S)

Prior to the preparation of the Gas Utility Plan the Developer will meet with the Gas Utility to discuss the proposed concept The Gas Utilities Plan will show:

- Existing and infrastructure locations.
- Existing UROW(s).
- Proposed major utility corridors.
- Identification of the supply points or targeted supply points along the existing infrastructure.
- Refer to Part 12 of this document for further Gas Utility guidance.

### 2.3.10 OPEN SPACE SYSTEM CONCEPTUAL PLANS (PARKS AND RECREATION)

Prior to the preparation of the Conceptual Landscape Plan, the Developer shall meet with the Parks and Recreation Department and the Planning and Development Services Department to discuss the proposed concept.

The Developer shall also arrange a meeting with Parks and Recreation representative, the Planning and Development Services representative, and the appropriate school board to discuss the conceptual Landscape Plan for any future school site.

The Landscape Concept Plan is to show:

- The location, size, landscape treatment, recreational function/use and type of Open Space (Municipal Reserve, Environmental Reserve, School Reserve, Conservation Reserve and/or as referenced within Section 665 within the MGA). This should include descriptive details as well as rendered preliminary landscape plans.
- The layout of the School Reserve site including location of school, parking lots, play areas and play fields. This shall be completed in consultation with the appropriate School Board.
- The location, size and type of any other parcels being developed by the Developer (i.e., Boulevards, Public Utility Lots, Storm Water Management facilities).
- The location of recreation amenities (i.e., playgrounds, park furniture, washrooms, dog off leash areas, sports fields, and any other recreational amenities or facilities)
- The layout of the trail system including surface treatment, trail widths, anticipated grades and connections to the existing trail system.
- The location of water and Electric service requirements for irrigation, any proposed park lighting and recreation amenities or facilities.
- If water for irrigation is to be provided by a non-potable source, the Developer shall provide a proposal outlining the non-potable system, including pumping and any other

technical details, cost-benefit analysis and analysis of the system including confirmation that there is sufficient water and pressure to power the irrigation system to meet the requirements of the Irrigation Design standards.

- The extent of plantings for the Open Space parcels and boulevards.
- The control of access at trail access points and around the boundary of the parcels.
- The overall Grading Plan shall include all Open Space parcels and shall include preliminary grading with minimum and maximum slopes and conceptual contours and preliminary drainage patterns,
- The Geotechnical Reports shall also address any limitations on landscape development with respect to:
    - Slope Stability, and
    - Erosion potential due to irrigation.

It is understood by both the Developer and the City that construction details such as irrigation, tree planting, trail connections and recreation amenities may not be known at the time of submission of the FSR, but that the best effort will be made by the Developer to the identify and represent the future intended use of the MR, SR, ER, CR and any other areas requiring development. The detailed design criteria for the following are included in Part 9 of this document.

- Storm Water Management Facilities
- Public Utility Lot
- Boulevards
- Any other legally registered public parcels and/or portions of parcels that require landscaping.

### 2.3.11 BIOPHYSICAL IMPACT ASSESSMENT(S)

The Biophysical Impact Assessment Reports are to be completed as part of the ASP process and included as part of the Functional Servicing Report. The Report shall be prepared and signed off by a qualified practicing Environmental Professional of Alberta. The Report shall identify and assess the environmental significance and sensitivity of the lands and shall recommend appropriate measures for protecting the environmental features. Any identified sensitive environmental features shall be included in the Conceptual Plan and shall include at a minimum the mapping of all Environmental Reserve and Conservation Reserve areas in each parcel along with a description of the potential project impacts, recommended mitigation measures, monitoring requirements and preservation, protection or restoration plans as applicable. The goal of the Biophysical Assessment is to ensure adequate protection of the environmentally significant areas and natural areas and prevent and/or minimize the environmental impacts.

Information on native flora and fauna inventory to be submitted as part of the ASP.

The Soils Report shall also address any limitations on landscape development with respect to:

- Slope Stability
- Erosion potential due to irrigation.

### 2.3.12 ENVIRONMENTAL SITE ASSESSMENT(S)

A Phase I Environmental Site Assessment (ESA) is to be completed as part of the ASP process and included as part of the Functional Servicing Report. The Report shall be completed in accordance with the *Alberta Environment Site Assessment Standard* and *Canadian Standards Association* (CSA) standard Phase I Environmental Site Assessment (CSA Z768-01) and signed off by a qualified practicing Environmental Professional of Alberta. A Phase II ESA in accordance with provincial and CSA standards (CSA Z769-00) shall be required if further investigation of an identified area of potential environmental concern is recommended in the Phase I ESA Report. Subsequent remediation will be required for confirmed areas of environmental impact. The City withholds the right to request proof of Environmental Site Assessments for respective developments.

### 2.3.13 HISTORICAL RESOURCES

The Listing of Historic Resources identifies lands in Alberta that contain or have a high potential to contain historic resources. A *Historical Resource Act* (HRA) approval is required for areas of the City of Medicine Hat the have Historic Resource Values (HRV) unless exempt under a Land Use Procedures bulletin. The HRV of an area should be identified in the Biophysical Assessment. The Developer has the responsibility of submitting an HRA approval where required and if requested to identify any significant historical resources, archaeological and palaeontological resources within the boundaries of the proposed development. The Developer must abide by the HRA requirements.

### 2.3.14 ALLOCATION AND USE OF PARKS SYSTEM SPACE

Refer to Part 9 of this document for a description of the parks and facility types that have been developed as part of the 2022 Parks and Recreation Master Plan. Section 7 of the 2010 Parks System Management Plan will continue to be utilized as a guideline until the plan is updated to address the new park types in the Parks and Recreation Master Plan.

The following principles should be followed when planning and allocating Open Space:

- All Storm Water Management Facilities shall be located on Public Utility Lots
- Storm water management facilities shall not be located on school or community facility building envelopes.

- Gas wells shall be located in Public Utility Lot parcels and shall not be included as part of the MR dedication. The design of the MR parcel shall ensure that gas wells do not compromise the functionality of the adjacent MR parcel.
- The open space and amenity value associated with storm water management facilities may be recognized by providing the Developer with an appropriate amount of Municipal Reserve credit.

#### 2.3.14.1 MR CREDIT FOR STORM WATER MANAGEMENT FACILITIES

Refer to Part 9 of this document for the principles and guidelines for determining MR credit for storm water management facilities.

## 2.4 COST SHARING

The Functional Servicing Report is to include a section on approximate costs and proposed cost sharing formulas for any oversized/ cost-shared improvements (excluding shallow utilities), identify the benefiting areas and the degree of benefit thus derived. Maps and tabulations are required to illustrate and document the approach and results.

Gas & Electric costs are shared with the Developer at the detailed design stage once calculated using the funding model.

## 2.5 REPORT & DRAWING SUBMISSIONS

Digital submissions may be submitted to Planning & Development Services for review and approval with appropriate Authentication. Upon approval, digital copies will be distributed to City Departments.

The Consultant is required to review the administrative requirements of the Municipal Servicing Standards Manual (MSSM) and confirm that submissions are complete; confirmation can be in the form of the submittals or by email.

Please note that the date of submission will not be identified as the date received. The date received will be confirmed once the submittals have been confirmed complete.

## 2.6 SUBDIVISION AND DEVELOPMENT APPROVALS

### 2.6.1 GENERAL

The detailed design drawing submission shall be consistent with the overall design concept as identified in an approved Functional Servicing Report and/ or Preliminary Engineering Reports and Studies and shall recognize and incorporate any special requirements (e.g. utility over sizing).

These Standards do not include the detailed design requirements for the communication cable servicing. The Engineering Consultant is responsible to coordinate their design with each of the individual providers.

The location of Canada Post community mailboxes shall be on hard level ground and provide year-round accessibility. Location to be coordinated with Canada Post by the Developer and be shown on the Roadways Plan.

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### 2.6.2 SUBMISSION OF DETAILED DESIGN DRAWINGS

The Engineering Consultant shall submit electronic copies. the Detailed Design drawings, clearly marked "Submission # - Issued for Approval", to the Planning & Development Services Department as per the directions in the submittals section above.

All Detailed Design drawings shall conform to the general specifications identified in Part 10 of this document. Specific design standards are provided in the following Sections:

- Part 3: Consulting Engineering Expectations
- Part 4: Grading Requirements
- Part 5: Water Distribution System
- Part 6: Sanitary Sewer System
- Part 7: Storm Drainage System
- Part 8: Roadways
- Part 9: Open Space System
- Part 10: Standards for Detailed Drawings
- Part 11: Electric Distribution System
- Part 12: Gas Distribution system
- Part 13 Solid Waste Collection

### 2.6.3 SUPPLEMENTARY INFORMATION

An accompanying report shall be submitted specifically addressing any and all deviations from the Standards and any site-specific conditions that may warrant special attention to the development.

### 2.6.4 DETAILED DESIGN DRAWING REVIEW AND APPROVAL

Formal comments and requirements on the Detailed Design drawings will be provided to the Engineering Consultant on completion of every plan review. Following approval from Alberta Environment and Sustainable Resource Development, submission of Detailed Design drawings revised to reflect all the requirements and comments and marked "for construction" is required prior to receiving approval from the Planning & Development Services Department on behalf of the City. Execution of a Service Agreement and authorization to begin construction will be authorized after City approval has been given.

### 2.6.5 DESIGN REVISIONS AFTER APPROVAL

Where it is necessary, for any reason, to make any changes to the Detailed Design drawings after they have been approved, the Engineering Consultant shall obtain approval of those changes prior to proceeding with construction of the specific part of the improvement for which the design change is proposed.

Three copies of each of the original approved drawings affected shall be submitted to the Planning & Development Services Department with the proposed changes shown in red, accompanied by a letter outlining reasons and justification. If the proposed changes are approved, one copy will be signed and returned to Engineering Consultant, accompanied by a letter authorizing the changes to be made on the original. The changes shall be reflected on the appropriate "As-Built" drawings. No changes other than those accepted are to be made to any original approved drawing.

## 2.7 SERVICE AGREEMENTS AND/OR DEVELOPMENT AGREEMENTS

### 2.7.1 GENERAL

A Developer, prior to registration of a subdivision with Alberta Land Titles or prior to commencing construction upon receiving plans approval following subdivision or development approval, may be required to enter into an agreement with the City as per the MGA. A Service or Development Agreement outlines a developer's obligation to construct improvements to City Standards, addresses the scope of improvements, special development requirements, and includes financial, cost sharing, maintenance, and performance security. A Service or Development Agreement also outlines the City's obligations to review plans, inspect construction, assume ownership and maintenance responsibilities after construction.

Preparation of the Service Agreement by the Planning & Development Services Department will typically take place concurrently with the Detailed Design drawing review and approval of other related reports required prior to development (e.g. Geotechnical, Historical Resources, etc.). Service Agreements are prepared and approved by the City Planner and Director of Development Services and the City Solicitor and endorsed by the Mayor and City Clerk of Medicine Hat and cannot be completed unless all required information has been received and approved.

A Service Agreement cannot be completed unless notification, approval or registration of the improvements as required by Alberta Environment and Protected Areas have been processed as the case may require, following issuance of the City's approval.

The steps, process and timing of plans review, approvals and Service Agreement preparation is time, complexity, and workload sensitive. The most current steps, process and timing can be obtained from the Planning & Development Services Department upon request and upon receipt of the scope and description of the project.

Standard templates are available from Planning & Development Services, upon request for the following documents used in a Service or Development Agreement:

a. Service Agreements:
   - Fee-Simple Subdivisions
   - Bareland Condominiums

b. Development Agreements for:
   - Site Developments

c. Lot restrictions and registerable instruments such as:
   - Drainage
   - Slope Stability
   - Joint Access
   - Joint Drainage
   - Joint Access and Drainage
   - UROW

In the case that such standard instrument templates are not available, it is expected that the Developer will retain the services of a solicitor to draft the required instruments and obtain approval from the City Solicitors office prior to their use.

These documents have been reviewed by representatives of the development industry and adopted by the City for these purposes.

### 2.7.2 COST SHARING

At the FSR or Preliminary Engineering Report stage the basis for the establishment of oversize, boundary and other measures of benefit accruing to any benefiting lands will have been set out.

At the Detail Design stage, the costs associated with the benefits derived from the improvements must be established and payment secured in the Service Agreement. These cost sharing calculations are required with the first submission of the Detailed Design drawings. Failure to do so will delay processing of a Service Agreement.

Cost sharing calculations must be submitted to the City in a prescribed format including all tabulations and plans. All cost sharing transactions must be performed and concluded upon execution of a Service or Development Agreement.

### 2.7.3 PERFORMANCE SECURITY

Auto renewable Letters of Credit (LOC) or a Subdivision Bond to secure the Developer's performance is required with each Service or Development Agreement in accordance with the

criteria outlined in the standard development or service agreements templates. Subdivision Bonds will only be accepted where the value of security required exceeds $100K.

Detailed cost calculations for the purposes of determining the appropriate level of performance security shall be submitted to the City along with the first submission of the Detailed Design drawings. Failure to do so will delay processing of a Service Agreement.

Auto renewable letters of credit in the correct amount are to be submitted prior to the execution of a Service Agreement. A partial release will not be allowed until the final CCC has been issued.

Once all CCCs are issued, a partial reduction by up to 90% may be provided; at the City's sole discretion and depending on the developments retained risk, and the City's risk tolerance.

### 2.7.4 INTERIM WORKS

The design of works or improvements of an interim nature may only be accepted at the City's sole discretion. Complete design for both the final and interim conditions are required and must receive approval from the City. Special provisions with respect to acceptable triggers for initiating the construction of permanent facilities and improvements such as, timing, capacity constraints, intensity of development, etc. must also be established and approved by the City at the time of initial approval.

## 2.8 GOVERNMENT OF ALBERTA REGULATING DEPARTMENT APPROVALS

The current Government of Alberta Regulating Department, Alberta Environment and Protected Areas requirements include:

- Notification of Extensions to Sanitary Sewerage Systems, Water Distribution Systems, Storm Drainage Systems. Notification will be forwarded to Alberta Environment and Protected Areas by the City following the City's Approval of the Detailed Design drawings.
- Approvals of major conveyances and facilities. Application to Alberta Environment and Protected Areas for approvals will be made by the City following the City's Approval of the Detailed Design drawings.
- Registration of new outfalls. Application to Alberta Environment and Protected Areas for registration will be made by the City following the City's Approval of the Detailed Design drawings.

Provincial regulations, the terms of the City's license to operate its utilities and drainage systems and these Standards require the submission of:

- Complete drawings.
- Design information including all engineering computations.
- Description of Methodology and Assumptions.

- Responsible Engineers Declaration (Attached form is required).
- Project Timing.

to Alberta Environment and Protected Areas by the City.

In order to meet this requirement, the City must first approve all submissions and then forward them to Alberta Environment and Protected Areas for further processing.

## 2.9 BARELAND CONDOMINUMS

The City requires the same information for Bareland Condominium projects as for Fee-Simple Subdivision projects.

## 2.10 INSPECTIONS AND CONSTRUCTION COMPLETION CERTIFICATE

Construction Completion Certificates (CCC) are to be applied for prior to November 15th and applications may recommence after January 15th.

It is the Developer's responsibility to ensure Developer Installed Utilities and Improvements are fully completed prior to making an application. The developer is to ensure that applications for CCC are made during the time of year where visual inspections can be completed. CCCs may be rejected if the City is unable to complete a full inspection due to snow cover or frozen ground.

Construction inspections are carried out by City Departments at their discretion. Following Construction of each improvement completed by a developer it is inspected for the purposes of Certification and upon receipt of all the information and documents required.

If upon completion of an inspection the City is satisfied that the Developer Installed Utilities and Improvements have been completed and the conditions of completion met, as required under a Service or Development Agreement, the City Planner and Director of Development Services will sign and issue a Construction Completion Certificate.

If, however, upon carrying out an inspection, defects or deficiencies in the Developer Installed Utilities and Improvements are discovered, or if the conditions of completion have not been met in substance or form, the proposed Certificate will be returned to the Developer unsigned with a report of the defects and deficiencies attached. Upon rectification of the listed defects and deficiencies, the Developer is to resubmit the documents and reapply for a CCC.

### 2.10.1 DEVELOPER RESPONSIBILITY FOR CONSTRUCTION COMPLETION CERTIFICATES

It is the Developer and the Engineer of Record's responsibility to ensure that Developer Installed Utilities and Improvements are fully completed before applying for CCC. The developer is to ensure that applications for CCC are made during the time of year when visual inspections can be completed. CCCs may be rejected if the City cannot complete a full inspection due to weather (snow cover or frozen ground), or if other deficiencies and

requirements below are not met. A CCC application shall include a cover letter outlining that the Engineer of Record has reviewed the MSSM requirements for a CCC application and verifies that the submission complies with all requirements. A partial CCC may be issued by the City, solely at the discretion of the City Planner and Director of Development Services. This will only be permitted in situations where there are minor deficiencies that are not fundamental to the design, functionality, or safety of the Developer Installed Utility and Improvements, at the City's discretion. The issuance of a partial CCC will not commence the warranty period until the partial conditions are completed. Security will not be reduced in situations where there are partial CCCs outstanding.

### 2.10.2 CONDITIONS OF CONSTRUCTION COMPLETION

Developer Installed Utilities and Improvements shall only be considered "complete" when the requirements of the MSSM, the Detailed Plans and Specifications, the City Planner and Director of Development Services and a Service or Development Agreement have been fully satisfied and the following conditions met:

### 2.10.3 ADMINISTRATIVE REQUIREMENTS

The following administrative requirements shall be completed before CCCs for the development can be issued:

a. Registration of all easements, encumbrances, restrictive covenants, and right-of-way documents indicated in the Development Agreement or on the plan of subdivision, utility right-of-way plans and approved engineering drawings.

b. All dedicated land such as without limitation, Public Utility Lots, Public Rights-of-Way (roads, lanes, etc.), Municipal Reserve (MR), Environmental Reserve (ER), School Reserve (SR), Conservation Reserve (CR), Utility Rights-of-Way's (UROW), Easements, have been registered in title to the City at the Land Titles office.

c. Written verification from the Developer's legal representative or legal surveyor that all trust conditions regarding terms of the Service Agreement and 'a' and 'b' above have been fulfilled by the Developer.

d. Full and complete plans for any and all works associated with a Service or Development Agreement have been approved by the City in conformance to the MSSM and the City's standard specifications.

e. All Alberta Environment and Protected Areas registrations, approvals, notifications, and permits have been received by the City.

f. Written verification by the responsible Developer's Consulting Engineer, that all works associated with a Service Agreement have been completed in accordance with approved plans and specifications and that no field changes other than those pre-authorized in writing by the City Planner and Director of Development Services and also conforming to the MSSM and the City's standard specifications, have been made.

g. QA and QC materials testing cannot be performed by the same agency. QC testing shall be done by an agency hired by the Developer's Contractor.

h. Written verification by the responsible Developer's Consulting Engineer, that all variations from the MSSM and the City's standard specifications have a subsisting approval from the responsible Department's General Manager.

i. All postponements and discharges of instruments, leases and liens have been carried out by the Developer, as required.

j. All insurance and performance security required by a Development Agreement have been submitted to the City, are current and remain in effect.

k. All offsite levies, cost sharing contributions, fees, charges have been paid to the City and other financial obligations have been fulfilled by the Developer.

l. Safety measures, litter control measures, access control measures, are installed and site clean-up completed including without limitation litter, trash, sediment, weeds, surplus materials, damaged and defective materials, storage facilities, operation and maintenance supplies, inoperative tools and equipment etc. have been removed from the development area and the development area left in a clean and orderly condition.

m. Public information signs have been installed in approved locations.

n. Written certification that As-Built plans and reports will be submitted to the City by March 1 of the year following the issuance of the CCC for Surface Works.

o. Survey notes, video inspection records and reports have been submitted to the City.

p. All materials testing and reports and certifications have been submitted to the City as required.

q. All survey pins indicating property corners shall, if removed by anyone other than the City, have been replaced by the Developer.

r. Any special conditions governing the acceptance of specialized materials or non-typical installation situations have been met.

### 2.10.4 ROUGH GRADING, SLOPE MANAGEMENT, EROSION CONTROL MEASURES AND ENVIRONMENTAL MITIGATION OR CORRECTIVE MEASURES

All stripping, topsoil stockpiles, cuts, fills, embankments, berms, temporary fencing, and disposal of deleterious materials have been carried out in accordance with the approved plans and specifications. A Geotechnical Report certifying that all slope management measures, rough grading, excavation, all embankment fills, and compaction have been carried out in accordance with the approved plans and specifications. All erosion control measures shall also be in place including but not limited to vegetative covers, synthetic linings, mulches, riprap, concrete, silt barriers, overland flow routes and drainage facilities graded and protected in conformance to the approved plans and specifications.

A certification or declaration prepared by the responsible Developer's Consulting Engineer, will be required certifying that all requirements, conditions and stipulations of approved environmental plans and permits have been carried out, completely fulfilled and plans to evidence compliance with any such on-going regulatory requirements with respect to soils, sub- soils, waters, air and plant or animal life connected with the development and that the development area meets the terms and conditions of the approvals of such plans and permits.

## 2.10.5 UNDERGROUND UTILITIES

### 2.10.5.1 DEEP UTILITIES

All deep utilities to be complete, installed in accordance with the approved plans using specified materials and within the specified installation tolerances stipulated in the City's standard specifications.

The Developer shall provide a Trench Compaction Report from a qualified Geotechnical Engineer certifying that all trenches have been backfilled and compacted in accordance with the approved plans and specifications as part of the conditions for deep utilities being considered complete and in addition, the following stipulations be met:

#### 2.10.5.1.1 SANITARY SEWERAGE SYSTEM

All sanitary sewerage system components including pipes, force mains, service connections and appurtenances have been completed and installed in accordance with the approved plans and specifications. All manholes have been completed with properly formed inverts, free from obstructions and foreign matter such as rocks, silt and gravel in accordance with the approved plans and specifications. All manhole rims and covers have been installed at the approved design grades and to suit staged construction of surface improvements. All pumping stations and associated appurtenances completed and accepted in accordance with Environmental Utilities Department Sewer Lift Station Design and Construction Standards and Procedures Manual.

All downstream sanitary sewerage systems receiving discharges from the development area are operational, publicly owned and duly registered with Alberta Environment and Sustainable Resource Development.

A video inspection and report of underground piping has been submitted by the Developer with results satisfactory to the City.

#### 2.10.5.1.2 WATER DISTRIBUTION SYSTEM

All water mains, service connections and appurtenances have been completed and installed in accordance with the approved plans and specifications, tested and inspected. Hydrostatic testing, leakage testing and disinfection have been carried out to the satisfaction of the General Manager of Environmental Utilities. All main valves, service valves, curb boxes, fire

hydrants and other appurtenances are operable, undamaged and at the approved design elevations and to suit staged construction of surface improvements.

All water supply or distribution systems interconnected with, or adjacent to, the development area system is operational, publicly owned and duly registered with Alberta Environment and Sustainable Resource Development.

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#### 2.10.5.1.3 SEWER AND WATER SERVICE CONNECTIONS

All service connections are complete, installed true to line, location, size, alignment, grade, plumb, inspected, tested in accordance with the approved plans and specifications, free from defects in an operable condition complete with surface markers.

#### 2.10.5.1.4 STORM DRAINAGE SYSTEM

##### 2.10.5.1.4.1 STORM SEWER SYSTEM

All underground and overland drainage system components including overland conveyances, inlets, service connections, storm sewers, manholes complete with properly formed inverts, catch basins, structures and appurtenances have been completed and installed in accordance with the approved plans and specifications and are free from obstructions and foreign matter such as rocks, silt and gravel, etc. Manhole and catch basin rims and covers have been installed at the approved design grades and to suit staged construction of surface improvements.

A CCTV inspection shall be carried out to demonstrate that the storm system has no defects at the CCC stage. The CCTV inspection shall be carried out for all pipes including but not limited to mains and CB leads.

All SWMFs including storage and treatment systems, outfalls and associated appurtenances are completed in accordance with the approved plans and with an approved operation and maintenance manual.

All downstream storm drainage systems receiving discharges from the development area are operational, publicly owned and duly registered with Alberta Environment and Sustainable Resource Development.

A video inspection and report of underground piping has been submitted by the Developer with results satisfactory to the City.

##### 2.10.5.1.4.2 OVERLAND OR SURFACE DRAINAGE CONVEYANCES, STORM WATER MANAGEMENT FACILITIES, OUTFALLS

A CCC will be issued for overland or surface drainage conveyances provided that all overland or surface drainage conveyances in the development area, are fully complete to the approved plans and specifications, all work is free of defects and deficiencies in materials and workmanship and free from conditions deemed to be hazardous by the City Planner and Director of Development Services.

#### 2.10.5.1.4.3 STORM WATER MANAGEMENT FACILITY CCC

Prior to issuance of a CCC for SWMF the following must be completed.

- Maintenance manuals must be provided.
- A Letter of Confirmation from a Geotechnical Engineer that the pond liner meets or exceeds specifications per approved design. Confirmation to include but not limited to liner thickness, location, termination elevation and permeability.
- A Letter of Confirmation that actual pond volumes meet or exceed design pond volumes including forebay and total storage where applicable. Confirmation to include but not limited to detailed survey report that demonstrates as-built pond contours, normal water elevation, high water elevation and free board.
- A Letter of Confirmation from a Landscape Architect that the pond plantings have been installed as per the approved Pond Landscaping Plan. Confirmation to include but not limited to confirmation of total quantities of plantings installed, species and location of plantings.
- If applicable, letter(s) from monitoring, recirculation or re-use system manufacturer(s) confirming that the installation of the system(s) is complete and function as per the approved design.

### 2.10.5.1.5 SHALLOW UTILITIES

CCCs will not be issued for shallow utilities. The Gas and Electric Utilities will communicate directly to the Planning and Development when the improvements are complete. The Developer will be responsible to ensure the completion of the communication utilities with the third-party provider.

### 2.10.5.2 SURFACE IMPROVEMENTS

All surface improvements have been completed and installed in accordance with the approved plans and within the specified material and installation tolerances stipulated in the City's standard specifications.

All deep utilities, appurtenances, and improvements whether surface or underground must be complete, free of defects, with As-Built plans and reports approved and have a subsisting CCC in order for the surface improvements for the development area to qualify for a surface improvement CCC. All surface improvements must be complete and installed in accordance with the approved plans and specifications and in addition, the following stipulations be met:

### 2.10.5.2.1 SIDEWALKS, CURBS AND GUTTERS

All sidewalks, wheelchair ramps, curbs and gutters in the development area, have been fully completed and installed in accordance with the approved plans and specifications, and all work

is free of defects and deficiencies in materials and workmanship and free from conditions deemed to be hazardous by the City Planner and Director of Development Services.

#### 2.10.5.2.2 ROADS PAVING – BASE LIFT

A CCC will be issued for road paving - base lift provided that all associated asphaltic concrete paving in the development area is fully complete to the approved plans and specifications, all work is free of defects and deficiencies in materials and workmanship and free from conditions deemed to be hazardous by the City Planner and Director of Development Services.

#### 2.10.5.2.3 SAFETY, TRAFFIC CONTROL

All devices to control safety, access, vehicular traffic and pedestrian traffic including but not limited to fences, line painting, street signs, traffic control signage, guide rails and traffic signalization equipment are installed as required on the approved plans and specifications for the development area, and all work is free of defects and deficiencies in materials and workmanship and free from conditions deemed to be hazardous by the City Planner and Director of Development Services.

#### 2.10.5.2.4 STREET LIGHTING

The Developer shall provide copies of certification from the installer of the street lighting in the development area that the street lighting is complete, in accordance with the specifications and in conformance with the locations, lines and UROW's provided for in the approved plans and specifications.

#### 2.10.5.2.5 ACCESS CONTROL AND SOUND FENCING

All access control and sound fencing are complete, installed true to line, location, size, alignment, grade, plumb, inspected, tested in accordance with the approved plans, and specifications, free from defects and in an operable condition.

#### 2.10.5.2.6 GRAVELED LANES, LANE PAVING, ROADS PAVING – SURFACE WEARING COURSE

All lanes are complete, to alignment and grade, in accordance with the approved plans, free from defects and in a useable condition.

All graveled lanes, lane paving, roads paving - surface wearing course will not require a CCC as these are to be complete prior to Final Acceptance inspections. The surface wearing course shall be constructed true to line, cross section, structure, alignment, grade, inspected, tested in accordance with the approved plans and specifications, free from defects.

### 2.10.6 OPEN SPACE DEVELOPMENT AND TRAILS

All Open Space Development has been completed and installed in accordance with the approved plans and specifications. All work must be complete, free of defects and deficiencies

in materials and workmanship and free from conditions deemed to be hazardous by the City Planner and Director of Development Services. In addition, all work has been inspected and meets conditions of completion as stipulated in the Parks and Recreation standard specifications, accurate As-Built plans and reports submitted, and all approved by the Director of Parks and Recreation.

Open Space CCCs may be signed by a Landscape Architect or the Engineering Consultant.

In addition, in order to qualify for an Open Space CCC, the following stipulations must be met:

#### 2.10.6.1 LANDSCAPING, IRRIGATION, TRAILS AND RECREATION AMENITIES

All landscaping including but not limited to topsoil, seeding, irrigation systems, trails, and any and all recreation amenities have been fully completed and installed in accordance with the approved plans and specifications and all work is free of defects and deficiencies in material and workmanship.

#### 2.10.6.2 TREES

All trees have been installed in accordance with the approved plans and specification and all work is free of defects and deficiencies in material and workmanship.

#### 2.10.6.3 ENVIRONMENTAL RESERVE, CONSERVATION RESERVE AND UNMANICURED AREAS

All Environmental Reserve, Conservation Reserve and any Unmanicured Areas (not serviced by an automated irrigation system), has been completed including but not limited to topsoil and seeding and has been established and is free of weeds according to the Parks and Recreation acceptance requirements. A developer may apply for a separate CCC for Environmental Reserve, Conservation Reserve and other Unmanicured Areas. This request will be considered on a case-by-case basis.

#### 2.10.6.4 OPEN SPACE MAINTENANCE

Once the Developer has obtained a CCC they are then responsible for all maintenance of the Open Space areas including but not limited to mowing, spraying, fertilizing, weed control, irrigation system inspection and maintenance, garbage bin litter pick up, snow removal of trails and adjacent sidewalks, in accordance with the Parks and Recreation standards and specifications. The developer is also responsible for all recreation amenity maintenance including but not limited to annual inspection of the playground equipment.

The developer is also responsible for tree and shrub bed maintenance including but not limited to pruning, removal of hazardous branches and maintenance of tree and shrub beds.

The developer shall submit a monthly log of all maintenance activities.

### 2.10.7 MAINTENANCE

After the issuance of the CCC, the Developer shall remain responsible for any and all maintenance, repairs, or replacements, to the Developer Installed Utilities and Improvements which may become necessary from any cause whatsoever, up to the date of issuance of the Final Acceptance Certificate (FAC). Maintenance shall not include damage caused by the City arising from the discharge of its responsibilities.

Maintenance is a continuous operation, which must be carried on until the date of issuance of the FAC for the Developer Installed Utilities and Improvements. The FAC will not be issued until all Maintenance required by the City Planner and Director of Development Services in their final inspection report has been carried out.

Without limiting the generality of the foregoing, if, during the construction or prior to issuance of the FAC, any defects, deficiencies or malfunctions become apparent in any of the Developer Installed Utilities and Improvements and the City Planner and Director of Development Services requires Maintenance to be carried out, the Developer shall within a reasonable time cause such Maintenance to be carried out, failing which or should an emergency exist, the City may carry out the Maintenance and recover the resulting costs from the Developer.

The Developer must maintain all of the Parks and Recreation work within the development area until the date of the issuance of the FAC, which shall be a minimum of two years from the date of the CCC. Maintenance shall include but not limited to:

- Maintenance shall include all items specified in Parks and Recreation Maintenance and Guarantee Specifications (section 01740) including but not limited to the maintenance of turf, trees, irrigation, trail, snow removal on trails and sidewalks and any other parks and recreation infrastructure and amenities within the development area.
- Maintenance shall be continuous and complete and shall include all measures necessary to maintain the turf and trees in a healthy, vigorous growing and condition in accordance with standard horticultural practice.
- Weed control shall be carried out when required to keep development area free of weeds. When herbicides are used, they shall be applied by a provincially licensed applicator in accordance with the manufacturer's recommendations and the associated Province of Alberta Weed Control Act.
- Trees and shrubs found dead or diseased or not in a healthy, satisfactory growing condition or which in any other way do not meet the requirement of the specifications shall be replaced by the Developer within 30 days (pending seasonal conditions). If the Developer fails to comply with the replacement of the plant material within the specified time period and does not provide the City with an acceptable schedule for the placement of the plant material, the City will have the components replaced and invoice the Developer for all costs associated with the replacement.

- All work must be maintained free from any conditions considered hazardous or present a public safety issue.

## 2.11 FINAL ACCEPTANCE CERTIFICATE

Final Acceptance Certificates (FAC) are to be applied for prior to November 15th and may recommence after January 15th.

It is the Developer's responsibility to ensure any Developer Installed Utilities and Improvements are fully completed and any defects and/or deficiencies have been addressed prior to making an application. The developer is to ensure that applications for FACs are made during the time of year where visual inspections can be completed. FACs may be rejected if the City is unable to complete a full inspection due to snow cover or frozen ground.

All utilities, appurtenances, and improvements whether surface or underground must be complete, free of defects, with approved As-Built plans and reports in place and with a subsisting CCC in order for the improvements for the development area to qualify for a FAC.

The City Planner and Director of Development Services, or their designate - the Superintendent of Development Engineering will issue a FAC provided that the following conditions of Final Acceptance have also been met:

- The maintenance period listed in Table 2.11.1 for each type of improvement following issuance of a CCC has expired.
- After confirmation that As-Built plans have been received by the City and associated conditions met.
- Completion of joint inspections between the Developer's Engineering Consultant and a representative from the City Department authorized by the City Planner and Director of Development Services to carry out such inspections.
- The correction of any remaining deficiencies or defects identified by the inspections.
- The following conditions have been met:

**Table 2.11.1 – CCC Maintenance Periods**

| TYPE OF IMPROVEMENT | | CCC | MAINTENANCE PERIOD | FAC |
|---|---|---|---|---|
| 1 | Rough Grading, Slope Management, Erosion Control Measures and Environmental Mitigation or Corrective Measures | 1* | One (1) Year ** | 1 |
| 2 | Underground Utilities | | | |
| | a. Deep Utilities | 2 (a)* | One (1) Year | 2 (a) |
| | i. Sanitary Sewerage System | | | |
| | ii. Water Distribution System | | | |
| | iii. Sanitary Sewer and Water Service Connections | | | |
| | b. Storm Drainage System | 2 (b) | One (1) Year | 2 (b) |
| | c. Storm Sewerage | | | |
| | d. Overland or Surface Drainage Conveyances, Storm Water Management Facilities, Outfalls | | | |
| | e. Shallow Utilities | *** | by others | N/A |
| 3 | Surface Improvements | | | |
| | a. Sidewalks, Curbs and Gutters | 3 (a+b+c) | Two (2) Years | 3 (a+b+c) |
| | b. Roads, Walkways, Paving and pavement markings - Base Lift | | | |
| | c. Safety, Traffic Control | | | |
| | d. Street Lighting | *** | by others | N/A |
| | e. Access Control and Sound Fencing | 3 (e) | Two (2) Years | 3 (e) |
| | f. Graveled Lanes, Lane Paving, Roads Paving - Surface Wearing Course | N/A | N/A | 3 (f) |
| 4 | Open Space Development | | | |
| | a. Landscaping, Parks, Irrigation, Trails, Trees, and Recreation Amenities | 4 (a) | Two (2) Years (a) | 4 (a) |
| | b. Trees, Environmental Reserve, Conservation Reserve, and Unmanicured Areas. (reviewed on a case-by-case basis) | 1 (b) | Two (2) Years (b) Minimum 2 Years but until FAC Requirements are Met. By agreement a separate CCC may be required for a 3-year maintenance period. | 1 (b) |

* Compaction Certification required.

** Longer periods where a deep fill report stipulates additional maintenance period.

*** Certification is required from the utility companies that their plant has been installed in accordance with the plans.

## 2.11.1 DEVELOPER RESPONSIBILITY FOR FAC

It is the Developer and the Engineer of Record's responsibility to ensure that Developer Installed Utilities and Improvements are fully completed before applying for FAC, and that all previously identified and new deficiencies have been addressed. The Developer is to ensure

that applications for FAC are made during the time of year when visual inspections can be completed. FACs may be rejected if the City cannot complete a full inspection due to weather (snow cover or frozen ground), or if other deficiencies and requirements below are not met. An FAC application shall include a cover letter outlining that the Engineer of Record has reviewed the MSSM requirements for a FAC application and verifies that the submission complies with all requirements.

### 2.11.2 ADMINISTRATIVE REQUIREMENTS

The following administrative requirements shall be completed before FACs for the development will be issued:

- The maintenance period has expired, and all maintenance required by the City has been carried out and the City reimbursed for any maintenance costs incurred by it.
- All insurance and performance security required by a Service Agreement are in place and valid. Any special conditions governing the acceptance of specialized materials or non-typical installation situations have been met.
- All encumbrances registered, instruments discharged where required and all terms and conditions of the Service Agreement fulfilled.
- As-built plans, laboratory test results, certifications, extended warranties have been provided.

### 2.11.3 ROUGH GRADING, SLOPE MANAGEMENT, EROSION CONTROL MEASURES AND ENVIRONMENTAL MITIGATION OR CORRECTIVE MEASURES

The Developer is to restore eroded areas to the approved grades, design and install additional erosion prevention measures as required and remove soils deposited by erosion from roads, lanes, walkways sidewalks, curbs, and gutters, catch basins, storm water management facilities and flushing of storm sewers. The Developer shall also repair or replace any Developer Installed Improvements that may have shifted, be out-of-plumb, malfunctioning, broken, cracked, or otherwise deemed defective by the City as a result of settlement of any deep embankment fills or utility trench backfill or other such cause arising from subsurface consolidations.

### 2.11.4 UNDERGROUND UTILITIES

#### 2.11.4.1 DEEP UTILITIES

All required maintenance, repair or replacement of any defects or deficiencies have been completed to the satisfaction of the City Planner and Director of Development Services and in addition, the following stipulations met:

#### 2.11.4.1.1 SANITARY SEWERAGE SYSTEM

All sanitary sewerage system components including pipes, force mains, service connections and appurtenances are free from obstructions and foreign matter such as rocks, silt and gravel. All manhole rims and covers have been adjusted to final grade. All pumping stations and associated appurtenances are accepted in accordance with Environmental Utilities Department Sewer Lift Station Design and Construction Standards and Procedures Manual.

#### 2.11.4.1.2 WATER DISTRIBUTION SYSTEM

All main valves, service valves, curb boxes, fire hydrants and other appurtenances are operable, undamaged, and adjusted to final grade.

#### 2.11.4.1.3 SANITARY SEWER AND WATER SERVICE CONNECTIONS

All service connections are operable, connected, and free of defects. Surface markers shall be present and in good condition on lots that may still be vacant.

#### 2.11.4.1.4 STORM DRAINAGE SYSTEM

#### 2.11.4.1.4.1 STORM SEWAGE

All underground drainage system components including inlets, service connections, storm sewers, manholes, catch basins, structures and appurtenances are free from obstructions and foreign matter such as rocks, silt and gravel, etc. Manhole and catch basin rims and covers have been adjusted to final grades.

#### 2.11.4.1.4.2 OVERLAND OR SURFACE DRAINAGE CONVEYANCES, STORM WATER MANAGEMENT FACILITIES, OUTFALLS

All overland drainage system components including overland conveyances, structures and appurtenances are free from obstructions and foreign matter such as rocks, silt, and gravel, etc. All SWMFs including storage and treatment systems, outfalls and associated appurtenances operating satisfactorily.

#### 2.11.4.1.4.3 STORM WATER MANAGEMENT FACILITIES

Prior to issuance of a FAC for a SWMF the following must be completed and supplied:

- Maintenance records provided.
- Establishment of pond plantings ensuring continued growth.

### 2.11.4.2 SHALLOW UTILITIES

A FAC will not be issued for shallow utilities. The Gas and Electric Utilities will communicate directly to Planning and Development Services when the improvements are complete. The

Developer will be responsible to ensure the completion of the communication utilities with the third-party provider.

### 2.11.5 SURFACE IMPROVEMENTS

All surface improvements to be complete, installed in accordance with the approved plans and the City's standard specifications using specified materials and within specified installation tolerances.

All utilities, appurtenances, and improvements whether surface or underground must be complete, free of defects, with approved As-Built plans and reports in place and with a subsisting CCC for the improvements for the development area to qualify for a FAC. All surface improvements must be complete and installed per the approved plans and specifications and in addition, the following stipulations must be met:

#### 2.11.5.1 SIDEWALKS, CURBS AND GUTTERS

All sidewalks, wheelchair ramps, curbs, and gutters in the development area, free of defects and deficiencies in materials and workmanship and from conditions deemed to be hazardous by the City Planner and Director of Development Services.

#### 2.11.5.2 LANE PAVING, ROADS PAVING – SURFACE WEARING COURSE

All lane paving and the surface wearing course for roads free of defects and deficiencies in materials and workmanship and from conditions deemed to be hazardous by the City Planner and Director of Development Services.

#### 2.11.5.3 SAFETY, TRAFFIC CONTROL

All devices to control safety, vehicular traffic and pedestrian traffic including but not limited to fences, line painting, street signs, traffic control signage, guide rails and traffic signalization equipment are free of defects and deficiencies in materials and workmanship and from conditions deemed to be hazardous by the City Planner and Director of Development Services.

#### 2.11.5.4 STREET LIGHTING

*Not Applicable*

#### 2.11.5.5 ACCESS CONTROL AND SOUND FENCING

All devices to control access, by vehicular and pedestrian traffic including but not limited to fences, are free of defects and deficiencies in materials and workmanship and from conditions deemed to be hazardous by the City Planner and Director of Development Services.

### 2.11.5.6 GRAVELED LANES AND OVERLAND OR SURFACE DRAINAGE CONVEYANCES

All graveled lanes and overland or surface drainage conveyances free of defects and deficiencies in materials and workmanship and from conditions deemed to be hazardous by the City Planner and Director of Development Services.

### 2.11.5.7 OPEN SPACE DEVELOPMENT AND TRAILS

All Open Space Development has been completed and installed per the approved plans and specifications. All work must be complete, free of defects and deficiencies in materials and workmanship and free of conditions deemed to be hazardous by the City Planner and Director of Development Services. In addition, all work has been inspected, meets conditions of completion as stipulated in the Parks and Recreation standard specifications and the following stipulations have been met:

- The Open Space Development and Trails has been maintained in accordance with the City requirements.
- All required maintenance, repair or replacement of any defects or deficiencies have been completed.
- All work must be jointly inspected by the Developer and a representative of the Parks and Recreation Department and be free of deficiencies, with accurate As-Built plans submitted and approved.
- Developer will complete the winterization of the irrigation system and activation in the spring.
- The Backflow Prevention Device shall be tested by a certified Backflow Prevention Tester and all the reports must be submitted to the City.
- The Playground Manufacturer shall complete the Playground Equipment Compliance Inspection Report (Annual Comprehensive Report) as prepared by the Canadian Playground Safety Institute.

### 2.11.5.8 WALKWAYS / PATHWAYS

All walkway/pathways with asphaltic surfacing free of defects and deficiencies in materials and workmanship and from conditions deemed to be hazardous by the City Planner and Director of Development Services.

## 2.11.6 ISSUANCE OF THE FINAL ACCEPTANCE CERTIFICATE (FAC)

Issuance of the FAC by the City Planner and Director of Planning and Development Services ends the Maintenance obligation of the Developer but does not relieve the Developer of any other obligations of a Service or Development Agreement.

## 2.12 CCC / FAC PROCESS

The Construction Completion Certificate and Final Acceptance Certificate processes are outlined in tabular form directly following in Table 2.12.1.

**Table 2.12.1 - Construction Completion Certificate and Final Acceptance Certificate**

| Construction Completion Certificate (CCC) | Final Acceptance Certificate (FAC) |
|---|---|
| 1. The Developer completes construction of the municipal improvement.<br>2. The Developer prepares the site for inspection and the Developer's Consultant inspects to verify that the improvements are completed satisfactorily. The Developer's Consultant requests a City inspection and makes application for CCC.<br>3. The Developer's Consultant submits four (4) copies of the CCC application to the Planning & Development Services Department. All documents that are requirements of CCC shall be attached or have been previously submitted to the City as per the Administrative Requirements (section 2.10.3).<br>4. On request of the Developer's Consultant, the City performs an inspection.<br>5. Within thirty days of receipt of the CCC application the City inspects the Work and verifies that all required documents have been received.<br>6. If deficiencies have been identified and not rectified, the CCC is rejected and returned to the Developer's Consultant.<br>***OR***<br>The CCC is approved, or approved with conditions, the maintenance period begins, and expiry dates are entered on the application. It is signed and returned to the Developer's Consultant. | 1. The Developer prepares the site for inspection and the Developer's Consultant inspects all improvements to verify they are acceptable to the City.<br>2. The Developer's Consultant submits four (4) copies of the FAC application to the Planning & Development Services Department. The Developer's Consultant also verifies the record drawings, and any other documents required to be submitted as per the Administrative Requirements (section 2.11.2).<br>3. Within thirty days of receipt of submission the City coordinates inspections, reviews report and identifies any deficiencies. A report of deficiencies is sent to the Developer's Consultant who arranges for correction of all deficiencies found.<br>4. If deficiencies are not cleared within the time permitted, then the FAC is rejected, returned to the Developer's Consultant and the maintenance period continues.<br>***OR***<br>The FAC is approved. It is signed and returned to the Developer's Consultant and the City takes over the improvement. |

*Notes:*

- If there are any discrepancies between these procedures and the terms of the Servicing Agreement, then the Servicing Agreement governs.
- Construction Completion Certificates are to be applied for prior to November 15th and after January 15th Annually.
- Final Acceptance Certificates are to be applied for prior to November 15th and after January 15th.

## 2.13 FLEXIBILITY TO STANDARDS

### 2.13.1 PROPOSALS FROM THE DEVELOPER

If the Developer wishes to:

- Apply methods which differ from a standard or specification in this document, or
- If these Standards or specifications do not cover a subject of concern to a specific design, or
- If the Developer proposes to use materials not approved in this document or City's operating department's specifications,

then the responsibility shall be upon the Developer to justify the proposal or resolve the concern to the satisfaction of the City. The concern shall be the subject of a report that the Developer shall have prepared by an APEGA Licensed Professional Engineer and signed, sealed in accordance with APEGA Professional Practice Guidelines, and submitted to the City for review.

The Report shall:

- Present the alternatives for resolution of the concern.
- Make a recommendation on the proposed standard or material to be used, with justifications in terms of implementation feasibility and economic, engineering, environmental, accessibility, operational and maintenance criteria.

The Report can be on company letterhead and meet these minimum requirements, or any proposed alternative solutions can be made on the "Alternative Solution Request Form" found at Appendix C of this document. The form, or the Report from the company responsible, is to be filled out and appropriately stamped by the professional taking responsibility for the application.

Interpretations and approvals will be given by the City. If deemed necessary, the City may revise or amend requirements. The Developer and the Consultant remain fully responsible for the design and construction of the municipal improvements according to good engineering practice adequate to address the specific needs and site conditions.

### 2.13.2 FINAL DECISIONS ON DESIGN STANDARDS

The City reserves the right to the final decision with regards to the interpretation of the intent of the design acceptability of changes from the standards proposed by the Developer's Design Engineer. Final decisions, interpretations, and approvals will be provided by the City to the applicant, in writing.

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# PART 3 – CONSULTING ENGINEERING EXPECTATIONS

## 3. CONSULTING ENGINEERS SCOPE AND EXPECTED WORK OUTCOMES

### 3.1 REFERENCE STANDARDS

The following documents were used in the preparation of this section.

- Professional Practice Guideline – Field Reviews of Engineering and Geoscience Work, *APEGA*, August 2022.

  https://www.apega.ca/docs/default-source/pdfs/standards-guidelines/practice-guideline_field-review_final.pdf?sfvrsn=dc301ce6_4

- Quality Management Guides – Guide to the Standard for Documented Field Reviews During Implementation or Construction, *Engineers & Geoscientists British Columbia*, June 15, 2023.

  https://www.egbc.ca/getmedia/ea43ed87-9b15-464c-bfdc-cd9ebd5a6e7b/EGBC-Documented-Field-Reviews-V2-0.pdf.aspx

- Consulting Engineer's Land Development Field services Guidelines, *City of Lethbridge Infrastructure Services Department,* as amended 2016.

  https://www.lethbridge.ca/media/lrepkzui/2016-field-services-guidelines.pdf

- City of Red Deer – Engineering Services Guidelines – Section 3, *City of Red Deer,* 2023 Edition.

  https://www.reddeer.ca/media/reddeerca/city-services/engineering/publications/Design-Guidelines.pdf

### 3.2 PREAMBLE AND OBJECTIVES

The objectives of the stakeholders involved in land development in the City of Medicine Hat have traditionally been to produce a safe, healthy, attractive, and economically viable development that meets the standards and specifications of the City within a reasonable time frame. This document outlines what the City Planner and Director of Development Services or their representative expects of the Developer's Consulting Engineer during the construction of new land development projects.

All lands – whether residential, commercial, or industrial – developed within the City are completed under the terms and conditions of an Agreement. The Agreement ensures that all

development within city limits occurs in accordance with City policies, standards, and specifications. The terms and conditions in the Agreement reference the Municipal Servicing Standards Manual (MSSM) for the City of Medicine Hat.

The Consulting Engineer is expected to be the primary contact and overall project manager in relation to private developments. The Consulting Engineer is expected to provide a professional level of design, field oversight, and inspection services.

The objective of this Section of the MSSM is to identify the **minimum** level of field services to be performed by the Consulting Engineer with reference to the APEGA Professional Practice Guidelines "Field Reviews of Engineering and Geoscience Work. (FREGW)". These field services are related to the construction, installation, and inspection of infrastructure. Infrastructure, as referred to in these Standards, includes those utilities (including but not limited to sanitary sewers, storm sewers, storm water management facilities, water mains and hydrants, sewer and water service connections), improvements (including but not limited to sidewalks, curbs and gutters and catch basins, paved roads, paved walkways, paved and/or graveled lanes, surface drainage facilities, bridges, culverts, retaining walls, and stairways), streetlights, boulevards, public utility lots, reserve parcels, and other elements designed and intended to service the development area. The term infrastructure also includes any such other lands and items as the City Planner and Director of Planning and Development Services determines appropriate. Unless otherwise specified, the term *Director* refers to the City Planner and Director of Development Services for the City of Medicine Hat or the individual authorized to act in their place.

The MSSM is intended to ensure that the construction and installation of infrastructure during development complies with City's specifications and standards. The requirements, procedures and processes for the various inspections and documentations that are required for the Construction Completion Certificate (CCC) and the Final Acceptance Certificate (FAC) are outlined in detail.

## 3.3 CONTRACTUAL RELATIONSHIPS

This section of the MSSM identifies the various contractual relationships involved in Subdivision development and the expected role of the Consulting Engineer.

### 3.3.1 CITY/DEVELOPER

The contractual relationship between the City and the Developer is defined through the Servicing Agreement (SA), Development Agreement (DA), and/or the Subdivision (SD) or Development Permit (DP), through which the Developer agrees to complete the construction of the infrastructure to the standards required by the City. Notwithstanding the specific circumstances set out below, the Developer is ultimately responsible for the performance of all obligations, terms and conditions specified in the SA, DA, SD, or DP.

### 3.3.2 DEVELOPER/CONSULTING ENGINEER

Under Section 2.3 of the SA the Developer shall employ skilled consultants and consulting engineers to design and supervise all work to be carried out under the agreement. The Developer remains responsible for the full and proper performance of all obligations, terms, and conditions under the SA, DA, SD, or DP.

The Consulting Engineer retained by and acting on behalf of the Developer, is to prepare design drawings, reports, and specifications based upon the particular location, ground form, site conditions and specific information pertaining to the subdivision to be constructed. The Consulting Engineer's designs and specifications are to meet or exceed City specifications, approved designs, provincial and federal regulations, and legislations, or as otherwise required by the City Planner and Director of Development Services or their Designate.

### 3.3.3 DEVELOPER/CONTRACTOR

The Contractor works for the Developer. Their prime responsibility is to construct the output in compliance with the approved design and construction documents. They are responsible for the quality of the work, but the Developer is ultimately responsible for the performance of all obligations, terms and conditions specified in the SA.

### 3.3.4 CONSULTING ENGINEER/CITY

The Consulting Engineer is the representative of the Developer, the City Planner and Director of Development Services or their Designate has the right to request that the Developer, through the Consulting Engineer, correct any deficiencies as they are observed.

The Consulting Engineer shall keep adequate records to satisfy the City Planner and Director of Development Services or their Designate that the work is being constructed and installed in a safe and approved manner. The Consulting Engineer must ensure that all professional work products, including designs, are appropriately Authenticated and Validated in accordance with the current APEGA practices.

The Consulting Engineer shall assist in the submittal of the CCC(s), prepare the FAC(s), and have any maintenance deficiency items dealt with expeditiously.

The City may, in cases of emergency or significant issue with installations, stop the construction and installation of the infrastructure. The City may issue a field work order to the Developer, with a copy of the field order given to the Contractor to stop the work.

### 3.3.5 CITY/CONTRACTOR

There is no direct contractual relationship between The City and the contractor. Any communications from the director or their designate regarding the ongoing work will be addressed directly to the Consulting Engineer, unless as otherwise provided for in these Guidelines.

## 3.4 CONSTRUCTION INSPECTIONS

The Consulting Engineer is responsible for determining the site supervision and inspection requirements and how these inspections are to be provided.

A joint inspection with the Consulting Engineer and a representative of the City may be requested with a reasonable time to prepare. During work in the City road right-of-way or tying into existing City infrastructure, the Consulting Engineer will ensure adequate on-site inspection services are provided; up to and including full-time inspections.

### 3.4.1 POST CONSTRUCTION SERVICE

#### 3.4.1.1 ACTIVITY PRIOR TO ISSUANCE OF A CONSTRUCTION COMPLETION CERTIFICATE

The Consulting Engineer shall inspect the Work with the Contractor, record any deficiencies, and advise the Contractor to repair any deficiencies. After the Contractor has repaired the deficiencies, the Consulting Engineer shall arrange for a joint inspection with the Contractor and the City Representative. The Consulting Engineer shall apply for a CCC or FAC, as required.

The CCC application shall be accompanied by all appropriate documentation identifying the construction has been in accordance with the design details and field guidance provided by the Consulting Engineer. Further explanation/detail regarding these items is outlined throughout this document and any applicable agreements.

#### 3.4.1.2 ACTIVITY SUBSEQUENT TO ISSUANCE OF A CONSTRUCTION COMPLETION CERTIFICATE

The Consulting Engineer shall conduct periodic checks of the requirements within the Service or Development Agreement during the maintenance period and note any failures, settlements, or other deficiencies in the Work, as well as respond to any public concerns forwarded to the City.

#### 3.4.1.3 ACTIVITY PRIOR TO ACCEPTANCE OF A FINAL ACCEPTANCE CERTIFICATE

Regardless of the Consulting Engineers client or project, prior to the submission of FAC, the Consulting Engineer and the Contractor shall conduct an inspection of the Work and shall record and repair all deficiencies. Once all deficiencies have been corrected, the Consulting Engineer shall request a joint inspection with the Contractor and the City Representative.

As part of the Service Agreement (SA) there is a requirement for the Developer to submit documentation including As-Built and/or Record drawings of the work, and these will form a significant part of the inspection process of the work.

The Consulting Engineer shall prepare a list of deficiencies identified during the joint inspection. Additional noted deficiencies are to be submitted to the City Engineer. When the additional deficiencies have been corrected, the Consulting Engineer shall, within a reasonable period of time, request from the City Engineer a re-inspection of only those items noted as being deficient in the prior inspection.

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# PART 4 – GRADING REQUIREMENTS

## 4. GRADING REQUIREMENTS

### 4.1 PURPOSE

The purpose of lot grading is to provide good drainage away from buildings for the benefit of property owners and ensure drainage patterns and catchment areas are maintained.

The purpose of the Grading requirement section of the Municipal Servicing Standards Manual (MSSM) is to regulate lot grading and surface drainage requirements within private properties and the City rights-of-way.

### 4.2 REFERENCE STANDARDS

Design details or procedures not specified in this section shall be determined in accordance with the following Reference Standards or as otherwise found applicable and approved by the City of Medicine Hat. Current editions of:

- Environmental Utilities Construction Specifications, *City of Medicine Hat,* 2023.

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards_Drawings_Specifications_EU.pdf
- Municipal Works Construction Specifications, *City of Medicine Hat,* 2023.

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards_Drawings_Construction.pdf
- Alberta Transportation Erosion and Sediment Control Manual, June 1, 2011.

  https://open.alberta.ca/dataset/aaae5384-c0e0-4421-9fd8-6ab835c6f3af/resource/5ae2cd05-f29f-4f71-a88f-08ac702125a9/download/2011-erosion-sediment-control-manual-june-2011.pdf
- Instruction Manual for Erosion and Sediment Control in Calgary, *City of* Calgary, 2023.

  https://www.calgary.ca/content/dam/www/uep/water/documents/water-documents/esc-2023/instructions-for-esc-application-2023.pdf
- Residential Lot Grading Guidelines, *City of Edmonton*, 2023.

  https://www.edmonton.ca/public-files/assets/document?path=residentialguidelines.pdf
- Commercial and Multi-Family Lot Grading Guidelines, *City of Edmonton*, 2022.

  https://www.edmonton.ca/sites/default/files/public-files/assets/CommercialGuidelines.pdf

- Drainage and Erosion Control Mobilization Construction, *Department of the Army Corps of Engineers Office on the Chier of Engineers*, April 1984.

  https://www.publications.usace.army.mil/USACE-Publications/Engineer-Manuals/udt_43544_param_orderby/Pub_x0020_Date_UDT_Value/udt_43544_param_direction/ascending/

- United States Department of Transportation, Federal Highway Administration(FHWA), Hydraulic Engineering Circular (HEC) Series Manuals on Erosion and Sediment Control.

  https://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm

  - HEC 15 - Design of Roadside Channels with Flexible Lining, *FHWA*, September 2005.

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/05114/05114.pdf

  - HEC 22 - Urban Drainage Design Manual, *FHWA*, February 2024.

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif24006.pdf

In general, the provisions of this section shall govern over the Reference Standards, where there are conflicts. The City may, at its discretion and in special cases only, issue requirements specific to such special cases derived from other accredited technical resources and published best practices.

## 4.3 DETAILED DESIGN SUBMISSIONS

### 4.3.1 GRADING AND EROSION CONTROL PLAN

A detailed Erosion Control and Sediment Control Plan conforming to the best practices cited above shall be submitted for approval along with any application for the authorization of stripping and grading.

This information may be submitted on separate plans or may be included on the Subdivision Drainage Plan, Subdivision Lot Grading Plan and or an Erosion and Sediment Control Plan.

### 4.3.2 SUBDIVISION LOT GRADING PLAN

A Lot Grading Plan is to be submitted as part of the Detailed Design drawings for a subdivision. The requirements listed below are only necessary for low density residential lots.

All other lots and parcels shall require a site-specific Grading Plan.

### 4.3.3 GENERAL PLAN INFORMATION

The following information is required on a Subdivision Lot Grading Plan:

- Drawing to a scale of 1:1000.
- Lot numbers, block numbers, street names.
- North arrow.

- Legend and definitions of any symbols, abbreviations and or table headings used.
- Limits of development/ construction.
- Trapped low or depression storage ponding area footprints and top of ponding elevation on streets, lanes, lots, and parcels.
- Fully dimensioned extent of flow path of major event runoff along roadways and other overland conveyances where they abut lots and parcels. This flow path is required wherever the runoff depth exceeds the elevation at the abutting property line and encroaches onto abutting property for the purposes of encumbrance registration.
- Original ground contours and elevations (0.5m intervals).
- Borehole locations and elevation of groundwater.
- Design details for any earth berms proposed within the development.
- Geotechnical Report slope setback lines from steep slopes.
- Locations and heights of any retaining walls that may be required or proposed.
- In addition to other requirements the following notes shall be included in bold text:
    - If the bearing surface of any excavation for a building foundation or part thereof is founded on fill, a bearing certificate conforming to City standards, shall be prepared, and submitted to the City prior to the construction of such foundation,
    - All Portland cement concrete in contact with soil shall be a Sulphate Resistant type 50 mix with a minimum 56 day compressive strength, as specified in the Geotechnical Report or deemed adequate for the intended purpose by the Design Engineer,
    - All foundations shall be provided with weeping tile drain connected to the sanitary sewer, unless a sump pump system or connection to the storm sewer has been approved by the City,
    - A Lot Grading Certificate will be required in all cases for each and every lot, and
    - Tabulation of Lot & Parcel information.

### 4.3.4 SPECIFIC LOT & PARCEL INFORMATION

The following information is required for every lot & parcel:

- Finished ground elevations at all lot corners and at proposed changes of surface slope along property boundaries.
- Elevations at front and back setbacks on common boundary property lines between adjacent parcels or lots.
- Lot classification by grading/drainage type in conformance with Section 4.4.4, “Lot Grading Classification”.

- Lot drainage direction arrows indicating the direction of surface drainage, particularly along lot flanks and at common boundaries between adjacent parcels or lots.
- Retaining wall requirements due to grade differential between adjacent parcels or lots.
- Symbolic designation (shading or hatching) showing the extent of steep slopes (in excess of 4:1) on lots and parcels, and top of slope and bottom of slope setbacks from these slopes.
- Minimum Building Opening Elevation (MBOE) applies where lots abut trapped lows, depression storage and major event flow paths where the runoff depth exceeds the elevation at the abutting property line. The MBOE shall be a minimum of 300 mm above the higher of:
    - The top of ponding elevation for trapped lows or depression storage, or
    - The elevation of the runoff at the highest property corner where runoff depth exceeds the elevation at the abutting property line.
- Lowest Top of Footing (LTF) elevation (based upon service inverts).
- Sanitary invert at property line.
- Water pressure reducing valve (if required).
- Water service size (if other than minimum size).
- Water and sanitary sewer services location.
- Proposed driveway location.
- Building envelopes (shading of building envelope will suffice).
- TF-BC - Top of Footing elevation based upon the lowest undisturbed ground contour within the building envelope, above which elevation a bearing certificate will be required,
- TF-DF - Top of footing elevation above which foundation requirements related to deep fills, shall apply. This top of footing elevation will be based upon the lowest undisturbed ground contour within the building envelope and the recommendations and requirements of the subdivision Geotechnical Report.
- Markings or symbols clearly identifying all lots and parcels that require restrictive covenants or encumbrances regarding:
    - Drainage,
    - Trapped lows (depression storage),
    - Major event flood levels and overland flow pathways,
    - Restrictions and prohibitions related to slope stability or other such lot-related conditions requiring the registration of such instruments, and

- Any other information that may be pertinent to the specific subdivision.

### 4.3.5 TABULATION

LTF, sanitary invert, finished ground elevations, MBOE, TF-BC, TF-DF, restrictive covenant and encumbrances information shall be presented in a tabular form, as shown below:

| Block No. | Lot No. | LTF | Sanitary Invert at property line | MBOE | TF-BC | TF-DF | Required Restrictive Covenant & Encumbrances |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |

### 4.3.6 APPROVALS

Stripping and grading of the subdivision or site cannot proceed until the Developer obtains a written letter of authorization from the City Planner and Director of Development Services. A letter of authorization for stripping and grading will not be issued unless a subdivision approval has first been obtained and an approved Functional Servicing Report (FSR) or approved Preliminary Engineering Report/Plan is in place. A Development Permit will not be required for such a letter of authorization. A checklist of requirements is as follows:

- Copies of any restrictive covenants, easements, City encumbrances, restrictions and caveats registered on the title.
- A letter of authorization from the registered owner of the land.
- A completed site environmental disclosure statement.
- A Lot Grading Plan, Drainage Plan, and or Erosion and Sediment Control Plan incorporating the following, if required:
  - Existing survey control monuments,
  - Loam and dirt stockpiles, and dust control provisions,
  - Overhead and underground utility lines,
  - Any natural drainage diversions,
  - Stripping and grading on adjacent lands,
  - Plans for the restoration of disturbed areas,
  - Mitigation measures for unstable areas and deep fills,
  - Areas with significant vegetation that is to be removed or protected and retained,
  - An erosion control and sedimentation control report, and
  - Litter control and snow fencing provisions.

### 4.3.7 PLACEMENT AND COMPACTION

Excavation and embankment construction shall be carried out in general conformance with the Geotechnical Report and the drainage requirements of the Functional Servicing Report (FSR). Compaction shall be carried out in a manner that minimizes voids and consolidation settlement by the use of mechanical equipment and adequate watering. Minimum compaction standards shall be:

- Within roadways and under foundation bearing surfaces – minimum of 98% of the maximum Standard Procter Dry Density (MDD) placed at moisture content of 2% of Optimum.
- Elsewhere - minimum of 95% of the MDD placed at moisture content of 2.0% of Optimum.
- Maximum lifts for compaction should be 150 mm. Shaping and trimming shall be similarly performed, and surfaces finished true to rough grading or finished grading tolerances as outlined in the following table.

**Table 4.3.1 – Acceptable As-Built Grading Tolerances**

| GRADE | TOLERANCE (metric)* | EXPLANATION |
|---|---|---|
| Rough Grade | (-0.07m) to (-0.20m) | Between 0.07m and 0.20m below design grade for Clay |
| Final Grade (on topsoil) | (-0.05m) to (-0.10m) | Between 0.05m and 0.10m below design grade for Topsoil |
| Final Grade (on landscaping) | (-0.01m) to (+0.05m) | Between 0.01m below to 0.05m above design grade for landscaping |

Note: Tolerances do not apply when minimum slopes are not achieved.

All surplus materials, free of deleterious materials, litter, garbage (with reusable organic materials stockpiled separately), shall be placed in stockpiles at approved locations, shaped and trimmed to neat lines and be finished with topsoil and seeded to native grass.

All deleterious materials, litter, garbage, waste organics and other waste materials shall be removed offsite for disposal.

All areas requiring restoration shall be finished with topsoil and seeded to native grass.

### 4.3.8 CONSTRUCTION VERIFICATION

On completion of site grading work the City will require a letter from a qualified Professional Geotechnical Engineer (registered to practice in the Province of Alberta) certifying that the site grading work was completed in accordance with the approved Detailed Design plans prior to the issuance of a CCC for rough grading.

## 4.4 LOT GRADING CERTIFICATE

This section outlines the requirements and considerations that apply to the detailed design of grading on individual lots and parcels and the requirements for obtaining approval for a Lot Grading Certificate.

### 4.4.1 LOT GRADING APPROVAL PROCESS

In accordance with the requirements of the Planning & Development Services Department.

### 4.4.2 LOT GRADING CERTIFICATION REQUIREMENTS

In accordance with the requirements of the Planning & Development Services Department.

### 4.4.3 LOT GRADING CERTIFICATION FORMS

In accordance with the requirements of the Planning & Development Services Department.

### 4.4.4 LOT GRADING CLASSIFICATION

All lots shall be designated with one or two of the following classifications on the Subdivision Lot Grading Plan.

These classifications identify each individual lot types of general drainage pattern. Where a lot exhibits a different drainage pattern on each side of the lot, the lot shall be identified as combination lot with a different drainage pattern on each side (i.e., Split Drainage/Walkout: e.g. D/W).

**Table 4.4.1 – Lot Grading Classification**

| Lot Designation | Description |
|---|---|
| A | Back to Front Drainage 2 to 3% overall slope |
| B | Back to Front Drainage 3 to 6% overall slope |
| C | Back to Front Drainage >6% overall slope |
| D | Split Drainage |
| R | Reverse Walkout |
| S | Bi-level Walkout |
| W | Full Walkout |

### 4.4.5 LOT GRADING DESIGN

The grading design must for the interior portions of a lot conform to the following requirements:

a. A minimum 100 mm drop or 5.0% grade over the first 2.0 m away from the foundation wall. If the distance between the foundation wall and the nearest lot boundary is less than 2.0 m, the finish grade elevation must be a minimum of 100 mm above the design elevation at the lot boundary.

b. Beyond the first 2.0 m, the lot is to slope at a 1% minimum and 10% maximum grade to the front, back or sides of the lot, In the case of a site with a walkout basement the maximum allowable slope front to rear to accommodate this eventuality will be 3:1 without the need for a retaining wall.

c. A minimum 1.0% longitudinal slope along sod lined or grassed swales located on the common property line between lots.

d. A minimum 0.5% longitudinal slope along asphalt and concrete swales or surfaces located on lots.

CONTENTS

# PART 5 – WATER DISTRIBUTION SYSTEM

## 5. WATER DISTRIBUTION SYSTEM

### 5.1 REFERENCE STANDARDS

- Water Supply for Public Fire Protection – A Guide to Recommended Practice in Canada, *Fire Underwriters Survey,* 2020. https://www.fireunderwriters.ca/assets/img/Water%20Supply%20for%20Public%20Fire%20Protection%20in%20Canada%202020.pdf
- Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Part 1, *Alberta Environment and Protected Areas,* 2012 (revised 2021). https://open.alberta.ca/dataset/f57fec02-7de8-4985-b948-dcf5e2664aee/resource/b5fd1f61-adae-4014-a96e-de57eda3791d/download/aep-standards-for-municipal-waterworks-revised-march-2021.pdf
- Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Part 2, *Alberta Environment and Protected Areas,* 2012. https://open.alberta.ca/dataset/f57fec02-7de8-4985-b948-dcf5e2664aee/resource/eb117384-bf6a-4db5-9290-5971ecb42a9f/download/part2-guidelinesmunicipalwaterworks-2012.pdf
- Environmental Utilities Construction Specifications, *City of Medicine Hat,* 2023. https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards_Drawings_Specifications_EU.pdf
- Environmental Utilities Standard Detail Drawings, *City of Medicine Hat,* 2023. https://www.medicinehat.ca/en/business-and-development/resources/Documents/Water-and-Sewer_Standard-Drawings.pdf
- Municipal Works Construction Specifications, *City of Medicine Hat*, 2023. https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards_Drawings_Construction.pdf
- National Plumbing Code of Canada 2020, *Canadian Commission on Building and Fire Codes National Research Council of Canada*, Eleventh Edition 2020. https://nrc-publications.canada.ca/eng/view/ft/?id=6e7cabf5-d83e-4efd-9a1c-6515fc7cdc71

## 5.2 GENERAL

The City of Medicine Hat Water Utility (Environmental Utilities Department) is responsible for developing municipal standards for design and construction of the municipal water system within the City of Medicine Hat. The purpose of these Standards is to ensure that the water distribution system is designed to deliver a safe, reliable, and effective water supply to customers while protecting the environment and promoting operational and maintenance efficiencies. This section details the design criteria for the water distribution system, including per capita water demand assumptions and peaking factors.

These Standards are based on many of the reference materials provided above and represent a minimum acceptable standard for the design of the water distribution system within the City of Medicine Hat.

References to the Environmental Utilities Department within this document are understood to mean the City of Medicine Hat Water Utility.

The potable water distribution system consists of the treatment plant, reservoirs, booster stations, feeder mains, distribution mains, and appurtenances. There are also aquifer transmission lines that provide raw (non-potable) water to industrial and irrigation customers in the Northwest quadrant of the City. Where these aquifer lines must be replaced, a pressure-rated pipe with appropriate colour coding must be used to distinguish the non-potable aquifer lines from the potable water mains. There are also non-potable irrigation lines that are not covered by this standard.

In general, larger water mains carrying large quantities of water between treatment plant, storage reservoirs and major pumping stations are designated Feeder Mains. Services should not be connected to these Mains. Water mains connecting Feeder Mains to areas to be served are designated as Distribution Mains.

The development plan shall include the information for Feeder Mains, which connect to the proposed developments, as well as the distribution system for the ultimate developments.

## 5.3 WATER LINE LOOPING

A loop, or grid shall be formed if there are more than 24 single residential units to be served, or if the main serving the area in the dead end is longer than 130 m, as measured from the nearest loop or grid, or along the centre line from the extension of the street curb line to the curb line at the dead end.

Notwithstanding the above, if the lot sizes in the area to be serviced are substantially smaller than the regular lots, and the situation of the water supply system in the area is generally above 420 kPa on average in summer months, up to 32 residential units may be allowed without looping.

If a private development has more than one connection to the public system, backflow prevention devices are to be installed at each connection downstream of the isolation valve to

prevent backflow into the public system. The devices must be approved by the Environmental Utilities Department and installation must be in accordance with the City of Medicine Hat Environmental Utilities Construction Specifications, including watertight, concrete vaults to house each device.

### 5.3.1 FLUSHING AND DISINFECTION

All water lines must be flushed and disinfected before being put into use in accordance with City of Medicine Hat Environmental Utilities Construction Specifications Section 10, Water Mains, 3.11 "Flushing and Disinfecting".

### 5.3.2 REFERENCE MATERIAL

In addition to the above, the design of the water distribution system shall be based on the following design factors, as well as other guidelines, and shall conform to, the most up-to-date versions of the codes of practice and required standards published by the Alberta King's Printer for Alberta Environment and Protected Areas. For other guidelines, please see the City of Medicine Hat - Environmental Utilities Construction Specifications, the City of Medicine Hat – Municipal Works Construction Specifications, Fire Underwriters Survey, Geotechnical Reports (if available), and other documents as directed by the City.

## 5.4 DESIGN FACTORS

### 5.4.1 HYDRAULIC ANALYSIS REQUIREMENTS

For developments that contain more than 24 regular residential lots, or for industrial or commercial developments, where no Functional Servicing Report (FSR) has been prepared or the proposed development's water usage will be greater than what was anticipated in the FSR, the City's Environmental Utilities Department may require a Hydraulic Network Analysis Report using a method acceptable to the City to ensure both domestic and fire flow requirements are met. In such cases, the City will supply data near the developments major system connection(s), if available in the City's water master plan model. The provided data will normally be the calculated flows, pressures, pipe sizes. It is the Developer's responsibility to provide appropriate data on hydrant flow tests, conducted by a qualified tester, as the cross-reference for the analysis.

The required report shall outline the results of the analysis and shall be submitted to the Environmental Utilities Department with the subdivision design drawings.

The Friction Coefficient 'C' shall be no greater than 130 for subdivision design.

Currently the Environmental Utilities Department is using InfoWater model for water network analysis.

### 5.4.2 DESIGN PARAMETERS

The following parameters shall be used in the design or evaluation of the water distribution system:

#### 5.4.2.1 DESIGN POPULATION

The design population shall be the ultimate population in the area under consideration based on the approved Area Structure Plan and conceptual scheme requirements, unless otherwise indicated in writing by the Environmental Utilities Department.

#### 5.4.2.2 CONSUMPTION RATES

#### 5.4.2.3 RESIDENTIAL PER CAPITA CONSUMPTION RATES

- Average Day Demand: 1000 litres per capita per day.
- Maximum Day Demand: 2600 litres per capita per day.
- Peak Hour Demand:3370 litres per capita per day.

#### 5.4.2.4 NON-RESIDENTIAL CONSUMPTION RATES

For non-residential development that uses water in its business processes, estimated peak water consumption rate shall be submitted by the Developer to the Environmental Utilities Department as part of the design approval from the City.

For non-residential development that does not use water in its business process, in the absence of practical data, or site-specific service requirements, the above residential per capita consumption rates may be used for estimating.

#### 5.4.2.5 FIRE FLOW REQUIREMENTS

Fire flow requirements shall be in accordance with the recommendations of the Fire Underwriters Survey for the type of development being considered.

The minimum fire flow used for low density residential subdivisions shall be 4,500 litres/minute.

The minimum fire flow used for medium density residential subdivisions shall be 7,200 litres/minute.

The minimum fire flow used for commercial, light and medium industrial, institutional and high-density residential developments, as well as schools shall be 9,000 litres/minute.

The minimum fire flow used for heavy industrial developments shall be 18,000 litres/minute.

#### 5.4.2.6 PRESSURE

Residual line pressure under maximum day plus fire flow conditions shall be no less than 140 kPa at ground level of any point in the system. Residual line pressure under peak hour flow conditions should be no less than 280 kPa. Maximum pressure under average day flow conditions shall be no greater than 550 kPa.

Pressures greater than 550 kPa may be allowed at the discretion of the Environmental Utilities Department.

#### 5.4.2.7 VELOCITY

Main line flow velocities should be 1.8 m/s or less during peak hour flow conditions, and 2.5 m/s during maximum day plus fire flow conditions.

## 5.5 MAINS

### 5.5.1 GENERAL

The grid mains must coincide with those in adjacent subdivisions to maintain the continuity of main sizes between subdivisions. Distribution mains shall be continuous (looped) wherever practicable.

Please refer to the following sub-section for the maximum length of main permissible between ties in residential developments. The standard grid main network required within residential subdivisions is illustrated in the Standards drawings.

In the initial stage of a large development area, the Environmental Utilities Department may temporarily waive this requirement in writing, provided that the Developer can demonstrate that the necessary maximum daily consumption plus fire flow can be delivered via the single water feed without looping. In such case, up to a maximum of two times (2 x) of the residential lots specified in Section 5.3 may be serviced temporarily by the system. Looping shall be provided within two years of temporarily servicing without looping and the City may require security from the Developer to ensure that looping occurs. Commercial and industrial developments will be determined in a case-by-case basis.

A standard hydrant assembly or a 50 mm flushing points shall be installed at the farthest reach of a dead-end main. See Environmental Utilities Construction Specifications and Standard Detail drawings for hydrant and flushing point details.

At water main crossings of sanitary and storm sewers, the following shall apply:

- Under normal conditions, water mains shall cross above sewers with a sufficient vertical separation to allow for proper bedding and structural support of water and sewer mains. The recommended minimum vertical clearance is 0.1 m. Special supporting structure is required in the case that the clearance is less than 0.1 m, but no less than 0.05 m. (See Construction Specifications for Details).

- Where it is necessary for the water main to cross below the sewer, the water main shall be protected by providing:
    - A vertical separation of at least 0.5 m from water main crown to sewer invert whenever practicable, otherwise the following will be required:
        - Structural support of the sewer to prevent excessive joint deflection and settling, and
        - A centering of the length of water main pipe segment at the point of crossing so that the joints are a minimum of 2 m from the sewer main.

In designing a feeder main, or a distribution main without services connecting at the high points, a combination air valve or hydrant shall be placed at significant high points in the water main profile to allow for purging of trapped air. (For detail of hydrant see Construction Specifications for Drawing)

### 5.5.2 DISTRIBUTION MAIN SIZES

The minimum size of distribution mains shall be as follows:

#### 5.5.2.1 RESIDENTIAL – LOW DENSITY

- No smaller than 150 mm diameter, if the length of the main between the supply grids or larger supply mains is 300 m or less.
- No smaller than 200 mm diameter for a hydrant supply line that is also used for service connections.
- No smaller than 200 mm diameter if the length of the main between the supply grid or larger supply mains is over 300 m, but not more than 500 m.
- 150 mm diameter if the main serving the area in the dead end is no longer than 130 m.

#### 5.5.2.2 NON-RESIDENTIAL AND MEDIUM- AND HIGH-DENSITY RESIDENTIAL

- No smaller than 200 mm for all subdivisions designated as industrial or commercial, as well as areas containing predominantly industrial or commercial premises.

### 5.5.3 ALIGNMENTS

Water mains should be located in streets whenever possible. Where water mains are not located within the street, hydrants, vaults, valves, and other appurtenances shall be accessible by a road suitable for travel by a heavy maintenance vehicle. The purpose of this requirement is to avoid having appurtenances installed such that they cannot be accessed for operation, maintenance, or repair.

It is recommended that the water main should have a separation of 3.0 m from sanitary or storm sewers, as well as other utilities. In lanes or public utility lots where space is limited, with

the approval of the Environmental Utilities Department, a minimum separation of 2.5 m from sanitary or storm sewer, or from the adjacent property line, and 2.0 m from other utilities shall be provided.

At street intersections, a minimum clearance of 1.2 m horizontally, measured from the outside surfaces, shall be maintained between water mains and any catch basins or storm manholes.

### 5.5.4 DEPTH OF COVER

Water mains shall be installed with a minimum depth of cover of 2.8 m measured from the road/lane/utility lot surface grade directly above the pipe to the top of the pipe. The maximum depth of cover over a water main shall be 4 m to top of pipe. Depth of cover greater than 4 m may be considered but will only be allowed with the express written approval of the Environmental Utilities Department. Where hydrants are connected to mains greater than 2.8 m depth, drain holes and main valves for hydrants shall be located at standard 2.8 m depth.

Water mains should be designed such that consistent grades in the pipes are maintained for as long as reasonably possible, within the confines of minimum and maximum depths of cover.

Where existing conditions dictate that the depth of bury be less than 2.8 m, the main/service is to be insulated as specified in the Environmental Utilities Construction Specifications.

The depth of cover over service line goosenecks from finished grade to top of pipe shall be 2.6 m.

## 5.6 APPURTENANCES

### 5.6.1 HYDRANTS

#### 5.6.1.1 SPACING

The maximum spacing between hydrants in residential area, as measured along the centre line of the right-of-way, shall be 180.0 m. Spacing of hydrants in industrial or commercial subdivisions should be reduced to 90 m. Where hydrants are placed along an arterial road in an industrial or commercial subdivision, hydrants may be required at 90 m spacing on both sides of the road. This requirement must be confirmed with the Fire & Emergency Services Department and the Environmental Utilities Departments prior to detailed design.

In cul-de-sacs of 75.0 m in length or less, the hydrant shall be installed at or near the intersection of the intersecting street.

In cul-de-sacs greater than 75.0 m in length, a hydrant shall also be installed in the bulb at the end of the cul-de-sac.

In addition to the above requirements, spacing between fire hydrants must conform to the requirements of the Fire Underwriters Survey (FUS). If there is discrepancy between this document and the FUS, the more stringent requirements shall apply.

#### 5.6.1.2 ALIGNMENT AND PLACEMENT

Fire hydrants should be placed at street intersections where possible to improve their visibility to emergency vehicles, particularly at cul-de-sac entrances. They shall be located at an alignment of:

- 2.0 m off the lip of gutter, or
- 0.5 m back of sidewalk.

Where a hydrant is installed at the corner of an intersection, it shall be installed on either side of the corner, at a location that minimizes potential conflict with wheelchair ramps and sidewalk users. Hydrants not installed at the corner should be at the extension of property lines whenever practical.

All hydrants must be separated from the distribution system by means of a hydrant lead with a hydrant service valve. Wherever possible, the hydrants shall be located on the same side of the street as the water mains to avoid having the hydrant leads crossing sanitary or storm sewers. The valve should be a minimum of three metres ( 3.0 m) from the main. Where the three metre ( 3.0 m) separation from the main would result in a valve being placed at or near the lip of gutter, the valve shall be located a minimum of 1 m from the main. In this case, the valve must be:

- Mechanically restrained back to the tee.
- Petrolatum corrosion protection must be applied to all non-epoxy components.

The total length of the lead should be 60.0 m or less, with a minimum diameter of 150 mm.

### 5.6.2 VALVES AND FITTINGS

#### 5.6.2.1 SPACING

Maximum spacing of shut-off valves in feeder mains should be 1500 m.

Boundary valves shall be clearly identified on the engineering design drawings.

#### 5.6.2.2 ALIGNMENT AND PLACEMENT

Main valves should be located such that no more than 24 single family lots (or up to 32 single and multi-family "mixed" lots) and one hydrant are involved in a shut down and no more than four valves are required to shut down any section of line.

A valve and additional lengths of pipe should be installed at interim limits of construction. For pipe diameters up to 200 mm, two additional lengths of pipe shall be installed. For pipe diameters 250 mm and greater, three additional lengths of pipe shall be installed after the valve. Mechanical restraint may be considered at the discretion of the Environmental Utilities Department.

Distribution main valves should be located at the beginning of curb returns at road intersections. Main valves should also be located on both sides of every hydrant tee to facilitate flushing and commissioning operations.

Valves are required on a water main at each end of the utility right-of-way or easement.

The Environmental Utilities Department reserves the right to require additional valves be installed as necessary to meet all operational requirements.

### 5.6.3 MECHANICAL RESTRAINTS AND THRUST BLOCKS

Approved, engineered, mechanical restraining devices shall be installed at all bends, tees, crosses, reducers, as well as all the other appurtenances as designated by the Environmental Utilities Department. All mechanical restraints must be sealed from moisture with an approved petrolatum tape or product.

All pipe segments shorter than a full length of pipe (i.e. pipes that have been cut) must have their joints restrained on both sides by engineered mechanical restraining devices approved by the Environmental Utilities Department.

Concrete thrust blocking may be required in addition to, or in lieu of, mechanical restraining devices at the discretion of the Environmental Utilities Department. All thrust blocking must conform to the requirements of the Environmental Utilities Construction Specifications.

### 5.6.4 SERVICE CONNECTIONS

Each lot, including a multi-family unit, shall have its own separate service connection. The service shall be installed to a point inside the property line (house side). This point shall be the maximum practical but no less than 3.0 m inside the property line. In the case where there are shallow utilities or easement inside the property line the services shall be no less than 2.0 m beyond the easement. All services connections shall be completed, or supervised by the Environmental Utilities Department, according to the details shown in Environmental Utilities Construction Specifications and Standard Detail drawings.

Service sizes must be in accordance with Plumbing Code requirements. The following water service standard sizes are allowable for new construction:

a. 25 mm
b. 50 mm
c. 100 mm
d. 150 mm
e. 200 mm

Non-standard service sizes may be accepted with written consent from the Environmental Utilities Department. For existing water services that are not standard sizes, it is up to the

Developer's plumbing contractor to make the connection from standard to non-standard size, or the Developer to replace the non-standard service on the private side.

Where the applicant is requesting a new or upgraded service for an infill or redevelopment lot, the applicant must have a fixture count and proposed line size completed by a Plumber to confirm if the service is adequately sized. The Environmental Utilities Department does not provide sizing for water or sanitary services. Planning and Development Services - Development Engineering and Building Safety Codes ensure compliance with the National Plumbing Code of Canada (NPCC), but they do not complete fixture counts for applicants. They will require proof that it meets the NPCC and review the information submitted.

Non-residential or apartment service connections shall be sized according to anticipated user requirements. A shut-off valve shall be installed at the property line (0.3 m within the road right-of-way) when the lot is serviced. The private portion of service connections is normally to be installed at the time that the lot is developed. Where public water infrastructure and private lots are being constructed concurrently, services are required to be installed on the public side first before being installed on the private side.

Service line to parks or green strips for irrigation purpose shall have minimum diameter of 50 mm.

The minimum depth of cover shall be 2.8 m to the top of pipe from finished grade.

The abandonment of a water service requires approved written consent from the Environmental Utilities Department and must be completed in accordance with the City of Medicine Hat Environmental Utilities Construction Specifications Section 11, Part 3.4 "Water Service Abandonments".

## 5.7 RESERVOIRS AND PUMP STATIONS

All reservoirs and pump stations shall be treated as a special facility that will be designed and constructed under the management of the Environmental Utilities Department with development costs, if applicable, to be determined on a case-by-case basis.

CONTENTS

# PART 6 - SANITARY SEWER SYSTEM

## 6. SANITARY SEWER SYSTEM

### 6.1 REFERENCE STANDARDS

- Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems Part 3, *Alberta Environment and Protected Areas,* 2013.

  https://open.alberta.ca/dataset/f57fec02-7de8-4985-b948-dcf5e2664aee/resource/6df3ae50-cacb-4e4c-b5b3-98d829ab661a/download/part3-wastewatersystemsstandards-2013.pdf

- Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems Part 4, *Alberta Environment and Protected Areas,* 2013.

  https://open.alberta.ca/dataset/f57fec02-7de8-4985-b948-dcf5e2664aee/resource/b90bd6e7-2747-4ea6-b033-b6fc3d248935/download/part4-wastewatersystemsguidelines-2013.pdf

- Environmental Utilities Construction Specifications, *The City of Medicine Hat,* 2023.

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards_Drawings_Specifications_EU.pdf

- Environmental Utilities Standard Detail Drawings, *The City of Medicine Hat,* 2023.

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Water-and-Sewer_Standard-Drawings.pdf

- Municipal Works Construction Specifications, *The City of Medicine Hat*, 2023.

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards_Drawings_Construction.pdf

- National Plumbing Code of Canada 2020, *Canadian Commission on Building and Fire Codes National Research Council of Canada*, Eleventh Edition 2020.

  https://nrc-publications.canada.ca/eng/view/ft/?id=6e7cabf5-d83e-4efd-9a1c-6515fc7cdc71

### 6.2 GENERAL

The City of Medicine Hat Sewer Utility (Environmental Utilities Department) is responsible for developing municipal standards for design and construction of the municipal sanitary sewer collection system within the City of Medicine Hat. The purpose of these Standards is to ensure that the sanitary sewer collection system is designed to provide safe, reliable, and effective

sanitary sewage collection while protecting the environment and promoting operational and maintenance efficiencies.

These Standards are based on the standards identified at references above and represent a minimum acceptable standard for the design of the sanitary sewer collection system within the City of Medicine Hat.

References to the Environmental Utilities Department within this document are understood to mean the City of Medicine Hat Sewer Utility.

The sanitary sewer system consists of the treatment plant, lift stations, mains, and appurtenances.

The sanitary system must be designed with consideration for the service area boundaries established by the City's Environmental Utilities Department for each sanitary trunk system.

Manhole bases may be cast-in-place or precast complete with flow channel, benching, and pipe stubs.

### 6.2.1 REFERENCE MATERIAL

In addition to the above, the design of the sanitary sewer system shall be based on the following design factors, as well as other guidelines, and shall conform to, the design standards provided by the most up-to-date version of the "Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems in Alberta", as published by Alberta Environment and Protected Areas. For other guidelines, please see the City of Medicine Hat - Environmental Utilities Construction Specifications, City of Medicine Hat – Municipal Works Construction Specifications, City of Medicine Hat - Environmental Utilities Sewage Lift Station Design and Construction Standards and Procedures, Geotechnical Reports (if available), and other documents as directed by the City.

## 6.3 DESIGN FACTORS

### 6.3.1 SYSTEM ANALYSIS REQUIREMENTS

For developments that contain more than 24 regular residential lots, or for industrial or commercial developments, the City's Environmental Utilities Department may require a System Analysis Report using a method acceptable to the City to ensure that there is sufficient system capacity. This Report will typically be included in the Functional Servicing Report.

#### 6.3.1.1 DESIGN PARAMETERS

The following parameters shall be used in the design or evaluation of the sanitary sewer system.

#### 6.3.1.2 DESIGN POPULATION

The design population shall be the ultimate population in the area under consideration based on the approved statutory plans, unless otherwise indicated in writing by the Environmental Utilities Department.

#### 6.3.1.3 AVERAGED SEWAGE FLOW

##### 6.3.1.3.1 RESIDENTIAL

For design purposes, the year-round average per capita daily flow for the City is 454 litres, out of which 68 litres (approx. 15%) is the assumed quantity from the weeping tiles and ground water infiltration. In areas where water table is within 1.0 m below the lowest footing of building, extra quantity in addition to the 68 litres may be required. The extra quantity of groundwater flow shall be determined by the Developer based on on-site geological investigation records submitted to the City for approval.

##### 6.3.1.3.2 NON-RESIDENTIAL

For non-residential land use areas, in the absence of practical data, or site-specific service requirements, one of the following options could be used for flow estimation:

- The average wastewater flow could be estimated with the statistical information as outlined in Section 4.1.1.2 of the "Standards and Guidelines for Municipal Water Supply, Wastewater, and Storm Drainage", Part 4.
- For low density non-residential, the estimated per hectare flow could be 16,800 litres per hectare per day.
- Sewage flow estimates to be based upon consumptive demand of water and is not to include process wastewater unless discharge to the sanitary sewer has been applied for and permitted for the process wastewater.

The inflow/infiltration may be handled with the method as described under the residential section above.

#### 6.3.1.4 PEAKING FACTORS

##### 6.3.1.4.1 RESIDENTIAL (POPULATION GENERATED)

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

$$Q_{pwd} = \frac{G \times P \times Pf}{86.4}$$

Where: $Q_{pwd}$ = the peak design flow rate (litres/sec)

G = the per capita average daily design flow (litres/day/person)

P = the design contributing population in thousands

P*f* = Harmon's Peaking Factor = $1 + 14/(4 + P^{0.5})$ but not less than 2.5

#### 6.3.1.4.2 NON-RESIDENTIAL

For non-residential developments (other than the home-based occupation), the peaking factor could vary greatly with the type of development. Each case shall be considered on an individual basis.

## 6.4 MAINS

### 6.4.1 GENERAL

The sanitary sewer shall be of sufficient capacity to carry peak flows.

In the case that the trunk main is connected to areas where a high groundwater table exists or manholes are located in street sags, appropriate allowance for the inflow/infiltration shall be included in the design.

At water main crossings of sanitary and storm sewers, the following shall apply:

- Under normal conditions, water mains shall cross above sewers with a sufficient vertical separation to allow for proper bedding and structural support of the water and sewer mains. The recommended minimum vertical clearance is 0.1 m.
- Where it is necessary for the water main to cross below the sewer, the water main shall be protected by providing:
    - Vertical separation of at least 0.5 m from water main crown to sewer invert,
    - Structural support of the sewer to prevent excessive joint deflection and settling, and
    - A centering of the length of water main pipe segment at the point of crossing so that the joints are at least 2 m from the sewer.

The guidelines in the following sections shall be used in the design of sanitary sewer system.

## 6.4.2 MAIN SIZES, VELOCITY AND SLOPE

**Table 6.4.1 – Minimum Pipe Diameters**

| DEVELOPMENT | DIAMETER |
|---|---|
| Industrial developments | 250 mm |
| Residential and other developments | 200 mm |

**Table 6.4.2 – Minimum Slope of Sewer Main**

| SIZE (mm) | SLOPE (%) |
|---|---|
| 200 | 0.40 |
| 250 | 0.28 |
| 300 | 0.22 |
| 375 | 0.15 |
| 450 | 0.12 |
| 525 | 0.10 |
| 600 | 0.08 |

Slopes for pipelines larger than 600 mm will be based on the following unless otherwise approved by Alberta Environment and Protected Areas and/or City Environmental Utilities Department:

- Minimum flow velocity = 0.6 m/sec
- Maximum flow velocity = 3.0 m/sec

## 6.4.3 ALIGNMENTS

Sewer mains shall be located in streets whenever possible. For consistency, it is recommended that the sewer main be installed in the middle of the street. Where sewer mains are not located within the street, manholes and other appurtenances shall be accessible by a road suitable for travel by a heavy maintenance vehicle. The purpose of this requirement is to avoid having manholes and appurtenances installed such that they cannot be accessed for operation, maintenance, or repair.

It is recommended that the sanitary sewer main should have a minimum separation of 3.0 m from water mains and storm sewer, as well as other utilities. In lanes or public utility lots where space is limited, with the approval of the Environmental Utilities Department, a minimum separation of 2.5 m from water main and storm sewer, and 2.0 m from other utilities shall be

provided. The minimum separation requirement from storm sewer may be reduced with the approval of the Environmental Utilities Department.

### 6.4.4 DEPTH OF COVER

Sewer main shall be installed with a minimum depth of cover of 2.8 m from the road/lane/utility lot surface grade directly above the pipe to the top of pipe.

Where existing conditions dictate that the depth of bury be less than 2.8 m, the main/service shall be insulated as specified in the Environmental Utilities Construction Specifications and Standard Detail drawings.

The cover for a sewer main with services connected, or anticipated to have services connected, shall not exceed 4.5 m. The cover for a trunk main without services connected shall not exceed 7.0 m. Greater depths of cover may be considered but will only be allowed with the express written approval of the Environmental Utilities Department.

### 6.4.5 CURVED SEWER

Although it is required that sanitary sewers be laid with straight alignments between manholes, curved sewers shall be permitted with the following restrictions:

- The sewer shall be laid as a simple curve with a radius equal to or greater than that recommended by the pipe manufacturer. Minimum radius shall not be less than 60 m.
- Manholes shall be located at the beginning and the end of the curve, unless otherwise approved by the Environmental Utilities Department.
- The curve shall run parallel to the centre line of the road or right-of-way.
- The minimum grade for sewers on curves shall be 50% greater than the minimum design grades.
- If concrete pipe is the preferred material for installation, curved pipes with proper radius shall be used. Pipe deflection at joints shall not exceed the manufacturer's recommendations.

## 6.5 APPURTENANCES

### 6.5.1 MANHOLES

#### 6.5.1.1 LOCATION

Manholes are to be installed at the following:

- The end of each line, and at all changes in grade, pipe size, alignment.
- Distances not greater than 120 m for sewers 375 mm or less.
- Distances not greater than 150 m for sewers 450 mm to 750 mm.

Efforts shall be made by the Engineering Consultant to avoid locating manholes in street sags.

#### 6.5.1.2 SIZING

- Minimum sizing of manhole shall be 1200 mm in diameter for sewers up to 600 mm.
- For 675 mm or larger sewer, 1500 mm manholes, or specially designed manholes, or precast manhole vaults, including tee riser manholes may be used.

#### 6.5.1.3 CHANNELLING AND BENCHING IN MANHOLES

- The depth of the flow channel shall be at least one-half the diameter of the downstream sewer.
- The flow channel for straight run sewer manholes shall be made to conform in shape and slope to that of the downstream sewer if the size of upstream pipe equals that of the downstream. At changes in direction, manhole benching shall be in accordance with Environmental Utilities Standard Detail drawings.
- In the case that the downstream pipe is larger, it is good practice that the obvert (crown) elevation of the lowest upstream pipe be equal to, or higher than the obvert of the downstream pipe. However, if it is not practical to do so, to maintain a continuous energy gradient through manholes, a minimum of 80% of the diameter above the invert elevation of the lowest upstream pipe shall be equal to, or higher than 80% of the diameter above the invert elevation of the outlet pipe, unless otherwise approved by the City's Environmental Utilities Department (See Environmental Utilities Standard Detail drawings).

#### 6.5.1.4 DROP MANHOLES

Drop structures shall be used on every inlet to a manhole when the elevation of the inlet is more than 600 mm above the outlet.

In a new installation of sewers and manholes, the drop structure shall be an exterior drop. Interior drop structures will only be permitted for inlet lines 200 mm maximum size where the velocity of the flow in the inlet line is less than 2.0 m/s, upon tie-in to existing manholes.

For design details of drop structures see Environmental Utilities Standard Detail drawings.

### 6.5.2 SERVICE CONNECTIONS

The minimum grade on the sanitary sewer service line shall be 2.0%; the minimum size shall be 100 mm inside diameter; the minimum depth of cover shall be 2.8 m to the top of pipe from finished grade.

Service sizes must be in accordance with Plumbing Code requirements. The following sanitary sewer service standard sizes are allowable for new construction:

a. 100 mm
b. 150 mm
c. 200 mm
d. 250 mm
e. 300 mm

Non-standard service sizes may be accepted with written consent from the Environmental Utilities Department. For existing sewer services that are not standard sizes, it is up to the Developer's plumbing contractor to make the connection from standard to non-standard size, or the Developer to replace the non-standard service on the private side.

Where the applicant is requesting a new or upgraded service for an infill or redevelopment lot, the applicant must have a fixture count and proposed line size completed by a plumber to confirm if the service is adequately sized. The Environmental Utilities Department does not provide sizing for water or sanitary services. Planning and Development Services - Development Engineering and Building Safety Codes ensure compliance with the National Plumbing Code of Canada (NPCC), but they do not complete fixture counts for applicants. They will require proof that it meets the NPCC and review the information submitted.

Non-residential and apartment service connections shall be sized according to anticipated user requirements. These service connections would normally be installed at the time that the lot is developed.

Each residential lot, including multi-family lot, shall have its own separate sanitary sewer service connection. The service shall be installed at a point inside the property line (house side). This point shall be the maximum practical but no less than 3.0 metres inside the property line. In the case that there are shallow utilities or easements inside the property line, the services shall be no less than 2.0 m beyond the easement. A cleanout shall be installed at the property line for all services. All services connections shall be completed, or supervised by the Environmental Utilities Department, according to the Construction Specifications and Standard Detail drawings.

In cul-de-sacs sanitary sewer service may be connected directly to the manhole provided that the lead enters the manhole less than 0.60 m above the invert of the main. Refer to Environmental Utilities Standard Detail drawing EU-107 for more information.

Unless otherwise approved by the Environmental Utilities Department, service line size shall be at least two (2) sizes smaller than the main, if it is to be connected directly to the main. If this condition is not met, a manhole will be required.

The abandonment of a sanitary sewer service requires approved written consent from the Environmental Utilities Department and must be completed in accordance with the City of

Medicine Hat Environmental Utilities Construction Specifications Section 11 Part 3.7 "Sanitary Sewer Service Abandonments".

#### 6.5.2.1 SAMPLING MANHOLES

Environmental Utilities requires new multi-family housing (6 plex and larger), institutional, commercial, and industrial customers to install, at their expense, a sampling manhole on the service line from the facility to the sewer main in accordance with City Sewer Bylaw 1541, Clause 509

The sampling manhole shall be provided within the road right-of-way or easement for the lot and shall be installed at the time that the lot develops, and the service is installed. The sampling manholes shall be installed in accordance with Sampling Manhole detail drawings provided in the Environmental Utilities Construction Specifications and Standard Detail drawings.

## 6.6 PUMP STATIONS

All pump stations shall be treated as a special facility developed in accordance with Environmental Utilities Department document "Sewage Lift Station Design and Construction Standards and Procedures."

CONTENTS

# PART 7 - STORM DRAINAGE SYSTEM

## 7. STORM DRAINAGE SYSTEM

### 7.1 REFERENCE STANDARDS

Design details or procedures not specified in this section shall be determined in accordance with the following Reference Standards or as otherwise found applicable and approved by the City of Medicine Hat.

Current editions of:

- Municipal Works Construction Specifications, *City of Medicine Hat,* 2023.

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards_Drawings_Construction.pdf

- Government of Alberta Regulating Department (Alberta Environment and Protected Areas).

  https://www.alberta.ca/environment-and-protected-areas

- Stormwater Management Guidelines for the Province of Alberta, *Alberta Environmental Protection*, 1999.

  https://open.alberta.ca/dataset/75b4611e-d962-4411-ac56-935ec2f8dcd1/resource/c6ccd70c-1a1e-4f2a-ae23-58e287ed5ada/download/stormwatermanagementguidelines-1999.pdf

- Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems Part 5, *Alberta Environment and Protected Areas,* 2013.

  https://open.alberta.ca/dataset/f57fec02-7de8-4985-b948-dcf5e2664aee/resource/aa3ba3a4-e415-4d85-ad66-496f98c9bc8e/download/part5-stormwatermanagementguidelines-2013.pdf

- Erosion and Sediment Control Manual, *Alberta Transportation*, 2011.

  https://open.alberta.ca/dataset/aaae5384-c0e0-4421-9fd8-6ab835c6f3af/resource/5ae2cd05-f29f-4f71-a88f-08ac702125a9/download/2011-erosion-sediment-control-manual-june-2011.pdf

- Water Environment Federation & American Society of Civil Engineers, Design and Construction of Urban Storm water Management Systems (ASCE Manuals and Reports of Engineering Practice No. 77, WEF Manual of Practice FD-20).

  https://ascelibrary.org/doi/book/10.1061/9780872628557

- Municipal Storm Water Management, 2nd Edition, *Thomas N. Debo, Andrew J. Reese*, 2003.

  https://www.routledge.com/Municipal-Stormwater-Management/Debo-Reese/p/book/9781566705844?srsltid=AfmBOooNEBzDack8rDFPw4012qglYBdQyJp6upjJLs1fOwh9zWRS2UHt

- United States Department of Transportation, Federal Highway Administration, Hydraulic Engineering Circular (HEC) Series and Hydraulic Design Series (HDS).
  - FHWA "Design of Riprap Revetment" – HEC 11 (Archived, Superseded by HEC 23 Volumes 1 & 2).

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/09111/09111.pdf

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/09111/09112.pdf
  - FHWA "Hydraulic Design of Energy Dissipators for Culverts and Channels" – HEC 14.

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/06086/hec14.pdf
  - FHWA "Design of Roadside Channels with Flexible Lining" – HEC 15.

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/05114/05114.pdf
  - FHWA "Urban Drainage Design Manual" – HEC 22.

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/hif24006.pdf
  - FHWA "Hydraulic Design of Highway Culverts" – HDS 4.

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/08090/HDS4_608.pdf
  - FHWA "Hydraulic Design of Highway Culverts" – HDS 5.

    https://www.fhwa.dot.gov/engineering/hydraulics/pubs/12026/hif12026.pdf

- Volume 3 Drainage Design Guidelines, Vol. 3-01: Development Planning Procedure and Framework – Appendix C "Guidelines for the Design and Construction of Flexible Thermoplastic Pipe in the City of Edmonton", *EPCOR*, 2021.

  https://www.epcor.com/content/dam/epcor/documents/supporting-documents/2022_drainage_design-standards_volume-3-03.pdf

- Drainage Manual Volumes 1 (1982) and 2 (1987), *Transportation Association of Canada (TAC)*, 1982.

  https://www.tac-atc.ca/en/knowledge-centre/technical-resources-search/publications/ptm-drain-e/

Parts of some reference standards may be superseded by more recent references. In general, the provisions of this section shall govern over the Reference Standards, where there are conflicts; the City may accept other methods derived from other accredited technical resources at its discretion.

## 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 historical data.

Minor System: A minor drainage system is the network of sewers, inlets, and street gutters, etc. which are designed to rapidly convey storm runoff from minor rainfall events.

For the purpose of these standards, a minor rainfall event is defined as a storm having a 1 in 5-year return period as recommended by Alberta Environment and Protected Areas Stormwater Management Guidelines.

Major System: A Major Drainage System is comprised of overland flow routes, swales, roadways, watercourses, and storage facilities, and outfalls into storage or watercourses, planned, designed, and incorporated as part of the urban infrastructure to convey runoff from major rainfall events.

For the purpose of these standards, a major rainfall event is defined as a storm having a 1 in 100-year return period as recommended by Alberta Environment and Protected Areas Stormwater Management Guidelines.

## 7.3 OBJECTIVES AND LEVELS OF SERVICE

Integrated Storm Water Management (SWM) Plans, in conformance with current Alberta Environment and Protected Areas Guidelines and conditions of the City of Medicine Hat's license to operate its drainage system, must be designed to fulfill the objectives of these standards and Alberta Environment and Protected Areas Guidelines, which include:

### 7.3.1 ECONOMIC MANAGEMENT

Storm drainage systems shall be designed to minimize the long-term operating and maintenance costs without jeopardizing the ease and economics of servicing developments.

### 7.3.2 STORM WATER QUANTITY MANAGEMENT

All areas are to be designed with storm drainage systems that, in general, follow the dual drainage system philosophy; that is a minor system designed to accommodate and convey minor events, and a major system designed to accommodate, store and or convey major events.

Storm drainage systems shall be designed with sufficient capacity to safely convey runoff, from the ultimate catchment area at the fully developed or build-out condition, for discharge into natural watercourses.

The design of the storm drainage systems shall be carried out to meet the following level of service objectives:

- Convey storm runoff in a minor drainage system designed to avoid injury, property damage, flooding, hydraulic surcharge of the minor system, environmental damage, erosion or sediment deposition and to minimize inconvenience associated with runoff from the 1 in 5 year and more frequent return period rainfall events.
- Convey storm runoff in a major drainage system or drainage conveyances designed to avoid injury, property damage, hydraulic surcharge of the minor system, environmental damage, erosion or sediment deposition, and to minimize flooding, and unacceptable inundation of transportation corridors, associated with runoff from the 1 in 100 year and more frequent return period rainfall events.
- Control discharge from minor and major drainage systems outfalls such that the flows and hydraulic capacities of downstream conveyance systems and watercourses remain like predevelopment conditions.
- Control the discharge of surface and underground drainage, from lots and site developments such that the hydraulic capacity of downstream public conveyances, allocated to such lots and site developments, are not exceeded.
- Control the discharge of runoff from lot and site developments to public drainage systems, without causing adverse impact upon or preventing the degradation of adjacent and downstream lots, sites and natural topography as contemplated by best practices.
- Subsurface disposal is not acceptable unless a hydro geologic study demonstrating that there will be no potential for adverse impact is submitted to and approved by the City.
- Where storm water flows are diverted from the natural drainage patterns or subsisting planned drainage systems because of a development or subdivision, the resulting impacts shall be identified, quantified and mitigation measures carried out to the City's satisfaction.

## 7.4 STORM RUNOFF QUALITY MANAGEMENT

Minor and major storm drainage systems shall be designed such that the discharge into natural watercourses will neither adversely impact the capacity of these watercourses to assimilate pollutants carried with the discharge nor impair the quality of water in the watercourses by incorporating measures to:

- Minimize and control the release of pollutants into the receiving watercourse from storm water runoff in conformance with Alberta Environment and Protected Areas - Storm water Management Guidelines and codes of practice for the Province of Alberta.
- Prevent or minimize the degradation of natural channels, ravines, riverbanks, and valley slopes by erosion due to the uncontrolled or unmanaged release of storm water runoff from publicly owned minor and major storm water management systems or from private properties.

- Control the release of pollutants from commercial and industrial properties and activities prior to their discharge into publicly owned minor and major storm water management systems.
- Operate the minor drainage system separately from the sanitary sewer system.

Storm water management facilities (SWMF) shall be incorporated into new developments to minimize the increase in the sediment loading and downstream flooding of subsisting planned drainage systems or existing receiving watercourses. Sediment removal measures shall be designed to achieve the removals stipulated in the Alberta Environment and Protected Areas Guidelines. Where erosion control or bank stability work is required, preservation of watercourse aesthetics and wildlife habitat shall be considered in the design.

Drainage from institutional, industrial, agricultural, or commercial operations that may potentially be contaminated shall not be discharged into the storm drainage system, without approved pretreatment.

## 7.5 STORM WATER MANAGEMENT PLANNING AND DESIGN REPORTING

### 7.5.1 REGIONAL MASTER DRAINAGE PLAN

A Regional Master Drainage Plan is an overall drainage plan for the City of Medicine Hat and area that defines on a regional basis:

- The short, medium, and long-term storm drainage servicing strategies to respond to development needs.
- Criteria for sighting, sizing and design of storm drainage systems.
- Addresses the environmental impact of storm water discharges, including, pollution loading, sedimentation, erosion, and measures for pollution control and abatement for the protection of the receiving waters.
- To supplement the Municipal Development Plan.
- This Plan is normally prepared and maintained by the City and may be amended by the City or by a third party.

## 7.6 WATERSHED DRAINAGE PLAN

A Watershed Drainage Plan identifies drainage and environmental constraints and defines options for management and development alternatives on a drainage watershed basis.

The analysis of alternative drainage systems in the Watershed Drainage Plan is at a broad and conceptual level incorporating:

- Evaluations of general proposed land use patterns.
- Identification of suitable trunk sewers.

- Identification of suitable major and minor drainage system outfall points to receiving waterways.
- Alternatives for the trunk sewers and major drainage system elements.
- Allocation of system capacity to tributary areas.
- Area-based cost analysis is done based on Watershed Drainage Plans.

This Plan is normally prepared and maintained by the City and may be amended by the City or by a third party.

## 7.7 FUNCTIONAL SERVICING REPORT OR PRELIMINARY ENGINEERING REPORT

Submission of a Functional Servicing Report (FSR) or Preliminary Engineering Report is required to support applications for the approval of Area Structure Plans (ASP), conceptual schemes, or subdivisions. The level of detail and content is to be in accordance with the provisions of these standards governing FSRs and Preliminary Engineering Reports.

### 7.7.1 DETAILED DESIGN SUBMISSION REQUIREMENTS

Detailed design submissions shall contain all reports, calculations, analysis, drawings, model input and output files necessary to evaluate the proposed storm drainage system unless they previously have been submitted and approved. Where there is a subsisting approved FSR or Preliminary Engineering Report, resubmission of the preliminary engineering will not be required. These calculations and reports are important for approval purposes and for the City to make an application to Alberta Environment and Protected Areas for their approval of the storm drainage systems.

### 7.7.2 COMMERCIAL, INSTITUTIONAL, INDUSTRIAL, MULTIFAMILY RESIDENTIAL SITES

The maximum allowable discharge rates of storm water from site developments will be limited to those identified in the FSR or Preliminary Engineering Report or as determined by the City.

### 7.7.3 REQUIREMENTS OF SUBDIVISION DESIGN

Development sites less than 0.16 hectare in area may discharge directly to a public storm sewer system or to approved overland conveyances. For design, the runoff coefficient for these sites shall be 0.9.

Provision of onsite storage is required for development sites larger than 0.16 hectare in area to reduce the runoff rate to the storm drainage system. The allowable discharge rate from any site shall be the greater of:

- 20 litres per second, (based upon the practical minimum inlet control device size for clog free operation), or

- 35 litres per second per hectare based upon practical maximum onsite detention volumes.

### 7.7.4 SITE DEVELOPMENT OR REDEVELOPMENT REQUIREMENTS

Site drainage plans are to be submitted to the City for each Site Development or Redevelopment. Plans shall address the following:

- Onsite detention for all sites over 0.16 hectare shall be provided unless approved otherwise by the City.
- Onsite catch basins and storm sewer system extension.
- The City may require storm water quality treatment by the provision of a high flow bypass oil grit separator or approved equivalent treatment system.

Computations shall use weighted runoff coefficients (see Table 7.8.2 for typical runoff coefficients) for each catchment area derived from the site development plans. Storage volume requirements for on-site detention shall be based upon design procedures acceptable to the City.

### 7.7.5 SITES LOCATED ADJACENT TO WATER COURSES OR WITHIN A FLOOD FRINGE ZONE

For sites located adjacent to natural watercourses or connected by overland conveyances, the City may allow storm water discharges to the watercourse with reduced onsite detention or without onsite detention provided that water quality objectives can be met. All such development proposals shall be evaluated on a case-by-case basis.

Special provisions may apply to sites located in a flood fringe zone. All such development proposals shall be evaluated on a case-by-case basis.

## 7.8 HYDROLOGIC DESIGN - COMPUTATIONAL REQUIREMENTS

### 7.8.1 TRIBUTARY AREAS

Tributary areas for both the major and minor systems shall be shown on plans together with the hydrologic characteristics of each catchment area. Tributary areas shall be laid out for each entry point into the minor or major systems. Tributary areas may be lumped together where areas are hydraulically connected on the surface at the entry point.

Where catchment areas outside a development boundary are tributary to the proposed storm drainage systems within the development boundary, the storm drainage systems shall be provided with the capacity to accommodate the predevelopment runoff from all tributary lands including those outside of the development area. The City may require the storm systems to be oversized to accommodate post development flows from off-site tributary areas.

### 7.8.2 RAINFALL

For the purposes of most storm water management projects, single event synthetic design storms based upon Atmospheric Environment Service's (AES) Intensity-Duration-Frequency (IDF) rainfall data and curves shall be used. The design of regional storm water management and treatment facilities may require continuous simulation of historic rainfall data. The City will supply such data.

### 7.8.3 TIME OF CONCENTRATION

Inlet times for sheet flow from a catchment area to entry points to the storm sewer system or overland conveyances shall be computed using:

- Kerby/Hathaway Formula

$$tc = 1.444 \left(L \frac{n}{S^{0.5}}\right)^{0.467} \text{ (unrestricted use)}$$

Where: $t_c$– Inlet time in minutes

L– distance of travel in metres

n– Manning's roughness coefficient for sheet flow, dimensionless

S– slope in m/m

- Travel time computations for the design of conveyances shall be carried out using Manning's equation.

$$V = \frac{1}{n} S^{1.5} R^{1.2}$$

Where: V - Velocity in metres per second

n– Manning's roughness coefficient (dimensionless)

S– slope in m/m

R– is the channel flow area divided by the wetted perimeter in metres

Time of concentration shall be computed by the addition of the inlet time to the computed travel times in conveyances.

## 7.8.4 HAND COMPUTATIONS METHODS

### 7.8.4.1 INTENSITY DURATION FREQUENCY (IDF) RELATIONSHIPS

The IDF curve data in Table 7.8.1 shall be used for hydrologic computations of rainfall intensity values using hand methods. The formula that shall be used to calculate rainfall intensity is:

$$i = \frac{A}{(T+B)^C}$$

Where: i – intensity in mm/hr

T- Time in minutes

A,B,C – Parameters for the selected return period with a range of application for durations of 5 minutes to 2 hours.

**Table 7.8.1 - IDF Curve Data**

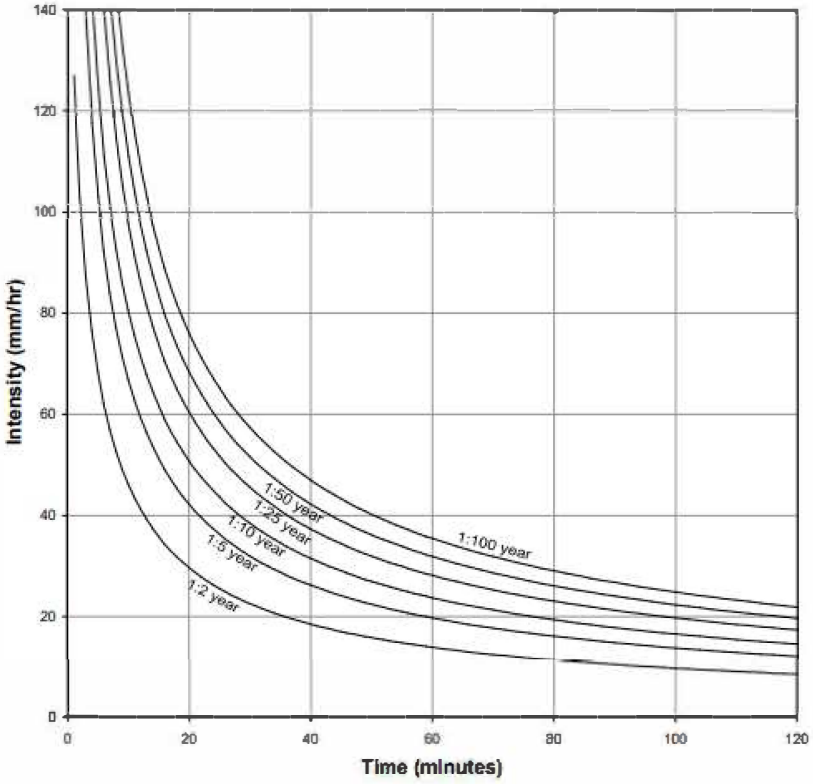



**Figure 7.8.1 – IDF Curves**

| RETURN PERIOD | A | B | C |
|---|---|---|---|
| 2 | 282.62 | 2.0 | 0.729 |
| 5 | 368.98 | 1.0 | 0.712 |
| 10 | 445.08 | 1.0 | 0.713 |
| 25 | 484.65 | 0 | 0.695 |
| 50 | 548.66 | 0 | 0.695 |
| 100 | 610.24 | 0 | 0.695 |

### 7.8.4.2 RATIONAL METHOD

The Rational Method shall be used for the detailed design of storm sewers for the minor event. Runoff shall be computed using the formula:

$$Q = 2.78CiA$$

Where: Q – runoff in litres/second

C – runoff coefficient (dimensionless)

i – intensity in mm/hr

A – Catchment or tributary area in hectares (ha)

For catchment areas in excess of 30ha tributary to a single trunk storm sewer or where the time of concentration exceeds 30 minutes as calculated in Section 7.8.3 the City may at its discretion specify that other hydrologic methods are used.

### 7.8.4.3 MODIFIED RATIONAL METHOD

The Modified Rational Method may be used for drainage systems design where the specified design storm returns over 10 years. Typically, this includes the design of overland conveyances and on-site storage for site developments. The Modified Rational Method incorporates a modifier to increase the runoff coefficient for larger events to account for the inherent inaccuracy of the Rational Method when carrying out computations for such events. The runoff coefficient in the formula for runoff in Section 7.8.4.2 shall be increased by the following factors, up to a maximum runoff coefficient of 1.00:

| | |
|---|---|
| 25-year | add 10% |
| 50-year | add 20% |
| 100-year | add 25% |

### 7.8.4.4 RUNOFF COEFFICIENTS

Runoff coefficients shall be calculated for the site-specific conditions where details of the ultimate site development are known. Otherwise, lumped values for runoff coefficients may be selected on the basis of zoning, or of general land uses as listed below:

**Table 7.8.2 - Typical Runoff Coefficients**

| LAND USE | RUNOFF COEFFICIENT |
|---|---|
| Pavement, Asphalt, concrete & Roofs | 0.90 |
| Compacted Graveled areas (parking lots) | 0.60 |
| Landscape Gravel areas | 0.25 |
| Lawns, undeveloped areas (slope less than 7%) | 0.10 to 0.15 |
| Lawns, steep (slope greater than 7%) | 0.20 |
| Playgrounds* | 0.20 to 0.35* |
| Industrial, commercial* | 0.50 to 0.90* |
| Single family residential | 0.40 |
| Multifamily, detached* | 0.40 to 0.90* |
| Multifamily, attached (row housing)* | 0.60 to 0.90* |
| Multifamily, apartment* | 0.50 to 0.90* |

* Lumped run-off coefficients shall be the weighted average of coefficients for sub-areas based upon condition of imperviousness of each sub-area.

Table adapted from Table 5.5 and 5.6 in the Design and Construction of Urban Storm water Management Systems (WEF Manual of Practice FD-20).

## 7.8.5 COMPUTER METHODS

All storm drainage conveyance system elements proposed to accommodate flows for servicing areas larger than 30 hectare and all storm water management storage facilities shall be designed using computer-modeling techniques.

### 7.8.5.1 UNIT HYDROGRAPHS

Hydrologic computation by computer models shall be incorporated into a computational report and submitted to the City for approval. Computations incorporating the following hydrologic procedures are acceptable for such purposes:

- Unit hydrograph for the convolution of rainfall hyetographs into runoff hydrographs:
  - SCS synthetic and Snyder synthetic unit hydrograph,
  - Colorado unit hydrograph,
  - Santa Barbara unit hydrograph,
  - Nash unit hydrograph.
- Reservoirs and hydraulic structures routing runoff hydrographs through storage shall be carried out using:

  - Modified Puls or storage indication method,
  - Modified Att-Kin method,
  - SWMM type methods.
- Routing runoff hydrographs through conveyances such as modelling runoff in conveyances downstream of storage reservoirs shall be carried out using:
  - Modified Att-Kin method,
  - Muskingum-Cunge Method,
  - Variable Storage Coefficient Method,
  - Dynamic wave methods (SWMM).
- Runoff hydrographs shall be used to:
  - Compute storage volumes,
  - Compute time to drain runoff detention storage reservoirs,
  - Compute stage-storage, stage-discharge and other hydraulic structure rating curves.

#### 7.8.5.2 SYNTHETIC RAINFALL FREQUENCY, DURATION AND HYETOGRAPH TIME STEP

Synthetic rainfall hyetographs for computer based hydrologic computational methods shall be constructed using the following criteria:

**Table 7.8.3 - Synthetic Rainfall Hyetographs**

| Design Application | Stage Of Development | Return Frequency Event | Storm Duration | Rainfall Distribution Method | Hyetograph Rainfall Time Step |
|---|---|---|---|---|---|
| Open overland conveyances only | Post development | 1:100 | 2 times the time of concentration to the entry point of the conveyance but not less than 1 hour. | Chicago or Huff (50% probability) 1st Quartile Distribution | 10 minutes |
| SWM Facility storage volumes | Post development | 1:100 | 24 hours | Chicago or Huff (50% probability) 3rd Quartile Distribution | 10 minutes to 1 hour |
| SWM Facility release rate | Predevelopment | 1:5 | 24 hours | Chicago or Huff (50% probability) 3rd Quartile Distribution | 10 minutes to 1 hour |
| Evaporation, discharge quality and infiltration SWM facilities | Post development | N/A | Historical rainfall data from AES | Extended period simulations | Historical rainfall data from AES |

### 7.8.5.3 RAINFALL DEPTH

Rainfall depths for the City of Medicine Hat as shown below are to be used for computer methods of hydrologic computations and distributed by the methods outlined in Section 7.8.5.2.

**Table 7.8.4 - Rainfall Depths**

| Frequency Duration | Return Period Rainfall Depths (mm)* | | | | | |
|---|---|---|---|---|---|---|
| | 2 year | 5 year | 10 year | 25 year | 50 year | 100 year |
| 5 minutes | 5.8 | 8.7 | 10.6 | 13.0 | 14.8 | 16.5 |
| 10 minutes | 8.1 | 11.8 | 14.3 | 17.4 | 19.7 | 22.0 |
| 15 minutes | 9.4 | 13.3 | 15.9 | 19.2 | 21.6 | 24.0 |
| 30 minutes | 11.1 | 16.1 | 19.5 | 23.7 | 26.9 | 30.0 |
| 1 hour | 13.1 | 18.9 | 22.8 | 27.7 | 31.3 | 34.9 |
| 2 hours | 15.4 | 21.5 | 25.5 | 30.5 | 34.3 | 38.0 |
| 6 hours | 22.8 | 30.2 | 35.1 | 41.3 | 45.8 | 50.4 |
| 12 hours | 28.8 | 42.4 | 51.4 | 62.8 | 71.2 | 79.6 |
| 24 hours | 36.1 | 55.7 | 68.7 | 85.1 | 97.2 | 109.3** |

* AES hourly rainfall data 1970 to 1999 available from the City upon request.
A,B,C coefficients for use with the Chicago method may be obtained from the City upon request.
** NOTE: August 4, 1927, 100-year rainfall depths noted at 121.9 mm.

### 7.8.5.4 HYDROLOGIC ABSTRACTIONS

The following values shall be used for allowances in computing net rainfall depths:

- **Depression Storage**
  - Pervious areas: 5.0 mm
  - Impervious areas: 2.0 mm
- **Infiltration**

  Horton Method

  $$f = fc + (fo - fc)e^{-k(t)}$$

  Where: $f_o$ - initial infiltration rate = 75 mm/hr

  $f_c$ - steady – state infiltration rate = 7.5 mm/hr

  k - decay rate = 4.14 (hr-1) or 0.00115 (sec-1)*

  t - time in hours or seconds

  *Unless site-specific infiltrometer tests indicate other hydrologic soil characteristics.

- **SCS CN Methods**

  If the computer model uses US Soil Conservation Services (SCS) CN Methods then rainfall losses shall be handled using SCS curve numbers, which incorporate abstractions and the proper use of modifiers to account for flow over areas of different perviousness. In general, an Antecedent Moisture Condition (AMC) II shall be used and CN values published in the reference standard TR-55 used as a guide to the proper selection of such values. All other parameters shall be as agreed upon by the City.

### 7.8.5.5 ACCEPTABLE COMPUTER MODELS

The following computer models are acceptable to the City for hydraulic analysis of conveyance systems:

- PCSWMM
- XPSWMM
- DDSWMM + EXTRAN

The following computer models are acceptable to the City for preliminary planning studies or sizing of detention storage:

- PCSWMM
- XPSWMM
- SWMHYMO
- QHM
- POND PACK

Use of any other computer models requires prior approval of the City.

### 7.8.5.6 REPORTING OF RESULTS

Computer model reports shall include input/output files in hard copy and digital format with the following information:

- A description of system design and operation and computational methods
- Model Name and version number
- Modelling parameters and assumptions
- Design storms, type of distribution and rainfall hyetograph in tabular and graphical form
- Type of unit hydrograph used
- Initial abstractions used
- Catchment areas and their hydrologic characteristics in a tabulation and on a plan
- Runoff hydrographs from convolution in both tabular and graphical form

- Hydrograph routing methods used
- Routed hydrograph in tabular and graphical form for:
  - Both inflow and outflow from each segment of storm water management facility.
  - Inflow and outflow at critical sections for conveyances.
- Rating and mass curves for SWMFs and associated structures.
- Time to drain storage zones of SWMFs.
- Final outflow hydrographs used to compute detention volumes.
- Hydrographic procedures result to model interconnected ponds where there is inter-pond influence.
- Effluent quality projections for both sediment and nutrients as model output in tabular form.
- Any other hydrologic data or information that may be required by the City.
- The reports shall be complete before the City will agree to commence a review of engineering studies and plans for approval.

## 7.9 DRAINAGE SYSTEM DESIGN AND HYDRAULICS

In addition to the objectives and level of service requirements outlined in this section, the following criteria and procedures are to be incorporated in the design of major and minor drainage systems:

### 7.9.1 OVERLAND CONVEYANCES

Overland conveyances including channels and roadways shall be designed to safely convey the

1 in 100-year design storm event at post-developed conditions, relative to the following guidelines:

- No building is inundated at its ground line from a 1:100-year return rain event.
- All ponding or overland flow from a road right-of-way or park onto private property is covered by a caveat or UROW registered against the property to the benefit of the City of Medicine Hat, to allow the water to pond on or flow over, across or along the property.
- The velocities and depths of flow in the major drainage system, to which the public has access, shall not exceed the Alberta Velocity Depth Guidelines for overland flow. The City may accept higher velocity/ depths in extreme topographic areas and will examine such requests on a case-by-case basis.

**Table 7.9.1 – Permissible Depths for Submerged Objects**

| WATER VELOCITY (m/s) | PERMISSIBLE DEPTH (m) |
|---|---|
| 0.5 | 0.80 |
| 1.0 | 0.32 |
| 2.0 | 0.21 |
| 3.0 | 0.09 |

From Alberta Environment and Protected Areas Standard Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, Part 5.

## 7.9.2 MAJOR SYSTEM DESIGN PROCEDURES AND CRITERIA

Flow and hydraulic capacity are to be calculated using Manning's equation for open channel flow. Values to be used for Manning's 'n' are provided in Table 7.9.2.

**Table 7.9.2 – Values for Manning's 'n' for Ditch And Channel Flow**

| SURFACE TYPE | 'n' |
|---|---|
| Portland Cement Concrete | 0.013 |
| Asphaltic Cement Concrete | 0.013 |
| Compacted Gravel | 0.020 |
| Loose Gravel | 0.025 |
| Manicured Grass | 0.030 |
| Non-manicured Grass | 0.040 |

Adapted from "Design and Construction of Urban Storm Water Management Systems (ASCE Manuals and Reports of Engineering Practice No. 77, WEF Manual of Practice FD-20)".

To assist the Designer the City has prepared figures showing Flow Rate vs. Flow Depth for typical grades on standard City roadway sections, lanes, and walkways. These figures include the following:

- Line showing the Alberta Velocity Depth Guideline.
- Top of Curb line (where applicable).
- Elevation at Property line (where applicable).
- % longitudinal grade.

## 7.9.3 ROADWAYS AND OTHER HARD-SURFACED CONVEYANCES

Flows in roadside gutters shall be computed at critical locations and checked using the City's Overland Flow Channel Characteristics sheets. Copies of these sheets with the flows at critical

locations plotted on them are to be submitted with the FSR or Preliminary Engineering Reports. Where road slopes and or cross sections in the detailed design differ from those in the FSR or Preliminary Engineering Reports and or computed overland flows differ, Overland Flow Channel Characteristics sheets are to be resubmitted.

Inundation of roadways by runoff from the design major event (1:100-year storm) is to be limited as follows:

- Collector roadways, at least one lane width (3.7 metres wide) is to remain uncovered by water.
- Arterial roadways one lane width (3.7 metres wide) in each direction is to remain uncovered by water.

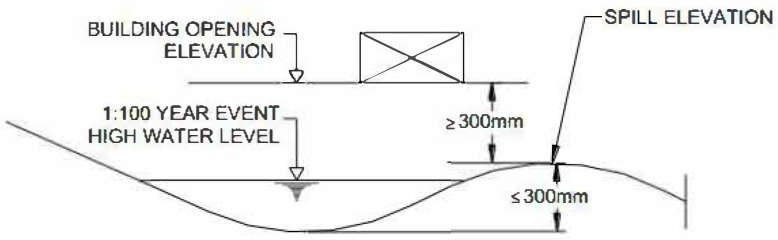
Also, a roadside gutter's depth of flow should be limited below the elevation of the property line of the road and the abutting properties. Where overland flow encroaches onto abutting properties:

- A restrictive covenant and caveat are to be registered on the title of the effected properties allowing the flow to encroach onto private property.
- Minimum building opening elevations are to be provided on the Subdivision Grading Plan. Minimum slopes for gutters and swales shall be:
  - 0.5% for all paved, concrete, and hard lined sections,
  - 0.8% for gravel or riprap lined sections, and
  - 1.0% for all vegetated sections.

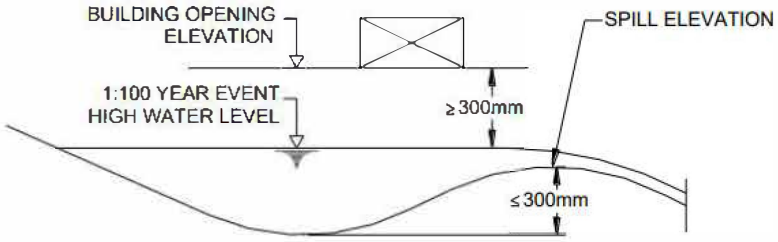
#### 7.9.3.1 POCKET OR TRAPPED LOW STORAGE

1. Trapped low storage at low points or "sags" on roadways shall not be used to replace or offset runoff storage volume requirements in Storm water management facilities.
2. Each trapped low shall have an overland escape route for excess runoff accumulations.
3. Any property adjacent to trapped low storage where the spill elevation is such that ponding will encroach onto the private property, a drainage restrictive covenant and caveat is to be registered on the title of the affected property. A drainage restrictive covenant is not required where the spill elevation is such that maximum depth of pocket or depression storage on a street is less than 150 mm, measured above the lowest point at the lip of gutter.
4. Overflow from all pocket or trapped low storage shall spill across public lands and is not to be drained across private property unless otherwise approved and drainage swales with corresponding UROW's have been provided.

5. Roadway grades shall be designed such that trapped lows shall have a maximum spill elevation of 300 mm measured above the lowest point at the lip of the gutter.
6. The lowest permissible building opening elevation on properties abutting a trapped low shall be a set at 300 mm above the higher of either:
7. The spill elevation, or
8. the high-water elevation at the trapped low for the 1:100-year event post development conditions.
9. Trapped low storage with a spill depth over 150 mm but less than 300 mm shall be provided with at least one type of curb inlet type catch basin with curb inlets.
10. Trapped Low storage is not allowed in lanes or walkways.




CASE 1, 1:100 YEAR HWL < SPILL ELEVATION




CASE 2, 1:100 YEAR HWL > SPILL ELEVATION

**Figure 7.9.1 - Trapped Low Storage Schematic**

## 7.9.4 DITCHES AND OPEN CHANNELS

### 7.9.4.1 FUNCTIONAL REQUIREMENTS

Lined earthen ditches and open channels will only be permitted as a major drainage system conveyance under the following circumstances:

1. When runoff from major design storm events (1:100-year return period) from any catchment area, exceeds the combined capacity of storm sewers (minor drainage

system) and streets/impoundments (major drainage system conveyances) within or servicing the catchment area.

1. Within approved rural classification road rights-of-way and only when conveying runoff from directly abutting roadways, abutting properties and public lands. A rural classification roadway, incorporating roadside ditches, may receive approval in a FSR or Engineering Design Brief provided that:
   - All access crossings incorporate drainage culverts, not exceeding 20 metres in length, spaced at a minimum separation of 30 metres between ends, of a minimum diameter of 400 mm, protected with an approved end treatment and with sufficient capacity to convey all the expected major event runoff, at build out conditions, from areas tributary to the ditch or channel,
   - Flow in the roadside ditches does not exceed 1.5 $m^3$/sec, is intermittent and does not exceed 72 hours or other period approved by the City Planner and Director of Development Services, and
   - Other design requirements have been met.
2. Within Utility rights-of-way (UROWs) for the conveyance of major event runoff from developments, impoundments, roadways or the terminus of major systems tributary to the channel or ditch and provided that:
   - A minimum 4.0 metres wide dedicated gravelled maintenance access is provided within the over-bank zone, adjacent to the main channel, located such that the gravelled surface is at least 150 mm above the 1:25 year design event water level in the main channel,

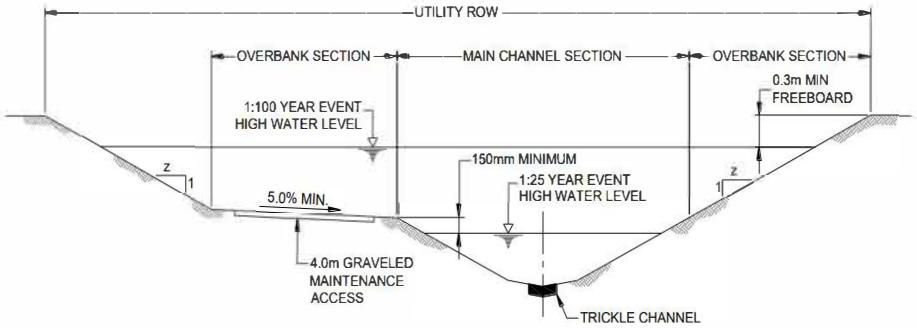



**Figure 7.9.2 – Typical Channel**

   - If the normal design depth of flow and velocity of flow exceed the Alberta Environment limitations (Table 7.9.1) public access shall be restricted by a 1.8 metres high chain-link fencing and lockable end gates enclosing all sides of the UROW,
   - A minimum separation of 20 metres or other such distance confirmed by geotechnical analysis or synthetic liner to prevent subsurface flow or water seepage

from the ditch or channel towards a roadway is incorporated, between the drainage channel and the roadbed, and

- Other design requirements have been met.

3. As secondary or supplemental storage to attenuate peak runoff from major storm events to supplement deficiency of capacity in primary detention ponds, provided that:
   - Ditch or channel volume dedicated to storage exceeds the waterway required for conveyance purposes, and the required enlargement can be shown on the design drawings and supporting calculations,
   - The rate of permitted discharge from the channel is not exceeded,
   - The ratio of supplemental to primary detention storage does not exceed 1:20, and
   - Other design requirements for detention pond storage have been met.

### 7.9.4.2 DESIGN REQUIREMENTS

1. The following information shall be incorporated into the design drawings for channels or ditches:
   - Cross sectional drawings with sections at transitions of grades, areas, roughness; above and below obstructions, confluence points of flow, curved reaches, sections of energy loss, etc., and
   - Plan profile drawings with hydraulic grade lines (HGL), backwater curves/ water surface profiles, lining, cut-off walls, etc.
2. Channels with design flows over 1.5 $m^3$/sec shall be provided with dual low-flow/ high-flow composite sections and a lined trickle channel at the bottom of the main channel. See Figure 7.9.2.
3. Composite channels – Main channel shall be designed to convey flows from a 1:10 year return event, for all tributary areas, with the balance of the cross section designed to convey flows from a 100-year return event storm from all tributary areas.
4. All channels carrying supercritical flow shall be provided with a rigid lining complete with a fabric-wrapped perforated pipe under-drain system unless the use of other linings can be supported by an engineering analysis.
5. The following design procedures shall be used, and worksheets submitted with drawings for approval:
   - Vegetated or grass lined roadside ditches and channels conveying flow rates up to 1.5 $m^3$/sec– permissible velocity or permissible tractive stress method.
   - Ditches or channels conveying flow rates over 1.5 $m^3$/sec or with a design flow depth over 450 mm – tractive stress method.

- Ditches or channels lined with non-vegetative flexible linings, rigid linings or composite linings:
  - Flow $\leq$ 1.5 $m^3$/sec, HEC 15 procedures,
  - Flow > 1.5 $m^3$/sec, HEC 11 procedures, or
  - Rigid linings, HDS 3 procedures,
- Ditches or channels lined with vegetative linings – HEC 15 procedures.
- Energy dissipaters and control structures - HEC 14 procedures.
- Culverts – HDS 5 procedures.

#### 7.9.4.3 CROSS SECTIONAL REQUIREMENTS

Channels and ditches shall be designed with either trapezoidal or parabolic cross sections designed with a:

- 2.0 metre minimum bottom width (which may be reduced to 1.5 metres by the City Planner and Director of Development Services in built up areas where Right-of-Way is constrained provided that hydraulic capacity is sufficient).
- Bottom cross slopes, roadside ditches = 0%, channels = 12:1.
- Roadside ditches – minimum depth of ditch = 600 mm from edge of road, minimum freeboard = 300 mm.
- Side slopes (z, see Figure 7.9.2):
  - Vegetated slopes, 4:1 maximum side slope,
  - Non-vegetated flexible linings, 2:1 maximum side slope, or
  - Rigid linings, 1:1 maximum.

#### 7.9.4.4 HYDRAULICS

##### 7.9.4.4.1 GENERAL

Ditches and channels should be designed to maintain sub critical flow (limit the Froude number (F) to below 1.0 where:

$$F = \frac{v}{(gy)^{0.5}}$$

Where: v = flow velocity

g = gravitational acceleration

y = hydraulic mean depth (Y=A/T)

A = cross sectional area

T = top width

Where localized supercritical (F>1) flow is encountered, energy dissipating devices, lining and other techniques should be utilized to render the flow sub critical. Determination of critical flow depths, normal flow depths, super-elevations on curves and other such hydraulically derived dimensions at peak flow conditions shall be computed using procedures outlined in the reference manuals. Channel design shall be carried out such that normal depths of uniform flow shall be at least 10% greater than critical flow depths.

#### 7.9.4.4.2 FREEBOARD

A minimum freeboard of 0.3 metres shall be provided for all channel flow. An additional allowance shall be made to the minimum freeboard, for super-elevation at curves, standing waves, and surface disturbances.

#### 7.9.4.4.3 RADIUS OF CURVATURE

Radius of Curvature measured at the channel centreline shall not be less than 10 x the top width of the channel, subject to a minimum value of 30 metres. Curves on channels should be avoided where possible.

#### 7.9.4.4.4 VELOCITIES

- Flow velocities shall not exceed 2.0 m/sec in channels with flexible linings or un-reinforced rigid linings or result in a Froude number greater than 1.0 except where provided herein.
- Flow velocities shall not exceed 5.5 m/sec in channels with reinforced rigid linings or result in a Froude number greater than 0.8.
- Flow velocities in channels lined with gabions:
    - Underlain with approved filter fabric shall be limited to 1.80 m/sec for 150 mm thick gabions and 2.1 m/sec for all other thicknesses.
    - With a filter fabric underlay are governed by channel bottom slopes and soil texture in accordance with Table 7.9.3.

**Table 7.9.3 - Filter Fabric Use**

| SOIL TEXTURE | MAXIMUM PERMISSIBLE VELOCITY (m/sec) | ALLOWABLE INVERT SLOPE (%) |
|---|---|---|
| Sandy Loam | 0.75 | 2.9 |
| Silty Loam | 0.90 | 4.1 |
| Sandy Clay Loam | 1.10 | 5.6 |
| Clay Loam | 1.20 | 7.4 |
| Clay, fine Gravel | 1.50 | 11.5 |

If bottom slopes are steeper or velocities greater than above an approved gravel filter shall be utilized as gabion underlay.

Maximum Permissible velocities for vegetation lined roadside ditches and channels with uniform stands of grass cover:

**Table 7.9.4 - Maximum Permissible Velocities for Vegetated Ditches and Channels**

| COVER VARIETY | SLOPE RANGE (%) | MAXIMUM PERMISSIBLE VELOCITY (M/S) |
|---|---|---|
| Bermuda grass | 0 - 5% | 1.8 |
| | 5 - 10% | 1.5 |
| | > 10% | 1.2 |
| Buffalo grass, Kentucky bluegrass, smooth bronze, blue gama | 0 - 5% | 1.5 |
| | 5 - 10% | 1.2 |
| | > 10% | 0.9 |
| Grass mixture | 0 - 5% | 1.2 |
| | 5 - 10% | 0.9 |
| | > 10% | not permitted |
| Weeping love grass, yellow bluestem, kudzu, alfalfa, crabgrass | 0 - 5% | 0.75 |
| | > 5% | not permitted |

In reaches of roadside ditches or channels where sedimentation is to be avoided, a minimum velocity of 0.60 m/sec should be maintained.

### 7.9.4.4.5 UNLINED CHANNELS AND ROADSIDE DITCHES

- While ditches and channels are not permitted to remain permanently unlined, an unlined condition must be analyzed for new ditches and channels to limit scour and erosion during the construction period and before vegetation becomes established.

- Temporary erosion and scour control measures such as jute, straw matting or spray tacking grass seed mixtures or such other measures, as approved by the City Planner and Director of Development Services shall be utilized.

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### 7.9.4.4.6 MANNING'S ROUGHNESS COEFFICIENT 'N'

The following values of Manning's 'n' shall be utilized for design and analysis:

- Unlined channels – as shown on Table 7.9.5.
- Vegetated channels – as shown in Table 7.9.6.
- Sheet flow - as shown in Table 7.9.7.
- Channels lined with flexible, composite and rigid linings; values of 'n' shall be computed using procedures in HEC 15 with some representative common values as listed in Table 7.9.8.

**Table 7.9.5 - Manning's Roughness Coefficient and Maximum Permissible Velocities for Ditches and Channels With Erodible Linings**

| SOIL TYPE | 'n' | VELOCITY (m/s) |
|---|---|---|
| Fine sand (non-colloidal) | 0.02 | 0.60 |
| Sandy loam, (non-colloidal) | 0.02 | 0.60 |
| Silt loam, (non-colloidal) | 0.02 | 0.70 |
| Fine gravel | 0.03 | 1.15 |
| Stiff clay (non-colloidal) | 0.025 | 1.25 |
| Graded silts to cobbles (non-colloidal) | 0.03 | 1.25 |
| Alluvial silt (non-colloidal) | 0.02 | 0.80 |
| Alluvial silt (colloidal) | 0.025 | 1.15 |
| Coarse gravel (non-colloidal) | 0.025 | 1.40 |
| Shale and hard pan | 0.025 | 1.40 |

**Table 7.9.6 - Manning's Roughness Coefficient 'n' for Vegetated Channels**

| COVER TYPE | DEPTH OF FLOW | |
|---|---|---|
| | 0.2 – 0.45 m (TYPICAL MINOR RUNOFF) | > 0.9 m (TYPICAL MAJOR RUNOFF) |
| Bermuda grass, buffalo grass, Kentucky blue | | |
| Mowed to 50 mm | 0.035 | 0.030 |
| 100 to 150 mm length | 0.040 | 0.030 |
| Any grass, good stand | | |
| 300 mm length | 0.070 | 0.035 |
| 600 mm length | 0.100 | 0.035 |
| Any grass, fair stand | | |
| 300 mm length | 0.060 | 0.035 |
| 600 mm length | 0.070 | 0.035 |

**Table 7.9.7 - Manning's Roughness Coefficient 'n' for Sheet Flow**

| COVER TYPE | 0.2 – 0.45 m (TYPICAL MINOR RUNOFF) |
|---|---|
| Concrete | 0.011 |
| Asphalt | 0.012 |
| Graveled Surface | 0.012 |
| Range (natural) | 0.013 |
| Grass (sod) | 0.45 |
| Short Grass Prairie | 0.15 |
| Dense Grass | 0.24 |
| Bermuda Grass | 0.41 |

**Table 7.9.8 - Manning's Roughness Coefficient 'n' for Lined Channels**

| LINING CATEGORY | | DEPTH OF FLOW | | |
|---|---|---|---|---|
| | TYPE | 0 – 150 mm | 150 – 600 mm | > 600 mm |
| Rigid | Concrete | 0.015 | 0.013 | 0.013 |
| | Grouted Rip Rap | 0.040 | 0.030 | 0.028 |
| | Stone Masonry | 0.042 | 0.032 | 0.030 |
| | Soil Cement | 0.025 | 0.022 | 0.020 |
| | Asphalt | 0.018 | 0.016 | 0.016 |
| Temporary | Woven Paper Net | 0.016 | 0.015 | 0.015 |
| | Jute Net | 0.028 | 0.022 | 0.019 |
| | Fiberglass Roving | 0.028 | 0.022 | 0.019 |
| | Synthetic Mat | 0.036 | 0.025 | 0.021 |
| Gravel Rip Rap | 25 mm $D_{50}$ | 0.044 | 0.033 | 0.030 |
| | 50 mm $D_{50}$ | 0.066 | 0.041 | 0.034 |
| Rock Rip Rap | 150 mm $D_{50}$ | 0.104 | 0.069 | 0.035 |
| | 300 mm $D_{50}$ | - | 0.078 | 0.040 |

The values of Manning's 'n' shown in Table 7.9.8 should be increased to account for meandering due to channel curvature, active sedimentation or erosion and debris, where such conditions are expected to influence the performance of the channel.

#### 7.9.4.4.7 WATER SURFACE PROFILES

Water surface profiles may be computed using:

- Hand methods (direct step & standard step methods), uniform flow or gradually varied flow; or
- Computer simulations (standard step & dynamic wave methods), uniform and gradually varied flows.

### 7.9.5 LININGS

Vegetated linings should not be used under the following conditions:

- Standing or continuously flowing water.
- In areas designated for reduced maintenance.

- Within hydraulic jump zones, at transitions in longitudinal/ side slopes, at bends, near obstructions, near flow constrictions or enlargements, near inlets, near outfalls and energy dissipating devices/ structures.
- Where a tractive stress method of analysis reveals channel bed instability with vegetative lining, a trickle channel with a non-vegetative flexible or rigid lining within the minor event depth zone will be required.
- A vegetative lining above this zone or above a minimum 250 mm lined depth may be permissible provided that side slope stability can be assured.
- Channel beds and side slopes can be stabilized by commercially available non-vegetative linings including gabions, rip rap, cellular, mat and grid synthetics etc. provided the specified design procedures are followed. All such lining materials shall be securely anchored into the channel or ditch surface and in areas of high groundwater, underlain with geotextile fabric or granular drainage layers.

## 7.9.6 INLETS, OUTLETS, OUTFALLS AND SPECIAL STRUCTURES FOR SWMF

### 7.9.6.1 GENERAL

Adequate protection against potential erosion and scour shall be provided at all inlets, outlets, outfalls, and special structures.

Special structures including check dams, energy dissipaters, stilling basins, spillways, box inlets, drop shafts, overflow weirs, flow splitters, flap gates and junction structures designed incorporating rip-rap at all pipe openings shall be designed in accordance with the procedures in HDS 5 and HEC 14.

Erosion, scour prone or unstable areas, slopes and segments of outfalls, outlets, and special structures, shall be lined with riprap filled gabions or concrete filled cellular synthetic mats.

### 7.9.6.2 INLET AND OUTLET STRUCTURES FOR STORM WATER MANAGEMENT FACILITIES:

SWMF inlet and outlet structures shall be designed in accordance with the following criteria:

- The last section of pipe into a pond has a velocity less than 1.5 m/s for all conditions of flow. Where it is not possible to achieve a velocity less than 1.5 m/sec energy dissipating structures are required. The design of these structures will be evaluated on a case-by-case basis.
- Riprap is required at all inlets and outlets.
- Invert elevations of the inlet pipes into the first storm sewer structure upstream of a pond shall be set above the water level in the pond for a 5-year return event storm at post development conditions.

Pond Inlet and outlet structures may be either a submerged or an un-submerged type. Submerged structures shall be used wherever there is a permanent water level. Partially submerged inlet and outlet structures are not acceptable. Special design considerations for each outfall type are as follows:

1. **Submerged type** - pond inlet and outlet structures and a first section of influent or outfall discharge sewer may be submerged for frost protection and to avoid special entry control provisions at the pipe opening wherever a permanent water level (PWL) can be maintained at the pipe opening.
    - The top of the structure shall be at least 300 mm below the permanent water level (PWL) of the SWMF, and
    - The invert of all pipes discharging into the first storm sewer structure upstream of the outfall structure shall be set such that water levels in the pond will not impede the hydraulic flow in the pipes or create backwater effects under 5-year return event post-development conditions.
2. **Un-submerged type**
    - Drop structures and energy dissipaters shall be used where necessary to prevent erosion, and
    - All un-submerged outlets shall be provided with end structures and adequate safety provisions. The design of tamper proof safety gratings shall be done according to the reference standards.

### 7.9.6.3 OUTFALL STRUCTURES

Outfall structures discharging runoff into receiving watercourses are special structures and shall be reviewed on a case-by-case basis. Outfalls shall be designed to Alberta Environment and Protected Areas Guidelines and Codes of Practice for Outfall Structures on Water Bodies and any other applicable federal or provincial regulations.

### 7.9.6.4 SPECIAL STRUCTURES

All special structures shall be designed in conformance with the reference standards based upon the hydraulic conditions of use.

### 7.9.6.5 REQUIREMENTS FOR CULVERTS AND HYDRAULIC DESIGN PROCEDURES

Culverts used in public ROWs and UROWs shall be designed with a minimum diameter of 400 mm and be provided with approved end treatment.

HDS 5 and RTAC Drainage Manual procedures shall be used to design culverts.

Culverts shall be designed to accommodate overland conveyance of runoff from major events.

Maximum headwater depth for culverts:

$$Hw = F \times \emptyset \qquad \{\text{for circular culverts}\}$$

Where: Hw = Headwater depth

F = 1.0 for roadside ditches and 1.2 for channels

Ø = diameter of culvert

Culverts of other than circular cross section will require the approval of the City Planner and Director of Development Services who may stipulate other criteria and conditions for their use.

### 7.9.7 INTER PARCEL DRAINAGE

#### 7.9.7.1 LOW DENSITY RESIDENTIAL SUBDIVISION REQUIREMENTS

- In low density residential subdivisions without lanes, with back-to-back lots where all or a portion of the runoff is discharged to the back of the lot (front to back drainage, split drainage, etc.) the following requirements will apply:
- A common 600 mm wide concrete swale (grassed swales are not permitted) shall be centered 0.6 metres from the common rear property line located preferably on the south or west sides of the property line. The concrete swale shall be protected by a UROW with a minimum width of 2.4 metre centered on the property line adjacent to the concrete swale.
- Back of lot concrete swales are to be less than 250 metres in length cumulative to a common point and have a total cumulative catchment area of less than 0.9 ha prior to discharge of runoff on to a roadway or approved channel with inlets as required.
- Concrete swales are to be built with continuous grade lines to a catch basin in a street or lane right-of-way. An inlet to the storm sewer shall be provided to capture the flow from a minor storm event from rear lot concrete swales before it crosses a sidewalk, to prevent ice build-up and dirt accumulation on the sidewalk.
- A restrictive covenant and caveat registered on the title of all lots having a UROW protecting a drainage swale prohibiting:
  - the change or modification of grades in the UROW,
  - impeding or blocking the flow of storm water runoff in the concrete swale.

#### 7.9.7.2 INSTITUTIONAL, COMMERCIAL, INDUSTRIAL AND MULTIFAMILY RESIDENTIAL DRAINAGE PROVISIONS

All onsite drainage shall be contained on institutional, commercial, industrial and multi-family residential sites and discharged directly to the storm sewer system. Parcels where drainage cannot be contained onsite shall be identified in the FSR or Preliminary Engineering Reports.

Overland conveyances in such cases may include lined swales and concrete gutters located for maintenance convenience and be covered by a restrictive covenant and caveat to be registered on the affected property's title. All inter-parcel drainage provisions for institutional, commercial, industrial, and multifamily residential sites with will be evaluated on a case-by-case basis.

#### 7.9.7.3 OVERLAND DRAINAGE ONTO PUBLIC LANDS

Properties draining onto public lands are required to have such drainage to be intercepted by a swale, which should be located within the area of the public lands. Type and style of surface conveyance to conform to the requirements of the General Manager of the Parks and Outdoor Recreation Department.

All runoff draining onto public lands shall be provided with erosion and sediment control measures to minimize sedimentation on the public lands.

#### 7.9.7.4 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures must be provided as stipulated elsewhere in this manual as:

- permanent measures
- temporary measures during construction

Erosion and sediment control plans shall conform to the best management practices in the reference standards.

#### 7.9.7.5 TEMPORARY DRAINAGE SYSTEM

Temporary measures to intercept drainage from adjacent catchments tributary to a subdivision or development area, control of erosion and sediment shall be provided adjacent to and within the working area of a new development or subdivision, subject to the City's approval. The temporary measures should include berming, ditching and other recognized best management practices to intercept and detain or redirect the drainage runoff to a storm sewer system or overland conveyance approved by the City of Medicine Hat for such purpose.

## 7.10 STORM WATER MANAGEMENT FACILITIES (SWMF)

### 7.10.1 GENERAL

The provision of SWMF, whether as privately owned on-site detention and treatment SWMFs for site development/ redevelopment projects, or as publicly owned SWMFs for bigger development and subdivision projects, is a development requirement for a number of reasons. The reasons include:

- Conformance with provincial regulations governing drainage systems, the terms of the City's License to operate its Drainage System, Alberta Environment and Protected Areas Codes of Practice and design Guidelines for Drainage Systems.
- The requirement, in the design of drainage systems for development and subdivision projects, the attenuation of peak flow rates of runoff from:
    - Storm sewers or other approved minor drainage system conveyances, associated with runoff from the 1 in 5 year and more frequent return period rainfall events,
    - Roadways, channels, and other approved major drainage system conveyances, associated with runoff from the 1 in 100 year and more frequent return period rainfall events, and
    - To prevent such peak flow rates of runoff from the tributary areas of the minor and major systems respectively, from exceeding those that would otherwise occur under undeveloped conditions.
- To prevent such peak or lesser flow rates of runoff:
    - From compromising public safety, creating hazards to drivers, pedestrians, or property owners,
    - From causing personal injury, property damage, environmental damage, erosion, or sediment deposition, and
    - From causing flooding, excessive hydraulic surcharge of the minor or major drainage systems, unacceptable inundation of transportation corridors or private property.
- To prevent the system outfall discharges from exceeding the design hydraulic capacities of downstream conveyance systems and receiving watercourses or their capacities to assimilate pollutants discharged by such outfalls.

The City of Medicine Hat requires that SWMFs be provided as follows:

- On-site detention and treatment systems for site developments/redevelopment projects and Bareland Condominium sites.
- In subdivisions and larger development projects where the drainage system is to be dedicated to the public, Hybrid SWMFs incorporating sediment removal forebays, detention storage zones and wetlands, within the detention storage zones for nutrient removal, are required prior to the discharge of storm runoff into designated overland conveyances, regional trunk storm sewers or into designated outfalls located at receiving watercourses.
- In subdivisions and larger development projects where the drainage system is to be dedicated to the public, Dry Detention ponds and Constructed Wetlands designed as separate facilities may be accepted provided that the features of the Wetland portions and Detention Storage portions of Hybrid SWMFs are incorporated into the Constructed Wetland and Dry Ponds respectively as described above.

In general, pumping of storm water will not be accepted as the final (permanent) servicing method, it may in extreme circumstances be used as a last resort and only in accordance with the City's stipulations at the time of initial approval.

Interim pumping of storm water from detention ponds will be permitted provided:

- The pumping does not compromise the overall quality improvement objectives,
- The pumping will be replaced by the permanent gravity discharge to an approved outfall at a receiving watercourse within the specified time stipulated in the Service Agreement for the development, and
- The developer is responsible for all operation and maintenance costs associated with the pumping.
- It can be shown that a permanent gravity discharge to an approved outfall at a receiving watercourse will be constructed within 12 months.

### 7.10.2 LAND DEDICATION

Lands used for the location and siting of SWMFs, shall be dedicated to the City and designated as Public Utility Lots (PUL). No land within the designated setback requirements, adjacent to the facility shall be developed for any purpose other than storm water management.

Municipal Reserve (MR) Credit will be limited and will be considered on a site-by-site basis based on the landscaping, amenity provisions and public access meeting the requirements of the City of Medicine Hat's policy.

### 7.10.3 GEOTECHNICAL REQUIREMENTS

Soils investigations specific to the detention facility shall be undertaken to determine the physical, geologic, and hydro-geologic characteristics of the sub-soils in the area of proposed SWMFs and more particularly the ground water table, it's variability, seepage considerations, soil permeability, stability of slopes and side-slopes under saturated conditions and seepage forces and characteristics for the design of erosion control and other measures to mitigate problem areas. These geotechnical requirements will be in addition to the normal subdivision or development orientated study and specially focused to address SWMFs.

### 7.10.4 FUNCTIONAL DESIGN REQUIREMENTS

The proposed location, size and other functional design characteristics of SWMFs shall be identified at the time of the submission of an ASP and FSR or Preliminary Engineering Studies for approval.

In addition to the hydrologic design requirements described below, the functional design submissions for the approval of SWMFs shall include:

- The Permanent Water Level (PWL), freeboard, overflow spillway, associated hydraulic computations, dimensions, active depth, total depth, freeboard, and bottom elevation in sediment fore bays.
- The High-Water Level (HWL), bottom of wetland-storage zone elevation, active storage depth, freeboard, by-pass sewer & inlet grate locations and elevations, inverts and hydraulic design, in the detention storage zone.
- Hydraulic design of the inlet and outlet structures, inverts, submergence depth and stability provisions.
- Seepage control provisions, slope stability provisions, liner provisions (type and permeability and thickness).
- Maintenance access (minimum 8.0 metre with graveled surface of 150 mm thickness over a prepared subgrade at least 600 mm above any water surface) provisions, landscaping provisions, public access zones expressed as a length of the SWMF perimeter and ratio of total perimeter.
- Setback distances to private property at various locations around the SWMF perimeter and total area of the PUL encompassing the SWMF.
- The feasibility of an emergency overflow spillway located next to the SWMF outlet structure, shall be evaluated for each storage facility and where feasible, such provisions shall be incorporated in the pond design, provided that an overland route is available. The functional requirements of such a spillway, as a design redundancy and the impact in the absence of one, should be considered in the event of blockage of the outlet or overloading due to successive 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.
- Hydrologic and hydraulic design computations.

It is recommended that the designer refer to the reference standards and "Storm water Management Guidelines for the Province of Alberta" for the design of a SWMF.

### 7.10.5 HYDROLOGIC, HYDRAULIC AND ENGINEERING DESIGN CRITERIA

SWMFs shall be designed as follows:

#### 7.10.5.1 ON-SITE DETENTION SYSTEMS

On-site detention systems for site developments/redevelopments and Bareland Condominium sites, shall be sized to detain the runoff from a 100-year return event storm at fully developed conditions on site, with the detained runoff permitted to be discharged into a public storm sewer at a release rate not exceeding 35 Litres per Hectare of site area per second, unless otherwise approved by the City.

In addition, a high flow-rate bypass oil/ grit separator or approved equivalent pre-treatment system may also be required for such projects, to remove sediments and other pollutants from runoff. The City on a case-by-case basis will evaluate the need for such pre-treatment devices.

Most oil/grit separators are proprietary products. The Designer should contact the City's Planning & Development Services Department to determine if a specific oil/grit separator type system is acceptable for the specific conditions of a site. If on-site detention is also required, such detention storage shall be provided upstream of the oil/grit separator. Manufactures' Guidelines are to be followed for any specific oil/grit separator. All sizing and design information shall be provided with the Detailed Engineering Plans.

### 7.10.5.2 HYBRID SWMFS

Hybrid SWMFs shall be designed with at least two cells consisting of a wet sediment forebay and a detention-storage/wetland zone that has an overland channel to convey runoff from the wet sediment forebay to the SWMF outlet.

The total active storage provided by all of the cells (sediment forebay and detention-storage/wetland zone) shall be of sufficient volume to contain the greater of:

- The post development runoff from the catchment area tributary to the SWMF based on a 1:100-year event 24-hrs duration design storm as stipulated in Section 7.8.3.5 (Chicago or 3rd quartile Huff distribution) and released at an attenuated rate of outflow. The permitted release rate of attenuated runoff out of the active storage of a SWMF, into a publicly owned conveyance (designated overland channel, regional trunk storm sewer or outfall discharging into a receiving watercourse) shall be designed not to exceed the peak rate of runoff from an area equal to the tributary post-developed catchment with pre-developed hydrologic characteristics, resulting from a 5 year return event storm (See Section 7.8.3.5), unless stipulated otherwise by the City.
- The volume required to detain the runoff from a 2-year return frequency rain event of 12 hours duration (Chicago or 3rd quartile Huff distribution) at post development hydrologic conditions as stipulated in Section 7.8.3.5) for at least 24 hours.

The maximum time required to drain down the active storage completely for the 100-year return frequency event shall not exceed 72 hours computed from the beginning of the inflow runoff hydrograph for this zone unless dictated otherwise by predevelopment discharge rate criteria which will be evaluated on a case-by-case basis.

In addition, Hybrid SWMFs shall also incorporate the following components:

1. An **inlet structure** of approved standard design located in the sediment forebay pool (as described in Section 7.9.6) and submerged a minimum depth of 0.8 metres below the PWL, is required. The elevation of the next upstream storm sewer shall be set with the crown of the downstream end matching the HWL. When grades of the system in upstream reaches do not permit this to occur, the downstream end of the said

penultimate storm sewer section may have its invert set at the PWL provided that the HGL computations are submitted to the City to demonstrate that the resulting HGL does not rise above weeping tile drain elevations or above building footings. HGL calculations shall also demonstrate that hydraulic head losses due to the losses at inlets, due to pipe friction and at outlets have been included in the computations. The friction slope (hydraulic grade line) of the ultimate section of storm sewer pipe discharging into a submerged inlet structure, shall not exceed 0.2% unless approved by the City Planner and Director of Development Services.

2. A **sediment forebay** with a permanent volume of water (below the permanent water level) at least equal to the volume of runoff from the catchment area tributary to the SWMF at post developed hydrologic condition, during a 2-year return frequency rain event of 12 hours duration (Chicago or 3rd quartile Huff distribution).
3. The depth of the fore bay below the permanent water level shall not be less than 2.0 metres or exceed 3.0 m. Wherever the detention-storage zone extends into the sediment fore bay area, the depth of HWL may be up to 2.0 metres above the PWL, subject to the building foundation and building opening elevation provisions.
4. The sediment forebay shall be checked to ensure that at least two (2) turnovers in water budget occur each season to avoid anaerobic zones.
5. The sediment fore bay shall be lined with a clay or geo-synthetic liner as recommended in the Geotechnical Report.
6. The freeboard provisions for a sediment fore bay shall be the same as those for the detention-storage/wetland zone.
7. Aspect ratios shall be provided as per the requirements of the reference standards.
8. A **transfer structure** between the sediment forebay and the constructed wetland/ detention storage zone to maintain the permanent water level (PWL) of the sediment forebay.
9. A **combination constructed wetland and detention-storage zone**.
10. A sub-soil drainage system incorporated in zones that remain moist for extended periods, and which are traversed by mowing or other maintenance equipment.
11. The wetland/detention-storage zone may be required to have a liner due to ground water seepage conditions. If so required, the zone shall be lined with a clay or geo-synthetic liner as recommended in the Geotechnical Report.
12. The detention storage volume and depth shall be provided above the depth required for the constructed wetland (maximum wetland depth, 0.5 metres). The combined total depth for the wetland and detention-storage functions shall in no case exceed 1.5 metres above the bottom of the detention-storage zone, provided that building foundations in the vicinity of the SWMF, in the geologic zone, remain at least 0.3

metres above the PWL and building opening elevations remain at least 0.6 metres above the HWL, otherwise reductions in this total depth will be required until the building foundation and opening elevation provisions are satisfied.

13. A freeboard of at least 0.5 metres above the HWL is also required. A greater freeboard (an additional 0.5 metres) will be required if provisions for an emergency spillway cannot be made.
14. Aspect ratios shall be provided as per the requirements of the reference standards.
15. The area of the combination constructed wetland-detention storage zone shall be based upon the greater of either:
    - 5.0% of the catchment area, tributary to the SWMF, reduced by the area of the sediment fore bay and any outlet pools (minimum of 20% but not exceeding 35% of the total SWMF area computed above), or
    - The footprint area of the detention-storage zone required after incorporating the wetland depths and depth of the HWL below minimum top of building foundations in the geologic zone.
16. An outlet structure of approved standard design shall be provided to release the runoff detained in the storage zone at an attenuated rate stipulated by the City into an approved conveyance or outfall discharging into a receiving water course, as described in Section 7.9.6. The outlet structure shall be designed to provide 24-hours detention of the 2-year event runoff per item #2 above and for the controlled discharges of the 100-year event runoff volume to the receiving water course.
17. Where possible, the outlet structure shall be designed to allow for draining of the permanent water for maintenance purposes.
18. An optional permanently wet pool around a **submerged outlet structure** is recommended where enhanced rates of sediment and nutrient removal are required.

## 7.10.6 MISCELLANEOUS DESIGN CRITERIA

### 7.10.6.1 SIDE SLOPES IN A SWMF

Side slopes in a SWMF shall be subject to the recommendations of a Geotechnical Engineer but in no case steeper than:

- 5H:1V in submerged zones.
- 4H:1V in active storage zones.
- 7H:1V above the HWL provided that accessibility provisions such as pathways have been incorporated, otherwise such side slope shall be no steeper than 10H:1V.
- Steeper segments within and above active storage zone slope complexes are acceptable if treated with acceptable erosion/corrosion-proof material, and stabilized

mechanically or with retaining walls with handrails, safety devices and provisions as required by the City.

- Access control is required at the outer edges of SWMF side slopes and may contain such provisions as large rock, post & cable fencing and dense landscaping located within a 1.0 metre flat submerged section along the perimeter of the sediment fore bay that is easily accessible to the public.

#### 7.10.6.2 BOTTOM SLOPES IN A SWMF

Bottom slopes in a SWMF shall be as follows:

- Flat in sediment fore bays and wet pools.
- To 2.0% in the detention-storage/wetland zone to promote adequate drainage and avoid soggy conditions except in the vicinity of the surface channel; the bottom area shall be sloped to approved catch basin inlets and connected to the bypass storm sewer or outlet structure.
- 0.5 to 1.0% surface grades in the vicinity of the surface channel in the detention-storage/wetland zone, where riparian vegetation and a wetland environment is to be maintained. A zero-gradient incorporating shallow pools is preferred provided that a hydraulic gradient of 0.1 to 0.3% can be maintained to the outlet.

In subdivisions and larger development projects where the drainage system is to be dedicated to the public, **Dry Detention ponds and Constructed Wetlands designed as separate facilities** may be accepted provided that the features of the Wetland portions and Detention Storage portions of Hybrid SWMFs are incorporated into the Constructed Wetland and Dry Ponds respectively and also incorporate features such as sub-soil drainage systems, irrigated, manicured turf, safety grillage around inlet and outlet structures in Dry Detention Ponds and sediment fore bays are incorporated in all categories of SWMF. All discharges from Dry Detention Ponds, to receiving watercourses, must first receive treatment in a constructed wetland designed for that purpose.

Where Dry Ponds incorporating sub-soil drainage systems, irrigated, manicured turf, safety grillage around inlet and outlet structures are accepted by the City, the ponds may be allowed to bypass the 1:5-year predevelopment event by the pond provided that:

- There is a treatment facility downstream of the pond designed to treat the runoff from the pond's catchment area prior to discharge into a water course.
- There is no requirement for a sediment forebay.

### 7.10.7 LANDSCAPE DESIGN

Storm water management ponds engineered wetlands and hybrids are to be landscaped to be aesthetically pleasing and contoured to provide an attractive feature for the subdivision while

minimizing maintenance requirements. To qualify for MR credit, amenity value must be shown by how the facility is designed and constructed.

Attention shall be given to areas to be manicured to ensure they have proper drainage, to allow them to dry out and be traversed by maintenance equipment.

Plantings in areas that will be periodically inundated must be able to tolerate occasional flooding. Due to the problems associated with liner perforation, plantings with large root systems are to be avoided in areas of periodic inundation. Trees should only be planted above the HWL.

Listings of approved species of trees and shrubs may be obtained from the City.

A landscape architect familiar with landscape design of SWMF and engineered wetlands shall be retained for the landscape design.

Detailed landscape of SWMF is an integral part of the design and shall be supplied as part of the approval submission for SWMF, engineered wetlands and hybrid facilities.

The landscape design should also include, but is not limited to:

- Landscape treatment
- Edge treatment
- Irrigation design (if required)
- Grass mix and variety
- Amenities (e.g. trails, benches, etc.)
- Tree and shrub variety

### 7.10.8 OPERATION, MAINTENANCE AND SERVICE MANUALS

The Developer is responsible for providing the City with five (5) copies of an Operation, Maintenance and Service Manual for every SWMF. Each copy of the manual is required to contain the following:

- Overview of the operation of the SWMF.
- An approved set of plans.
- Design criteria, details and computations.
- Specific operating procedures for the storm water management facility.
- Seasonal change-over procedures.
- Listing of equipment.
- Running and corrective maintenance requirements.
- Maintenance schedule.

- Suppliers, local or proximate, of mechanical components and parts including product and part numbers.
- Supplier's product manuals, catalogues, contact list, addresses and telephone numbers.

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### 7.10.9 SIGNAGE

The design of SWMFs, engineered wetlands, and hybrid facilities shall include adequate provisions for the installation of signage to warn of anticipated water level fluctuations, with marking of maximum water levels to be expected for design conditions. A plan shall be provided to the City clearly indicating where signs are to be placed.

## 7.11 MINOR SYSTEM

### 7.11.1 GENERAL

Storm sewer mains shall be designed for open channel flow without surcharging during the minor storm event (1 in 5-year return frequency), at post developed conditions, using the Manning equation. Surcharging of the minor system may be allowed under exceptional circumstances such as retrofit conditions and only if the flow surcharge exceeds the sewer capacity by no more than 10% of the capacity of limited segments of a sewer line and may be approved only on a case-by-case basis.

### 7.11.2 WEEPING TILE

The City permits residential weeping tile to be connected to the sanitary sewer system. Where weeping tile connections to the storm sewer system are proposed special provisions may apply.

### 7.11.3 INVERT DRAINAGE CROSSINGS

Invert drainage crossings of public streets with asphalt or concrete swales are not permitted in new developments.

The use of invert drainage crossings is not permitted at high traffic volume driveways. These driveways shall be provided with catch basin inlets to intercept drainage upstream of the intersection.

All other institutional, industrial, commercial, and multi-family driveway accesses shall be provided with a concrete drop curb and gutter, or concrete swale section to maintain the continuity of gutter flows. Asphalt swales at driveways are not permitted.

### 7.11.4 MINOR SYSTEM PERFORMANCE DURING EVENTS EXCEEDING THE MINOR EVENT

For the purpose of design calculations surcharging of the minor system during a major event is not acceptable. The use of inlet control devices (ICD) to control inlet capacity are discouraged

on all storm systems that are to be dedicated to the City. Entry of runoff from major event flows on roadways into storm sewers shall be controlled by judicious design of grate inlets, catch basins control and lead sizing.

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### 7.11.5 BACKWATER CALCULATIONS

Where the minor system discharges into storage ponds, with a permanently wet forebay backwater calculations are to be performed to determine the HGL upstream of the SWMF. Calculations shall be done in the pond at the high-water level for the major event. Alternately calculations may be done using a computer model that calculates pond elevations using inflow and outflow hydrographs and calculates backwater conditions using the pond elevations over time and the inflow hydrograph (See Section 7.8.5.2).

### 7.11.6 ALIGNMENT

Storm sewers shall be located on alignments designated on standard street section drawings. A minimum parallel, horizontal separation of 3.0 m from any other pipeline shall be provided. Consistent alignments shall be used along the entire length of a street, lane, or PUL unless approved otherwise. Storm sewer alignment in lanes and public utility lots shall be approved on a case-by-case basis.

#### 7.11.6.1 CURVED SEWERS

Curved sewers are permitted with the following restrictions:

- The sewer shall be laid as a simple curve with a radius equal to or greater than that recommended by the pipe manufacturer. Minimum radius shall not be less than 60 m.
- The curve shall run parallel to the street centreline.
- The minimum pipe slope for curved storm sewers shall be 50% greater than the minimum slope for a straight sewer to achieve flushing velocity.

### 7.11.7 PIPES

#### 7.11.7.1 FLOW CAPACITY

Sewer hydraulics shall be calculated using Manning's equation for flow in open channels. Manning's 'n' value shall be 0.013 for concrete, 0.011 for Polyvinyl Chloride (PVC) and 0.024 for Corrugated Steel Pipe (CSP). For other types of pipe, the value suggested by the manufacturer shall be used.

#### 7.11.7.2 MINIMUM SIZES

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

### 7.11.7.3 VELOCITY REQUIREMENTS

Mean velocities below 0.7 m/s will not be allowed.

Design velocities more than 3.0 m/s are discouraged. For velocities over 3.0 m/s, special provisions are required that address structural stability, erosion, energy dissipation, and sewer displacement. Special provisions may include drop structures, anchor blocks, and energy dissipaters; their suitability will be reviewed case-by-case.

### 7.11.7.4 DEPTH OF COVER

Storm sewer mains shall be provided with a minimum frost cover of 1.2 metres.

### 7.11.7.5 PIPE STRENGTH

Structural design of pipes shall be performed to provide for loads due to trench backfill and live loads. The strength of pipe shall be calculated on the basis of the external loads, trench conditions, and bedding class provided. Bedding shall be consistent with the Manufacturer's requirements. Further information on pipe strength requirements is found in "Design and Construction of Urban Storm water Management Systems (ASCE Manuals and Reports of Engineering Practice No. 77, WEF Manual of Practice FD-20)".

Selection of bedding, trench backfill and pipe deflection parameters from the reference "Guidelines for the Design and Construction of Flexible Thermoplastic Pipe in the City of Edmonton, 2008" may be used for the structural design of PVC pipes.

### 7.11.7.6 MANHOLES

Manholes shall be installed:

- At the upstream end of each storm sewer line. Where practical such terminal manholes are to be installed within an intersection, or near the center of a cul-de-sac bulb.
- At all changes in size, grade, or horizontal alignment.
- At all junctions.
- Manholes shall be located at the beginning and end of curves, and at intervals not greater than 90 m along the curve.
- At a minimum of 120 m along the length of the sewer for sewers 375 mm in diameter or less.
- At a minimum of 150 m along the length of the sewer for sewers 450 mm in diameter or greater.
- Greater spacing may be allowed on sewer trunks larger than 750 mm in diameter and wherever T-riser manholes are utilized.

Manholes shall also be installed for every lateral or service where the size of the lateral is 300 mm diameter or greater or the size of the service is greater than 250 mm diameter and a standard saddle is available from the pipe manufacturer for the type and size of main the service is tying into.

Pipes at all junctions shall be designed such that the crown elevation of the lowest upstream pipe is equal to or higher than the crown (obvert) of the downstream pipe. In extremely constrained circumstances where pipe crowns cannot be matched, the minimum match shall be as shown in Figure 7.11.1.

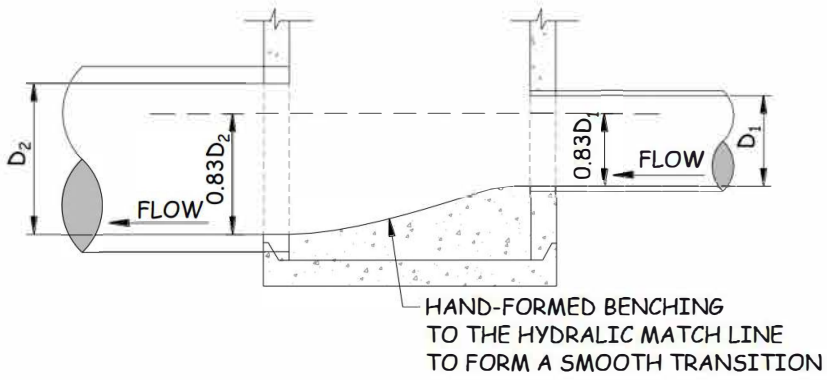


**Figure 7.11.1 - Pipe Size Change**

### 7.11.7.7 HYDRAULIC LOSSES THROUGH MANHOLES

Pipe inverts at junctions shall be set in conformance with the provisions of the reference standard WEF Manual of Practice FD 20. For manholes with 600 mm diameter and smaller inlet and outlet pipes, the following drops in elevation are required to compensate for hydraulic losses through the manhole:

**Table 7.11.1 – Manhole Minimum Drops**

| Horizontal Deflection | Minimum Drop |
|---|---|
| Less than 45 degrees | 30 mm |
| Between 45 and 90 degrees | 50 mm |

* Horizontal deflections greater than 90 degrees are not recommended and must conform to the provisions of the reference standards.

### 7.11.7.8 MANHOLE BENCHING

The flow channel (benching) through manholes shall be made to conform in shape and slope to that of the sewer. The depth of the flow channel shall be at least one-half the diameter of the downstream sewer preferably 80% of the pipe diameter of the highest pipe.

#### 7.11.7.9 DROP MANHOLES

If the elevation difference in the inverts of an inlet pipe and the outlet pipe is greater than 600 mm, a drop structure shall be installed. Internal drop structures are permitted as long as a minimum 900 mm clear space is maintained from the inside wall to the tee of the drop structure and the vertical drop pipe section may be sized one pipe size smaller than the influent pipe as shown on the standard drawing. This can be accomplished by the use of larger diameter manholes or type S-1 manholes. Where a drop structure is required for 600 mm diameter and larger inlet pipe or flow velocities greater than 3.0 m/s are proposed the drop structure shall be an exterior drop with energy dissipation devices in the manhole.

#### 7.11.7.10 ANGLE BETWEEN PIPE CONNECTIONS AT MANHOLE

Manholes shall have a minimum of 300 mm solid concrete between pipe openings. If less than 300 mm solid concrete between pipe openings is not possible with the standard 1200 mm diameter manhole, then the diameter of the manhole is to be increased, or the type of the manhole is to be changed to an S-1 manhole.

#### 7.11.7.11 T-RISER MANHOLES

"T-Riser" manhole may be used on mains 1200 mm in diameter and larger, provided that:

- The T-Riser may be placed adjacent to any pipe elbow for change in pipe alignment/
- T-Riser is placed at all pipe junctions.
- There is less than 0.5% change in grade at the T-riser.
- There is less than 300 mm increase in pipe size across the T-riser.
- Concrete bedding may be required to provide additional stability where ground conditions dictate.

## 7.12 CATCH BASINS AND CATCH BASIN MANHOLES

### 7.12.1 GENERAL, LOCATIONS

Catch basin's locations shall be determined based on the following requirements:

- Spacing requirements, as noted in Section 7.12.1.1.
- All street sag locations.
- At sag corners of roadway intersections catch basins shall normally be located at the beginning or end of the curb return.
- On flow through corners, catch basins should be located upstream of the wheelchair ramp.
- Catch basins are not to be located within the limits of a wheelchair ramp.

- Catch basins should be provided at the closest possible point to the point of discharge of concrete swales or back-of-lot drainage.

#### 7.12.1.1 CATCH BASIN SPACING

Catch basin and inlet spacing shall be determined such that during a minor event no overflow of the catch basin will occur and the depth of flow in gutters will not exceed the top of curb. Surface water shall be intercepted by a catch basin or other inlet device before flowing a distance greater than:

- Arterial Road: 150 metres.
- Collector Road: 150 metres.
- Residential Road: 210 metres.
- Lane: 210 metres.
- Paved overland relief channel connecting to a major drainage conveyance 200 metres.
- Cul-de-sac over 100 metres in length from intersection to centre of bulb shall be provided with catch basins at the intersection with the main street.

#### 7.12.1.2 CATCH BASIN LEADS

The minimum size of catch basin leads shall be 200 mm diameter from catch basin. Each catch basin installation shall be designed to convey minor event flows without creating surcharges during major events.

The minimum size of connection to the storm sewer system from private developments (systems not to be dedicated to the City) is 150 mm.

In all cases catch basin leads shall be designed to ensure that self-cleansing velocities are maintained.

Minimum grade on all catch basin leads is 1.0%. Catch basin leads may be installed with a continuous curve to avoid conflicts.

The length of catch basin leads shall not exceed 35 metres without an intermediate manhole. Storm sewer mains and inlet leads shall be provided with a minimum frost cover of 1.2 metres.

#### 7.12.1.3 TYPES OF CATCH BASINS AND CATCH BASIN MANHOLES

Catch basins shall be built with a 900 mm or larger barrel. Catch basin manholes shall be built with a 1200 mm barrel. A maximum of two catch basins are permitted in series. Catch basins and catch basin manholes shall be built with a sump of a minimum depth of 300 mm.

The type of inlet assembly to be used for catch basins and catch basin manholes shall be as follows:

- Type 'K' or 'C' shall be used in conjunction with standard curb and gutter, and standard monolithic sidewalk construction.
- Type 'K3' assembly shall be used in conjunction with lane construction.
- Type 'K7' assembly shall be used in conjunction with rolled monolithic sidewalk construction.
- For landscape area drains and swales, a Type 'K', 'K3', or Parks catch basin may be used.

#### 7.12.1.4 DESIGN CAPACITY

Sufficient inlet capacity shall be provided as catch basins or specially designed inlets to accommodate the design runoff from a 1 in 5-year rainfall event into the minor storm drainage system without excessive carry-over to downstream inlets.

#### 7.12.1.5 HYDRAULIC RATING CURVES FOR APPROVED CATCH BASIN STYLES

Hydraulic rating curves for approved styles of catch basin may be obtained from the City by request.

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# PART 8 – ROADWAYS

## 8. ROADWAYS

### 8.1 GENERAL

The section covers the design of the transportation system including but not limited to roadways, alleys/lanes, sidewalks located within the road right-of-way (RROW). This section consists of four parts namely, Roadways, Roadways-Functional Requirements, Roadways-Design Criteria and Typical Road Cross Sections (RD-100 to 110).

### 8.2 ROADWAY CLASSIFICATION

This section provides design information for the following road classification:

| | | |
|---|---|---|
| Arterial Roadway: | Major & Minor | Drawings RD-100&101 |
| Collector Roadway: | Industrial/Commercial Districts - Major & Minor | Drawings RD-102 &105 |
| Collector Roadway: | Residential Districts - Major & Minor | DrawingsRD-103,104,106 & 107 |
| Local Roadway: | Industrial/Commercial & Residential Districts | Drawings RD-108 & 109 |
| Lanes/Alleys | | Drawing RD-110 |

The characteristics of roadway classifications described above are in accordance with the TAC design classification system. Factors such as land use, service function, intersection spacing, traffic volume, traffic flow characteristics, running speed, vehicle type and connection to other roadways; shall be considered for the roadway classification. This standard applies to all roadways within City Limits except roadways under the jurisdiction of Alberta Transportation.

### 8.3 REFERENCE STANDARDS

Design details or procedures not specified in this section shall be determined in accordance with the following Reference Standards (current edition):

- Geometric Design Guide for Canadian Roads, *Transportation Association of Canada (TAC),* 2017, 2020.

  https://www.tac-atc.ca/en/knowledge-centre/technical-resources-search/publications/pkg-geodes17b-e/

- Pavement Design Manual, Alberta Transportation and Economic Corridors, 1997.

  https://open.alberta.ca/dataset/b7a69f09-bc18-4a65-b280-923dfe51a1c1/resource/92f6366e-dc96-49a1-b7d4-8a600164c958/download/pavedm2.pdf

- A Policy on Geometric Design of Highways and Streets – 7th Edition, *American Association of State Highway and Transportation Officials*, 2019.

  https://store.transportation.org/Common/DownloadContentFiles?id=1776

Reference on Transportation Systems can also be found at:

- Transportation Association of Canada

  http://www.tac-atc.ca

- Alberta Transportation and Economic Corridors

  https://www.alberta.ca/transportation-and-economic-corridors

- Institute of Transportation Engineers

  http://www.ite.org/

- Transportations Research Board

  http://www.trb.org

Additional references have been cited in the following sub-sections as required. The City of Medicine Hat does not rely exclusively on any one of the above-noted references. The City shall approve the final design based on a combination of the references above and the design standards contained herein. **The standards contained in this section are required minimum standards; wherever possible, higher standards should be used.** In cases of discrepancies between these standards and the above noted references, these standards will govern; however, the City of Medicine Hat is the final approving authority. The City may, at its discretion and in special cases only, issue requirements specific to such special cases derived from other accredited technical resources such as the Airport Vicinity Protection Area, Water way crossings, etc.

## 8.4 TRANSPORTATION IMPACT ASSESSMENT

### 8.4.1 GENERAL

Engineering studies and assessing the impact of development generated traffic, may be required to be submitted to the City preceding an approval of:

- Annexation.
- Land use Reclassification.
- Area Structure Plan (ASP) and related Functional Servicing Report (FSR).
- Subdivision.

- Development permit
- Road closures
- Variance in access requirements

### 8.4.2 WARRANTS

There are a number of criteria under which a Transportation Impact Assessment (TIA) may be required. In general, a TIA should be conducted whenever a proposed development will generate 100 new peak-hour trips on intersecting or adjacent roadways. A TIA may also be required when there are less than 100 additional peak hour trips under one or more of the following conditions:

- The development is located in an area of high roadway congestion and/or a high employment or population growth area.
- The development requires an amendment to Land Use By-Law (LUB).
- The development, its access(es) or type of operation is not consistent with land-use zoning or transportation plans.
- As part of the proposed development, a new traffic signal is proposed.
- If in the opinion of the City, the development has the potential to create unacceptable adverse traffic operational and/or safety impacts on the road network. The onus is on the applicant to demonstrate that a TIA is not required.
- Existing access (es) are operating inefficiently or there are traffic safety concerns.

## 8.5 SCOPE

The scope of a TIA shall generally conform to the reference standards outlined in Section 8.3 and shall also incorporate the following information and criteria:

- Design horizon year for the development shall be the build-out year of the development or as stipulated in the reference standards.
- Background traffic volumes shall be consistent with the time horizons used in the City's current Transportation Network Study.
- Intersection Level of Service and Capacity criteria will be provided by the City of Medicine Hat, and generally shall not fall below Level of Service (LOS) C for new developments and LOS D for redevelopment in built up areas. Level of Service for individual approaches and movements to an intersection shall be subject to the City's review and discretion.
- Operating data for existing Traffic Signals will be provided by the City of Medicine Hat.
- Mitigative measures, right-of-way requirements, improvements (including traffic control devices) and cost allocation.

## 8.6 ANALYSIS PROCEDURE AND REPORTING REQUIREMENTS

Travel demand forecasts, Capacity Analysis and Traffic Study procedures shall be carried out in accordance with the reference standards and guidance from the City. Traffic study reports shall include all assumptions made. All findings and recommendations shall be supported by acceptable analysis, maps, charts, figures, calculations, tables and modelling input and output files.

## 8.7 ROADWAY DESIGN REQUIREMENT

### 8.7.1 CROSS SECTION ELEMENTS

#### 8.7.1.1 TRAVEL LANE

The travel lane widths for all road classes are summarized in Table 8.7.1 and are measured from the lip of gutter.

#### 8.7.1.2 SIDEWALK AND BOULEVARD

Accessible cement concrete sidewalks or asphaltic cement shared-use sidewalks will be required as specified in Table 8.7.1, for each classification of roadway. Sidewalks in industrial districts shall be provided where required under the condition of approval of a FSR/ ASP or Engineering Design Brief/ Conceptual Scheme or based on a needs assessment as required by the City. Refer to City standard drawings RD 302 - 304 for sidewalk details. Where lanes, commercial, industrial, institutional and multi-family driveways cross sidewalks, the crossing shall be constructed with reinforced concrete.

Appropriate signs shall be installed along shared-use sidewalk to indicate that pedestrians and cyclists are permitted to use the sidewalk.

If a developer wishes to use material other than concrete and/or asphalt for sidewalks or shared-use sidewalk, the responsibility shall be upon the Developer to justify the use of alternative material and address all concerns to the satisfaction of the City by submitting a report signed and sealed by a Professional Engineer permitted to practice in Alberta. The City will review the requests for use of alternative material on a case-by-case basis and reserves the right to make the final decision.

Boulevards are provided primarily for snow storage and may also be used for landscaping and/or tree planting.

#### 8.7.1.3 CROSS SLOPE

The cross slope for roadways shall be 2% towards the outside pavement edge and measured from lip of gutter.

### 8.7.1.4 CURB AND GUTTER

Portland cement concrete curb and gutter will be required on all roadways unless otherwise shown on the roadway sections and approved by the City. Standard vertical face curb and gutter shall be used on arterial roadways, medians, urban commercial and industrial roadways, existing highway service roads, and adjacent to parks, bus stops, institutional, multifamily sites and for access control purposes where required. Refer to City standard drawings for curb and gutter details.

### 8.7.1.5 MEDIAN CHANNELIZATION ELEMENTS

Median and channelization elements including divisional, directional and refuge islands shall be designed in conformance with the Geometric Design Guide for Canadian Roads, TAC. Warrants and capacity analysis shall be submitted where required in conformance to the Geometric Design Guide for Canadian Roads, TAC. Where a pedestrian crosswalk distance across an approach exceeds 20.0 m (measured from between the edge pavements along the centerline of the crosswalk across an intersection approach) the intersection shall be channelized.

Medians and channelization elements shall normally be raised and surface treatment for medians shall comprise of:

- Cement concrete curb surrounding the perimeter.
- Cement concrete or other approved hard surfacing (excluding asphalt) between curbs.
- Provisions for landscaping, in accordance with MSSM – Part 9, may be made in medians only provided that:
    - The median is wider than 4.0 m from lip-of-gutter to lip-of-gutter,
    - A Portland cement concrete strip 0.50 m in width behind the back of curb is provided,
    - Provision for mower access is provided consisting of a minimum of two (2) dropped sections of curb at a minimum spacing of 100 m,
    - Individual tree wells or continuous tree pits are provided with a minimum horizontal dimension of 1.5 m in any direction,
    - Irrigated landscaping is provided for median areas between cement concrete cross-section elements wider than 2.0 m, and
    - Wheelchair ramps within pedestrian crosswalk zones.

## 8.7.2 GEOMETRIC DESIGN

### 8.7.2.1 HORIZONTAL ALIGNMENT

The minimum centerline radii shall be provided as required in the Design Criteria for each functional classification of roadway. Superelevation is required on Collector and Arterial Roadways with a design speed of 50 km/h and over and is to conform to the procedures in the Geometric Design Guide for Canadian Roads, TAC. Transition spirals are not normally required except in special design cases and shall conform to the Geometric Design Guide for Canadian Roads, TAC.

**Table 8.7.1 - Summary of Cross Section Elements**

| ROADWAY CLASSIFICATION | TYPICAL CROSS SECTION DRAWING NO. | RIGHT-OF-WAY (M) | CARRIAGEWAY (M) | TRAVEL LANE WIDTH (M) | CROSS SLOPE (%) | SIDEWALK | SHARED USE SIDEWALK |
|---|---|---|---|---|---|---|---|
| **Arterial Roadway** | | | | | | | |
| Major | RD-100 | 60-80 | 2x7.4 | 3.7 | 2 | - | 3.0 m on both sides |
| Minor | RD-101 | 50-65 | 2x7.4 | 3.7 | 2 | - | 3.0 m on both sides |
| **Industrial/Commercial Collector Roadway** | | | | | | | |
| Major | RD-102 | 26.9&31.1[1)] | 14.8 & 19.0[1)] | 3.5&4.2[1)] | 2 | 1.8 m separate sidewalk on one side | 3.0 m shared-use Sidewalk on one side |
| Minor | RD-105 | 25.5 | 13.4 | 3.5 | 2 | 1.8 m separate or 1.8 m monolithic sidewalk on one side | 3.0 m shared-use sidewalk on one side |
| **Residential Collector Roadway** | | | | | | | |
| Major Divided | RD-103 | 31.6 | 2x7 | 3.5 | 2 | 1.8 m separate sidewalk on one side | 3.0 m shared-use sidewalk on one side |
| Major Undivided | RD-104 | 26.1 | 14 | 3.5 | 2 | 1.8 m separate sidewalk on one side | 3.0 m shared-use sidewalk on one side |
| Minor | RD-106 | 22 | 12.4 | 3.5 | 2 | 1.8 m separate or monolithic sidewalk on both side | - |
| Minor Widened Carriageway[2)] | RD-107 | 23.2 | 13.6 | 4.1 | 2 | 1.8 m separate or monolithic sidewalk on both side | - |
| **Local Roadway** | | | | | | | |
| Industrial/ Commercial Collector | RD-108 | 22 | 12 | 3.5 | 2 | 1.8 m separate or monolithic sidewalk on both side | - |
| Residential | RD-109 | 16 & 19.6 | 10 | 3 | 2 | 1.8 m separate or monolithic sidewalk on both side | - |

1) Includes a 4.2 m wide TWLTL
2) Carriageway widened to accommodate bicycle

### 8.7.2.2 VERTICAL ALIGNMENT

Minimum and maximum roadway gradients shall be provided as required in the Design Criteria for each functional classification of roadway. All grades shall be referenced to lip of gutter and referenced to geodetic Datum.

Cul-de-sacs and expanded bulb corners shall be designed with the centerline grade increased to ensure that a minimum lip-of-gutter grade of 0.5% is maintained along the full length of the lip of gutter, to account for length increases due to curvature. The minimum grade of the curb return at corner curves shall be increased to 0.6% where drainage is not intercepted by either a storm sewer inlet or surface conveyance to an approved drainage system.

Parabolic vertical curves shall be provided at points of grade change where the algebraic difference is greater than 1.0%. The minimum length of vertical curve shall not be less than 30 metres except for smoothing vertical curves for superelevation runoff and tangent runout, which can be reduced to 15.0 metres and 20.0 metres, respectively. In the vicinity of sag vertical curves, the cross slope shall be adjusted as necessary to maintain a minimum lip-of-gutter grade of 0.5%.

Minimum vertical clearances between roadway surfaces and overhead power and communication lines shall be as per the Alberta Electrical and Communication Utility Code.

**Table 8.7.2- Summary of Geometrical Design Standards**

| Roadway Classification | Typical Cross Section Drawing No. | Posted Speed (km/h) | Minimum horizontal curve radii (m) [1] | Super Elevation (%) [2] | Minimum horizontal curve length (m) | Minimum Gradient (%) | Maximum Gradient (%) | Minimum curb radii (m) [3] | Minimum Intersection Spacing (m) |
|---|---|---|---|---|---|---|---|---|---|
| **Arterial Roadway** | | | | | | | | | |
| Major | RD-100 | 60/70/80 | 120/190/250 | Yes | 150 | 0.5 | 6 | 15 [4] | 400 |
| Minor | RD-101 | 50/60/70 | 90/120/190 | Yes | 150 | 0.5 | 6 | 15 [4] | 200 |
| **Industrial/Commercial Collector Roadway** | | | | | | | | | |
| Major | RD-102 | 50/60 | 90/130 | Yes | 60 | 0.5 | 8 | 15 [4] | 60 |
| Minor | RD-105 | 50/60 | 90/130 | Yes | 60 | 0.5 | 8 | 15 [4] | 60 |
| **Residential Collector Roadway** | | | | | | | | | |
| Major Divided | RD-103 | 50/60 | 90/130 | Yes | 60 | 0.5 | 8 | 15 | 60 |
| Major Undivided | RD-104 | 50/60 | 90/130 | Yes | 60 | 0.5 | 8 | 15 | 60 |
| Minor | RD-106 | 50 | 90 | No | 60 | 0.5 | 8 | 12 | 60 |
| Minor Widened Carriageway | RD-107 | 50 | 90 | No | 60 | 0.5 | 8 | 12 | 60 |
| **Local Roadway** | | | | | | | | | |
| Industrial/ Commercial Collector | RD-108 | 50 | 90 | No | 60 | 0.5 | 8 | 12 [4] | 60 |
| Residential | RD-109 | 50 | 90 | No | 60 | 0.5 | 8 | 9 | 60 |
| **Lane/Alley** | | | | | | | | | |
| 6.0 and 9.0 m | RD-110 | 20 | 60 | No | N/A | 0.7 | 8 | N/A | As Needed |

1) Larger curve radius should be used wherever possible

2) Refer Geometric Design Guide for Canadian Roads, TAC

3) Intersection with roads of higher or equal functional classification

4) Equivalent 3 centered compound curves may be provided

## 8.7.3 INTERSECTION

Roadways should be designed to intersect at right angles. However, roadways may intersect at angles between 80° and 100°. Only Local or Minor Collector roadways with peak hour traffic volumes less than 200 vehicles per hour may intersect at angles between 70° and 110°.

Intersections should be spaced as shown in the Functional Requirements for each category of roadway. Intersection sight distances, combined vertical and horizontal alignments, including approaching grades and intersection cross slopes shall be design in accordance with the current edition of the Geometric Design Guide for Canadian Roads, TAC.

In addition to the reference materials listed in 8.3, at a minimum, the following document will be used in the preparation of roundabout designs:

- "Synthesis of North American Roundabout Practice"- Ourston Roundabouts for TAC
- "The Region's Planning and Feasibility Process for Roundabouts"- Region of Waterloo

### 8.7.4 ROADWAY PAVEMENT

All roadways shall be paved with hot mix flexible asphaltic concrete pavement (HMA) in accordance with the pavement design for each roadway functional classification of roadway, as provided for in the approved Geotechnical Report, in accordance with the pavement design procedure outlined in reference document in Section 8.2. In no case shall the pavement structure for any functional classification of roadway be less than the minimum structure specified in the Design Criteria.

Sub-drain system shall be installed along outer edges of all functional class of roads. A typical sub-drain system shall consist of 100 mm perforated PVC pipe complete with geotextile sock and drain rock surround and the installation shall be as follows:

a. Along edge of back of sidewalk at location having monolithic sidewalk.
b. Along lip of gutter at location having separate sidewalk.

Refer to City standard drawings ST 420-421 for sub-drain installation details.

### 8.7.5 MISCELLANEOUS REQUIREMENTS

#### 8.7.5.1 ACCESS MANAGEMENT

Access management shall be as required in the Functional Requirements for each functional classification of roadway. In addition, the access management concepts and techniques shall be applied in accordance with Geometric Design Guide for Canadian Roads, TAC.

#### 8.7.5.2 CUL-DE-SAC

Cul-de-sacs will be permitted on dead-ended low volume local roadways only, provided that the number of dwelling units developed on the dead-ended roadway and cul-de-sac:

- do not exceed 40.
- the length of dead-ended roadway, measured from the centerline of the intersection to the center of the cul-de-sac bulb does not exceed 150 m, unless a paved access restricted to the passage of emergency vehicles is located within 85 m of the end of the

bulb connecting the cul-de-sac with another roadway or lane in which case the maximum length can be increased to 180 m.

- Cul-de-sacs on local residential roadways shall be designed with a minimum lip-of-gutter (edge of pavement) radius of 13 m and a 23 m curb return radius measured at the lip-of- gutter.
- Cul-de-sacs on local industrial/ commercial roadways shall be designed with a minimum lip-of-gutter (edge of pavement) radius of 15 m and a 25 m curb return radius measured at the lip-of-gutter.
- Geometric requirements for cul-de-sacs shall apply to both symmetrical and offset bulbs.
- Islands will not be approved inside cul-de-sacs.

#### 8.7.5.3 P-LOOP

The centerline length of a looped local roadway with a single (1) entrance from an intersecting main local or collector standard roadway shall not exceed 850 m, measured along the centerline of the road, nor service more than 85 dwelling units or the equivalent commercial or industrial properties (for the purposes of utility service interruptions). The centerline length of the primary leg of a P-loop shall not exceed 180 m, in conformance with the standard details herein. Centerline lengths shall be measured between centerline intersections of connecting roadways. All single entry looped local roadways shall be provided with paved emergency access connecting the internal loop to another roadway or lane.

Islands may be approved inside of P-loops provided that:

- The island is constructed with acceptable hard surfacing, or
- Landscaped, provided that:
- The land inside the loop is designated Municipal Reserve,
- The General Manager of the Parks and Outdoor Recreation Department approves it as park facility.

#### 8.7.5.4 EXPANDED BULB

Expanded bulbs must be used on local roadways wherever the minimum centerline radius of curvature cannot be provided.

#### 8.7.5.5 TWO WAY LEFT TURN LANE (TWLTL)

Two-way left turn lanes shall be designed in accordance with the TAC manual, NCHRP Report 279 and the TRB Access Management Manual.

### 8.7.5.6 LANES/ALLEYS

A minimum 7.0 m long apron paved with hot-mix asphaltic concrete, (paved apron) across the full width of the lane shall be provided at all approaches to paved roadways.

The length of overland drainage on a graveled lane shall not exceed 350 m prior to being intercepted by either a storm sewer inlet or surface conveyance, with sufficient capacity discharging to an approved drainage system. A 3.5 m long paved apron across the full width of the lane shall be provided on each side of such storm sewer inlets or surface conveyances located in or adjacent to a lane. Maximum centerline length of a lane between approaches to an intersection with a higher functional classification roadway shall not exceed 300 m. Lanes shall not intersect a higher functional classification roadway in the area of influence of an intersection of two or more higher functional classification roadways.

If the lane grade is steeper than 5% for a distance 75 m or greater than the lane shall be deep based, or other alternative provisions acceptable to the City shall be made to mitigate frequent washouts after rain events.

Lanes adjacent to multi-family residential sites with four or more dwelling units commercial, industrial, or institutional sites in a residential district, where the City deems that the lane will be used to accesses such sites, shall be paved to the closest paved roadway.

### 8.7.5.7 ACCESSIBILITY

Pedestrian environments which are designed to be used by the general public, including those with disabilities, should be accessible to all persons, as well as being safe, functional and attractive. The design elements to be addressed are identified in the Geometric Design Guide for Canadian Roads, TAC.

Wheelchair ramps shall be provided at all intersections of roadways, whether existing or proposed and incorporated into pedestrian facilities. For all classifications of streets, wheelchair ramp(s) should be constructed to direct pedestrians in a line perpendicular to the vehicular traffic flows and shall be constructed within crosswalk zones. Catch basins will not be permitted within the area of the ramp and should generally be placed up gradient of the pedestrian crossing. In retrofit or rehabilitation situation, every effort should be made to install wheelchair ramps in such a way to direct pedestrians perpendicular to traffic flow.

In the vicinity of public facilities including but not limited to transit stops, community mailboxes, buildings, parks, trails, municipal buildings and business districts, landings should be incorporated into the design of sidewalks to provide rest areas for wheelchair users. Such landings should also be provided where longitudinal sidewalk gradients exceed 6.25%, at a spacing of 9.0 m.

### 8.7.5.8 COMMUNITY MAILBOX

The Developer shall submit to the City an overall plan showing the proposed location of community mailboxes approved by Canada Post, in conjunction with their design plan

submissions. The location of Community mailboxes should be determined after consideration has been given to the convenience of the location to the local residents and the safety of pedestrians and vehicles at the proposed location.

It is preferred that Community mailboxes are to be located:

- Next to an open space or playground,
- On the boulevard abutting a sidewalk,
- On the flank side of lots towards the back property line. Community mailboxes are not to be located:
- Not on Major Collectors or Arterial roadways,
- Not within the driveway setback from intersections,
- Where there are no site distance restrictions,
- Not closer than 10 m from a fire hydrant or bus stop,
- Not on a utility easement (deep or shallow),
- No closer than 3 m to streetlight standards, street name poles, or above ground utility boxes,
- No closer than 3 m away from a tree and no interference with the spray pattern of an irrigation zone.

#### 8.7.5.9 TRAFFIC CALMING

Traffic Calming measures will be determined on a case-by-case basis. Any proposed traffic calming measures must be identified and approved as part of the Area Structure Plan approval process. Refer to the Canadian Guide to Neighborhood Traffic Calming manual for typical traffic calming measures.

### 8.8 ILLUMINATION

Roadway illumination shall be provided using LED fixtures on all functional classifications of roadways except lanes. Illumination shall be designed and constructed to conform to available City standards or the TAC Canadian Guide for the Design of Roadway Lighting.

### 8.9 BERMS AND FENCING

Berms and sound attenuation fencing along roadways in a RROW shall be designed and constructed in accordance with the Standard Cross-Sections and/or an approved Functional Servicing Report (FSR). All sound attenuation measures must be designed and built to have a maintenance free life of 30 years or as approved by the City. If utility relocations are required to accommodate the installation of a sound attenuation berm or fencing, the agency installing the berm or fencing will be responsible for all associated costs of the utility relocation.

## 8.10 ACCESS CONTROL FENCING

Access control fencing as determined most applicable to the site by the City shall be constructed at the following locations:

- Along the common boundary between a cul-de-sac (road or lane) and abutting roadway,
- Along the length of a lane which parallels and abuts an adjacent road,
- Along a lane that parallels and abuts an open space area,
- Along a lane adjacent to public utility lots, and
- On both sides of walkways or emergency accesses when they abut private property on both sides.

### 8.10.1 NOISE IMPACT ASSESSMENT

For new residential development adjacent to a roadway if the projected noise levels are assessed to exceed the City's Design Noise Level of 60 dB, the Developer will be responsible for providing noise attenuation at their expense. The choice of sound attenuation measure is left to the Developer, subject to City approval. This standard does not apply to existing residential development.

Noise assessments shall be carried out for new development using current industry practices and methods by an APEGA Licensed Professional Engineer, providing signed and sealed reports. The noise assessments should include traffic projections of twenty (20) years into the future, as estimated and/or approved by the City. All sound impact is to be measured 1.5 m above ground level and 3.0 m from the dwelling toward the sound source.

## 8.11 TRAFFIC CONTROL DEVICES

Traffic control devices shall conform to the TAC Manual of Uniform Traffic Control Devices (MUTCD). A schedule of the signs and pavement marking to be installed must be provided on the detailed roadway drawings.

Traffic signals will be installed when a traffic impact study or when a needs assessment, as required by the City, indicate that traffic signals are required. If such a study or needs assessment indicate a future requirement for traffic signals, provisions will be made at the time of development, for the installation of traffic signals either as a complete installation or by the installation, of ductwork conduit, bases and other rough-in elements required for the future traffic signals as deemed acceptable at the City's discretion.

Special provisions with respect to traffic control devices may be required for the design of roadways around the perimeter and within 250 m of the perimeter of the City of Medicine Hat

Municipal Airport. These requirements shall be obtained from the General Manager of the Medicine Hat Regional Airport Authority.

## 8.12 ACCOMMODATION OF INFRASTRUCTURE AND CROSSING

Where utilities or other infrastructure are proposed across, along, over or under an existing roadway, an application in conformance with the City of Medicine Hat standards, specifications, bylaws and applicable policies shall first be submitted for approval. The application shall include Engineering Design Reports; detailed drawings and such other information as may be required, consistent with the nature of the application, for a complete assessment to be completed by the City. Depending upon the nature of the application, rights-of-way use agreements, crossing permits, set-back requirements, horizontal and vertical clearance requirements, line and depth ranges, encroachment limits, permits, approvals, fees, insurance and payment for the use, restoration and future rehabilitation of the roadway may be required.

Where a proposed infrastructure crosses or abuts existing watercourses, drainage facilities, railroads, oil/gas pipelines, overhead primary electric power lines, utilities within easements or rights-of-way, provincial highways, irrigation facilities, open space, natural features, other municipal roadways, the design requirements of the respective authorities having jurisdiction shall first be obtained and submitted to the City prior to a development or subdivision application.

## 8.13 TEMPORARY ROADS AND TURNAROUNDS

When it is determined by the City that a temporary road is required and acceptable in an area where a development is proposed the road shall be built in accordance with plans and specifications approved by the City. All costs (both construction and decommissioning) of temporary roads shall be borne by the Developer.

Where a temporary road is required as an alternate means of access to a proposed subdivision and will be used after residents occupy the subdivision the road shall be constructed to a 8m width, 2 lane graveled roadway. Signs indicating the temporary nature of the road shall be erected at each end of the temporary roadway.

Where a temporary road is required for construction access only, the road shall be constructed to a 6.0 m graveled lane standard. Where the road crosses curbs, gutters, sidewalks and trails provision shall be made to permit regular vehicle traffic to cross, without damaging, the curbs, gutters, sidewalks and trails. Signs indicating the temporary nature of the road and that it is for construction traffic only shall be erected at each end of the temporary roadway.

Where a roadway temporarily terminates at mid-block and has no provision for egress, a temporary turnaround shall be constructed in accordance with prevailing City Standards.

Temporary roadways shall be shown on the detail design drawings complete with horizontal and vertical alignments, drainage details and cross sections.

## 8.14 TRAFFIC ACCOMMODATION AT CONSTRUCTION SITES

Traffic accommodation at Construction Sites shall conform to City of Medicine Hat standard specifications and MUTCD.

## 8.15 EMERGENCY ACCESS

The intent of this standard is to provide a clear direction with regards to emergency vehicle access requirements at all stages of development. Developers are required to meet the minimum laid out in this section but are free to provide more than the minimum requirements for access by emergency vehicles.

### 8.15.1 DEFINITIONS

**Primary Access:** The primary access is considered to be the normal principal vehicle access to a site. The primary access shall have a minimum throat width of 9.0 m from face of curb to face of curb except where the access is provided with a median to divide entering and exiting traffic in which case it is to be demonstrated using vehicle turning templates that a fire truck as per Medicine Hat Fire & Emergency Services Department specifications can successfully enter and exit the site.

**Secondary Access:** A secondary access is any additional route into and out of a site that is normally used by vehicles to access the site.

**Emergency Access:** An Emergency Access is provided for the use of vehicles when the primary access is blocked and there is no secondary access.

**Site:** Buildings, structures, complexes, subdivisions, open spaces or other developments generally covered by one area structure plan, outline plan, land use change, subdivision approval, development approval, building permit, etc. allowing for the access to the site to be evaluated with respect to its size, density, uses, etc.

**Emergency vehicle lanes (fire lanes):** Emergency vehicle lanes to provide access to buildings or facilities on a private site are governed by the Alberta Building Code and the Alberta Fire Code in effect at the time of review.

**Public Emergency Access:** An emergency access owned and maintained by a municipality typically providing access between two points in the road network.

**Private Emergency Access:** An emergency access owned and maintained by a private entity for access to and from a private site to a road network or adjoining private site with an access to the road network.

**Temporary Emergency Access:** Any emergency access that is intended only to be available on a short-term basis.

## 8.15.2 SITE ACCESS

While all sites have a primary access the requirement to have additional accesses must be evaluated based on NFPA 1141 standard. It is always preferable to have a secondary access instead of an emergency access; however this may not always be practical. The required number of access routes for residential and non-residential districts, as per NFPA 1141 standard, is summarized below.

**Table 8.15.1 - Required Number of Access Routes (Part 1)**

| Number of Access Routes* | For Residential Districts Number of Households | For Non-Residential Districts Number of Parking Spaces |
|---|---|---|
| 1 | 0-100 | 0-1250 |
| 2 | 101-600 | 1251-3000 |
| 3 | >600 | >3000 |

*Assuming length of measurement line is less than 90 m

In addition to the above the number of access routes is also dependent on the length of measurement line which is defined as the measurement of the primary access route taken from the center line of the connecting public street to the closest point of the access route adjacent to the farthest building's principal entrance. The number of access required with respect to length of measurement line is presented below.

**Table 8.15.2 - Required Number of Access Routes (Part 2)**

| Number of Access Routes* | Length of measurement |
|---|---|
| 1 | < 90 m |
| 1 with turn around | 120 < 90 m |
| 2 | 200 < 120 m |
| 3 | > 200m |

## 8.15.3 LOCATION AND TIMING OF ADDITIONAL ACCESSES

Where more than one access is required for a given stage of development the location and timing of additional accesses shall be as follows:

Multiple means of access should be located as remotely from each other as practical,

To be installed when the additional access is warranted under the guidance of NFPA 1141.

## 8.15.4 SECONDARY ACCESS

A secondary access is an access intended to routinely be used by the general public and can also be used by emergency vehicles to access the site. Secondary accesses shall meet the

same minimum criteria of a primary access but also can include exclusive right-in and/or right-out accesses. Lanes are not considered secondary accesses.

### 8.15.5 EMERGENCY ACCESS

An emergency access is permitted where it is not possible to provide secondary access or standard lane/alley is considered as emergency access. Once it is determined that an emergency access is required it must be determined what type of emergency access is to be provided. Emergency accesses consist of the following types:

- For emergency vehicle use only,
- For general vehicle use, And
- Permanent Emergency Access
- Temporary Emergency Access

All emergency access shall meet the following criteria:

- Located as remotely from other accesses as far as practical,
- Designed to support a load of 38,556 kg (85,000 lbs.),To be constructed of all-weather surface,
- Maximum grade of 8%,
- Grade changes greater than 2% to be provided with a vertical curve with a K value greater than 2.

### 8.15.6 EMERGENCY ACCESS - EMERGENCY VEHICLE USE ONLY

Emergency access for use by emergency vehicles only shall be constructed to the following standards:

- Minimum 4.0 m wide all weather travel surface,
- Minimum 6.0 m wide clear zone centred on the travel surface. The clear zone shall have no vertical obstructions higher than 150 mm including but not limited to vegetation, fences, gate posts and bollards.
- Minimum centreline horizontal curve radii of 12.0 m. Preferable greater than 20.0 m.
- Shall be restricted from unauthorized use by way of approved bollards (break-away) or approved access gate. No-parking signs shall be posted 10 m on either side of the centreline of the emergency access and 2.3 m above surrounding grade.

### 8.15.7 EMERGENCY ACCESS - GENERAL VEHICLE USE

Emergency access for general vehicle use when the primary access is blocked shall be constructed to the following standards:

- Where the maximum length is less than 200m City Lane standards and additional ROW at corners to accommodate a 12.0 m centreline radius at corners to the centre of the intersecting lanes.
- Where the maximum length is more than 200 m:
- Minimum 7.4m wide gravel all weather travel surface (to accommodate two-way traffic),
- Minimum 9.0 m wide clear zone centred on the travel surface. The clear zone shall have no vertical obstructions higher than 150 mm including but not limited to vegetation, fences, gate posts and permanent bollards
- Minimum centreline horizontal curve radii of 20.0 m. Preferable greater than 40.0 m.

### 8.15.8 TEMPORARY EMERGENCY ACCESS

Temporary Emergency Accesses should have a projected need of no more than 5 years. Where it is projected that the Emergency Access will be required for more than 5 years it should be built to a permanent standard. Temporary Emergency accesses are to be owned and maintained by the Developer.

Temporary Emergency Accesses should be constructed to the following minimum standards:

- Gravel all weather surface
- Breakaway bollards at each end

### 8.15.9 PERMANENT EMERGENCY ACCESS

Permanent emergency accesses shall be built to the following standards:

- Asphalt paved surface in accordance with City lane standards.
- Curb cuts at the access
- Approved gates, or bollards, if required
- Landscaping, fencing or other treatments

## 8.16 REMOVAL/ALTERATIONS TO EMERGENCY ACCESS ROUTES

Emergency access routes shall not be altered, modified, removed or placed out of service without approval by the Medicine Hat Fire Service.

## 8.17 MAINTENANCE OF EMERGENCY ACCESSES

Private emergency accesses shall be maintained by the property owner benefiting from the access. Public emergency access shall be maintained by the City after the City's acceptance of the access constructed by a developer through the standard CCC process.

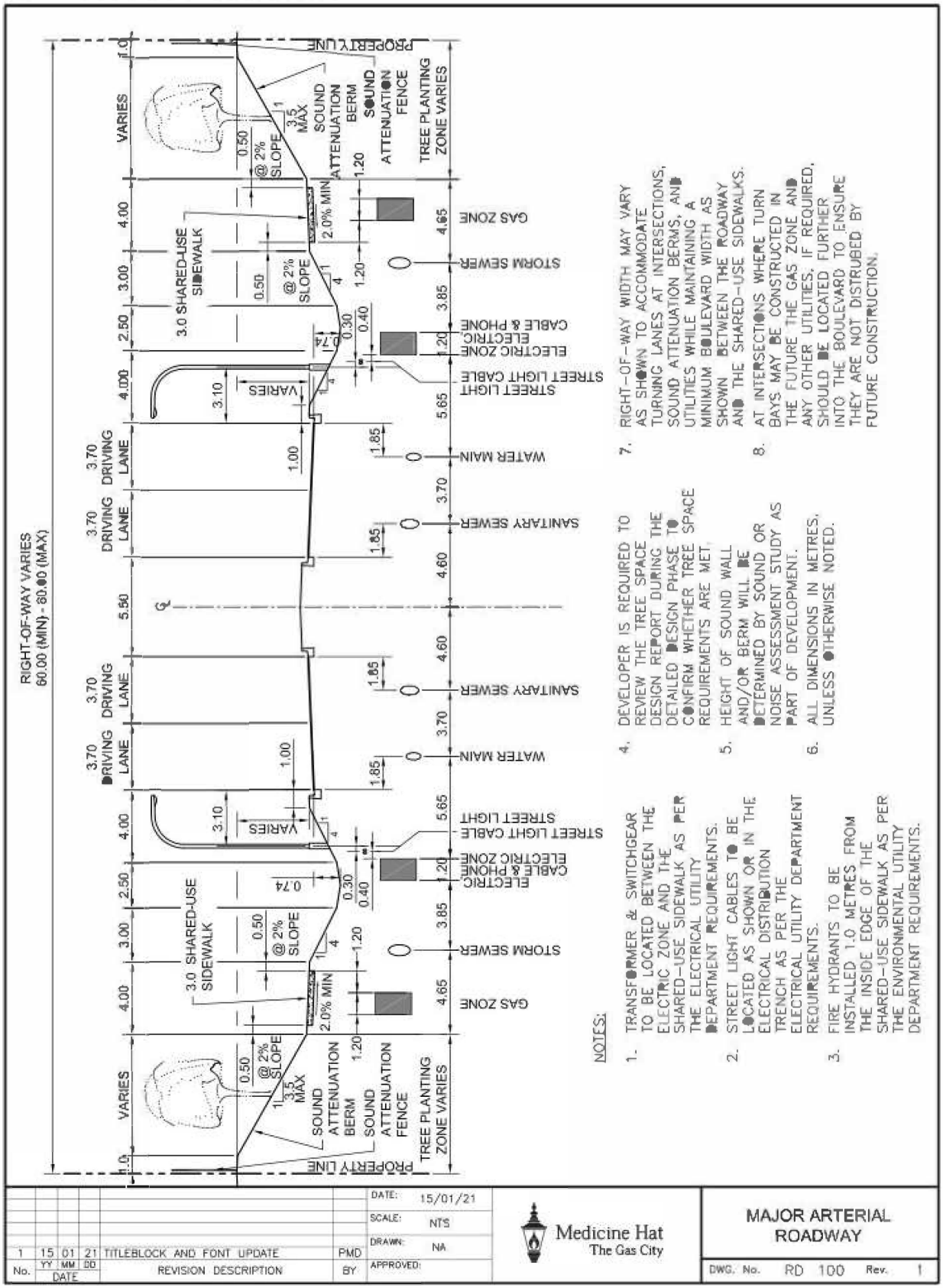
## 8.18 TRANSIT REQUIREMENT

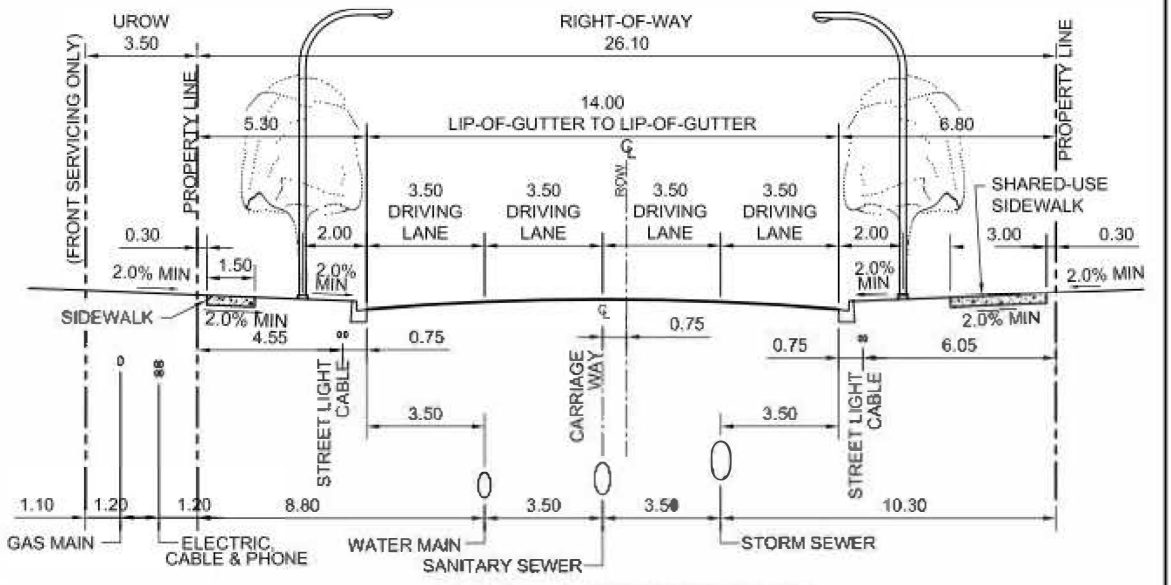
In accordance with current City of Medicine Hat policy, all residences should be within a 400m walking distance of an existing or proposed bus stop. Bus stops shall be designed in accordance with the Canadian Urban Transit Association, and the Barrier Free Design Guide. A drawing showing the proposed extension of the transit route, including location of proposed bus stops and bus bays is to be submitted to the City. All proposed bus stops require accessible pedestrian access which includes wheelchair ramps and sidewalks.

The construction of driveways and or vehicular access across bus stop waiting areas is prohibited. Restrictive Covenants must be registered on the affected lots to prohibit vehicular access across bus stop waiting areas.

In order to minimize pavement wear, a concrete bus pad should be constructed on the roadway at bus stop locations. The concrete bus pad should be a minimum of 3.0 m wide, stretching across the entire lane or bay over which a bus would stop. The concrete bus pad thickness shall be designed for the local soil conditions and shall be submitted as part of pavement structural design report for the development.

## 8.19 TYPICAL ROADWAYS CROSS SECTION

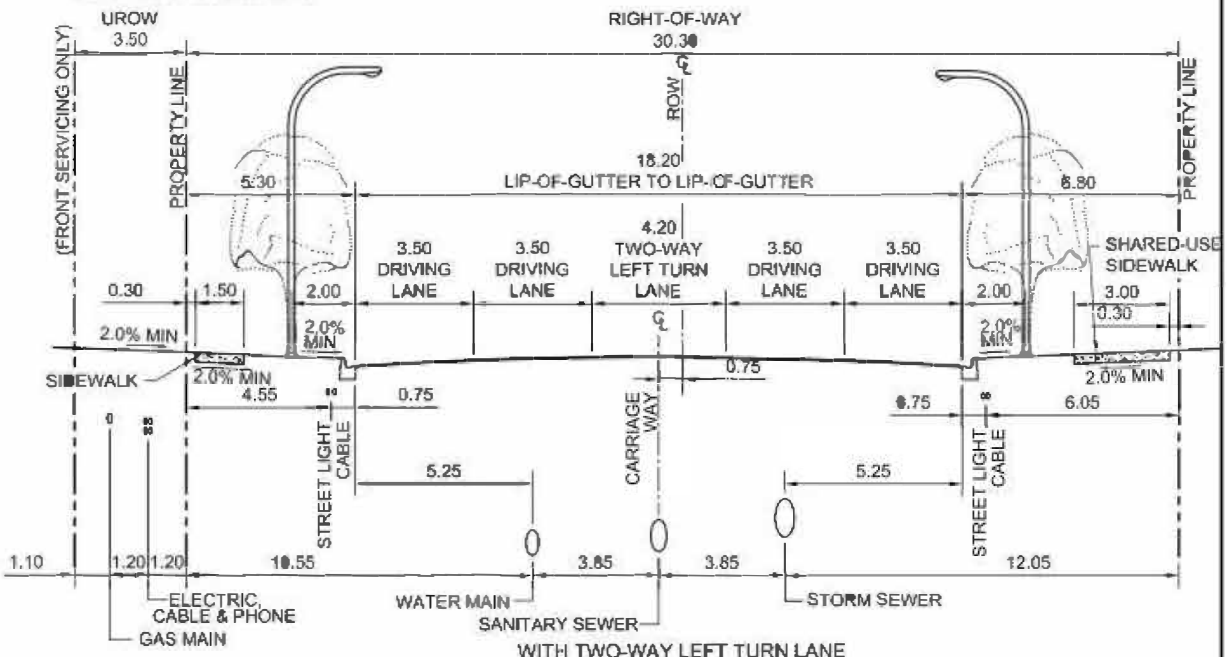





WITHOUT TWO-WAY LEFT TURN LANE

NOTES:

1. UROW ARE REQUIRED FOR FRONT SERVICING AND MAY BE REQUIRED ON BOTH SIDES OF THE ROAD RIGHT-OF-WAY.
2. TRANSFORMER TO BE CENTERED 1.2 METRES INSIDE PROPERTY LINE PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
3. STREET LIGHT CABLES TO BE LOCATED AS SHOWN OR IN THE ELECTRICAL DISTRIBUTION TRENCH AS PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
4. FIRE HYDRANTS TO BE INSTALLED 1.50 METRES BEHIND LIP-OF-GUTTER FOR SEPARATE AND SHARED-USE SIDEWALK AS PER THE ENVIRONMENTAL UTILITY DEPARTMENT REQUIREMENTS.
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.
7. RIGHT-OF-WAY WIDTH MAY VARY AS SHOWN TO ACCOMMODATE TURNING LANES AT INTERSECTIONS WHILE MAINTAINING A MINIMUM BOULEVARD WIDTH AS SHOWN BETWEEN THE ROADWAY AND THE SIDEWALKS.




WITH TWO-WAY LEFT TURN LANE

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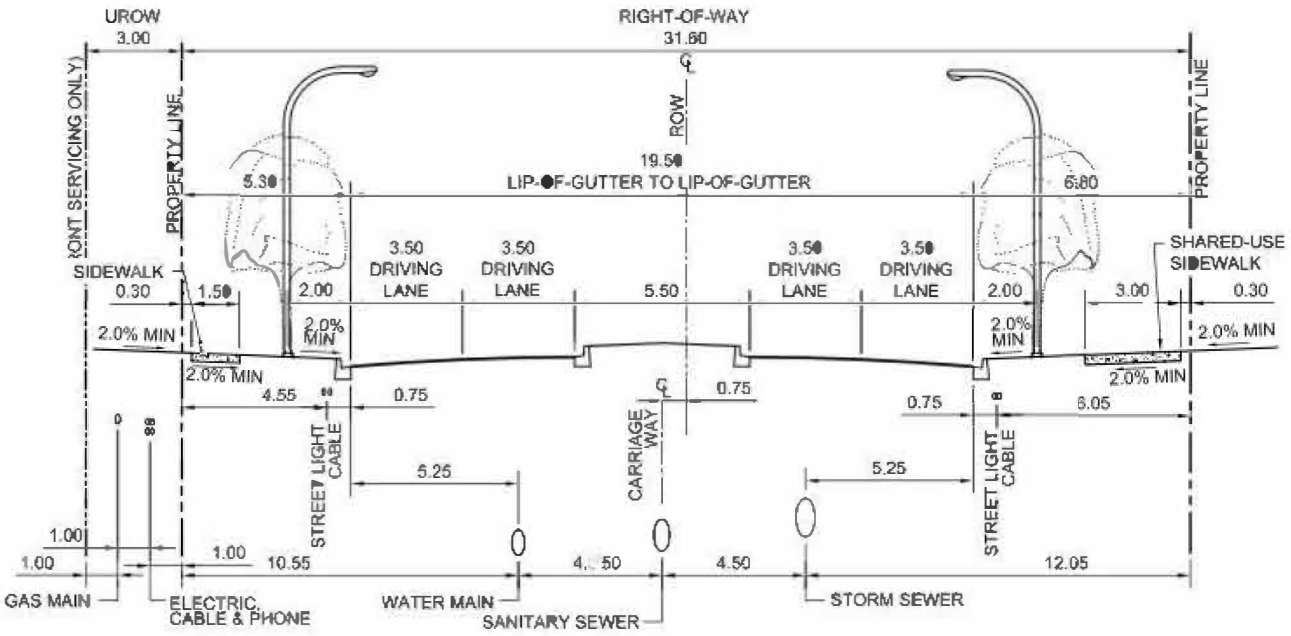
APPROVED:

Medicine Hat
The Gas City

MAJOR COLLECTOR ROADWAY
INDUSRIAL/COMMERCIAL
DISTRICTS

DWG. No. RD 102 Rev. 1




SEPARATE SIDEWALK SECTION

NOTES:

1. UROW ARE REQUIRED FOR FRONT SERVICING.
2. TRANSFORMER TO BE CENTERED 1.0 METRE INSIDE PROPERTY LINE PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
3. STREET LIGHT CABLES TO BE LOCATED AS SHOWN OR IN THE ELECTRICAL DISTRIBUTION TRENCH AS PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
4. FIRE HYDRANTS TO BE INSTALLED 1.50 METRES BEHIND LIP-OF-GUTTER FOR SEPARATE AND SHARED-USE SIDEWALK AS PER THE ENVIRONMENTAL UTILITY DEPARTMENT REQUIREMENTS.
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. IF ELECTRIC, CABLE AND PHONE SERVICES ARE INSTALLED WITHIN THE LANE/ALLEY, 3.0 METRE UROW WILL THEN BE REDUCED TO 1.5 METRE FOR GAS SERVICING.
7. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.
8. RIGHT-OF-WAY WIDTH MAY VARY AS SHOWN TO ACCOMMODATE TURNING LANES AT INTERSECTIONS WHILE MAINTAINING A MINIMUM BOULEVARD WIDTH AS SHOWN BETWEEN THE ROADWAY AND THE SIDEWALKS.
9. OUTSIDE DRIVING LANE MAY BE USED AS A PARKING LANE, SUBJECT TO CITY APPROVAL.
10. STREET LIGHT MAY BE INSTALLED IN THE CENTER MEDIAN TO REDUCE CONFLICTS WITH TREES AND PROVIDE BETTER ILLUMINATION.

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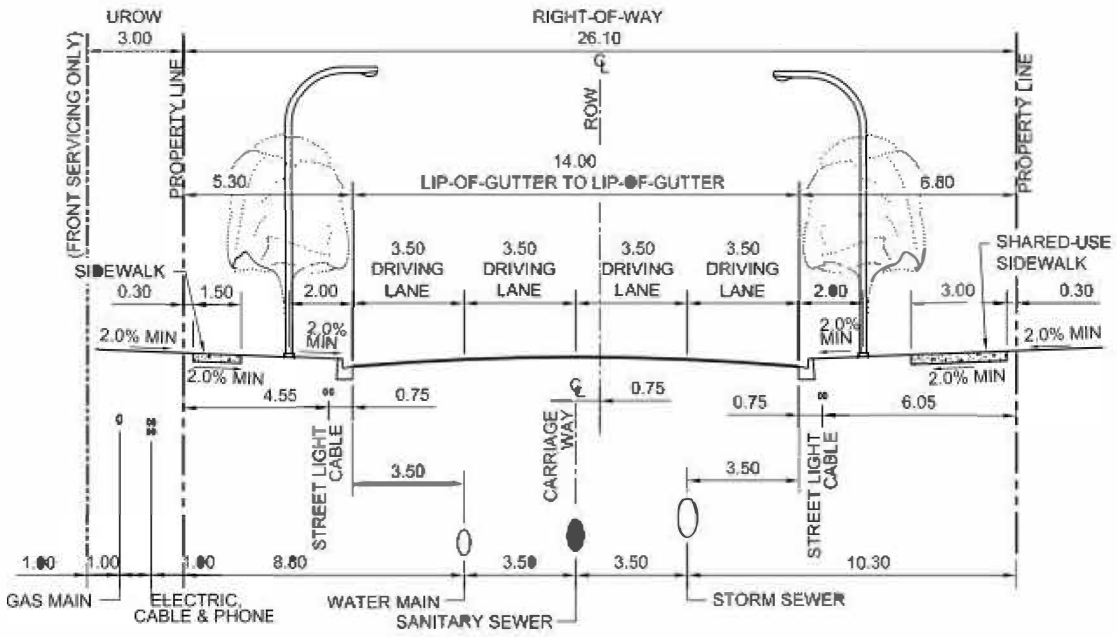
Medicine Hat
The Gas City

MAJOR COLLECTOR
ROADWAY DIVIDED
RESIDENTIAL DISTRICTS

DWG. No. RD 10.3 Rev. 1



Medicine Hat




SEPARATE SIDEWALK SECTION

NOTES:

1. UROW ARE REQUIRED FOR FRONT SERVICING.
2. TRANSFORMER TO BE CENTERED 1.0 METRE INSIDE PROPERTY LINE PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
3. STREET LIGHT CABLES TO BE LOCATED AS SHOWN OR IN THE ELECTRICAL DISTRIBUTION TRENCH AS PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
4. FIRE HYDRANTS TO BE INSTALLED 1.50 METRES BEHIND LIP-OF-GUTTER FOR SEPARATE AND SHARED-USE SIDEWALK AS PER THE ENVIRONMENTAL UTILITY DEPARTMENT REQUIREMENTS.
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. IF ELECTRIC, CABLE AND PHONE SERVICES ARE INSTALLED WITHIN THE LANE/ALLEY, 3.0 METRE UROW WILL THEN BE REDUCED TO 1.5 METRE FOR GAS SERVICING.
7. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.
8. RIGHT-OF-WAY WIDTH MAY VARY AS SHOWN TO ACCOMMODATE TURNING LANES AT INTERSECTIONS WHILE MAINTAINING A MINIMUM BOULEVARD WIDTH AS SHOWN BETWEEN THE ROADWAY AND THE SIDEWALKS.
9. OUTSIDE DRIVING LANE MAY BE USED AS A PARKING LANE, SUBJECT TO CITY APPROVAL.

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APPROVED:

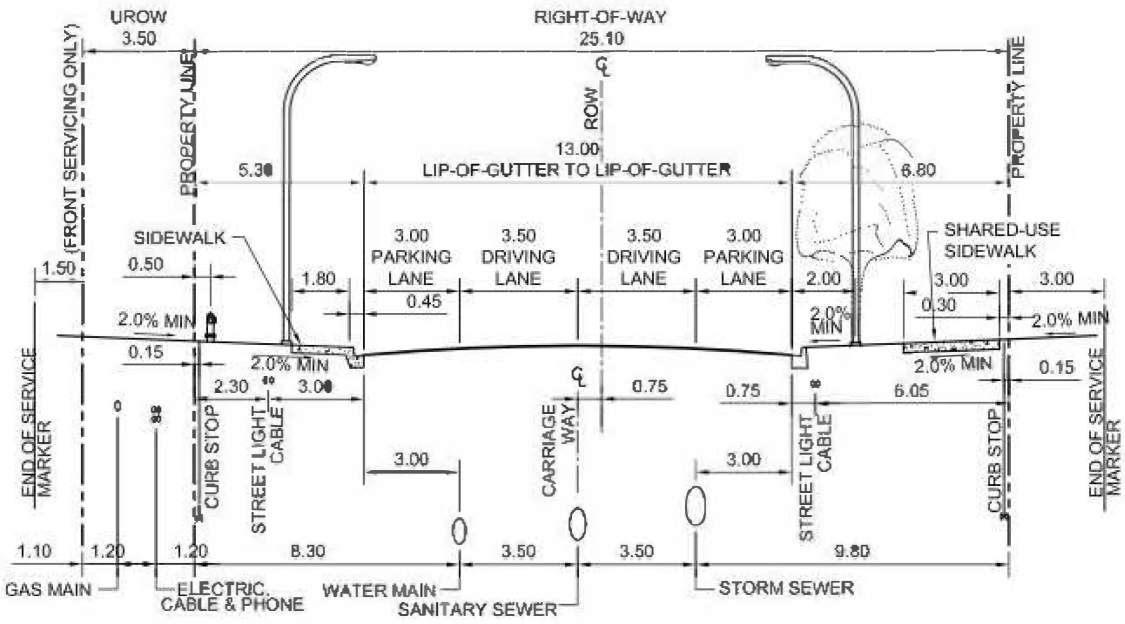
Medicine Hat
The Gas City

DWG: No RD 104 Rev. 1

MAJOR COLLECTOR
ROADWAY UNDIVIDED
RESIDENTIAL DISTRICTS



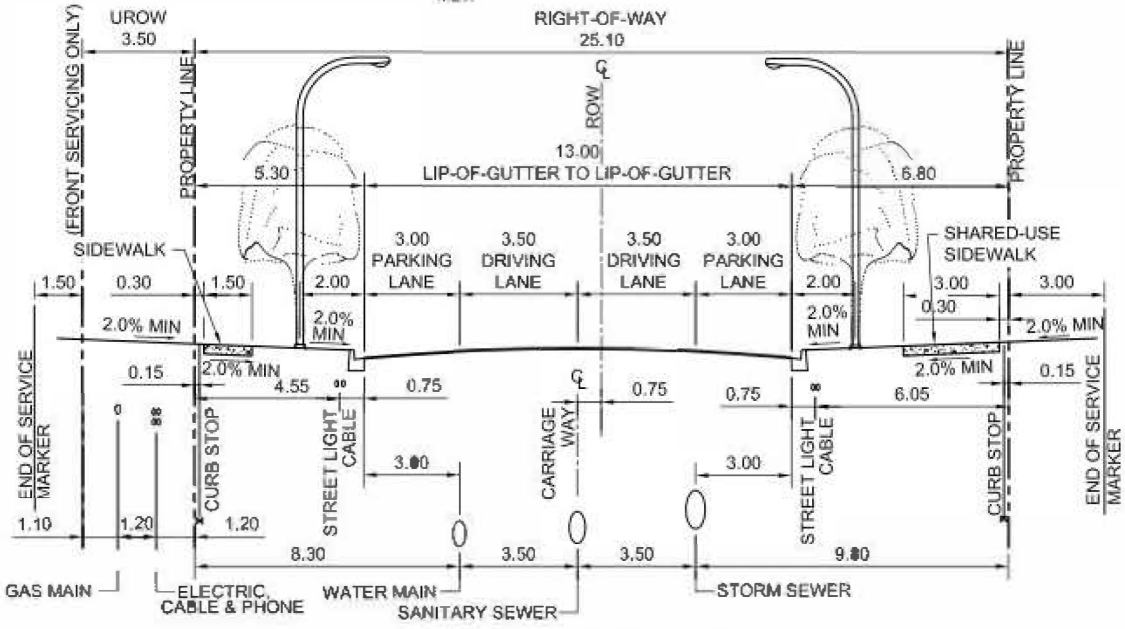
Medicine Hat




MONOLITHIC SIDEWALK SECTION

NOTES:

1. UROW ARE REQUIRED FOR FRONT SERVICING.
2. TRANSFORMER SHALL BE CENTERED 1.2 METRES INSIDE PROPERTY LINE PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
3. STREET LIGHT CABLES SHALL BE LOCATED AS SHOWN OR IN THE ELECTRICAL DISTRIBUTION TRENCH AS PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
4. FIRE HYDRANTS SHALL BE INSTALLED 1.50 METRES BEHIND LIP-OF-GUTTER FOR SEPARATE AND SHARED-USE SIDEWALK AS PER THE ENVIRONMENTAL UTILITY DEPARTMENT REQUIREMENTS.
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. FOR SECTIONS WITH MONOLITHIC SIDEWALKS ONLY, ALIGNMENT OF STREET LIGHT BASES SHALL BE ADJACENT TO THE BACK OF WALK.
7. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.




SEPARATE SIDEWALK SECTION

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MINOR COLLECTOR ROADWAY
INDUSTRIAL/ COMMERCIAL
DISTRICTS

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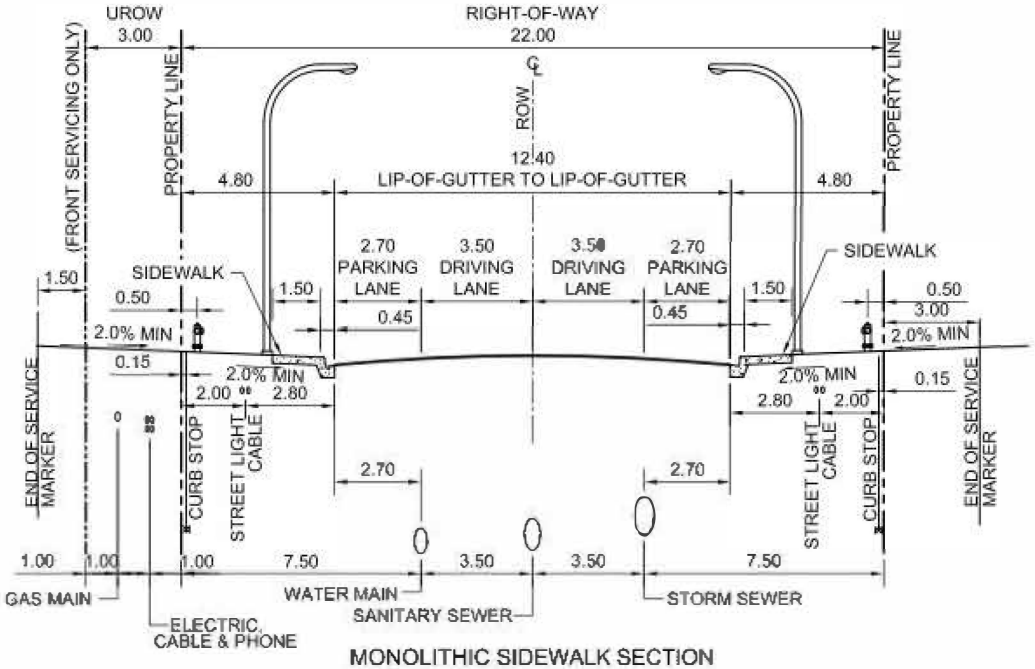


MONOLITHIC SIDEWALK SECTION

NOTES:

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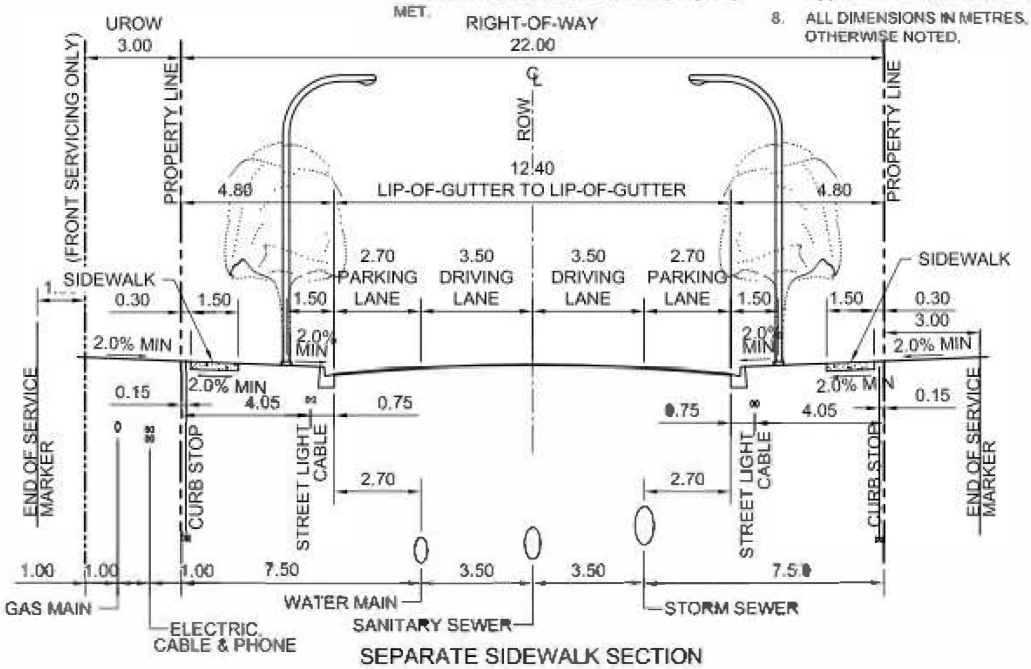
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. IF ELECTRIC, CABLE AND PHONE SERVICES ARE INSTALLED WITHIN THE LANE/ALLEY, 3.0 METRE UROW WILL THEN BE REDUCED TO 1.5 METRE FOR GAS SERVICING
7. FOR SECTIONS WITH MONOLITHIC SIDEWALKS ONLY, ALIGNMENT OF STREET LIGHT BASES SHALL BE ADJACENT TO THE BACK OF WALK.
8. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.




SEPARATE SIDEWALK SECTION

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Medicine Hat
The Gas City

MINOR COLLECTOR ROADWAY
RESIDENTIAL DISTRICTS

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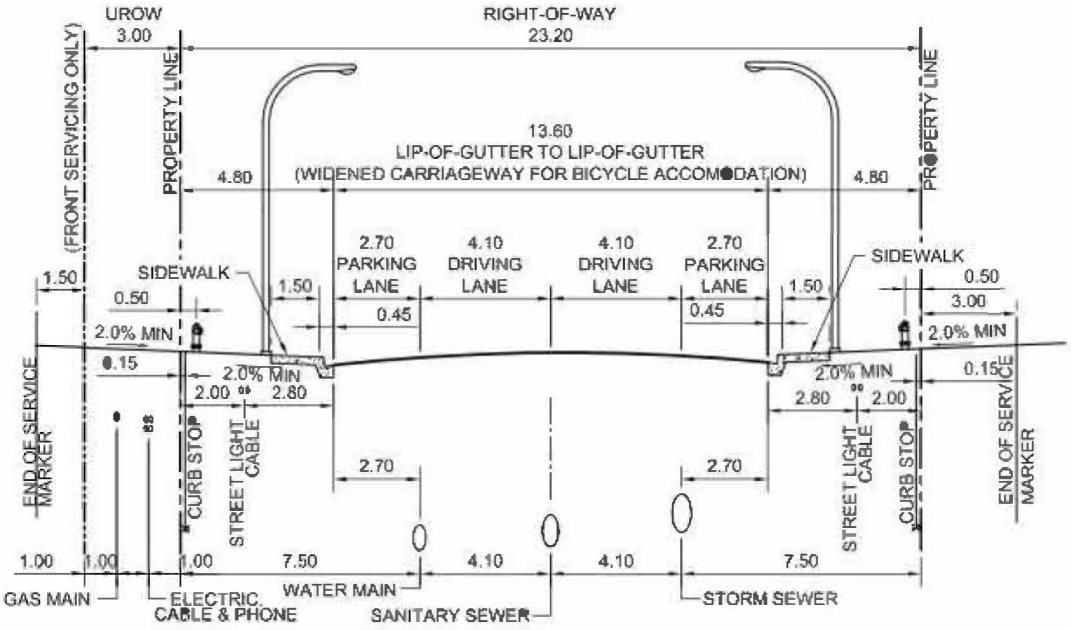
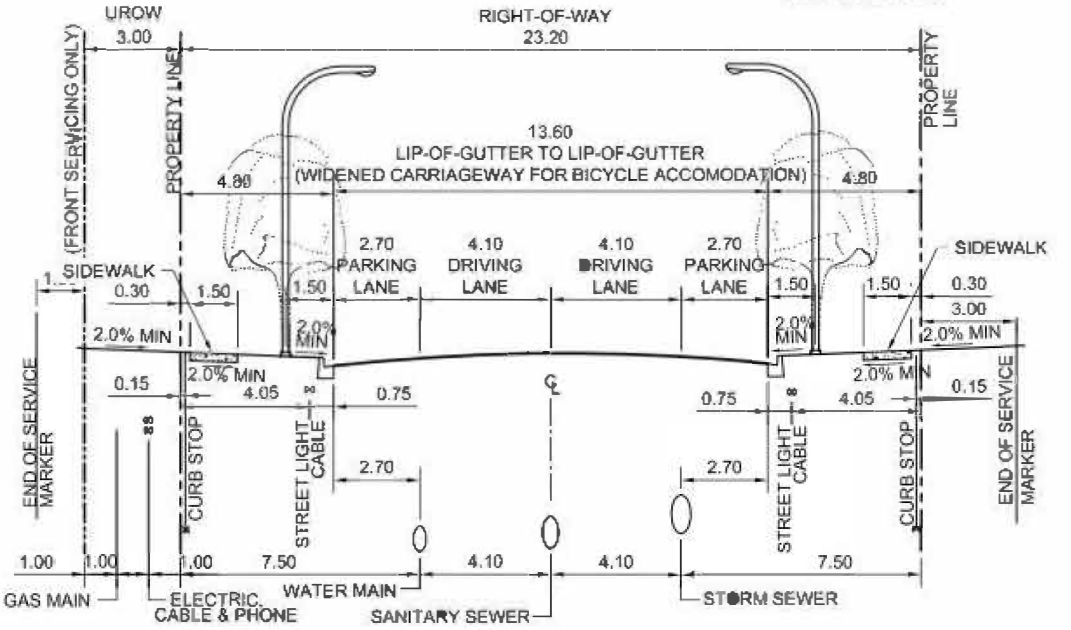



MONOLITHIC SIDEWALK SECTION

NOTES:

1. UROW ARE REQUIRED FOR FRONT SERVICING.
2. TRANSFORMER SHALL BE CENTERED 1.0 METRES INSIDE PROPERTY LINE PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
3. STREET LIGHT CABLES SHALL BE LOCATED AS SHOWN OR IN THE ELECTRICAL DISTRIBUTION TRENCH AS PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
4. FIRE HYDRANTS SHALL BE INSTALLED 1.50 METRES BEHIND LIP-OF-GUTTER FOR SEPARATE AND SHARED-USE SIDEWALK AS PER THE ENVIRONMENTAL UTILITY DEPARTMENT REQUIREMENTS.
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. IF ELECTRIC, CABLE AND PHONE SERVICES ARE INSTALLED WITHIN THE LANE/ALLEY, 3.0 METRE UROW WILL THEN BE REDUCED TO 1.5 METRE FOR GAS SERVICING
7. FOR SECTIONS WITH MONOLITHIC SIDEWALKS ONLY, ALIGNMENT OF STREET LIGHT BASES SHALL BE ADJACENT TO THE BACK OF WALK.
8. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.




SEPARATE SIDEWALK SECTION

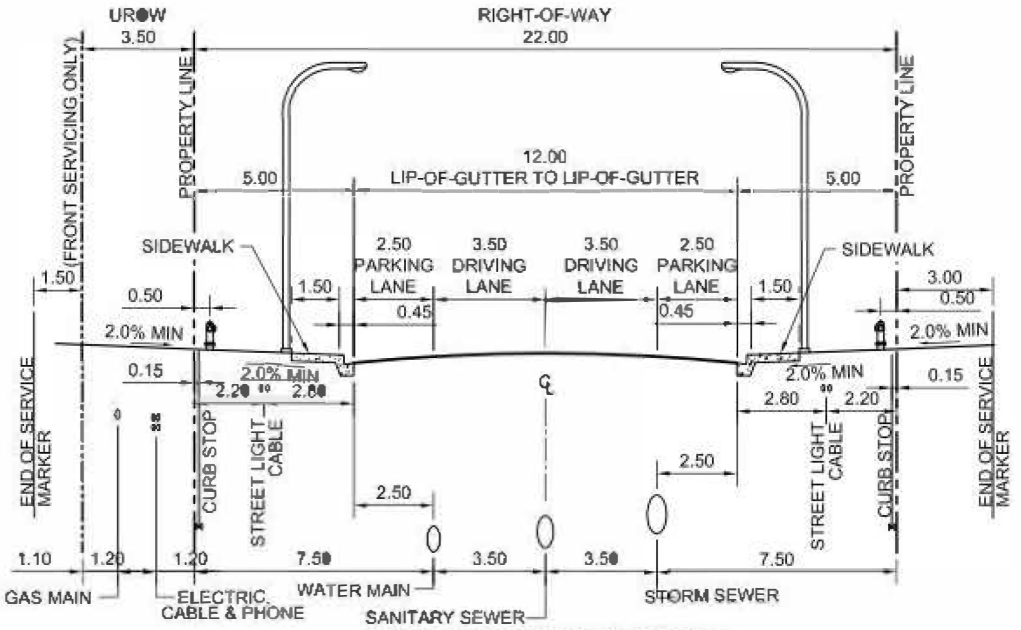
| No. | DATE (YY MM DD) | REVISION DESCRIPTION | BY |
|---|---|---|---|
| 1 | 15 01 21 | TITLEBLOCK AND FONT UPDATE | PMD |

DATE: 15/01/21
SCALE: NTS
DRAWN: NA
APPROVED:

Medicine Hat
The Gas City

MINOR COLLECTOR ROADWAY
WIDENED CARRIAGEWAY
RESIDENTIAL DISTRICTS

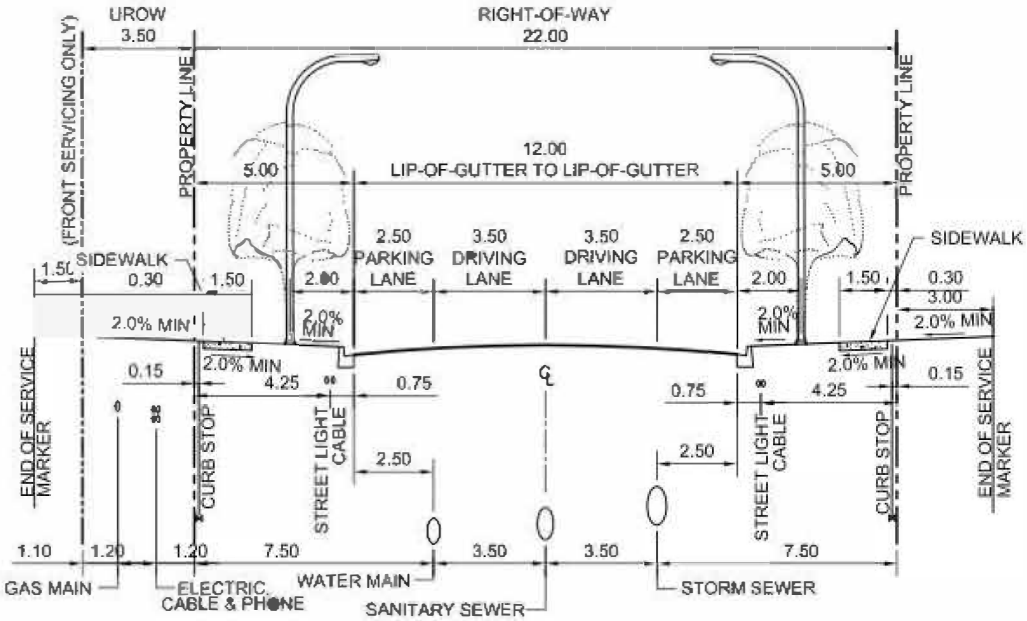
DWG. No. RD 107 Rev. 1




MONOLITHIC SIDEWALK SECTION

NOTES:

1. UROW ARE REQUIRED FOR FRONT SERVICING.
2. TRANSFORMER SHALL BE CENTERED 1.2 METRES INSIDE PROPERTY LINE PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
3. STREET LIGHT CABLES SHALL BE LOCATED AS SHOWN OR IN THE ELECTRICAL DISTRIBUTION TRENCH AS PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
4. FIRE HYDRANTS SHALL BE INSTALLED 1.50 METRES BEHIND LIP-OF-GUTTER FOR SEPARATE AND SHARED-USE SIDEWALK AS PER THE ENVIRONMENTAL UTILITY DEPARTMENT REQUIREMENTS.
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. FOR SECTIONS WITH MONOLITHIC SIDEWALKS ONLY, ALIGNMENT OF STREET LIGHT BASES SHALL BE ADJACENT TO THE BACK OF WALK.
7. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.




SEPARATE SIDEWALK SECTION

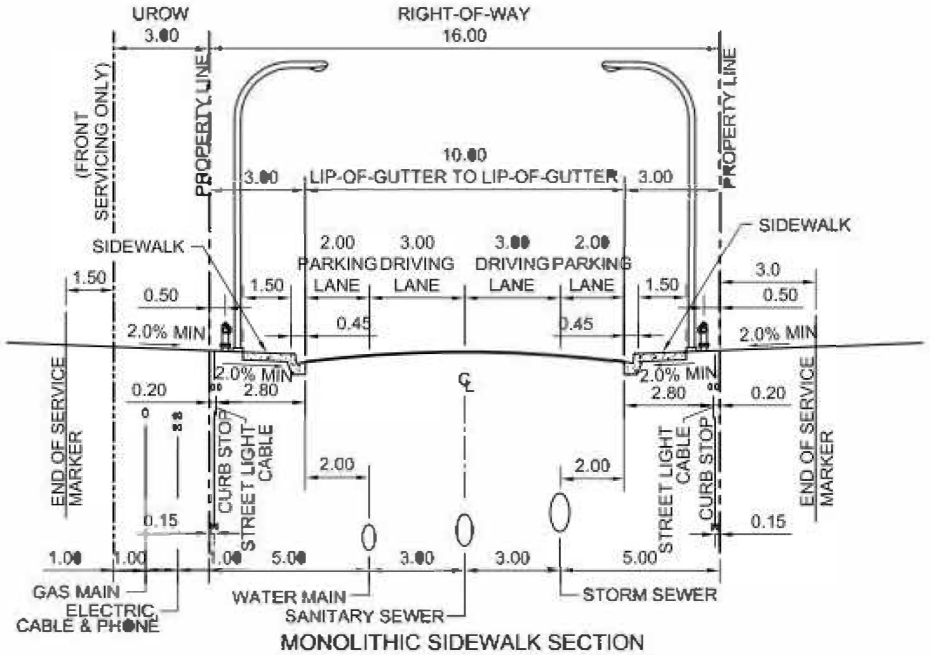
| No. | YY | MM | DD | REVISION DESCRIPTION | BY |
|---|---|---|---|---|---|
| 1 | 15 | 01 | 21 | TITLEBLOCK AND FONT UPDATE | PMD |

DATE: 15/01/21
SCALE: NTS
DRAWN: NA
APPROVED:

Medicine Hat
The Gas City

LOCAL ROADWAY
INDUSTRIAL/COMMERCIAL
DISTRICTS

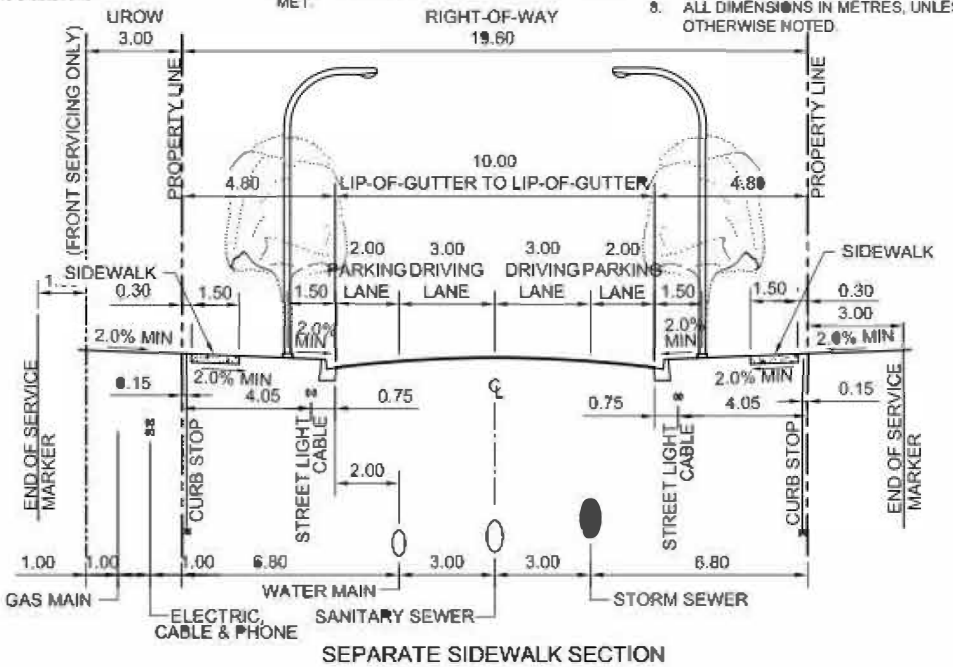
DWG. No. RD 108 Rev. 1




MONOLITHIC SIDEWALK SECTION

NOTES:

1. UROW ARE REQUIRED FOR FRONT SERVICING.
2. TRANSFORMER SHALL BE CENTERED 1.0 METRES INSIDE PROPERTY LINE PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
3. STREET LIGHT CABLES SHALL BE LOCATED AS SHOWN OR IN THE ELECTRICAL DISTRIBUTION TRENCH AS PER THE ELECTRICAL UTILITY DEPARTMENT REQUIREMENTS.
4. FIRE HYDRANTS SHALL BE INSTALLED 1.50 METRES BEHIND LIP-OF-GUTTER FOR SEPARATE AND SHARED-USE SIDEWALK AS PER THE ENVIRONMENTAL UTILITY DEPARTMENT REQUIREMENTS.
5. DEVELOPER IS REQUIRED TO REVIEW THE TREE SPACE DESIGN REPORT DURING THE DETAILED DESIGN PHASE TO CONFIRM WHETHER TREE SPACE REQUIREMENTS ARE MET.
6. IF ELECTRIC, CABLE AND PHONE SERVICES ARE INSTALLED WITHIN THE LANE/ALLEY, 3.0 METRE UROW WILL THEN BE REDUCED TO 1.5 METRE FOR GAS SERVICING
7. FOR SECTIONS WITH MONOLITHIC SIDEWALKS ONLY, ALIGNMENT OF STREET LIGHT BASES SHALL BE ADJACENT TO THE BACK OF WALK.
8. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.




SEPARATE SIDEWALK SECTION

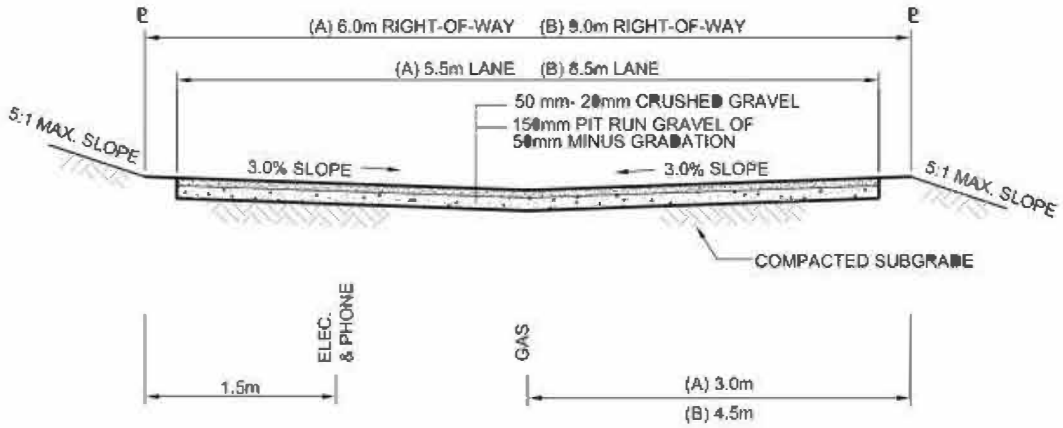
| No. | DATE (YY MM DD) | REVISION DESCRIPTION | BY |
|---|---|---|---|
| 1 | 15 01 21 | TITLEBLOCK AND FONT UPDATE | PMD |

DATE: 15/01/21
SCALE: NTS
DRAWN: NA
APPROVED:

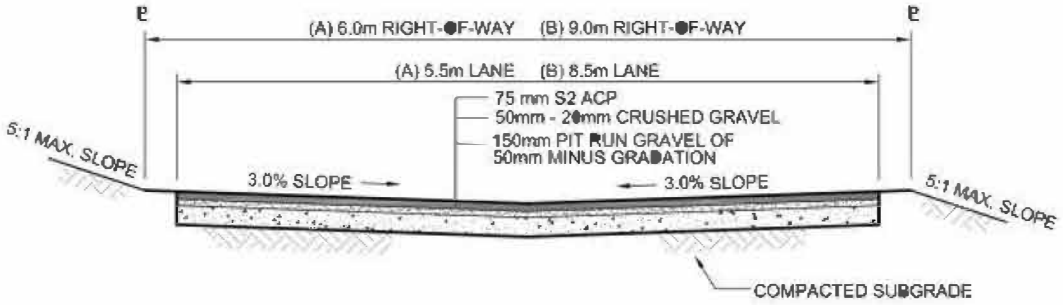
Medicine Hat
The Gas City

LOCAL ROADWAY
RESIDENTIAL DISTRICTS

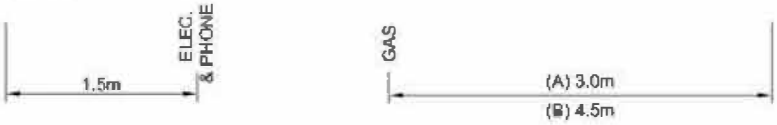
DWG. No. RD 109 Rev. 1




GRAVEL LANE/ALLEY




150mm PIT RUN GRAVEL OF 50mm MINUS GRADATION




(A) RESIDENTIAL - 6m ROW
(B) COMMERCIAL/ INDUSTRIAL - 9m ROW

PAVED LANE/ALLEY

NOTES:

1. ALL DIMENSIONS IN METRES, UNLESS OTHERWISE NOTED.
2. MINIMUM LONGITUDINAL GRADE OF LANES SHALL BE 0.7%.

| No. | DATE (YY MM DD) | REVISION DESCRIPTION | BY |
|---|---|---|---|
| 1 | 15 01 21 | TITLEBLOCK AND FONT UPDATE | PMD |

DATE: 15/01/21
SCALE: NTS
DRAWN: NA
APPROVED:

Medicine Hat
The Gas City

GRAVEL & PAVED LANE / ALLEY

DWG. No. RD 110 Rev. 1

## 8.20 FUNCTIONAL REQUIREMENTS

# Major Arterial Roadway

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| >20,000 | 4 (min) | WB - 21 | Variable (see cross section) | 400 m |

### FUNCTION

- Cross-city traffic movement and connections between highways
- Primary purpose: Traffic Movement
  Transportation and Drainage Corridor
- Secondary purpose: Restricted neighborhood access
  Utility corridor Evacuation Route
- Spacing optimally at section lines or approximately 1.6 km on center (may be replaced by a higher classification of road)

### ACCESS CONDITIONS

- Direct Driveway Access is restricted. All-turns driveways are prohibited unless access traffic volumes warrant a signalized intersection. Access design to conform to Access Management guidelines in TAC Standard,
- A minimum spacing of 400 m between signalized intersections should be maintained unless otherwise approved by the City Planner and Director of Development Services to accommodate exceptional situations,
- Major Arterial roadway may intersect with, other Major Arterial roadways, Minor Arterial roadways, Major Collector roadways and Country Residential roadways.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 60, 70, or 80 |
| **Parking** | Not permitted on new roadways |
| **Pavement Width** | 7.4 m in each direction |
| **Sidewalk** | 3.0 m shared-use sidewalk on both sides |
| **Traffic Signals** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation |
| **Accessible Pedestrian Crossing** | At grade, intersections only |
| **Bus Route** | Yes, No stops |
| **Truck Route** | Yes |
| **Sound Attenuation** | Height of sound wall and/or berm will be determined by sound or noise assessment study as part of new development |

### NOTE

- New Major Arterial roadways are to be provided with sufficient ROW at intersections for the construction of auxiliary lanes and turning lanes and may requireROW for grade separated interchange.
- 2 – 3.7 m wide driving lanes in each direction of travel separated by a 5.5 m wide median. Left or rightturning lane width - 3.7 m.
- Speed differential between through traffic andturning vehicles limited to 25 km/h.
- Signalized intersections spaced to permit efficient2-way progression between intersections at desirable operational speeds. i.e., stopped vehicle delay for new areas LOS C (overall) with no approach or movement below LOS D. Stopped delay in built up area to be LOS D with no approach or movement below LOS E.
- Progression band cycle length (%) = 40% min (25% at peak hour).
- Auxiliary left & right turn lanes will be required at intersections, with adequate queuing lengths to limit speed differential and store all turning vehicles with a probability of 85 – 95%.
- Traffic signal cycle lengths = 45 – 90 seconds (90 – 120 seconds at peak hour).
- ROW width will vary depending on the height and/orneed for sound berm.

**TYPICAL CROSS SECTION** **RD-100**

# Minor Arterial Roadway

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| 10,000 – 30,000 | 4 | WB-21 | 36.3 m (min) | 200 m |

## FUNCTION

- Inter neighborhood or intercommunity traffic movement
- Primary purpose: Traffic Movement
  Transportation and Drainage Corridor
- Secondary purpose: Restricted property access
  Utility corridor Evacuation Route
- Spacing optimally at section lines or approximately 1.6 km on center (may be replaced by a higher classification of road)

## ACCESS CONDITIONS

- Direct Driveway Access is restricted. All-turns driveways are prohibited unless access traffic volumes warrant a signalized intersection. Access design to conform to Access Management guidelines in TAC Standard,
- A desirable spacing of 400m between signalized intersections should be maintained unless otherwise approved by the City Planner and Director of Development Services to accommodate exceptional situations,
- Arterial roadways may intersect with, other Arterial roadways, Collector roadways, Local Industrial roadways, and Country Residential roadways.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 50, 60, or 70 |
| **Parking** | Not permitted on new roadways |
| **Pavement Width** | 7.4 m in each direction (min) |
| **Sidewalk** | 3.0 m shared-use sidewalk on both sides |
| **Traffic Signals** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation |
| **Accessible Pedestrian Crossing** | At grade, intersections only |
| **Bus Route** | Yes, Stops require turnouts or bus bays |
| **Truck Route** | Yes |
| **Sound Attenuation** | Height of sound wall and/or berm will be determined by sound or noise assessment study as part of new development |

## NOTE

- New Minor Arterial Roadways are to be provided with sufficient ROW at intersections for the construction of auxiliary lanes and turning lanes when they are required.
- 2 – 3.7 m wide driving lanes in each direction of travel separated by a 5.5 m wide median. Left or right turning lane width - 3.7 m.
- Speed differential between through traffic and turning vehicles limited to 25 km/h.
- Signalized intersections spaced to permit efficient 2-way progression between intersections at desirable operational speeds. i.e., stopped vehicle delay for new areas LOS C (overall) with no approach or movement below LOS D. Stopped delay in built up area to be LOS D with no approach or movement below LOS E.
- Progression band cycle length (%) = 40% min (25% at peak hour).
- Auxiliary left & right turn lanes may be required at intersections, with adequate queuing lengths to limit speed differential and store all turning vehicles with a probability of 85 – 95%.
- Traffic signal cycle lengths = 45 – 90 seconds (90 – 120 seconds at peak hour).
- ROW width will vary depending on the height and/or need for sound berm.

**TYPICAL CROSS SECTION** **RD-101**

# Major Collector Roadway - Industrial/Commercial Districts

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| 1,000 – 12,000 | 4 | WB-21 | 26.10 m (min) | 60 m |

## FUNCTION

- Primary purpose: Traffic Movement
  Transportation and Drainage Corridor
- Secondary purpose: Controlled property access
  Utility corridor Evacuation Route
- Used where the Daily Traffic Volumes exceed the volumes for a Minor Collector Roadway but are 12,000 vehicles/day or less
- To serve secondary traffic generators, such as neighborhood commercial centers, parks, and golf courses, and inter neighborhood travel

## ACCESS CONDITIONS

- Direct Driveway Access is controlled. Access design to conform to Access Management guidelines in TAC Standard,
- Desirable intersection spacing of 200 m should be maintained unless otherwise approved by the City Planner and Director of Development Services to accommodate exceptional situations. In no case shall intersection spacing be less than 60 m,
- Major Collector Roadways may intersect with Local roadways, other Collector roadways, and Arterial roadways but not with lanes/alleys.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 50 or 60 |
| **Parking** | Restricted |
| **Pavement Width** | 2 x 3.5 m wide driving lanes in each direction = 14.0 m |
| **Sidewalk** | 3.0 m shared-use sidewalk on one side and 1.5 m separate walk with 3.5 m min boulevards |
| **Traffic Signals** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation |
| **Accessible Pedestrian Crossing** | At grade, intersections only |
| **Bus Route** | Yes, Bus stops are signed |
| **Truck Route** | Restricted |
| **Sound Attenuation** | Not required |

## NOTE

- Major Collector roadways are undivided roadways.
- Outside driving lanes may be used as parking lanes.
- 2 – 3.5 m wide driving lanes in each direction for a total of 4 driving lanes. Left or right turning lane width - 3.5 m and TWLTL 4.2 m wide, if required.
- Signalized intersections spaced to permit efficient 2-way progression between intersections at desirable operational speeds. i.e., stopped vehicle delay for new areas LOS C (overall) with no approach or movement below LOS D. Stopped delay in built up area to be LOS D with no approach or movement below LOS E.
- Major Collector roadways may be used as a restricted truck route.

**TYPICAL CROSS SECTION** **RD-102**

CONTENTS

# Major Collector Divided Roadway - Residential Districts

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| 1,000 – 12,000 | 4 | WB-15 | 31.60 m | 60 m |

## FUNCTION

- Primary purpose: Traffic Movement
  Transportation and Drainage Corridor
- Secondary purpose: Controlled property access
  Utility corridor Evacuation Route
- Used where the Daily Traffic Volumes exceed the volumes for a Minor Collector Roadway but are 12,000 vehicles/day or less
- To serve secondary traffic generators, such as neighborhood commercial centers, parks, and golf courses, and inter neighborhood travel

## ACCESS CONDITIONS

- Direct Driveway Access is controlled. Access design to conform to Access Management guidelines inTAC Standard,
- Desirable intersection spacing of 200 m should be maintained unless otherwise approved by City Planner and Director of Development Services to accommodate exceptional situations. In no case shall intersection spacing be less than 60 m,
- Major Collector Roadways may intersect with Local roadways, other Collector roadways, andArterial roadways but not with lanes/alleys.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 50 or 60 |
| **Parking** | Restricted |
| **Pavement Width** | 2 x 3.5 m wide driving lanes in each direction + 5.50 m median = 19.5 m |
| **Sidewalk** | 3.0 m shared use sidewalk on one side and 1.5 m separate walk |
| **Traffic Signals** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation |
| **Accessible Pedestrian Crossing** | At grade, intersections only |
| **Bus Route** | Yes, Bus stops are signed |
| **Truck Route** | Restricted |
| **Sound Attenuation** | Not required |

## NOTE

- Major Collector roadways are undivided roadways.
- Outside driving lanes may be used as parking lanes.
- 2 – 3.5 m wide driving lanes in each direction for a total of 4 driving lanes. Left or right turning lane width - 3.5 m.
- Signalized intersections spaced to permit efficient 2-way progression between intersections at desirable operational speeds. i.e., stopped vehicle delay for new areas LOS C (overall) with no approach or movement below LOS D. Stopped delay in built up area to be LOS D with no approach or movement below LOS E.
- Industrial/Commercial Major Collector roadways may be designated as a truck route.

**TYPICAL CROSS SECTION** **RD-103**

CONTENTS

# Major Collector Undivided Roadway - Residential Districts

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| 1,000 – 12,000 | 4 | WB-15 | 26.10 m (min) | 60 m |

## FUNCTION

- Primary purpose: Traffic Movement
  Transportation and Drainage Corridor
- Secondary purpose: Controlled property access
  Utility corridor Evacuation Route
- Used where the Daily Traffic Volumes exceed the volumes for a Minor Collector Roadway but are 12,000 vehicles/day or less
- To serve secondary traffic generators, such as neighborhood commercial centers, parks, and golf courses, and inter neighborhood travel

## ACCESS CONDITIONS

- Direct Driveway Access is controlled. Access design to conform to Access Management guidelines inTAC Standard,
- Desirable intersection spacing of 200 m should be maintained unless otherwise approved by the City Planner and Director of Development Services to accommodate exceptional situations. In no case shall intersection spacing be less than 60 m,
- Major Collector Roadways may intersect with Local roadways, other Collector roadways, and Arterial roadways but not with lanes/alleys.

| TRAFFIC FEATURES | | NOTE |
|---|---|---|
| **Posted Speed (km/h)** | 50 or 60 | • Outside driving lanes may be used as parking lanes.<br>• 2 – 3.5 m wide driving lanes in each direction. Left or right turning lane width - 3.5 m.<br>• Signalized intersections spaced to permit efficient 2-way progression between intersections at desirable operational speeds. i.e., stopped vehicle delay for new areas LOS C (overall) with no approach or movement below LOS D. Stopped delay in built up area to be LOS D with no approach or movement below LOS E. |
| **Parking** | Restricted | |
| **Pavement Width** | 2 x 3.5 m wide driving lanes in each direction = 14.0 m | |
| **Sidewalk** | 3.0 m shared-use sidewalk on one side and 1.5 m separate walk | |
| **Traffic Signals** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation | |
| **Accessible Pedestrian Crossing** | At grade, intersections only | |
| **Bus Route** | Yes, Bus stops are signed | |
| **Truck Route** | Restricted | |
| **Sound Attenuation** | Not required | **TYPICAL CROSS SECTION** **RD-104** |

# Minor Collector Roadway - Industrial/Commercial Districts

| DAILY TRAFFIC VOLUME - (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| 1,000 – 8,000 | 4 | WB - 21 | 25.10 m (min) | 60 m |

## FUNCTION

- Primary purpose: Traffic Movement Land access
  Transportation and Drainage Corridor
- Secondary purpose: Utility corridor
- To be used where the Daily Traffic Volumes exceed the volumes for a Local Industrial/ Commercial roadway but are less than 8,000 vehicles/day
- To collect and distribute traffic from Industrial/ Commercial Collector roadways, Major Collector roadways and Arterial roadways to roadways of a lower classification
- To serve secondary traffic generators, such as neighborhood commercial centers, parks, and golf courses, and inter neighborhood travel
- May be used as bus routes

## ACCESS CONDITIONS

- Direct Driveway Access is permitted to abutting properties in conformance with driveway requirements. Access design to conform to Access Management guidelines in TAC Standard,
- Desirable intersection spacing of 100m should be maintained unless otherwise approved by the City Planner and Director of Development Services to accommodate exceptional situations,
- Industrial/ Commercial Collector roadways may intersect with, Local Industrial/ Commercial roadways, other Industrial/ Commercial Collector roadways, Major Collector roadways and Arterial roadways,
- Intersections of Industrial/ Commercial Collector roadways with Local Residential roadways and Minor Collector roadways are discouraged.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 50 or 60 |
| **Parking** | Permitted<br>Except in transit zones |
| **Pavement Width** | 13.0 m |
| **Sidewalk** | 3.0 m shared-use sidewalk on one side and 1.5 m separate walk or 1.8 m monolithic sidewalk |
| **Traffic Signals** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation |
| **Accessible Pedestrian Crossing** | At grade, intersections only |
| **Bus Route** | Yes, Bus stops are signed |
| **Truck Route** | Yes |
| **Sound Attenuation** | Not required |

## NOTE

- Industrial/Commercial Urban Minor Collector roadways are undivided.
- 2 – 3.5 m wide driving lanes and 3.0 m wide parking lanes.
- No residential frontage is permitted.
- Signalized intersections spaced to permit efficient 2-way progression between intersections at desirable operational speeds. i.e., stopped vehicle delay for new areas LOS C (overall) with no approach or movement below LOS D. Stopped delay in built up area to be LOS D with no approach or movement below LOS E.
- Industrial/Commercial Urban Minor Collector roadways may be designated as a truck route.
- Considering the high percentage of heavy vehicles shared-use sidewalk proposed to accommodate bicyclist.
- 1.8 m mono sidewalk proposed to provide access from parking lane.

**TYPICAL CROSS SECTION** **RD-105**

CONTENTS

# Minor Collector Roadway - Residential Districts

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| 1,000 – 8,000 | 4 | SU | 22.00 m (min) | 60 m |

## FUNCTION

- Primary purpose: Traffic Movement Land access & Transportation and Drainage Corridor
- Secondary purpose: Utility corridor
- Used where the Daily Traffic Volumes exceed the volumes for a Local Residential roadway but are less than 8,000 vehicles/day or less
- To collect and distribute traffic from Major Collector roadways and Arterial roadways to roadways of a lower classification
- To serve secondary traffic generators, such as neighborhood commercial centers, multifamily sites, parks, and golf courses, and inter neighborhood travel
- May be used as bus routes

## ACCESS CONDITIONS

- Direct Driveway Access is permitted to abutting properties. Driveways to conform to the Land Use Bylaw unless traffic volumes exceed those from 20 residential development equivalent units when access design to conform to Access Management guidelines in TAC Standard,
- Desirable intersection spacing of 80m should be maintained unless otherwise approved by the City Planner and Director of Development Services to accommodate exceptional situations. In no case shall intersection spacing be less than 60 m,
- Minor Collector roadways may intersect with Local Residential roadways, other Collector roadways, Arterial roadways, and lanes/alleys.

| TRAFFIC FEATURES | | NOTE |
|---|---|---|
| **Posted Speed (km/h)** | 50 | • Minor Collector roadways are undivided.<br>• 2 – 3.5 m wide driving lanes and 2 - 2.7 m wide parking lanes.<br>• Alternate widened carriageway section for bicycle accommodation is 13.5 m wide with 2 – 4.10 m wide driving lanes and 2 – 2.7 m parking lanes. The widened section should considered when AADT>3,000 veh/day.<br>• Signalized intersections spaced to permit efficient 2-way progression between intersections at desirable operational speeds. i.e., stopped vehicle delay for new areas LOS C (overall) with no approach or movement below LOS D. Stopped delay in built up area to be LOS D with no approach or movement below LOS E.<br>• Construction, delivery, buses, and garbage trucks are permitted. |
| **Parking** | Permitted<br>Except at transit zones | |
| **Pavement Width** | 12.0 m | |
| **Sidewalk** | 1.5 m separate or monolithic sidewalk | |
| **Traffic Control Devices** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation | |
| **Accessible Pedestrian Crossing** | At grade, intersections only | |
| **Bus Route** | Yes, Bus stops are signed | |
| **Truck Route** | No | |
| **Sound Attenuation** | Not required | **TYPICAL CROSS SECTION** **RD- 106 & 107** |

# Local Roadway - Industrial/Commercial Districts

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| 1,000 – 5,000 | 4 | WB - 19 | 22.00 m (min) | 60 m |

## FUNCTION

- Primary purpose: Land access to commercial and industrial properties.
  Transportation and Drainage Corridor
- Secondary purpose: Traffic Movement
  Utility corridor
- May be used as bus routes

## ACCESS CONDITIONS

- Direct Driveway Access is permitted to abutting industrial and commercial properties in conformance with driveway requirements. Driveways to conform to the Land Use Bylaw unless traffic volumes exceed those from 20 residential development equivalent units when access design to conform to Access Management guidelines in TAC Standard,
- Desirable intersection spacing is 80 m. In no case shall intersection spacing be less than 60 m,
- Local Industrial/Commercial roadways may intersect with, other Local Industrial/Commercial roadways, Industrial/Commercial Collector roadways, Major Collector roadways and Arterial roadways,
- Intersections of Local Industrial/Commercial roadways with Local Residential roadways and Minor Collector roadways are discouraged.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 50 |
| **Parking** | Permitted<br>Except in transit zones |
| **Pavement Width** | 12.0 m |
| **Sidewalk** | 1.5 m monolithic or separate sidewalk |
| **Traffic Signals** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation |
| **Accessible Pedestrian Crossing** | At grade, intersections only |
| **Bus Route** | Yes, Bus stops are signed |
| **Truck Route** | No |
| **Sound Attenuation** | Not required |

## NOTE

- Industrial/Commercial Collector roadways are undivided.
- 2 – 3.5 m wide driving lanes and 2.5 m wide parking lanes.

**TYPICAL CROSS SECTION** **RD-108**

# Local Roadway - Residential Districts

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| < 3,000 | 4 | SU | 16.0 m (min) | 60 m |

## FUNCTION

- Primary purpose: Land access
  Transportation and Drainage Corridor
- Secondary purpose: Traffic Movement
  Utility corridor
- Should not be used as a bus route

## ACCESS CONDITIONS

- Direct Driveway Access is permitted to abutting residential properties. Driveways to conform to the Land Use Bylaw unless traffic volumes exceed those from 20 residential development equivalent units when access design to conform to Access Management guidelines in TAC Standard,
- Access to commercial properties shall conform to driveway requirements,
- Desirable intersection spacing is 80 m. In no case shall intersection spacing be less than 60 m,
- Local Residential roadways may intersect with other Local Residential roadways, Collector roadwaysand lanes/alleys. Intersections of Local Residential roadways with Arterial roadways and Industrial/ Commercial roadways are discouraged.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 50 |
| **Parking** | Permitted<br>Except in transit zones |
| **Pavement Width** | 10.0 m |
| **Sidewalk** | 1. 5m monolithic or separate sidewalk |
| **Traffic Control Devices** | Where required by intersection signal Warrant Analysis (TAC), Capacity Analysis or micro simulation |
| **Accessible Pedestrian Crossing** | At grade, intersections only |
| **Bus Route** | No |
| **Truck Route** | No |
| **Sound Attenuation** | Not required |

## NOTE

- Residential Streets are undivided roadways.
- 2 – 3.00 m wide driving lanes and 2 - 2.00 m wide parking lanes.
- Parking is permitted on both sides but may be restricted under special circumstances.
- Sidewalks are required on both sides of roadway.

**TYPICAL CROSS SECTION** **RD-109**

# 9.0 metre Lane/Alley

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| < 1,000 | NA | SU | 9.0 m (min) | As needed |

## FUNCTION

- Primary purpose : Land access (Traffic movement not a consideration)
  Transportation and Drainage Corridor
- Secondary purpose: Utility corridor

## ACCESS CONDITIONS

- Desirable intersection spacing is 80 m. In no case shall intersection spacing be less than 60 m,
- 9.0 metre Lanes in Industrial subdivisions may intersect with other Lanes and Industrial/ Commercial roadways,
- Residential Lanes may intersect with other Residential Lanes, Local Residential roadways and Minor Collector roadways. An intersection of Residential lanes with Arterial roadways and Major Collector roadways is discouraged.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 20 |
| **Parking** | None |
| **Pavement Width** | 8.5 m, if required |
| **Sidewalk** | N/A |
| **Traffic Signals** | N/A |
| **Pedestrian Crossing** | At grade |
| **On-street Bikeway** | N/A |
| **Truck Route** | N/A |
| **Sound Attenuation** | Not required |

## NOTE

- Lanes shall be paved in accordance with the lane paving policy. The policy provides that lanes adjacent to multi-family residential sites involving dwelling units of four or more units shall be paved to the closest intersection with a roadway of a higher functional classification than a lane. This requirement will apply if the lane is used as access to on-site parking.
- Lanes abutting medium density residential, commercial developments and low-density residential developments are to be built to a 9.0 metre lane standard if the medium-density residential or commercial development is allowed access to the lane.
- Lanes abutting medium density residential, commercial, and low density residential developments are to be paved atthe expense of the medium density residential or commercial development at the time the medium-density development is constructed if the medium density residential or commercial development is allowed access to the lane.
- Area Structure Plan or Conceptual Schemes that propose lots with primary vehicle parking accessing to the lane (back yard garages) will be required built to a 9.0 metre lane standard.

**TYPICAL CROSS SECTION** **RD-110**

CONTENTS

# 6.0 metre Lane/Alley

| DAILY TRAFFIC VOLUME (VEHICLES/DAY) | NUMBER OF LANES | DESIGN VEHICLE | RIGHT-OF-WAY REQUIREMENT | MINIMUM INTERSECTION SPACING |
|---|---|---|---|---|
| <1,000 | NA | SU | 6.0 m (min) | As needed |

## FUNCTION

- Primary purpose: Land access (Traffic movement not a consideration)
  Transportation and Drainage Corridor
- Secondary purpose: Utility corridor

## ACCESS CONDITIONS

- Desirable intersection spacing is 80 m. In no case shall intersection spacing be less than 60 m,
- Residential Lanes may intersect with other Residential lanes, Residential streets, and Minor Collector streets. Intersections of Residential lanes with Arterial Streets and Major Collector Streets are discouraged.

| TRAFFIC FEATURES | |
|---|---|
| **Posted Speed (km/h)** | 20 |
| **Parking** | None |
| **Pavement Width** | 5.5 m, if required |
| **Sidewalk** | N/A |
| **Traffic Signals** | N/A |
| **Pedestrian Crossing** | At grade |
| **Bus Route** | No |
| **Truck Route** | No |
| **Sound Attenuation** | Not required |

## NOTE

- Lanes shall be paved in accordance with the lane paving policy. The policy provides that lanes adjacent to multi-family residential sites involving dwelling units of four or more units shall be paved to the closest intersection with a roadway of a higher functional classification than a lane. This requirement will apply if the lane is used as access to on-site parking.
- 6.0 metre Lanes that are paved will have a pavementwidth of 5.5 m.
- Lanes abutting both commercial and residential developments are to be built to a 9.0 metre lane standard if the commercial development is allowed access to the lane.
- Developments intended to have the primary vehicle parking accessing the lane (back yard garages) should be built to a
  9.0 metre lane standard.
- High-density multifamily sites that are intended to access the lane shall be built to a 9.0 metre standard.

**TYPICAL CROSS SECTION** **RD-110**

## 8.21 DESIGN CRITERIA

# Major Arterial Roadway

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Expressway Divided (UAD60, UAD70, or UAD80) | 60 to 80 km/h |

**HORIZONTAL ALIGNMENT**

**Stopping Sight Distance (metres)**

| Classification | Minimum | Desirable |
|---|---|---|
| Arterial UAD60 | 85 | 90 |
| Arterial UAD70 | 110 | 120 |
| Arterial UAD80 | 140 | 150 |

**Minimum Centerline Radius of Curvature (metres)**

| Classification | Superelevated Section | |
|---|---|---|
| | 0.04 m/m | 0.06 m/m |
| Arterial UAD60 | 130 | 120 |
| Arterial UAD70 | 200 | 190 |
| Arterial UAD80 | 280 | 250 |

| Minimum Curve Length | Minimum Tangent Section Length |
|---|---|
| 3 x the design speed, minimum 150 m | As per Geometric Design Guide for Canadian Roads, Section 2.14 (TAC Standards) |

**TURNING MOVEMENT ACCOMMODATION**

- Based upon Warrants

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads (TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 6.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway A = The algebraic difference in the road grades in percent.
  - not less than 30.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 60 | 15 | 10 |
| 70 | 22 | 15 |
| 80 | 35 | 20 |

**Cross Slope & Superelevation**

- Normal cross slope shall be 2%
- Maximum 0.06 m/m

**ROAD STRUCTURE**

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but not less than the minimum pavement structure.

# Minor Arterial Roadway

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Arterial Divided (UAD50, UAD60 or UAD70) | 50 to 70 km/h |

## HORIZONTAL ALIGNMENT

**Stopping Sight Distance (metres)**

| Classification | Minimum | Desirable |
|---|---|---|
| Arterial UAD50 | 65 | 65 |
| Arterial UAD60 | 85 | 90 |
| Arterial UAD70 | 110 | 120 |

**Minimum Centerline Radius of Curvature (metres)**

| Classification | Superelevated Section | |
|---|---|---|
| | 0.04 m/m | 0.06 m/m |
| Arterial UAD50 | 90 | 90 |
| Arterial UAD60 | 130 | 120 |
| Arterial UAD70 | 200 | 190 |

| Minimum Curve Length | Minimum Tangent Section Length |
|---|---|
| 3 x the design speed, minimum 150 m | As per Geometric Design Guide for Canadian Roads, Section 2.14 (TAC Standards) |

## TURNING MOVEMENT ACCOMMODATION

- Based upon Warrants

## Corner Sight Clearances

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads (TAC Standards)

## VERTICAL ALIGNMENT

Maximum & Minimum Grades

- Maximum Grade: 6.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway A = The algebraic difference in the road grades in percent.
  - not less than 30.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 50 | 7 | 6 |
| 60 | 15 | 10 |
| 70 | 22 | 15 |

## Cross Slope & Superelevation

- Normal cross slope shall be 2%
- Maximum 0.06 m/m

## ROAD STRUCTURE

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but not less than the minimum pavement structure.

# Major Collector Roadway - Industrial/Commercial Districts

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Collector Undivided (UCU50 and UCU60) | 50 to 60 km/h |

**HORIZONTAL ALIGNMENT**

**Stopping Sight Distance (metres)**

| Classification | Minimum | Desirable |
|---|---|---|
| Collector UCU50 | 65 | 65 |
| Collector UCU60 | 85 | 90 |

**Minimum Centerline Radius of Curvature (metres)**

| Classification | Superelevated Section | |
|---|---|---|
| | 0.04 m/m | 0.06 m/m |
| Collector UCU50 | 90 | 90 |
| Collector UCU60 | 120 | 130 |

| Minimum Curve Length | Minimum Tangent Section Length |
|---|---|
| 60.0 m | 60.0 m |

**TURNING MOVEMENT ACCOMMODATION**

- Medians, left-turn bays, and intersection channelization are normally not required

**Note**

- Minimum of a 15.0 m radius curb returns

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads(TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway A = The algebraic difference in the road grades in percent.
  - not less than 30.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 50 | 7 | 6 |
| 60 | 15 | 10 |

**Cross Slope & Superelevation**

- Normal cross slope shall be 2%
- Maximum 0.06 m/m

**ROAD STRUCTURE**

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but not less than the minimum pavement structure.

# Major Collector Divided Roadway - Residential Districts

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Collector Undivided (UCU50 and UCU60) | 50 to 60 km/h |

**HORIZONTAL ALIGNMENT**

**Stopping Sight Distance (metres)**

| Classification | Minimum | Desirable |
|---|---|---|
| Collector UCU50 | 65 | 65 |
| Collector UCU60 | 85 | 90 |

**Minimum Centerline Radius of Curvature (metres)**

| Classification | Superelevated Section | |
|---|---|---|
| | 0.04 m/m | 0.06 m/m |
| Collector UCU50 | 90 | 90 |
| Collector UCU60 | 120 | 130 |

| Minimum Curve Length | Minimum Tangent Section Length |
|---|---|
| 60.0 m | 60.0 m |

**TURNING MOVEMENT ACCOMMODATION**

- Based upon Warrants

**Note**

- Minimum of a 15.0 m radius curb returns

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads (TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres
    K = Vertical curve coefficient for the design speed of the roadway
    A = The algebraic difference in the road grades in percent
  - not less than 30.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 50 | 7 | 6 |
| 60 | 15 | 10 |

**Cross Slope & Superelevation**

- Normal cross slope shall be 2%
- Maximum 0.06 m/m

**ROAD STRUCTURE**

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Road Structure.

All residential roads shall be constructed in two stages, with the final lift of asphalt placed two construction seasons after the initial construction and prior to the issuance of the Final Acceptance Certificate. Specific requirements are addressed in the Developer's Service Agreement.

# Major Collector Undivided Roadway – Residential Districts

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Collector Undivided (UCU50 and UCU60) | 50 to 60 km/h |

**HORIZONTAL ALIGNMENT**

**Stopping Sight Distance**

| Classification | Minimum | Desirable |
|---|---|---|
| Collector UCU50 | 65 m | 65 m |
| Collector UCU60 | 85 m | 90 m |

**Minimum Centerline Radius of Curvature**

| Classification | Superelevated Section | |
|---|---|---|
| | 0.04 m/m | 0.06 m/m |
| Collector UCU50 | 90 | 90 |
| Collector UCU60 | 120 | 130 |

| Minimum Curve Length | Minimum Tangent Section Length |
|---|---|
| 60.0 m | 60.0 m |

**TURNING MOVEMENT ACCOMMODATION**

- Based upon Warrants

**Note**

- Minimum of a 15.0 m radius curb returns

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads(TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway A = The algebraic difference in the road grades in percent
  - not less than 30.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 50 | 7 | 6 |
| 60 | 15 | 10 |

**Cross Slope & Superelevation**

- Normal cross slope shall be 2%
- Superelevated crossfall, desirable 0.04 m/m, maximum 0.06 m/m

**ROAD STRUCTURE**

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Road Structure.

All residential roads shall be constructed in two stages, with the final lift of asphalt placed two construction seasons after the initial construction and prior to the issuance of the Final Acceptance Certificate. Specific requirements are addressed in the Developer's Service Agreement.

# Minor Collector Roadway - Industrial/Commercial Districts

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Collector Undivided (UCU50 and UCU60) | 50 to 60 km/h |
| **HORIZONTAL ALIGNMENT** | |
| **Stopping Sight Distance** | **Minimum Centerline Radius of Curvature** |
| Collector UCU50 = 65 m | Collector UCU50 = desirable 140 m, minimum 90 m |
| Collector UCU60 = 85 m | Collector UCU60 = desirable 140 m, minimum 120 m |
| **Minimum Curve Length** | **Minimum Tangent Section Length** |
| 60.0 m | 60.0 m |

**TURNING MOVEMENT ACCOMMODATION**

- Medians, left-turn bays, and intersection channelization are normally not required

**Note**

- Intersections with roadways of an equal or lower functional classification shall be provided with a 15.0 m curb return radii or equivalent 3 centered compound curves
- Intersections with roadways of a higher functional classification shall be provided with curb return radii as required by the higher functional classification roadway

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads(TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres

    K = Vertical curve coefficient for the design speed of the roadway

    A = The algebraic difference in the road grades in percent
  - not less than 30.0 m

| | K (minimum) | |
|---|---|---|
| V (km/h) | Crest | Sag |
| 50 | 7 | 6 |
| 60 | 15 | 10 |

**Crown & Superelevation**

- Normal cross slope shall be 2%
- Superelevation is not required for Industrial/Commercial Collector roadways, if the centerline curve radii greater than 140 m

**ROAD STRUCTURE**

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Road Structure.

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# Minor Collector Roadway - Residential Districts

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Collector Undivided (UCU50) | 50 km/h |
| **HORIZONTAL ALIGNMENT** | |
| **Stopping Sight Distance** | **Minimum Centerline Radius of Curvature** |
| Collector UCU50 = 65m | Collector UCU50 = desirable 140m, minimum 90m |
| Minimum Curve Length | Minimum Tangent Section Length |
| 60.0 m | 60.0 m |

**TURNING MOVEMENT ACCOMMODATION**

- Medians, left-turn bays, and intersection channelization are normally not required

**Note**

- The cumulative length of Minor Collector roadways between intersections with Major Collectors or Arterials shall conform to the following guideline; the maximum number of equivalent dwelling units serviced shall not exceed 800. AADT is to be calculated based upon 10 trip ends/day per equivalent dwelling units
- Intersections with roadways of an equal or lower functional classification shall be provided with a 12.0 m curb return radii
- Intersections with roadways of a higher functional classification shall be provided with curb return radii as required by the higher functional classification roadway

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads (TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway

    A = The algebraic difference in the road grades in percent.
  - not less than 30.0 m

| | K (minimum) | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 50 | 7 | 6 |

**Crown & Superelevation**

- Normal cross slope shall be 2%
- Superelevation not required for Minor Collector roadways if centerline curve radii greater than 140 m

**ROAD STRUCTURE**

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Road Structure.

All residential roads shall be constructed in two stages, with the final lift of asphalt placed two construction seasons after the initial construction and prior to the issuance of the Final Acceptance Certificate. Specific requirements are addressed in the Developer's Service Agreement.

## Local Roadway - Industrial/Commercial Districts

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Local Undivided (ULU50) | 50 km/h |
| **HORIZONTAL ALIGNMENT** | |
| **Stopping Sight Distance** | **Minimum Centerline Radius of Curvature** |
| Local ULU50 = 65 m | Local ULU50 = desirable 140 m, minimum 90 m |
| **Minimum Curve Length** | **Minimum Tangent Section Length** |
| 60 m | 60 m |

**TURNING MOVEMENT ACCOMMODATION**

- Medians, left-turn bays, and intersection channelization are normally not required

**Note**

- Intersections with roadways of an equal or lower functional classification shall be provided with a 12.0 m curb return radii or equivalent 3 centered compound curves
- Intersections with roadways of a higher functional classification shall be provided with curb return radii as required by the higher functional classification roadway

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads (TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway A = The algebraic difference in the road grades in percent
  - not less than 30.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 50 | 7 | 6 |

**Crown & Superelevation**

- Normal cross slope shall be 2%
- Superelevation is not required Local Industrial/Commercial roadways

**ROAD STRUCTURE**

Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Road Structure.

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## Local Roadway - Residential Districts

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Local Undivided (ULU50) | 50 km/h |
| **HORIZONTAL ALIGNMENT** | |
| **Minimum Stopping Sight Distance** | **Minimum Centerline Radius of Curvature** |
| Local ULU 50 = 65 m | Local ULU 50 = desirable 140 m, minimum 90 m |
| **Minimum Curve Length** | **Minimum Tangent Section Length** |
| 60.0 m | 30.0 m |

**TURNING MOVEMENT ACCOMMODATION**

- Medians, left turn bays and intersection channelization are normally not required

**Note**

- The cumulative length of Minor Collector roadways between intersections with Major Collectors or Arterials shall conform to the following guideline; the maximum number of equivalent dwelling units serviced shall not exceed 250. AADT is to be calculated based upon 10 trip ends/day per equivalent dwelling units or as supported by an approved traffic study
- Intersections with roadways of an equal or lower functional classification shall be provided with a 9.0 m curb return radii
- Intersections with roadways of a higher functional classification shall be provided with curb return radii as required by the higher functional classification roadway

**Corner Sight Clearances**

- Corner sight clearances shall be in accordance with Geometric Design Guide for Canadian Roads(TAC Standards)

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade: 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA
    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway
    A = The algebraic difference in the road grades in percent.
  - not less than 30.0 m

| | K (minimum) | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 50 | 7 | 6 |

**Crown & Superelevation**

- Normal cross slope shall be 2%
- Superelevation is not required Local Residential roadways

| ROAD STRUCTURE |
| --- |
| Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Road Structure:<br>• 50 mm Asphaltic Concrete Wearing Course.<br>• 80 mm Asphaltic Concrete Base Course.<br>• 250 mm Crushed Gravel Base Course (20 mm minus gradation).<br>• 150 mm deep scarified and compacted subgrade.<br>All residential roads shall be constructed in two stages, with the final lift of asphalt placed two construction seasons after the initial construction and prior to the issuance of the Final Acceptance Certificate. |

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## 9.0 m Lane/Alley

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| None | 30 km/h |
| **HORIZONTAL ALIGNMENT** | |
| **Minimum Stopping Sight Distance** | **Minimum Centerline Radius of Curvature** |
| 9.0 metre Lane 30 m | 9.0 metre Lane = 60 m<br>Deflections may be substituted if adequate curvature is not possible |
| **Minimum Curve Length** | **Minimum Tangent Section Length** |
| N/A | N/A |

**TURNING MOVEMENT ACCOMMODATION**

- Medians, left turn bays and intersection channelization are not required

**Note**

- The maximum length of a 9.0 metre Lane between intersections with higher functional classification roadways shall be 300 m
- Lane layout shall deter vehicle shortcutting through neighborhoods
- Dead end lanes are discouraged

**Corner Sight Clearances**

- At the intersection of a lane and a higher functional classification roadway a corner cut shall be provided

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%, desirable less than 6.0%
- Minimum Grade 0.5%
- Minimum Length of Vertical Curve not less than:
  - o L = KA

    Where: L = Length of vertical curve in metres K = Vertical curve coefficient for the design speed of the roadway

    A = The algebraic difference in the road grades in percent
- Vertical curve not required where L < 10.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 30 | 2 | 2 |

**Cross slope & Superelevation**

- Cross slope shall be a 0.03 (3%) inverted Cross slope
- Superelevation shall not be used in lanes

**Intersections**

- Approach gradients to an intersection shall not exceed of 4.0%
- Centerline grades shall be continuous through of lane/ lane intersections

| DRAINAGE |
| --- |
| • Lanes should drain towards roads<br>• Trapped Lows in Lanes will not be accepted<br>• Installation of Catch basins in lanes is discouraged but may be accepted if the lane surface is paved for 5.5 metres in all directions of travel away from the catch basin |
| **ROAD STRUCTURE** |
| Minimum Structure for Graveled Lanes:<br>• 50 mm (150 mm for Deep Based Lanes) Crusher Run Gravel Base Course (20 mm minus gradation)<br>• 150 mm Pit Run or Crushed Granular Subbase Course (50 mm minus gradation)<br>• 150 mm deep scarified and compacted subgrade<br>Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Structure for Paved Lanes:<br>• 75 mm Asphaltic Wearing Course<br>• 200 mm Crushed Gravel Base Course (20 mm minus gradation)<br>• 150 mm deep scarified and compacted subgrade<br>9.0 metre lanes shall be constructed to the final grade within one year of completion of underground utilities. Prior to issuance of a Final Acceptance Certificate as outlined in the Service Agreement, the lane shall be rehabilitated by removing contaminated material and soft spots, scarifying and re-compacting the remaining base course gravel, and the final placement and compacting additional base course gravel, shaped to the final design cross section and grades. |

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# 6.0 metre Lane/Alley

| CLASSIFICATION | DESIGN SPEED |
|---|---|
| Urban Local Undivided | 30 km/h |
| **HORIZONTAL ALIGNMENT** | |
| **Minimum Stopping Sight Distance** | **Minimum Centerline Radius of Curvature** |
| 6.0 metre Lane = 30 m | 6.0 metre Lane = 60 m<br>Deflections may be substituted if adequate curvature is not possible |
| **Minimum Curve Length** | **Minimum Tangent Section Length** |
| N/A | N/A |

**TURNING MOVEMENT ACCOMMODATION**

- Medians, left turn bays and intersection channelization are not required

**Note**

- The maximum length of a 6.0 metre Lane between intersections with higher functional classification roadways shall be 300 m
- Lane layout shall deter vehicle shortcutting through neighborhoods
- Dead end lanes are discouraged

**Corner Sight Clearances**

- At the intersection of a lane and a road a corner cut shall be provided

**VERTICAL ALIGNMENT**

**Maximum & Minimum Grades**

- Maximum Grade: 8.0%
- Minimum Grade 0.5%
- Minimum Length of Vertical Curve not less than:
  - L = KA

    Where: L = Length of vertical curve in metres

    K = Vertical curve coefficient for the design speed of the roadway

    A = The algebraic difference in the road grades in percent
- Vertical curve not required where L < 10.0 m

| K (minimum) | | |
|---|---|---|
| v (km/h) | Crest | Sag |
| 30 | 2 | 2 |

**Crown & Superelevation**

- Crown shall be a 0.03 (3%) inverted crown
- Superelevation shall not be used in lanes

**Intersections**

- Approach gradients to an intersection shall not exceed of 4.0%
- Centerline grades shall be continuous through of lane/ lane intersections

| DRAINAGE |
| --- |
| • Lanes should drain towards roads<br>• Trapped Lows in Lanes will not be accepted<br>• Installation of Catch basins in lanes is discouraged but may be accepted if the lane surface is paved for 5.5 metres in all directions of travel away from the catch basin |
| **ROAD STRUCTURE** |
| Minimum Structure for Graveled Lanes:<br>• 50 mm (150 mm for Deep Based Lanes) Crusher Run Gravel Base Course (20 mm minus gradation)<br>• 150 mm Pit Run or Crushed Granular Subbase Course (50 mm minus gradation)<br>• 150 mm deep scarified and compacted subgrade<br>Pavement Road Structure shall be as determined by the geotechnical study for the specific roadway section but no less than the minimum Pavement Structure for Paved Lanes:<br>• 75 mm Asphaltic Wearing Course<br>• 200 mm Crushed Gravel Base Course (20 mm minus gradation)<br>• 150 mm deep scarified and compacted subgrade<br>6.0 metre lanes shall be constructed to the final grade within one year of completion of underground utilities. Prior to issuance of a Final Acceptance Certificate as outlined in the Service Agreement, the lane shall be rehabilitated by removing contaminated material and soft spots, scarifying and re-compacting the remaining base course gravel, and the final placement and compacting additional base course gravel, shaped to the final design cross section and grades. |

# Part 9 – OPEN SPACE SYSTEM REQUIREMENTS

## 9. OPEN SPACE SYSTEM REQUIREMENTS

### 9.1 REFERENCE STANDARDS

Design details or procedures not specified in this section shall be determined in accordance with the following Reference Standards or as otherwise found applicable and approved by the City of Medicine Hat.

Current editions of:

- City of Medicine Hat Parks and Recreation Master Plan

  https://www.medicinehat.ca/en/government-and-city-hall/resources/Documents/RecreationMasterPlan.pdf

- City of Medicine Hat Parks System Management Plan

  https://www.medicinehat.ca/en/government-and-city-hall/resources/Documents/ParksSystemManagementPlan.pdf

- City of Medicine Hat Leisure Trails Future Development Plan

  https://www.medicinehat.ca/en/government-and-city-hall/resources/Documents/LeisureTrailsFutureDevelopmentPlan.pdf

- City of Medicine Hat Playground Management Plan

  https://www.medicinehat.ca/en/parks-recreation-and-culture/resources/Documents/Playground-Management-Plan.pdf

- City of Medicine Hat Irrigation Design Standards

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards-and-Specifications/IrrigationDesignStandardsInstall.pdf

- City of Medicine Hat Irrigation Product List

  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards-and-Specifications/IrrigationProductList.pdf

- Location of City of Medicine Hat General Landscape Specifications & Detail Drawings

  https://www.medicinehat.ca/en/business-and-development/construction-standards-and-specifications.aspx

- City of Medicine Hat Tree Protection Design Standard
  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards-and-Specifications/TreeProtectionPlanDesignSt.pdf
- City of Medicine Hat Recommended Tree Species
  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards-and-Specifications/PreferredTreeSpecies.pdf
- City of Medicine Hat Site Furnishing Guidelines
  https://www.medicinehat.ca/en/business-and-development/resources/Documents/ParkFurnitureSpecific.pdf
- CAN/CSA – a current version of "Children's Playground Equipment and Surfacing"
  https://www.csagroup.org/store/product/CSA%20Z614:20/
- City of Medicine Hat Signage Standards
  https://www.medicinehat.ca/en/business-and-development/resources/Documents/Standards-and-Specifications/CMH-Signage-Standards.pdf
- CSA/ASC B651: a current version of "Accessible Design for the Built Environment"
  https://www.csagroup.org/wp-content/uploads/2430328.pdf

## 9.2 DEVELOPMENT STANDARDS

### 9.2.1 DEFINITION OF PARK TYPES

Refer to Section 5.0 thru 5.8 of the Parks System Management Plan for definition of the various park types including principles and policies related to the purpose, function, and size of the various park types.

### 9.2.2 ALLOCATION AND USE OF PARKS SYSTEM SPACE

- Refer to the Parks System Management Plan for principles and policies related to the function, size, location, and functionality of the parks space.
- MR Credit for storm water management facilities will be limited and will be considered on a site-by-site basis.
- Gas wells shall be located in Public Utility Lot (PUL) parcels and shall not be included as part of the Municipal Reserve (MR) dedication. The design of the MR parcel shall ensure that gas wells do not compromise the functionality of the adjacent Municipal Reserve parcel.

## 9.3 SUBMISSIONS

The Developer shall acquire the professional service of a registered member of the Alberta Landscape Architect Association (ALAA) to prepare Conceptual and Detailed Landscape Plans.

The Developer shall arrange a meeting with a Parks and Recreation (PKRC), and a Planning and Development Services (PDS) representative along with the appropriate school board to discuss the conceptual landscape plan for any future school site. The school board representative will also be involved in the detailed design process for the future school site.

### 9.3.1 LANDSCAPE PLANS

#### 9.3.1.1 CONCEPTUAL LANDSCAPE PLAN INFORMATION

A Conceptual Landscape Plan for all Municipal Reserve and Environmental Reserve parcels is to be submitted as part of the Functional Servicing Report.

Prior to the preparation of the Conceptual Landscape Plan, the Developer shall meet with the Parks and Recreation and Planning and Development Services Departments to discuss the proposed concept.

The following information is required on a Conceptual Landscape Plan:

- Lot numbers, block numbers, street names and drawn to a scale of 1:1000.
- North arrow.
- Legend and definitions of any symbols, abbreviations and or table headings used.
- Limits of development/ construction.
- Original ground contours and elevations (0.5 m intervals).
- Conceptual details for any earth berms proposed within the development.
- Grading details – a minimum of 2% gradient is recommended; lesser grades are subject to the approval of the Director of Parks and Recreation. Such deviations are to be clearly identified on design drawings.
- Drainage patterns.
- Extent of landscape development and type.
- Conceptual details for location of plant material, asphalt trails including continuity and accessibility, site furnishings and amenities.
- Conceptual layout of proposed playground sites and confirmation that it meets 600m distribution.
- Location of existing or proposed utilities.

- High level electrical service requirements, to aid in City Design of Electric Service by the Electric Department. The actual service will be designed just before time-of-service install be City Electric Services.
- Location of water service.
- Confirmation of size of water service, including a conceptual layout of the irrigation system.

#### 9.3.1.2 DETAILED LANDSCAPE PLAN INFORMATION

A Landscape Plan for all Reserve parcels is to be submitted as part of the Detailed Design drawings set for every development.

The following information can be provided on separate sheets:

- Site Grading and Drainage Plan.
- Layout Plan.
- Playground Plan.
- Planting Plan.
- Irrigation Plan.

##### 9.3.1.2.1 INFORMATION REQUIRED ON ALL LANDSCAPE PLANS:

- Lot numbers, block numbers, street names and drawn to a scale of minimum 1:500, prefer 1:250.
- North arrow.
- Legend and definitions of any symbols, abbreviations and or table headings used.
- Limits of development/ construction.
- Easements and Utility Rights-of-Way.

##### 9.3.1.2.2 INFORMATION REQUIRED ON THE SITE GRADING AND DRAINAGE PLAN:

- Major items associated with layout.
- Original ground contours and elevations at 0.5 metre contour intervals.
- Elevations to be shown at each break.
- Details for any earth berms proposed within the development.
- Geotechnical Report slope setback lines from steep slopes.
- Finished ground elevations at all lot corners and at proposed changes of surface slope along property boundaries.

- Drainage direction arrows indicating the direction and percent gradient of surface drainage, particularly at common boundaries between adjacent parcels or lots.

#### 9.3.1.2.3 INFORMATION REQUIRED ON THE LAYOUT PLAN:

- Existing features clearly identified whether to be saved or removed,
- Location of all hard surface landscaping (trails, shale/mulch areas, benches, garbage receptacle, bridges etc.), playgrounds and park amenities (basketball hoops, asphalt pads etc.). Include symbol in legend.
- Engineering details for grade related features (e.g. trails where slope is greater than 5%).
- Protection, and if necessary, restoration requirements for Environmental Reserve parcels.
- Fence type and alignment, where required.
- Proposed and existing utility alignments.

#### 9.3.1.2.4 INFORMATION REQUIRED ON THE PLAYGROUND PLAN:

- Location and details of components of playground.
- Location and details of borders, low impact surface material, benches, garbage containers.

#### 9.3.1.2.5 THE FOLLOWING INFORMATION IS REQUIRED ON THE PLANTING PLAN:

- Major items associated with Layout Plan.
- Location of proposed or existing utilities screened in lighter color.
- Plant material shown with crowns at 2/3 maximum size.
- Outline of planting beds, including mulch detail.
- Proposed contours at 0.5 metre contour intervals.
- Location of plant material. Symbol, Latin and common name, cultivar, quantities, type of container, and size of all plant material in tabular format.

#### 9.3.1.2.6 THE FOLLOWING INFORMATION SHALL BE REQUIRED ON THE IRRIGATION PLAN:

- Major items of Planting Plan, Layout Plan and Grading Plans screened in lighter color.
- Location of proposed or existing utilities screened in lighter color.
- Proposed contours at 0.5 metre contour intervals, screened in a lighter colour.

- Location and size of water service.
- Schedule of irrigation materials (electric zone valves, isolation valves, irrigation main line and laterals, sprinkler heads, controllers, irrigation vaults, conduit etc.) describing sizes, materials, manufacturer and model number.
- Each valve to be numbered in relation to the irrigation controller.
- Indicate static water pressure used for irrigation system design.
- Design velocity and design pressure of irrigation system, including pressure loss calculations.
- Design pressure, pressure range and electrical rating of the booster pump (if applicable).
- Provide nozzle sizes for each head.
- Irrigation Design and Operational Data in tabular format including station, type of head, nozzle size, psi, station flow (in US gpm), precipitation rate, run time per zone and total run time.
- The watering window shall be in accordance with the City of Medicine Hat Irrigation Design Standards.

## 9.4 PARKS SYSTEM DEVELOPMENT REQUIREMENTS

### 9.4.1 PLANNING PRINCIPLES

- Park and recreation planning and provision of public parks system space shall be carried out in accordance with the Municipal Government Act, Subdivision Regulations, and the City of Medicine Hat Land Use Bylaws.
- Incorporate all appropriate lands such as School Reserves, playgrounds, active open space, trails and Environmental Reserves into an approved, well designed parks system plan.
- Give highest priority to sensitive integration of proposed built development and the natural environment. The visual quality of a development will depend on the successful integration of the man-made elements with the natural landscape features that exist on the site. This careful integration will ensure preservation and retention of the natural features and thus the beauty of the area.
- The grades of private property and roads abutting land slated for school/parks system development should be designed to ensure efficient drainage of public parks system space.
- Prior to the landscape development detailed design phase, the Developer shall meet with the Parks and Recreation and Planning and Development Services Departments to discuss the proposed design.

- Prior to the landscape development detailed design phase for a future school site, the Developer shall meet with the Parks and Recreation, and Planning and Development Services Departments and the appropriate School board to discuss the proposed design.
- The Developer is encouraged to propose park development initiatives that are innovative, environmentally friendly or incorporates smart technology that is not approved in this document or not in Department's landscape specifications. The responsibility shall be upon the Developer to justify/rationalize the proposed initiative based on the following criteria: value or benefit to the Department, sustainability, capital cost, operating cost, feasibility, economic benefits, environmental impacts, and engineering or design requirements. The Department may request an amendment or revision to the initiative and will either give approval to proceed, give the approval to proceed as a one-time pilot project, or not approve the initiative. The Developer and the Consultant remain fully responsible for the design and construction of the initiative according to good engineering and/or landscape design practice.

### 9.4.2 SUBGRADE AND DRAINAGE

**Table 9.4.1 - Maximum and Minimum Gradients in Landscape Areas**

| Location | Minimum | Maximum |
|---|---|---|
| Lawn and Grass | 50:1 (2%) | 5:1-4:1 (20-25%) |
| Grass Swales (without additional erosion protection) | | |
| 1. Slopes along invert<br>2. Side Slopes | 50:1 (2%)<br>6:1 (16.7%) | 10:1 (10%)<br>3:1 (33%) |
| Unmown of Native Grass Areas | 50:1 (2%) | 4:13:1 (33%) preferred |
| Play Fields (ball fields, soccer, etc.) | 66:1 (1.5%) | 33:1 (3%) |
| Plazas and Open space Spaces | 100:1 (1%) | 40:1-20:1 (2.5-2%) |
| Patios and Terraces | 100:1 (1%) | 50:1 (2%) |

- The aforementioned grades are the recommended minimum and maximums slopes. The City reserves the right to review on a case-by-case basis and provide recommendations that may deviate from the above list. There recommendations may be based on factors including but not limited to soil conditions, surrounding context and land uses, existing vegetation, and existing water movements.
- Any deviations and/or alternatives initiated by the Consultant or Designer are subject to approval of the General Manager of the Parks & Recreation Department.
- Grass swales shall be minimized across all reserve parcels.

- City reserves the right to limit the amount of off-site drainage onto a reserve parcel.

### 9.4.3 STREET TREE PLANTING

Refer to the Tree Space Design Report for detailed design requirements of street trees within road rights of way and boulevards.

### 9.4.4 MUNICIPAL RESERVE

Developed to a turf grass standard including grading, amended topsoil supply and spread, irrigation installation and tree planting.

### 9.4.5 IRRIGATION DESIGN

- Refer to the City of Medicine Hat Irrigation Design Standards for detailed design requirements.

  https://www.medicinehat.ca/en/business-and development/resources/Documents/Standards-and-Specifications/IrrigationDesignStandardsInstall.pdf
- Provide a centrally controlled automated irrigation system controller for all turf areas compatible with the City of Medicine Hat current irrigation central control requirements. Contact the Parks and Recreation Department for the current version and requirements.
- Use of non-potable water sources is encouraged.

### 9.4.6 TREE PLANTING

- Provide a minimum of sixty-two trees (62) per hectare (twenty-five {25} trees per acre) of Municipal Reserve provided.
- Tree species are to be 30% coniferous and 70% deciduous.
- In principle, coniferous tree sizes at time of planting shall be as follows:
  - 25% - 1.5-metre height,
  - 50% - 2.0-metre height, and
  - 25% - 2.5-metre height.
- In principle, deciduous tree sizes at time of planting shall be as follows:
  - 50% - 50 mm caliper, and
  - 50% - 85 mm caliper.
- Shrub planting to be limited and considered on a site-by-site basis.
- Shrub species are to be 40% coniferous and 60% deciduous.

- Coniferous shrub sizes at time of planting shall be as follows:
  - 50% - 2 gallon potted, and
  - 50% - 5 gallon potted.
- Deciduous shrub sizes at time of planting shall be as follows:
  - 50% - 2 gallon potted, and
  - 50% - 5 gallon potted.

Tree and shrub species shall be as per the current City of Medicine Hat Recommended Tree Species List.

The following table (9.4.2) shows the setback and spacing guidelines for all tree plantings in Municipal Reserves:

**Table 9.4.2 - Municipal Reserve Plantings**

| Description | Deciduous Trees | Coniferous Trees |
|---|---|---|
| Setback – Hard Surfaces | 5 m | ½ maximum spread |
| Setback – Vertical Elements | 2 m | ½ maximum spread |
| Setback – Utilities (UROW) | No planting within UROW | No planting within UROW |
| Tree Spacing | ½ maximum spread | ½ maximum spread |

- Deciduous trees planted in medians must be a minimum of 750 mm from back of concrete curbs and 4.5 m from bullnose.
- Tree planting should be strategically spaced to avoid blocking street light illumination levels, sight lines in the vicinity of intersections, pedestrian crossings, and traffic signs.
- Tree planting to consider existing or proposed utility setbacks in the designed locations and meet any required setbacks.

## 9.4.7 LEISURE TRAILS

- Trails and trail linkages are to be provided. Ensure trail alignments correspond to Area Structure Plans and avoid isolated and disjointed trails.
- Trail layout should be designed to connect the residential areas with park areas and other centres such as schools, recreation centres, natural features including escarpments, natural areas and associated park system space, commercial districts, and prime scenic attractions.
- Trails developed in Environmental Reserve areas should be designed and sited to minimize physical and visible disturbance to landform or vegetation. Minimize damage

to Environmental Reserve parcels by careful trail route selection, by sensitive use of retaining structures, and by grading side slopes to minimize disturbances.

- Trails should be barrier free/accessible.
- Maximum distance between access points should be 500 metres.
- All trails are to be constructed of asphalt to accommodate both pedestrians and cyclists.
- Trail width 3.0 metres minimum standard.
- Trails should be setback a minimum of 10.0 m from residential property lines.
- Safety railing shall be installed when a trail is within 2.0 m of the top of a 2:1 slope or steeper, and the slope is greater than 1.0 m in height.
- Minimum railing height and design to meet current building code standards.
- Link trail to pedestrian facilities within road rights-of-way.
- Terminate or link trails to wheelchair ramps at street intersections.
- Provide a standard single-arm swing gate where the entrance to a trail is to Environmental Reserve, Natural Area or intersects with road or lane.
- Line up entrances for visual continuity where trail route crosses street.
- Ensure no catch basins located at trail entrance.
- Ensure no manholes are located within the trail.
- Where possible, ensure no obstructions to visibility within 5.0 m of junction with other trails and streets (trees, shrubs, utility boxes, fences, etc.).
- Unless exception criteria apply, trails shall comply with the following limits on gradients:
  - 5% or less for any distance,
  - 5.1% to 8.33% for a maximum distance of 61.0 m,
  - 8.34% to 10% for a maximum distance of 9.0 m, and
  - 10% to 12% for a maximum distance of 3.0 m.

### 9.4.8 WALKWAYS

- To be provided for pedestrian access.
- 3.0 metre width, constructed of asphalt, constructed within a 3.0 m right-of-way (ROW).

- Walkways proposed for utility line access that do not benefit pedestrian access, shall be registered as a utility right-of-way or PUL. The Director of Parks and Recreation will make the determination as to the suitability of a pedestrian walkway.



### 9.4.9 PLAYGROUNDS

- Provide a creative playground structure to be located within 600 metres walking distance of 95% of the residences in the subdivision.
- All playground installation must conform to a current version of CSA Z614 A Guideline on Children's Playground Equipment and Surfacing.
- A Minimum of One bench per creative playground structure shall be provided.
- One CMH approved solid waste collection receptacle per playground shall be provided.
- Identify requirements for playground zone signage on appropriate plan.
- Review planting plan adjacent to playgrounds to ensure it adheres to the CSA playground standards.

### 9.4.10 ACCESS CONTROL

- All Municipal Reserves abutting a roadway or lane must be provided with a standard curb along the roadway or lane to prevent vehicular access.
- All Environmental Reserves abutting a roadway or lane must be provided with a standard curb and bollard and chain along the roadway or lane to prevent vehicular access.
- All Environmental Reserves abutting a residential property must be provided with bollard and chain installed on the City side of the property line no more than 150 mm from the property line.
- Standard single arm swing gates must be provided at entrances to walkways. These are not required at ALL entrances and are reviewed on a case-by-case basis.
- All uniform fences must be constructed on the private side of the property line.

### 9.4.11 SITE FURNISHINGS

- All site furnishings are to be vandal resistant where possible.
- Site furnishings shall complement and enhance the natural setting. Details which are consistent with local materials, color and style should be utilized.
- Signage for parks should comply with the City's current Signage specs and standards.

### 9.4.12 SPORTS FIELDS

- Developer shall provide sufficient space for future development of sports fields. The space requirements for indoor and outdoor leisure facilities should be secured several years in advance of subdivision development as part of the Area Structure Plan process.
- Grade play surface and perimeter buffer strip for positive drainage. Optimum grade 1.5%. Maximum grade 2% in all directions including the 3-metre buffer strip.
- Grading plans for soccer fields shall illustrate drainage patterns in two directions.

### 9.4.13 BOULEVARDS

- Landscaping of boulevards shall be consistent with the landscaping on the adjacent parcel. (i.e., Boulevards adjacent to Municipal Reserve shall be developed to the Municipal Reserve standard and boulevards adjacent to Environmental Reserve shall be seeded to coarse grass).
- Boulevard design must not conflict with the City of Medicine Hat's Boulevard Development and Maintenance Policy.

### 9.4.14 ENVIRONMENTAL RESERVE AREAS

- Ensure no construction of permanent structures, other than leisure trails or interpretive elements, in natural areas or environmental reserves.
- All development proposals should detail the intended methods of protecting the natural systems during construction. The design of the development should consider the protection of natural features during regular use of the development after construction.
- Any natural areas designated for preservation that are damaged during construction must be rehabilitated and re-vegetated to the satisfaction of the City of Medicine Hat.
- Replanting should be done with indigenous tree, shrub and grass species in natural areas where existing vegetation has been disturbed or destroyed. Rehabilitation should be undertaken in a manner that promotes natural succession.
- Ensure that any recreational development proposed will not damage the natural environment. Protection and management of the natural or cultural environment is the primary concern, and recreational use is only a secondary objective.
- Ensure preservation of existing tree cover, vegetation and site features through responsible site planning and design.

## 9.5 DEVELOPMENT ACTIVITIES

The following tables identify the development activities for various park types and summarize the responsibility for these activities, in accordance with the Parks System Management Plan:

**Table 9.5.1 – Development Activities**

| Development Activity | Pocket Park | Neighborhood Park | Community Park | City Wide Park |
|---|---|---|---|---|
| Grading | Developer | Developer | Developer | Developer |
| Topsoil and amendment | Developer | Developer | Developer | Developer |
| Turf Grass with Centrally Controlled Irrigation | Developer | Developer | Developer | Developer |
| Trees | Developer | Developer | Developer | Developer |
| Shrubs and Shrub Beds | Developer | Developer | Developer | Developer |
| Flowerbeds | Not Appropriate | City | City | City |
| Leisure Trail | Developer | Developer | Developer | Developer |
| Benches | Developer | Developer | Developer | Developer |
| Garbage Containers | Developer | Developer | Developer | Developer |
| Playground Equipment | May Be Required Developer | Developer | Developer | Developer |
| Picnic Tables | Not Appropriate | Developer | Developer | Developer |
| ER Protection and Restoration | Developer | Developer | Developer | Developer |
| Asphalt Pad and Hoops for Basketball | Not Appropriate | City | City | City |
| Ball Diamond Backstop and Fencing | Not Appropriate | City | City | City |
| Soccer Field Goal Posts | Not Appropriate | City | City | City |
| Outdoor Ice Rink Service and Boards | Not Appropriate | City | City | City |
| Tennis Court and Fencing | Not Appropriate | City | City | City |
| Bleachers | Not Appropriate | City | City | City |
| Washroom | Not Appropriate | Not Appropriate | City | City |
| Paved Parking Lot | Not Appropriate | Not Appropriate | City | City |
| Football/Rugby Field | Not Appropriate | City | City | City |
| Sportsfield Lighting | Not Appropriate | City | City | City |
| Park Lighting | Not Required | Not Required | Developer | Developer |

* For playground equipment per location

| Development Activity | School Sites | Greenways | Natural Parks |
|---|---|---|---|
| Topsoil and Amendment | Developer | Not Appropriate | Not Appropriate |
| Turf Grass with Centrally Controlled Irrigation | Developer | Not Appropriate | Not Appropriate |
| Trees | Developer | Not Appropriate | Not Appropriate |
| Shrubs and Shrub Beds | Developer | Not Appropriate | Not Appropriate |
| Flowerbeds | Not Appropriate | Not Appropriate | Not Appropriate |
| Leisure Trail | Developer | Developer | Developer |
| Benches | Developer | Developer | Developer |
| Garbage Containers | Developer | Developer | Developer |
| Playground Equipment $40,000 in 2012 dollars + CCI* plus installation, border, and surfacing | Developer | Not Appropriate | Not Appropriate |
| Picnic Tables | Developer | Not Appropriate | Not Appropriate |
| ER Protection and Restoration | Developer | Developer | Developer |
| Asphalt Pad and Hoops for Basketball | TBD** | Not Appropriate | Not Appropriate |
| Ball Diamond , Backstop and Fencing | TBD** | Not Appropriate | Not Appropriate |
| Soccer Field Goal Posts | TBD** | Not Appropriate | Not Appropriate |
| Outdoor Ice Rink Service and Boards | City if appropriate | Not Appropriate | Not Appropriate |
| Tennis Court and Fencing | City if appropriate | Not Appropriate | Not Appropriate |
| Bleachers | TBD** | Not Appropriate | Not Appropriate |
| Washroom | Not Appropriate | Not Appropriate | Not Appropriate |

* For playground equipment per location

** Funding and type of amenities to be determined in consultation with the Joint School Planning Committee

CONTENTS

# PART 10 – STANDARDS FOR DETAILED DRAWINGS

## 10. STANDARDS FOR DETAILED DESIGN DRAWINGS

### 10.1 INTRODUCTION

The City requires that Detailed Design drawings be submitted with consistent information on each respective drawing within the plan set. Plans are to be prepared under the direction of authorized professionals such as Engineers, Landscape Architects, Certified Irrigation Designers, Legal Surveyors, Professional Licensees, P.Tech (Eng), etc. All final design drawings, including substantial changes to the finished work products, such as in As-Built or Record drawings, are to be properly Authenticated and Validated in accordance with current APEGA practices or the regulating body for each profession.

Drawing specific information pertaining to drawing formats (including line types and weights) is included within this section and shall be followed by Developers for the submission of hard copy drawings, to ensure consistency.

The legends are provided to assist the Developer in creating an accurate and consistent Detailed Design drawing, as well as accurate digital files that the City requires to be submitted.

### 10.2 DETAILED DESIGN DRAWINGS

The City requires that all Detailed Design drawing submissions are complete, containing all requisite drawings and information. The following plans constitute a Detailed Design drawing set:

- Cover Plans:
  - Title Page, and
  - Index Plan.
- Detailed Municipal Engineering Plans:
  - Erosion and Sediment Control Plan,
  - Overall Water and Sanitary Sewer Plan,
  - Overall Storm Sewer Plan,
  - Overland Storm Drainage Plan,
  - Roadways Plan,

  - Subdivision Lot Grading Plan,
  - Rough Grading Plan,
  - Plan/Profiles, and
  - Details.
- Supplemental Plans:
  - Tentative Legal Plan(s),
  - Tentative Utility Right-of-Way Plan(s),
  - City Gas Utility Detail Design Plan,
  - City Electric Utility Detail Design Plan,
  - 3rd Party Telecommunications Design Plans,
  - Composite Utilities Plan,
  - Landscape Plans, and
  - Traffic Accommodation Plan (if required).

At a minimum, each type of plan will contain the information indicated below and be in conformance with the design standards. Examples of each drawing are included within this document.

### 10.2.1 COVER PLANS

#### 10.2.1.1 TITLE PAGE

- City of Medicine Hat name.
- Name and phase of development area.
- Key Plan of City with development area identified.
- Developers name.
- Consultant name.
- Date.
- Revision status.

#### 10.2.1.2 INDEX PLAN

- Development Area and/or construction area boundaries.
- Plan view of area showing profile drawing numbers.
- List of drawings.
- Street names as per Planning Services designation.

- Lot and Block numbers as per Planning Services designation.

### 10.2.2 ENGINEERING PLANS

#### 10.2.2.1 EROSION AND SEDIMENT CONTROL PLAN

- Development area and/or construction area boundaries.
- Legend and definitions of any symbols, abbreviations and/or table headings used.
- Existing ASCM locations and identification numbers.
- Geotechnical test hole locations and identification numbers.
- Predevelopment contours.
- Temporary construction access.
- Construction access control.
- Extent of stripping.
- All stockpile locations.
- Retaining walls.
- Deep fills.
- Temporary and permanent erosion and sediment control measures adequate to protect against major storm runoff event flows, complete with supporting calculations.
- Dust control plans for:
    - during construction,
    - interim, and
    - permanent.

#### 10.2.2.2 OVERALL WATER AND SANITARY SEWER PLAN

- Development area and/or construction area boundaries.
- Lot and block numbers as per Planning Services designation.
- Legend and definitions of any symbols, abbreviations and/or table headings used.
- Water pipeline (size, type).
- Sanitary pipeline (sizes, type, slope).
- Dimensions from property line and/or other utilities.
- Water valves, fitting (size, type) and hydrant locations.
- Manholes and identification.

- Lot water and sanitary service line location.
- Tie-in locations, if required.
- Injection locations.
- Future connection locations.
- Duct crossing locations.
- Notes on special requirements (e.g. boring locations, PRV, lift stations, etc.).
- Parks water service including duct crossings.
- Lot restrictions with respect to common or shared services requiring the registration of caveats.

#### 10.2.2.3 OVERLAND STORM DRAINAGE PLAN

- Development Area and/or construction area boundaries.
- Legend and definitions of any symbols, abbreviations and/or table headings used.
- Major drainage system catchment area boundaries, catchment identification.
- Hydrologic characteristics, minor and major peak runoff.
- Catchment drainage direction.
- Drainage directions along road surfaces and in parks.
- Major overland flow routes.
- Overland spill location(s).

#### 10.2.2.4 OVERALL STORM SEWER PLAN

- Development Area and/or construction area boundaries.
- Lot and block numbers as per Planning Services designation.
- Legend and definitions of any symbols, abbreviations and/or table headings used.
- Storm pipeline (size, type, slope).
- Manholes and identification.
- Catch basins, leads and identification.
- Tie-in location(s).
- Allowable release rate.
- Minor and Major drainage system calculation table (see Figure 10.2.1).
- Flow, velocity, and depth along major overland flow routes.
- Ponding areas (trap low), including:

- Identification,
- Maximum ponding extents ,
- Maximum and 1:100 yr. volume and depth,
- Geodetic elevation of top of maximum ponding surface, and
- Spill direction.

- Lot restrictions with respect to ponding or overland drainage encroachments requiring the registration of caveats.

**Storm Sewer Design Spreadsheet**

**Development:**
Location: Medicine Hat, AB

**Developer:**
Consultant:

Storm Event: 1:5 Year

Manning's n = 0.011 (PVC Pipe)
Manning's n = 0.013 (Concrete Pipe)

| | | | Hydrology | | | | | | Hydraulics | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Catchment ID | From Manhole | To Manhole | Area (ha) | C | Time (min) | I (mm/hr) | Q Design (L/s) | Q Total (L/s) | Slope (%) | Pipe Dia. (mm) | Pipe Type | Velocity Full (m/s) | Pipe Length (m) | Time of Flow (min) | Capacity Full (L/s) |
| Lot 8 | | MH A | 0.7 | 0.4 | 10 | 66.9 | 52.4 | | | | | | | | |
| Lot 7 | | MH A | 0.47 | 0.4 | 10 | 66.9 | 35 | | | | | | | | |
| Road west | | MH A | 0.27 | 0.4 | 10 | 66.9 | 20.1 | | | | | | | | |
| | MH A | MH B | | | | | | 107.4 | 0.9 | 300 | PVC | 1.5 | 89 | 1 | 108.4 |
| Lot 6 | | MH B | 0.58 | 0.6 | 11 | 66.9 | 64.4 | | | | | | | | |
| Lot 5 | | MH B | 0.41 | 0.4 | 11 | 66.9 | 30.1 | | | | | | | | |
| | MH B | MH E | | | | | | 202 | 1.1 | 375 | PVC | 2 | 95 | 0.8 | 217.3 |
| Lot 9 | | MH C | 1.16 | 0.4 | 10 | 66.9 | 86.2 | | | | | | | | |
| | MH C | MH D | | | | | | 86.2 | 0.6 | 300 | PVC | 1.3 | 89 | 1.2 | 88.5 |
| Lot 4 | | MH D | 0.43 | 0.4 | 11.2 | 62.9 | 30 | | | | | | | | |
| Lot 10 | | MH D | 0.87 | 0.4 | 11.2 | 62.9 | 61 | | | | | | | | |
| Lot 11 | | MH D | 0.18 | 0.8 | 11.2 | 62.9 | 25.2 | | | | | | | | |
| | MH D | MH E | | | | | | 202.4 | 0.5 | 525 | PVC | 1.7 | 50 | 0.5 | 359.4 |
| | MH E | Outfall | | | | | | 404.4 | 0.5 | 600 | Con | 1.5 | 50 | 0.5 | 434.2 |

**Figure 10.2.1 - Typical Drainage System Calculation Table – Rationale Method**

## 10.2.2.5 ROADWAYS PLAN

- Development Area and/or construction area boundaries.
- Lot and block numbers as per Planning Services designation.
- Legend and definitions of any symbols, abbreviations and/or table headings used.
- Survey Control Monuments.
- Road and RROW widths.
- Lot driveway locations.
- Walkways, trails, sidewalks, wheelchairs ramps, curbs and gutters.

- Road Lip of gutter (LOG) or edge of pavement, including:
  - Beginning of curve elevations,
  - End of curve elevations, and
  - Elevations at grade change (high and low points).
- Road Centerline elevations grades with direction arrows. Include elevations at grade changes (high and low points), beginning and end of curves.
- Catch basin rim type and elevation.
- Trap lows, including:
  - Identification,
  - Maximum ponding extents,
  - Maximum and 1:100 yr. volume and depth,
  - Geodetic elevation of top of maximum ponding surface,
  - Spill direction.
  - Sidewalk or curb, including:
  - Description (rolled vs. standard face),
  - Width, and
  - Distance from property line,
  - Corner radii (lip-of-gutter or edge of pavement), and
  - Bulb radii.
- Channelization elements.
- Temporary accesses.
- Emergency accesses.
- Shared or joint accesses.
- Access prohibitions and restrictions (i.e. right-in, right-out).
- Driveway restrictions.
- Concrete swales (if required).
- Roadway based retaining walls (if required).
- Access control, (Fencing, chain and bollards, special curbs etc.).
- Road and lane sections (if Details Plan not required).
- Paved aprons in lanes abutting roads and surrounding catch basins.

- Paved walkway, including:
  - Beginning of curve elevations,
  - End of curve elevations,
  - Elevations at grade changes (high and low points),
  - Centerline grade with direction arrow, if applicable, and
  - Grade of cross-fall with direction arrow.
- Utility rights-of-way.
- Paved walkway section (if Details Plan not required).
- Surface infrastructure (i.e. catch basins, manholes, water valves, hydrants, etc.).
- Traffic control devices.
- Pavement markings.
- Street light illumination design.
- Street name signs and locations.
- Mailbox locations.
- Bus stop locations.
- Fencing.

#### 10.2.2.6 SUBDIVISION LOT GRADING PLAN

- Development Area and/or construction area boundaries.
- Lot and block numbers as per Planning Services designation.
- Legend and definitions of any symbols, abbreviations and/or table headings used.
- Road and RROW widths.
- Utility rights-of-way.
- Original ground contours and elevations (0.5 m intervals).
- Lot driveway locations.
- Walkways, trails, sidewalks, wheelchairs ramps, curbs and gutters.
- Road Lip of gutter (LOG) or edge of pavement, including:
  - Beginning of curve elevations,
  - End of curve elevations, and
  - Elevations at grade change (high and low points).

- Road Centerline elevations grades with direction arrows. Include elevations at grade changes (high and low points), beginning and end of curves.
- Trap lows, including:
  - Identification,
  - Maximum ponding extents,
  - Maximum and 1:100 yr. volume and depth,
  - Geodetic elevation of top of maximum ponding surface, and
  - Spill direction.
- Concrete swales, include elevations at beginning, end, grade changes and horizontal deflections (if required).
- Paved walkway, including:
  - Beginning of curve elevations,
  - End of curve elevations,
  - Elevations at grade changes (high and low points),
  - Centerline grade with direction arrow, if applicable, and
  - Grade of cross-fall with direction arrow.
- Fully dimensioned extent of flow path of major event runoff along roadways and other overland conveyances where they abut lots and parcels. This flow path is required wherever the runoff depth exceeds the elevation at the abutting property line and encroaches onto abutting property for the purposes of encumbrance registration.
- Borehole locations and elevation of groundwater.
- Design details for any earth berms proposed within the development.
- Slope setback lines from steep slopes per Geotechnical Report.
- Locations and heights of any retaining walls that may be required or proposed.
- Tabulation of Lot & Parcel information.
- The following Specific Lot & Parcel information shall be provided for every lot & parcel:
  - Finished ground elevations at all lot corners and at proposed changes of surface slope along property boundaries,
  - Elevations at front and back setbacks on common boundary property lines between adjacent parcels or lots,
  - Lot classification by grading/ drainage type in conformance with Section 4.4.4

- Lot drainage direction arrows indicating the direction of surface drainage, particularly along lot flanks and at common boundaries between adjacent parcels or lots,
- Retaining wall requirements due to grade differential between adjacent parcels or lots,
- Symbolic designation (shading or hatching) showing the extent of steep slopes (in excess of 4:1) on lots and parcels, and top of slope and bottom of slope setbacks from these slopes,
- Minimum Building Opening Elevation (MBOE, applies where lots abut trapped lows, depression storage and major event flow paths where the runoff depth exceeds the elevation at the abutting property line). The Minimum Building Opening Elevation shall be a minimum of 300 mm above the higher of:
  - the top of ponding elevation for trapped lows or depression storage, or
  - the elevation of the runoff at the highest property corner where runoff depth exceeds the elevation at the abutting property line.
- Lowest Top of Footing elevation (LTF, based upon service inverts),
- Sanitary invert at property line,
- Water pressure reducing valve (if required),
- Water service size (if other than minimum size),
- Water and sanitary sewer services location,
- Proposed driveway location,
- Building envelopes (shading of building envelope will suffice),
- Top of Footing elevation (TF-BC), based upon the lowest undisturbed ground contour within the building envelope, above which elevation a bearing certificate will be required,
- Top of footing elevation, (TF-DF) above which foundation requirements related to deep fills, shall apply. This top of footing elevation will be based upon the lowest undisturbed ground contour within the building envelope and the recommendations and requirements of the subdivision Geotechnical Report, and
- Markings or symbols clearly identifying all lots and parcels that require restrictive covenants or encumbrances regarding:
  - drainage,
  - trapped lows (depression storage),
  - major event flood levels and overland flow pathways,

    - restrictions and prohibitions related to slope stability, or
    - other such lot-related conditions requiring the registration of such instruments.
- Any other information that may be pertinent to the specific subdivision.

### 10.2.2.7 ROUGH GRADING PLAN

Rough grading plans represent the cut/fill and shaping requirements to prepare the site for final grading per the Subdivision Lot Grading Plan.

- Development Area and/or construction area boundaries.
- Lot and block numbers as per Planning Services designation.
- Legend and definitions of any symbols, abbreviations and/or table headings used.
- Road and RROW widths.
- Utility rights-of-way.
- Original ground contours and elevations (0.5 m intervals).
- Walkways, trails, sidewalks, wheelchairs ramps, curbs and gutters.
- Road Lip of gutter (LOG) or edge of pavement, including:
    - Beginning of curve elevations,
    - End of curve elevations, and
    - Elevations at grade change (high and low points).
- Road Centerline elevations grades with direction arrows. Include elevations at grade changes (high and low points), beginning and end of curves.
- Swales with elevations at beginning, end, change in grade, horizontal deflection (if required).
- Paved walkway, including:
    - Beginning of curve rough grade elevations,
    - End of curve rough grade elevations,
    - Rough grade elevations at grade changes (high and low points),
    - Centerline grade with direction arrow, if applicable, and
    - Grade of cross-fall with direction arrow.
- Fully dimensioned extent of flow path of major event runoff along roadways and other overland conveyances where they abut lots and parcels. This flow path is required wherever the runoff depth exceeds the elevation at the abutting property line and encroaches onto abutting property for the purposes of encumbrance registration.

- Borehole locations and elevation of groundwater.
- Rough grade for any earth berms proposed within the development.
- Slope setback lines from steep slopes per Geotechnical Report.
- Elevations at all lot corners and at proposed changes of surface slope along property boundaries.
- Elevations at front and back setbacks on common boundary property lines between adjacent parcels or lots.
- Lot classification by grading/drainage type in conformance with Section 4.4.4.
- Lot drainage direction arrows indicating the direction of surface drainage, particularly along lot flanks and at common boundaries between adjacent parcels or lots.
- Retaining wall requirements due to grade differential between adjacent parcels or lots.
- Symbolic designation (shading or hatching) showing the extent of steep slopes (in excess of 4:1) on lots and parcels, and top of slope and bottom of slope setbacks from these slopes.

#### 10.2.2.8 PLAN/PROFILES

- Normally 2 plan views, one with surface features, the other with underground. A single plan view may be used where the right-of-way width is in excess of 30 metres.
- Development Area and/or construction area boundaries.
- Grid profile at 0.2 m minor grids and 1.0 m major grids on vertical and 5.0 m minor grid and 20 m major grid on horizontal.
- Elevation and stations.
- Original ground profile.
- Road LOG profile.
- Road ditch/ swale profile, if applicable.
- Road pavement structure.
- Vertical curve info (start and end station, length, m, k).
- Road alignment change stations (CT, CS, SC, TC).
- MH rim elevation, type, inverts, identification.
- Street light locations dimensioned from property line.
- Duct crossing locations with reference to details.
- Shallow utility lines (Gas, Electric, Telephone and Cable. Indicate service point/s for each lot for electric, gas, telecommunications).

- Sanitary sewer - design Q, pipe capacity, velocity, slope, pipe type, pipe class, bedding, and backfill, length, pipe size.
- Storm pipe – design Q, pipe capacity, velocity, slope, pipe type, pipe class, bedding, and backfill, length, pipe size.
- Hydraulic grade line (where required).
- Water pipe – pipe size, pipe type, pipe class, bedding, and backfill, hydrants, valves, fittings and other related accessories.
- Pipe crossing separation.
- Special crossing details (i.e. concrete support saddle), drop structure.
- Existing utility lines when affected/crossed by new construction activities.
- All existing utilities within the scope of the project to be located and identified with depth and location above and below grade.
- Parks services (water and electric).

#### 10.2.2.9 DETAILS

- Road crossing (e.g. utility ducts) details.
- Typical road sections.
- Other details, as necessary.

### 10.2.3 SUPPLEMENTAL PLANS

#### 10.2.3.1 TENTATIVE LEGAL PLAN

Plan is to be a copy of the tentative legal plan prepared by a legal surveyor that has been submitted to Planning for approval. The plan may be plotted to N.T.S. to fit on the required drawing size.

#### 10.2.3.2 TENTATIVE UTILITY RIGHT-OF- WAY PLAN

Plan is to be a copy of the tentative UROW plan prepared by a legal surveyor. The plan may be plotted to N.T.S. to fit on the required drawing size.

#### 10.2.3.3 CITY GAS UTILITY DISTRIBUTION DETAIL DESIGN PLAN

Plan is to be a copy of the Gas Utility Detail Design plan.

#### 10.2.3.4 CITY ELECTRIC DISTRIBUTION UTILITY DETAIL DESIGN PLAN

Plan is to be a copy of the Electric Utility Detail Design plan.

### 10.2.3.5 THIRD PARTY TELECOMMUNICATIONS DESIGN PLANS

Plan is to be a copy of the Telecommunication Detail Design plan, if PDF provided.

### 10.2.3.6 COMPOSITE UNDERGROUND UTILITIES PLAN

This plan is not part of the engineering plans to be approved as the detail design plans. Its use is as a design tool to resolve conflicts.

- Development Area and/or construction area boundaries.
- Lot and block numbers as per Planning Services designation.
- Legend and definitions of any symbols, abbreviations.
- Utility rights-of-way.
- Deep utility pipelines (Storm, Sanitary, Water).
- Water valves, fittings and hydrant locations.
- Water injection points.
- Manholes and identification.
- Pipe sizes, type and slope.
- Catch basins, leads, and identification.
- Dimensions from property line and/or other utilities.
- Lot servicing lines.
- Shallow utility lines (Gas, Electric, and Telecommunication).
- Street light locations.
- Street light cable alignments.
- Transformers and switchgears.
- Telecommunication pedestals and vaults.
- Parks water and electrical services.
- All duct crossing locations.
- Notes on special requirements (e.g. boring locations, PRV, lift stations, etc.).

### 10.2.3.7 LANDSCAPE PLAN

Landscape plans are to be prepared by a certified landscape architect.

- Irrigation details including:
  - Services (water meter, irrigation vault, blow out),
  - Mainline (type, size),

  - Laterals (type, size),
  - Irrigation heads (type and nozzle size),
  - Controller (type and size),
  - Conduit,
  - Electric zone valve (type, size), and
  - Each valve numbered in relation to the controller.
- Overall landscape details (e.g. vegetation, groundcover, etc.).
- Ground contours.
- Tree planting (Latin and common name, caliper, quantity, type of container).
- Other amenities (e.g. benches, trails, garbage containers, accessibility etc.).
- Development Area and/or construction area boundaries.

#### 10.2.3.8 TRAFFIC ACCOMODATION PLAN

Traffic Accommodation plans are to be prepared and Authenticated/Validated according to APEGA current Practices.

## 10.3 DRAWING SPECIFICATIONS

### 10.3.1 UNIT OF MEASUREMENT

All plans to be drawn in the SI system (metric) of units to standard scales.

### 10.3.2 SHEET SIZE

Standard A1 Metric 841 mm x 594 mm.

### 10.3.3 DIGITAL FILES

Digital files are to be submitted with the hard (paper) copies of the approved drawings and the As-Built drawings in two different formats, AutoCAD 2022 or newer readable files and PDF files. AutoCAD files are to be referenced in NAD_1983_CSRS_3TM_111 coordinates.

### 10.3.4 TITLE BLOCK

The Title Block on all drawings shall include the following information:

- Drawing number.
- City of Medicine Hat name.
- Name and phase of development area.
- Developers name.

- Revision number.
- Revision record block.
- Permit to Practice and Engineering Seals signed and dated.
- Scale and scale bar.
- Consultants name and or logo.

### 10.3.5 SHEET LAYOUT

Generally, sheet layout shall conform to the following:

- Allow 26 mm binding edge along the left-hand side. Plan or profile shall not be drawn in this area.
- Maintain a minimum of 10 mm clearance along the top, right, and bottom sides.
- Whenever possible, show the north arrow pointing upward on the top right-hand side of the page.

### 10.3.6 TEXT AND DIMENSIONING

Text and Dimensioning of drawings are to be clear and readable. To this end the following guidelines should be applied:

- Overlapping of text and lines is to be avoided.
- The lettering is in a clear, clean font type that is easily readable.
- Lettering sizes are to be as indicated in Section 10.3.9.
- Preferred minimum-lettering height is 2.0 mm, Absolute minimum lettering height is 1.5 mm and should be used sparingly.
- All dimensions of utilities to be referenced to property lines.

### 10.3.7 EXISTING PROPOSED AND FUTURE

All symbols represent proposed utilities and appurtenances are to be solid shapes. All symbols representing existing appurtenances are to be hollow shapes. All "Future" Symbols should be solid grey.

### 10.3.8 SCALE

Drawing scale shall be appropriate to the level of detailed required to convey the information for the drawing and the overall size of the development. The typical scale of most plan submissions is:

- Overall plans; 1:1000, (1:500 or 1:1500, 1:2000 may be acceptable dependent on the size and complexity of the project. Projects too large to fit on a standard A1 size sheet at a

scale of 1:1000 will need to be tiled into sections and a key plan provided showing the match lines).

- Plan/Profiles, Horizontal: 1:500, Vertical: 1:50.

### 10.3.9 DRAFTING STANDARDS

The following table details the line types, pen thickness and text sizes required for overall plans. For each item listed a separate layer should be utilized in the electronic files. Where there is a requirement for additional items that are not listed a new layer shall be created and line weight, line type object fill, and text size are to be selected consistent with the type of item being shown and good drafting practices.

**Table 10.3.1 - Drafting Standard Text, Line, Weight, and Fill Types**

| ITEM | LINE WEIGHT | LINE TYPE | OBJECT FILL & SHADING | TEXT SIZE |
|---|---|---|---|---|
| **General** | | | | |
| Project Boundary | 1.00 mm | Dashed | N/A | N/A |
| Project Boundary Label | 0.25 mm | Continuous | N/A | 2.5 mm |
| Plan and Profile Label | 0.50 mm | Continuous | N/A | 4.5 mm |
| Drawing List | 0.35 mm | Continuous | N/A | 3.5 mm |
| General Notes | 0.25 mm | Continuous | N/A | 2.0 mm |
| Proposed Dimensions | 0.18 mm | Continuous | N/A | 2.0 mm |
| **Legal and Planning** | | | | |
| Lot and Block Lines | 0.18 mm | Continuous | N/A | N/A |
| Street Names | 0.50 mm | Continuous | N/A | 3.5 mm |
| Block Numbers | 0.25 mm | Continuous | N/A | 5.0 mm |
| Lot Numbers | 0.25 mm | Continuous | N/A | 2.5 mm |
| UROW's | 0.25 mm | Dashed | N/A | N/A |
| Zoning Numbers (Multifamily, commercial and industrial lots) | 0.25 mm | Continuous | N/A | 2.0 mm |
| **Water** | | | | |
| Existing Water Lines and Appurtenances | 0.25 mm | Dash dot | none | N/A |
| Existing Water Lines and Appurtenances Text, Dimensioning and Notation | 0.18 mm | Continuous | N/A | 2.0 mm |
| Proposed Water Lines and Appurtenances | 0.50 mm | Dash dot | solid | N/A |

| | | | | | |
|---|---|---|---|---|---|
| | Proposed Water Text, Dimensioning and Notation | 0.18 mm | Continuous | N/A | 2.0 mm |
| **Sanitary Sewer** | | | | | |
| | Existing Sanitary Sewer Lines and Appurtenances | 0.25 mm | Continuous | none | N/A |
| | Existing Sanitary Sewer Lines and Appurtenances Text, Dimensioning and Notation | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Proposed Sanitary Sewer Lines and Appurtenances | 0.50 mm | Continuous | solid | N/A |
| | Proposed Sanitary Sewer Text, Dimensioning and Notation | 0.18 mm | Continuous | N/A | 2.0 mm |
| **Storm Drainage** | | | | | |
| | Existing Storm Sewer Lines and Appurtenances | 0.25 mm | Long Dash | none | N/A |
| | Existing Catch Basins | 0.25 mm | Long Dash | none | N/A |
| | Existing Catch Basins Leads | 0.25 mm | Hidden2 | N/A | N/A |
| | Existing Storm Sewer Text, Dimensioning and Notation | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Proposed Storm Sewer Lines and Appurtenances | 0.50 mm | Long Dash | solid | N/A |
| | Proposed Catch Basins | 0.50 mm | Long Dash | solid | N/A |
| | Proposed Catch Basin Leads | 0.50 mm | Hidden2 | N/A | N/A |
| | Proposed Storm Sewer Text, Dimensioning and Notation | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Drainage Calculation Table | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Storm Symbols | 0.25 mm | Continuous | N/A | N/A |
| | Catchment Boundary | 1.00 mm | Continuous | 70% | N/A |
| | Catchment Identification and Area text | 0.70 mm | Continuous | N/A | 5.0 mm |
| | Drainage Arrows | 0.35 mm | Continuous | N/A | N/A |
| | Trap Low Boundary | 0.35 mm | Continuous | N/A | N/A |
| | Trap Low Hatch | 0.18 mm | Hatch | 50% | N/A |
| | Trap Low Text | 0.25 mm | Continuous | N/A | 2.0 mm |
| | Overland Flow Text | 0.25 mm | Continuous | N/A | 2.0 mm |
| **Shallow Utilities** | | | | | |
| | Existing Gas Line and Appurtenances | 0.18 mm | Phantom | none | N/A |
| | Proposed Gas Line and Appurtenances | 0.35 mm | Phantom | solid | N/A |

| | | | | | |
|---|---|---|---|---|---|
| | Existing Electric Line and Appurtenances | 0.18 mm | Center | none | N/A |
| | Proposed Electric Line and Appurtenances | 0.35 mm | Center | solid | N/A |
| | Existing Telecommunication Cable and Appurtenances | 0.18 mm | Hidden | none | N/A |
| | Proposed Telecommunication Cable and Appurtenances | 0.35 mm | Hidden | solid | N/A |
| | Shallow Utility Line Labels | 0.18 mm | Continuous | N/A | 2.0 mm |
| **Roads** | | | | | |
| | Existing Sidewalk and Curb | 0.25 mm | Continuous | N/A | N/A |
| | Proposed Sidewalk and Curb | 0.50 mm | Continuous | N/A | N/A |
| | Road Grade Labels | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Catch Basin Label and Rim Elevation | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Sidewalk and Curb Description | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Corner and Bulb Radius | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Road and RROW Widths | 0.25 mm | Continuous | N/A | 2.0 mm |
| | Existing Bollards & Fencing | 0.25 mm | Continuous | none | 2.0 mm |
| | Proposed Bollards & Fencing | 0.25 mm | Continuous | solid | 2.0 mm |
| | Existing Mailboxes | 0.25 mm | Continuous | none | 2.0 mm |
| | Proposed Mailboxes | 0.25 mm | Continuous | solid | 2.0 mm |
| | Existing Bus Stop | 0.25 mm | Continuous | N/A | 2.0 mm |
| | Proposed Bus Stop | 0.25 mm | Continuous | N/A | 2.0 mm |
| | Existing Street and Traffic Control Signs, Markings and Devices | 0.25 mm | Continuous | none | 2.0 mm |
| | Proposed Street and Traffic Control Signs, Markings and Devices | 0.25 mm | Continuous | solid | 2.0 mm |
| | Survey Control Markers | 0.25 mm | Continuous | N/A | 2.0 mm |
| | Proposed Spot Elevations | 0.18 mm | Continuous | N/A | 2.0 mm |
| **Cross Sections** | | | | | |
| | Section Symbols | 0.70 mm | Continuous | N/A | 4.5 mm |
| | Section Labels | 0.50 mm | Continuous | N/A | 3.5 mm |
| | Section Line Weight | 0.25 mm | Continuous | N/A | N/A |
| | Section Hatch Line Weight | 0.18 mm | Continuous | N/A | N/A |
| | Section Dimensions | 0.18 mm | Continuous | N/A | 2.0 mm |
| | Section Notes and Leaders | 0.18 mm | Continuous | N/A | 2.0 mm |

| | | | | | |
|---|---|---|---|---|---|
| **Grading** | | | | | |
| | Pre-development Original Ground Contours<br>2.0 m interval – Major Contours | 0.50 mm | Continuous | 50% | 2.0 mm |
| | Pre-development Original Ground Contours<br>0.5 m interval – Minor Contours | 0.25 mm | Continuous | 50% | N/A |
| | Lot Corner and Boundary Elevations | 0.18 mm | Continuous | N/A | N/A |
| | Building Envelope | 0.18 mm | Dashed | 30% | N/A |
| | Symbols | 0.35 mm | Continuous | N/A | 2.0 mm |
| | Grading Text | 0.18 mm | Continuous | N/A | 2.0 mm |
| | General Notes | 0.25 mm | Continuous | N/A | 2.0 mm |
| | Lot Drainage Arrows | 0.18 mm | Continuous | N/A | N/A |
| | Existing Trail Alignments | 0.25 mm | Continuous | N/A | 2.0 mm |
| | Proposed Trail Alignments | 0.50 mm | Continuous | N/A | 2.0 mm |
| | Specific Lot & Parcel Table | 0.18 mm | Continuous | N/A | 2.0 mm |
| **Profiles** | | | | | |
| | Major Grid | 0.35 mm | Continuous | 50% | N/A |
| | Minor Grid | 0.18 mm | Continuous | 50% | N/A |
| | Elevation and Station Labels | 0.50 mm | Continuous | N/A | 3.5 mm |
| | Original Ground Profile | 0.25 mm | Continuous | N/A | N/A |
| | Lip of Gutter/Ditch/Swale Profile | 0.35 mm | Dashed | N/A | N/A |
| | Vertical Curve Dimensioning and Notes | 0.25 mm | Continuous | N/A | 2.5 mm |
| | Road Alignment Stationing | 0.25 mm | Continuous | N/A | 2.5 mm |
| | Road Structure | 0.25 mm | Continuous | N/A | 2.5 mm |
| | Hydraulic Grade Line | 0.25 mm | Hidden | N/A | N/A |
| **Landscaping** | | | | | |
| | Irrigation Services | 0.50 mm | Continuous | N/A | N/A |
| | Irrigation Mainline | 0.50 mm | Continuous | N/A | N/A |
| | Irrigation Laterals | 0.50 mm | Continuous | N/A | N/A |
| | Irrigation Heads | 0.25 mm | Continuous | N/A | N/A |
| | Irrigation Controllers | 0.25 mm | Continuous | N/A | N/A |
| | Irrigation Conduits | 0.25 mm | Continuous | N/A | N/A |
| | Irrigation Electric Zone Valves | 0.25 mm | Continuous | N/A | N/A |

## 10.4 SYMBOL LEGEND

Note: City Electric and Gas Departments will provide a Legend on their drawings given to the Developer and their consultants. The Symbols used on that Legend will govern what is submitted.

The following are drawing standards that can be used on other drawings being submitted.

## ELECTRIC LEGEND

PROPOSED ELECTRICAL
EXISTING ELECTRICAL
EXSITING CABINET
PROPOSED CABINET
EXSITING POLE
PROPOSED POLE
EXSITING SERVICE BOXES
PROPOSED SERVICE BOX
EXISTING ST. LTS.
PROPOSED ST. LTS.
EXISTING VAULT
PROPOSED VAULT

## GAS LEGEND

PROPOSED GAS PIPELINE
EXISTING GAS PIPELINE
PROPOSED GAS VALVE
EXISTING GAS VALVE
CAP
STOPPER
REDUCER
POLY STEEL TRANSITION

## WATER/SEWER LEGEND

EXISTING STORM LINE
PROPOSED STORM LINE
EXISTING WATER LINE
PROPOSED WATER LINE
EXISTING SEWER LINE
PROPOSED SEWER LINE
EXISTING VALVE
PROPOSED VALVE
EXISTING HYDRANT
PROPOSED HYDRANT
EXISTING REDUCER
PROPOSED REDUCER
EXISTING MANHOLE
PROPOSED MANHOLE
CATCH BASIN
CATCH BASIN ROUND TOP
DUPLEX DWELLING R-2 = LOTS
FOURPLEX DWELLING R-3 = LOTS

LANE OR WHEEL CHAIR RAMP
DUCT CROSSING

PROJECT BOUNDARY

CONTENTS

# PART 11 – ELECTRIC DISTRIBUTION SYSTEM

## 11. ELECTRIC DISTRIBUTION SYSTEM

### 11.1 GENERAL REQUIREMENTS

The role of the Electric Distribution Utility in the land development process is to provide requirements for electric distribution infrastructure for development of Area Structure Plans, Subdivision Plans and Development applications.

The following outlines the general requirements which must be met prior to the Utility commencing design for servicing the development.

- Design for electric is done at the same time as gas and can only be started once lot layout, site grading, water, sanitary sewer, storm sewer, and road design has reached a 75% - 95% design completion. At the 75% to 95% design completion, it is required to show design items such as valve boxes, hydrants, other shallow utilities, and irrigation plans to avoid conflicts.
- Roads, laneways, and utility rights of way (UROW) must have sufficient width to accommodate facility separations as well as future maintenance activities for the lifetime of the utility asset.
- Detailed design of the electric system requires the service capacity per zoning classification for their development. It is loosely determined by the lot zoning, and Developers are responsible to understand, and clarify the capacity expectations required before design can start.

### 11.2 PROCESS TO EXTEND ELECTRIC DISTRIBUTION INFRASTRUCTURE

The initial request for Electric Utility work is made by the Developer to the Utility using an application form found on the City website.

**The responsibilities of the Utility are:**

- Design the system extension and indicate what civil facilities (i.e.: trench, ducts) the Developer will be required to install.
- Design wiring of streetlights in conformance with the illumination design provided by the Developer in the illumination design approved by the road authority.
- Inspect Trenches dug for the Electric Utility prior to duct/conduit or cable installation.
- Inspect ducts laid in open trench prior to backfill.

- Supply and installation of the system extension and related equipment.
- Inspection and quality control of the work.
- Energization of the facilities.

**The responsibilities of the Developer are:**

- Provide detailed design of the site layout including water, sanitary, storm and roads.
- Electrical load details.
- Provide a project schedule with the objective of negotiating a mutually agreed schedule based on the order milestones must be achieved. Developer will communicate and coordinate other facility installations and prepare for electric installation to follow the road and sidewalk installation.
- Prepare plans for streetlight illumination design and have them approved by the road authority.
- Accept the Utilities design of the system extension and equipment placement.
- Obtain all necessary UROW agreements.
- Supply and install civil facilities to support the electric system as directed by the Utility,
- Excavate, sand pad and backfill for the electric system as directed by the Utility when required.

## 11.3 DESIGN PARAMETERS

- All electrical distribution facilities must be designed in accordance with the requirements of the Alberta Electrical Utility Code (AEUC), and any amendments thereto, under the Alberta Safety Codes Act, and where applicable the Canadian Electrical Code (CEC) – Part 1.
- Primary, secondary, service and streetlight cables are to be installed in ducts with utility approved pull rope for all installations.
- Duct sizes are provided by the Utility during the design stage.

## 11.4 ALIGNMENTS

Minium final separation between underground distribution voltage electric lines, conduits, grounding grids and other utilities is 300 mm.

## 11.5 CLEARANCE REQUIREMENTS FROM LIVE ELECTRICAL INFRASTRUCTURE

Maintaining adequate clearance of people, buildings, trees, vehicles, other utilities, and other objects is critical for safety and is the end customers

responsibility to ensure they maintain these distances. These are called the safe limits of approach.

Minium separations between overhead electric infrastructure is determined by the voltage of the line. Developers and customers are to contact the utility to determine the requirement.

- Seven (7.0) metres is the starting distance for safe limits of approach. Alberta Occupational Health & Safety (OH&S) and the CMH Electric Utility have guidelines for customers on how to work safely and determine if their safe limits of approach can be reduced from Seven (7.0) metres.
- No removal of soil or addition of landscaping are permitted within 1.0 m of any electric utility pole or anchor.
- Switchgear requires a minimum of 3.0 m of unobstructed working space on all sides of the switchgear.
- Enclosures and transformers require a minimum of 3.0 m of unobstructed working space on the side with the doors and 1.0 m on the other sides.
- Pedestals, buried ground grids, guardrails and bollards require a minimum of 1.0 m unobstructed working space on all sides.
- No materials, fill or spill piles may be stored or located underneath overhead powerlines as this reduces clearance to conductors and creates an unsafe workspace.

## 11.6 TELECOMMUNICATIONS

Telecommunication utilities are private utilities and separate from City of Medicine Hat Electric. The developer is responsible to initiate designs and coordinate the installation of telecom utilities that operate within the City.

## 11.7 STREETLIGHTS

The streetlight design consists of two specialities, illumination for road safety and wiring. The road authority approves illumination designs provided by the Developer. The Electric Utility provides the electrical design once the illumination design is approved.

## 11.8 CONSUMER SERVICING REQUIREMENTS

This section provides general information on servicing related to revenue metering. Servicing requirements are for new developments or alteration requests made since the issuing of this MSSM. Additional detailed information is found online in the Electric Utility Customer Connection guide.

- Each parcel with its own land title requires its own service. This service must originate from a lane, road right-of-way or UROW and not cross other titled pieces of land to get to the end consumer.

- Detached single family residential parcels have a service stub installed to the lot at the time of subdivision development. Detached single family residential structures receive one service and one meter.
- Semi-Detached (Multi Family) Dwellings (two or more side by side units) with separate land titles/parcels for each unit receive one service and one meter per parcel. Gang metering is not permitted on these structures because of the separate land titles.
- Semi-Detached (Multi-Family) Dwellings (two or more units in front to back or side by side configuration) on one parcel receive one service and a gang bank of meters in one location on the overall structure. This includes multifamily developments that are part of a Bareland Condominium agreement.
- Multi-Family Dwellings which are vertically stacked, typically recognized as apartments or condominiums, receive one service and either a bulk meter or a gang of meters in one location on the overall structure.
- Suites within any of the residential types do not receive their own meter.
- Commercial lots are not pre-serviced at the time of subdivision development. but are designed and constructed to the first applicant to develop the lot.

## 11.9 CROSS SECTION

Updates pending.

As a part of the planned updates for 2026 there will be reviews made of the rights-of-way and spacings for all deep and shallow utilities.

## 11.10 UROW LANDSCAPING

The UROW is to protect the utility for it's lifetime of regular inspections and maintenance as well as replacement or repair activities which may occur. Any improvements in a UROW that can hinder the utility in these tasks are not permissible. Grass is considered the best landscaping improvement in a UROW. landscaping restrictions for both gas and electric are:

- No trees or shrubs.
- No structures.
- No multi-level landscape features.
- No grade changes.

CONTENTS

# PART 12 – GAS DISTRIBUTION SYSTEM

## 12. GAS DISTRIBUTION SYSTEM

### 12.1 GENERAL

The role of the Gas Distribution Utility in the land development process is to provide requirements for gas distribution infrastructure for development of Area Structure Plans, Subdivision Plans, and Development Applications.

The following outlines the general requirements which must be met prior to the Utility commencing design for servicing the development:

- Design for gas is done at the same time as electric and can only be started once lot layout, site grading, water, sanitary sewer, storm sewer, and road design has reached a 75% - 95% design completion. At the 75% to 95% design completion, it is required to show design items such as valve boxes, hydrants, other shallow utilities, and irrigation plans to avoid conflicts.
- Roads, laneways, and utility rights of way (UROW)must have sufficient width to accommodate facility separations as well as future maintenance activities for the lifetime of the utility asset.
- Detailed design of the gas system requires the service capacity per zoning classification for their development. It is loosely determined by the lot zoning, and Developers are responsible to understand, and clarify the capacity expectations required before design can start.

### 12.2 PROCESS TO EXTEND GAS DISTRIBUTION INFRASTRUCTURE

The initial request for Gas Utility work is made by the Developer to the Utility using an application form found on the City website.

**The responsibilities of the Utility are:**

- Design the system extension and indicate what ducts across roads the Developer will be required to install.
- Inspect trenches dug for gas lines prior to installation.
- Inspect ducts laid in open trench prior to backfill.
- Supply and installation of the system extension and related equipment.
- Inspection and quality control of the work.

- Commissioning of the facilities.
- Excavate, sand pad, and backfill for the gas system as directed by the Utility when required.

**The responsibilities of the Developer are:**

- Provide detailed design of the site layout, including water, storm, sanitary and roads
- Gas load details for development.
- Provide a project schedule with the objective of negotiating a mutually agreed schedule based on the order milestones must be achieved. Developer will communicate and coordinate other facility installations and prepare for gas installation to follow the electric and telecommunications installation.
- Accept the Utilities design of the system extension and equipment placement.
- Obtain all necessary UROW agreements.
- Supply and install ducts to support the gas system as directed by the Utility & contact Gas Distribution for inspection prior to backfill.

## 12.3 DESIGN PARAMETERS

All gas distribution facilities must be designed in accordance with the requirements of the CSA Z662 code, and any amendments or revisions thereto.

## 12.4 ALIGNMENTS

- Minium final separation between distribution pressure gas infrastructure and other utilities is 300 mm.
- Minium final separation between Alberta Energy Regulated high pressure gas infrastructure and other utilities is 600 mm.

## 12.5 CLEARANCE REQUIREMENTS FROM LIVE GAS INFRASTRUCTURE

Maintaining adequate clearance of people, buildings, trees, vehicles, other utilities and other objects is critical for safety and is the end customers responsibility to ensure they maintain these distances.

Alberta Occupational Health & Safety (OH&S) has guidelines for customers on how to work safely while conducting ground disturbance activities.

No removal of soil or addition of landscaping or buildings are permitted over gas infrastructure or within a UROW. Encroachments on gas infrastructure may be removed by the Gas Utility at the expense of the Developer or property owner.

## 12.6 CONSUMER SERVICING REQUIREMENTS

This section provides general information on servicing related to revenue metering.

- Each property with its own land title requires its own service. This service must originate from a lane, road right-of-way or UROW and not cross other titled pieces of land to get to the end consumer.
- Detached single family residential structures receive one service and one meter.
- Attached Multi Family dwellings with separate land titles for each unit receive one service and one meter per land title. Multi bank metering is not permitted on these structures because of the separate land titles.
- Semi-Detached (Multi-Family) Dwellings that are side by side or front to back and on one titled lot receive one service and a multi-bank of meters in one location on the overall structure. This includes multifamily developments that are part of a Bareland condo agreement.
- Semi-Detached (Multi-Family) Dwellings which are vertically stacked, typically recognized as apartments or condominiums, receive one service and either a bulk meter or a multi-bank of meters in one location on the overall structure.
- Suites within any of the residential types do not receive their own meter.
- Commercial lots have services and meter sets designed and constructed to the first applicant to develop the lot.

## 12.7 CROSS SECTION

Updates pending.

As a part of the planned updates for 2026 there will be reviews made of the rights-of-way and spacings for all deep and shallow utilities.

## 12.8 UROW LANDSCAPING

The UROW is to protect the utility for it's lifetime of regular inspections and maintenance as well as replacement or repair activities which may occur. Any improvements in a UROW that can hinder the utility in these tasks are not permissible. Grass is the considered the best landscaping improvement in a UROW. landscaping restrictions for both gas and electric are:

- No trees or shrubs.
- No structures.
- No multi-level landscape features.
- No grade changes.

CONTENTS

# PART 13 - SOLID WASTE COLLECTION

## 13. SOLID WASTE COLLECTION

### 13.1 GENERAL

The role of the Solid Waste Utility in the land development process is to provide comments on Area Structure Plans, Subdivision Plans and Development Applications pertaining to the collection of garbage, recyclable materials, and yard waste. Proposed changes to collection points or methods of collection, building additions and changes of use should also be reviewed by the Solid Waste Utility.

The Municipal Servicing Standards Manual – Solid Waste Collection sets out design requirements for the collection of waste from each of the various categories of development and land use. In addition to these requirements, development must adhere to the City's Waste Bylaw (no. 1805) and other applicable bylaws and regulations.

The solid waste collection system consists of bins for collection of non-hazardous refuse from residential and non-residential customers. Collection bins for residential recyclable material are located at various central drop-off depots throughout the City. Some commercial customers have individual bins for recycling cardboard or other materials.

**General Requirements**

The following section contains general requirements which must be met prior to the City or a private solid waste collector commencing service to the development. Specific requirements based on the type of development and use will be addressed in subsequent sections.

- The City will collect only garbage, recycling and yard waste, and reserves the right to revoke collection services to any development that does not adhere to the requirements as laid out in this document and the Waste Bylaw (no. 1805).
- Collection services for garbage are provided for non-hazardous municipal solid waste only. The City will not collect any hazardous or pathological waste.
- Private roads and laneways must have sufficient width and road structure to accommodate solid waste collection vehicles.
- The property owner is responsible for locating carts or bins to a suitable point for collection. The city will not be responsible for servicing carts or bins that are inaccessible to a collection vehicle.

## 13.2 SITE PLAN APPROVAL REQUIREMENTS

To ensure that the Solid Waste Utility has the opportunity to review Site plans as they pertain to solid waste collection, all developers or site owners must include details on the following during the site design process:

- Number of dwelling units and number of stories in the development.
- Type of commercial/industrial/institutional development.
- Access routes for collection vehicles.
- Size and number of garbage bins and recycling bins (for commercial development).

Development plans shall include information about waste management strategies for construction and demolition materials. Site plans for commercial and multi-family residential development shall include locations for garbage bins and screening. In general, the locations for garbage bins serving four (4) or more single-family residential units shall be suitable to accommodate collection by either the side-load (City units) or front-load vehicles (private haulers).Where site constraints exist that limit the bin location and configuration to only one of these alternatives, the site drawings shall clearly identify this in the following manner:

1. Where bin location and configuration are suitable for only side-load vehicles, the site drawings shall include the following statement:

   *"The location and configuration of garbage bins on this site is suitable for collection by side-load collection vehicles only."*

2. Where bin location and configuration are suitable for only front-load vehicles, the site drawings shall include the following statement:

   *"The location and configuration of garbage bins on this site is suitable for collection by front-load collection vehicles only."*

In addition to the statement on the drawings, developers of sites that are suited only to front-load collection vehicles shall sign the "Declaration for Private Solid Waste Collection Services". This declaration shall be in the form given in the sample template on the following page and must include the following information:

- The name of the individual making the declaration on behalf of the Developer.
- The address of the development.
- The name of the development.
- The signature of the individual making the declaration.

A copy of this declaration is to be included with the Development Agreement for the site to record the decision. The developer is also required to advise future owners and/or condominium boards of the decision.

## Declaration for Private Solid Waste Collection Services

Development: _____

Address: _____

As the Developer for _____, I hereby certify that solid waste collection services for this development will be provided by a private contractor and not by the City of Medicine Hat. I further certify that this development is designed with the intent to utilize private collection services, and that future owners or condominium boards will be required to utilize private collection services and not obtain solid waste collection services from the City of Medicine Hat, unless changes are made to the bin configuration or layout to accommodate City of Medicine Hat solid waste collection vehicles. A copy of this declaration will be provided to the future owner or condominium board for this development in order to advise them that private collection services must be utilized, unless changes are made to accommodate solid waste collection by the City of Medicine Hat.

Signed _____

Print Name_____

Date _____

CC: Planning Department
Environmental Utilities Department
Development Engineering Department

## 13.3 DESIGN PARAMETERS FOR SITES

### 13.3.1 GENERAL REQUIREMENTS

The number and size of waste management bins shall be selected based on the type of development, the anticipated waste stream, and the anticipated loading from the residents or customers. Where bins require screening, the screening shall be designed in accordance with the guidelines provided by the Planning and Development Services Department of the City of Medicine Hat and in consultation with the City's Solid Waste Utility.

### 13.3.2 LOCATION OF WASTE MANAGEMENT BINS

Waste management bins, whether screened or not, shall be located and configured to be accessible by appropriate collection vehicles. Bin locations shall be such that, whenever possible, collection vehicles can access the bins, service the site and leave the site without backing up onto a roadway. If backing up is required, the bins shall be located to minimize both the amount of backing up required and the potential for conflict or interference between collection vehicles and other vehicles, pedestrians, structures, facilities, and/or landscaping.

Sites must be designed so that solid waste collection vehicles can safely enter the site, access the bins, unload the bins, and leave the site. Laneways and driveways must provide adequate width and space for vehicles to maneuver easily, safely, and without undue interference with other vehicular or pedestrian traffic. Clear lines of site must also be maintained, and any vegetation or structures that impede line of sight trimmed back or removed.

Turning radius template for the City of Medicine Hat side-load commercial solid waste collection vehicle is provided in Figure 13.3.1.

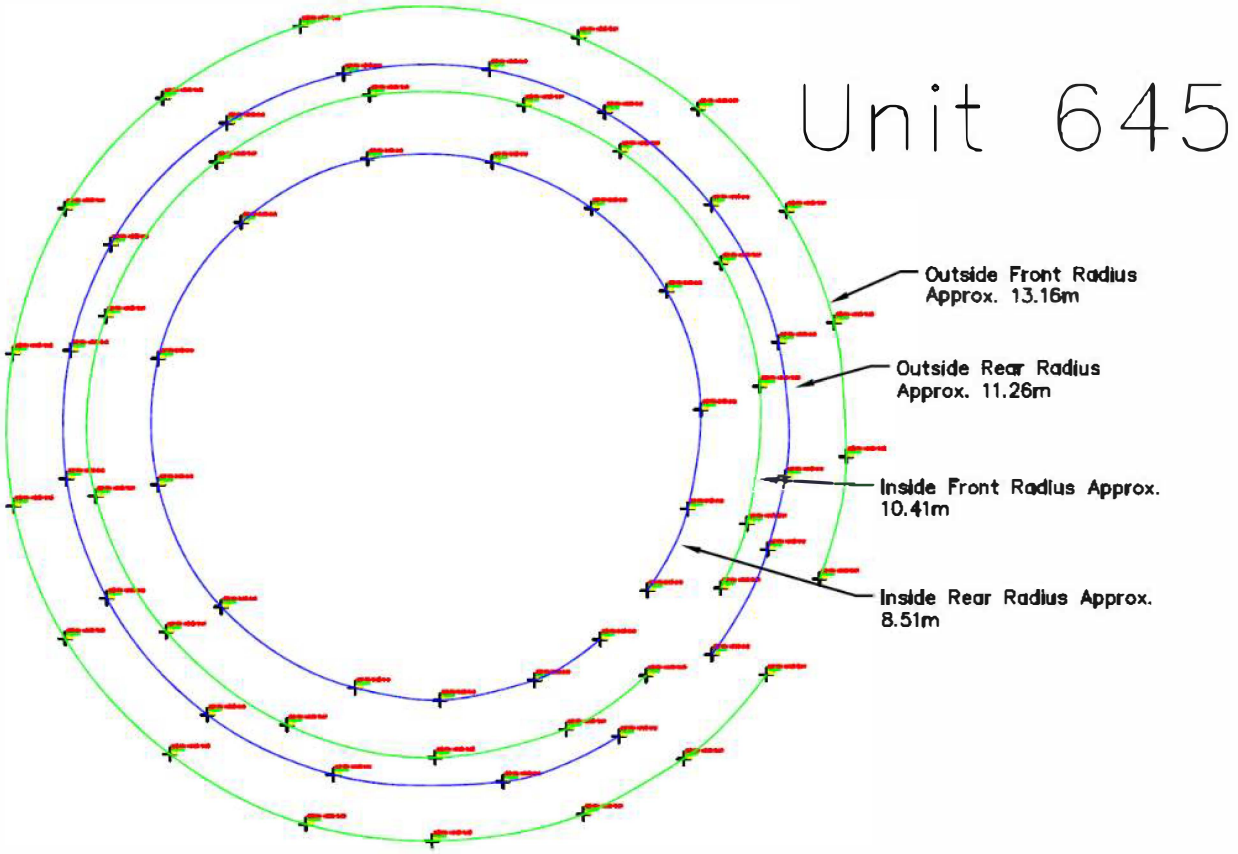


**Figure 13.3.1 - Turning Radius for City of Medicine Hat Side-Load Solid Waste Collection Vehicle**

## 13.4 DESIGN PARAMETERS FOR BIN PADS AND ENCLOSURES

Bins that are to be collected by the City' Solid Waste Utility must not be located within a building. If the bin is contained within a building for ease of access by residents or users, the bin must be removed on collection day to a location acceptable and accessible by City solid waste collection vehicles. Where bins are required to be moved from the collection or staging area to facilitate collection by City vehicles, it is the responsibility of the owner or condominium corporation to do so; this also applies to bin relocation of greater than 6 m. If an owner/operator wishes to make alterations to the City bin to allow for easier relocation, these alterations must first be approved in writing by the Waste and Recycling Manager and must not interfere with the City's ability to service the bin. The owner/operator is responsible for maintaining any alterations to the bin, as well as any damage to the bin.

A pad or staging area for bins requires a speed bump to prevent containers from rolling onto adjacent roadways, lanes, or parking areas.

Bins must be located on a surface suitable for supporting the bin, such as a concrete pad, asphalt surface, or packed gravel surface. Concrete pads must not have curbs or that will interfere with the unloading of the bin.

The bin must be located on or immediately adjacent to a surface that is suitable for use by heavy vehicles. This roadway or laneway to the bin must be maintained in good and serviceable condition and must be kept clear of snow and debris that could impede access by collection vehicles.

If bin enclosures are required to satisfy Planning and aesthetic considerations, these enclosures shall be designed in accordance with the following guidelines:

1. Enclosure gates are to open 180 degrees.
2. Gates are to be restrained so that they will not hit vehicles or accidentally swing shut during servicing.
3. At least one all weather "No Parking" sign is to be installed in front of the gate.
4. A minimum of 0.6 m clearance is required on all sides of the desired bin(s) to ensure adequate clearance for collection vehicles.
5. Where locks are provided for gates, the owner or condominium corporation must ensure that gates are unlocked by 6 a.m. on collection day or provide keys to the service provider. Where the City of Medicine Hat is the service provider, the owner must sign a Service Agreement that clearly states whether the owner or the City will unlock the gates and pay the additional service fee to have the City unlock the gates on collection day.

# APPENDIX A - ENGINEERING DECLARATIONS

## A1 NOTES

- The following templated Engineering Declarations are provided to facilitate the Engineer of Record to clearly identify the works that have been installed and that they have been designed and installed in accordance with the stipulations found in the declarations.
- Each declaration shall be accompanied by a description clearly identifying the diameters, corresponding lengths, and types of materials used in the declared items to ensure that appropriate records can be maintained, and appropriate physical maintenance planned and assigned in the future.
- Any variances from the MSSM Guidelines must be identified with the reasoning for said variances.

# ENGINEER'S DECLARATION: FOR APPROVAL AND/OR REGISTRATION STORM DRAINAGE SYSTEM

**Project:**_____

**Location:**_____**Medicine Hat, Alberta;**

**Section:**_____**Twp:**_____**Rge:**_____**West of the 4th Meridian**

**Approval #:**_____**, 2004, as amended.**

I, the undersigned, Professional Engineer of record for the above works, hereby acknowledge that I have reviewed the latest edition of the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, as published by Alberta Environment and Protected Areas and certify that the design of the above noted project complies with all of the requirements specified for the construction of storm drainage systems.

I further certify that:

- The design of the storm drainage system is fully in accordance with the Municipal Servicing Standards of the City of Medicine Hat and drawings and specifications thereof submitted to the City;
- The storm drainage system treatment facility and outfall are designed to function under all normal and foreseeable operating conditions without causing flow surcharge in storm sewers in excess of what is deemed acceptable by the City of Medicine Hat and with only such inundation of roadways, overland conveyances and properties, as is deemed acceptable by the City of Medicine Hat;
- The storm drainage system treatment facility and outfall are designed to achieve under all normal and foreseeable operating conditions all substance release requirements as specified in Alberta Regulation 119/1993, as amended, pursuant to the Environmental Protection and Enhancement Act;
- The City of Medicine Hat has reviewed an engineering design report, drawings and specifications for the proposed storm drainage treatment facility and outfall, as attached, which includes among other engineering design information:
  - Pre and post-development storm drainage flows from the service and tributary area;
  - Hydrologic analysis of the runoff flows indicating design parameters derived there-from including rainfall hyetographs, runoff hydrographs, flow routing tabulations & outflow hydrographs, storage and release hydrographs;
  - Design hydraulic capacity, rating curves, critical elevations, side slopes, structure details;
  - Location and design of ultimate system discharge point from the proposed treatment facility, outfall and erosion control measures;
  - Nature and extent of treatment of the storm drainage prior to discharge into the environment expressed as proportion of sediment removal and nutrient removal in the treatment facility.
- The increased runoff flows associated with the development of the land area tributary to the proposed system,[ to the interim extent shown on the plans and report[optional]], are within the design hydraulic capacity of the registered system or outfall and will not cause under all normal and foreseeable operating conditions flow surcharge in storm sewers or inundation of roadways, overland conveyances or properties, in excess of what is deemed acceptable to the City of Medicine Hat;
- The storm drainage system treatment facility and outfall are designed to service only those classes of property permitted pursuant to the said Regulation and Approval.

I agree to provide the City and Director, immediately upon receipt of notice, any maps, engineering drawings, specifications, design data or information required in such notice.

I certify that the attached engineering report, a draft of which has previously been reviewed by the City of Medicine Hat and Alberta Environment and Protected Areas, who have found it acceptable, provides a detailed explanation of any variances of the design from the Standards and Guidelines and City of Medicine Hat Servicing Standards. The report also provides technically supportable and justifiable reasons, consistent with industry best practices, why the variances are necessary and should be accepted.

**SIGNED AND SEALED by:**

**Name:**_____ **APEGA Seal:**
**Company Name:**_____
**Address:**_____
**Telephone:**_____ **APEGA Permit to Practice:**

I acknowledge that designs that are found not to be in accordance with the said Alberta Environment and Protected Areas Standards and Guidelines and the City of Medicine Hat's Municipal Servicing Standards, may result in enforcement action and/or referral to APEGA.

# ENGINEER'S DECLARATION: EXTENSION TO A WATERWORKS, WASTEWATER, OR STORM DRAINAGE SYSTEM

**Project:**_____

**Location:**_____**Medicine Hat, Alberta;**

**Section:**_____**Twp:**_____**Rge:**_____**West of the 4th Meridian**

**Approval #:**_____**, 2004, as amended.**

I, the undersigned, the Professional Engineer of record for the above works, hereby acknowledge that I have reviewed the latest edition of the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, as published by Alberta Environment and Protected Areas and certify that the design of the above noted project complies with all of the requirements specified for the construction of water distribution systems.

I further certify that:

- The design of the water distribution system extension is fully in accordance with the Servicing Standards of the City of Medicine Hat and drawings and specifications thereof submitted to the City;
- The City of Medicine Hat has reviewed and accepted the said design drawings and specifications and requires the attached conditions to their acceptance;
- The increased water flow associated with the extension is within the design capacity of the existing water distribution system;
- The increased water demand associated with the extension is within the design capacity of the authorized system providing potable water to the water distribution system;
- A minimum residual pressure of at least 150 kilopascals is designed to be achieved under all normal and foreseeable operating conditions;
- The extension is designed to service only those classes of property permitted pursuant to the said Regulation and Approval.

I agree to provide the City and Director, immediately upon receipt of notice, any maps, engineering drawings, specifications, design data or information required in such notice.

I certify that the attached engineering report, a draft of which has previously been reviewed by the City of Medicine Hat and Alberta Environment and Protected Areas, who have found it acceptable, provides a detailed explanation of any variances of the design from the Standards and Guidelines and City of Medicine Hat Servicing Standards. The report also provides technically supportable and justifiable reasons, consistent with industry best practices, why the variances are necessary and should be accepted.

**SIGNED AND SEALED by:**

**Name:**_____ **APEGA Seal:**

**Company Name:**_____

**Address:**_____

**Telephone:**_____ **APEGA Permit to Practice:**

I acknowledge that designs that are found not to be in accordance with the said Alberta Environment and Protected Areas Standards and Guidelines and the City of Medicine Hat's Municipal Servicing Standards, may result in enforcement action and/or referral to APEGA.

# ENGINEER'S DECLARATION: EXTENSION TO A WATERWORKS, WASTEWATER, OR STORM DRAINAGE SYSTEM

**Project:**_____

**Location:**_____**Medicine Hat, Alberta;**

**Section:**_____**Twp:**_____**Rge:**_____**West of the 4th Meridian**

**Approval #:**_____**, 2004, as amended.**

I, the undersigned, the Professional Engineer of record for the above works, hereby acknowledge that I have reviewed the latest edition of the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, as published by Alberta Environment and Protected Areas and certify that the design of the above noted project complies with all of the requirements specified for the construction of water distribution systems.

I further certify that:

- The design of the sanitary wastewater collection system extension is fully in accordance with the Servicing Standards of the City of Medicine Hat and drawings and specifications thereof submitted to the City;
- The wastewater collection system is designed to function under all normal and foreseeable operating conditions without flow surcharge unacceptable to the City of Medicine Hat;
- The wastewater collection system is designed to achieve under all normal and foreseeable operating conditions all substance release requirements as specified in Alberta Regulation 119/1993, as amended, pursuant to the Environmental Protection and Enhancement Act;
- [The wastewater pumping station and force mains are designed in conformance with the Standards and Guidelines above as well as the City of Medicine Hat's document entitled "Sewer Lift Station Design and Construction Standards and Procedures Manual" Optional]
- The City of Medicine Hat has reviewed and accepted the said design drawings and specifications subject to the attached conditions;
- The increased flow associated with the extension or replacement is within the design capacity of the existing wastewater collection system and does not cause any flow surcharge therein, in excess of what is deemed acceptable by the City of Medicine Hat;
- The increased flow associated with the extension or replacement is within the design capacity of the authorized wastewater system providing treatment of the collected wastewater;
- The extension or replacement is designed to service only those classes of property permitted pursuant to the said Regulation and Approval.

I agree to provide the City and Director, immediately upon receipt of notice, any maps, engineering drawings, specifications, design data or information required in such notice.

I certify that the attached engineering report, a draft of which has previously been reviewed by the City of Medicine Hat and Alberta Environment and Protected Areas, who have found it acceptable, provides a detailed explanation of any variances of the design from the Standards and Guidelines and City of Medicine Hat Servicing Standards. The report also provides technically supportable and justifiable reasons, consistent with industry best practices, why the variances are necessary and should be accepted.

**SIGNED AND SEALED by:**

**Name:**_____ **APEGA Seal:**

**Company Name:**_____

**Address:**_____

**Telephone:**_____ **APEGA Permit to Practice:**

I acknowledge that designs that are found not to be in accordance with the said Alberta Environment and Protected Areas Standards and Guidelines and the City of Medicine Hat's Municipal Servicing Standards, may result in enforcement action and/or referral to APEGA.

# ENGINEER'S DECLARATION: EXTENSION TO A WATERWORKS, WASTEWATER, OR STORM DRAINAGESYSTEM

**Project:**_____

**Location:**_____**Medicine Hat, Alberta;**

**Section:**_____**Twp:**_____**Rge:**_____**West of the 4th Meridian**

**Approval #:**_____**, 2004, as amended.**

I, the undersigned, Professional Engineer of record for the above works, hereby acknowledge that I have reviewed the latest edition of the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, as published by Alberta Environment and Protected Areas and certify that the design of the above noted project complies with all of the requirements specified for the construction of storm drainage systems.
I further certify that:

- The design of the storm drainage system extension is fully in accordance with the Servicing Standards of the City of Medicine Hat and drawings and specifications thereof submitted to the City;
- The storm drainage system extension is designed to function under all normal and foreseeable operating conditions without causing flow surcharge in storm sewers in excess of what is deemed acceptable by the City of Medicine Hat and with only such inundation of roadways, overland conveyances and properties as is deemed acceptable by the City of Medicine Hat;
- The storm drainage system extension is designed to achieve under all normal and foreseeable operating conditions all substance release requirements as specified in Alberta Regulation 119/1993, as amended, pursuant to the Environmental Protection and Enhancement Act;
- The City of Medicine Hat has reviewed and accepted the said design drawings and specifications subject to the attached conditions;
- The increased flow associated with the extension or replacement is within the design capacity of the existing storm drainage system and does not cause any flow surcharge of storm sewers or inundation of roadways, overland conveyances or properties, in excess of what is deemed acceptable by the City of Medicine Hat;
- The increased flow associated with the extension or replacement is within the design capacity of the authorized storm drainage detention, retention, treatment or management facility providing storage of peak runoff flow from minor and major rainfall events and treatment of the storm drainage runoff;
- The increased flow associated with the extension or replacement is within the design capacity of the registered drainage system or outfall in a watercourse to safely convey, without exceeding its hydraulic capacity, peak runoff flow from minor and major rainfall events;
- The extension or replacement is designed to service only those classes of property permitted pursuant to the said Regulation and Approval.

I agree to provide the City and Director, immediately upon receipt of notice, any maps, engineering drawings, specifications, design data or information required in such notice.

I certify that the attached engineering report, a draft of which has previously been reviewed by the City of Medicine Hat and Alberta Environment and Protected Areas, who have found it acceptable, provides a detailed explanation of any variances of the design from the Standards and Guidelines and City of Medicine Hat Servicing Standards. The report also provides technically supportable and justifiable reasons, consistent with industry best practices, why the variances are necessary and should be accepted.

**SIGNED AND SEALED by:**

**Name:**_____ **APEGA Seal:**
**Company Name:**_____
**Address:**_____
**Telephone:**_____ **APEGA Permit to Practice:**

I acknowledge that designs that are found not to be in accordance with the said Alberta Environment and Protected Areas Standards and Guidelines and the City of Medicine Hat's Municipal Servicing Standards, may result in enforcement action and/or referral to APEGA.

## ENGINEER'S DECLARATION: FOR APPROVAL AND/OR REGISTRATION ON-SITE WATERWORKS, WASTEWATER COLLECTION AND STORM DRAINAGE SYSTEM FOR A BARELAND CONDOMINIUM

**Project:**_____

**Location:**_____**Medicine Hat, Alberta;**

**Section:**_____**Twp:**_____**Rge:**_____**West of the 4th Meridian**

**Approval #:**_____**, 2004, as amended.**

I, the undersigned, Professional Engineer of record for the above works, hereby acknowledge that I have reviewed the latest edition of the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems, as published by Alberta Environment and Protected Areas and certify that the design of the above noted project complies with all of the requirements specified for the construction of on-site, waterworks, wastewater collection and storm drainage systems for a Bareland Condominium Development.

I further certify that:

- The design of the on-site waterworks, sanitary wastewater collection system and on-site storm drainage system is fully in accordance with the Municipal Servicing Standards of the City of Medicine Hat and the design, drawings and specifications thereof submitted to the City;
- The on-site waterworks, sanitary wastewater collection system and on-site storm drainage system are designed to function under all normal and foreseeable operating conditions without exceeding the design capacity of the publicly owned water supply system, sanitary wastewater collection system and the publicly owned storm drainage system and without causing flow surcharge in publicly owned sanitary wastewater and storm sewers in excess of what is deemed acceptable by the City of Medicine Hat and with only such inundation of roadways, overland conveyances, properties and receiving watercourses by storm runoff, as is deemed acceptable by the City of Medicine Hat;
- The on-site sanitary wastewater collection and storm drainage systems are designed to achieve under all normal and foreseeable operating conditions all substance release requirements as specified in Alberta Regulation 119/1993, as amended, pursuant to the Environmental Protection and Enhancement Act;
- The increased sanitary wastewater flows, runoff flows and water demands associated with the development and of the land area tributary to the proposed system,[ to the interim extent shown on the plans and report[optional]], are within the design hydraulic capacity of the associated publicly owned waterworks, sanitary wastewater system and off-site storm drainage system or outfall and will not cause under all normal and foreseeable operating conditions flow surcharge in the said sanitary wastewater system or storm sewers or cause the inundation of roadways, overland conveyances or properties, in excess of what is deemed acceptable to the City of Medicine Hat or to create a residual pressure in the publicly owned water system less than 150 kilopascals;
- The on-site waterworks, sanitary wastewater collection system and on-site storm drainage systems are designed to service only those classes of property permitted pursuant to the said Regulation and Approval.

I agree to provide the City and Director, immediately upon receipt of notice, any maps, engineering drawings, specifications, design data or information required in such notice.

I certify that the attached engineering design has previously been reviewed by the City of Medicine Hat and Alberta Environment and Protected Areas, who have found it acceptable, and which provides a detailed explanation of any variances of the design from the Standards and Guidelines and City of Medicine Hat Servicing Standards. The report also provides technically supportable and justifiable reasons, consistent with industry best practices, why the variances are necessary and should be accepted.

**SIGNED AND SEALED by:**

**Name:**_____ **APEGA Seal:**

**Company Name:**_____

**Address:**_____

**Telephone:**_____ **APEGA Permit to Practice:**

I acknowledge that designs that are found not to be in accordance with the said Alberta Environment and Protected Areas Standards and Guidelines and the City of Medicine Hat's Municipal Servicing Standards, may result in enforcement action and/or referral to APEGA.

# APPENDIX B – SUMMARY OF MAJOR CHANGES

## B1 SUMMARY OF CHANGES

This is a summary of the changes from the MSSM of December 2015 to the "New" MSSM as of 2025.

The Planning & Development Services Department in concert with our internal partners completed a document review. This review was intended to provide updates and clarity on development and the MSSM use process. This is a summary of all the major changes to the MSSM. There has been general rewording for clarity; grammar, and punctuation have also been amended as a matter of course and are not recorded here.

This update includes minor technical changes, which are highlighted below. A more comprehensive technical review of the document is planned for 2025, focusing on service levels, and further alignment with the Municipal Development Plan. The summary below captures major changes. It is the responsibility of the Developer and Consultants to be familiar with the document.

**Overall General Changes:**

- Updated document formatting for ease of finding information.
- Inclusion of an overall Table of Contents with Sub Tables of Contents for each section. This should make searching online easier.
- Addition of *Definitions* section before the *General Process for Development* section. (APPENDIX D).
- Addition of a section detailing the City of Medicine Hat's *Consulting Engineering Expectations*. (Section 3).
- Addition of *Electric*, *Gas*, and *Solid Waste* sections. (Sections 11, 12, 13).
- Update of terminology to align with the current Planning & Development Services structure.

**Part 1 – Introduction to MSSM**

- Changed Guideline to Standard as this document outlines a set of Minimum Acceptable Standards the City of Medicine Hat is willing to accept for development infrastructure.
- Added in the statement that the Gas and Electric Departments own the rights to gas and electric Infrastructure in the City of Medicine Hat.
- Added an Intent and Use of This Document section.
- Clarified usage and interpretations of these standards in several sections.

- Added in a Scope and Interpretation section.
- Added a Use of The General Design Standards section.
- Added in an Other Authorities Statutory Approvals Requirements section.
- Added in a General Planning and Land Use section.

**Part 2 – General Process for Development (previously Section 1.0)**

- Identified the Planning and Development Process as a new section.
- Functional Servicing Report requirements have clarified the expectations of Gas and Electric Departments for this stage of development, including connection points, gas, and electric consumption expectations, etc.
- Within the Reports and Studies section, a new section has been added clarifying Parks and Recreation and Open Space Requirements:
    - Parks and Recreation Open Space System Conceptual Landscaping Plan incorporating the following:
        - MR (MR)
        - School Reserve (SR)
        - Environmental Reserve (ER)
        - Conservation Reserve (CR)
    - Conceptual Landscaping Plans and Other Conceptual Landscaping Plans for any other parcels being developed (i.e., Boulevards, Roads Rights of Way, Public Utility Lots, Storm Water Management Facilities)
    - Geotechnical Test-Hole Location Plan
    - All Reports submitted as a part of the Areas Structure Plan (i.e., Biophysical Impact Assessment Native Flora and Fauna Inventory, Historic Resources, etc.) including mitigation plans for preservation or restoration of same.
- Section 2.3.3 (previously Section 1.1.4) Site Grading Plans
    - Added in the requirement for identification of existing utility locations on-site grading plans.
- New Sections 2.3.8 Electric Utility Plans and 2.3.9 Gas Utility Plans
    - Updated to reflect existing gas and electric utility requirements.
- Section 2.3.10 (previously 1.1.10, 1.1.10.1) renamed Parks and Recreation Open Space Conceptual Plans
    - Identified overall requirements to produce the conceptual plan for Parks and Open Space.

- Clarifications as to the requirements for inclusion in the Landscape Concept Plan.

- 2.3.11 New Section Biophysical Impact Assessment Requirements section.
  - Identify the requirements for this to be added to the ASP, and the general criterion within Section 9.
- 2.3.12 New Section Environmental Site Assessments
  - Identifies requirements for Environmental Site Assessments as part of Area Structure Plans and guidance for such.
- 2.3.13 New Section Historical resources
  - Identifies guidance and expectations around Historic Resource Act (HRA) and buildings within Medicine Hat that have a Historic Resource Value (HRV).
- 2.3.14 (previously 1.1.11) Expansion to the Allocation and Usage of Parks System Space section.
  - Updates and identifies the 2022 Parks and Recreation Master Plan as the planned guidelines and interim guidelines to be the 2010 plan.
  - Identifies that SWMFs are to be on PUL's.
  - Clarifies that MR Credit for SWMF may be available as calculated per Section 9.
- 2.4 (Previously 1.1.12) Cost Sharing
  - Identifies and clarifies that Costs for the Gas and Electric Works will be provided to the Developer at the Detailed Design stage once calculated and using the appropriate funding model.
- 2.5 (Previously 1.1.13) Report and Drawing Submissions
  - Reports, Drawings, and Submissions are acceptable in electronic format, and the requirement for appropriate Authentication and Validation is following current APEGA and other Professional Practice Standards.
- 2.6 (Previously 1.2) Requirements for Subdivision and Development Approval
  - Clarification of consultant requirement to coordinate Electric, Gas, and other Shallow Utilities including street lighting design.
- 2.6.2 (Previously 1.2.2) Submission of Detailed Design drawings
  - Update of drawing sections referenced.
- 2.7.3 (Previously 1.3.3) Performance Security
  - Clarification of security requirements and reduction.
- 2.10 Inspections and Construction Completion Certificates
  - Added in a timeline for acceptance of CCCs.

- CCCs WILL NOT BE ACCEPTED between 15 Nov and 15 January Annually.

- 2.10.3 (Previously 1.5.1.1) Administrative Requirements
  - Paragraph b. Addition of school Reserve, and Conservation Reserve.
- 2.10.6 (Previously 1.5.1.5) Open Space Development and Trails
  - Updates to signing authority for Construction Completion Certificates (CCC) to permit approval by a Landscape Architect.
  - Addition of the following requirements to obtaining a CCC:
    - 2.10.6.1 Landscaping, Irrigation, Trails, and Amenities
    - 2.10.6.2 Trees
    - 2.10.6.3 ER, CR, and Unmanicured Areas
    - 2.10.6.4 Open Space Maintenance.
- 2.10.7 (Previously 1.6) Maintenance
  - Addition of a maintenance period for Parks and Recreation work within the development of 2 years and an updated list of the maintenance required.
- 2.11 Final Acceptance Certificate
  - Added in a timeline for acceptance of FACs.
  - FACs WILL NOT BE ACCEPTED between 15 Nov and 15 January Annually.
- 2.11 Table 2.11.1 (previously1.7 and Table 1.7)
  - Change of section 4a to update the length of maintenance to 2 years.
  - Change of section 4b to update the length of maintenance for Environmental Reserve and Unmanicured areas to a minimum of 2 years and up to 3 years for unmanicured areas depending on issuance of FAC and/or by specific identification within the agreement.
- 2.11.4. (previously 1.7.1.3.3) Underground Utilities
  - Clarification that Electric and Gas will notify Planning and Development Services when the improvements are complete, and the Developer's responsibilities regarding telecommunication and other shallow utilities.
- 2.11.5.7 Open Space Development and Trails
  - Updated to clarify requirements of FAC approvals.
- 2.11.7 (Previously 1.8) Flexibility to Standards and 2.11.7.1 (previously 1.8.1) Proposals from the Developer
  - Rewritten to provide clarity and update the methodology. Provision of a template for application is provided in Appendix C.

- 2.11.9 (Previously 1.8.2) Final Decision on Design Standards
    - Rewritten to provide clarity.

**Part 3 Consulting Engineers Expectations**

- A new section confirming the requirements and expectations of the Consulting Engineer.

**Part 4 Grading Requirements (previously Section 2)**

- Section 4.1 Addition of a purpose statement
- Section 4.2 (previously 2.1) Reference Standards
    - Addition of City of Edmonton Lot Grading Guidelines as a reference.
- Addition of Table 4.3.1 Acceptable As-Built Grading Tolerances

**Part 5 Water Distribution System**

- Section 5.3 (previously 3.1.1) *Water Line Looping*
    - Identification of private developments with more than one connection need for backflow prevention at each connection downstream of the isolation valve to prevent backflow into the system.
- Section 5.3.1 addition of *Flushing and Disinfection* section
    - Identifies all lines must be flushed and disinfected according to the Medicine Hat EU Construction Specifications Section 10, 3.11.
- Section 5.4.2.5 (previously 3.2.2.3) *Fire Flow Requirements*
    - Addition of Light and Medium Industrial fire flow requirement of 7200 l/min
    - Addition of Heavy Industrial fire flow requirement of 18,000 l/min.
- Section 5.5.4 (previously 3.3.4) *Depth of Cover*
    - The depth of cover on water mains has been *increased from 2.6m to 2.8m* to accommodate deeper local frost depth. For protection from frost penetration.
    - Water mains should be designed to ensure consistent grades of pipes, for as much and as long as possible, within the confines of minimum and maximum cover depths.
- Section 5.6.1.1 (previously 3.4.1.1) *Hydrant Spacing*
    - Need for hydrant spacing to conform to the Fire Underwriters Survey requirements or the most stringent of all resource references.
- Section 5.6.2.2 (previously 3.4.2.2) *Alignment and Placement*
    - Identification that main valves should also be placed on both sides of every hydrant tee to facilitate flushing and commissioning operations.

- Environmental Utilities Department reserves the right to require additional valves to be installed as necessary to meet all operational requirements.

- Section 5.6.3 (previously 3.4.3 Thrust Blocks) *Mechanical Restraints and Thrust Blocks*
  - Rewrite of section identifying requirements for approved engineered mechanical restraining devices,
  - All mechanical restraints are to be sealed against moisture,
  - All pipe segments shorter than a full pipe length must have joints restrained on both sides by engineered mechanical restraints,
  - The requirement for additional concrete thrust blocking in addition to or in lieu of other mechanical restraints,
  - All at the discretion and with the approval of the Environmental Utilities Department.
- Section 5.6.4 (previously Section 3.4.4) *Service Connections*
  - Identification of Service Sizes in accordance with the Plumbing Code and the sizes of each; 25, 50, 100, 150, 200 mm.
  - Identification that non-standard sizes may be accepted with written consent from the Environmental Utilities Department.
  - Identification that it is up to the Developer's plumber to make any connections from non-standard to standard size pipes, or to replace the non-standard pipe on the private side.
  - Any service upgrades (infill development) must be accompanied by a fixture count and estimate of line size requirements to confirm adequate sizing to confirm compliance with the National Plumbing Code of Canada (NPCC).
  - Identification of order of installation for public and private water infrastructure installation
  - Identification that the depth of cover is now 2.8m
  - Approval requirements for any water services to be abandoned by the Environmental Utilities Departments in accordance with the Environmental Utilities Construction Specifications Section 11, 3.4 "Water Service Abandonments."

**Part 6 Sanitary Sewer System**

- Section 6.2 *General*
  - Change of title from Alberta Environment and Sustainable Resource Development to Alberta Environment and Protected Areas throughout this section.
- Section 6.4.4 (previously 4.3.4) *Depth of Cover*

- Depth of Cover again *increased from 2.6 m to 2.8 m*. For protection from frost penetration.
- Section 6.5.2 (previously 4.4.2) *Service Connections*
  - Clarification on National Plumbing Code of Canada approved sizes, and developer's requirements to have their plumber connect to non-standard sizes from standard sizes for services OR that they would need to remove the non-standard service to the private development.
  - Additionally, where the Developer is requesting an upgrade or for infill development, the request for approvals must be accompanied by a fixture count to verify the proposed servicing size.
  - Clarification on Cul-de-Sac sanitary servicing connections directly entering a manhole and the Environmental Utilities Standard detail drawing requirement (EU-107).
  - Addition of a clarification on the abandonment of sanitary services and the requirement for written approvals, and the associated Environmental Utilities construction specification section 11, 3.7 "sanitary sewer service abandonments"
- Section 6.5.2.1 (previously 4.4.3) *Sampling Manholes*
  - Rewrite of section for clarification.
  - Identifies requirements for a sampling manhole for a new multi-family (6 plex and larger), institutional, industrial site in alignment with the City Sewer Bylaw 1541 Clause 509.
  - Identifies the location of the sampling manhole.
  - Identifies the standard Environmental Utilities Construction Standards and Specification to be used for design.

**Part 7 Storm Drainage System, and Part 8 Roadways**

- There were no changes made to these two sections aside from formatting, as a complete technical review is planned to be completed in 2025.

**Part 9 Open Space System Requirements (previously Section 7: Landscaping Requirements)**

- Name changes of section to OPEN SPACE SYSTEM REQUIREMENTS
- Section 9.1 Reference Standards
  - Renamed, updated, and added reference to new Master Plans
  - Added in specific reference to the CAN/CSA Children Playspaces Equipment Standard.
  - Added reference to Barrier Free Standards of Medicine Hat.

- Section 9.3.1.1 (previously 7.3.1.1) Conceptual Landscape Plan Information
    - Electric Requirements must be identified to aid in City design of the Electric Service by the Electric Department.

## Part 10 Standards for Detailed Design Drawings

A significant review of this Standard has been undertaken and a thorough realignment with expectations. The whole section has been renumbered, and in some cases realigned for ease of understanding, and many areas within this section have been re-ordered and had additional required information identified, to take into account the expectations for drawings, so a thorough review will be required. In addition, some specific identified changes follow here.

- Section 10.1 (previously 8.1) *Introduction*
    - Designs submitted for approval as a part of the professional work product must be properly Authenticated and Validated as per APEGA's Current Practice Standards.
- 10.2.2.2 Overall Water and Sanitary Sewer Plan
    - This section has had an increase in the information and drawings identified and required.
- 10.2.2.7 and 10.2.2.8 Rough Grading Plan, and Plan/Profiles
    - The addition of separate Rough Grading Plan, and Plan/Profiles sections with additional Requirements to amplify the overall set of drawings.
- 10.2.3.5 Third Party Telecommunications Design Plans
    - This section has been added to identify the requirement to add in a plan for this need.
- Section 10.2.3.8 (previously 8.3.3.7) *Traffic Accommodation Plan*
    - The Traffic Accommodation Plan is to be Authenticated and Validated in accordance with current APEGA Practice Standards.
- Section 10.3.3 (previously 8.4.3 Electronic Files) *Digital Files*
    - Electronic Changed to Digital, and AutoCAD Standard changed from 2010 to 2022 and referenced to NAD_1983_CSRC_3TM_111 Coordinates.
- Table 10.3.9-1 Drafting Standard Text, Line, Weight, and Fill Types
    - Whole table has been reviewed and updated. Some items have changed.
- Section 10.4 (Previously 8.5) *Symbol Legend*
    - Recognition that the City Electric and Gas Departments may use somewhat different Symbol standards. The identified standards are provided as a General Rule for other drawings.

**Parts 11- Electric Distribution System, 12- Gas Distribution System, and 13 Solid Waste Collection**

- These are new sections that have been added in an effort to assist developers and consultants, providing clarity on City expectations and processes.

**Appendices A & B with additional information.**

- Appendix A Engineering Declarations
  - Addition of a requirement to accompany each declaration with descriptors identifying length, diameter, and types of materials used for each work a declaration is submitted for.
- Appendix B is the summary of all major changes within the MSSM.

**Appendix C- 2023 Alternate Solution Request Form.**

- In keeping with guidance in Sections 2.11.7: *Flexibility to Standards*, and 2.11.7.1 – *Proposals from the Developer*
  - A form has been supplied for a developer or their consultant to apply for requests or proposals to deviate from the standards set out in the MSSM.

**Appendix D – Definitions**

A *Definitions* section was added to clarify terms used throughout the document.

# APPENDIX C – ALTERNATIVE SOLUTION REQUEST FORM

| GENERAL INFORMATION (to be completed by the applicant, please print) | | |
|---|---|---|
| Project Name: | | |
| Project Municipal Address: | | |
| Lot: | Block: | Plan: |
| Ref. Agreement or Application#: | Date: | |

MSSM - SECTION 2.11.7 Flexibility to Standards:

2.11.7.1 PROPOSALS FROM THE DEVELOPER:

If the Developer wishes to:

- Apply methods which differ from a standard or specification in this document, or
- If these standards or specifications do not cover a subject of concern to a specific design, or
- If the Developer proposes to use materials not approved in this document or City's operating department's specifications, then the responsibility shall be upon the Developer to justify the proposal or resolve the concern to the satisfaction of the City. The concern shall be the subject of a report that the Developer shall have prepared by an APEGA Licensed Professional and signed, sealed in accordance with APEGA Professional Practice guidelines, and submitted to the City for review.

The Developer shall prepare a report that:

- Presents the alternatives for resolution of the concern.
- Makes a recommendation on the proposed standard or material to be used, with justifications in terms of implementation feasibility and economic, engineering, environmental, accessibility, operational and maintenance criteria.

The report can be on company letterhead and meet these minimum requirements, or any proposed alternative solutions can be made on the "Alternative Solution Request Form" found at Appendix C to this document. The form, or the report from the company responsible, is to be filled out and appropriately stamped by the professional taking responsibility for the application.

Interpretations and approvals will be given by the City. If deemed necessary, the City may revise or amend requirements. The Developer and the Consultant remain fully responsible for the design and construction of the municipal improvements according to good engineering practice adequate to address the specific needs and site conditions.

2.11.7.3 FINAL DECISIONS ON DESIGN STANDARDS:

The City reserves the right to the final decision with regards to the interpretation of the intent of the design acceptability of changes from the standards proposed by the Developer's design Engineer. Final decisions, interpretations, and approvals will be provided by the City to the applicant, in writing.

CONTENTS

| APPLICANT INFORMATION | |
|---|---|
| Applicants Name: | |
| Address: | Postal Code: |
| Phone: | E-mail: |
| Cell Phone: Text: ☐ Yes ☐ No | |

| Authentication | Qualifications |
|---|---|
| Professional Authentication | Names, qualifications, background, and experience of the professionals requesting the alternative solution. |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

| Standards and Specifications affected and brief overall description of the scope and reasons for the application. |
|---|
| |

| Analysis: Objectives or justifications including assumptions limiting or restriction factors, testing procedures, engineering studies, or performance parameters to support the assessment. The information provided shall be in sufficient detail to convey the design intent and to support the validity, accuracy, relevance, and precision of the review. |
| --- |
| |
| Methods and rationales used to determine that a proposed alternative solution will achieve at least the same level of performance. Provide information concerning any special maintenance or operational requirements. |
| Attachments: |

CONTENTS

# APPENDIX D - DEFINITIONS

## MSSM DEFINITIONS

### 0.1 Accessibility

Accessibility refers to standards that have been mandated for the design and construction of the built or virtual urban environments providing an accessible environment where all individuals have access to the City's services, facilities, open spaces and programs in a way that respects the dignity and independence of people with disabilities. (City of Medicine Hat, 2021)

### 0.2 Amenity

Specific pieces within the built environment that provide consumer benefit.

### 0.3 APEGA Professional Practice Standards (PPS)

The current standards produced by The Association of Professional Engineers and Geoscientists of Alberta (APEGA) to guide the identified professionals in the completion of their work in accordance with legislation under the current Engineering and Geoscience Professions Act. (APEGA, 2024)

### 0.4 Arborist

A person who is versed in the art of arboriculture, including tree surgery, the prevention and cure of diseases and the control of insect pests. Arborists shall have current certification by the International Society of Arboriculture (ISA).

### 0.5 As-Built

A document that reflects the installed, fabricated, constructed, or commissioned condition of an item or project based on information provided by another party and not verified by the professional member. As-Built drawings document how a project was actually constructed in the field and identify variances from the initial design. (APEGA, 2023)

(Alberta - Safety Codes Council, 2008)

### 0.6 Authentication

Authenticating a professional work product means an APEGA licensed professional has completed, performed a thorough review of, or directly supervised and controlled the engineering or geoscience work and accepts professional responsibility for the engineering or geoscience involved. Authentication must be performed in accordance with Section 4.0 of the Authentication Practice Standard. (APEGA, 2022)

### 0.7 Berm

A mound of earth used as a landscaping buffer or screen for visual or sound management.

### 0.8 Borrow Material

Includes topsoil, clay, silt, sand, gravel, and peat not from within the area of the Work.

### 0.9 Brownfield Development

This refers to an abandoned, vacant, derelict, or underutilized property where past actions have resulted in real or perceived contamination and where there is an active potential for redevelopment. (City of Medicine Hat, MY- MH MDP-Bylaws approved Oct 2020(4636); amended August 2021 (4674)

### 0.10 Buffer

A land area used to visibly separate one use from another through screening and distance.

### 0.11 Caliper

The diameter or thickness of the trunk of a nursery-grown tree as measured no less than 150 mm above the ground root flare level for trees with a caliper up to 100 mm.

### 0.12 Common Excavation

Includes clay, silt, sand, gravel, and rocks excavated within and maintained within the area of the Work.

### 0.13 Coniferous

A plant with foliage that typically persists and remains green year-round, commonly known as evergreens.

### 0.14 Critical Root Zone

An area on the ground around a tree that is within the drip line of a tree.

### 0.15 City

Shall refer to the City of Medicine Hat, Alberta, Canada.

### 0.16 City Engineer (Representative)

Shall refer to the Professional Engineer, licensee, or designated representative, authorized by the City to authorize changes to these Standards.

### 0.17 Clearing

Removal and proper disposal of exposed objectionable matter from an area. This may include but is not limited to trees, roots, grass, underbrush, rubble, any type of structures, etc.

### 0.18 Construction Completion Certificate (CCC)

The written acceptance certificate issued by the City acknowledging the completion of construction of a municipal improvement or facility. Once the CCC is issued, the maintenance

period commences, wherein the Developer is still the owner and responsible for maintenance and warranty work.

### 0.19 Consultant

The professional responsible for the Design. Where applicable throughout these Standards, this term may refer to/or include the Landscape Architect or the Developers designated representative.

### 0.20 Consulting Engineer (APEGA Definition)

Professional Member or Permit Holder registered with APEGA who engages in the practice of engineering, geology or geophysics in the Province of Alberta and provides professional services directly to a client.

### 0.21 Contractor

The person, firm, or corporation that undertakes the installation of municipal infrastructure on behalf of the Developer or the City.

### 0.22 Cross-Sections (X-Sect)

Cross sections depict the existing ground conditions, including all natural and/or manmade features, as sections perpendicular to the respective stations along a survey baseline or construction centerline. They show all surficial and sub surface improvements.

Including but not limited to:

- Utility Rights of Way.
- Trees.
- Curb and gutter.
- Road surface and camber.
- Sidewalks and pathways.
- Street lighting.
- Fire hydrants and water lines.
- Sanitary sewer.
- Water supply and distribution.
- Storm sewer.
- Electrical distribution.
- Gas lines.
- Other shallow utilities.
- Positions of various appurtenances to the previously identified such as:

- connection boxes,
- manholes, and
- valves.

- It describes relative positioning and areas set out for the development of these infrastructures.

### 0.23 Deciduous

A plant with foliage that is shed annually.

### 0.24 Design(s)

Shall mean the design(s), reports, studies, engineering drawings, technical specifications, landscape plans and associated documents, included for the execution and implementation of such, pertaining to a Development, Subdivision, or other municipal improvement.

### 0.25 Developer

shall mean the person, firm, or corporation named within a Development Agreement, whether as the owner or an agent for the owner of the land included therein.

### 0.26 Development

Means:

a) An excavation or stockpile and the creation of either of them,

b) A building or an addition to or replacement or repair of a building and the construction or placing of any of them on, in, over or under land,

c) A change of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the use of the land or building, or

d) A change in the intensity of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the intensity of use of the land or building. (Alberta Government - Municipal Government Act, 2024)

### 0.27 Developer Representative

The developer and/or the person(s) designated by the Developer who has the authority to approve or reject the contractor's work, request inspections, and have the authority to exchange other open space development information with City representatives.

### 0.28 Diameter Breast-Height (DBH)

The standard measurement of tree size (for trees existing on site). The tree trunk is measured 1.4 m (4.5 feet) above ground. If the tree splits into multiple trunks below 1.4 m, measure the trunk at its most narrow point beneath a split.

### 0.29 Drip Line

A vertical line extending from the outermost branches of a tree to the ground.

### 0.30 Engineering Drawings

Shall mean the detailed engineering drawings and specifications prepared by the Consultant for a Subdivision or Development that forms part of a Development Agreement.

### 0.31 Engineering Declarations

Information or forms submitted by the Consultant required to be submitted to Alberta Environment to notify and gain approval for the creation or extension of a waterworks, wastewater, or storm drainage system. Developers must provide certain information to Alberta Environment, prior to construction, as part of the written notice required when extending or replacing watermains, sanitary sewers and/or storm sewers. (Alberta Environment, 2003)

### 0.32 Environmental Reserve (ER)

Means lands dedicated to the municipality to be preserved in their natural state in order to prevent pollution and provide public access to bodies of water and prevent personal injuries due to the dangerous natural features of the land. Environmental reserve consists of swamps, gullies, coulees, natural drainage courses and areas subject to flooding, steep slopes, and strips not less than 6 m in width at the edge of any lakes, rivers, streams, or other body of water. (Municipal Government Act, 2024)

### 0.33 Fill

An earth structure built up by successive lifts of a specified material at specified densities.

### 0.34 Final Acceptance Certificate (FAC)

The written acceptance certificate issued by the City for the municipal improvements once all repairs, defects, and deficiencies have been completed and the maintenance period has expired. This certificate releases any further guarantee or maintenance responsibilities by the Developer for the local improvements specified in the certificate.

### 0.35 Floodway

That part of the Flood Risk Area where floodwaters are deepest, fastest, and most destructive as shown on the Flood Risk Maps in the Medicine Hat Floodplain Study Addendum prepared by Alberta Environment, Water Resources and Environment Canada, February 1991. (City of Medicine Hat- LUB 4168, last amended 2023)

### 0.36 Flood Fringe

That part of the Flood Risk Area adjoining the floodway where floodwaters are generally shallower and the rate of flow is slower, as shown on the Flood Risk Maps in the Medicine Hat Floodplain Study Addendum prepared by Alberta Environment, Water Resources and Environment Canada, February 1991. (City of Medicine Hat- LUB 4168, last amended 2023)

### 0.37 Flood Plain

An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

### 0.38 Flood Risk Area

The lands at or below the designated flood level that are predicted to be affected by a 1 in 100-year flood as shown on the Flood Risk Maps in the Medicine Hat Floodplain Study Addendum prepared by Alberta Environment, Water Resources and Environment Canada, February 1991. (City of Medicine Hat- LUB 4168, last amended 2023)

### 0.39 Functional Servicing Report (FSR)

A Functional Servicing Report (FSR) is an accompaniment to an Outline Plan. It is a detailed technical report that outlines the conceptual servicing framework of a proposed development and summarizes the information as the basis for the detailed design of each phase of that development.

### 0.40 Functionality

The quality of being useful, practical, and right for the purpose for which something was made.

### 0.41 Greenfield Development

New residential or non-residential land uses constructed on previously undeveloped land, such as agricultural land. (City of Medicine Hat, MY- MH MDP-Bylaws approved Oct 2020(4636); amended August 2021 (4674)

### 0.42 Guidelines

A general rule, principle, or piece of advice. A guideline aims to streamline processes according to a set routine or sound practice. A guideline is similar to a rule but is legally less binding as justified deviations are possible.

### 0.43 Historical Resource

Any work of nature or of humans that is primarily of value for its palaeontological, archaeological, prehistoric, historic, cultural, natural, scientific, or esthetic interest including, but not limited to, a palaeontological, archaeological, prehistoric, historic, or natural site, structure, or object. (Alberta Government, 2022)

### 0.44 Historic Object

Any historic resource of a movable nature including any specimen, artifact, document or work of art. (Alberta Government, 2022)

### 0.45 Historic Site

Any site that includes or consists of an historical resource of an immovable nature or that cannot be disassociated from its context without destroying some or all of its value as an

historical resource and includes a prehistoric, historic, or natural site or structure. (Alberta Government, 2022)

### 0.46 Infill Development

The development of vacant parcels within previously built areas. These areas are usually already serviced by existing public infrastructure, such as transportation, water, wastewater, and other utilities. (City of Medicine Hat, MY- MH MDP-Bylaws approved Oct 2020(4636); amended August 2021 (4674)

### 0.47 Interim

A term used to denote items which currently function within a transitionary phase. Thus an "interim" item is one that shall transition to a permanent condition at some specified time.

### 0.48 Inundation

Shall refer to a flood; a rising and spreading of water over grounds.

### 0.49 Landscape Architect

The consulting professional authorized by the Alberta Association of Landscape Architects (AALA) acting on behalf of the Developer or Prime Consultant to coordinate the preparation of all landscape drawings, and inspection of all onsite work.

### 0.50 Landscape Development

All landscaping, or its protection, in public spaces or environmental reserve.

### 0.51 Land Use Bylaw (LUB)

This is a bylaw of the Municipality (Medicine Hat) required under the Municipal Government Act which governs the land development process and requirements for development approvals within the City of Medicine Hat. It identifies at a high order the land use areas and boundaries as well as the permitted and discretionary uses within each one. Specific Development regulations and requirements for each of these districts are also identified.

The Development Authorities and the powers, authorities, and duties of the Chief Administrative Officer, or their designate relating to developments are established herein.

### 0.52 Lot

A portion of a subdivision or any other parcel of land intended as a unit for transfer of ownership, or lease to, or separate use of, another, or for development. The word "lot" includes, but is not limited to, "plot" or "parcel".

### 0.53 Lot Area

The area contained within the property lines of a lot, excluding space within any road right-of-way but including the area of any easement.

### 0.54 Lot Grading

Lot grading is the reshaping or sloping of the land in such a way that surface drainage from rainstorms, snowmelt or groundwater is directed away from the buildings and is controlled in a manner that eliminates or minimizes the impact on adjacent properties.

### 0.55 Lowest Top of Footing (LTF)

The top of footing elevation will be based upon the lowest undisturbed ground contour within the building envelope and the recommendations and requirements of the subdivision Geotechnical Report will identify requirements.

### 0.56 Maintenance

The act of keeping property or equipment (including vegetation and surficial works and subsurface infrastructures) in good condition by making repairs, correcting problems, etc.in order to ensure their continued sustainable operations and healthy growth.

### 0.57 Minimum Building Opening Elevation (MBOE)

The lowest opening allowed into a building. MBOE applies where lots abut trapped lows, depression storage and major event flow paths where the runoff depth exceeds the elevation at the abutting property line.

### 0.58 Municipal Government Act (MGA)

The Municipal Government Act (informally known as Bill 23) is an act of the Alberta Legislature and it defines the laws and rules under which municipalities shall operate.

### 0.59 Municipal Infrastructure

The physical assets developed and used to support the City's people and activities. The City's infrastructure inventory includes such assets as drainage, roads and right-of-way infrastructure, parks and green spaces, buildings, fleet vehicles, transit facilities, buildings, traffic control devices, recreation facilities, computer networks, library, etc.. (City of Medicine Hat, MY- MH MDP-Bylaws approved Oct 2020(4636); amended August 2021 (4674)

### 0.60 Municipal Reserve (MR)

Land provided, as part of a subdivision, by the Developer without compensation for park and school purposes in accordance with the provisions of the Municipal Government Act. This includes lands dedicated as Municipal Reserve (MR), School Reserve (SR), and Municipal and School Reserve (MSR). (City of Medicine Hat, MY- MH MDP-Bylaws approved Oct 2020(4636); amended August 2021 (4674)

### 0.61 Municipal Reserve Credit (MR CREDIT)

A fiscal credit granted to a developer that defrays their costs against the provision of their Municipal Reserves.

### 0.62 Naturalization

A type of habitat restoration; the deliberate reintroduction of species that are native to a given area or are well adapted to the climate circumstance; activities that are intended to improve and enhance the natural environment. The biodiversity and ecosystem function of a naturalized ecosystem is lower compared to a reference habitat but higher compared to a reclaimed ecosystem.

### 0.63 Natural Area

An area of natural vegetation that is generally undisturbed, unmaintained, and is self-perpetuating. It includes not only trees, but also native shrubs, ground covers, wildflowers, vines, and grasses.

### 0.64 Open Spaces, Green Spaces or Public Open Spaces

Shall mean any parcel of land retained as permanently vegetated land, which is set aside and designated as reserve for a public use.

### 0.65 Original Ground

Constitutes the state of the ground previous to any earthworks development.

### 0.66 Pathways

A track that a person can walk along.

### 0.67 Prepared Sub-Grade.

The soil immediately beneath a planned surface structure that has been prepared as specified for the construction of that surface structure to prevent excessive deformation.

### 0.68 Pre-Servicing

Pre-servicing identifies the delivery of the "final" service to the actual site as part of the construction of the property.

### 0.69 Prime Contractor

The person in control of the work site or the person designated by the person in control of the worksite; the designation must be made in writing. (OHS, 2024)

### 0.70 Public Utility Lot

Land required to be given under Division 8 of the Municipal Government Act for public utilities. (Municipal Government Act, 2024)

### 0.71 Programming

The planned and scheduled usage of recreational items within the built environment.

### 0.72 Protected Flood Fringe

Areas that could be flooded if dedicated flood berms fail or do not work as designed during the 1:100 design flood, even if they are not overtopped. Protected flood fringe areas are part

of the flood fringe and do not differentiate between areas with deeper and faster moving water and shallower or slower moving water.

### 0.73 Record Drawings

Documents prepared be a licensed professional to record design changes for which they accept professional responsibility. The licensed professional may have issued the changes and authenticated them previously through change orders, change directives, or site instructions. The changes are then incorporated into one final drawing set along with the original design elements. Since the licensed professional is professionally responsible for the record drawings, they must authenticate the drawings to comply with the practice standard Authenticating Professional Work Products. Note that authenticating record drawings does not mean the licensed professional conducted a field review or reviewed the site conditions. (APEGA, 2023)

### 0.74 Recreation Amenities

Shall include, but not limited to tennis courts, play structures or equipment, sports fields, outdoor ice rinks, spray parks, skate parks and trails.

### 0.75 Regulatory approvals

Any and all approvals, licenses, registrations, or authorizations of any federal, provincial, or municipal regulatory agency, that are necessary for the development, in the indicated jurisdiction.

### 0.76 Safety

The condition of being protected from or unlikely to cause danger, risk, or injury. Regarding construction, being a safe environment where most risks have been mitigated to a reasonable level.

### 0.77 Setbacks

There is a requirement to set developments back from possible risks created by building too close to areas or items that could cause problems.

### 0.78 Shall

The use of the word “shall” denotes a mandatory requirement.

### 0.79 Should, May

The use of the words “should” or “may” denotes an optional or suggested recommendation.

### 0.80 Speed Review

This is an engineering study of specific roadways to determine the appropriate “safe” speeds which vehicles may travel on them based on engineering design principles.

### 0.81 Standards

Denotes a level of quality considered by the municipality to be the basis approved as a measure, norm, or model in comparative evaluations:

Standards provide a shared vision, understanding, procedure, or vocabulary needed to meet required expectations. Because standards present precise descriptions and terminology, they offer an objective and authoritative basis which the municipality can use to identify to developers or contractors expected outcomes.

Standards can also refer to the latest version of these municipal engineering standards in their entire scope.

### 0.82 Stop Work Order

In accordance with the Land Use Bylaw, the municipality may stop work for a period; indefinitely; or cancel any permits issued for non-compliance with said permits. It is also noted in Servicing Agreements that a manager may stop work based on the requirements of the agreement not being met.

### 0.83 Storm Water Management Facilities (SWMF)

The effective storage and treatment of storm water runoff, which is in excess of the allowable, designed discharge rate.

### 0.84 Street Lighting

Street lighting is a key organizing streetscape element that defines the nighttime visual environment in urban settings. Street lighting includes roadway and pedestrian lighting in the public right-of-way. Street light poles and fixtures can also create a defining visual characteristic during daylight hours. (City and County of San Francisco, 2015)

### 0.85 Subdivision

The division of a parcel of land by an instrument and "subdivide" has a corresponding meaning. (Alberta Government - Municipal Government Act, 2024)

### 0.86 Temporary

Denotes items that will function for some specified time and will then be removed or replaced. "Temporary" items do not transition into a permanent condition.

### 0.87 Temporary Protection

Fencing, barricades, signage, or other adequate means of protection for a particular area such as newly seeded or sodded areas, partially constructed play structures and existing plant material to be preserved.

### 0.88 Temporary Servicing

Temporary servicing involves bringing in a service to allow for construction, until such time as the site is ready for the final service.

### 0.89 Traffic Impact Assessment (TIA)

A valuable tool for assessing potential impacts of traffic generated by a proposed development to the surrounding transportation system. (Alberta Transportation, Revised February 2021)

### 0.90 Trails

Similar to pathways, these are walking, or biking paths that are wider and usually run through environmental reserve lands.

### 0.91 Transportation Master Plan (TMP)

A plan encompassing the totality of all multi-modal transportation for a municipality including walking, biking, personal motor vehicles, mass transit, and heavy delivery or tractor trailer. Generally, the plan is created in partnership with the growth strategy and the development plans.

### 0.92 Unsuitable Material

Material deemed unsuitable for fill by the City including peat, roots, stumps, topsoil, frozen soil, garbage, etc.

### 0.93 Validation of Professional Work Products

Professional work product (PWP) validation means a permit holder's Responsible Member has reviewed the PWP to ensure it meets the quality control and assurance measures described in the permit holder's Professional Practice Management Plan. Validation must be performed in accordance with Section 4.4.2 of the PPS. (APEGA, 2022)

### 0.94 Vegetation Establishment Period

A period in which metabolic changes must occur in some dormant seeds before germination will happen.

### 0.95 Waste Management Bin

A larger metal or plastic container designed to temporarily store solid waste usually picked up with a truck using long forks mounted on the front or side of the vehicle. Usually used for commercial or industrial enterprises.

### 0.96 Waste Management Cart

A black-wheeled garbage collection cart for residential use.

### 0.97 Water Quality

The chemical, physical, and biological characteristics of water based on the standards for its intended usage. It is most frequently used by reference to a set of standards against which compliance, generally achieved through treatment of the water, can be assessed.

### 0.98 Water Quality Measures

Water quality guidelines are science-based numeric concentrations or narrative statements that are recommended to protect various water uses. These uses include aquatic life, agriculture (livestock watering and irrigation), recreation and aesthetics.

### 0.99 Weeds

All plants, and seeds, designated "Noxious" or "Prohibited Noxious" under the Weed Control Regulation of the Alberta Weed Control Act, latest edition.

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