



**The City of Calgary**

***DESIGN GUIDELINES***  
***FOR***  
***SUBDIVISION***  
***SERVICING***

**January**  
**2012**

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# *Design Guidelines For Subdivision Servicing*

*January 2012*

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# PREFACE

This document serves as a consolidation of engineering design standards that are used in the preparation of subdivision construction drawings for the construction of public infrastructure. This document covers topics ranging from the approvals process for construction drawings, surface and underground infrastructure design guidelines, to hydrogeological study requirements.

This document is intended to supplement the current editions of each of the *Roads, Water, Sewer and Parks Construction Specification* documents, the *Urban Development Policy Manual*, the *Consulting Engineers' Field Services Guidelines*, the current *Master Development Agreement*, and *the 2011 Complete Streets Interim Guide*.

Since the last edition of this document was published in 2004, changes to the engineering standards have evolved through annual negotiations between the City of Calgary and the Urban Development Institute (UDI). The changes have been incorporated. This document will be updated as further changes are agreed to by both the City and UDI.

I would like to thank both City staff and UDI members who contributed to the updating of the document.

Sincerely,

Joel Armitage, M.Eng., P.Eng.  
Manager  
Urban Development  
Development and Building Approvals

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# **SECTION I: OVERVIEW**

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# 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 Development and Building Approvals Business Unit 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 seven main sections:

- Preface
- Overview
- Roads
- Waterworks
- Wastewater and Stormwater
- Geotechnical and Hydro-geological Requirements
- Bridge Structures

### 3) **Urban Development**

Urban Development Division represents the following Business Units and other organizations:

- Roads
- Transportation Infrastructure
- Transportation Planning
- Water Resources
- Waste and Recycling Services
- Land Information and Mapping
- Parks
- Canada Post
- Public/Private School Boards

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

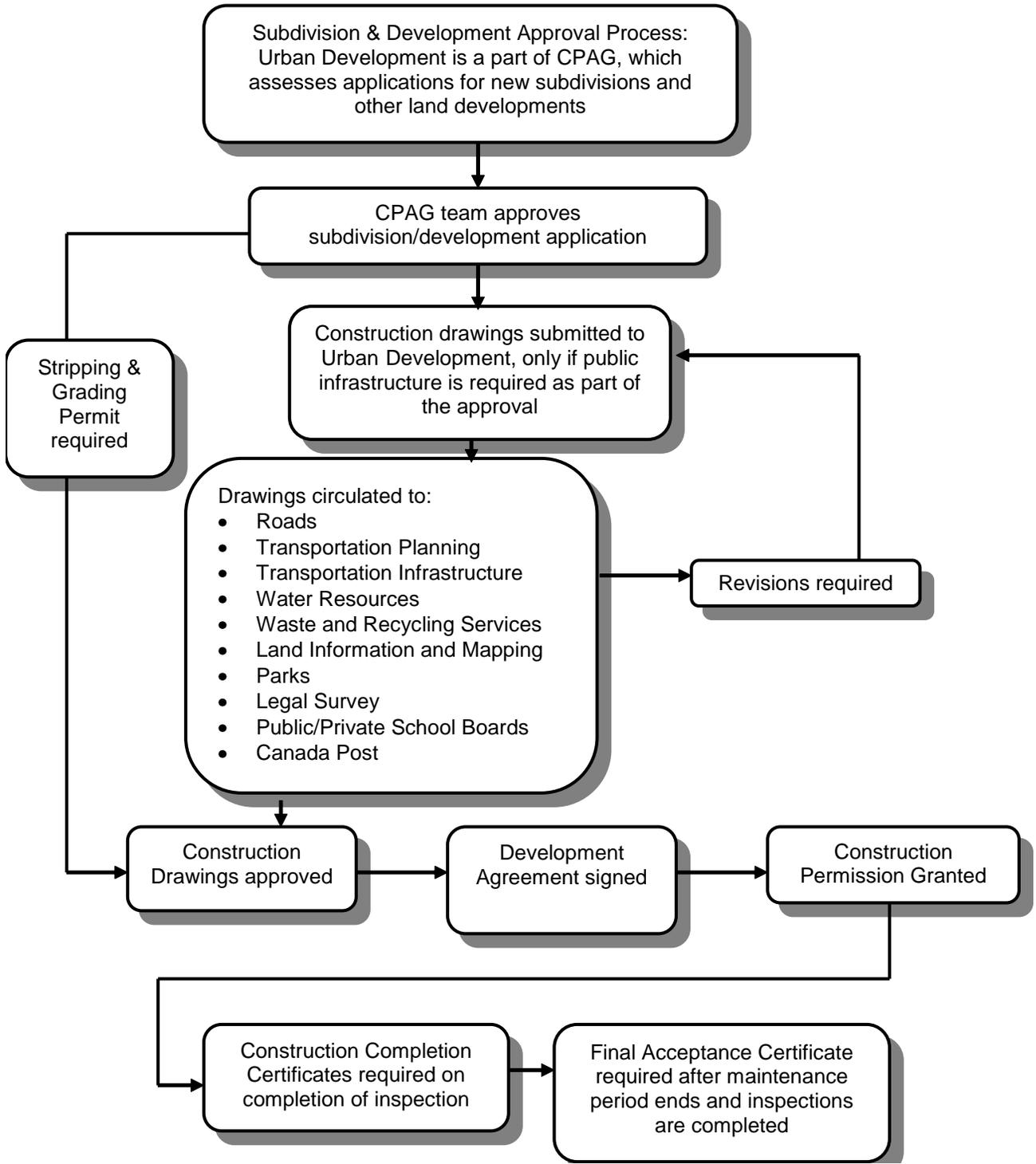
The Division also partners with Alberta Environment, a provincial approval authority, to ensure development does not adversely impact our eco-systems, both man-made and natural, on a large scale, and that any local contaminants found are dealt with properly.

## **B. GENERAL INFORMATION**

### 1) **Process Overview**

The chart "***Urban Development: A Process Overview***" (page 7) provides a general description of the various processes that must take place when subdivision or other land development occurs.

# Urban Development: A Process Overview



## 2) Construction Drawings

Construction drawings are submitted to Urban Development. These drawings are circulated to the appropriate Business Units for their review and comments.

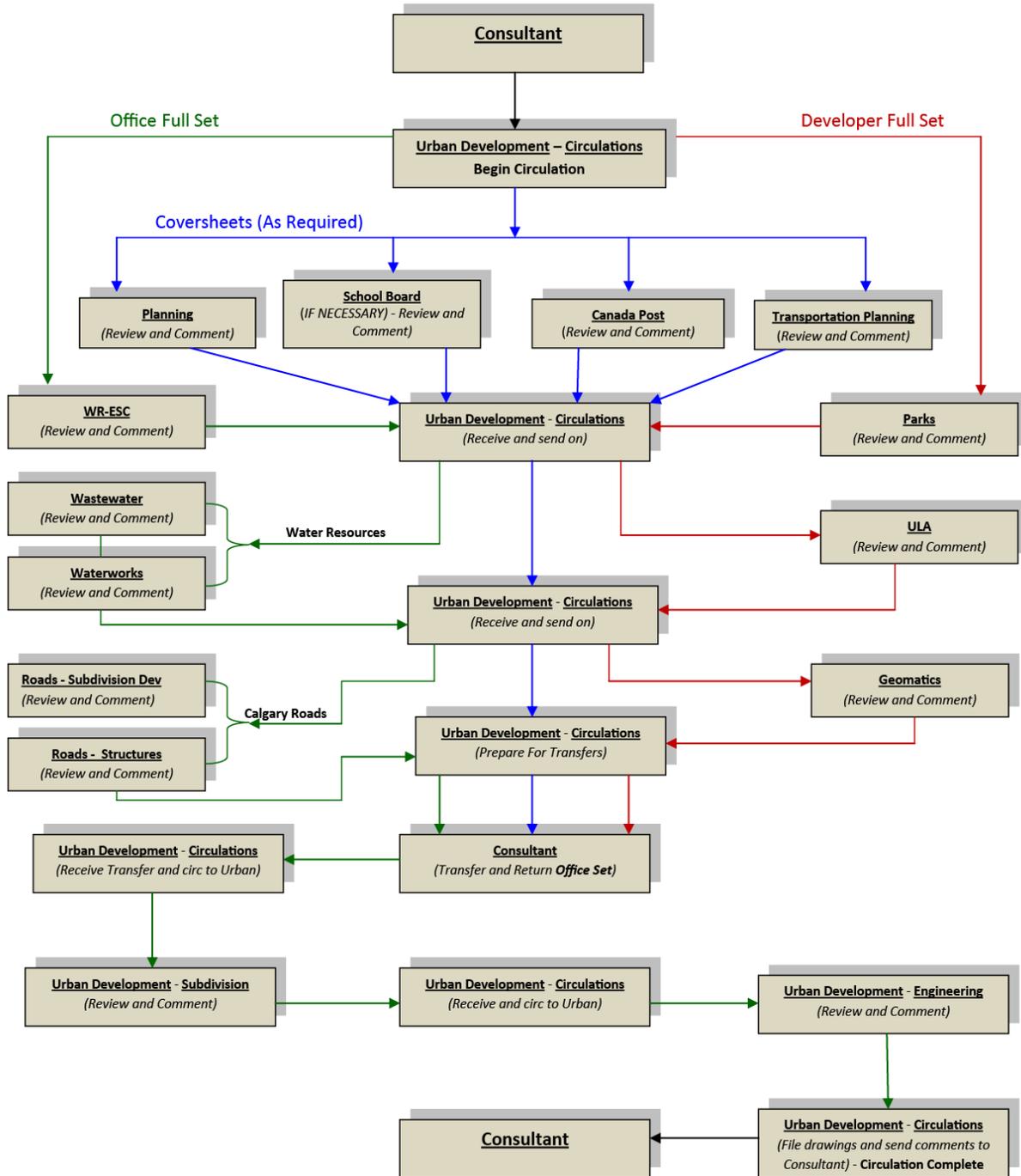
All layout sheets and block profiles shall conform to the general specifications and typical examples outlined in the City of Calgary ***Specifications Standards***.

Refer to “***Standard Block Profile Specifications for CAD and Manual Formats***”. Available for purchase at the City of Calgary, Land Information and Mapping (\$10.00).

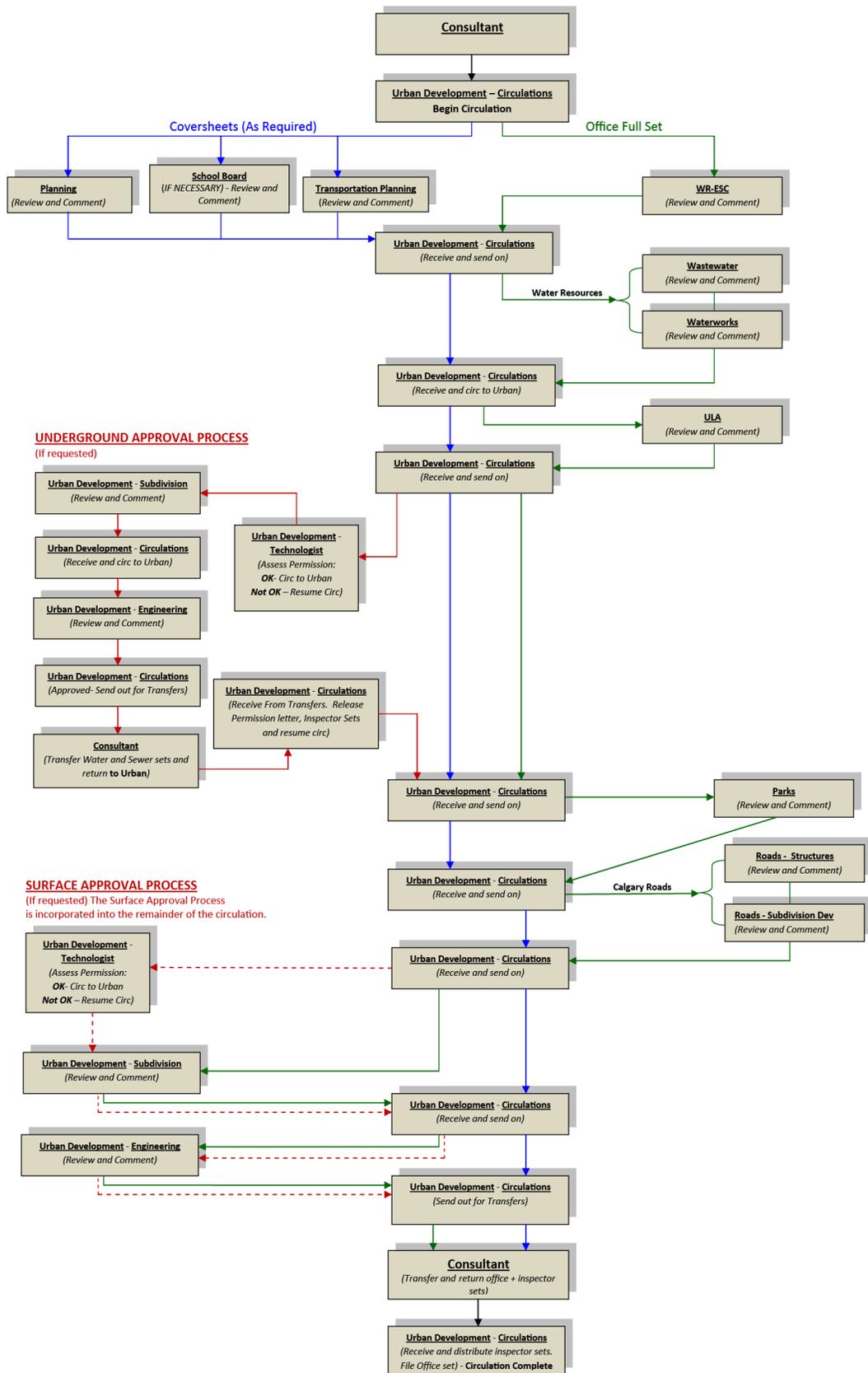
The first submission of Construction Drawings is termed the Preliminary Construction Drawings. Upon receiving approval of the Preliminary Construction Drawings, Engineering Consultant may submit the Final Construction Drawings.

The approval process is detailed in charts “***Preliminary Construction Drawings – Circulation Process***” and “***Final Construction Drawings – Circulation Process***”.

**PRELIMINARY CONSTRUCTION DRAWINGS- CIRCULATION PROCESS**



**FINAL CONSTRUCTION DRAWINGS- CIRCULATION PROCESS**



### 3) Development Agreement

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.

Following the approval of the Preliminary Construction Drawings, the developer may request, in writing, that *Urban Development* proceed with the preparation of the proposed special clauses for the Development Agreement.

The following is a brief synopsis of a standard Subdivision Development Agreement. It is highly recommended that *Urban Development* be contacted to obtain a general copy of an Agreement and/or to speak with the Subdivision Development 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
- Policies of Urban Development

The purpose of the agreement is to put in contractual form the 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 of the land
- Timeframe for construction and maintenance
- Exactly what is to be built
- Amounts of payments for acreage assessments, 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 *Urban Development Institute* and thus subject to change. A copy of a current agreement can be obtained through *Urban Development*.

#### **4) Permission for Stripping and Rough Grading**

Stripping and rough grading under a development agreement (DA) 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 Urban Development
- d) additional requirements may be imposed if school or reserve sites are affected (contact *Urban Development* 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 the Manager, Urban Development 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:

- 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 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 approved by Urban Development
- f) Final Construction Drawings are to be approved by the Manager, Urban Development
- 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 Certificates**

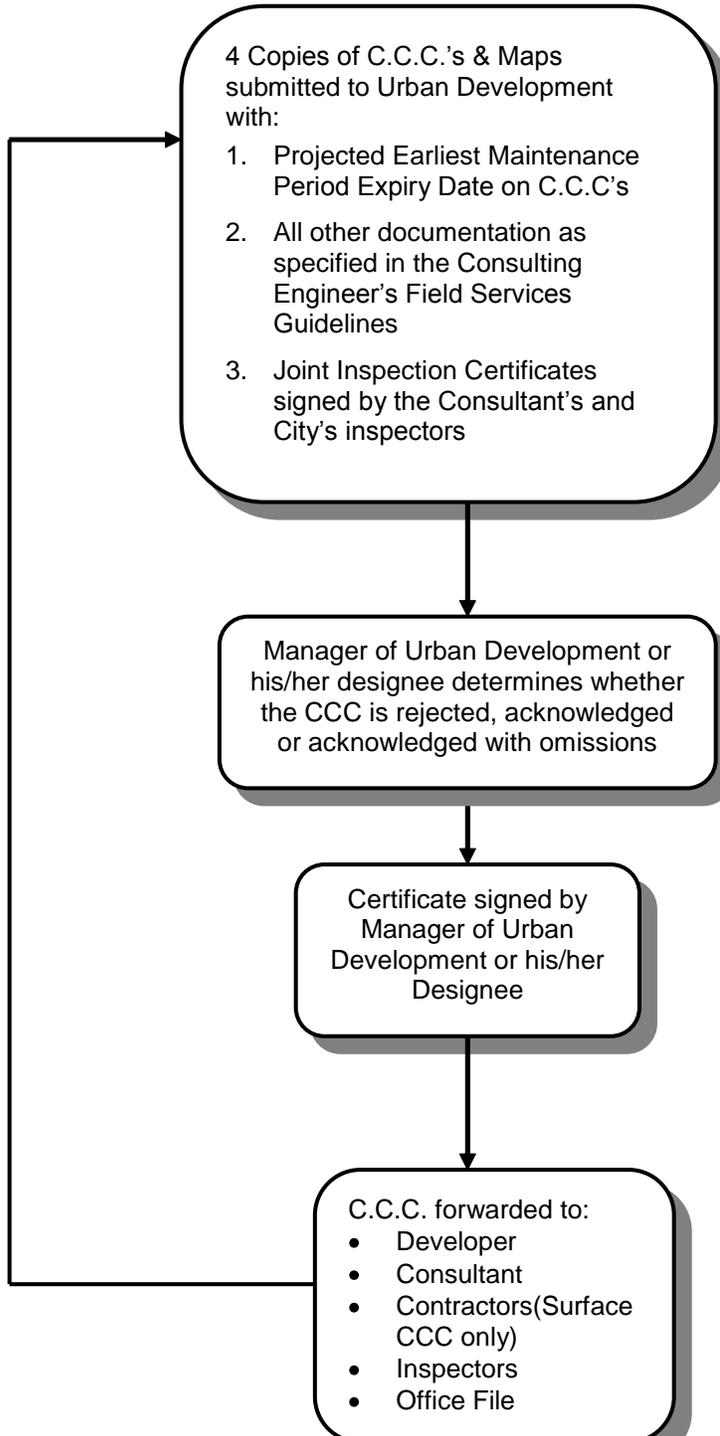
*The City of Calgary* will not accept Construction Completion Certificates (CCC's) until all the parties have executed the Development Agreement.

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 Engineering Consultant.

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

CCC's are submitted to the City and processed according to the chart "**Construction Completion Certificates**".

# Construction Completion Certificates C.C.C.



Note:

1. Projected Earliest Maintenance Period Expiry Date may vary with type of certificate: See the Standard Development Agreement for maintenance periods
2. Length of time for acknowledgement is approximately one month

## 7) **Final Acceptance Certificates**

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 the Manager, Urban Development, and are processed according to the chart "**Final Acceptance Certificates**" on page 16.

## 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.

The Manager, Urban Development shall determine the amount of securities and reductions in accordance with the terms and conditions of the Development Agreement.

## 9) **Engineering Drawing of Record**

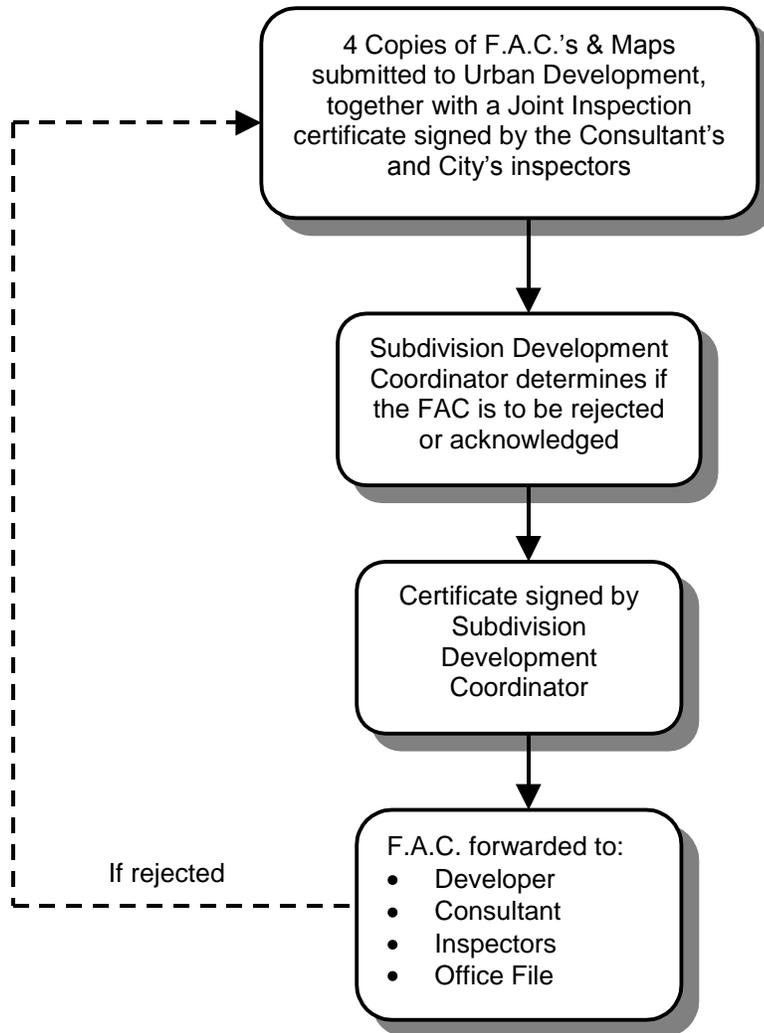
The Developer shall supply the Manager of Urban Development with plans made on vellum or other approved material or in AutoCAD format conforming to the City requirements showing the actual locations, as installed by the Developer, of roads, sidewalks, sewers, water mains and other utilities. These plans shall be submitted as soon as possible after completion of construction and before being released from public and other liabilities. On the profiles the elevations are to be referred to City datum if the plans are in imperial measure and the geodetic datum if the plans are in metric measure.

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 the Manager, Urban Development 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.

Only when the "as-built drawings" have been received and approved by the Manager, Urban Development, will the subdivision obtain final acceptance.

# Final Acceptance Certificates F.A.C.



Note:

Length of time for acknowledgement may vary with workload (60-90 days)

## **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*
- *Design Guidelines for Development Permits & Development Site Servicing Plans*
- *Guidelines for Erosion & Sediment Control*
- *Land Use Bylaw 1P2007*
- *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](http://www.calgary.ca)

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## **SECTION II: ROADS**

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# ROADS

## A. GENERAL INFORMATION

### 1) General

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 Guideline are minimum standards; wherever possible, higher standards should be used. This Guideline does not address details of roadways above Major street classification. Designs for Freeways and Expressways are based on Transportation Association of Canada (TAC) guidelines and must be approved by the approving authority of the *Transportation Department*

### 2) Cross Sections

Cross sections of each street classification are shown in **Section C Roadway Design Standards**. 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.

### 3) Dead Ends and “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 diagrams on **pages 23, 24 and 25**.

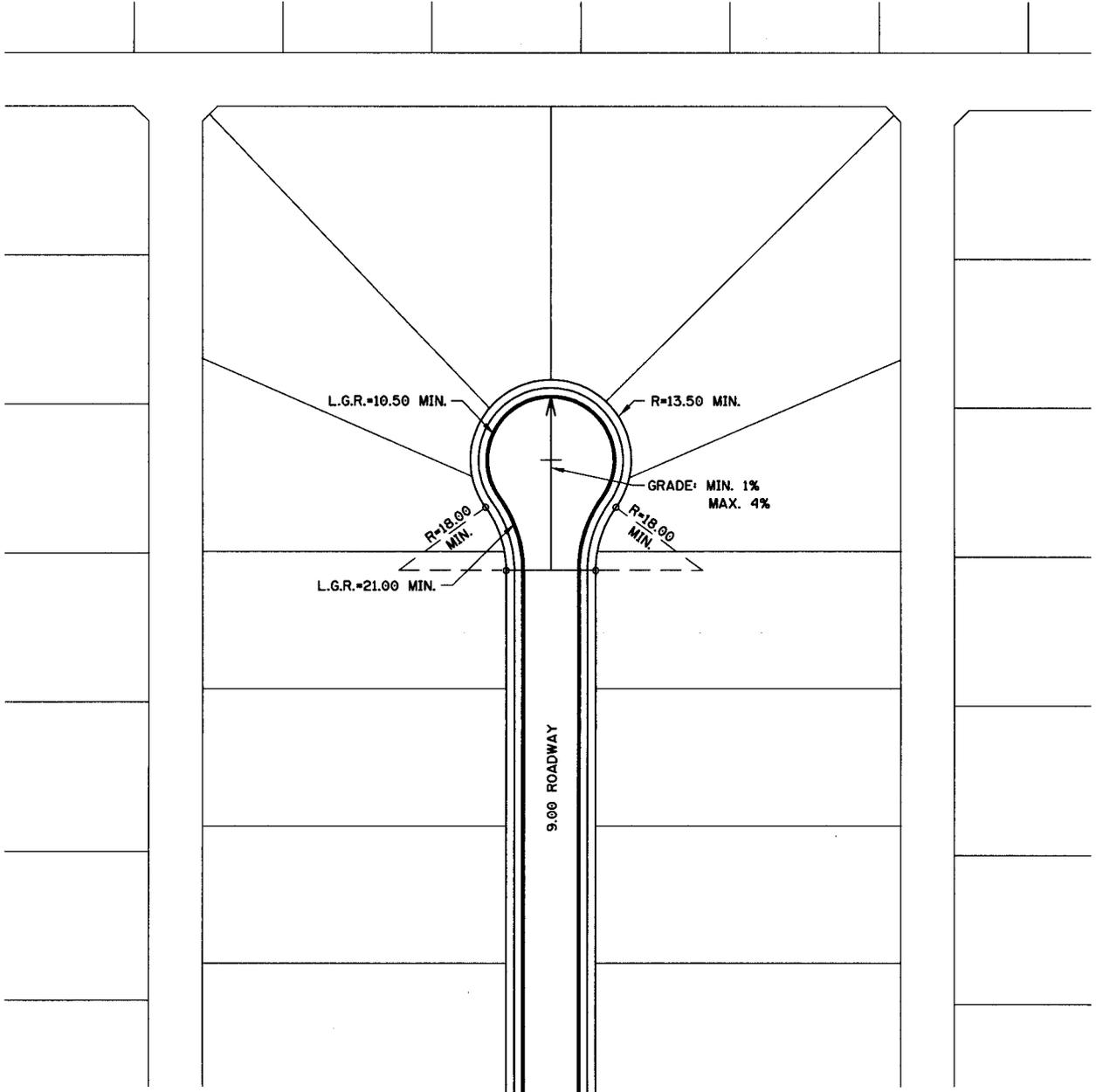
If the cul-de-sac is required for buses turning around, a minimum radius of 15.5 m shall be provided. When a post and cable fence is

required, such as with a temporary turnaround, a radius of 18.5 m is required.

The maximum allowable length of a cul-de-sac is 200 m measured from the centreline 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.



No.	Date	Revision
2	2007-01	ADDED CENTERLINE GRADE
1	98/12	REVISE LIP OF GUTTER RADII

Drawn  
J.T.R.

Date  
SEPT.'96

Scale  
N.T.S.

Approved for  
City Engineer

App'd



THE CITY OF CALGARY  
ROADS

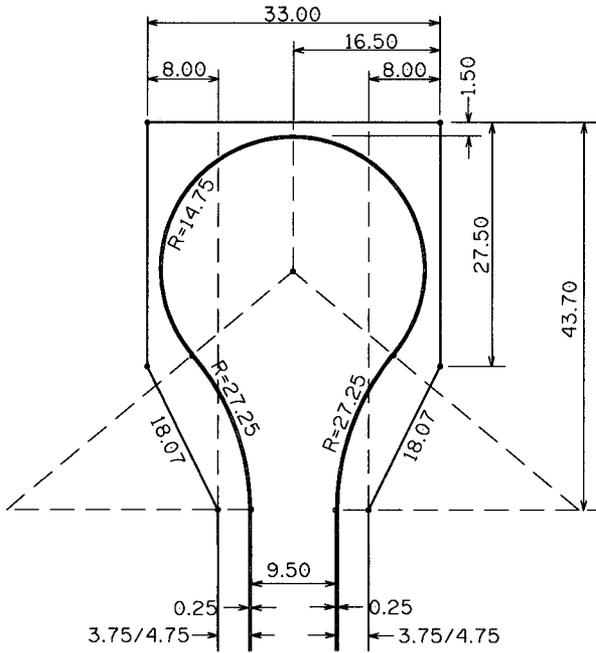
TYPICAL RESIDENTIAL STREET  
CUL-DE-SAC DESIGN  
MINIMUM REQUIREMENTS

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED

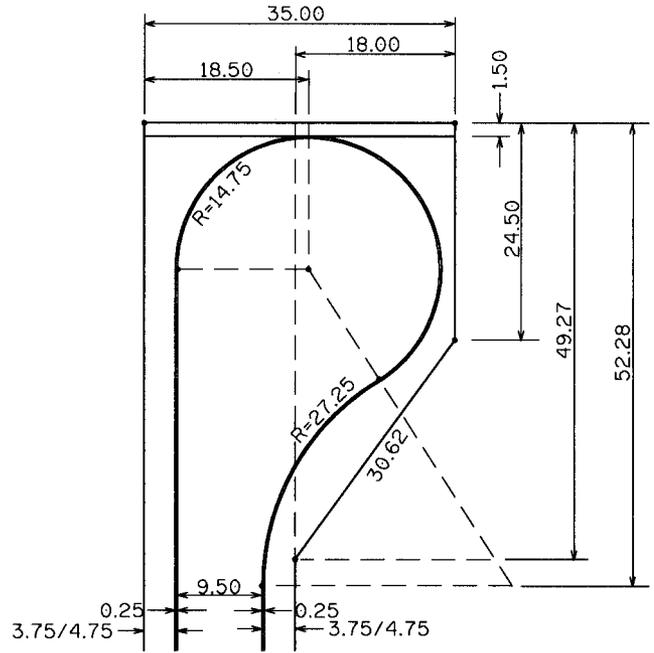


Sheet  
**12**

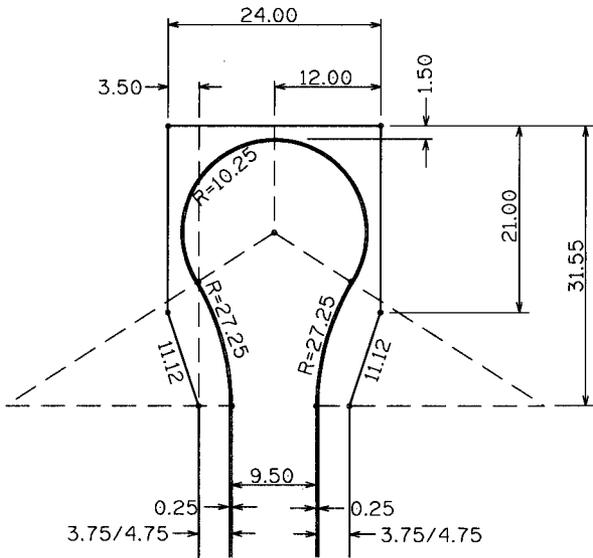
File Number  
454.1004.004



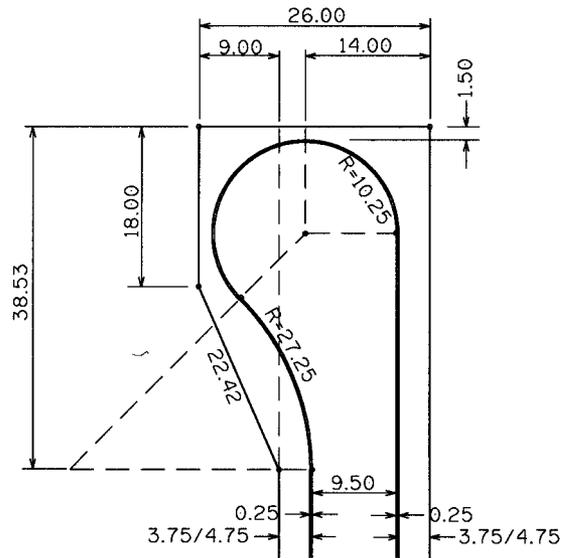
INDUSTRIAL STREET (ABSOLUTE MINIMUM)  
 ROAD WIDTH = 9.50  
 NO PARKING IN CUL-DE-SAC  
 MINIMUM DESIGN TST VEHICLE  
 MANEUVERING REQUIRED



INDUSTRIAL STREET (ABSOLUTE MINIMUM)  
 ROAD WIDTH = 9.50  
 NO PARKING IN CUL-DE-SAC  
 MINIMUM DESIGN TST VEHICLE  
 MANEUVERING REQUIRED



INDUSTRIAL STREET (ABSOLUTE MINIMUM)  
 ROAD WIDTH = 9.50  
 NO PARKING IN CUL-DE-SAC  
 MINIMUM DESIGN S.U. VEHICLE  
 MANEUVERING REQUIRED



INDUSTRIAL STREET (ABSOLUTE MINIMUM)  
 ROAD WIDTH = 9.50  
 NO PARKING IN CUL-DE-SAC  
 MINIMUM DESIGN S.U. VEHICLE  
 MANEUVERING REQUIRED

DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



No.	Date	Revision	App'd
3	02-03	DELETED FOC RADII	
2	01-05	REVISE LOG DIMENSION	
1	00-04	REVISE LOG TO 3.75 AND CHANGE TITLE	

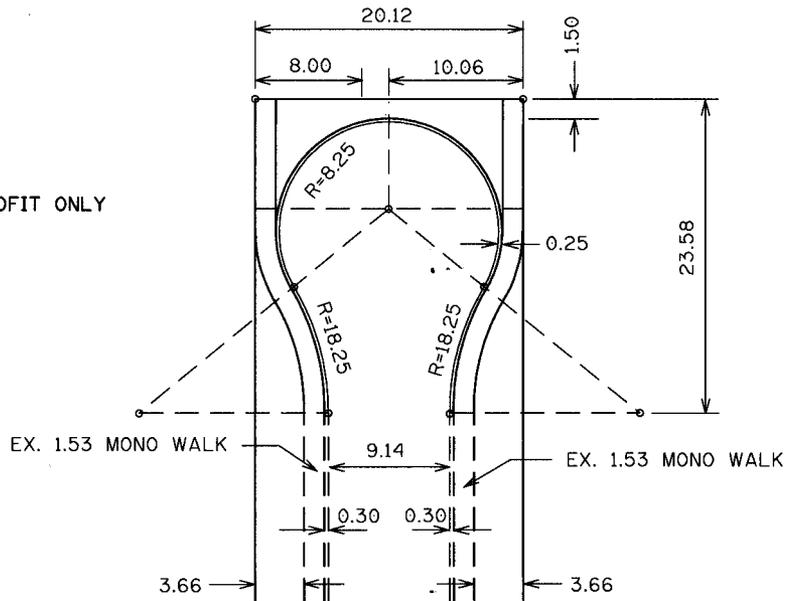
Drawn J.T.R.	Date SEPT. '96
Scale NTS	
Approved for City Engineer	



THE CITY OF CALGARY  
 ROADS  
 TYPICAL CUL-DE-SAC  
 FOR INDUSTRIAL STREET

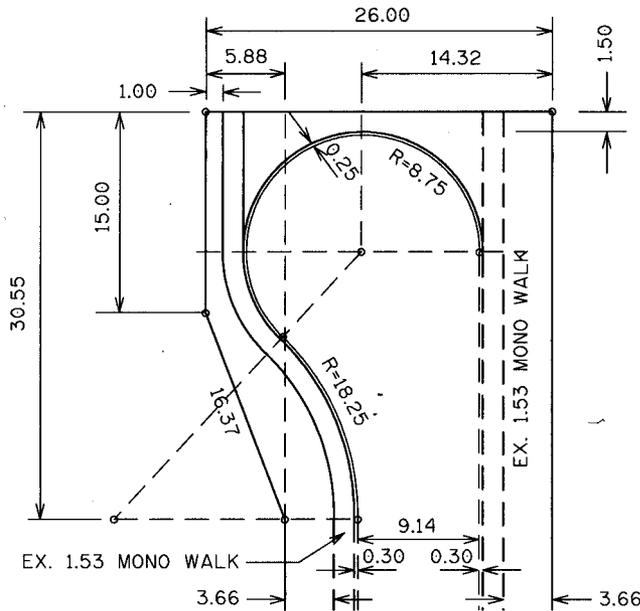
Sheet <b>17</b>
File Number 454.1004.001

NOTE: FOR RETROFIT ONLY



### STANDARD CUL-DE-SAC

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



NOTE: FOR RETROFIT ONLY

### OFFSET CUL-DE-SAC

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

DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



			Drawn J.T.R.	Date SEPT. '96	<p>THE CITY OF CALGARY ROADS</p>	Sheet <b>18</b>
			Scale NTS	Approved for City Engineer		<p><b>TYPICAL CUL-DE-SAC FOR 20.12m R.O.W. RESIDENTIAL STREET</b></p>
3	03-11	ADDITIONAL RETROFIT NOTES				
2	02-03	DELETED FOC RADII				
1	99-12	REMOVE LANE DETAILS				
No.	Date	Revision	App'd			

#### 4) Fencing

Residential development along **Deerfoot Trail** and along the Transportation Utility Corridor (**T.U.C./Ring road**) generally requires visual screen fencing. If visual screening is not required, then the developer is responsible for installing a 1.8-m chain link fence (see also *Visual Screening requirements, pg. 68*).

Residential development along **Local Majors, Majors, Expressways, Freeways, LRT** and other rail lines may require sound attenuation. If sound attenuation is not required adjacent to Major streets, Expressway and Freeway category roads, a uniform screening fence shall be provided along Majors while along Expressways and Freeways either a screening fence or a 1.8m chainlink fence may be used (see also *Sound Attenuation requirements, pg. 68*). 1.8m chain link fencing is required along **MR/ER** land adjacent to Freeways and Expressways.

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

#### 5) Grades and 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%.

For Maximum Approach Grades and Vertical Curve requirements, see **C.1 3) g) Max. Approach Grades and Vertical Curve Requirements on page 53**.

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 Standard Specifications Roads Construction 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 **E 4) Boulevard Grades Next to Trapped Low on page 121**.

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*.

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.

## 6) **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.

## 7) **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.

## 8) **Service Roads**

Service (frontage) roads adjacent to Major 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 Major 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.

## 9) **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, see **Section D**.

## 10) **Transitional Spirals**

Transition spirals should be used on all curves on Major and Industrial Major 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.

## 11) 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 Major streets, Local Major streets, Primary Collector streets and connector streets with medians, 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*.

## 12) 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 as shown in **Section C.1 3) b) Stopping Sight Distance Vertical Curves on page 48**. The minimum acceptable length for vertical curve is 30 m except for the smoothing vertical curves used for superelevation runoff and tangent runoff.

## B. ROADWAY DEFINITIONS

<b>Freeways</b>		<i>Definition</i>	
DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
>45,000	4, 6 or 8	60.0 m (min.)	2.0 – 2.4 km
FUNCTION			
<ul style="list-style-type: none"> <li>Urban Freeways are designed to accommodate heavy traffic volumes travelling at high speed under free flow conditions</li> <li>To provide optimum mobility for through traffic</li> <li>To connect major points of traffic generators</li> <li>To connect to main highways approaching the City</li> <li>To function as part of the Truck Route System</li> </ul>			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> <li>Divided highway with full control of access and grade separations at intersections</li> <li>Access provided at designated cross roads by means of specially designed interchange</li> <li>Direct access to abutting property is prohibited</li> </ul>			
TRAFFIC FEATURES		NOTE	
<b>Posted Speed (kph)</b>	80-110	<ul style="list-style-type: none"> <li>All traffic movements, including pedestrian traffic, are accommodated by interchanges or pedestrian overpasses, at the ultimate stage</li> <li>Freeways are designed in accordance with TAC standards and for capacity conditions based on Level of Service 'D'</li> <li>The right-of-way varies from a minimum of 60 m depending on the number of lanes, sloping requirements, road grades, and noise attenuation requirements</li> <li>Noise attenuation study is required at the Outline Plan application stage for residential lots adjacent to interchange areas, including the Transportation Utility Corridors (TUC) areas, to determine noise attenuation and right-of-way requirements</li> </ul>	
<b>Parking</b>	None		
<b>Sidewalk</b>	None		
<b>Traffic Signals</b>	For interim condition only		
<b>Pedestrian Crossing</b>	Grade-separated		
<b>On-street Bike Route</b>	No		
<b>Bus Route</b>	No		
<b>Truck Route</b>	Yes		
<b>Sound Attenuation</b>	Yes	TYPICAL CROSS SECTION See TAC Standards	

## Expressways

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
30,000 – 90,000	4, 6 or 8	60.0 m (min.)	800 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To permit relatively unimpeded flow for through traffic between major elements of <i>The City of Calgary</i></li> <li>To function as part of the Truck Route System</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>Intersections are grade separated when warranted</li> <li>Divided roadways with full control of access</li> <li>Direct access to abutting property is prohibited</li> <li>Only roadways of Major category or higher may intersect with Expressways</li> <li>Intersections should be 800 m apart but in special circumstances may be a minimum of 450 m</li> <li>At-grade intersections should be signalized</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
<b>Posted Speed (kph)</b>	60-80	<ul style="list-style-type: none"> <li>Interchange spacing will generally be similar to that of Freeways; however closer spacing may be considered under special circumstances</li> <li>Expressways are designed in accordance with TAC standards and for capacity conditions based on Level of Service 'D'</li> <li>Pedestrian crosswalks are permitted at intersections; however, grade separated walkways are used where warranted</li> <li>The right-of-way varies from a minimum of 60 m depending on the number of lanes, sloping requirements, road grades, and noise attenuation requirements</li> <li>Noise attenuation study is required at the Outline Plan application stage for residential lots adjacent to interchange areas, including the Transportation Utility Corridors (TUC) areas, to determine noise attenuation and right-of-way requirements</li> </ul>	
<b>Parking</b>	None		
<b>Sidewalk</b>	None		
<b>Traffic Signals</b>	For interim condition only		
<b>Pedestrian Crossing</b>	Grade-separated, at-grade for interim condition		
<b>On-street Bike Route</b>	No		
<b>Bus Route</b>	No		
<b>Truck Route</b>	Yes	<b>TYPICAL CROSS SECTION</b> <b>See TAC standards</b>	
<b>Sound Attenuation</b>	Yes		

## Major Streets (Divided)

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
10,000 – 30,000	4 or 6	36.0 m (min.)	300 m (min.)
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To expedite the movement of vehicles between major traffic generators and from subdivision to subdivision</li> <li>To serve adjacent commercial lands and to collect and distribute traffic from Freeways and Expressways to lesser category streets or directly to traffic destinations</li> <li>Major streets may be designated as truck routes and bus routes</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>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</li> <li>No direct vehicular access is allowed to abutting residential properties</li> <li>Intersections may be grade separated when warranted</li> <li>Proposed intersection spacing less than the minimum (300 m) shall be located and designed to the satisfaction of the General Manager, Transportation</li> <li>The minimum acceptable spacing between the terminal of the interchange ramp and the centreline of the first intersection is 400 m</li> <li>Where intersections are at grade, channelization is used to control turning movements at some intersections</li> <li>Intersections are generally controlled by traffic signals</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50-70	<ul style="list-style-type: none"> <li>Bus bays are desirable at all transit stop locations but shall be determined by Calgary Transit</li> <li>No residential frontage is permitted</li> <li>Major streets are designed for capacity conditions at Level of Service 'D'</li> <li>The right-of-way may be necessary at times to increase depending on the number of lanes, sloping and noise attenuation requirements and special conditions such as the accommodation of LRT</li> <li>Noise attenuation study is required for residential lots adjacent to Major streets to determine noise attenuation requirements</li> <li>Boulevard pathway is not desirable where there is excessive driveways, alleys and street crossings</li> <li>4.3m wide curb lanes required.</li> </ul>	
Parking	None		
Sidewalk	1.4 m separate walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Yes		
Bus Route	Yes		
Truck Route	Yes		
Sound Attenuation	Yes	<b>TYPICAL CROSS SECTION</b> See Page 69	

## Industrial Major Streets (Undivided)

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
10,000 – 30,000	4	30.0 m	300 m (min.)
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To expedite the movement of vehicles between major traffic generators and from industrial subdivision to industrial subdivision</li> <li>To serve adjacent commercial and industrial lands and to collect and distribute traffic from other Major and Industrial streets to lesser category streets or directly to traffic destinations</li> <li>Industrial Major streets may be designated as bus routes</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>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</li> <li>Intersections may be grade separated when warranted</li> <li>Proposed intersection spacing less than the minimum (300 m) shall be located and designed to the satisfaction of the General Manager, Transportation</li> <li>Where intersections are at grade, channelization is used to control turning movements at some intersections</li> <li>Intersections are generally controlled by traffic signals</li> </ul>			
<b>TRAFFIC FEATURES</b>			<b>NOTE</b>
Posted Speed (km/h)	50-70	<ul style="list-style-type: none"> <li>Bus bays are desirable at all transit stop locations but shall be determined by Calgary Transit</li> <li>No residential frontage is permitted</li> <li>Major streets are designed for capacity conditions at Level of Service 'D'</li> <li>The right-of-way may be necessary at times to increase depending on the number of lanes, sloping and special conditions such as the accommodation of LRT</li> <li>Boulevard pathways are desirable where truck traffic &gt;20% and few driveways</li> <li>4.3m wide curb lanes required.</li> </ul>	
Parking	None		
Sidewalk	1.4 m separate walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Optional		
Bus Route	Yes		
Truck Route	Yes		
Sound Attenuation	No	<b>TYPICAL CROSS SECTION</b> See Page 73	

## Local Major Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
15,000	4	27.0 m	150 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To be used where the Daily Traffic Volumes exceed the volumes for a Primary Collector but are less than 15,000 vehicles/day</li> <li>To serve as secondary traffic generators much the same as Primary Collector streets</li> <li>May be used as bus routes</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>No residential frontage is permitted</li> <li>No direct vehicular access to abutting residential properties, including driveways and lanes, is permitted</li> <li>Minimum intersection spacing is 150 m. Wherever possible, a greater spacing should be used</li> <li>Access is available to abutting commercial property and multi-family (RM-4 or higher density land use district) subject to traffic conditions or design conditions at the discretion of the approval authority of the <i>Transportation Department</i>, and is generally restricted to right turns in and out</li> <li>No lane connection to Local Major streets is permitted</li> <li>Local Major streets may intersect with Residential Entrance streets, Collector streets, Primary Collector streets, other Local Major streets and Major streets</li> </ul>			
<b>TRAFFIC FEATURES</b>			<b>NOTE</b>
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>Left turn bays and intersection channelizations are generally not necessary but may be required to accommodate traffic conditions</li> <li>Sufficient width is provided for two driving lanes in each direction</li> <li>Noise attenuation study is required for residential lots adjacent to Local Major streets to determine noise attenuation requirements</li> </ul>	
Parking	None		
Sidewalk	1.4 m separate walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Yes		
Bus Route	Yes		
Truck Route	No		
Sound Attenuation	Yes	<b>TYPICAL CROSS SECTION</b> See Page 76	

# Primary Collector Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
10,000	2 or 4	23.5 m, 27.0 m, 32.0 m	120 m / 60 m (see below)
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To be used where the Daily Traffic Volumes exceed the volumes for a Collector but are less than 10,000 vehicles/day</li> <li>To serve as secondary traffic generators much the same as Collector streets</li> <li>May be used as bus routes</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>A minimum intersection spacing of 120 m shall be provided between a Major Street and the first intersection on the Primary Collector street from the Major Street</li> <li>Intersection spacing for those subsequent to the above condition shall be a minimum 60 m spacing</li> <li>Access to abutting properties is permitted but is generally restricted to right turns in and out</li> <li>Primary Collector streets can be either divided or undivided with traffic signals at Major intersections</li> <li>Lane connection to Primary Collector streets is permitted</li> <li>Primary Collector streets may intersect with Residential Streets, Residential Entrance streets, Collector streets, other Primary Collector streets, Local Major streets and Major streets</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>There are three types of Primary Collector streets: 23.5 m R.O.W. - 2 lanes in each direction with no median 27.0 m R.O.W. - 2 lanes in each direction separated by a 3.5 m median 32.0 m R.O.W. - 2 lanes and a parking lane of 2.5 m in each direction separated by a 3.5 m median</li> <li>Sufficient width is provided for two driving lanes with lane width of 3.5 m in each direction</li> <li>Curb lanes may be used for parking depending on the traffic conditions in the area</li> </ul>	
Parking	Yes		
Sidewalk	1.4 m separate walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Signed Bicycle Route		
Bus Route	Yes		
Truck Route	No		
Sound Attenuation	No	<b>TYPICAL CROSS SECTION</b> See Pages 78, 79 and 80	

# Collector Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
5,000	2	19.0 m and 21.0 m	60 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To be used where the Daily Traffic Volumes exceed the volumes for a Residential Road but are less than 5,000 vehicles/day</li> <li>To collect and distribute traffic from Major streets to lesser standard streets</li> <li>To serve as secondary traffic generators, such as neighborhood commercial centers, parks and golf courses, and from neighborhood to neighborhood within the community</li> <li>All Collector streets designated as bus routes must use the 21.0 m right-of-way cross-section</li> <li>May be used as bus routes</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>Direct access is permitted abutting properties</li> <li>Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 80 m should be used</li> <li>Collector streets may intersect with Residential streets, Residential Entrance streets, other Collector streets, Primary Collector streets, Local Major streets and Major streets</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>Collector Streets are undivided roadways</li> <li>There are two types of Collector Streets:                      21.0 m R.O.W. – 2 driving lane of 3.5 m wide and 2 parking lane of 2.25 m wide                       19.0 m R.O.W.* – 2 driving lanes of 3.5 m wide and 1 parking lane of 2.5 m wide</li> </ul> <p>* This standard may only be used where residential and/or commercial frontage occurs on one side of the road and where no bus route is planned</p>	
Parking	Except at bus zones		
Sidewalk	1.4 m separate walk or 1.5 m mono walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Signed Bicycle Route		
Bus Route	Yes		
Truck Route	No		
Sound Attenuation	No	<b>TYPICAL CROSS SECTION</b> See Pages 85 and 86	

# Residential Entrance Streets

*Definition*

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
<1,000	2	22.5 m and 23.5 m	60 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To provide area in the median for subdivision entrance features</li> <li>May be used as a connection between the Collector street and the Residential street</li> <li>May provide alternate access for emergency purposes</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>Direct access is permitted to abutting residential properties</li> <li>Access is not permitted to commercial properties</li> <li>Residential Entrance streets may intersect with Residential streets, other Residential Entrance streets, Collector streets, Primary Collector streets and Local Major streets</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>There are two types of Residential Entrance Streets:                      22.5 m R.O.W. – two 6.5 m carriageways separated by a 3.5 m median. Residential frontage is not permitted                       23.5 m R.O.W. – two 7.0 m carriageways separated by a 3.5 m median. Residential frontage is permitted</li> </ul>	
Parking	Yes		
Sidewalk	1.1 m mono walk on both sides		
Traffic Signals	No		
Pedestrian Crossing	At grade		
On-street Bike Route	Signed Bicycle Route		
Bus Route	No		
Truck Route	No		
Sound Attenuation	No	<b>TYPICAL CROSS SECTION</b> See Page 93	

# Residential Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
<1,000	2	15.0 m	60 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To provide direct access to abutting residential properties</li> <li>To collect and distribute traffic from residential properties to Collector and Residential streets</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>Direct access is permitted to abutting residential properties</li> <li>Access is not permitted to commercial properties</li> <li>Residential streets may intersect with other Residential streets, Residential Entrance streets, Collector streets and Primary Collector streets</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>Undivided roadway with intersections controlled by signage</li> <li>Parking is permitted on both sides but may be restricted under special circumstances</li> <li>Sidewalk is normally only required on one side, but preferable on both sides, refer to <b>Section E – Sidewalks, Walkways, Crosswalks, Boulevard Grades, Community Mailboxes</b> for more details</li> </ul>	
Parking	Yes		
Sidewalk	1.1 m mono walk on at least one side, preferable on both sides		
Traffic Signals	No		
Pedestrian Crossing	At grade		
On-street Bike Route	Signed Bicycle Route		
Bus Route	No		
Truck Route	No	<b>TYPICAL CROSS SECTION</b> See Page 95	
Sound Attenuation	No		

# Industrial Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
<10,000 (see Note)	2	18.0 m (min.)(see notes)	60 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To provide direct access to adjacent industrial and commercial properties</li> <li>To collect and distribute traffic from industrial and commercial properties to other industrial and higher standard roadways</li> <li>May be used as bus routes</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>Direct access is permitted to industrial and commercial properties</li> <li>Industrial streets may intersect other Industrial streets, Industrial Major and Major streets</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>Undivided roadway with Intersections controlled by signage or signals where warranted</li> <li>There are two types of Industrial streets: 18.0 m R.O.W – 9.5 m pavement width with sidewalk on one side 19.0 m R.O.W. – 9.5 m pavement width with sidewalks on both sides</li> <li>The pavement width of Industrial streets can be widened to 12 m as an option to improve maneuverability for trucks, the R. O.W. requirements will be increased to 20.5 m and 21.5 m respectively</li> <li>If the Daily Traffic Volume is &gt;5,000, the pavement width should be widened to 12 m</li> <li>Sidewalks are required on both sides on Transit bus routes and Industrial Major streets, and on one or both sides of Industrial streets to provide pedestrian connections to Transit bus routes</li> <li>Sidewalk requirements for industrial subdivisions will be determined at the outline plan stage by the approval authority of the <i>Transportation Department</i></li> </ul>	
Parking	No		
Sidewalk	1.2 m mono sidewalk on at least one side and on both sides on bus routes		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Signed Bicycle Route		
Bus Route	Yes		
Truck Route	Yes		
Sound Attenuation	No	<b>TYPICAL CROSS SECTION</b> See Pages 100, 101 and 102	

## Grand Boulevards – Alternate Street Design

*Definition*

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
10,000	2	26.0 m	120 m / 60 m (see below)
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>• Functions are similar to Primary Collector and Collector streets</li> <li>• To serve as secondary traffic generators</li> <li>• To serve as a main route in within the community to accommodate substantial traffic volumes</li> <li>• May be used as bus routes and are designed to accommodate Frequent Transit Service</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>• A minimum intersection spacing of 120 m shall be provided between a Major Street and the first intersection on the Grand Boulevard from the Major Street</li> <li>• Intersection spacing for those subsequent to the above condition shall be a minimum 60 m spacing</li> <li>• No access to abutting commercial properties</li> <li>• Access to abutting multi-family residential properties is permitted and is generally restricted to right turns in and out</li> <li>• Residential frontage of single and multi-family development is permitted</li> <li>• Single family, semi-detached and duplex style homes must access from a rear alley</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>• Two 6.5 m carriageways including one driving in each direction separated by a 3.5 m median</li> <li>• Sufficient width is provided for one driving lane in each direction and the wide lanes also accommodate bicycle traffic</li> </ul>	
Parking	Yes		
Sidewalk	1.4 m separate walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bikeway	Signed Bicycle Route		
Bus Route	Yes		
Truck Route	No	<b>TYPICAL CROSS SECTION</b> See Page 88	
Sound Attenuation	No		

## High Streets - Alternate Street Design

*Definition*

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
7,000	2	21.0 m	60 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To provide internal community connections as well as main connections to external major streets</li> <li>To serve as secondary traffic generators, such as neighborhood commercial centers, parks and golf courses, and from neighborhood to neighborhood within the community</li> <li>May be used as bus routes and are designed for Frequent Transit Services operating in both directions</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>Residential frontage of single and multi-family developments with direct residential driveway access is permitted</li> <li>Rear alleys are optional but are recommended</li> <li>Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 120 m should be provided</li> </ul>			
<b>TRAFFIC FEATURES</b>			<b>NOTE</b>
<b>Posted Speed (kph)</b>	50	<ul style="list-style-type: none"> <li>7.7 m pavement width for two driving lanes and two 1.9 m parking lanes on both sides, total pavement width of 11.5 m</li> <li>Undivided roadways with traffic signals at major intersections when warranted</li> <li>Parking is permitted, except in bus zones, along both sides</li> </ul>	
<b>Parking</b>	Yes		
<b>Sidewalk</b>	1.4 m separate walk on both sides		
<b>Traffic Signals</b>	As warranted		
<b>Pedestrian Crossing</b>	At grade		
<b>On-street Bike Route</b>	Signed Bicycle Route		
<b>Bus Route</b>	Yes		
<b>Truck Route</b>	No		
<b>Sound Attenuation</b>	No	<b>TYPICAL CROSS SECTION</b> See Page 89	

## Connector Streets - Alternate Street Design

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
5,000	2	20.0 m	60 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>• Functions are similar to Collector streets</li> <li>• May be used as bus routes and are designed for Moderate Transit Service such as a local route operating in one direction and are suitable for use by school buses</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>• Residential frontage of single and multi-family developments with direct residential driveway access is permitted</li> <li>• Rear alleys are optional but are recommended</li> <li>• Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 120 m should be provided</li> </ul>			
<b>TRAFFIC FEATURES</b>		<b>NOTE</b>	
Posted Speed (kph)	50	<ul style="list-style-type: none"> <li>• 6.7 m pavement width for two driving lanes with two 1.9 m parking lanes on both sides, total pavement width of 10.5 m</li> <li>• Undivided roadways with traffic signals at major intersections when warranted</li> <li>• Parking is permitted, except in bus zones, along both sides</li> </ul>	
Parking	Yes		
Sidewalk	1.4 m separate walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Signed Bicycle Route		
Bus Route	Yes		
Truck Route	No		
Sound Attenuation	No	<b>TYPICAL CROSS SECTION</b> See Page 90	

## Avenues – Alternate Street Design

*Definition*

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
3,000	2	19.3 m	60 m
<b>FUNCTION</b>			
<ul style="list-style-type: none"> <li>To be used as a connection between all forms of “connectors” streets and Residential streets</li> <li>Not designed to accommodate transit service but are suitable for use by school buses</li> </ul>			
<b>ACCESS CONDITIONS</b>			
<ul style="list-style-type: none"> <li>Residential frontage of single and low density multi-family developments with direct residential driveway access is permitted</li> <li>Rear alleys are optional but are recommended</li> <li>Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 120 m should be provided</li> </ul>			
<b>TRAFFIC FEATURES</b>			<b>NOTE</b>
Posted Speed (kph)	50		<ul style="list-style-type: none"> <li>6.0 m pavement width for two driving lanes with two 1.9 m parking lanes on both sides, total pavement width of 9.8 m</li> <li>Parking is permitted but may be restricted under special circumstances</li> </ul>
Parking	Yes		
Sidewalk	1.4 m separate walk on both sides		
Traffic Signals	As warranted		
Pedestrian Crossing	At grade		
On-street Bike Route	Signed Bicycle Route		
Bus Route	No		
Truck Route	No		
Sound Attenuation	No	<b>TYPICAL CROSS SECTION</b> See Page 91	

## **C. ROADWAY DESIGN STANDARDS**

### **C.1 GENERAL DESIGN STANDARDS**

- 1) Design Elements for Urban Thoroughfares

See table on page 44.

LOCATION	RESIDENTIAL CLASSIFICATIONS												INDUSTRIAL SUBDIVISIONS			
	Residential Entrance (Frontage Lots)	Residential Entrance (Rearage Lots)	Residential Street	Collector One Side	Collector Street	Parking Both Sides	Primary Collector (Optional)	Street (Divided) Parking Both Sides	Primary Collector (Optional)	Local Major Street	Major Street (Divided)	Major Street (Divided)	Major Street (Divided)	Industrial Street No Parking	Industrial Street No Parking on One Side	Major Street (Undivided)
CITY OF CALGARY CLASSIFICATIONS	U.L.U.	U.L.U.	U.L.U.	U.C.U.	U.C.U.	U.C.U.	U.C.D.	U.C.D.	U.C.D.	U.C.D.	U.A.D.	U.A.D.	U.L.U.	U.L.U.	U.A.U.	U.A.U.
T.A.C. CLASSIFICATIONS	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
1. Basic R.O.W. Width (m)	22	23	15	19	21	23.5	32	27	27	27	36	36	17	18	30	30
2. Basic Pavement Width (m)	2 x 6.5	2 x 7.0	9.0	9.5	11.5	14.0	2 x 9.5	2 x 7.0	2 x 7.0	2 x 7.0	2 x 8.0	2 x 8.0	9.5**	9.5**	16.0	16.0
Travel Lane Width (m)	3.7	3.7	2.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.7/4.3	3.7/4.3	4.75	4.75	3.7/4.3	3.7/4.3
Parking Lane Width (m)	2.8	3.3	2.0	2.5	2.25	3.5	2.5	3.5	-	-	-	-	-	-	-	-
Curb and Gutter (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Median Width (m)	3.5	3.5	-	-	-	-	3.5	3.5	3.5	3.5	6.0	6.0	-	-	-	-
3. Minimum Centre Line Radius (m)	80	80	80	90	90	90	90	90	90	90	120	120	80	80	90	120
Maximum Super-elevation (m/m)	-	-	-	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.06	0.06	-	-	0.06	0.06
Maximum Grade (%)	8	8	12	8	8	8	8	8	8	8	7	6	10	10	7	6
Minimum Grade (%)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.6	0.5	0.6
Minimum Stopping Distance (m)	65	65	65	65	65	65	65	65	65	65	65	85	65	65	65	85
Mono Sidewalk Width (m)	1.1	1.1	1.1	1.5	1.5	-	-	-	-	-	-	-	-	1.2	-	-
Separate Sidewalk Width (m)	-	-	-	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	-	-	1.4	1.4

NOTES: 1. In certain individual cases it may be necessary to increase basic right-of-way to enclose excessive cuts and fills.  
2. This does not include pavement widening for intersection channelization, etc.  
3. Minimum radii are acceptable only where restricting conditions will not permit the use of larger radii.  
4. Radii of less than 80 metres acceptable on residential street if accompanied by pavement widening as per T.A.C. standards.  
5. All pavement widths and median widths are measured from Lip of Gutter to Lip of Gutter.  
\*6. The basic pavement width of major roads may be widened to 2 x 11.7m and the basic Right-of-Way be increased accordingly.  
\*\*7. Optional 12.0m/19.5m or 12.0m/20.5m industrial street to provide more pavement width to better accommodate higher traffic volumes.  
\*\*\*8. Outside Lip of Gutter is 0.25 and median Lip of Gutter is 0.50.

Drawn J.T.R. Date 1996-09 Scale N.T.S. Approved for <i>[Signature]</i> City Engineer			THE CITY OF CALGARY ROADS <b>DESIGN ELEMENTS FOR URBAN THROUGHFARES</b>		Sheet <b>1</b> File Number 454.1014.014
No.	Date	Revision	App'd _____		
3	2007-12	REVISED CURB AND GUTTER & BASIC PAVEMENT WIDTH			
2	2004-04	REVISED OUTSIDE LIP OF GUTTER AND ADDED NOTE *8			
1	1999-01	GENERAL REVISIONS			

FILE: Z:\PERMANENT\STO\_DRAWINGS\MICROSTATION\_FILES\4641014\4641014014.DWG  
DATE: 11-DEC-07 10:08

DIMENSIONS ARE MILLIMETRES UNLESS OTHERWISE NOTED

## 2) Alternative Street Design Standard Design Elements

Grand Boulevards, High Streets, Connector Streets and Avenues are “connectors” that augment the current collector road standards. The design criteria of these connectors are the same as the Primary Collector streets (divided) and Collector streets (undivided). These new standards will primarily be used in the following situations:

- In entirely new subdivisions where the developer and the City agree that the subdivision concept is suitable for their application
- In extensions of existing subdivisions where there is a boundary between the new segment of the subdivision and the existing segment
- In major “infill” situations where there is a clear boundary with the existing development

Some of these connectors will accommodate transit service:

- Frequent Transit Service is envisioned as average headway (time between buses) per direction is less than 20 minutes
- Moderate Transit Service is envisioned as average headway per direction is greater or equal to 20 minutes

Please refer to the table on the opposite page for Alternative Street Design Standards Design Elements.

LOCATION	RESIDENTIAL CLASSIFICATIONS			
	Avenue	Connector Street	High Street	Grand Boulevard
CITY OF CALGARY CLASSIFICATIONS				
T.A.C. CLASSIFICATIONS	U.C.U. 50	U.C.U. 50	U.C.U. 50	U.C.D. 50
1. Basic R.O.W. Width (m)	19.3	20	21	26
2. Basic Pavement Width (m)	9.8	10.5	11.5	16.5
Travel Lane Width (m)	3.0	3.35	3.85	4.6
Parking Lane Width (m)	1.9	1.9	1.9	1.9
Curb and Gutter (m)	0.25	0.25	0.25	0.25
Median Width (m)	-	-	-	3.5
3. Minimum Centre Line Radius (m)	90	90	90	90
Maximum Superelevation (m/m)	0.04	0.04	0.04	0.04
Maximum Grade (%)	8	8	8	8
Minimum Grade (%)	0.6	0.6	0.6	0.6
Minimum Stopping Distance (m)	65	65	65	65
Mono Sidewalk Width (m)	1.5	1.5	1.5	-
Separate Sidewalk Width (m)	1.4	1.4	1.4	1.4

- NOTES:
1. In certain cases it may be necessary to increase basic right-of-way to accommodate sloping.
  2. This does not include pavement widening for intersection channelization, etc.
  3. Minimum radii are acceptable only where conditions will not permit the use of larger radii.
  4. All pavement widths and median widths are measured from Lip of Gutter to Lip of Gutter.

DIMENSIONS ARE MILLIMETRES UNLESS OTHERWISE NOTED 

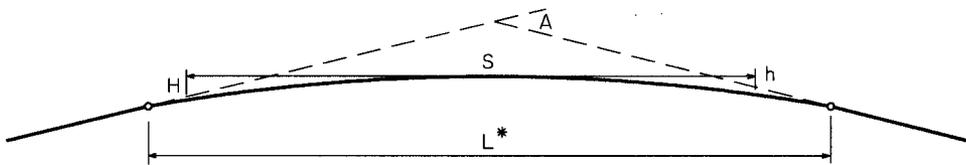
Drawn J.T.R.		Date 1996-09		 THE CITY OF CALGARY ROADS	Sheet <b>2</b>
Scale N.T.S.		Approved for <i>Benji</i> City Engineer			File Number 454.1014.020
No.	Date	Revision		App'd	

### 3) Standard Intersection Design Elements

Pages 48 - 54 contain drawings indicating standard intersection design elements including:

- Stopping Sight Distance Vertical Curves
- Introduced Medians
- Typical Slot Left Turn Lane Designs
- Typical Left Turn Bay Design
- Examples of Typical Channelization of Island Designs
- Max Approach Grades and Vertical Curve Requirements
- Gutter Drainage at Flat Sag Vertical Curves

## CREST CURVES

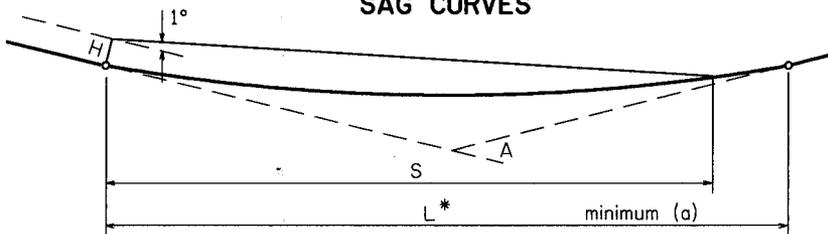


design speed ( km/h )	stopping sight distance (m)		crest . K (m)	
	minimum (a)	desireable (b)	minimum (c)	desireable (d)
40	45	45	4	5
50	65	65	7	10
60	85	90	15	20
70	110	120	22	35
80	140	150	35	55
90	170	180	55	85
100	200	210	70	110
110	220	240	85	140
120	240	260	105	170
130	260	280	120	200
140	270	300	130	220

L - length of vertical curve in metres  
 A - algebraic difference in grades percent  
 S - minimum stopping sight distance in metres  
 H - height of driver's eye 1.05m  
 h - height of object  
 $K = \frac{L}{A}$

- \* L in metres should not be less than design speed in kilometres per hour
- (a) based on fixed perception reaction time of 2.5 s
  - (b) based on variable perception reaction time of 2.5 s at 40 km/h to 3.5 s at 140 km/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	

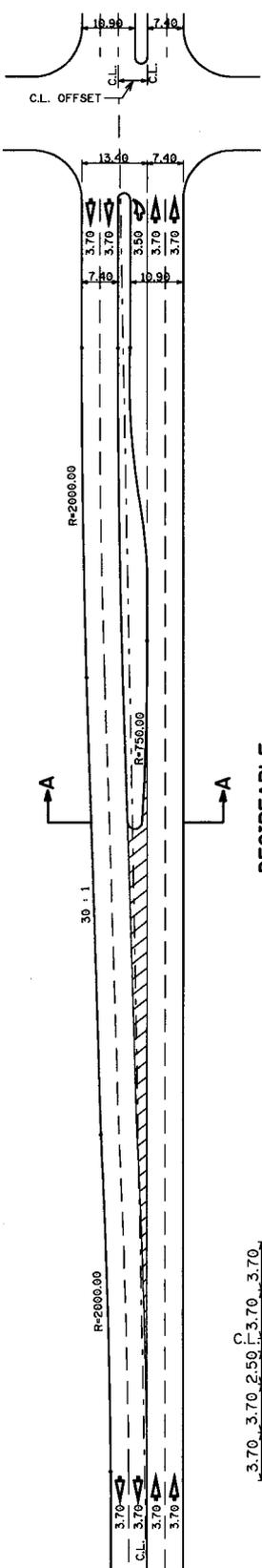
L - length of vertical curve in metres  
 A - algebraic difference in grades percent  
 S - minimum stopping sight distance in metres  
 H - height of head lamps 0.6m  
 1° - angle of light beam upward from plane of vehicle  
 $K = \frac{L}{A}$

- \* L in metres should not be less than design speed in kilometres per hour  
centripetal acceleration 0.3 m/s<sup>2</sup>

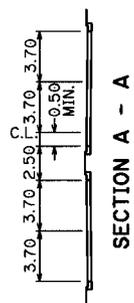
DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



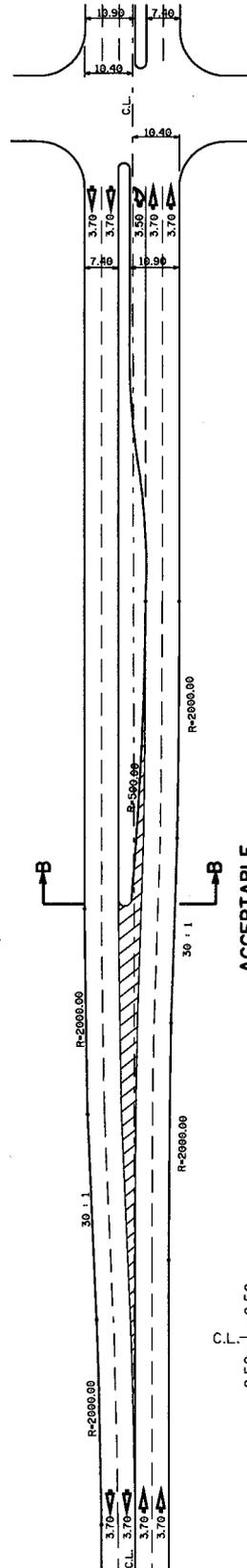
	Drawn J.T.R.	Date SEPT. '96	<b>THE CITY OF CALGARY</b> ROADS	Sheet <b>20</b>
	Scale: N.T.S.		<b>STOPPING SIGHT DISTANCE VERTICAL CURVES</b>	File Number 454.1014.012
1	00-04	REVISE MIN. CREST FROM 100 TO 105	Approved for <i>Henry</i> City Engineer	
No.	Date	Revision	App'd	



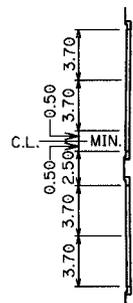
DESIREABLE  
MEDIAN - OFFSET FROM CENTRE LINE  
SECTION A - A



SECTION A - A

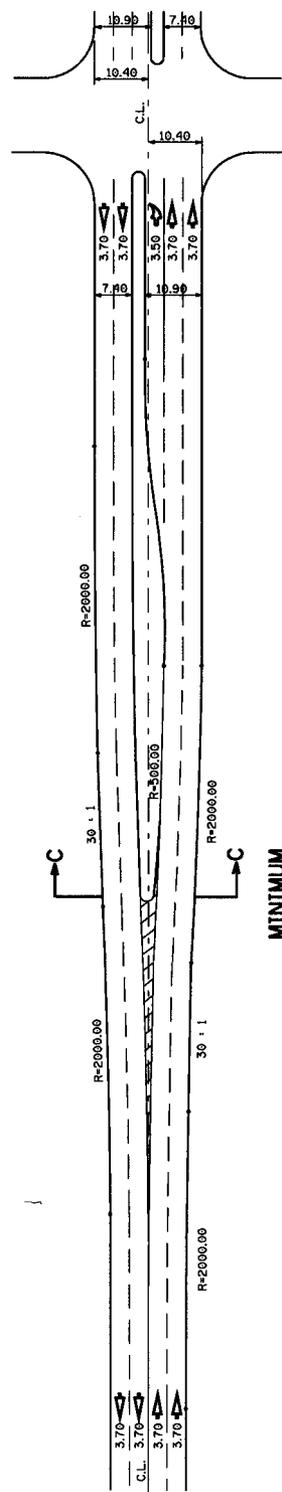


ACCEPTABLE  
MEDIAN - SPLIT ON CENTRE LINE  
APPROACH NOSE OFFSET FROM C.L.  
SECTION B - B

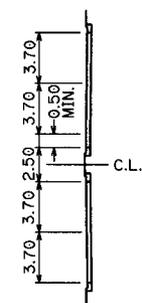


SECTION B - B

NOTE: LEFT TURN LANES  
AS PER 454.1014.063



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



SECTION C - C

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



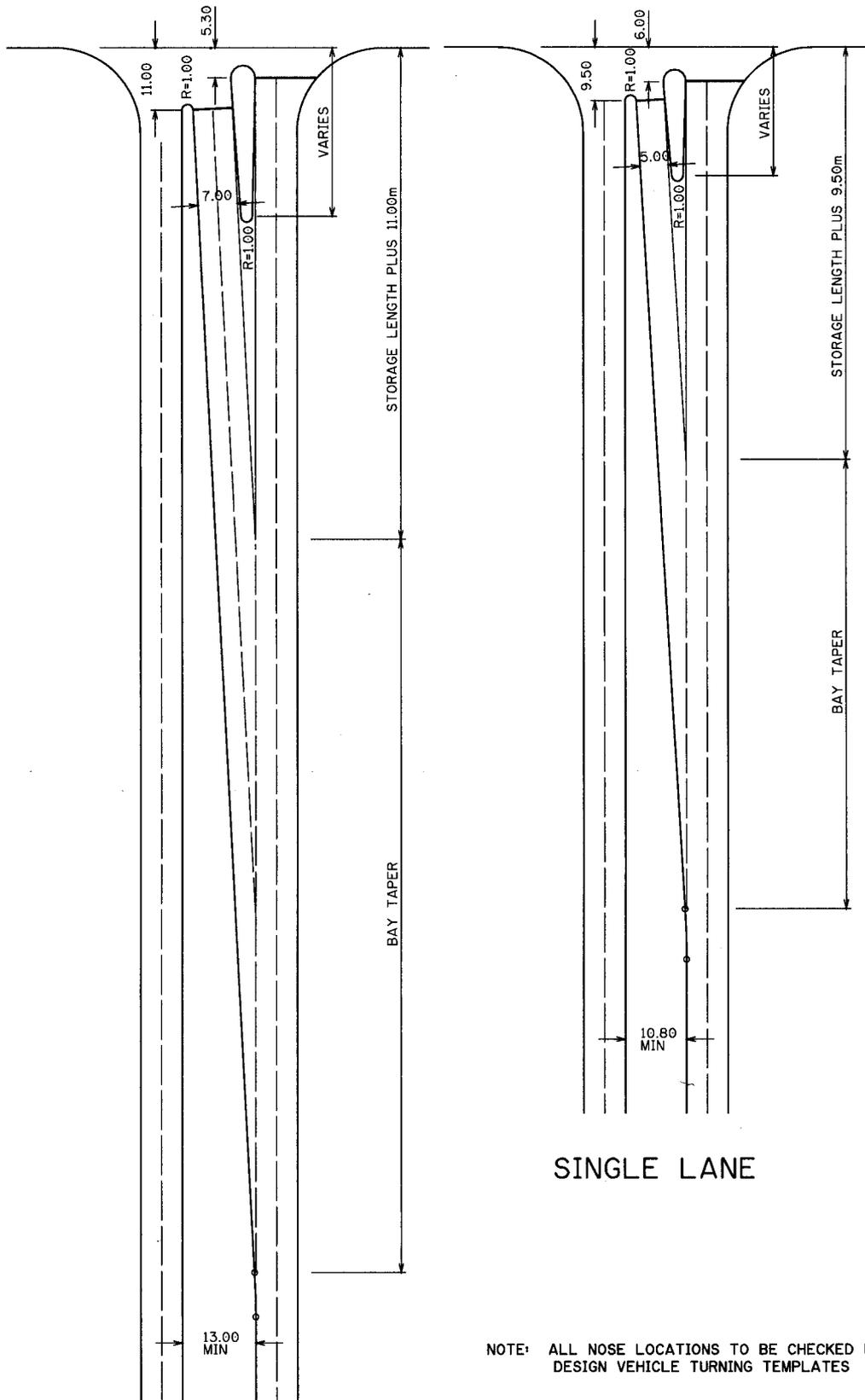
THE CITY OF CALGARY  
ROADS

Drawn J.T.R. Date SEPT. '96  
Scale: N.T.S.  
Approved for [Signature] City Engineer

INTRODUCED MEDIAN

Sheet  
**23**  
File Number  
454.1009.004

No.	Date	Revision	App'd
1	00-04	REVISE MEDIAN O/S TO 0.50	



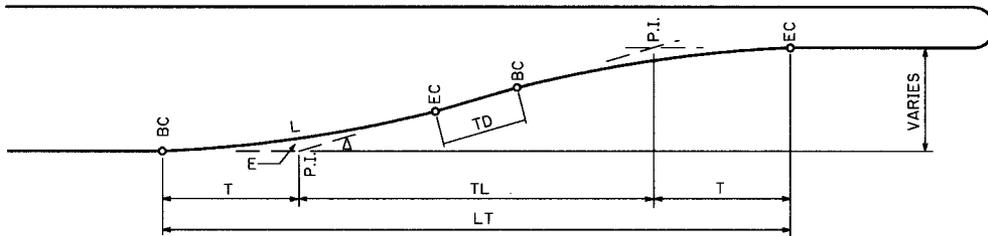
DOUBLE LANE

SINGLE LANE

NOTE: ALL NOSE LOCATIONS TO BE CHECKED USING DESIGN VEHICLE TURNING TEMPLATES

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

		Drawn S.P.G.		Date 99-12	 <b>THE CITY OF CALGARY</b> ROADS	Sheet
		Scale: NTS				<b>24</b>
		Approved for		 City Engineer	File Number	
No.	Date	Revision			454.1014.021	
		App'd				



CURVE DATA										
OFFSET	DESIGN SPEED km/h	$\Delta$	R	T	L	E	TL	TD	LT	P.I. - P.I.
3.50	50 km/h	6° 30'	150.00	8.518	17.017	0.242	30.719	13.883	47.754	30.919
3.50	60 km/h	5° 00'	150.00	6.549	13.090	0.143	40.005	27.060	53.103	40.158
3.50	70 km/h	4° 00'	150.00	5.238	10.472	0.091	50.052	39.704	60.522	50.180
3.50	80 km/h	3° 00'	200.00	5.237	10.472	0.069	66.784	56.401	77.250	66.875
DUAL 3.50	60 km/h	5° 00'	150.00	6.549	13.090	0.143	80.010	67.218	93.108	80.316
DUAL 3.50	70 km/h	4° 00'	150.00	5.238	10.472	0.091	100.105	89.873	110.581	100.349

No.	Date	Revision	App'd
1	00-04	REMOVED 3.35 DUAL AND 3.70 ROWS	

Drawn	Date
J.T.R.	SEPT. '96
Scale	N.T.S.
Approved for	
City Engineer	<i>[Signature]</i>



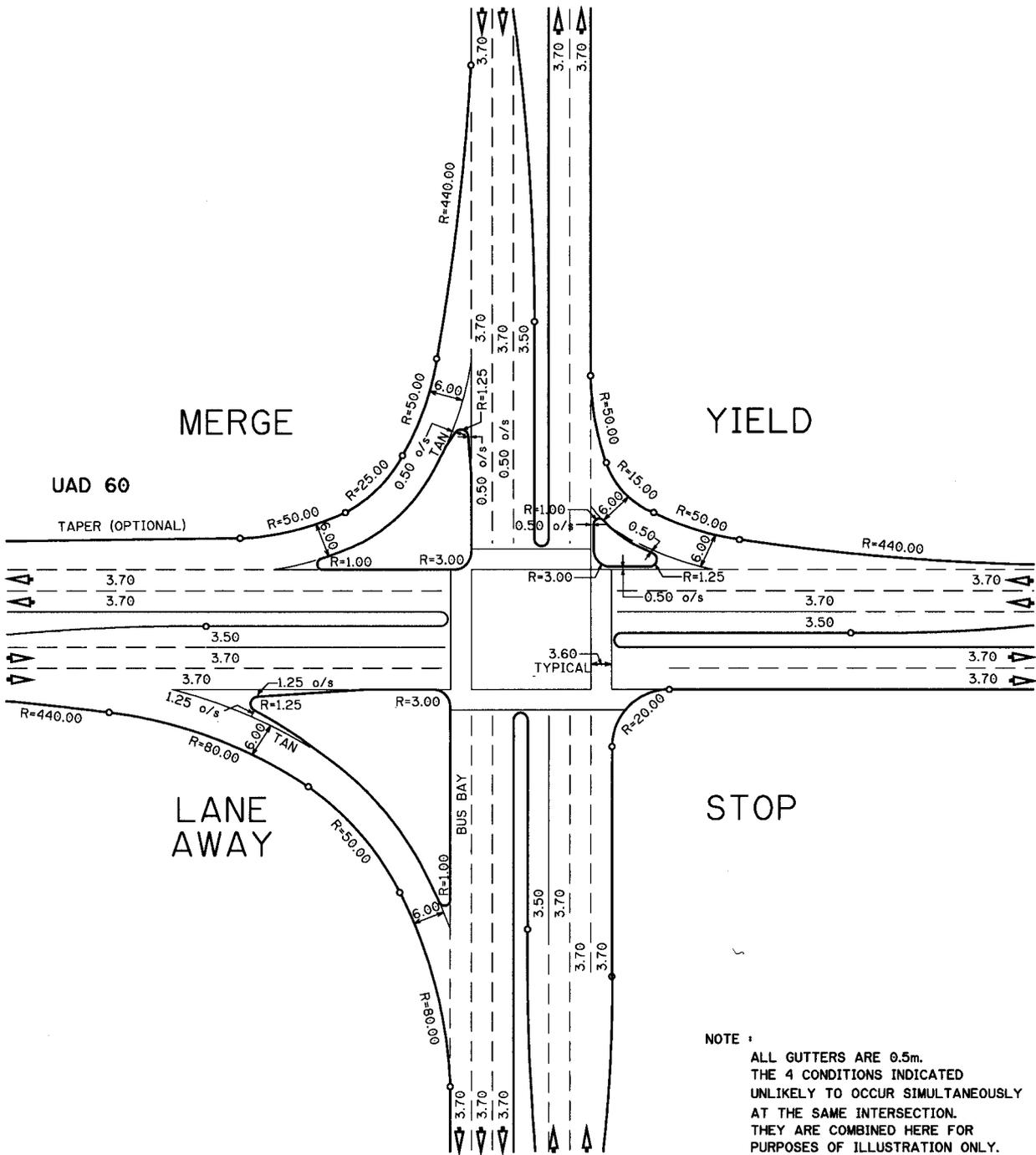
THE CITY OF CALGARY  
ROADS

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



TYPICAL  
LEFT TURN BAY DESIGNS

Sheet	26
File Number	454.1014.003



NOTE :  
 ALL GUTTERS ARE 0.5m.  
 THE 4 CONDITIONS INDICATED  
 UNLIKELY TO OCCUR SIMULTANEOUSLY  
 AT THE SAME INTERSECTION.  
 THEY ARE COMBINED HERE FOR  
 PURPOSES OF ILLUSTRATION ONLY.

DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



THE CITY OF CALGARY  
 ROADS

Sheet  
**27**

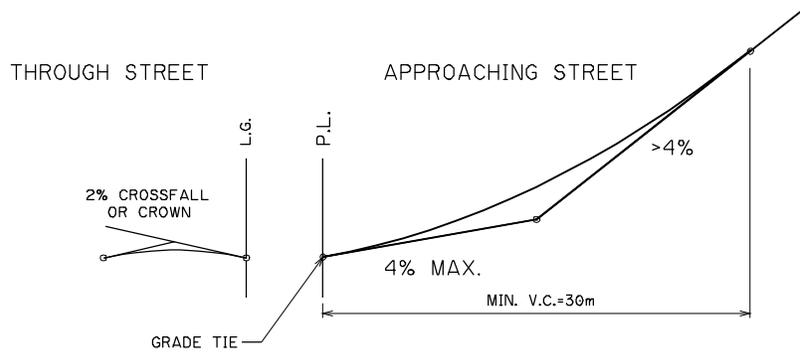
Drawn J.T.R. Date SEPT. '96  
 Scale: NTS  
 Approved for  
 City Engineer

EXAMPLES OF TYPICAL  
 CHANNELIZATION OF  
 ISLAND DESIGNS

File Number  
 454.1014.004

No.	Date	Revision	App'd
2	00-04	REVISE VARIOUS DIMENSIONS	
1	98-12	PUT LABEL LANE WIDTHS	

# MAXIMUM APPROACH GRADES AND GRADE TIE AT PROPERTY LINE



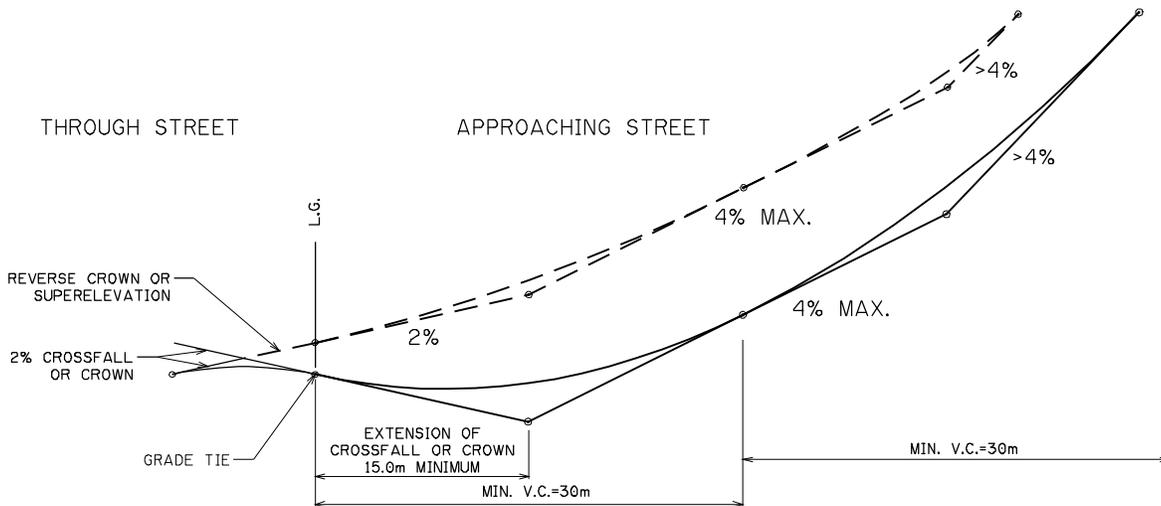
THROUGH STREET	APPROACHING STREET	GRADE TIE
UNDIVIDED COLLECTOR INDUSTRIAL STREET ** PRIMARY COLLECTOR	UNDIVIDED ROADWAY	* CENTRELINE TIE
RESIDENTIAL	UNDIVIDED ROADWAY/ DIVIDED ROADWAY	* CENTRELINE TIE

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

**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.

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



THROUGH STREET	APPROACHING STREET	GRADE TIE
MAJOR INDUSTRIAL MAJOR LOCAL MAJOR *** PRIMARY COLLECTOR	DIVIDED ROADWAY	3 POINT TIE
	UNDIVIDED ROADWAY	2 POINT TIE
COLLECTOR INDUSTRIAL	DIVIDED ROADWAY	3 POINT TIE

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

**NOTE:**

- \*\*\* LG TIE APPLIES IF PRIMARY COLLECTOR IS IN SUPERELEVATION.

5	2008-11	ADDED NOTE ***		Drawn	Date
4	06-12	ADDED NOTE **		B.DORE	90-11
3	02-04	ADDED REVERSE CROWN OR SUPERELEVATION ON LOWER SPEC		Scale:	NTS
2	01-02	INTERSECTION INFO ADDED		Approved for	
1	00-04	REVISE TITLE BLOCK		City Engineer	
No.	Date	Revision	App'd		



THE CITY OF CALGARY  
ROADS

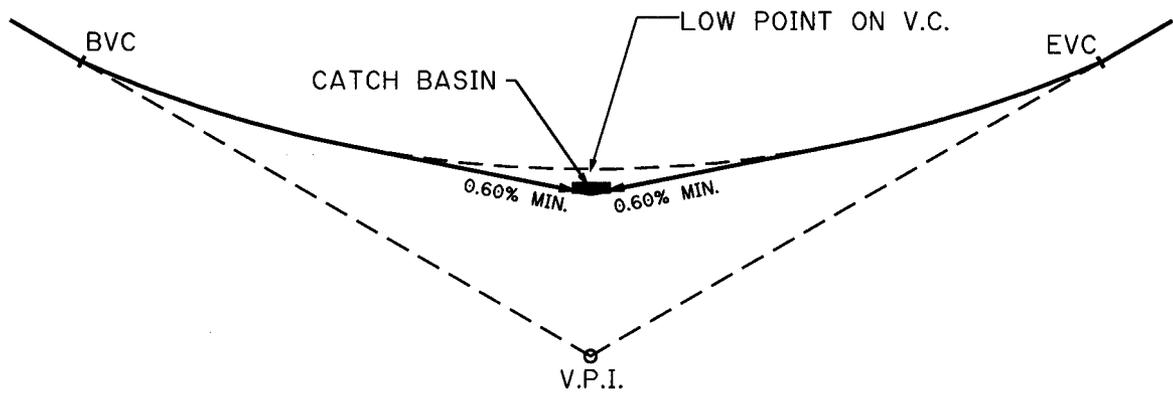
DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



**MAXIMUM APPROACH GRADES  
AND VERTICAL CURVE  
REQUIREMENTS**

Sheet	<b>29</b>
File Number	454.1005.011

# CATCH BASIN @ LOW POINT ON FLAT VERTICAL CURVE



DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED

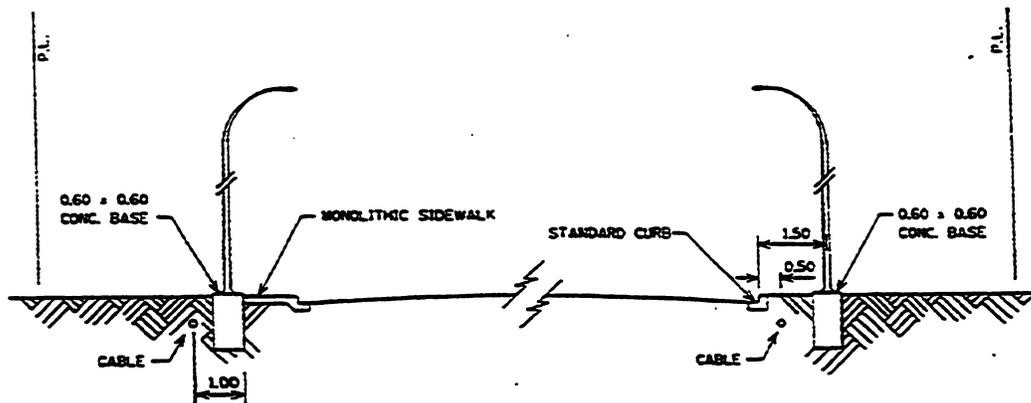


			Drawn S.P.G.	Date 99-12	 THE CITY OF CALGARY ROADS	Sheet	30
			Scale	NTS		GUTTER DRAINAGE AT FLAT SAG VERTICAL CURVES	
			Approved for	 Civil Engineer			
No.	Date	Revision	App'd				

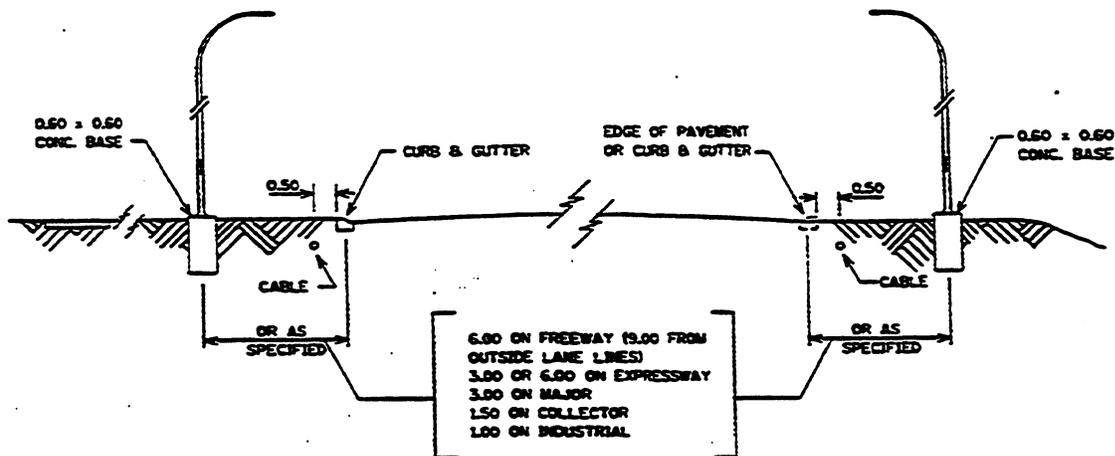
#### 4) Standard Cross-Section Elements

Pages 56 - 63 contain drawings indicating standard cross-section design elements including:

- Standard Street Pole Line Assignment
- Requirements in Utility ROWs (Easements)
- Standard Depth Zones For U/G Joint Use Installation (Residential Distribution)
- Standard Placement Service Pedestal and Transformer 3.5m Front Yard URW
- Standard Placement – 4 Party Joint Service Pedestal and Transformer 3.5m Front Yard URW
- Standard Placement Service Pedestal and Transformer 3.0m Front Yard URW
- Standard Placement 2.40m Easement With Swale
- Tree Separation to Utilities



RESIDENTIAL WITH STANDARD CURB OR MONOLITHIC SIDEWALK



THOROUGHFARE STANDARD WITH ROLLED CURB & GUTTER (OR EDGE OF PAVEMENT)

**NOTE:**

LOCATION OF STREET LIGHT POLES IN CHANNELIZED INTERSECTIONS TO BE DETERMINED JOINTLY BY THE ELECTRIC SYSTEM IN TERMS OF ADEQUATE ILLUMINATION AND ECONOMIC FEASIBILITY AND THE TRANSPORTATION DEPARTMENT IN TERMS OF MAXIMUM MOTORIST SAFETY.

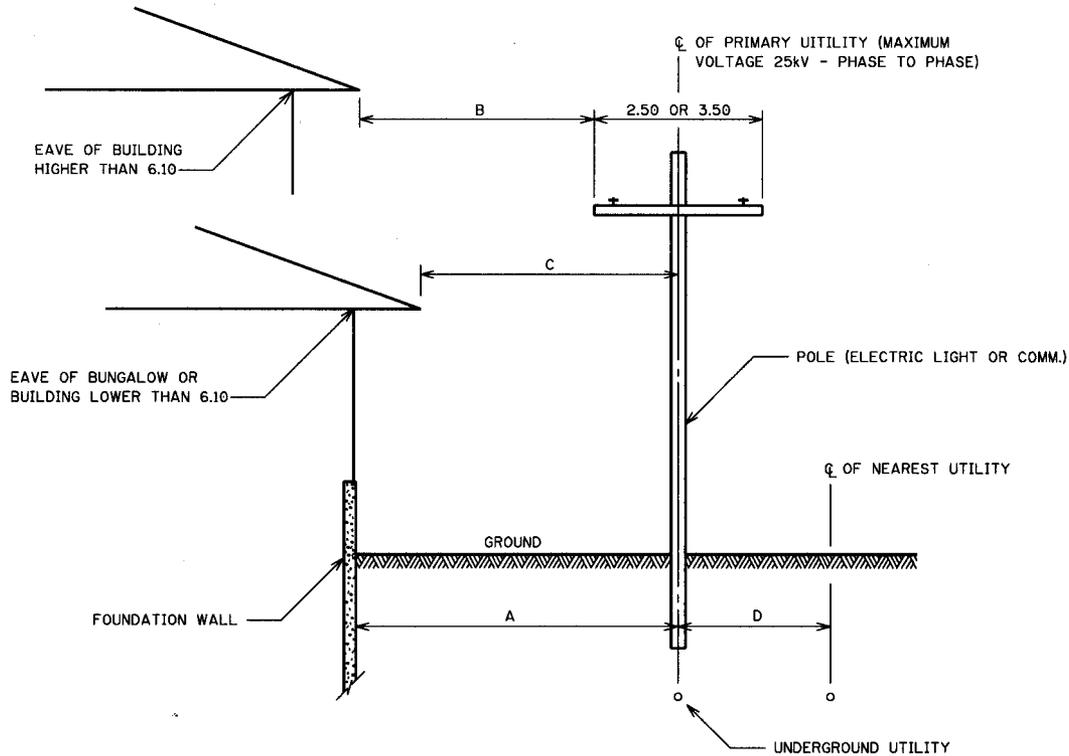
**DOWNTOWN**

STREET LIGHTING SIGNS, POSTS, HYDRANTS, ETC.  
0.76 BACK OF FACE OF CURB  
LOW VOLTAGE DUCT 2.83 B.O.C.

**NOTE:**

POWER POLES, STREET LIGHTING POLES, TRANSFORMER BOXES AND OTHER SURFACE FEATURES SHALL MAINTAIN A MIN. 3.00m CLEARANCE FROM HYDRANT.

1100-04 REVISED DIM. FROM L.G. TO CABLE FROM 1.00		Drawn R.B.T. Date JULY '34 Scale: NTS Approved for City Engineer	THE CITY OF CALGARY STANDARD STREET POLE LINE ASSIGNMENT	METRIC Sheet <b>22</b> File Number 454.1008.005
No.	Date	Revision		



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

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.

NOTE : 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.

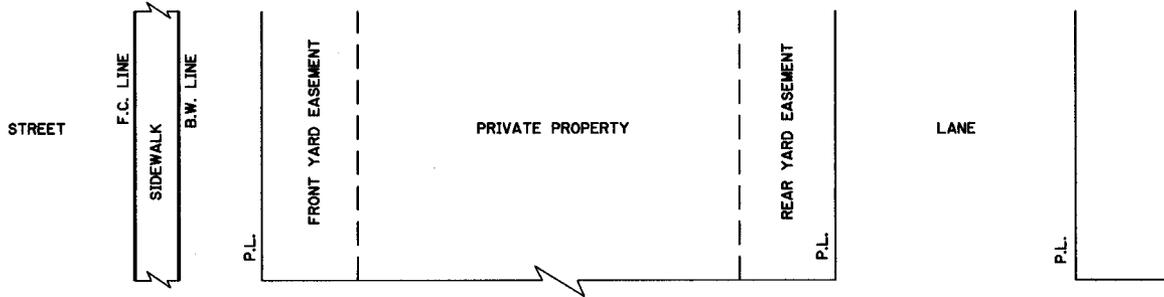
NEW UTILITY RIGHTS-OF-WAY SHALL  
BE CONSIDERED ONLY IN INSTANCES  
WHERE THESE RIGHTS-OF-WAY ABUT  
ADJACENT ROADS, LANEWAYS, OR ADJACENT  
PROPERTY BOUNDARIES.

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

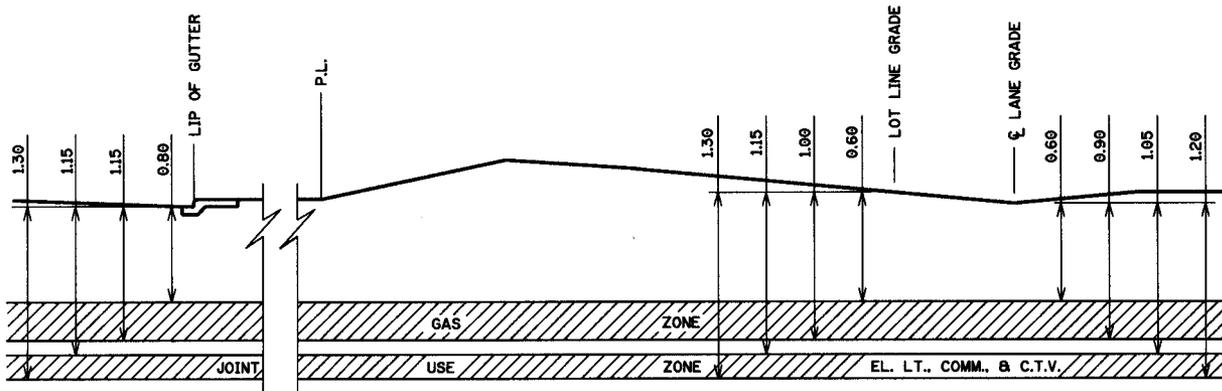
DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED

METRIC

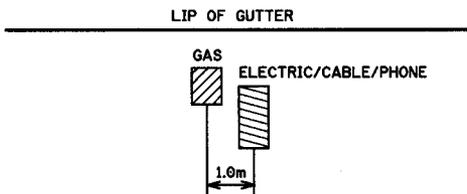
		Drawn R.B.T.	Date AUG. '94	 THE CITY OF CALGARY ROADS	Sheet
		Scale:	N.T.S.		23
		Approved for <i>Alamy</i>	City Engineer	REQUIREMENTS IN UTILITY R/W's (EASEMENTS)	File Number
No.	Date	Revision	App'd		454.1008.006



PLAN



NOTE - 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.



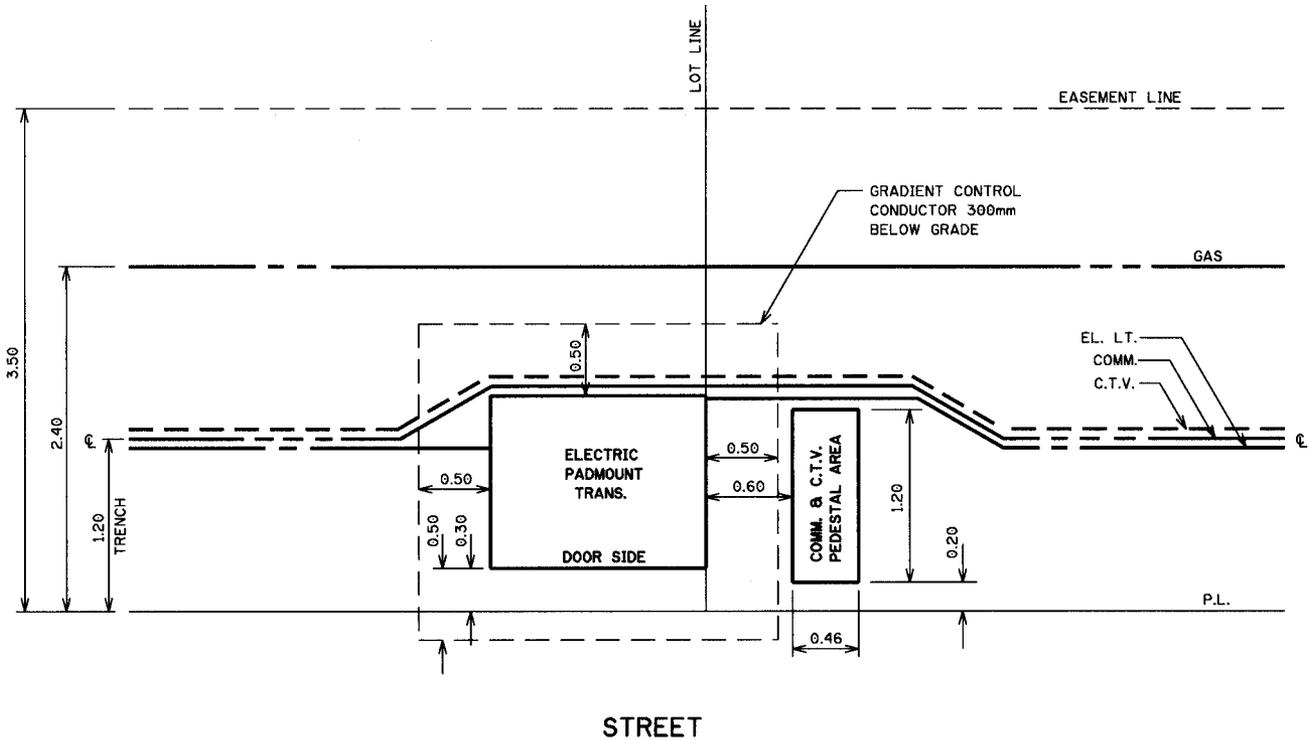
MINIMUM 1.0m HORIZONTAL SEPARATION  
 BETWEEN GAS PIPE AND ELECTRIC CABLES

TYPICAL ROAD CROSSING SEPARATION

DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



		Drawn R.B.T.		Date AUG. '94		THE CITY OF CALGARY ROADS		Sheet	
		Scale: N.T.S.		Approved for		STANDARD DEPTH ZONES FOR U/G JOINT USE INSTALLATION (RESIDENTIAL DISTRIBUTION)		24	
2 00-04		REVISED UTILITY COMPANY NAMES		City Engineer				File Number	
1 970922		ADD TYPICAL ROAD CROSSING SEPARATION						454.1008.007	
No.	Date	Revision		App'd					



NOTE: POWER POLES, STREET LIGHTING POLES, TRANSFORMER BOXES AND OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT.

ELECTRIC PADMOUNT = 1.168 x 1.016  
COMM. PEDESTAL = 0.330 x 0.406  
C.T.V. PEDESTAL = 0.330 x 0.406

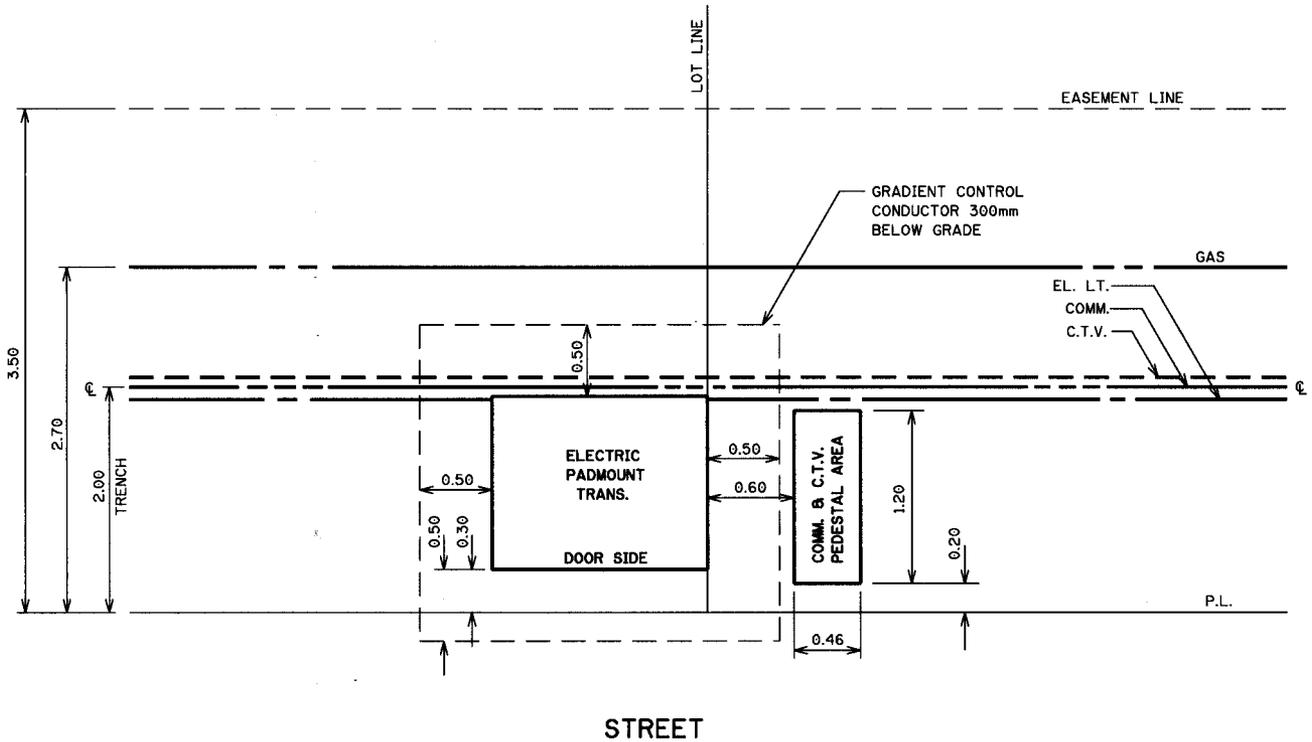
**3 PARTY JOINT SERVICE  
3.50 FRONT YARD EASEMENT**

NOT USED IN NEW DEVELOPMENTS

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



Drawn R.B.T. Date AUG. '94 Scale: N.T.S. Approved for City Engineer				Sheet <b>25</b> File Number 454.1008.033	
No.	Date	Revision	App'd	THE CITY OF CALGARY ROADS <b>STANDARD PLACEMENT-3 PARTY          JOINTSERVICE PEDESTAL AND          TRANSFORMER 3.5m FRONT YARD U.R.W.</b>	
4	00-04	ADDED NOTES UPDATED VAR. TEXT			
3	94-06	REVISED 5.50 DIM. TO 0.50			
2	93/12	REVISED WITH NEW PEDESTAL AREA			
1	88/01	NOTE ADDED			



NOTE: POWER POLES, STREET LIGHTING POLES, TRANSFORMER BOXES AND OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT.

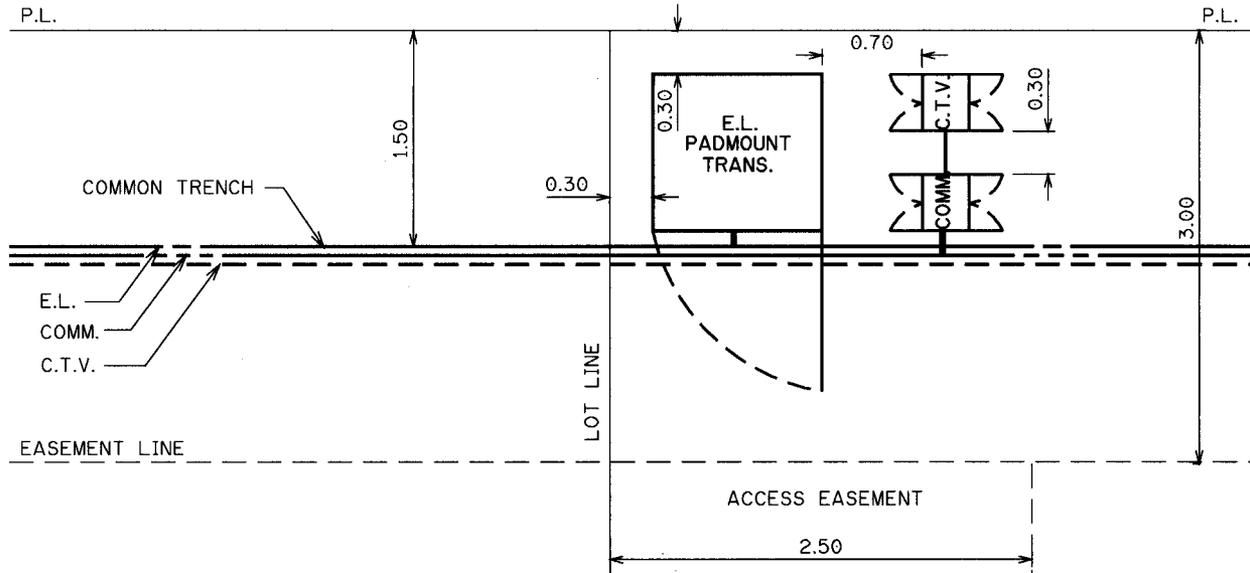
ELECTRIC PADMOUNT = 1.168 x 1.016  
COMM. PEDESTAL = 0.330 x 0.406  
C.T.V. PEDESTAL = 0.330 x 0.406

**4 PARTY JOINT SERVICE  
3.50 FRONT YARD EASEMENT**

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED

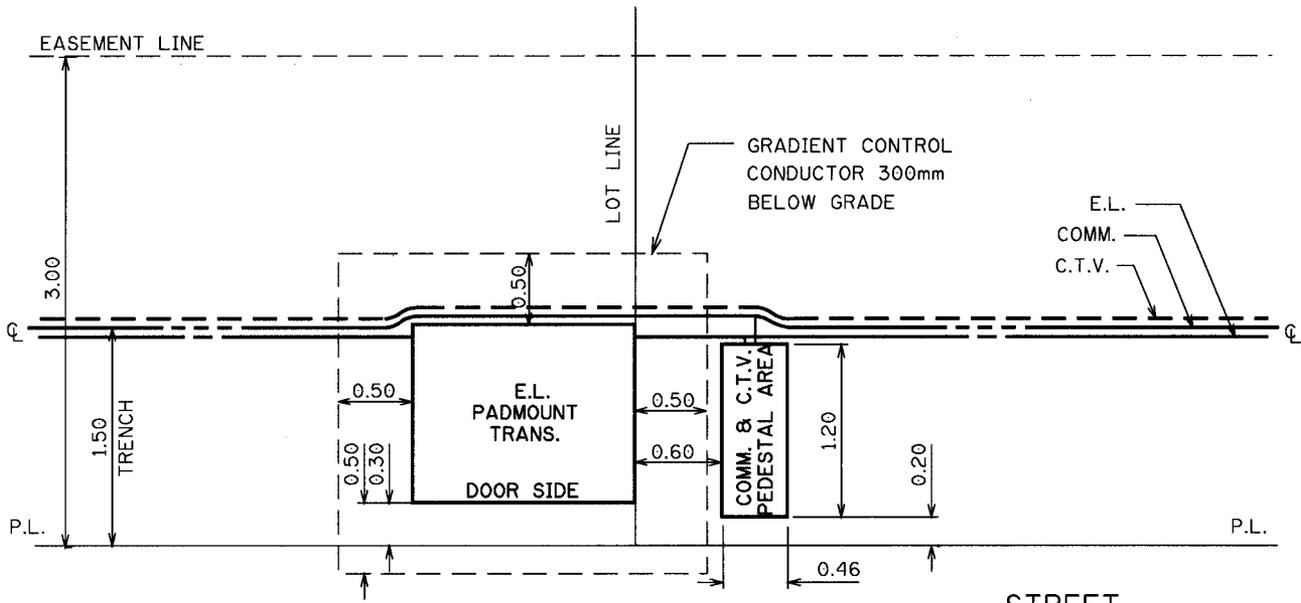


			Drawn S.P.G.	Date 00/04	<p>THE CITY OF CALGARY ROADS</p>	Sheet
			Scale N.T.S.	Approved for <i>[Signature]</i> City Engineer		<p><b>26</b></p>
No.	Date	Revision	App'd	<p>STANDARD PLACEMENT-4 PARTY JOINTSERVICE PEDESTAL AND TRANSFORMER 3.5m FRONT YARD U.R.W.</p>		File Number 454.1008.051



## REAR YARD EASEMENT SHALLOW UTILITIES ONLY

\* NOTE: NOT TO BE USED \*  
IN NEW CONSTRUCTION.



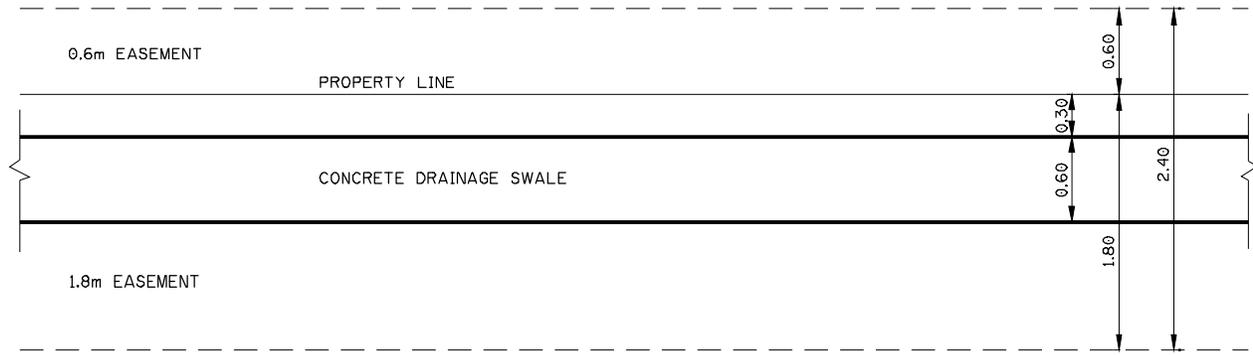
## 3.00m FRONT YARD EASEMENT

NOTE - POWER POLES, STREET LIGHTING POLES, TRANSFORMER BOXES AND OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.0m CLEARANCE FROM HYDRANT.  
- STANDARD PLACEMENT OF SERVICE PEDESTALS AND PADMOUNT TRANS. IN RESIDENTIAL FRONT AND REAR YARD 3m EASEMENTS. ADDITIONAL WIDTH WOULD BE REQUIRED IF GAS IS IN EASEMENT.

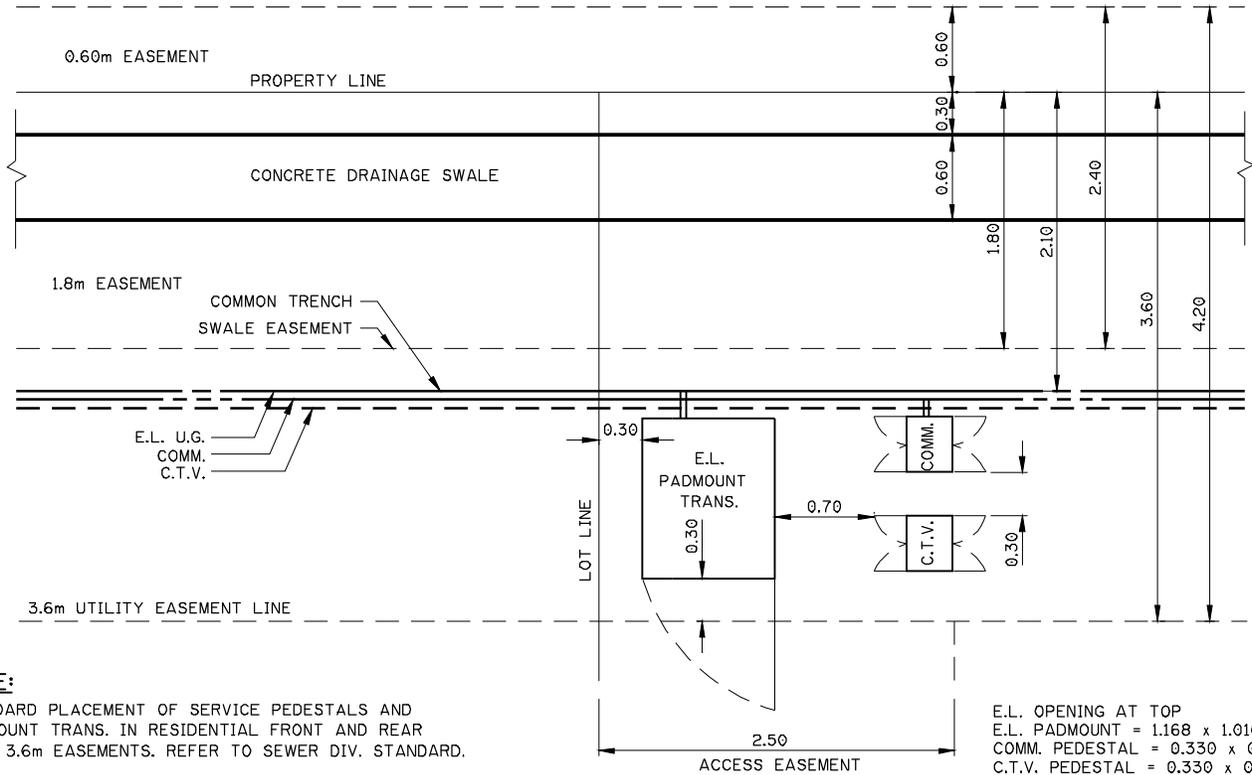
E.L. PADMOUNT = 1.168 x 1.016  
COMM. PEDESTAL = 0.330 x 0.406  
C.T.V. PEDESTAL = 0.330 x 0.406

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED

			Drawn <b>B.DORE</b>	Date <b>12-93</b>	<b>THE CITY OF CALGARY</b> ROADS	Sheet <b>27</b>
			Scale: <b>N.T.S.</b>		<b>STANDARD PLACEMENT</b> SERVICE PEDESTAL AND TRANS- FORMER 3.0m FRONT U.R.W.	File Number <b>454.1008.034</b>
2	00-04	REVISED UTILITY COMPANY NAMES	Approved for			
1	93-12	REVISED WITH NEW PEDESTAL AREA & NOTE	App'd			
No.	Date	Revision	App'd	City Engineer		



## 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

				DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED		METRIC	
				THE CITY OF CALGARY ROADS		Sheet <b>28</b>	
				Scale: N.T.S.		File Number	
				Approved for		454.1008.035	
				City Engineer		STANDARD PLACEMENT 2.4m EASEMENT WITH SWALE	
No.	Date	Revision	App'd				
3	2008-11	REVISED EASEMENTS					
2	00-04	REVISED UTILITY COMPANY NAMES					
1	12-93	ADD NOTE FOR NEW CONSTRUCTION					

# TREE SEPARATIONS TO UTILITIES WITHIN ROAD RIGHTS-OF-WAY

UTILITIES:	DECIDUOUS			CONIFEROUS			POPLAR	
	DEEP:	SERVICES MEDIANS	MAINS BLVD (parallel to tree line)	SERVICES MEDIANS	MAINS BLVD (parallel to tree line)	SERVICES	MAINS (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 HYDRANTS	0m **	2.5m	3.0m	0m **	3.0m	4.0m	3.0m	4.0m
	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*	2.0m*	2.0m*
AGT	1.5m	1.5m	2.0m*	2.0m*	2.0m*	2.0m*	2.0m*	2.0m*
CTV	1.5m	1.5m	2.0m*	2.0m*	2.0m*	2.0m*	2.0m*	2.0m*
CCES	1.5m	1.5m	2.0m*	2.0m*	2.0m*	2.0m*	2.0m*	2.0m*
CCES:								
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.

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.

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



				Drawn D.J.L.	Date 99-04	 THE CITY OF CALGARY ROADS			Sheet <b>29</b>
				Scale N.T.S.	<b>TREE SEPARATIONS TO UTILITIES</b>			File Number 454.1008.038	
1	98-12-15	Add note		Approved for City Engineer <i>Henry</i>					
No.	Date	Revision	App'd						

## C.2 DESIGN STANDARDS BY ROAD CLASSIFICATION

### 1) Major Streets (Divided)

Major Streets (Divided)		<i>Alignment Design Standards</i>
CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Arterial Divided (UAD) 50 Urban Arterial Divided (UAD) 60 Urban Arterial Divided (UAD) 70	50 – 70 kph	<b>See Pages 66, 67 and 68</b>
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Major UAD 50 = 65 m Major UAD 60 = 85 m Major UAD 70 = 110 m  <b>See Pages 44 and 48</b>	Major UAD 50 = 90 m, 130 m – 6000 m (desirable) Major UAD 60 = 120 m, 260 m – 6000 m (desirable) Major UAD 70 = 170 m, 400 m – 6000 m (desirable)	
Median and Left Turn Bay		
<ul style="list-style-type: none"> <li>• Minimum median width on a Major street is 6.0 m for a parallel left turn lane and 9.5 m for parallel dual left turn lanes</li> <li>• Introduced median is used to transition an undivided road to a divided road with a left turn median, <b>see Page 49.</b></li> <li>• 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.</li> <li>• No left turn bays will be permitted on curves with a centreline radius less than 440 m; nor, anywhere within a centreline transition curve (spiral) if the minimum radius of that spiral is less than 440 m</li> <li>• Standard left turn bays shall be provided on Major streets at all intersections. For left turn bay designs, <b>see Page 51.</b></li> <li>• The minimum storage length for a left turn bay is 60 m with a 3.5 m wide left turn lane</li> <li>• Dual left turn bays and slot turn bays are to be designed to TAC standards, <b>see Page 50.</b></li> </ul>		
Note		
<ul style="list-style-type: none"> <li>• Major streets are classified as Urban Arterial Divided (UAD) roadways and are designed for speeds of 50, 60 and 70 kilometers per hour. Most Major streets fall within the 60 kph category; however, developers will be informed by the approving authority of the <i>Transportation Department</i> of the applicable design speed</li> <li>• Standard curb with 0.5 m gutter is to be used on the median and 0.25 m gutter on the outside edges (with 4.3 m wide curb lane).</li> <li>• Reverse gutter is used where necessary</li> <li>• Street light poles, power poles and traffic signal poles are to be located a minimum of 3.5 m from the lip of gutter</li> </ul>		

## VERTICAL ALIGNMENT

### Maximum & Minimum Grades

Maximum grade: Major UAD 50 = 7.0%  
Major UAD 60 = 6.0%  
Major UAD 70 = 5.0%

Minimum grade: 0.6%

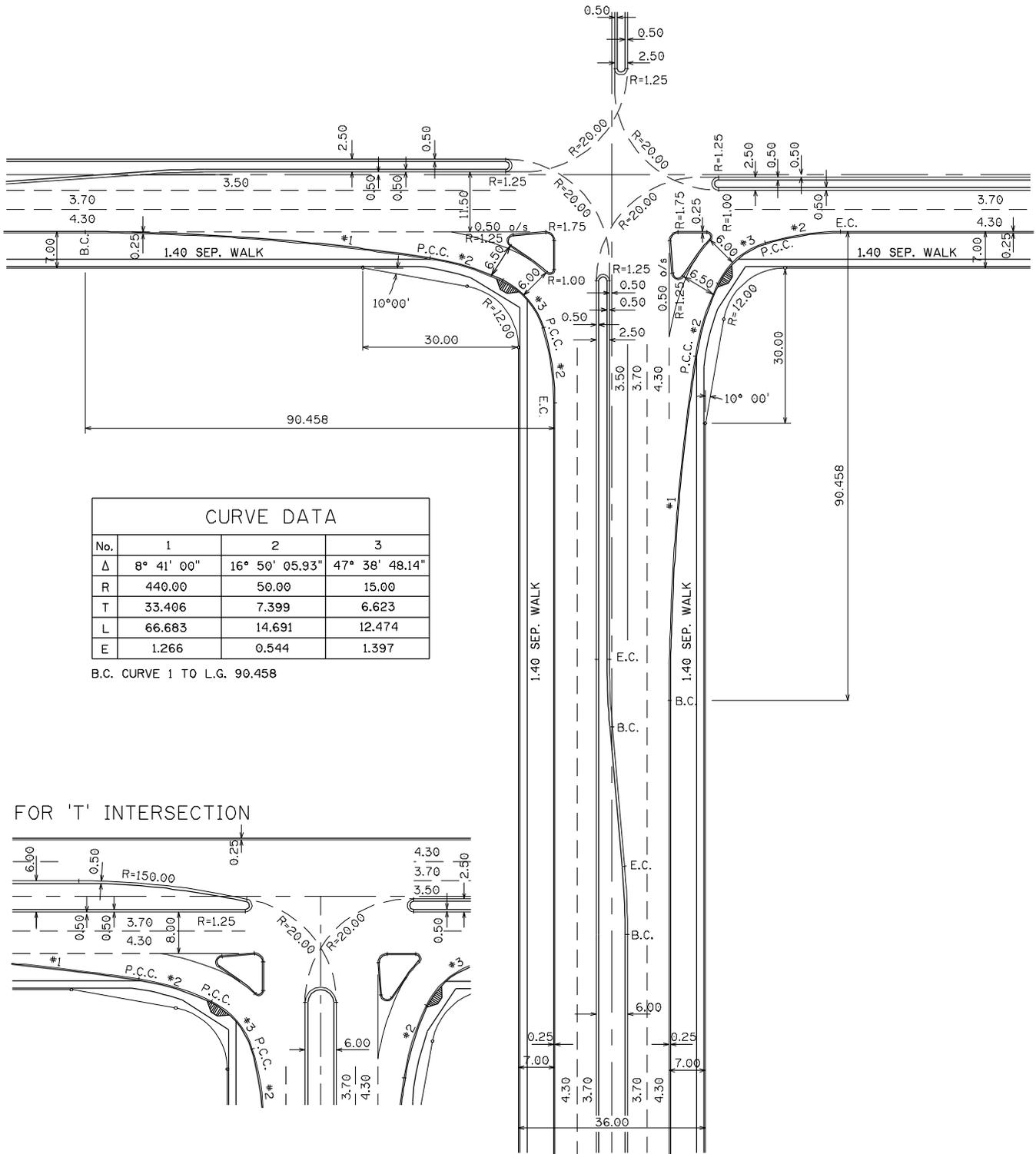
The maximum and minimum grades also apply to the development of superelevation

### Grade at Intersections

- The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Major street with a vertical curve of a minimum length of 30m, i.e. the crossfall of the Major street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Major street
- **See Page 53** for Maximum Approach Grades and Vertical Curve requirement
- The maximum profile grade on a Major street at an intersection shall be 4% for a minimum distance 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

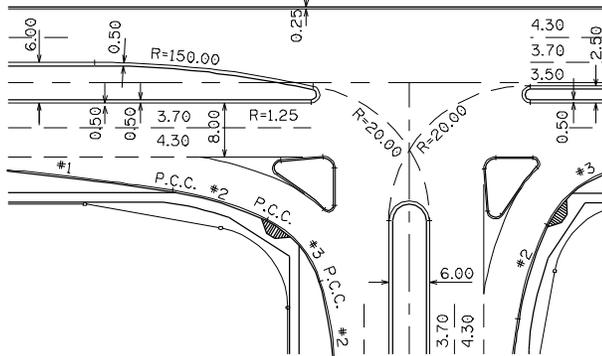
- The length of vertical curve is calculated based on the stopping sight distance as shown in **Page 48**.
- For Major streets, crest vertical curves are to be designed using the desirable "K" values for 20 kph higher than the design speed.
- Superelevation shall be developed through the transition spiral by using the following superelevation tables:  
  
Major UAD 50  $e_{max} = 0.06$   
Major UAD 60  $e_{max} = 0.08$   
Major UAD 70  $e_{max} = 0.08$
- For development of Superelevation and Superelevation Tables, see **Section D and Pages 117 and 118**.
- The superelevation through all Major street intersections shall not exceed 4%
- Right turn ramp on a Major street shall have a minimum of 4% crossfall within the length of the island



CURVE DATA			
No.	1	2	3
$\Delta$	8° 41' 00"	16° 50' 05.93"	47° 38' 48.14"
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

B.C. CURVE 1 TO L.G. 90.458

FOR 'T' INTERSECTION



NOTE: FOR INDUSTRIAL AREAS, USE  
CORNER DESIGN FOR INDUSTRIAL  
MAJOR TO MAJOR STREET

6	2008-11	ADDED SIDEWALKS AND CORRECTED CENTER LINE ON "T" INTERSECTION	
5	06-11	CORRECTED MEDIAN WIDTH ON "T" INTERSECTION	
4	03-11	REVISED TURNING RADII AND WIDE CURB LANE	
3	99-05	ADDED DIAGRAM "FOR T INTERSECTION"	
2	99-05	REVISE L. TURN BAY AND MISC. TEXT	
No.	Date	Revision	App'd

Drawn	Date
R.B.T.	OCT. '94
Scale:	N.T.S.
Approved for	
City Engineer	



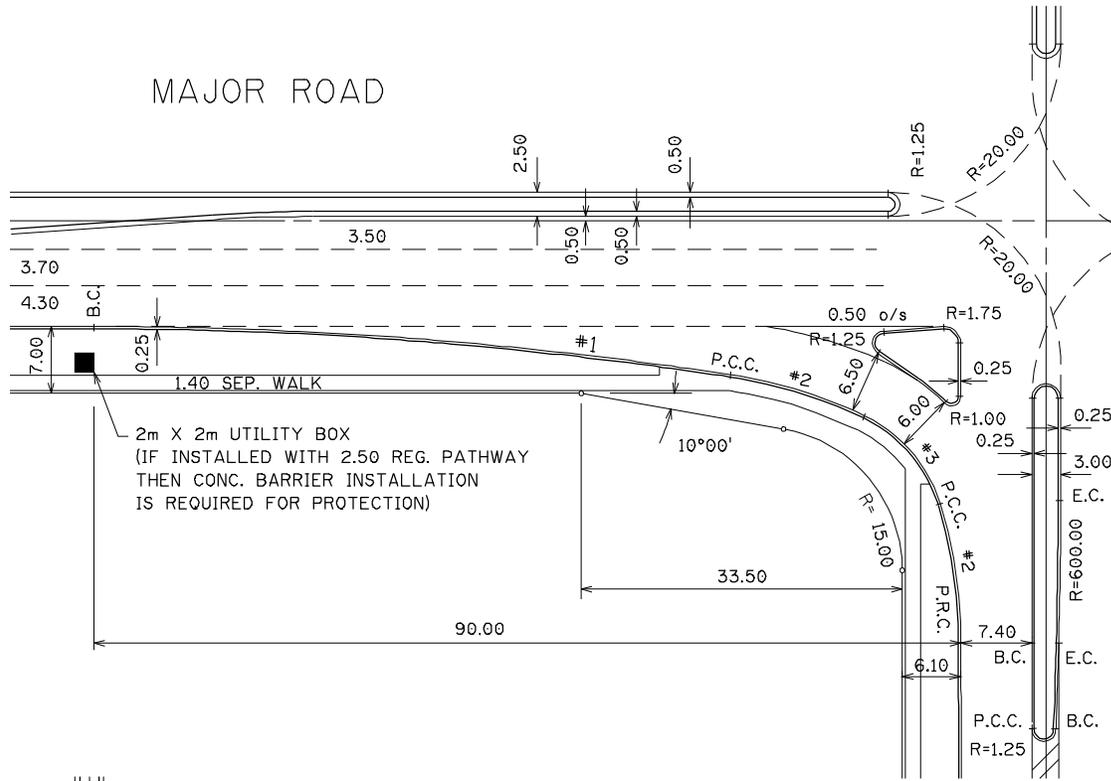
THE CITY OF CALGARY  
ROADS  
INTERSECTION DESIGN (REVISED)  
FOR 36.00m R.O.W.  
MAJOR TO MAJOR STREET

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



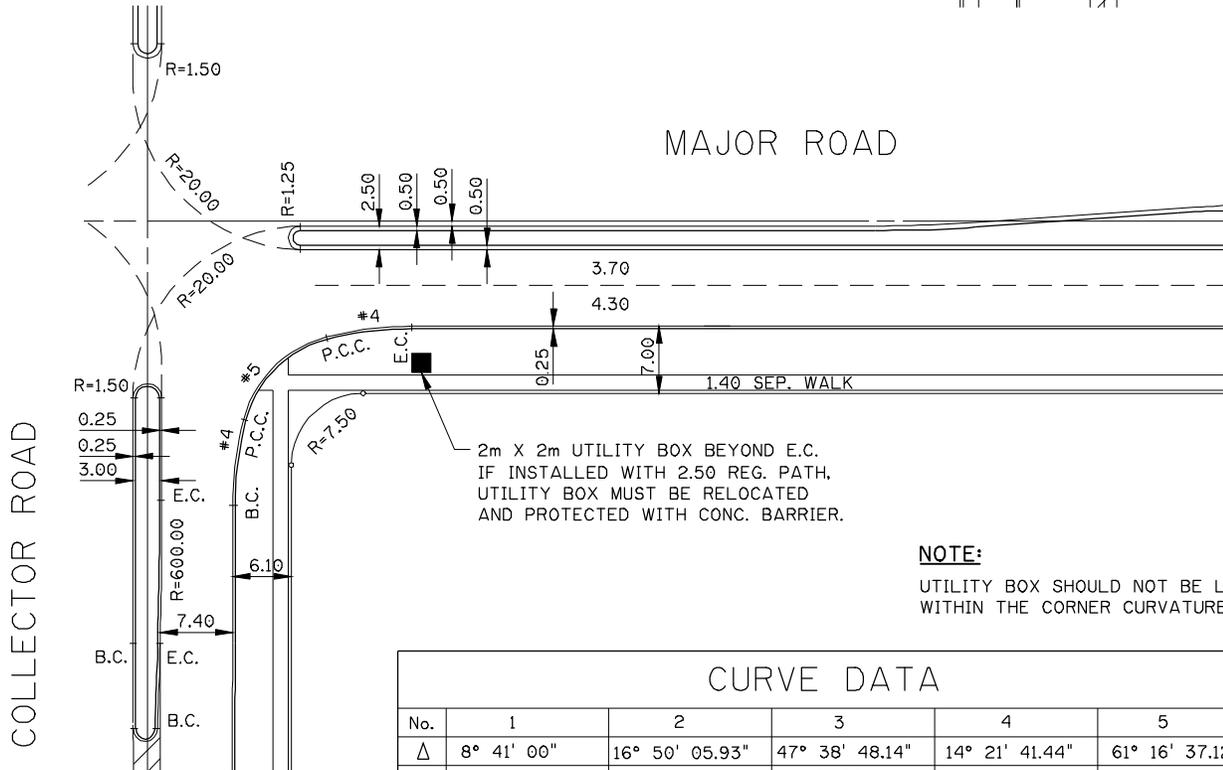
Sheet	7
File Number	454.1014.005

MAJOR ROAD



COLLECTOR ROAD

MAJOR ROAD



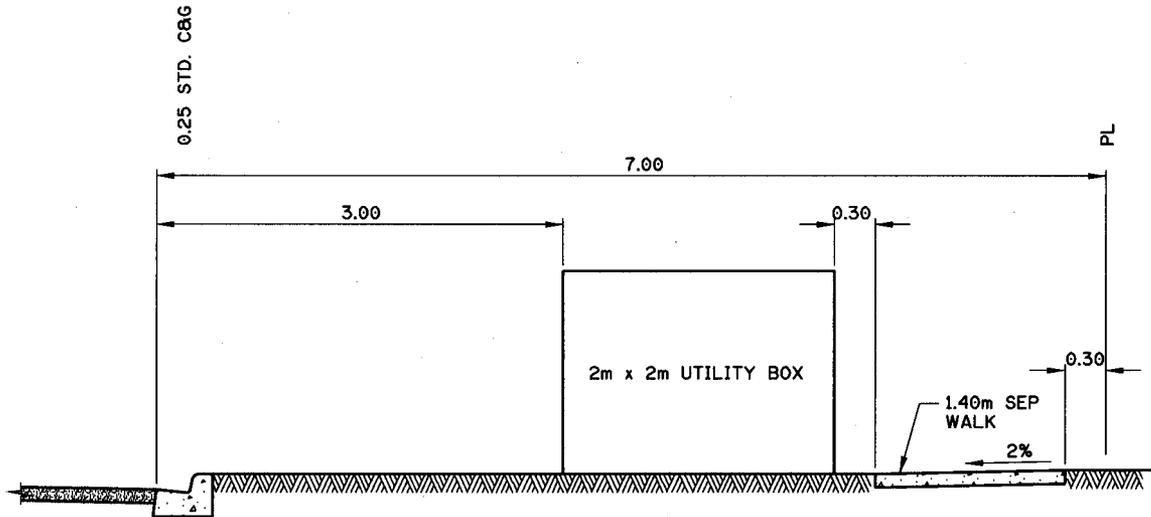
**NOTE:**

UTILITY BOX SHOULD NOT BE LOCATED WITHIN THE CORNER CURVATURE.

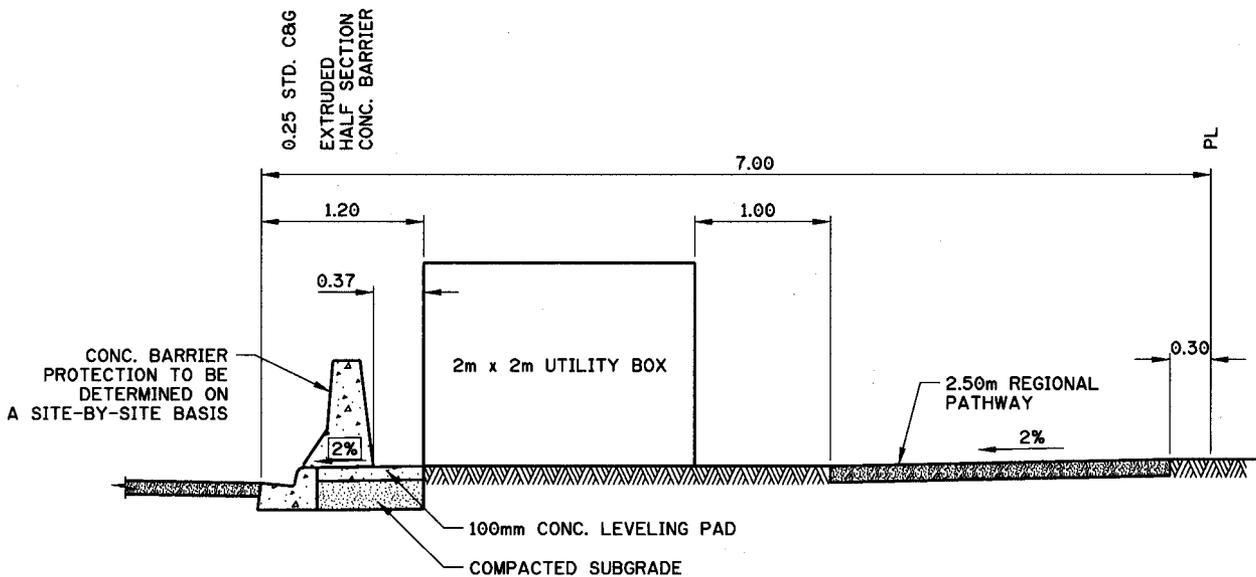
CURVE DATA

No.	1	2	3	4	5
$\Delta$	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

				Drawn JP	Date 2006-11	<p>THE CITY OF CALGARY ROADS</p>	DIMENSIONS ARE METERS UNLESS OTHERWISE NOTED 
				Scale N.T.S.	Approved for City Engineer		
1	2008-11	ADDED NOTE		UTILITY BOX IN 36.00m R.O.W. MAJOR/COLLECTOR INTERSECTION			File Number 454.1008.054
No.	Date	Revision	App'd				



UTILITY BOX IN 7.00m BOULEVARD WITH 1.40m SEPARATE WALK FOR 36.00m R.O.W. DIVIDED MAJOR ROAD

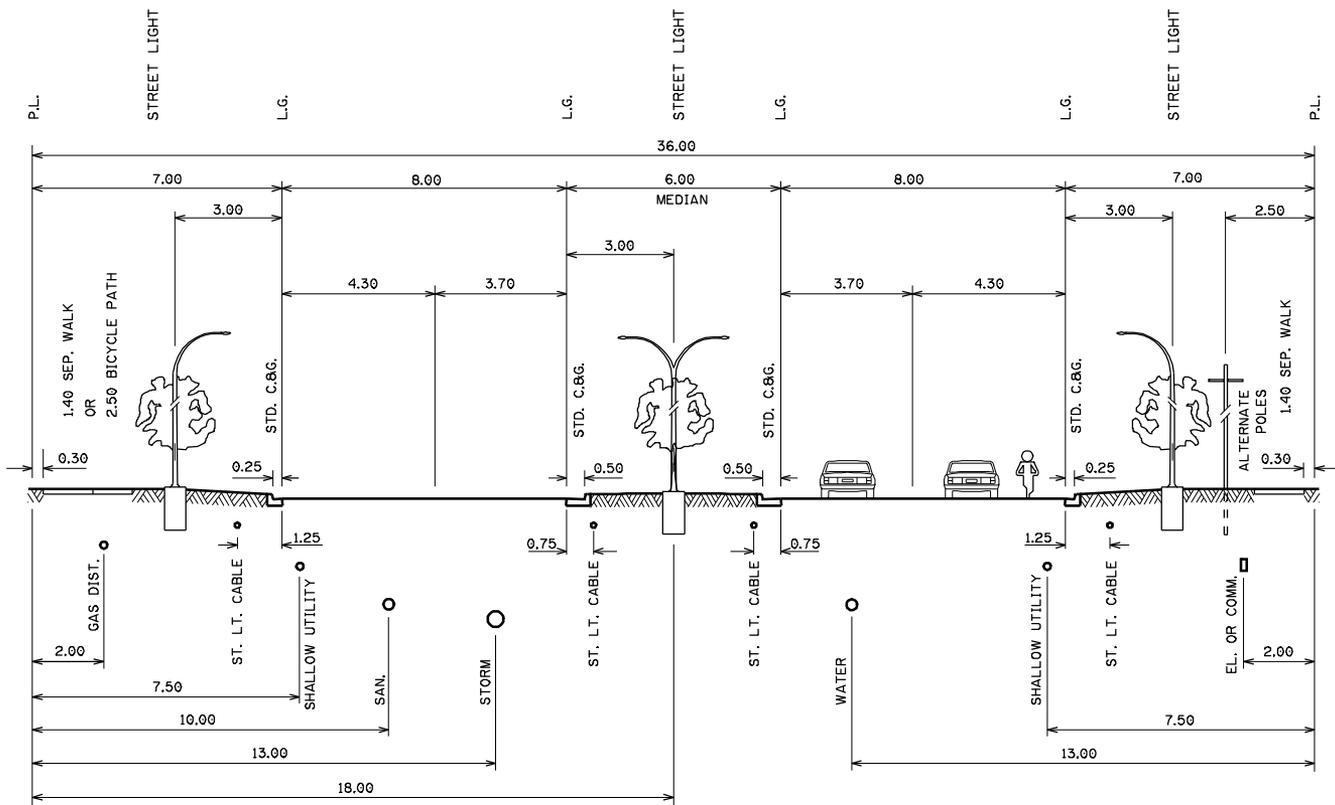


UTILITY BOX IN 7.00m BOULEVARD WITH 2.50m REGIONAL PATHWAY FOR 36.00m R.O.W. DIVIDED MAJOR ROAD

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED



				Drawn JP	Date 2006-11		Sheet
				Scale N.T.S.			<b>32</b>
				Approved for		<b>UTILITY BOXES IN BOULEVARDS-SECTIONS</b>	File Number
No.	Date	Revision	App'd	City Engineer			<b>454.1008.055</b>



- NOTES:
- HYDRANTS ON 4.00 LINE.
  - HYDRANT VALVES ON 1.00 LINE FROM WATER MAIN.
  - SERVICE VALVES ON 4.00 LINE.
  - TREES ON 4.00 LINE IN BOULEVARD AND 18.00 LINE IN MEDIAN.
  - TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS / RECREATION.
  - ALL TREES TO BE SHALLOW ROOT SPECIES.
  - TREE PLANTING NOT PERMITTED UNDER OVERHEAD POWER LINES.
  - POWER POLES, STREET LIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT.
  - GAS FEEDER MAINS IN CARRIAGE WAY, DISTRIBUTION LINE IN BOULEVARD, OPPOSITE SIDE FROM OVERHEAD.
  - WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM & SAN. LINES.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
  - THIS STANDARD IS INTENDED AS A GUIDELINE FOR NEW DEVELOPMENT, WHERE NOT APPLICABLE MAKE ADJUSTMENTS AS REQUIRED.
  - 0.50m STD. C&G CAN BE REPLACED WITH 0.25m STD. C&G ONLY WHEN THE MAJOR ROAD IS PART OF A SUBDIVISION, MAJORS THAT ACT AS MAIN ROADS IN THE CITY MUST HAVE 0.50m STD. C&G.
  - OPTIONAL J/U OVERHEAD ALIGNMENT ON ST. LT. POLES ON WATER SIDE OF ROAD IN THE EVENT OF 2.50m PATHWAY.

6	2009-05	REVISED SIDEWALK/PATHWAY NOTE & DIMENSION	
5	2007-04	REVISED HYDRANTS, SHALLOW UTIL. & ST. LT CABLE O/S. ADDED NOTE	
4	03-12	REVISED LANE WIDTHS AND ADDITIONAL NOTE	
3	00-11	ADDED SIDEWALK/BICYCLE PATH DIMENSION	
2	00-04	REVISED UTILITY COMPANY NAMES	
1	98-10	REVISE SHALLOW UTILITY O/S	
No.	Date	Revision	App'd

Drawn R.B.T.	Date JULY '94	 <p>THE CITY OF CALGARY ROADS</p>	Sheet <b>14</b>
Scale: NTS	Approved for		File Number 454.1008.026
City Engineer			DIVIDED MAJOR 36.00m R/W 2x8.00m ROAD WITH WIDE CURB LANE

## 2) Industrial Major Streets (Undivided)

<b>Industrial Major Streets (Undivided)</b>		<i>Alignment Design Standards</i>
<b>CLASSIFICATION</b>	<b>DESIGN SPEED</b>	<b>INTERSECTION DESIGN</b>
Urban Arterial Undivided (UAU) 50 Urban Arterial Undivided (UAU) 60	50 – 60 kph	<b>See Page 72</b>
<b>HORIZONTAL ALIGNMENT</b>		
<b>Minimum Stopping Sight Distance</b>	<b>Minimum Radius of Curvature</b>	
Major UAU 50 = 65 m Major UAU 60 = 85 m <b>See Pages 44 and 48</b>	Major UAD 50 = 90 m, 130 m – 6000 m (desirable) Major UAD 60 = 120 m, 260 m – 6000 m (desirable)	
<b>Median and Left Turn Bay</b>		
<ul style="list-style-type: none"> <li>Medians and Left turn bays are not normally required on Industrial Major streets. However, if they are determined to be necessary by the approving authority of the <i>Transportation Department</i>, additional right-of-way will be required</li> </ul>		
<b>Note</b>		
<ul style="list-style-type: none"> <li>Industrial Major streets are classified as Urban Arterial Undivided (UAU) roadways and are designed for speeds of 50 and 60 kilometers per hour. Most Industrial Major streets fall within the 60 kph category; however, developers will be informed by the approving authority of the <i>Transportation Department</i> of the applicable design speed</li> <li>Standard curb with 0.5 m gutter is to be used</li> <li>Street light poles, power poles and traffic signal poles are to be located a minimum of 3.5 m from the lip of gutter</li> </ul>		

## VERTICAL ALIGNMENT

### Maximum & Minimum Grades

Maximum grade: Major UAU 50 = 7.0%  
Major UAU 60 = 6.0%

Minimum grade: 0.6%

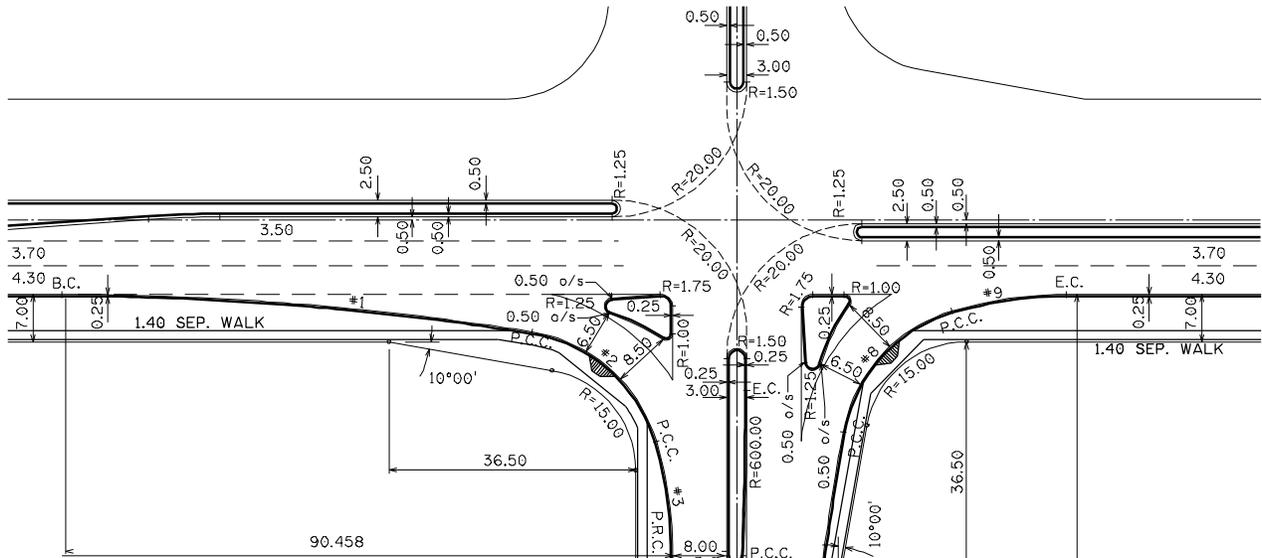
- The maximum and minimum grades also apply to the development of superelevation

### Grade at Intersections

- The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Industrial Major 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 Major 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 Major street
- **See Page 53** for Maximum Approach Grades and Vertical Curve requirement
- The maximum profile grade on a Industrial Major street at an intersection shall be 4% for a minimum distance 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 on **Page 48**.
- For Industrial Major streets, crest vertical curves are to be designed using the desirable "K" values for 20 kph higher than the design speed.
- Superelevation shall be developed through the transition spiral by using the following Superelevation tables:  
  
Major UAU 50  $e_{max} = 0.06$   
Major UAU 60  $e_{max} = 0.08$
- For development of Superelevation and Superelevation Tables, **see Section D and Pages 117 and 118**.
- The superelevation through all Industrial Major street intersections shall not exceed 4%



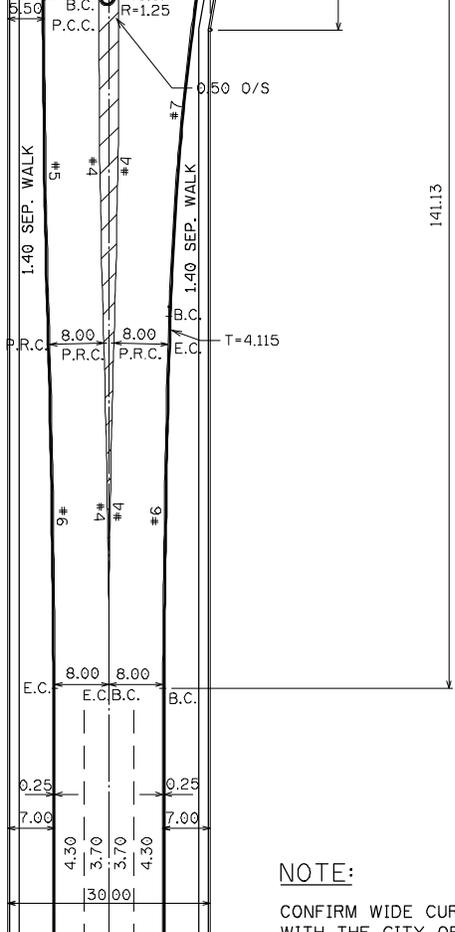
CURVE DATA			
No.	1	2	3
Δ	9° 06' 03.05"	64° 31' 43.33"	16° 22' 13.62"
R	440.00	23.00	60.00
T	35.018	14.520	8.630
L	69.890	25.903	17.143
E	1.391	4.200	0.618

B.C. CURVE 1 TO L.G. 90.458

CURVE DATA			
No.	4	5	6
Δ	1° 40' 39.03"	1° 40' 39.03"	1° 40' 39.03"
R	1750.00	1758.00	1742.00
T	25.620	25.728	25.512
L	51.237	51.453	51.020
E	0.188	0.188	0.187

B.C. CURVE 6 TO L.G. 141.13  
p = 1.50

CURVE DATA			
No.	7	8	9
Δ	8° 35' 52.50"	63° 21' 14.02"	16° 22' 14.45"
R	440.00	23.00	60.00
T	33.076	14.192	8.630
L	66.027	25.432	17.143
E	1.241	4.026	0.618



**NOTE:**

CONFIRM WIDE CURB LANE REQUIREMENTS WITH THE CITY OF CALGARY ROADS.

No.	Date	Revision	App'd
7	2008-11	ADDED SIDEWALKS AND REVISED ISLAND THROAT WIDTH	
6	07-03	REVISED RADII ON CURVE #5 AND #6	
5	03-11	WIDE CURB LANE AND AN ADDITIONAL NOTE	
4	00-04	REVISE TURNING RADII TO 20.00m	
3	99-12	REVISE RADII ON CURVE 2 & 3 AND GOT 8 & 9	

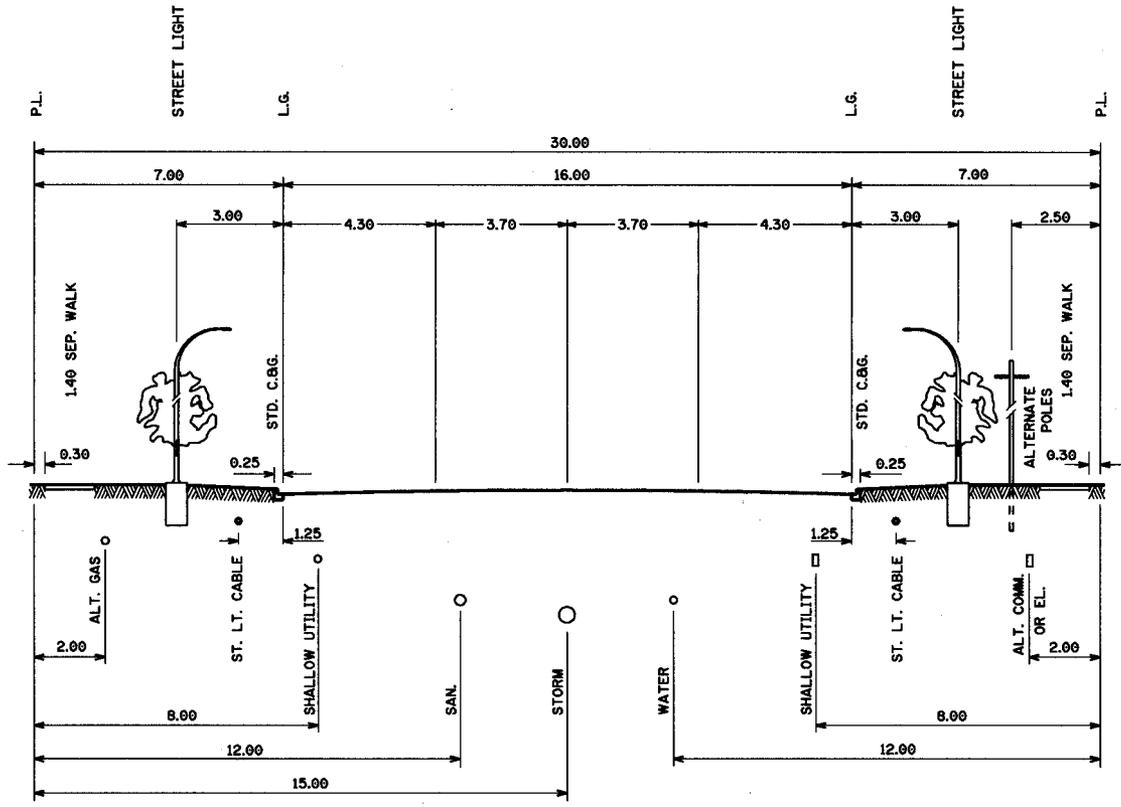
Drawn	Date
J.T.R.	SEPT. '96
Scale:	N.T.S.
Approved for	
City Engineer	



THE CITY OF CALGARY  
ROADS  
TYPICAL TEARDROP DESIGN  
FOR 30.00m R.O.W.  
INDUSTRIAL MAJOR TO MAJOR ST.

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

Sheet	8
File Number	454.1014.006



- NOTES:
- HYDRANTS ON 4.00 LINE.
  - HYDRANT VALVES ON 11.00 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - TREES ON 4.00 LINE
  - POWER POLES, STREET LIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT.
  - GAS FEEDER MAINS IN CARRIAGE WAY, DISTRIBUTION LINE IN BOULEVARD, OPPOSITE SIDE FROM OVERHEAD.
  - ALL TREES TO BE SHALLOW ROOT SPECIES.
  - TREE PLANTING NOT PERMITTED UNDER OVERHEAD POWER LINES.
  - OPTIONAL J/U OVERHEAD ALIGNMENT ON ST. LT POLES ON WATER SIDE OF ROAD IN THE EVENT OF 2.50m PATHWAY.

No.	Date	Revision	App'd
4	2007-04	REVISED SHALLOW UTIL. & ST. LT CABLE O/S. ADDED NOTES	
3	03-12	REVISED DRIVING LANE WIDTHS	
2	00-04	ADD CAPACITY NOTE, CHANGE UTIL. COMPANY NAMES	
1	98-09	CHANGE SHALLOW UTILITY O/S	

Drawn R.B.T.	Date JULY '94
Scale NTS	
Approved for City Engineer	<i>[Signature]</i>



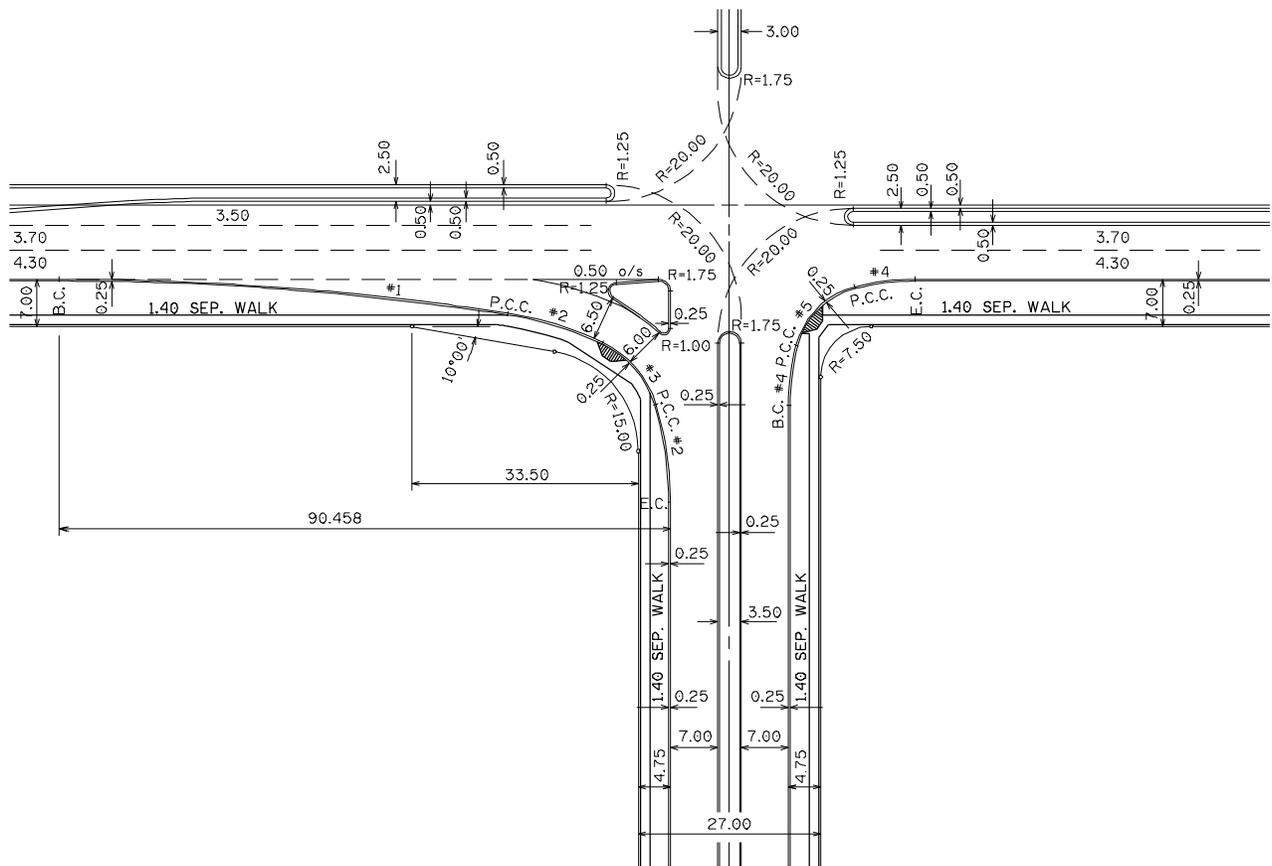
THE CITY OF CALGARY  
ROADS  
UNDIVIDED MAJOR  
30.00m R/W, 16.00m ROAD

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC

Sheet <b>13</b>
File Number 454.1008.025

### 3) Local Major Streets

Local Major Streets		<i>Alignment Design Standards</i>
CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Collector Divided (UCD) 50	50 kph	<b>See Page 75</b>
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Local Major UCD 50 = 65 m <b>See Pages 44 and 48</b>	Local Major UCD 50 = 90 m	
Median and Left Turn Bay		
<ul style="list-style-type: none"> <li>• Minimum median width is 3.5 m</li> <li>• Left turn bays and intersection channelizations are normally not required on Local Major streets. However, if they are determined to be necessary by the approving authority of the <i>Transportation Department</i>, additional right-of-way will be required</li> </ul>		
Note		
<ul style="list-style-type: none"> <li>• Standard curb with 0.25 m gutter is to be used on the median and the outside edges</li> <li>• Reverse gutter is used where necessary</li> <li>• For corner radii and corner cut requirements, <b>see Section H</b></li> </ul>		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 8.0% Minimum grade: 0.6%		
Grade at Intersections		
<ul style="list-style-type: none"> <li>• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the lane line of the Local Major street with a vertical curve of a minimum length of 30 m, i.e. the crossfall of the Local Major 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 Major street</li> <li>• <b>See Page 53</b> for Maximum Approach Grades and Vertical Curve requirement</li> <li>• The maximum profile grade on a Local Major street at an intersection shall be 4% for a minimum distance of 50 m measured from the Vertical Point of Intersection (VPI) to the centreline of the intersecting street, on both sides of the intersection</li> </ul>		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> <li>• The length of vertical curve is calculated based on the stopping sight distance as shown on <b>Page 48</b>.</li> <li>• For Local Major streets, crest vertical curves are to be designed using the desirable "K" values for 10 kph higher than the design speed</li> <li>• The maximum Superelevation rate for a Local Major street shall not exceed <math>e_{max} = 4\%</math></li> <li>• For development of Superelevation and Superelevation Tables, <b>see Section D and Pages 117 and 118</b>.</li> </ul>		



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

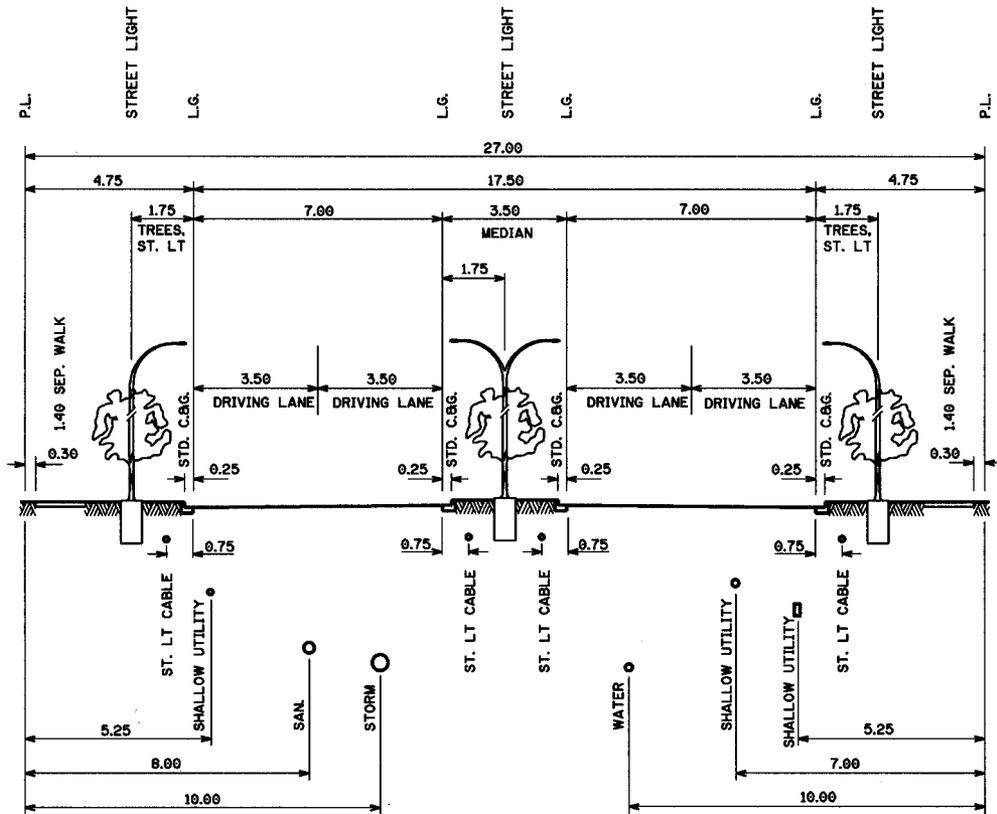
B.C. CURVE 1 TO L.G. 90.458

NOTE: SAME DESIGN CAN BE USED FOR 27.00m  
 PRIMARY COLLECTOR (DIVIDED) OR FOR  
 32.00m PRIMARY COLLECTOR (DIVIDED)  
 TO MAJOR STREET

DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



				Drawn S.P.G.	Date DEC. '98	 <b>THE CITY OF CALGARY</b> ROADS	Sheet <b>6</b>
				Scale: N.T.S.	INTERSECTION DESIGN FOR 27.00m R.O.W. LOCAL MAJOR TO MAJOR STREET		File Number
				Approved for City Engineer			454.1014.017
No.	Date	Revision		App'd			



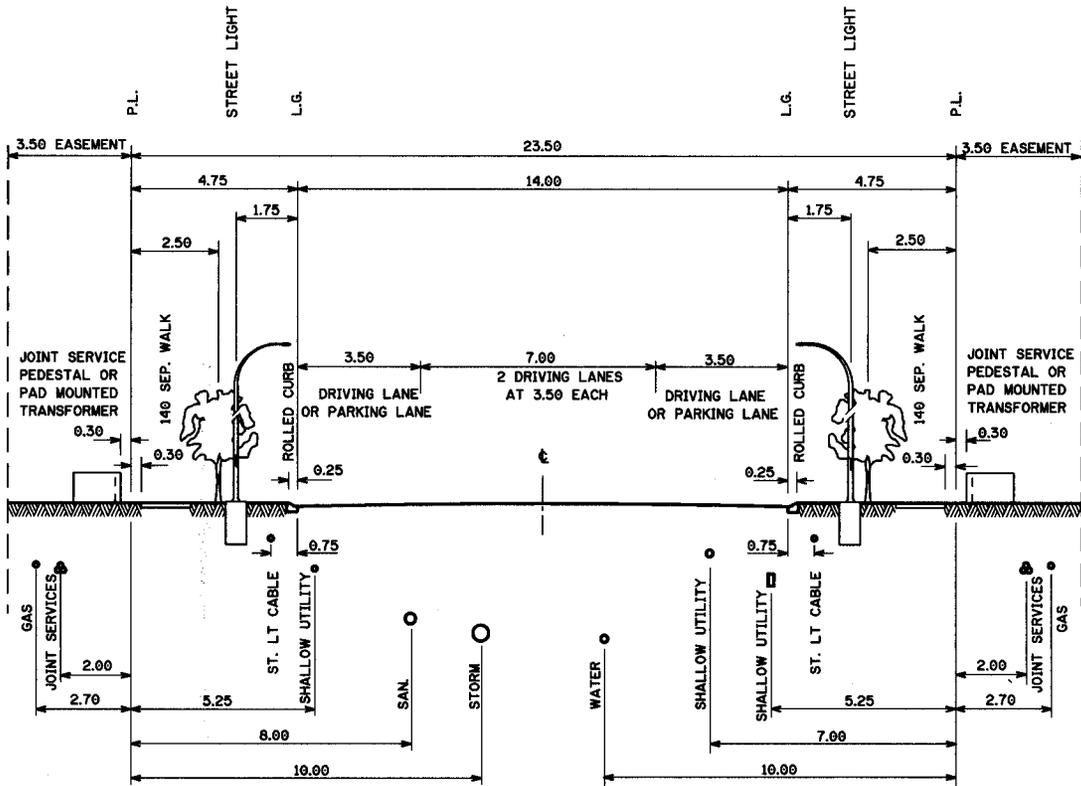
- NOTES:
- HYDRANTS ON 2.50 LINE.
  - HYDRANT VALVES ON 9.00 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - TREES ON 3.00 LINE IN BOULEVARD AND ON CENTRE LINE IN MEDIAN.
  - TREES SHALL BE SHALLOW ROOTED DECIDUOUS SPECIES AS APPROVED BY PARKS / RECREATION DEPARTMENT.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM SANITARY AND STORM LINES.

ENVIRONMENTAL CAPACITY 15,000 VEHICLES PER DAY  
 NO RESIDENTIAL FRONTAGE  
 NO TRUCK ROUTES

4 2007-04 REVISED HYDRANT, TREES & ST. LT CABLE O/S 3 00 - 04 REVISE UTILITY COMPANY NAMES 2 98 - 10 REVISE SHALLOW UTILITY O/S 1 95 - 05 NOTE REVISED			Drawn J.T.R. Date 95 - 01 Scale: NTS Approved for <i>Blay</i> City Engineer	THE CITY OF CALGARY ROADS LOCAL MAJOR 27.00m R/W, 2x7.00m ROAD	DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC Sheet 12 File Number 454.1008.044
No.	Date	Revision	App'd		

## 4) Primary Collector Streets

Primary Collector Streets		<i>Alignment Design Standards</i>
CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Collector Divided (UCD) 50 Urban Collector Undivided (UCU) 50	50 kph	<b>See Page 75</b> (same as Local Major)
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Primary Collect UCD, UCU 50 = 65 m <b>See Pages 44 and 48</b>	Primary Collector UCD, UCU 50 = 90 m	
Median and Left Turn Bay		
<ul style="list-style-type: none"> <li>• Minimum median width is 3.5 m</li> <li>• Left turn bays and intersection channelization are not normally required</li> </ul>		
Note		
<ul style="list-style-type: none"> <li>• The cumulative length of Primary Collector streets prior to feeding onto Major streets should not be excessive. The maximum number of dwelling units serviced shall not exceed 1000</li> <li>• Standard curb with 0.25 m gutter is to be used on the median and low profile rolled curb with 0.25 m gutter on the outside edges</li> <li>• Standard curb is to be used on Primary Collector streets if the grade is greater than 6% and where there are no driveways</li> <li>• Reverse gutter is used where necessary</li> <li>• For corner radii and corner cut requirements, <b>see Section H</b></li> </ul>		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 8.0% Minimum grade: 0.6%		
Grade at Intersections		
<ul style="list-style-type: none"> <li>• 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</li> <li>• <b>See Page 53</b> for Maximum Approach Grades and Vertical Curve requirement</li> <li>• It is desirable to ensure that the grade on the Primary Collector streets is less than the permitted maximum of 8% at intersections to improve operational aspects such as stopping and starting in winter conditions</li> </ul>		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> <li>• The length of vertical curve is calculated based on the stopping sight distance as shown on <b>Page 48</b>.</li> <li>• The maximum Superelevation rate for a Primary Collector street shall not exceed <math>e_{max} = 4\%</math></li> <li>• For development of Superelevation and Superelevation Tables, <b>see Section D and Pages 117 and 118</b>.</li> </ul>		



- NOTES:
- HYDRANTS ON 2.50 LINE
  - HYDRANT VALVES ON 9.00 LINE
  - SERVICE VALVES ON 2.50 LINE
  - TREES ON 2.50 LINE IN BOULEVARD
  - TREES SHALL BE SHALLOW ROOTED SPECIES AS APPROVED BY PARKS/RECREATION DEPT.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - WATERMAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM STORM & SANITARY LINES.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50 INSIDE P.L., OR 5.00 INSIDE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.

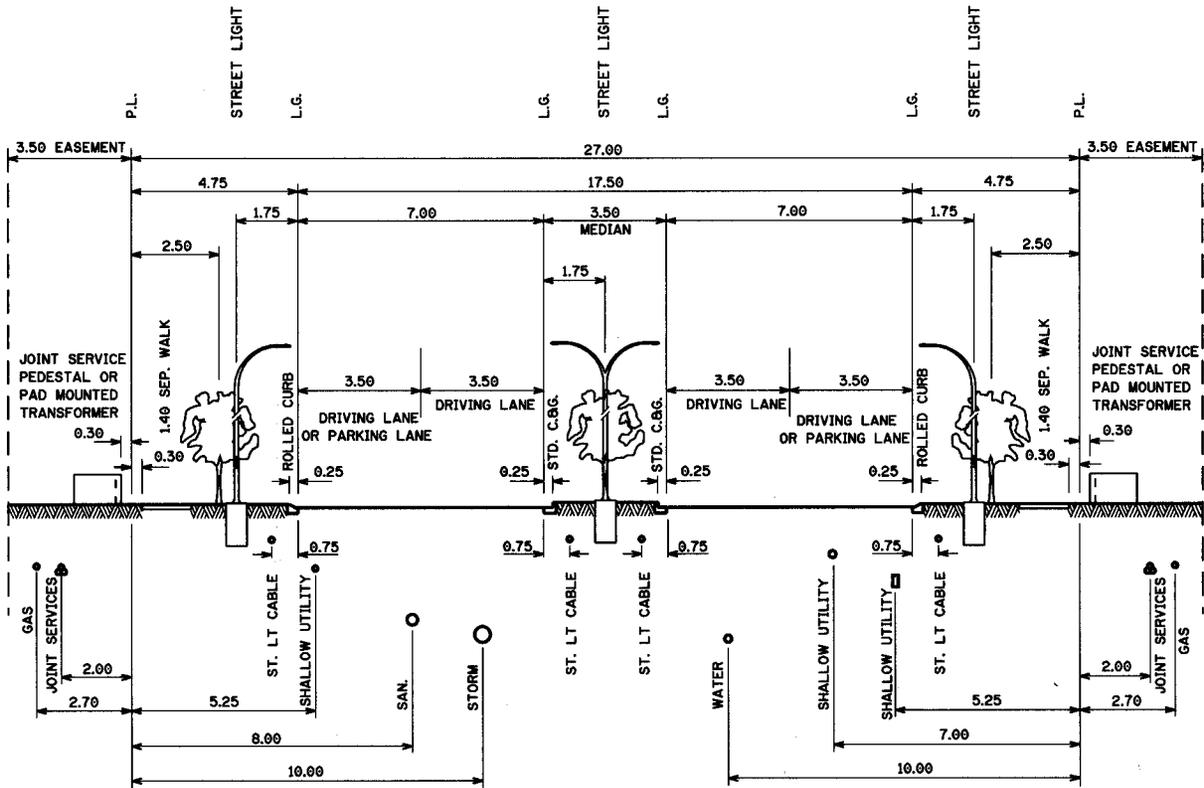
ENVIRONMENTAL CAPACITY 12,500 VEHICLES PER DAY  
RESIDENTIAL STREET FRONTAGE PERMITTED

5	2007-04	REVISED HYDRANTS & ST. LT CABLE O/S	
4	2003-05	REVISED ENVIRONMENTAL CAPACITY	
3	00 - 04	REVISE SHALLOW UTILITY O/S. CHANGE UTIL. COMPANY NAMES	
2	98 - 10	REVISE SHALLOW UTILITY O/S	
1	95 - 05	NOTE REVISED	
No.	Date	Revision	App'd

Drawn  
J.T.R.  
Date  
94 - 10  
Scale:  
NTS  
Approved for  
*[Signature]*  
City Engineer

THE CITY OF CALGARY  
ROADS  
UNDIVIDED PRIMARY  
COLLECTOR  
23.50m R/W, 14.00m ROAD

Sheet  
**9**  
File Number  
454.1008.041



- NOTES:
- HYDRANTS ON 2.50 LINE.
  - HYDRANT VALVES ON 9.00 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - TREES ON 2.50 LINE IN BOULEVARD AND ON CENTRE LINE IN MEDIAN.
  - TREES SHALL BE SHALLOW ROOTED DECIDUOUS SPECIES AS APPROVED BY PARKS / RECREATION DEPARTMENT.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMERS, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM SANITARY AND STORM LINES.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50 INSIDE P.L. OR 5.00 INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.

ENVIRONMENTAL CAPACITY 12,500 VEHICLES PER DAY

7	2007-04	REVISED HYDRANT & ST. LT CABLE O/S
6	2003-05	REVISED ENVIRONMENTAL CAPACITY
5	00 - 04	REVISE SHALLOW UTILITY O/S
4	98 - 10	REVISE SHALLOW UTILITY O/S
3	95 - 05	NOTE REVISED
No.	Date	Revision

Drawn	J.T.R.	Date	95 - 01
Scale:	NTS		
Approved for	<i>P. Bering</i>		
City Engineer			

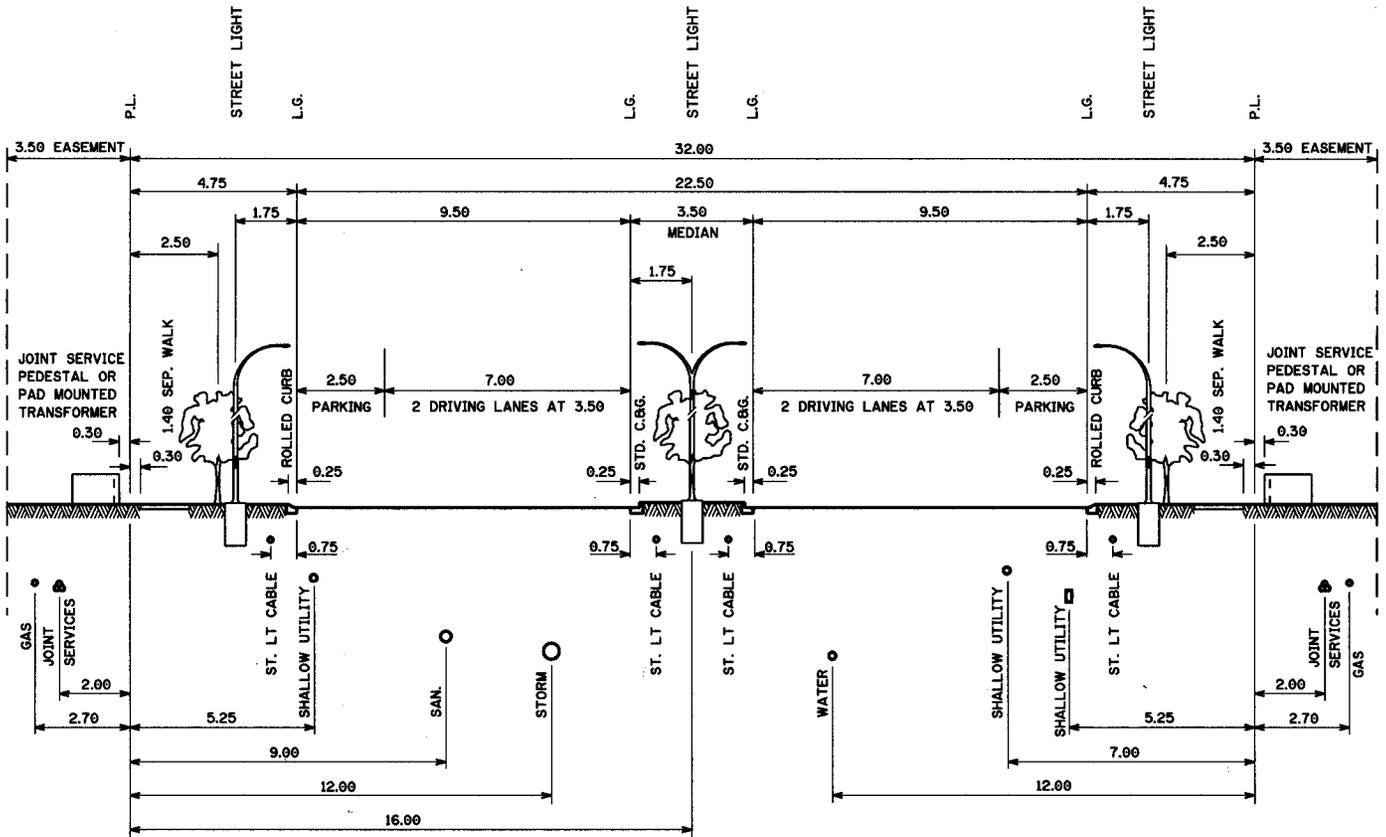


THE CITY OF CALGARY  
ROADS  
PRIMARY COLLECTOR  
27.00m R/W, 2x7.00m ROAD

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

METRIC

Sheet	10
File Number	454.1008.042



OPTION WITH ADDITIONAL PARKING LANE

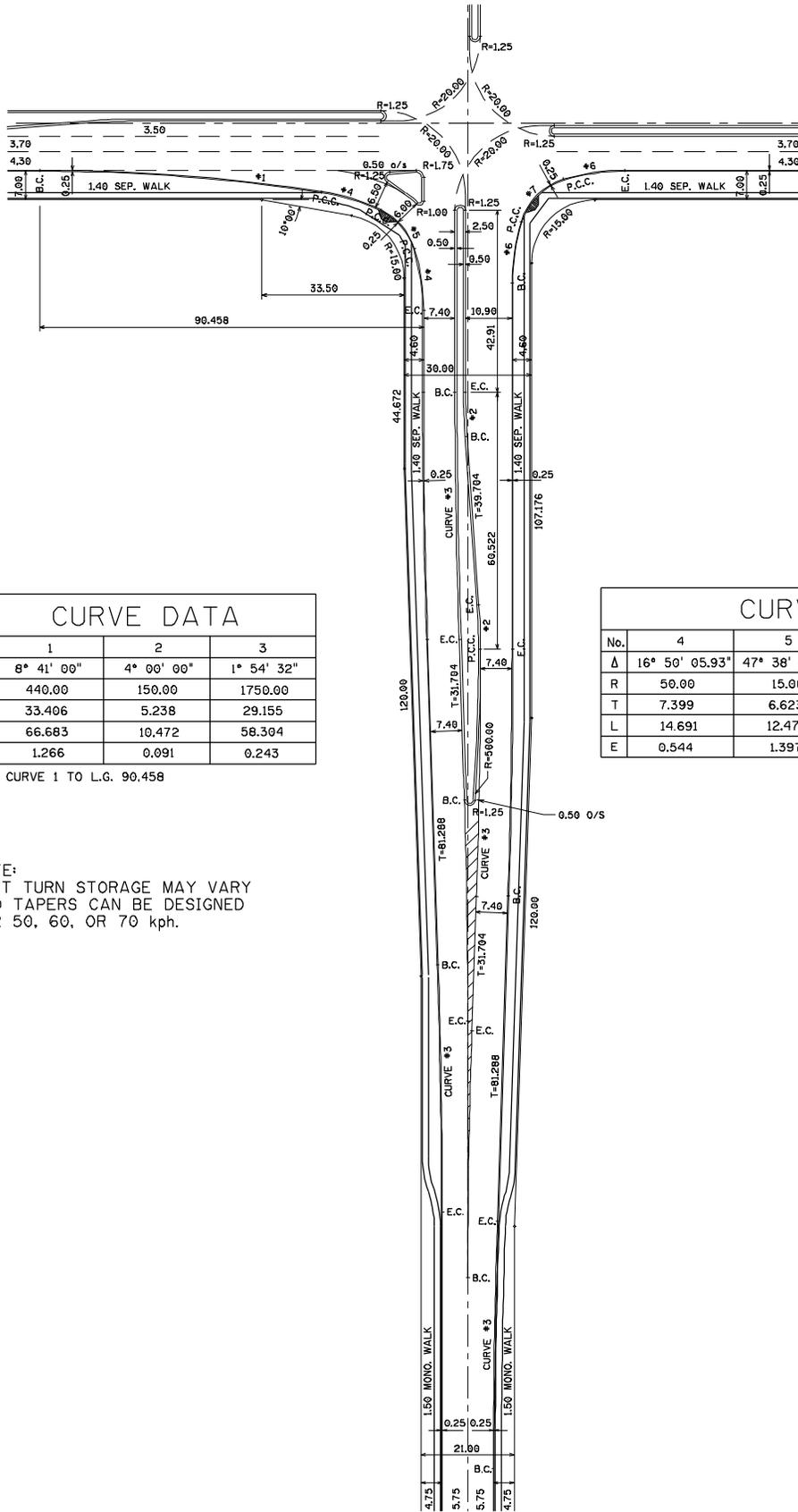
- NOTES:
- HYDRANTS ON 2.50 LINE.
  - HYDRANT VALVES ON 11.00 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - TREES ON 2.50 LINE IN BOULEVARD AND ON CENTRE LINE IN MEDIAN.
  - TREES SHALL BE SHALLOW ROOTED DECIDUOUS SPECIES AS APPROVED BY PARKS / RECREATION DEPARTMENT.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM SANITARY AND STORM LINES.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50 INSIDE P.L. OR 5.00 INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.

ENVIRONMENTAL CAPACITY 12,500 VEHICLES PER DAY

7	2007-04	REVISED HYDRANT & ST. LT CABLE O/S		Drawn	Date	 <b>THE CITY OF CALGARY</b> ROADS	Sheet <b>11</b> File Number <b>454.1008.043</b>
6	2003-05	REVISED ENVIRONMENTAL CAPACITY		J.T.R.	95 - 01		
5	00 - 04	REVISE SHALLOW UTILITY O/S AND COMPANY NAMES		Scale:	NTS		
4	98 - 10	REVISE SHALLOW UTILITY O/S		Approved for		<b>PRIMARY COLLECTOR</b> <b>(OPTIONAL)</b> <b>32.00m R/W, 2x9.50m ROAD</b>	
3	95 - 05	NOTE REVISED		<i>PKerry</i>			
No.	Date	Revision	App'd	City Engineer			

## 5) Collector Streets

Collector Streets		<i>Alignment Design Standards</i>
CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Collector Undivided (UCU) 50	50 kph	<b>See Pages 82, 83 and 84</b>
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Collect UCU 50 = 65 m <b>See Pages 44 and 48</b>	Collector UCU 50 = 90 m	
Median and Left Turn Bay		
<ul style="list-style-type: none"> <li>• Medians, left turn bays and intersection channelization are normally not required</li> <li>• A tear-drop median is required on a Collector street when the Collector street is designated as a bus route and intersecting with a Major street, <b>see Page 84</b></li> </ul>		
Note		
<ul style="list-style-type: none"> <li>• The cumulative length of Collector streets prior to feeding onto Major streets shall not be excessive. The maximum number of dwelling units serviced shall not exceed 500</li> <li>• Low profile rolled curb a with 0.25 m gutter is to be used except in areas identified as bus zones and adjacent to parcels which will not contain residential development (e.g. commercial sites, parks, school reserves, etc.) where standard curb is to be used</li> <li>• Standard curb is to be used on Collector streets if the grade is greater than 6% and where there are no driveways</li> <li>• Reverse gutter is used where necessary</li> <li>• For corner radii and corner cut requirements, <b>see Section H</b></li> </ul>		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 8.0% Minimum grade: 0.6%		
Grade at Intersections		
<ul style="list-style-type: none"> <li>• The grade line of the approaching street (maximum approach grade of 4%) shall tie to the Collector street in the following manner:               <ul style="list-style-type: none"> <li>• tie to the property line grade if the approaching street is undivided</li> <li>• 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</li> </ul> </li> <li>• <b>See Page 53</b> for Maximum Approach Grades and Vertical Curve requirement</li> <li>• It is desirable to ensure that the grade on the Collector streets is less than the permitted maximum of 8% at intersections to improve operational aspects such as stopping and starting in winter conditions</li> </ul>		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> <li>• The length of vertical curve is calculated based on the stopping sight distance as shown on <b>Page 48</b>.</li> <li>• The maximum Superelevation rate for a Collector street shall not exceed <math>e_{max} = 4\%</math></li> <li>• For development of Superelevation and Superelevation Tables, <b>see Section D and Pages 117 and 118</b>.</li> </ul>		



CURVE DATA			
No.	1	2	3
Δ	8° 41' 00"	4° 00' 00"	1° 54' 32"
R	440.00	150.00	1750.00
T	33.406	5.238	29.155
L	66.683	10.472	58.304
E	1.266	0.091	0.243

B.C. CURVE 1 TO L.G. 90.458

NOTE:  
LEFT TURN STORAGE MAY VARY  
AND TAPERS CAN BE DESIGNED  
FOR 50, 60, OR 70 kph.

CURVE DATA				
No.	4	5	6	7
Δ	16° 50' 05.93"	47° 38' 48.14"	16° 50' 05.93"	56° 19' 48.14"
R	50.00	15.00	50.00	15.00
T	7.399	6.623	7.399	6.031
L	14.691	12.474	14.691	14.747
E	0.544	1.397	0.544	2.015

5	2008-11	ADDED CENTER LINE AND SIDEWALKS		
4	2007-01	CHANGED GUTTER FROM 0.50 TO 0.25		
3	2003-11	REVISED TURNING RADII AND WIDE CURB LANE		
2	99-05	REVISE L. TURN BAY AND ADD NOTE		
1	98/12	REMOVE DIM. AND ADD LL TO RIGHT TURN TAPER		
No.	Date	Revision	App'd	City Engineer

Drawn	J.T.R.	Date	SEPT.'96
Scale:	N.T.S.	Approved for	
		City Engineer	



THE CITY OF CALGARY  
ROADS  
TYPICAL CHANNELIZATION DESIGN  
FOR 21.00m R.O.W.  
COLLECTOR TO MAJOR STREET

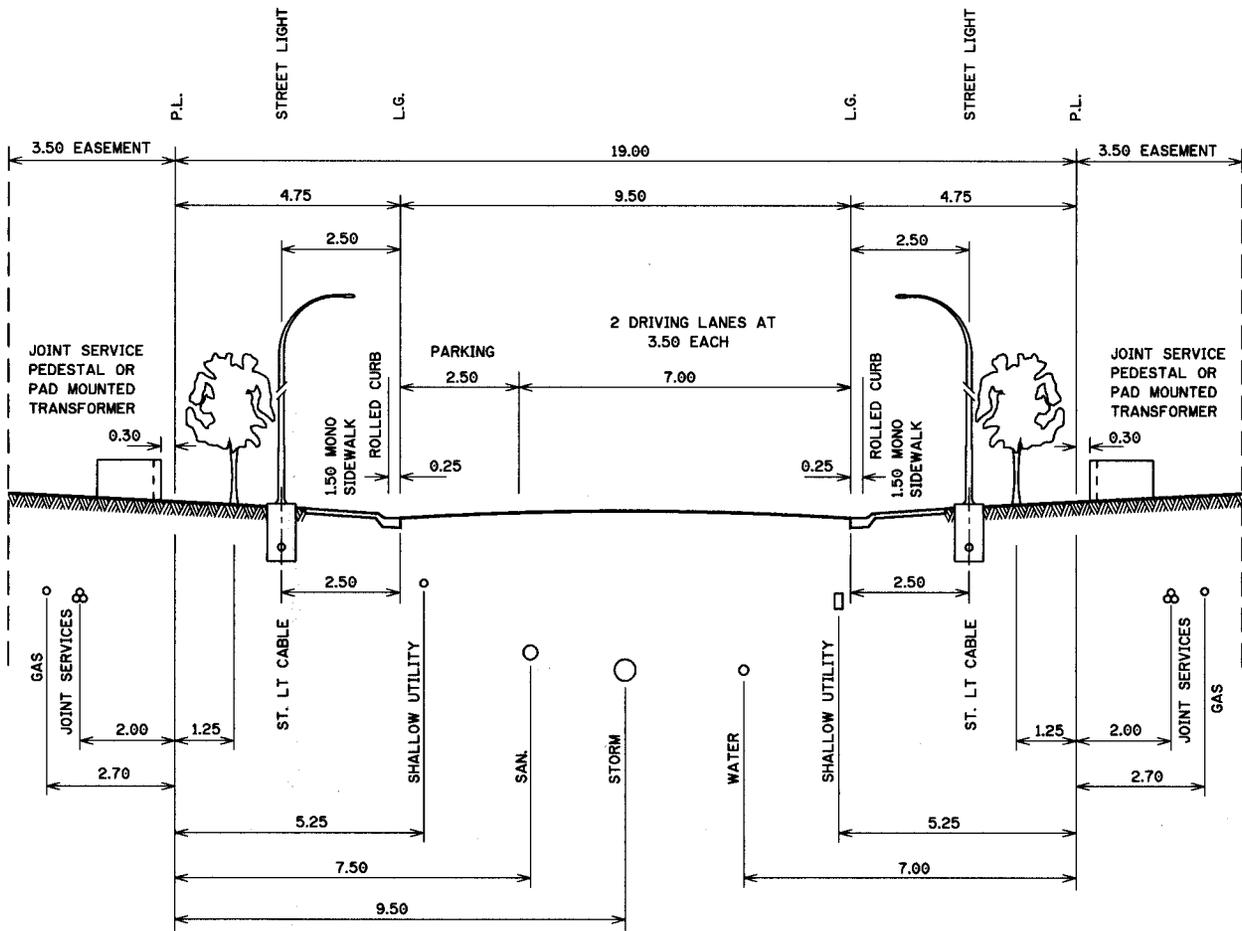
DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



Sheet	<b>3</b>
File Number	454.1014.010







- NOTES:
- HYDRANTS ON 2.00 LINE.
  - HYDRANT VALVES ON 6.00 LINE.
  - SERVICE VALVES ON 1.25 LINE.
  - TREES ON 1.25 LINE.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
  - POWER POLES, STREETLIGHT POLES, AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. 3.00m CLEARANCE FROM HYDRANT.
  - SERVICE VALVES FOR HYDRANTS LOCATED ON THE OPPOSITE SIDE OF ROAD FROM THE WATER LINE TO BE PLACED 8.0m FROM P.L. (1.0m FROM WATER LINE).

NOTE:  
THIS STANDARD OF COLLECTOR MAY ONLY BE USED WHERE IT DOES NOT ABUT RESIDENTIAL FRONTAGE OR OTHER PARKING ATTRACTOR ON ONE SIDE.

**OPTIONAL STANDARD**

- 1.40 SEPARATE SIDEWALK WITH B.W. 0.30 TO REPLACE MONO. SIDEWALK AS AN ALTERNATIVE WITH TREE AND SERVICE VALVE ALIGNMENT TO BE ADJUSTED TO THE 2.50m LINE AND THE ST. LT. CABLE ON THE 4.00m LINE (0.75m FROM L.G.).
- STREET LIGHT POLES SET TO 1.75m FROM L.G. WITH SEPARATE WALK.
- HYDRANTS SET TO 2.50m FROM P.L. WITH SEPARATE WALK.

ENVIRONMENTAL CAPACITY 5,500 VEHICLES PER DAY

7	2007-04	REVISED STREET LIGHT POLE & CABLE O/S, ADDED NOTES	
6	2003-11	ADDITIONAL NOTE	
5	2003-05	REVISED ENVIRONMENTAL CAPACITY	
4	00-04	REVISED SHALLOW UTILITY O/S, CHANGE UTIL. COMPANY NAMES	
3	98-10	REVISED SHALLOW UTILITY O/S	
No.	Date	Revision	App'd

Drawn J.T.R. Date JULY '94  
Scale: NTS  
Approved for City Engineer

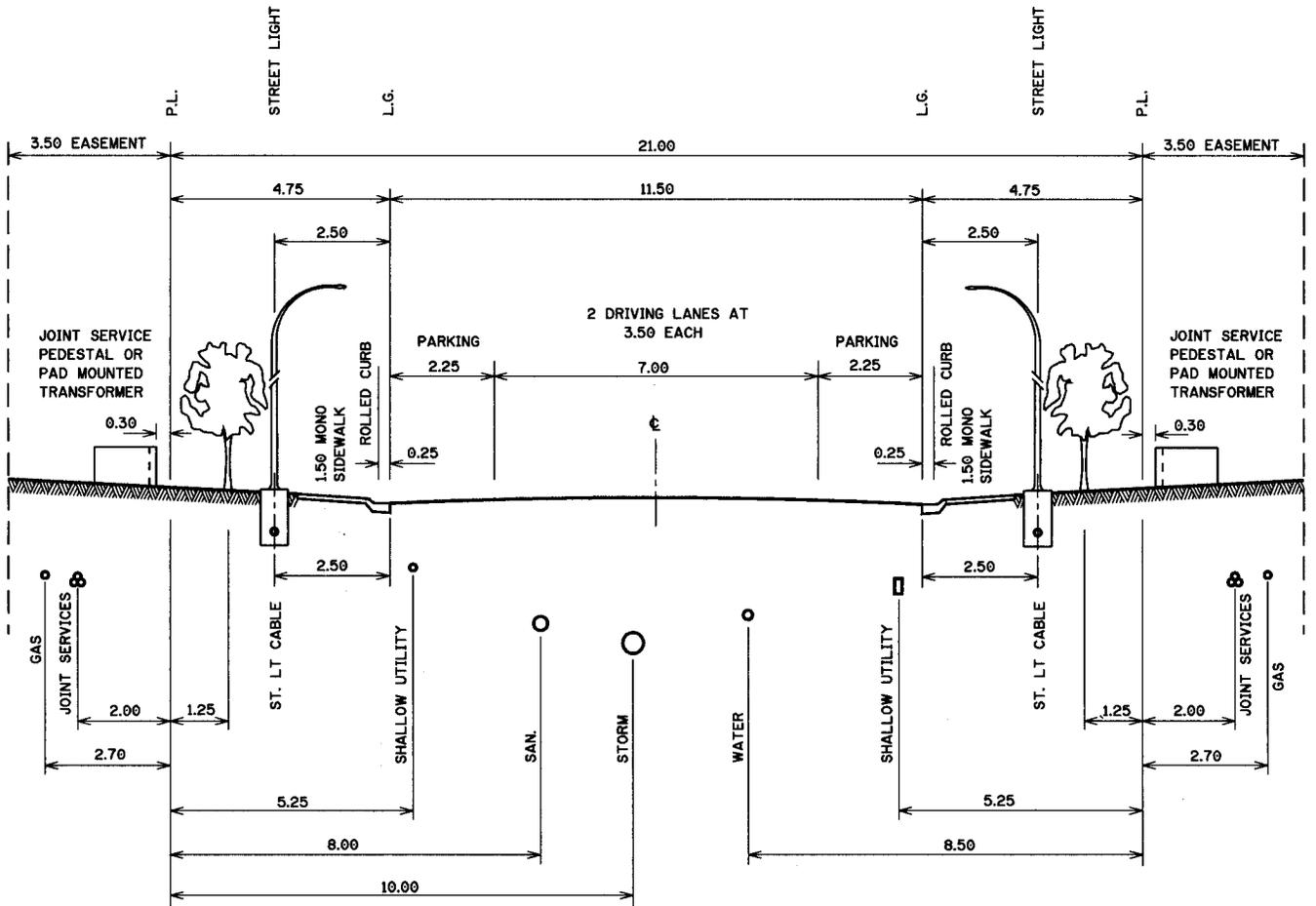
DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

**METRIC**

**THE CITY OF CALGARY**  
ROADS

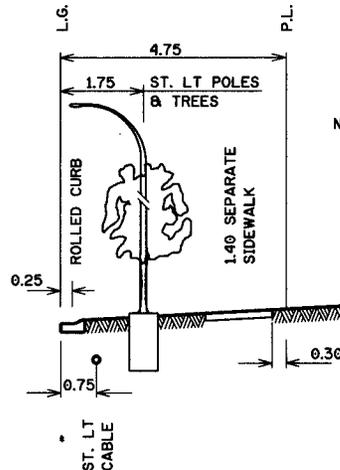
**COLLECTOR**  
**PARKING ONE SIDE**  
**19.00m R/W, 9.50m ROAD**

Sheet **6**  
File Number 454.1008.022



**ALTERNATIVE WITH SEPARATE SIDEWALK**

- NOTES: - HYDRANTS ON 2.00 LINE.  
 - HYDRANT VALVES ON 7.50 LINE.  
 - SERVICE VALVES ON 1.25 LINE.  
 - TREES ON 1.25 LINE.  
 - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.  
 - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.  
 - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.  
 - ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM & SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.  
 - SERVICE VALVES FOR HYDRANTS LOCATED ON THE OPPOSITE SIDE OF ROAD FROM THE WATER LINE TO BE PLACED 9.5m FROM P.L. (1.0m FROM WATER LINE).



- NOTES: - SERVICE VALVES ON 2.50m LINE.  
 - HYDRANTS ON 2.5m LINE.

**ENVIRONMENTAL CAPACITY 5,500 VEHICLES PER DAY**

7	2007-04	REVISED STREET LIGHT POLE O/S, REVISED & ADDED NOTE	
6	2003-11	ADDITIONAL NOTE	
5	2003-05	REVISED ENVIRONMENTAL CAPACITY	
4	00-04	REVISED SHALLOW UTILITY O/S, CHANGE UTIL. COMPANY NAMES	
3	98-10	REVISE SHALLOW UTILITY O/S	
No.	Date	Revision	App'd

Drawn J.T.R. Date 95 - 01  
 Scale: NTS  
 Approved for  
 City Engineer

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

**METRIC**

**THE CITY OF CALGARY**  
ROADS

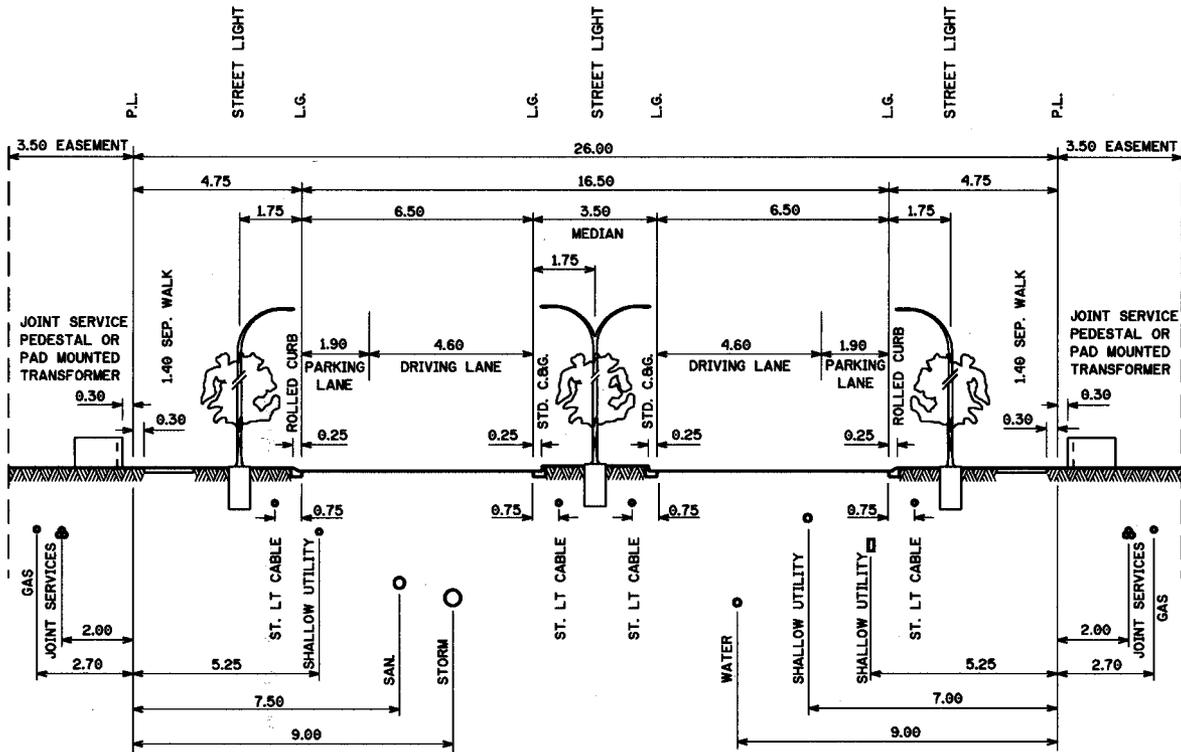
**COLLECTOR**  
**PARKING BOTH SIDES**  
**21.00m R/W, 11.50m ROAD**

Sheet **7**  
File Number **454.1008.040**

## 6) **Alternate Streets**

Pages 88 - 91 contain drawings indicating cross-section standards for Alternate Streets including:

- Grand Boulevard
- High Street
- Connector Street
- Avenue

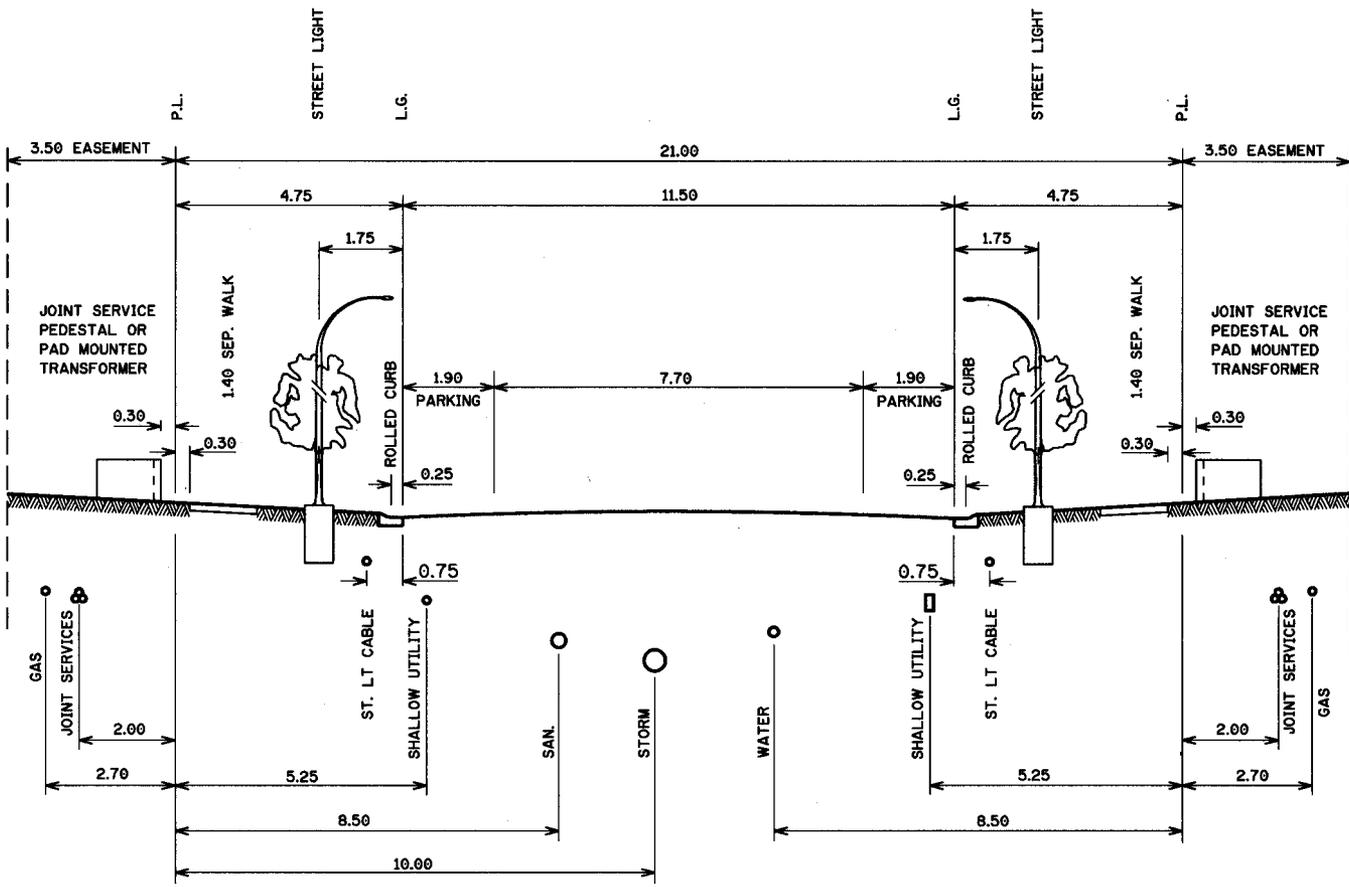


ALTERNATIVE STREET DESIGN STANDARD

- NOTES:
- HYDRANTS ON 2.50 LINE.
  - HYDRANT VALVES ON 8.00 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - TREES SHALL BE SHALLOW ROOTED DECIDUOUS SPECIES AS APPROVED BY PARKS / RECREATION DEPARTMENT.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - WATER MAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM SANITARY AND STORM LINES.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50 INSIDE P.L. OR 5.00 INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
  - SERVICE VALVES FOR HYDRANTS LOCATED ON THE OPPOSITE SIDE OF ROAD FROM THE WATER LINE TO BE PLACED 10.0m FROM P.L. (1.0m FROM WATER LINE).

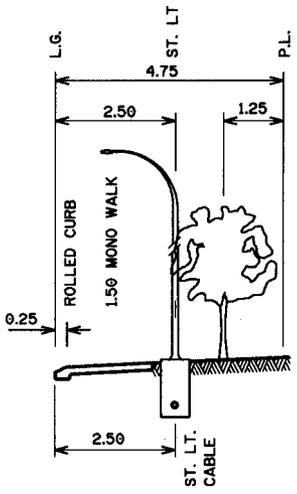
ENVIRONMENTAL CAPACITY 10,000 VEHICLES PER DAY  
 MUST HAVE A BACK LANE (RESIDENTIAL)  
 NO FRONT DRIVEWAYS (RESIDENTIAL)  
 SERVICE FROM LANES WHERE POSSIBLE

		Drawn SPG		Date 99-07	 THE CITY OF CALGARY ROADS	Sheet
		Scale:		NTS		18
		Approved for		 City Engineer	GRAND BOULEVARD 26.00m R/W, 2x6.5m ROAD	File Number
No.	Date	Revision				App'd
2	2007-04	REVISED HYDRANT O/S. ADDED ST. LT. POLE & CABLE ON MEDIAN				
1	2003-12	ADDITIONAL NOTE AND REVISED WATER LINE LOCATION				



ALTERNATIVE STREET DESIGN STANDARD

- NOTES:-
- HYDRANTS ON 2.50 LINE.
  - HYDRANT VALVES ON 7.50 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER. PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM & SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
  - SERVICE VALVES FOR HYDRANTS LOCATED ON THE OPPOSITE SIDE OF ROAD FROM THE WATER LINE TO BE PLACED 9.5m FROM P.L. (1.0m FROM WATER LINE).

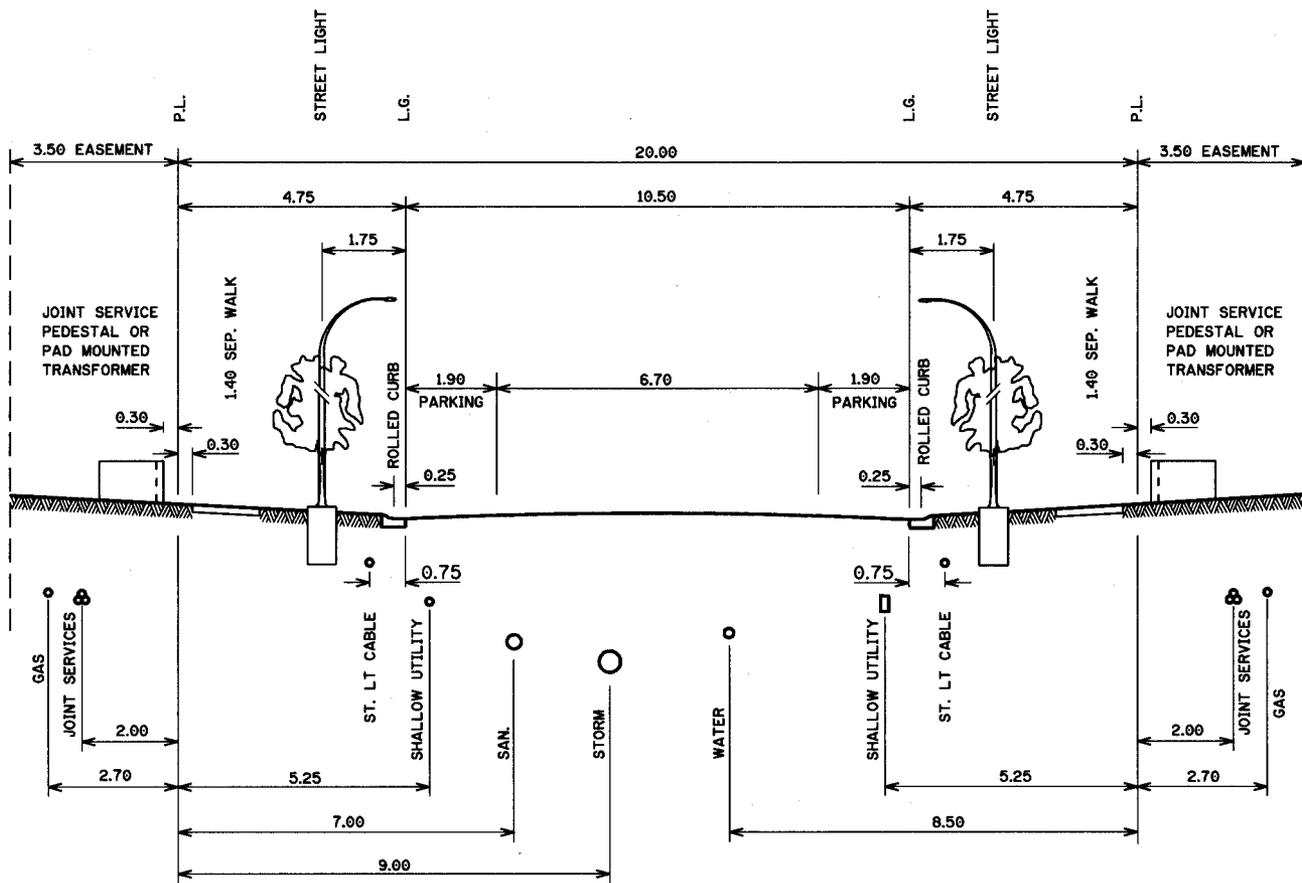


- NOTES:-
- SERVICE VALVES ON 1.25m LINE.
  - HYDRANTS ON 2.00m LINE.

ALTERNATIVE WITH MONO WALK

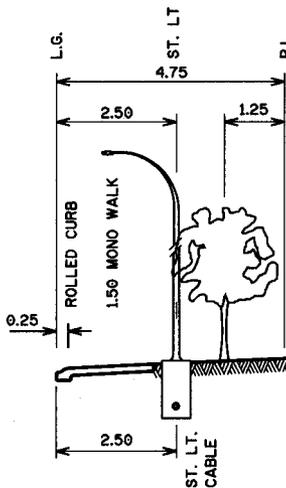
ENVIRONMENTAL CAPACITY 7,000 VEHICLES PER DAY  
 REAR LANE RECOMMENDED  
 FRONT DRIVEWAYS ARE ACCEPTABLE

		<b>THE CITY OF CALGARY</b> ROADS		Sheet <b>19</b>
		Drawn SPG	Date 99-07	File Number <b>454.1008.049</b>
		Scale NTS	Approved for 	
2 2007-04	REVISED HYDRANTS O/S. ADDED NOTE			
1 2003-12	ADDITIONAL NOTE			
No.	Date	Revision	App'd	



ALTERNATIVE STREET DESIGN STANDARD

- NOTES:-
- HYDRANTS ON 2.50 LINE.
  - HYDRANT VALVES ON 7.50 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM & SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.
  - SERVICE VALVES FOR HYDRANTS LOCATED ON THE OPPOSITE SIDE OF ROAD FROM THE WATER LINE TO BE PLACED 9.5m FROM P.L. (1.0m FROM WATER LINE).



- NOTES:-
- SERVICE VALVES ON 1.25m LINE.
  - HYDRANTS ON 2.00m LINE.

ALTERNATIVE WITH MONO WALK

ENVIRONMENTAL CAPACITY 5,000 VEHICLES PER DAY

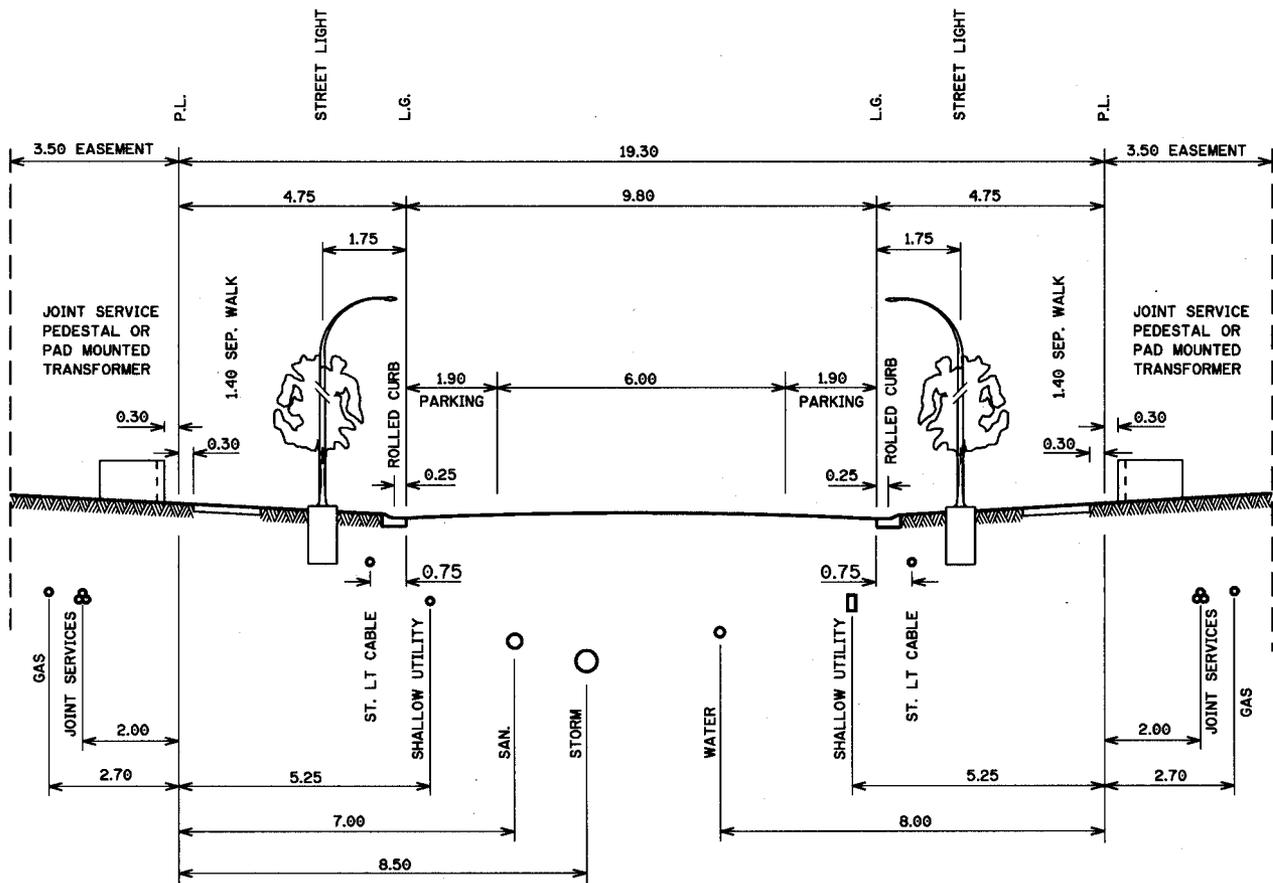
No.	Date	Revision	App'd
3	2007-05	REVISED HYDRANTS O/S, ADDED NOTE	
2	2003-12	ADDITIONAL NOTE	
1	2002-01	REVISED STORM DIMENSION TO 9.0m	

Drawn SPG	Date 99-07
Scale NTS	
Approved for <i>Bay</i>	
City Engineer	

THE CITY OF CALGARY  
ROADS

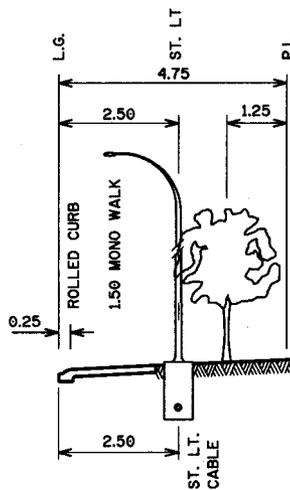
CONNECTOR STREET  
20.00m R/W, 10.50m ROAD

Sheet  
**20**  
File Number  
454.1008.048



ALTERNATIVE STREET DESIGN STANDARD

- NOTES:-
- HYDRANTS ON 2.50 LINE.
  - HYDRANT VALVES ON 5.25 LINE.
  - SERVICE VALVES ON 2.50 LINE.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - ADDITIONAL SEPARATION MAY BE REQUIRED BETWEEN STORM & SANITARY SEWERS IF EXCESSIVE VERTICAL DIFFERENCE OCCURS.



- NOTES:-
- SERVICE VALVES ON 1.25m LINE.
  - HYDRANTS ON 2.00m LINE.

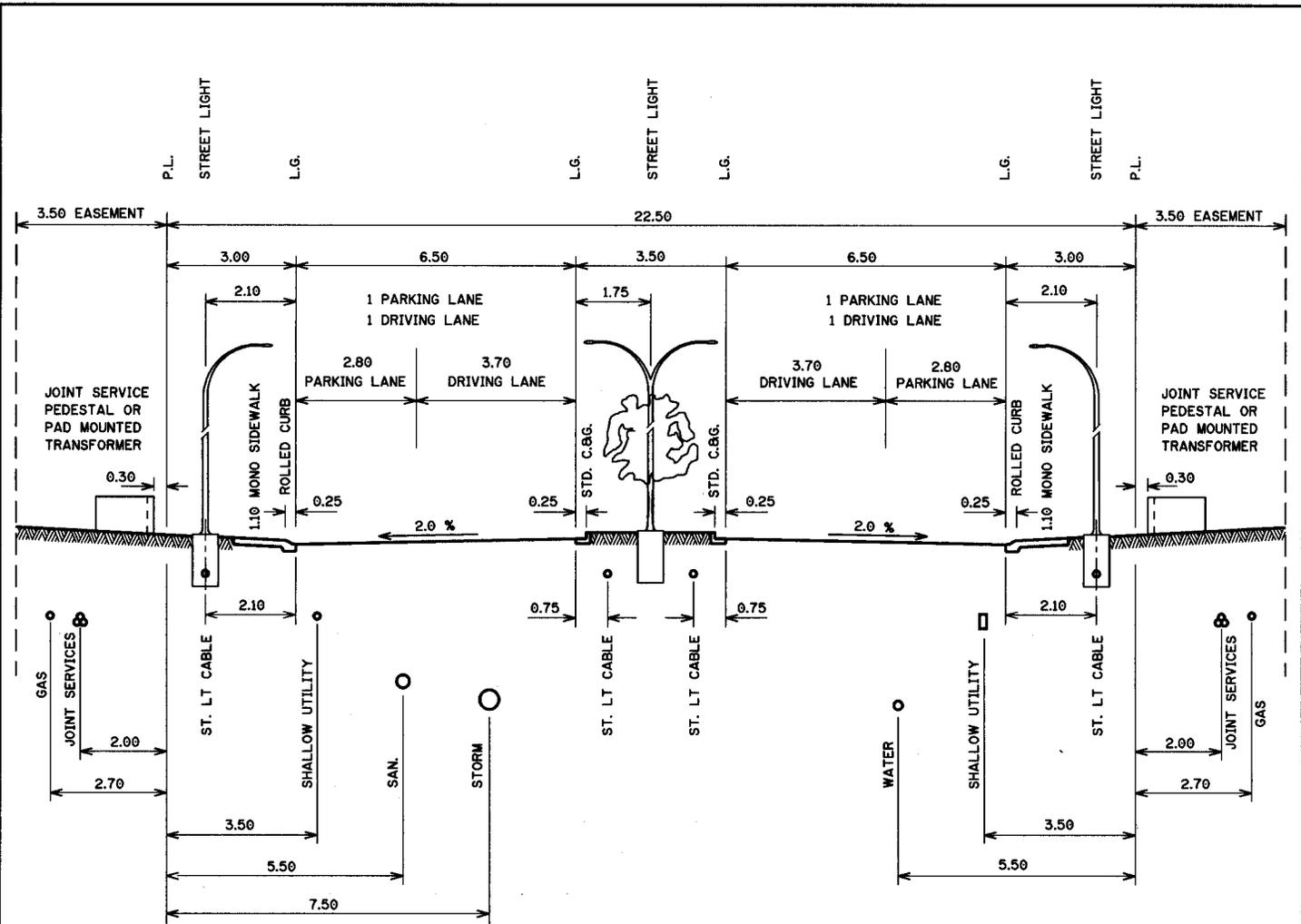
ALTERNATIVE WITH MONO WALK

ENVIRONMENTAL CAPACITY 3,000 VEHICLES PER DAY

		Drawn SPG		Date 99-07	THE CITY OF CALGARY ROADS	Sheet
		Scale: NTS				21
		Approved for		City Engineer	AVENUE 19.30m R/W, 9.80m ROAD	File Number
No.	Date	Revision				App'd
2	2007-05	REVISED HYDRANTS O/S, ADDED NOTE				
1	2003-12	REVISED WATER AND STORM DIMENSIONS, REVISED NOTES				

## 7) Residential Entrance Streets

Residential Entrance Streets		<i>Alignment Design Standards</i>
CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Local Divided (ULD) 50	50 kph	See Page 93 for typical cross-section
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Residential ULD 50 = 65 m See Pages 44 and 48	Residential ULD 50 = 80 m	
Median and Left Turn Bay		
<ul style="list-style-type: none"> <li>• Minimum median width is 3.5 m</li> <li>• Left turn bays and intersection channelization are not required</li> </ul>		
Note		
<ul style="list-style-type: none"> <li>• Same requirements as Residential streets</li> <li>• Standard curb with 0.25 m gutter is to be used on the median and low profile curb with 0.25 m gutter on the outside edges except in areas adjacent to parcels which will not contain residential developments where standard curb is to be used</li> <li>• For corner radii and corner cut requirements, see Section H</li> </ul>		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 8.0% Minimum grade: 0.6%		
Grade at Intersections		
<ul style="list-style-type: none"> <li>• The grade line of the intersecting street (maximum approach grade of 4%) shall tie to the property line grade of a Residential Entrance street</li> <li>• See Page 50 for Maximum Approach Grades and Vertical Curve requirement</li> </ul>		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> <li>• The length of vertical curve is calculated based on the stopping sight distance as shown on Page 48.</li> <li>• Superelevation is not required</li> </ul>		



**FOR FLANKAGE LOTS**

- NOTES:
- HYDRANTS ON 0.75 LINE.
  - HYDRANT VALVES ON 4.50 LINE.
  - SERVICE VALVES ON 0.50 LINE.
  - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
  - ST. LT. CABLE TO BE INSTALLED IN EASEMENTS ONLY IF WATER IS SERVICED FROM THE FRONT.
  - ST. LT. CABLE CENTRED IN 1.50m EASEMENT WHERE THERE IS NO GAS EASEMENT.
  - POWER POLES, STREET LIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT.
  - WATERMAIN WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM SANITARY AND STORM LINES.

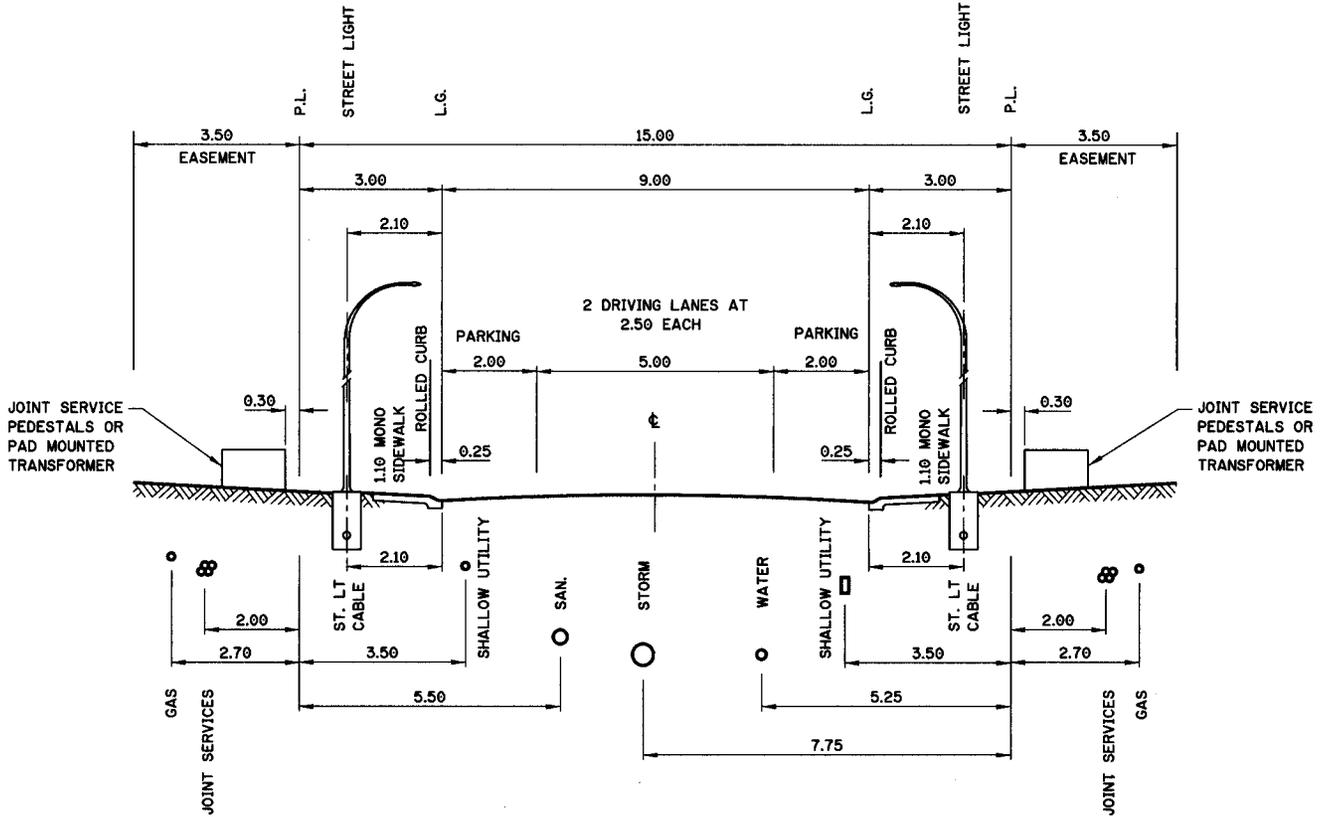
**FOR FRONTAGE LOTS**  
 L.G. TO L.G. DIMENSION 7.00m.  
 R.O.W. DIMENSION 23.50m

**ENVIRONMENTAL CAPACITY 1,500 VEHICLES PER DAY**

5	2007-04	REVISED STREET LIGHT POLE O/S, ADDED ST. LT CABLE		Drawn	Date	<b>THE CITY OF CALGARY</b> ROADS	Sheet <b>8</b> File Number 454.1008.032
4	2003-05	REVISED ENVIRONMENTAL CAPACITY		R.B.T.	JULY '94		
3	00-04	REVISE SHALLOW UTILITY O/S, AND ADD ENV. CAPACITY NOTE		Scale:	NTS	<b>RESIDENTIAL ENTRANCE</b> <b>STREET</b> <b>22.50m R/W, 2x6.50m ROAD</b>	
2	98-12	REVISE SHALLOW UTILITY O/S		Approved for			
1	97-09	CHANGE TO SHALLOW UTILITY COMMENT		City Engineer			
No.	Date	Revision	App'd				

# Residential Streets

Residential Streets		<i>Alignment Design Standards</i>
CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Local Undivided (ULU) 50	50 kph	<b>See Page 95 for typical cross-section</b>
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Residential ULU 50 = 65 m <b>See Pages 44 and 48</b>	Residential ULU 50 = 80 m Radii less than 80 m are acceptable on a Residential street if accompanied by acceptable pavement widening (e.g. bulb) The minimum cul-de-sac and bulb radius is 10.5 m. The minimum radius for the approach curves to a cul-de-sac or bulb is 21.0 m. <b>See Page 23.</b>	
Median and Left Turn Bay		
<ul style="list-style-type: none"> <li>• Left turn bays and intersection channelization are not required</li> <li>• Medians are used in Residential “bays”. The medians must have a minimum median width of 3.5 m. The width of the carriageway in the bays should be:               <ul style="list-style-type: none"> <li>9.0 m for two-way traffic if there is parking along the median and the outside curb</li> <li>8.5 m for two way traffic if parking is prohibited along the median or signed one-way and parking along median</li> <li>7.0 m for one-way traffic if parking is prohibited along the median</li> </ul> </li> <li>• The road width for the turnaround at the top of the bay is of minimum 9.5 m for all cases</li> <li>• If at a ‘T’ intersection, 2-way traffic permitted. If at a 4-way intersection only one-way permitted. * <i>Carriageway widths are subject to line assignment requirements</i></li> </ul>		
Note		
<ul style="list-style-type: none"> <li>• The cumulative length of Residential streets before feeding onto Collector streets should not be excessive. The maximum number of dwelling units serviced shall not exceed 100</li> <li>• For corner radii and corner cut requirements, <b>see Section H</b></li> </ul>		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 12.0%(If alternate access is 8.0% or less), Cul-de-sac = 8.0% Minimum grade: 0.6%		
<ul style="list-style-type: none"> <li>• The minimum and maximum grades for a cul-de-sac bulb are 1.0% and 4.0% respectively, as measured from the beginning of the bulb to the top of the bulb.</li> <li>• <b>See Page 23</b></li> </ul>		
Grade at Intersections		
<ul style="list-style-type: none"> <li>• The grade line of the intersecting street (maximum approach grade of 4%) shall tie to the property line grade of a Residential street</li> <li>• <b>See Page 53</b> for Maximum Approach Grades and Vertical Curve requirement</li> </ul>		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> <li>• The length of vertical curve is calculated based on the stopping sight distance as shown on <b>Page 48.</b></li> <li>• Superelevation is not required</li> </ul>		



**CARRIAGEWAY ALTERNATES**

- A. CROWNED
- B. DISHED
- C. X-FALLED

NOTE: FOR CROWNED SECTION

CURB REQUIRED ON BOTH SIDES.

FOR DISHED SECTION

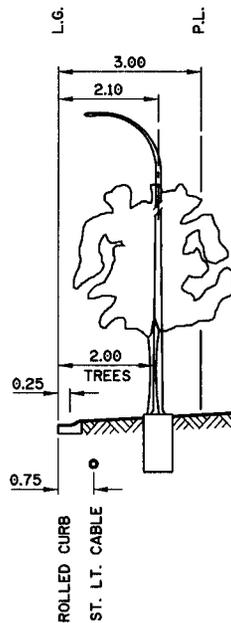
MINIMUM GRADE OF 1% REQUIRED WITH MAXIMUM DRAINAGE LENGTH OF 150.00.

FOR X-FALLED SECTION

CURB REQUIRED ON LOW SIDE.

- NOTE: - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. OF 3.00 SEPARATION TO THE CENTRE LINE OF POWER POLES & STREET LIGHTING POLES.
- WATER VALVES FOR ALL HYDRANTS, PARKS SERVICES AND NON SINGLE FAMILY HOMES TO BE SET 1.0m FROM MAIN.
- HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. OF 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS AND OTHER SURFACE STRUCTURES.

- NOTE: - HYDRANT ON 0.75 LINE.
- HYDRANT VALVES ON 4.25 LINE.
- SERVICE VALVES ON 0.50 LINE.
- PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50 INSIDE P.L., OR 5.00 INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
- ST. LT. CABLE CENTRED IN 1.50 EASEMENT WHERE THERE IS NO GAS EASEMENT.
- 11.5m OF PAVEMENT AND A 17.5m R.O.W. SHALL BE PROVIDED ADJACENT TO ALL SCHOOL SITES.



**ALTERNATIVE WITH NO SIDEWALK**

**ENVIRONMENTAL CAPACITY 1,500 VEHICLES PER DAY**

8	2007-04	REVISED HYDRANT, ST. LT. POLES & CABLE O/S, ADDED NOTE	
7	2003-05	REVISED ENVIRONMENTAL CAPACITY	
6	2002-11	ADDED SCHOOL R.O.W. NOTE	
5	2000-04	REVISE SHALLOW UTILITY O/S, CHANGE UTIL. COMPANY NAMES	
4	98-10	CHANGE LABEL TO SHALLOW UTILITY	
No.	Date	Revision	App'd

Drawn	J.T.R.	Date	95 - 01
Scale:	NTS		
Approved for	<i>Benny</i>		
City Engineer			



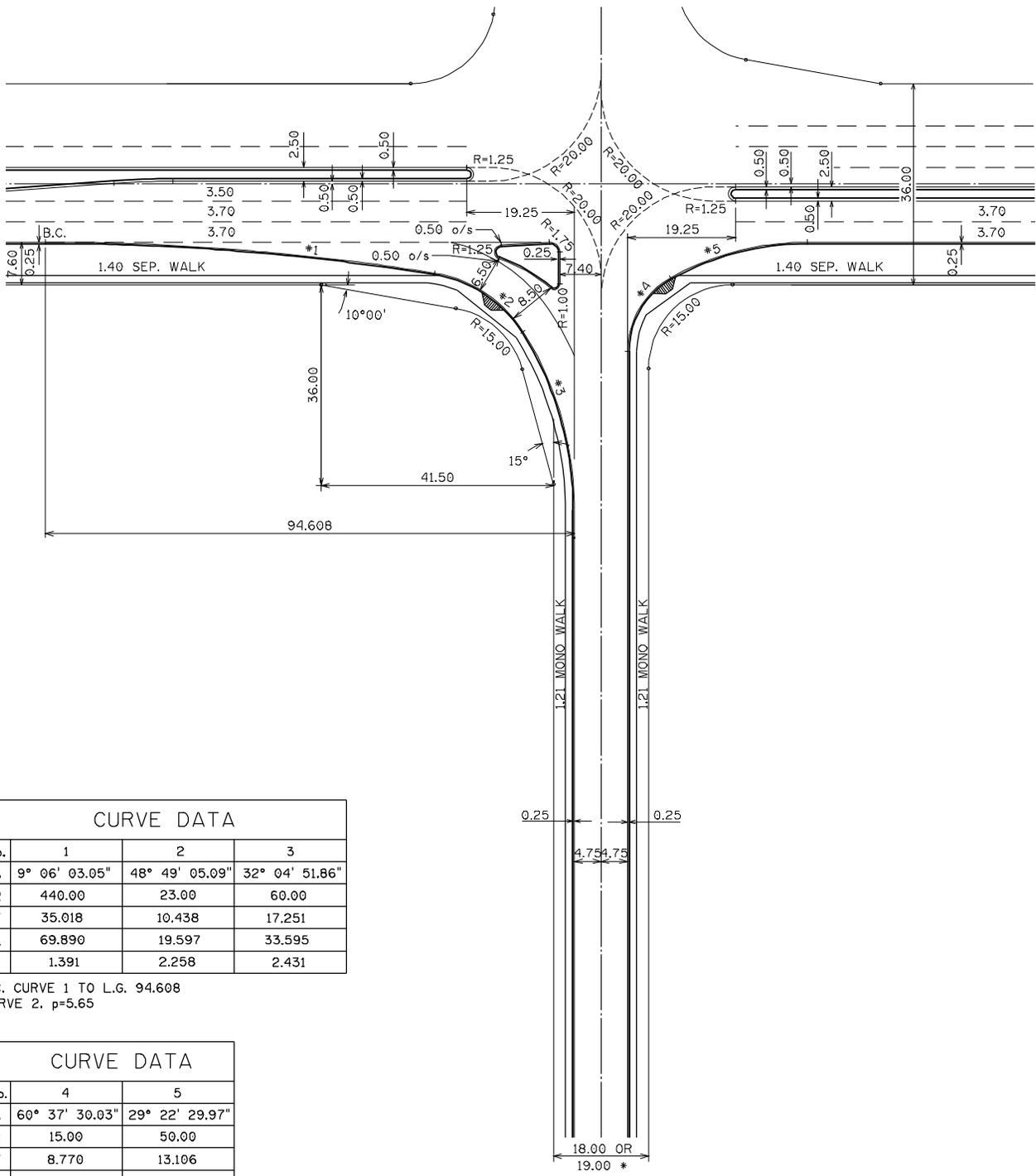
THE CITY OF CALGARY  
ROADS  
**RESIDENTIAL - PARKING**  
BOTH SIDES  
15.00m R/W, 9.00m ROAD

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED **METRIC**

Sheet	<b>5</b>
File Number	454.1008.039

## 8) Industrial Streets

Industrial Streets		<i>Alignment Design Standards</i>
CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Local Undivided (ULU) 50	50 kph	See Pages 97, 98 and 99
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Industrial ULU 50 = 65 m <b>See Pages 44 and 48</b>	Industrial ULU 50 = 80 m <ul style="list-style-type: none"> <li>Radii less than 80 m are acceptable on an Industrial street if accompanied by acceptable pavement widening (e.g. bulb)</li> </ul>	
Median and Left Turn Bay		
<ul style="list-style-type: none"> <li>Medians, left turn bays and intersection channelization are normally not required</li> </ul>		
Note		
<ul style="list-style-type: none"> <li>For corner radii and corner cut requirements, see intersection designs in <b>Pages 97, 98 and 99</b></li> </ul>		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grades: 10.0%, Cul-de-sac = 8.0% Minimum grade: 0.6% <ul style="list-style-type: none"> <li>The minimum and maximum grades for a cul-de-sac bulb are 1.0% and 4.0% respectively, as measured from the beginning of the bulb to the top of the bulb.</li> </ul>		
Grade at Intersections		
<ul style="list-style-type: none"> <li>The grade line of the intersecting street (maximum approach grade of 4%) shall tie to the Industrial street in the following manner:               <ul style="list-style-type: none"> <li>tie to the property line grade if the approaching street is undivided</li> <li>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 2% crown 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</li> </ul> </li> <li><b>See Page 53</b> for Maximum Approach Grades and Vertical Curve requirement</li> </ul>		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> <li>The length of vertical curve is calculated based on the stopping sight distance as shown on <b>Page 48</b>.</li> <li>Superelevation is not required</li> </ul>		



CURVE DATA			
No.	1	2	3
Δ	9° 06' 03.05"	48° 49' 05.09"	32° 04' 51.86"
R	440.00	23.00	60.00
T	35.018	10.438	17.251
L	69.890	19.597	33.595
E	1.391	2.258	2.431

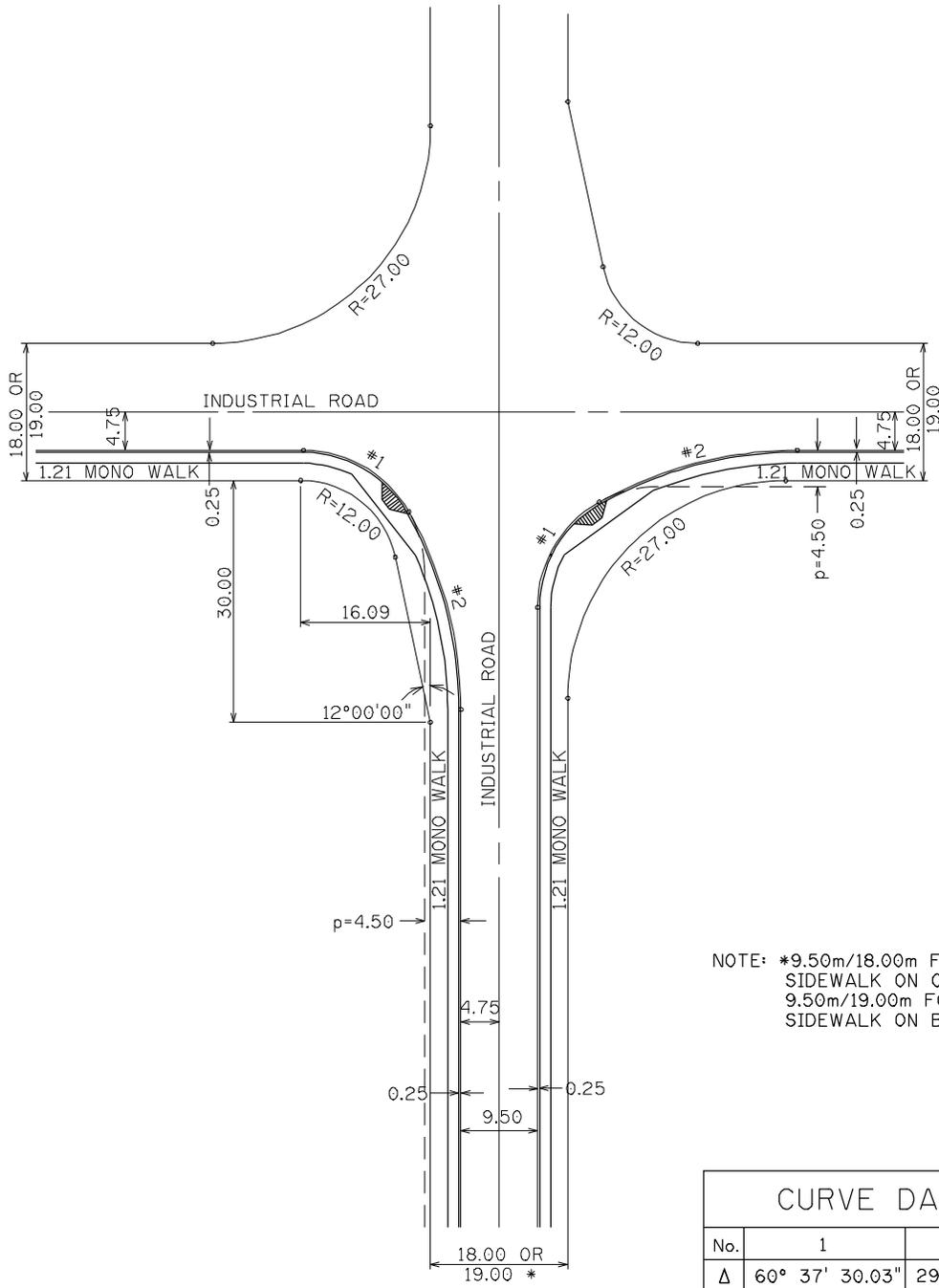
B.C. CURVE 1 TO L.G. 94.608  
 CURVE 2, p=5.65

CURVE DATA		
No.	4	5
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

p = 4.50

NOTE: \*9.50m/18.00m FOR  
 SIDEWALK ON ONE SIDE  
 9.50m/19.00m FOR  
 SIDEWALK ON BOTH SIDES

4 2008-11 ADDED SIDEWALKS		Drawn S.P.G.	Date 00-04	THE CITY OF CALGARY ROADS	Sheet <b>9</b>
3 06-01 REVISED CURVES 1, 2 AND 3					
2 03-11 ADDITION OF WIDE CURB LANE		Approved for		File Number 454.1014.022	
1 01-01 REVISED INDUSTRIAL R.O.W. TO 18.00m OR 19.00m		City Engineer			
No.	Date	Revision		App'd	



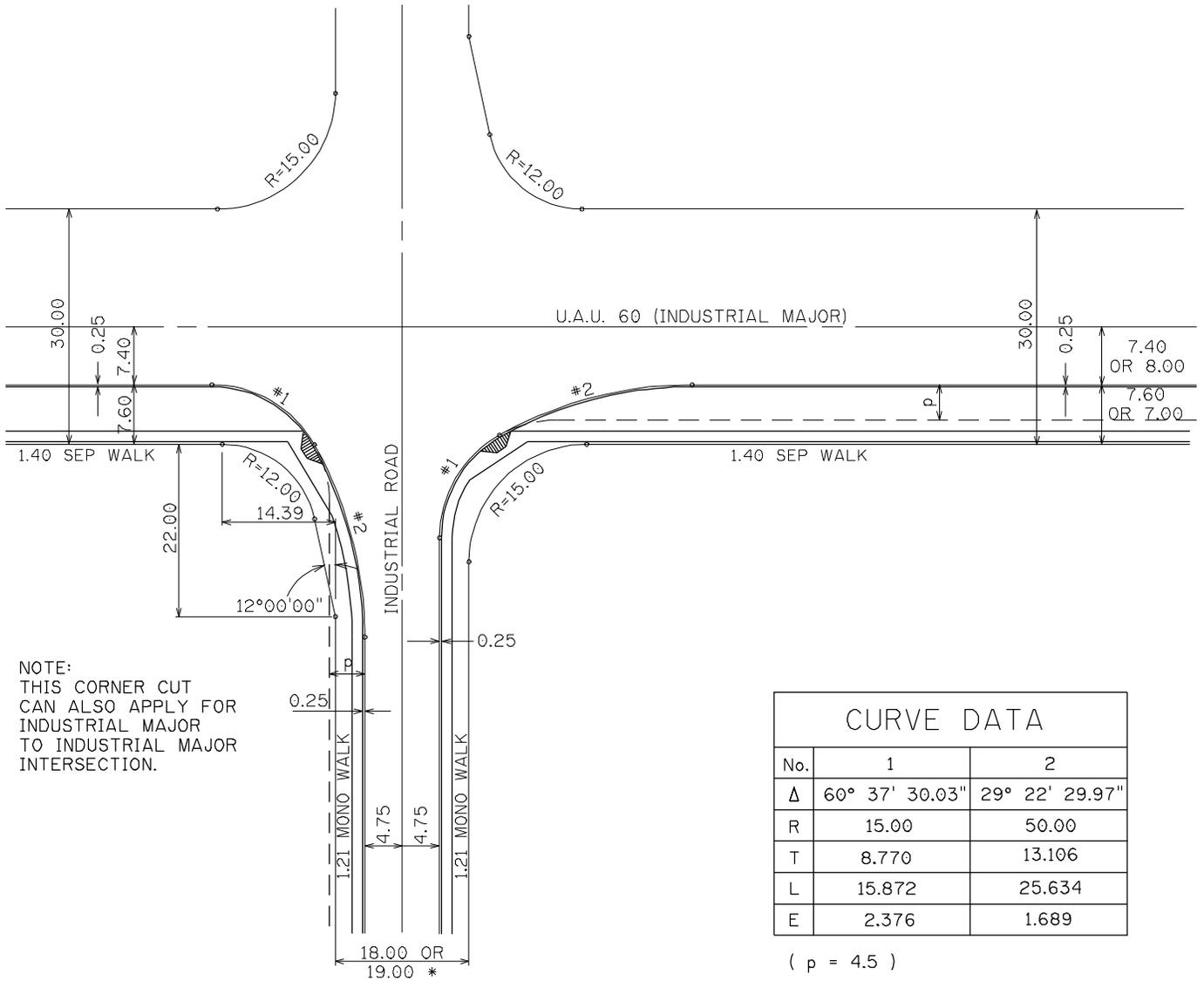
NOTE: \*9.50m/18.00m FOR  
SIDEWALK ON ONE SIDE  
9.50m/19.00m FOR  
SIDEWALK ON BOTH SIDES

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

( p = 4.5 )

NOTE : 1. FOR SKEWED INTERSECTIONS, SLIGHTLY  
LARGER RADII MAY BE REQUIRED TO  
ACCOMMODATE LARGE TRUCKS.  
2. EITHER PROPERTY LINE IS ACCEPTABLE.

				Drawn J.T.R.	Date SEPT. '96	 THE CITY OF CALGARY ROADS	Sheet <b>10</b>
				Scale: NTS	Approved for  City Engineer		File Number 454.1008.002
3	2008-11	ADDED SIDEWALKS					
2	01-01	REVISE R.O.W. DIM TO 18.00m OR 19.00m					
1	99-12	REVISE CORNER TO BE A TWO CENTER CURVE					
No.	Date	Revision	App'd				



5	2008-11	ADDED SIDEWALKS	
4	2004-04	REVISED MAJOR CURB GUTTER FROM 0.50 TO 0.25	
3	03-11	ADDITIONAL NOTE AND DIMENSIONS	
2	01-01	CHANGE R.O.W WIDTH TO 18.00m OR 19.00m	
1	99-12	REVISE CORNER TO BE A TWO CENTER CORNER	
No.	Date	Revision	App'd

Drawn	Date
J.T.R.	SEPT. '96
Scale:	NTS
Approved for	
City Engineer	



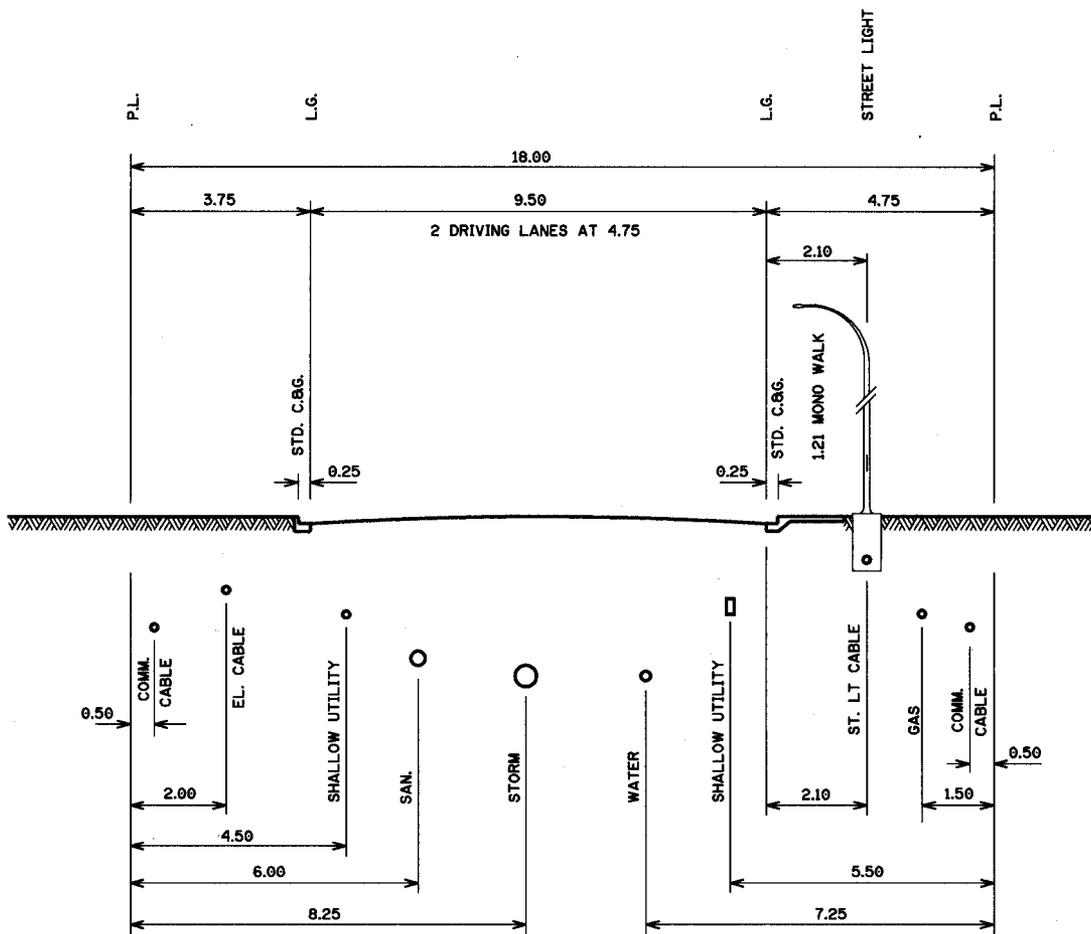
THE CITY OF CALGARY  
ROADS

INTERSECTION DESIGN  
INDUSTRIAL TO  
INDUSTRIAL MAJOR

DIMENSIONS ARE METRES  
UNLESS OTHERWISE NOTED



Sheet	11
File Number	454.1008.001



- NOTE: - THIS LAYOUT FOR INDUSTRIAL DEVELOPMENTS NOT USING OVERHEAD FACILITIES.
- HYDRANTS ON 2.50 LINE.
  - GAS, HYDRANTS AND STREET LIGHTING WILL BE ON THE SAME SIDE AS THE WALK.
  - HYDRANT VALVES 1.00m FROM MAIN
  - SERVICE VALVE @ 2.50m OR 1.00m FROM MAIN, AT WATERWORKS DISCRETION.
  - POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT AND SERVICES.
  - ADD 2.50m PAVEMENT FOR PARKING ON ONE SIDE.

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED



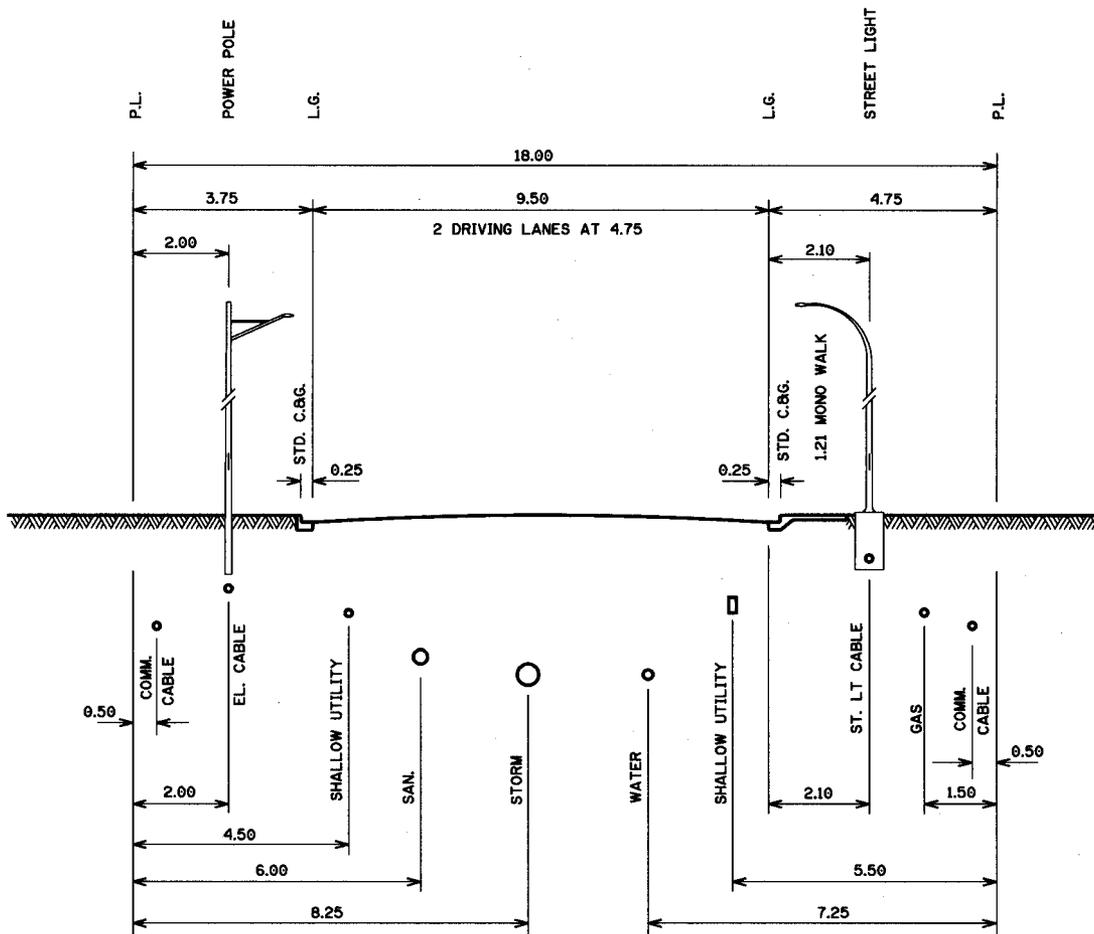
No.	Date	Revision	App'd
1	2007-04	REVISED ST. LT POLE & CABLE O/S. ADDED NOTE	

Drawn	R.B.T.	Date	DEC '97'
Scale:	NTS		
Approved for			
City Engineer			



THE CITY OF CALGARY  
ROADS  
STANDARD INDUSTRIAL STREET  
WITH SIDEWALK ON ONE SIDE-NO PARKING  
NO OVERHEAD FACILITIES  
18.00m R/W. 9.50m ROAD

Sheet	15
File Number	454.1008.053

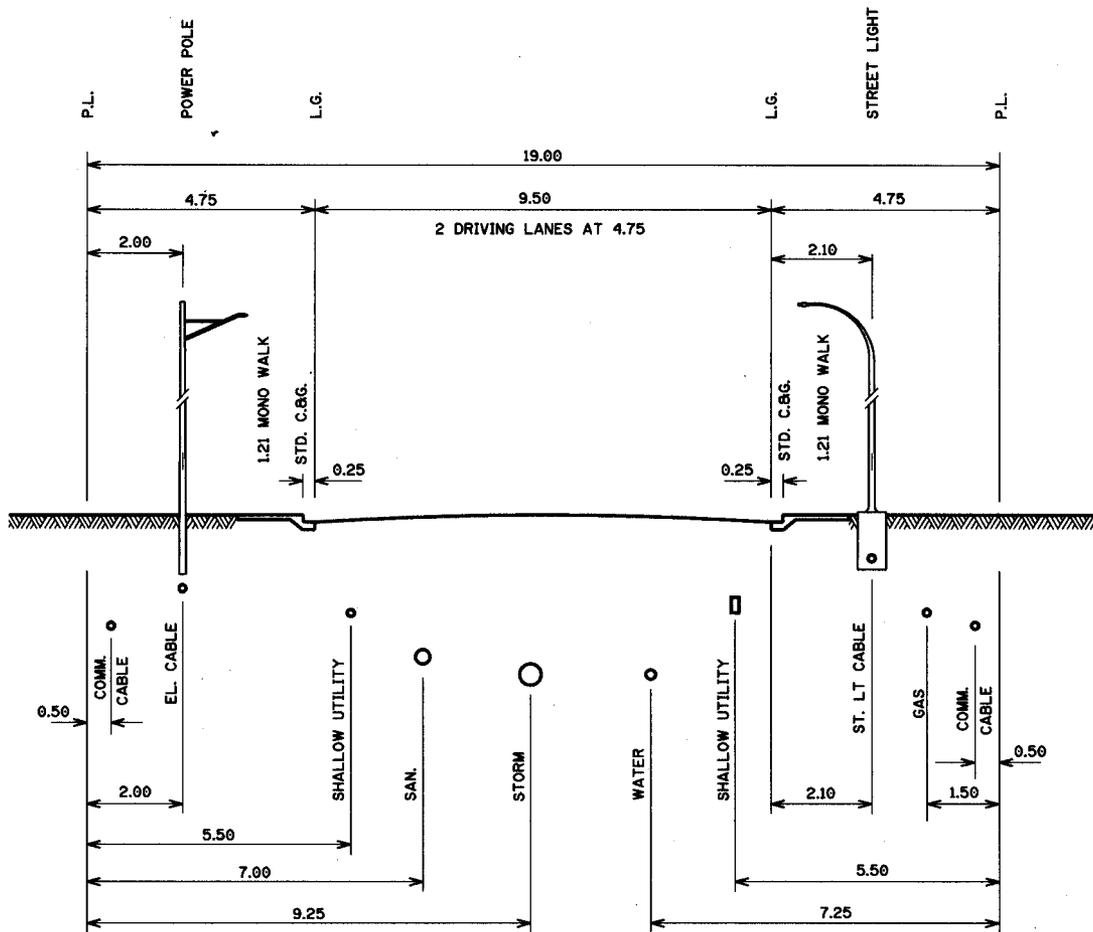


- NOTE: - HYDRANTS ON 2.50 LINE.  
 (OPPOSITE SIDE TO EL. POWER POLE)  
 - HYDRANT VALVES 1.00m FROM MAIN  
 - SERVICE VALVE @ 2.50m OR 1.00m FROM MAIN, AT WATERWORKS DISCRETION.  
 - GAS, HYDRANTS AND STREET LIGHTING WILL BE ON THE SAME SIDE AS THE WALK.  
 - POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT AND SERVICES.  
 - ADD 2.50m PAVEMENT FOR PARKING ON ONE SIDE.

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED



		Drawn R.B.T.	Date DEC '97'		Sheet
		Scale:	NTS		16
3		2007-04		REVISD ST. LT POLE & CABLE O/S, ADDED NOTE	STANDARD INDUSTRIAL STREET WITH SIDEWALK ON ONE SIDE-NO PARKING 18.00m R/W. 9.50m ROAD
2		2003-12		ADDITIONAL PARKING NOTE	
1		01-01		REVISE TITLE BLOCK	File Number
No.	Date	Revision	App'd	City Engineer	454.1008.045



- NOTE:
- HYDRANTS ON 2.50 LINE. (OPPOSITE SIDE TO EL. POWER POLE)
  - HYDRANT VALVES 1.00m FROM MAIN
  - SERVICE VALVE @ 2.50m OR 1.00m FROM MAIN, AT WATERWORKS DISCRETION
  - POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT AND SERVICES.
  - GAS, HYDRANTS & STREET LIGHTING WILL BE ON THE OPPOSITE SIDE OF ENMAX LINES.
  - ADD 2.50m PAVEMENT FOR PARKING ON ONE SIDE.

		Drawn S.P.G.		Date 01-01	 <b>THE CITY OF CALGARY</b> ROADS	Sheet
		Scale: NTS		STANDARD INDUSTRIAL STREET WITH SIDEWALK ON BOTH SIDES-NO PARKING 19.00m R/W, 9.50m ROAD		17
2 2007-04		REVISED ST. LT POLE & CABLE O/S, ADDED NOTE		Approved for  City Engineer		File Number
1 2003-12		ADDITIONAL PARKING NOTE				454.1008.052
No.	Date	Revision		App'd		

# Lanes/ Alleys

## Lanes (Alleys)

## Alignment Design Standards

### CONSTRUCTION TYPES

Lanes are graded for the full cross section and graveled as per specification file number 454.1011.003

All lanes shall be constructed in accordance with **City of Calgary Standard Specifications – Roads Construction** and shall consist one of the following:

- Deep base grading and gravelling
- Full depth asphaltic concrete paving for the full right-of-way (All lanes constructed adjacent to commercial establishments other than in the downtown area shall be with full depth asphaltic concrete paving)
- Asphaltic concrete paving on a granular base for the full right-of-way width
- Asphaltic concrete paving on a soil cement base
- Portland Cement concrete paving (All lanes constructed in the downtown area shall be with Portland Cement concrete paving)

### RIGHTS-OF-WAY

6.1 m (existing older areas – infill)  
8.0 m  
9.0 m  
10.0 m

**See Pages 110 - 113**

### LENGTHS

- The maximum length of lanes between exits to streets shall not exceed 350 m
- The lane layout shall be checked for possible vehicle shortcutting

### MAXIMUM AND MINIMUM GRADES

Maximum Grade: 12.0%  
Minimum Grade: 0.6%

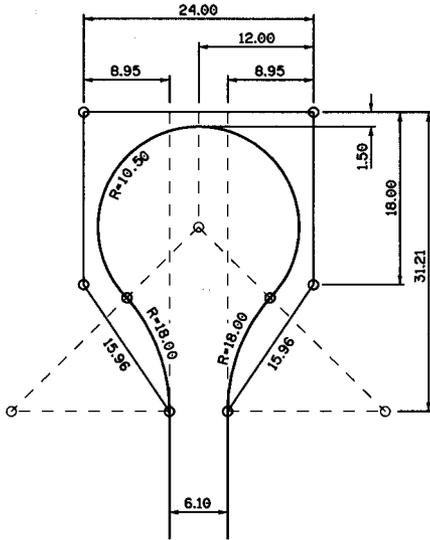
**DRAINAGE**

- 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 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*. Lanes shall be deep gravel based when the following conditions exist: (see standard specification file number 454.1011.003)
  - At horizontal lane intersections for 5.0 m beyond intersection.
  - When the lane grade is 5% or greater, and in excess of 75 m from the source of lane drainage. When a lane with 5% or greater grade intersects with a lane with flatter grade, the latter lane shall be deep based for the following lengths:

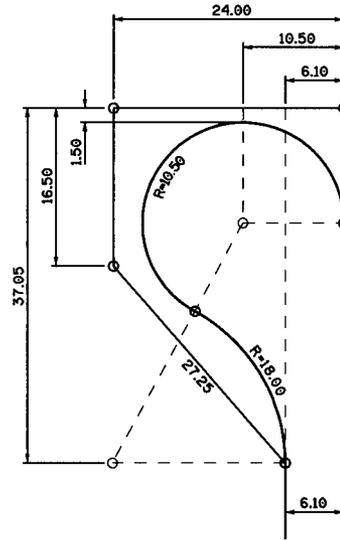
Up to 2%	30 m
2% to 3%	45 m
3% and over	Total length
  - When a lane with grade less than 5% drains onto a lane with grade equal to or greater than 5%, the portion of the receiving lane in excess of 75 m, as measured from the initial source of drainage shall be deep based.
- If concrete drainage swales drain into 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*. Alternatively, if a catch basin can not be installed, then the lane must be paved from a point 3 m upgrade from the point of discharge all the way downgrade to where the lane connects to the street.

**CORNER CUTS**

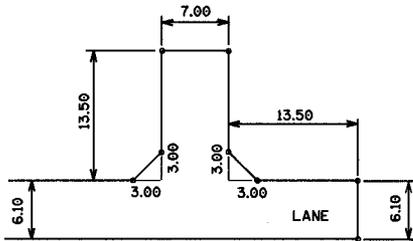
- Corner cuts must be provided at all lanes to lane intersections and are to be determined based on the turning path of a SU-9 vehicle
- An alternative is to provide a widening at one corner of the lane intersection as shown on **Page 109**.



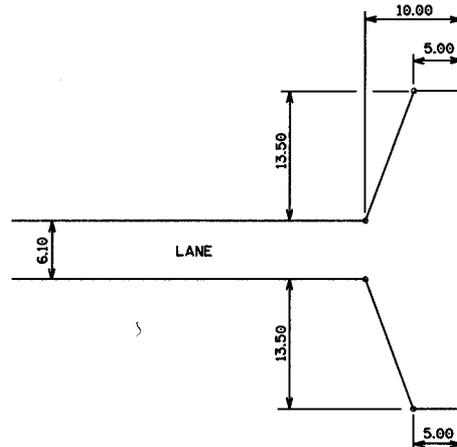
EXISTING LANE R/W - 6.10  
 EXISTING ROAD WIDTH - 6.10  
 NO PARKING IN CUL-DE-SAC  
 NO CURB  
 MINIMUM DESIGN S.U. VEHICLE  
 MANEUVERING REQUIRED



EXISTING LANE R/W - 6.10  
 EXISTING ROAD WIDTH - 6.10  
 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 - 6.10



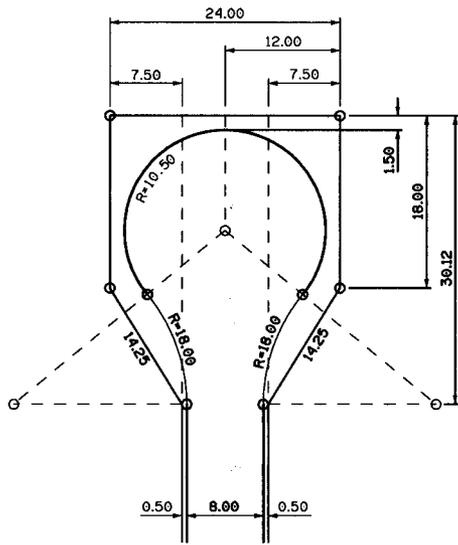
TRUCK LENGTH - 11.60  
 S.U. VEHICLE  
 EXISTING LANE WIDTH - 6.10

DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED

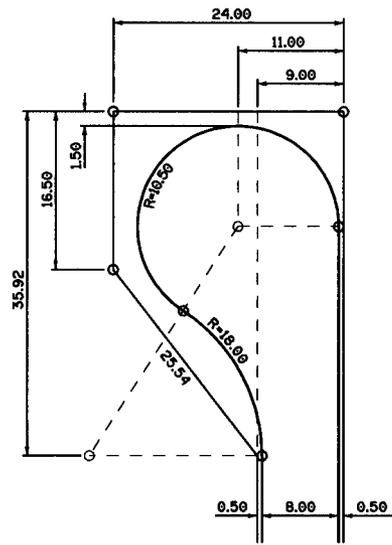


No.		Date		Revision		App'd		Drawn <b>SPG</b>	Date <b>99-07</b>	<b>THE CITY OF CALGARY</b> ROADS	Sheet <b>13</b>
								Scale: <b>NTS</b>	Approved for 		<b>TYPICAL LANE CUL-DE-SAC          AND HAMMERHEAD DESIGNS          FOR 6.10m LANES</b>

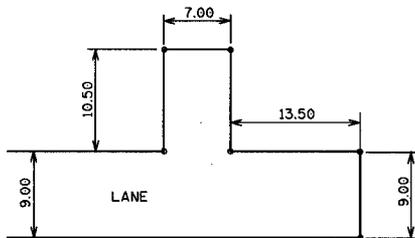




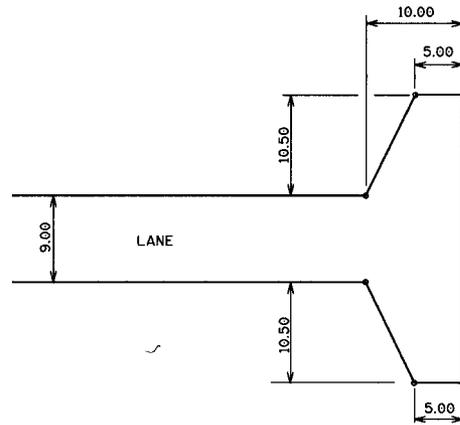
LANE R/W - 9.00  
 ROAD WIDTH - 8.00  
 NO PARKING IN CUL-DE-SAC  
 NO CURB  
 MINIMUM DESIGN S.U. VEHICLE  
 MANEUVERING REQUIRED



LANE R/W - 9.00  
 ROAD WIDTH - 8.00  
 NO PARKING IN CUL-DE-SAC  
 NO CURB  
 MINIMUM DESIGN S.U. VEHICLE  
 MANEUVERING REQUIRED



TRUCK LENGTH : 11.60  
 S.U. VEHICLE  
 LANE WIDTH : 9.00

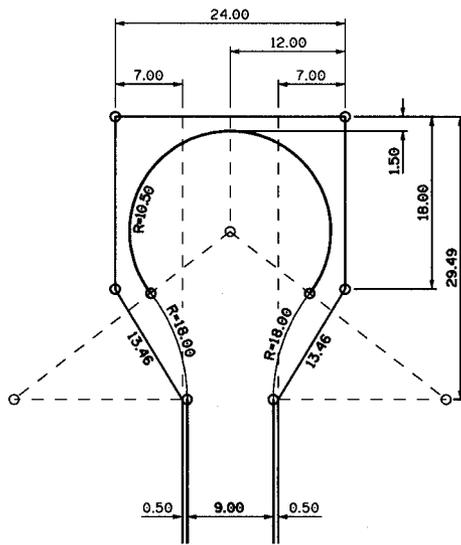


TRUCK LENGTH : 11.60  
 S.U. VEHICLE  
 LANE WIDTH : 9.00

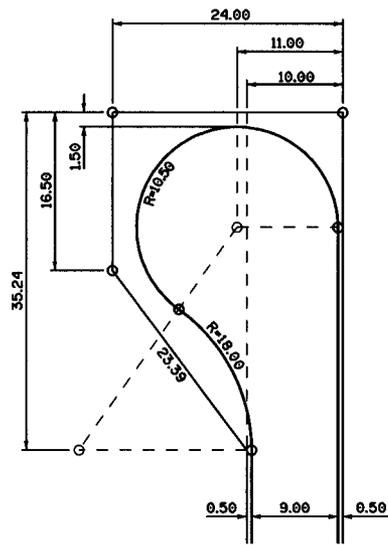
DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



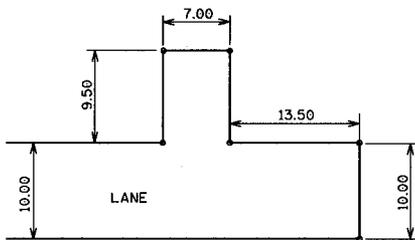
			Drawn SPG	Date 99-07	 <b>THE CITY OF CALGARY</b> ROADS	Sheet
			Scale NTS			<b>15</b>
			Approved for <i>[Signature]</i> City Engineer		<b>TYPICAL LANE CUL-DE-SAC          AND HAMMERHEAD DESIGNS          FOR 9.00 LANES</b>	File Number
No.	Date	Revision	App'd			454.1004.008



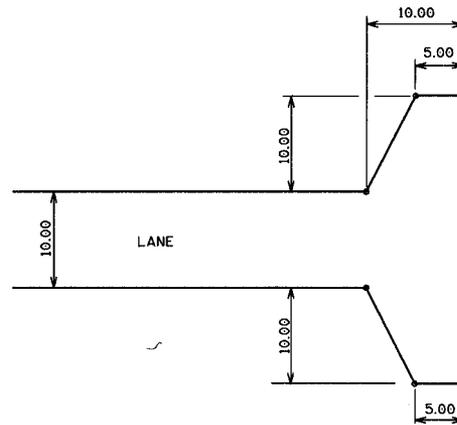
LANE R/W - 10.00  
 ROAD WIDTH - 9.00  
 NO PARKING IN CUL-DE-SAC  
 NO CURB  
 MINIMUM DESIGN S.U. VEHICLE  
 MANEUVERING REQUIRED



LANE R/W - 10.00  
 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  
 LANE WIDTH - 10.00

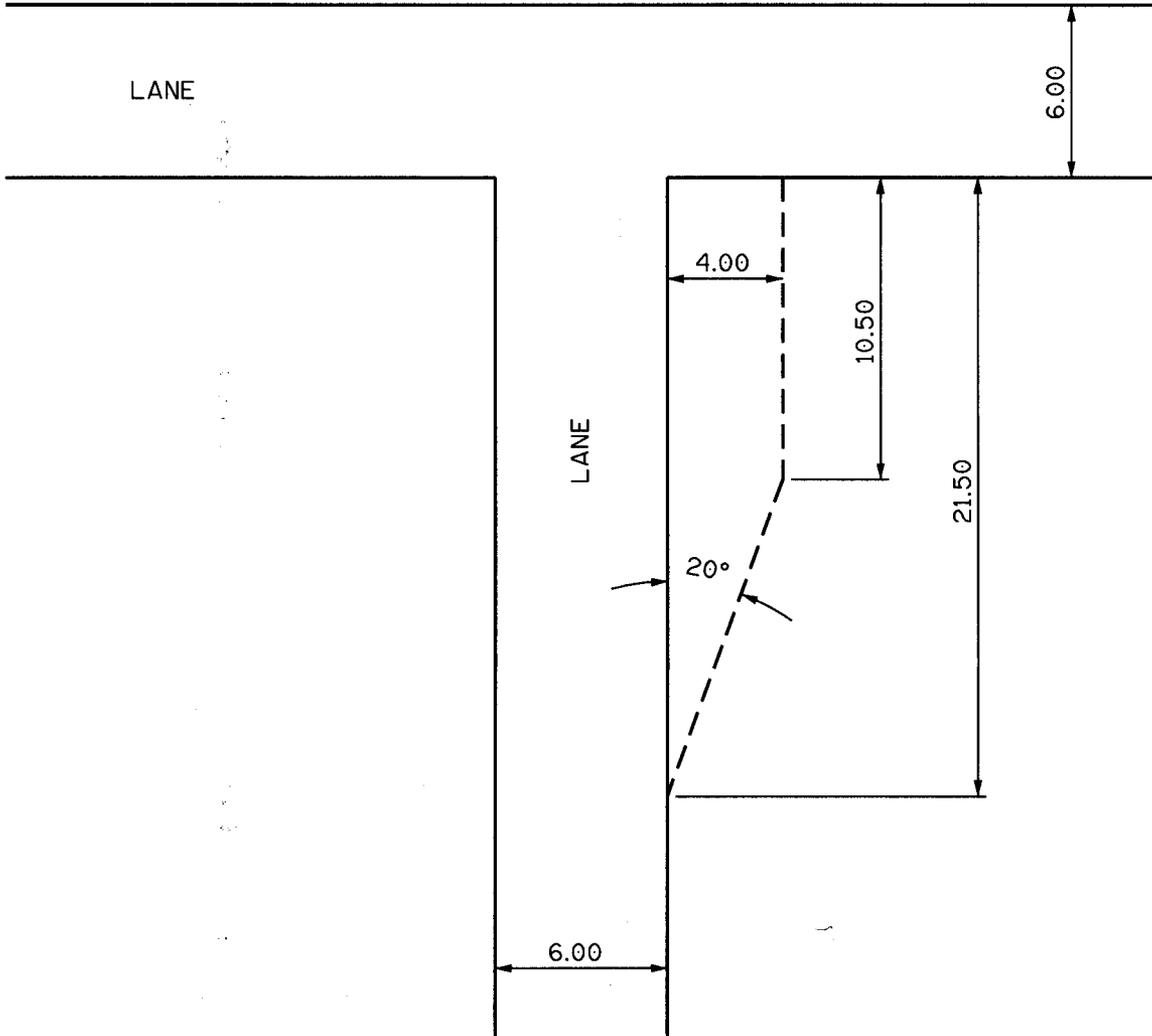


TRUCK LENGTH - 11.60  
 S.U. VEHICLE  
 LANE WIDTH - 10.00

DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



		Drawn SPG		Date 99-07	 <b>THE CITY OF CALGARY</b> ROADS	Sheet
		Scale: NTS		<b>16</b>		File Number
		Approved for		<b>TYPICAL LANE CUL-DE-SAC          AND HAMMERHEAD DESIGNS          FOR 10.00m LANES</b>		454.1004.009
No.	Date	Revision	App'd			City Engineer

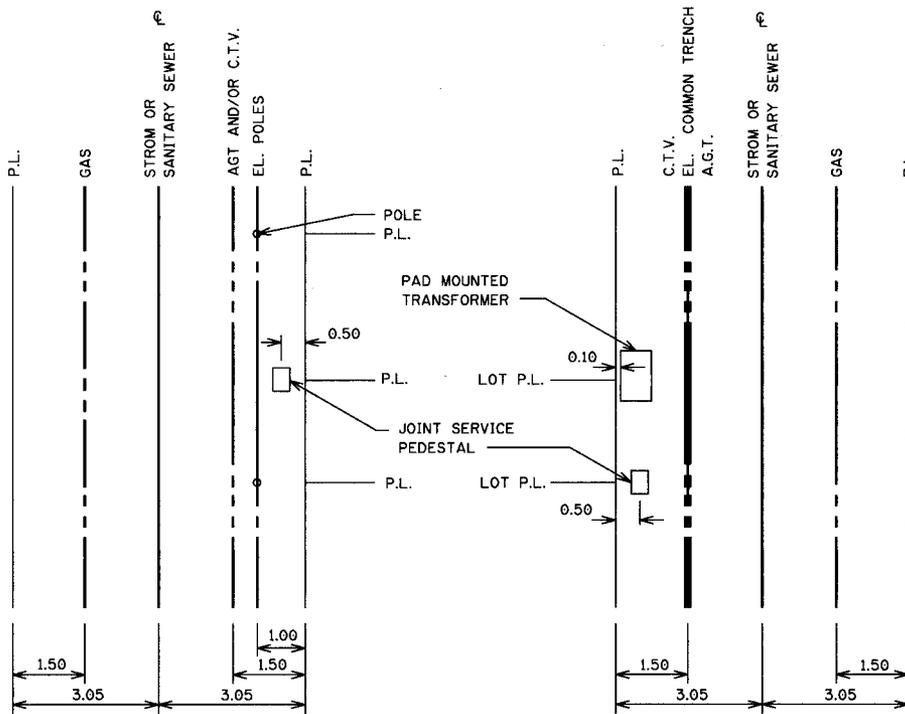


NOTE:  
 MINIMUM REQUIREMENTS IN 6.0m LANE  
 FOR S.U.9 TURNING VEHICLE ( NO CORNER  
 CUT POSSIBLE ON THE OPPOSITE SIDE )

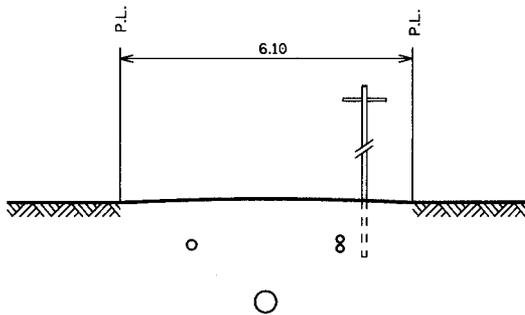
DIMENSIONS ARE METRES  
 UNLESS OTHERWISE NOTED



				Drawn AS	Date 96/05	 THE CITY OF CALGARY ROADS	Sheet <b>19</b>
				Scale NTS			File Number 454.1004.005
				Approved for CIV Engineer	<b>T - LANE INTERSECTION          MINIMUM REQUIREMENTS          FOR TURNING</b>		
No.	Date	Revision	App'd				

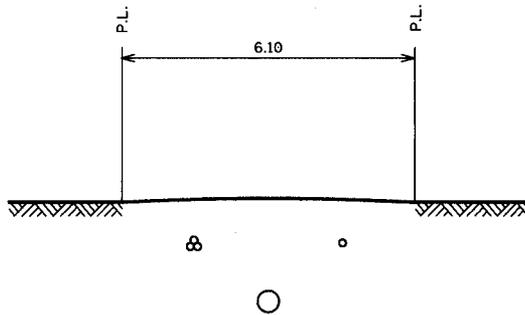


PLAN



ELECTRICAL DISTRIBUTION (OVERHEAD)

SERVICE VALVES ON 0.30 LINE BOTH SIDES.



ELECTRICAL DISTRIBUTION (UNDERGROUND)

SERVICE VALVES ON 0.30 LINE BOTH SIDES.

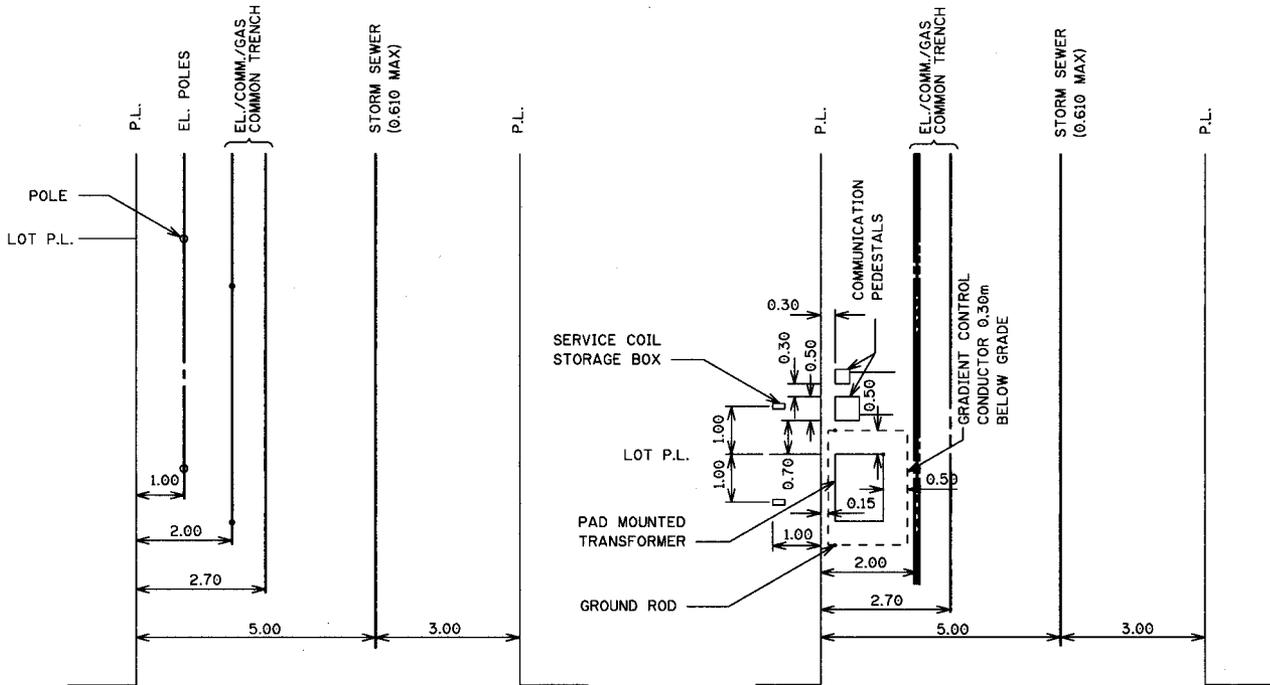
NOTE:

1. IN DOWNTOWN CORE, SERVICING ARRANGEMENTS TO BE CONSIDERED ON INDIVIDUAL BASIS.
2. NOT TO BE USED IN NEW DEVELOPMENT.

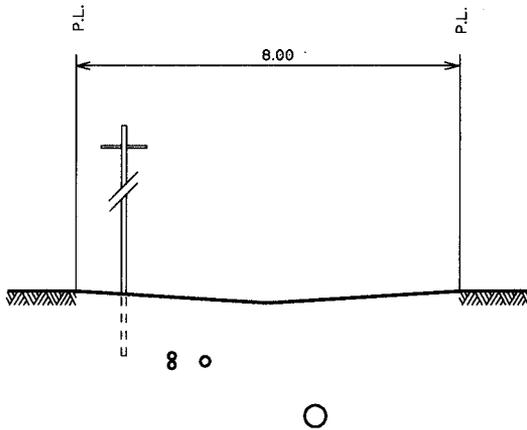
DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED



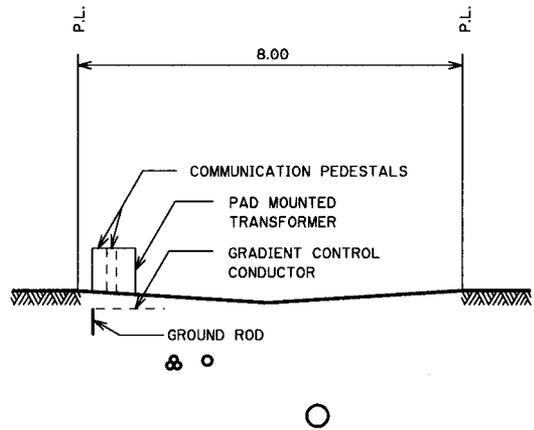
		Drawn R.B.T.		Date JUNE '94	 <b>THE CITY OF CALGARY</b> ROADS	Sheet
		Scale 1m 0 1m				<b>1</b>
		Approved for		 City Engineer	EXISTING LANES 6.10m WIDTHS	
No.	Date	Revision			App'd	File Number



PLAN



ELECTRICAL DISTRIBUTION (OVERHEAD)



ELECTRICAL DISTRIBUTION (UNDERGROUND)

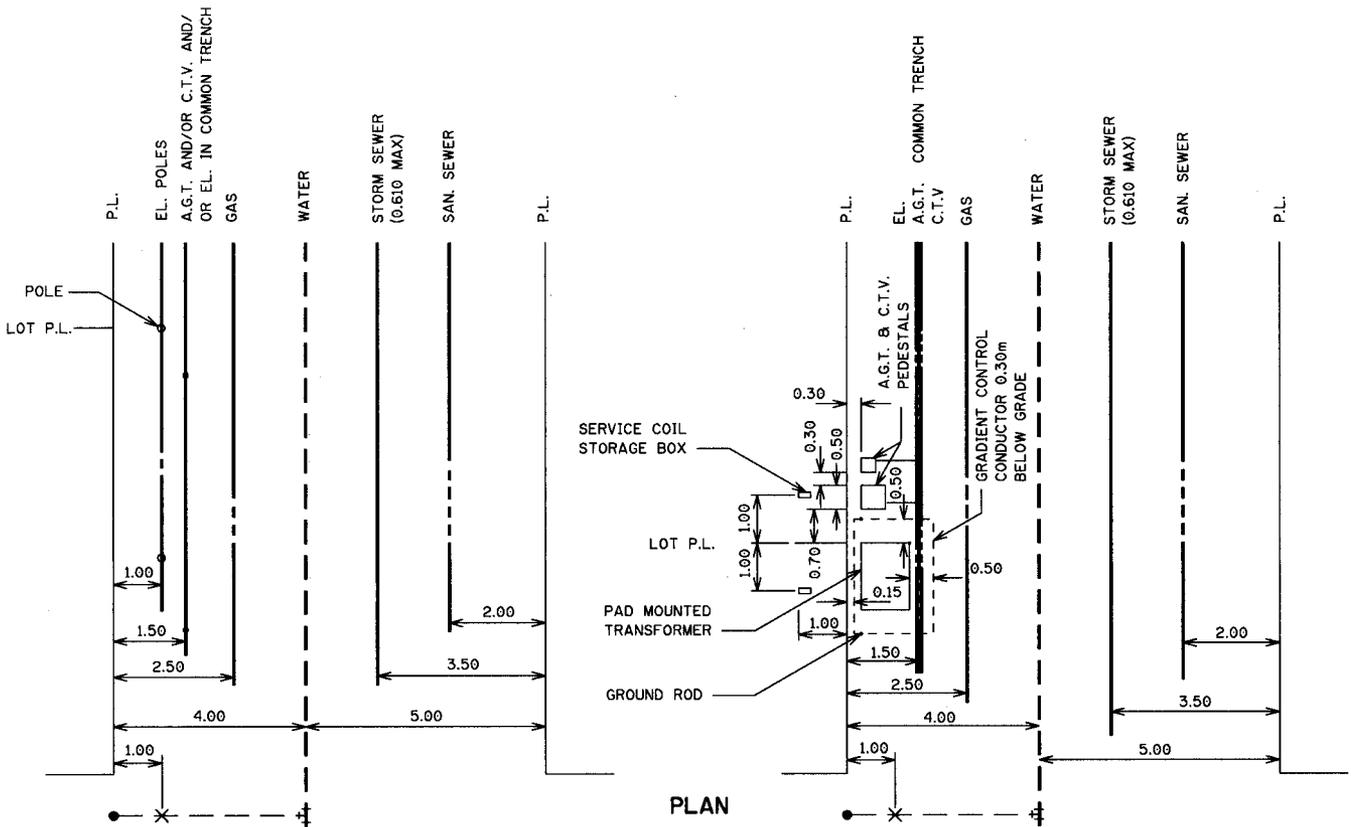
NOTE: 1. THE MAXIMUM SIZE OF STORM IS 610mm (24") DIAMETER & MAXIMUM DEPTH OF 3.50m.

EL/COMM/GAS COMMON TRENCH

COMMUNICATION PEDESTAL PLACEMENTS TO BE DETERMINED IN FIELD.

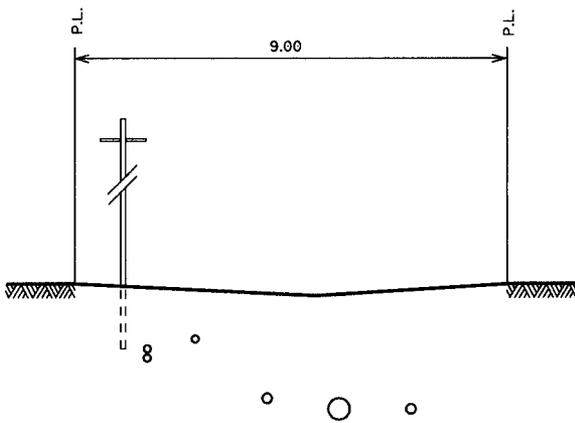
DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

		Drawn R.B.T. Date JUNE '94 Scale: 1m 0 1m Approved for <i>[Signature]</i> City Engineer		THE CITY OF CALGARY ROADS <b>STANDARD LANES</b> <b>8.00m WIDTHS</b>	Sheet <b>2</b> File Number 454.1008.036
2	03-11	REVISED STORM SEWER OFFSET			
1	01-01	COMMON TRENCH DIM. TO 2.0m/GAS TO OPP. SIDE			
No.	Date	Revision	App'd		



PLAN

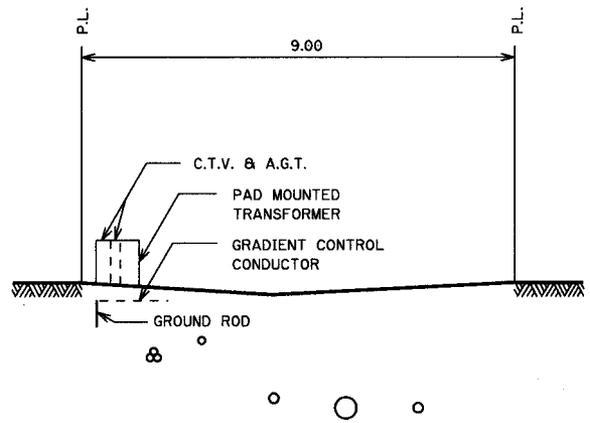
NOT TO BE USED  
IN NEW DEVELOPMENT



ELECTRICAL DISTRIBUTION (OVERHEAD)

C.T.V. ON POLES OR COMMON WITH A.G.T.  
SERVICE VALVES ON 0.50 LINE BOTH SIDES.

- NOTE:
1. THE GRADE OF THE STORM SEWER INVERT MUST BE LESS THAN 1.22 DIFFERENT THAN THAT OF THE SANITARY INVERT.
  2. THE MAXIMUM SIZE OF STORM IS 610mm (24") DIAMETER.
  3. POWER POLES, STREETLIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.0m CLEARANCE FROM HYDRANTS.



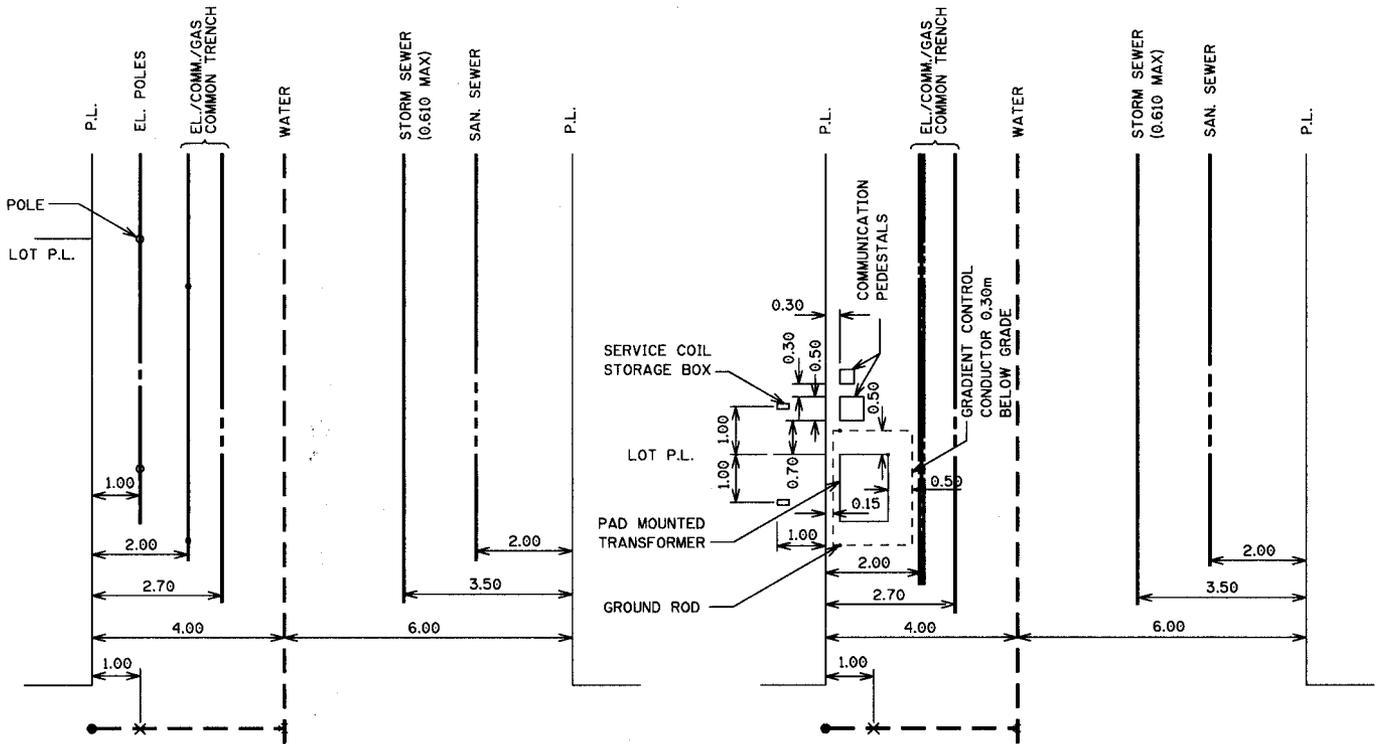
ELECTRICAL DISTRIBUTION (UNDERGROUND)

A.G.T., EL. AND C.T.V. IN SAME DITCH  
SERVICE VALVES ON 0.50 LINE BOTH SIDES.

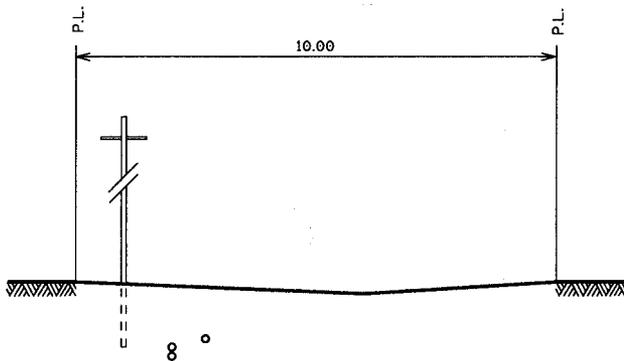
A.G.T. & C.T.V. PEDESTAL PLACEMENTS  
TO BE DETERMINED IN FIELD.

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

Drawn R.B.T.		Date JULY '94		<p>THE CITY OF CALGARY ROADS</p>	Sheet
Scale: 1m 0 1m		Approved for			<p>STANDARD LANES 9.00m WIDTHS</p>
No.	Date	Revision	App'd	City Engineer	
					454.1008.004



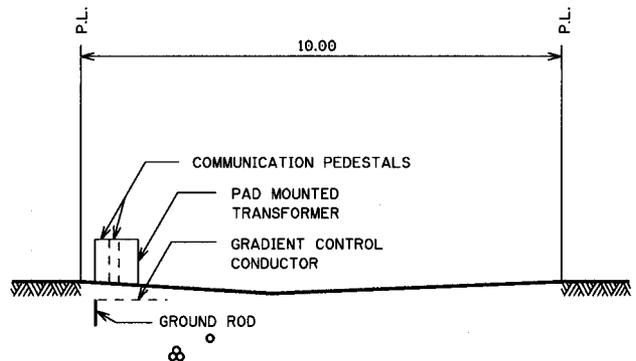
PLAN



**ELECTRICAL DISTRIBUTION (OVERHEAD)**

SERVICE VALVES ON 0.50 LINE BOTH SIDES.

- NOTE: 1. THE GRADE OF THE STORM SEWER INVERT MUST BE LESS THAN 1.22 DIFFERENT WITH THAT OF THE SANITARY SEWER INVERT.  
 2. THE MAXIMUM SIZE OF STORM IS 610mm (24") DIAMETER & MAXIMUM DEPTH OF 3.50m.



**ELECTRICAL DISTRIBUTION (UNDERGROUND)**

EL./COMM./GAS COMMON TRENCH  
 SERVICE VALES ON 0.50 LINE BOTH SIDES.

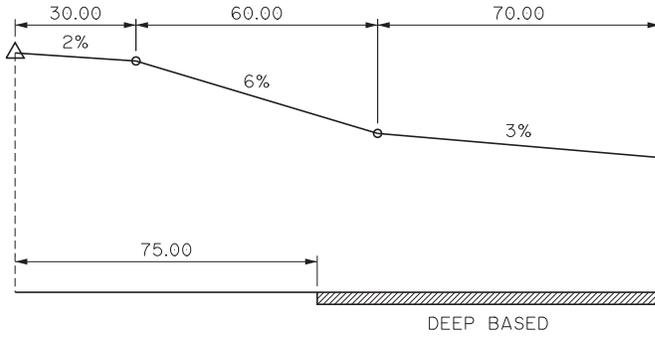
COMMUNICATION PEDESTAL PLACEMENTS  
 TO BE DETERMINED IN FIELD.

DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED

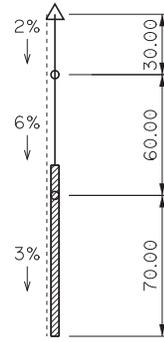
			Drawn R.B.T.	Date JULY '94	 <b>THE CITY OF CALGARY</b> ROADS	Sheet <b>4</b>	
			Scale: 1m = 0 1m	Approved for City Engineer <i>[Signature]</i>		<b>STANDARD LANES</b> 10.00m WIDTHS	File Number 454.1008.037
No.	Date	Revision	App'd				
1	01-01	COMMON TRENCH & GAS DIM. TO 2.00m & 2.70m					

# EXAMPLES OF DEEP GRAVEL BASE REQUIREMENT

1:

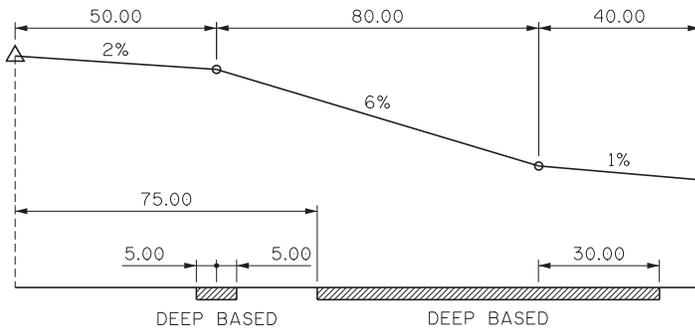


PROFILE

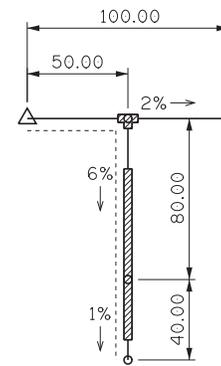


PLAN

2:

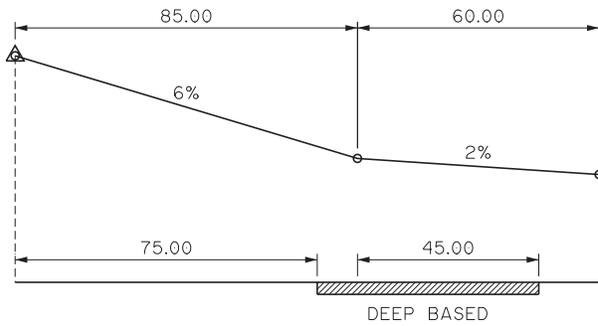


PROFILE

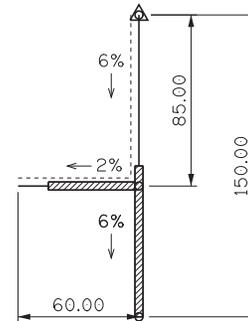


PLAN

3:



PROFILE



PLAN

**NOTES:**

1. PROFILES FOLLOW DOTTED LINE (.....) SHOWN ON PLAN
2.  $\triangle$  SOURCE OF LANE DRAINAGE

				Drawn SY	Date 09-02	 THE CITY OF CALGARY ROADS	DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED	
				Scale NTS			EXAMPLES OF DEEP GRAVEL BASE REQUIREMENT  (PROFILE & PLAN)	Sheet
				Approved for				File Number
No.	Date	Revision	App'd	City Engineer				

## D. 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:

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

**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 **page 117**, and the TAC manual.

The superelevation runoff is calculated based in the following formula:

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

where:

$$\begin{aligned} L_{\text{runoff}} &= \text{superelevation runoff (m)} \\ A &= \text{spiral parameter (m)} \\ R &= \text{centreline radius (m)} \end{aligned}$$

If transition spirals are used, (e.g. Major streets and Industrial Major 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 Major streets, Primary Collector streets, Collector streets and connector 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 kph) 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 runoff 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 Major streets to 6-lane Major streets), the superelevation should be developed by rotating about the inside pavement edge of the future widening.

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

For Local Major streets, Primary Collector streets, Collector streets and connector streets, a 15 m smooth vertical curve is required at the point where the tangent runoff 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.





## **E. SIDEWALKS, WALKWAYS, CROSSWALKS, BOULEVARD GRADES, COMMUNITY MAILBOXS**

### **1) Sidewalks**

Sidewalks are required:

- On both sides of Major streets, Industrial streets (with bus route), Local Major streets, Primary Collector streets, Collector streets and Residential Entrance streets
- On at least one side of Residential streets
- On at least one side of Industrial streets
- On one side of crescents with more than 40 dwelling units
- On one side of cul-de-sac with more than 20 dwelling units
- On one side of the stem portion of a “P” Loop and one on one side of the loop if there are more than 40 dwelling units
- Adjacent to multi-family, commercial and school sites
- To connect to Community Mailbox Locations
- Additional sidewalks will be required to provide network continuity or access to future developments, to the satisfaction of the General Manager, Planning and Transportation Policy.

If sidewalk is required only on one side of the street, it shall be constructed on the side with the most frontages.

The sidewalk on Major streets, Industrial Major streets, Local Major streets, Primary Collector streets, Collector streets and roadways over 10.5 m wide shall be of Class A concrete.

The sidewalk on Residential streets and roadways 10.5 m wide or less, except within 45 m of a roadway with Class A concrete, shall be of Class B concrete.

All sidewalk shall have a 2% cross slope.

Sidewalk slope should be flat for at least 1.1m of the sidewalk cross-section. This applies to High streets, Connector and Avenue cross-sections.

Grates of any kind are not permitted in sidewalks.

## 2) 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 pinned curb wall or 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.

## 3) Crosswalks

All crosswalks at intersections are to be shown on design plans, construction drawings, and all sidewalk connection required for sidewalk continuity and ties to crosswalks are to be provided.

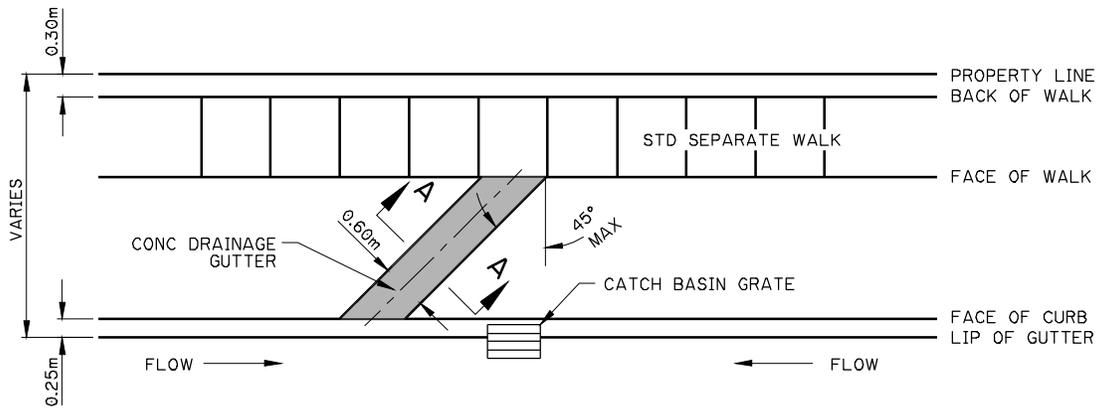
Wheelchair ramps must be provided at all intersection corners, all traffic islands and medians at crosswalks. Medians shall be cut back, wherever possible, if they are in conflict with the crosswalks.

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

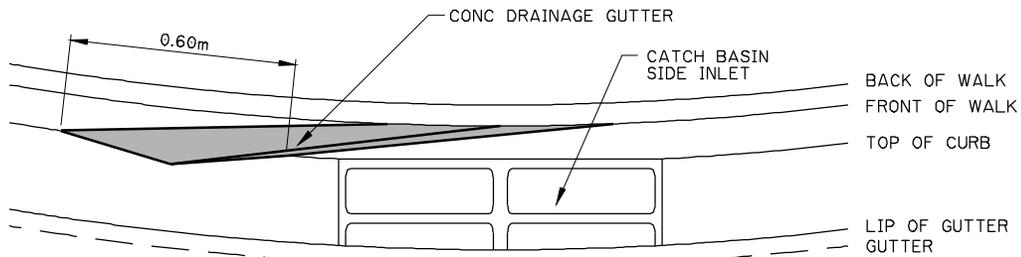
## 4) Boulevard Grades Next to Trapped Low

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

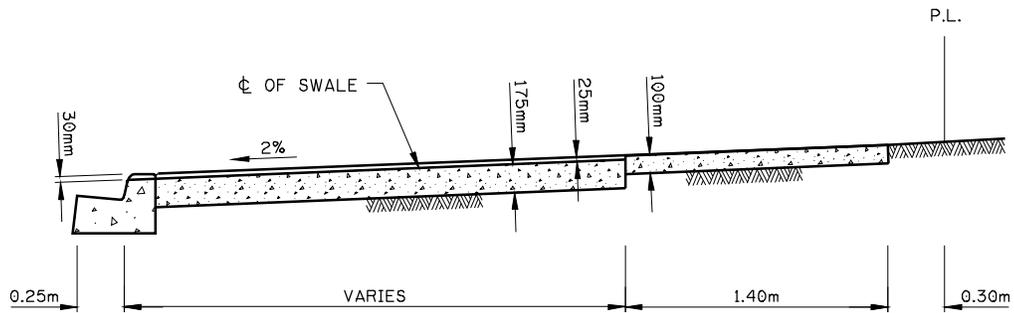
However, if the boulevard contains a separate sidewalk and is adjacent to a trap low of a depth of 0.3metres or greater, a drainage crossing as per specification 454.1013.019 shall be provided and is to be graded at 4% up from the top of the curb to the front of the walk to accommodate drainage of the sidewalk. **See diagram on page 121.**



**PLAN VIEW**



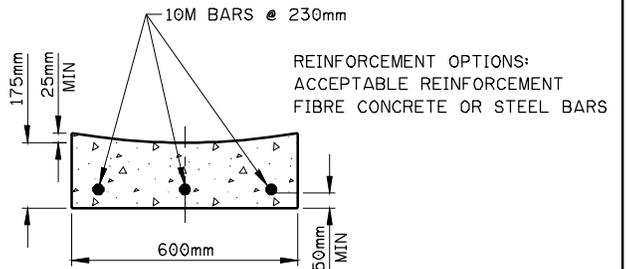
**PROFILE VIEW**



**CROSS SECTION**

**NOTES:**

1. ON ROAD WITH GRADE > 3% THE SWALE MUST BE "OFFSET" TO ALLOW BETTER FLOW.
2. TYPE 'B' 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-STREETS CONSTRUCTION CHAPTER 310.



**SECTION A-A**

				Drawn J.P.	Date 2009-06		DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED
				Scale N.T.S.	Approved for City Engineer		
1	2009-07	REVISED SWALE DIRECTION AND ADDED SWALE DETAIL		<b>BOULEVARD DRAINAGE CROSSING AT TRAPPED LOW FOR SEPARATE WALK</b>			File Number 454.1013.019
No.	Date	Revision	App'd				

## 5) Community Mailboxes

Community mailboxes must be located along sidewalks/walkways/pathways.

### F. 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.

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

$$\text{Guardrail Need Index} = \text{Basic Need Index} \times f_{sw} \times f_{hc} \times f_{cc} \times f_{pc} \times f_{rc}$$

where:

Basic Need Index = Value from **Table II-F.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

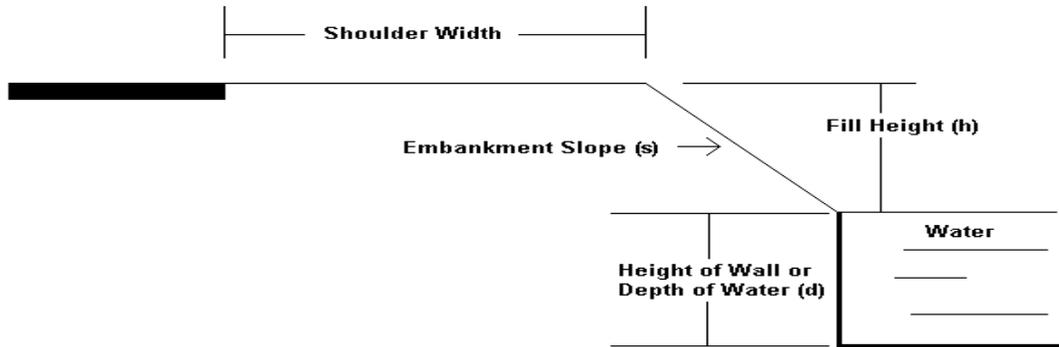
For Adjustment Factors refer to **Table II-F.3**

**Table II-F.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-F.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.: accident history). When examining the need for guardrail for expressways or freeways, and median barriers, a more thorough investigation should be undertaken as outlined in the TAC Manual.

**Table II-F.1: Warranting Values for Guardrail**

ROADWAY CLASSIFICATION & DESIGN SPEED (KM/H)	GUARDRAIL WARRANT VALUE
UCU 50 or UCD 50 (Various Collectors)	70
UAU 60 or UAD 60 (Majors)	70
UED 80 or UFD 100 (Expressways & Freeways)	50



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

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

<b>HEIGHT OF FILL (h) – metres</b>	<b>SLOPE 1.5:1</b>	<b>SLOPE 2:1</b>	<b>SLOPE 2.5:1</b>	<b>SLOPE 3:1</b>	<b>SLOPE 4:1 or Flatter</b>
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-F.3: Adjustment Factors to be Applied to Basic Need Index**

ITEM	FACTOR
<p><b>Shoulder Width, Overall (m), <math>f_{sw}</math></b>            3.6 or more            3.0            2.4            1.8 or less</p>	<p>1.00            1.05            1.10            1.15</p>
<p><b>Horizontal Curvature (As related to Design Speed), <math>f_{hc}</math></b>            Tangent or Flat Curve*            Intermediate Curve** to Flat Curve            Inside Curve           <ul style="list-style-type: none"> <li>• Minimum** or near minimum radius or isolated*** intermediate curve</li> <li>• Isolated minimum or near minimum radius curve</li> <li>• Inside curves with <math>R &lt; 170</math> m</li> </ul>           Outside Curve           <ul style="list-style-type: none"> <li>• Minimum or near minimum radius or isolated intermediate curve</li> <li>• Isolated minimum or near minimum radius curve</li> <li>• Outside curves with <math>R &lt; 170</math> m</li> </ul>           * Flat curve is a curve which is large enough that it does not require superelevation as per the superelevation tables shown on <b>Page 118</b> 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.</p>	<p>1.00            1.05            1.10            1.15            1.15            1.20            1.25            1.25</p>
<p><b>Climatic Conditions, <math>f_{cc}</math></b>            Freezing - Significant (Use for Calgary Climatic Conditions)</p>	<p>1.15</p>
<p><b>Downgrade or Profile Conditions, <math>f_{pc}</math></b>            2% or less            3%            4% or moderate crest V.C.* in combination with horizontal curve            5%            6% or extreme crest V.C.** in combination with horizontal curve            7% or more</p> <p>* 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.</p>	<p>1.00            1.05            1.10            1.15            1.20            1.25</p>
<p><b>Roadside Conditions, <math>f_{rc}</math></b>            Ground sloping away from toe of fill at the rate of:            10% or less            15%            20%            25% or more            For boulders on slope, buildings or road at toe of slope</p>	<p>1.00            1.10            1.15            1.20            1.20</p>

## G. BICYCLE PATHS AND REGIONAL PATHWAYS

If pathways are designed in parks area, refer to Section “PATHWAY TRAILS, PAVING STONES” in Development Guidelines and Standard Specifications for Landscape Construction instead of the following guideline.

### **Bicycle Paths (Regional Pathways)**

*Alignment Design Standards*

#### **RIGHT-OF-WAY**

- Where the bicycle path is constructed on its own legal registered right-of-way the minimum width shall be 3.0 m
- The minimum width of pathways within road rights-of-way is 2.5 m

#### **DESIGN SPEED**

Design speed = 25 kph

#### **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**

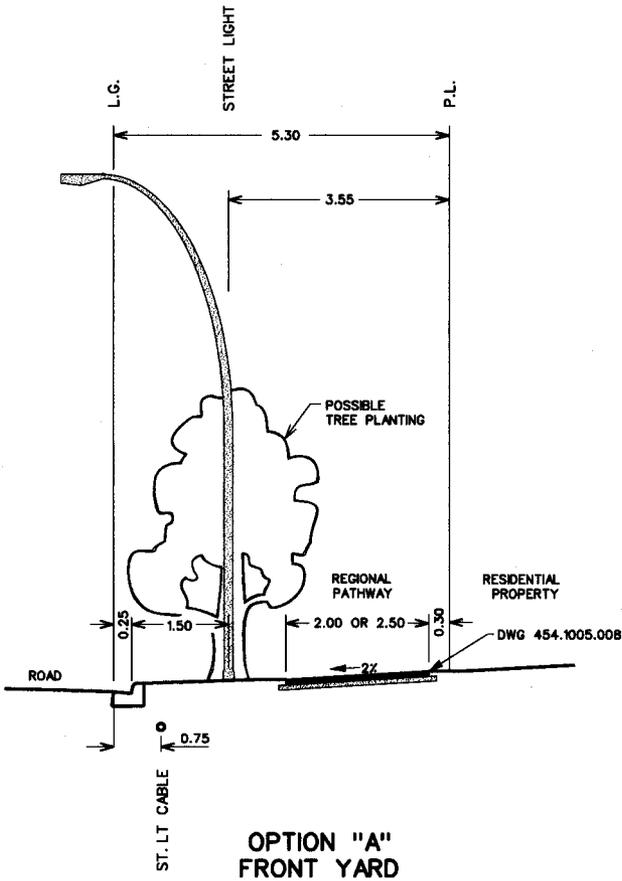
- The table below sets out the acceptable lengths for crest vertical curves:

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

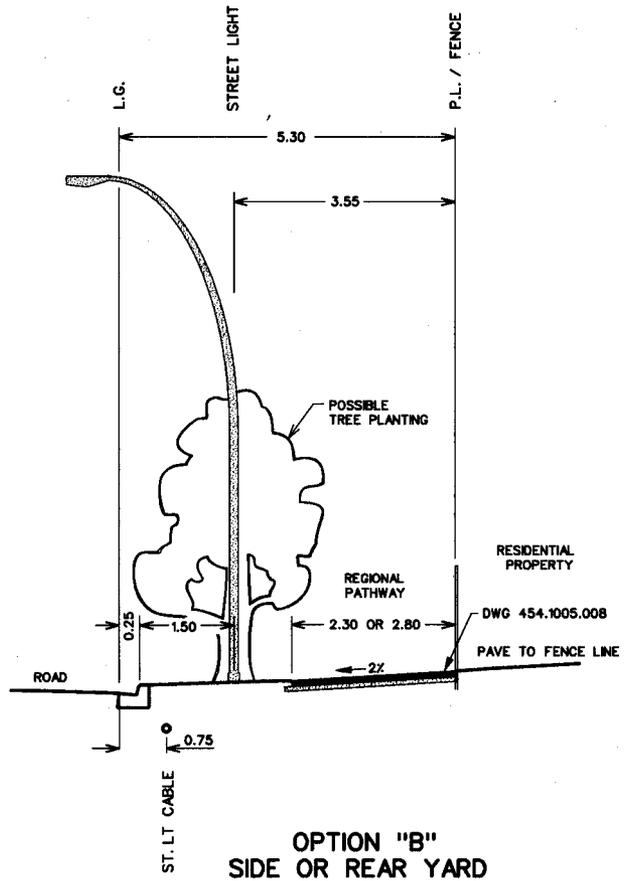
where:

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



**OPTION "A"  
FRONT YARD**



**OPTION "B"  
SIDE OR REAR YARD**

- NOTES:
- HYDRANTS ON 3.60 LINE
  - SERVICE VALVES ON 3.60 LINE
  - TREES ON 3.60 LINE IN BOULEVARD
  - TREES SHALL BE SHALLOW ROOTED SPECIES AS APPROVED BY PARKS/RECREATION DEPT.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE CENTERLINE OF POWER POLES & STREET LIGHTING POLES.
  - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 3.00 SEPARATION TO THE EDGE OF TRANSFORMER, PULL BOX / JUNCTION TERMINALS & OTHER SURFACE STRUCTURES.
  - THIS X-SECTION WILL APPLY TO ALL RESIDENTIAL OR COLLECTOR ROADS WITH LOCAL 2.0m OR REGIONAL 2.5m PATHWAYS.
  - ROAD R/W MUST BE WIDENED ACCORDINGLY TO ACCOMMODATE THIS X-SECTION.

			Drawn B.DORE	Date 99-01	 <b>THE CITY OF CALGARY</b> ROADS	DIMENSIONS ARE MILLIMETRES UNLESS OTHERWISE NOTED 
			Scale: N.T.S.			
			Approved for <i>[Signature]</i>		<b>PATHWAYS</b> 2.0m LOCAL & 2.50m REGIONAL PATHWAY	Sheet <b>30</b>
No.	Date	Revision	App'd	City/Engineer		File Number 454.1008.046
1	2007-05	ADDED STREET LIGHT CABLE, REVISED NOTE				

## H. CORNER AND ISLAND DESIGN

### 1) Corner Radii

The following are the various requirements for intersection corner radii (lip of gutter) and property corner cuts:

**Table II-H.1: Requirements for Intersection Corner Radii & Property Corner Cuts**

MAIN STREET	INTERSECTING STREET	LIP OF GUTTER RADIUS	PROPERTY CORNER CUT (or equivalent radius)
<b>Major</b>	Major	Page 66	Page 66
	Industrial Major	Page 72	Page 72
	Local Major	Page 75	Page 75
	Primary Collector	Page 75	Page 75
	Collector	Pages 82, 83 and 84	Pages 82, 83 and 84
<b>Local Major</b>	Local Major	12.25 m	4.5 m x 4.5 m
	Primary Collector	12.25 m	4.5 m x 4.5 m
	Collector	12.25 m	4.5 m x 4.5 m
	Residential Entrance	10.75 m	4.5 m x 4.5 m
	Residential	10.75 m	4.5 m x 4.5 m
<b>Primary Collector</b>	Primary Collector	12.25 m	4.5 m x 4.5 m
	Collector	12.25 m	4.5 m x 4.5 m
	Residential Entrance	10.75 m	4.5 m x 4.5 m
	Residential	10.75 m	4.5 m x 4.5 m
<b>Collector</b>	Collector	12.25 m	4.5 m x 4.5 m
	Residential Entrance	10.75 m	4.5 m x 4.5 m
	Residential	10.75 m	4.5 m x 4.5 m
<b>Residential Entrance</b>	Residential Entrance	9.25 m	4.5 m x 4.5 m
	Residential	9.25 m	4.5 m x 4.5 m
<b>Residential</b>	Residential	9.25 m	4.5 m x 4.5 m
<b>Industrial Major</b>	Industrial Major	15 m-50 m	Page 100
	Industrial	15 m-50 m	Page 100
<b>Industrial</b>	Industrial	15 m-50 m	Page 99

For expressway and freeway ramps the property line requirements will be provided by the City and are to be designed according to TAC standards.

### 2) Corner Details

Corner details are only required for expressway and freeway intersections and ramps. The plans are to include road design and corner details, including curve data, catch basins and a corner grade profile for each corner. The plans are to be drawn with Plan

Scale of 1:200, Horizontal Scale of 1:200 and Vertical Scale of 1:20.

### 3) Guidelines For Corner Details

Standard Drawing on **Page 83**, illustrates a typical type of Collector-Major 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 Major street requires a three centered horizontal curve (36 m-12 m-36 m). The road crossfall of the Major 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 Major street, usually 2%, to this midpoint. Extending the crossfall in this manner will provide for a smooth passage through the intersection for the Major 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 Major street is basically established with the striking of the grade for the Major 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 Major (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.

## I. TRANSIT AND SIGNAL REQUIREMENTS

### 1) 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.

See *City of Calgary Standard Specification – Roads Construction* drawing file numbers 454.1012.001 to 454.1012.007.

### 2) 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.

### 3) 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.

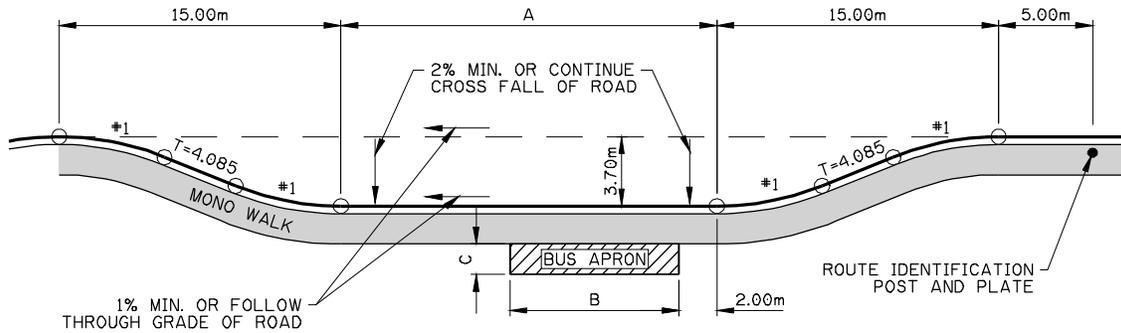
- b) For developments already approved and when a traffic signal is requested by a developer and is not currently scheduled for construction within the Council approved budget appropriation, the signal may be installed provided the developer pays the full cost of the signal in advance of construction.

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.

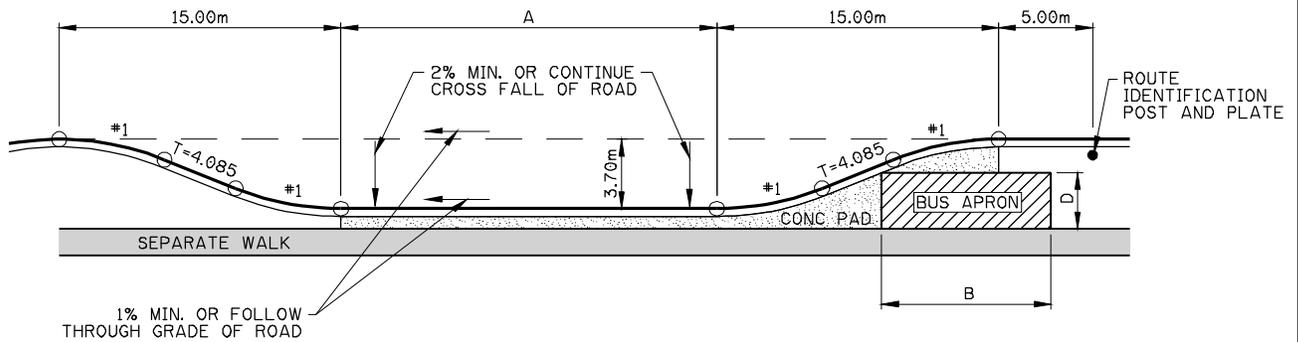
If the signal is not warranted at the time it is requested, the cost of the signal will be discounted at a rate of 20% per year until such time as the signal is warranted (to a maximum of five years). The discounted amount will be refunded to the developer, without interest, when funds have been approved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



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

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

### NOTES:

1. POST MUST BE A MINIMUM OF 0.50m FROM FACE OF CURB
2. CONCRETE PAVEMENT REQUIRED IN ALL BUS BAYS. THE THICKNESS SHALL BE 100mm AS PER DRAWINGS AND THE MATERIALS IS TO MEET CLASS 'A' CONCRETE SPECIFICATIONS AS LISTED IN SECTION 310.00.00 OF THE STANDARD SPECIFICATIONS ROAD 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

5	2008-11	SIDEWALK AND VARIABLE DIMENSIONS ADDED		Drawn	Date	<b>THE CITY OF CALGARY</b> ROADS	DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED	
4	2007-12	ADDED GRADE NOTES		J.T.R.	SEPT '96			
3	03-11	CHANGE TO 60 km/h AND ADDITIONAL NOTES		Scale	N.T.S.	<b>TYPICAL TRANSIT BUS BAY DESIGN</b> (60km/h - ROADWAY)	Sheet	
2	00-04	REMOVE CURVE #2 FROM TABLE		Approved for			<b>25</b>	File Number
1	98-12	ADD NOTE & NEW DIMENSION		City Engineer				454.1012.005
No.	Date	Revision	App'd					

## J. SOUND ATTENUATION AND VISUAL SCREENING REQUIREMENTS

### 1) 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, Planning and Transportation Policy.

A noise analysis is required for all residential development adjacent to Local Major streets, Major streets, Expressways, Freeways, 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 can be obtained from the City Clerk's Office.

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, Planning and Transportation Policy.

Where sound attenuation is not required adjacent to Major streets, Expressway and Freeway category roads, a uniform screening fence shall be provided (A 1.8m chainlink fence may be used along Expressways and Freeways). The maximum height of the uniform screening fence shall be 2.0 m.

### 2) 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.

## **K. EMERGENCY ACCESS TO PRIVATE SITES**

### **1) 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 may 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.

## 2) Access

### i. 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.

### ii. 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.

### iii. 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.

### iv. 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.

### v. 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.

**vi. 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
<b>&lt;101 Dwelling Units</b>	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).
<b>101 – 600 Dwelling Units</b>	2 accesses required (second public or emergency access route).			2 accesses required (second public access route only).
<b>&gt; 601 Dwelling Units</b>	3 accesses required (only one emergency access is permitted).			

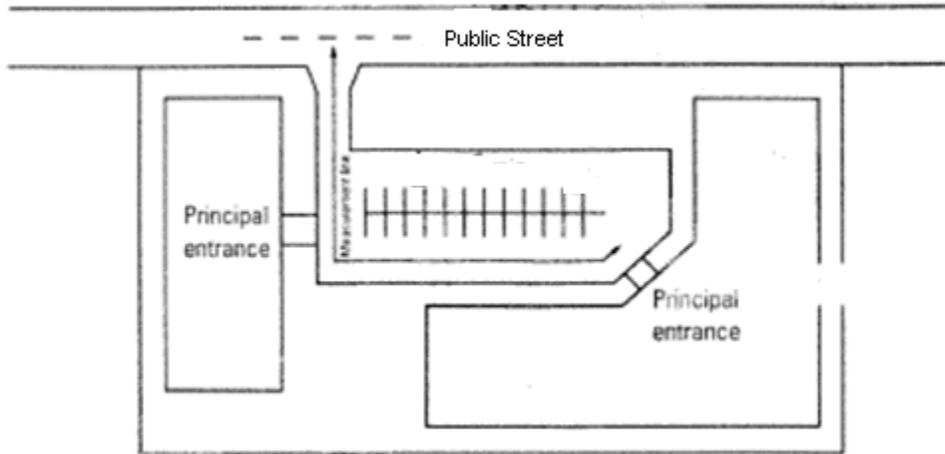
**Non-Residential Requirements Based on Parking Stalls**

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.

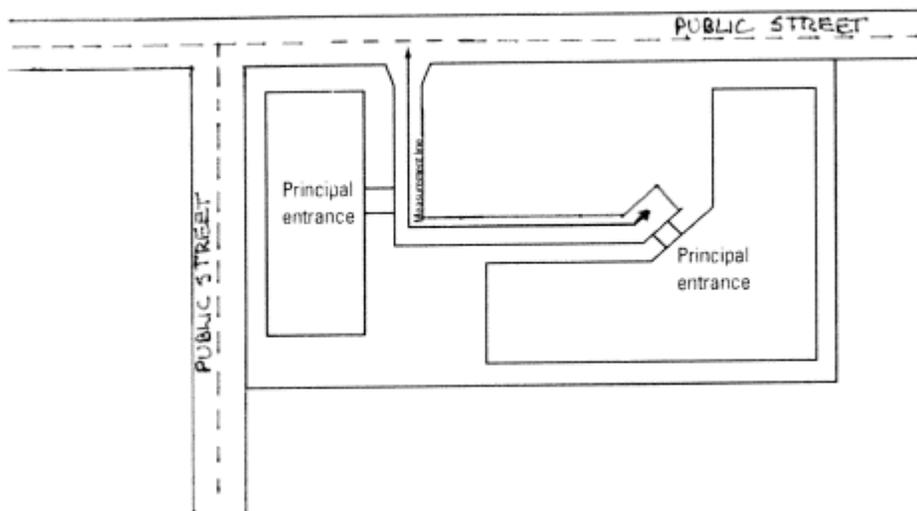
### vii. Measurement of Primary Access Route



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.

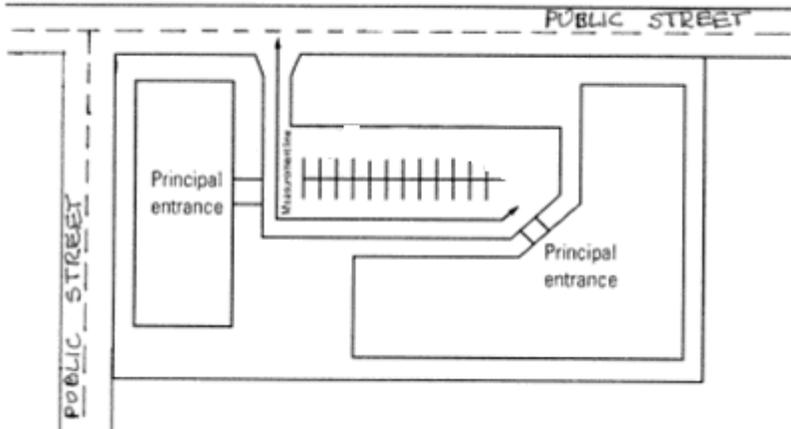
The number of access routes is also dependant on the length of the Measurement Line. The more stringent requirement between dwelling unit and access route length will apply. See the following sections.

### viii. 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.

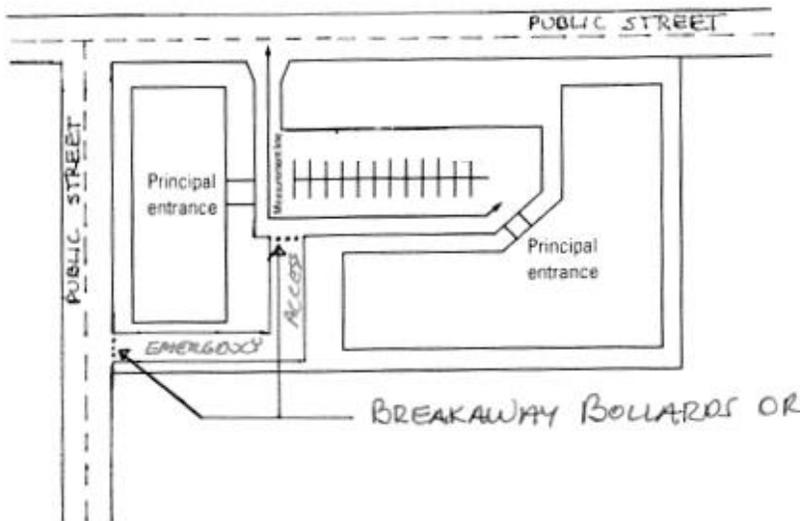
**ix. Access Route Between 90m and 120m**



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 Lane Cul-de-Sac and Hammerhead Designs for 6.10m Lanes".

**x. 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.

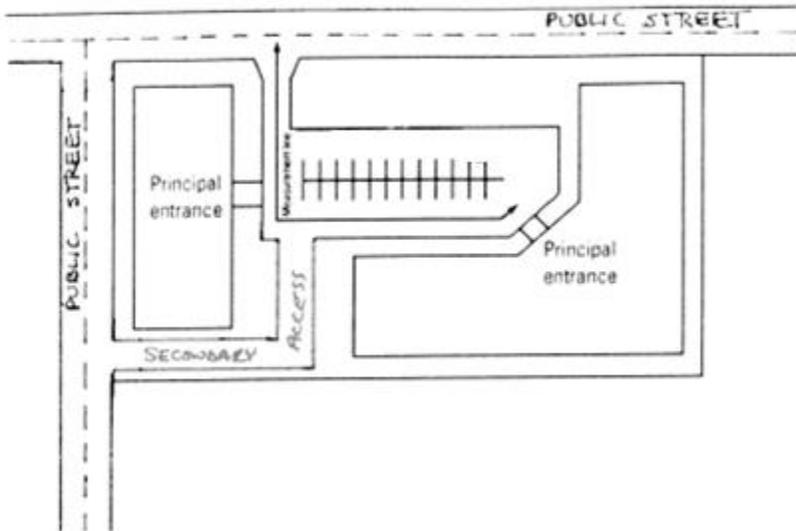
Only one emergency access route is allowed per site. Other accesses must be second public access routes available for public use.

Breakaway bollards, gate design and signage specifications are provided in the City of Calgary Standard Specifications – Roads Construction. 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.

**xi. 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.

## **xii. Access Route Design Criteria**

The access route shall be a minimum of 6m wide hard surface. See section 4.2.14 for required widths and their relation to on street parking.

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.

### **xiii. 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.

### **xiv. 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.

### **xv. 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.

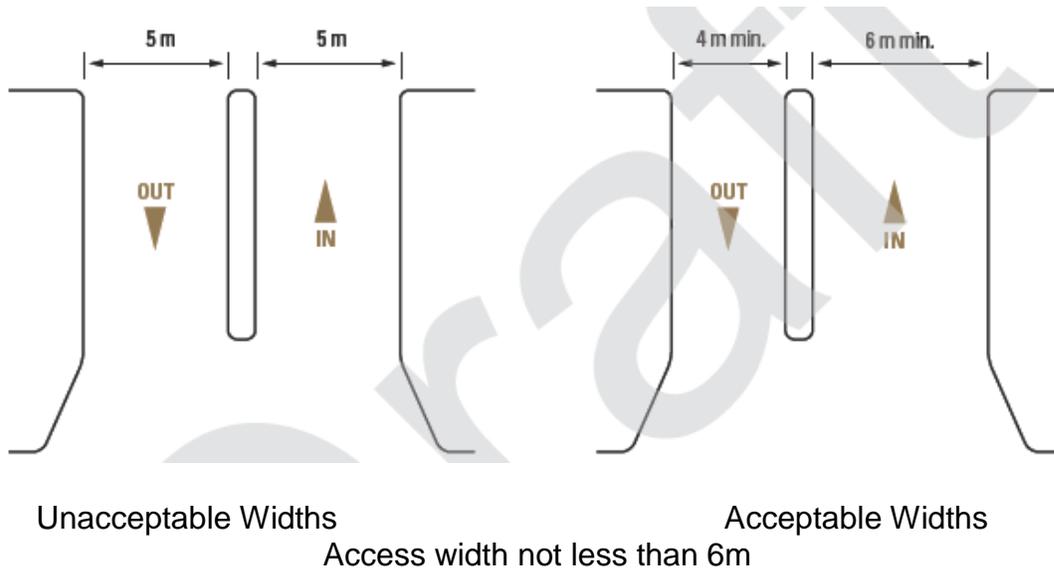
## **3) Maintenance of Access Routes**

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.

#### 4) Split Entry Access Driveways



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.

#### 5) Roundabout Design

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.

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# **SECTION III: WATERWORKS**

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# WATERWORKS

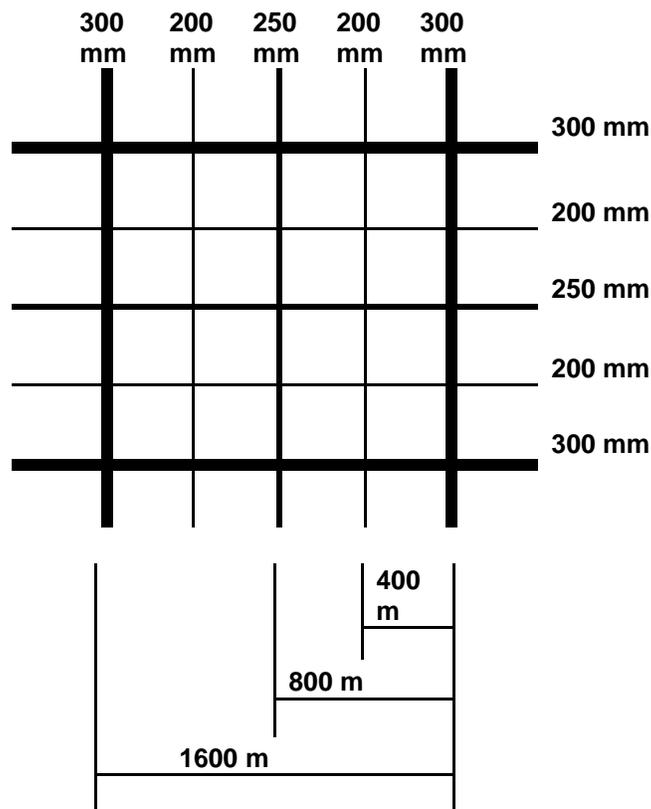
## A. GENERAL

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

- g) 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:

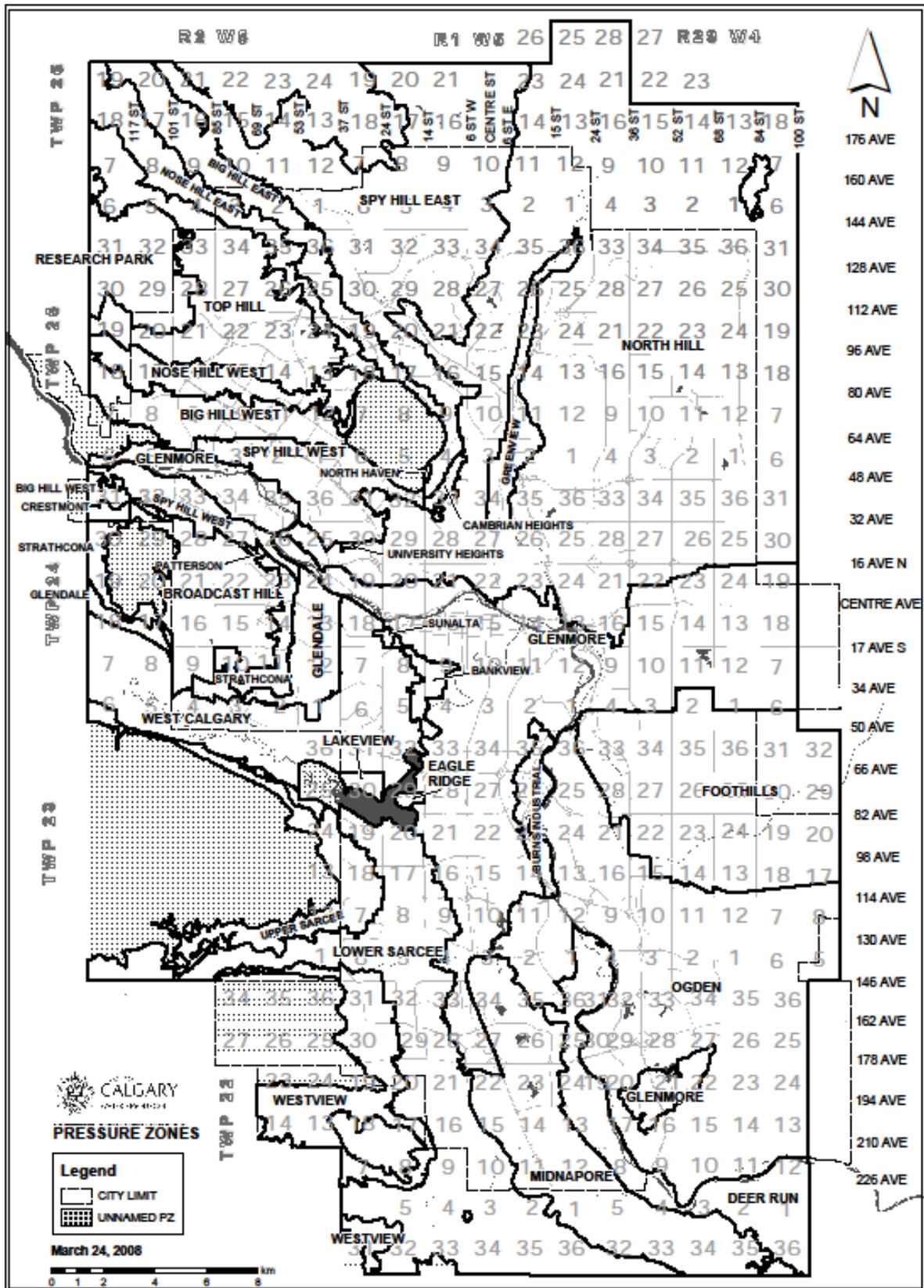
Note: Above to be confirmed by actual survey and supporting consultant grade sheets upon installation.

- h) 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.
- i) 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.
- j) 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.

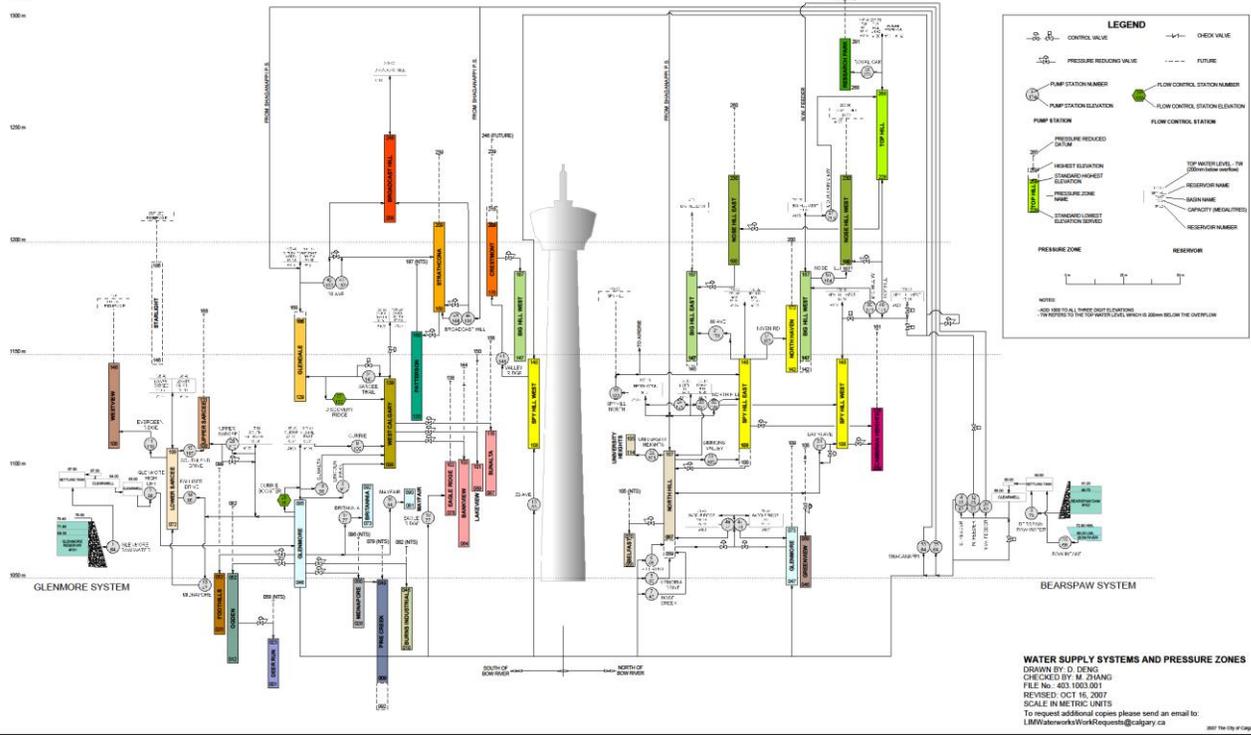
### **3) Pressure Zones**

- 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 150 and 151.***



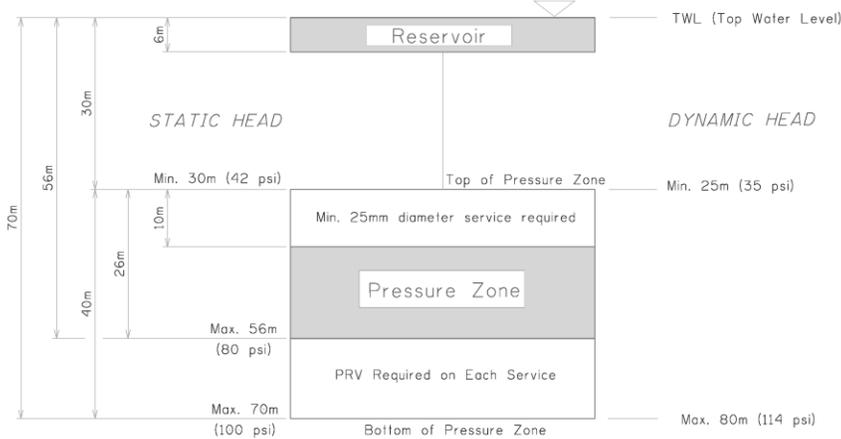


# WATER SUPPLY SYSTEM AND PRESSURE ZONES



**WATER SUPPLY SYSTEMS AND PRESSURE ZONES**  
 DRAWN BY: D. DENG  
 CHECKED BY: M. SHANG  
 FILE No.: 403.1003.001  
 REVISED: OCT 16, 2007  
 SCALE IN METRIC UNITS  
 To request additional copies please send an email to: LIMWaterworksWorkRequests@calgary.ca  
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## City of Calgary Pressure Zone Criteria



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 of 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).



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#### 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) Feeder mains

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

- a) All proposed and future feeder mains, 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 feeder mains 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 C.2 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 C.2 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.

### 2) Coverage

- a) Low Density Residential:
  - (i) 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. CATHODIC PROTECTION

- 1) The Distribution system shall be provided with cathodic protection as outlined in Section 504.07.00 of the Standard Specifications, Waterworks Construction.

Design Guide for Cathodic Protection for Yellow Jacket Ductile Iron Pipe Distribution System by Sacrificial Anodes.

1. Determine the total coated surface area of the system (**see Table III-F.2: Surface Area of Ductile Iron Pipe per Length Unit**).
2. Determine the equivalent bare area of the system. Assume 1.5% of the total coated surface area is bare.
3. Determine the current requirement to protect the bare metal. Assume 22 mA of current is required per square metre of pipe.
4. Determine the total number of anodes to protect the system. Use a design life of 30 years (**see Table III-F.3: Expected Anode Life Magnesium Anodes**).

Use the following table to compute the anode requirement. This table must appear on the "Water Cover Sheet" of each subdivision.

This table serves as a record for the corrosion control maintenance personnel.

**Table III-F.1: Cathodic Protection**

ELEMENTS BEING PROTECTED	SIZE OF PIPE (mm)					
	100	150	200	250	300	400
Pipe Lengths Metres						
Hydrant Leads Valve and Casing (4.7 m of 150 mm Y.D.I. per unit)						
Hydrant Barrels (3m of 150 mm Y.D.I. per unit)						
Total Length Metres						
Surface Area, m <sup>2</sup> (length x m <sup>2</sup> /m)						

Total Surface Area \_\_\_\_\_ m<sup>2</sup>  
 Bare Metal (Multiply x 0.015) \_\_\_\_\_ m<sup>2</sup>  
 Current (m<sup>2</sup> x 22 mA/ m<sup>2</sup>) \_\_\_\_\_ mA  
 Total Number of Anodes \_\_\_\_\_ Anodes required

**Table III-F.2: Surface Area of Ductile Iron Pipe per Length Unit**

PIPE SIZE	m <sup>2</sup> /m
400 mm	1.388
300 mm	1.053
250 mm	0.886
200 mm	0.722
150 mm	0.551
100 mm	0.383

**Table III-F.3: Expected Anode Life for Magnesium Anodes**

CURRENT	ANODE SIZE		
	7.5 kg	9.1 kg	14.5 kg
25 mA	33.5 years	39.4 years	63.1 years
50 mA	16.8	19.7	31.6
75 mA	11.2	13.1	21.0
100 mA	8.4	9.9	15.8
125 mA	6.7	7.9	12.6
150 mA	5.6	6.6	10.5
175 mA	4.8	5.6	9.0
200 mA	4.2	4.9	7.9

**Note:**

- Use 7.7 kg anodes in low resistivity environment (e.g. clay, glacial till, etc.)
- Use 9.1 kg anodes in high resistivity environment (e.g. sand, gravel)
- Use 14.5 kg anodes only to protect existing unprotected mains (i.e. at tie-in points to existing mains)
- Use a maximum of three anodes per test point installation

The following abbreviations shall be used on design and as-built drawings to denote elements required for cathodic protection:

- YDI = Yellow jacket Ductile Iron Pipe
- X = Sacrificial Anode
- Y = Impressed Current Anode
- T = Test Point
- R = Rectifier

e.g. 2-7.7-X-76-03

Where:

- 2 = Number of Anodes
- 7.7 = Weight of Each Anode in Kilograms
- X = Type of Anode
- 76 = Year of Installation
- 03 = Month of Installation

When using PVC pipe, all metallic fittings, valves, hydrants, etc. shall be cathodically protected as specified in the **Standard Specifications Waterworks Construction**.

## **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 AND STORMWATER**

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# WASTEWATER AND 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 feeder mains, often defined as 500 mm in diameter 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 diameter 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 constructed 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) All sanitary sewers and any storm sewers subject to surcharge shall have rubber gaskets.
- c) Concrete sewer mains over 300 mm in diameter shall be reinforced concrete pipe.

## 2) Sizing

**Table IV-C.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-C.2**. Additional information can be found in Section 403.05.01 of the Standard Specifications for Sewer Construction.

## 5) Line Assignments Through Round-Abouts

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

**Table IV-C.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-C.3** below.

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

Nominal Pipe Size (mm)	SANITARY		STORM		WEeping TILE	
	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<sup>3</sup> 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-D.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:

- 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<sup>3</sup>  
Live Load: CL-800

Should an engineered backfill be utilized with densities markedly higher or lower than this 2165 kg/m<sup>3</sup> 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](http://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.

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**SECTION V  
GEOTECHNICAL AND  
HYDROGEOLOGICAL  
REQUIREMENTS**

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# GEOTECHNICAL AND HYDROGEOLOGICAL REQUIREMENTS

## A. GENERAL

- a) Geotechnical Reports are required in order to confirm the adequacy of the lands to support the development(s) being proposed with the application. The reports are to be paid for by the Developer and prepared by a qualified Geotechnical Engineer licensed to practice in Alberta.
- b) Three 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, and c), Deep Fills Reports. The general Geotechnical Evaluation Report has a broad context while Slope Stability and Deep Fills Reports specifically deal with certain aspects of the geotechnical conditions on site(s).
- c) The work undertaken for the evaluation(s) should include methods such as desk study, air photo examination, field reconnaissance, parametric analysis, and engineering judgment.
- d) 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.

- e) Based on the recommendations of the Geotechnical Report(s), the Director, Roads 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.

- f) 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. GEOTECHNICAL EVALUATION REPORTS**

- a) A (general) Geotechnical Evaluation Report shall be submitted to the Urban Development Division prior to outline plan submission. The report should use comprehensive method(s) of analysis to clearly define geotechnical conditions and to confirm the geotechnical conditions are adequate for the site.

The report shall identify geotechnical issues, amongst other things, with regards to the slope of the subject lands where existing or final design slopes exceed fifteen (15%) percent or where past instability subsidence, erosion, seepage and previous land use is in evidence; and further recommend the preparation of other geotechnical reports such as, Slope Stability report, Deep Fills report, etc. according to The City Of Calgary guidelines.

- b) The evaluation shall include a plan which classifies the terrain according to the following categories:
  - i) Lands free from geotechnical hazards.
  - ii) Lands requiring further investigation before they can be developed; and
  - iii) Lands unsuitable for development from a geotechnical point of view.
- c) Evaluation of natural hazards shall be undertaken by a Professional Engineer, qualified in the field of geotechnical engineering and registered with APEGGA.
- d) The following geotechnical reports shall be submitted concurrent with an Outline Plan submission and/or a submission of Land Use Redesignation application. If not received at that time, then the report will be required prior to tentative Plan or prior to approval of the Development Permit, whichever applicable.
  - i) Additional geotechnical reports identified as being necessary as per the above item a).

- ii) Above, including, but not limited to, a Geotechnical Report for Slope Stability.
- e) The Geotechnical Evaluation Report shall contain the following information as minimum:
  - i) Introduction – project description, scope and purpose of the investigation;
  - ii) Site description and characteristics – site geology and topography;
  - iii) Site & Laboratory investigation – the equipment and procedure used for testhole drilling, the types of soil and rock samples and the procedures used in their collection, field tests and the procedures used, testhole logs, the type of laboratory tests performed;
  - iv) Analysis of field & laboratory test results and conclusion : soil conditions, groundwater conditions, geotechnical concerns;
  - v) Recommendation(s) with regard to site grading, foundations, retaining walls, slab-on-grade, construction procedures, concrete type, pavement design, weeping tile sub-drains, testing and inspection during construction.

## **C. SLOPE STABILITY REPORTS**

- a) Slope Stability Report(s) are required to define stable and unstable lands within the area set out in the report. The stability of the land often dictates the boundaries of the development. The report outlines the operational rules and restrictions required for any portion of the lands to ensure that the lands remain stable in the long-term.
- b) Slope Stability Reports are required prior to issuing a Development Permit and/or a Building Permit whenever any slope across a property is 15% or greater in gradient or the development is to be located within a zone where an imaginary line drawn from the toe to the top of an embankment exceeds a slope of 1 (V) in 3 (H). Where a proposed development does not have existing or proposed grades in excess of 15%, then the Geotechnical Engineer shall submit a certified letter to that effect.
- c) A Slope Stability Report may in some cases be required at the Outline Plan stage. The Slope Stability Report is

requested prior to the Approval of the Tentative Plan or prior to the Approval of the Development Permit, if applicable, whichever occurs first. Where lands at the Outline Plan stage are defined as unstable they shall be zoned as Environmental Reserve (ER).

- d) No development shall occur if the Factor of Safety (Fs) against slope failure is less than 1.5. Lands with Fs equal to or greater the 1.5 will be acceptable for development from a slope stability point of view. Where the Fs is less than 1.5, the slope may be modified, subject to the approval of the appropriate approving authority, using remedial measures that are to the satisfaction of the Manager, Urban Development, to increase the Fs to a minimum of 1.5, thus increasing the area able to be developed.
- e) The Slope Stability Report shall contain the following information as a minimum:
  - i) Property lines;
  - ii) Stability limit, in the form of Setback Lines, established with respect to most probable adverse ground water and loading conditions. This stability limit shall be shown on the site plan concurrently with the footprint of the proposed development including building, structure, etc.;
  - iii) Top of embankment or escarpment;
  - iv) Toe of slope;
  - v) Where development at the toe of slope is proposed the report is to address the effect and extent of slope failure on the subject land and the adjacent properties and the protection of same; and
  - vi) Erosion control and other mitigation measures, such as drainage works, grading, etc.
  - vii) A statement stating that: “the stability analysis and the results shown in this report comply with all the requirements of The City of Calgary guidelines for slope stability”.
- f) In addition to the above, it may be required, in specific cases to evaluate in detail:
  - i) Building locations and foundation design; and
  - ii) The effect of surcharges due to proposed structures, retaining walls and future site grading.

- g) Certification from a geotechnical engineer that a set back line, if applicable, shown on the outline plan is in compliance with the recommendations of the Slope Stability Reports. The Slope Stability Report may be submitted concurrently with the setback line certification;
- i) Certification from the geotechnical engineer that the site in its post development form, i.e. re-graded, would be compliant with the recommendations of the Geotechnical Evaluation Report and the Slope Stability Report.

## **D. DEEP FILLS REPORT**

- a) A deep fill shall be defined as compacted soil or broken rock placed to a depth of more than two metres over the natural ground. Detailed requirements for the Deep Fills report are listed in The City of Calgary guidelines titled “Geotechnical Reports for Deep Fills”. “Deep Fills Report” means a geotechnical analysis of the soils within the Development Area by a Geotechnical Engineering Consultant prepared in accordance with The City’s “Guidelines for Preparation of Deep Fills Report”, as amended and replaced from time to time, which certifies, amongst other things, that all fill material was placed and compacted in accordance with City Specifications and includes recommendations or special foundation designs necessary to ensure the integrity of any structure constructed in fill areas. The report will be used to determine the nature of soils and ground water and engineering strength of the soils, which will determine the parameters for the design of the Infrastructure and private development anticipated to be constructed within and external to the Development Area, and will warrant the suitability of the private lots within the Development Area for the intended purpose;
- b) A Geotechnical Report for Deep Fills is required for all tentative plans with areas which will have fills of more than 2.00 metres in depth, if the proposed development will not have any fills in excess of 2m, and then the Geotechnical Engineer shall submit a certified letter to that effect.
- c) Deep Fills report shall contain a plan showing areas of cuts and fills. The interval between the ground elevation contours shall be no more than 1.00 metre. The Director, Roads may

defer the submission of a cut and fill plan until the first tentative plan is submitted.

- d) Based on the recommendations of the Deep Fills Report, the Director, Roads 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 the tentative plan area shall indicate which lots are encumbered with the Development and Geotechnical Covenant.

## **E. 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 APEGGA. The Report is submitted to The City of Calgary Roads Material and Research Business Unit 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. See Chapter 29 Section (f) 7

See the following Urban Development Division Reports for more Detailed Information:

- *Geotechnical Reports for Deep Fills 1991 September 03*
- *Geotechnical Reports Requirements for Developments. 1992 January 24*
- *Geotechnical Reports for Slope Stability 1992 January 10 and 1993 November 22*

## **F. ROADWAY DRAINAGE**

When the groundwater 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 a Professional Engineer, identifying the measures necessary to prevent frost damage. Recommendations will include alternatives such as insulation, subdrains, gravel blankets, etc.

Four (4) copies of these reports are to be submitted through the approving authority of the *Transportation Department* and subsequently to be reviewed by the Materials and Research Engineer, Calgary Roads.

## **G. 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.

## H. RETAINING WALL

### Retaining Wall Permit Application Requirements

**Application Acceptance Check List for DP:** \_\_\_\_\_

***Retaining wall permit application shall, as a minimum, include all the requirements listed below.***

#### 1. Design, Drawings and Maintenance:

***General:***

- The design has been sealed and signed by a Professional Engineer or Geotechnical Engineer registered in Alberta. (If not, application can not be accepted)

***Design (must specify code(s) used in the design)***

- City of Calgary – Design Guidelines for Bridges and Structures;  
 Alberta Building Codes;  
 Canadian Foundation Engineering Manual;  
 Other (specify) \_\_\_\_\_
- Is there any load on top of the wall (surcharge load) i.e. roadway, vehicles, storage, buildings, back slope etc. Please (specify)  
\_\_\_\_\_

***Drawings:***

- The drawings are presented on 11x17 size paper or larger;  
(If not, application can not be accepted)  
 The drawings are numbered in S1, S2.....Sn sequence;  
(If not, application can not be accepted)

***Retaining wall maintenance will be 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 (type clearly identified on drawings)  
 cast in place concrete  
 prefabricated concrete panels

- timber
- other (specify) \_\_\_\_\_

**Soil parameters and drainage:** (check if yes)

- Soil type must be specified on drawings or in report;
- Geogrid must be specified on drawings along with min. required embedment length;
- Saturated soil;
- Irrigation system behind or on top of the wall;
- Drainage provided on top and within the backfill;

**3. Factors of Safety (FOS) and Geotechnical:**

<b>Factors of safety for:</b>	City of Calgary	Actual wall design
<input type="checkbox"/> Sliding.....	1.5.....	_____
<input type="checkbox"/> Overturning.....	2.0.....	_____
<input type="checkbox"/> Bearing Capacity.....	2.0.....	_____
<input type="checkbox"/> Geo-grid pullout and overstress.....	1.5.....	_____

*If geogrid has not been used, use N/A*

**Geotechnical Report:** (check if yes)

- '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:**

- By checking this box the applicant accepts to provide, at the end of construction, 'The Letter of Construction Conformance' to the City of Calgary, "Building regulations" stating that construction was completed in accordance with the design documents provided for this DP application. The letter must be signed and sealed by a qualified professional engineer supervising construction. Failure to submit the 'Letter' may cause the City to consider the wall unsafe and request removal of the wall on applicant's expense.

**Applicant's Signature:**

**Date:**

---

**(Confirming that all required information has been provided and is correct)**

**Screened by:**

**Date:**

## I. 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.

## J. HYDRO-GEOLOGICAL EVALUATION

Where underground water is a concern, hydro-geological 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. Detailed hydro-geologic reports typically include but not limited to the following elements:

a) Report Format

The followings items should be included in the report.

- Title Page
- Signature Page
  - Identify client or party that commissioned the report.
  - Indicate that The City of Calgary may use the report findings to mitigate current/potential groundwater issues.
  - Name geologist(s) in charge for the preparation of the report. A disclosure statement of the geologist's financial interest, if any, in the project or client's organization, should also be clarified. The geologist(s) responsible for the report shall sign and stamp the hydro-geologic report.
- Table of Contents
- Lists of Tables, Figures, and Appendices
- References and Data Sources
- Tables, Figures, and Appendices
- Executive Summary

b) Introduction

c) Purpose and Scope

- State the purpose and scope of the report and hydrogeology investigation, including a proposed use of a site. Also, identify the level of the study, i.e., feasibility,

preliminary, or final. Summarize the report in an executive summary.

- Describe the location and size of the study area, and its general setting with respect to major or regional geographic and geologic features. Describe the general nature, distribution, and surface exposure of earth material within the study area.

d) Methods of Data Collection: Data collection methods, dates and procedures should be documented.

- Field Investigation: Field data collection techniques should be described. If relevant, field data collection forms or photocopies of field log books should be presented. Describe field data collection and exploration procedures (i.e., surface geologic reconnaissance, drilling, trenching, geophysical surveys and logging). Indicate where interpretations are added to direct field observations and provide the basis for such interpretations. A clear distinction should be made between observed and inferred features and relationships.
- Sources of Hydrologic Data
- The nature and source of data used (published, unpublished and verbal) should be cited. Basic sources include boring logs, as-built well construction diagrams and geophysical logs.
- Geophysical Survey Methods

e) Hydro-geologic Settings

The hydro-geologic setting includes a physiographic setting of the study area on a regional and local scale, but not limited to the followings:

- The nature of subsurface and surface material, structural features and relationships, and the 3-dimensional distribution of earth materials, aquifers, and confining units exposed and inferred within the area. Where possible, confirm the presence of named formations and other formal or informally named stratigraphic units.
- Indicate/discuss the surface and subsurface expressions, aerial distributions, and thicknesses of geologic units, degree of soil development, and the originating process of geologic materials.
- Present pertinent physical characteristics including: color, grain size, texture (degree of rounding), mineralogy/lithology, porosity and permeability, stratification, cementation, thickness, strength and variability.

- Discuss any special physical or chemical features present (structural features, instability, expansive clays, water chemistry and quality, hot springs, fumaroles).
- f) Analysis Procedures and Methods  
Analyses includes the following procedures and methods but not limited to:
- Data Analysis and Interpretation
  - Test Drilling and Examination of Drill Cuttings
  - Water Quality Sampling
  - Water Level Measurements: Monitor Wells
  - If relevant, Tracing Techniques to figure out groundwater correlation between the study area and adjacent residential area
  - Aquifer Tests to test hydraulic conductivity
  - Laboratory Testing Methods and Reports: Final laboratory reports and chain-of-custody documentation should be provided in an appendix.
  - Geographic Information and Geologic Mapping
- g) Hydrogeologic Assessment  
Hydro-geologic Assessment includes the followings but not limited to:
- Subsurface Investigation findings including topography, drainage and hydrogeologic factors within or affecting the study area and the adjacent properties identified in the area scope.
  - Hydrogeologic Setting including the effects of groundwater, springs, streams, and irrigation canals (if necessary), and how these may be affected by fluctuations in precipitation and temperature, and the occurrence, distribution and variations in drainage, ponds, wetlands, springs, seeps.
  - Hydrogeologic Impact Assessment including potential and direct impacts of the proposed development on existing hydrogeologic setting of the area – the area is not limited to the proposed development property boundary.
  - Construction of Hydrogeologic Maps
- h) Numerical Model Documentation
- i) Conclusions

- j) Recommendations  
Include recommendations for follow-up work and/or mitigation plan(s) in the study area. The mitigation plan(s) include engineering solutions to mitigate the impacts.

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# **SECTION VI: BRIDGE STRUCTURES**

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# 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.

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;
- 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 cost analysis;
  - 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;
- j) Participation in public engagement process;
- k) Participation in presentation of the project to Calgary Planning Commission;
- 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;
- 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 75% 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.

## **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 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 of 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 of 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.

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.
- 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 compact disc (CD).

## **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**

<b>Activity</b>	<b>Milestone Date</b>
<b>Concept and issue/risk identification summary</b>	

<b>Preliminary Design Report Submission</b>	
<b>Design Brief Submission</b>	
<b>Initial Public Consultation</b>	
<b>Detailed Design Submissions</b> <b>60%,</b> <b>90%</b> <b>100%</b> <b>Specification submission 100%</b>	
<b>Tender &amp; Award</b>	
<b>Construction Start</b>	
<b>Construction Completion</b>	
<b>Submission of project Record documents</b>	

## **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 S6-06 Canadian Highway Bridge Design Code
- The City of Calgary Design Guidelines for Bridges and Structures
- 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](http://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 Building Grades Clerk, Municipal Building, 6<sup>th</sup> Floor, 800 Macleod Trail SE at the current prices, between the hours of 8:00 a.m. to 12:00 noon and 1:00 p.m. to 4:30 p.m. (Monday to Friday).

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.

#### **1.2.3 DETAILED ELEMENTS**

As a minimum, the Proposal shall include the following elements:

## **1. PROJECT UNDERSTANDING**

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 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 3.3.

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.

<b>Consultant</b>	
<b>Date</b>	
<b>Evaluated By</b>	

<b>Selection Criteria Description</b>	<b>Point Value</b>	<b>X</b>	<b>Rating</b>	<b>Total Score</b>	<b>Comments</b>
Company Experience	3				
Project Team Experience	5				
Understanding of Work/ Technical Capability	5				
Resources and Technical Innovation	4				
Quality Management	3				
<b>Total Points</b>	<b>20</b>				

The following table provides brief description and relative weight for each of the criteria.

<b>Rating</b>	<b>Description</b>
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.