THE CITY OF CALGARY

Design Guidelines For Subdivision Servicing 2020

Public Infrastructure
Development Engineering
Roads
Water Resources
Water Services
Transportation Infrastructure

October 2020

Table of Contents

Table of Figures

SECTION I: OVERVIEW

A. INTRODUCTION

The Design Guidelines for Subdivision Servicing has been prepared to guide the Development Industry through The City of Calgary's design and construction approval process.

Note: Requirements of these guidelines alone do not constitute the only conditions of development in the City of Calgary. The Community Planning Business Unit of the Planning and Development Department should be contacted to determine pertinent development requirements.

1) Purpose

The primary focus of this document is to aid Engineering Consultants in the preparation of Construction Drawings. The purpose of the review of Construction Drawings is to ensure that:

- all development is designed and constructed to appropriate City Standards; and
- upon acceptance of the development by the City, the future public responsibilities for maintenance fall within normal, reasonable and tolerable levels.

2) Organization of This Manual

This manual contains six main sections:

- Overview
- Roads
- Waterworks
- Wastewater and Stormwater
- Geotechnical and Hydrogeological Requirements
- Bridge Structures

3) Public Infrastructure and Development Engineering

Public Infrastructure of the Calgary Approvals Coordination Business Unit, and Development Engineering of the Water Resources Business Unit (under the Utilities & Environmental Protection Department), jointly represent the following Business Units and other organizations:

- Roads
- Transportation Infrastructure
- Transportation Planning
- Water Resources
- Waste and Recycling Services
- Infrastructure & Information Services
- Parks
- Canada Post

- Public/Private School Boards

The Divisions' mandate is to ensure that public infrastructure is constructed safely, and meets required engineering standards and specifications. Any public infrastructure must connect effectively to existing infrastructures, which includes sewers, water, roads, etc.

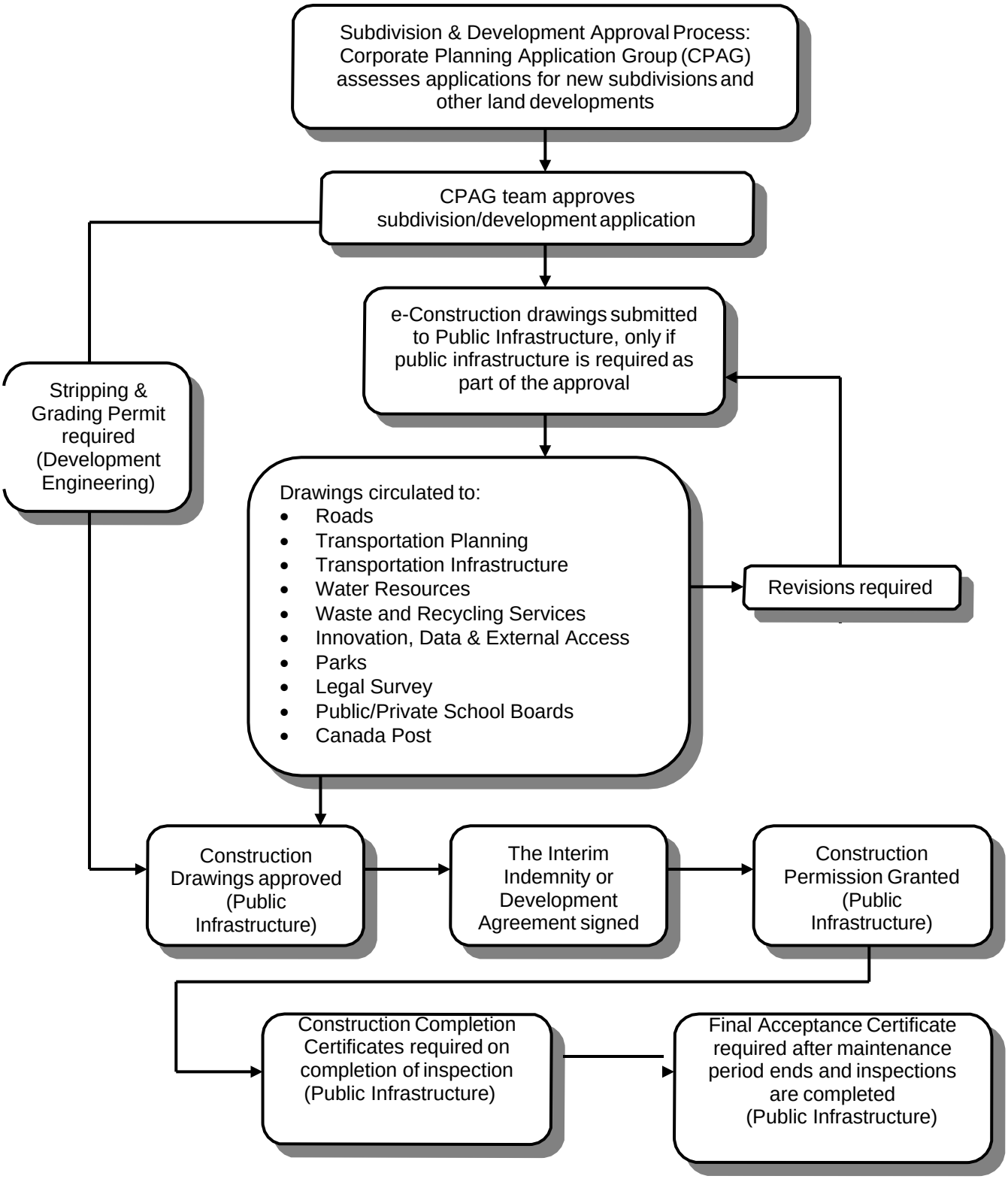
The Divisions also partner with Alberta Environment, a provincial approval authority, to ensure development does not adversely impact our eco-systems, both man-made and natural, on a large scale, and that any local contaminants found are dealt with properly.

B) GENERAL INFORMATION

1) Process Overview

The chart "Development Process Overview" on Page 12 provides a general description of the various processes that must take place when subdivision or other land development occurs.

Development Process Overview



2) Construction Drawings

Construction drawings are submitted to the City electronically. These drawings are circulated to the appropriate Business Units and organizations for their review and comments.

The first submission of Construction Drawings is termed the Preliminary Construction Drawings. The Consultant Engineer will be able to submit a Final or Revised Final set of Construction Drawings once the most recent submission has been RELEASED.

Refer to the City of Calgary website www.calgary.ca (under Construction drawings for Public Infrastructure) for e-Construction Drawings (e-CD) application, submission and approval processes.

All layout sheets and block profiles for Construction Drawings shall conform to the general specifications and typical examples outlined in the City of Calgary Specifications Standards.

Refer to the City of Calgary website www.calgary.ca (under CAD Standards Publications) for the "Standard Block Profile Specifications for CAD and Manual Formats".

3) Development Agreement

All Development Agreement requests are required to be submitted electronically. In order to apply for a Subdivision Development Agreement, the Developer must complete the online application requesting the preparation of the current year Development Agreement.

Refer to the City of Calgary website www.calgary.ca (under Urban Development Online Services) for request for Development Agreement Online.

The construction of a subdivision/other forms of land development is subject to the terms and conditions of a Development Agreement and appropriate performance and maintenance securities. The standard Development Agreement together with the Consulting Engineer's Field Services Guidelines detail the construction, maintenance, inspection, and financial and security requirements of the Developer. The standard Development Agreement may be registered on the title of the affected lands.

The following is a brief synopsis of a standard Subdivision Development Agreement. It is highly recommended that Public Infrastructure be contacted to obtain a general copy of an Agreement and/or to speak with the Area Infrastructure Strategist or the Public Infrastructure Coordinator.

The Standard Development Agreement, written for an applicant, is based upon the following:

- Construction drawings
- Outline Plan and Land Use conditions
- Tentative Plan conditions
- Related Policies

The agreement forms the contractual responsibilities of the Developer and of the City for the development of land approved for subdivision. It is a very detailed contract that establishes:

- Financial and construction obligations for both the City and the Developer for the developing land
- Timeframe for construction and maintenance

- Exactly what infrastructure is to be built
- Payment amounts for levies, and how and when they are to be invoiced
- Amount of performance security required
- Ensure the applicant has liability insurance
- Method of payment
- Rules and times for payments on oversize or boundary conditions
- Endeavor to assist in cost recovery conditions

This agreement is comprised of two parts:

1) Standard Subdivision Development Agreement
2) Conditions specific to each project (commonly known as Special Clauses).

A performance security is required from the applicant in order to remediate the site if the applicant encounters financial difficulty and is unable to complete construction. The security is returned to the applicant upon completion of all of his obligations.

The Standard Agreement is negotiated yearly between the City of Calgary and the Building Industry and Land Development and thus subject to change. A copy of a current agreement can be obtained from the City of Calgary website www.calgary.ca.

4) Permission for Stripping and Rough Grading

Stripping and rough grading under a Development Agreement shall not be permitted until the following conditions are satisfied:

a) the Outline Plan has been approved by the Calgary Planning Commission and the Land Use has been approved by City Council

b) cut and fill plan identifying areas where proposed fill exceeds 2 m and a plan indicating method to be used to provide erosion and sediment control

c) an Erosion and Sediment Control Plan has been submitted and reviewed by Development Engineering

d) additional requirements may be imposed if school or reserve sites are affected (contact Development Engineering for additional details)

e) appropriate indemnity letters, insurance certificates and financial securities for the stripping and grading have been provided

A detailed Stripping and Grading report, prepared and certified by a qualified Geotechnical Engineering Consultant, shall be submitted by the Consulting Engineer to Development Engineering upon completion of the site grading. This report will outline the site preparation quality control and testing and detail the site conditions and building envelopes. The report shall also identify all geotechnical and /or environmental items encountered during the stripping and grading and indicate the remedial measures taken.

5) Permission to Install Underground Utilities and Construct Surface Improvements

The following requirements must be fulfilled before permission for any subdivision construction is granted for construction of any underground or surface improvements:

a) the Outline Plan for the development area is to be approved by the Calgary Planning Commission

b) the Land Use Redesignation for the development area is to be approved by City Council

c) the Tentative legal plan has been submitted and advertised for the appropriate time period with no appeals registered

d) letter of authorization is received from Alberta Environment

e) an Erosion and Sediment Control Plan has been submitted, reviewed and to the satisfaction of Development Engineering

f) Final Construction Drawings are to be approved by Public Infrastructure

g) The terms and conditions of the Special Clauses of the Development Agreement have been agreed upon

h) Appropriate security, insurance certificate, and indemnity have been provided in accordance with the Development Agreement

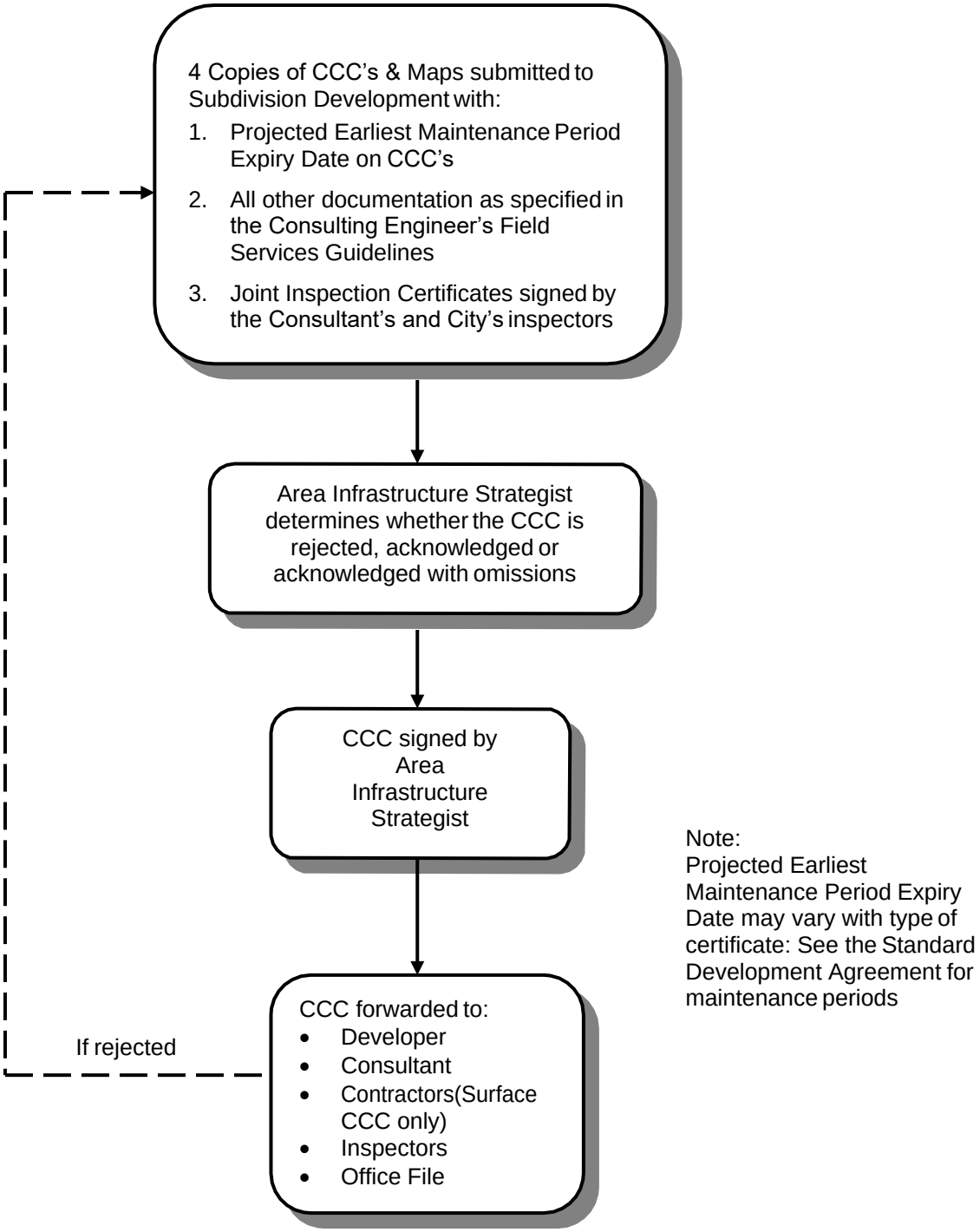
6) Construction Completion Certificate (CCC)

Upon completion of the construction of each utility and each surface improvement in compliance with the Consulting Engineer's Field Services Guidelines, CCC's are to be prepared and issued by the Consultant Engineer.

The maintenance period for each utility and surface improvement shall commence on the date of acknowledgement of the CCC.

CCC's are submitted to Public Infrastructure and processed according to the chart "Construction Completion Certificates" on Page 16.

Construction Completion Certificates CCC



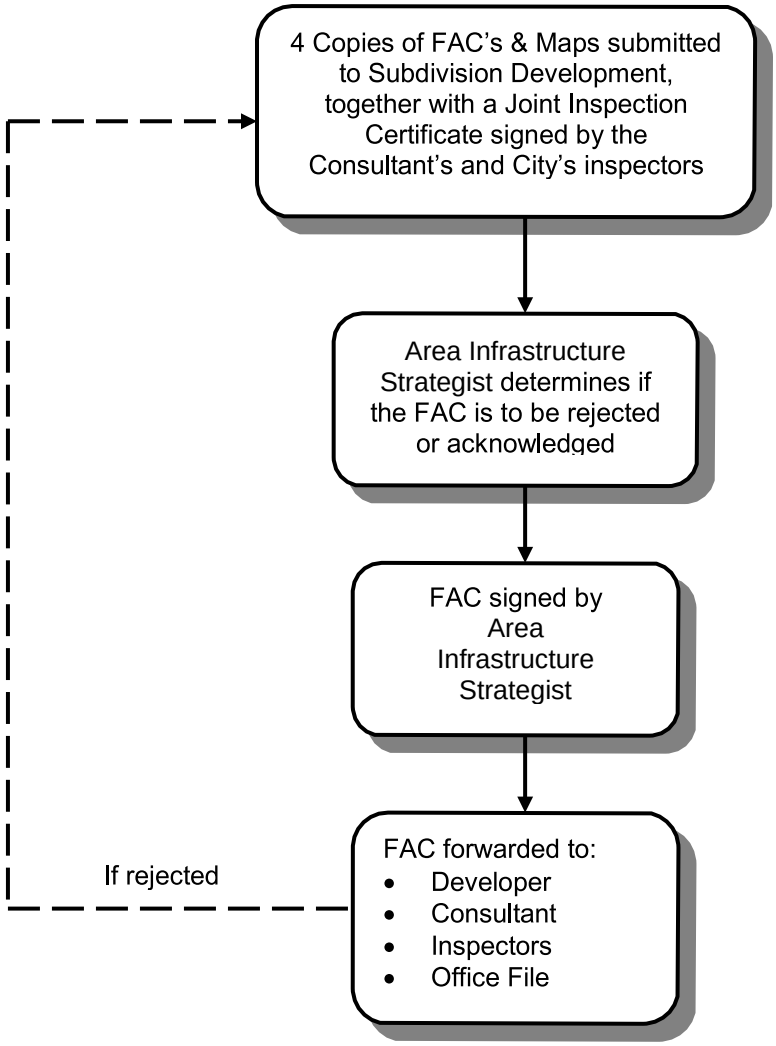
7) Final Acceptance Certificate (FAC)

The maintenance period for each construction activity varies.

After the initial inspection and the completion of all deficiencies for each construction activity, and prior to expiry of each maintenance period, Final Acceptance Certificates (FAC's) are to be submitted by the Consulting Engineer.

FAC's are subject to the approval of Subdivision Development, and are processed according to the chart "Final Acceptance Certificates" on Page 18.

Final Acceptance Certificates
FAC



Note:
Length of time for acknowledgement may vary with workload

8) Performance and Maintenance Securities

Stripping and rough grading, installation of underground utilities, and construction of surface improvements shall not be undertaken without appropriate Performance Securities being provided to the City.

Public Infrastructure shall determine the amount of securities and reductions in accordance with the terms and conditions of the Development Agreement.

9) Engineering Drawing Record

The Developer shall supply Water Resources – Standards and Agreements with plans in a format conforming to the City requirements showing the actual locations, as installed by the Developer, of roads, sidewalks, sewers, water mains and other utilities. These plans shall be submitted as soon as possible after completion of construction and before being released from public and other liabilities.

The Developer shall also supply all other appurtenant drawings such as outfalls, special manholes, retention ponds, lift stations, and railway crossing details, as installed by the Developer.

In addition, the Developer shall supply Water Resources – Standards and Agreements with plans and profiles of all utility rights-of-ways for the purpose of locating underground power, telephone, gas and cable television facilities. The Developer shall indicate and label the road grade to the lip of gutter on all plans and profiles where curb and gutter has been installed.

A Final Acceptance Certificate (FAC) is issued by Public Infrastructure only when the “as-built drawings” have been received and approved by Water Resources – Standards and Agreements.

As-built sets must be submitted electronically in AutoCAD and PDF to Standards and Agreements (S&A) by email at WaterUtilityAsbuilt@calgary.ca.

C. RELATED DOCUMENTS AND RESOURCES

- ***Bylaw 5P85***
- ***City of Calgary Standard Specifications – Roads Construction***
- ***City of Calgary Standard Specifications – Sewer Construction***
- ***City of Calgary Standard Specifications – Waterworks Construction***
- ***City of Calgary Design Guidelines for Bridges & Structures***
- ***Complete Streets Guide***
- ***Development Site Servicing Plans Guildlines***
- ***Guidelines for Erosion & Sediment Control***
- ***Land Use Bylaw 1P2007***
- ***Residential Street Design Policy***
- ***Specifications for Block Profiles***
- ***Stormwater Management and Design Manual***
- ***Noise Issues Related to Designated Truck Routes (OE96-55)***
- ***Surface Transportation Noise Policy for the City of Calgary (CALTS 117)***
- ***TAC Design Guidelines***
- ***The Complete Streets Interim Guide***
- **www.calgary.ca**

SECTION II: ROADS

Terms of Use

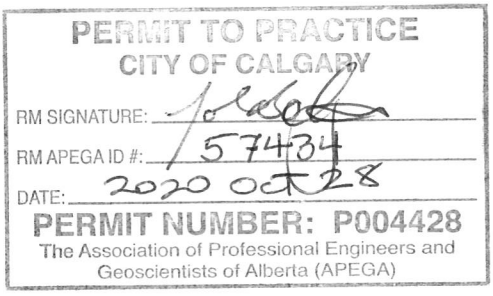
"Section II: Roads" is made available for use in the City of Calgary effective as of the date below.

27 October 2020

Date

27 October 2020

Rob Talarico, P.Eng. M.Sc.
Senior Design & Development Engineer, Development & Projects, Roads



John Bolger, P.Eng.
Manager, Development & Projects, Roads

"Section II: Roads" is presented as accurate and complete as of the date indicated above. Use of these Guidelines shall not absolve any user from the obligation to exercise their professional judgement and follow good practice. Should any user have questions as to the intent or accuracy of the Guidelines or drawings herein, or concern that conflict may exist between other Guidelines or Specifications and these Guidelines, the user is advised to seek clarification from the Manager, Development & Projects.

A. INTRODUCTION

The Municipal Development Plan (MDP) and Calgary Transportation Plan (CTP) were approved by City Council in September 2009. The plans set out a vision and policies for sustainable growth: a more compact city form that promotes walking, cycling and transit, and preserves open space, parks and other environmental amenities.

The Complete Streets Guide and the Residential Street Design Policy have since been developed for the City of Calgary that standardizes the complete street elements in the design of all road rights-of-way in both existing and new community developments.

The previous Design Guidelines for Subdivision Servicing (DGSS) had 14 street classifications. The Complete Street Guide has 13 with some previous classifications being eliminated and some new classifications introduced. Figure 1 on Page 23 was developed to assist in translation from the previous street classification to the CTP street classifications. For each of the CTP classifications, a variety of context-dependent alternate cross sections have been identified.

The information in Section II: Roads in this DGSS has been revised to reflect the guidance and principles presented in the Complete Streets Guide and the Residential Street Design Policy.

A street system incorporates several types of roadways with each individual type having its own particular design standards. A road network is formed when these roadways are linked logically together. The patterns of the network in new subdivisions should coincide with the layout shown on the approved Design Brief or Area Structure Plan. This will ensure efficient and appropriate hierarchical street connections to adjacent subdivision areas and the continuity of bus routes. In the event that the adjacent street system has not been developed, interim access arrangements shall be provided. All intersections are controlled by adequate traffic control devices including signage, roundabouts or signals where warranted.

The standards contained in this DGSS are minimum standards; wherever possible, higher standards should be used. The DGSS does not address details of roadways above Arterial Street classification. Designs for Skeletal Roads (Freeways and Expressways) are based on Transportation Association of Canada (TAC) guidelines and in accordance with the City of Calgary transportation planning studies, and must be approved by the approving authority of the Transportation Department.

Section II: Roads in this DGSS provides a general guideline in roadway design standards, all construction methodologies and materials used are required to follow the requirements as specified in the current edition of the Roads Construction Standard Specifications.

Figure 1: Previous DGSS and CTP Road Classification

PREVIOUS DGSS CLASSIFICATION	CTP CLASSIFICATION	
Expressway/Freeway	Road	Skeletal Road
Major Street	Arterial	Arterial Street
Major Industrial Street		Industrial Arterial Street
Local Major Street		Local Arterial Street
N/A	Liveable	Parkway
N/A		Urban Boulevard
N/A		Neighbourhood Boulevard
Primary Collector Street	Local	Primary Collector Street
Grand Boulevard		Collector Street
Collector Street		
Connector Street		
Avenue		
High Street		Activity Centre Street
Industrial Street		Industrial Street
Residential Entrance Street		Residential Entrance Street
Residential Street		Residential Street
Lane (Alley)		Lane (Alley)

B. ROAD CLASSIFICATIONS - COMPLETE STREETS

Skeletal Roads	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
> 30,000	4, 6 or 8	60.0 m (min.)

FUNCTION

- To connect and permit relatively unimpeded higher speed flow for through traffic between major elements of the City of Calgary's transportation network
- To provide priority for autos and goods movement
- Have limited direct access and therefore limited interaction with adjacent land uses
- Facilities within the right-of-way for walking and cycling are not common but sometimes vital to regional pathway connectivity

ACCESS CONDITIONS

Industrial Properties	Not permitted
Commercial Properties	Not permitted
Multi-Residential Properties	Not permitted
Residential Properties	Not permitted
Lane (Alley)	Not permitted

- Intersections are grade separated; interim at-grade intersections may be considered at the discretion of the approving authority of Transportation Department
- Divided roadways with full control of access
- Skeletal Roads may have intersections with other Skeletal Roads and Arterial Street types only

NOTE

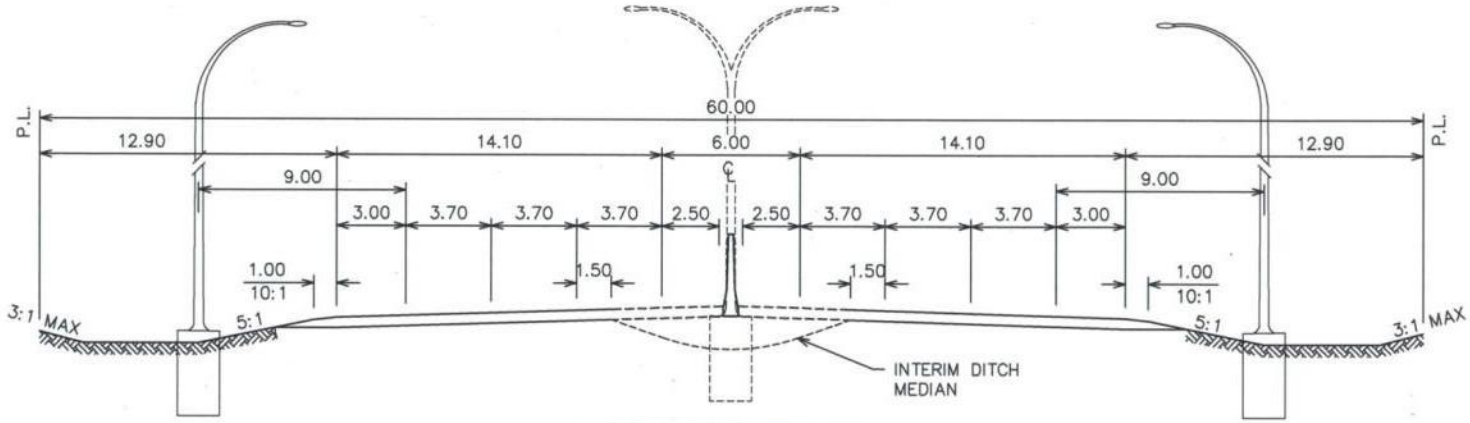
- The right-of-way width of minimum 60 m is based on a 6-lane cross-section but may vary depending on number of lanes, sloping requirements, intersection angles, road grades and noise attenuation requirements
- Noise attenuation study is required at the Tentative Plan application stage for residential lots adjacent to Skeletal Roads and interchange areas, including Transportation Utility Corridors (TUC), to determine noise attenuation and right-of-way requirements

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	3.7 m	**Posted Speed (km/h)**	80 -100 km/h
Basic Width	2 x 11.1 m + paved shoulders	**Parking**	No
Paved Shoulder	• Outside: 3.00 m with open shoulder; OR • Outside: 2.50 m with C&G • Inside: 2.50 m with median barrier	**Traffic Signals**	• At grade intersections should be signalized for interim stage
Curb & Gutter	• No C&G with open shoulder; OR • Outside: 0.5 m rolled C&G • Median: 0.5 m standard C&G	**Pedestrian Crossing**	• Grade separated as warranted • At Grade crosswalk for interim stage only
Median Width	6.0 m (min.)	**On-street Bike Route**	No
Sidewalk Width	None	**Bus Route**	Limited
Multi-Use Pathway	None	**Truck Route**	Yes
Bike Lane Width	None	**Sound Attenuation**	Yes

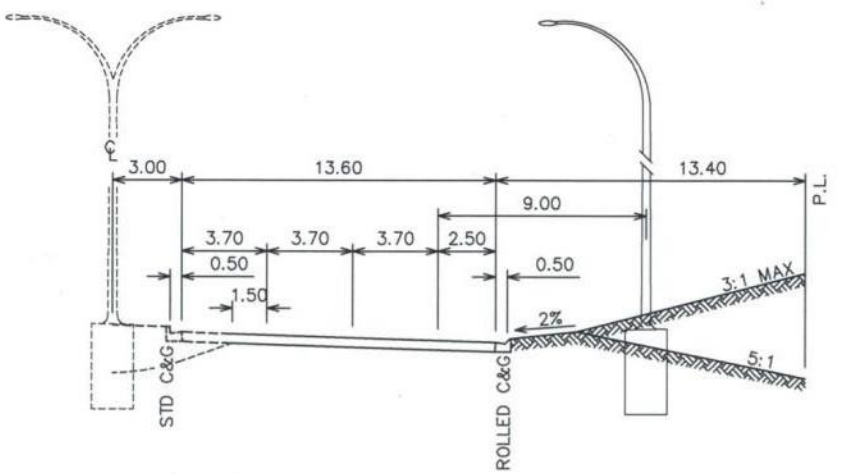
NOTE

- For interim section with median ditch, provide 1.5 m inside painted shoulder
- Pedestrian / Bicycle movement may be accommodated if safe horizontal clearance requirements can be met

HORIZONTAL ALIGNMENT	
Minimum Interchange/intersection Spacing	• Interchange spacing = 2.0 – 2.4 km, closer spacing may be considered under special circumstances • At-grade intersection spacing = 800 m (min.) for interim conditions only
Design Speed	80-100 km/h
Minimum Stopping Sight Distance	140 m
Minimum Centreline Radius	340 m
VERTICAL ALIGNMENT	
Maximum Grade	4%
Minimum Grade	0.8%
Maximum Superelevation	6%
NOTE	
• Skeletal Roads are designed in accordance with TAC standards	



DEPRESSED MEDIAN
4–LANE STAGE
OPEN SHOULDER



DEPRESSED MEDIAN
4–LANE STAGE
CURB AND GUTTER

NOTES:

1. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARDS.
2. CROSS-SLOPE TO BE MODIFIED WITH SUPERELEVATED SECTIONS.
3. UTILITY LINE ASSIGNMENTS MUST BE IDENTIFIED DURING PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. WHEN APPLICABLE, WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
5. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
6. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
7. MULTI-USE PATHWAYS ARE PERMITTED OUTSIDE OF CLEARZONE.
8. SETBACK TO STREET LIGHT POLE MAY VARY WITH DESIGN SPEED.
9. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.
10. OFFSETTING OF ROADWAY CENTRELINE WITHIN RIGHT OF WAY IS NOT RECOMMENDED DUE TO FUTURE UTILITY CONFLICTS.

PERMIT
PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date : 2015 May 4
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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No.	Date	Revision	App'd

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Designed:	EW
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Scale:	NTS

CROSS SECTION
SKELETAL ROAD

Figure 2

File Number 454.1008.056

Arterial Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
20,000 – 35,000	4 or 6	36.0 m / 46.0m

FUNCTION

- To expedite the movement of vehicles between communities and major destinations
- To serve the adjacent commercial lands and to collect and distribute traffic from Skeletal Roads to other street types or directly to traffic destinations
- High priority for autos, goods movement, transit and cycling modes
- Arterial Streets make up much of the Primary Transit Network and Truck Route Network

ACCESS CONDITIONS

Industrial Properties	Permitted
Commercial Properties	Permitted
Multi-Residential Properties	Not permitted
Residential Properties	Not permitted
Lane (Alley)	Not permitted

- Direct access is only available to abutting commercial and industrial properties subject to traffic and design conditions and is generally restricted to right turns in and out
- Intersections may be grade separated when warranted
- At grade intersections should be channelized to provide proper control of the turning movements
- Arterial Streets may intersect with Skeletal Roads, other Arterial streets, Liveable streets, Primary Collector Streets, Collector Streets and Industrial Streets

NOTE

- Arterial Streets are 4 or 6-lane divided roadways with on-street bike lanes or multi-use pathways and no parking allowed
- The right-of-way width may need to be increased depending on number of lanes, turning lanes, sloping requirements, intersection angles, road grades, noise attenuation requirements and special conditions such as accommodation of LRT, LID and pedestrian pathways
- Noise attenuation study is required for residential lots adjacent to Arterial Streets to determine noise attenuation requirements
- Bus bays are desirable when design/posted speed > 60 km/h and at all transit timing stop locations
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102
- For a 6-lane Arterial Street, see Figure 4, Page 31. The median width can be reduced to 6.0 m if future analysis supports the intersection will function at acceptable levels with a single left turn lane.
- Local widening is required at intersections. 36.0 m (4 lanes, Single Parallel left turn); 39.5 m (4 lanes, Dual Parallel or Single Slot left turn); 43.0 m (4 lanes, Dual Slot or 6 lanes Single Parallel left turn); 46.5 m (6 lane, Dual Parallel or Single Slot left turn); 50.0 m (6 lane, Dual Slot left turn)

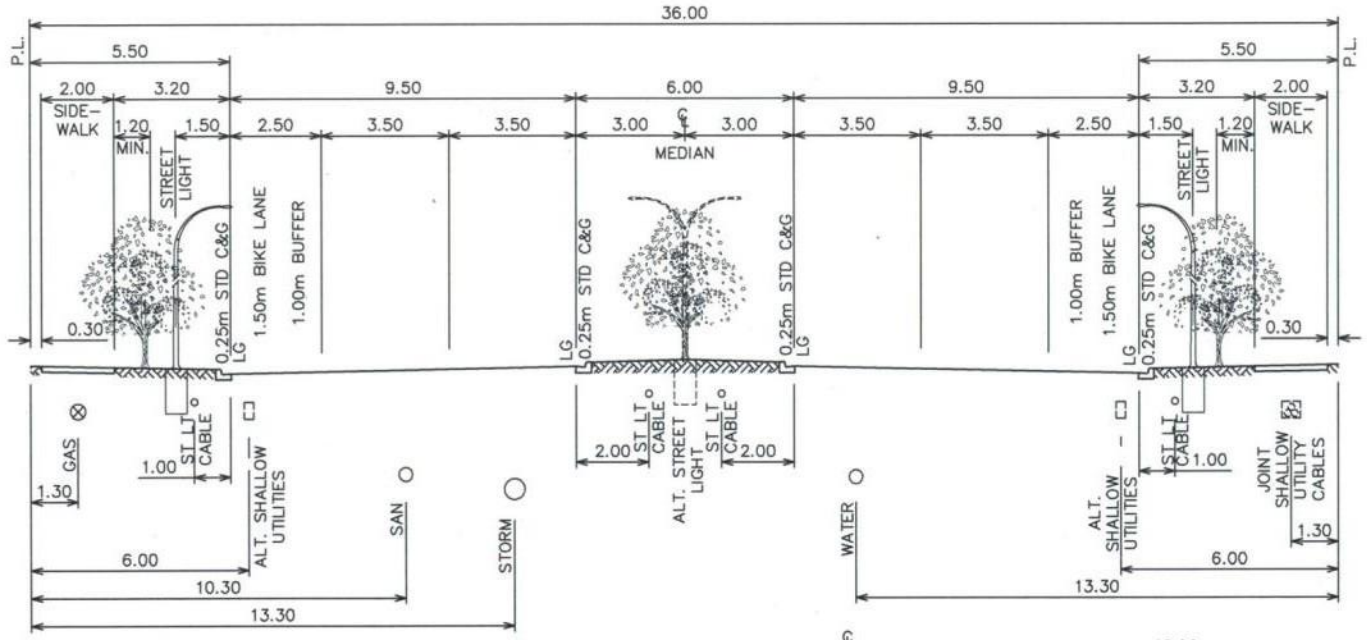
BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	3.5 m	**Posted Speed (km/h)**	50 / 60 km/h
Basic Width	• 2 x 9.5 m with on-street bike lane; OR • 2 x 7.0 m with multi-use pathway	**Parking**	No
Paved Shoulder	None	**Traffic Signals**	At grade intersections signalized as warranted
Curb & Gutter	0.25 m standard C&G	**Pedestrian Crossing**	At grade
Median Width	• 6.0 m minimum (Single Parallel LT) • 9.5 m (Dual Parallel or Single Slot LT) • 13.0 m (Dual Slot LT)	**On-street Bike Route**	Yes
Sidewalk Width	2.0 m separate walk on both sides with on-street bike lanes; OR	**Bus Route**	Yes
Multi-Use Pathway	3.0 m multi-use pathway on both sides without no-street bike lane	**Truck Route**	Yes
Bike Lane Width	1.5 m + 1.0 m buffer	**Sound Attenuation**	Yes

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• Minimum intersection Spacing = 300 m (min.) • Intersection spacing less than minimum 300 m is considered an exception and has to be designed to the satisfaction of the General Manager, Transportation Department • The minimum acceptable spacing between the terminal of an interchange ramp and the centerline of the first intersection on a Divided Arterial is 400 m
Design Speed	50 / 60 km/h
Minimum Stopping Sight Distance	• 50 km/h = 65 m • 60 km/h = 85 m
Minimum Centreline Radius	• 400 m at all intersection locations (see below) • 50 km/h = 90 m, 130 m – 6000 m (desirable) • 60 km/h = 130 m, 260 m – 6000 m (desirable) • 60.00 m Spirals minimum • C/L Radii <260 m requires pavement widening for vehicle tracking • Avoid the use of 'Broken Back' horizontal curves
MEDIAN & LEFT TURN BAY	

• **No left turn bays will be permitted on curves with a centerline less than 400 m; nor, anywhere within a centerline transition curve (spiral) if the minimum radius of that spiral is less than 400 m**
• Standard left turn bays shall be provided on Arterial Streets at all intersections.
• The minimum storage length for a left turn bay is 60 m with a 3.5 m lane(s)
• Median width:6.0 m minimum (Single Parallel left turn), 9.5 m (Dual Parallel left turn or Single Slot left turn, 13.0 m (Dual Slot left turn
  • For typical Slot left turn bay designs, see Figure 50,Page 109
  • For typical Parallel left turn bay designs, see Figure 51, Page 110
• Slot left turn bays are required as an interim design on wide medians, such as those reserved for future LRT or future widening in the median
• Introduced median is used to transition from an undivided road to a divided road with a left turn median, see Figure 49, Page 108
• Right Turn Channelization island 47.2 m^2 minimum (LG area)	

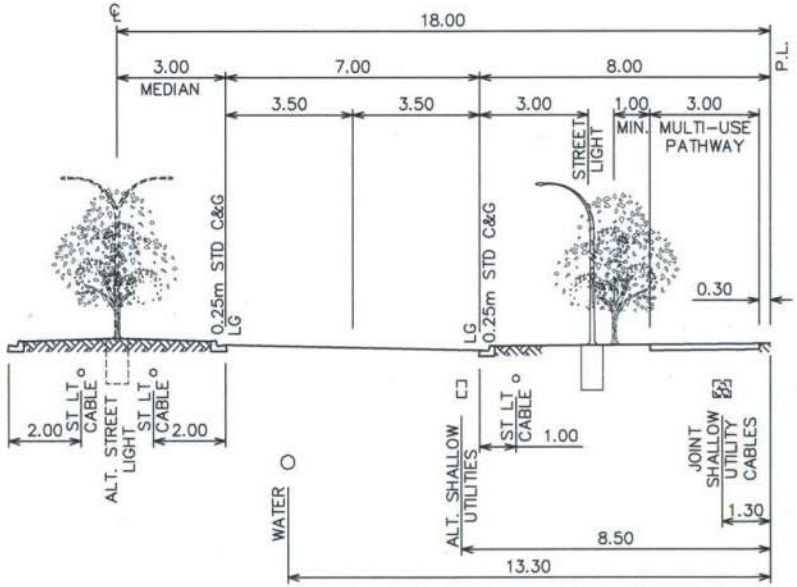
VERTICAL ALIGNMENT	
Maximum Grade	• 50 km/h = 7.0% • 60 km/h = 6.0% • Intersections = 4.0% (see below)
Minimum Grade	0.6%
Maximum Superelevation	6%
GRADE AT INTERSECTIONS	
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Arterial Street with a vertical curve of a minimum length of 30 m, i.e. the crossfall of the Arterial Street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Arterial Street • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • The maximum profile grade of an Arterial Street at an intersection shall be 4% for a minimum of 100 m measured from the Vertical Point of Intersection (VPI) to the centreline of the intersecting street, on both sides of the intersection	
VERTICAL CURVES & SUPERELEVATION	

- The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107
- For Arterial Streets, crest vertical curves are to be designed using the desirable "K" values for 20 km/h higher than the design speed
- For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Section 'F' Pages 122 to 125
- The maximum and minimum grades also apply to the Development of Superelevation
- The superelevation through all Arterial Street intersections shall not exceed 4%
- Right turn ramp on an Arterial Street shall have a desirable crossfall between 2% to 4% within the length of the island



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 3.00 LINE WITH 2.00m SEPARATE WALK OR 5.50 LINE WITH 3.00m MULTI-USE PATHWAY.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 3.00 LINE WITH 2.00m SEPARATE WALK OR 5.50 LINE WITH 3.00m MULTI-USE PATHWAY.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.20m FROM SIDEWALK AND 1.00m FROM PATHWAY, AND ON CENTRELINE OF MEDIAN.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES. FOR "ALTERNATIVE FOR OFF-STREET BIKES", SANITARY ON 10.30 LINE AND STORM ON 13.30 LINE.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.



ALTERNATIVE FOR OFF-STREET BIKES

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature :
Date : 2015 May 4
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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DATE: Wednesday, January 21, 2015 2:35:49 PM
ISC: UNRESTRICTED

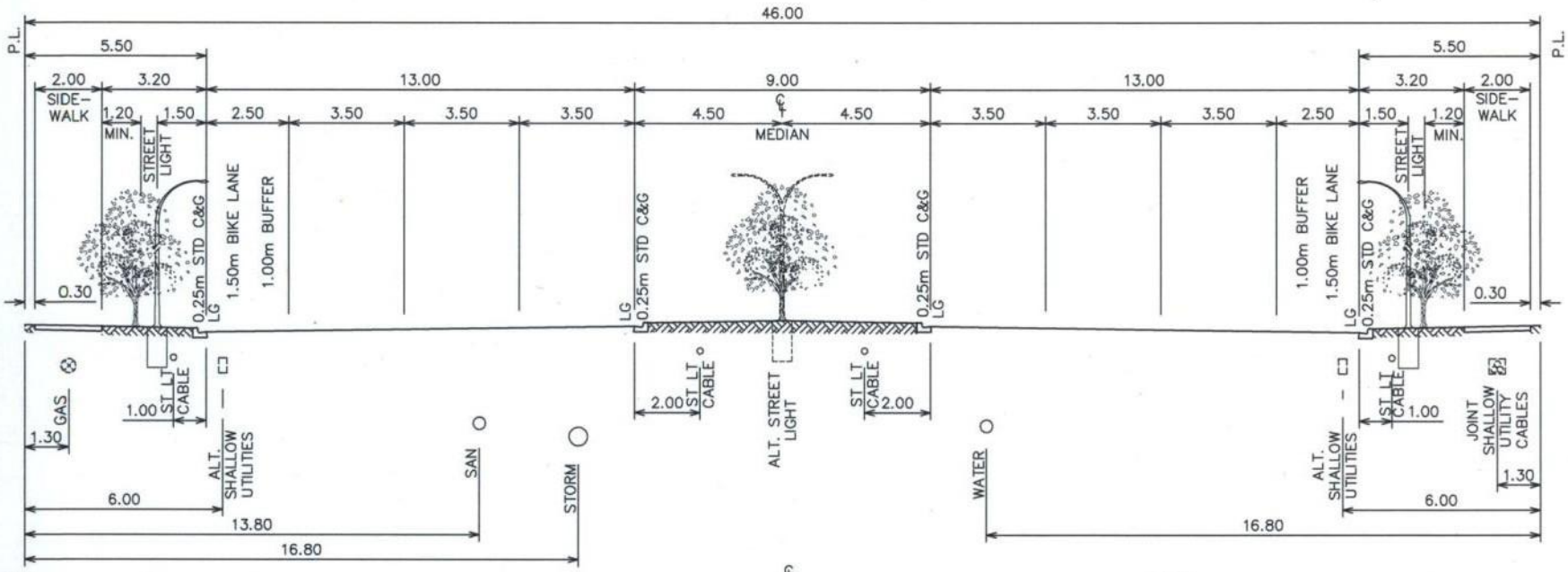
No.	Date	Revision	App'd

Drawn JL	Date 2014-06
Designed	EW
Checked	EW
Scale:	NTS

CROSS SECTION
ARTERIAL STREET – 4 LANES

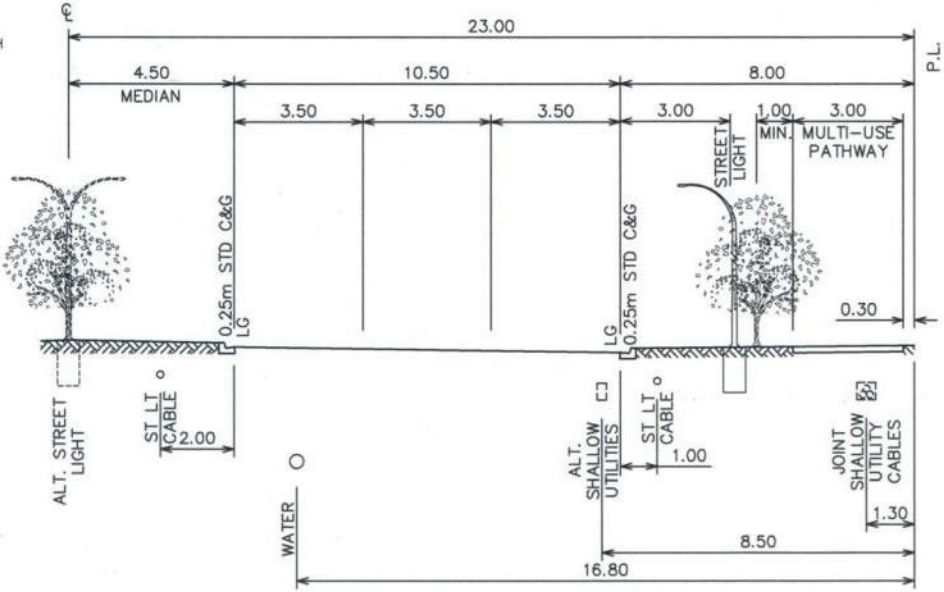
Figure 3

File Number 454.1008.057



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 3.00 LINE WITH 2.00m SEPARATE WALK OR 5.50 LINE WITH 3.00m MULTI-USE PATHWAY.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 3.00 LINE WITH 2.00m SEPARATE WALK OR 5.50 LINE WITH 3.00m MULTI-USE PATHWAY.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.20m FROM SIDEWALK AND 1.00m FROM PATHWAY, AND ON CENTRELINE OF MEDIAN.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES. FOR "ALTERNATIVE FOR OFF-STREET BIKES", SANITARY ON 13.80 LINE AND STORM ON 16.80 LINE.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.



ALTERNATIVE FOR OFF-STREET BIKES

PERMIT TO PRACTICE THE CITY OF CALGARY
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Date : 2015 May 4
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No.	Date	Revision	App'd

Drawn JL	Date 2014-06
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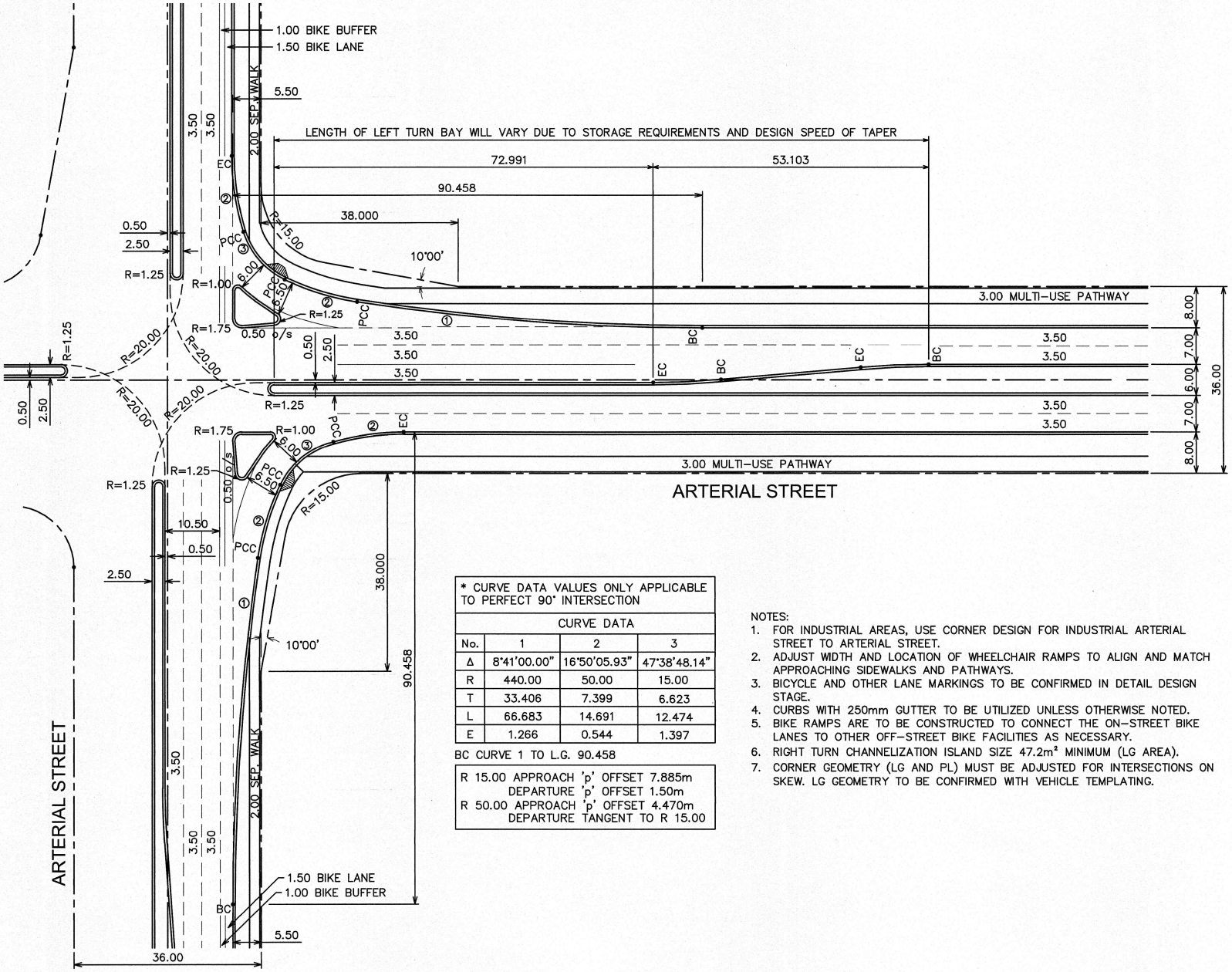
CROSS SECTION
ARTERIAL STREET – 6 LANES

Figure 4

File Number 454.1008.058



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T	33.406	7.399	6.623
L	66.683	14.691	12.474
E	1.266	0.544	1.397

BC CURVE 1 TO L.G. 90.458

R 15.00 APPROACH 'p' OFFSET 7.885m
DEPARTURE 'p' OFFSET 1.50m
R 50.00 APPROACH 'p' OFFSET 4.470m
DEPARTURE TANGENT TO R 15.00

NOTES:
1. FOR INDUSTRIAL AREAS, USE CORNER DESIGN FOR INDUSTRIAL ARTERIAL STREET TO ARTERIAL STREET.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.
6. RIGHT TURN CHANNELIZATION ISLAND SIZE 47.2m² MINIMUM (LG AREA).
7. CORNER GEOMETRY (LG AND PL) MUST BE ADJUSTED FOR INTERSECTIONS ON SKEW. LG GEOMETRY TO BE CONFIRMED WITH VEHICLE TEMPLATING.

PERMIT
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CITY OF CALGARY
RM SIGNATURE:
RM APEGA ID #: 157434
DATE: 2020 Oct 28
PERMIT NUMBER: P004428
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

SEAL
PROFESSIONAL ENGINEER ALBERTA
ROBERT J. TALARICO
27 October 2020

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED **METRIC**
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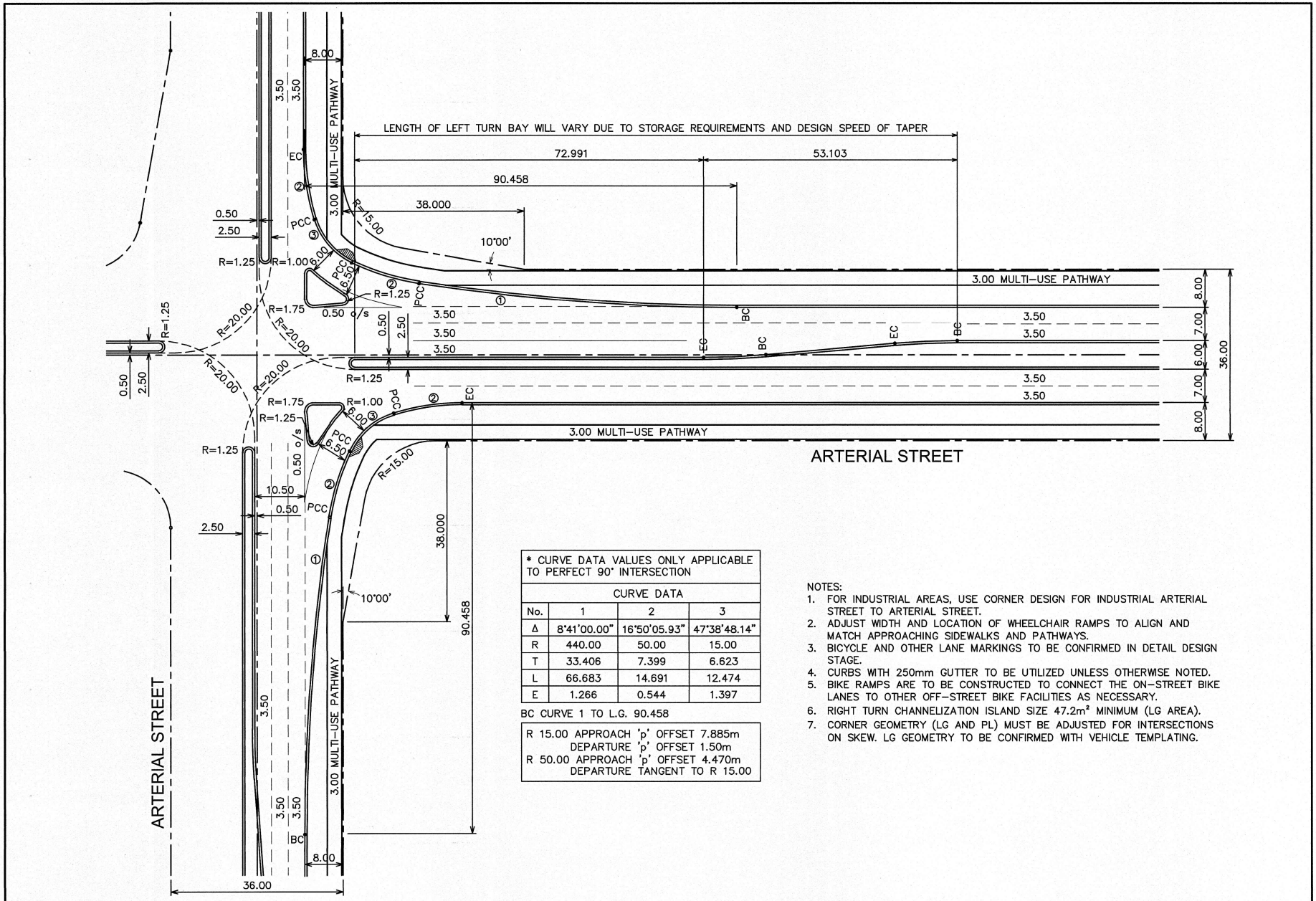
ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	Date
JL	2020-10
Designed	
EW	
Checked	
EW	
Scale:	
NTS	

INTERSECTION DESIGN
ARTERIAL STREET TO ARTERIAL STREET
MULTI-USE PATHWAY/ON-STREET BIKE LANE

Figure
5
File Number
454.1014.023



* CURVE DATA VALUES ONLY APPLICABLE TO PERFECT 90° INTERSECTION			
CURVE DATA			
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T	33.406	7.399	6.623
L	66.683	14.691	12.474
E	1.266	0.544	1.397

BC CURVE 1 TO L.G. 90.458

R 15.00 APPROACH 'p' OFFSET 7.885m
DEPARTURE 'p' OFFSET 1.50m
R 50.00 APPROACH 'p' OFFSET 4.470m
DEPARTURE TANGENT TO R 15.00

NOTES:
1. FOR INDUSTRIAL AREAS, USE CORNER DESIGN FOR INDUSTRIAL ARTERIAL STREET TO ARTERIAL STREET.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.
6. RIGHT TURN CHANNELIZATION ISLAND SIZE 47.2m² MINIMUM (LG AREA).
7. CORNER GEOMETRY (LG AND PL) MUST BE ADJUSTED FOR INTERSECTIONS ON SKEW. LG GEOMETRY TO BE CONFIRMED WITH VEHICLE TEMPLATING.

PERMIT
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RM SIGNATURE:
RM APEGA ID #: 151404
DATE: 2020 Oct 28
PERMIT NUMBER: P004428
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

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PROFESSIONAL ENGINEER ALBERTA ROBERT J. TALARICO
27 October 2020

THE CITY OF CALGARY
ROADS

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ISC: UNRESTRICTED

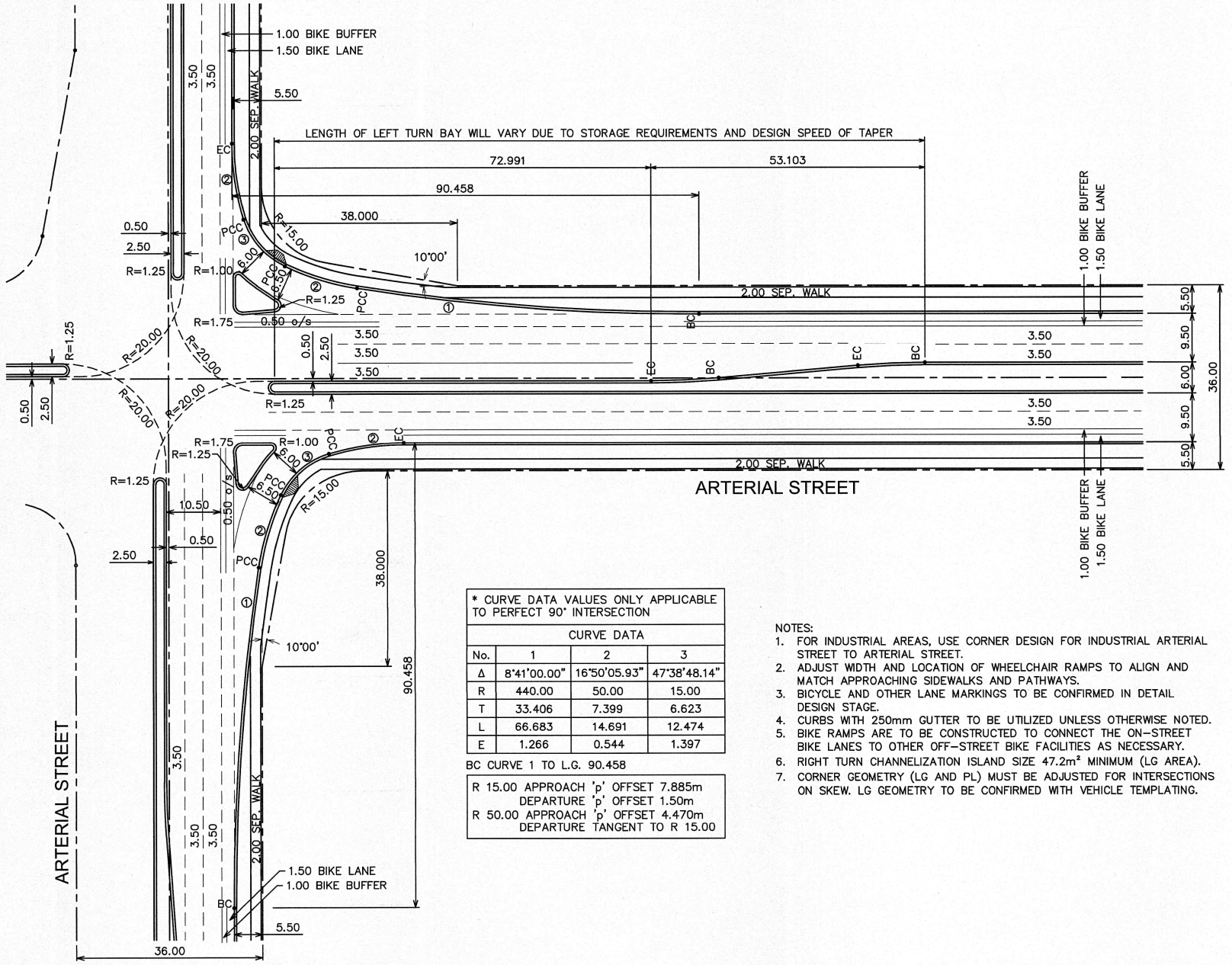
No.	Date	Revision	App'd

Drawn	Date
JL	2020-10
Designed	EW
Checked	EW
Scale:	NTS

INTERSECTION DESIGN
ARTERIAL STREET TO ARTERIAL STREET
MULTI-USE PATHWAYS

Figure 6

File Number 454.1014.024



* CURVE DATA VALUES ONLY APPLICABLE TO PERFECT 90° INTERSECTION			
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R	440.00	50.00	15.00
T	33.406	7.399	6.623
L	66.683	14.691	12.474
E	1.266	0.544	1.397

BC CURVE 1 TO L.G. 90.458

R 15.00 APPROACH 'p' OFFSET 7.885m
DEPARTURE 'p' OFFSET 1.50m
R 50.00 APPROACH 'p' OFFSET 4.470m
DEPARTURE TANGENT TO R 15.00

NOTES:
1. FOR INDUSTRIAL AREAS, USE CORNER DESIGN FOR INDUSTRIAL ARTERIAL STREET TO ARTERIAL STREET.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.
6. RIGHT TURN CHANNELIZATION ISLAND SIZE 47.2m² MINIMUM (LG AREA).
7. CORNER GEOMETRY (LG AND PL) MUST BE ADJUSTED FOR INTERSECTIONS ON SKEW. LG GEOMETRY TO BE CONFIRMED WITH VEHICLE TEMPLATING.

PERMIT
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RM SIGNATURE:
RM APEGA ID #: 57484
DATE: 2020 Oct 28
PERMIT NUMBER: P004428
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

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ROBERT J. TALACKO
27 October 2020

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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No.	Date	Revision	App'd

Drawn	Date
JL	2020-10
Designed	EW
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INTERSECTION DESIGN
ARTERIAL STREET TO ARTERIAL STREET
ON-STREET BIKE LANES

Figure 7

File Number 454.1014.025

Industrial Arterial Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
10,000 – 30,000	4	30.0 m (min.)

FUNCTION

- To expedite the movement of vehicles between major traffic generators and between industrial subdivisions
- To serve adjacent commercial and industrial lands and to collect and distribute traffic from other Arterial Streets and Industrial Streets to lesser category streets or directly to traffic destinations
- May serve as a bus route
- High priority for goods movement
- Accommodate all other modes of travel wherever possible
- The size of the adjacent industrial lots dictates the level of connectivity or access

ACCESS CONDITIONS

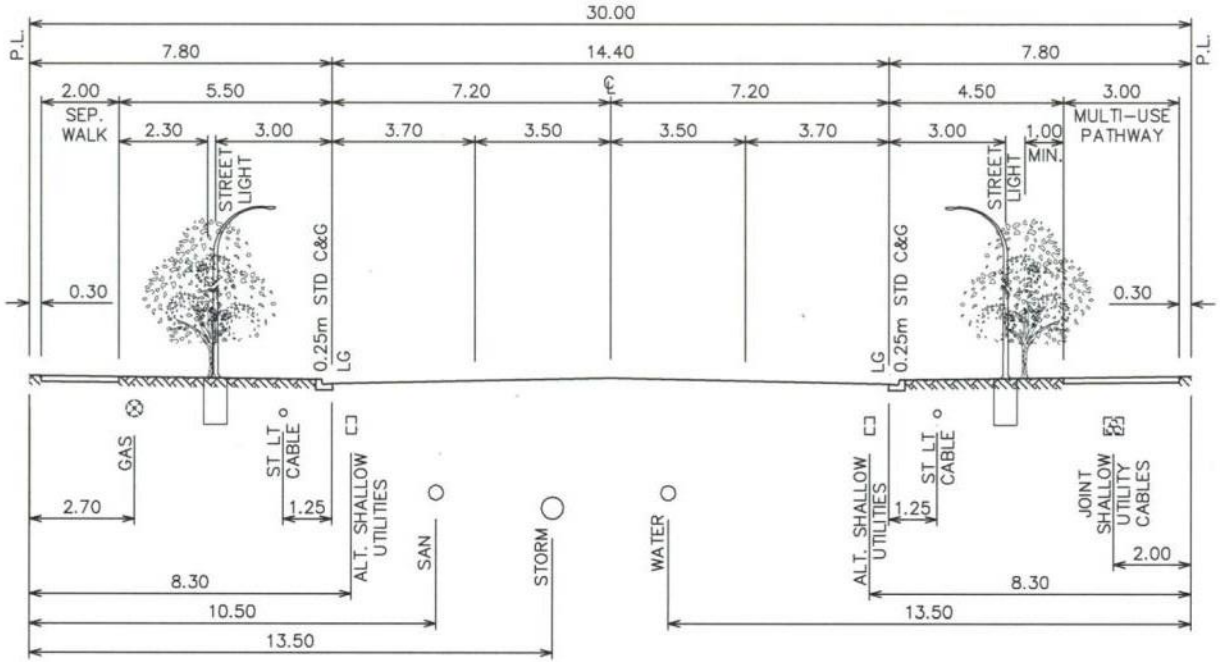
Industrial Properties	Permitted	• Direct access is only available to abutting commercial and industrial properties subject to traffic and design conditions and is generally restricted to right turns in and out • Intersections may be grade separated when warranted • At grade intersections should be channelized to provide proper control of the turning movements • Industrial Arterial Streets may intersect with Skeletal Roads, Arterial Streets, other Industrial Arterial Streets and Industrial Streets
Commercial Properties	Permitted	
Multi-Residential Properties	Not permitted	
Residential Properties	Not permitted	
Lane (Alley)	Not permitted	

NOTE

- Industrial Arterial Streets are 4-lane undivided roadways with no on-street bike lane and no parking allowed
- The right-of-way width may need to be increased depending on number of lanes, turning lanes, sloping requirements, intersection angles, road grades and special conditions such as accommodation of LRT
- Bus bays are desirable when design/posted speed > 60 km/h and at all transit timing stop locations
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	•Centre lane = 3.5 m •Outside lane = 3.7 m	**Posted Speed (km/h)**	50 / 60 km/h
Basic Width	14.4 m	**Parking**	No
Paved Shoulder	None	**Traffic Signals**	At grade intersections should generally be signalized
Curb & Gutter	0.25 m standard C&G	**Pedestrian Crossing**	At grade
Median Width	None. 3.0 m (min) at Arterial intersections	**On-street Bike Route**	No
Sidewalk Width	2.0 m separate walk on one side; AND	**Bus Route**	Yes
Multi-Use Pathway	3.0 m multi-use pathway on one side	**Truck Route**	Yes
Bike Lane Width	None	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• Minimum intersection spacing = 300 m (min.) • Intersection spacing less than minimum 300 m is considered an exception and has to be designed to the satisfaction of the General Manager, Transportation Department
Design Speed	50 / 60 km/h
Minimum Stopping Sight Distance	• 50 km/h = 65 m • 60 km/h = 85 m
Minimum Centreline Radius	• 50 km/h = 90 m, 130 m – 6000 m (desirable) • 60 km/h = 130 m, 260 m – 6000 m (desirable)
MEDIAN & LEFT TURN BAY	
• Medians and left turn bays are not normally required on Industrial Arterial Streets. However, if they are determined to be necessary by the approving authority of the Transportation Department, additional right-of-way will be required • Median width:6.0 m minimum (Single Parallel left turn), 9.5 m (Dual Parallel left turn or Single Slot left turn, 13.0 m (Dual Slot left turn	
VERTICAL ALIGNMENT	
Maximum Grade	• 50 km/h = 7.0% • 60 km/h = 6.0%
Minimum Grade	0.6%
Maximum Superelevation	6%
GRADE AT INTERSECTIONS	
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Industrial Arterial Street with a vertical curve of a minimum length of 30 m, i.e. the crossfall (or 2% if the road is crowned) of the Industrial Arterial Street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Industrial Arterial Street • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • The maximum profile grade of an Industrial Arterial Street at an intersection shall be 4% for a minimum of 100 m measured from the Vertical Point of Intersection (VPI) to the centreline of the intersecting street, on both sides of the intersection	
VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • For Industrial Arterial Streets, crest vertical curves are to be designed using the desirable “K” values for 20 km/h higher than the design speed • For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125 • The maximum and minimum grades also apply to the development of superelevation • The superelevation through all Industrial Arterial Street intersections shall not exceed 4%	



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 5.00 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 5.00 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK AND PATHWAY.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

PERMIT
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THE CITY OF CALGARY
Signature :
Date : 2015 May 4
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL
PROFESSIONAL ENGINEER ALBERTA
2015/05/01

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED **METRIC**
FILE: Z:\permanent\DGSS_2014\dwg\4541008\ACAD\454.1008.059.dwg
DATE: Wednesday, January 21, 2015 2:40:46 PM
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No.	Date	Revision	App'd

Drawn	JL	Date 2014-10
Designed	EW	
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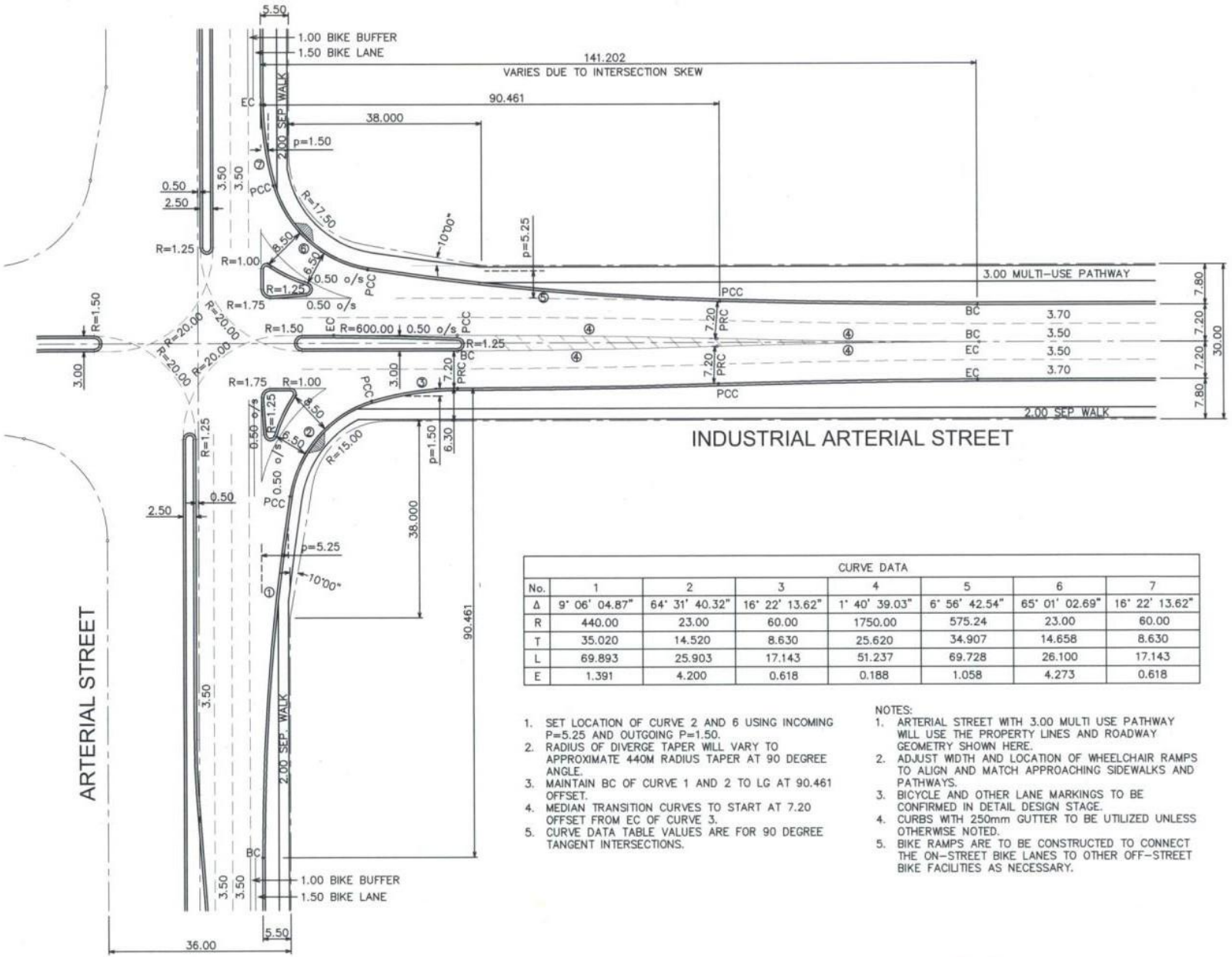
CROSS SECTION
INDUSTRIAL ARTERIAL STREET

Figure 8

File Number 454.1008.059



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R	440.00	23.00	60.00	1750.00	575.24	23.00	60.00
T	35.020	14.520	8.630	25.620	34.907	14.658	8.630
L	69.893	25.903	17.143	51.237	69.728	26.100	17.143
E	1.391	4.200	0.618	0.188	1.058	4.273	0.618

1. SET LOCATION OF CURVE 2 AND 6 USING INCOMING P=5.25 AND OUTGOING P=1.50.
2. RADIUS OF DIVERGE TAPER WILL VARY TO APPROXIMATE 440M RADIUS TAPER AT 90 DEGREE ANGLE.
3. MAINTAIN BC OF CURVE 1 AND 2 TO LG AT 90.461 OFFSET.
4. MEDIAN TRANSITION CURVES TO START AT 7.20 OFFSET FROM EC OF CURVE 3.
5. CURVE DATA TABLE VALUES ARE FOR 90 DEGREE TANGENT INTERSECTIONS.

NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature:
Date: 2015 May 14
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
ROBERT J. TALARICO
17 NOV 2014

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED. METRIC
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DATE: Monday, June 16, 2014 1:15:01 PM
ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	JL	Date 2014-06
Designed	EW	
Checked	EW	
Scale:	NTS	

INTERSECTION DESIGN
INDUSTRIAL ARTERIAL STREET
TO ARTERIAL STREET

Figure 9

File Number 454.1014.026

Local Arterial Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
15,000 – 20,000	4	32.0 m (min,)

FUNCTION

- To provide significant connections between residential communities and destinations where traffic volumes are at the low end of Arterial streets
- To provide Arterial connections while allowing more opportunities for access than a Divided Arterial Street
- May serve as a segment of a bus route
- High priority for transit, cycling and walking modes

ACCESS CONDITIONS

Industrial Properties	Not permitted
Commercial Properties	Permitted
Multi-Residential Properties	Permitted
Residential Properties	Not permitted
Lane (Alley)	Not permitted

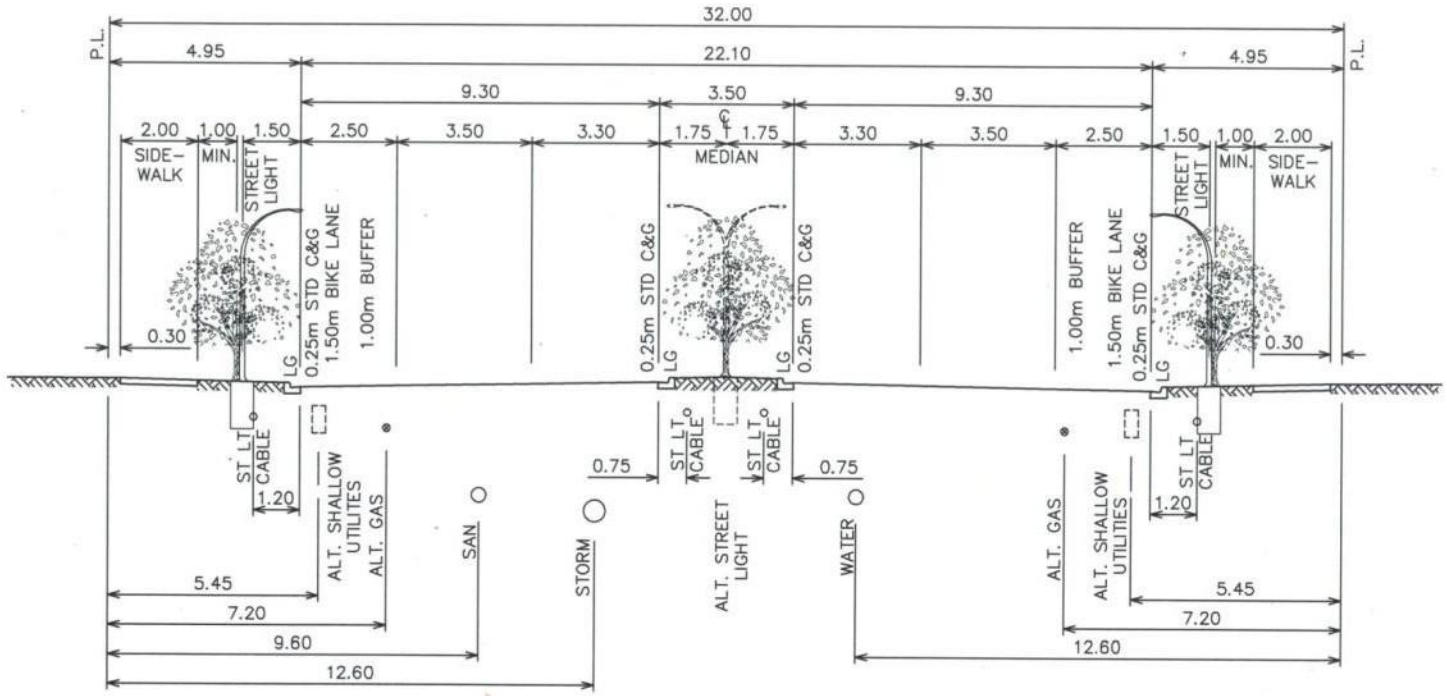
- Direct access to abutting commercial and multi-residential sites is permitted subject to traffic or design conditions at the discretion of the approving authority of the Transportation Department
- Local Arterial Streets may intersect with Arterial Streets, other Local Arterial Streets, Primary Collector Streets, Collector Streets, Activity Centre Streets and Residential Entrance Streets

NOTE

- Local Arterial Streets are 4-lane divided roadways with on-street bike lanes and no parking allowed
- Left turn bays and channelization intersections are generally not necessary but may be required to accommodate traffic conditions. However, if they are determined to be necessary by the approving authority of the Transportation Department, additional right-of-way will be required
- Noise attenuation study is required for residential lots adjacent to Local Arterial Streets to determine noise attenuation requirements
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	• Inside lane = 3.3 m •Middle lane = 3.5 m	**Posted Speed (km/h)**	50 km/h
Basic Width	2x 9.3 m	**Parking**	No
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	0.25 m standard C&G	**Pedestrian Crossing**	At grade
Median Width	3.5 m	**On-street Bike Route**	Yes
Sidewalk Width	2.0 m separate walk on both sides	**Bus Route**	Yes
Multi-Use Pathway	None	**Truck Route**	No
Bike Lane Width	1.5 m + 1.0 m buffer	**Sound Attenuation**	Yes

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• Minimum intersection spacing = 150 m if no left turn bays are required. Wherever possible, a greater spacing should be used
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	90 m, 130 m – 6000 m (desirable)
MEDIAN & LEFT TURN BAY	
• Median, left turn bays and intersection channelization are not normally required. However, if they are determined to be necessary by the approval authority of the Transportation Department, additional right-of-way will be required	
VERTICAL ALIGNMENT	
Maximum Grade	8%
Minimum Grade	0.6%
Maximum Superelevation	4%
GRADE AT INTERSECTIONS	
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Local Arterial Street with a vertical curve of a minimum length of 30 m, i.e. the crossfall of the Local Arterial Street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Local Arterial Street • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • The maximum profile grade of a Local Arterial Street at an intersection shall be 4% for a minimum of 50 m measured from the Vertical Point of Intersection (VPI) to the centreline of the intersecting street, on both sides of the intersection	
VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • For Local Arterial Streets, crest vertical curves are to be designed using the desirable “K” values for 10 km/h higher than the design speed • The maximum and minimum grades also apply to the development of superelevation • For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125	



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 3.00 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 3.00 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK AND PATHWAY, AND ON CENTRELINE OF MEDIAN.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature : [signature]
Date : 2015 May 14
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL: PROFESSIONAL ENGINEER ALBERTA

THE CITY OF CALGARY
ROADS

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ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	JL	Date 2014-06
Designed		EW
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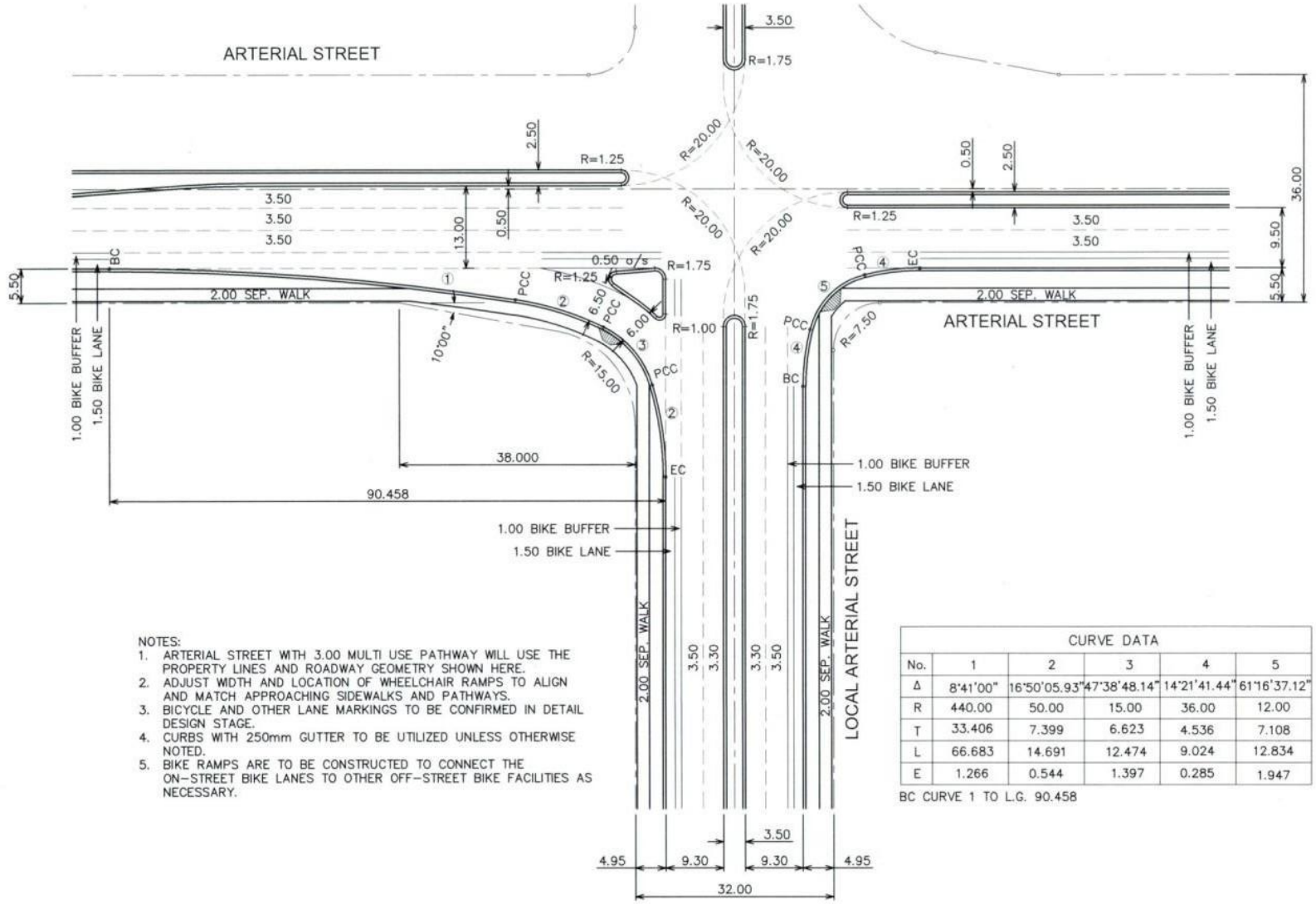
CROSS SECTION
LOCAL ARTERIAL STREET

Figure 10

File Number 454.1008.060



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

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T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature
Date 2015 May 7
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
17 Nov 2014

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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Drawn	Date
JL	2014-04
Designed	EW
Checked	EW
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INTERSECTION DESIGN
LOCAL ARTERIAL STREET TO ARTERIAL STREET

Figure 11

File Number 454.1014.027

Parkways	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
20,000 – 35,000	4	36.0 m

FUNCTION

- To connect adjacent land uses while focusing on integration with natural areas
- Parkways are used where adjacent land uses include large natural parks, waterways or special public institutions
- High priority for cycling and walking modes

ACCESS CONDITIONS

Industrial Properties	Generally not permitted
Commercial Properties	Generally not permitted
Multi-Residential Properties	Generally not permitted
Residential Properties	Not permitted
Lane (alley)	Not permitted

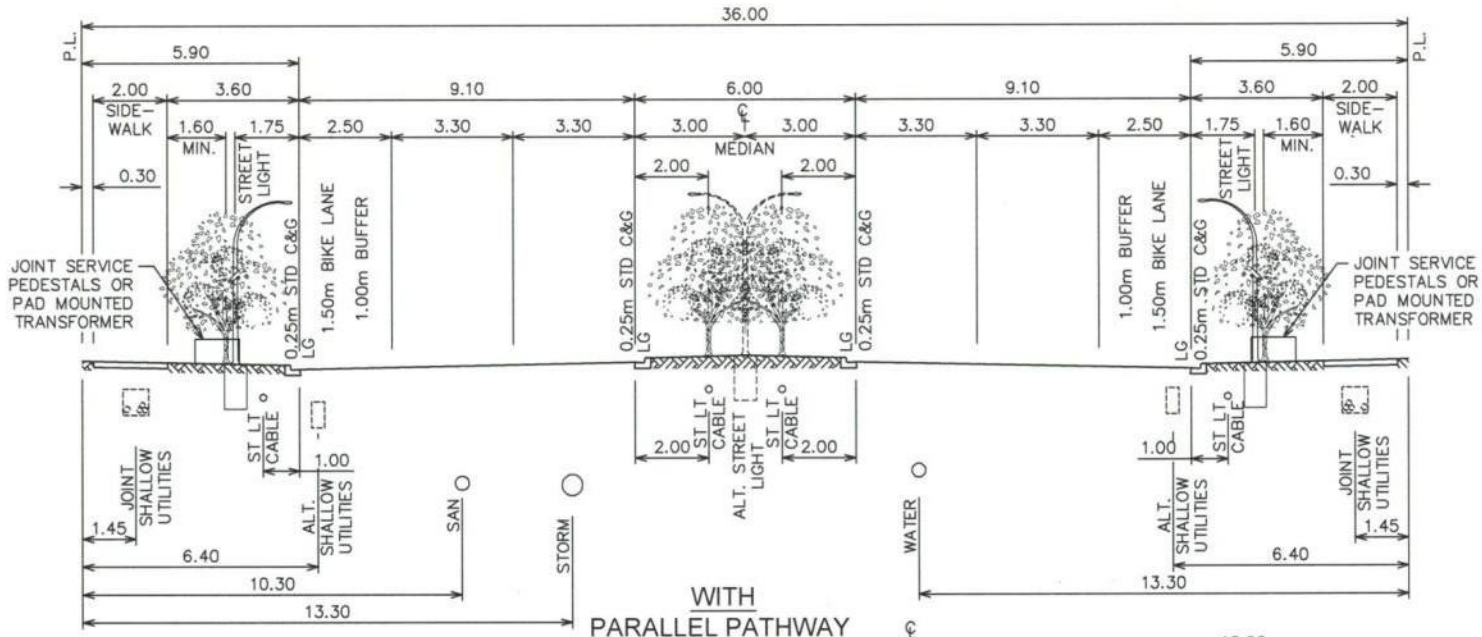
- Direct access to abutting property is generally not permitted and to be determined at the discretion of the approving authority of the Transportation Department
- Parkways may intersect with Arterials Streets, Local Arterial Streets, other Liveable streets, Primary Collector Streets, Collector Streets, Activity Centre Streets and Residential streets

NOTE

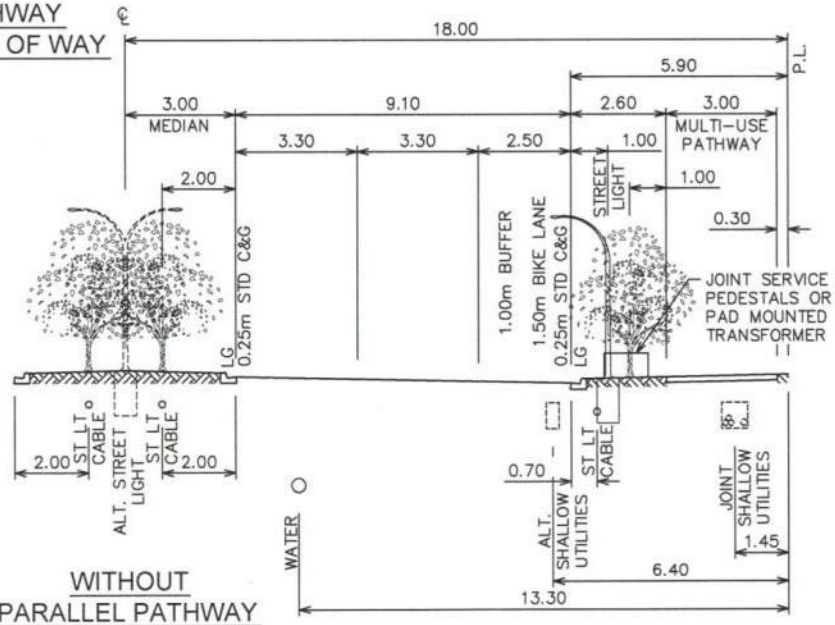
- Parkways are 4-lane divided roadways with on-street bike lanes and no parking allowed
- Sidewalk width varies depending if there is parallel pathway outside of right-of-way
- Noise attenuation study may be required for residential lots adjacent to Parkways to determine noise attenuation requirements on a case by case basis, where it is deemed appropriate, depending on the character of the street and the associated development
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	3.3 m	**Posted Speed (km/h)**	50 km/h
Basic Width	2 x 9.1 m	**Parking**	No
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	0.25 m standard C&G	**Pedestrian Crossing**	At grade
Median Width	6.0 m	**On-street Bike Route**	Yes
Sidewalk Width	• 2.0 m separate walk with parallel pathway; OR • 3.0 m separate walk without parallel pathway	**Bus Route**	Yes
Multi-Use Pathway	None	**Truck Route**	No
Bike Lane Width	1.5 m + 1.0 m buffer	**Sound Attenuation**	Yes

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• Minimum intersection spacing = 300 m • Intersection spacing less than minimum 300 m is considered an exception and has to be designed to the satisfaction of the General Manager, Transportation Department
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	90 m, 130 m – 6000 m (desirable)
MEDIAN & LEFT TURN BAY	
• Minimum median width is 6.0 m • The requirement of left turn bays and intersection channelization will be determined at the discretion of the approving authority of the Transportation Department	
VERTICAL ALIGNMENT	
Maximum Grade	8%
Minimum Grade	0.6%
Maximum Superelevation	4%
GRADE AT INTERSECTIONS	
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Parkway with a vertical curve of a minimum length of 30 m, i.e. the crossfall of the Parkway shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Parkway • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • The maximum profile grade of a Parkway at an intersection shall be 4% for a minimum of 50 m measured from the Vertical Point of Intersection (VPI) to the centreline of the intersecting street, on both sides of the intersection	
VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • For Parkways, crest vertical curves are to be designed using the desirable “K” values for 10 km/h higher than the design speed • The maximum and minimum grades also apply to the development of superelevation • For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125	



WITH
PARALLEL PATHWAY
OUTSIDE OF RIGHT OF WAY



WITHOUT
PARALLEL PATHWAY
OUTSIDE OF RIGHT OF WAY

NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 4.00 LINE WITH 2.00m SEPARATE WALK OR 4.00 LINE WITH 3.00m MULTI-USE PATHWAY.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 4.00 LINE WITH 2.00m SEPARATE WALK OR 4.00 LINE WITH 3.00m MULTI-USE PATHWAY.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.60m FROM SIDEWALK AND 1.00m FROM PATHWAY, AND ON CENTRELINE OF MEDIAN.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES. FOR "WITHOUT PARALLEL PATHWAY OUTSIDE OF RIGHT-OF-WAY", SANITARY ON 10.30 LINE AND STORM ON 13.30 LINE.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

PERMIT
PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date : 2015 May 4
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL
PROFESSIONAL ENGINEER ALBERTA
2015/05/01

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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ISC: UNRESTRICTED

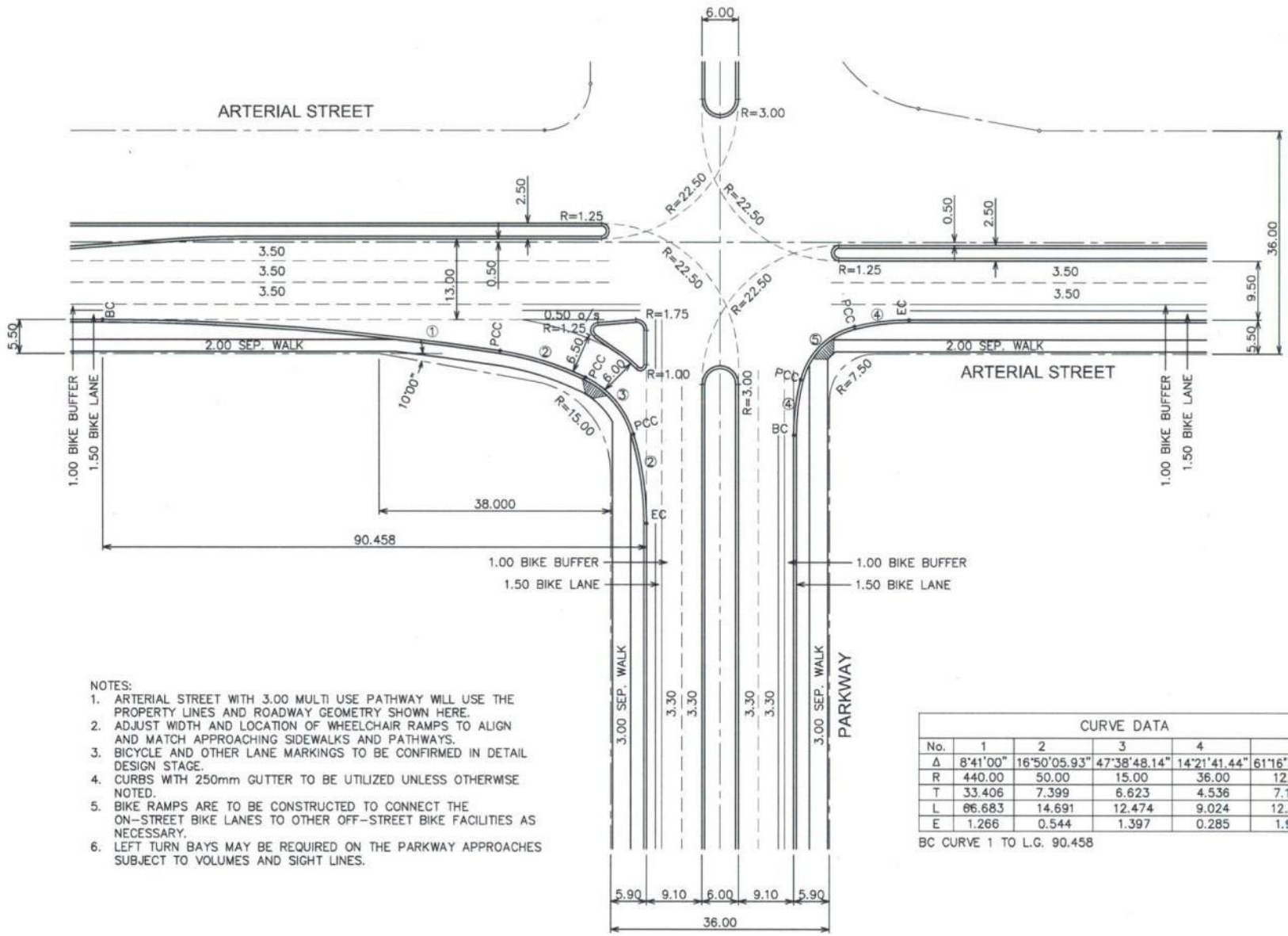
No.	Date	Revision	App'd

Drawn: JL	Date: 2014-06
Designed:	EW
Checked:	EW
Scale:	NTS

CROSS SECTION
PARKWAY

Figure 12

File Number 454.1008.061



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.
6. LEFT TURN BAYS MAY BE REQUIRED ON THE PARKWAY APPROACHES SUBJECT TO VOLUMES AND SIGHT LINES.

CURVE DATA					
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R	440.00	50.00	15.00	36.00	12.00
T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature :
Date : 26 May (4)
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA ROBERT J. TALARICO 26 NOV 14

THE CITY OF CALGARY ROADS

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DATE: Wednesday, November 26, 2014 8:35:40 AM
ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	JL	Date 2014-06
Designed	EW	
Checked	EW	
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INTERSECTION DESIGN
PARKWAY
TO ARTERIAL STREET

Figure 13

File Number 454.1014.028

Urban Boulevards	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
17,500 – 25,000	4	36.0 m / 42.6 m

FUNCTION

- To provide connections in high density corridors and Active Centres
- Urban Boulevard are local and regional destinations and provide high levels of connectivity to surrounding communities
- High priority for transit, cycling and walking modes
- High quality urban design and green infrastructure are critical components of Urban Boulevards

ACCESS CONDITIONS

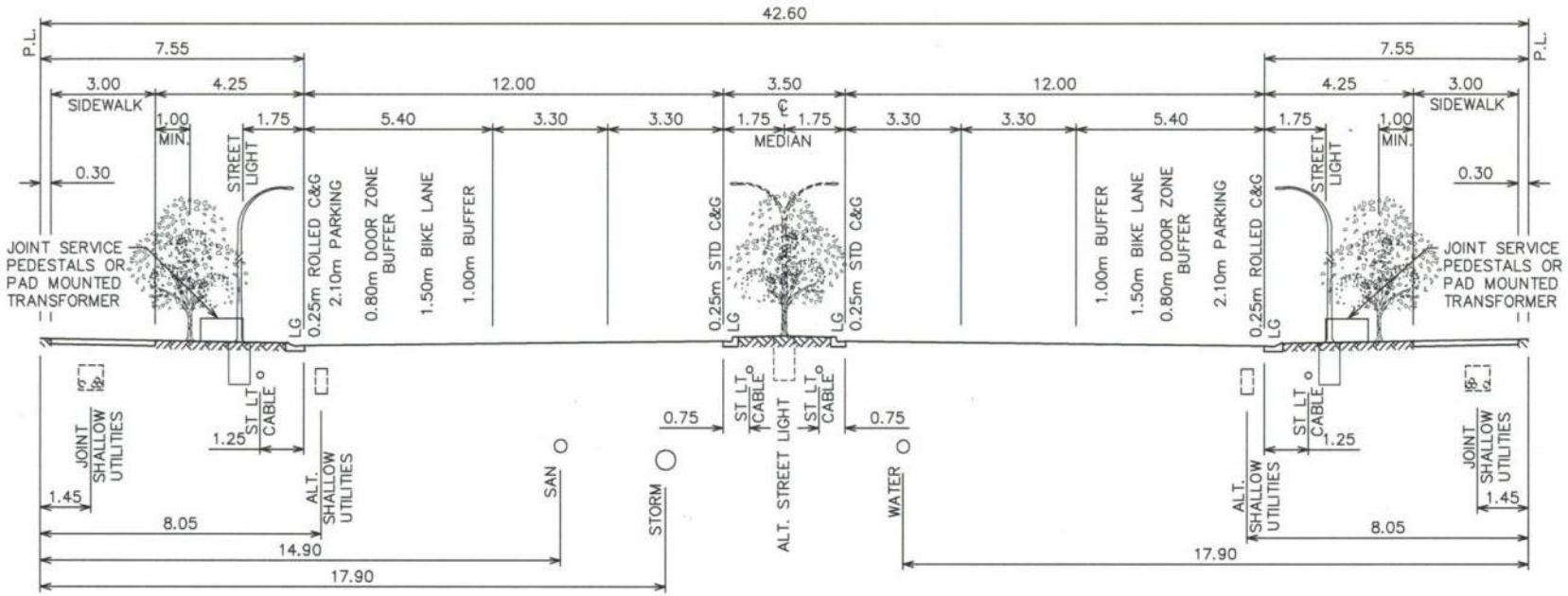
Industrial Properties	Not Permitted	• Access to properties should be from back lanes • Urban Boulevards may intersect with Arterial streets, other Liveable streets, Primary Collector Streets, Collector Streets, Activity Centre Streets and Residential streets
Commercial Properties	Generally not permitted	
Multi-Residential Properties	Generally not permitted	
Residential Properties	Not permitted	
Lane (Alley)	Generally not permitted	

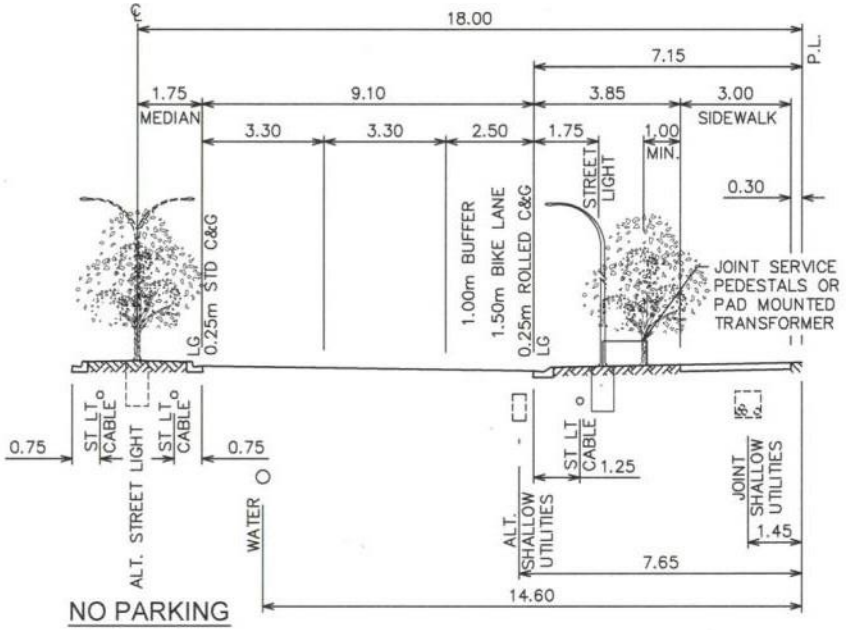
NOTE

- There are two types of Urban Boulevard streets (divided roadways):
  - 36.0 m R.O.W. – 2 driving lanes with bike lane in each direction, no parking
  - 42.6 m R.O.W. – 2 driving lanes with bike lane and parking in each direction
- Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at the crosswalk areas
- Standard curb is to be used in areas identified as bus zones and adjacent to parcels which will not contain residential development (e.g. commercial sites, parks, school reserves, etc.)
- Standard curb is to be used if the grade is greater than 6% where there are no driveways
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	3.3 m	**Posted Speed (km/h)**	50 km/h
Basic Width	• 2 x 9.1 m (2 driving lanes with bike lanes in each direction, no parking); OR • 2 x 12.0 m (2 driving lanes with bike lanes and parking in each direction)	**Parking**	2.1 m + 0.8 m door zone buffer (with bike lane)
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	• 0.25 m rolled C&G • Median: 0.25 m standard C&G	**Pedestrian Crossing**	At grade
Median Width	3.5 m	**On-street Bike Route**	Yes
Sidewalk Width	3.0 m separate walk on both sides	**Bus Route**	Yes
Multi-Use Pathway	None	**Truck Route**	No
Bike Lane Width	1.5 m + 1.0 m buffer	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• A minimum intersection spacing of 120 m shall be provided between an Arterial Street and the first intersection on an Urban Boulevard • Intersection spacing for other intersections shall be minimum 80 m • A maximum intersection spacing of 200 m is recommended to provide a high level of connectivity
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	90 m, 130 m – 6000 m (desirable)
MEDIAN & LEFT TURN BAY	
• Minimum median width is 3.5 m • Left turn bays and intersection channelization are not normally required	
VERTICAL ALIGNMENT	
Maximum Grade	8%
Minimum Grade	0.6%
Maximum Superelevation	4%
GRADE AT INTERSECTIONS	
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Urban Boulevard with a vertical curve of a minimum length of 30 m, i.e. the crossfall of the Urban Boulevard shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Urban Boulevard • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • The maximum profile grade of an Urban Boulevard at an intersection shall be 4% for a minimum of 50 m measured from the Vertical Point of Intersection (VPI) to the centreline of the intersecting street, on both sides of the intersection	
VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • For Urban Boulevards, crest vertical curves are to be designed using the desirable “K” values for 10 km/h higher than the design speed • The maximum and minimum grades also apply to the development of superelevation • For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125	





NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 5.00 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 5.00 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK, AND ON CENTRELINE OF MEDIAN.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES. FOR "NO PARKING", SANITARY ON 11.60 LINE AND STORM ON 14.60 LINE.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

PERMIT
PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date : 26 May 14
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL
PROFESSIONAL ENGINEER ALBERTA
2015/03/01

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED **METRIC**
FILE: Z:\permanent\DGIS_2014\dwg\4541008\ACAD\454.1008.062.dwg
DATE: Wednesday, January 21, 2015 2:48:03 PM
ISC: UNRESTRICTED

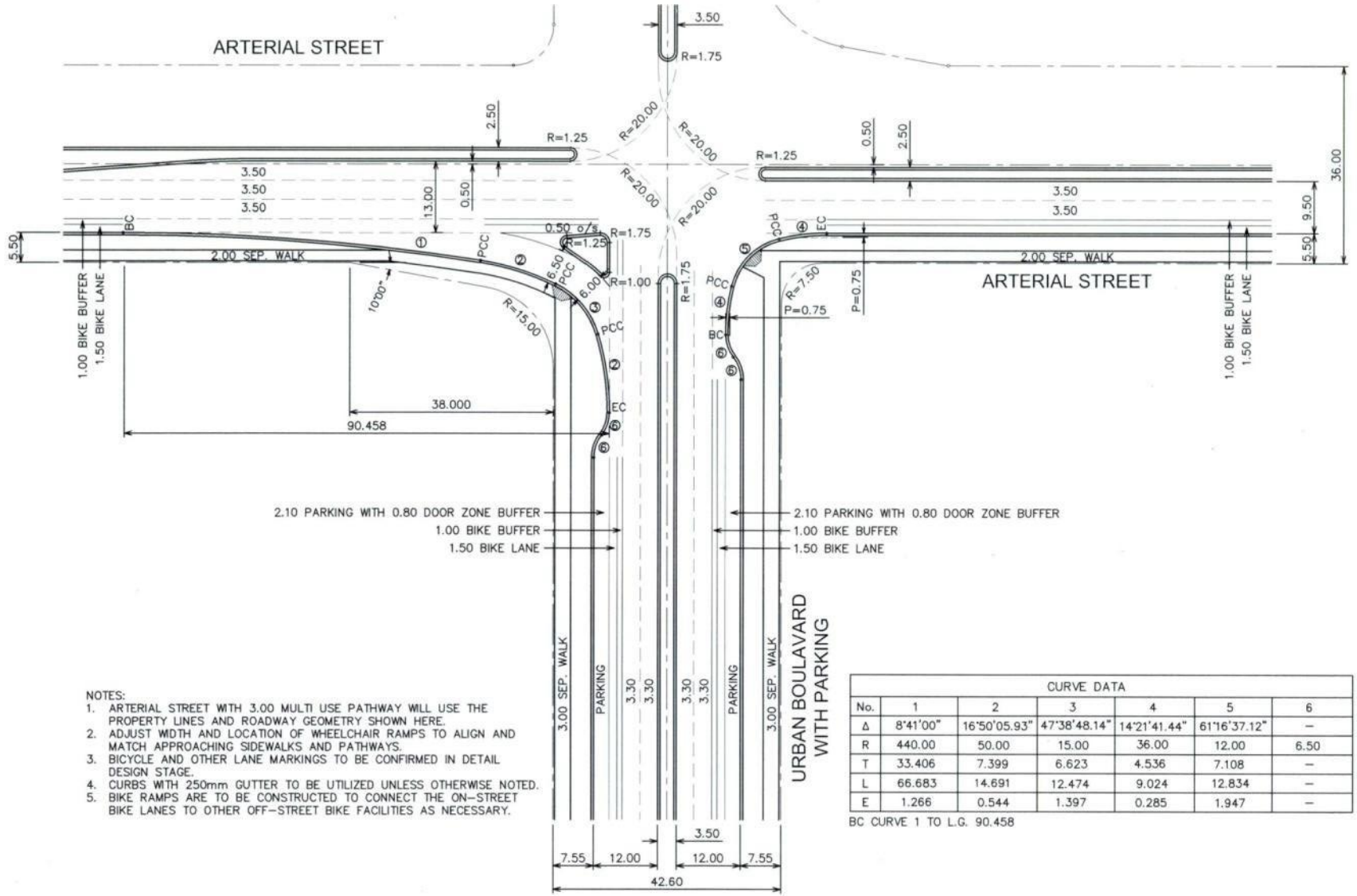
No.	Date	Revision	App'd

Drawn JL	Date 2014-06
Designed	EW
Checked	EW
Scale:	NTS

CROSS SECTION URBAN BOULEVARD

Figure 14

File Number 454.1008.062



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

CURVE DATA						
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T	33.406	7.399	6.623	4.536	7.108	–
L	66.683	14.691	12.474	9.024	12.834	–
E	1.266	0.544	1.397	0.285	1.947	–

BC CURVE 1 TO L.G. 90.458

PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date : 2016/04/19
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
ROBERT J. TALARICO
17 NOV 2016

THE CITY OF CALGARY
ROADS

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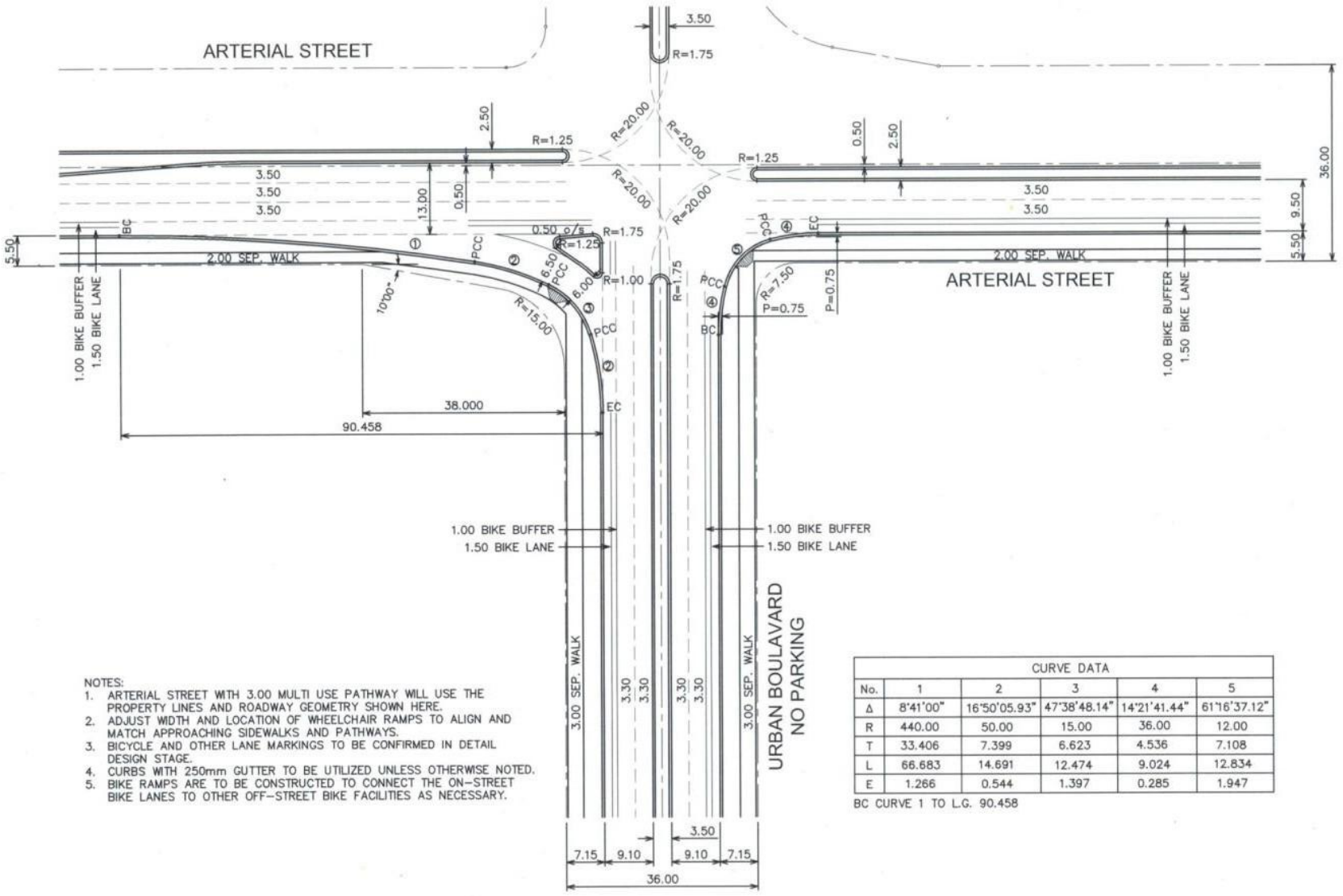
No.	Date	Revision	App'd

Drawn	Date
JL	2014-06
Designed	EW
Checked	EW
Scale:	NTS

INTERSECTION DESIGN
URBAN BOULEVARD – WITH PARKING TO ARTERIAL STREET

Figure 15

File Number 454.1014.029



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

CURVE DATA					
No.	1	2	3	4	5
Δ	8°41'00"	16°50'05.93"	47°38'48.14"	14°21'41.44"	61°16'37.12"
R	440.00	50.00	15.00	36.00	12.00
T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature :
Date : 2015 July 10
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL: PROFESSIONAL ENGINEER ALBERTA ROBERT J. TALARICO 17 NOV 2014

THE CITY OF CALGARY ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED. METRIC
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No.	Date	Revision	App'd

Drawn JL	Date 2014-06
Designed	EW
Checked	EW
Scale:	NTS

INTERSECTION DESIGN
URBAN BOULEVARD – NO PARKING
TO ARTERIAL STREET

Figure 16
File Number 454.1014.030

Neighbourhood Boulevards	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
12,500 – 22,500	2 or 4	30.0 m

FUNCTION

- To connect mixed-use retail and medium-density residential uses to the surrounding road network
- Neighbourhood Boulevards are destinations for the local communities surrounding them
- May serve as a segment of a bus route
- High priority for cycling and walking modes
- Neighbourhood Boulevard provides the highest level of connectivity within the family of Liveable streets

ACCESS CONDITIONS

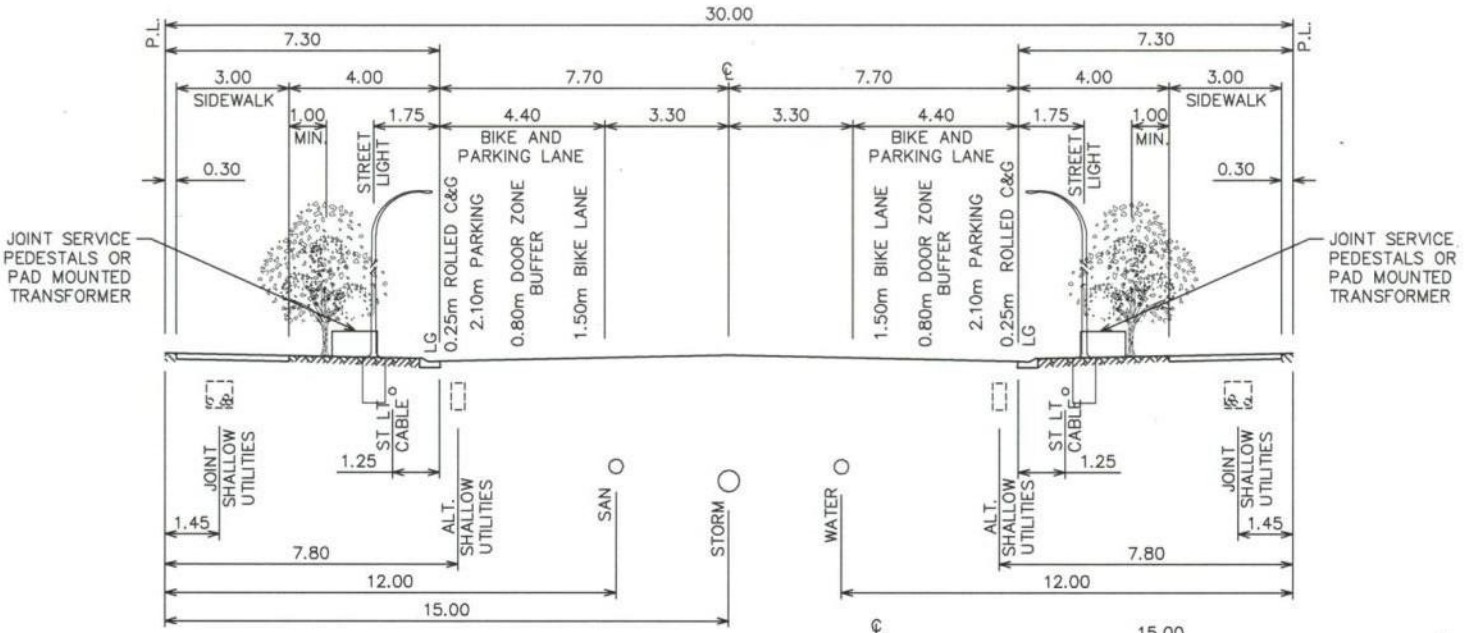
Industrial Properties	Not permitted	• Access to properties should be from back lanes • Neighbourhood Boulevards may intersect with Arterial Streets, Local Arterial Streets, other Liveable streets, Primary Collector Streets, Collector Streets, Activity Centre Streets and Residential streets
Commercial Properties	Generally not permitted	
Multi-Residential Properties	Generally not permitted	
Residential Properties	Not permitted	
Lane (Alley)	Permitted	

NOTE

- There are two types of Neighbourhood Boulevards (undivided roadways):
  - 30.0 m R.O.W. – 1 driving lane with bike lane and parking in each direction
  - 30.0 m R.O.W. – 2 driving lanes and parking in each direction, no bike lane
- Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at the crosswalk areas
- Standard curb is to be used in areas identified as bus zones and adjacent to parcels which will not contain residential development (e.g. commercial sites, parks, school reserves, etc.)
- Standard curb is to be used if the grade is greater than 6% where there are no driveways
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

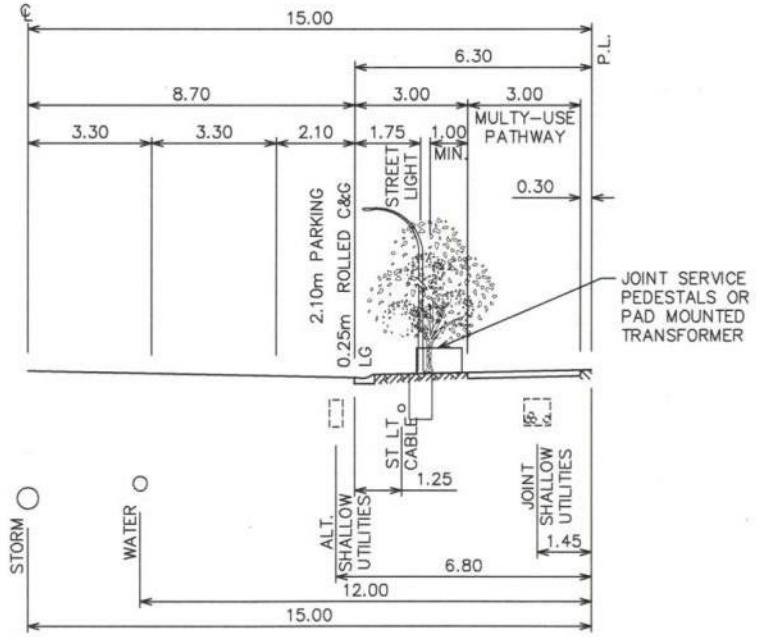
BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	3.3 m	**Posted Speed (km/h)**	50 km/h
Base Width	• 15.4 m (1 driving lane with bike lane and parking in each direction); OR • 17.4 m (2 driving lanes and parking in each direction, no bike lane)	**Parking**	• 2.1 m and 0.8 m door zone with bike lane; OR • 2.1 m with no bike lane
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	0.25 m rolled C&G	**Pedestrian Crossing**	At grade
Median Width	None	**On-street Bike Route**	Yes
Sidewalk Width	3.0 m separate walk on both sides with bike lane; OR	**Bus Route**	Yes
Multi-Use Pathway	3.0 m multi-use pathway on both sides with no bike lane	**Truck Route**	No
Bike Lane Width	1.5 m with no buffer	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• A minimum intersection spacing of 120 m shall be provided between an Arterial Street and the first intersection on a Neighbourhood Boulevard • Intersection spacing for other intersections shall be minimum 60 m
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	90 m, 130 m – 6000 m (desirable)
MEDIAN & LEFT TURN BAY	
• Median, left turn bays and intersection channelization are not normally required	
VERTICAL ALIGNMENT	
Maximum Grade	8%
Minimum Grade	0.6%
Maximum Superelevation	4%
GRADE AT INTERSECTIONS	
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Neighbourhood Boulevard with a vertical curve of a minimum length of 30 m, i.e. the crossfall of the Neighbourhood Boulevard shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Neighbourhood Boulevard • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • The maximum profile grade of a Neighbourhood Boulevard at an intersection shall be 4% for a minimum of 50 m measured from the Vertical Point of Intersection (VPI) to the centreline of the intersecting street, on both sides of the intersection	
VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • For Neighbourhood Boulevards, crest vertical curves are to be designed using the desirable “K” values for 10 km/h higher than the design speed • The maximum and minimum grades also apply to the development of superelevation • For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125	



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 4.50 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 4.50 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK AND MULTI-USE PATHWAY.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES. FOR "FOUR LANES, NO BIKE LANES", SANITARY ON 12.00 LINE AND STORM ON 15.00 LINE.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.



FOUR LANES, NO BIKE LANES

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature :
Date :
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL

THE CITY OF CALGARY ROADS

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ISC: UNRESTRICTED

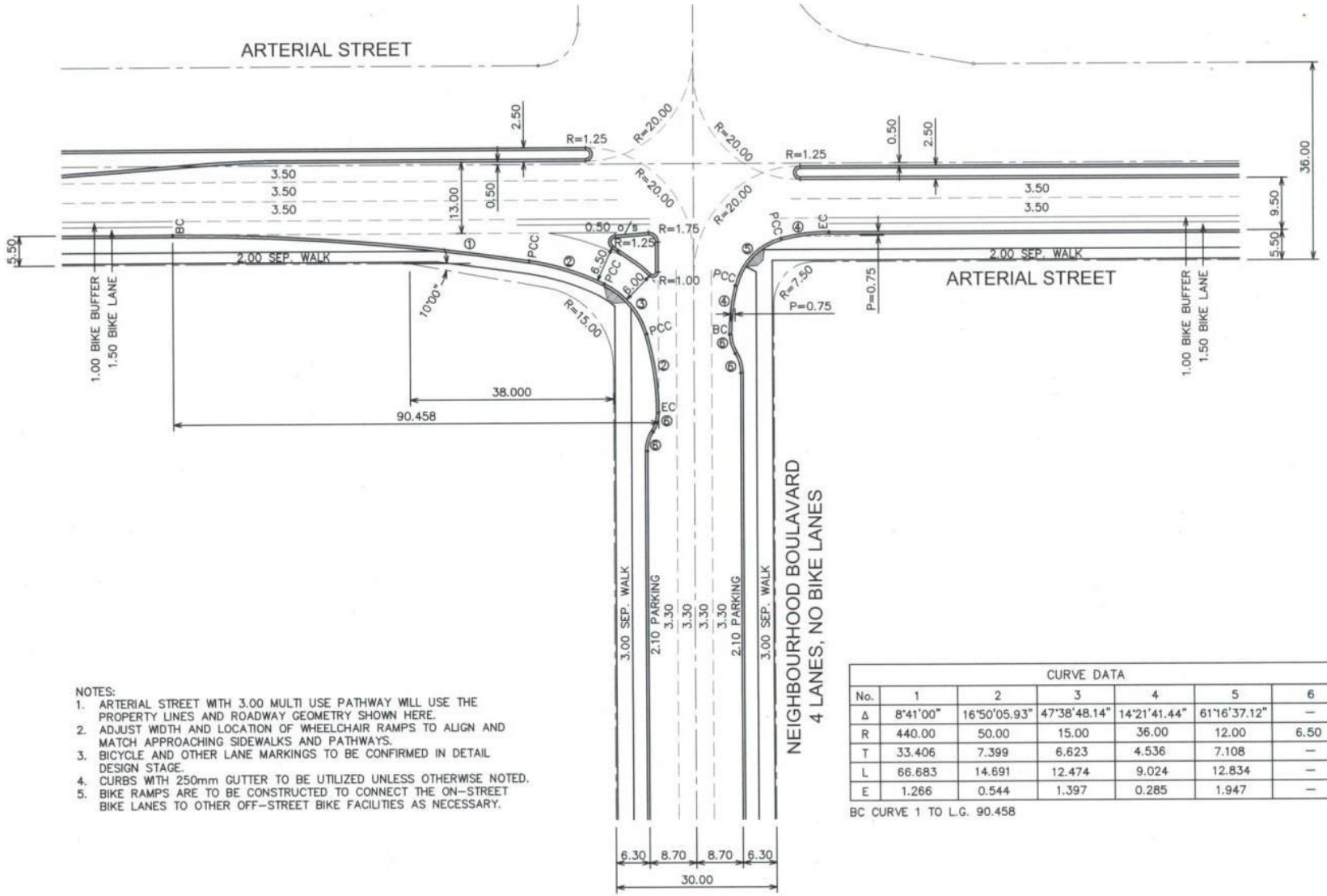
No.	Date	Revision	App'd

Drawn: JL	Date: 2014-06
Designed:	EW
Checked:	EW
Scale:	NTS

CROSS SECTION
NEIGHBOURHOOD BOULEVARD

Figure 17

File Number 454.1008.063



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

CURVE DATA						
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T	33.406	7.399	6.623	4.536	7.108	—
L	66.683	14.691	12.474	9.024	12.834	—
E	1.266	0.544	1.397	0.285	1.947	—

BC CURVE 1 TO L.G. 90.458

PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date : 2nd April
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
ROBERT A. TALARICO
17 NOV 2014

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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Drawn	Date
JL	2014-06
Designed	EW
Checked	EW
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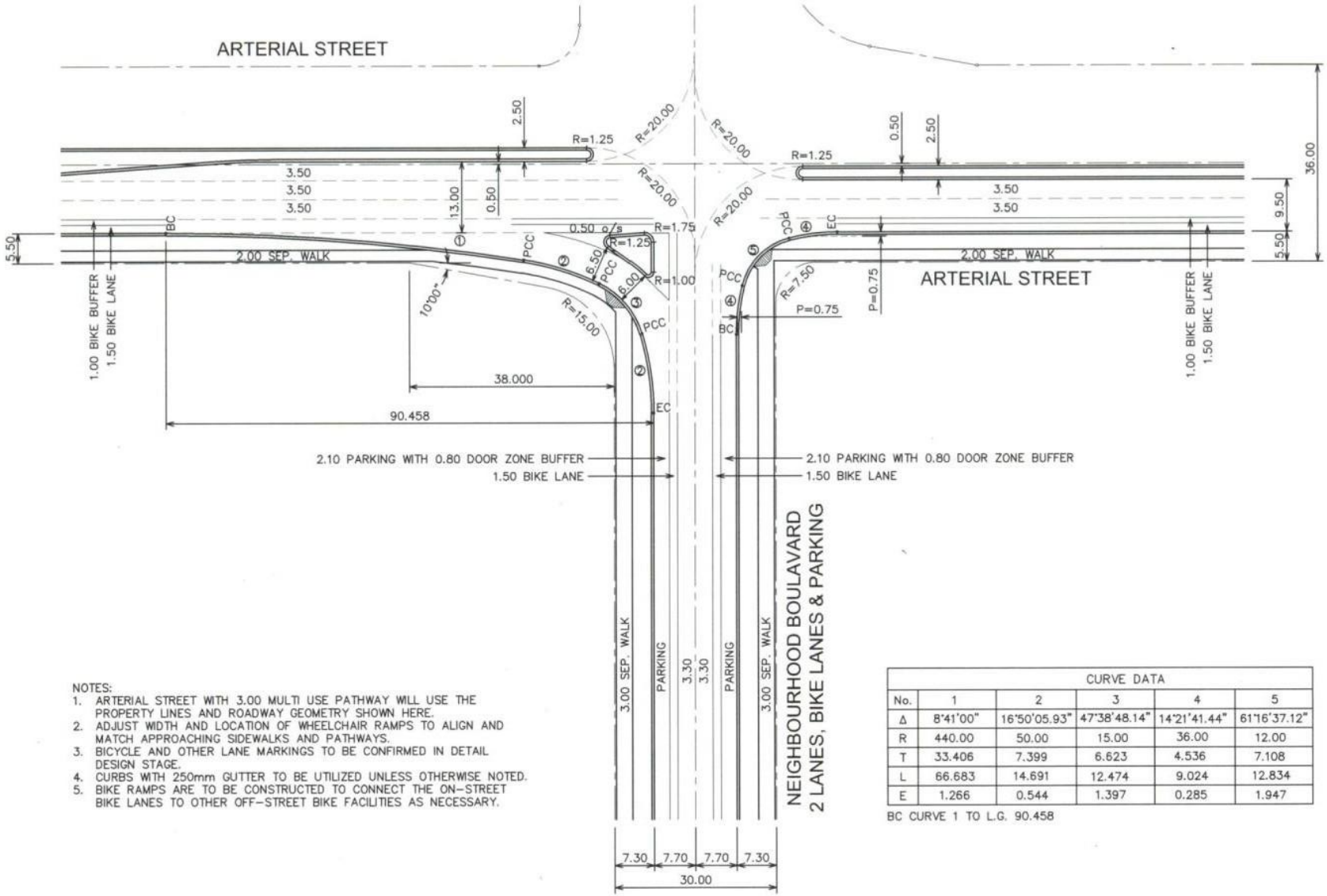
INTERSECTION DESIGN NEIGHBOURHOOD BOULEVARD – 4 LANES TO ARTERIAL STREET

Figure 18

File Number 454.1014.031



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

CURVE DATA					
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T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature:
Date: 20 Aug 19
PERMIT NUMBER: P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
ROBERT J. TALARICO
21 AUG 2014

THE CITY OF CALGARY
ROADS

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JL	2014-06
Designed	EW
Checked	EW
Scale:	NTS

INTERSECTION DESIGN
NEIGHBOURHOOD BOULEVARD – 2 LANES
TO ARTERIAL STREET

Figure 19

File Number 454.1014.032

Primary Collector Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
8,000 – 15,000	2 or 4	29.0 m / 30.0 m

FUNCTION

- To connect local streets in residential areas to local destinations and Arterial Streets
- To serve secondary traffic generators such as neighbourhood commercial centres, parks, golf courses, and neighbourhood-to-neighbourhood traffic within the community
- May serve as a segment of a bus route
- High priority for transit, cycling and walking modes

ACCESS CONDITIONS

Industrial Properties	Not permitted
Commercial Properties	Permitted
Multi-Residential Properties	Permitted
Residential Properties	Permitted
Lane (Alley)	Permitted

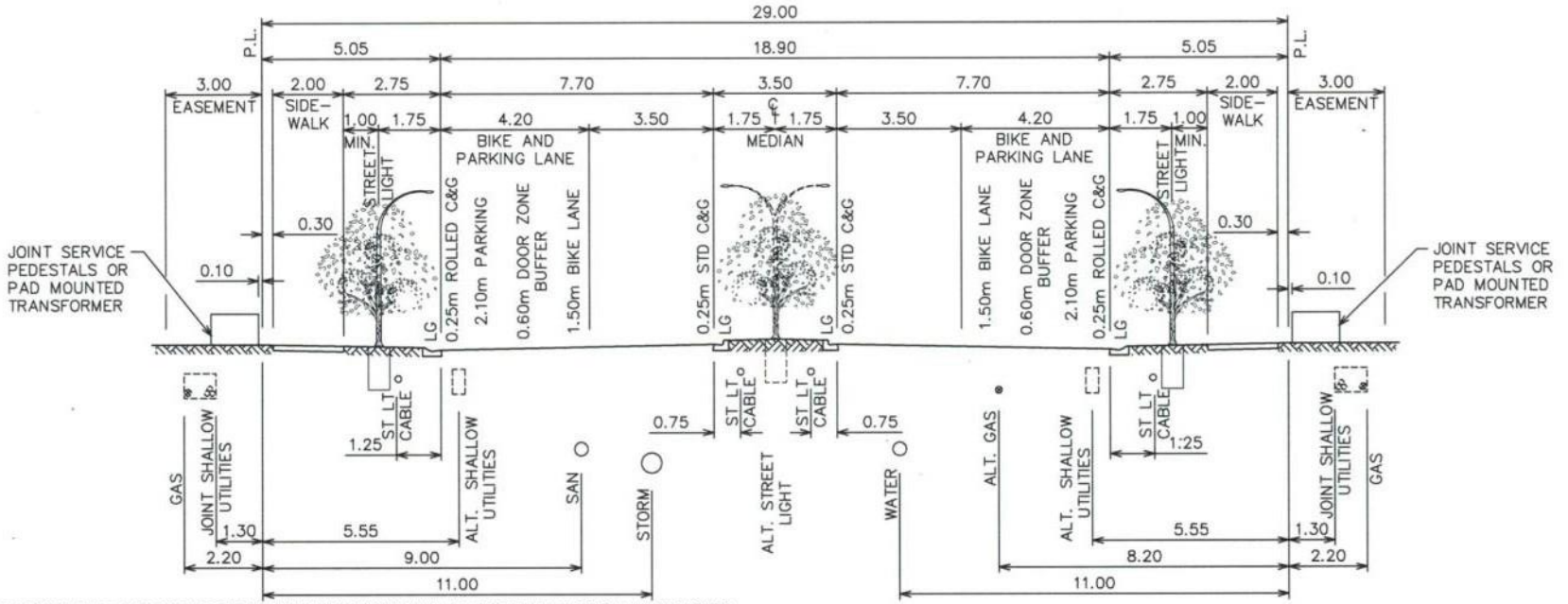
- Access to adjacent properties is permitted but is generally restricted to right turns in and out
- Primary Collector Streets may intersect with Arterial Streets, Local Arterial Streets, Liveable streets, other Primary Collector Streets, Collector Streets, Activity Centre Streets and Residential streets

NOTE

- There are two types of Primary Collectors (divided roadways):
  - 29.0 m R.O.W. – 1 driving lane with bike lane and parking in each direction
  - 30.0 m R.O.W. – 2 driving lanes with bike lane in each direction, no parking
- Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at the crosswalk areas
- Standard curb is to be used in areas identified as bus zones and adjacent to parcels which will not contain residential development (e.g. commercial sites, parks, school reserves, etc.)
- Standard curb is to be used if the grade is greater than 6% where there are no driveways
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

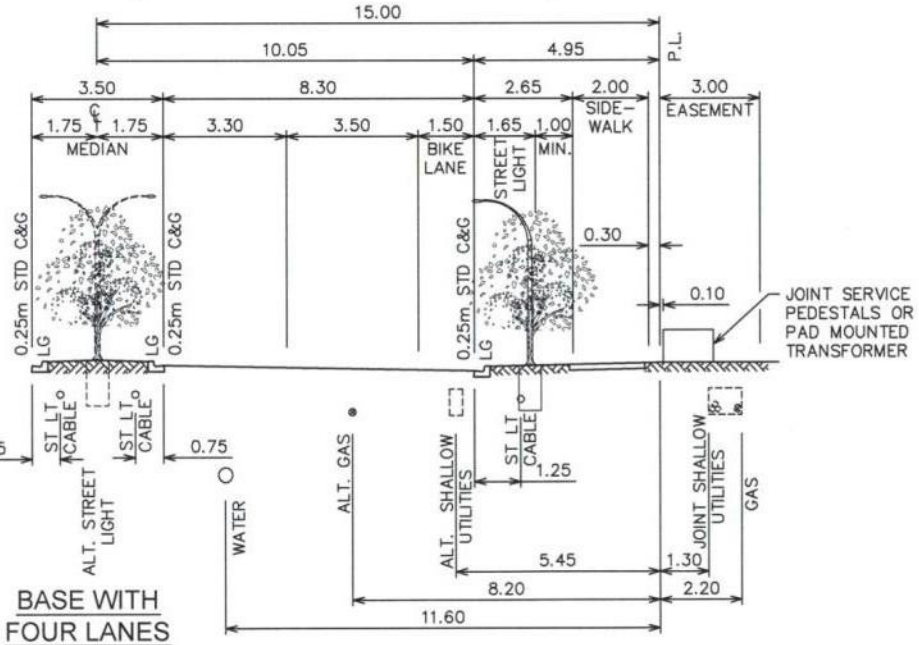
BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	• 3.5 m (I driving lane in each direction); OR • 3.3 m (inside lane) + 3.5 m (middle lane) (2 driving lanes in each direction)	**Posted Speed (km/h)**	50 km/h
Basic Width	• 2 x 7.7 m (1 driving lane with bike lane and parking in each direction); OR • 2 x 8.3 m (2 driving lanes with bike lane in each direction, no parking)	**Parking**	2.1 m and 0.6m door zone buffer (with bike lane)
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	• 0.25 m rolled C&G • Median: 0.25 m standard C&G	**Pedestrian Crossing**	At grade
Median Width	3.5 m	**On-street Bike Route**	Yes
Sidewalk Width	2.0 m separate walk on both sides	**Bus Route**	Yes
Multi-Use Pathway	None	**Truck Route**	No
Bike Lane Width	1.5 m with no buffer	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• A minimum intersection spacing of 120 m shall be provided between an Arterial Street and the first intersection on a Primary Collector Street • Intersection spacing for other intersections shall be minimum 60 m
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	90 m, 130 m – 6000 m (desirable)
MEDIAN & LEFT TURN BAY	
• Minimum median width is 3.5 m • Left turn bays and intersection channelization are not normally required	
VERTICAL ALIGNMENT	
Maximum Grade	8%
Minimum Grade	0.6%
Maximum Superelevation	4%
GRADE AT INTERSECTIONS	
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Primary Collector Street with a vertical curve of a minimum length of 30 m, i.e. the crossfall (or 2% if the road is crowned) of the Primary Collector Street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Primary Collector Street • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • It is desirable to ensure that the grade on the Primary Collectors is less than the permitted maximum 8% at intersections to improve operational aspects such as stopping and starting in winter conditions	
VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • The maximum and minimum grades also apply to the development of superelevation • For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125	



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE EASEMENT ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE EASEMENT.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 3.00 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 3.00 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK AND ON CENTRELINE OF MEDIAN.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES. FOR "BASE WITH FOUR LANES", SANITARY ON 8.60 LINE AND STORM ON 11.60 LINE.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.



BASE WITH FOUR LANES

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SEAL

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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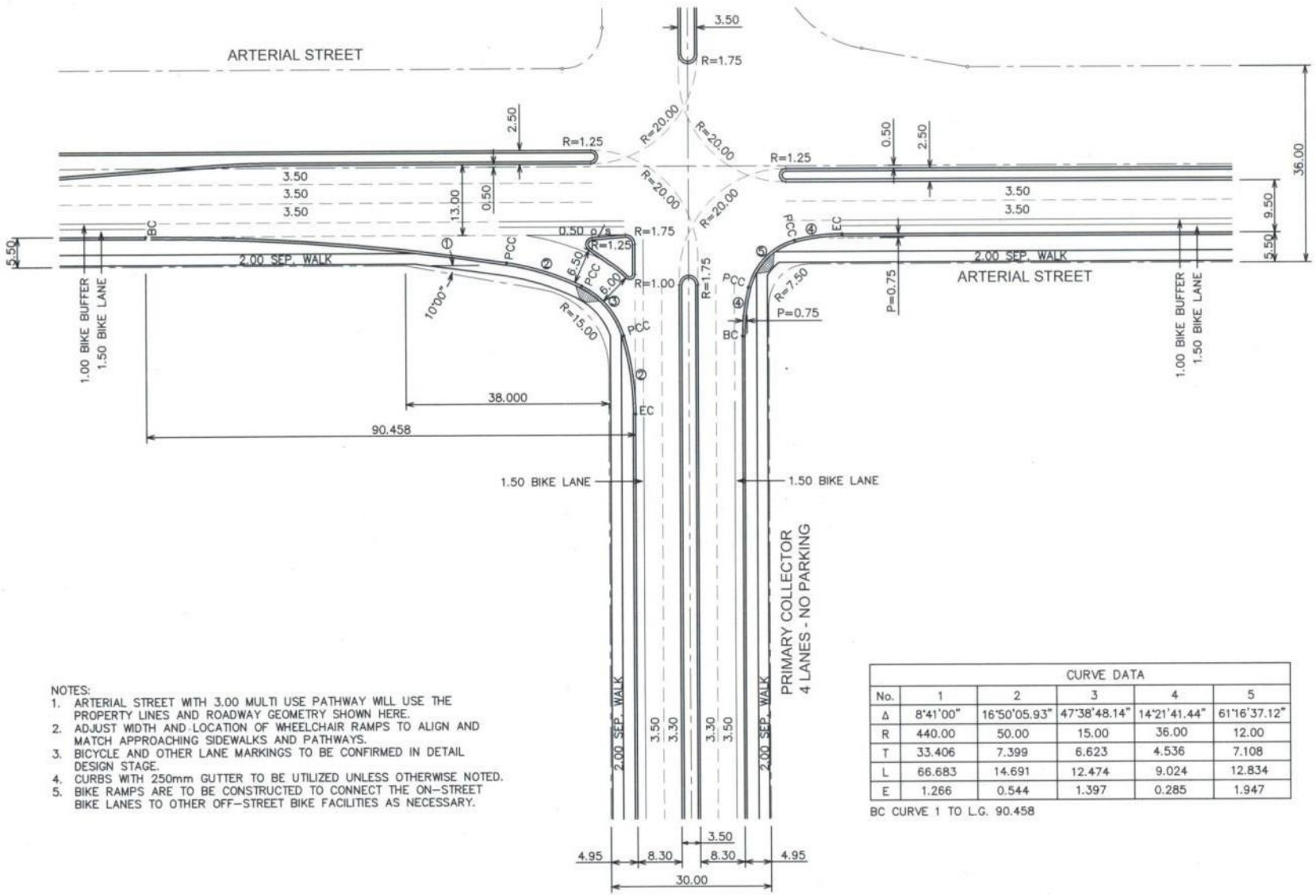
DATE: Thursday, February 04, 2016 9:30:23 AM
ISC: UNRESTRICTED

No.	Date	Revision	App'd
1	2016-01	REVISED PEDESTAL/TRANSFORMER OFFSET	EW

Drawn: JL	Date: 2014-06
Designed:	EW
Checked:	EW
Scale:	NTS

CROSS SECTION PRIMARY COLLECTOR STREET

Figure: 20
File Number: 454.1008.064



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

CURVE DATA					
No.	1	2	3	4	5
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R	440.00	50.00	15.00	36.00	12.00
T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date : 2016 Aug 11
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
ROBERT J. TALARICO
17 NOV 2014

THE CITY OF CALGARY ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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ISC: UNRESTRICTED

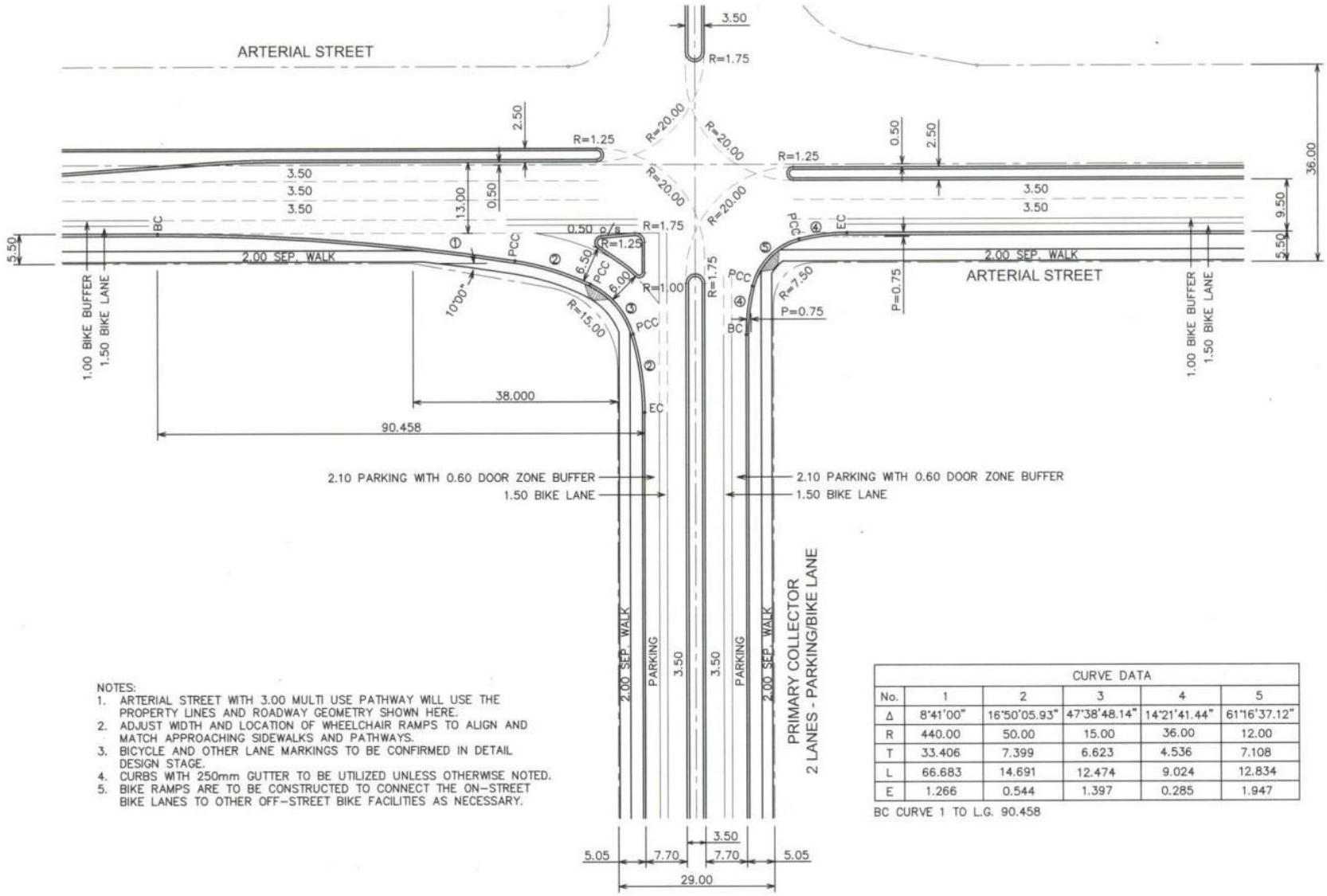
No.	Date	Revision	App'd

Drawn JL	Date 2014-06
Designed	EW
Checked	EW
Scale:	NTS

INTERSECTION DESIGN
PRIMARY COLLECTOR STREET – 4 LANES TO ARTERIAL STREET

Figure 21

File Number 454.1014.033



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

CURVE DATA					
No.	1	2	3	4	5
Δ	8°41'00"	16°50'05.93"	47°38'48.14"	14°21'41.44"	61°16'37.12"
R	440.00	50.00	15.00	36.00	12.00
T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

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Date : 2015 Aug 11
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PROFESSIONAL ENGINEER ALBERTA
21 Nov 2014

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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No.	Date	Revision	App'd

Drawn JL	Date 2014-06
Designed	EW
Checked	EW
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INTERSECTION DESIGN
PRIMARY COLLECTOR STREET – 2 LANES TO ARTERIAL STREET

Figure 22

File Number 454.1014.034

Collector Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
2,000 -8,000	2	22.5 m

FUNCTION

- To connect local streets within a community, and to connect those streets to the transportation network beyond the community
- To serve secondary traffic generators such as neighbourhood commercial centres, parks, golf courses and neighbourhood-to-neighbourhood traffic within the community
- High Priority for transit, cycling and walking modes

ACCESS CONDITIONS

Industrial Properties	Not permitted
Commercial Properties	Permitted
Multi-Residential Properties	Permitted
Residential Properties	Permitted
Lane (Alley)	Permitted

- Direct access is permitted to abutting properties
- Collector Streets may intersect with Arterial Streets, Local Arterial Streets, Liveable streets, Primary Collector Streets, other Collector Streets, Activity Centre Street and Residential streets

NOTE

- There are two types of Collectors (undivided roadways):
  - 22.5 m R.O.W. – 2 driving lanes with bike lanes on both sides, parking on one side (an addition of 2.70 m right-of-way will be required if parking is to be provide on both sides)
  - 21.0 m R.O.W. – 2 driving lanes with parking on both sides, no bike lane (for < 3,000 VPD)
- Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at the crosswalk areas
- Standard curb is to be used in areas identified as bus zones and adjacent to parcels which will not contain residential development (e.g. commercial sites, parks, school reserves, etc.)
- Standard curb is to be used if the grade is greater than 6% and where there are no driveways
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	3.3 m	**Posted Speed (km/h)**	50 km/h
Basic Width	• 12.3 m (2 driving lanes with bike lanes on both sides, parking on one side); OR • 10.8 m (2 driving lanes with parking on both sides, no bike lane)	**Parking**	• 2.1 m and 0.6m door zone buffer (with bike lane); OR • 2.1 m with no bike lane
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	0.25 m rolled C&G	**Pedestrian Crossing**	At grade
Median Width	None. 3.0 m for bus route on a Collector, when intersecting with an Arterial 6.0 m if left turn bay is required on the Collector, when intersecting with an Arterial	**On-street Bike Route**	Yes
Sidewalk Width	•2.0 m separate walk on both sides; OR •2.0 m monowalk on both sides	**Bus Route**	Yes
Multi-Use Pathway	None	**Truck Route**	No
Bike Lane Width	1.5 m with no buffer	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	• A minimum intersection spacing of 120 m shall be provided between an Arterial Street and the first intersection on a Collector Street • Intersection spacing for all other intersections shall of minimum 60 m
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	90 m, 130 m – 6000 m (desirable)

MEDIAN & LEFT TURN BAY

- A tear-drop median is required on a Collector when it is designed as a bus route and intersecting with an Arterial Street, see Figures 26 & 29, Pages 67 & 70
- Median, left turn bays and intersection channelization are not normally required; if required, see Figures 27 & 30, Pages 68 & 71

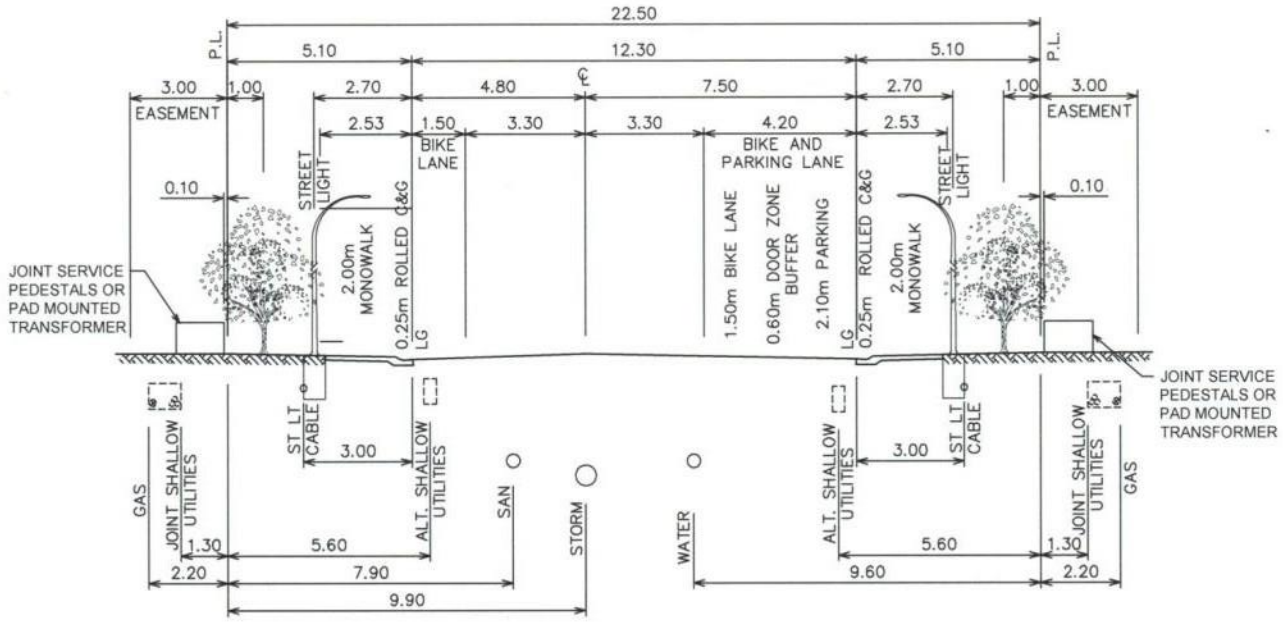
VERTICAL ALIGNMENT	
Maximum Grade	8%
Minimum Grade	0.6%
Maximum Superelevation	4%

GRADE AT INTERSECTIONS

- The grade line of the approaching street (maximum approach grade of 4%) shall tie to the Collector Street in the following manner:
  - Tie to the property line grade if the approaching street is undivided
  - Tie to the lane line of the Collector Street with a vertical curve of a minimum length of 30 m if the approaching street is divided, i.e. the crossfall (or 2% if the road is crowned) of the Collector Street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Collector Street
- For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112
- It is desirable to ensure that the grade on the Collectors is less than the permitted maximum 8% at intersections to improve operational aspects such as stopping and starting in winter conditions

VERTICAL CURVES & SUPERELEVATION

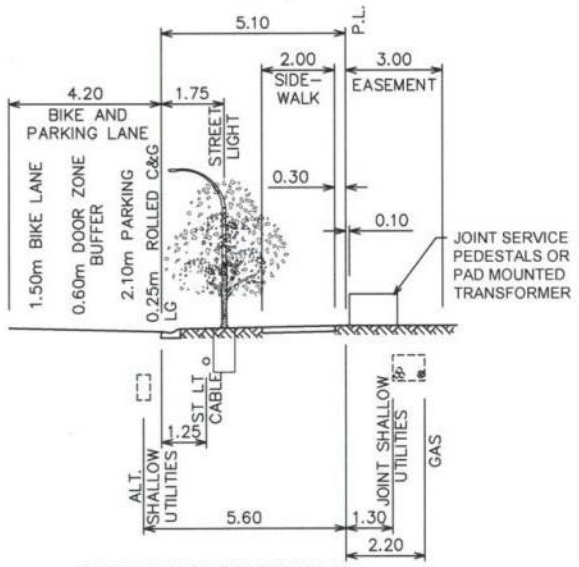
- The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107
- The maximum and minimum grades also apply to the development of superelevation
- For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125



PARKING ONE SIDE AND BIKE LANES

NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE EASEMENT ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE EASEMENT.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 1.00 LINE WITH 2.00m MONOWALK OR 3.00 LINE WITH 2.00m SEPARATE WALK.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 1.00 LINE WITH 2.00m MONOWALK OR 3.00 LINE WITH 2.00m SEPARATE WALK.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.



SEPARATE SIDEWALK

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Date : 2016 Feb 9
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The Association of Professional Engineers, Geologists and Geophysicists of Alberta

THE CITY OF CALGARY ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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ISC: UNRESTRICTED

No.	Date	Revision	App'd
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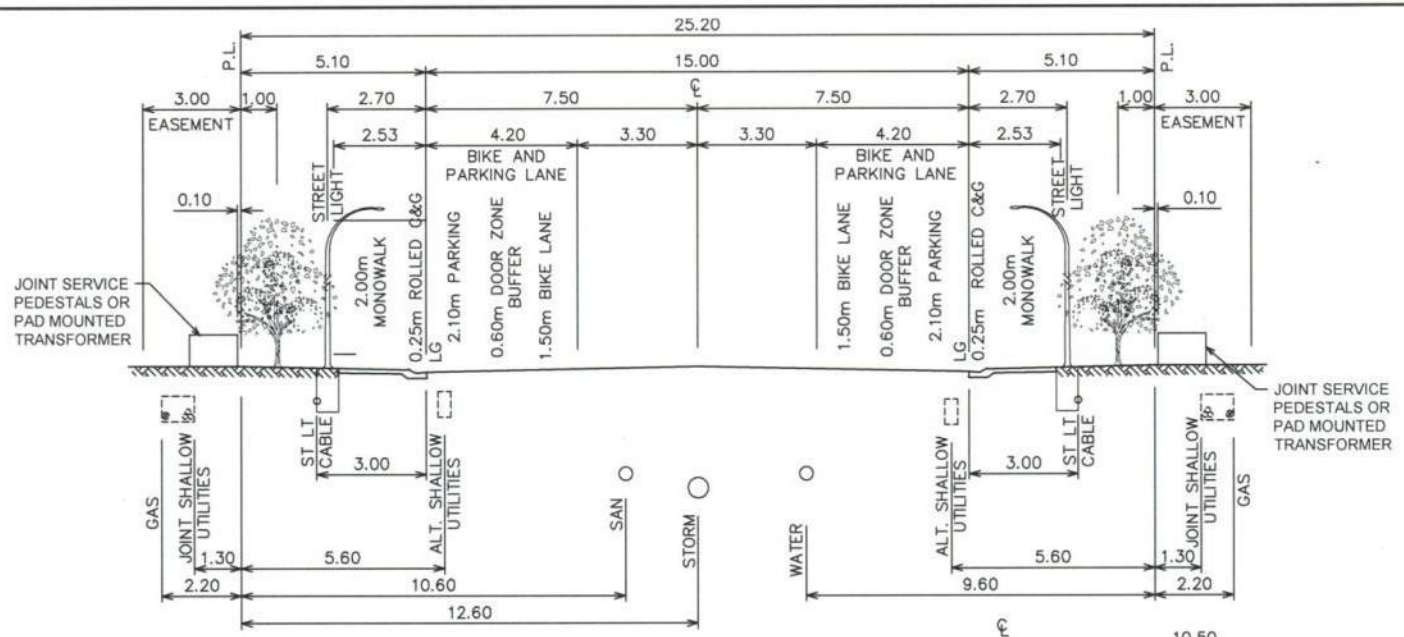
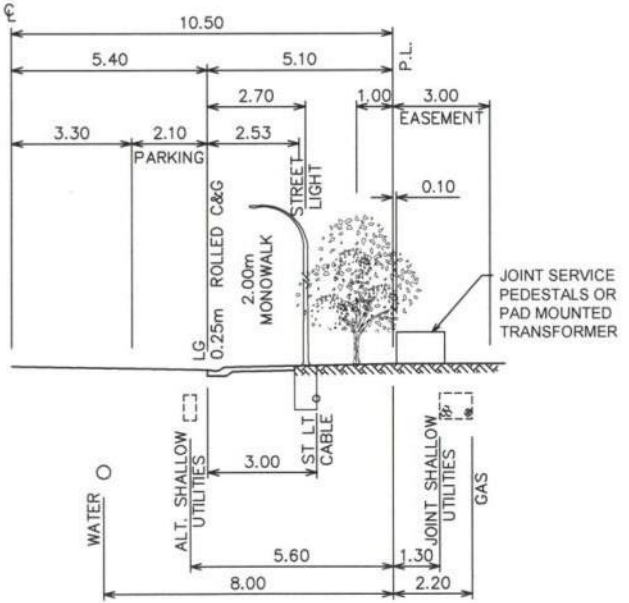
Drawn JL	Date 2014-12
Designed	EW
Checked	EW
Scale:	NTS

CROSS SECTION
COLLECTOR STREET
PARKING ONE SIDE

Figure 23
File Number 454.1008.065



PARKING BOTH SIDES AND BIKE LANES



PARKING BOTH SIDES, NO BIKE LANES FOR < 3,000 VPD

NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE EASEMENT ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE EASEMENT.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 1.00 LINE WITH 2.00m MONOWALK OR 3.00 LINE WITH 2.00m SEPARATE WALK.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 1.00 LINE WITH 2.00m MONOWALK OR 3.00 LINE WITH 2.00m SEPARATE WALK.
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10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
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12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES. FOR "PARKING BOTH SIDES, NO BIKE LANES ", SANITARY ON 8.50 LINE AND STORM ON 10.50 LINE.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
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21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

PERMIT

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THE CITY OF CALGARY
Signature :
Date : 2016 Feb 5
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL

PROFESSIONAL ENGINEER ALBERTA
2016.02.03

THE CITY OF CALGARY
ROADS

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FILE: Z:\permanent\DGSS_2016\454\1008\ACAD\454.1008.073_1.dwg
DATE: Thursday, February 04, 2016 9:26:30 AM
ISC: UNRESTRICTED

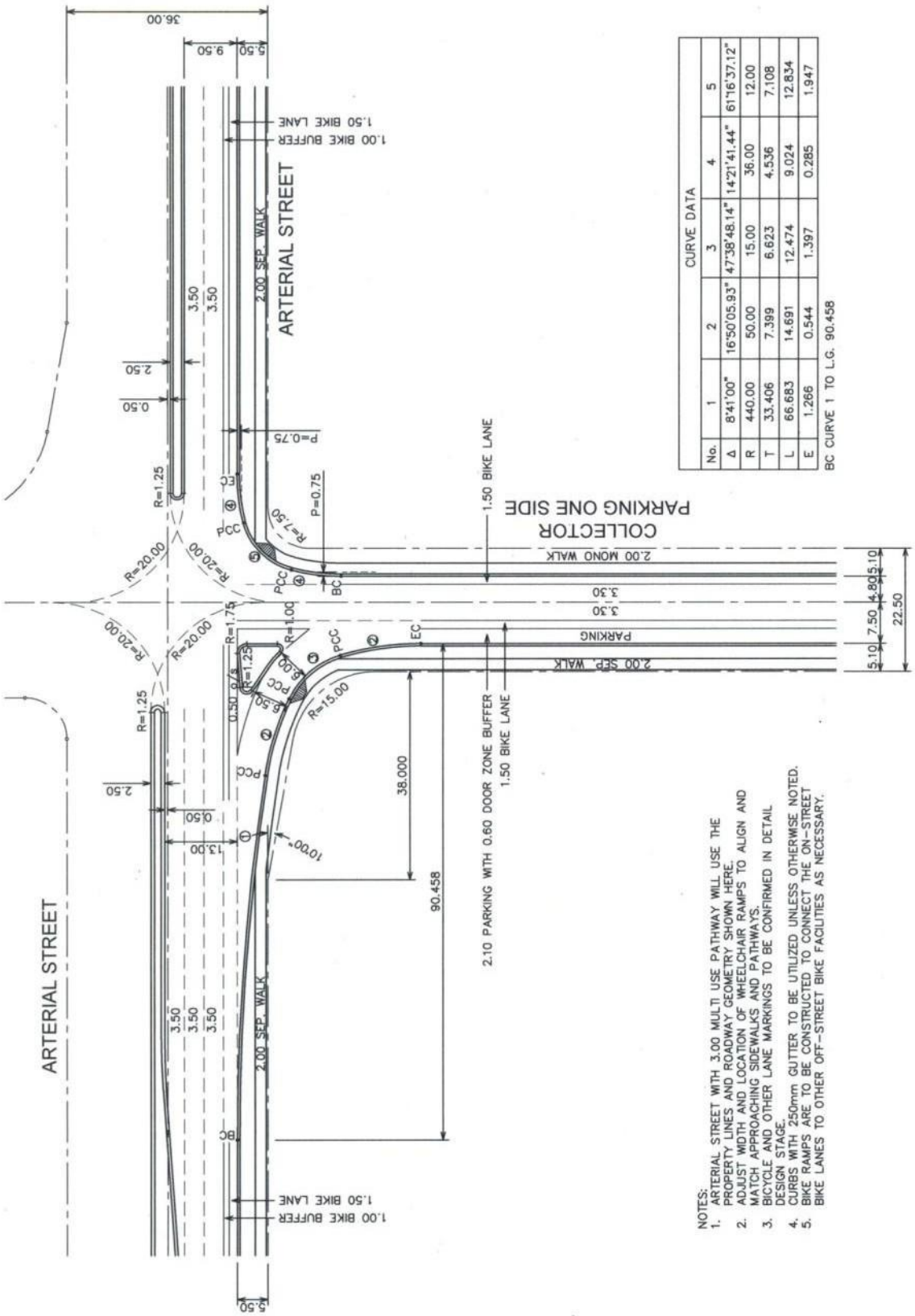
No.	Date	Revision	App'd
1	2016-01	REVISED PEDESTAL/TRANSFORMER OFFSET	EW

Drawn	JL	Date 2014-12
Designed	EW	
Checked	EW	
Scale:	NTS	

CROSS SECTION COLLECTOR STREET PARKING BOTH SIDES

Figure 24

File Number 454.1008.073



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T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

PERMIT
PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date :
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL
PROFESSIONAL ENGINEER ALBERTA
J. TALAMO
2015

THE CITY OF CALGARY
ROADS

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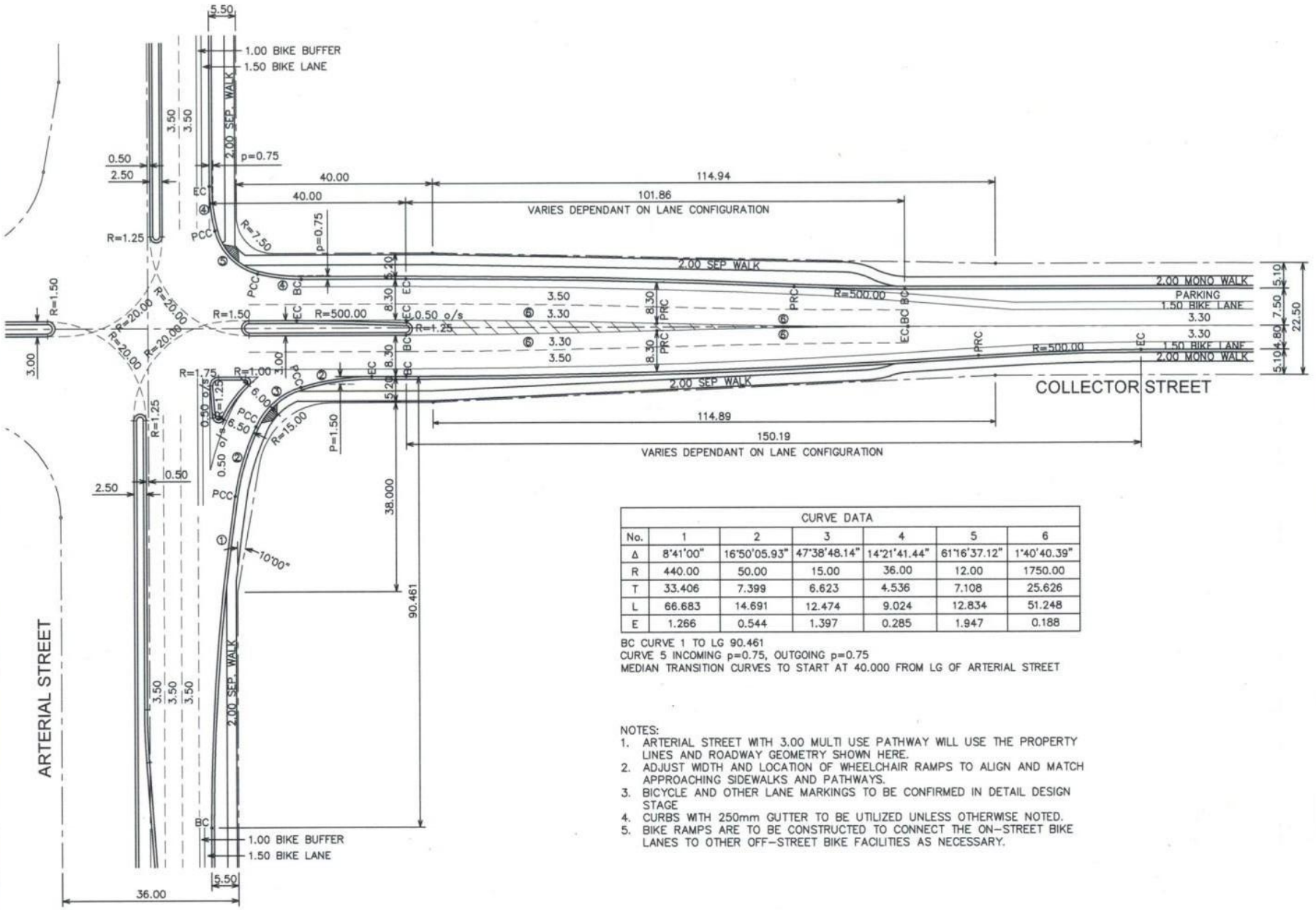
ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn: JL Date: 2014-12
Designed: EW
Checked: EW
Scale: NTS

INTERSECTION DESIGN
COLLECTOR STREET – PARKING ONE SIDE
TO ARTERIAL STREET

Figure 25
File Number 454.1014.035



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BC CURVE 1 TO LG 90.461
CURVE 5 INCOMING p=0.75, OUTGOING p=0.75
MEDIAN TRANSITION CURVES TO START AT 40.000 FROM LG OF ARTERIAL STREET

NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
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PERMIT
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THE CITY OF CALGARY
Signature :
Date : 2015 August
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL
PROFESSIONAL ENGINEER ALBERTA
ROBERT J. TALARICO
13 Jan 2015

THE CITY OF CALGARY
ROADS

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No.	Date	Revision	App'd

Drawn	JL	Date 2014-12
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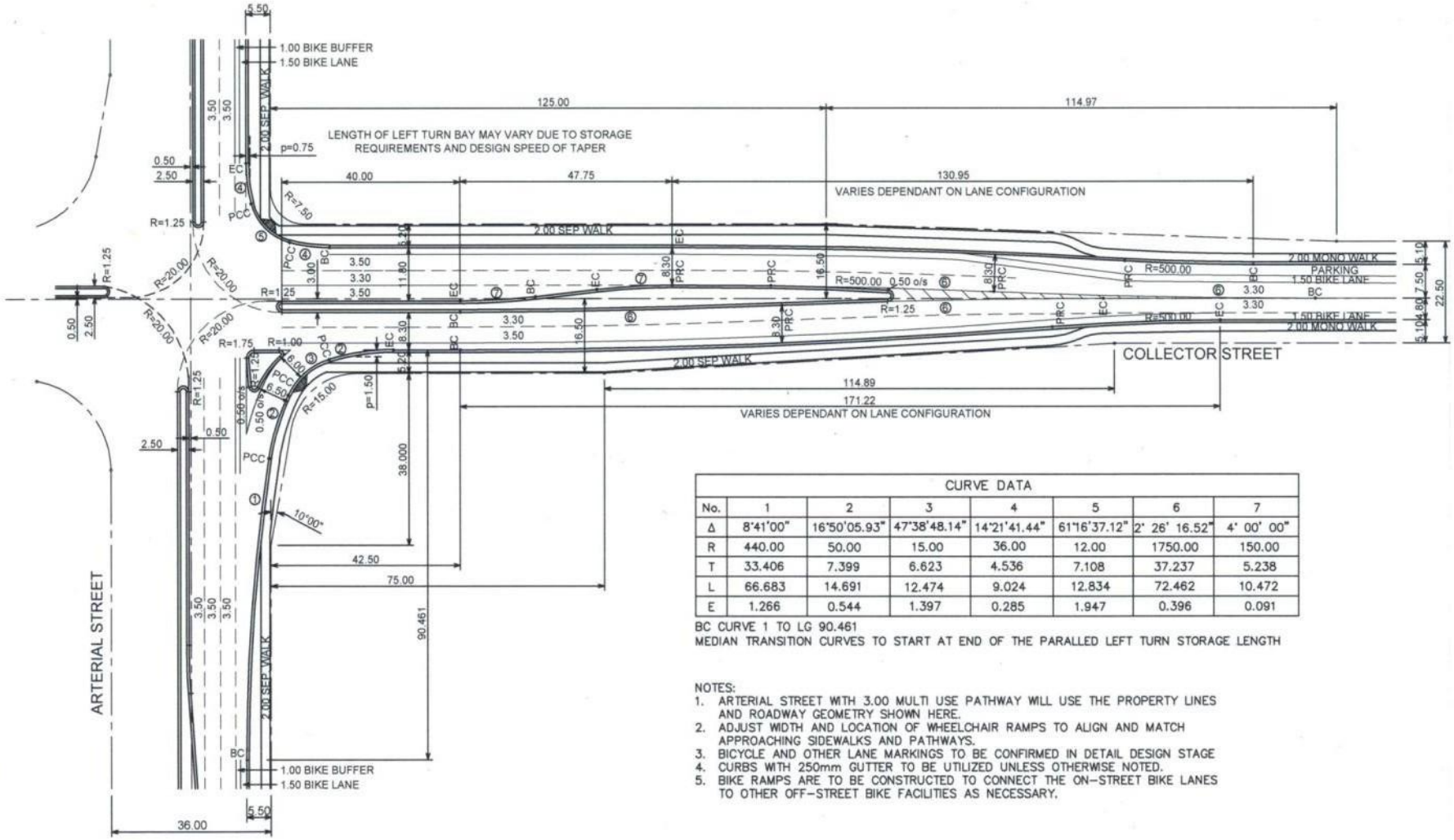
Checked		EW
Scale:		NTS

INTERSECTION DESIGN
COLLECTOR STREET – PARKING ONE SIDE TO ARTERIAL STREET–TEARDROP MEDIAN (BUS ROUTE)

Figure 26
File Number 454.1014.036



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T	33.406	7.399	6.623	4.536	7.108	37.237	5.238
L	66.683	14.691	12.474	9.024	12.834	72.462	10.472
E	1.266	0.544	1.397	0.285	1.947	0.396	0.091

BC CURVE 1 TO LG 90.461
MEDIAN TRANSITION CURVES TO START AT END OF THE PARALLED LEFT TURN STORAGE LENGTH

NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

PERMIT
PERMIT TO PRACTICE
THE CITY OF CALGARY
Signature :
Date : 23/15 Aug 11
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ROBERT J. TALMAN
13 Jan 2015

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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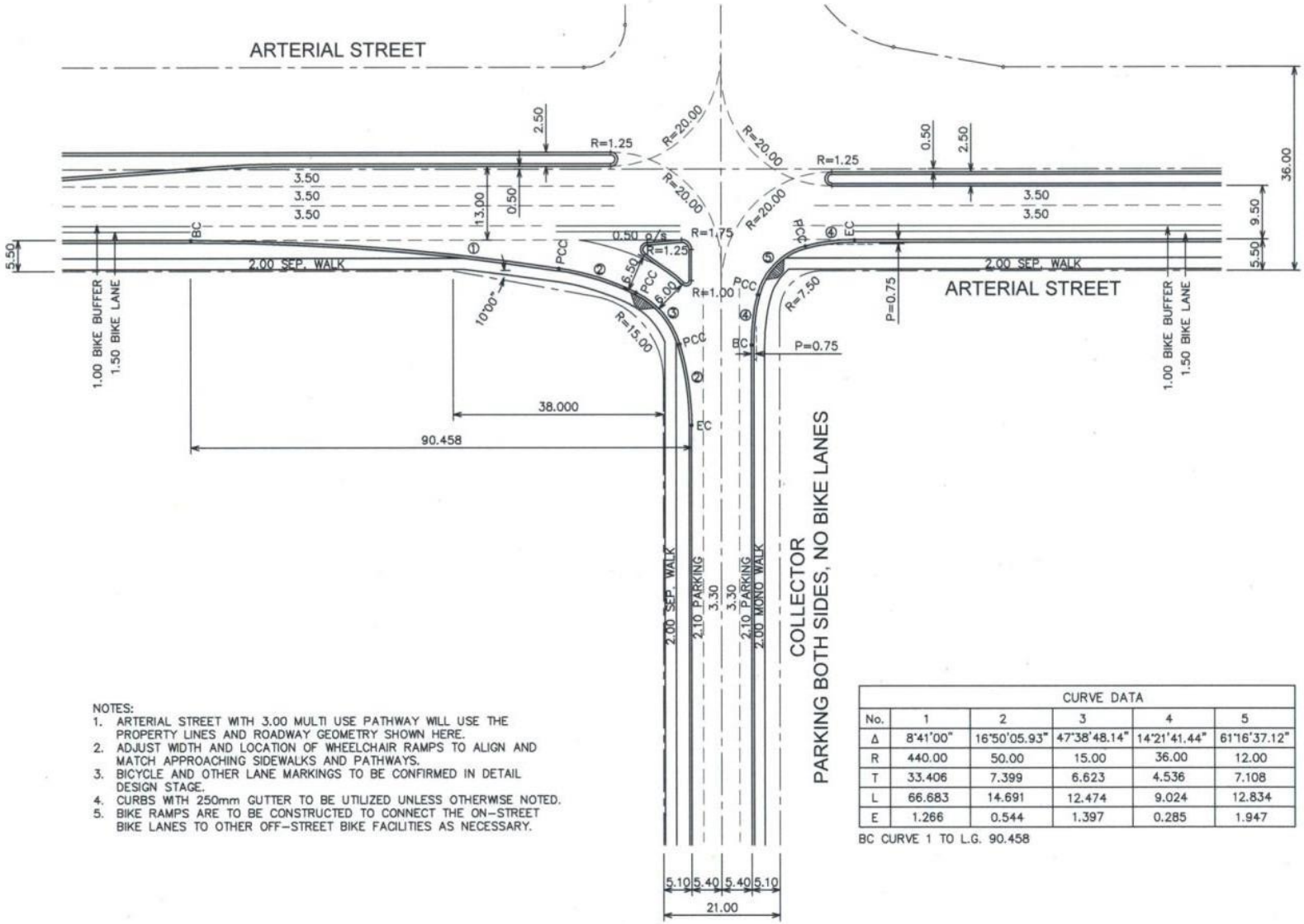
DATE: Tuesday, December 16, 2014 1:55:45 PM
ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	JL	Date 2014-06
Designed	EW	
Checked	EW	
Scale:	NTS	

INTERSECTION DESIGN
COLLECTOR STREET–PARKING ONE SIDE TO ARTERIAL STREET–LEFT TURN BAY

Figure 27
File Number 454.1014.037



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

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T	33.406	7.399	6.623	4.536	7.108
L	66.683	14.691	12.474	9.024	12.834
E	1.266	0.544	1.397	0.285	1.947

BC CURVE 1 TO L.G. 90.458

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ROBERT J. TALARICO

THE CITY OF CALGARY
ROADS

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No.	Date	Revision	App'd

Drawn	JL	Date 2014-12
Designed		EW
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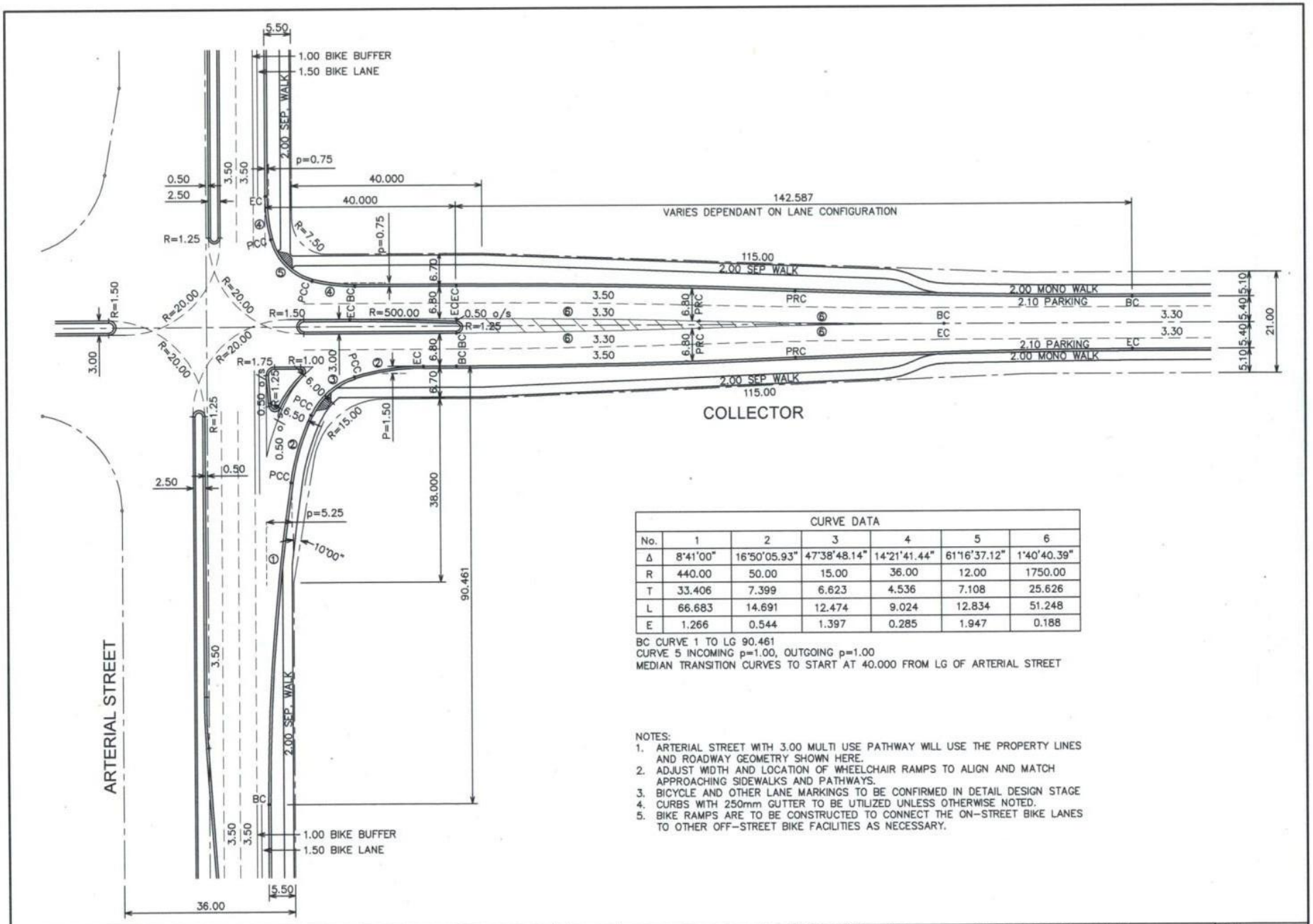
INTERSECTION DESIGN
COLLECTOR STREET–PARKING BOTH SIDES TO ARTERIAL STREET

Figure 28

File Number 454.1014.038



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E	1.266	0.544	1.397	0.285	1.947	0.188

BC CURVE 1 TO LG 90.461
CURVE 5 INCOMING p=1.00, OUTGOING p=1.00
MEDIAN TRANSITION CURVES TO START AT 40.000 FROM LG OF ARTERIAL STREET

NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

PERMIT
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Signature :
Date : 2015 A 01
PERMIT NUMBER : P 4428
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PROFESSIONAL ENGINEER ALBERTA
13 Jan 2015

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	JL	Date 2014-12
Designed		EW
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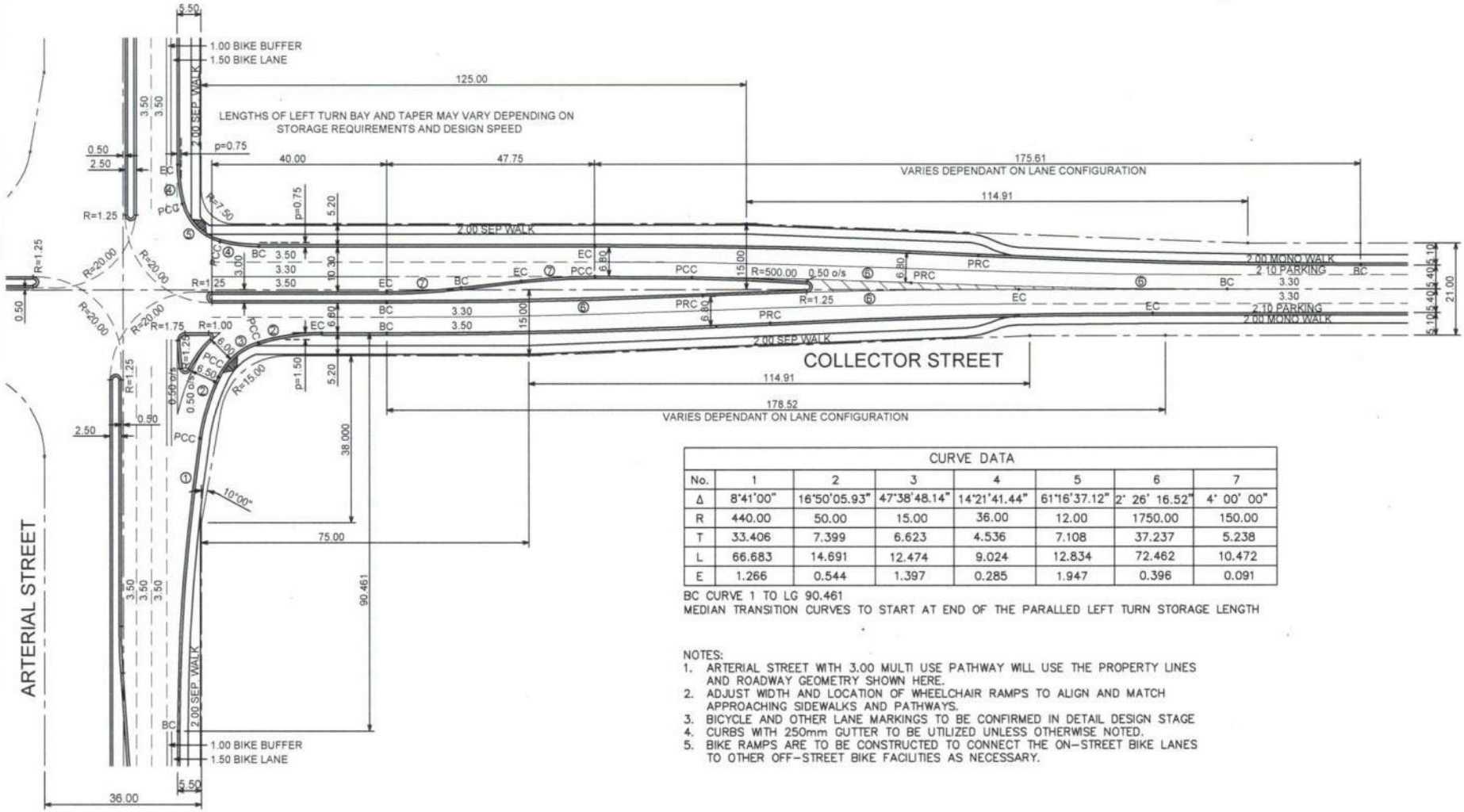
Scale:		NTS

INTERSECTION DESIGN
COLLECTOR STREET–PARKING BOTH SIDES TO ARTERIAL STREET–TEARDROP MEDIAN (BUS ROUTE)

Figure 29

File Number 454.1014.039



CURVE DATA							
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R	440.00	50.00	15.00	36.00	12.00	1750.00	150.00
T	33.406	7.399	6.623	4.536	7.108	37.237	5.238
L	66.683	14.691	12.474	9.024	12.834	72.462	10.472
E	1.266	0.544	1.397	0.285	1.947	0.396	0.091

BC CURVE 1 TO LG 90.461
MEDIAN TRANSITION CURVES TO START AT END OF THE PARALLED LEFT TURN STORAGE LENGTH

NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

PERMIT
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Signature :
Date : 22/5/A
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

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PROFESSIONAL ENGINEER ALBERTA
ROBERT J. TALARICO
13 Jan 2015

THE CITY OF CALGARY
ROADS

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FILE: Z:\permanent\DGSS_2014\dwg\454\1014\ACAD\454.1014.040.dwg
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ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn JL	Date 2014-12
Designed	EW
Checked	EW
Scale:	NTS

INTERSECTION DESIGN
COLLECTOR STREET–PARKING BOTH SIDES TO ARTERIAL STREET–LEFT TURN BAY

Figure 30
File Number 454.1014.040

Activity Centre Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
3,000 – 15,000	2	26.0 m

FUNCTION

- To provide a local street appropriate for activity nodes and corridors within a community
- To serve major activity centres (e.g. Transit Oriented Development), commercial and residential land uses
- Typical have parking on both sides with two travel lanes
- Street furniture, trees and other forms of green infrastructures are important elements
- Adjacent land uses are medium to high density mixed-use
- May serve as a bus route
- High priority for transit, cycling and walking modes

ACCESS CONDITIONS

Industrial Properties	Not permitted	• Access to properties should be from back lanes • Activity Centre Streets may intersect with Local Arterial Streets, Liveable streets, Primary Collector Streets, Collector Streets, other Activity Centre Streets and Residential streets • Activity Centre Street intersecting with Arterial Street is not desirable
Commercial Properties	Generally not permitted	
Multi-Residential Properties	Generally not permitted	
Residential Properties	Not permitted	
Lane (Alley)	Permitted	

NOTE

- Activity Centre Streets are 2-lane undivided roadways with bike lanes and parking
- Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at the crosswalk areas
- Standard curb is to be used in areas identified as bus zones and adjacent to parcels which will not contain residential development (e.g. commercial sites, parks, school reserves, etc.)
- Standard curb is to be used if the grade is greater than 6% where there are no driveways
- Reverse gutter is used where necessary
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	3.3 m	**Posted Speed (km/h)**	50 km/h
Basic Width	15.4 m	**Parking**	2.1 m and 0.8m door zone buffer (with bike lane)
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	0.25 m rolled C&G	**Pedestrian Crossing**	At grade
Median Width	None	**On-street Bike Route**	Yes
Sidewalk Width	2.5 m separate walk on both sides	**Bus Route**	Yes
Multi-Use Pathway	None	**Truck Route**	No
Bike Lane Width	1.5 m with no buffer	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	Minimum intersection spacing = 60 m
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	90 m, 130 m – 6000 m (desirable)

MEDIAN & LEFT TURN BAY

- Median, left turn bays and intersection channelization are not normally required

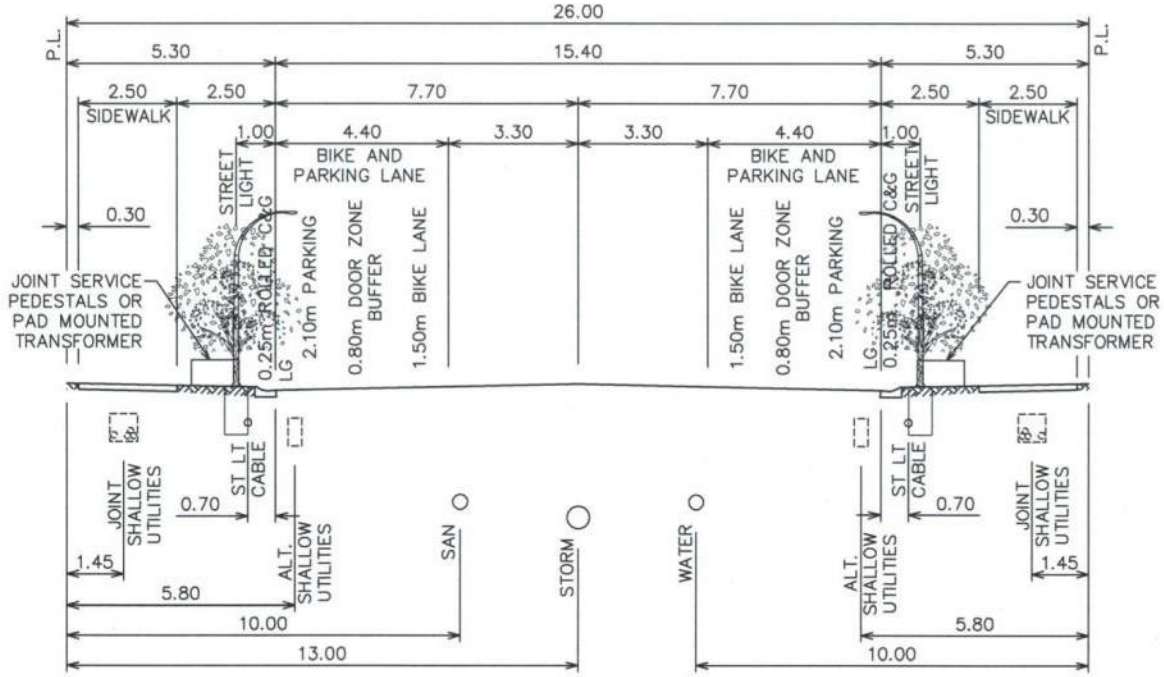
VERTICAL ALIGNMENT	
Maximum Grade	8%
Minimum Grade	0.6%
Maximum Superelevation	4%

GRADE AT INTERSECTIONS

- The grade line of the approaching street (maximum approach grade of 4%) shall tie to the Activity Centre Street in the following manner:
  - Tie to the property line grade if the approaching street is undivided
  - Tie to the lane line of the Activity Centre Street with a vertical curve of a minimum length of 30 m if the approaching street is divided, i.e. the crossfall (or 2% if the road is crowned) of the Activity Centre Street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Activity Centre Street
- For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112
- It is desirable to ensure that the grade on the Activity Centre Street is less than the permitted maximum 8% at intersections to improve operational aspects such as stopping and starting in winter conditions

VERTICAL CURVES & SUPERELEVATION

- The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107
- The maximum and minimum grades also apply to the development of superelevation
- For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Pages 124 & 125



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 4.00 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 4.00 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature :
Date : 2015 Aug 11
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL

THE CITY OF CALGARY ROADS

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FILE: Z:\permanent\DGSS_2014\dwg\4541008\ACAD\454.1008.066.dwg
DATE: Wednesday, January 21, 2015 2:58:39 PM
ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn JL	Date 2014-12
Designed	EW
Checked	EW
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CROSS SECTION ACTIVITY CENTRE STREET

Figure 31

File Number 454.1008.066

Industrial Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
3,000 – 12,000	2	19.0 m

FUNCTION

- To serve direct access to adjacent industrial and commercial properties
- To collect and distribute traffic from industrial and commercial properties to Arterial Streets
- May operate as a segment of bus route
- High priority for goods movement

ACCESS CONDITIONS

Industrial Properties	Permitted
Commercial Properties	Permitted
Multi-Residential Properties	Not permitted
Residential Properties	Not permitted
Lane (Alley)	Permitted

- Industrial Streets may intersect with Arterial Streets, Industrial Arterial Streets and other Industrial Streets

NOTE

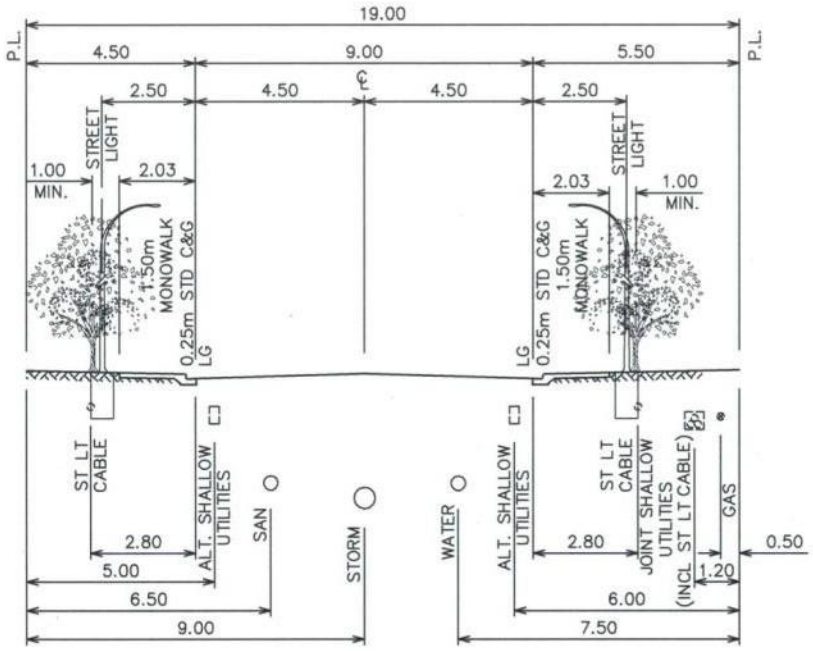
- Industrial Streets (9.0 m/ 19.0 m) are 2-lane undivided roadways with no bike lane and no parking allowed
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Page 97-102
- The pavement width of Industrial Streets can be widened to 12.0 m as an option to improve manoeuvrability for trucks, or parking on one side at the discretion of Transportation Department, the R.O.W. requirements will be increased to 22.0 m

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	4.5 m	**Posted Speed (km/h)**	50 km/h
Basic Width	9.0 m	**Parking**	None
Paved Shoulder	None	**Traffic Signals**	As warranted
Curb & Gutter	0.25 m standard C&G	**Pedestrian Crossing**	At grade
Median Width	None	**On-street Bike Route**	No
Sidewalk Width	1.5 m monowalk on both sides	**Bus Route**	Yes
Multi-Use Pathway	None	**Truck Route**	Yes
Bike Lane Width	None	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	Minimum intersection spacing = 60 m
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	• 80 m • Radii less than 80 m are acceptable if accompanied by pavement widening (e.g. bulb)
MEDIAN & LEFT TURN BAY	
• Median, left turn bays and intersection channelization are not normally required	
VERTICAL ALIGNMENT	
Maximum Grade	• 10% • 8% for Cul-de-sac
Minimum Grade	0.6%
Maximum Superelevation	None
GRADE AT INTERSECTIONS	

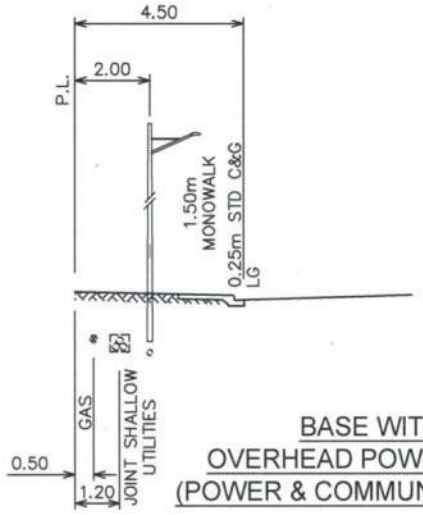
• The minimum and maximum grades for a cul-de-sac bulb are 1.0% and 4% respectively, as measured from the beginning of the bulb to the top of the bulb
• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the Industrial Street in the following manner:
  o Tie to the property line grade if the approaching street is undivided
  o Tie to the lane line of the Industrial Street with a vertical curve of a minimum length of 30 m if the approaching street is divided, i.e. the crossfall (or 2% if the road is crowned) of the Industrial Street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Industrial Street
• For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112	

VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • Superelevation is not required	



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD RIGHT-OF-WAY ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE BOULEVARD.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 2.00 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 2.00 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES OFFSET MINIMUM 1.00m FROM SIDEWALK.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.



BASE WITH
OVERHEAD POWER POLE
(POWER & COMMUNICATIONS)

PERMIT
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THE CITY OF CALGARY
Signature :
Date : 2015 Aug 11
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL
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2015/08/01

THE CITY OF CALGARY
ROADS

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FILE: Z:\permanent\DGSS_2014\dwg\4541008\ACAD\454.1008.067.dwg
DATE: Wednesday, January 21, 2015 3:00:39 PM
ISC: UNRESTRICTED

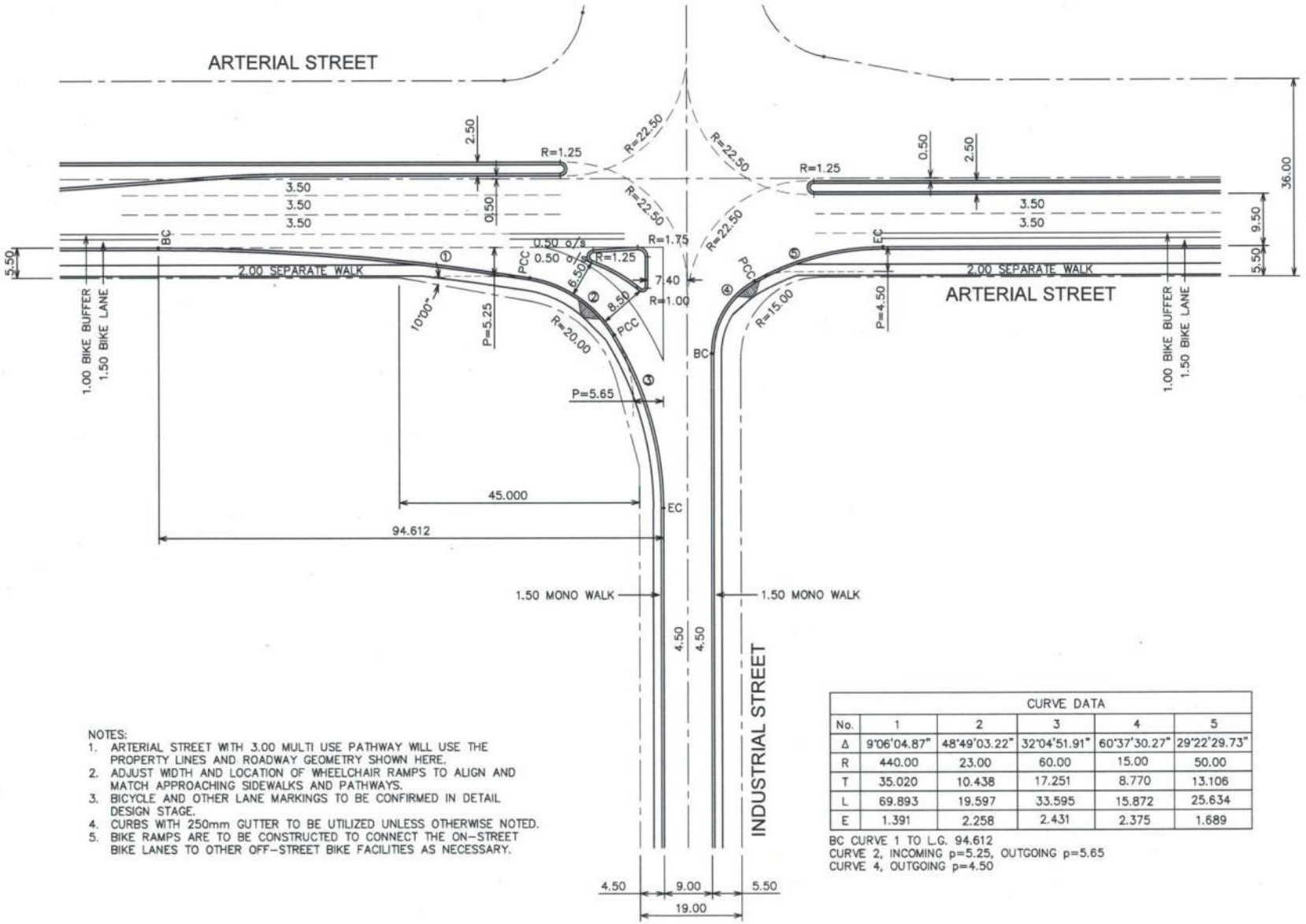
No.	Date	Revision	App'd

Drawn	JL	Date 2014-12
Designed	EW	
Checked	EW	
Scale:	NTS	

CROSS SECTION
INDUSTRIAL STREET
NO PARKING

Figure 32

File Number 454.1008.067



NOTES:
1. ARTERIAL STREET WITH 3.00 MULTI USE PATHWAY WILL USE THE PROPERTY LINES AND ROADWAY GEOMETRY SHOWN HERE.
2. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
3. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
4. CURBS WITH 250mm GUTTER TO BE UTILIZED UNLESS OTHERWISE NOTED.
5. BIKE RAMPS ARE TO BE CONSTRUCTED TO CONNECT THE ON-STREET BIKE LANES TO OTHER OFF-STREET BIKE FACILITIES AS NECESSARY.

CURVE DATA					
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Δ	9°06'04.87"	48°49'03.22"	32°04'51.91"	60°37'30.27"	29°22'29.73"
R	440.00	23.00	60.00	15.00	50.00
T	35.020	10.438	17.251	8.770	13.106
L	69.893	19.597	33.595	15.872	25.634
E	1.391	2.258	2.431	2.375	1.689

BC CURVE 1 TO L.G. 94.612
CURVE 2, INCOMING p=5.25, OUTGOING p=5.65
CURVE 4, OUTGOING p=4.50

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13 Jan 2015

THE CITY OF CALGARY
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ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	Date
JL	2014-12
Designed	EW
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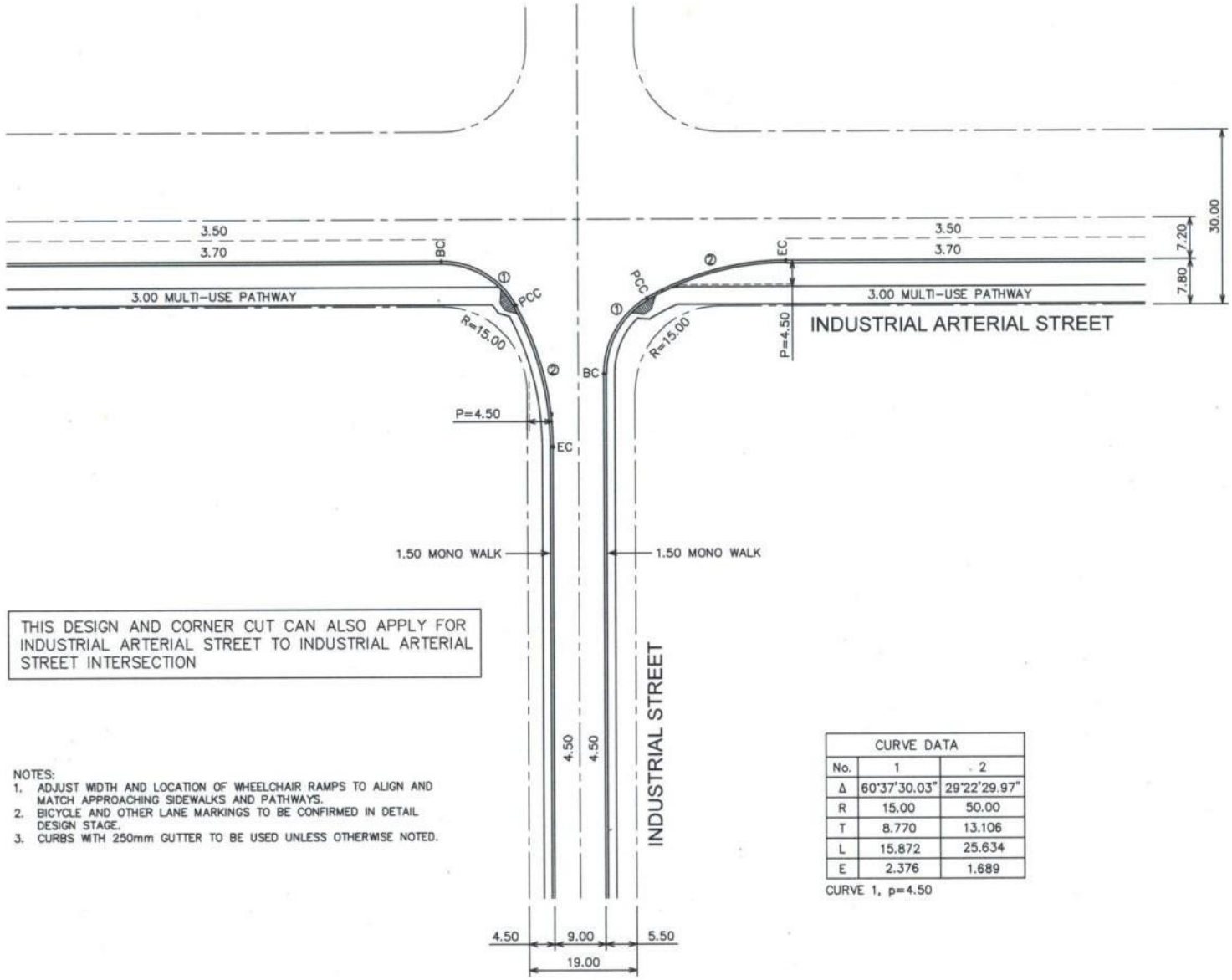
Scale:	NTS

INTERSECTION DESIGN INDUSTRIAL STREET TO ARTERIAL STREET

Figure 33

File Number 454.1014.041



THIS DESIGN AND CORNER CUT CAN ALSO APPLY FOR INDUSTRIAL ARTERIAL STREET TO INDUSTRIAL ARTERIAL STREET INTERSECTION

NOTES:
1. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
2. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
3. CURBS WITH 250mm GUTTER TO BE USED UNLESS OTHERWISE NOTED.

CURVE DATA		
No.	1	2
Δ	60°37'30.03"	29°22'29.97"
R	15.00	50.00
T	8.770	13.106
L	15.872	25.634
E	2.376	1.689

CURVE 1, p=4.50

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THE CITY OF CALGARY ROADS

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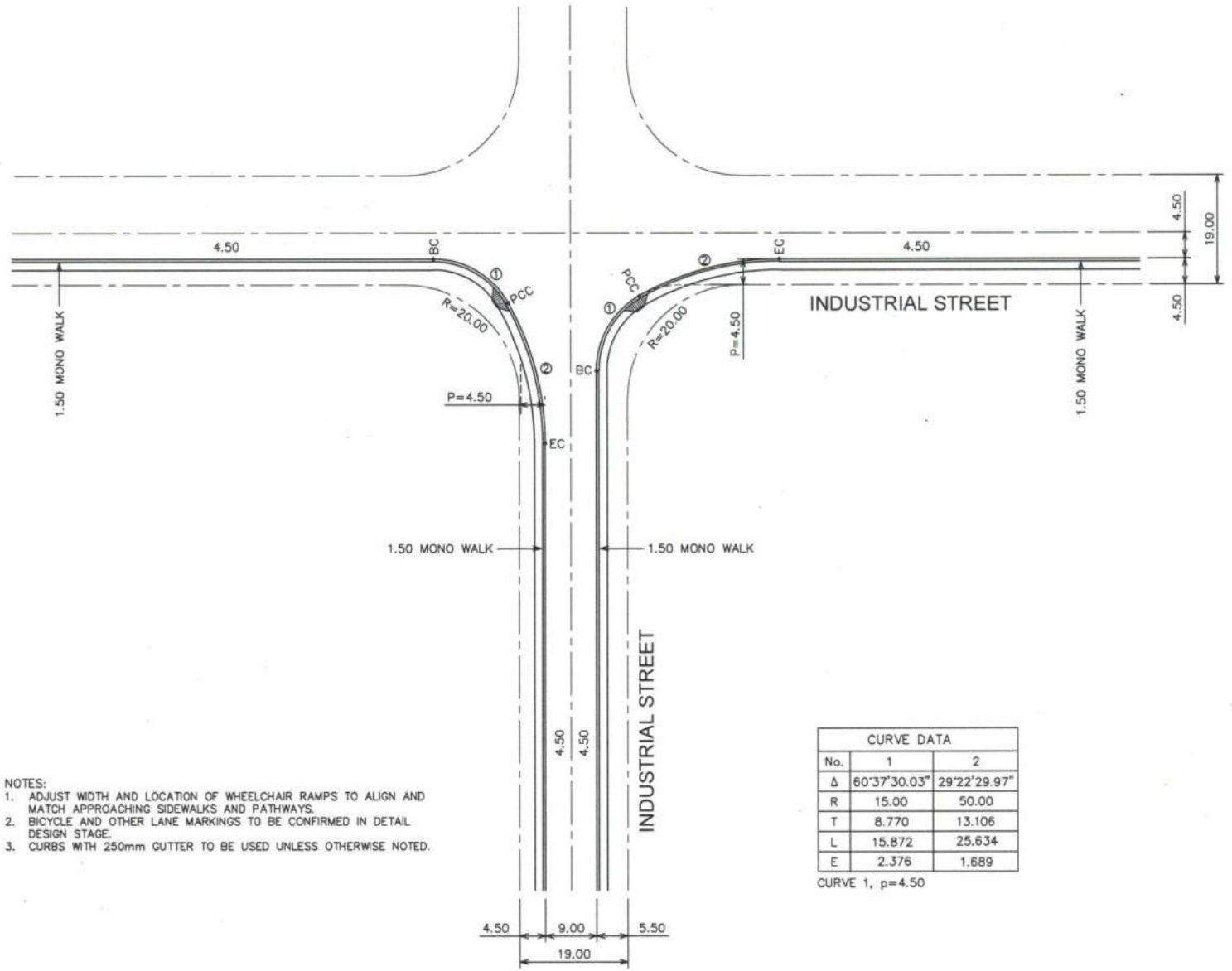
Drawn	JL	Date 2014-12
Designed	EW	
Checked	EW	
Scale:	NTS	

INTERSECTION DESIGN INDUSTRIAL STREET TO INDUSTRIAL ARTERIAL STREET

Figure 34

File Number 454.1014.042



NOTES:
1. ADJUST WIDTH AND LOCATION OF WHEELCHAIR RAMPS TO ALIGN AND MATCH APPROACHING SIDEWALKS AND PATHWAYS.
2. BICYCLE AND OTHER LANE MARKINGS TO BE CONFIRMED IN DETAIL DESIGN STAGE.
3. CURBS WITH 250mm GUTTER TO BE USED UNLESS OTHERWISE NOTED.

CURVE DATA		
No.	1	2
Δ	60°37'30.03"	29°22'29.97"
R	15.00	50.00
T	8.770	13.106
L	15.872	25.634
E	2.376	1.689

CURVE 1, p=4.50

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13 Jan 2015

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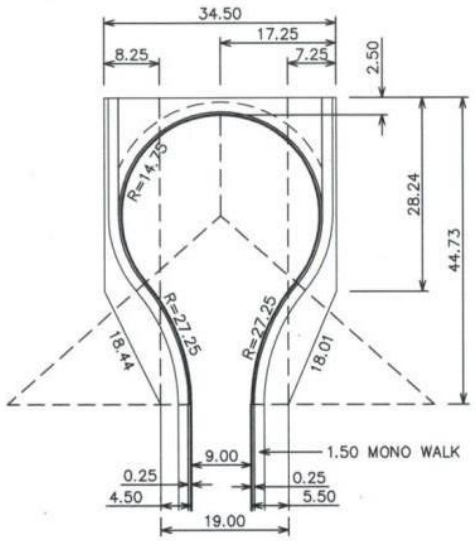
Scale:	NTS	

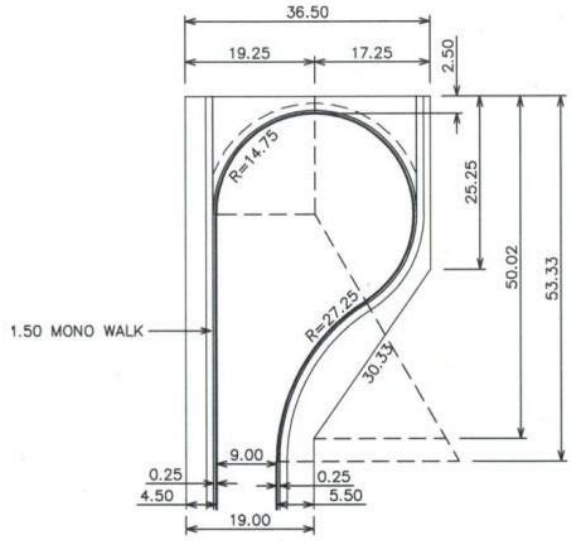
INTERSECTION DESIGN INDUSTRIAL STREET TO INDUSTRIAL STREET

Figure 35

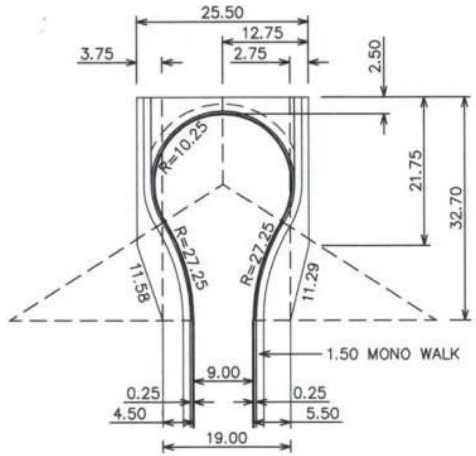
File Number 454.1014.043



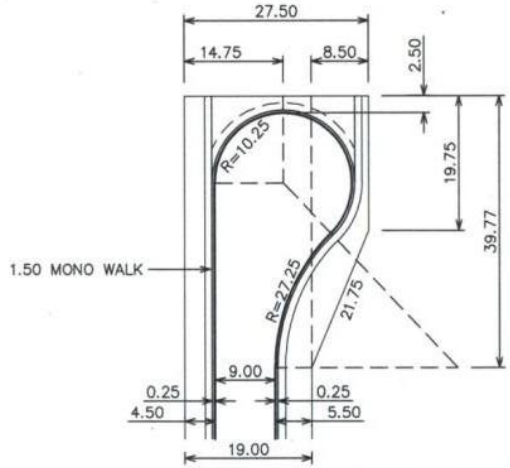
INDUSTRIAL STREET (ABSOLUTE MINIMUM)
ROAD WIDTH = 9.00
NO PARKING IN CUL-DE-SAC
MINIMUM DESIGN TST VEHICLE
MANEUVERING REQUIRED



INDUSTRIAL STREET (ABSOLUTE MINIMUM)
ROAD WIDTH = 9.00
NO PARKING IN CUL-DE-SAC
MINIMUM DESIGN TST VEHICLE
MANEUVERING REQUIRED



INDUSTRIAL STREET (ABSOLUTE MINIMUM)
ROAD WIDTH = 9.00
NO PARKING IN CUL-DE-SAC
MINIMUM DESIGN SU VEHICLE
MANEUVERING REQUIRED



INDUSTRIAL STREET (ABSOLUTE MINIMUM)
ROAD WIDTH = 9.00
NO PARKING IN CUL-DE-SAC
MINIMUM DESIGN SU VEHICLE
MANEUVERING REQUIRED

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ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn JL	Date 2014-12
Designed	EW
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TYPICAL CUL-DE-SAC DESIGNS FOR INDUSTRIAL STREET

Figure 36

File Number 454.1004.010

Residential Streets	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
≤2,000	2	16.0 m / 18.4 m / 22.5 m

FUNCTION

- To provide direct access to adjacent residential properties
- To collect and distribute traffic from residential properties to Collector and Residential Streets
- High priority for cycling and walking modes
- Green infrastructure should be incorporated wherever possible

ACCESS CONDITIONS

Industrial Properties	Not permitted
Commercial Properties	Not Permitted
Multi-Residential Properties	Permitted
Residential Properties	Permitted
Lane (Alley)	Permitted

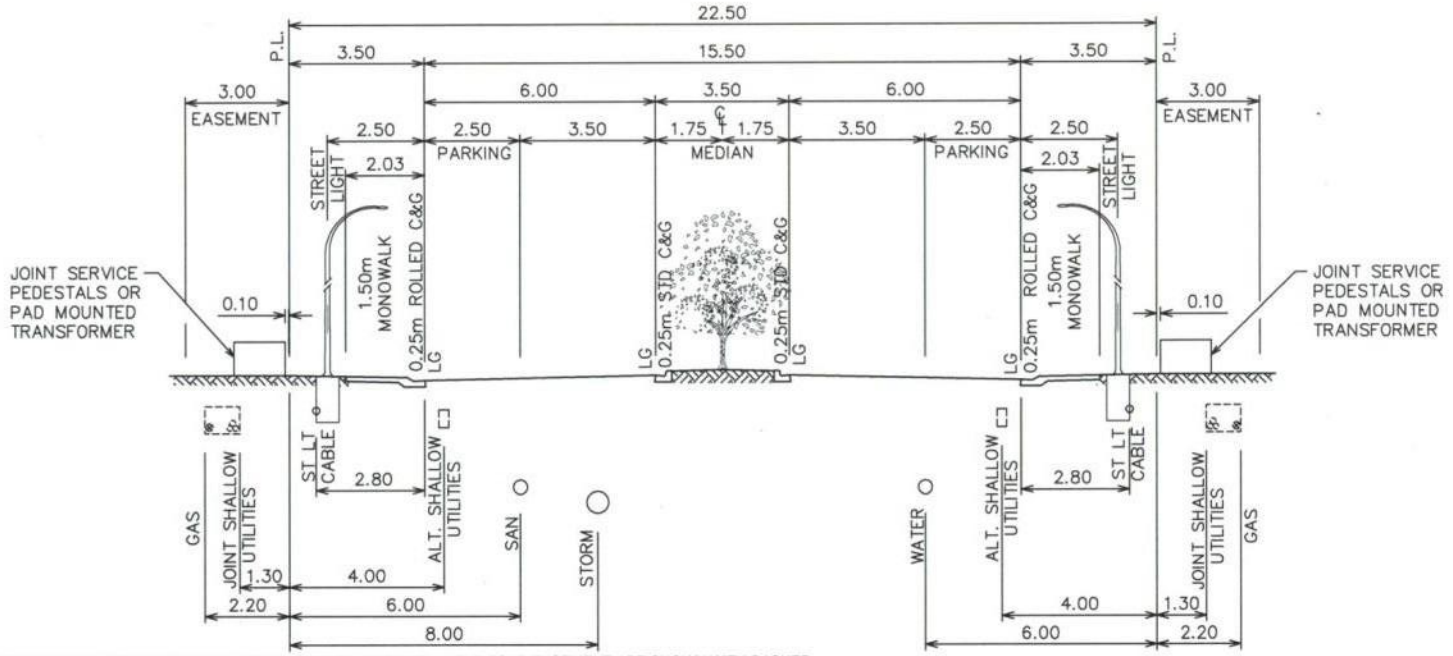
- Residential Streets are roadways with intersections controlled by signage
- Residential streets may intersect with Liveable streets, Primary Collector Streets, Collector Streets, Activity Centre Streets and other Residential streets

NOTE

- Parking permitted on both sides but may be restricted under special circumstances
- There are three types of Residential Streets (undivided roadways):
  - Residential 'M' – monowalk on both sides with no rear lane and front drives. This standard cannot be applied to flankage lots
  - Residential 'M-L'- monowalk on both sides with rear lanes
  - Residential 'SW-L' separate walk on both sides with rear lanes
- Residential Entrance Streets with a centre median can also be used (divided roadway):
  - 22.5 m R.O.W. - no frontage lot
  - 23.5 m R.O.W. – with frontage lots
- The cumulative length of a Residential Street before feeding onto a Collector should not be excessive. The maximum number of dwelling units serviced shall not exceed 100
- For corner radii and property corner cut requirements, see Corner Radii & Corner Details, Pages 97-102

BASE CROSS-SECTION		**BASE TRAFFIC FEATURES**	
Travel Lane Width	N/A	**Posted Speed (km/h)**	50 km/h
Basic Width	• Residential 'M' – 8.5 m • Residential 'M-L' – 9.0 m • Residential 'SW-L' – 9.0 m • Entrance Streets: o 2 x 6.0 m (no frontage lot) o 2 x 6.5 m (with frontage lots)	**Parking**	Yes
Paved Shoulder	None	**Traffic Signals**	None
Curb & Gutter	• 0.25 m rolled C&G • Median: 0.25 m Standard C&G	**Pedestrian Crossing**	At grade
Median Width	3.5 m for Residential Entrance Street	**On-street Bike Route**	Signed Bicycle Route
Sidewalk Width	1.5 m separate walk OR 1.5 m mono-walk on both sides	**Bus Route**	No
Multi-Use Pathway	None	**Truck Route**	No
Bike Lane Width	None	**Sound Attenuation**	No

HORIZONTAL ALIGNMENT	
Minimum Intersection Spacing	Minimum intersection spacing = 60 m
Design Speed	50 km/h
Minimum Stopping Sight Distance	65 m
Minimum Centreline Radius	• 80 m • Radii less than 80 m are acceptable if accompanied by pavement widening (e.g. bulb) • The minimum cul-de-sac and bulb radius is 10.5 m and the minimum radius for the approach curves to the bulb is 21.0 m, see Figure 40, Page 71
MEDIAN & LEFT TURN BAY	
• Left turn bays and intersection channelization are not required • Medians are used in Residential Entrance Streets and Residential "bays" with a minimum width of 3.5 m • The road width for the turnaround at the top of the bay is of minimum 9.5 m for all cases • If the bay is at a T-intersection, 2-way traffic permitted; if at a 4-way intersection, only one-way permitted	
VERTICAL ALIGNMENT	
Maximum Grade	• 12% if alternate access of 8% or less is available • Cul-de-sac = 8%
Minimum Grade	0.6%
Maximum Superelevation	None
GRADE AT INTERSECTIONS	
• The minimum and maximum grades for a cul-de-sac bulb are 1.0% and 4% respectively, as measured from the beginning of the bulb to the top of the bulb • The grade line of the approaching street (maximum approach grade of 4%) shall tie to the property line grade of a Residential Street	
VERTICAL CURVES & SUPERELEVATION	
• The length of vertical curve is calculated based on the stopping sight distance as shown in Figure 48, Page 107 • For Intersection Approach Grades and Vertical Curve Requirements, see Figure 53, Page 112 • Superelevation is not required	



NOTES:

1. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE ROAD EASEMENT ARE SHOWN WITH DASHED LINES.
2. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE EASEMENT.
3. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
4. HYDRANTS ON 1.00 LINE.
5. HYDRANT VALVES 1.00m FROM WATER LINE.
6. SERVICE VALVES ON 1.00 LINE.
7. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
8. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
9. TREES ON CENTRELINE OF MEDIAN.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. NON CANOPY TREES PERMITTED UNDER OVERHEAD POWERLINES WITH CONSENT OF UTILITY OPERATOR.
12. BUS LOADING ZONES MUST BE CONSIDERED WHEN LOCATING TREES AND UNDERGROUND/SURFACE UTILITIES.
13. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
14. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
15. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
16. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS AND BIKE LANES.
17. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
18. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
19. ROAD AND BOULEVARD WIDTH MAY VARY TO ACCOMMODATE BICYCLE FACILITIES.
20. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
21. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

FOR FRONTAGE LOTS

LG TO LG DIMENSION - 6.50m
R.O.W. DIMENSION - 23.50m

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THE CITY OF CALGARY
Signature :
Date : 2016 Feb 30
PERMIT NUMBER : P 4428
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2016-02-03

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DATE: Thursday, February 04, 2016 9:22:53 AM
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No.	Date	Revision	App'd
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Drawn	Date 2014-12
Designed	EW
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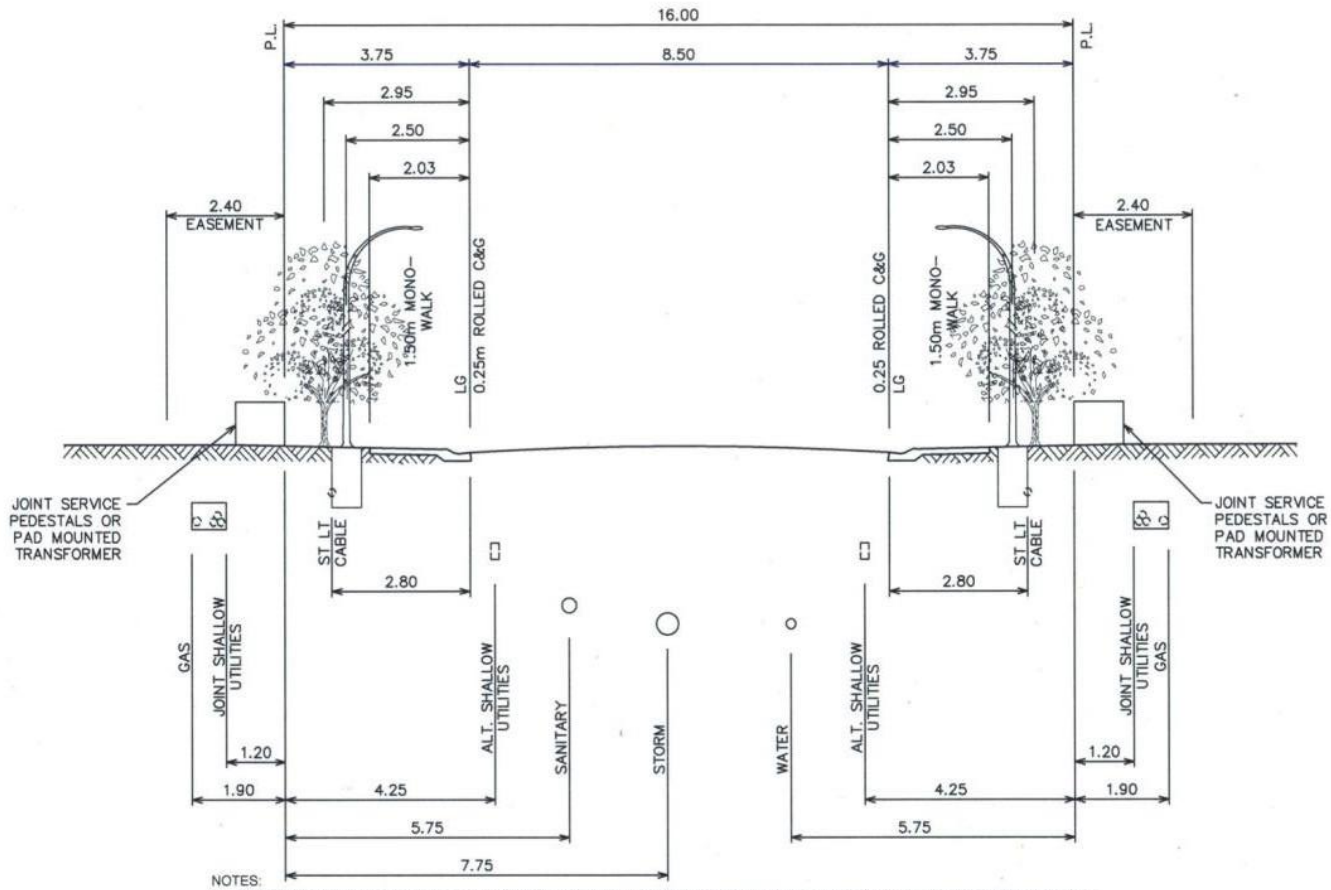
CROSS SECTION
RESIDENTIAL ENTRANCE STREET

Figure 37
File Number 454.1008.068



NOTES:

1. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS NO REAR LANE WITH FRONT DRIVE ONLY. THIS STANDARD CANNOT BE APPLIED TO FLANKAGE LOTS.
2. THE RECOMMENDED LOCATIONS FOR THE SHALLOW UTILITIES WITHIN THE EASEMENT ARE SHOWN WITH DASHED LINES.
3. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE EASEMENT.
4. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
5. HYDRANTS ON 1.00 LINE.
6. HYDRANT VALVES 1.00m FROM WATER LINE.
7. SERVICE VALVES ON 1.00 LINE.
8. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
9. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
12. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
13. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
14. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS.
15. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
16. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
17. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.

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No.	Date	Revision	App'd

Drawn JL	Date 2014-12
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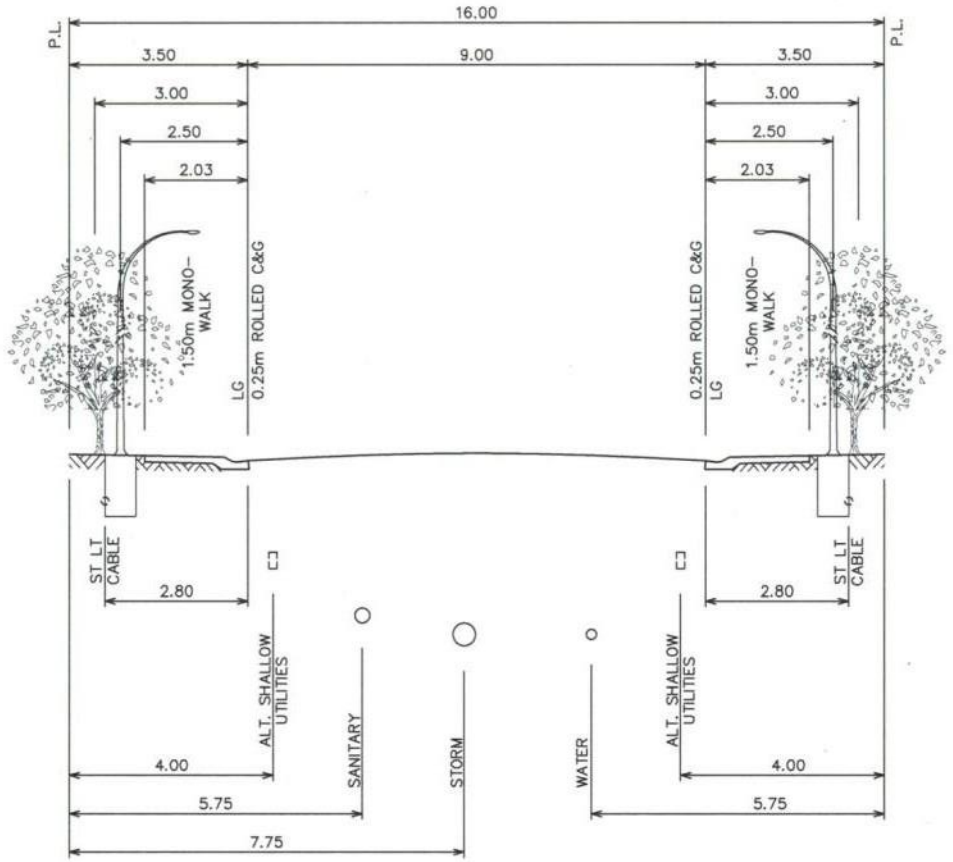
Scale:	NTS

CROSS SECTION
RESIDENTIAL STREET "M"
MONO-WALK, NO REAR LANE

Figure 38

File Number 454.1008.069



NOTES:

1. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS REAR LANE.
2. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES.
3. ALT. UTILITIES IS AN ALTERNATIVE LOCATION FOR ANY UTILITY THAT CANNOT BE ACCOMMODATED IN THE REAR LANE.
4. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
5. HYDRANTS ON 1.00 LINE.
6. HYDRANT VALVES 1.00m FROM WATER LINE.
7. SERVICE VALVES ON 1.00 LINE.
8. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
9. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
12. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
13. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
14. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS.
15. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
16. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
17. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
18. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

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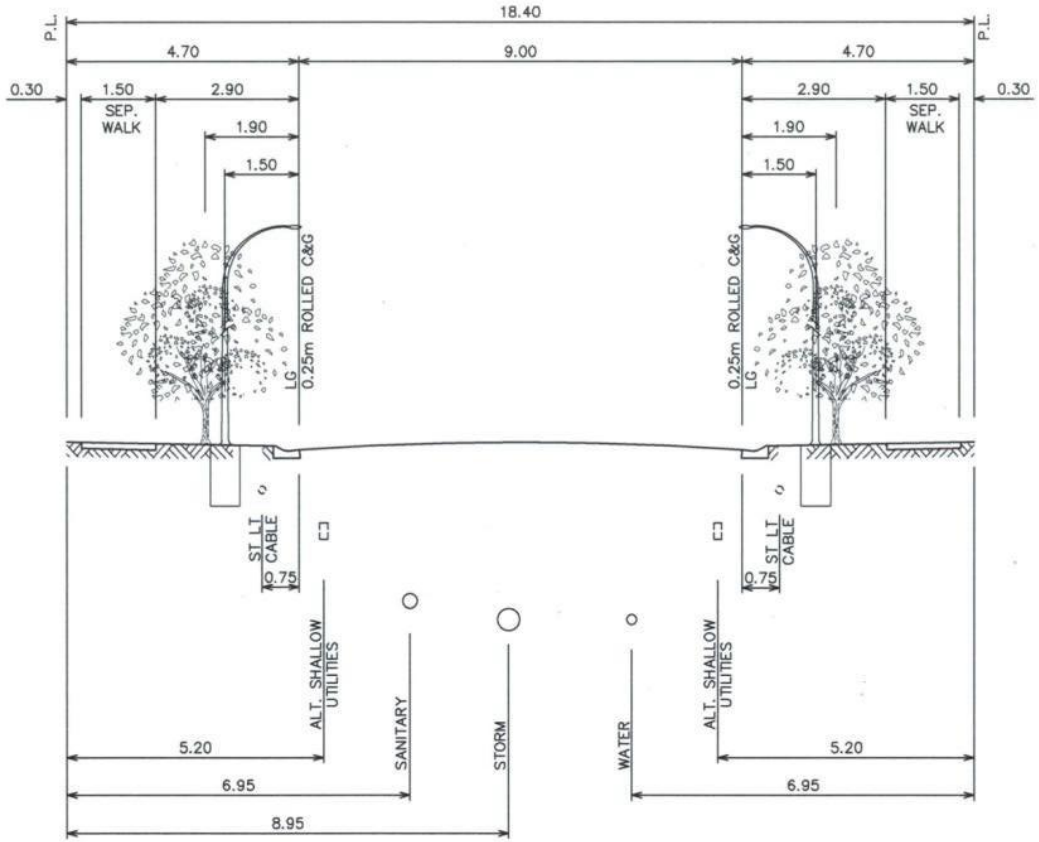
No.	Date	Revision	App'd

Drawn JL	Date 2014-12
Designed	EW
Checked	EW
Scale:	NTS

CROSS SECTION
RESIDENTIAL STREET "M-L"
MONO-WALK WITH REAR LANE

Figure 39

File Number 454.1008.070



NOTES:

1. CROSS SECTION TO BE APPLIED ONLY WHERE THERE IS REAR LANE.
2. SHALLOW UTILITIES TO BE LOCATED IN REAR LANES.
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4. UTILITY LINE ASSIGNMENTS MUST BE CONFIRMED DURING THE PLANNING STAGE OF UTILITIES AND PRIOR TO THE APPROVAL OF TENTATIVE PLAN.
5. HYDRANTS ON 3.00 LINE.
6. HYDRANT VALVES 1.00m FROM WATER LINE.
7. SERVICE VALVES ON 3.00 LINE.
8. HYDRANTS AND SERVICE VALVES SHALL MAINTAIN A MINIMUM 3.00m SEPARATION TO CENTRELINE OF POWER POLES, STREETLIGHTS, TREES, AND THE EDGE OF TRANSFORMERS, PULL BOXES, JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.
9. TREE AND STREET LIGHT POLES SHALL BE PLACED WITH A MINIMUM OF 4-5m APART DEPENDING ON THE TREE SPECIES.
10. TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS AND ALL TREES TO BE SHALLOW ROOT SPECIES.
11. TYPICAL 2% GRADE FOR ROAD CROSS-SLOPE AND BOULEVARD.
12. WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM AND SANITARY LINES.
13. ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM AND AND SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
14. THE AVERAGE VEHICULAR WHEEL PATHS ARE BETWEEN 1.05m (PASSENGER VEHICLES) AND 1.30m (BUSSES/TRUCKS) FROM CENTRELINE OF DRIVING LANES, MANHOLES IN ROADWAY SHOULD BE INSTALLED OUTSIDE OF VEHICULAR WHEEL PATHS.
15. PRE-SERVICED DEEP UTILITY CONNECTIONS TO BE INSTALLED 3.50m INSIDE PROPERTY LINE, OR AN ADDITIONAL 1.50m BEYOND AN EXISTING UTILITY EASEMENT.
16. OFFSETTING ROADWAY CENTRELINE WITHIN THE RIGHT-OF-WAY IS NOT RECOMMENDED DUE TO POTENTIAL FUTURE UTILITY CONFLICTS.
17. POSITIONING AND VISIBILITY OF REQUIRED SIGNAGE MUST BE CONSIDERED RELATIVE TO ALL SURFACE STRUCTURES AND PLANTINGS.
18. THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.

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Date : 2015 April 1
PERMIT NUMBER : P 4428
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THE CITY OF CALGARY
ROADS

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Drawn JL	Date 2014-12
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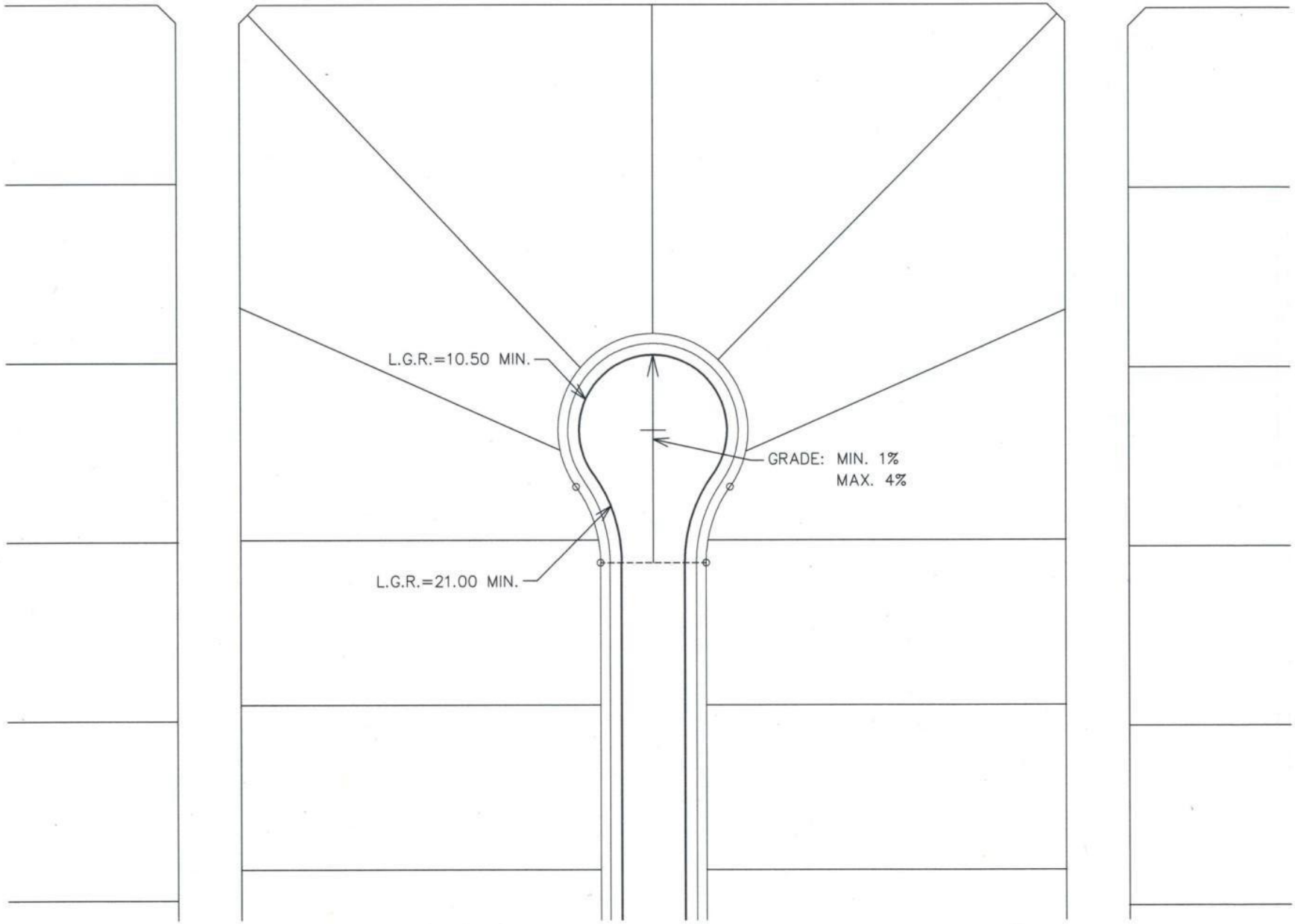
CROSS SECTION
RESIDENTIAL STREET "SW-L"
SEPARATE-WALK WITH REAR LANE

Figure 40

File Number 454.1008.071



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ROBERT J. TALARICO
13 Jan 2015

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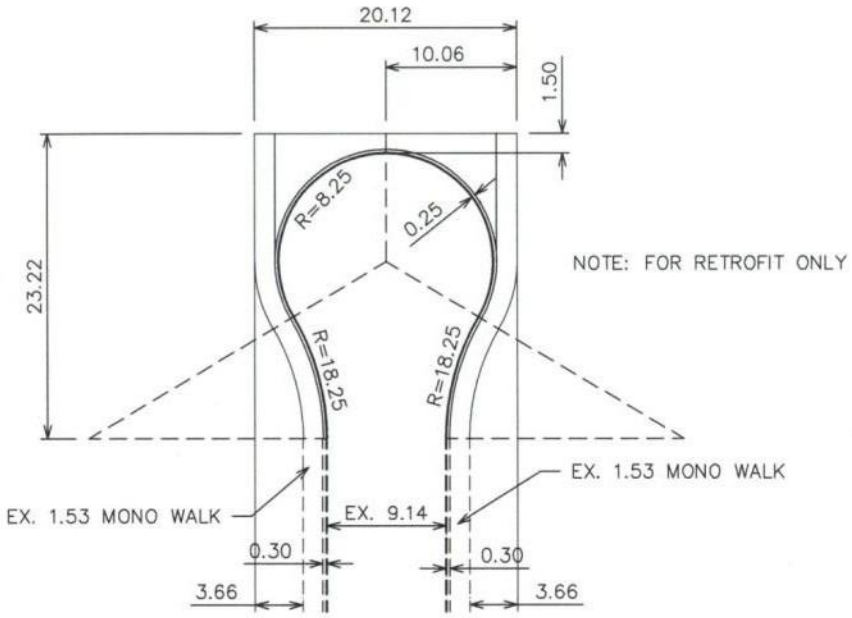
TYPICAL CUL-DE-SAC DESIGN FOR RESIDENTIAL STREET

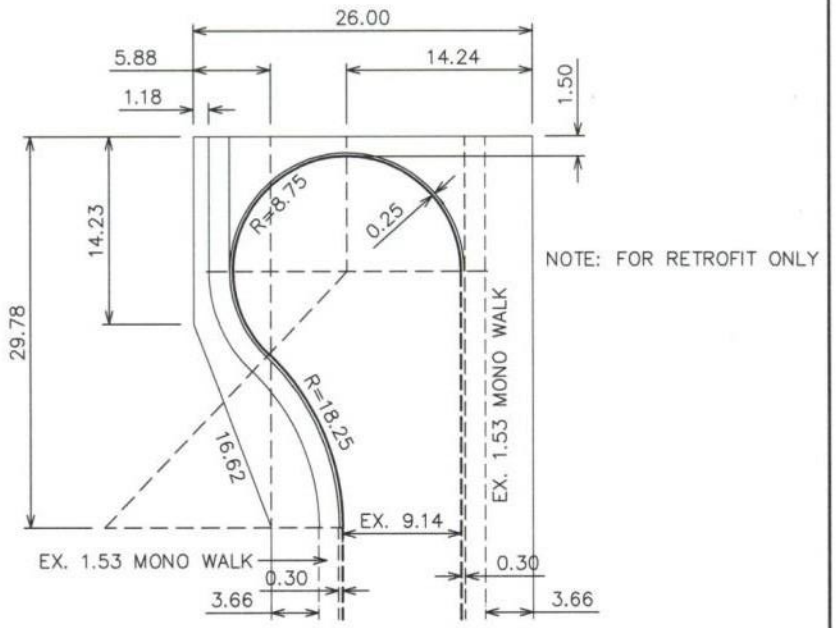
Figure 41

File Number 454.1004.004



STANDARD CUL–DE–SAC

RESIDENTIAL STREET (ABSOLUTE MINIMUM)
EXISTING R/W – 20.12
EXISTING ROAD WIDTH = 9.14
NO PARKING IN CUL–DE–SAC
MINIMUM DESIGN P. VEHICLE
MANEUVERING REQUIRED FOR SU VEHICLE



OFFSET CUL–DE–SAC

RESIDENTIAL STREET (ABSOLUTE MINIMUM)
EXISTING R/W – 20.12
EXISTING ROAD WIDTH = 9.14
NO PARKING IN CUL–DE–SAC
MINIMUM DESIGN P. VEHICLE
MANEUVERING REQUIRED FOR SU VEHICLE

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TYPICAL CUL–DE–SAC DESIGNS FOR 20.12m R.O.W. RESIDENTIAL STREET (RETROFIT ONLY)

Figure 42
File Number 454.1004.002

Lanes (Alleys)	*Definition and Design Elements*	
DAILY TRAFFIC VOLUME (vehicles/day)	**NUMBER OF LANES**	**RIGHT-OF-WAY REQUIREMENT**
≤1,500 (Inner City) ≤ 500 (Outer City)	1	7.0 m / 8.0 m / 10.0 m

FUNCTION

- To provide direct rear access to abutting low to high density residential properties
- Lanes also provide a service access for garbage collection, deliveries, loading/unloading, and may serve as an alternate alignment for shallow, deep or overhead utilities
- High priority for autos

NOTE

- Lanes are graded for the full cross section and gravelled as per specification file number 454.1011.003
- All lanes shall be constructed in accordance with the current edition of the City of Calgary – Roads Construction Standard Specifications and shall consist one of the following:
    - Deep base grading and gravelling
    - Full depth asphaltic concrete paving (all lanes adjacent to commercial properties except in the downtown core)
    - Asphaltic concrete paving on a granular base
    - Asphaltic concrete paving on a soil cement base
    - Portland Cement concrete paving (all lanes in the downtown core)

HORIZONTAL ALIGNMENT

- The maximum length of lanes between exits to streets shall not exceed 350 m
- The lane layout shall be reviewed to discourage vehicle shortcutting
- The length of drainage in lanes shall be minimized
- Any drainage length over 175 m is subject to review by the Water Resources Business Unit
- The maximum length of drainage in lanes shall be 350 m, cumulative, to any one catch basin or catch basins
- Where catch basins are located in lanes, it will be necessary to compact utility trenches and pave 23.0 m in each direction from the catch basin
- Trapped lows in lanes should be avoided wherever possible
- The developers shall be responsible for erosion control and any design or construction deficiencies during the maintenance period of the subdivision, and all work performed shall be to the satisfaction of the approving authority of the Transportation Department
- Corner Cuts must be provided at all lane to lane intersections and are to be determined based on the turning path of a SU-9 vehicle
- An alternate is to provide a widening at one corner of the lane intersection as shown on Figure 45, Page 80

VERTICAL ALIGNMENT

Maximum Grade	12%
Minimum Grade	0.6%
Maximum Superelevation	None

- Lanes shall be deep gravel based when the following conditions exist, see standard specification file number 454.1011.003, also see example of requirements in Figure 47, Page 96:

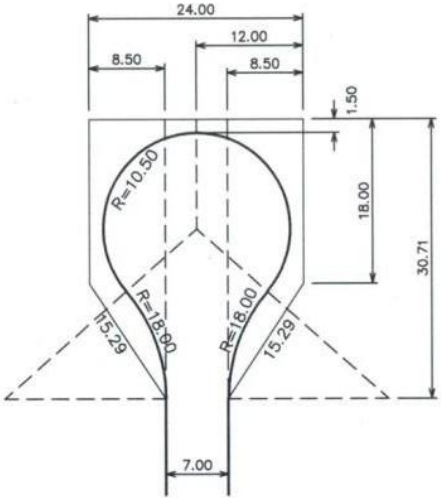
  a) At horizontal lane intersections for 5.0 m beyond intersection, measured from the property line corner cut, if any

  b) When the lane grade is 5% or greater, the portion of the lane in excess of 75m from the source of drainage shall be deep based

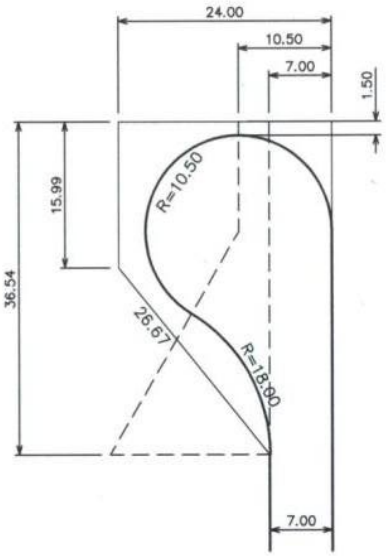
  When a lane with 5% or greater intersects or continues with a lane with flatter grade, the latter lane shall be deep based for the following lengths:

  c) Up to 2% 30 m
  d) 2 % to 3% 45 m
  e) 3% and over total length

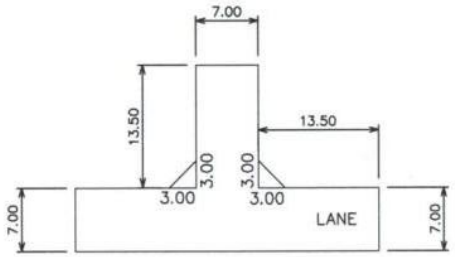
- If the concrete drainage swale drains in to a lane, then a catch basin must be installed complete with asphalt apron at the point of discharge. Details must be reviewed and approved by the Water Resources Business Unit
- Alternately, if a catch basin cannot be installed, then the lane must be paved from a point 3.0 m upgrade from the point of discharge all the way downgrade to where the lane connects to the street



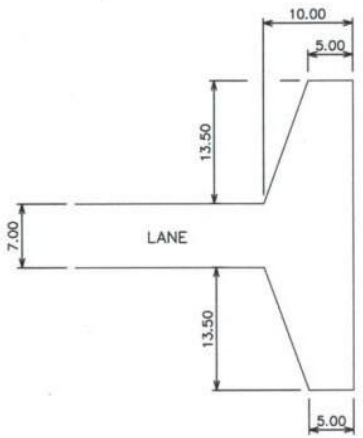
EXISTING LANE R/W = 7.00
EXISTING ROAD WIDTH = 7.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED



EXISTING LANE R/W = 7.00
EXISTING ROAD WIDTH = 7.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED



TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 7.00



TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 7.00

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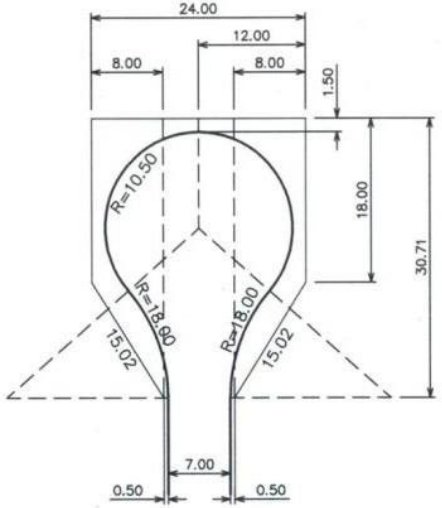
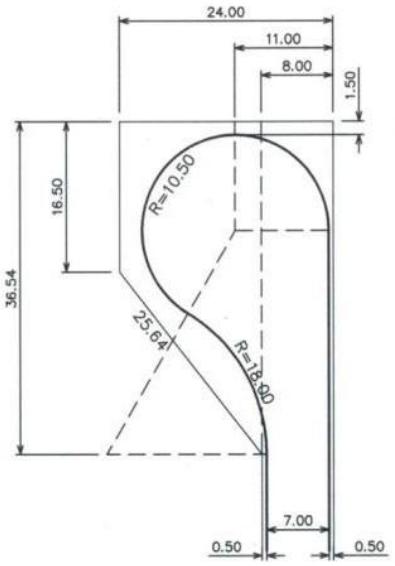
TYPICAL CUL-DE-SAC AND HAMMERHEAD DESIGNS FOR 7.00m LANES

Figure: 43

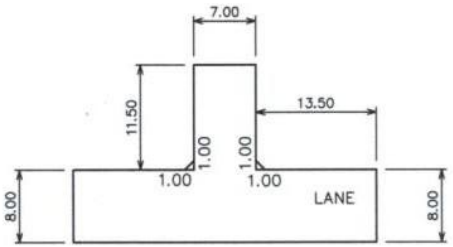
File Number: 454.1004.011



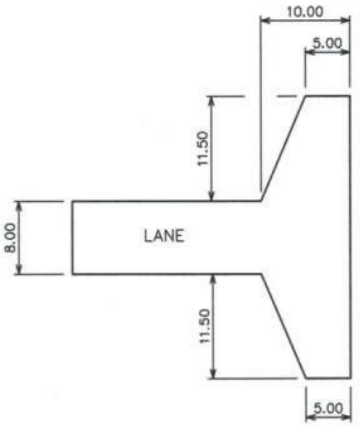
EXISTING LANE R/W = 8.00
EXISTING ROAD WIDTH = 7.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED



EXISTING LANE R/W = 8.00
EXISTING ROAD WIDTH = 7.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED



TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 8.00



TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 8.00

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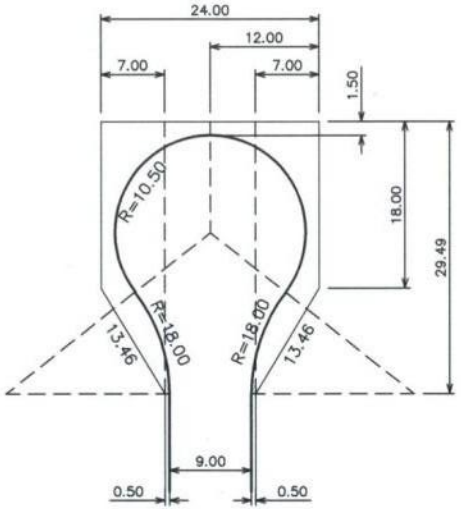
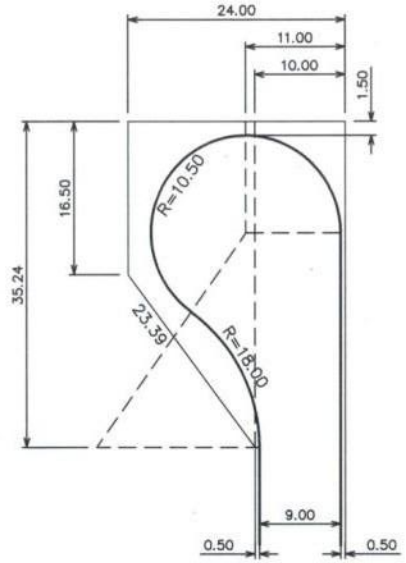
TYPICAL CUL-DE-SAC AND HAMMERHEAD DESIGNS FOR 8.00m LANES

Figure 44

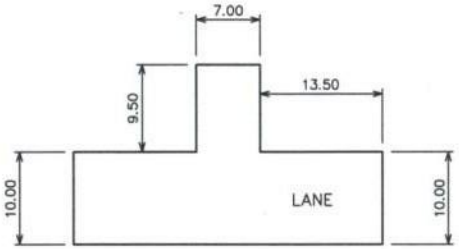
File Number 454.1004.007



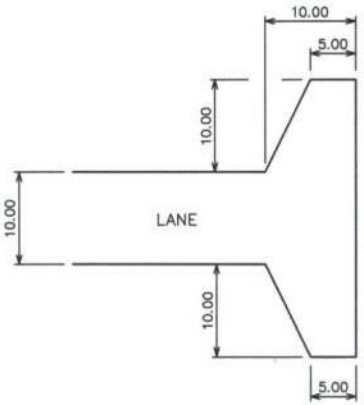
EXISTING LANE R/W = 10.00
EXISTING ROAD WIDTH = 9.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED



EXISTING LANE R/W = 10.00
EXISTING ROAD WIDTH = 9.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED



TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 10.00



TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 10.00

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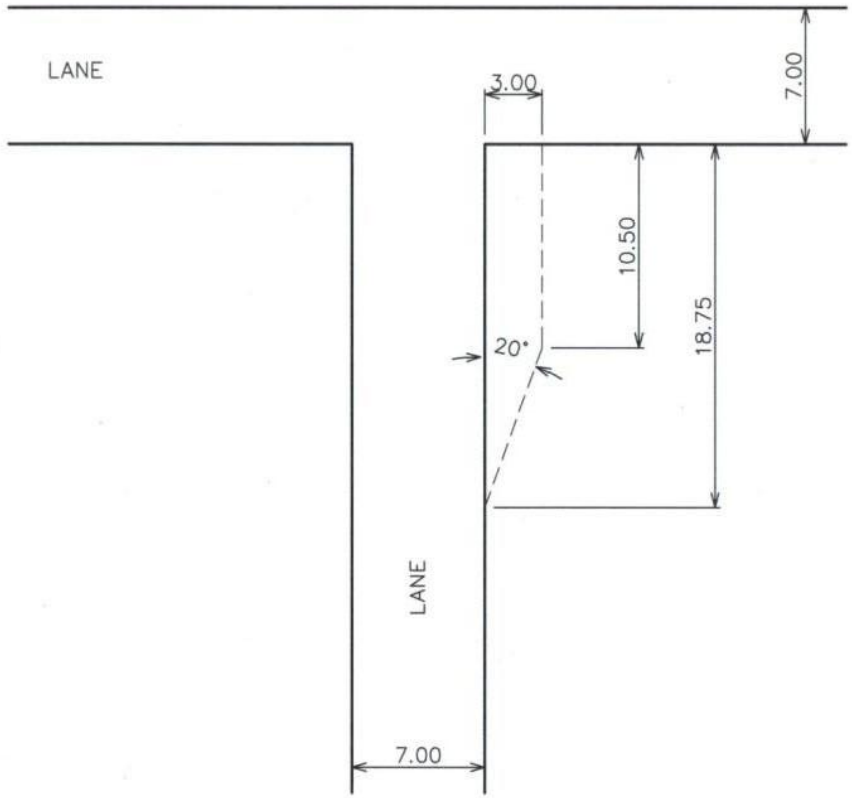
TYPICAL CUL-DE-SAC AND HAMMERHEAD DESIGNS FOR 10.00m LANES

Figure: 45

File Number: 454.1004.009



NOTE:
MINIMUM REQUIREMENTS IN 7.0m LANE FOR S.U.9 TURNING VEHICLE (NO CORNER CUT POSSIBLE ON THE OPPOSITE SIDE.)

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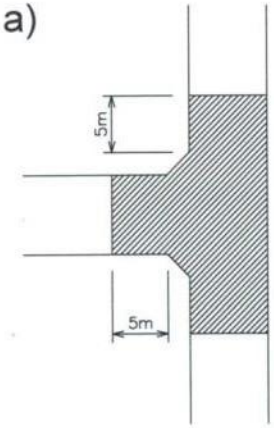
T-LANE INTERSECTION
MINIMUM TURNING REQUIREMENTS
FOR 7.00m LANE

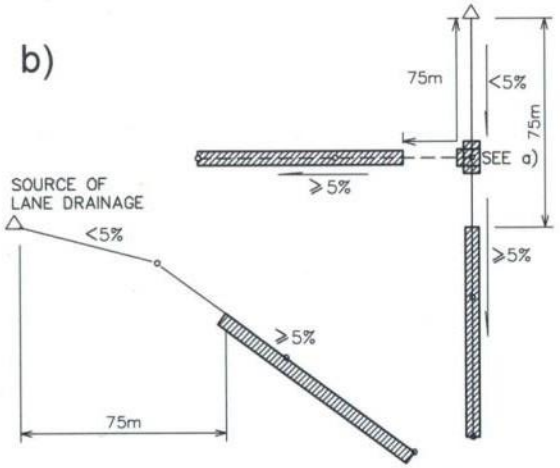
Figure 46
File Number 454.1004.012

a)



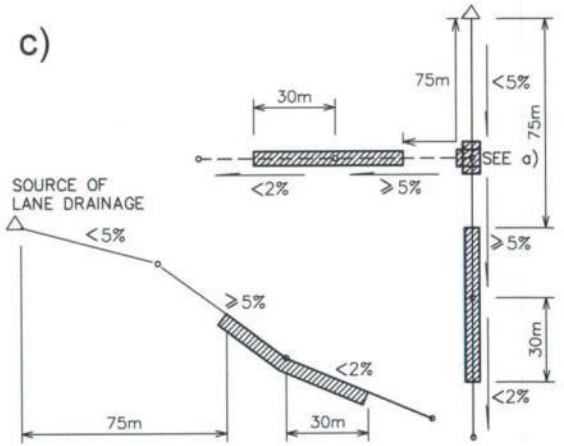
DETAIL

b)



PROFILE PLAN

c)



PROFILE PLAN

△ SOURCE OF LANE DRAINAGE
▨ DEEP BASE GRAVEL

NOTES:
LANES SHALL BE DEEP GRAVEL BASED WHEN THE FOLLOWING CONDITIONS EXIST:

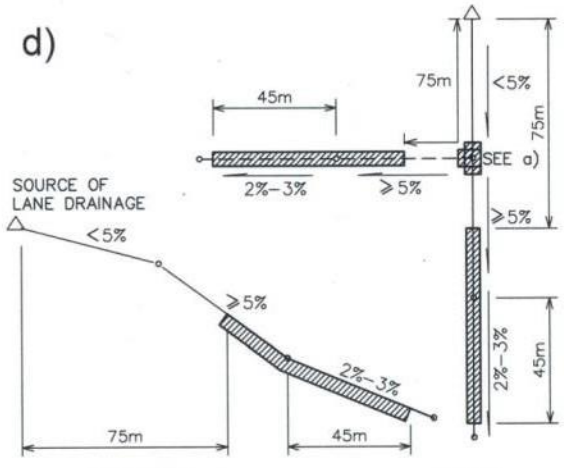
a) AT HORIZONTAL LANE INTERSECTIONS FOR 5.0m BEYOND INTERSECTION, MEASURED FROM THE PROPERTY LINE CORNER CUT, IF ANY.

b) WHEN THE LANE GRADE IS 5% OR GREATER, THE PORTION OF THE LANE IN EXCESS OF 75m FROM THE SOURCE OF DRAINAGE SHALL BE DEEP BASED.

WHEN A LANE WITH 5% OR GREATER INTERSECTS OR CONTINUES WITH A LANE WITH FLATTER GRADE, THE LATTER LANE SHALL BE DEEP BASED FOR THE FOLLOWING LENGTHS:

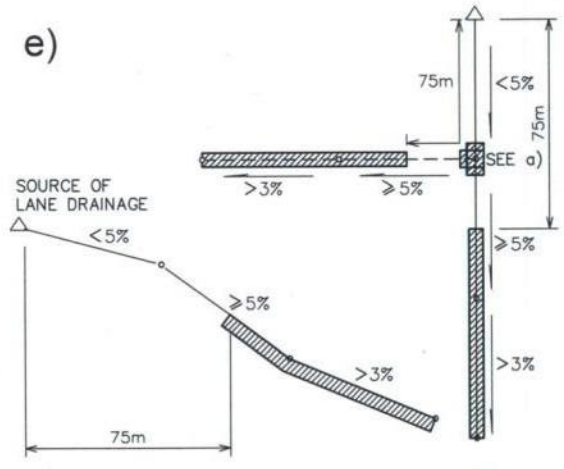
c) UP TO 2% 30m
d) 2% TO 3% 45m
e) 3% AND OVER TOTAL LENGTH

d)



PROFILE PLAN

e)



PROFILE PLAN

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EXAMPLES OF DEEP BASED GRAVEL LANE REQUIREMENTS

Figure 47

File Number 454.1011.008

C. CORNER RADII & CORNER DETAILS

1) Corner Radii

The following design vehicle principles should be applied when selecting corner radii for all street types other than Skeletal Streets, Arterial and Industrial streets:

- Passenger vehicles must be able to turn from inside lane to inside lane without violating lane configurations
- When checking corner radii with vehicular turning templates, a minimum of 0.5 m offset should be allowed between the vehicular envelop and edge of pavement (e.g. lip of gutter), and maintain a minimum of 0.3 m offset to centerline of street
- Turning vehicles should not cross the centerline of the intersection approach, but may encroach into multiple receiving lanes with the same travel direction
- Emergency vehicles must be able to physically maneuver between fixed objects on all corners but is allowed to use the entire pavement width
- Other design vehicles may be considered if justified by the land uses in the area
- Wherever possible, symmetrical designs should be used in the same intersection for aesthetic purposes and still allow the maneuvering of the design vehicle in all directions.

The following table indicates the various requirements for intersection corner radii (lip of gutter) and property corner cuts for Arterial Street, Industrial Arterial Street and Industrial Street, based on a 90 degree intersection configuration.

MAIN STREET	INTERSECTING STREET	LIP OF GUTTER RADIUS AND PROPERTY CORNER CUT (or equivalent radius)
Arterial Street	Arterial Street	Figures 5-7, Pages 32-34
	Industrial Arterial Street	Figure 9, Page 38
	Local Arterial Street	Figure 11, Page 42
	Parkway	Figure 13, Page 46
	Urban Boulevard	Figures 15-16, Pages 50-51
	Neighbourhood Boulevard	Figures 18-19, Pages 55-56
	Primary Collector Street	Figures 21-22, Pages 60-61
	Collector Street	Figures 25-30, Pages 66-71
	Industrial Street	Figure 33, Page 78
Industrial Arterial Street	Industrial Arterial Street	Figure 34, Page 79
	Industrial Street	Figure 34, Page 79
Industrial Street	Industrial Street	Figure 35, Page 80

2) Curb Extensions

Curb extensions extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian safety by reducing the pedestrian crossing distances; visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and

reducing the time that pedestrians are in the street. Curb extensions can be located at intersections or mid-block.

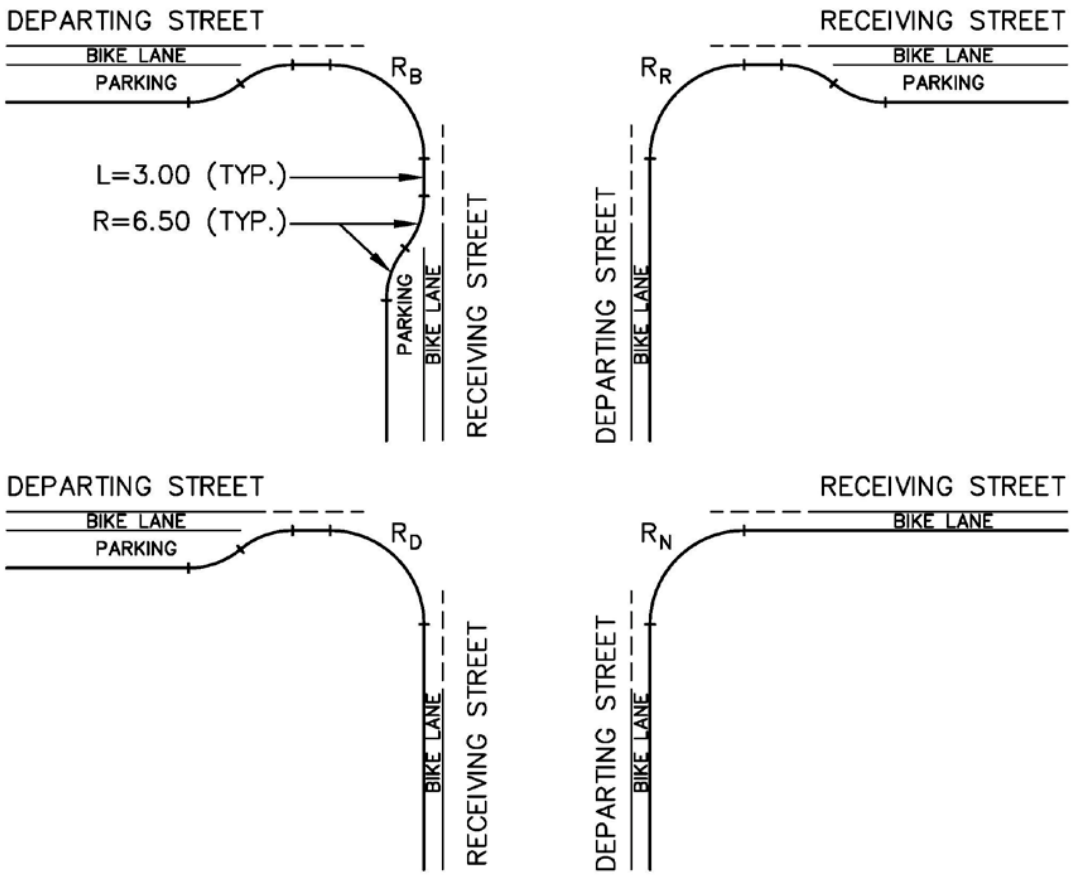
Where on-street parking is allowed, curb extensions should be considered to replace the parking lane at crosswalks on Liveable Streets and Local Streets. Where there is a painted on-street bike lane, a 1.5 m bike lane, with or without the 1.0 m buffer, should be maintained between the curb extension and the traffic lane. For Residential Streets and Collector Streets with less than 3,000 vpd, a minimum pavement width of 7.00 m between curb extensions (LG to LG) should be maintained. Due to the reduced street width, the corner radius on a curb extension may need to be larger and must be checked with vehicular turning templates in all cases.

The following examples of curb extensions and tables indicate potential geometry for intersection lip-of-gutter corner radii for Liveable and Local Streets, based on 90-degree intersection configuration (with the exception of Industrial Streets). However, vehicle templating, based on the appropriate design vehicle, is required to confirm to the geometry of all curb extensions.

Where:

R_B = Corner radius with curb extensions on both the departing and receiving streets
R_D = Corner radius with curb extension on the departing street only
R_R = Corner radius with curb extension on the receiving street only
R_N = Corner radius with no curb extension

The property corner cut for these intersections is 4.50 m x 4.50 m (or equivalent radius).



DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Local Arterial Street – no parking (3.30+3.30+2.50B) **Parkway – no parking** (3.30+3.30+2.50B) **Urban Boulevard – no parking** (3.30+3.30+2.50B) (Design Vehicle = Transit Bus B12) (SU9 for Residential Entrance and Residential streets)	**Local Arterial Street – no parking** **Parkway – no parking** **Urban Boulevard – no parking**				**7.5**
	Urban Boulevard			**7.5***	**7.5**
	Neighbourhood Boulevard **Primary Collector Street** **Collector Street** **Activity Centre Street**			**12.5***	**10.5**
	Neighbourhood Boulevard – no bike lane			**12.5***	**9.0**
	Primary Collector Street – no parking				**9.0**
	Collector Street – no parking				**12.5**
	Collector Street – no bike lane			**12.5***	**12.5**
	Residential Entrance Street				**9.0**
	Residential Street			**12.5***	**9.0**

DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Urban Boulevard (3.30+3.30+2.50B+2.90P) (Design Vehicle = Transit Bus B12) (SU9 for Residential Entrance and Residential streets)	**Local Arterial Street – no parking** **Parkway – no parking** **Urban Boulevard – no parking**		**7.5***		**7.5**
	Urban Boulevard	**7.5***	**5.0***	**7.5***	**5.0**
	Neighbourhood Boulevard **Primary Collector Street** **Collector Street** **Activity Centre Street**	**12.5***	**10.5***	**12.5***	**10.5**
	Neighbourhood Boulevard – no bike lane	**12.5***	**9.0***	**12.5***	**9.0**
	Primary Collector Street – no parking		**9.0***		**9.0**
	Collector Street – no parking		**12.5***		**12.5**
	Collector Street – no bike lane	**12.5***	**12.5***	**12.5***	**12.5**
	Residential Entrance Street		**9.0***		**9.0**
	Residential Street	**10.5***	**9.0***	**10.5***	**9.0**

DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Neighbourhood Boulevard **(**3.30+1.50B+2.90P) **Primary Collector Street** (3.50+1.50B+2.70P) **Collector Street** (3.30+1.5B+2.70P) **Activity Centre Street** (3.30+1.50B+2.90P) (Design Vehicle = Transit Bus B12) (SU9 for Residential Entrance and Residential streets)	**Local Arterial Street – no parking** **Parkway – no parking** **Urban Boulevard – no parking**		**7.5***		**10.5**
	Urban Boulevard	**7.5***	**5.0***	**7.5***	**10.5**
	Neighbourhood Boulevard **Primary Collector Street** **Collector Street** **Activity Centre Street**	**12.5***	**10.5***	**12.5***	**10.5**
	Neighbourhood Boulevard – no bike lane	**12.5***	**9.0***	**12.5***	**10.5**
	Primary Collector Street – no parking		**9.0***		**10.5**
	Collector Street – no parking		**12.5***		**12.5**
	Collector Street – no bike lane	**12.5***	**12.5***	**12.5***	**12.5**
	Residential Entrance Street		**9.0***		**9.0**
	Residential Street	**10.5***	**9.0***	**12.5***	**9.0**

*These curb extension radii are for individual corners and may not provide a symmetrical design on both sides of the street. Wherever possible, symmetrical designs should be used for aesthetic purposes and still allow the maneuvering of the design vehicle in all directions.

339DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Neighbourhood Boulevard – no bike lane (3.30+3.30+2.10P) (Design Vehicle = Transit Bus B12) (SU9 for Residential Entrance and Residential streets)	**Local Arterial Street – no parking Parkway – no parking Urban Boulevard – no parking**		**7.5***		**9.0**
	Urban Boulevard	**7.5***	**5.0***	**7.5***	**9.0**
	Neighbourhood Boulevard Primary Collector Street Collector Street Activity Centre Street	**12.5***	**10.5***	**12.5***	**10.5**
	Neighbourhood Boulevard – no bike lane	**12.5***	**9.0***	**12.5***	**9.0**
	Primary Collector Street – no parking		**9.0***		**9.0**
	Collector Street – no parking		**12.5***		**12.5**
	Collector Street – no bike lane	**12.5***	**12.5***	**12.5***	**12.5**
	Residential Entrance Street		**9.0***		**9.0**
	Residential Street	**10.5***	**9.0***	**10.5***	**9.0**

DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Primary Collector Street – no parking (3.30+3.50+1.50B) (Design Vehicle = Transit Bus B12) (SU9 for Residential Entrance and Residential streets)	**Local Arterial Street – no parking Parkway – no parking Urban Boulevard – no parking**				**9.0**
	Urban Boulevard			**7.5***	**9.0**
	Neighbourhood Boulevard Primary Collector Street Collector Street Activity Centre Street			**12.5***	**10.5**
	Neighbourhood Boulevard – no bike lane			**12.5***	**9.0**
	Primary Collector Street – no parking				**9.0**
	Collector Street – no parking				**12.5**
	Collector Street – no bike lane			**12.5***	**12.5**
	Residential Entrance Street				**9.0**
	Residential Street			**10.5***	**9.0**

DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Collector Street – no parking (3.30+1.50B) (Design Vehicle = Transit Bus B12) (SU9 for Residential Entrance and Residential streets)	**Local Arterial Street – no parking Parkway – no parking Urban Boulevard – no parking**				**12.5**
	Urban Boulevard			**7.5***	**12.5**
	Neighbourhood Boulevard Primary Collector Street Collector Street Activity Centre Street			**12.5***	**12.5**
	Neighbourhood Boulevard – no bike lane			**12.5***	**12.5**
	Primary Collector Street – no parking				**12.5**
	Collector Street – no parking				**12.5**
	Collector Street – no bike lane			**12.5***	**12.5**
	Residential Entrance Street				**12.5**
	Residential Street			**10.5***	**12.5**

*These curb extension radii are for individual corners and may not provide a symmetrical design on both sides of the street. Wherever possible, symmetrical designs should be used for aesthetic purposes and still allow the maneuvering of the design vehicle in all directions.

DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Collector Street – no bike lane (3.30+2.10P) (Parking both sides, <3,000 vpd) (Minimum 7.00 m pavement width with curb extensions) (Design Vehicle = Transit Bus B12) (SU9 for Residential Entrance and Residential streets)	**Local Arterial Street – no parking** **Parkway – no parking** **Urban Boulevard – no parking**		**7.5***		**12.5**
	Urban Boulevard	**7.5***	**5.0***	**7.5***	**12.5**
	Neighbourhood Boulevard **Primary Collector Street** **Collector Street** **Activity Centre Street**	**12.5***	**10.5***	**12.5***	**12.5**
	Neighbourhood Boulevard – no bike lane	**12.5***	**9.0***	**12.5***	**12.5**
	Primary Collector Street – no parking		**9.0***		**12.5**
	Collector Street – no parking		**12.5***		**12.5**
	Collector Street – no bike lane	**12.5***	**12.5***	**12.5***	**12.5**
	Residential Entrance Street		**9.0***		**12.5**
	Residential Street	**10.5***	**9.0***	**10.5***	**12.5**

DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Residential Entrance Street – no bike lane (3.50+2.50P) (Design Vehicle = SU9)	**Local Arterial Street – no parking** **Parkway – no parking** **Urban Boulevard – no parking**				**9.0**
	Urban Boulevard			**7.5***	**9.0**
	Neighbourhood Boulevard **Primary Collector Street** **Collector Street** **Activity Centre Street**			**12.5***	**9.0**
	Neighbourhood Boulevard – no bike lane			**9.0***	**9.0**
	Primary Collector Street – no parking				**9.0**
	Collector Street – no parking				**12.5**
	Collector Street – no bike lane			**12.5***	**12.5**
	Residential Entrance Street				**9.0**
	Residential Street			**10.5***	**9.0**

DEPARTING STREET	RECEIVING STREET	LIP OF GUTTER RADIUS			
		R_B	R_D	R_R	R_N
Residential Street – no bike lane (Minimum 7.00m pavement width with curb extensions) (Design Vehicle = SU9)	**Local Arterial Street – no parking** **Parkway – no parking** **Urban Boulevard – no parking**		**7.5***		**9.0**
	Urban Boulevard	**7.5***	**5.0***	**7.5***	**9.0**
	Neighbourhood Boulevard **Primary Collector Street** **Collector Street** **Activity Centre Street**	**12.5***	**7.5***	**7.5***	**9.0**
	Neighbourhood Boulevard – no bike lane	**10.5***	**7.5***	**9.0***	**9.0**
	Primary Collector Street – no parking		**7.5***		**9.0**
	Collector Street – no parking		**12.5***		**12.5**
	Collector Street – no bike lane	**12.5***	**12.5***	**12.5***	**12.5**
	Residential Entrance Street		**9.0***		**9.0**
	Residential Street	**10.5***	**9.0***	**10.5***	**9.0**

*These curb extension radii are for individual corners and may not provide a symmetrical design on both sides of the street. Wherever possible, symmetrical designs should be used for aesthetic purposes and still allow the maneuvering of the design vehicle in all directions.

Corner Details

Corner details are normally only required for Skeletal intersections and ramps. However, for other road classifications, corner details may be required to ensure the road grades and drainage are properly designed to meet standards. The plans are to include road design and corner details, including curve data, catch basins and a corner grade profile for each corner.

Guidelines For Corner Details

Standard Drawing in Figure 28, Page 69, illustrates a typical type of Collector Street to Arterial Street intersection. Striking corner grades at intersections will require adherence to the following criteria:

i) The right turn movement from the Collector Street to the Arterial Street requires a three centered horizontal curve (36 m-12 m- 36 m). The road crossfall of the Arterial Street is to be extended to the midpoint of the corner and a corner profile struck as follows:

Establish a grade for the midpoint of the corner (halfway between the B.C. and E.C.). This is accomplished by extending the road crossfall of the Arterial Street, usually 2%, to this midpoint. Extending the crossfall in this manner will provide for a smooth passage through the intersection for the Arterial Street traffic. The grades at the B.C., E.C., and midpoint are then connected. Steeper grades may require a degree of rounding to avoid an abrupt intersection of grades.

ii) The opposite corner is to be channelized, which will require striking grades for the traffic island in conjunction with the corner profile.

The grade of the island side adjacent to the Arterial Street is basically established with the striking of the grade for the Arterial Street since this side is a continuation of the lip of gutter line.

The grade of the island adjacent to the Collector Street is usually an extension of the road crossfall of the Arterial Street (i.e. 2%).

The grade of the turning bay side of the island will basically be established by the striking of the other two sides.

iii) Striking the corner grade profile for the turning lane should generally include the following criteria:

The grade along the length of the 440 m radius taper will correspond to a line joining a series of points which have been calculated by extending the road crossfall of 2% for the additional distance.

Attaining a minimum of 4% crossfall at the nose of the island is desirable, which is to be maintained for the length of the island. The transition from the 4% crossfall to normal crossfall of the Collector Street is to be accomplished within the remaining corner length.

GENERAL INFORMATION

Cross Sections

Cross sections of each street classification are shown in the Cross Section details. All dimensions are measured from lip of gutter to lip of gutter or from lip of gutter to lane line or from lane line to lane line.

Dead Ends & "P" Loops

Any public roadway that comes to a dead end in a proposed subdivision must have a cul-de-sac with sufficient turning space for vehicles. See Typical Cul-de-sac Designs for each of the road classifications.

If the cul-de-sac is required for buses turning around, a minimum radius of 15.5 m shall be provided. For temporary turnarounds, a radius of 18.5 m is required with post and cable fence.

The maximum allowable length of a cul-de-sac is 200 m measured from the centerline of the intersection to the start of the bulb. Alternate emergency vehicle access is required for a cul-de-sac that exceeds 200 m in length.

The maximum length of the stem portion of a "P" Loop shall be 200 m. Alternative vehicle access is required within the stem if the length of the stem exceeds 200 m. It is recommended that a median be constructed in the stem portion of "P" Loops wherever possible.

Refer to Design Guidelines for Development Site Servicing Plans for additional requirements for emergency access through a P-Loop to private multi-family, commercial and industrial sites.

Fencing

Residential development along Deerfoot Trail and along the Transportation Utility Corridor (T.U.C.)/Ring Roads requires sound attenuation and visual screening analysis to determine the fencing requirements, see Section K, Page 140. If visual screening is not required, the developer is responsible for installing a 1.8m chain link fence.

Residential development along Local Arterial Streets, Arterial Streets and Skeletal Roads, LRT and other rail lines may require sound attenuation. If sound attenuation is not required adjacent to Skeletal Road and Arterial Street category roads, a uniform screening fence shall be provided along Arterial Streets while along Skeletal Roads either a screening fence or a 1.8m chain link fence may be used. 1.8m chain link fencing is required along MR/ER land adjacent to Skeletal Roads.

Lanes and streets, in residential development, require post and cable fencing when parallel to Arterial Streets, Local Arterial Streets and Industrial Arterial Streets. Lanes adjacent to tot lots and open space areas also require post and cable fencing.

Grades & Grade Ties

Grades are to be struck with reference to the lip of gutter line and referenced to Geodetic

Datum.

All roads shall have a minimum grade of 0.6%. Maximum and minimum grades should only be used where absolutely necessary; these grades also apply to the transition grades when developing superelevation. At least one access road to any particular area of a subdivision must be less than or equal to 8%.

Depending on the width of the approaching street and the grade of the through street (i.e. >4%), 2-point ties (lip of gutter ties on both sides) or 3-point ties (lip of gutter ties on both sides and median tie) should be shown on the profiles as grade ties, see Intersection Approach Grades and Vertical Curve Requirements in Figure 53, Page 112.

The standard boulevard must be graded 2% up from the top of curb to the property line or to a separate walk. However, if the boulevard contains a separate sidewalk and is adjacent to a trap low of a depth of 0.3 metres or greater, a drainage crossing as per Roads Construction Standard Specifications 454.1013.019 shall be provided and is to be graded at 4% up from top of the curb to the front of the walk to accommodate drainage of the sidewalk, see Figure 64, Page 128.

Any deviation in the boulevard grade resulting from excessive cuts and fills, any berms, swales, etc., must be approved by the approval authority of the Transportation Department.

Intersection Angle

Intersection angles of less than 75° are not acceptable. Intersection angle shall be measured as the acute angle formed between the centerlines of two roadways. Intersections at the inside of curves are undesirable and should be avoided wherever possible.

Intersection Transitions

To facilitate continuous and safe traffic operations all roadway and intersection transitions in and adjacent to the development boundaries are to be detailed on the construction drawings. Transitioning R.O.W./pavement width at or through intersections is not acceptable. Cross-sections are to match across intersections.

Service Roads

Service (frontage) roads adjacent to Arterial streets are to have a minimum separation of 45 m between the edges of pavement where the service road intersects a street that ties to the Arterial thoroughfare. A more acceptable alternative would be to turn the service road such that it runs parallel to the connecting street, until access is gained from an intersecting street.

Superelevation

Superelevation is required for all roads except for Industrial Streets, Residential Streets and Residential Entrance Streets. Normal crossfall on all divided roadways and on all undivided roadways shall be 2%. For Development of Superelevation and Superelevation Tables, see Figures 62 & 63, Page 124 & 125.

Transition Spirals

Transition spirals should be used on all curves on Arterial Streets and Industrial Arterial Streets.

The minimum length of a spiral is to be 60 m and shall be calculated as per the TAC manual.

Compound spirals shall be used as necessary to join curves of varying radii to provide a transition between two curves horizontally and vertically.

Broken back curves, that is, two curves in the same direction separated by a short section of tangent are not acceptable.

Trees and Subdivision Entrance Features in Medians

Trees and subdivision entrance features in the medians shall be set back at a minimum of 7.5 m from the median bull-noses on Arterial Streets, Local Arterial Streets, Primary Collector Streets, and a minimum of 4.5 m from the bull-noses on Residential Entrance Streets. Any surface treatment and/or features placed in the median must be approved by the approving authority of the Transportation Department.

Vertical Curves

Vertical curves are required at all points where a grade change results in an 'M' value of 0.03 or greater.

The length of vertical curve should be calculated based on the stopping sight distance, see Stopping Sight Distance Vertical Curves in Figure 48, Page 107. The minimum acceptable length for vertical curve is 30 m except for the smoothing vertical curves used for superelevation runoff and tangent runout.

Roundabout Design

Roundabout Guidelines, including design, right-of-way requirements and landscaping is available at the City website and on other current best practices such as TAC Canadian Roundabout Design Guide and FHWA Roundabouts: An Information Guide FHWA RD-00-067, etc..

Roundabouts must accommodate turning movements for the appropriate design vehicle.

B-12 vehicle turn templating is required for on-site roundabouts. Mountable aprons are acceptable design features for on-site roundabouts to accommodate fire vehicles.

No parking is permitted in roundabouts or within the length of the splitter islands. Direct access generally not permitted, but may be considered subject to proper intersection designs and approval by the approving authority of Transportation Department.

ROADWAY DESIGN STANDARDS
Standard Intersection Design Elements

The following pages contain drawings indicating standard intersection design elements including:

- Stopping Sight Distances and Vertical Curves
- Introduced Medians
- Typical Slot left Turn Lane Designs
- Typical Left Turn Bay Designs
- Typical Intersection Channelization Designs
- Intersection Approach Grade and Vertical Curve Requirements
- Gutter Drainage at Flat Sag Vertical Curves

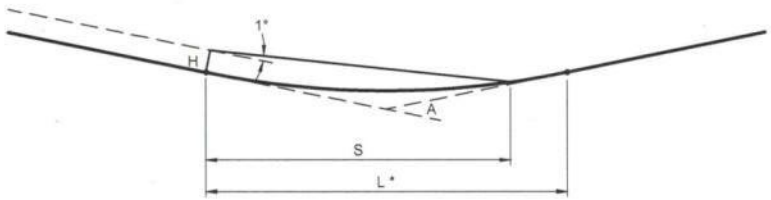
CREST CURVES

DESIGN SPEED (km/h)	STOPPING SIGHT DISTANCE		CREST - K (m)	
	MINIMUM (a)	DESIREABLE (b)	MINIMUM (c)	DESIREABLE (d)
40	45	45	4	5
50	65	65	7	10
60	85	90	15	20
70	110	120	22	35
80	140	150	35	55
90	170	180	55	85
100	200	210	70	110
110	220	240	85	140
120	240	260	105	170
130	260	280	120	200
140	270	300	130	220

L- LENGTH OF VERTICAL CURVE IN METRES
A - ALGEBRAIC DIFFERENCE IN GRADE PERCENT
S- MINIMUM STOPPING SIGHT DISTANCE IN METRES
H - HEIGHT OF DRIVER'S EYE 1.05m
h - HEIGHT OF OBJECT
K - L/A

* "L" IN METRES SHOULD NOT BE LESS THAN DESIGN SPEED IN KILOMETRES PER HOUR.
(a) BASED ON FIXED PERCEPTION REACTION TIME OF 2.5s
(b) BASED ON VARIABLE PERCEPTION REACTION TIME OF 2.5s AT 40km/h TO 3.5s AT 140km/h
(c) BASED ON FIXED PERCEPTION REACTION TIME AND TAIL LIGHT HEIGHT OF 380mm
(d) BASED ON VARIABLE PERCEPTION REACTION TIME AND OBJECT HEIGHT OF 150mm

SAG CURVES



DESIGN SPEED (km/h)	STOPPING SIGHT DISTANCE (m)	SAG - K (m) MINIMUM	
		HEADLIGHT CONTROL	COMFORT CONTROL
40	45	7	4
50	65	11	6
60	85	20	10
70	110	25	15
80	140	30	20
90	170	40	20
100	200	50	25
110	220	55	25
120	240	60	30
130	260	65	–
140	270	70	–

L- LENGTH OF VERTICAL CURVE IN METRES
A - ALGEBRAIC DIFFERENCE IN GRADE PERCENT
S- MINIMUM STOPPING SIGHT DISTANCE IN METRES
H - HEIGHT OF HEAD LAMPS 0.6m
1° - ANGLE OF LIGHT BEAM UPWARD FROM PLANE OF VEHICLE
K - L/A

* "L" IN METRES SHOULD NOT BE LESS THAN DESIGN SPEED IN KILOMETRES PER HOUR.
CENTRIPETAL ACCELERATION 0.3m/s²

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Checked	EW
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STOPPING SIGHT DISTANCE
VERTICAL CURVES

Figure 48
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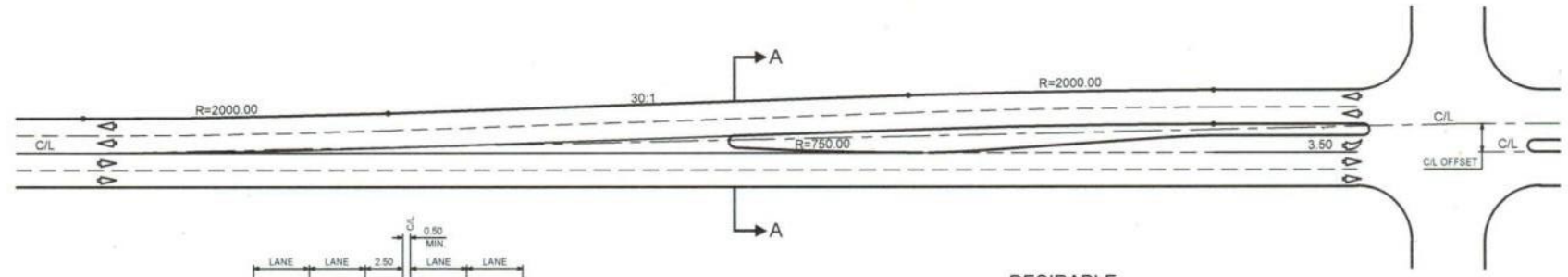
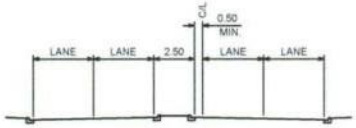
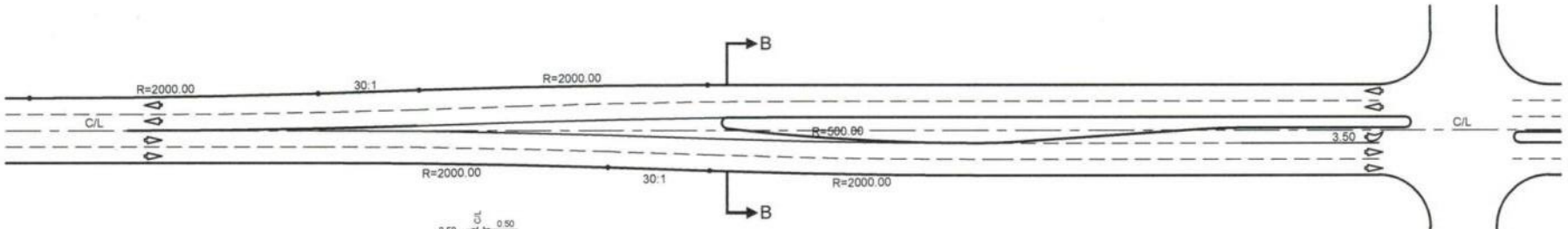
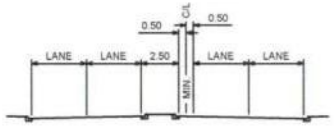




SECTION A-A

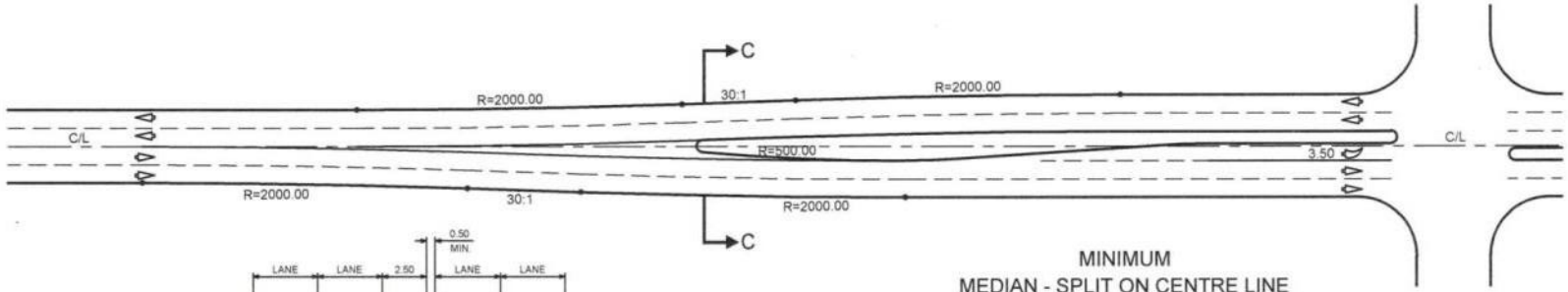
DESIRABLE
MEDIAN - OFFSET FROM CENTRE LINE
SECTION A-A

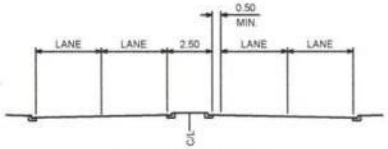




SECTION B-B

ACCEPTABLE
MEDIAN - SPLIT ON CENTRE LINE
APPROACH NOSE OFFSET FROM C.L.
SECTION B-B





SECTION C-C

MINIMUM
MEDIAN - SPLIT ON CENTRE LINE
APPROACH NOSE ON C.L.
SECTION C-C

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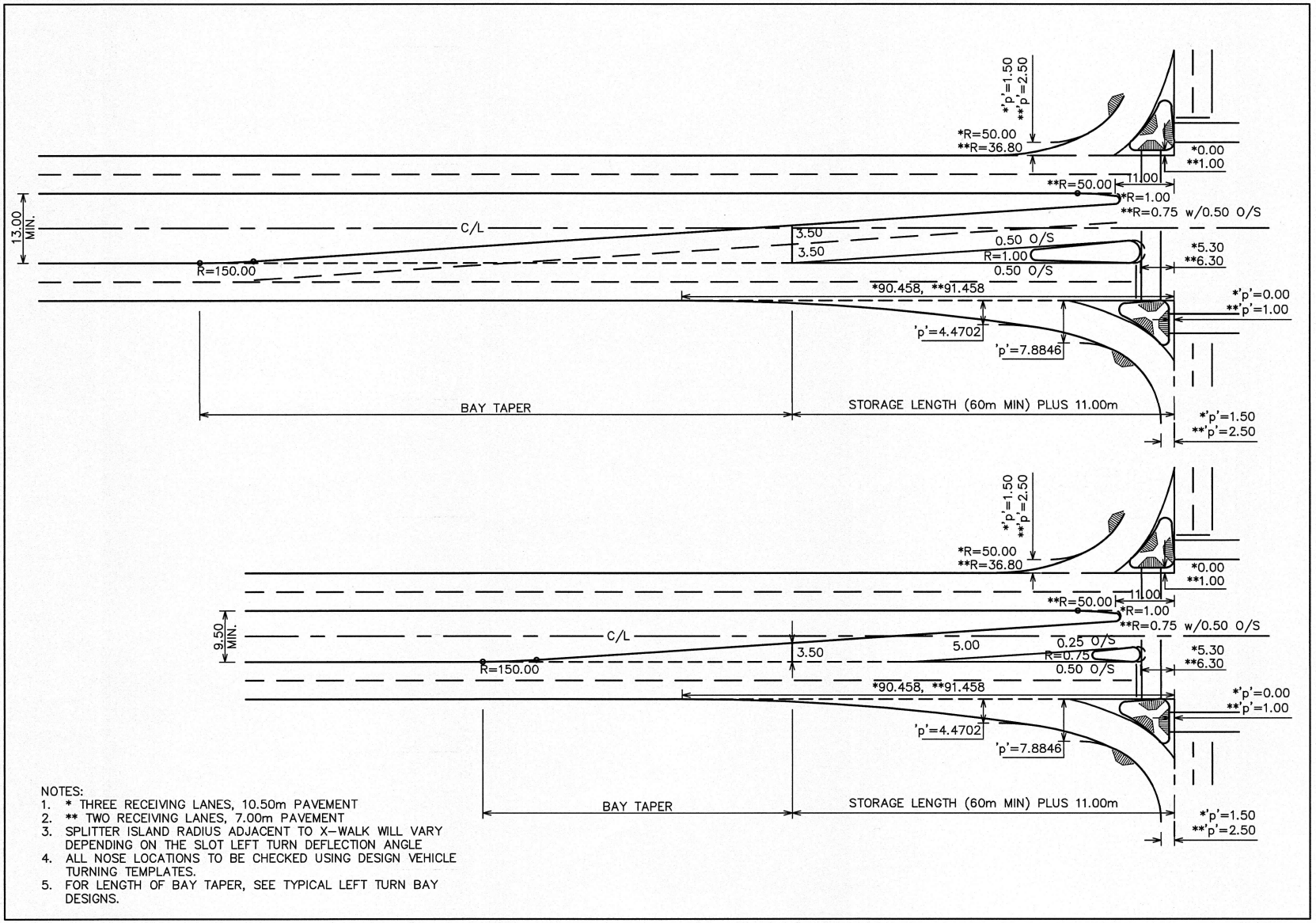
INTRODUCED MEDIANS

Figure 49

File Number 454.1009.004



NOTES:
1. * THREE RECEIVING LANES, 10.50m PAVEMENT
2. ** TWO RECEIVING LANES, 7.00m PAVEMENT
3. SPLITTER ISLAND RADIUS ADJACENT TO X-WALK WILL VARY DEPENDING ON THE SLOT LEFT TURN DEFLECTION ANGLE
4. ALL NOSE LOCATIONS TO BE CHECKED USING DESIGN VEHICLE TURNING TEMPLATES.
5. FOR LENGTH OF BAY TAPER, SEE TYPICAL LEFT TURN BAY DESIGNS.

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RM APEGA ID #: 57407
DATE: 2020 OCT 28
PERMIT NUMBER: P004428
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PROFESSIONAL ENGINEER ROBERT J. TALACKO PROVINCE OF ALBERTA
27 October 2020

THE CITY OF CALGARY
ROADS

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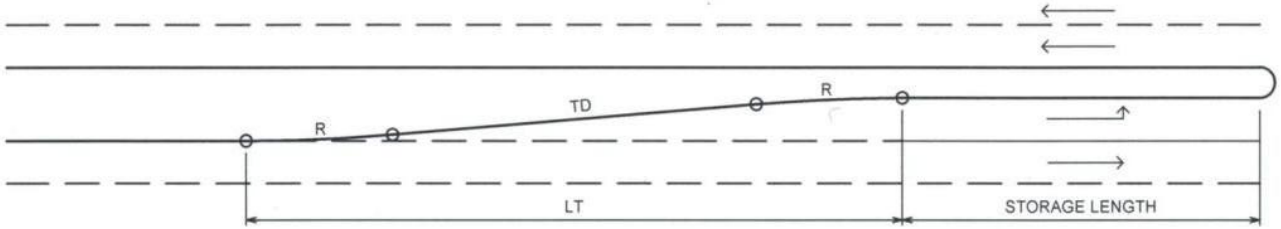
TYPICAL SLOT LEFT TURN LANE DESIGNS

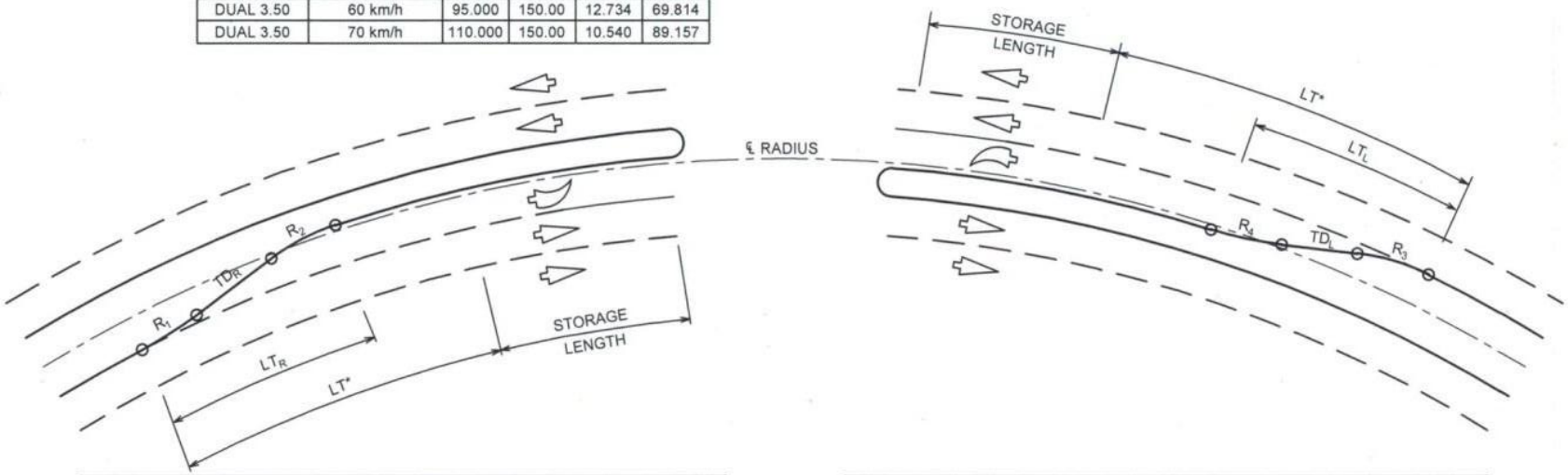
Figure 50

File Number 454.1014.021



BAY TAPER DATA RADII ⩾800 AND TANGENT					
OFFSET	DESIGN SPEED km/h	LT	R	L	TD
3.50	50 km/h	50.000	150.00	14.923	20.304
3.50	60 km/h	55.000	150.00	12.257	30.615
3.50	70 km/h	60.000	150.00	10.614	38.888
3.50	80 km/h	77.250	200.00	10.474	56.390
DUAL 3.50	60 km/h	95.000	150.00	12.734	69.814
DUAL 3.50	70 km/h	110.000	150.00	10.540	89.157

NOTES:
LT* IS THE SAME LENGTH AS LT IN THE RADII ⩾800 AND TANGET TABLE
L, L_1, L_2, L_3, L_4= LENGTH OF ARC



BAY TAPER DATA CURVE RIGHT							
OFFSET	CENTER LINE RADIUS	LT_R	R_1	L_1	R_2	L_2	TD_R
3.50	130	20.000	35.000	5.793	20.000	6.460	8.383
3.50	260	25.000	55.000	9.277	35.000	9.308	6.891
3.50	400	30.000	80.000	11.750	50.000	11.122	7.517
3.50	600	35.000	105.000	13.826	70.000	13.321	8.178
3.50	⩾800	SEE RADII ⩾800m AND TANGENT TABLE					

BAY TAPER DATA CURVE LEFT							
OFFSET	CENTER LINE RADIUS	LT_L	R_3	L_3	R_4	L_4	TD_L
3.50	130	20.000	20.000	6.741	35.000	6.533	6.841
3.50	260	25.000	35.000	9.694	55.000	10.005	5.449
3.50	400	30.000	50.000	11.453	80.000	12.369	6.309
3.50	600	35.000	70.000	13.604	105.000	14.312	7.208
3.50	⩾800	SEE RADII ⩾800m AND TANGENT TABLE					

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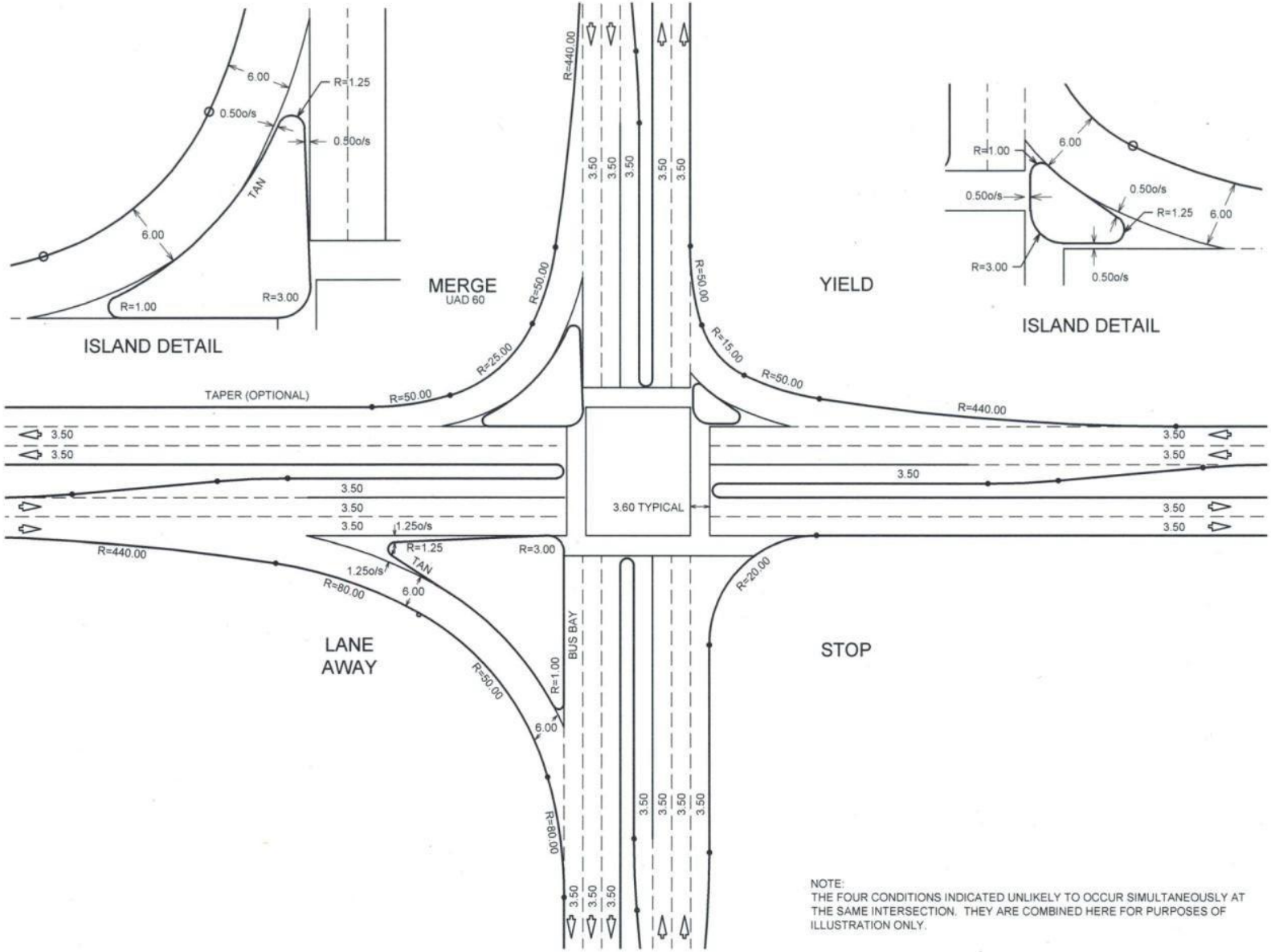
TYPICAL
LEFT TURN BAY
DESIGNS

Figure 51
File Number 454.1014.044



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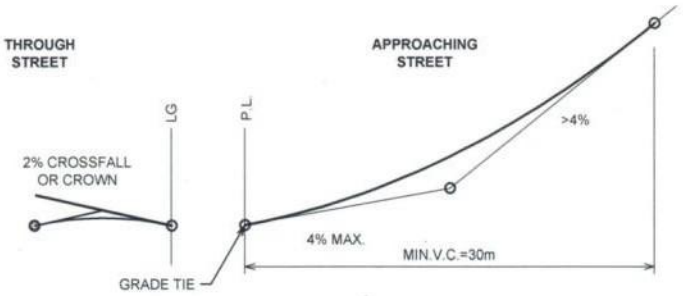
TYPICAL INTERSECTION CHANNELIZATION DESIGNS

Figure 52

File Number 454.1014.045

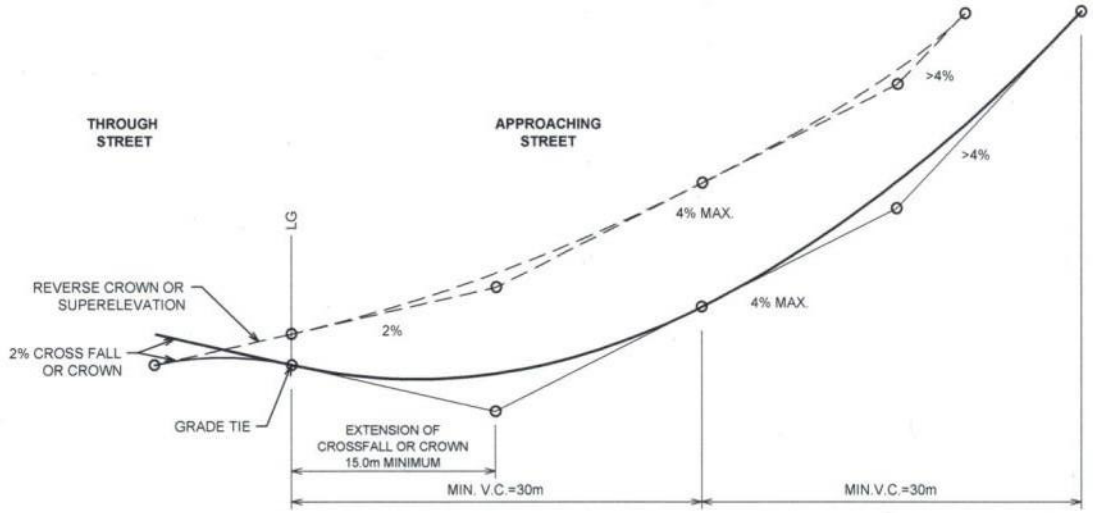


THROUGH STREET	APPROACHING STREET	GRADE TIE
**PRIMARY COLLECTOR STREET COLLECTOR STREET ACTIVITY CENTRE STREET INDUSTRIAL STREET	UNDIVIDED ROADWAY	*CENTRELINE TIE
RESIDENTIAL STREET	UNDIVIDED ROADWAY DIVIDED ROADWAY	*CENTRELINE TIE

NOTES:
* 2 POINT TIE OR 3 POINT TIE MAY BE REQUIRED DEPENDING ON THE WIDTH OF THE APPROACHING STREET AND THE GRADE OF THE THROUGH STREET.
** APPLIES IF PRIMARY COLLECTOR IS NOT IN SUPERELEVATION.

FOR 50 KPH:
MIN. K=7 FOR CREST VERTICAL CURVES
MIN. K=6 FOR SAG VERTICAL CURVES

MAXIMUM APPROACH GRADES AND GRADE TIE AT PROPERTY LINE



THROUGH STREET	APPROACHING STREET	GRADE TIE
ARTERIAL STREET INDUSTRIAL ARTERIAL STREET LOCAL ARTERIAL STREET LIVERBLE STREET *** PRIMARY COLLECTOR STREET	DIVIDED ROADWAY	3 POINT TIE
	UNDIVIDED ROADWAY	2 POINT TIE
COLLECTOR STREET ACTIVITY CENTRE STREET INDUSTRIAL STREET	DIVIDED ROADWAY	3 POINT TIE

NOTES:
*** LOG TIE APPLIES IF PRIMARY COLLECTOR IS IN SUPERELEVATION.

FOR 60 KPH:
MIN. K=15 FOR CREST VERTICAL CURVES
MIN. K=10 FOR SAG VERTICAL CURVES

FOR 50 KPH:
MIN. K=7 FOR CREST VERTICAL CURVES
MIN. K=6 FOR SAG VERTICAL CURVES

MAXIMUM APPROACH GRADES AND GRADE TIE AT LANE LINE (LIP OF GUTTER)

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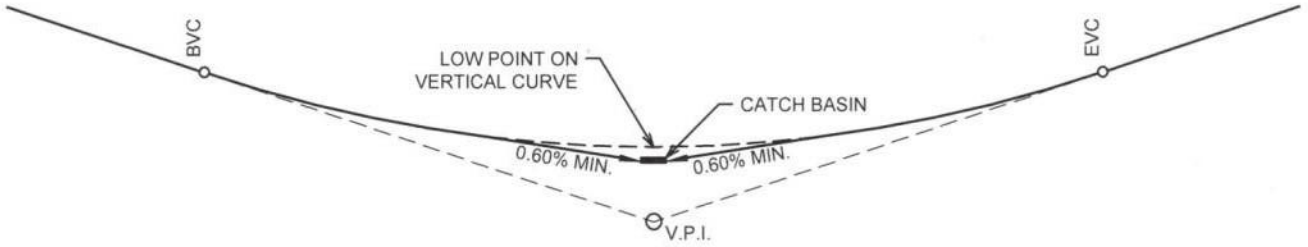
INTERSECTION APPROACH GRADE & VERTICAL CURVE REQUIREMENTS

Figure: 53
File Number: 454.1014.046

CATCH BASIN @ LOW POINT
ON FLAT VERTICAL CURVE



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GUTTER DRAINAGE
AT FLAT SAG
VERTICAL CURVES

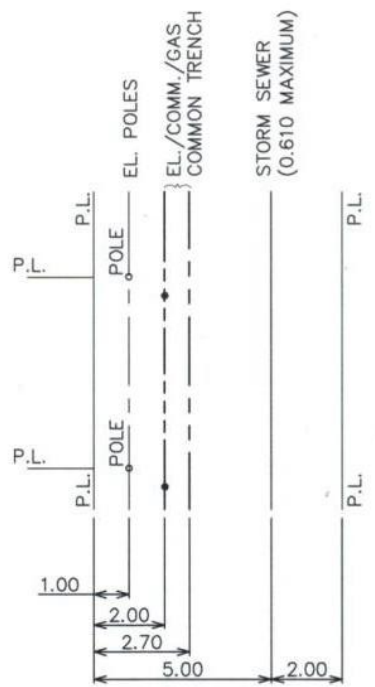
Figure 54

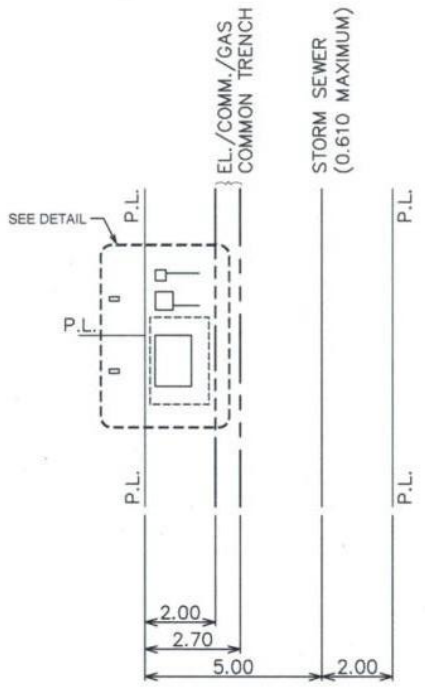
File Number 454.1003.020

Standard Utility Design Elements

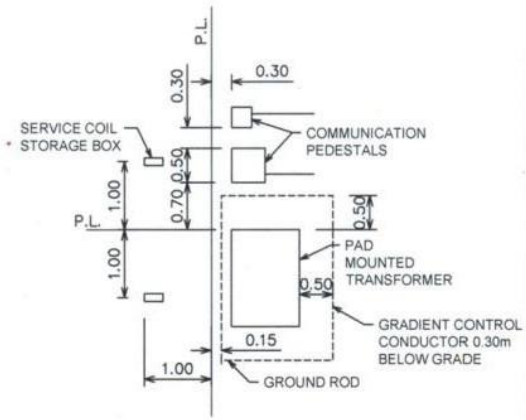
The following pages contain drawings indicating standard utility design elements including:

- Utility Line Assignment for 7.00m Lane
- Utility Line Assignment for 8.00m Lane
- Utility Line Assignment for 10.00m Lane
- Requirements in Utility R.O.W. (Easement)
- Standard Depth Zones for U/G Joint Use Installation (Residential Distribution)
- Standard Placement – Easement with Swale
- Tree Separations to Utilities

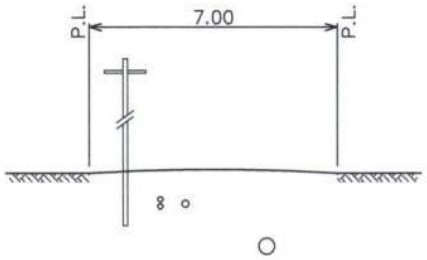


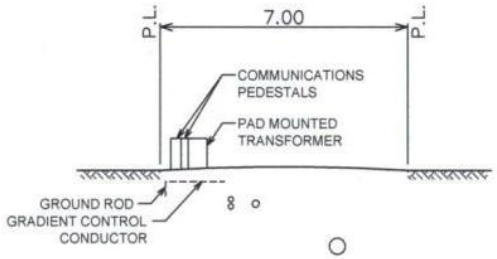


PLAN



DETAIL





ELECTRICAL DISTRIBUTION (OVERHEAD)

NOTE: THE MAXIMUM SIZE OF STORM IS 610mm (24") DIAMETER & MAXIMUM DEPTH OF 3.50m.

ELECTRICAL DISTRIBUTION (UNDERGROUND)

EL./COMM. /GAS COMMON TRENCH
COMMUNICATION PEDESTAL PLACEMENTS TO BE DETERMINED IN THE FIELD.

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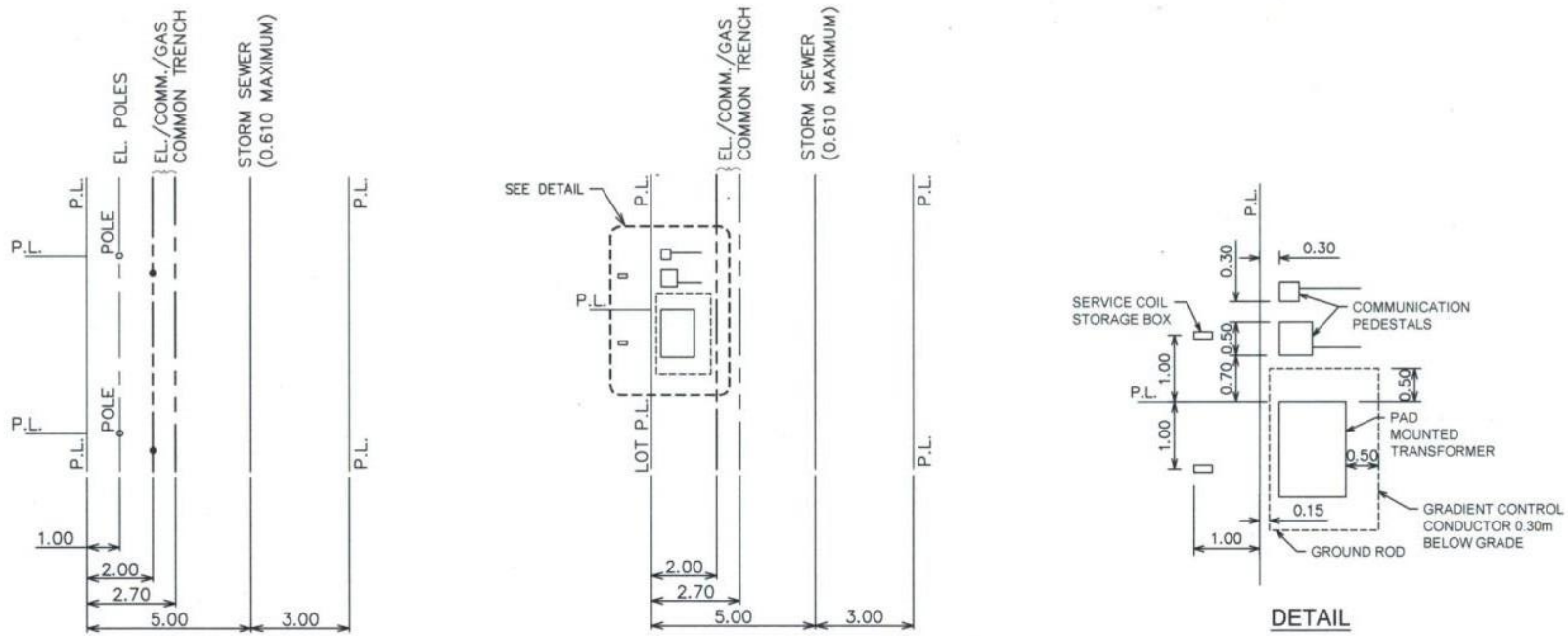
UTILITY LINE ASSIGNMENTS FOR 7.00m LANE

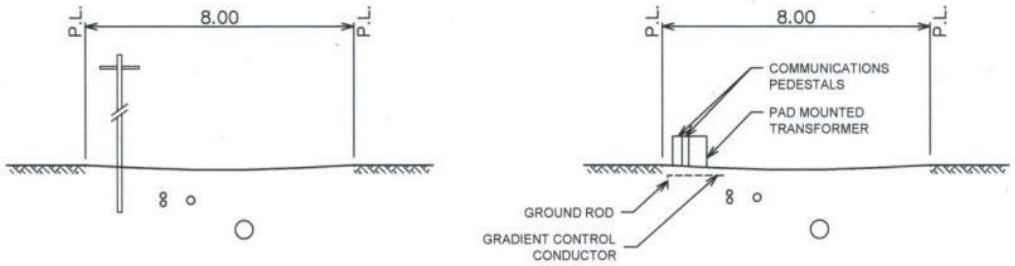
Figure 55

File Number 454.1008.072



PLAN

DETAIL



ELECTRICAL DISTRIBUTION (OVERHEAD)

NOTE: THE MAXIMUM SIZE OF STORM IS 610mm (24") DIAMETER & MAXIMUM DEPTH OF 3.50m.

ELECTRICAL DISTRIBUTION (UNDERGROUND)

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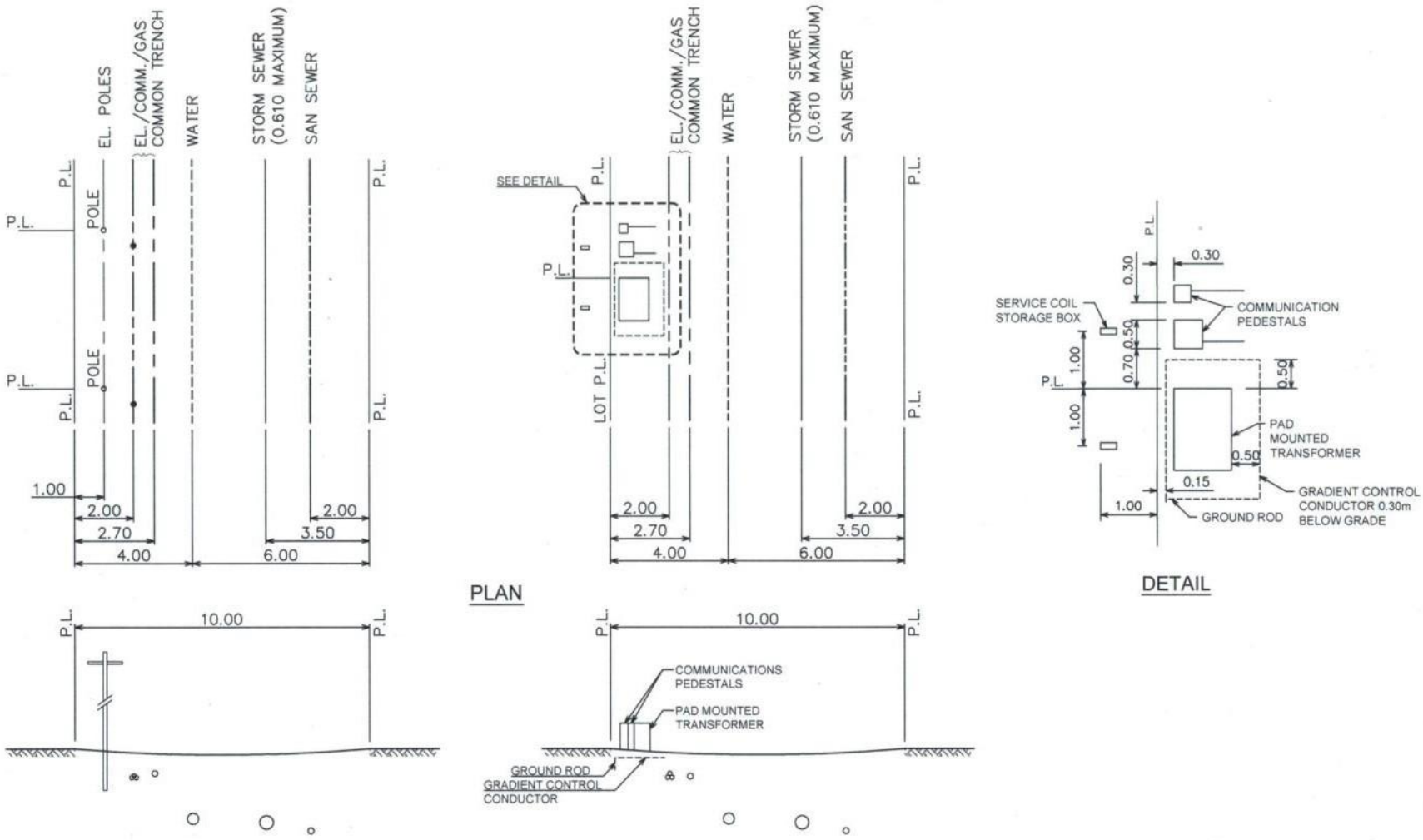
UTILITY LINE ASSIGNMENTS FOR 8.00m LANE

Figure 56
File Number 454.1008.036



ELECTRICAL DISTRIBUTION (OVERHEAD)

NOTES:

1. SERVICE VALVES ON 0.50m LINE BOTH SIDES.
2. THE GRADE OF THE STORM SEWER INVERT MUST BE LESS THAN 1.22m DIFFERENCE WITH THAT OF THE SANITARY SEWER INVERT.
3. THE MAXIMUM SIZE OF STORM IS 610mm (24") DIAMETER & MAXIMUM DEPTH OF 3.50m.

ELECTRICAL DISTRIBUTION (UNDERGROUND)

EL./COMM./GAS COMMON TRENCH
SERVICE VALVES ON 0.50 LINE BOTH SIDES
COMMUNICATION PEDESTAL PLACEMENTS TO BE DETERMINED IN THE FIELD.

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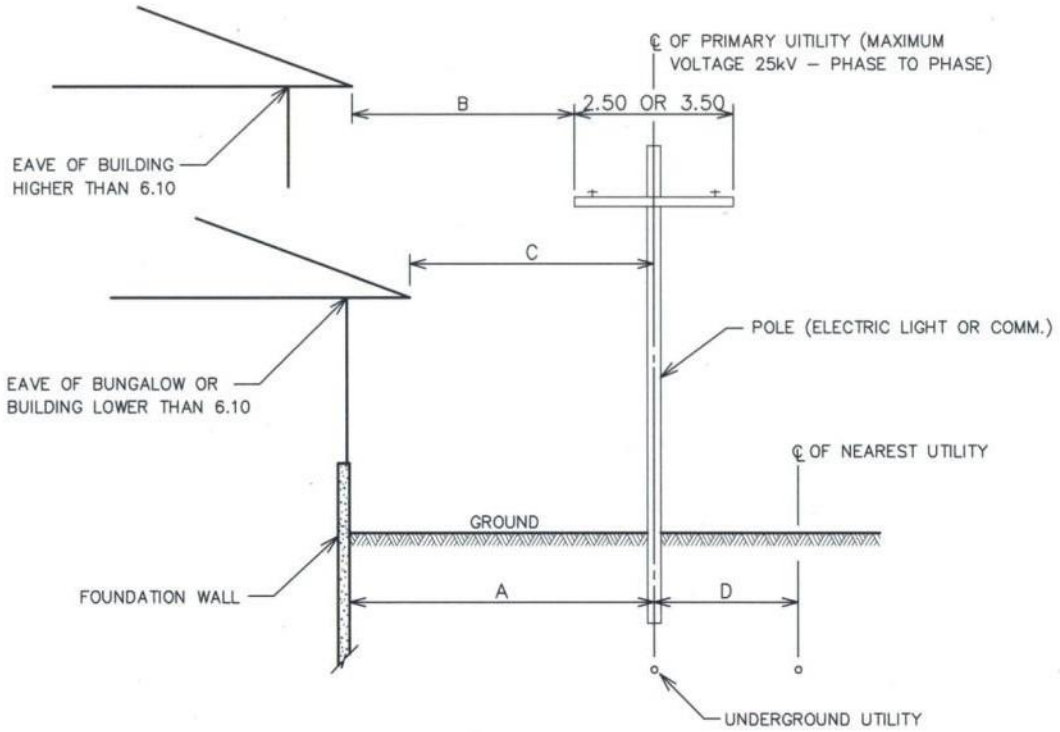
UTILITY LINE ASSIGNMENTS FOR 10.00m LANE

Figure 57
File Number 454.1008.037



NOTES:
FOR SEWER OR WATER R/W, MINIMUM WIDTH = (2 x A)

THESE WIDTHS ARE MINIMUMS. ADDITIONAL WIDTH MAY BE REQUIRED FOR :
1. SEWER 1.22 OR LARGER.
2. POURED IN PLACE DUCTS.
3. SEWERS IN EXTREMELY UNSTABLE SOIL.

OVERHEAD UTILITIES ARE TO BE OFFSET FROM :
(A) FOUNDATION WALL OF BUNGALOW OR BUILDING LOWER THAN 6.10.
(B) EAVE OF BUILDING HIGHER THAN 6.10.
(C) GAS TO BE OFFSET FROM EAVES IN ALL CASES.

WHERE APPLICABLE, COMMON TRENCH WILL BE USED FOR ELECTRIC LIGHT, COMM. & C.T.V.

NEW UTILITY RIGHTS–OF–WAY PROPOSED ON RESERVE PARCELS SHALL BE APPROVED BY THE PLANNING SUB–COMMITTEE.

NEW UTILITY RIGHTS–OF–WAY SHALL BE CONSIDERED ONLY IN INSTANCES WHERE THESE RIGHTS–OF–WAY ABUT ADJACENT ROADS, LANEWAYS, OR ADJACENT PROPERTY BOUNDARIES.

* E.C.U.S.R. IS ELECTRICAL PROTECTION ACT : ELECTRICAL & COMMUNICATIONS UTILITY SYSTEM REGULATION.

MINIMUM DISTANCES

PRIMARY UTILITY		DISTANCE A	B	C	D
SEWER	4.50 DEPTH	3.00	–	–	2.00
	4.50 AND OVER	4.50	–	–	2.00
WATER		4.50	–	–	3.00
GAS		1.50	–	1.50	2.00
ELECTRIC LIGHT – UNDERGROUND		SEE ELECTRIC UTILITY & E.C.U.S.R.*			
ELECTRIC LIGHT – OVERHEAD		SEE ELECTRIC UTILITY & E.C.U.S.R.*			
COMM. – UNDERGROUND		0.75	–	–	2.00
COMM. – OVERHEAD		2.50	2.50	–	1.20

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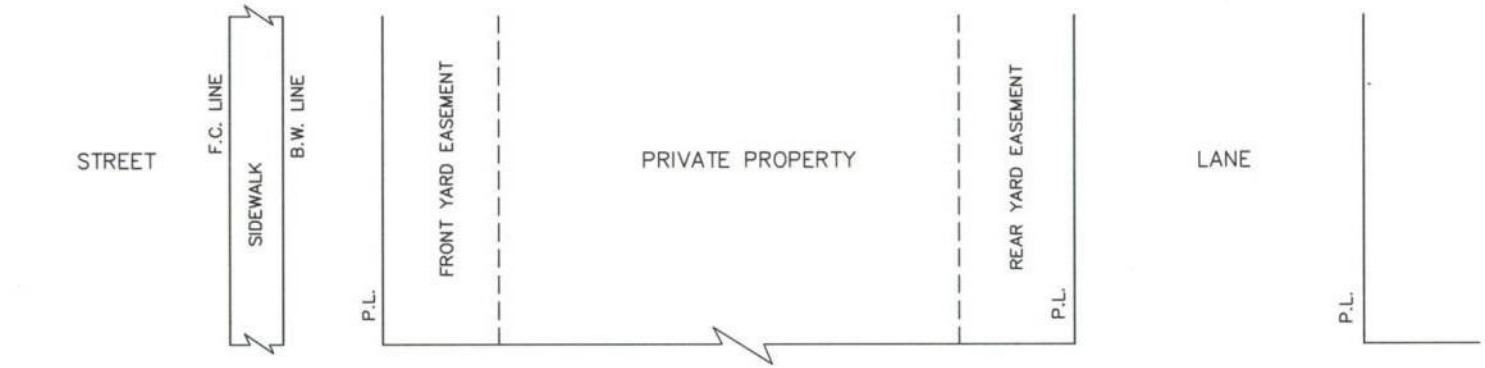
REQUIREMENTS IN UTILITY R.O.W.'s (EASEMENTS)

Figure 58

File Number 454.1008.006



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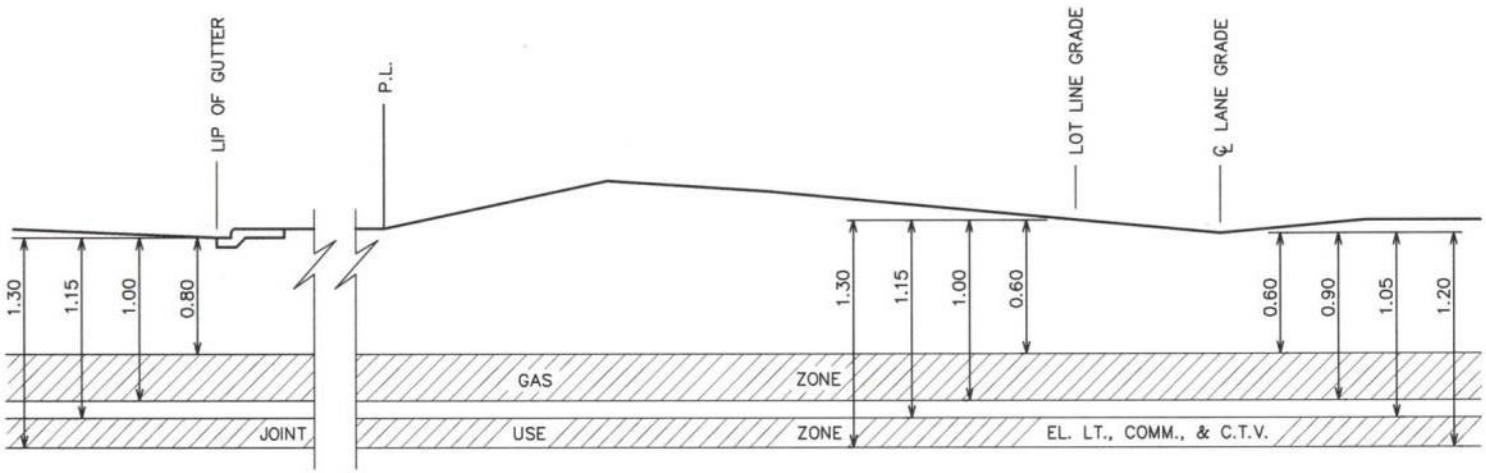

NOTES:
DEPTHS MEASURED FROM
1. TOP OF CURB IN FRONT YARD EASEMENT.
2. LOT LINE GRADE IN REAR YARD EASEMENT.
3. CENTRE LINE GRADE IN LANES.

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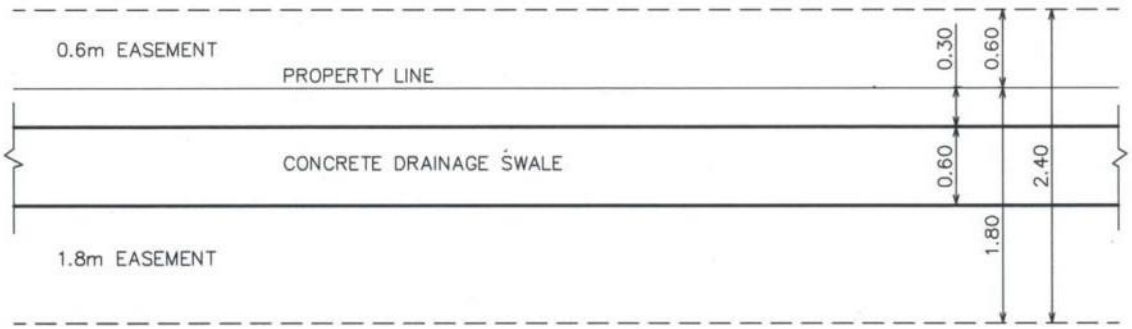
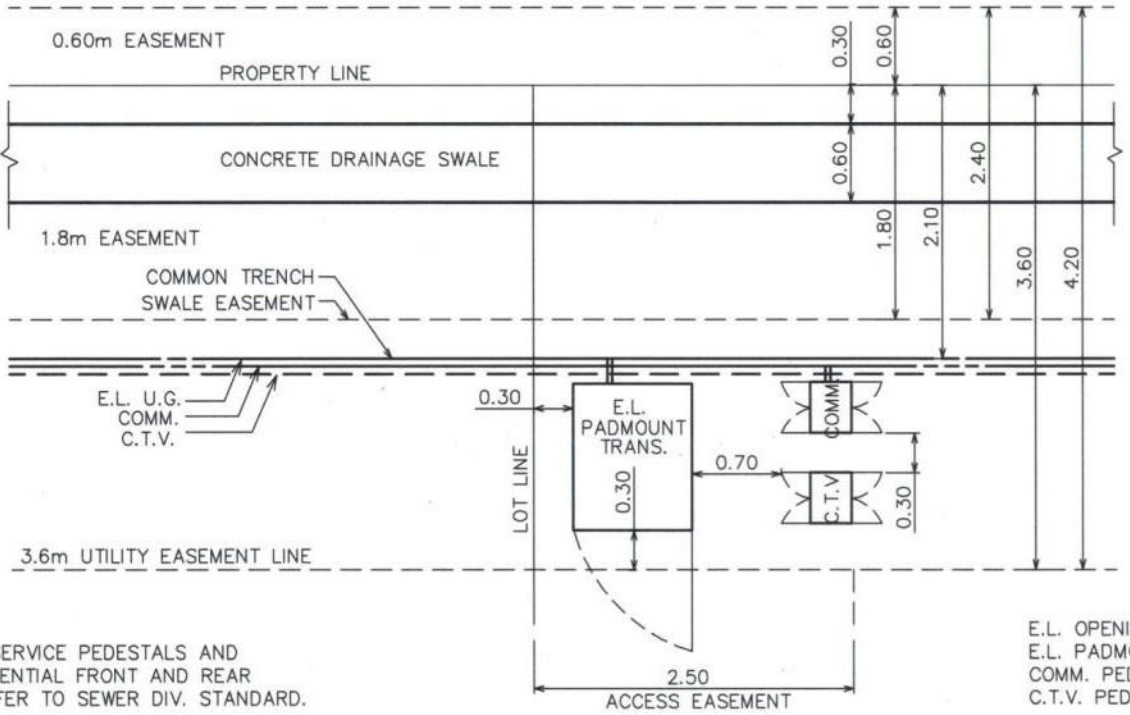
Scale:	NTS

STANDARD DEPTH ZONES FOR U/G JOINT USE INSTALLATION (RESIDENTIAL DISTRIBUTION)

Figure: 59
File Number: 454.1008.007



CONCRETE SWALE
TYPICAL



NOTE:
STANDARD PLACEMENT OF SERVICE PEDESTALS AND PADMOUNT TRANS. IN RESIDENTIAL FRONT AND REAR YARD 3.6m EASEMENTS. REFER TO SEWER DIV. STANDARD.

E.L. OPENING AT TOP
E.L. PADMOUNT = 1.168 x 1.016
COMM. PEDESTAL = 0.330 x 0.406
C.T.V. PEDESTAL = 0.330 x 0.406

CONCRETE SWALE WITH UTILITY

NOTE: NOT TO BE USED IN NEW CONSTRUCTION

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STANDARD PLACEMENT
EASEMENT WITH SWALE

Figure 60
File Number 454.1008.035

TREE SEPARATIONS TO UTILITES WITHIN ROAD RIGHTS-OF-WAY

UTILITIES:	DECIDUOUS			CONIFEROUS			POPLAR	
	SERVICES		MAINS	SERVICES		MAINS	SERVICES	MAINS
DEEP:	MEDIANS	BLVD	(parallel to tree line)	MEDIANS	BLVD	(parallel to tree line)		(parallel to tree line)
SANITARY & STORM (<4.5m DEEP)	0m **	2.5m	3.0m	0m **	3.0m	4.0m	3.0m	4.0m
	0m **	2.5m	3.0m	0m **	3.0m	4.0m	3.0m	4.0m
WATER	0m **	2.5m	3.0m	0m **	3.0m	4.0m	3.0m	4.0m
HYDRANTS	N/A	2.5m	2.5m	N/A	3.0m	4.0m	3.0m	4.0m
SHALLOW:								
GAS	2.0m		2.0m	2.0m*		2.0m*	2.0m*	2.0m*
TELUS	1.5m		1.5m	2.0m*		2.0m*	2.0m*	2.0m*
CTV	1.5m		1.5m	2.0m*		2.0m*	2.0m*	2.0m*
ENMAX	1.5m		1.5m	2.0m*		2.0m*	2.0m*	2.0m*
ENMAX:								
OVERHEAD (TO OUTSIDE CONDUCTOR)	7.0m - 9.0m			7.0m - 9.0m			9.0m	
TRANSFORMERS (WITHIN U.R/W)	N/A (TREE PLANTING NOT PERMITTED WITHIN UTILITY RIGHTS-OF-WAY)			N/A (TREE PLANTING NOT PERMITTED WITHIN UTILITY RIGHTS-OF-WAY)			N/A (TREE PLANTING NOT PERMITTED WITHIN UTILITY RIGHTS-OF-WAY)	
STREET LIGHT POLES	4.0m - 5.0m			MIN. 4.0m			5.0m	

12/93

SEPARATIONS BETWEEN UTILITIES AND TREES AS AGREED BY U.D.I., WATERWORKS, SEWERS, COMM., SHAW CABLE TV, ROGERS CABLE TV, ELECTRIC, AND GAS.

* A 3.0m SEPARATION MAY BE REQUIRED AT THE DISCRETION OF THE UTILITIES.
** PIPE JOINTS ARE NOT PERMITTED ON WATER OR SEWER SERVICES LOCATED UNDER MEDIANS.

TREE SETBACKS FROM CURB AND SIDEWALK WILL REMAIN AS NOTED IN THE TYPICAL ROAD CROSS SECTIONS REFERRED TO IN THIS APPENDIX.

TREES ON RESIDENTIAL (15.0m R/W) BOULEVARDS, WITH NO SIDEWALKS, CAN BE PLANTED 1.0m FROM DRIVEWAYS. (FOR RETROFIT SITUATIONS ONLY).

CONIFEROUS - CONE BEARING TREES SUCH AS PINE AND SPRUCE.
DECIDUOUS - TREES SHEDDING LEAVES ANNUALLY.
POPLAR - TREES OF THE POPULUS FAMILY HAVING RAPID GROWTH.
NO TREES ARE TO BE PLANTED WITHIN 4.5m OF THE MEDIAN BULLNOSE ON A DIVIDED STREET.

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TREE SEPARATIONS TO UTILITIES

Figure 61

File Number 454.1008.038

DEVELOPMENT OF SUPERELEVATION

The length of roadway required to develop superelevation consists of two components, tangent runout and superelevation runoff. The tangent runout refers to the distance required to eliminate the adverse crossfall (2% to 0%) and the superelevation runoff is the additional distance necessary to acquire the full superelevation rate.

The total length required to remove the adverse crown and develop full superelevation is the sum of the tangent runout and the superelevation runoff:

$$L_{total} = L_{runout} + L_{runoff}$$

Note: The total length required to remove the adverse crown and develop full superelevation may need to be adjusted in order to ensure that roadway drainage and minimum grade requirements are adequately met.

The superelevation runoff is based on the spiral parameter "A". The spiral parameters can be developed based on three criteria, namely:

- comfort
- relative slope
- aesthetics

Quantitative expressions of the design values for the spiral parameters are given on the Superelevation Tables, see Figure 62, Page 108 and the TAC manual.

The superelevation runoff is calculated based in the following formula:

$$L_{runoff} = \frac{A^2}{R}$$

Where:

L_{runoff} = superelevation runoff (m)

A = spiral parameter (m)

R = centreline radius (m)

If transition spirals are used, (e.g. Arterial Streets and Industrial Arterial Streets), the superelevation runoff is to be contained within the spiral length (tangent to spiral (T.S.) and spiral to curve (S.C.). Note that transition spirals shall be of minimum length of 60 m even if the calculated superelevation runoff length is less than 60 m. The tangent runout is normally achieved at the same rate as the superelevation runoff.

For curves without spirals, (e.g. Local Arterial Streets, Liveable Streets, Primary Collector Streets, Collector Streets and Activity Centre Streets), the superelevation runoff is applied over a length equivalent to the spiral length calculated based on the spiral parameter. It is generally accepted to use a minimum superelevation runoff length of 30 m on lower speed roads (e.g. 50 km/h) which represents the approximate distance traveled in 2 seconds at the design speed. The superelevation runoff is developed so that 60% of the length is on the tangent and 40% in the curve. The tangent runout is normally achieved at the same rate as the superelevation runoff.

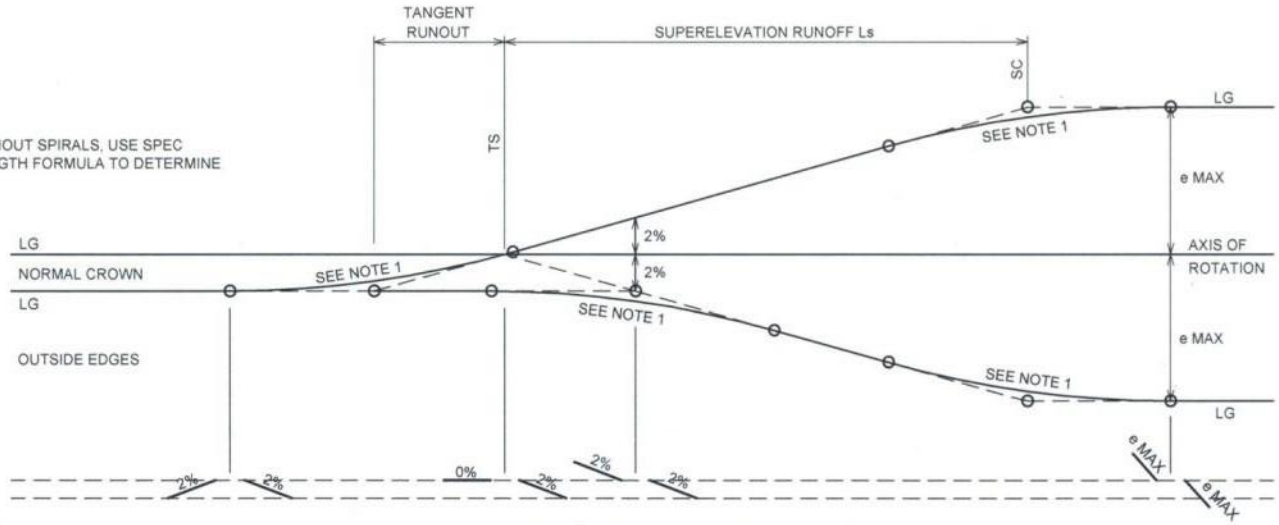
In superelevating a divided street, each roadway is separately rotated about the inside pavement edge. Where there is a possibility of future widening by adding lanes to the median (i.e. 4-lane Arterial Streets to 6-lane Arterial Streets), the superelevation should be developed by rotating about the inside pavement edge of the future widening.

For Arterial Streets and Industrial Arterial Streets, a 20 m smoothing curve is required at the point where the tangent runout is introduced and where the superelevation runoff ends and vice versa.

For Local Arterial Streets, Liveable Streets, Primary Collector Streets, Collector Streets and Activity Centre Streets, a 15 m smoothing vertical curve is required at the point where the tangent runout is introduced and where the superelevation runoff ends and vice versa. Smoothing curves required where 'M' value is greater than or equal to 0.03.

See Superelevation Development for Divided and Undivided roadways in Figure 62 Page 124.

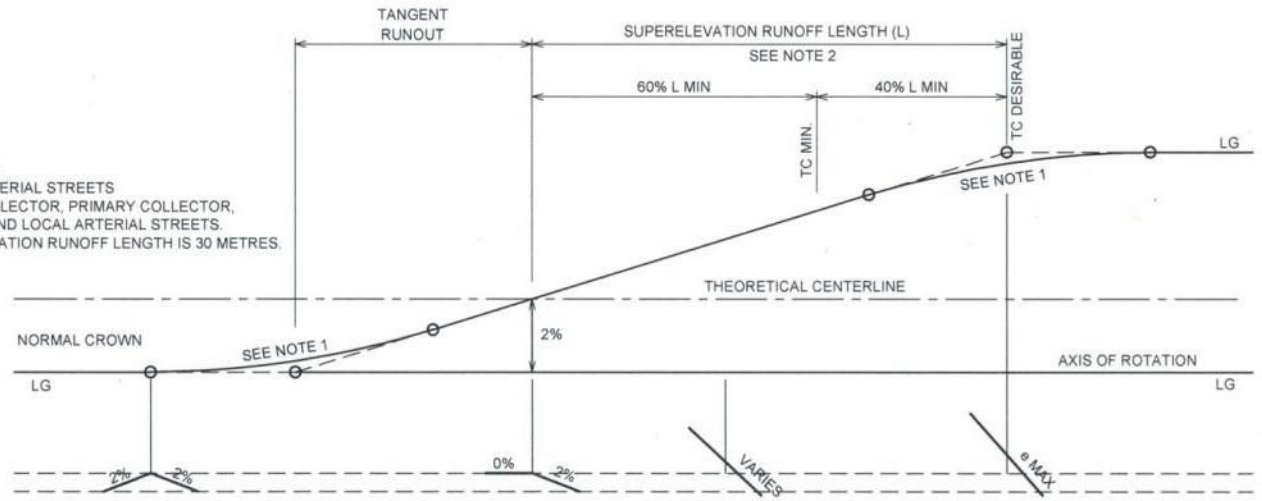
NOTE:
FOR DIVIDED ROADS WITHOUT SPIRALS, USE SPEC #454.1014.002 SPIRAL LENGTH FORMULA TO DETERMINE RUNOFF LENGTH.



AXIS OF ROTATION AT MEDIAN LIP OF GUTTER

DIVIDED ROADWAY WITH SPIRAL

NOTES:
1. SMOOTHING CURVES:
   - 20 METRES FOR ARTERIAL STREETS
   - 15 METRES FOR COLLECTOR, PRIMARY COLLECTOR, LIVEABLE STREETS AND LOCAL ARTERIAL STREETS.
2. MINIMUM SUPERELEVATION RUNOFF LENGTH IS 30 METRES.



LEGEND:
LG = LIP OF GUTTER
e = RATE OF SUPERELEVATION
Ls = LENGTH OF SPIRAL
TS = TANGENT TO SPIRAL
SC = SPIRAL TO CURVE
TC = TANGENT TO CURVE

UNDIVIDED ROADWAY WITHOUT SPIRAL

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SUPERELATION DEVELOPMENT FOR DIVIDED AND UNDIVIDED ROADWAYS

Figure 62

File Number 454.1014.001

50 km/h eMAX = 0.060							
RADIUS	e	A		RADIUS	e	A	
		2 LANE	3&4 LANE			2 LANE	3&4 LANE
7000	NC	0	0	400	0.031	100	100
5000	NC	0	0	350	0.034	100	100
4000	NC	0	0	300	0.037	90	100
3000	NC	0	0	250	0.040	85	90
2000	NC	0	0	220	0.043	80	90
1500	NC	0	0	200	0.045	75	90
1200	NC	0	0	180	0.047	70	90
1000	RC	170	170	160	0.049	70	85
900	RC	150	150	140	0.052	65	80
800	RC	150	150	120	0.055	65	75
700	0.021	140	140	100	0.058	65	70
600	0.024	125	125	90	0.060	65	70
500	0.027	120	120	minimum R=90			

60 km/h eMAX = 0.060							
RADIUS	e	A		RADIUS	e	A	
		2 LANE	3&4 LANE			2 LANE	3&4 LANE
7000	NC	0	0	600	0.030	140	140
5000	NC	0	0	500	0.034	125	125
4000	NC	0	0	400	0.038	115	120
3000	NC	0	0	350	0.041	110	115
2000	NC	0	0	300	0.044	100	110
1500	RC	225	225	250	0.048	90	100
1200	RC	200	200	220	0.050	90	100
1000	0.021	175	175	200	0.052	85	100
900	0.023	175	175	180	0.054	85	90
800	0.025	160	160	160	0.056	85	90
700	0.027	150	150	140	0.059	85	90
				minimum R=130			

50 km/h eMAX = 0.040					
RADIUS	e	RADIUS	e	RADIUS	e
7000	NC	800	NC	200	RC
5000	NC	700	RC	180	RC
4000	NC	600	RC	160	RC
3000	NC	500	RC	140	RC
2000	NC	400	RC	120	RC
1500	NC	350	RC	100	0.026
1200	NC	300	RC	90	0.032
1000	NC	250	RC		
900	NC	220	RC		

60 km/h eMAX = 0.080			
RADIUS	e	A	
		2 LANE	3&4 LANE
7000	NC	0	0
5000	NC	0	0
4000	NC	0	0
3000	NC	0	0
2000	NC	0	0
1500	RC	225	225
1200	RC	200	200
1000	0.023	175	175
900	0.025	175	175
800	0.027	160	160
700	0.030	150	150
600	0.034	140	140
500	0.039	125	135
400	0.045	115	125
350	0.049	110	125
300	0.053	100	120
250	0.059	100	120
220	0.062	95	110
200	0.065	90	110
180	0.068	90	105
160	0.072	85	100
140	0.076	85	100
120	0.080	85	95
minimu R=120			

70 km/h eMAX = 0.080			
RADIUS	e	A	
		2 LANE	3&4 LANE
7000	NC	0	0
5000	NC	0	0
4000	NC	0	0
3000	NC	0	0
2000	RC	240	275
1500	0.021	255	250
1200	0.026	220	225
1000	0.029	200	200
900	0.032	180	180
800	0.035	175	175
700	0.038	165	165
600	0.042	150	160
500	0.048	140	150
400	0.054	125	150
350	0.058	120	150
300	0.063	120	140
250	0.069	110	135
220	0.073	110	125
200	0.075	110	125
180	0.078	110	120
minimum R=170			

LEGEND
A = SPIRAL PARAMETER IN METRES
NC = NORMAL CROSS SECTION
RC = REMOVE ADVERSE CROWN & SUPERELEVATE AT NORMAL RATE
e = RATE OF SUPERELEVATION

SPIRAL LENGTH FORMULA
$L = A^2/R$
L = LENGTH OF SPIRAL (m)
A = SPIRAL PARAMETER (m)
R = RADIUS (m)

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SUPERELEVATION TABLES

Figure 63
File Number 454.1014.002

SIDEWALKS, WALKWAYS, CROSSWALKS, BOULEVARD GRADES, COMMUNITY MAILBOXES

Sidewalks

All sidewalks shall have a 2% cross slope. Grates of any kind are not permitted in sidewalks.

The following guidelines should be used for the planning, design, and construction of sidewalks.

1. Separated sidewalks should be a minimum 1.5m wide (all classifications).
2. Monolithic sidewalks should be a minimum 2.0m wide for improved pedestrian safety and to provide adequate width for snow storage (1.5m permitted on residential and industrial streets).
3. Sidewalks should be provided on both sides of all street classifications (including most residential and industrial street areas) with the exception of Skeletal Roads.
4. Sidewalks wider than two metres should be provided along transit routes and connections to transit hubs.
5. Sidewalks wider than two metres should be provided for connections to schools, within activity centers and near major pedestrian generators (e.g. stadiums). Mono sidewalk should be provided adjacent to school sites / joint use sites for potential pick-up / drop-off activities.
6. If monolithic, sidewalks should be wider than two metres to provide separation from traffic, when (does not apply to Industrial Streets):
    a) Truck volumes are greater than 10 per cent of total volume
    b) Design speed is greater than 60 kilometres per hour
    c) Traffic volume is greater than 20,000 vehicles per day
7. Sidewalk widths should be determined based on surrounding land uses (higher density requires wider sidewalks).
8. Ideally, two directional wheelchair ramps should be installed at all street intersection corners (if corner radii and catch basin locations permit).

Walkways

The maximum grade for a walkway shall be 10%.

Walkways are normally 2.5 m except for regional pathways in parks. Where the walkway is located on its own legal right-of-way of 3.0 m wide, the pathway shall be paved to the full width of 3.0 m.

Walkways are normally constructed to a crowned section, however, where the walkway is used to control drainage, it may be constructed at a 2% crossfall with concrete curb and gutter on the downhill side.

Vehicular barriers shall be provided on walkways where they intersect with streets and lanes. Each walkway is to be designated and labeled as “Walkway” on all plans of subdivision.

Crosswalks

Wheelchair ramps must be provided at all intersection corners, all traffic islands and medians at crosswalks. Locations of wheelchair ramps should align with the crosswalks and vice versa. Medians shall be cut back, wherever possible, if they are in conflict with the crosswalks. Medians shall be designed to have sufficient areas to accommodate pedestrian refuge, signal poles, street signs and wheel chair ramps.

Patterned concrete crosswalks are not permitted on Arterial Streets, Industrial Arterial Streets or Local Arterial Streets, nor are they permitted on streets with grades steeper than 4%. All proposed patterned concrete crosswalks must be reviewed and approved by the approving authority of the Transportation Department.

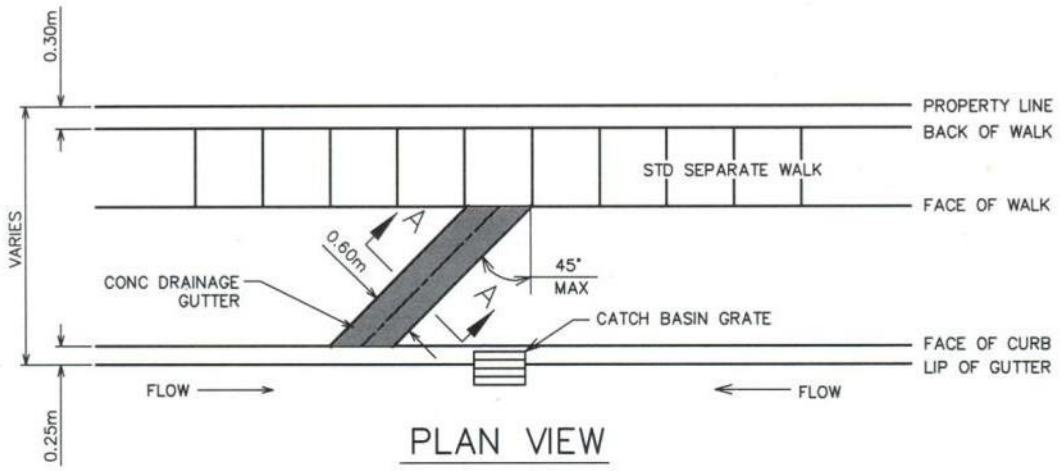
Boulevard Grades Next to Trapped Low

The standard boulevard must be graded 2% up from the top of curb to the property line or to a separate walk.

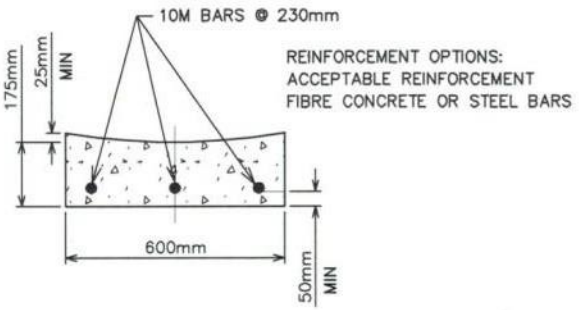
However, if the boulevard contains a separate sidewalk and is adjacent to a trap low of a depth of 0.3metres or greater, a drainage crossing as per specification 454.1013.019 shall be provided and is to be graded at 4% up from the top of the curb to the front of the walk to accommodate drainage of the sidewalk. See Boulevard Drainage Crossing at Trapped Low for Separate Walk in Figure 64, Page 128.

Community Mailboxes

Community mailboxes must be located along sidewalks/ walkways/pathways. Mailboxes shall not be located along school frontages or within bus zones.



PLAN VIEW



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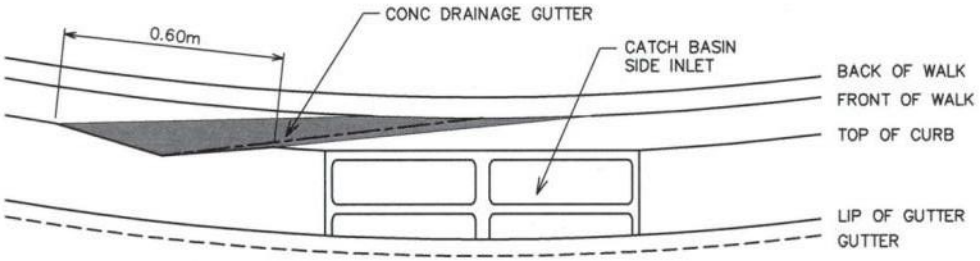
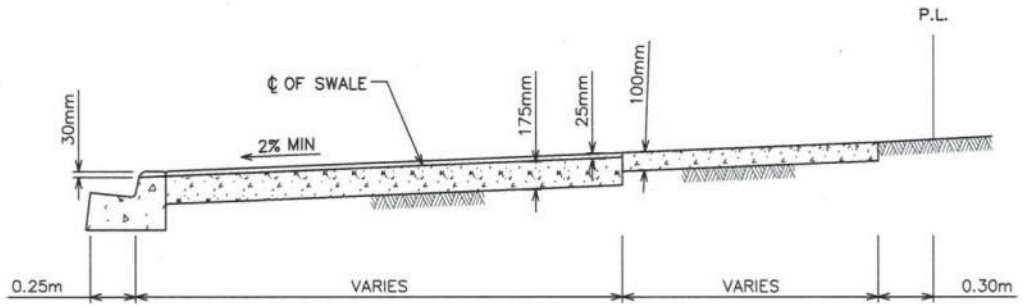


PROFILE VIEW

NOTES:
1. ON ROAD WITH GRADE > 3% THE SWALE MUST BE "OFFSET" FROM CATCH BASIN LOCATION TO ALLOW BETTER FLOW.
2. TYPE 'C' CONSTRUCTION DETAIL REQUIRED WHEN TYING DRAINAGE GUTTER TO SIDEWALK AND OR CURB & GUTTER. REFER TO DRAWING 454.1015.006.
3. CONCRETE AS SET OUT UNDER STANDARD SPECIFICATIONS – SEWER CONSTRUCTION SECTION 403.1008 OR UNDER STANDARD SPECIFICATION–ROADS CONSTRUCTION CHAPTER 310.



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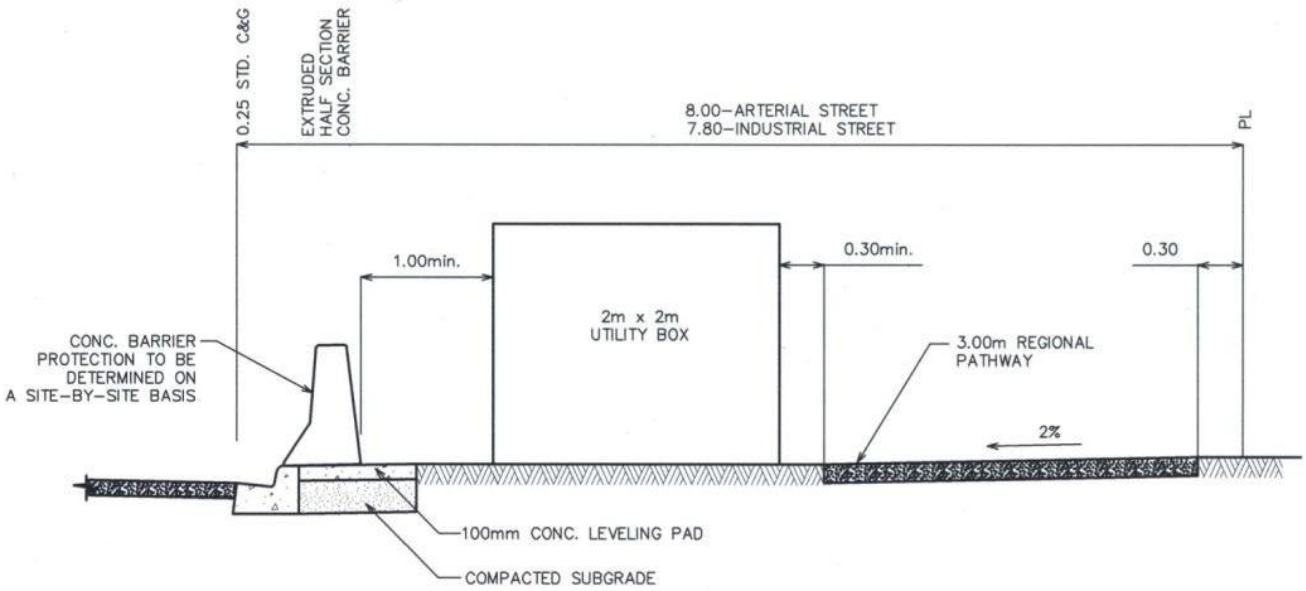
BOULEVARD DRAINAGE CROSSING AT TRAPPED LOW FOR SEPARATE WALK

Figure: 64

File Number: 454.1013.019



NOTE:
POCKET EASEMENT WILL BE REQUIRED IF THE MINIMUM OFFSET REQUIREMENTS CANNOT BE MET IN NARROWER BOULEVARD OR FOR LARGER UTILITY BOX SIZE. EASEMENT REQUIREMENT AND TYPE OF BARRIER TO BE DETERMINED AT THE DESIGN STAGE.

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UTILITY BOXES IN BOULEVARDS

Figure 65

File Number 454.1008.055

BIKEWAYS, BICYCLE PATHS AND REGIONAL PATHWAYS

The following guidelines should be used for the planning, design and construction of bicycle facilities in the City of Calgary:

1. The type of bicycle facility should be determined based on:
    - Bicycle network connectivity (as specified in the City of Calgary Pathway and Bikeway Implementation Plan);
    - Current and future demand for a route;
    - Cycling policies (e.g. Bicycle Policy TP011);
    - Design/posted motor vehicle speed;
    - Surrounding land uses;
    - Driveway frequency;
    - Level of transit service (e.g. frequent BRT vs. Infrequent bus, and
    - Daily traffic volume and composition
2. Collector streets carrying more than 3,000 vehicles per day shall include dedicated bike lanes
3. Minimum bike lane width is 1.5 metres free of obstructions and obstacles (1.2 may be permitted in retrofit projects where there are constraints)
4. Wider on-street facilities (e.g. 1.5m minimum bike lane + 0.8m minimum buffer) shall be provided adjacent to a parking lane (door zone buffer), next to vertical barriers and on a grade (as cyclists may not travel in a straight line while travelling uphill)
5. A buffered (e.g. minimum 1.0 m painted, or texted buffer) or physically separated (e.g. by a curb or parked vehicles) exclusive facility should be provided when any of the following criteria are met:
    a) Truck volumes are >10 percent of total volume
    b) Design speed >60 km/h
    c) Two-way traffic volumes exceed 20,000 vehicles per day
    d) The speed differential between cyclists and motor vehicles is too great (e.g. when travelling uphill)
6. Wherever possible, minimum width for regional pathways is 3.0m (uplands) and 4.0m (river and creek valleys)
7. If a regional or local pathway is required in lieu of a sidewalk, the boulevard width and right-of-way shall be increased accordingly equal to the difference in the pathway and sidewalk widths. The line assignments for deep utilities, alternate shallow utilities, service valves and hydrants are to be adjusted accordingly
8. The setback requirements of pathways to obstacles, (e.g. fence) should be in accordance with the Development Guidelines and Standard Specifications: Landscape Construction or at the discretion of Parks

For pathway construction details, refer to Section “PATHWAYS, TRAILS, PAVING STONES” in Development Guidelines and Standard Specifications for Landscape Construction and Roads Construction Standard Specifications.

Bicycle Paths (Regional & Local Pathways)

Definition & Design Elements

DEFINITION

There are two types of pathway systems:

- Regional Pathways:
  - The regional pathway system is a city-wide linear network that facilitates non-motorized movements for recreation and transportation purposes
  - It is a multi-use facility and no one user or type of user is to be given preference
  - The spine of the system, including waterways, escarpments and ravines
- Local Pathways:
  - Provide secondary routes within communities, linking residential areas to facilities such neighbourhood parks, schools and other local community destinations
  - Serve as links to the regional pathway system

RIGHT-OF-WAY (WIDTH)

- 2.5 m minimum for local pathways
- 2.5 m minimum for regional pathways with 3.0 m provided wherever possible
- 3.5 m minimum for river pathways with 4.0 m provided where possible
- 2.5 m minimum pedestrian pathways and 2.5 m minimum bicycle pathway for twinned pathways with 3.0 m provided where possible

DESIGN SPEED

Design speed = 25 km/h

MINIMUM STOPPING SIGHT DISTANCE

Minimum Stopping Sight Distance = 25 m

CENTRELINE RADIUS

- The minimum radius of curvature shall be 7.0 m and should be only used where restrictive conditions dictate
- Radii less than 11.0 m require a pavement widening of 0.6 m on the inside of the curve

MAXIMUM AND MINIMUM GRADES

- Maximum Grade = 10%
- Minimum Grade = 0.6%
- Grade should not exceed 5% for a distance more than 100 m

VERTICAL CURVES & SUPERELEVATION

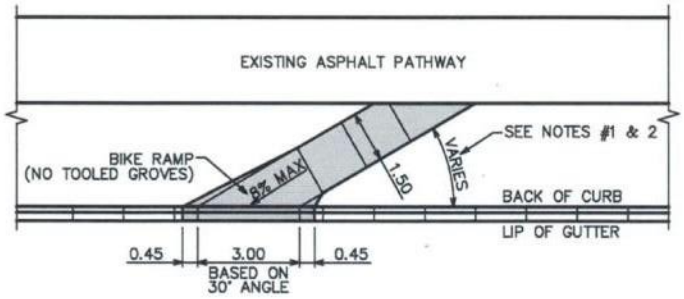
- The table below sets out the acceptable lengths for crest vertical curves:

A	4	6	8	10	12	14	16	18	20
L	24	36	49	61	73	85	98	110	122

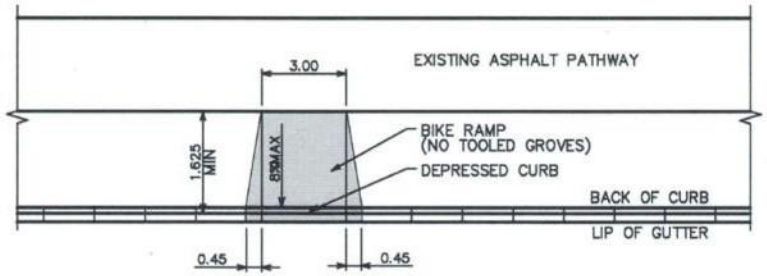
where:

A = the algebraic grade difference
L = length of vertical curve (m)

- Where the centreline radius is less than 30 m consideration should be given to introducing superelevation at the maximum rate of 0.04m/m

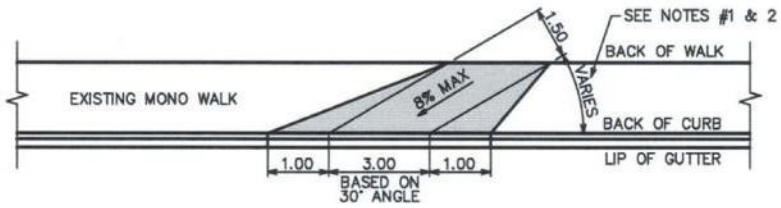


PLAN - OPTION A

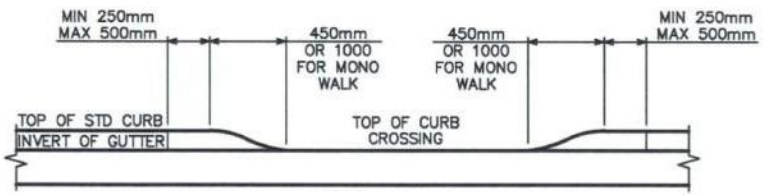


PLAN - OPTION B

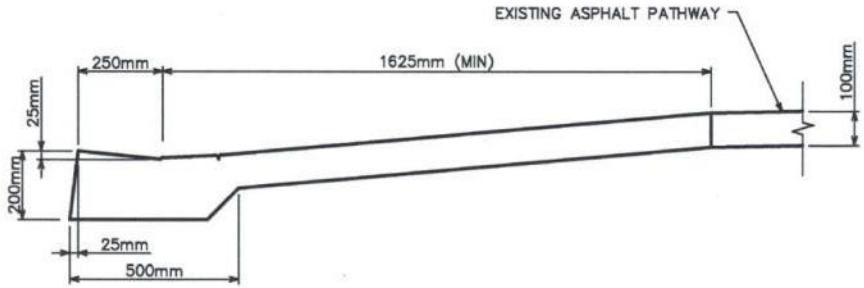
NOTES:
1. ANGLE WILL VARY WITH DIFFERENT SITUATION
2. FOR DIRECTIONAL RAMPS USE 30°
3. WIDTH OF BIKE RAMP CAN VARY
4. MAXIMUM SLOPE OF CURB DROP 8% (12.5:1)
5. SOIL CONDITION SHOULD BE REVIEWED TO ASSESS THE NEED FOR GRAVEL BASE, SLAB REINFORCEMENT OR SUB-DRAINAGE SYSTEM



PLAN - OPTION C



ELEVATION VIEW



SECTION

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BIKE RAMP DETAILS

Figure 66

File Number 454.1013.020

TRANSIT AND SIGNAL REQUIREMENTS

Bus Zones

Bus Zones must be identified on the Outline Plans either by Calgary Transit or the developers and shall be reviewed and approved by Calgary Transit. Bus Zones shall also be shown on all Construction drawings.

Standard curb and gutter is required at bus stop patron waiting areas.

Concrete aprons are required between the curb and separate sidewalk. On Collector Streets with mono sidewalks, bus stop pads will be required behind the mono sidewalk at specific locations as determined by the approving authority of the Transportation Department.

The construction of driveways and/or vehicular access across bus stop patron waiting areas is prohibited. Restrictive Covenants must be registered on the affected lots to prohibit vehicular access across bus zone areas. The lot sizes shall be designed to provide sufficient width to accommodate for both driveways and bus pad.

For bus zone designs, see City of Calgary Roads Construction - Standard Specifications drawing file numbers 454.1012.001 to 454.1012.007. For typical bus bay designs, see Figure 67, Page 134, and for mid-block crossing bus zone details, see Figure 68, Page 135.

Traffic Control Ducts

Traffic control duct locations will be identified by the approving authority of the Transportation Department and are to be installed by the developer prior to roadway construction.

Traffic Signals

The Transportation Department installs traffic signals when intersections have met warrants requiring a traffic signal and funds have been approved by Council for the signal installation. However, traffic signals may be installed outside this normal priority rating and budgetary procedure in situations as follow:

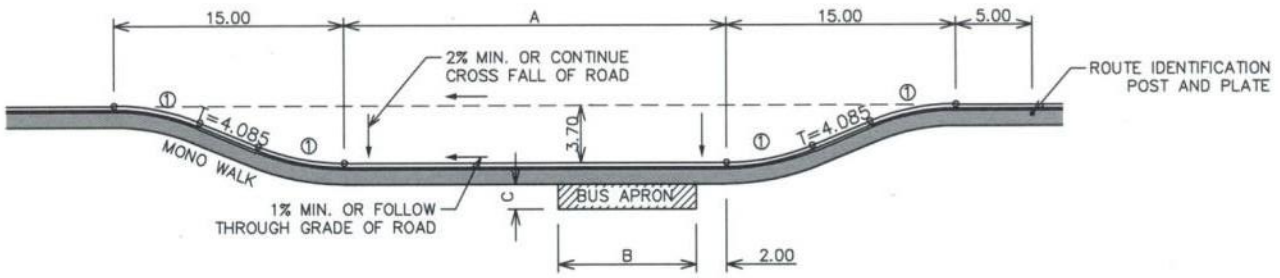
a) During the development approval process, traffic signal requirements are identified and the signals installed at the time of development with the total cost charged to the developer. Signals required because of traffic generated by the development shall be installed with the full cost charged to the developer.

b) For developments already approved and when a traffic signal is requested by a developer and is not currently scheduled for construction within the Council approved budget appropriation, the signal may be installed provided the developer pays the full cost of the signal in advance of construction.

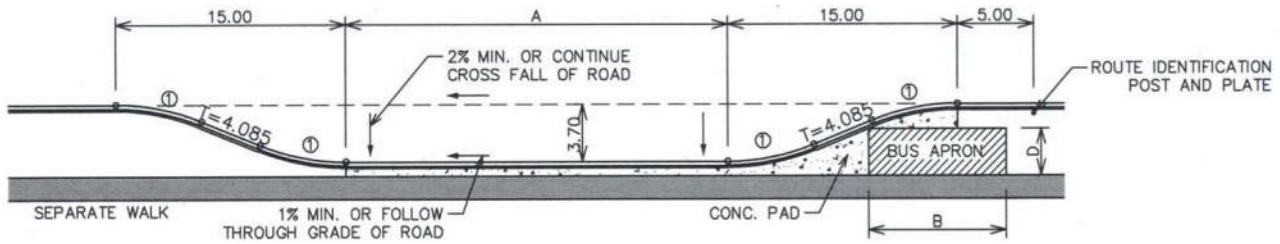
If the signal is warranted at the time it is requested, the developer will receive a full refund of the cost, without interest, when funds have been approved as part of the normal budget process.

If the signal is not warranted at the time it is requested, the cost of the signal will be discounted at a rate of 20% per year until such time as the signal is warranted (to a maximum of five years). The discounted amount will be refunded to the developer, without interest, when funds have been approved as part of the normal budget process.

This refund and discount policy does not apply to a location where transportation studies indicate that a traffic signal would have a negative effect on traffic flow.



FOR MONO WALK



FOR SEPARATE WALK

NOTES:
1. POST MUST BE A MINIMUM OF 0.50m FROM FACE OF CURB.
2. CONCRETE PAVEMENT REQUIRED IN ALL BUS BAYS. FOR SPECIFICATIONS SEE 454.1012.008 OF THE STANDARD SPECIFICATIONS ROADS CONSTRUCTION.
3. EXTEND CROSS-FALL INTO BUS BAY.
4. BUS BAYS ARE TO HAVE A MINIMUM PARALLEL WIDTH OF 3.70m TO THE EDGE OF LANE.
5. TRANSIT APRONS MAY BE INCREASED TO 3.00 X 15.00m FOR ARTICULATED BUSES IF NEEDED.
6. APPLICABLE FOR TIMEPOINTS OR ROADWAYS AT 60km/h AND ABOVE.

BUS BAY DESIGN FOR:	DIMENSIONS IN METRES			
	A	B	C	D
SINGLE STANDARD BUS	20.00	9.00	1.60	MIN. 1.60 MAX. 3.00
SINGLE ARTICULATED BUS	25.00	15.00	1.60	MIN. 1.60 MAX. 3.00
MULTIPLE BUSES	37.00	15.00	3.00	3.00

CURVE DATA	
No.	1
Δ	21° 56' 35.57"
R	15.00
T	2.908
L	5.745

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature :
Date : 2015 Aug 11
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL

THE CITY OF CALGARY ROADS

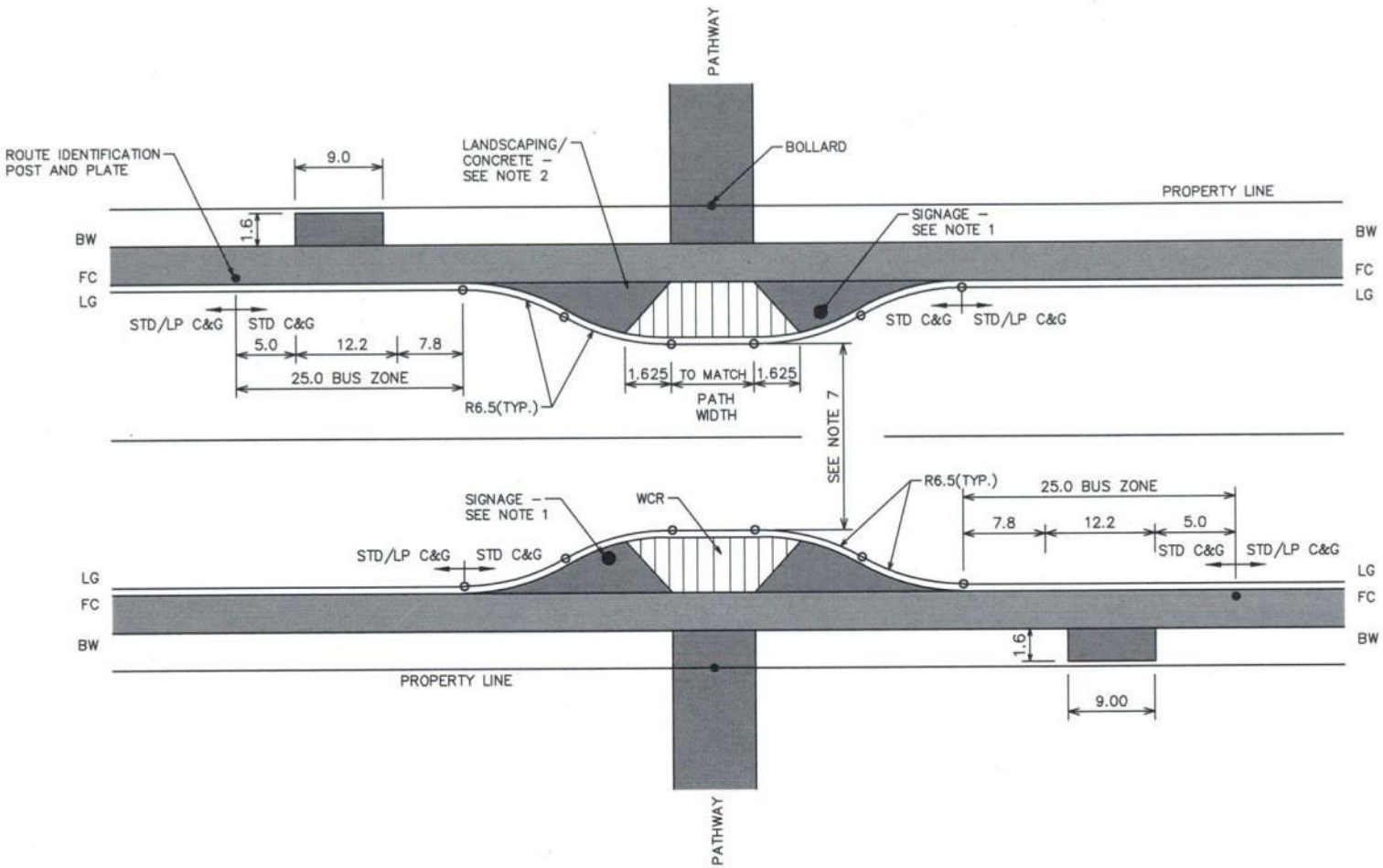
DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
FILE: Z:\permanent\DGSS_2014\dwg\4541012\ACAD\454.1012.005.dwg
DATE: Wednesday, February 04, 2015 3:35:48 PM
ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	JL	2014-06
Designed	EW	
Checked	EW	
Scale:	NTS	

TYPICAL TRANSIT BUS BAY DESIGN
60KM/H ROADWAY

Figure 67
File Number 454.1012.005



NOTES:
1. SIGNAGE LOCATION TO BE CONFIRMED WITH TRAFFIC DIVISION.
2. CURB EXTENSIONS TO BE HARD SURFACED FOR MONOWALKS AND GRASSED FOR SEPARATE WALKS.
3. CROSSING LOCATION SHALL BE CENTERED ON CURB EXTENSIONS.
4. PAVEMENT WIDTH AND ROUTE IDENTIFICATION POST LOCATION VARIES FOR DIFFERENT ROADWAY CLASSIFICATIONS.
5. POST MUST BE A MINIMUM OF 0.5m FROM FACE OF CURB.
6. WHEN BICYCLE LANES ARE PRESENT, MODIFICATIONS MAY BE REQUIRED TO CURB EXTENSIONS.
7. PAVEMENT WIDTHS:
   - 2 LANE ROADWAY 8.00m LG TO LG
   - COLLECTOR STREET < 3.000 VPD 7.00m LG TO LG
   - RESIDENTIAL STREET 7.00m LG TO LG
   - SINGLE LANE WITH A CENTER MEDIAN 6.00m FC TO FC

PERMIT TO PRACTICE THE CITY OF CALGARY
Signature :
Date :
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

SEAL

THE CITY OF CALGARY
ROADS

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
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ISC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn	JL	Date 2014-06
Designed		EW
Checked		EW
Scale:		NTS

MID-BLOCK CROSSING
BUS ZONE DETAILS

Figure 68

File Number 454.1012.009

GUARDRAILS

Guardrail installations shall be avoided. Side slopes are to be flattened and other roadside features should be avoided to reduce the need for guardrail installation.

There are several factors taken into consideration when determining if a guardrail is warranted at a specific location. This warrant method is used for fill slope situations. Guardrail requirements for other hazards such as cut slopes, fixed objects, non- traversable slopes and medians should be analyzed using TAC methods and the Alberta Transportation Roadside Design Guide.

The Guardrail Need Index can also be calculated based on the following equation: *(Highway Research Board, 1964):*

Guardrail Need Index = Basic Need Index x f_{sw} x f_{hc} x f_{cc} x f_{pc} x f_{rc}

where:

Basic Need Index = Value from Table II-J.2

f_{sw} = Adjustment Factor for shoulder width
f_{hc} = Adjustment Factor for horizontal curvature
f_{cc} = Adjustment Factor for climatic conditions
f_{pc} = Adjustment Factor for downgrade or profile conditions
f_{rc} = Adjustment Factor for roadside conditions

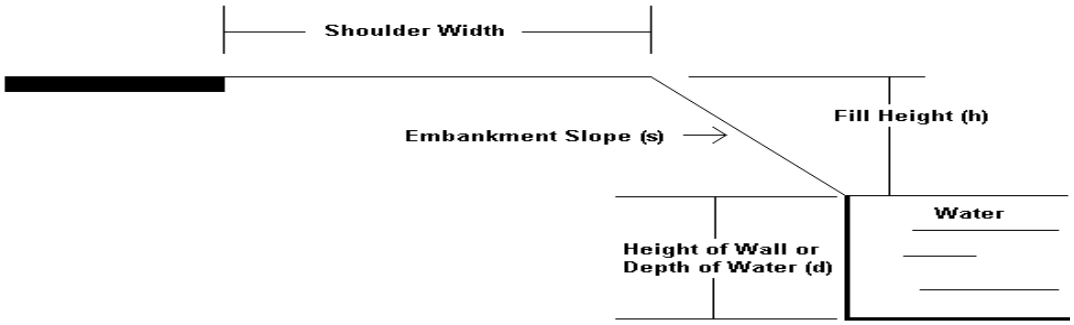
For Adjustment Factors refer to Table II-J.3

Table II-J.2 indicates the Basic Need Index for embankment conditions. The height of fill needs to be adjusted if there is a wall or water at the toe of the embankment slope.

If the Guardrail Need Index is less than the Guardrail Warrant Value (refer to Table II-J.1), then normally a guardrail is not required. However, sometimes there may be other factors need to be considered that may not be covered by this warrant method (e.g.: collision history). When examining the need for guardrail and median barriers, a more thorough investigation should be undertaken as outlined in the TAC Manual and the Alberta Transportation Roadside Design Guide.

Table II-J.1: Warranting Values for Guardrail

ROADWAY CLASSIFICATION & DESIGN SPEED (KM/H)	GUARDRAIL WARRANT VALUE
UCU 50 or UCD 50 (Various Collector streets)	70
UAU 60 or UAD 60 (Arterial streets)	70
UED 80 or UFD 100 (Skeletal Roads)	50



Wall at toe of slope: Add 5 x depth of wall (d) to height of fill (h) and enter Table II-J.2 with the larger equivalent (h) for the slope (s) indicated.

Water at toe of slope: Add 8 x depth of water (d) to height of fill (h) and enter Table II-J.2 with the larger equivalent (h) for the slope (s) indicated.

Table II-J.2: Basic Need Index for Embankment Slope

HEIGHT OF FILL (h) – metres	SLOPE 1.5:1	SLOPE 2:1	SLOPE 2.5:1	SLOPE 3:1	SLOPE 4:1 or Flatter
1.2 or less	40	35	30	25	10
1.8	45	40	35	30	15
2.4	50	45	40	35	20
3.0	55	50	45	40	25
3.6	60	55	50	45	30
4.5	65	60	55	50	35
6.0	70	65	60	55	40
9.0	75	70	65	60	45
12.0 or more	80	75	70	65	50

Table II-J.3: Adjustment Factors to be Applied to Basic Need Index

ITEM	FACTOR
Shoulder Width, Overall (m), f_{sw}	
3.6 or more	1.00
3.0	1.05
2.4	1.10
1.8 or less	1.15
Horizontal Curvature (As related to Design Speed), f_{hc}	
Tangent or Flat Curve*	1.00
Intermediate Curve** to Flat Curve	1.05
Inside Curve	
• Minimum** or near minimum radius or isolated*** intermediate curve	1.10
• Isolated minimum or near minimum radius curve	1.15
• Inside curves with R < 170 m	1.15
Outside Curve	
• Minimum or near minimum radius or isolated intermediate curve	1.20
• Isolated minimum or near minimum radius curve	1.25
• Outside curves with R < 170 m	1.25
* Flat curve is a curve which is large enough that it does not require superelevation as per the superelevation tables shown on Page 125 or in the TAC Manual.	
** Minimum radii curves are those calculated by the usual design process to satisfy the requirements of speed, maximum superelevation and road surface friction. Intermediate curves are those curves whose radius is twice that of the minimum.	
***Isolated curve is a curve on a road that has long tangent portions before and after the curve.	
Climatic Conditions, f_{cc}	1.15
Freezing - Significant (Use for Calgary Climatic Conditions)	
Downgrade or Profile Conditions, f_{pc}	
2% or less	1.00
3%	1.05
4% or moderate crest V.C.* in combination with horizontal curve	1.10
5%	1.15
6% or extreme crest V.C.** in combination with horizontal curve	1.20
7% or more	1.25
* Moderate crest V.C. is that which satisfies the sight distance criteria for the design speed.	
**Extreme crest V.C. is that which does not satisfy the required sight distance for the design speed.	
Roadside Conditions, f_{rc}	
Ground sloping away from toe of fill at the rate of:	
10% or less	1.00
15%	1.10
20%	1.15
25% or more	1.20
For boulders on slope, buildings or road at toe of slope	1.20

SOUND ATTENUATION AND VISUAL SCREENING REQUIREMENTS

Sound Attenuation

Prior to approval of any Tentative Plan or Development Permit and subsequent to finalizing lot and building grades, a noise analysis is to be submitted to and approved by the Director, Transportation Planning.

A noise analysis is required for all residential development adjacent to the Local Arterial Streets, Arterial Streets, Skeletal Roads LRT and other rail lines. The Surface Transportation Noise Policy for the City of Calgary (CALTS 117) and Noise Issues Related to Designated Truck Routes (OE96-55) outlines the requirements for noise attenuation. These documents are available from the City of Calgary websites.

Where sound attenuation is required adjacent to public lands, i.e. lanes and public streets, a concrete noise fence or equivalent is to be provided to the satisfaction of the Director, Transportation Planning.

Where sound attenuation is not required adjacent to Arterial and Skeletal category roads, a uniform screening fence shall be provided (A 1.8m chainlink fence may be used along Skeletal Roads). The maximum height of the uniform screening fence shall be 2.0 m.

Visual Screening Requirements

Visual screening cross-sections shall be submitted to the approving authority of the Transportation Department for review and approval prior to the approval of any Tentative Plan, Subdivision Construction drawings or Development Permit, for residential developments adjacent to:

- Transportation and Utility Corridor (T.U.C.)
- Ring Roads (Stoney Trail, East Freeway, Marquis of Lorne Trail/Highway 22X and Highway 8)
- Deerfoot Trail

The visual screening cross-sections are to be drawn to scale and shall demonstrate how trucks on the T.U.C., Ring Road or Deerfoot Trail can be screened from the adjacent residential development.

The cross-sections shall use a line of sight drawn from an observer eye level 1.5 m above the main floor balcony, or main floor elevation for residential developments without a balcony, of the residential development, to the top of a truck located 4.0 m above the centreline of the T.U.C., Ring Road or Deerfoot Trail.

The Developer is responsible to provide for the visual screening using berms, fencing, etc. during construction of the subdivision or development permit.

Any screening that is determined to be required in the future shall also be accommodated by the current proposed design.

All cross-sections shall show the property lines, lot grading and future road grades and any backsloping requirements.

Any proposed backsloping or surface disturbance of T.U.C. lands requires Ministerial Consent from the Province of Alberta. Ministerial Consent must be acquired prior to approval of Outline Plans.

If it is determined that visual screening can be accomplished without the aid of a screen fence, then the developer is responsible for installing a 1.8 m chain link fence along the T.U.C. or Deerfoot Trail property line.

EMERGENCY ACCESS TO PRIVATE SITES

Forward

The intent of this guideline is to provide clear direction at the Outline Plan, Subdivision, Development Permit and Building Permit stages with regard to emergency vehicle access to private sites. This guideline provides design criteria regarding access and operation of emergency vehicles, personnel and equipment to ensure that emergency services response can be carried out in a safe, efficient and timely manner while maintaining the highest level of safety for life and property.

The Calgary Fire Department recognizes that in some instances there may be unique design challenges that make it difficult to satisfy the following guidelines. In such instances alternative solutions will be considered at the discretion of the Calgary Fire Department.

In addition to these guidelines the developer must also ensure that all requirements of the Alberta Building Code and the Alberta Fire Code are adhered to.

Access

Primary Driveway Access

The primary driveway access is considered to be the principal access to a site used by occupants of a development or building on a daily basis. The primary driveway access will be connected to a public street and built in accordance with the Standard Specifications – Roads Construction document.

Primary Access Route

The primary access route is considered to be the on-site route used by the public and emergency vehicles to approach the principle entrance of a building.

Second Public Access Route

The second public access route is to be designed to the same minimum standards as the primary access route. The public can use this secondary route at all times.

Emergency Access Route

The emergency access route shall be designed to the same minimum standards as the primary access route but has restricted access. The emergency access route will be made available to emergency vehicles and potentially the public during emergency situations for access and egress. A second public access route is preferred over an emergency access as it assures maintenance.

Requirements Based on Dwelling Unit Count

Multi-residential projects with one to 100 dwelling units require at least one primary access route.

Multi-residential projects with 101 to 600 dwelling units require at least two access routes.

Multi-residential projects with 601 dwelling units or more require at least three access routes.

The number and type of access routes is also dependant on the length of the Measurement Line for projects with less than 600 dwelling units. The more stringent requirement between unit count and access route length will apply. See the following sections.

Access Route Requirement Summary

Below are the minimum access requirements based on dwelling units and Measurement Line length as detailed in the above sections.

	<90m	**90m – 120m**	**120m – 200m**	**>200m**
<101 Dwelling Units	Single access is suitable.	Single access with a turnaround required.	2 accesses required (second public or emergency access route).	2 accesses required (second public access route only).
101 – 600 Dwelling Units	2 accesses required (second public or emergency access route).			2 accesses required (second public access route only).
> 601 Dwelling Units	3 accesses required (only one emergency access is permitted).			

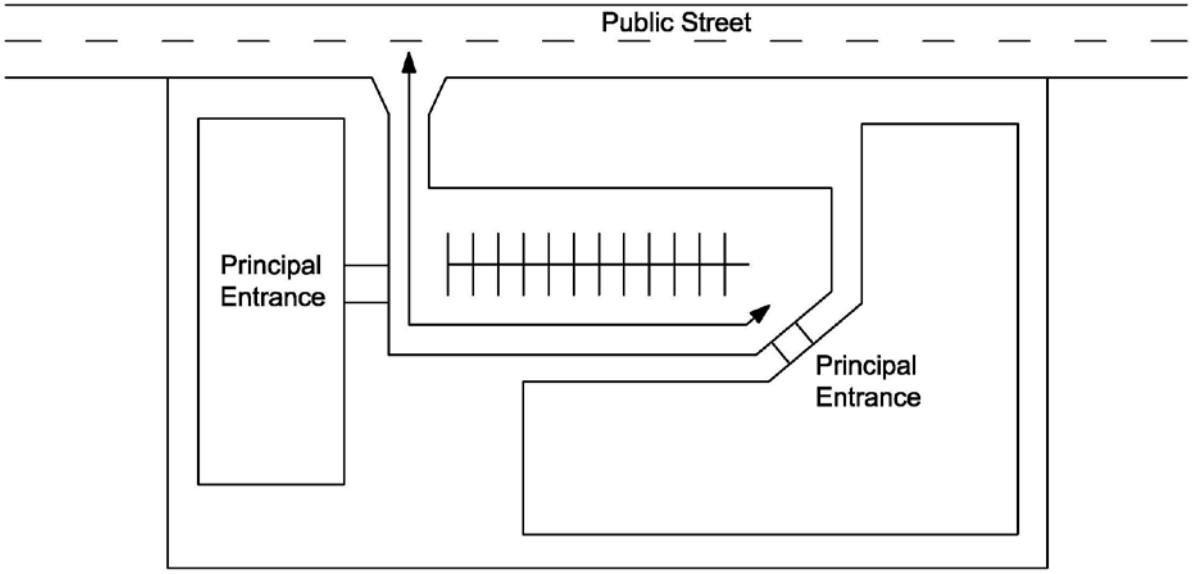
Non-Residential Requirements Based on Parking Stalls

Non-residential projects with 0 to 1250 parking stalls require at least one primary access route.

Non-residential projects with 1251 to 3000 parking spaces require at least two access routes.

Non-residential projects with >3001 parking stalls require at least three access routes.

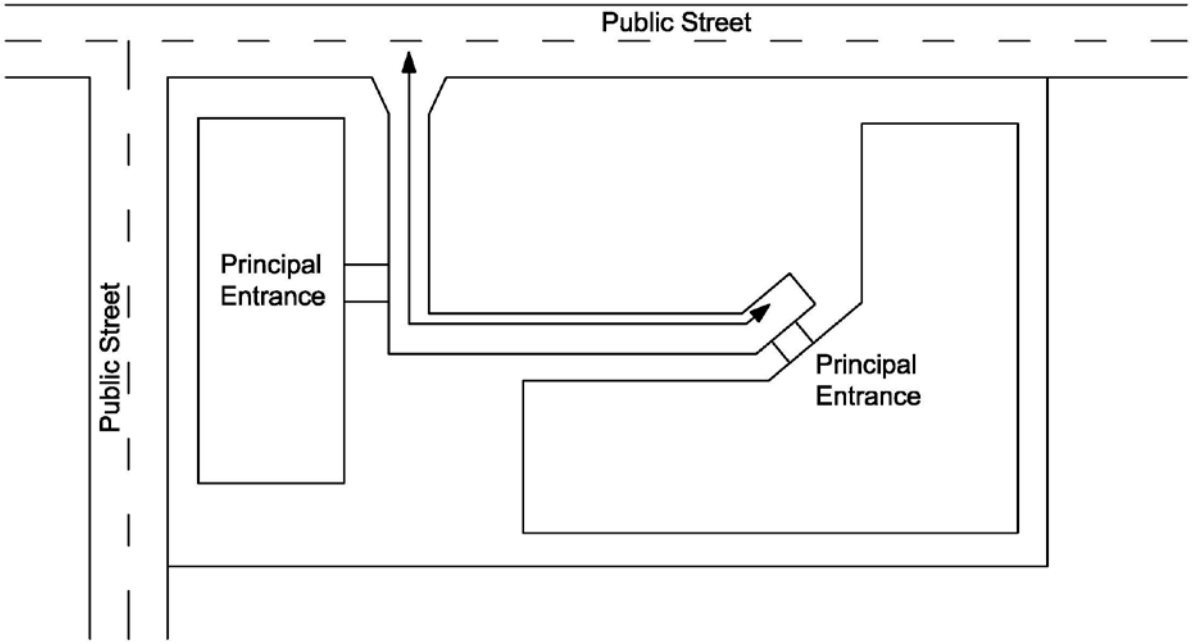
Measurement of Primary Access Route



The measurement of the primary access route (the “Measurement Line”) is taken from the centre line of the public street to the closest point of the access route adjacent to the farthest building’s principal entrance.

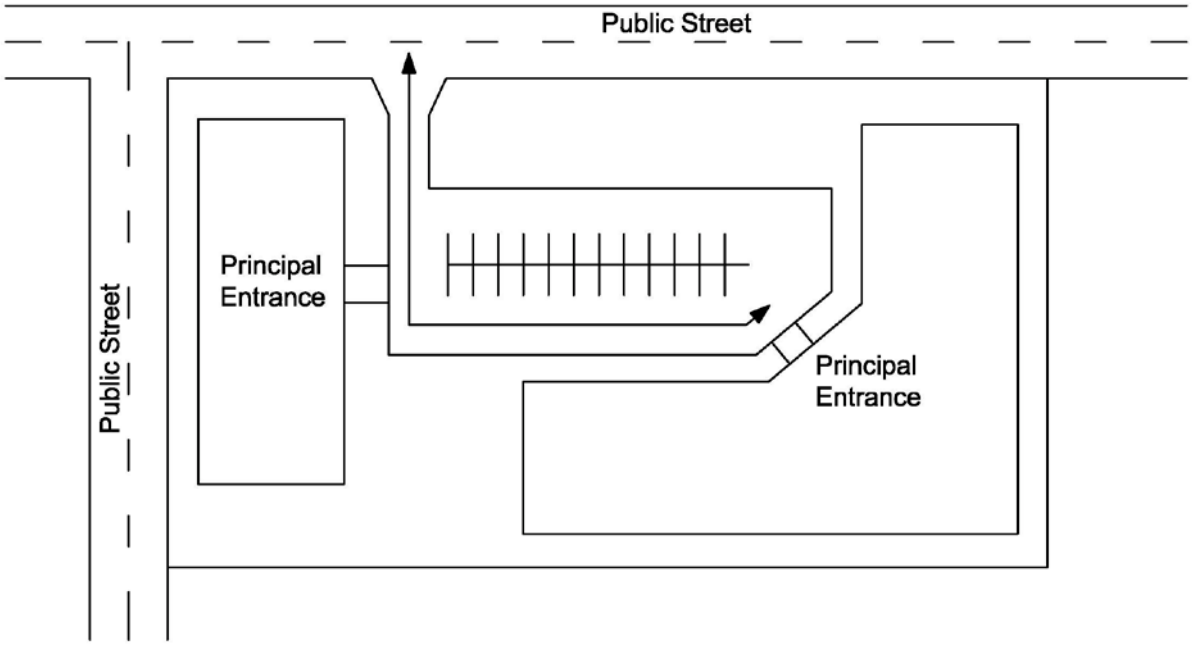
The number of access routes is also dependant on the length of the Measurement Line. The more stringent requirement between dwelling unit and access route length will apply. See the following sections.

Access Route less than 90m



If the Measurement Line is less than 90m and the total number of dwelling units is 100 or less, no other access is required for Fire Department purposes.

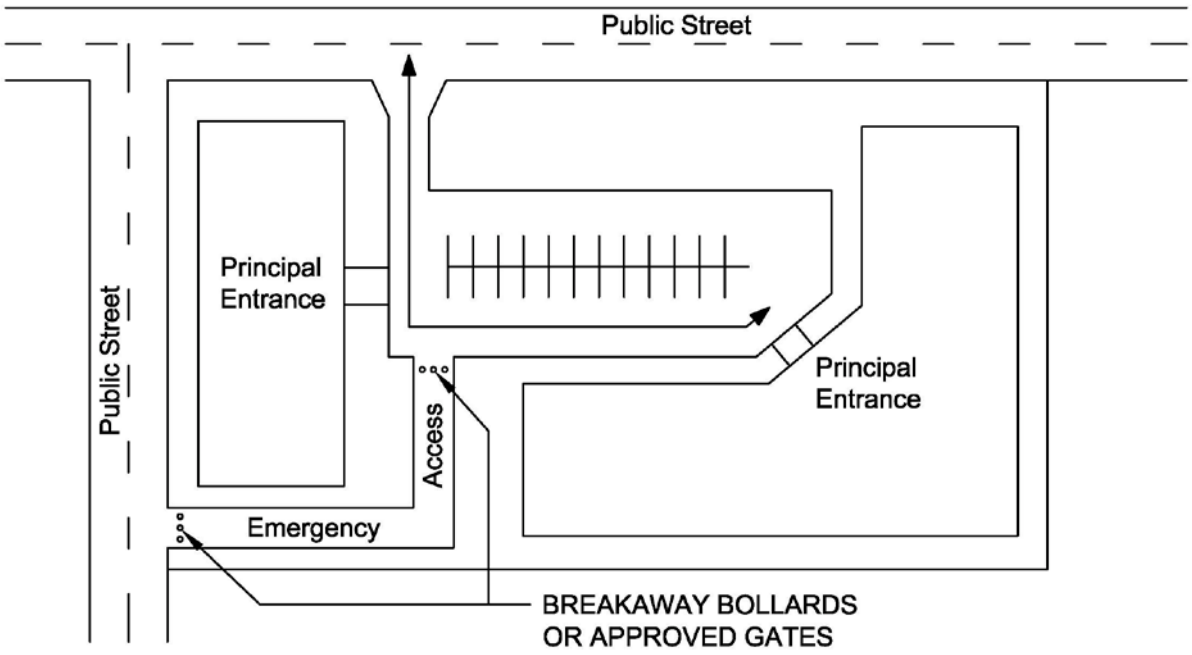
Access Route Between 90m and 120m



If the Measurement Line is between 90m and 120m a turnaround is required. Turnarounds can be a parking area as shown, a hammerhead or bulb.

B-12 vehicle templating is required for a hammerhead or bulb if their design is smaller than that required by “Design Guidelines for Subdivision Servicing – Typical Cul-de-sac and Hammerhead Designs for 7.00 m Lane”.

Access Route Between 120m and 200m



If the Measurement Line is between 120m and 200m an emergency access route is required. Alternatively a second public access route is acceptable and preferred.

It shall provide an additional route into and out of building sites or complexes.

The emergency access route is to be constructed as remote from the primary access driveway as possible or practical.

The emergency access route shall be connected to a public street.

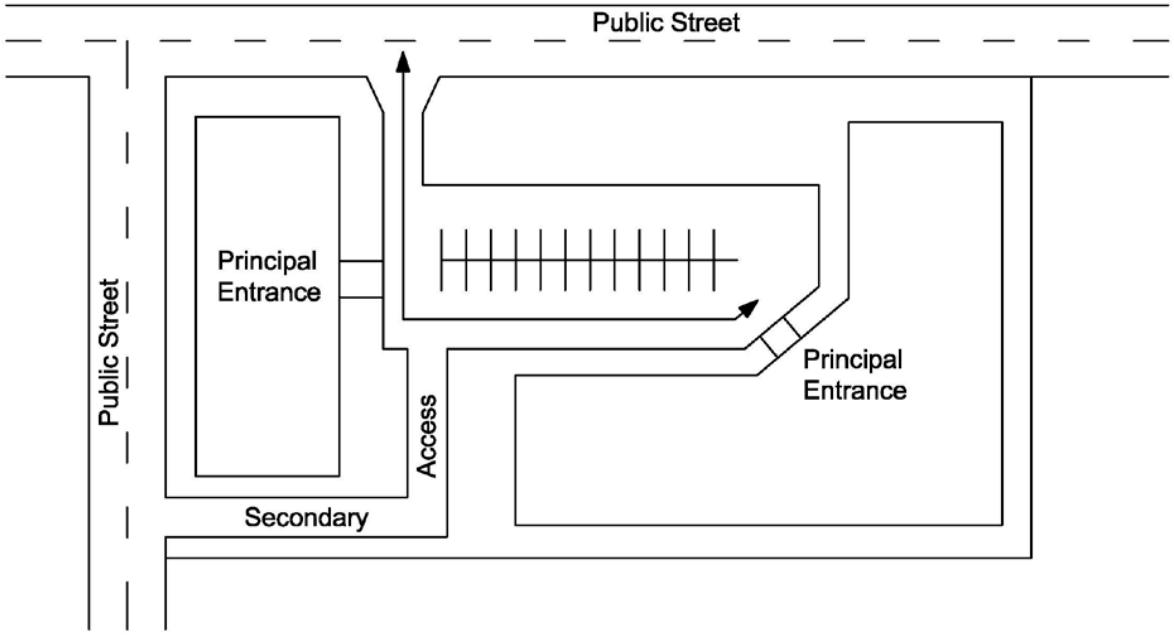
Only one emergency access route is allowed per site. Other accesses must be second public access routes available for public use.

Breakaway bollards, gate design and signage specifications are provided in the City of Calgary Roads Construction Standard Specifications. Please note: Gates are preferred over breakaway bollards with the exception of access onto a regional pathway system.

Copies of keys to gates are not required by the Fire Department. Locks or chains will be cut in the event of an emergency.

Rolled or other mountable curb is required at the entrance to the emergency access route. Flares are not required for the emergency access.

Access Route greater than 200m



If the Measurement Line is greater than 200m a second public access route is required.

The second public access route shall be connected to a public street. Right-in/right-out access/egress is acceptable when an all-turns access is not permitted.

The second public access route is to be constructed as remote from the primary access driveway as possible or practical.

Access Route Design Criteria

The access route shall be a minimum of 6m wide hard surface.

One way access routes are to be a minimum of 6m wide with no parking. Aerial units (ladder trucks) require a minimum of 6m clear width to allow for the extension of the vehicle outriggers/stabilizers to perform aerial operations. These units are deployed to all fires (residential, commercial, industrial and institutional).

The acceptable driving surface of an access route is the asphalt area measured between the lip of gutter or edge of asphalt if no gutter exists.

Minimum centerline turning radius at all corners for an access route shall be 12m.

The access route shall be finished with concrete, heavy duty asphalt or other hard-surface approved material designed to permit all weather accessibility. Turfstone, Structural Grass or similar products are at the discretion of the Calgary Fire Department.

All access routes shall be designed to support a load of 38,556 kg (85,000 lbs.) and have a minimum overhead clearance of 5m.

Fire department vehicles shall have direct access to at least one face of every building by means of an access route, street or yard.

Second public and emergency accesses are to be constructed in their final form prior to issuance of a Development Completion Permit.

Temporary access for construction shall be to the satisfaction of the Manager of Building Regulations and the Fire Department.

Access Route Grades

Fire Department review and approval is required for sites where part of the access route has a grade that is greater than 8%. Emergency vehicles do not operate as designed on steeper slopes.

Parking/Stopping Restrictions

Below are the minimum access route widths required by the Calgary Fire Department. Additional width may be required by other city departments including Roads and Transportation.

<7.49m Wide: No stopping/parking on either side of the access route. "No Parking Fire Lane" signs shall be posted on both sides of the access route.

7.5m – 8.99m Wide: Parking on one side of the access route, no stopping on the other. "No Parking Fire Lane" signs shall be posted on one side of the access route.

≥9m Wide: Parking shall be permitted on both sides of the access route.

Signage shall be as per the Calgary Sign Code Manual.

Load Limit Signs in Proximity to a Structure

Access routes may be designed over below grade structures and bridges provided that load limit signs are posted and the structures are designed to support a load of 38,556 kg (85,000 lbs.). Below grade structures under the access route must have a 4 hour fire rating.

Vehicle load limits shall be posted in conspicuous, clearly visible areas at both entrances to a bridge or access over a below grade structure such as a parkade. Signage shall be as per the Calgary Sign Code Manual.

Maintenance of Access Routes

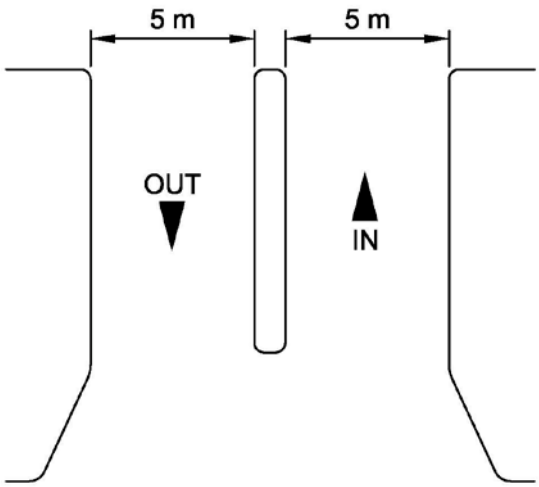
Streets, yards and roadways provided for fire department access shall be maintained so as to be ready for use at all times by fire department vehicles.

Vehicles shall not be parked to obstruct access by fire department vehicles and signs shall be posted prohibiting such parking.

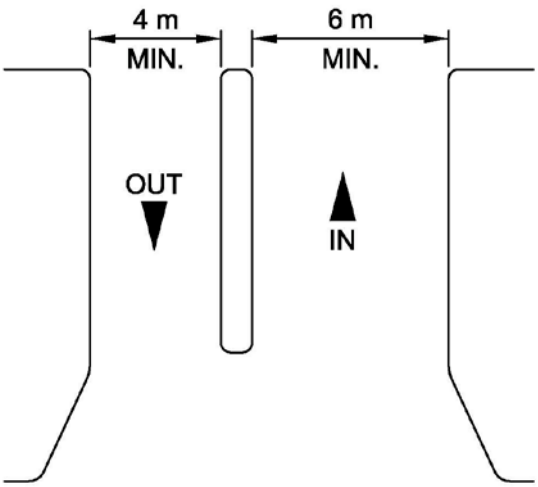
Access routes shall not be altered, modified, removed or placed out of service without written request to and written support by the Fire Department, subject to the Subdivision

Approval Authority and Building Regulations.

Split Entry Access Driveways



Unacceptable Widths



Acceptable Widths
Access width not less than 6m

A split-entry driveway (divided by a median creating an entrance and exit) will not be deemed to be the primary access on one side and an emergency access route or secondary access route on the other side.

One side of the access route driveway must be a minimum of 6m wide.

SECTION III: WATERWORKS

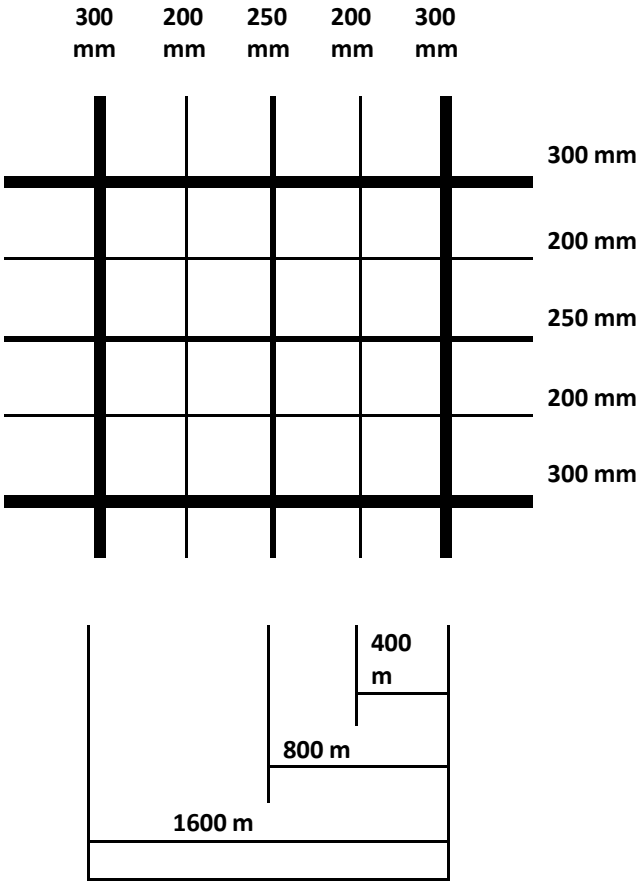
A. GENERAL

In the event of a variance between these Guidelines and the Standard Specifications Waterworks Construction, the latest publication of the Standard Specifications Waterworks Construction shall govern.

B. MAINS

1) Grid Main Network

a) A standard grid main network is required throughout a residential subdivision.



b) The grid mains must coincide with those in adjacent subdivisions so that continuity of main size is maintained between subdivisions. The maximum length of mains between ties permissible in residential development areas are as follows:

150 mm	250 m
200 mm	550 m
250 mm	760 m

c) Demands in industrial, commercial, and high-density areas must be determined and the above grid and main size adjusted accordingly. Minimum main sizes in industrial subdivisions shall be 250 mm.

d) All grid mains must be continuous throughout the subdivision. Where the continuity of the grid system is not being provided by the Developer, oversize payments may not be made, at the discretion of Water Resources, if the total end area of the mains

being provided is less than the standard grid main network specified under Clause 1(a), above.

e) Grid mains may be increased in size without compensation to the Developer, when in the opinion of Water Resources, the increase in size is required to hydraulically compensate for dead end mains or high density developments.

f) The water distribution system shall be designed to eliminate dead-end mains. In cases where newly constructed dead-end mains are unavoidable, the following shall apply for residential areas:

(i) The main shall be 200mm in diameter from the mouth of the cul-de-sac to a hydrant.

(ii) Where no hydrant is installed the main shall be 100mm. Minimum of 150mm pipe shall be installed to the mouth of the cul-de-sac c/w same size tee and valve.

g) Sizes and layout of watermains shall be in accordance with the most current approved Outline Plan.

2) Oversize

a) Notwithstanding Clauses 1(d) and 1(e), oversize payments will be made on mains larger than 250 mm in diameter in residential subdivisions and larger than 300 mm in diameter in industrial and commercial subdivisions. In addition, where the installation of a permanent pressure reducing valve chamber is required, The City of Calgary will pay the full cost at the current approved Unit Rates.

An "Oversize" table indicating lengths of oversize main, number of oversize valves, difference between base and oversize applicable unit rates, and total oversize payment calculation shall be shown on the Water Cover Sheet.

Example:

Subdivision Name/Phase	Developer
Oversize: Year and applicable rate	
____m of 300 mm @ $ (unit rate diff.)	=
____300mm valve(s) @ $ (unit rate diff.)	=
____m of 400 mm @ $ (unit rate diff.)	=
____400mm valve(s) @ $ (unit rate diff.)	=
Subtotal	=
Admin @ 5%	=
Total	=
$ (Rounded Total amount)	By: (initial)
Location: (X Road, Y Blvd.)	Date:

Note: Above to be confirmed by actual survey and supporting consultant grade sheets upon installation.

b) The City will make no payment for oversize watermains or permanent pressure reducing valve chambers unless these facilities are specifically designated for compensation by the City on the Final Construction Drawings for approval by Water Resources. No oversize will be paid for temporary PRV chambers.

c) Where looping of watermains cannot be accommodated in the public right-of-way, easements with encased mains may be required in order to achieve a reliable network. The City will only make payment for oversize of the carrier main, as described in clause 1(a), and not for the encasement pipe.

d) Oversize shall be paid for TUC crossings as follows:

(i) For perpendicular crossings: Normal for 60 metres and 100% for the remainder of the TUC width.

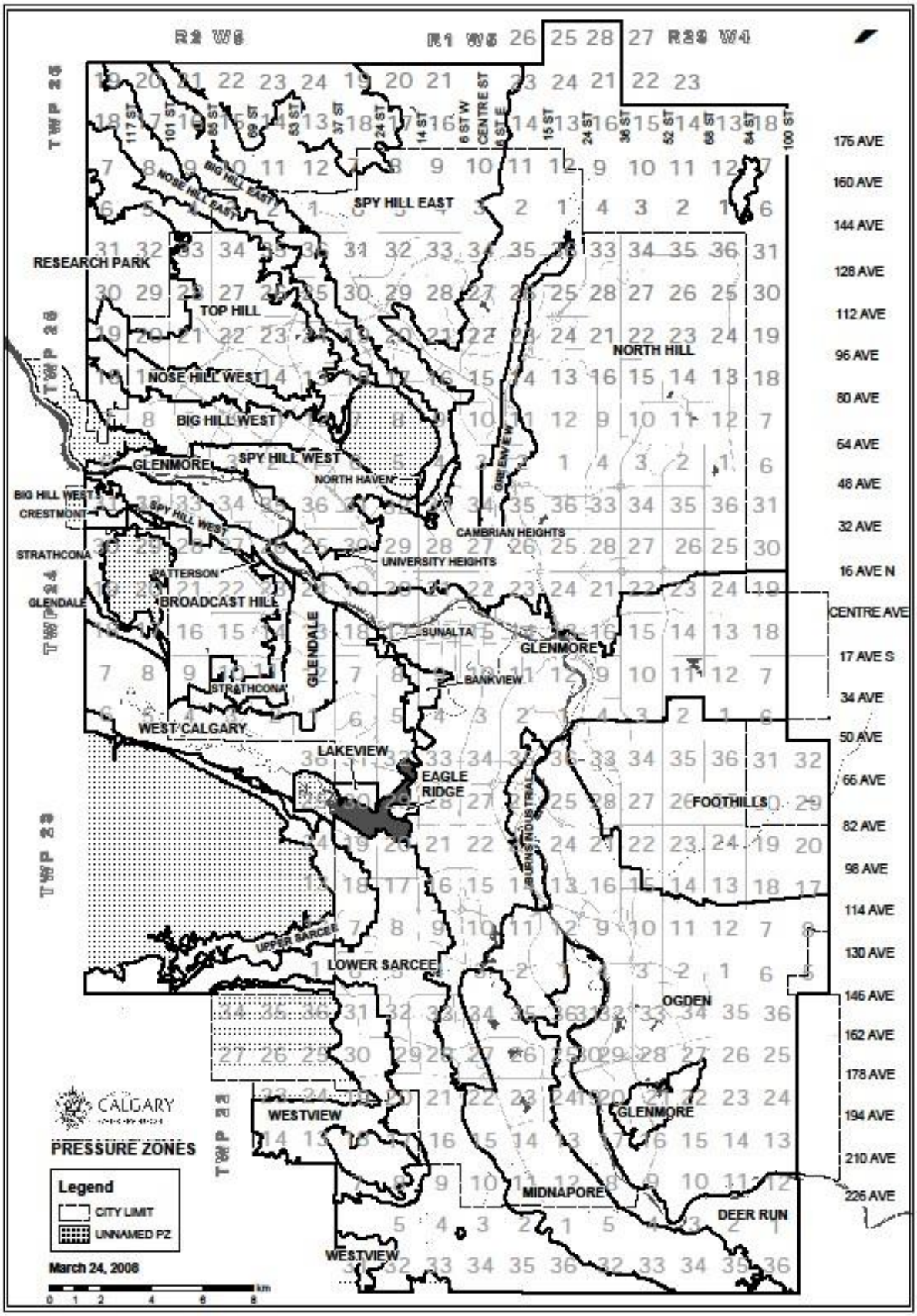
(ii) Parallel oversize alignments shall be paid as Normal

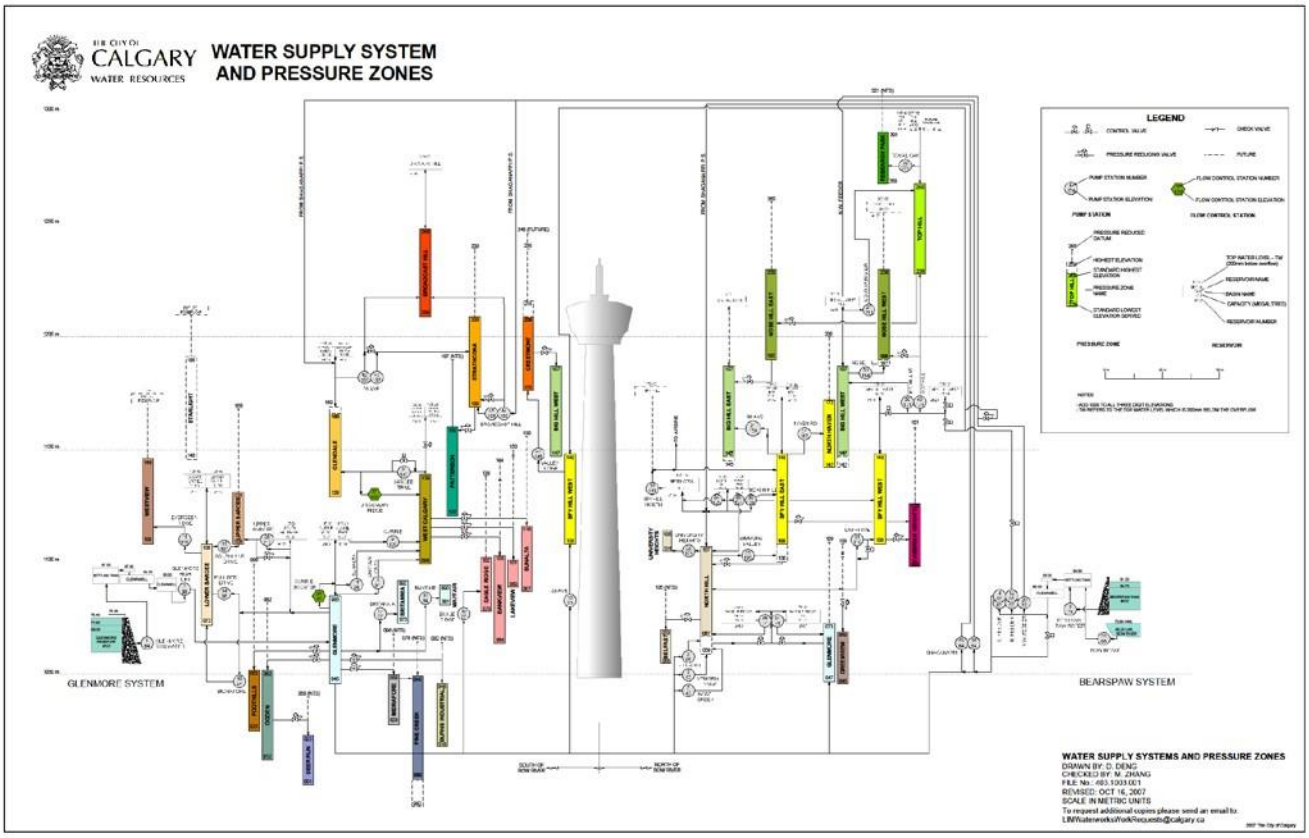
3) Pressure Zones

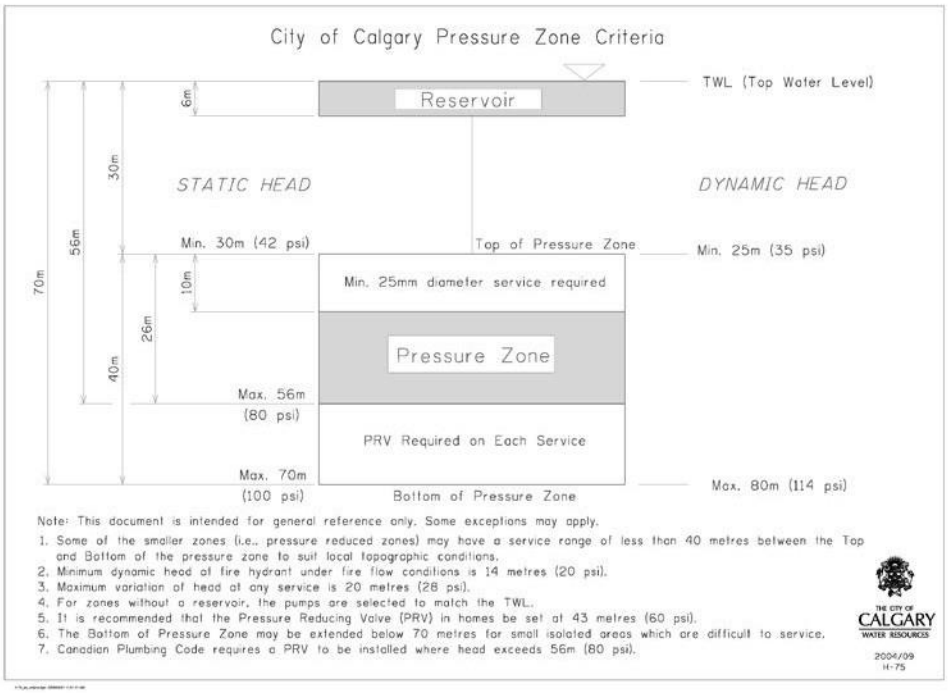
a) For subdivisions involving more than one pressure zone, the design of the distribution system on the Outline Plan shall take the following into consideration:

(i) Pressure zone boundaries (based on final site grading), pressure reducing valves, and check valves must be clearly indicated.

(ii) Lots (or parcels of land) adjacent to the pressure zone boundary (as identified under 3a (i) above) are to have the proposed grading shown to indicate which pressure zone the lot will be serviced from. A pressure zone map, elevation schematics and pressure zone criteria chart are shown on Pages 154 and 155.


R2 W5
R1 W5
R29 W4
TWP 26
TWP 25
TWP 24
TWP 23
TWP 22
117 ST
101 ST
85 ST
69 ST
53 ST
37 ST
24 ST
14 ST
6 ST W
CENTRE ST
6 ST E
15 ST
24 ST
36 ST
52 ST
68 ST
84 ST
100 ST
176 AVE
160 AVE
144 AVE
128 AVE
112 AVE
96 AVE
80 AVE
64 AVE
48 AVE
32 AVE
16 AVE N
CENTRE AVE
17 AVE S
34 AVE
50 AVE
66 AVE
82 AVE
98 AVE
114 AVE
130 AVE
146 AVE
162 AVE
178 AVE
194 AVE
210 AVE
226 AVE
BIG HILL EAST
NOSE HILL EAST
SPY HILL EAST
RESEARCH PARK
TOP HILL
NORTH HILL
NOSE HILL WEST
BIG HILL WEST
SPY HILL WEST
GLENMORE
NORTH HAVEN
GREENVIEW
CAMBRIAN HEIGHTS
BIG HILL WEST
CRESTMONT
SPY HILL WEST
STRATHCONA
UNIVERSITY HEIGHTS
PATTERSON
GLENDALE
BROADCAST HILL
GLENDALE
SUNALTA
GLENMORE
BANKVIEW
STRATHCONA
WEST CALGARY
LAKEVIEW
EAGLE RIDGE
BURNS INDUSTRIAL TRAIL
FOOTHILLS
UPPER SARCEE
LOWER SARCEE
OGDEN
WESTVIEW
GLENMORE
MIDNAPORE
DEER RUN
WESTVIEW
CALGARY
PRESSURE ZONES
Legend
CITY LIMIT
UNNAMED PZ
March 24, 2008
km
0 1 2 4 6 8


THE CITY OF CALGARY
WATER RESOURCES
WATER SUPPLY SYSTEM AND PRESSURE ZONES
LEGEND
GLENMORE SYSTEM
BEARSPAW SYSTEM
WATER SUPPLY SYSTEMS AND PRESSURE ZONES
DRAWN BY: D. DENG
CHECKED BY: M. ZHANG
REVISED: OCT 16, 2007
SCALE: IN METRIC UNITS


City of Calgary Pressure Zone Criteria
TWL (Top Water Level)
Reservoir
6m
30m
56m
70m
STATIC HEAD
DYNAMIC HEAD
Min. 30m (42 psi)
Top of Pressure Zone
Min. 25m (35 psi)
Min. 25mm diameter service required
10m
26m
40m
Pressure Zone
Max. 56m
(80 psi)
PRV Required on Each Service
Max. 70m
(100 psi)
Bottom of Pressure Zone
Max. 80m (114 psi)
Note: This document is intended for general reference only. Some exceptions may apply.
1. Some of the smaller zones (i.e., pressure reduced zones) may have a service range of less than 40 metres between the Top and Bottom of the pressure zone to suit local topographic conditions.
2. Minimum dynamic head at fire hydrant under fire flow conditions is 14 metres (20 psi).
3. Maximum variation of head at any service is 20 metres (28 psi).
4. For zones without a reservoir, the pumps are selected to match the TWL.
5. It is recommended that the Pressure Reducing Valve (PRV) in homes be set at 43 metres (60 psi).
6. The Bottom of Pressure Zone may be extended below 70 metres for small isolated areas which are difficult to service.
7. Canadian Plumbing Code requires a PRV to be installed where head exceeds 56m (80 psi).
THE CITY OF CALGARY
WATER RESOURCES
2004/09
H-75

4) Looped mains

a) Distribution mains shall be continuous (looped) whenever possible. Dual mains with an isolation valve between legs may be submitted for consideration where no other alternative exists, as either an interim or permanent solution.

b) A portion of the distribution network that is not looped is termed a closed system. A closed system is where all flows must be conveyed by a single pipe at some point along the flow path through the transmission and distribution network.

c) Where a closed system (dead end) is approved:

Maximum number of single dwelling units (R1 or R2)

= 45 on a permanent basis; or

= 100 on a temporary basis

For temporary dead end mains, install temporary flushing hydrant or temporary flushing assembly. For permanent dead end mains, install flushing assembly as per the Standard Specifications Waterworks Construction.

5) Mains in Easements

a) Grid mains and distribution mains shall not be placed in easements unless approved by Water Resources.

b) The number of 250 mm and 300 mm grid mains located within easements is to be kept to an absolute minimum – these grid mains are to be located within public rights-of way wherever possible.

c) No horizontal or vertical deflections in the watermain system will be permitted within easements between lots.

d) Easement details:

(i) Watermains shall be located in the centre of the easement.

(ii) The minimum easement width is 6 m for encased mains in residential, commercial, and industrial installations.

(iii) The minimum easement width is 9 m for non-encased mains in MR, MSR, ER, commercial, and industrial installations.

(iv) All encasement pipes shall extend 1.0m beyond the property line.

e) Services (with the exception of Parks' water services – where the watermain extends through MR in easement) shall not be connected to a watermain located within an easement unless approved by Water Resources. Sufficient valves shall be provided to permit isolation of the main in the easement without disruption of services outside the easement. For encased mains, the valves shall be, where possible, located 5 m minimum beyond the end of the encasement pipe.

f) The Developer is responsible for providing adequate rights-of-way and easements to tie in existing dead end watermains (installed by adjacent developers) at the boundary of its subdivision.

6) Feedermains

A feedermain is defined as 500mm diameter and larger water transmission pressure pipe.

a) All proposed and future feedermains, as indicated in the Area Structure Plan (A.S.P.) and Outline Plans, shall be provided an appropriate horizontal and vertical corridor within a public right-of-way to allow for future unencumbered installation.

b) All proposed and future feedermains shall be shown on the Waterworks coversheet and Block Profiles, (in plan view) in the Subdivision Construction Drawings as reserved line assignments. The City of Calgary, Water Resources and Infrastructure and Information Services must approve the alignment.

C. VALVES

a) The placement of valves is to be such that any section of the system can be isolated by the turning off a maximum of four valves. This isolated section in a looped system may contain up to a maximum of 45 single family services and no more than one hydrant taken out of service.

b) Hydrants are to be separated from the distribution system by a gate valve.

c) Valves at intersections shall be located on the projection of property lines or dimensioned to property lines.

D. HYDRANTS

1) Location

a) Hydrants are to be located on standard line assignments as indicated in ROADS Section II Design Standards by Road Classification – Cross-Section Standards wherever possible. Hydrants should be located on the side of the street closest to the watermain to minimize the length of the hydrant lead.

b) Hydrants as well as other Waterworks facilities (valves, services, mains, etc.) shall have a minimum of 3 m clearance between Enmax facilities (power poles, light standards, transformer pads, catch basins, etc.) unless otherwise specified in the Standard Specification Waterworks Construction. The Developer's consultant is responsible for coordinating the Enmax and Waterworks facilities to ensure compliance with all regulatory and safety codes including the 3 m minimum separation.

c) Where a hydrant is installed at a corner of an intersection it shall be installed opposite the Beginning of Curve (B.C.) of the curb and gutter and in accordance with the standard line assignments in ROADS Section II Design Standards by Road Classification – Cross-Section Standards. The hydrant shall be located opposite the side yard (flankage) of the adjacent lot.

d) Distance between hydrants shall be measured along the roadway.

e) Note that the Developer is responsible for ensuring that all hydrants are operable at all times or tagged with an "out of order" sign when repairs are required. Repairs are to be made in a reasonable amount of time.

2) Coverage

(i) Low Density Residential:The maximum allowable spacing between fire hydrants shall be 300 m and they shall be separated by a line valve.

(ii) Spacing of all hydrants shall be determined such that all lots are within coverage of two hydrants. The maximum allowable distance from the first (primary) hydrant to all property lines of a lot shall be 150 m. The maximum allowable distance from the second (backup) hydrant to all property lines of a lot shall be 300 m.

(iii) The backup hydrant shall not be supplied from the same dead end main as the primary hydrant.

b) Institutional, commercial, industrial and high density residential developments:

(i) The maximum allowable spacing between fire hydrants shall be 150 m and they shall be separated by a line valve.

(ii) Spacing of all hydrants shall be determined such that all lots are within coverage of two hydrants. The maximum allowable distance from the first (primary) hydrant to all property lines of a lot shall be 75 m. The maximum allowable distance from the second (backup) hydrant to all property lines of a lot shall be 150 m.

(iii) The backup hydrant shall not be supplied from the same dead end main as the primary hydrant.

E. SERVICE CONNECTIONS

1) General

a) All service connections shall be installed in compliance with the Engineering and Environmental Services' "Service Connections Policy" as detailed in the current editions of the manuals entitled Design Guidelines for Development Permits, Development Site Servicing Plans and Waste and Recycling Services for commercial/industrial applications and the Standard Specifications for Waterworks Construction.

b) The horizontal separation between a catch basin barrel and water service and/or sewer service shall be 3 m or greater centreline to centreline.

2) Residential

a) Residential water services shall be 20 mm, except that 25 mm services shall be installed for those lots having a suggested front grade elevation (FG) within the upper 10 m of the pressure zone (Static pressure between 42 psi and 57 psi). Pressure Reducing Valves are required for those lots having a suggested front grade elevation (FG) greater than 56 m below the Reservoir elevation or Peizometric head elevation (static pressure greater than 80 psi). It is recommended that the pressure reducing valve be set at 60 psi for residential services.

b) Service connections to residential lots (R-1 and R-2) are to be installed 3.5 m inside the property line for subdivisions with lanes and 5 m inside the property line for subdivisions without lanes.

c) The following note shall be shown on the Building grade plan for lots requiring 25mm water services:

Note: Water service shall be 25mm from main to hot water tank and 20mm min. from hot water tank to the fixture shut offs in the highest bathroom.

3) Parks

a) Parks water services to be under the control of Parks Development & Operations must be:

(i) Shown on the Waterworks cover sheet and plan-profile drawings of the Subdivision Construction Drawings.

(ii) Size and location of Parks services must be approved by the Parks Development & Operations prior to the submission of the Final Construction Drawings.

b) Service connections for the irrigation of entrance lots, common park areas and winter seasonal services (ie. Ice rinks) are to be metered complete with approved backflow preventers. Irrigation meters must be protected from freezing to the satisfaction of Water Resources. Where the irrigation system is temporary, the Developer shall physically disconnect the connection at the watermain prior to the FAC being issued.

c) For DC lots which require private irrigation water services, the services are to be metered complete with approved backflow preventors. These services shall be maintained by the Homeowners Association.

4) School Sites

Pre-servicing of school sites will be permitted at the request of School Boards provided that the size and location of the water service can be verified.

5) Frost Protection

Where services or watermains cross, or are in close proximity to, a large stormwater main, culvert, or outfall, resulting in an increased risk of freezing to the water main or service, an evaluation for any additional frost protection requirements shall be made. Where cold air intrusion from a proposed large diameter storm system could result in a risk of freezing to water services, the Consultant shall identify all locations of potential concern and determine in conjunction with the Engineer the extent of required remedial action. Any measures deemed necessary shall be indicated on the Subdivision Construction Drawings. Acceptable measures include:

(i) Revisions to vertical alignment of the main, service, or duct.

(ii) Insulation as per the Standard Specifications, Waterworks Construction.

(iii) An approved thermal modeling analysis confirming acceptable frost protection as designed.

F. CATHODICNPROTECTION

General

All metallic components of the Water Distribution and Wastewater Collection system shall be provided with cathodic protection and dielectric coatings as outlined in Section 504.07.00 of the Standard Specifications, Waterworks Construction.

Where the cathodic protection installation, materials or Standard drawings contained therein are deemed insufficient by the Engineer to address a specific project cathodic protection need, a design prepared by a NACE qualified CP Design professional may be submitted for review and approval prior to installation.

1) Galvanic anode systems

a) Non-metallic Pipe System

When pipe is non-metallic, all metallic fittings, valves, hydrants, etc. shall be installed with Zinc anodes as specified in the Standard Specifications Waterworks Construction.

b) Existing metallic pipe system

Whenever an existing metallic water or sewer main is exposed for any purpose, Magnesium anodes shall be installed for "hot spot" cathodic protection. Refer to Standard Specifications Waterworks Construction for guidance.

Existing metallic piping must be electrically isolated from any new metallic elements or piping by an electrical isolation, refer to Sec. 503.02.15 Standard Specifications Waterworks Construction.

c) New metallic Pipe Systems

All installations of new metallic pipe shall be under cathodic protection as per Standard Specifications Waterworks Construction 504.07.00. Anode size, type, number and location of test leads and Test station configuration will be determined by Water Resources Corrosion upon review of preliminary Submissions. Where the total length of proposed new metallic main exceeds 1000 metres, refer to the Impressed Current system section below.

d) Encasement Pipe

Encasement piping is exempted from the standard coatings requirement. When an encasement pipe is required, refer to Sec. 504.02.02, Sheet 15 and 15A, 453.1017.007 sheet 16 and 16A for cathodic protection requirements.

2) Impressed Current Systems

Where a new metallic piping system in excess of 1000 metres in length is proposed, the Developer will provide an impressed cathodic protection system designed by a NACE qualified CP Design professional for review and approval. The Submission will include all easements, ROW's and an AC power supply connection as required for the impressed current installation.

G. JOINT USE RESERVOIR SITES

1) Definition of Joint Use Reservoir Sites

a) A "Joint Use Reservoir Site" is defined as land or easements purchased or otherwise obtained, by Water Resources, for the purpose of constructing and operating:

- a potable water storage reservoir and/or pump stations
- valve chambers
- drainage facilities (both overland and underground)
- power lines
- communication facilities
- access roads to and on the site.

2) Development Guidelines for Joint Use Reservoir Sites

a) Water Resources shall retain the right to construct and maintain Waterworks facilities on the Joint Use Reservoir Site for the purposes defined above without the express consent of the other tenants of the site.

b) No development will be permitted on the undeveloped portion of the Joint Use Reservoir Site where Water Resources has future facilities planned.

c) Plans and a description of any and all development proposals on the Joint Use Reservoir Site shall be submitted to Water Resources. No development on the Joint Use Reservoir Site shall commence without the written approval of the Water Resources.

d) Access to the Joint Use Reservoir Site shall be acceptable to Water Resources.

e) All utilities on Joint Use Reservoir Sites shall be protected by registered easements of suitable width, as determined by Water Resources, centered over the utility. Easements shall be left unencumbered with no substantial change in grade on the easements without the written approval of Water Resources.

f) Access to the top of reservoir structures by vehicles or heavy loads shall be prevented by the installation of a suitable fence or other barriers to the satisfaction of Water Resources at no cost to Water Resources.

g) A chain link fence acceptable to Water Resources shall be provided around pumping stations and reservoir access structures.

h) Herbicides, pesticides, fertilizers or other substances which may contaminate a potable water supply shall not be used on or immediately adjacent to Joint Use Reservoir Sites.

i) Maintenance and all costs associated therewith of Joint Use Reservoir Sites, except for the areas contained within the chain link fences, as described in f) above, shall be provided by Parks Development & Operations.

j) Irrigation systems shall not be installed directly over underground reservoir structures.

k) The finished grade over the reservoir structure shall not be changed.

l) The proposed location of trees, shrubs, fences, special recreational surfaces or any other structure on the Joint Use Reservoir Site requires the written approval of the

Director of Water Resources before installation.

m) Parks Development & Operations shall remove trees, shrubs, fences or any structure on the Joint Use Reservoir Site required to accommodate additional waterworks or ancillary facilities at no cost to Water Resources.

n) No work on the site, with the exception of grass cutting, shall be carried out without the presence of a Waterworks Inspector.

o) Joint Use Site tenants other than Business Units of the City of Calgary will be required to enter into an agreement with Water Resources.

SECTION IV:
WASTEWATER/STORMWATER

A. CITY FUNDED INFRASTRUCTURE

The City of Calgary Water Services is responsible for the design, construction and installation of certain large regional facilities and transmission pipes for the Water, Sanitary and Storm Systems. Infrastructure that would normally be funded by The City:

- Water feedermains, often defined as 500 mm in diamter and greater.
- Regional water reservoirs and pumping stations.
- Major sanitary sewer trunks, often defined as 600 mm in diameter or greater.
- Regional sanitary lift stations.
- Stormwater trunks that are 900 mm in diamter and greater and that are downstream of a wet pond – and service more than one landowner/developer.
- Large regional stormwater management facilities, such as Regional Wet Ponds and wetlands.

When a developer requires infrastructure that is normally funded by The City, and wishes to be compensated for the costs of building that infrastructure, then a formal written agreement is required, typically a Construction & Finance Agreement. Water Services will not consider requests to reimburse Developers for infrastructure construced without an executed Construction & Finance Agreement.

Prior to undertaking any design or submission of City funded infrastructure, please contact Water Services, Leader of Development Approvals to discuss the financing process.

B. OVERSIZE

1) General

a) Any sewer system or part of a system shall be designed to serve the area within the subdivision boundary plus any area which is tributary to the system, as outlined in the storm and sanitary catchment maps.

b) Where oversize is required to service areas upstream of the development, preliminary design drawings and profiles for the sewer up to the end of the servicing area may be required to be submitted and approved by Water Resources prior to the release of underground construction permission. Contact Water Resources, Development Approvals to determine if these will be required.

2) Oversize claims

a) When the City of Calgary requires a sewer to be larger than necessary to serve an additional area not owned or controlled by the Developer, The City shall pay, from the Developer Funded Infrastructure Stabilization Fund – Utility Oversize to the Developer the additional cost of such “oversize”.

b) All oversize claims shall be shown on the construction drawings and shall include the following:

- Overall design, which takes into account all tributary areas to the sewer system
- Developer’s design, which takes into account only those areas owned or controlled by the Developer. Use identical pipe slopes and pipe material, as used in the overall design.

c) For sanitary and storm sewers, oversize will not apply unless the pipe diameter exceeds 300 mm, with the exception of 100% oversize.

d) For pipe 1800 mm or larger, a public tender shall be called.

e) In areas where the sewer mains are located deeper than 6 m, a dual sewer system may be required and the Developer will be entitled to an oversize recovery for all mains installed at a depth of 6 m or more to the crown of the pipes. This requirement shall be determined as early as possible in the approval process. Cost recoveries shall be based on the oversized portion of the main and shall be paid at Standard Development Agreement Unit Rates.

f) When oversize is based on hydraulic grade line consideration rather than capacity, then the Developer's size shall also be determined using hydraulic grade line consideration. A copy of both sets of calculations shall be included with the construction drawings.

C. MANHOLES

1) General

a) All manholes and appurtenances shall conform to and be constructed as per The City of Calgary Standard Specifications, Sewer Construction (latest edition).

b) Transitions in pipe diameter, grade or direction (with the exception of curved sewers and prefabricated bends, where permitted) are to be accomplished by the means of manholes.

c) In all cases, a manhole is required at the upper end of the sewer for maintenance.

d) At manholes where changes in pipe diameter occur, keep the elevation of the crowns of the pipes continuous to maintain the same energy gradient, except in the case of an acute angle (less than 90 degrees), a minimum of 150 mm drop will be required.

e) Where no change in pipe diameter occurs, allow a drop of 30 mm in a straight through manhole, 60 mm in the presence of a bend which is 90 degrees or greater and 150 mm in the presence of a bend which is less than 90 degrees.

f) When connecting laterals to large trunks, it may be advantageous to build a manhole on the lateral immediately adjacent to the trunk and make a direct connection from the manhole to the trunk.

2) Distance between Manholes

The maximum distance between manholes is to be 185 m.

3) Manhole Rims

Manhole rim elevations shall be accurately set to the nearest centimetre. Set rims to match the finished grade.

4) Manhole Type

a) Generally, for 600 mm diameter pipe and smaller use a Type 5A manhole. The size of manholes with 3 or more pipe are subject to review. Please refer to manufacturer's recommendation for Type 1-S Manhole sizes.

b) Pre-cast T-Riser manholes will be accepted for sewers 1200 mm diameter or larger where there is no change in pipe size, grade or direction.

5) Sanitary Sewer Manholes

a) A drop manhole shall be provided in sanitary sewer manholes where the difference in elevation between the incoming pipe invert and the outgoing pipe centreline is greater than 760 mm.

b) Only one interior drop structure will be allowed in each manhole.

c) A drop manhole will not be allowed when the incoming pipe exceeds 300 mm.

d) Sanitary sewer shall be extended a minimum of 1.5 m past the last house service lead with the exception of sanitary mains in cul-de-sacs where a maximum of 6 service leads can be tied directly to the upper manhole. These leads must enter the manhole less than 300 mm above the outgoing invert.

D. MAINS AND SERVICES

1) General

a) All pipe shall conform to and be installed per The City of Calgary Standard Specifications, Sewer Construction (latest edition).

b) For larger mains (450mm and up) the standard line assignments may have to be adjusted at the direction of Water Resources. Under no circumstances shall the horizontal separation be less than 1.0m.

c) All sanitary sewers and any storm sewers subject to surcharge shall have rubber gaskets.

d) Concrete sewer mains over 300 mm in diameter shall be reinforced concrete pipe.

2) Sizing

Table IV-D.1: Minimum Size for Public Mains

	SANITARY SEWERS	STORM SEWERS
Residential Area	200 mm	300 mm
Commercial or Industrial Area	250 mm	375 mm

The minimum size main for weeping tile shall be 150 mm.

3) Cover

a) The minimum cover for sanitary sewers shall be 2.5 m from pipe crown to finished grade. Preferred depth range is 2.6 to 3 m.

b) The minimum cover for storm sewers shall be 1.2 m from pipe crown to finished grade.

4) Pipe Curvature

a) Sewers may be laid on horizontal curves to conform to curved street layouts.

b) Minimum radii of curvature shall be as shown in Table IV-D.2. Additional information can be found in Section 403.05.01 of the Standard Specifications for Sewer Construction.

5) Line Assignments through Roundabouts

a) Unless previously approved by Water Resources, Development Approvals, all water, sanitary sewers and storm sewers shall be routed through the centre of the roundabout.

Table IV-D.2: Minimum Radii of Curvature for Sewers

NOMINAL PIPE DIAMETER (mm)	CONCRETE PIPE (2.4 m LENGTHS - BASED ON 13 mm JOINT PULL)	BEVELLED CONC. PIPE (2.4 m LENGTHS - BASED ON 13 mm JOINT PULL)	PVC PIPE DR 28 / 35 (2 .0 m LENGTHS)	PVC PIPE DR 28 / 35 (4.0 m LENGTHS)
100			23 m (5 ° per joint)	46 m (5 ° per joint)
150			23 m (5 ° per joint)	46 m (5 ° per joint)
200			23 m (5 ° per joint)	46 m (5 ° per joint)
250			23 m (5 ° per joint)	46 m (5 ° per joint)
300	81 m		23 m (5 ° per joint)	46 m (5 ° per joint)
375	98 m		38 m (3 ° per joint)	76 m (3 ° per joint)
450	116 m		38 m (3 ° per joint)	76 m (3 ° per joint)
525	139 m		38 m (3 ° per joint)	76 m (3 ° per joint)
600	156 m		38 m (3 ° per joint)	76 m (3 ° per joint)
675	174 m	87 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
750	191 m	96 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
900	226 m	113 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
1050	261 m	130 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
1200	288 m	144 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
1350	323 m	162 m		
1500	357 m	179 m		
1650	392 m	196 m		
1800	427 m	214 m		
1950	469 m	234 m		
2100	496 m	249 m		
2400	566 m	284 m		
2700	643 m	321 m		
3000	705 m	353 m		

6) Design Slope

The minimum design slope for sewers shall be as shown in Table IV-D.3 below.

Table IV-D.3: Minimum Design Slopes for Sewers (%)

	SANITARY		STORM		WEEPING TILE	
Nominal Pipe Size (mm)	**Concrete n = 0.013**	**PVC n = 0.013**	**Concrete n = 0.013**	**PVC n = 0.011**	**Concrete n = 0.013**	**PVC n = 0.011**
75 WTD Service					2.00	2.00
100 Service	2.00	2.00			2.00	2.00
150 Service	1.00	1.00	1.00	1.00		
150 WTD					0.48	0.35
200	0.80	0.80	0.80	0.60	0.32	0.24
250	0.40	0.40	0.56	0.40	0.24	0.18
300	0.32	0.32	0.44	0.32		
375	0.24	0.24	0.32	0.24		
450	0.18	0.18	0.26	0.18		
525	0.16	0.16	0.22	0.16		
600	0.12	0.12	0.18	0.12		
675	0.10	0.10	0.15	0.11		
750	0.10	0.10	0.13	0.10		
900 and greater	0.10	0.10	0.10	0.10		

7) Service Connections

General

All service connections shall be installed in conformance with The City of Calgary's Service Connection Policy as detailed in Design Guidelines for Development Permits, Development Site Servicing Plans and Waste & Recycling for Commercial / Industrial Applications.

Generally, services which are one half or less than the diameter of the main may be connected directly to the main without a manhole being constructed on the main. A manhole may be required if the service is unusually long, exceeds 150 mm in diameter, or is required by the Director, Water Resources.

Horizontal deflections, other than simple curves, will not be allowed on the City's portion of the service connection.

Service connections shall not be installed to sewer mains deeper than 6 m, to the crown of the pipe.

Note: A secondary sewer may have to be installed to allow for servicing.

Residential Lots

Developers shall install service connections to all single family, semi-detached or duplex lots. These services shall extend either 3.5 m (no shallow utility easement) or 5 m (with shallow utility easement) into the lot.

School Sites

The School Boards shall be given the opportunity to indicate the servicing requirements for the school sites on the Preliminary Construction Drawings.

The Developer, at their contract rates, shall undertake the installation of the service connections for the school sites.

Multi-family Residential/Commercial/Industrial

Pre-servicing of lots zoned other than single family, semi-detached or duplex will not be permitted without prior approval from Water Resources.

E. PIPE BEDDING

a) All pipe bedding shall conform to and be installed per The City of Calgary Standard Specifications, Sewer Construction Sections 403.04.00, & 403.04.01.

b) All PVC / PVC Profile pipe designers are to follow the procedures laid out in the 'Standard Practice For The Design And Construction Of Flexible Thermoplastic Pipe In The City Of Calgary', latest edition. Should an engineered backfill be utilized with densities markedly higher or lower than the 2165 kg/m^3 value recommended, the designer shall review the specifics of the material's long-term performance characteristics with Water Resources to seek approval for use of alternate design values.

Table IV-E.1: Maximum Installation Depth of Reinforced Concrete Pipe (Depth to Invert in metres)

Nominal Pipe Diameter (mm)	Standard Installation Type	Maximum Depth to INVERT (m) for:			
		Class II	Class III	Class IV	Class V
300	1	5.4	7.0	10.7	14.9
	2	3.7	4.9	7.5	10.5
	3	2.8	3.8	5.9	8.2
	4	-	2.2	3.8	5.4
375	1	5.6	7.2	11.1	15.4
	2	3.8	5.1	7.8	10.8
	3	2.9	3.9	6.1	8.5
	4	-	2.4	4.0	5.7
450	1	5.7	7.4	11.3	15.7
	2	3.9	5.2	7.9	11.0
	3	3.0	4.1	6.3	8.7
	4	-	2.5	4.2	5.9
525	1	5.8	7.5	11.5	15.9
	2	4.0	5.3	8.0	11.1
	3	3.1	4.2	6.4	8.9
	4	-	2.6	4.4	6.1
600	1	5.9	7.6	11.6	16.0
	2	4.1	5.3	8.1	11.2
	3	3.2	4.2	6.5	9.0
	4	-	2.8	4.5	6.2
675	1	6.0	7.7	11.6	16.1
	2	4.1	5.4	8.2	11.3
	3	3.2	4.3	6.6	9.1
	4	-	2.9	4.6	6.4
750	1	6.0	7.7	11.7	16.1
	2	4.2	5.4	8.2	11.3
	3	3.3	4.3	6.6	9.1
	4	-	2.9	4.7	6.5
900	1	6.1	7.8	11.7	16.1
	2	4.3	5.5	8.3	11.4
	3	3.4	4.4	6.7	9.2
	4	-	3.1	4.9	6.7
1050	1	6.2	7.9	11.8	16.3
	2	4.4	5.7	8.5	11.6
	3	3.5	4.5	6.8	9.3
	4	-	3.2	5.0	6.9
1200	1	6.3	8.0	11.9	16.3
	2	4.6	5.8	8.6	11.8
	3	3.6	4.7	7.0	9.5
	4	-	3.4	5.2	7.0

Nominal Pipe Diameter (mm)	Standard Installation Type	Maximum Depth to INVERT (m) for:			
		Class II	Class III	Class IV	Class V
1350	**1**	6.4	8.1	12.0	16.4
	2	4.7	5.9	8.7	11.9
	3	3.7	4.8	7.1	9.6
	4	-	3.5	5.3	7.2
1500	**1**	6.5	8.2	12.1	16.5
	2	4.8	6.0	8.8	12.0
	3	3.8	4.9	7.1	9.6
	4	-	3.6	5.5	7.3
1650	**1**	6.6	8.3	12.1	16.5
	2	4.9	6.1	8.9	12.1
	3	3.8	5.0	7.3	9.7
	4	-	3.7	5.6	7.5
1800	**1**	6.6	8.3	12.2	16.6
	2	4.9	6.2	9.0	12.2
	3	3.8	5.0	7.3	9.8
	4	-	3.7	5.7	7.5
1950	**1**	6.7	8.4	12.3	16.7
	2	5.1	6.4	9.2	12.3
	3	4.0	5.2	7.5	10.0
	4	-	3.9	5.8	7.8
2100	**1**	6.8	8.5	12.4	16.8
	2	5.2	6.5	9.3	12.4
	3	4.0	5.3	7.6	10.1
	4	-	-	6.0	8.1
2400	**1**	7.0	8.7	12.5	16.9
	2	5.4	6.7	9.5	12.7
	3	-	5.5	7.8	10.3
	4	-	-	6.2	8.1
2700	**1**	7.2	8.9	12.7	17.0
	2	5.6	6.9	9.8	13.0
	3	-	5.7	8.1	10.6
	4	-	-	6.4	8.4
3000	**1**	7.4	9.1	12.9	17.2
	2	5.8	7.2	10.0	13.2
	3	-	5.9	8.3	10.8
	4	-	-	6.7	8.6

Notes:

1. Calculations based on "Standard Practice for the Design and Installation of Rigid Gravity Sewer Pipe in the City of Calgary", January 2008, with the following loading:

   Soil Unit Weight: 2165 kg/m^3

   Live Load: CL-800

Should an engineered backfill be utilized with densities markedly higher or lower than this 2165 kg/m^3 value, the designer shall review the specifics of the material's long-term performance characteristics with Water Resources to seek approval for use of alternate design values.

2. Standard installation types as per City of Calgary Standard Specifications Sewer Construction/ASTM C1479.
3. Minimum cover over crown of pipe assumed to be:

   Type 1 Installation 0.6m

   Type 2 Installation 0.8m

   Type 3 Installation 1.2m

   Type 4 Installation 1.3m

   For shallower covers, a more detailed analysis should be performed.
4. Valid for standard wall B or wall C pipe.
5. Type 1 Installation requires special approval on a case by case basis.
6. For depths greater than shown for Class V pipe, use a higher quality installation (i.e. Type 1) or use a direct design (SIDD) pipe design.
7. For sizes greater than 900 mm, direct design (SIDD) pipe design may be used.

F. FLOOD RISK AREA GUIDELINES

a) Developments in flood fringe, floodway, and overland flow flood risk areas are subject to the regulations described in the Land Use Bylaw IP2007, Part 3, Division 3.

b) In general, all landowners or developers proposing construction within the designated flood risk areas of the Bow River, Elbow River and Nose Creek drainage basins are required to comply with Land Use Bylaw IP2007, Part 3, Division 3.

c) Application of the Bylaw is discretionary and more stringent requirements may be imposed where warranted. Requirements may be imposed for Pine Creek, Fish Creek or other water courses though flood risk areas may not be designated for these within Land Use Bylaw IP2007.

d) Alberta Environment maintains authority over natural water courses and may impose requirements or issue orders beyond those of Land Use Bylaw IP2007 to protect these or nearby courses.

G. SANITARY SEWER FLOWS

a) Water Resources is currently reviewing the parameters to develop new sanitary planning guidelines. The per capita flow and I/I (inflow and infiltration) allowance will be reviewed; therefore, the peak flow design for future planning may change.

b) Prior to designing a trunk sewer, the consultant shall contact Water Resources, Development Approvals for the current design parameters.

c) When sanitary sewers are larger than 300 mm, sanitary sewer calculations drainage plan must be included in the Construction Drawings.

H. LIFT STATIONS AND FORCEMAINS

When constructing public infrastructure, contact Water Resources, Development Approvals for lift station and forcemain design guidelines.

I. STORMWATER MANAGEMENT AND DESIGN

a) Parks Development & Operations shall be given the opportunity to indicate the need for catch basins and leads to intercept overland flows entering their lands.

b) Please refer to the City of Calgary publication Stormwater Management and Design Manual. This is a comprehensive manual covering all aspects of conventional stormwater design.

c) Please refer to the City of Calgary publications Stormwater Source Control Practices Handbook & Source Control Practices Reference Manual for Low Impact Design (LID), and stormwater source control design.

J. EROSION AND SEDIMENT CONTROL AND CONSTRUCTION STORMWATER POLLUTION PREVENTION

a. Prior to commencement of soil disturbance, Erosion and Sediment Control (ESC) reports and drawings must be prepared and submitted to The City for review. This requirement applies to all sites with overall size greater than or equal to 2.0 hectares. At its sole discretion, The City may also require a report and/or drawings for smaller sites of 0.4 to 2.0 hectares overall size.

b. Erosion and sediment control reports and drawings for stripping and grading under a Development Agreement or Development Permit, as well as City of Calgary capital construction projects and other Development Liaisons are reviewed by the Water Quality Services Division of Water Resources.

c. Reports and Drawings must conform to the guidelines set out in the current edition of The City of Calgary Guidelines for Erosion and Sediment Control, which can be found and downloaded at www.calgary.ca/UD, under publications.

d. Under Drainage Bylaw 37M2005, S. 7, a Permit is required to pump or direct impounded water from a parcel into any City storm sewer (or where the water will ultimately enter City storm sewer). A similar requirement exists for discharge of impounded water into a sanitary sewer. For more information, contact 3-1-1.

e. Under Drainage Bylaw 37M2005, S. 4, it is illegal to discharge prohibited substances from construction sites and other parcels into a storm sewer, or to where they may enter a storm sewer. In addition to soil and sediment, concrete wash water, saw cuttings, and other concrete waste, must not enter storm sewers. Construction sites are required to take precautions such as appropriate collections and disposal, spill protection and secondary containment for all prohibited materials that could enter the storm drainage system. In addition to enforcement at the municipal level, there are substantial penalties under Federal and Provincial environmental legislation.

SECTION V: GEOTECHNICAL AND HYDROGEOLOGICAL REQUIREMENTS

A. GENERAL

a) Geotechnical Reports are required to confirm the adequacy of the lands to support the development(s) being proposed with a development application. The reports are to be paid by the Developer and prepared by a qualified Geotechnical Engineer licensed to practice in Alberta.

b) Four types of Geotechnical Reports are reviewed by The City of Calgary as part of development applications. These reports are a), general Geotechnical Evaluation Reports, b), Slope Stability Reports, c), Deep Fills Reports, and d) Hydrogeological reports. The general Geotechnical Evaluation Report has a broad context while Slope Stability and, Deep Fills specifically deal with certain aspects of the geotechnical conditions on site(s).

c) Where underground water is a concern, hydrogeological investigation is required. The investigation, study, and reporting should be conducted by a professional hydro-geologist, and based on their best on standard, best practices and professional judgment.

d) Geotechnical Reports submitted to The City of Calgary must adhere to the requirements described in the Geotechnical Guidelines for Land Development Applications.

e) The work undertaken for the evaluation(s) should include but not limited to methods such as desk study, air photo examination, field reconnaissance, parametric analysis, and engineering judgment.

f) Geotechnical engineering consultants are required to make various certifications with respect to the geotechnical properties of sites under development.

   The following definition shall apply wherever the words “certify” or “certification” is used in the Geotechnical Report Requirements: A professional engineer’s certification of conditions comprises a declaration of his professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of his responsibility to abide by contract documents, applicable codes, standards, regulations or ordinances.

g) Based on the recommendations of the Geotechnical Report(s), Manager of Infrastructure Planning may require a Development and Geotechnical Covenant to be registered on title of all affected lots concurrent with the registration of the plan of subdivision (tentative plan). The building grade plan included in the construction drawings for tentative plan area shall indicate which lots are encumbered with the Development and Geotechnical Covenant.

h) It is the responsibility of the Developer and/or builder to ensure that all development conditions identified in the Geotechnical Reports are complied with.

B. PAVEMENT ROAD STRUCTURE REPORT

Every subdivision phase requires an Asphalt Pavement Road Structure Design Report to ensure that the paved road structure meets The City Standard Specifications Roads Construction for each type of road category being constructed in that phase. Prior to constructing surface improvements, a pavement design shall be submitted, under cover letter, by the Developer or his qualified Professional Consulting Engineer.

This Report is to be prepared by a qualified geotechnical Consulting Engineer who is registered with APEGA (The Association of Professional Engineer and Geoscientists of Alberta). The Report is submitted to The City of Calgary Roads Material and Research Division for its review and approval. Pavement designs shall include a review of subgrade drainage and/or water table concerns and shall provide recommendations for the use of continues subdrains and separation membranes. When the ground water level is 1.5 m or less below the proposed road

grades, the Developer is required to submit a geotechnical report prepared, stamped and sealed by the Professional Engineer, identifying the measures necessary to prevent frost damage. Recommendations should include alternatives such as insulation, subdrains, gravel blankets, etc.

a) When the Report is approved a letter is sent to the consulting engineer noting the Report and pavement structure design for each road category that is required for the proposed development. A copy of this letter is attached to the permission to construct surface improvements.

C. SOIL CONTAMINATION

Redevelopment of former industrial sites will be contingent upon the Developer submitting a stamped and sealed report from a qualified Geotechnical Engineering Consultant, to the satisfaction of the approving authority of the Transportation Department, stating there is no soil contamination on site.

D. RETAINING WALL

For retaining walls 1.2 m in height or greater, the Developer is to apply for a Development Permit and provide the following:

Development Permit Stage requires:

- Submission of the Structural Design Drawings, for review and acceptance, for the retaining wall(s), prepared by a qualified Professional Engineer under seal and permit to practice stamps to the satisfaction of the Chief Structures Engineer, Roads. The intent of the drawings is to show the feasibility of the proposed retaining wall(s) at the location(s) indicated;
- Submission of the first two forms, Retaining Wall Design Disclosure Statement and Letter of Commitment for Design and Field Review of Retaining Wall, listed below;
- The execution and registration on all affected titles a Building and Development Restrictive Covenant and Maintenance and Access Agreement (a Retaining Wall Agreement), to the satisfaction of the Director, Water Resources, which will remain in full force and effect for the life of the retaining wall(s). The agreement requires two Legal Plans to be registered concurrently with the Agreement at Land Titles: (1) Maintenance Access Right of Way; and (2) Restricted Development Area. The Agreement also requires two schedules to be attached to the Agreement: (1) Permissible Vegetation; and (2) Retaining Wall Design.

Development Completion Permit Stage requires:

- Submission of the final form, Assurance of Engineering Field Review and Compliance, to the Development Authority at the Development Completion Permit stage following construction completion, listed below.

E. WEEPING DRAIN TILE REQUIREMENTS FOR RESIDENTIAL (R1, R2, R2a, Condominium & Townhouse Development)

Refer to the City of Calgary **Stormwater Management and Design manual,** Section 3 for details.

Retaining Wall Design
Disclosure Statement

Application # _____

Site Address: _____

Legal Description: _____

For each individual retaining wall, a separate Retaining Wall Design Disclosure Statement is required. Retaining wall development permit application shall, as a minimum, include all of the requirements listed below.

1. Design, Drawings and Maintenance

General

- ❑ The design shall be sealed and signed by a Professional Engineer qualified in design of retaining walls.

Design - specify code(s) used in the design

- ❑ The Calgary Design Guidelines for Bridges and Structures (**must be used for all walls owned and maintained by The City of Calgary)
- ❑ Alberta Building Codes
- ❑ Canadian Foundation Engineering Manual
- ❑ Other (specify)

  _____
- ❑ Specify load on top of the wall (surcharge load) i.e. roadway, vehicles, storage, buildings, back slope etc.

  Please specify

  _____

Detailed Drawings

- ❑ The drawings are presented on 11 X 17 paper or larger
- ❑ The drawings are numbered in a logical sequence (i.e. S1, S2 ……Sn)
- ❑ Technical specifications are included with the drawings or Notes are provided on the drawings.
- ❑ An access area has been considered and defined on the drawings for maintenance of the wall

Retaining wall maintenance will be the responsibility of:

- ❑ The City of Calgary (wall constructed on City property)
- ❑ Property owner (wall constructed on private property)

2. Materials, Soil and Technical Requirements

Material for retaining wall construction

- ❑ Segmental block wall (clearly identified on drawings)
- ❑ Cast in place concrete
- ❑ Prefabricated concrete panels
- ❑ Timber
- ❑ Other (specify

  _____

Soil parameters and drainage:

- ❑ Soil type (as specified on drawings or in geotechnical report - attach if applicable)
- ❑ Geo-grid (as specified on drawings along with minimum required embedment length)
- ❑ Saturated soil (must be accounted for in the design)
- ❑ Irrigation system behind or on top of the wall (identify proximity on drawings)
- ❑ Drainage provided on top and within the backfill

3. Factors of Safety (FOS) and Geotechnical

Factors of safety for:	City of Calgary minimum	Actual wall design
❑ Sliding	**1.5**	_____
❑ Overturning	**2.0**	_____
❑ Bearing capacity	**2.0**	_____
❑ Geo-grid pullout and overstress (if geo-grid has not been uses, use N/A)	**1.5**	_____

Geotechnical Report:

- ❑ Geotechnical Report submitted with the application
  If not, please specify why not

  _____

- ❑ Global and local stability analysis prepared
  If yes, factors of safety must be presented in the report or on the drawings.
  If no, geotechnical report must address the reasons.

4. Special provisions **MANDATORY**

- ❑ The applicant has submitted a **Letter of Commitment** with this application, signed by a qualified professional engineer (see template attached as an example). The Engineer of Record is required to authenticate the design drawings and specifications for all retaining walls 1.0 m in height or greater at any point.

- ❑ The applicant agrees to submit a signed **Assurance of Engineering Field Review and Compliance** form (see attached) at construction completion. The letter must be signed and sealed by a qualified professional engineer supervising construction.

  Failure to submit these items may cause The City to consider the wall(s) unsafe and request removal of the wall(s) at the applicant's expense.

The Applicant (undersigned) confirms that all required information above has been provided and is correct.

_____

Applicant (or agent/representative) Name
(please print)

_____

Applicant's Signature **Date**
(Confirming that all required information has been provided and is correct)

Letter of Commitment for Design and Field Review of Retaining Wall

To: The City of Calgary

Commitment to Design and Field Review of Retaining Walls

Project Name	
Site Address	
Application Number	

I hereby give assurance that the structural and geotechnical design related to retaining wall components described on drawings, specifications, and other supporting documents, prepared by the undersigned Professional Engineer, comply with (please check all that are appropriate):

- ❑ The City of Calgary Design Guidelines for Bridges and Structures
- ❑ The Alberta Building Code
- ❑ The Canadian Foundation Manual

I hereby undertake to be responsible for field review of the above referenced project components during construction and commit to fulfilling duties as outlined on the **Assurance of Field Review and Compliance** form, which I will submit upon construction completion.

I also undertake to notify the authority having jurisdiction in writing if the contract for field review is terminated at any time during construction.

Seal and Signature of Engineer of Record **Company Name**

_____
Date

_____
Name

_____
Telephone

To: The City of Calgary

Field Review of Retaining Walls

Assurance of Engineering Field Review and Compliance

Project Name	
Site Address	
Application Number	

I hereby give assurance that

(a) I have fulfilled my obligations for field reviews;

(b) I have enclosed documents supporting all approved changes to the plans and specifications prepared by me which was issued for this project;

(c) The components of the project are in general conformance with the plans, specifications and other project-related documents;

(d) I have enclosed Record Drawings reflecting all approved changes to the Drawings and Specifications;

(e) I am a registered Professional Engineer with APEGGA (Association of Professional Engineers, Geologists, and Geophysicists).

I, the undersigned, confirm that all required information has been provided and is correct.

Seal and Signature of Engineer of Record **Company Name**

_____

Date

_____

Name

_____

Telephone

~~**E.A. WEEPING DRAIN TILE REQUIREMENTS FOR RESIDENTIAL (R1, R2, R2a, Condominium & Townhouse Development)**~~

~~Refer to the City of Calgary **Stormwater Management and Design manual,** Section 3 for details.~~

SECTION VI: BRIDGE STRUCTURES

BRIDGE STRUCTURES

THE CITY OF
CALGARY
TRANSPORTATION INFRASTRUCTURE

TERMS OF REFERENCE

FOR

Bridge Structures
Designed and Built for the City of Calgary

A. GENERAL

The City of Calgary, Transportation Infrastructure (TI) Business Unit, is issuing these Terms of Reference to outline the requirements for the design and field engineering services for bridge structures and other structural elements of transportation infrastructure. The work that is anticipated is comprised of, but not limited to, conceptual plan, preliminary design, detailed design, environmental impact evaluation, construction review, and contract administration.

The Developer shall be responsible for all design and construction activities including coordination with a contractor, sub-contractors, consultant and sub-consultants, where applicable.

1. STAKEHOLDERS

The Consultant may be required to obtain information and/ or coordinate with various stakeholders. The list of stakeholders includes, but is not limited to, the following:

- The City of Calgary Transportation Infrastructure;
- Calgary Transit (if applicable);
- The City of Calgary Transportation Planning;
- The City of Calgary Parks;
- The City of Calgary Roads, Structures and Bridges;
- Surrounding communities

2. DESIGN

a) STRUCTURAL

Structural consultants ("Engineer") shall be pre-qualified with the City of Calgary in the category: Engineering and Architectural Related Consultants, Discipline Structural – Bridges.

b) GEOTECHNICAL

If no geotechnical investigation has been done to date, the Developer will engage and retain a consulting firm to provide engineering services for a geotechnical investigation. The Developer's Engineer will be required to establish the scope required for the geotechnical investigation and work with the geotechnical engineer.

c) ENVIRONMENTAL

The Contractor shall submit an ECO plan and Erosion Sediment Control plan for the project as per The City of Calgary's Environmental Policy.

d) HYDROTECHNICAL

If applicable to the project, the Consultant shall hire a hydrotechnical consultant to prepare a hydrotechnical plan for the project and obtain relevant permits from regulatory agencies.

e) LANDSCAPE DESIGN

All landscape design shall be carried out by a registered landscape architect, in accordance with The City of Calgary Parks Development Guidelines and Specifications, Landscape Construction, most current edition.

f) UTILITY DESIGN AND COORDINATION

Utility location, design, re-location and alterations shall be carried out by a qualified Engineer.

3. CONSTRUCTION

a) GENERAL CONTRACTOR

General contractors engaged by a Developer to construct bridges and structures for The City of Calgary shall be pre-qualified with The City of Calgary in the category relevant to the scope of construction project.

b) SURVEY

Site survey shall be provided by the Developer

c) CONSTRUCTION REVIEW AND INSPECTION

The City will play a supplementary quality assurance role on the project. As such, a representative from Transportation Infrastructure, Bridges and Structures will be assigned to the project and should be copied on all meeting notices, design submittals, quality assurance testing, quality control audits, scope of testing and test results, major installations, structure erection and concrete pour procedures, and any other documentation deemed necessary by the City at the start of the project. The TI representative may attend some construction activities, communicate with the Developer with respect to non-conformances and request a corrective action, as required.

d) QC/ QA MATERIALS AND TESTING

The Developer shall hire independent testing firms to provide quality assurance on the project. Terms of Reference for engagement of testing agencies and test results should be copied to the City for information.

B. SCOPE OF WORK

1. PROJECT ELEMENTS

The work shall include, but not necessarily be limited to, the following elements:

a) Project site review including topography, property lines, utility locations and any other environmental or functional considerations;

b) Provision of a detailed design schedule acceptable to The City;

c) Conceptual design including development of structure geometry, functional analysis of user (all users) circulation and connectivity to transportation facilities;

d) Establishing scope for project specific geotechnical investigation, and engagement of a geotechnical consulting firm with geotechnical and foundation engineering expertise closely related to the project scope;

e) Preparation of Quality Management Plan for design and construction;

f) Preliminary design by a City of Calgary Prequalified Bridge Design Consulting firm, including:

- contemplated structural systems and materials;

- structure aesthetics, context-sensitive fit and architectural features;
- co-ordination with roadway design, if applicable
- landscape and pathway design;
- cost estimates;
- life cycle and cost analysis for all alternatives;
- constructability assessment;
- construction schedule;
- coordination with LRT and CPR amenities (if applicable);
- hydraulic assessment review (if required);
- lighting assessment and management plan (if required)

g) Submission of Preliminary Design Report;

h) Design Brief summarizing the main features of the selected structure;

i) Renderings of two alternative bridge types for presentation at public meetings, where applicable;

j) Participation in public engagement process, where applicable;

k) Participation in presentation of the project to Calgary Planning Commission, where applicable;

l) Preparation of detailed design and coordination of reviews with The City's Transportation Infrastructure;

m) Environmental impact evaluation including the development of an Erosion and Sediment Control plan (as required), review of ECO Plan template and provisions for 100% bridge deck water runoff retention;

n) Storm Water Management Coordination;

o) Submission of 60%, 90% and 100% complete detailed design drawings;

p) Submission of 100% complete specifications;

q) Provision of quality control and assurance of the design including certification by a letter bearing the signature and seal of an independent design reviewer or the signature and seal of the independent design reviewer on the Issued for Construction Drawings;

r) Construction cost estimates at 60% and 100% complete design stages, where applicable;

s) Preparation of Tender documents; Responding to Bidder queries during Tender, evaluation of Bidder submissions and provision of Tender award recommendation;

t) Construction review amounting to approximately 75% (or more, as required) of active construction time, contract administration and review of construction related procedures, and responding to Requests For Information;

u) Safety assessment including design or design reviews of temporary structural installations (as required);

v) Street lighting Coordination;

w) Review, respond to and record construction related design changes;

x) Submit project closure documentation, including record drawings, warranties and maintenance manuals (where applicable);

y) Conduct Substantial Completion and Construction Completion Certificate (CCC) and Final Acceptance Certificate (FAC) inspections;

z) Submission of TCA (Tangible Capital Assets) information in a format provided by the City of Calgary representative.

2. DESIGN CRITERIA

The design of the conceptual layout, structural system, development of details, preparation of Tender documents, construction reviews and project closure shall conform to the City of Calgary Design Guidelines for Bridges and Structures, and to design standards referenced herein.

Additional project–specific requirements may be included as design criteria, based on the project development process and emerging issues.

The design shall include durability and life-cycle sustainability analysis of the considered alternatives.

The design should include consideration for minimizing the environmental impacts of permanent installations and temporary works.

The aesthetics of the bridge should include principles of context-sensitive design.

3. ADDITIONAL RESPONSIBILITIES

The Developer is also required to perform the following tasks:

i) Review and confirm transportation, utility, geotechnical, and survey information;

ii) Coordinate utility-related scope and designs with respective utility agencies;

iii) Participate / hold meetings to review design progress and reviews with project team, and ensure all project objectives are met on time;

iv) Deliver effective project co-ordination, field engineering and construction administration during construction;

v) Closely collaborate with sub-consultants and Transportation Infrastructure on all aspects of the design and construction;

vi) Provide all resources to meet the objectives of this project within schedule and on budget;

vii) The Developer's Consultant must be a City of Calgary Prequalified Bridge Design Consultant, and shall be responsible for the engineering integrity and professional liability for the work performed, including work done by any sub-consultants. The review or acceptance of the Developer's Consultant's work by The City does not relieve the Developer's Consultant from any responsibility for the work.

viii) Provide regular (monthly) updates on project schedule and progress.

4. SERVICES BY THE CITY CALGARY

The City may provide to the Developer, upon request, information such as pertinent drawings of the project site, road geometry, utility and Right of Way plans, survey information, and any other project-relevant information available.

The City may attend design progress meetings, review the project progress regularly, communicate with stakeholders, and upon request, may provide co-ordination with The City's departments. The Developer is responsible for managing the project.

The City will review the technical content of the design and construction administration as part of The City's Quality Assurance. The level of review by The City will not include checking of calculations, detailed dimensions, or checking of the engineering principles applied.

5. PROJECT DELIVERABLES

In addition to project deliverables outlined in Section 1 Project Elements, the following requirements shall be met:

a) DESIGN DRAWINGS

i) The list of drawings shall be as specified in The City of Calgary Design Guidelines for Bridges and Structures.

ii) All submissions of drawings are to be prepared in AutoCAD format.

iii) Standard cover sheet and standard drawing title block information in AutoCAD format will be supplied by Transportation Infrastructure.

iv) At the 60% and 90% review stage, and 100% stage, submit drawings at half-size (11"x17") and in pdf format. Ensure all half size drawings are legible.

v) Prior to construction, full size and half size Issued for Construction (IFC) project drawings including all addenda revisions shall be submitted to the City.

vi) The IFC drawings and specifications shall be signed and sealed by a professional engineer registered to practice in the Province of Alberta.

b) TECHNICAL PROJECT SPECIFICATIONS

As part of the design process, the Developer shall develop technical project specifications that appropriately and fully define the project work and construction requirements for the project elements or items that may not be fully or specifically addressed by the Referenced Standards and City of Calgary Standard Specifications.

A list of supplementary reference standards can be found in Appendix A. The City of Calgary Standard Technical Specifications for Structures that the Developer may be required to utilize is as follows:

- 02510 (b) Bridge Deck Asphaltic Concrete Paving;
- 02850 Noise Barriers;
- 03200 Concrete Reinforcement;
- 03300 Cast In Place Concrete;
- 03301 High Performance Concrete;
- 03483 MSE Walls;

- 07100 Bridge Deck Waterproofing;
- Highway Accessory Supports Guidelines for Structural Design and Construction;
- Project specific modifications to the City of Calgary Standard Specifications may be done using Special Conditions.

c) OTHER SUBMISSIONS

In addition to the design drawings and specifications, design support documents shall be supplied for review with the submissions. These documents shall include, but not be limited to, the following:

i) A copy of the roadway and landscaping design showing all sight lines, setback requirements, clear zones, and utility corridors, as applicable;

ii) Utility composite drawing for line assignment coordination (gas, electrical, telephone, cable, water, sewer, storm, street lights, communications, etc.) where applicable;

iii) Technical specifications for bridges and structures for each category of work not specifically covered under The City of Calgary Design Guidelines for Bridges and Structures;

iv) Design notes (for information only);

v) Construction site reports and other site documentation (i.e. Requests for Information, Site Instructions, Field Orders, Contemplated Change Notices, Change Orders, etc.);

vi) Reviewed shop drawings;

vii) Inspection and testing reports;

viii) Progress photos;

ix) Product data sheets for specified non-standard products;

x) Minutes of design and construction progress meetings;

xi) Environmental inspection reports;

xii) Quality Management Plan and implementation reports;

xiii) Maintenance Manual(s);

xiv) TCA cost breakdown.

d) DRAWINGS OF RECORD AND SUPPORTING DOCUMENTATION

At completion of the Project, electronic versions of the Record Drawings (in AutoCAD and .pdf format) shall be copied to compact disc and submitted to TI. All product material and/ or maintenance manuals as well shall be submitted at the completion of the project.

Drawings of Record and supporting documentation used for construction shall be supplied by the Developer in accordance with City of Calgary “Guidelines for the Preparation of Tender Documents and Contract Administration”, including:

i) Final record plans, profiles and cross-sections, foundations, and material used in the structure;

ii) All design loads and load combinations relevant to the bridges and structures provided on the drawings;

iii) Hydrologic and hydraulic calculations, drawings, maps, etc. (as applicable);

iv) All Quality Assurance documentation showing test data and location;

v) All final documentation on the safety and environmental audits.

Copies of the original CADD drawings (in AutoCAD format) are to be used and amended as required to reflect the actual constructed Works at Project Completion. The drawing numbers will remain the same as the originals for storage and retrieval purposes. Record Drawings will be stand-alone documents and shall contain all of the original information except that which has been changed by the construction revisions.

The drawings shall be drafted in the format and to the standards of the original design drawings and plotted on standard Mylar drawing sheets with waterproof ink.

Each item or area on the drawing that has been changed from the original design shall have an eight-millimeter triangle adjacent to the area of the change with the number of the change inscribed within the triangle. The same number shall be shown cross-referenced in a “Construction Revisions” block with a description of the change beside it.

The Record Drawings shall be signed and sealed by the Professional Engineer to verify the drawings represent the original design with all construction and design revisions added.

All of the Contract Drawings, including detour staging drawings, shall be produced as Record Drawings.

The signed drawings shall be forwarded to TI Representative for review and comment. The Mylar drawings shall be accompanied by CADD drawings (in AutoCAD format and PDF format) saved on memory stick.

C. PROPOSAL REQUIREMENTS FOR ENGAGING DESIGN CONSULTANTS

The Developer is encouraged to use the requirements for engaging Design Consultants to render services for future City of Calgary owned structures, included in Appendix IIB.

D. PROJECT PROGRAM

1) PROJECT SCHEDULE

Desired timeline for this work are outlined in Table 4.1 Proposed Milestone Dates.

TABLE 4.1 PROPOSED MILESTONE DATES

Activity	Milestone Date
Concept and issue/risk identification summary	
Preliminary Design Report Submission	
Design Brief Submission	

Initial Public Consultation	
Detailed Design Submissions **60%,** **90%** **100%** **Specification submission 100%**	
Tender & Award	
Construction Start	
Construction Completion	
Submission of project Record documents	

2) PROJECT DESCRIPTION

Include information specific to a project.

Appendix VI - A – REFERENCE MATERIAL AND STANDARDS

REFERENCE MATERIAL AND STANDARDS (all are latest edition, unless otherwise noted)

- CAN/CSA S6-14 Canadian Highway Bridge Design Code
- The City of Calgary Design Guidelines for Bridges and Structures, Latest Edition
- The City of Calgary Guidelines for Preparation of Tender Documents and Contract Administration
- The City of Calgary Transit Facilities Design Guidelines and Standards
- CAN/CSA Standard B651 Accessible Design for the Built Environment
- The City of Calgary Standard Specifications Roads Construction
- The City of Calgary Development Guidelines and Standard Specifications Landscape Construction
- The City of Calgary Transportation Department – Traffic Operations Division – Traffic Control Manual
- The City of Calgary Worksite Temporary Traffic Control Manual
- The City of Calgary Surface Transportation Noise Attenuation Policy
- The City of Calgary Planning Policy Report to S.P.C. on Transportation, Transit and Parking Report No. TTP 2000-12
- The City of Calgary Standards for Mechanical Site Plans
- City of Calgary Force Account Rates
- Traffic Operations Sign Code Book
- CP Rail Requirements for Structures Adjacent to Railroad Tracks
- CP Rail RAC Clearance Requirements
- CP Rail Grade Separation Agreement and Insurance Requirements

The following manuals are now available on the website for environmental management:

- Stormwater Management & Design Manual
- Guidelines for Erosion & Sediment Control
- Field Manual for Effective Erosion & Sediment Control

  (http://www.calgary.ca/wastewater) – select Water & Wastewater Systems/Storm

The following manual is available on the website for environmental management:

- ECO Plan Guide
  (www.calgary.ca/docgallery/bu/environmental_management/eco_plan_guide.pdf)

Current City Standards' editions are incorporated by reference only. Consultants not already possessing current editions of The City Standards noted above may obtain same from the City of Calgary website.

Other References include:

- Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads, 1999 edition (with Alberta Supplement, latest edition)
- Manual of Uniform Traffic Control Devices (MUTCD).

Wherever standards (e.g., CSA, ASTM and others) are referred to in these Terms of Reference, the most current edition shall apply. The City reserves the right to include other or updated reference standards during project duration, as required by project-specific conditions.

Appendix VI - B – CITY OF CALGARY PROPOSAL REQUIREMENTS FOR ENGAGING DESIGN CONSULTANTS FOR CITY OF CALGARY OWNED PROJECTS

1. PROPOSAL REQUIREMENTS

1.1 INTRODUCTION

Your firm is invited to submit a written Statement of Qualifications in letter format of not more than ten (10) pages. One original and three additional copies are to be submitted. This proposal will serve as the basis for evaluation.

Schematic or Work Flow Mapping, Organizational Charts and personnel resumes are not to be considered in the number of pages.

1.2 ELEMENTS OF PROPOSAL

1.2.1 PROPOSAL REQUIREMENTS

All proposals must include:

- Executive summary describing the Consultant's understanding of the project objectives, and how they will achieve them;
- Concise summary of the Consultant expertise as it relates to the project scope;
- Roles and responsibilities of anticipated staff, detailed availability schedule, locations, relevant experience and level of qualification of all project team members, project managers, technical leaders and construction review personnel shall be clearly identified;
- A project schedule that shows milestones;
- A list of resources which the Consultant considers essential in the project and has access to;
- A list of relevant projects completed by the Consultant with at least two references (name, position, organization, location, phone, fax, and email address) for relevant projects completed;
- A disclosure statement, if required, in accordance with Clause 1.4 and 1.5 of the Conditions of Proposal.

1.2.2 DETAILED ELEMENTS

As a minimum, the Proposal shall include the following elements:

1. PROJECT UNDERSTANDING AND METHODOLOG

Proponents must demonstrate their understanding of the project scope and requirements. Briefly outline the key issues as the Proponent understands them.

The Consultant should identify objectives of the project and how they will be achieved, anticipated major issues, and what the approach to resolution would be.

2. PROJECT TEAM

Provide a project organization chart of the core project team including the roles and responsibilities of each team player.

Identify key project personnel: the person who will assume responsibility for managing the project, lead design engineer and construction administration/review lead professional.

Attach details concerning project personnel citing relevant experience, credentials, and accomplishments in projects of comparable complexity and scope to this project.

3. PROJECT STAFFING

The City requests the consultant to include with their submission an estimate of the level of involvement of each individual who will be working on this project and their availability to work on this project. This information should be provided for each individual as follows:

- Identify a percentage of total time that each individual will be working on this project;
- Their availability throughout the duration of the project;
- Identify those individuals who will be assigned key roles, the city where they are currently geographically based and their availability to provide services over the duration of the project.

4. STAFFING CHANGES

Staff changes by the successful Consultant during the assignment phase will require written approval from the City, prior to any such change. The qualifications and experience of the proposed staff must be equivalent to or better than staff proposed at the RFP phase. Failure to comply may result in the termination of the assignment.

5. PROJECT SCHEDULE

Provide a detailed schedule of key project activities respecting the project requirements and deliverables as outlined in this RFP.

Advise of any suggested modifications to the proposed scope of work and related schedule and ability to complete the work within the project budget.

6. RESOURCES

A list of any additional technical and human resources which the candidates deem helpful, timesaving, and cost effective to the project, such as availability of key personnel and computer software, should be included and evaluated accordingly.

7. QUALITY MANAGEMENT PLAN

Provide Quality Management Plan for the project delivery and construction. Include elements such as independent design check, project schedule and deliverables, budget control and construction Quality Assurance.

8. RECORD OF PERFORMANCE AND ACHIEVEMENTS

Provide the following information with respect to the Consultant's achievements in delivering projects with particular emphasis on initiatives aligned with the technical areas of:

- Design and construction of pedestrian bridges and overpasses;
- Working within Environmentally Sensitive Areas;
- Transportation Infrastructure design and construction;
- Context sensitive design, structure aesthetics;
- Projects involving temporary traffic management or construction in limited space;
- Public consultation;
- Innovative design, materials or solutions;

Identify and provide a brief description of Transportation Infrastructure projects that have been undertaken in the last five (5) years which are considered relevant and comparable to this project.

Preference will be given to candidates with extensive experience in planning, designing, construction review and contract administration of pedestrian bridges. Ability to participate in public consultation process will also be considered. The Project Manager should have directly related experience in planning, design and construction supervision for this type of work.

9. INNOVATION, SUSTAINABILITY AND ADDED VALUE

Describe and provide examples where the Consultant has employed innovative technology, management systems, and approaches that have provided additional value to clients in past projects.

Describe any additional value added services that the Proponent can offer to the City of Calgary within the scope of this RFP.

10. OVERALL PRESENTATION

The qualification package should be thoughtfully prepared, neat, concise, professional and containing relevant information in accordance with the Supplemental Conditions of Proposal.

2. EVALUATION

2.1 SELECTION AND AWARD PROCESS

All Proposals will be evaluated using the Evaluation Matrix shown in Section 2.3.

A selection committee, chaired by Transportation Infrastructure, will review all submissions. The Consultant may be asked to make a brief presentation (30 minutes, followed by a 30-minute question period). Transportation Infrastructure will only contact the selected candidates. Refer to Clause 11 of the Conditions of Proposal for further information on candidate selection.

For proposals pertaining to multiple projects, the City reserves the right to award individual projects to different Consultants, regardless of preference indicated in the submitted proposal.

Engineering Fees shall not be included in the proposal.

2.2 SELECTION AND AWARD – TENTATIVE SCHEDULE

City distribute RFP to Pre-Qualified Consultants	
RFP Submission Deadline	
City selects successful consultant(s)	

- Notification of the successful Engineering Consulting Firm(s) is expected within approximately 14 days of receipt of RFP submissions.
- The City reserves the right to modify any of the dates noted above.

2.3 EVALUATION MATRIX

The criteria described below will be used to evaluate the proponents written submissions.

Consultant	
Date	
Evaluated By	

Selection Criteria Description	Point Value	X	Rating	Total Score	Comments
Company Relevant Experience	3				
Project Team Qualifications and Experience	5				
Project Understanding and Methodology of Work/Technical Capability	5				
Resources, Sustainability and Technical Innovation	4				
Quality Management and Project Delivery Management	3				
Total Points	**20**				

The following table provides brief description and relative weight for each of the criteria.

Rating	Description
5	Exceeds Expectations, proponent clearly understands the requirement, excellent probability of success
4	Somewhat Exceeds Expectations,
3	Meets Expectations, Proponent has good understanding of requirement. Good probability of success
2	Somewhat meets Expectations, Minor weakness and/or deficiencies. Fair probability of success
1	Does not meet expectations, demonstrate understanding of the requirements, low probability of success
0	Non compliant, response indicates complete misunderstanding of the requirements, no probability of success.

Note: A score of ZERO (0) on ANY of the Rated Criteria items MAY result in disqualification of a Submission.

- The City of Calgary/Developer will score all proposals in accordance with the above matrix.
- The City of Calgary/Developer will then negotiate a final contract with the highest evaluated proponent, in accordance with Clause 18 of the Conditions of Proposal.