

SECTION 6: ROADWAYS

6.1 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 Standard Drawings and Standard Specifications
- Alberta Transportation
 - Highway Geometric Design Guide
 - Pavement Design Manual
- Transportation Association of Canada (TAC):
 - Geometric Design Guide for Canadian Roads (TAC Standards)
 - Manual of Uniform Traffic Control Devices for Canada (MUTCD)
 - Guide for the Design of Roadway Lighting
 - Pedestrian Crossing Control Manual
 - Canadian Guide to Neighborhood Traffic Calming
- American Association of State Highway and Transportation Officials (AASHTO) - A Policy on Geometric Design of Highways and Streets. (AASHTO Manual)
- Transportation Research Board, National Research Council (USA),
 - Highway Capacity Manual,
 - Access Management manual,
 - Intersection Channelization Design Guide (Report 279)
- Institute of Transportation Engineers (ITE)
 - Trip Generation Manual
 - Transportation and Land Development
 - Manual of Traffic Signal Design
 - Traffic Access and Impact Studies for Site Development - Recommended Practice.
- Travel demand forecasting procedures
 - TRB or other best practices acceptable to the City

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 such as the Airport Vicinity Protection Area, Water way crossings, etc.

6.2 ROADWAY CLASSIFICATIONS

The following roadway classifications and designations, established in accordance with the classification system outlined in the TAC Standards, have been adopted for use by the City of Medicine Hat:

- Principle Arterial UAD; 60, 70 and 80
- Minor Arterial UAD; 50, 60 and 70
- Undivided Arterial UAU; 50, 60 and 70
- Major Collector; UCU 50 and 60
- Industrial/ Commercial Major Collector; UCU 50 and 60
- Industrial/ Commercial Minor Collector; UCU 50 and 60
- Industrial/ Commercial Local; ULU 50 and 40
- Minor Collector; UCU 50
- Local Residential; ULU 50 and 40
- Low volume local residential ULU 50 and 40 (equal to or less than 400 vpd)
- Country Residential; – Two lane Rural RLU 50
- 9.0 and 6.0 metre wide lanes; ULU 20

New highway frontage roads are not accepted in the City of Medicine Hat. Country Residential roads are not normally acceptable in an urban setting unless they form part of an approved country residential subdivision.

The Province of Alberta highways #1 and #3 are the responsibility of Alberta Transportation and as such are deemed to be special category roadways and not within the scope of these standards.

Walkways and trails are not within the scope of this section. (See Section 7, Parks and Outdoor Recreation Standards)

6.3 TRAFFIC VOLUMES AND DESIGN CONSIDERATIONS

6.3.1 TRAFFIC INFORMATION

Traffic Information shall be obtained from existing sources wherever such information is available and relevant. Existing sources may be:

6.3.1.1 CITY OF MEDICINE HAT

- City of Medicine Hat Transportation Network Study (Roadway System Master Plan), most current edition,
- Selected Arterial Roadway Functional Design Studies, most current update:
- Selected screen line, cordon and intersection counts at existing roadway locations,
- Collision data at selected intersections and roadway sections.

6.3.1.2 TRAFFIC STUDIES, CRITERIA, REFERENCE STANDARDS, FIELD DATA

Criteria and parameters for traffic studies design and analysis shall be obtained from the Reference Standards unless otherwise approved by the General Manager of Municipal Engineering. Field counts may be required for current and relevant traffic information.

Field counts and traffic studies shall be carried out in consultation with the General Manager of Municipal Engineering.

6.4 ACCESS MANAGEMENT

Provision of access to property shall conform to the Land Use Bylaw and the reference standards specifically the TAC standards.

6.5 TRAFFIC IMPACT ASSESSMENT (TIA)

6.5.1 GENERAL

Engineering studies, 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 and related FSR
- Subdivision
- Development permit
- Road closures
- Variance in access requirements

6.5.2 WARRANTS

A TIA will be required if:

- A development can be expected to generate more than 100 new peak-hour trips on intersecting or adjacent roadways;
- Where traffic problems such as high accident rates, traffic congestion, short cutting or access problems are being experienced in the area, regardless of the magnitude of peak hour volumes generated by the development,
- Change in land use may change directional distribution of site generated traffic by greater than 20%;
- Variances to the above may be permitted at the City's discretion.

Additional guidance may be obtained from the City.

6.5.3 SCOPE

The scope of a TIA shall generally conform to the reference standards outlined in section 3.1 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 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,

6.5.4 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.

6.6 ROADWAY DESIGN CRITERIA

6.6.1 GENERAL

All roadways shall conform to:

- the geometric design criteria of the TAC Manual
- the City's standard cross sections
- the recommendations of an approved TIA and/or
- this standard

incorporating traffic control devices, regulatory and warning signage unless otherwise approved by the City.

In addition, the following design criteria shall apply:

6.6.1.1 HORIZONTAL CURVES

Centerline radii less than 60 metres will not be accepted.

6.6.1.2 CUL-DE-SACS

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 metres, unless a paved access restricted to the passage of emergency vehicles is located within 85 metres 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 metres;

Cul-de-sacs on local residential roadways shall be designed with a minimum lip-of-gutter (edge of pavement) radius of 13 metres and a 23 metre 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 metres and a 25 metre 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.

6.6.1.3 P-LOOPS

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 metres, 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 metres, in conformance with the standard details herein.

All single entry looped local roadways shall be provided with paved emergency access connecting the internal loop to another roadway or lane.

Centerline lengths shall be measured between centerline intersections of connecting roadways.

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.

6.6.1.4 EXPANDED BULBS

Expanded bulbs must be used on local roadways wherever the minimum centerline radius of curvature cannot be provided, in accordance with the standard details herein.

6.6.1.5 TWO-WAY LEFT TURN LANES (2WLTL)

Two-way left turn lanes shall be designed in accordance with the TAC manual, NCHRP Report 279 and the TRB Access management Manual.

6.7 INTERSECTIONS

At-grade, simple and channelized intersections are covered by this standard. Reference Standards should be consulted for grade separated and rotary type intersections.

Intersections with three (3) approaches are desirable for all functional roadway categories.

Intersections with four (4) or more approaches are:

- Acceptable for all functional classifications of roadways provided that adequate provisions are made for traffic control devices,
- Undesirable for Lane/ Lane intersections.

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 on curves are to be avoided. Where an intersection must be placed on a curve, calculations and drawings confirming the adequacy of intersection site distances are to be submitted to the General Manager of Municipal Engineering.

6.7.1 INTERSECTION SPACING

Intersections should be spaced as shown in the Functional Requirements for each category of roadway.

6.7.2 INTERSECTION SIGHT DISTANCES

Intersections shall be designed with sufficient sight distances for design vehicles to safely depart from a stopped position and make the desired manoeuvre through the intersection. Sight triangles for any intersection with an arterial road shall meet the sight distance requirements in the TAC manual.

6.7.3 TURNING ROADWAY GEOMETRICS

Turning radii for intersecting roadways shall conform to Table 3.7.3. Radii and other geometrics are measured to the lip of gutter or edge of pavement. Variations must be approved by the General Manager of Municipal Engineering. Requests for variation are to be accompanied by an engineering study that outlines the reasons and rationale for the deviation and engineering analysis supporting the proposed geometrics, acceptable to the City.

Table 3.7.3 Minimum Turning Radii Requirements (metres)

Angle of Turn	Design Classification	Design Vehicle	Simple Curve		Symmetrical Simple Curve Radius With Taper				
			Radii (m)	Corner Cut*1 (m)	Radii (m)	Offset (m)	Taper	Corner Cut**4,5 (corner cut -taper length) (m)	Turning Roadway Width*3 (m)
70	A	P	11.5	4.5 x 4.5	7.0	1.0	10:1	1.6x1.6-11.2	6.0
	B	SU	18.0	6.5 x 6.5	14.0	0.6	10:1	4.2x4.2-12.8	
	C	WB-15			23.0	1.0	15:1	6.4x6.4-20.9	
	D	WB-21			43.0	1.3	20:1	18.0x18.0-28.3	
75	A	P	11.0	4.5 x 4.5	8.0	0.9	10:1	2.4x2.4-11.5	6.0
	B	SU	17.0	6.5 x 6.5	14.0	0.6	10:1	4.8x4.8-12.9	
	C	WB-15			20.0	1.0	15:1	6.0x6.0-20.2	
	D	WB-21			43.0	1.3	20:1	20.0x20.0-28.8	
80	A	P	10.5	4.5 x 4.5	7.0	0.9	10:1	2.4x2.4-11.9	6.0
	B	SU	16.0	6.5 x 6.5	13.0	0.6	10:1	5.5x5.0-12.6	
	C	WB-15			20.0	1.0	15:1	6.8x6.8-20.4	
	D	WB-21			39.0	1.3	25:1	20.0x20.0-33.3	
85	A	P	10.0	4.5 x 4.5	7.0	0.8	10:1	2.4x2.4-11.3	6.0
	B	SU	15.0	6.5 x 6.5	12.0	0.6	10:1	4.8x4.8-12.4	
	C	WB-15			19.0	1.1	15:1	7.2x7.2-20.2	
	D	WB-21			37.0	1.3	30:1	21.0x21.0-36.8	
90	A	P	9.0	4.5 x 4.5	6.0	0.8	10:1	2.8x2.8-11.2	6.5 6.0
	B	SU	15.0	6.5 x 6.5	12.0	0.6	10:1	5.6x5.6-12.4	
	C	WB-15			18.0	1.2	15:1	7.4x7.4-20.1	
	D	WB-21			37.0	1.3	30:1	24.0x24.0-36.4	
95	A	P	9.0	5.0 x 5.0	7.0	0.8	10:1	3.2x3.2-11.2	6.7 6.0
	B	SU	15.0	7.0 x 7.0	12.0	0.8	10:1	6.2x6.2-12.6	
	C	WB-15			17.0	1.2	15:1	8.0x8.0-19.6	
	D	WB-21			37	1.3	30:1	27.0x27.0-36.3	
100	A	P	9.0	5.5 x 5.5	7.0	0.8	10:1	3.6x3.6-11.2	6.7 6.0
	B	SU	15.0	7.75 x 7.75	11.0	0.8	10:1	6.0x6.0-12.4	
	C	WB-15			17.0	1.2	15:1	9.0x9.0-19.7	
	D	WB-21			35.0	1.0	25:1	29.0x29.0-31.2	
105	A	P	9.0	6.25 x 6.25	6.0	0.8	10:1	3.0x3.0-11.0	
	B	SU	15.0	8.5 x 8.5	11.0	1.0	10:1	7.0x7.0-12.2	
	C	WB-15			17.0	1.2	15:1	10.2x10.2-19.8	
	D	WB-21			35.0	1.0	15:1	32.0x32.0-21.5	
110	A	P	9.0	7.0 x 7.0	6.0	0.7	10:1	3.4x3.4-10.9	
	B	SU	15.0	9.5 x 9.5	10.0	1.0	10:1	6.4x6.4-12.2	
	C	WB-15			16.0	1.2	15:1	10.4x10.4-19.6	
	D	WB-21			31.0	1.0	15:1	30.0x30.0-27.2	

Table 3.7.3 Minimum Turning Radii Requirements Continued (metres)

Angle of Turn	Design Classification	Design Vehicle	3-Centered Compound Curve Symmetric				2-Centered Compound Curve Asymmetric			
			Radii R1-R2-R3 (m)	Offset (m)	Corner Cut* ^{4,5} (corner cut - taper length) (m)	Turning Roadway Width* ^{2,3} (m)	Radii R1-R2 (m)	Offset (m)	Corner Cut* ^{4,5} (corner cut - taper length) (m)	Turning Roadway Width* ^{2,3} (m)
70	A	P	30-8-30	0.6	2.2x2.2-6.4					
	B	SU	36-14-36	0.6	4.2x4.2-7.8					
	C	WB-15	54-15-54	1.8	3.0x3.0-15.4		21-130	2.45	5.0x5.0-28.8	
	D	WB-21	126-26-126	2.6	9.0x9.0-28.0		24-150	2.8	6.5*6.5-32.8	
75	A	P	30-8-30	0.6	6.4-2.6x2.6					
	B	SU	36-14-36	0.6	4.8x4.8-8.0					
	C	WB-15	45-15-45	2.0	4.0x4.0-14.1		20-130	2.45	5.0x5.0-29.2	
	D	WB-21	128-23-128	3.0	8.0x8.0-30.4	6.0	23-150	2.8	7.5x7.5-32.4	
80	A	P	30-7-30	0.7	2.2x2.2-6.8					
	B	SU	36-13-36	0.6	5.5x5.0-7.8					
	C	WB-15	50-18-50	2.0	6.0-6.0-15.7		19-130	2.45	5.5x5.5-29.0	
	D	WB-21	130-23-130	3.0	9.0x9.0-30.6	6.0	22-150	2.8	8.5x8.5-32.0	
85	A	P	30-7-30	0.7	2.4x2.4-6.9					
	B	SU	36-12-36	0.6	4.8x4.8-7.9					
	C	WB-15	55-18-55	2.0	7.0x7.0-16.5		19-130	2.45	6.5x6.5-29.0	
	D	WB-21	132-22-132	3.0	9.5x9.5-31.2	6.0	22-150	2.8	9.5x9.5-32.3	6.0
90	A	P	30-6-30	0.8	2.2x2.2-7.2					
	B	SU	36-12-36	0.6	5.6x5.6-7.8					
	C	WB-15	55-18-55	2.0	7.5x7.5-17.0		18-130	2.45	7.0x7.0-28.8	
	D	WB-21	134-20-134	3.0	9.5x9.5-31.0	6.0	21-150	2.8	10.0x10.0-32.3	6.1
95	A	P	30-6-30	0.8	2.2x2.2-7.3					
	B	SU	36-12-36	0.8	6.2x6.2-8.3					
	C	WB-15	55-16-55	2.0	7.5x7.5-16.3		18-130	2.45	8.0x8.0-28.9	
	D	WB-21	140-20-140	3.4	10.5x10.5-34	6.2	20-150	2.8	11.0x11.0-32.9	6.2
100	A	P	30-6-30	0.8	2.6x2.6-7.1					
	B	SU	33-11-33	0.8	6.0x6.0-8.3					
	C	WB-15	55-15-55	2.2	7.5x7.5-16.9	7.0	18-130	2.45	9.5x9.5-28.6	6.8
	D	WB-21	145-18-145	3.7	10.0x10.0-36	6.5	19-160	3.1	13.4x13.4-32.0	6.4
105	A	P	30-6-30	0.8	3.0x3.0-7.1					
	B	SU	30-11-30	1.0	7.0x7.0-8.2					
	C	WB-15	55-14-55	2.5	7.5x7.5-17.7	7.2	17-140	2.69	10.0x10.0-28.3	7.0
	D	WB-21	152-15-152	4.0	8.0x8.0-37.3	7.2	19-160	3.1	12.5x12.5-34.0	6.4
110	A	P	30-6-30	0.8	3.2x3.2-7.3					
	B	SU	30-10-30	1.0	6.4x6.4-8.5					
	C	WB-15	55-15-55	2.5	9.2x9.2-18.3	7.2	16-150	2.8	10.2x10.2-32.0	7.2
	D	WB-21	158-15-158	4.0	9.2x9.2-37.3	7.2	18-160	3.1	11.8x11.8-35.0	6.8

Table 3.7.3 Notes:

- Simple curve arcs may be used as a substitute for triangular corner cuts, provided that sufficient ROW is maintained.
- Turning roadway widths are only provided where a minimum sized channelization island can be accommodated. If a channelization island is required to serve as a pedestrian refuge island then the island size is to be checked to ensure sufficiency (minimum size = 10 m²). Where channelization is required and minimum island size cannot be achieved using the minimum radii, larger radii, tapers, and auxiliary lanes shall be used to achieve a minimum island size.
- Minimum turning roadway width is 6.0 metres.
- The offsets for the corner are to be applied to the ROW and then the corner cut taken. The taper length distance is applied from the end of the corner cut. In the case of transition curves, the ROW taper may be replaced with a curve.
- Most conservative corner cut. Corner cut may be less if it can be shown that all of the infrastructure improvements (including trails, berms, ditches, etc.) can be accommodated with a reduced corner.

6.7.4 MEDIANS AND CHANNELIZATION ELEMENTS

Median and channelization elements including divisional, directional and refuge islands shall be designed in conformance with the TAC manual and reference standards. Warrants and capacity analysis shall be submitted where required in conformance to the TAC standards. Where a pedestrian crosswalk distance across an approach exceeds 20.0 metres (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:

- Portland cement concrete curb surrounding the perimeter
- Portland cement concrete or other approved hard surfacing (excluding asphalt) between curbs.
- Provisions for landscaping may be made in medians only provided that:
 - the median is wider than 4.0 metres from lip-of-gutter to lip-of-gutter,
 - A Portland cement concrete strip 0.50 metres 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 metres,
 - 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 Portland cement concrete cross-section elements wider than 2.0 metres.
- Wheelchair ramps within pedestrian crosswalk zones.

6.8 VERTICAL ALIGNMENT

6.8.1 GRADIENTS

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 edge of pavement or lip of gutter (LOG) and referenced to geodetic Datum. Longitudinal roadway grades shall conform to Table 3.8.1 for each roadway functional classification.

Table 3.8.1 Minimum and Maximum Road Grades

Roadway Classification	Grade (%)		
	Minimum	Desirable Maximum	Maximum
Lanes	0.5%	6.0%	8.0%
Local Residential	0.5%	6.0%	8.0%
Country Residential/ Two Lane Rural	0.4%	6.0%	8.0%
Industrial/ Commercial & Minor Collector	0.5%	6.0%	8.0%
Industrial/ Commercial & Major Collector	0.5%	6.0%	8.0%
Minor Arterial	0.5%	5.0%	6.0%
Principle Arterial	0.5%	4.0%	6.0%

Approach grades are desirable between 0.5% and 3.0% at intersecting roadways and shall not exceed a absolute maximum approach grade of 4.0% for a minimum length as listed in Table 3.8.1a, measured from the projection of the lip-of-gutter of the approach roadway at the intersection.

Table 3.8.1a Minimum Length of Approach Grade at Intersections (metres)

Approach Roadway Classification	Through Roadway Classification					
	Lanes	Local Residential	Local Industrial/ Commercial & Minor Collector	Industrial/ Commercial Collector & Major Collector	Minor Arterial	Principle Arterial
Lanes	20.0	20.0	20.0	30.0	NA	NA
Local Residential	-	25.0	25.0	30.0	30.0* ¹	NA
Country Residential/ Two Lane Rural	-	25.0	25.0	30.0	50.0* ¹	NA
Industrial/ Commercial & Minor Collector	-	-	50.0	50.0	50.0	NA
Industrial/ Commercial & Major Collector	-	-	-	50.0	50.0	50.0* ²
50 km/h Arterial	-	-	-	-	50.0	50.0
60 km/h Arterial	-	-	-	-	65.0	65.0
70 km/h Arterial	-	-	-	-	90.0	90.0
80 km/h Arterial	-	-	-	-	105.0	105.0

*1 If such intersections are permitted under City’s access management policies.

*2 Usually with divided cross-sections and with constrained movements in accordance with City’s access management policies.

Cul-de-sacs and expanded bulb corners shall be designed with the centerline profile 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.

6.8.2 VERTICAL CURVES

Parabolic vertical curves shall be provided at points of grade change where the algebraic difference is $\geq 1.0\%$. The length of vertical curves ($L=KA$) shall be calculated using the K values in Table 3.8.2.

Table 3.8.2 Minimum K Values

Classification	K		
	Crest VC		Sag VC (Comfort Control Based)
	(min Stopping Sight Distance)	(desirable)	
Local Roadways	7	10	6
Collector Roadways	7	10	6
50 km/h Arterial	7	10	6
60 km/h Arterial	15	20	10
70 km/h Arterial	22	35	15
80 km/h Arterial	35	55	20

The minimum length of vertical curve is 30 metres except for:

- smoothing vertical curves for superelevation runoff and tangent runoff, which can be reduced to 15.0 metres and 20.0 metres respectively,
- Adverse design conditions, reduced lengths may be permitted.

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%.

6.8.3 SUPERELEVATION/TRANSITION SPIRALS

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 TAC Manual.

Transition spirals are not normally required except in special design cases. Such designs shall conform to the TAC Manual.

6.8.4 CORNER DETAILS

Submission of corner details, drawn at an appropriate scale in plan view, will be required for all intersections of roadways involving Major Collector and Arterial roadways. The procedures for preparing corner details are outlined in the TAC Manual. The corner details shall include curve data and grade transitions around channelization elements.

6.8.5 VERTICAL CLEARANCE

Minimum vertical clearances between roadway surfaces and overhead power and communication lines outlined in table 3.8.5 shall be maintained for all roadways, subject to approval of the applicable utility company.

TABLE 3.8.5 Minimum Vertical Clearances

VOLTAGE (kV)	BETWEEN TOP OF PAVEMENT AND LINE (m)	
	Lanes & Entrances to Commercial and Industrial Properties	All Other Roadways
Guide wires, Cables, Telecommunication lines	5.3	5.4
0 – 0.75	5.3	5.7
0.75 - 22	5.5	6.0
22 - 50	5.9	6.4
50 - 90	6.2	6.7
90 - 120	6.4	6.9
120 - 150	6.8	7.3
150 - 250	6.8 plus 0.011m for each 1 kV in excess of 150 kV	7.3 plus 0.011m for each 1 kV in excess of 150 kV
250 - 300	7.9 plus 0.056m for each 1 kV in excess of 250 kV	8.4 plus 0.046m for each 1 kV in excess of 250 kV
Over 300	10.7 plus 0.025m for each 1 kV in excess of 300 kV	10.7 plus 0.025m for each 1 kV in excess of 300 kV

- Note:
1. Derived from Table 2 of the Alberta Electrical and Communication Utility Code.
 2. These clearances are basic clearances and in all cases, lines are to be designed so that the basic clearances will not be reduced under loading conditions or summer temperatures.

6.9 CROSS SECTION ELEMENTS

6.9.1 GENERAL

Travelled ways, medians, auxiliary lanes, pedestrian facilities, traffic control devices and other cross section elements shall conform to:

- the City's standard cross sections,
- functional design sheets,
- TAC Manual, and
- Reference Standards.

6.9.2 ROADWAY CROWN

Roadway crowns shall be provided as shown in Table 3.9.2.

TABLE 3.9.2 Roadway Crown

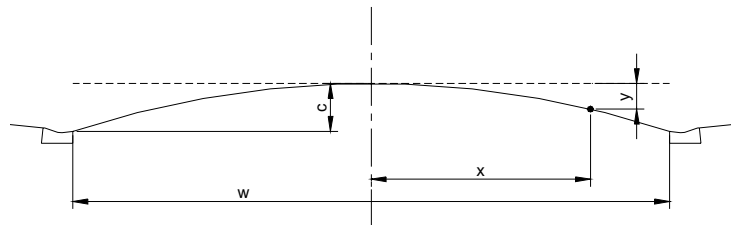
ROAD WIDTH (m)	CENTERLINE GRADE (mm)			
	0.6 – 3.0%	3.0 – 4.0%	4.0% - 6.0%	6.0 - 8.0%
10	150	125	100	75
12	180	150	120	90
13	195	165	130	100
15	230	190	150	110

Crowns shall be parabolic and of the form given by:

$$y = 4 c * (x / w)^2$$

Where:

- y = vertical distance on parabolic surface below the maximum crown at distance x from the maximum crown in millimetres.
- c = total crown of cross section in millimetres (taken from table 3.8.1)
- w = total width of cross section in metres.
- x = horizontal distance of a point on the parabolic curve from the centerline in metres.



Asymmetrical crowns are not desirable but may be considered under exceptional circumstances subject to specific approval.

6.9.3 CURB AND GUTTER

Portland cement concrete curb and gutter (Type 50 cement) will be required on all roadways unless otherwise shown on the roadway sections and approved by the General Manager of Municipal Engineering.

Reverse gutters shall be provided at locations where the road cross slopes away from the curb such as, super elevated sections, divisional islands, directional islands, refuge islands and along medians.

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.

6.9.4 SIDEWALKS

Portland cement concrete sidewalks (Type 50 cement) or asphaltic cement trails will be required as specified on the functional criteria and roadway cross-sections for each classification of roadway.

Sidewalks in industrial areas shall be provided where required under the condition of approval of a Functional Servicing Report/ Area Structure Plan or Engineering Design Brief/ Conceptual Scheme or based on a needs assessment as required by the General Manager of Municipal Engineering

Where Lanes, Commercial, Industrial, Institutional and Multi Family driveways cross sidewalks, the crossing shall be constructed with reinforced concrete.

6.9.4.1 ACCESSIBILITY

Public facilities shall be accessible to pedestrian traffic and wherever possible incorporate provisions for wheelchair accommodation.

6.9.4.2 WHEELCHAIR ACCOMMODATION

In the vicinity of public facilities such as 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 metres. It is recognized that topographical constraints, road gradients, adjacent building layout and economics along some roads may make the provision of landings difficult and in some cases impractical.

Wheelchair ramps shall be provided at all intersections of roadways, whether existing or proposed and incorporated into pedestrian facilities. For Residential Streets, Local Industrial Commercial Streets and Minor Collector Streets the ramp shall be placed at the midpoint of the curb return. For all other 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.

6.9.5 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 section 2 of this standard. In no case shall the pavement structure for any functional classification of roadway be less than the minimum structure in the Design Criteria.

Locations at trapped lows or with high groundwater table and/ or frost susceptible soils may require a perforated drain system and geosynthetic layer system to support construction and interim traffic prior to the application of the final asphaltic concrete wearing course.

6.10 COMMUNITY MAILBOXES

6.10.1 GENERAL

The Developer shall submit to the City an overall plan showing the proposed location of community mailboxes approved by Canada Post, in conjunction with his design plan submissions.

6.10.2 LOCATION CRITERIA

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 flankage side of lots towards the back property line.

Community mailboxes are not to be located:

- On Major Collectors or Arterial roadways,
- Not within the driveway setback from intersections,
- Where there are site distance restrictions,
- Not closer than 10 metres from a fire hydrant or bus stop,
- On a utility easement (deep or shallow)
- Closer than 3 metres to streetlight standards, street name poles, or above ground utility boxes.

6.11 ILLUMINATION

Roadway illumination shall be provided on all functional classifications of roadways except lanes. Illumination shall be designed and constructed to conform to the TAC Canadian Guide for the Design of Roadway Lighting.

6.12 TRAFFIC CONTROL DEVICES

Traffic control devices shall conform to the TAC Manual of Uniform Traffic Control Devices (MUTCD).

6.12.1 SIGNS

A schedule of the signs to be installed must be provided on the detailed roadway drawings.

6.12.2 SIGNALS

Traffic signals will be installed when a traffic impact study or when a needs assessment, as required by the General Manager of Municipal Engineering, 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.

6.12.3 PAVEMENT MARKINGS

Pavement markings shall conform to the Manual of Uniform Traffic Control Devices.

6.12.4 AIRPORT VICINITY

Special provisions with respect to traffic control devices may be required for the design of roadways around the perimeter and within 250 metres of the perimeter of the City of Medicine Hat Municipal Airport. These requirements shall be obtained from the General Manager of the Municipal Works Department of the City of Medicine Hat as the Airport Authority.

6.13 LANES

The City of Medicine Hat prefers laned subdivisions.

A minimum 7.0 metre 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 metres 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 metre 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 metres.

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 metres or greater then the lane shall be deep based, or other alternative provisions acceptable to the General Manager of Municipal Engineering 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.

6.14 EMERGENCY ACCESS

6.14.1 EMERGENCY ACCESS DESIGN REQUIREMENTS

Where emergency accesses are required, they shall be provided with all weather-driving surface over a minimum width of:

- 3.0 metres centered in a right of way of minimum width of 6.0 metres. Provided that the abutting areas are also grassed and capable of mowed operation. A minimum of 0.5 metres clearance from the edge of the all weather surface to any obstructions is required, or
- fully paved right-of-way between two property boundaries provided that there is adequate room within the right-of-way for off-loading and projecting equipment from emergency vehicles. A minimum 6.0 metre wide right-of-way may be acceptable where there are no deflections or curves.

The traveled surface may be concrete, asphalt, paving stone or turf stone or approved alternate and is to be designed to support fire-fighting equipment.

Emergency accesses shall be designed to provide for the access, maneuvering, and egress of fire fighting equipment and shall be designed with adequate radii, width, horizontal and vertical alignments, etc for these movements.

Adequate overhead clearances for roadways shall be maintained for emergency accesses

6.14.2 EMERGENCY ACCESS END TREATMENT

The ends of emergency accesses are to be provided with knockdown posts or removable bollards at 1.5m spacing on center. The removable posts, removable bollards or gates shall prevent non-emergency vehicle access while allowing access for City maintenance equipment.

Emergency accesses must be signed at each intersection with a roadway as an "Emergency Access". The signage must meet the intent of the Alberta Fire Code.

Standard curbs at the approaches to emergency accesses are adequate; drop curbs are not required.

6.15 TRANSIT ROUTES

In accordance with current City of Medicine Hat policy, all residences should be within a 400 metre walking distance of an existing or proposed bus stop. A drawing showing the proposed extension of the transit route, including general location of proposed bus stops and bus bays is to be submitted to the General Manager of Municipal Engineering.

Standard curb and gutter is required at bus stop waiting areas. Bus stops shall be designed in accordance with the accessibility provisions of Section 3.9.3.

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.

6.16 BERMS AND FENCING

Berms and sound attenuation fencing along roadways in a road right-of-way shall be designed and constructed in accordance with the Standard Cross-Sections and/or an approved FSR.

Access control fencing as determined most applicable to the site by the General Manager of Municipal Engineering 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.

6.17 RAILWAY CROSSINGS AT GRADE

At-grade crossings of railway lines shall follow design procedures outlined in the TAC Manual.

6.18 ACCOMODATION OF INFRASTRUCTURE AND CROSSINGS

6.18.1 GENERAL

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 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 proposal, for a complete assessment to be completed by the City.

Depending upon the nature of the proposal, 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 roadway 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.

This preliminary submission shall include engineering analysis, preliminary design, engineering reports and documentation detailing the crossing or encroachment agreements.

6.18.2 TRENCHES

Pipelines, conduit or cables across, along or under roadways of all functional classifications may be installed by open-cut trenching methods provided that the trench is backfilled with competent material and compacted to a minimum density of 98% of the standard Proctor Dry Density at a moisture content within 2% or the optimum, within the full roadway right-of-way along the trench. Alternately, open cut trenches may be backfilled with no-shrink fill pursuant to City of Medicine Hat standard specifications.

6.18.3 DIRECTIONAL DRILLING, CORING OR JACKING

Pipelines, conduit or cables across or under existing roadways of a functional classification of Major Collector Roadway and higher shall be carried out by directional drilling, coring or jacking methods unless specific approval and permits have been issued by the Road Authority, for open-cut trenching methods. Minimum clearances to all utilities and infrastructure within the roadway right-of-way shall be maintained and monitoring provisions employed. Bell-holes and monitoring excavations shall be backfilled as described under Section 3.18.2 Trenches.

6.18.4 CERTIFICATION OF COMPLIANCE

A report, sealed by the professional engineer responsible for monitoring trenching and trench backfill compaction testing, certifying that each segment of trench backfill has been compacted to the City of Medicine Hat standard specifications, shall be submitted to the General Manager of Municipal Engineering promptly upon completion of installations and correction of defects.

6.19 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 General Manager of Municipal Engineering. 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 8-metre width, 2-lane graveled rural roadway standard. 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 metre 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.

6.20 TRAFFIC ACCOMMODATION AT CONSTRUCTION SITES

Traffic accommodation at Construction Sites shall conform to City of Medicine Hat standard specifications and MUTCD.

6.21 RIGHT-OF-WAY DEDICATION

Road rights-of-way to accommodate any intersection improvements, auxiliary lanes or turning lanes where these improvements are necessary to existing roadways due to the impact of a development shall be dedicated to the City.