



THE CITY OF
CALGARY

DESIGN GUIDELINES
FOR
SUBDIVISION
SERVICING

*Design Guidelines
for
Subdivision
Servicing*

August 2004

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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 four main sections:

- Overview
- Roads
- Waterworks
- Wastewater and Drainage

3) Urban Development

Urban Development is the representative in the Corporate Planning Applications Group (CPAG) for the following Business Units of the *Utilities and Environmental Protection (UEP)* and the *Land Use and Mobility Portfolios*:

- Calgary Roads
- Waterworks
- Waste Water & Drainage
- Solid Waste Services
- Environmental Management
- Engineering Services

Urban Development's goal is to ensure that development is done safely and meets required engineering-oriented standards and specifications. Any development must link effectively to the existing infrastructure, which includes sewers, water, roads, etc.

Urban Development also works with Alberta Environment, a provincial approval authority, to ensure development does not adversely impact systems, both man-made and natural, on a larger scale and that any local contaminants found are dealt with properly.

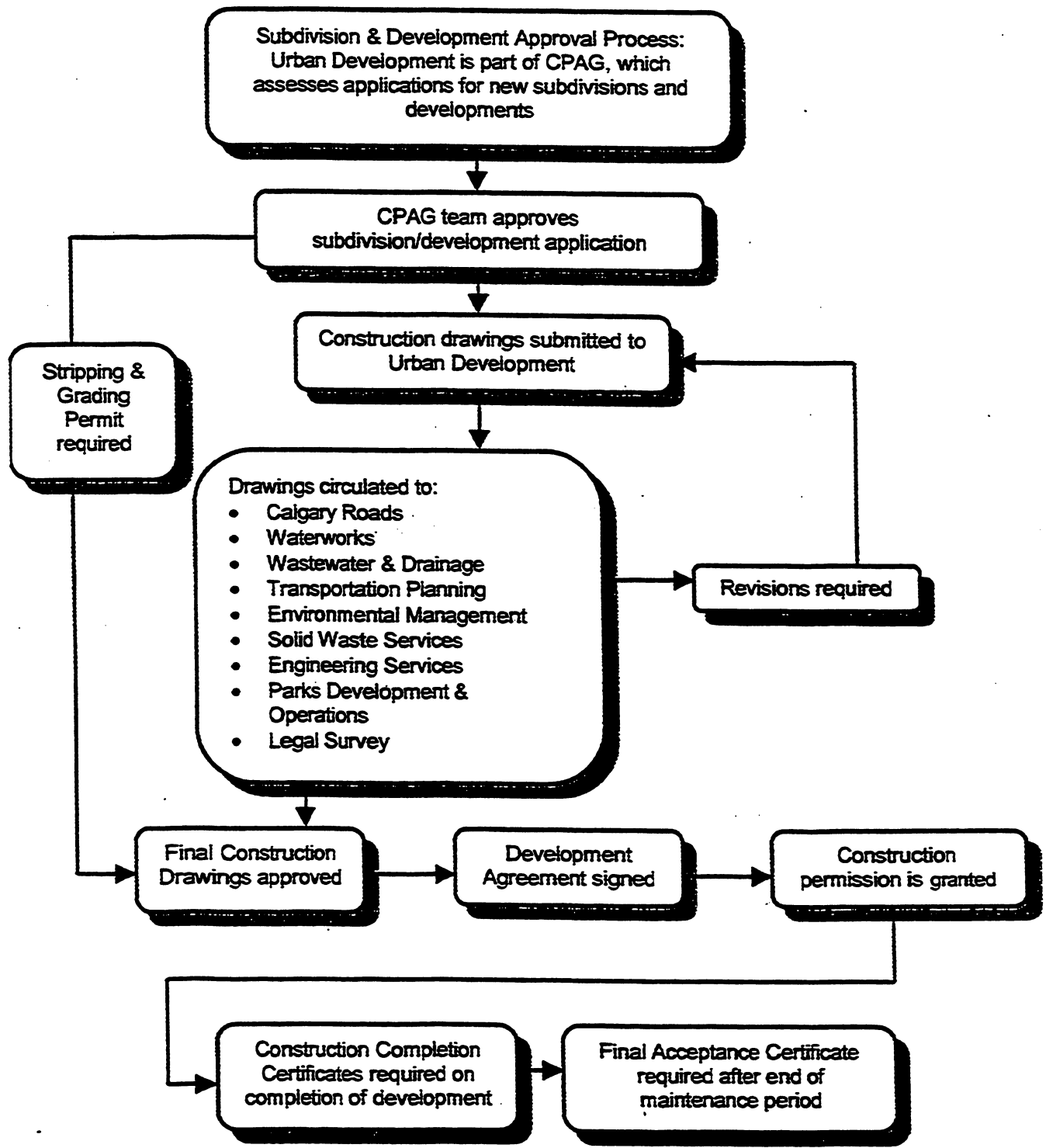
B. GENERAL INFORMATION

1) Process Overview

The chart "*Urban Development: A Process Overview*" (page 5) provides a general description of the various processes that must take place when subdivision or development occurs.

The development permit approval process is not described in this manual, but this information can be found on *the City of Calgary* website.

Urban Development: A Process Overview



2) Construction Drawings

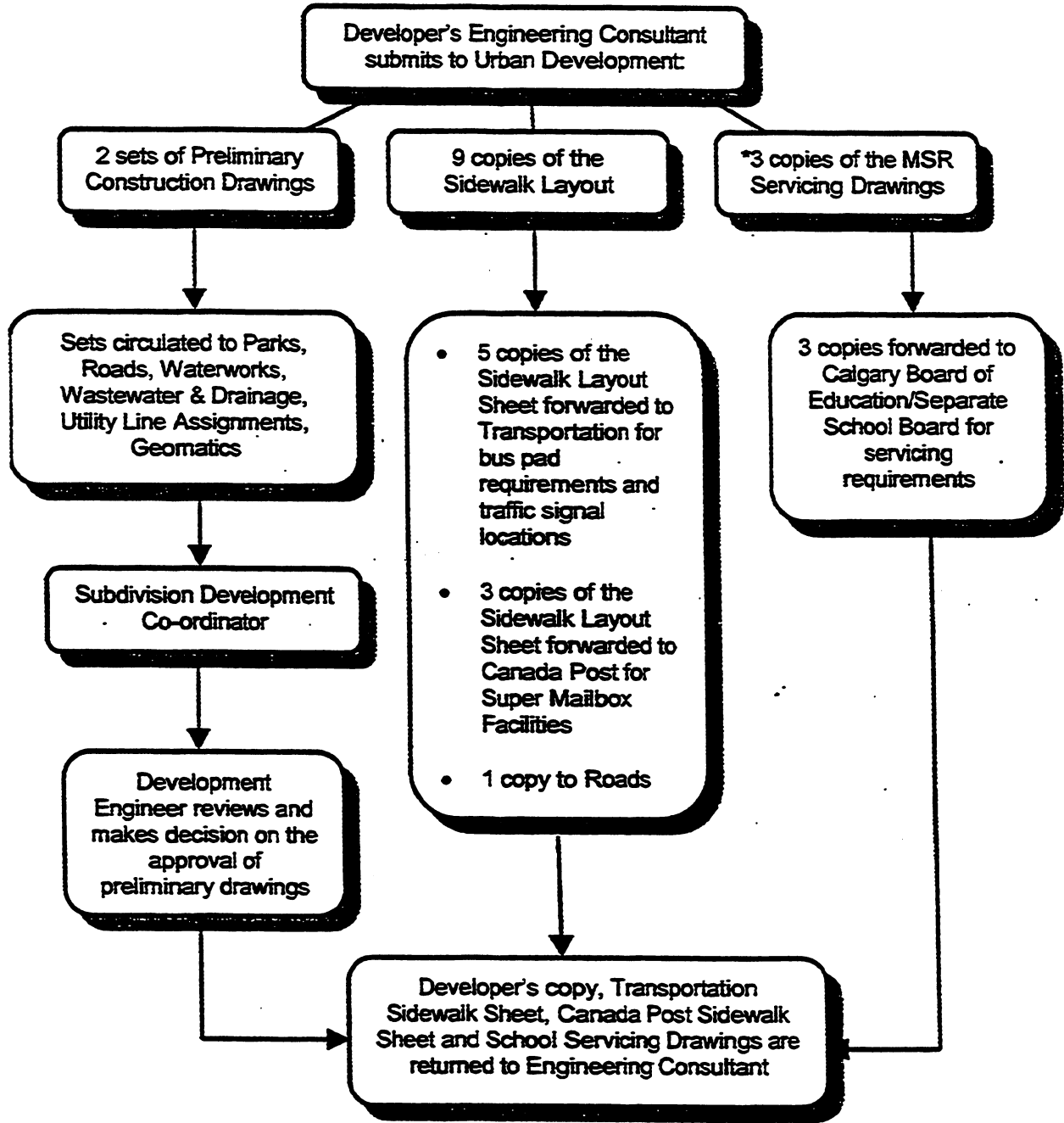
Engineering drawings are to be submitted to Urban Development. These drawings are circulated to the appropriate Business Units for their review and comment.

All layout sheets and block profiles shall conform to the general specifications and typical examples outlined in *Specifications for Block Profiles*.

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

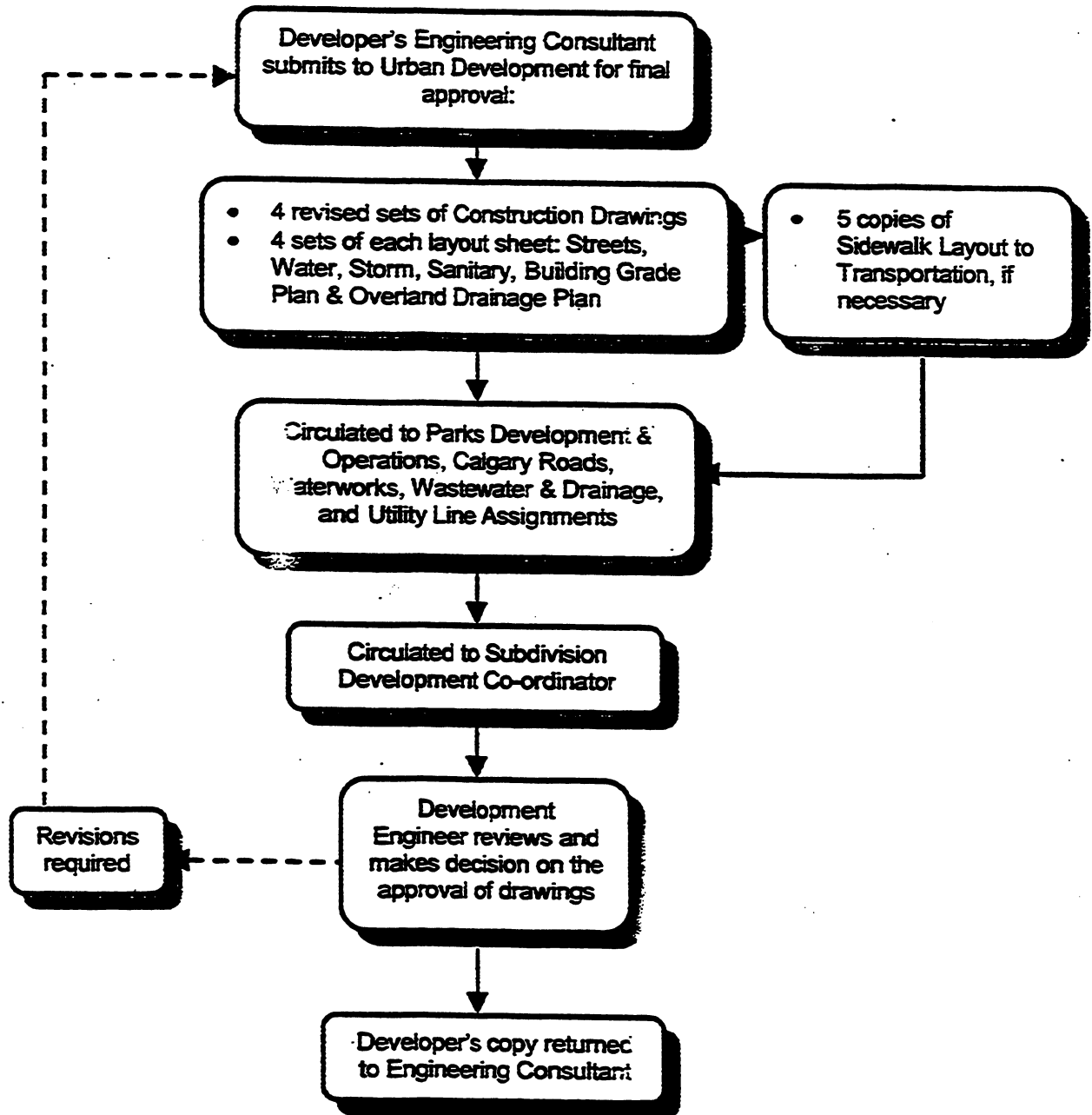
The approval process is detailed in charts "*Approval of Subdivision Construction Drawings*" and "*Approval of Final Subdivision Construction Drawings*".

Approval of Preliminary Subdivision Construction Drawings



***Note:**
If a subdivision contains a Municipal School Reserve (MSR) site, 3 copies of the water, storm, and sanitary sewer coversheets are also to be included.

Approval of Final Subdivision Construction Drawings



Note:

Professional Engineer's stamp and Permit Holder's number are required on all drawings.

3) Development Agreement

The construction of a subdivision 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 the *Urban Development Business Unit* 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 Plans 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*, 6th Floor, Municipal Building.

4) Permission for Stripping and Rough Grading

Stripping and rough grading 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) an application for a Development Permit for the stripping and rough grading has been approved by *Development and Building Approvals*
- c) 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
- d) An Erosion and Sediment Control Plan has been submitted and reviewed by Urban Development
- e) additional requirements may be imposed if school or reserve sites are affected (contact *Urban Development* for additional details)
- f) 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 General 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 & Sediment Control Plan has been submitted and reviewed by Urban Development
- f) Final Construction Drawings are to be approved by the General 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
- i) Prior to the construction of the surface improvements, the Consulting Engineer shall provide certification that all underground utility trenches, for streets for which surface improvements are to be constructed, have been backfilled, compacted, and comply with all aspects of the Standard Specifications Roads Construction. Such certification is to be in the form of a letter signed and stamped by a professional engineer.

6) Engineering Drawing of Record

The Developer shall supply the General Manager, Urban Development with plans made on polyester base or other approved material conforming with 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 liability. 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 General 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 constructed drawings" have been received and approved by the General Manager, Urban Development, will the last Final Acceptance Certificate be released.

7) Construction Completion Certificates

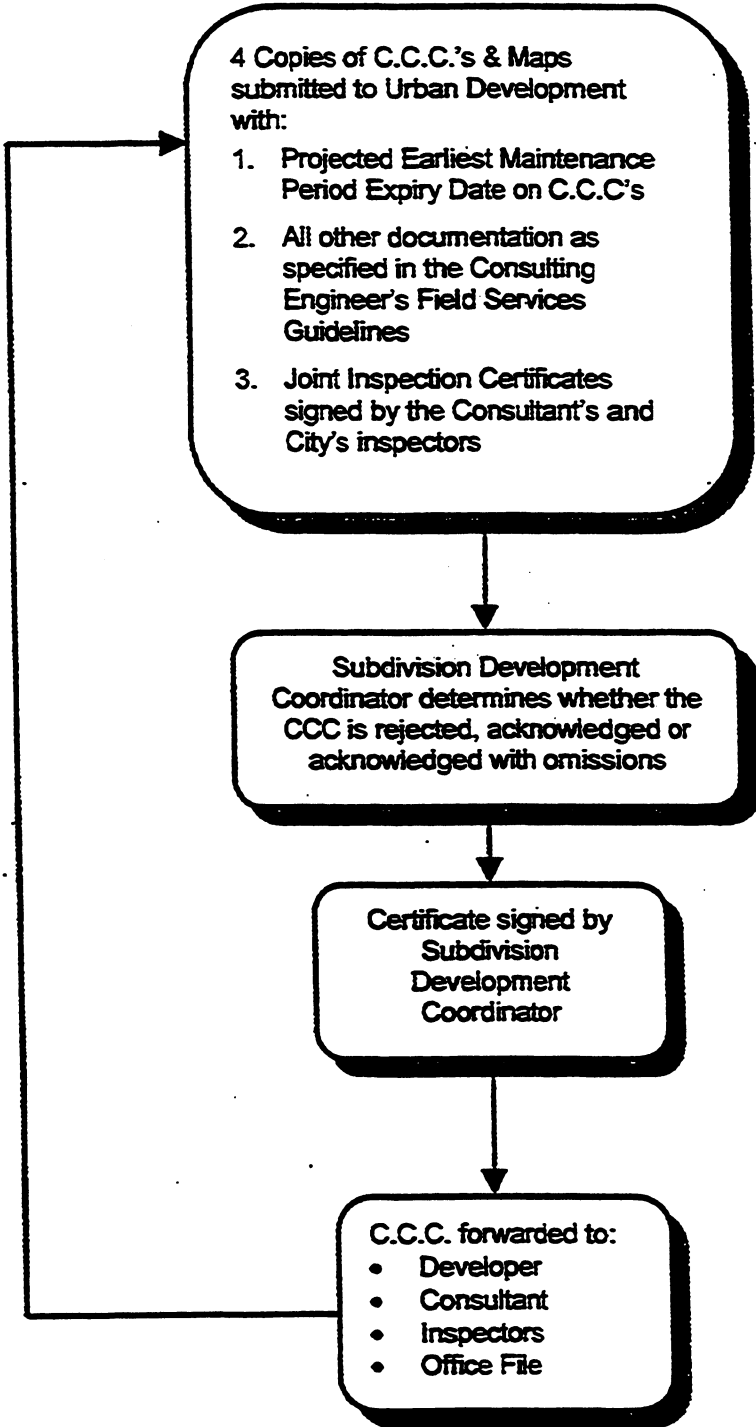
The City of Calgary will not accept Construction Completion Certificates (CCC's) until all the parties have executed the Development Agreement.

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. The detailed Stripping and Grading Report must be submitted concurrent with the CCC submission.

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

8) 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 General Manager, Urban Development, and are processed according to the chart "*Final Acceptance Certificates*" on page 17.

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

10) Environmental

Prior to the approval of a subdivision or development application, environmental reporting requirements will be reviewed by the City of Calgary Environmental Development Review. If it is determined that a Phase 1 Environmental Site Assessment (ESA) report is required, the report shall identify the actual and potential surface and groundwater contamination and will be used to determine if the site is suitable for the intended development, as related to the environmental issues. The report is to be prepared in accordance with the accepted guidelines, practices and procedures that include, but are not limited to, those in the Canadian Standards Association (1994) "Phase 1 Environmental Site Assessment – Z768-94"

If the Phase 1 ESA report indicates that there is actual or potential site contamination, then the applicant is to submit a current Phase 2 ESA report. The report is to be prepared in accordance with the accepted guidelines, practices and procedures that include, but are not limited to, those in the Canadian Standards Association (1998) "Phase 2 Environmental Site Assessment – Z769-00"

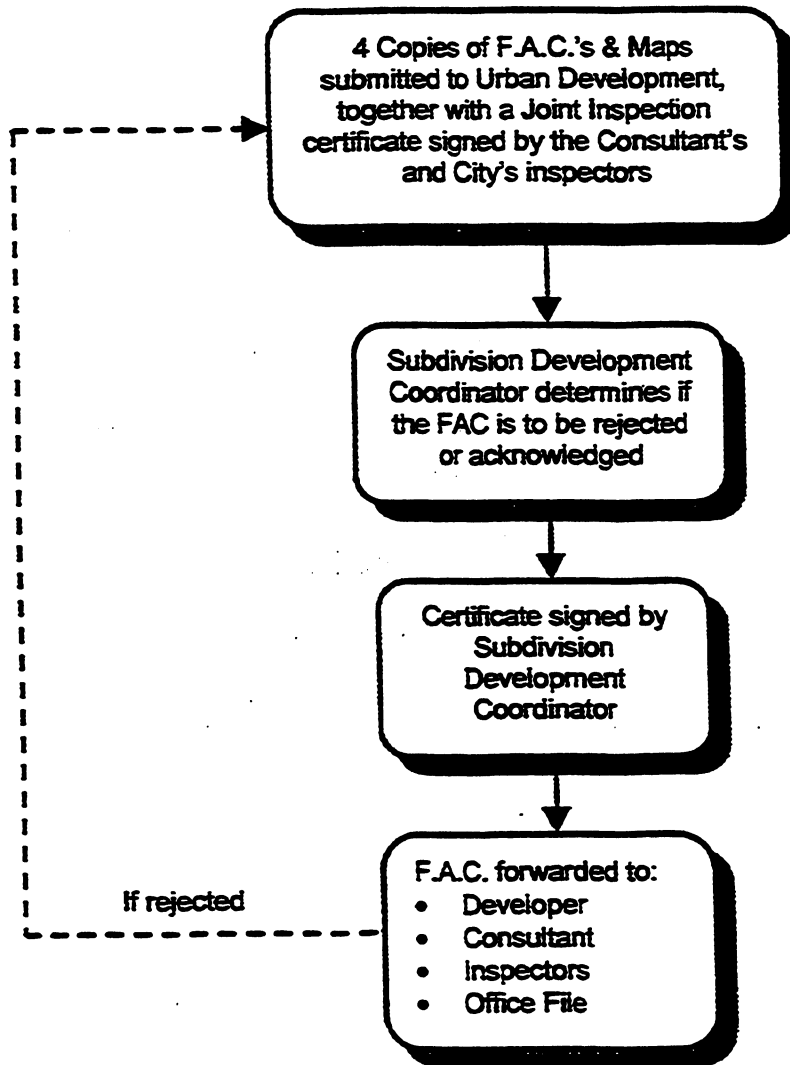
If the Phase 2 ESA report indicates that there is a requirement for remediation or risk management, then the applicant shall submit a current Phase 3 ESA report. The report(s) shall document how the site will be remediated or risk managed to such an extent that the site will be suitable for the intended development.

All report(s) are to be prepared by a qualified professional and will be reviewed to the satisfaction of the City of Calgary, Alberta Environment and the Calgary Health Region.

Notwithstanding the ESA reporting requirements, if during construction of the development, the applicant, the owner of the development, or any of their agents or contractors becomes aware of any contamination:

- a) The person discovering such contamination shall forthwith report the contamination to Alberta Environment, the Calgary Health Region and the City of Calgary, and
- b) The applicant shall submit a current Phase 2 ESA report to Alberta Environment, the Calgary Health Region and the City of Calgary, and
- c) If required, the applicant shall submit a Phase 3 ESA report to Alberta Environment, the Calgary Health Region and the City of Calgary.
- d) All report(s) are to be prepared by a qualified professional and will be reviewed to the satisfaction of the City of Calgary, Alberta Environment and the Calgary Health Region.

Final Acceptance Certificates F.A.C.



Note:

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

C. RELATED DOCUMENTS & RESOURCES

- *Bylaw 5P85*
- *City of Calgary Standard Specifications – Roads Construction*
- *City of Calgary Standard Specifications – Sewer Construction*
- *City of Calgary Standard Specifications – Waterworks Construction*
- *Design Guidelines for Development Permits, Mechanical Site Plans and Sanitation Plans*
- *Guidelines for Erosion & Sediment Control*
- *Land Use Bylaw 2P80*
- *Noise Issues Related to Designated Truck Routes (OE96-55)*
- *Specifications for Block Profiles*
- *Stormwater Management and Design Manual*
- *Surface Transportation Noise Policy for the City of Calgary (CALTS 117)*
- *TAC manual*
- www.calgary.ca

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SECTION II: ROADS

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ROADS

A. ROADWAY CLASSIFICATION

1) General

Street systems incorporate several types of roadways with each individual type having its own particular design standards. The road patterns in new subdivisions should coincide with the layout shown on the appropriate approved Design Brief or Area Structure Plan. This will assure logical street connections to adjacent subdivision areas and bus route continuity. In the event that the adjacent street system has not been developed, interim access arrangements shall be provided. All intersections are controlled by signage or signals where warranted.

The standards contained in this Guideline are required minimum standards; wherever possible, higher standards should be used. This Guideline will not go into detail for roadways above a Major street classification. Designs for Freeways and Expressways will be based on Transportation Association of Canada (TAC) standards and must be approved by the approving authority of the *Transportation Department*.

2) Corner Radii and Island Design

Corner radii are shown *in Section H- Corner Radii and Corner Details and Appendix II-A*. All corner radii are expressed in arc for curves. Corner radii below the minimum standards are subject to the approval of the approval authority of the *Transportation Department*.

Islands less than 10 m² shall not be used. If the island is required for future traffic signals, the corner design should be revised to provide the necessary area to position the signals.

3) Cross Sections

Cross sections of each street classification are shown in *Appendix II-B*. 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.

4) 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 *Appendix II-A, Sheets 12 - 18*.

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.

5) Fencing

Residential development along Deerfoot Trail and along the T.U.C./Ring roads 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. 63*).

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. 62*). 1.8m chainlink 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.

6) 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 *Appendix II-A, Sheet 29*.

The boulevard must be graded at 2% up from the top of the curb to the property line.

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.

7) Intersection Angle

Intersection angles of less than 75° are not acceptable. Intersections at the inside of curves are undesirable and should be avoided wherever possible.

8) 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 to match across intersections.

9) 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.

10) **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*.

11) **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.

12) **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*.

13) **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 *Appendix II-A, Sheet 20*. 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

Freeways		<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"> Urban Freeways are designed to accommodate heavy traffic volumes travelling at high speed under free flow conditions To provide optimum mobility for through traffic To connect major points of traffic generators To connect to main highways approaching the City To function as part of the Truck Route System 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Divided highway with full control of access and grade separations at intersections Access provided at designated cross roads by means of specially designed interchange Direct access to abutting property is prohibited 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	80-110	<ul style="list-style-type: none"> All traffic movements, including pedestrian traffic, are accommodated by interchanges or pedestrian overpasses, at the ultimate stage Freeways are designed in accordance with TAC standards and for capacity conditions based on Level of Service 'D' 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 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 	
Parking	None		
Sidewalk	None		
Traffic Signals	For interim condition only		
Pedestrian Crossing	Grade-separated		
On-street Bike Route	No		
Bus Route	No		
Truck Route	Yes		
Sound Attenuation	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
FUNCTION			
<ul style="list-style-type: none"> To permit relatively unimpeded flow for through traffic between major elements of <i>The City of Calgary</i> To function as part of the Truck Route System 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Intersections are grade separated when warranted Divided roadways with full control of access Direct access to abutting property is prohibited Only roadways of Major category or higher may intersection with Expressways Intersections should be 800 m apart but in special circumstances may be a minimum of 450 m At-grade intersections should be signalized 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	60-80	<ul style="list-style-type: none"> Interchange spacing will generally be similar to that of Freeways; however closer spacing may be considered under special circumstances Expressways are designed in accordance with TAC standards and for capacity conditions based on Level of Service 'D' Pedestrian crosswalks are permitted at intersections; however, grade separated walkways are used where warranted 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 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 	
Parking	None		
Sidewalk	None		
Traffic Signals	For interim condition only		
Pedestrian Crossing	Grade-separated, at-grade for interim condition		
On-street Bike Route	No		
Bus Route	No		
Truck Route	Yes		
Sound Attenuation	Yes	TYPICAL CROSS SECTION See TAC standards	

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.)
FUNCTION			
<ul style="list-style-type: none"> To expedite the movement of vehicles between major traffic generators and from subdivision to subdivision To serve adjacent commercial lands and to collect and distribute traffic from Freeways and Expressways to lesser category streets or directly to traffic destinations Major streets may be designated as truck routes and bus routes 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> 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 No direct vehicular access is allowed to abutting residential properties Intersections may be grade separated when warranted Proposed intersection spacing less than the minimum (300 m) shall be located and designed to the satisfaction of the General Manager, Planning and Transportation Policy The minimum acceptable spacing between the terminal of the interchange ramp and the centreline of the first intersection is 400 m Where intersections are at grade, channelization is used to control turning movements at some intersections Intersections are generally controlled by traffic signals 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50-70	<ul style="list-style-type: none"> Bus bays are desirable at all transit stop locations but shall be determined by Calgary Transit No residential frontage is permitted Major streets are designed for capacity conditions at Level of Service 'D' 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 Noise attenuation study is required for residential lots adjacent to Major streets to determine noise attenuation requirements Boulevard pathway is not desirable where there is excessive driveways, alleys and street crossings 4.3m wide curb lanes required. 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 14	

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.)
FUNCTION			
<ul style="list-style-type: none"> To expedite the movement of vehicles between major traffic generators and from industrial subdivision to industrial subdivision 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 Industrial Major streets may be designated as bus routes 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Direct access is only available to abutting commercial and industrial properties subject to traffic and design conditions and is generally restricted to right turns in and out Intersections may be grade separated when warranted Proposed intersection spacing less than the minimum (300 m) shall be located and designed to the satisfaction of the General Manager, Planning and Transportation Policy Where intersections are at grade, channelization is used to control turning movements at some intersections Intersections are generally controlled by traffic signals 			
TRAFFIC FEATURES		NOTE	
Posted Speed (km/h)	50-70	<ul style="list-style-type: none"> Bus bays are desirable at all transit stop locations but shall be determined by Calgary Transit No residential frontage is permitted Major streets are designed for capacity conditions at Level of Service 'D' 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 Boulevard pathways are desirable where truck traffic >20% and few driveways 4.3m wide curb lanes required. 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 13	

Local Major Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
10,000 – 15,000	4	27.0 m	150 m
FUNCTION			
<ul style="list-style-type: none"> To be used where the Daily Traffic Volumes exceed the volumes for a Primary Collector but are less than 15,000 vehicles/day To serve as secondary traffic generators much the same as Primary Collector streets May be used as bus routes 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> No residential frontage is permitted No direct vehicular access to abutting residential properties, including driveways and lanes, is permitted Minimum intersection spacing is 150 m. Wherever possible, a greater spacing should be used 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 No lane connection to Local Major streets is permitted Local Major streets may intersect with Residential Entrance streets, Collector streets, Primary Collector streets, other Local Major streets and Major streets 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> Left turn bays and intersection channelizations are generally not necessary but may be required to accommodate traffic conditions Sufficient width is provided for two driving lanes in each direction Noise attenuation study is required for residential lots adjacent to Local Major streets to determine noise attenuation requirements 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 12	
Sound Attenuation	Yes		

Primary Collector Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
5,000 – 10,000	2 or 4	23.5 m, 27.0 m, 32.0 m	120 m / 60 m (see below)
FUNCTION			
<ul style="list-style-type: none"> To be used where the Daily Traffic Volumes exceed the volumes for a Collector but are less than 10,000 vehicles/day To serve as secondary traffic generators much the same as Collector streets May be used as bus routes 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> 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 Intersection spacing for those subsequent to the above condition shall be a minimum 60 m spacing Access to abutting properties is permitted but is generally restricted to right turns in and out Primary Collector streets can be either divided or undivided with traffic signals at Major intersections Lane connection to Primary Collector streets is permitted Primary Collector streets may intersect with Residential Streets, Residential Entrance streets, Collector streets, other Primary Collector streets, Local Major streets and Major streets 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> 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 Sufficient width is provided for two driving lanes with lane width of 3.5 m in each direction Curb lanes may be used for parking depending on the traffic conditions in the area 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheets 9, 10 & 11	

Collector Streets

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
1,000 – 5,000	2	19.0 m and 21.0 m	60 m
FUNCTION			
<ul style="list-style-type: none"> To be used where the Daily Traffic Volumes exceed the volumes for a Residential Road but are less than 5,000 vehicles/day To collect and distribute traffic from Major streets to lesser standard streets To serve as secondary traffic generators, such as neighborhood commercial centers, parks and golf courses, and from neighborhood to neighborhood within the community All Collector streets designated as bus routes must use the 21.0 m right-of-way cross-section May be used as bus routes 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Direct access is permitted abutting properties Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 80 m should be used Collector streets may intersect with Residential streets, Residential Entrance streets, other Collector streets, Primary Collector streets, Local Major streets and Major streets 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> Collector Streets are undivided roadways 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 <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	TYPICAL CROSS SECTION See Appendix II-B, Sheets 6 & 7	

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
FUNCTION			
<ul style="list-style-type: none"> To provide area in the median for subdivision entrance features May be used as a connection between the Collector street and the Residential street May provide alternate access for emergency purposes 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Direct access is permitted to abutting residential properties Access is not permitted to commercial properties Residential Entrance streets may intersect with Residential streets, other Residential Entrance streets, Collector streets, Primary Collector streets and Local Major streets 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> 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 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 8	

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
FUNCTION			
<ul style="list-style-type: none"> To provide direct access to abutting residential properties To collect and distribute traffic from residential properties to Collector and Residential streets 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Direct access is permitted to abutting residential properties Access is not permitted to commercial properties Residential streets may intersect with other Residential streets, Residential Entrance streets, Collector streets and Primary Collector streets 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> Undivided roadway with intersections controlled by signage Parking is permitted on both sides but may be restricted under special circumstances Sidewalk is normally only required on one side, but preferable on both sides, refer to <i>Section E - Sidewalks and Walkways</i> for more details 	
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		
Sound Attenuation	No	TYPICAL CROSS SECTION See Appendix II-B; Sheet 5	

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
FUNCTION			
<ul style="list-style-type: none"> To provide direct access to adjacent industrial and commercial properties To collect and distribute traffic from industrial and commercial properties to other industrial and higher standard roadways May be used as bus routes 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Direct access is permitted to industrial and commercial properties Industrial streets may intersect other Industrial streets, Industrial Major and Major streets 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> Undivided roadway with intersections controlled by signage or signals where warranted 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 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 If the Daily Traffic Volume is >5,000, the pavement width should be widened to 12 m 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 Sidewalk requirements for industrial subdivisions will be determined at the outline plan stage by the approval authority of the <i>Transportation Department</i> 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheets 15 & 16	

1) ALTERNATIVE STREET DESIGN STANDARDS

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 primary 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

Grand Boulevards – Alternate Street Design

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
5,000 – 10,000	2	26.0 m	120 m / 60 m (see below)
FUNCTION			
<ul style="list-style-type: none"> • Functions are similar to Primary Collector and Collector streets • To serve as secondary traffic generators • To serve as a main route in within the community to accommodate substantial traffic volumes • May be used as bus routes and are designed to accommodate Frequent Transit Service 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> • 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 • Intersection spacing for those subsequent to the above condition shall be a minimum 60 m spacing • No access to abutting commercial properties • Access to abutting multi-family residential properties is permitted and is generally restricted to right turns in and out • Residential frontage of single and multi-family development is permitted • Single family, semi-detached and duplex style homes must access from a rear alley 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> • Two 6.5 m carriageways including one driving in each direction separated by a 3.5 m median • Sufficient width is provided for one driving lane in each direction and the wide lanes also accommodate bicycle traffic 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 17	
Sound Attenuation	No		

High Streets - Alternate Street Design

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
4,000 – 7,000	2	21.0 m	60 m
FUNCTION			
<ul style="list-style-type: none"> To provide internal community connections as well as main connections to external major streets To serve as secondary traffic generators, such as neighborhood commercial centers, parks and golf courses, and from neighborhood to neighborhood within the community May be used as bus routes and are designed for Frequent Transit Services operating in both directions 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Residential frontage of single and multi-family developments with direct residential driveway access is permitted Rear alleys are optional but are recommended Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 120 m should be provided 			
TRAFFIC FEATURES		NOTE	
Posted Speed (kph)	50	<ul style="list-style-type: none"> 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 Undivided roadways with traffic signals at major intersections when warranted Parking is permitted, except in bus zones, along both sides 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 18	

Connector Streets - Alternate Street Design

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
1,000 – 5,000	2	20.0 m	60 m
FUNCTION			
<ul style="list-style-type: none"> • Functions are similar to Collector streets • 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 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> • Residential frontage of single and multi-family developments with direct residential driveway access is permitted • Rear alleys are optional but are recommended • Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 120 m should be provided 			
TRAFFIC FEATURES			NOTE
Posted Speed (kph)	50	<ul style="list-style-type: none"> • 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 • Undivided roadways with traffic signals at major intersections when warranted • Parking is permitted, except in bus zones, along both sides 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 19	

Avenues – Alternate Street Design

Definition

DAILY TRAFFIC VOLUME (vehicles/day)	NUMBER OF LANES	RIGHT-OF-WAY REQUIREMENT	MINIMUM INTERSECTION SPACING
1,000 – 3,000	2	19.3 m	60 m
FUNCTION			
<ul style="list-style-type: none"> To be used as a connection between all forms of "connectors" streets and Residential streets Not designed to accommodate transit service but are suitable for use by school buses 			
ACCESS CONDITIONS			
<ul style="list-style-type: none"> Residential frontage of single and low density multi-family developments with direct residential driveway access is permitted Rear alleys are optional but are recommended Minimum intersection spacing is 60 m, wherever possible, a desirable intersection spacing of 120 m should be provided 			
TRAFFIC FEATURES			NOTE
Posted Speed (kph)	50	<ul style="list-style-type: none"> 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 Parking is permitted but may be restricted under special circumstances 	
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	TYPICAL CROSS SECTION See Appendix II-B, Sheet 20	

C. ALIGNMENT DESIGN STANDARDS

Major Streets (Divided)

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Arterial Divided (UAD) 50 Urban Arterial Divided (UAD) 60 Urban Arterial Divided (UAD) 70	50 – 70 kph	See Appendix II-A Sheets 3 - 9
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 See Appendix II-A, Sheets 1 and 20	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"> • 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 • Introduced median is used to transition an undivided road to a divided road with a left turn median, see <i>Appendix II-A, Sheet 23</i> 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. • No left turn bays will be permitted on curves with a centreline radius less than 400 m nor within 60 m of the end of a centreline transition curve (spiral) if the radius is less than 440 m • Standard left turn bays shall be provided on Major streets at all intersections. For left turn bay designs, see <i>Appendix II-A, Sheet 26</i> • The minimum storage length for a left turn bay is 60 m with a 3.5 m wide left turn lane • Dual left turn bays and slot turn bays are to be designed to TAC standards, see <i>Appendix II-A, Sheet 24</i> 		
Note		
<ul style="list-style-type: none"> • 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 • 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). • Reverse gutter is used where necessary • Street light poles, power poles and traffic signal poles are to be located a minimum of 3.5 m from the lip of gutter 		

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 *Appendix II-A, Sheet 29* 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 *Appendix II-A, Sheet 20*
- 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 Appendix II-A, Sheets 21 & 22*
- 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

Industrial Major Streets (Undivided)

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Arterial Undivided (UAU) 50 Urban Arterial Undivided (UAU) 60	50 – 60 kph	See Appendix II-A, Sheet 11
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Major UAU 50 = 65 m Major UAU 60 = 85 m See Appendix II-A, Sheets 1 and 20	Major UAD 50 = 90 m, 130 m – 6000 m (desirable) Major UAD 60 = 120 m, 260 m – 6000 m (desirable)	
Median and Left Turn Bay		
<ul style="list-style-type: none"> 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 		
Note		
<ul style="list-style-type: none"> 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 Standard curb with 0.5 m gutter is to be used Street light poles, power poles and traffic signal poles are to be located a minimum of 3.5 m from the lip of gutter 		

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 *Appendix II-A, Sheet 29* 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 in *Appendix II-A, Sheet 20*
- 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 Appendix II-A, Sheets 21 & 22*
- The superelevation through all Industrial Major street intersections shall not exceed 4%

Local Major Streets

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Collector Divided (UCD) 50	50 kph	See Appendix II-A, Sheet 6

HORIZONTAL ALIGNMENT

Minimum Stopping Sight Distance	Minimum Radius of Curvature
Local Major UCD 50 = 65 m See Appendix II-A, Sheets 1 and 20	Local Major UCD 50 = 90 m

Median and Left Turn Bay

- Minimum median width is 3.5 m
- 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 *Transportation Department*, additional right-of-way will be required

Note

- Standard curb with 0.25 m gutter is to be used on the median and the outside edges
- Reverse gutter is used where necessary
- For corner radii and corner cut requirements, see *Section H*

VERTICAL ALIGNMENT

Maximum & Minimum Grades

Maximum grade: 8.0%
Minimum grade: 0.6%

Grade at Intersections

- 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
- See Appendix II-A, Sheet 29 for Maximum Approach Grades and Vertical Curve requirement
- 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

Vertical Curves & Superelevation

- The length of vertical curve is calculated based on the stopping sight distance as shown in Appendix II-A, Sheet 20
- For Local Major streets, crest vertical curves are to be designed using the desirable "K" values for 10 kph higher than the design speed
- The maximum Superelevation rate for a Local Major street shall not exceed $e_{max} = 4\%$
- For development of Superelevation and Superelevation Tables, see Section D and Appendix II-A, Sheets 21 & 22

Primary Collector Streets

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Collector Divided (UCD) 50 Urban Collector Undivided (UCU) 50	50 kph	See <i>Appendix II-A, Sheet 6</i> (same as Local Major)
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Primary Collect UCD, UCU 50 = 65 m See <i>Appendix II-A, Sheets 1 and 20</i>	Primary Collector UCD, UCU 50 = 90 m	
Median and Left Turn Bay		
<ul style="list-style-type: none"> Minimum median width is 3.5 m Left turn bays and intersection channelization are not normally required 		
Note		
<ul style="list-style-type: none"> 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 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 Standard curb is to be used on Primary Collector streets if the grade is greater than 6% and where there are no driveways Reverse gutter is used where necessary For corner radii and corner cut requirements, see <i>Section H</i> 		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 8.0% Minimum grade: 0.6%		
Grade at Intersections		
<ul style="list-style-type: none"> 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 See <i>Appendix II-A, Sheet 29</i> for Maximum Approach Grades and Vertical Curve requirement 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 		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> The length of vertical curve is calculated based on the stopping sight distance as shown in <i>Appendix II-A, Sheet 20</i> The maximum Superelevation rate for a Primary Collector street shall not exceed $e_{max} = 4\%$ For development of Superelevation and Superelevation Tables, see <i>Section D and Appendix II-A, Sheets 21 & 22</i> 		

Collector Streets

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Collector Undivided (UCU) 50	50 kph	See Appendix II-A, Sheets 3 – 5
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Collect UCU 50 = 65 m See Appendix II-A, Sheets 1 and 20	Collector UCU 50 = 90 m	
Median and Left Turn Bay		
<ul style="list-style-type: none"> Medians, left turn bays and intersection channelization are normally not required 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, see Appendix II-A, Sheet 5 		
Note		
<ul style="list-style-type: none"> 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. Low profile rolled curb 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 Standard curb is to be used on Collector streets if the grade is greater than 6% and where there are no driveways Reverse gutter is used where necessary For corner radii and corner cut requirements, see Section H 		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 8.0% Minimum grade: 0.6%		
Grade at Intersections		
<ul style="list-style-type: none"> 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"> tie to the property line grade if the approaching street is undivided tie to the lane line of the Collector street with a vertical curve of a minimum length of 30 m if the approaching street is divided. i.e. the crossfall (or 2% if the road is crowned) of the Collector street shall be extended and intersects the grade of the approaching street and the resulting vertical curve ends at the lane line of the Collector street See Appendix II-A, Sheet 29 for Maximum Approach Grades and Vertical Curve requirement 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 		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> The length of vertical curve is calculated based on the stopping sight distance as shown in Appendix II-A, Sheet 20 The maximum Superelevation rate for a Collector street shall not exceed $e_{max} = 4\%$ For development of Superelevation and Superelevation Tables, see Section D and Appendix II-A, Sheets 21 & 22 		

Residential Entrance Streets

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Local Divided (ULD) 50	50 kph	See Appendix II-B, Sheet 8 for typical cross-section
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance		Minimum Radius of Curvature
Residential ULD 50 = 65 m See Appendix II-A, Sheets 1 and 20		Residential ULD 50 = 80 m
Median and Left Turn Bay		
<ul style="list-style-type: none"> Minimum median width is 3.5 m Left turn bays and intersection channelization are not required 		
Note		
<ul style="list-style-type: none"> Same requirements as Residential streets 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 For corner radii and corner cut requirements, see Section H 		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grade: 8.0% Minimum grade: 0.6%		
Grade at Intersections		
<ul style="list-style-type: none"> The grade line of the intersecting street (maximum approach grade of 4%) shall tie to the property line grade of a Residential Entrance street See Appendix II-A, Sheet 29 for Maximum Approach Grades and Vertical Curve requirement 		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> The length of vertical curve is calculated based on the stopping sight distance as shown in Appendix II-A, Sheet 20 Superelevation is not required 		

Residential Streets

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Local Undivided (ULU) 50	50 kph	See Appendix II-B, Sheet 5 for typical cross-section
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Residential ULU 50 = 65 m See Appendix II-A, Sheets 1 and 20	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. See Appendix II-A, Sheet 12	
Median and Left Turn Bay		
<ul style="list-style-type: none"> Left turn bays and intersection channelization are not required 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"> 9.0 m for two-way traffic if there is parking along the median and the outside curb 8.5 m for two way traffic if parking is prohibited along the median or signed one-way and parking along median 7.0 m for one-way traffic if parking is prohibited along the median The road width for the turnaround at the top of the bay is of minimum 9.5 m for all cases If at a 'T' intersection, 2-way traffic permitted. If at a 4-way intersection only one-way permitted. * Carriageway widths are subject to line assignment requirements 		
Note		
<ul style="list-style-type: none"> The cumulative length of Residential streets before feeding onto Collector streets should not be excessive. The a maximum number of dwelling units serviced shall not exceed 100 For corner radii and corner cut requirements, see Section H 		
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"> The grade along the centreline chainage at the end of a cul-de-sac should be extended to the top of the bulb and of minimum 1.0% from the beginning of curve (BC) or the end of curve (EC) to the top of the bulb 		
Grade at Intersections		
<ul style="list-style-type: none"> The grade line of the intersecting street (maximum approach grade of 4%) shall tie to the property line grade of a Residential street See Appendix II-A, Sheet 29 for Maximum Approach Grades and Vertical Curve requirement 		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> The length of vertical curve is calculated based on the stopping sight distance as shown in Appendix II-A, Sheet 20 Superelevation is not required 		

Industrial Streets

Alignment Design Standards

CLASSIFICATION	DESIGN SPEED	INTERSECTION DESIGN
Urban Local Undivided (ULU) 50	50 kph	See Appendix II-A Sheets 9 – 11
HORIZONTAL ALIGNMENT		
Minimum Stopping Sight Distance	Minimum Radius of Curvature	
Industrial ULU 50 = 65 m See Appendix II-A, Sheets 1 and 20	Industrial ULU 50 = 80 m <ul style="list-style-type: none"> • Radii less than 80 m are acceptable on an Industrial street if accompanied by acceptable pavement widening (e.g. bulb) 	
Median and Left Turn Bay		
<ul style="list-style-type: none"> • Medians, left turn bays and intersection channelization are normally not required 		
Note		
<ul style="list-style-type: none"> • For corner radii and corner cut requirements, see intersection designs in Appendix II-A, Sheets 9 -11 		
VERTICAL ALIGNMENT		
Maximum & Minimum Grades		
Maximum grades: 10.0%, Cul-de-sac = 8.0% Minimum grade: 0.6%		
<ul style="list-style-type: none"> • The grade along the centreline chainage at the end of a cul-de-sac should be extended to the top of the bulb and of minimum 1.0% from the beginning of curve (BC) or the end of curve (EC) to the top of the bulb 		
Grade at Intersections		
<ul style="list-style-type: none"> • 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"> • tie to the property line grade if the approaching street is undivided • 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 • See Appendix II-A, Sheet 29 for Maximum Approach Grades and Vertical Curve requirement 		
Vertical Curves & Superelevation		
<ul style="list-style-type: none"> • The length of vertical curve is calculated based on the stopping sight distance as shown on in Appendix II-A, Sheet 20 • Superelevation is not required 		

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 Appendix II-B, Sheets 1 – 4

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 *Wastewater and Drainage 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 more for a length exceeding 75 m, that portion in excess of 75 m shall be deep based.
 - 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% intersects with a lane of grade of 5% or greater, that portion of the latter lane in excess of 75 m from the source of lane 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 *Wastewater and Drainage 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 in *Appendix II-A, Sheet 19*

D. DEVELOPMENT OF SUPERELEVATION

The length of roadway required to develop superelevation consists of two components, tangent runoff and superelevation runoff. The tangent runoff 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 runoff and the superelevation runoff:

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

Note: *The total length require 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 in **Appendix II-A, Sheet 22**, 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 runoff 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 visa versa. Smoothing curves required where 'M' value is greater than or equal to 0.03.

For Development of Superelevation and Superelevation Tables, see *Appendix II-A, Sheets 21 and 22.*

E. SIDEWALKS AND WALKWAYS

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
 - 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.

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. More than one wheel chair ramp may be required at each corner to line up with the crosswalks in different directions.

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*.

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 nomograph shown in *Appendix II-A, Sheet 28* can be used to determine the need for guardrails. Note that the nomograph uses imperial units.

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

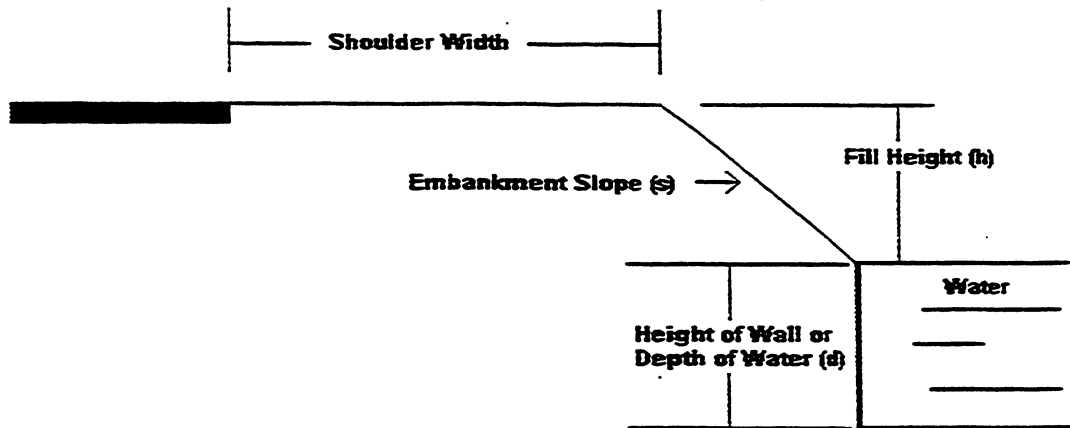
For Adjustment Factors refer to *Table II-F.3*

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

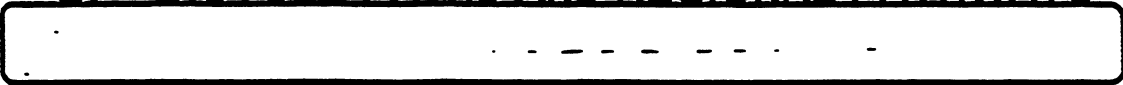
Table II-F.2: Basic Need Index for Embankment Slope

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

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

ITEM	FACTOR
Shoulder Width, Overall (m), f_{sw} 3.6 or more 3.0 2.4 1.8 or less	1.00 1.05 1.10 1.15
Horizontal Curvature (As related to Design Speed), f_{hc} Tangent or Flat Curve* Intermediate Curve** to Flat Curve Inside Curve <ul style="list-style-type: none"> • Minimum** or near minimum radius or isolated*** intermediate curve • Isolated minimum or near minimum radius curve • Inside curves with $R < 170$ m Outside Curve <ul style="list-style-type: none"> • Minimum or near minimum radius or isolated intermediate curve • Isolated minimum or near minimum radius curve • Outside curves with $R < 170$ m * Flat curve is a curve which is large enough that it does not require superelevation as per the superelevation tables shown in <i>Appendix II-A, Sheet 16</i> 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.	1.00 1.05 1.10 1.15 1.15 1.20 1.25 1.25
Climatic Conditions, f_{cc} Freezing - Significant (Use for Calgary Climatic Conditions)	1.15
Downgrade or Profile Conditions, f_{pc} 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	1.00 1.05 1.10 1.15 1.20 1.25
Roadside Conditions, f_{rc} 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	1.00 1.10 1.15 1.20 1.20

G. BICYCLE PATHS AND REGIONAL PATHWAYS



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

NOTE: Further details are available in the TAC Design Guidelines for Bicycle Paths

H. CORNER RADII AND CORNER DETAILS

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)
Major	Major	Appendix II-A Sheet 7	Appendix II-A Sheet 7
	Industrial Major	Appendix II-A Sheet 8	Appendix II-A Sheet 8
	Local Major	Appendix II-A Sheet 6	Appendix II-A Sheet 6
	Primary Collector	Appendix II-A Sheet 6	Appendix II-A Sheet 6
	Collector	Appendix II-A Sheets 3,4 & 5	Appendix II-A Sheets 3,4 & 5
Local Major	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
Primary Collector	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
Collector	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
Residential Entrance	Residential Entrance	9.25 m	4.5 m x 4.5 m
	Residential	9.25 m	4.5 m x 4.5 m
Residential	Residential	9.25 m	4.5 m x 4.5m
Industrial Major	Industrial Major	15 m-50 m	Appendix II-A Sheet 11
	Industrial	15 m-50 m	Appendix II-A Sheet 11
Industrial	Industrial	15 m-50 m	Appendix II-A Sheet 10

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 *Appendix II-A Sheet 4*, 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.

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. GEOTECHNICAL REQUIREMENTS

1) Geotechnical Reports

Prior to the approval of any subdivision development the geotechnical report requirements will be reviewed. If it is determined that a geotechnical report is required, a report shall be submitted to the approving authority of the *Transportation Department* for review and approval. This report shall address all geotechnical and hydrogeological aspects of the development and the effects of the development on any adjacent lands.

Geotechnical concerns shall include but not be limited to the following:

- effects on any adjacent land, developed or undeveloped
- slope stability
- ground water quality (alkalinity)
- buried landfill (in ravines, etc.)
- unusual foundation conditions (very soft, quick soils, swelling soils, deep fills, highly organic deposits)
- highly erodible soils
- identify frost susceptible soils and propose solutions to mitigate their effect

A Subdivision Grading Report and Cut and Fill contour plan, acceptable to the approving authority of the *Transportation Department*, are required prior to approval of a Tentative Plan. The Subdivision Grading Report must indicate those areas where proposed fill will exceed 2.0 m and indicate any associated special development restrictions. Based on the Subdivision Grading Report recommendations, the approving authority of *Transportation*

Department may require Development and Geotechnical Covenants to be registered on all affected lots.

Slope stability reports are required prior to land use redesignation, subdivision, development and/or building approval when deemed a requirement by the approving authority of *Transportation Department*. In general, a Slope Stability Report is required whenever the slope of the subject or adjacent lands or portions thereof exceeds 15% or where past subsidence or seepage is evidenced in the vicinity of the site.

Four (4) copies of the Slope Stability Reports, prepared, stamped and sealed by a Professional Soils Consulting Engineer in conformance with the "Slope Stability Requirements" as detailed in the current edition of the *Design Guidelines for Development Permits, Mechanical Site Plans and Sanitation Plans*, are to be submitted.

2) Weeping Drain Tile Requirements For Residential (R1, R2, R2a, Condominium And Townhouse) Development

Refer to the *Design Guidelines for Development Permits, Mechanical Site Plans and Sanitation Plans*, Section III B. 12 for details.

3) Roadway Subdrainage

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.

4) 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. Also see page 14, Section 1: *Overview*.

APPENDIX II-A

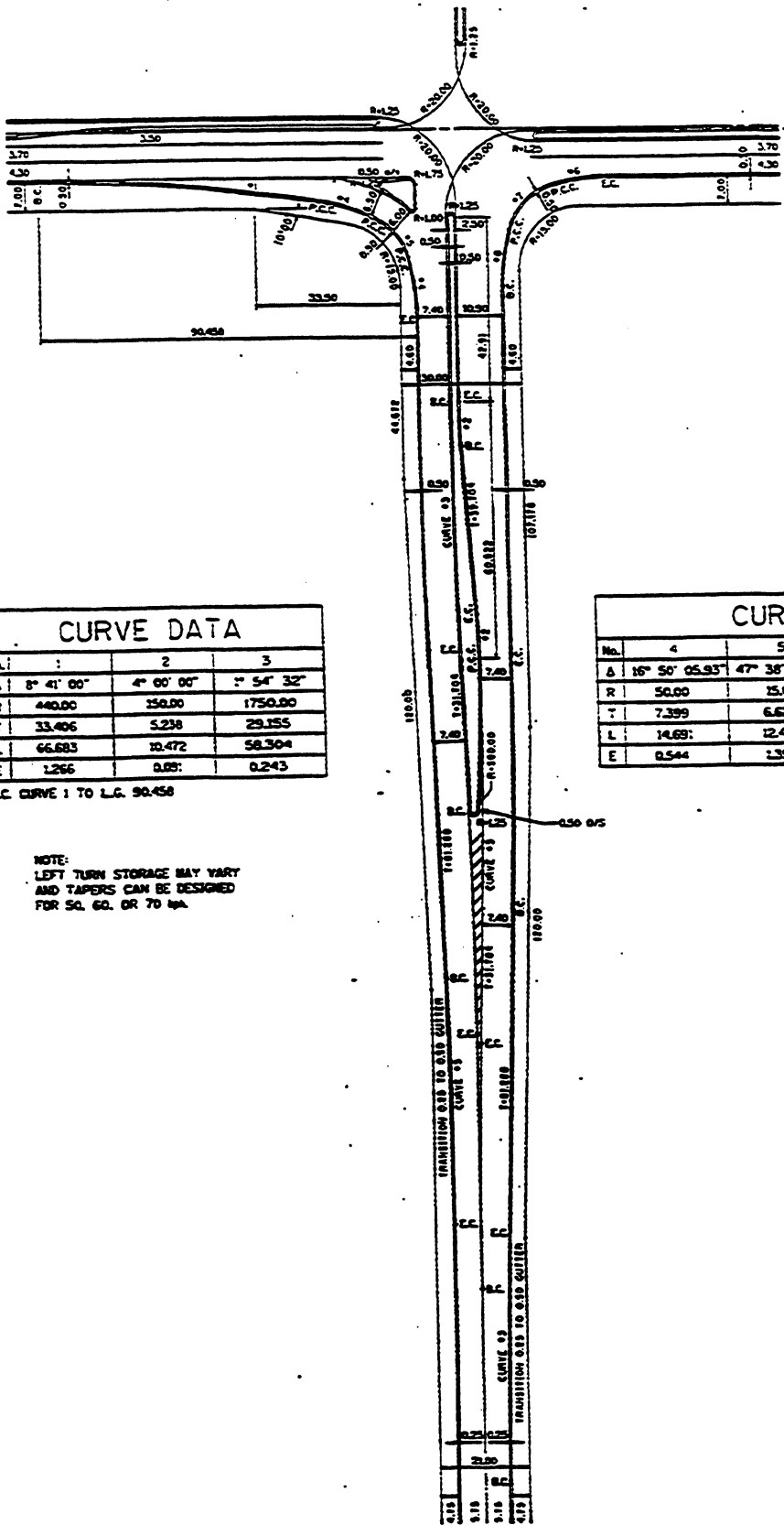
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ALTERNATIVE STREET DESIGN STANDARD DESIGN ELEMENTS

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
Medion 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

- NOTE: 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.

SHEET No. 2



CURVE DATA			
No.	1	2	3
Δ	8° 41' 00"	4° 00' 00"	7° 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	0.05	0.243

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

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

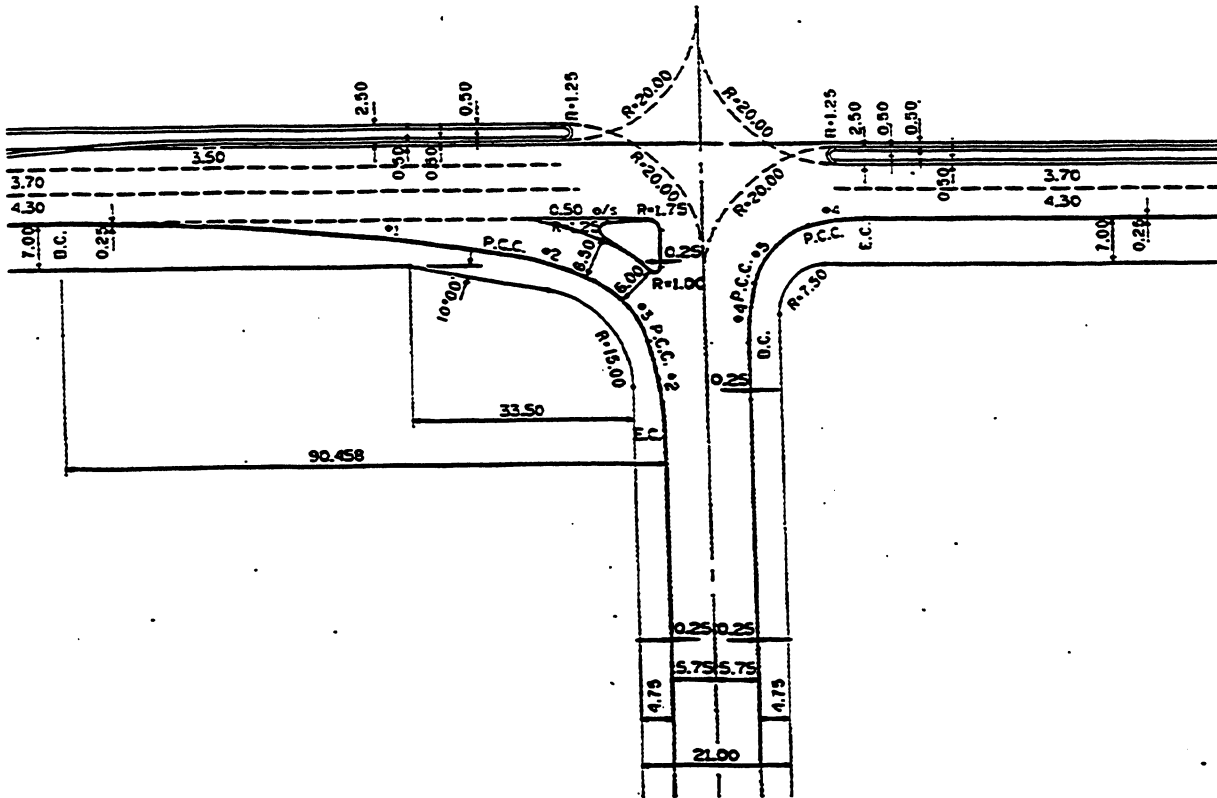
CURVE DATA				
No.	4	5	6	7
Δ	16° 50' 05.93"	47° 38' 48.14"	16° 50' 05.93"	56° 19' 48.14"
R	50.00	15.00	50.00	15.00
T	7.399	6.623	7.399	8.031
L	14.691	12.474	14.691	14.747
E	0.544	1.397	0.544	2.015

No. 1	Date	Revision
3	03-11	REVISED TURNING RADII AND WIDE CURB LANE
2	199-05	REVISE L. TURN BAY AND ADD NOTE
1	198/12	REMOVE DIM. AND ADD LL TO RIGHT TURN TAPER

Drawn: J.R.
Date: SEP. 76
Scale: N.T.S.
Approved for: [Signature]
City Engineer

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

Sheet **3**
File Number 454.1014.010



CURVE DATA			
No.	1	2	3
Δ	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

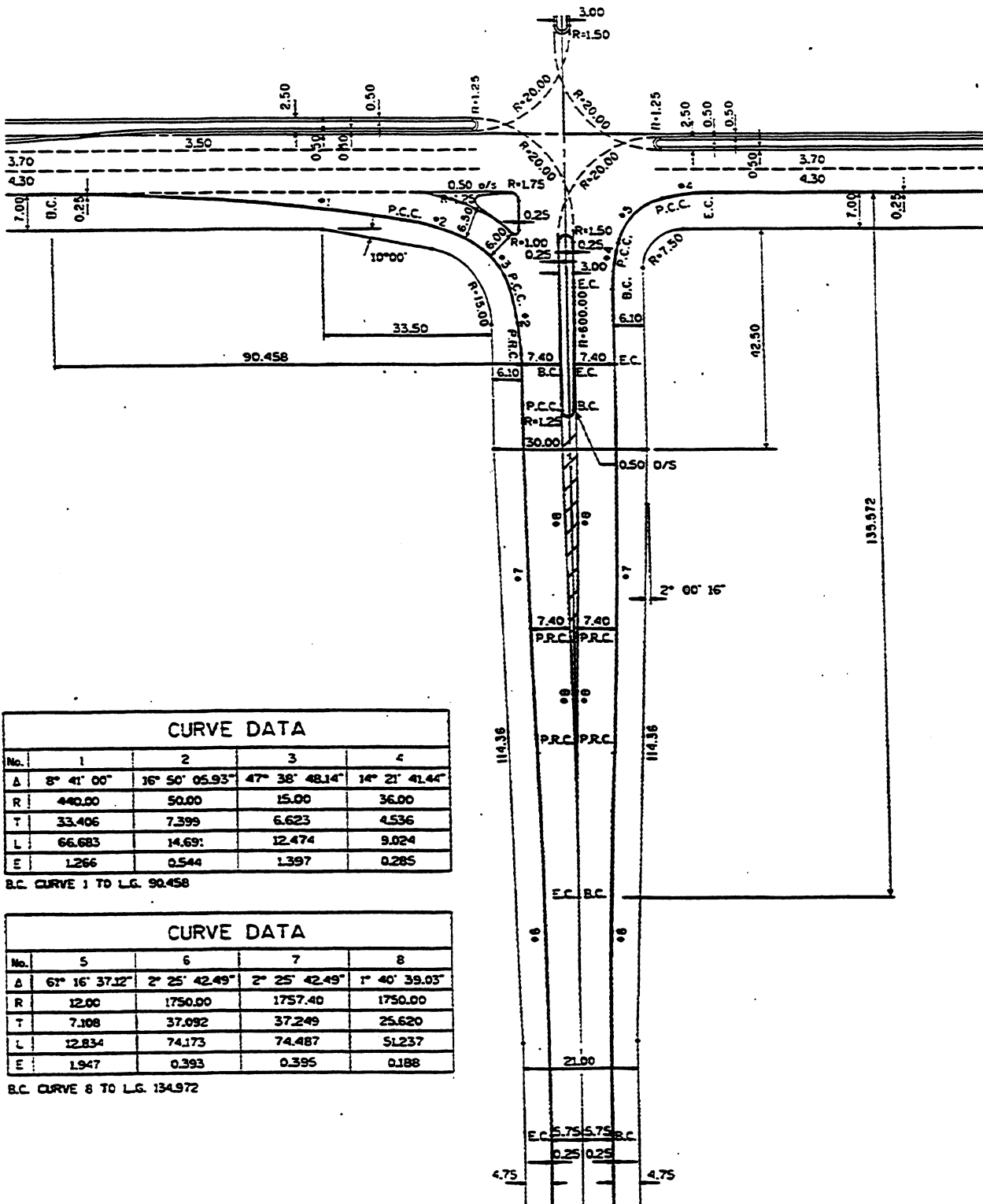
B.C. CURVE 1 TO L.G. 90.458

CURVE DATA		
No.	4	5
Δ	14° 21' 41.44"	6° 16' 37.12"
R	36.00	12.00
T	4.536	7.108
L	9.024	12.834
E	0.285	1.947

NOTE: SAME DESIGN CAN BE USED FOR 23.50m R.O.W. PRIMARY COLLECTOR (UNDIVIDED) TO MAJOR STREET.

3 03-11 REVISED TURNING RADI!! 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		Drawn: J.L. Date: 30.1.14 Scale: N.T.S. Approving for: <i>[Signature]</i> City Engineer	THE CITY OF CALGARY METRIC INTERSECTION DESIGN FOR 21.00m R.O.W. COLLECTOR TO MAJOR STREET	Sheet: 4 File Number: 454.1014.007
--	--	---	---	--

SOLE RESPONSIBILITY FOR THE DESIGN AND CONSTRUCTION OF THIS PROJECT IS ASSIGNED TO THE CITY OF CALGARY. THE CITY OF CALGARY IS NOT RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF THIS PROJECT.



CURVE DATA

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

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

CURVE DATA

No.	5	6	7	8
Δ	61° 16' 37.12"	2° 25' 42.49"	2° 25' 42.49"	1° 40' 39.03"
R	12.00	1750.00	1757.40	1750.00
T	7.108	37.092	37.249	25.620
L	12.834	74.173	74.487	51.237
E	1.947	0.393	0.395	0.188

B.C. CURVE 8 TO L.G. 139.972

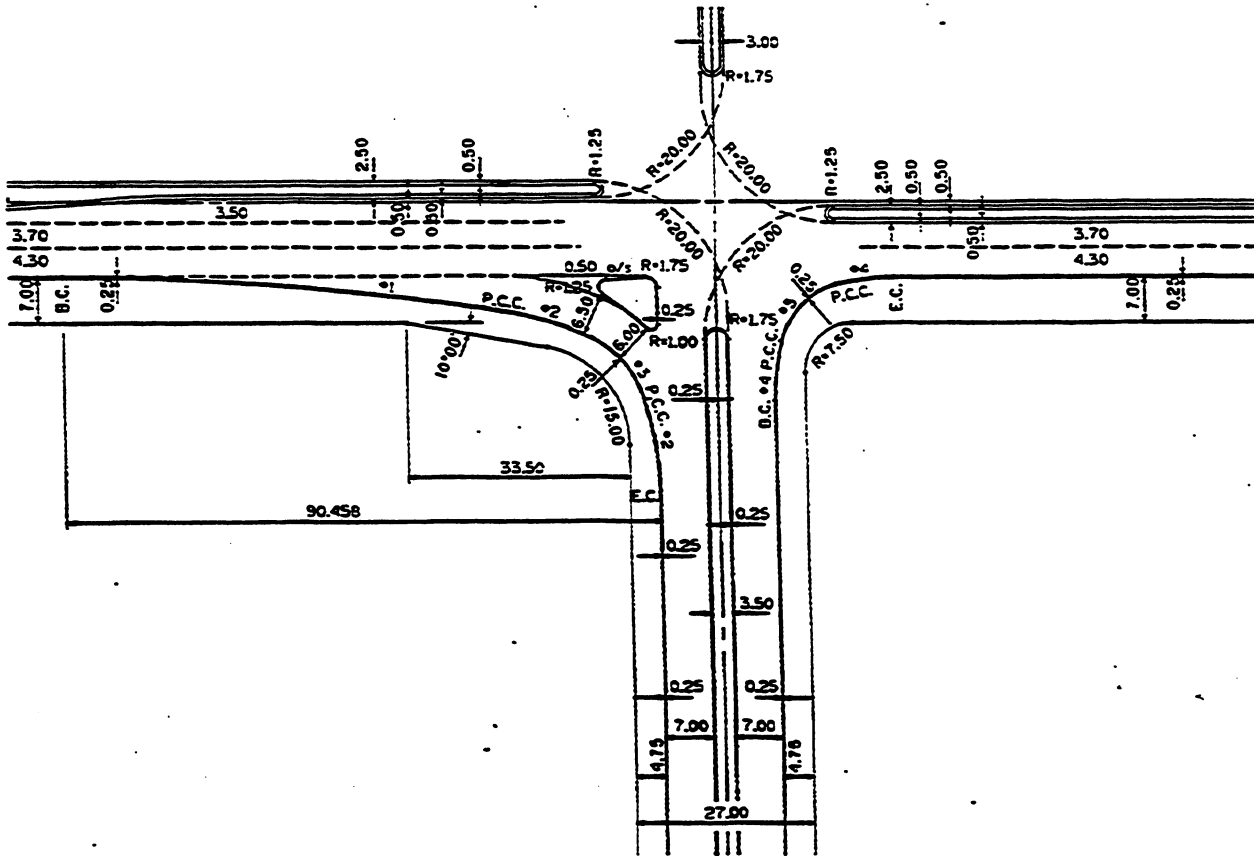
No.	Date	Revision
1	03-11	REVISED TURNING RADI AND WIDE CURB LANE
2	99-05	REVISE L. TURN BAY AND ADD DIMENSION
3	98-12	REMOVE DIM. AND ADD LL TO RIGHT TURN TAPER

Drawn	JLR	Date	SEPT. '96
Scale:	N.T.S.	Approved for	<i>Cherry</i>
App'd		City Engineer	

THE CITY OF CALGARY
 METRIC
 TYPICAL TEARDROP DESIGN
 FOR 21.00m R.C.W. (BUS ROUTE)
 COLLECTOR TO MAJOR STREET

Sheet	5
File Number	454.1014.008

NOT REPRODUCED WITHOUT PERMISSION OF THE CITY OF CALGARY



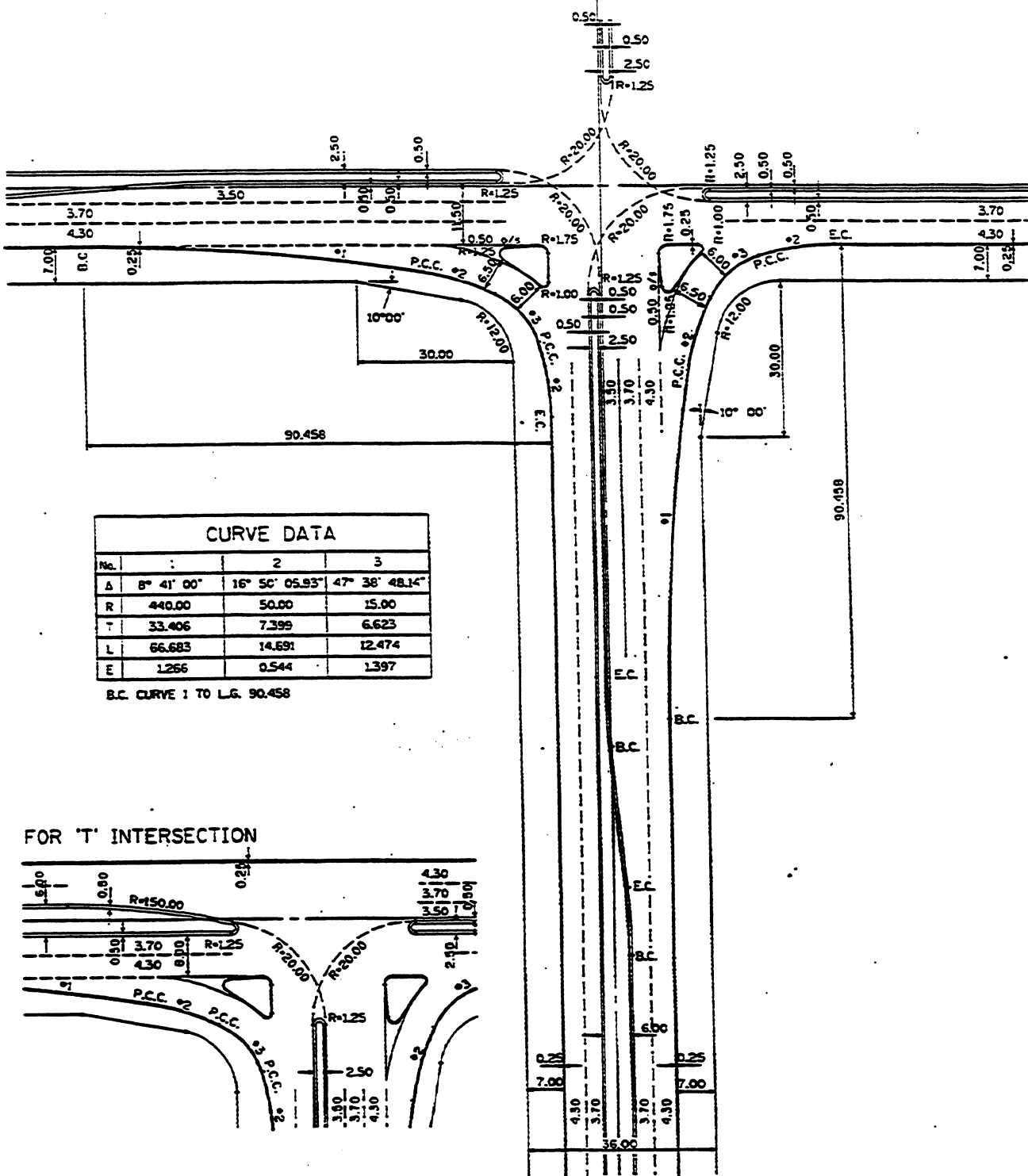
CURVE DATA			
No.	1	2	3
Δ	8° 41' 00"	16° 50' 05.93"	47° 38' 48.14"
R	440.00	50.00	15.00
T	33.406	7.399	6.623
L	66.683	14.691	12.474
E	1.266	0.544	1.397

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

CURVE DATA		
No.	4	5
Δ	14° 21' 41.44"	67° 16' 37.32"
R	36.00	12.00
T	4.536	7.108
L	9.024	12.834
E	0.285	1.947

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

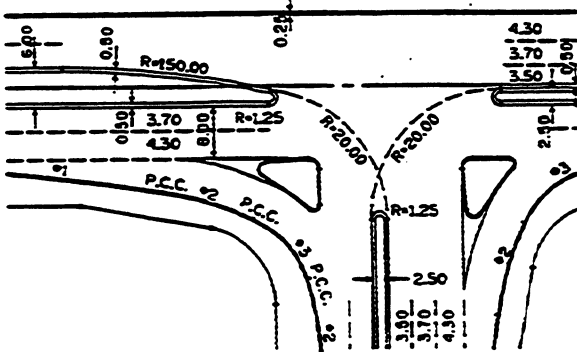
Drawn		Date	THE CITY OF CALGARY METRIC	Sheet
S.P.L.		SEP. 78		6
Scale:		N.T.S.	INTERSECTION DESIGN	
Approved for		City Engineer	FOR 27.00m R.O.W.	
No. Date			LOCAL MAJOR TO MAJOR STREET	
Revision		File Number		454.1014.017
1 03-11 REVISED TURNING RADII AND WIDE CURB LANE				



CURVE DATA			
No.	1	2	3
Δ	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

No.	Date	Revision
4	03-11	REVISED TURNING RADII AND WIDE CURB LANE
3	199-05	ADDED DIAGRAM FOR 'T' INTERSECTION
2	199-05	REVISE L. TURN BAY AND MISC. TEXT
1	198/12	REMOVE DIM. AND ADD LL TO RIGHT TURN TAPER

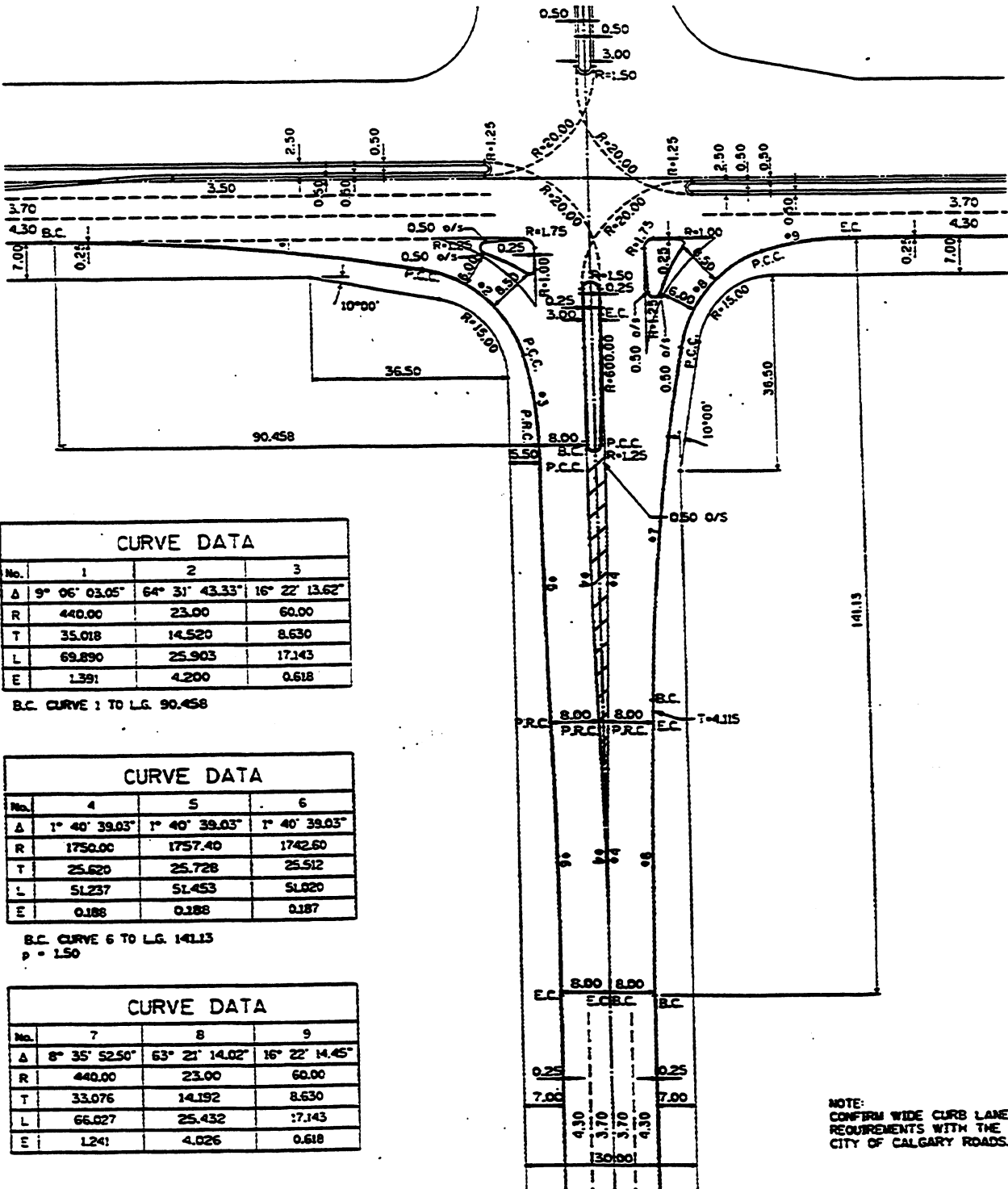
Drawn	Date
R.S.T.	DEC. 74
Scale:	N.T.S.
Approved for	
City Engineer	

THE CITY OF CALGARY
 METRIC

INTERSECTION DESIGN (REVISED)
 FOR 36.00m R.O.W.
 MAJOR TO MAJOR STREET

Sheet: **7**
 File Number: 454.1014.005

SEE REVISIONS... 198/12



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	1757.40	1742.60
T	25.620	25.728	25.512
L	51.237	51.453	51.020
E	0.186	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.

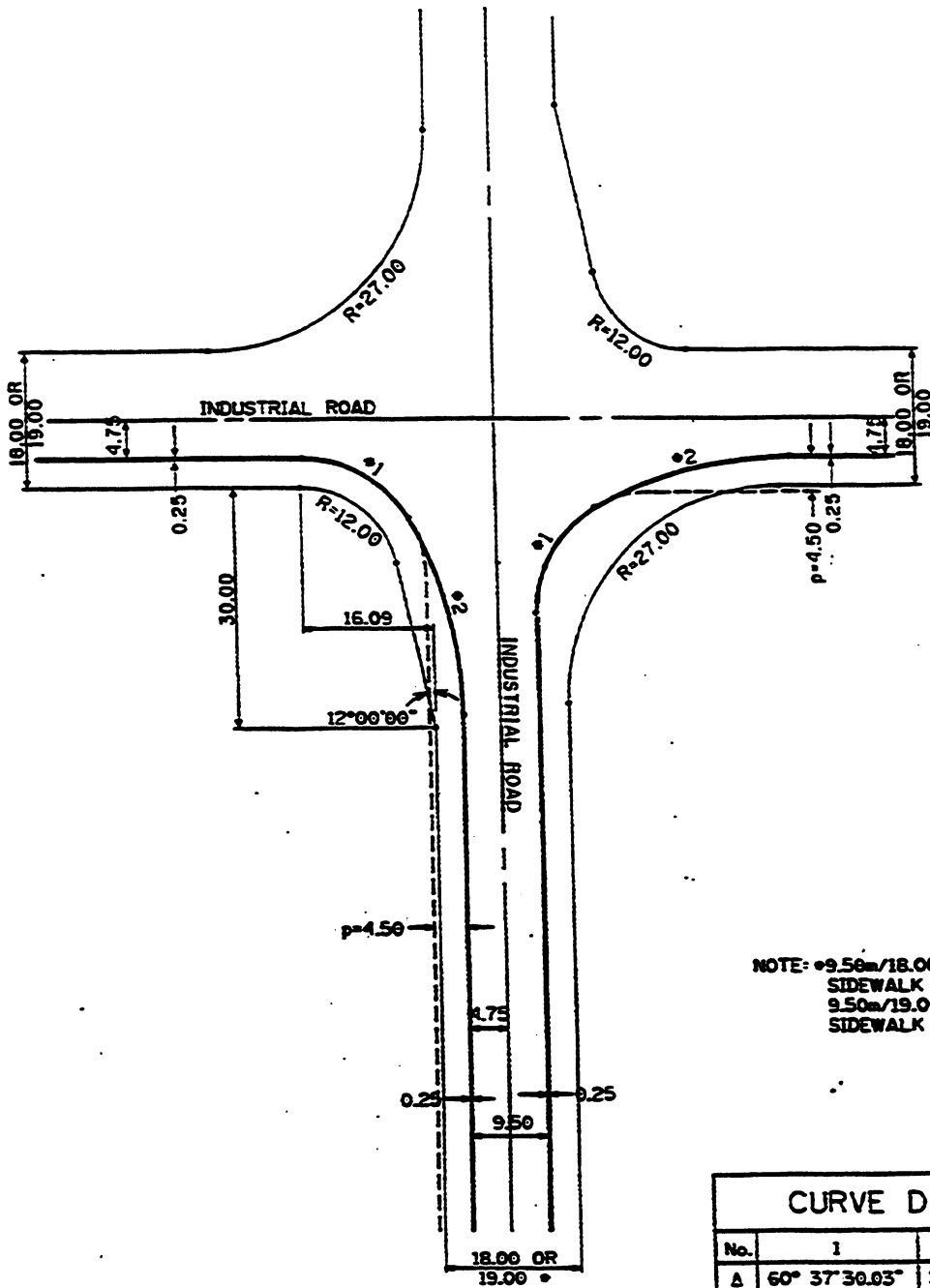
51 03-111 WIDE CURB LANE AND AN ADDITIONAL NOTE	
4100-04 REVISE TURNING RADII TO 20.00m	
3199-12 REVISE RADII ON CURVE 2 & 3 AND GOT 8 & 9	
2199-05 REVISE L TURN BAY, CURVE DATA AND N. ISLAND	
1198-12 REMOVE DIM. AND ADD LL TO RIGHT TURN TAPER	
No.	Date
Revision	
App'd	City Engineer

Drawn	ATR	Date	SEPT. 98
Scale:	N.T.S.		
Approved for	<i>Pratt</i>		
City Engineer			

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

METRIC
 Sheet: **8**
 File Number: 454.1014.006

100% BY TELETYPE... 100% BY TELETYPE... 100% BY TELETYPE...



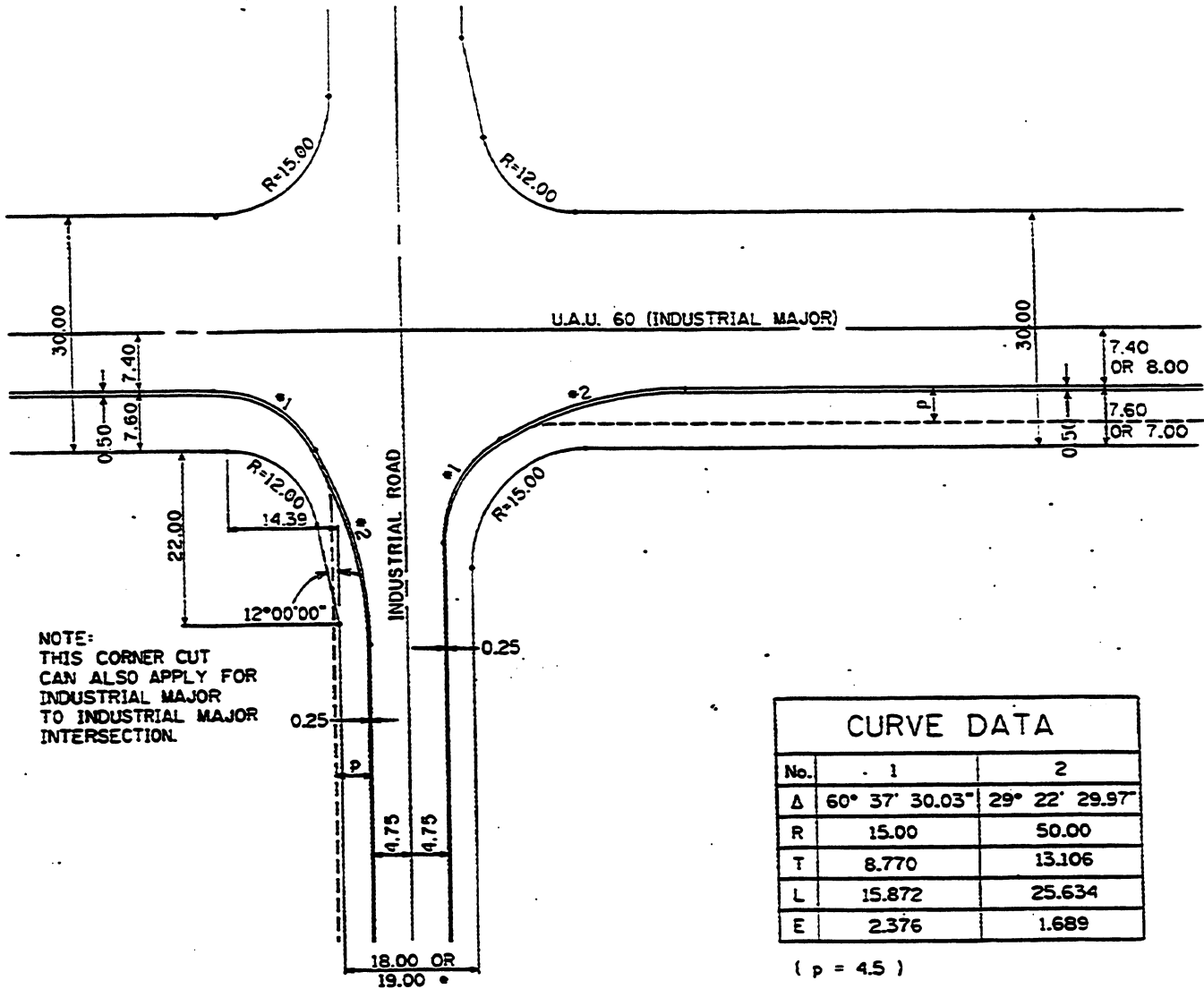
NOTE: 9.50m/18.00m FOR
SIDEWALK ON ONE SIDE
9.50m/19.00m FOR
SIDEWALK ON BOTH SIDES

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.R.	Date 3/27/12	THE CITY OF CALGARY METRIC	Sheet 10
		Scale NTS	Approved for <i>[Signature]</i>	INTERSECTION DESIGN FOR INDUSTRIAL TO INDUSTRIAL STREET	
2	01-01	REVISE R.O.W. DIM TO 18.00m OR 19.00m		File Number 454.1008.002	
1	99-12	REVISE CORNER TO BE A TWO CENTER CURVE			
No.	Date	Revision	App'd		



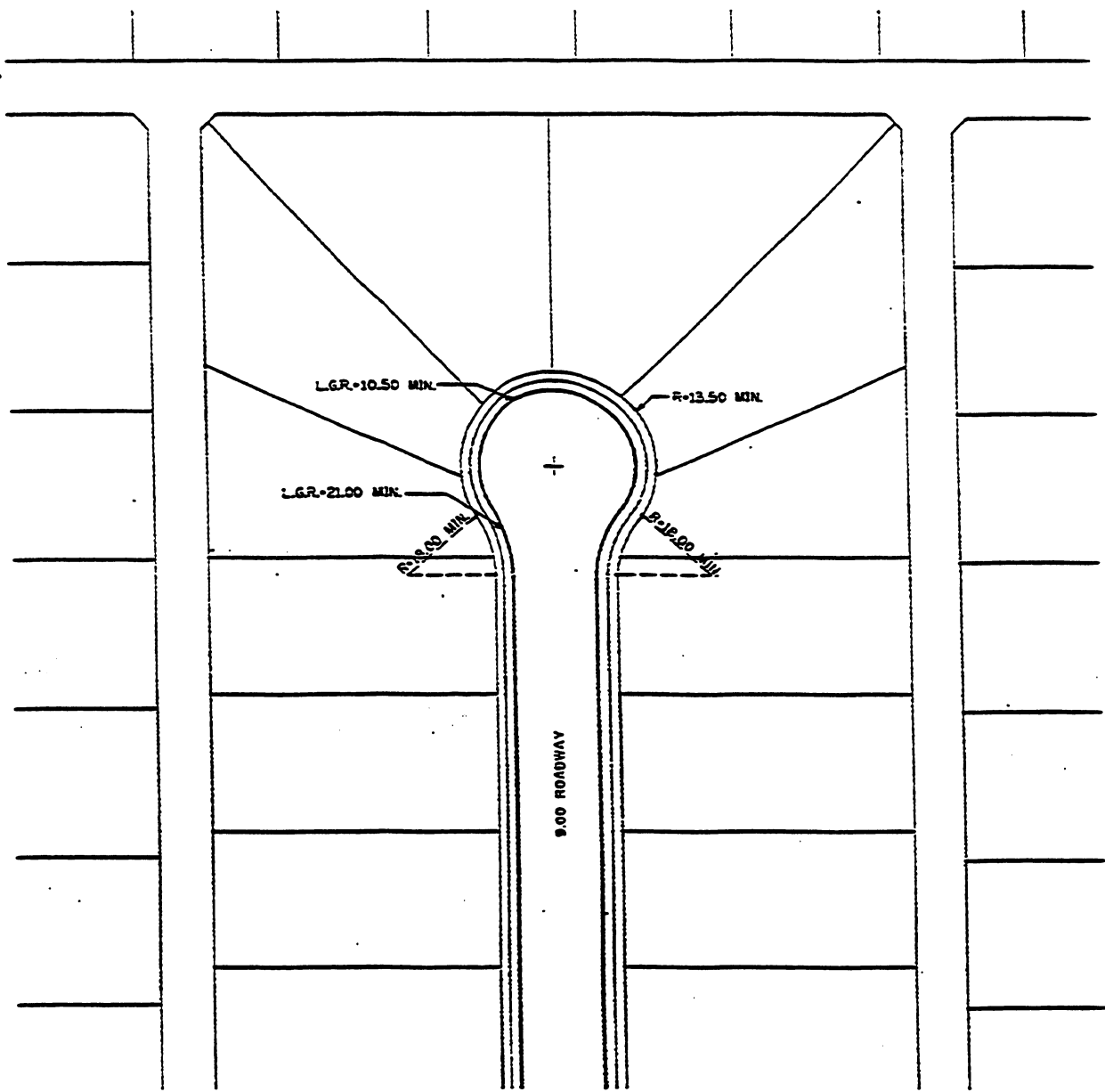
NOTES:
 -9.50m/18.00m FOR
 SIDEWALK ON ONE SIDE
 -9.50m/19.00m FOR
 SIDEWALK ON BOTH SIDES
 -CONFIRM WIDE CURB LANE
 REQUIREMENTS WITH THE
 CITY OF CALGARY ROADS.

No.	Date	Revision
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

Drawn J.T.R.	Date SEPT. '96
Scale NTS	
Approved for C.R. Egan	

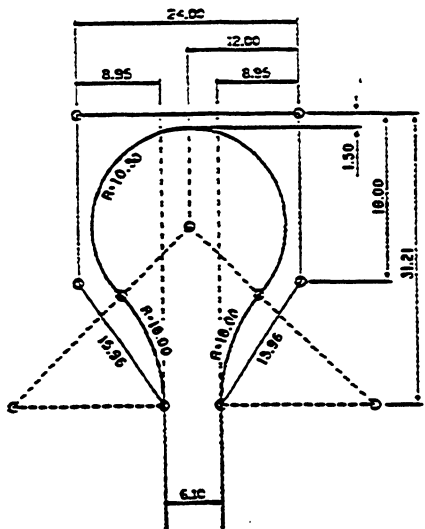
THE CITY OF CALGARY
 INTERSECTION DESIGN
 INDUSTRIAL TO
 INDUSTRIAL MAJOR

Sheet 11
File Number 454.1008.001

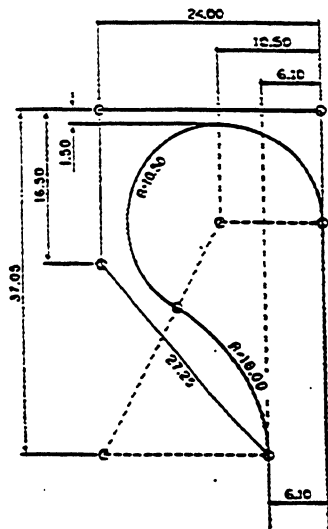


		Drawn J.T.R.	Date SEPT. 98	THE CITY OF CALGARY Engineering & Planning	Sheet 12
		Scale 1:25		TYPICAL RESIDENTIAL STREET CUL-DE-SAC DESIGN MINIMUM REQUIREMENTS	File Number 454.1004.004
1 98/12 REVISE LIP OF GUTTER RAD!!		App'd <i>[Signature]</i>	Eng'g Engineer		
No.	Date	Revision			

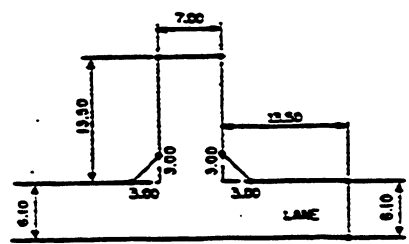
NOT REPRODUCED WITHOUT PERMISSION OF THE CITY OF CALGARY
 2000 1000-0000 0000



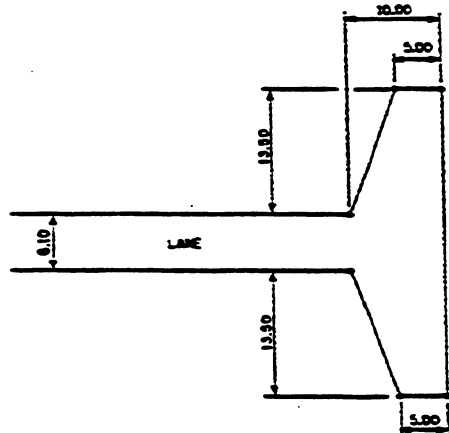
EXISTING LANE R/W - 6.10
 EXISTING ROAD WIDTH - 6.10
 NO PARKING IN CUL-DE-SAC
 NO CURB
 MODERN DESIGN S.U. VEHICLE
 MANEUVERING REQUIRED



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

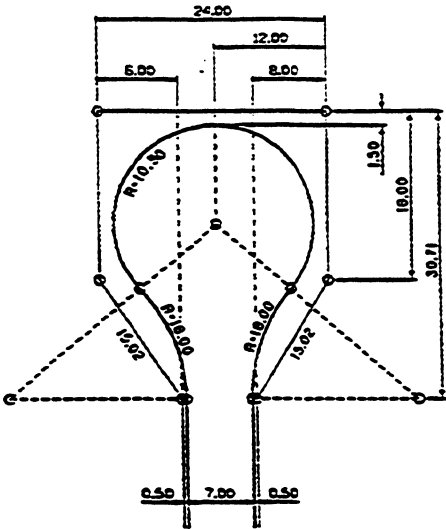


TRUCK LENGTH - 11.60
 S.U. VEHICLE
 EXISTING LANE WIDTH - 6.10

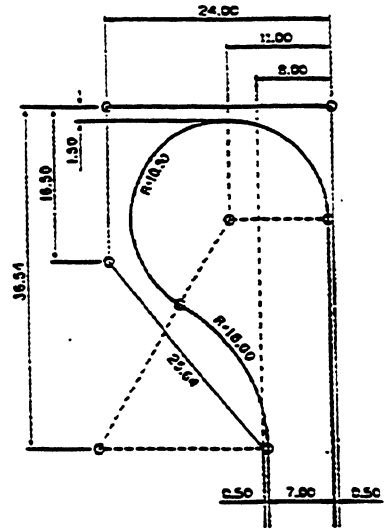


TRUCK LENGTH - 11.60
 S.U. VEHICLE
 EXISTING LANE WIDTH - 6.10

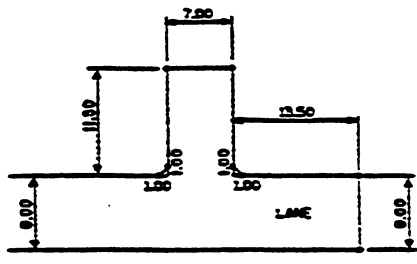
<small>THIS DOCUMENT IS THE PROPERTY OF THE CITY OF CALGARY. IT IS TO BE RETURNED TO THE CITY OF CALGARY UPON REQUEST.</small>			
Origin: SPG Scale: NTS Approved for: [Signature] City Engineer	Date: 99-07 App: G	THE CITY OF CALGARY Planning & Development TYPICAL LANE CUL-DE-SAC AND HAMMERHEAD DESIGNS FOR 6.10m LANES	Sheet: 13 File Number: 454.1004.006
No. Date	Revision		



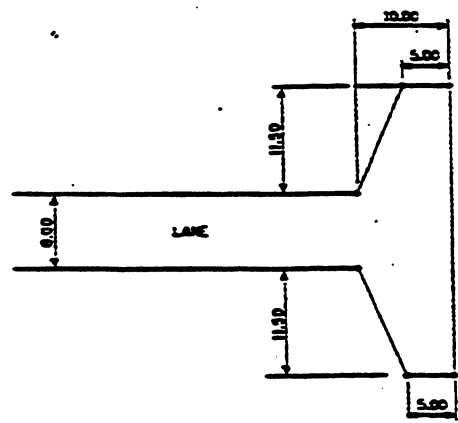
LANE R/W - 8.00
 ROAD WIDTH - 7.00
 NO PARKING IN CUL-DE-SAC
 NO CURB
 MODERATE DESIGN S.U. VEHICLE
 MANEUVERING REQUIRED



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

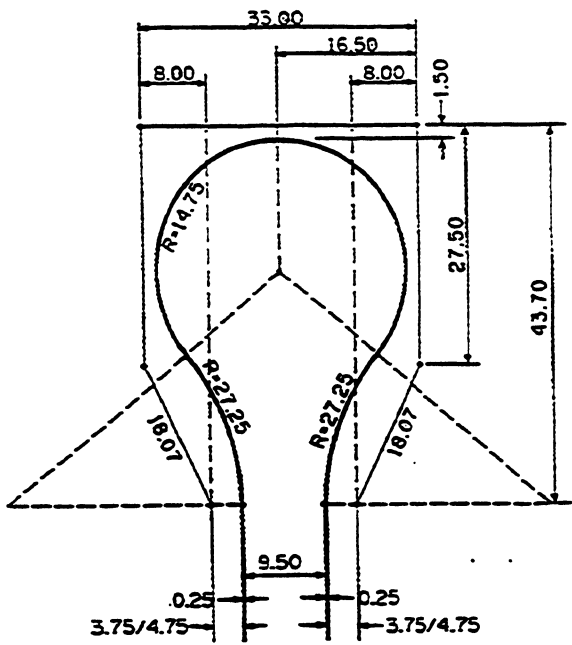


TRUCK LENGTH : 11.60
 S.U. VEHICLE
 LANE WIDTH : 8.00

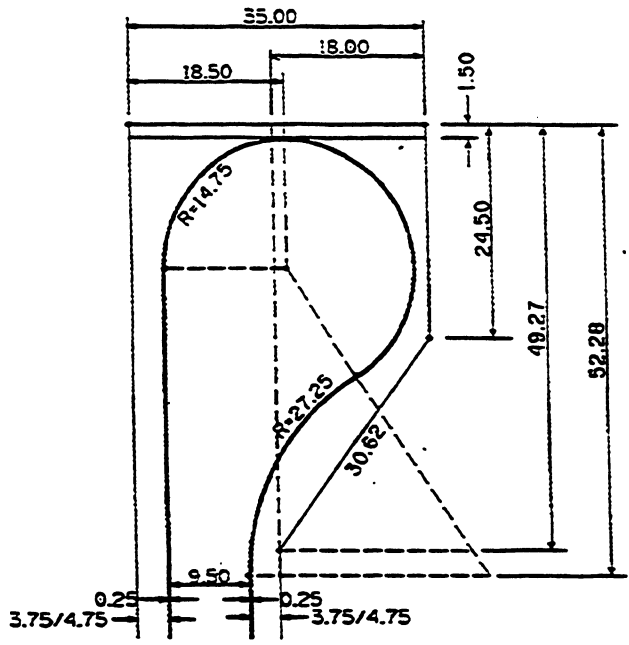


TRUCK LENGTH : 11.60
 S.U. VEHICLE
 LANE WIDTH : 8.00

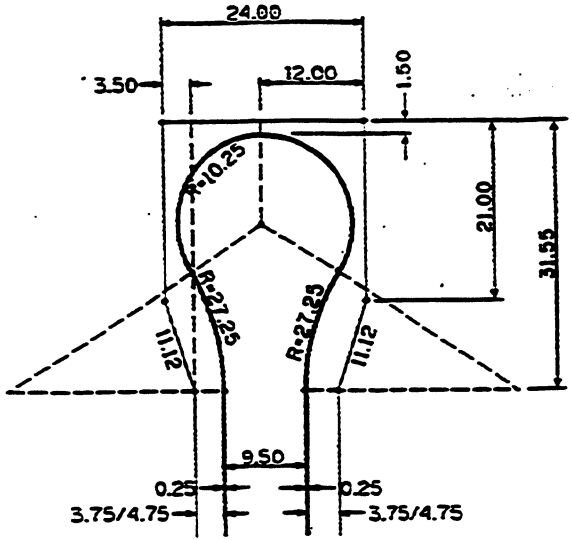
THE CITY OF CALGARY Planning & Development Traffic Engineering		Drawn: SPG Date: 99-07 Scale: NTS Approved for: [Signature] City Engineer	SHEET NO. OF TOTAL SHEETS 14 File Number 4541004.007
No.	Date	Revision	App'd



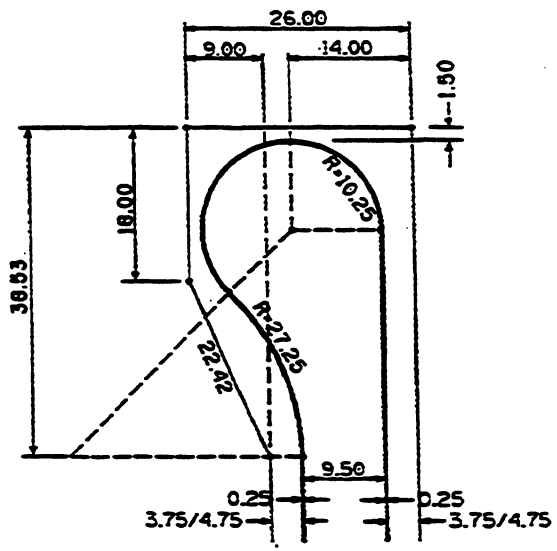
INDUSTRIAL STREET (ABSOLUTE MINIMUM)
ROAD WIDTH - 9.50
NO PARKING IN CUL-DE-SAC
MINIMUM DESIGN TST VEHICLE
MANEUVERING REQUIRED



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.L. VEHICLE
MANEUVERING REQUIRED



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

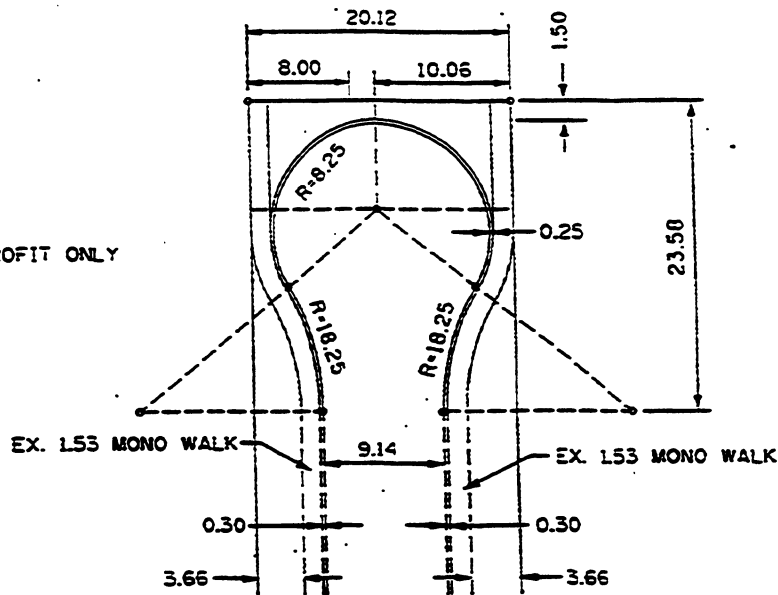
No.	Date	Revision
3102-03		DELETED FOC RADII
2101-05		REVISE LOG DIMENSION
1100-04		REVISE LOG TO 3.75 AND CHANGE TITLE

Drawn
Date
Scale
NTS
Approved
City Engineer

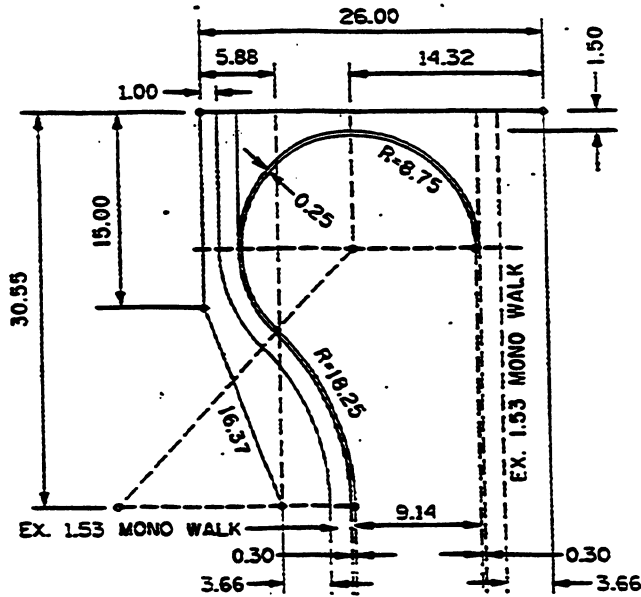
THE CITY OF CALGARY
TYPICAL CUL-DE-SAC
FOR INDUSTRIAL STREET

Sheet
17
File Number
4541004.001

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

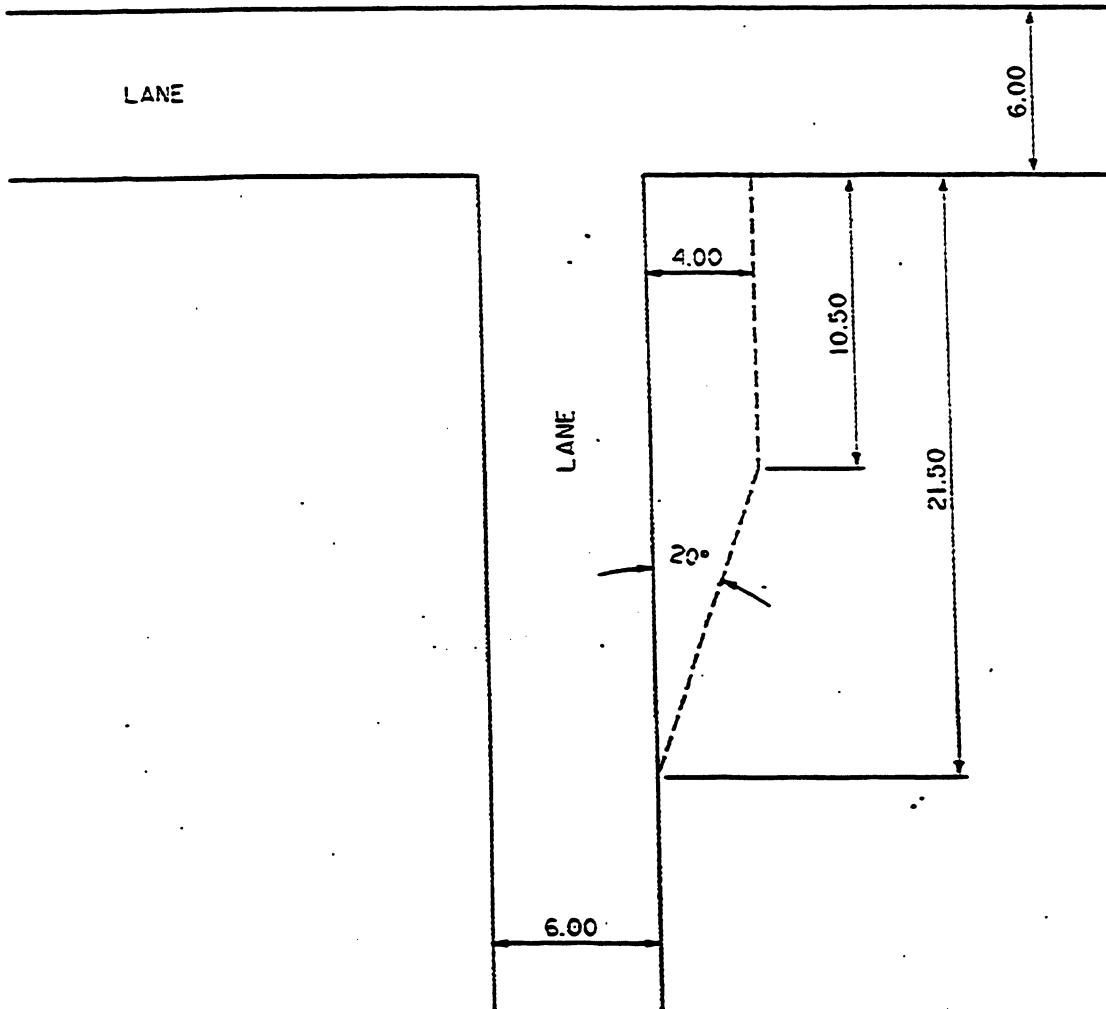
OFFSET CUL-DE-SAC
RESIDENTIAL STREET (ABSOLUTE MINIMUM)
EXISTING R/W - 20.12
EXISTING ROAD WIDTH = 9.14
NO PARKING IN CUL-DE-SAC
a) MINIMUM DESIGN P. VEHICLE
b) MANEUVERING REQUIRED FOR S.U. VEHICLE

No.	Date	Revision
3	03-11	ADDITIONAL RETROFIT NOTES
	2102-03	DELETED FOC RADII
	1199-12	REMOVE LANE DETAILS

Drawn	Date
LTA	SEPT. 78
Scale:	NTS
App'd for	
App'd	City Engineer

THE CITY OF CALGARY
METRIC
TYPICAL CUL-DE-SAC
FOR 20.12m R.O.W.
RESIDENTIAL STREET

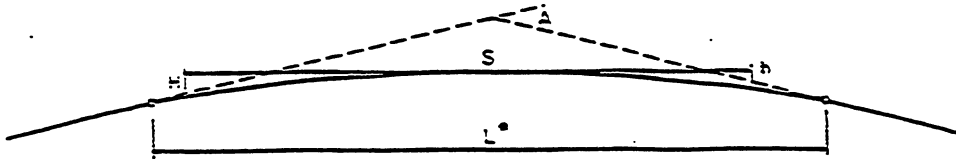
Sheet	18
File Number	454.1004.002



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

Drawn AS		Date 96/05	THE CITY OF CALGARY Engineering & Construction		Sheet: 19
Scale: NTS		T - LANE INTERSECTION MINIMUM REQUIREMENTS FOR TURNING			File Number 454.1004.005
Approved for		CAL. ENGINEER			
No.	Date	Revision	App'd		

CREST CURVES

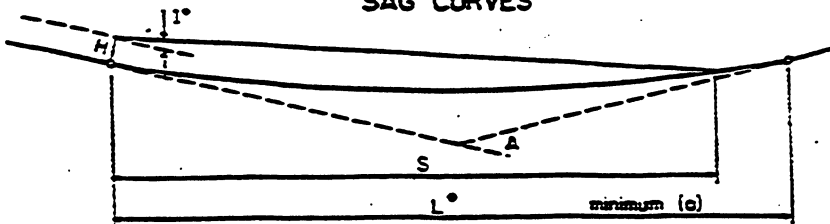


design speed (km/h)	stopping sight distance (m)		crest . K (m)	
	minimum (c)	desireable (b)	minimum (c)	desireable (c)
40	45	45	4	5
50	65	65	7	10
60	85	90	15	20
70	110	120	22	35
80	140	150	35	55
90	170	180	55	85
100	200	210	70	110
110	220	240	85	140
120	240	260	105	170
130	260	280	120	200
140	270	300	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	center 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/s²

	Drawn 212	Date SEPT. 78	 THE CITY OF CALGARY	Sheet 20
	Scale N.T.S.		STOPPING SIGHT DISTANCE VERTICAL CURVES	File Number 4541014.012
1106-84 REVISE MIN. CREST FROM 100 TO 105	Approved by City Engineer			
No. Date Revision				

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

minimum R = 90

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

minimum R = 120

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

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

minimum R = 170

LEGEND

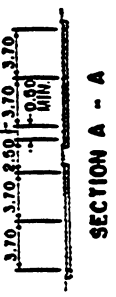
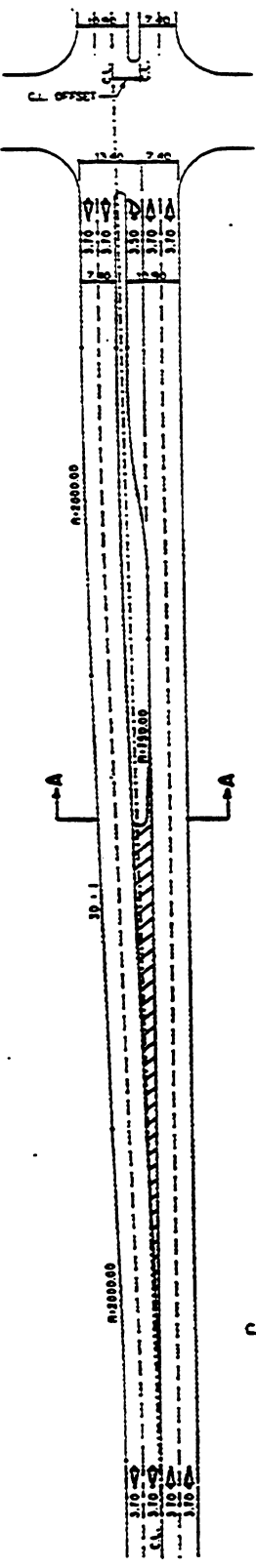
- A = SPIRAL PARAMETER IN METERS
- NC = NORMAL CROSS-SECTION
- RC = REMOVE ADVERSE CROWN & SUPERELEVATE AT NORMAL RATE
- e = RATE OF SUPERELEVATION

SPIRAL LENGTH FORMULA

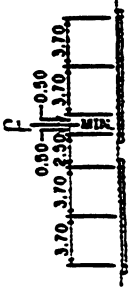
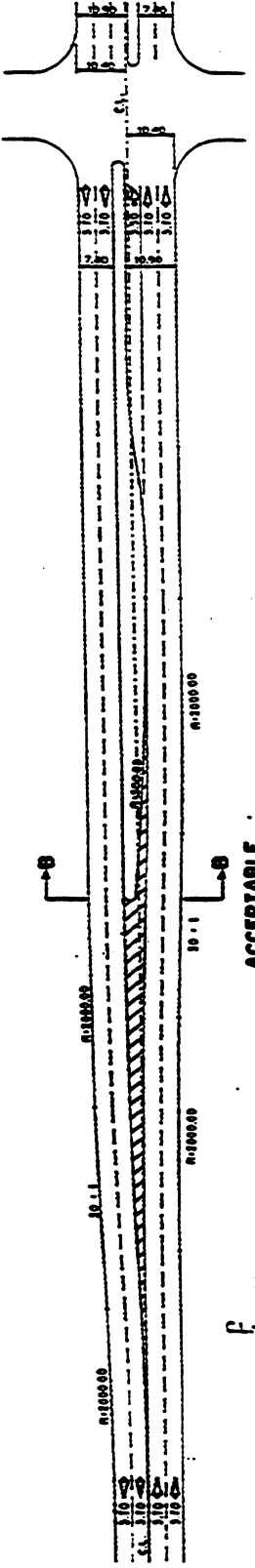
- $L = A^2/R$
- L = LENGTH OF SPIRAL (m)
- A = SPIRAL PARAMETER (m)
- R = RADIUS (m)

FILE REFERENCE: 11-10-1989-REVISED-5000-SPEED-4500-4500-1-80
 FILE: 80-09-0287 1332

THE CITY OF CALGARY ENGINEERING & SURVEYING STREET ENGINEERING			SHEET OF 22 22
Drawn D.J.L.	Date 99-04	Scale N.T.S.	Sheet 22
3 02-04 REVISED TABLE 50km/h e MAX. 0.040	Approved for <i>[Signature]</i>	SUPERELEVATION TABLES	Fac. Number 454.1014.002
2 99-12 ADD TABLE 50km/h e MAX. 0.040	App'd City Engineer		
1 98-12 ADD SPIRAL LENGTH FORMULA			
No. Date Revision			

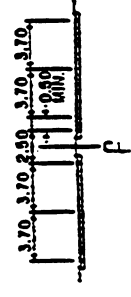
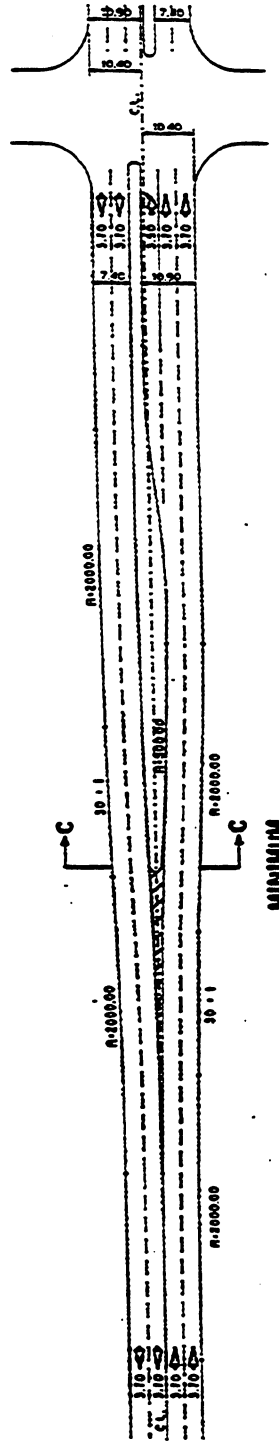


DESIREABLE
MEDIAN - OFFSET FROM CENTRE LINE
SECTION A - A



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

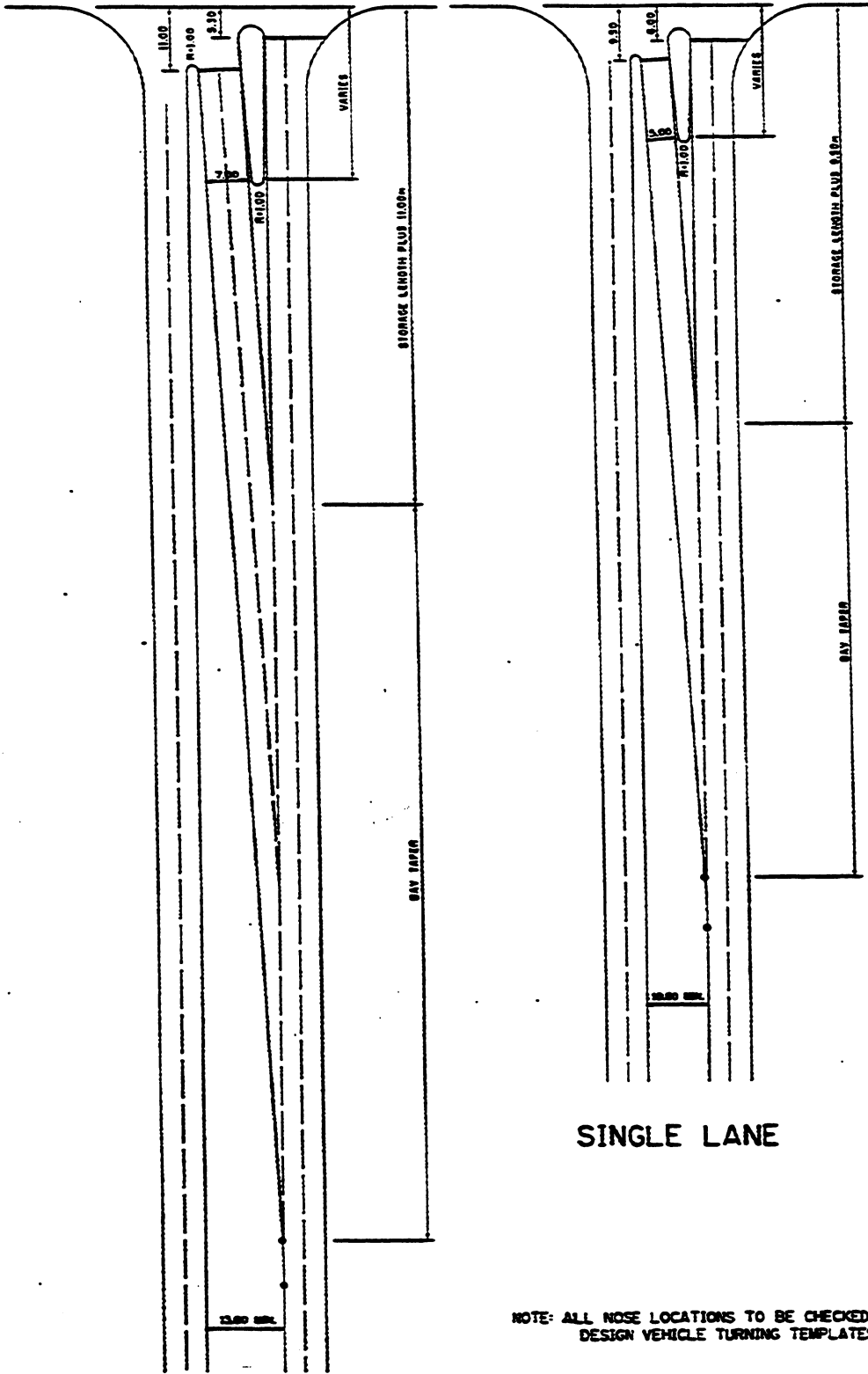
NOTE: LEFT TURN LAKES
AS PER 454-1014.003



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

100-04 REVISE MEDIAN O/S TO 0.50		Scale: 1:25	Date: SEPT. 94	THE CITY OF CALGARY Engineering & Construction Roads Department	Sheet: 23
No.:	Date:	Appr'd. by:	Author:	INTRODUCED MEDIAN	File Number: 454.1009.004
Revision:		Chk'd. by:	Eng'g:		

PLS. REFER TO: 100-04

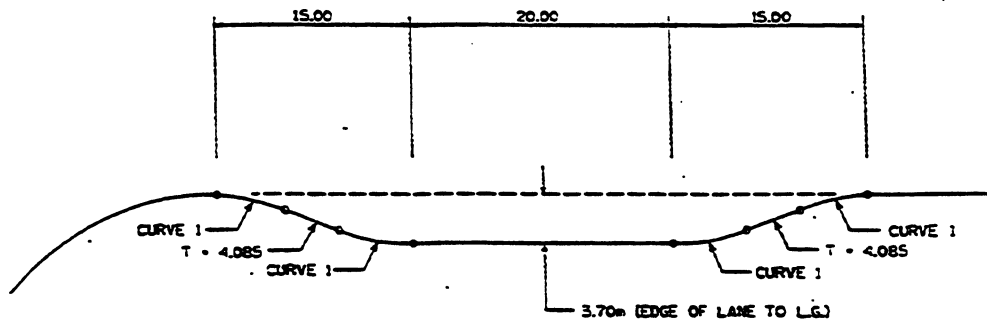


DOUBLE LANE

SINGLE LANE

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

No.		Date		Revision		App'd		THE CITY OF CALGARY <small>STRATEGIC & OPERATIONAL</small>		METRIC Sheet: 24 File Number: 454.1014.021	
								Drawn: SP.G. Date: 99-12 Scale: NTS Approved for: <i>[Signature]</i> City Engineer		TYPICAL SLOT LEFT-TURN LANE DESIGNS	



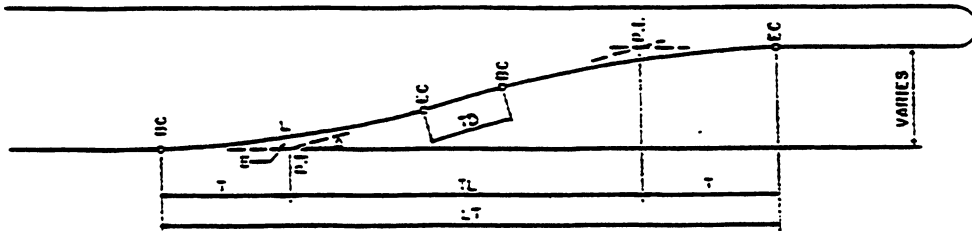
CURVE DATA	
No.	1
Δ	21° 56' 35.57"
R	15.00
T	2.908
L	5.745

NOTES:

- ADD 17.00m FOR EACH ADDITIONAL STANDARD BUS EXPECTED TO USE THE TURNOUT AT THE SAME TIME
- CONCRETE PAVEMENT REQUIRED IN ALL BUS BAYS
- EXTEND CROSS-FALL INTO BUS BAY

**STANDARD DESIGN FOR TRANSIT BUS BAY
(60 km/h ROADWAY)**

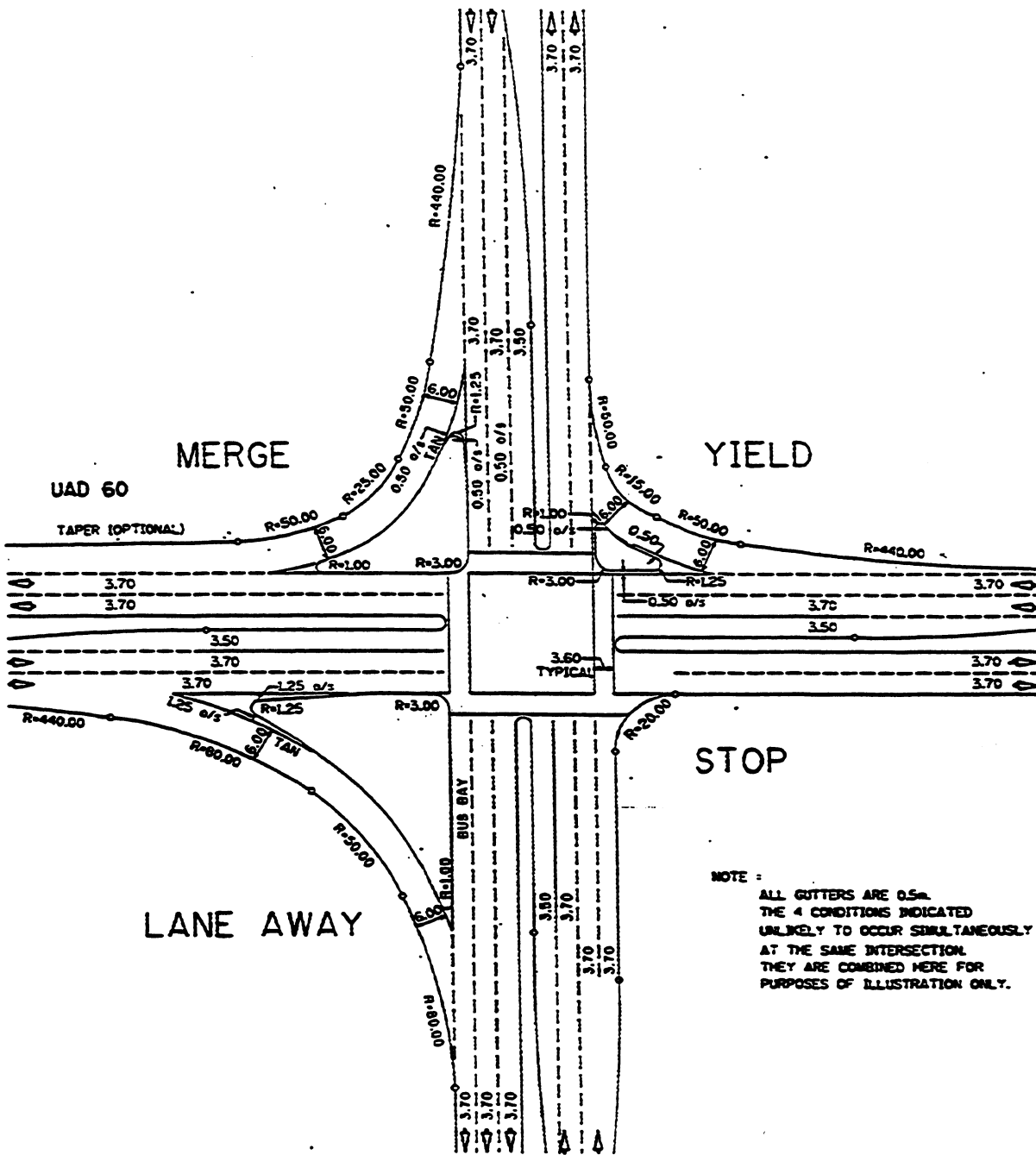
		THE CITY OF CALGARY <small>Planning & Development Public Works</small>		Scale: NTS Approved for <i>Harry</i> City Engineer	THE CITY OF CALGARY Planning & Development Public Works	Sheet 25 File Number 454.1012.005
No.	Date	Revision		App'd		
3	03-11	CHANGE TO 60 km/h AND ADDITIONAL NOTES				
2	00-04	REMOVE CURVE #2 FROM TABLE				
1	98-12	ADD NOTE B NEW DIMENSION				



CURVE DATA

OFFSET	DESIGN SPEED km/h	Δ	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	30.779	13.823	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

1100-04 REMOVED 3.35 DUAL AND 3.70 ROWS		Drawn ATZ	Date SEPT. 26	THE CITY OF CALGARY Department of Transportation Traffic Engineering	Sheet 26
No. Date Revision		Scale N.T.S.	Approved by <i>Ben</i>	TYPICAL LEFT TURN BAY DESIGNS	File Number 454.1014.803



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.

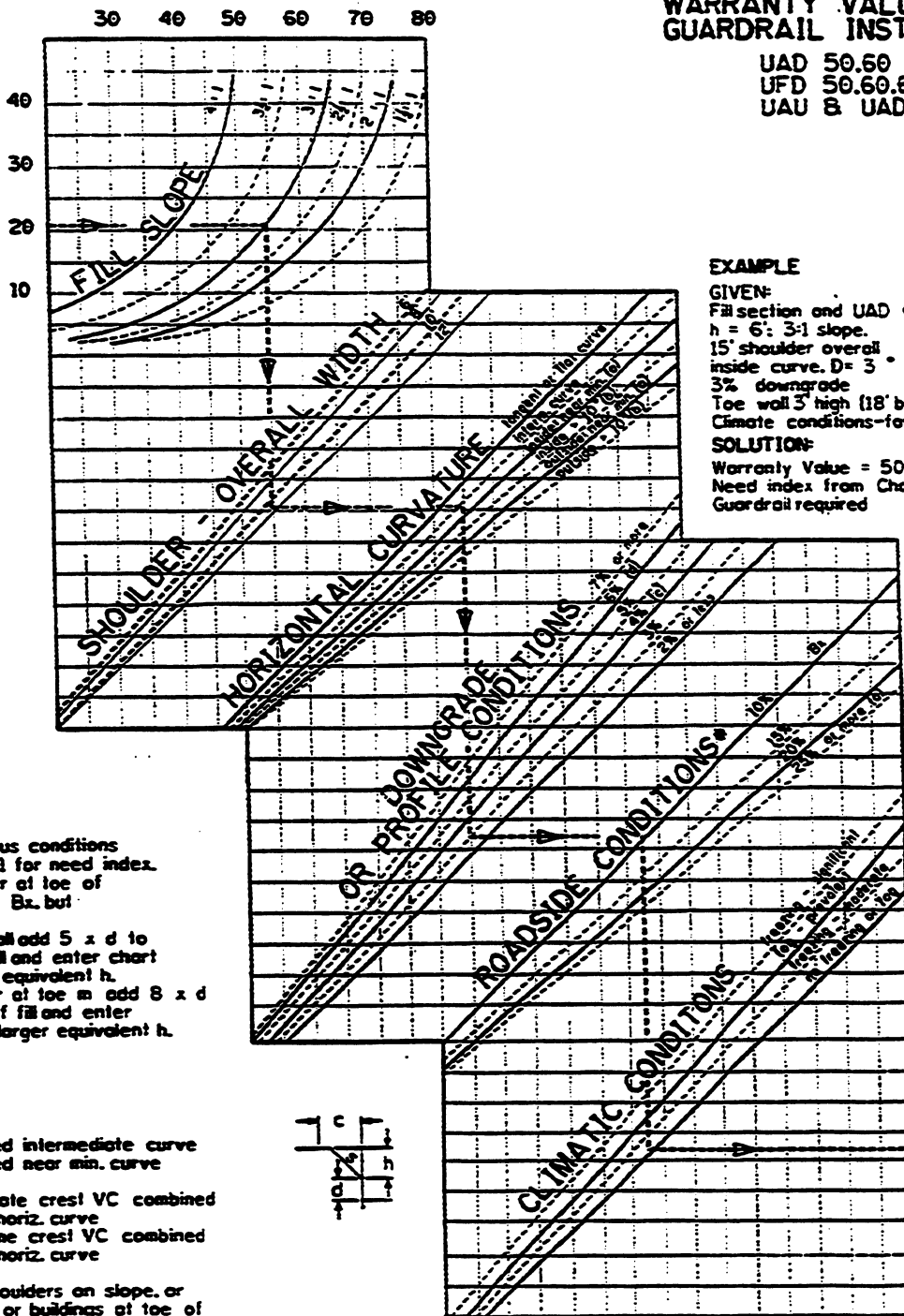
2100-04 REVISE VARIOUS DIMENSIONS		Drawn J.T.A.	Date SEPT. '86	THE CITY OF CALGARY Public Works Department	Sheet 27
198-12 PUT LABEL LANE WIDTHS		Scale NTS	Approved for <i>[Signature]</i>	Examples of Typical Channelization of Island Designs	File Number 454.1014.004
No.	Date	Revision	App'd		

FILE NO. 454.1014.004 - 27

WARRANTY VALUES FOR GUARDRAIL INSTALLATION

UAD 50.60 =50
 UFD 50.60.65.70 =50
 UAU & UAD 30.40 =50

h = HEIGHT OF FILL - FT.



EXAMPLE

GIVEN:
 Fill section and UAD 60
 h = 6'; 3:1 slope.
 15' shoulder overall
 inside curve. D= 3
 3% downgrade
 Toe wall 3' high (18' beyond shoulder)
 Climate conditions-favourable

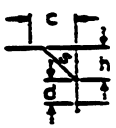
SOLUTION:
 Warranty Value = 50
 Need index from Chart = 62
 Guardrail required

NOTE:

For precipitous conditions see Table F-1 for need index. If wall or water at toe of slope, use line Bx, but:

- with toe wall add 5 x d to height of fill and enter chart with larger equivalent h.
- with water at toe m add 8 x d to height of fill and enter chart with larger equivalent h.

- (a) or isolated intermediate curve
- (b) or isolated near min. curve
- (c) or moderate crest VC combined with horiz. curve
- (d) or extreme crest VC combined with horiz. curve
- (e) and/or boulders on slope, or road or buildings at toe of slope



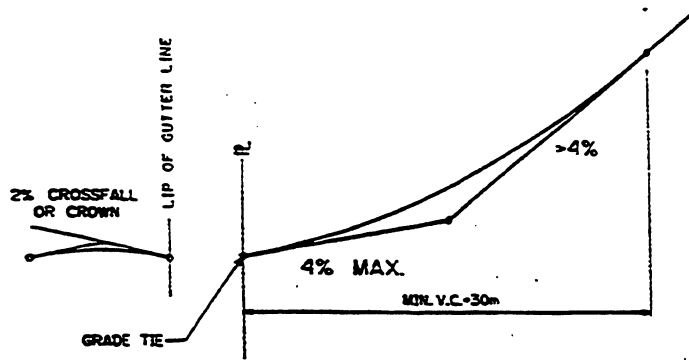
NOTE: METRIC CONVERSION IS CURRENTLY UNAVAILABLE

No. _____		Date _____		Revision _____		Drawn by _____ Date 02-02-03 Scale N.T.S. Approved by _____ City Engineer		THE CITY OF CALGARY 28 File Number 454.100L009	
No. _____		Date _____		Revision _____		Approved by _____ City Engineer		GUARDRAIL NEEDED INDEX CHART	

MAXIMUM APPROACH GRADES AND GRADE TIE AT PROPERTY LINE

THROUGH STREET

APPROACHING STREET



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

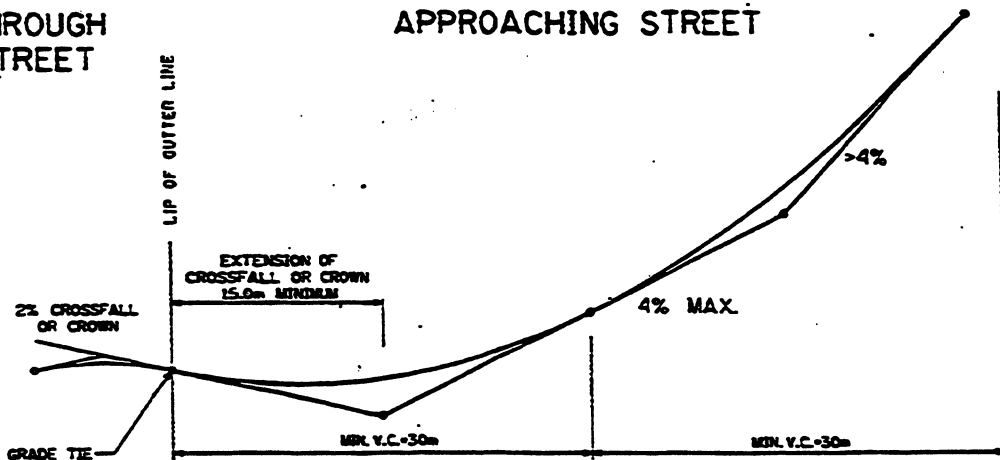
FOR 50 KPH:
MIN. K=7 FOR CREST VERTICAL CURVES
MIN. K=6 FOR SAG VERTICAL CURVES

NOTE: •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

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

THROUGH STREET

APPROACHING STREET



THROUGH STREET	APPROACHING STREET	GRADE TIE
MAJOR INDUSTRIAL 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

2	01-02	INTERSECTION INFO ADDED
1	00-04	REVISE TITLE BLOCK
No.	Date	Revision

Drawn: B. DORE
Date: 90-11
Scale: NTS
Approved for: [Signature]
City Engineer

METRIC

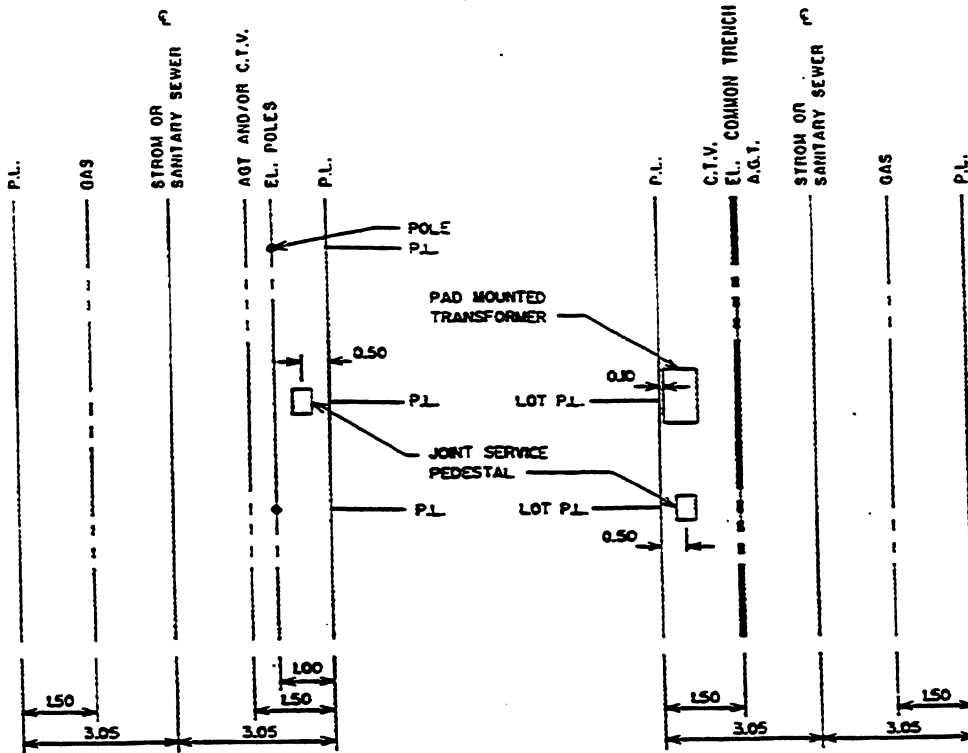
THE CITY OF CALGARY
Engineering & Construction

Sheet **29**
File Number 454.1005.011

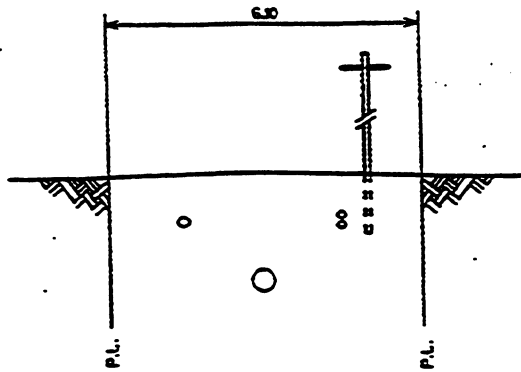
MAXIMUM APPROACH GRADES AND VERTICAL CURVE REQUIREMENTS

APPENDIX II-B

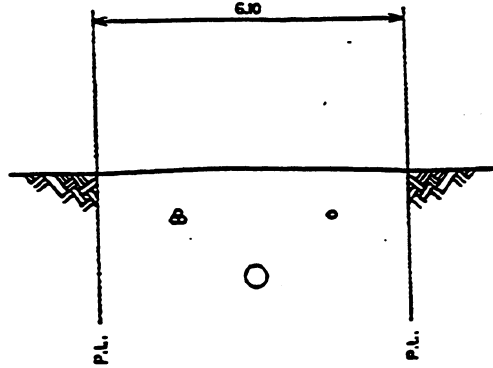
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PLAN



ELECTRICAL DISTRIBUTION (OVERHEAD)
SERVICE VALVES ON 0.30 LINE BOTH SIDES.

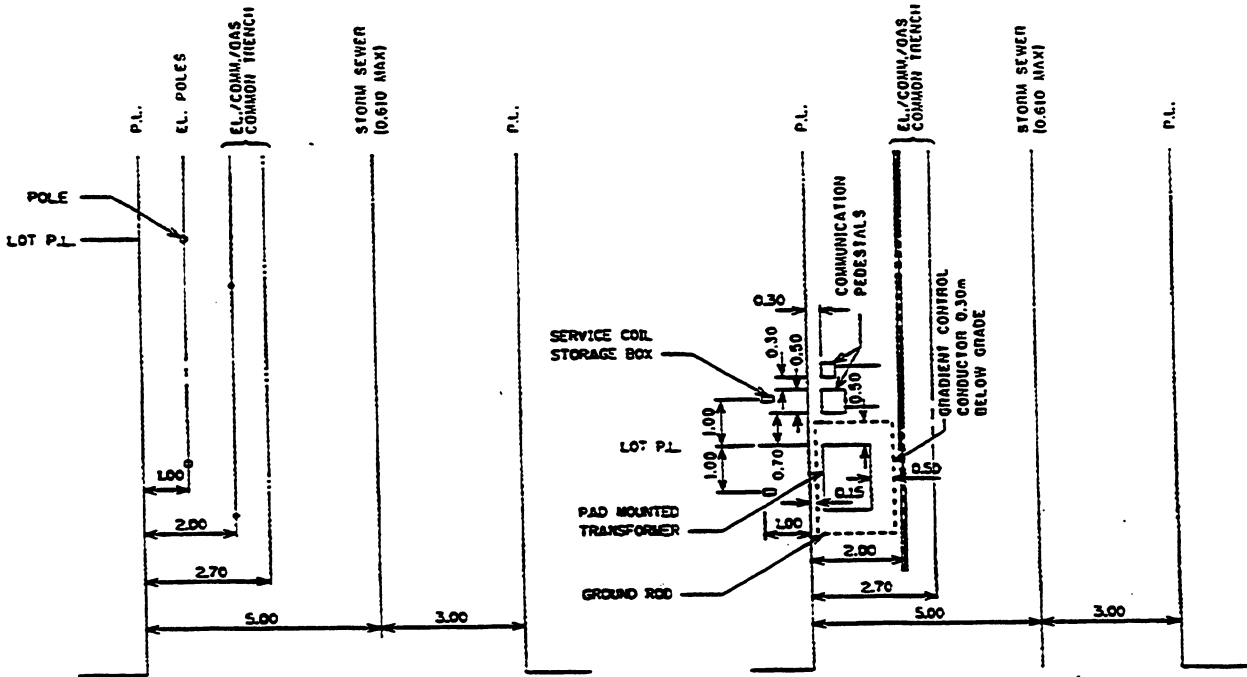


ELECTRICAL DISTRIBUTION (UNDERGROUND)
SERVICE VALVES ON 0.30 LINE BOTH SIDES.

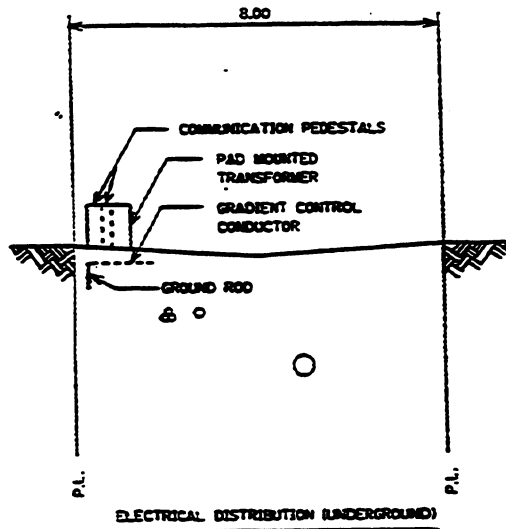
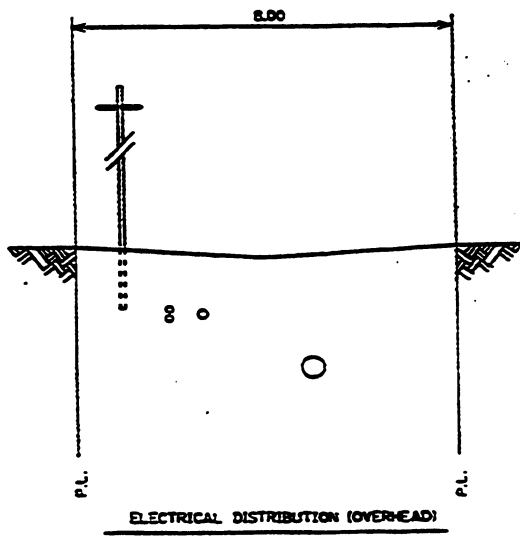
NOTE:

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

Drawn R.B.T.		Date JUNE '94	THE CITY OF CALGARY METRIC	Sheet 1
Scale 1:100		Approved for [Signature]		File Number 454J008.003
Date	Revision	App'd		



PLAN

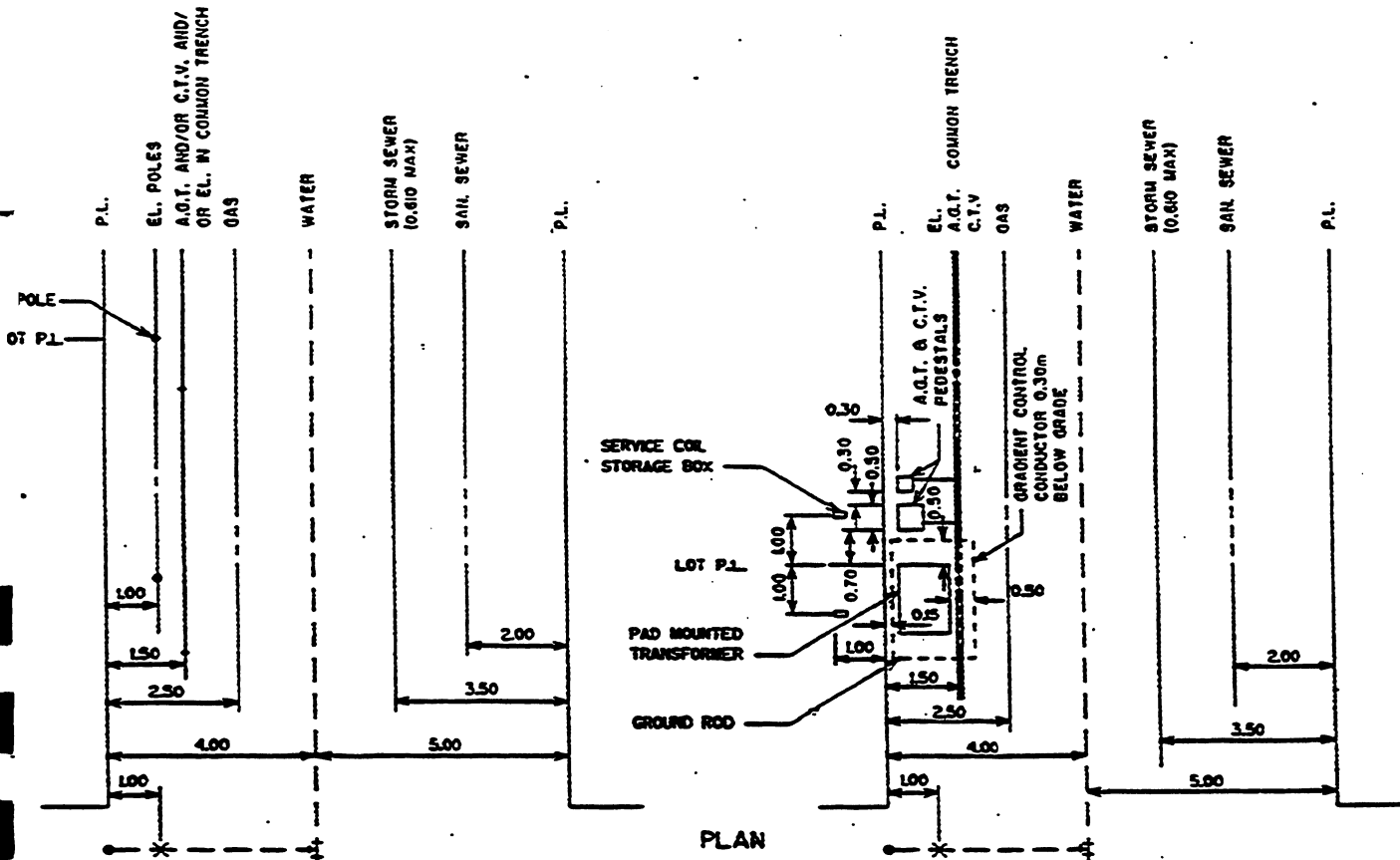


NOTE: 1. THE MAXIMUM SIZE OF STORM IS 610mm (24") DIAMETER & MAXIMUM DEPTH OF 3.50m.

EL./COMM./GAS COMMON TRENCH

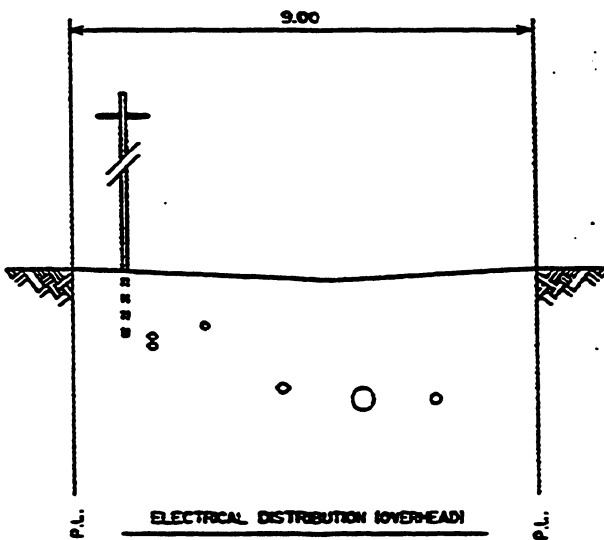
COMMUNICATION PEDESTAL PLACEMENTS TO BE DETERMINED IN FIELD.

Drawn R.B.T. Date JUNE '94 Scale: 1m = 0 3m		THE CITY OF CALGARY METRIC	Sheet 2 File Number 454.1008.036
2 05-11 REVISED STORM SEWER OFFSET 1 01-01 COMMON TRENCH DIM TO 2.0m/GAS TO OPP. SIDE		Approved for <i>[Signature]</i> App'd City Engineer	STANDARD LANES 8.00m WIDTHS
No.	Date	Revision	

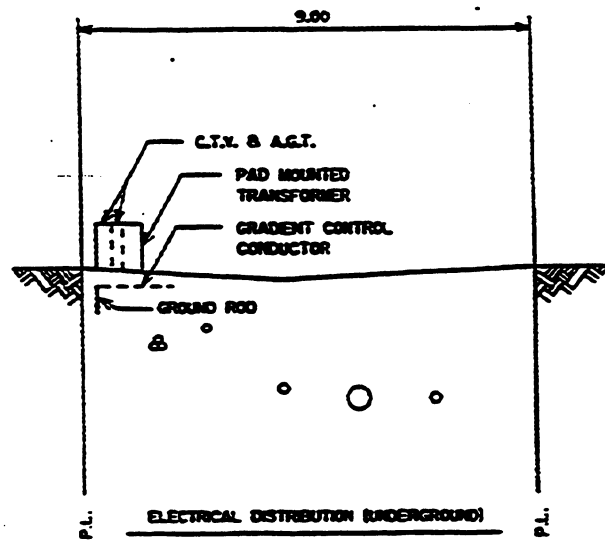


PLAN

NOT TO BE USED
IN NEW DEVELOPMENT



ELECTRICAL DISTRIBUTION (OVERHEAD)



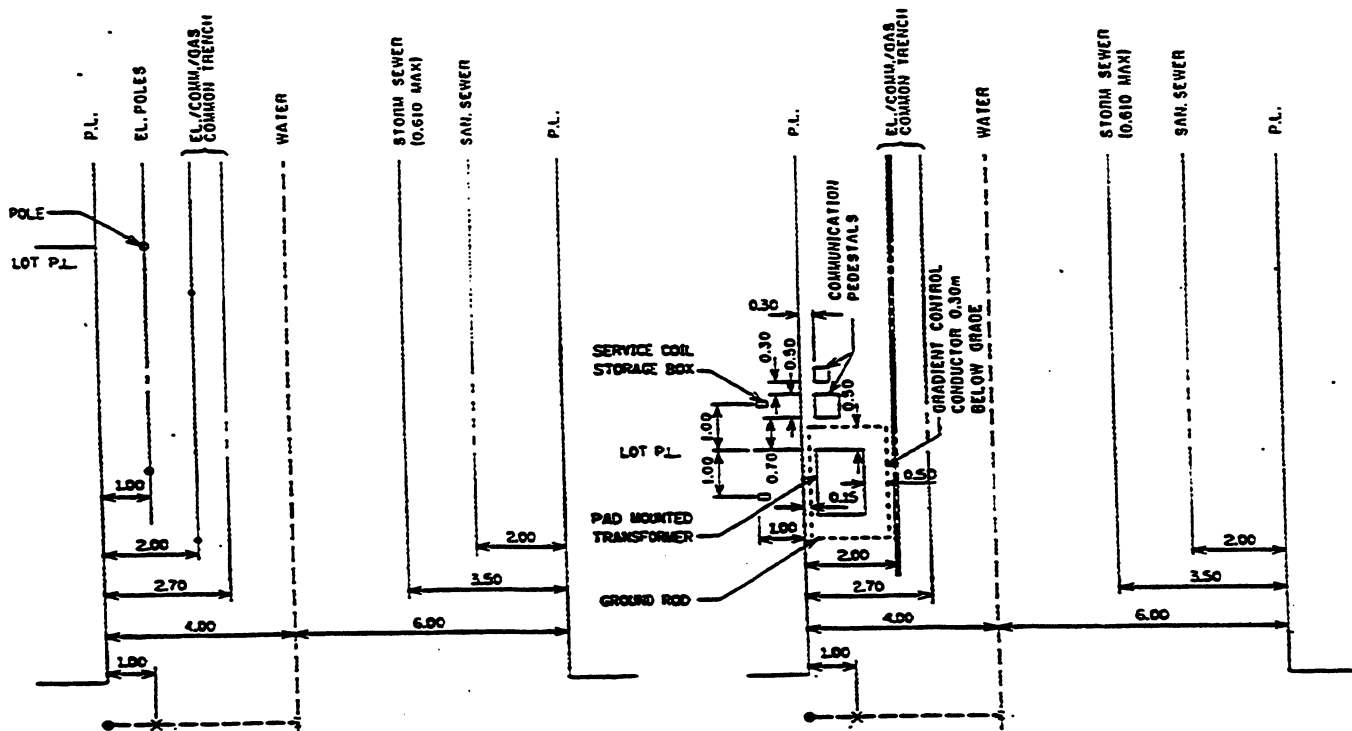
ELECTRICAL DISTRIBUTION (UNDERGROUND)

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

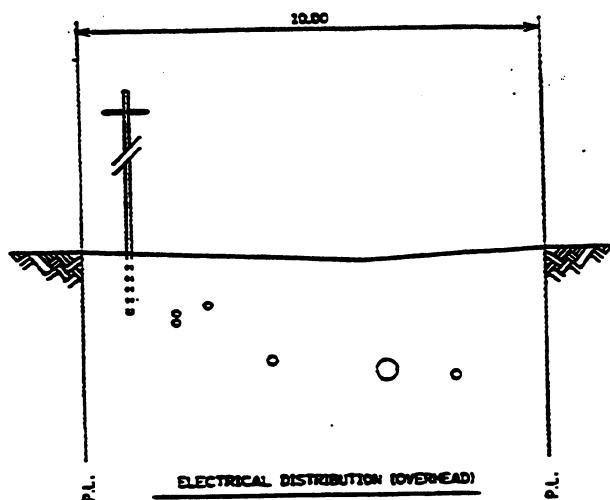
A.G.T. . EL. AND C.T.V. IN SAME DITCH
SERVICE VALVES ON 0.50 LINE BOTH SIDES.

- NOTE:
1. THE GRADE OF THE STORM SEWER INVERT MUST BE LESS THAN 122 DIFFERENT THAN THAT OF THE SANITARY INVERT.
 2. THE MAXIMUM SIZE OF STORM IS 900mm (24") DIAMETER.
 3. POWER POLES . STREETLIGHT POLES . TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.0m CLEARANCE FROM HYDRANTS.

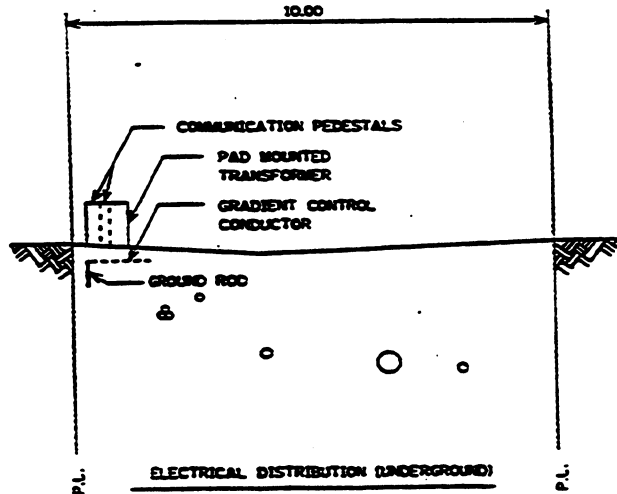
A.G.T. & C.T.V. PEDESTAL PLACEMENTS
TO BE DETERMINED IN FIELD.



PLAN



ELECTRICAL DISTRIBUTION (OVERHEAD)
SERVICE VALVES ON 0.50 LINE BOTH SIDES.



ELECTRICAL DISTRIBUTION (UNDERGROUND)
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.

No.	Date	Revision	App'd
1	01-01	COMMON TRENCH & GAS DIM TO 2.00m & 2.70m	

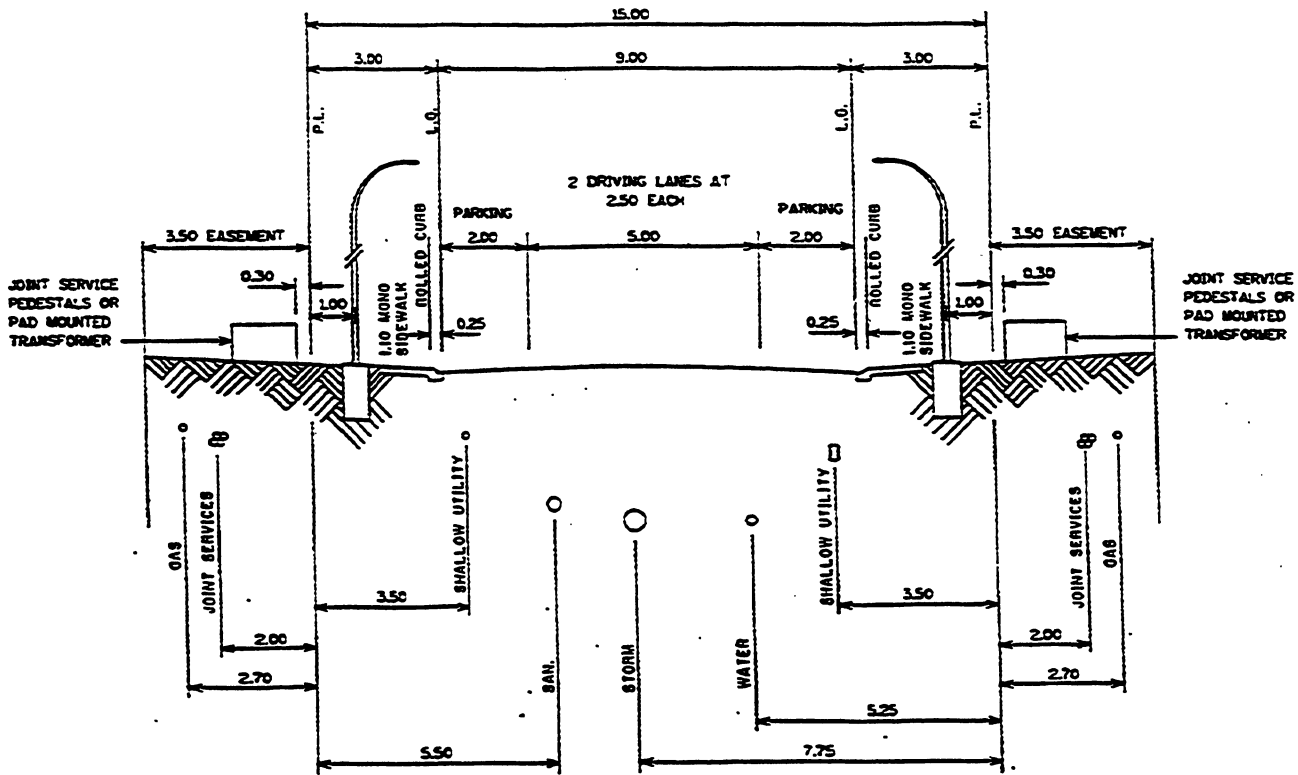
Drawn	Date
R.B.T.	22.7 '94
Scale:	1m = 0 1m
Approved for	
City Engineer	

THE CITY OF CALGARY
METRIC

Sheet **4**

File Number 454.1008.037

STANDARD LANES
10.00m WIDTHS



CARRIAGEWAY ALTERNATES

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

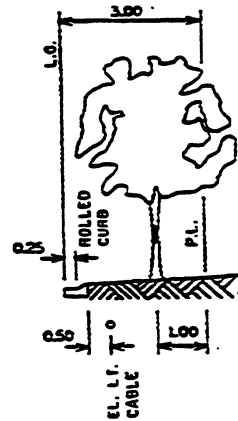
NOTE: FOR CROWNED SECTION
CURB REQUIRED ON BOTH SIDES.

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 2.50 SEPARATION
TO THE CENTRE LINE OF POWER POLES
& STREET LIGHTING POLES.
- 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.
- 1.5m OF PAVEMENT AND A 17.5m R.O.W.
SHALL BE PROVIDED ADJACENT TO ALL
SCHOOL SITES.



**ALTERNATIVE WITH
NO SIDEWALK**

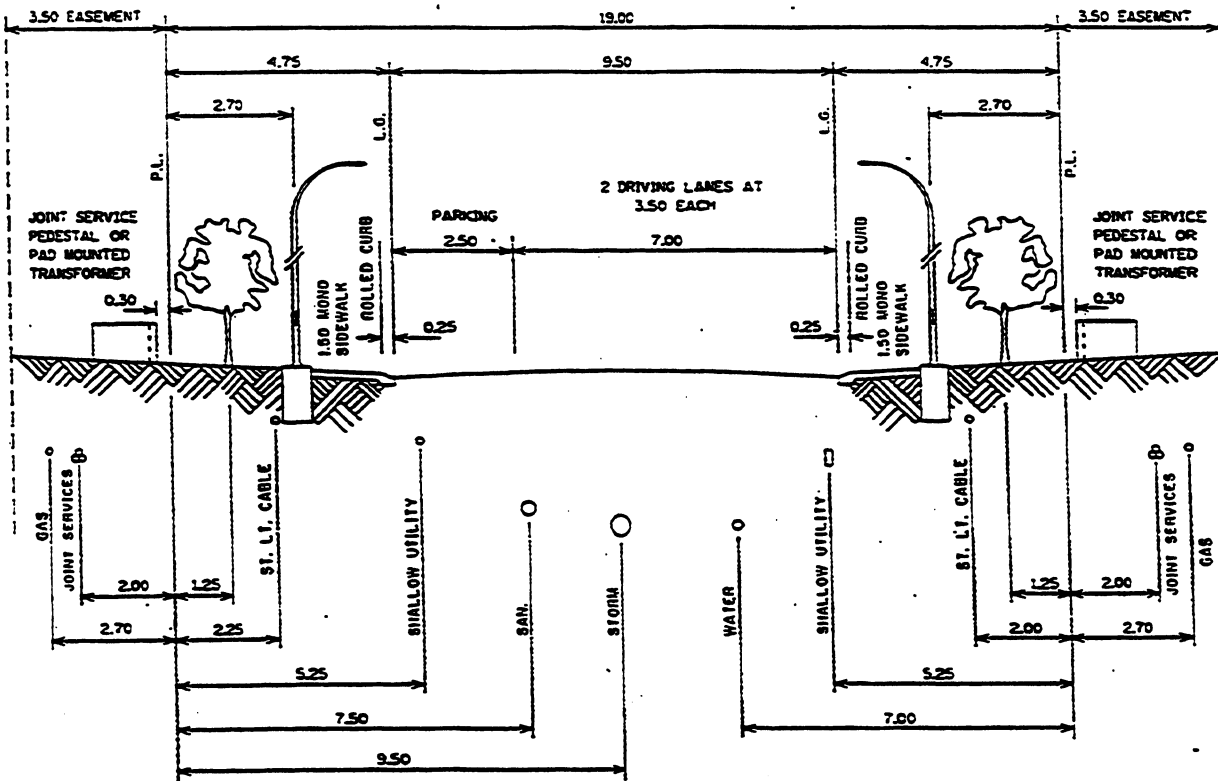
**- ENVIRONMENTAL CAPACITY 1.000
VEHICLES PER DAY**

6	102 - 11	ADDED SCHOOL R.O.W. NOTE	
5	100 - 04	REVISE SHALLOW UTILITY O/S. CHANGE UTIL. COMPANY NAMES	
4	198 - 10	CHANGE LABEL TO SHALLOW UTILITY	
3	195 - 05	ALTERNATIVE WITH NO SIDEWALK DETAIL ADDED	
2	195 - 05	NOTES REVISED	
1	195 - 03	NOTE ADDED	
No.	Date	Revision	App'd

Drawn: J.T.R. Date: 95 - 01
Scale: NTS
Approved: [Signature] City Engineer

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

Sheet: 5
File Number: 454.1008.039



- NOTE:
- HYDRANTS ON 2.00 LINE.
 - HYDRANT VALVES ON 6.50 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.
 - POWER POLES, STREETLIGHT POLES, AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 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 TO THE 2.50m LINE AND THE ST. L.T. CABLE ON THE 4.00m LINE.

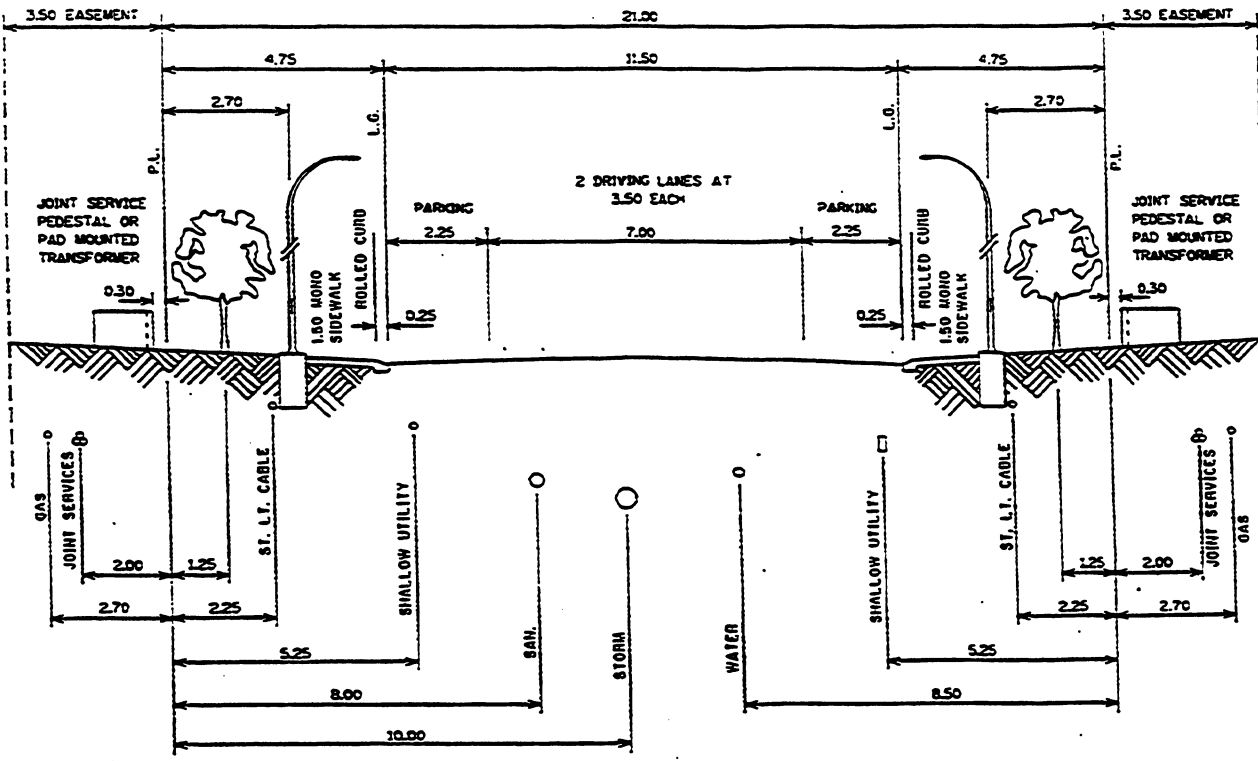
- ENVIRONMENTAL CAPACITY 5.000 VEHICLES PER DAY

5	103 - 11	ADDITIONAL NOTE
4	100 - 04	REVISE SHALLOW UTILITY O/S. CHANGE UTIL. COMPANY NAMES
3	198 - 10	REVISE SHALLOW UTILITY O/S
2	197 - 06	REVISED NOTES
1	195 - 06	R/W, L.G. & UTILITY DIMENSIONS REVISED
No. Date	Revision	

Drawn J.T.R. Date JULY '94
Scale: NTS
Approved for [Signature]
App'd City Engineer

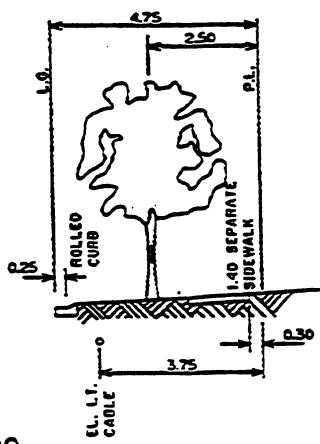
THE CITY OF CALGARY
ENGINEERING & CONSTRUCTION
COLLECTOR
PARKING ONE SIDE
19.00m R/W. 9.50m ROAD

METRIC
Sheet 6
File Number 454.1008.022



- NOTE:**
- 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. 2.50 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 3.5m FROM P.L. (1.0m FROM WATER LINE).

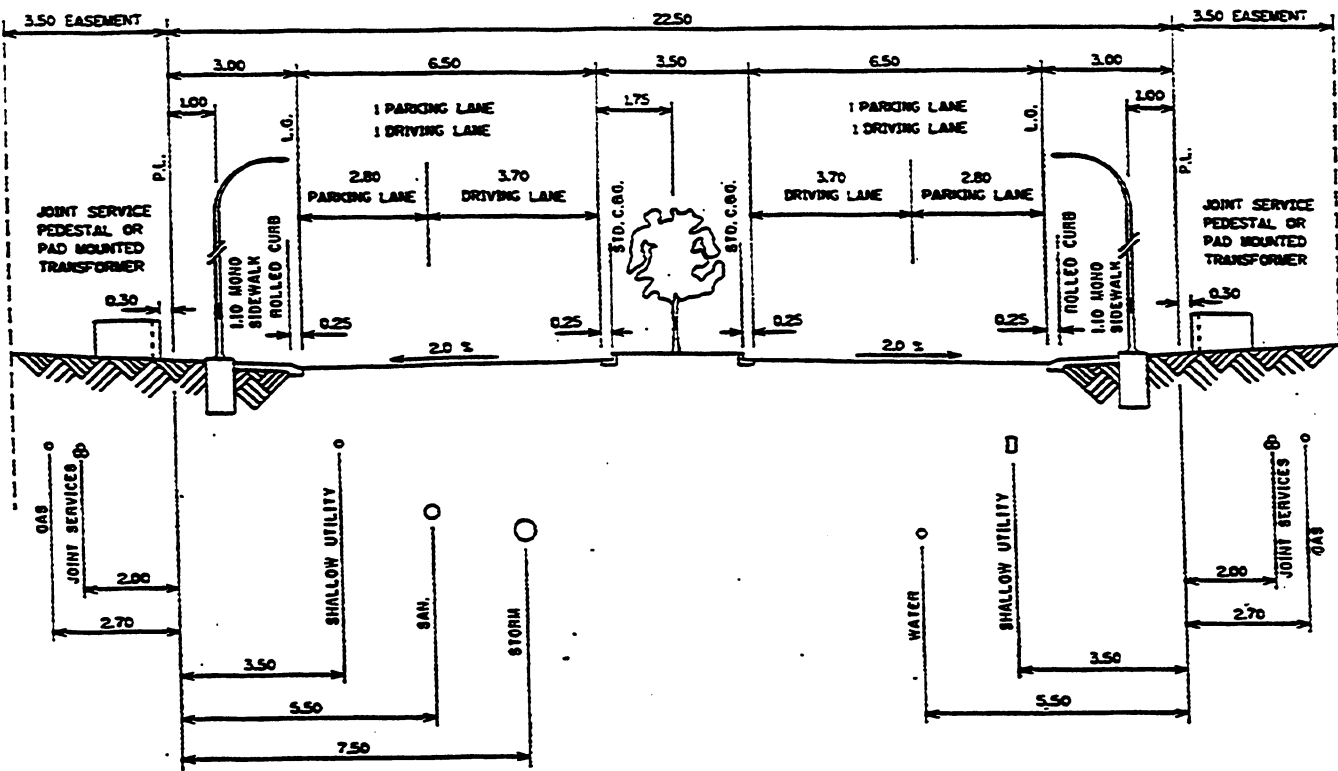
ALTERNATIVE WITH SEPARATE SIDEWALK
- SERVICE VALVES ON 2.50m LINE.



- ENVIRONMENTAL CAPACITY 5.000 VEHICLES PER DAY

5 103 - 11	ADDITIONAL NOTE	Drawn	J.T.R.	Date	95 - 01	THE CITY OF CALGARY MUNICIPAL ENGINEERING DEPARTMENT	Sheet	<h1>7</h1>
4 100 - 04	REVISE SHALLOW UTILITY O/S. CHANGE UTIL. COMPANY NAMES	Scale:	NTS	COLLECTOR PARKING BOTH SIDES 21.00m R/W. 11.50m ROAD			File Number	
3 198 - 10	REVISE SHALLOW UTILITY O/S	Approved for						
2 195 - 05	REVISED NOTE & SEPARATION BETWEEN STORM & WATER	App'd						
1 195 - 03	R.O.W. WIDTH REDUCED. NOTE ADDED & DETAIL DRAWING ADDED							
No. Date	Revision							

FILE REVISIONS: 195-03, 195-05, 198-10, 100-04, 103-11



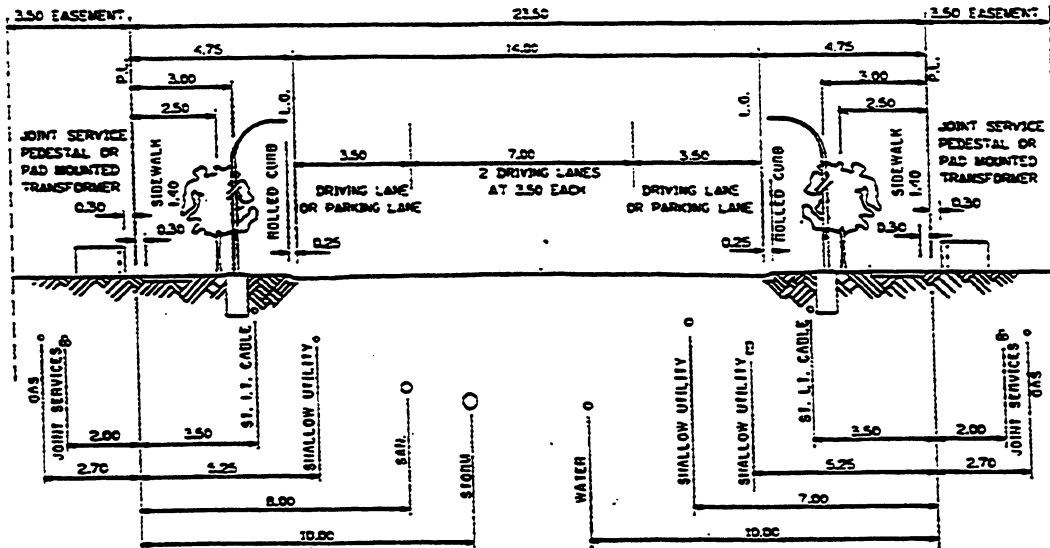
FOR FLANKAGE LOTS

- 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. L.T. CABLE TO BE INSTALLED IN EASEMENTS ONLY IF WATER IS SERVICED FROM THE FRONT.
 - ST. L.T. 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 1.000
 VEHICLES PER DAY

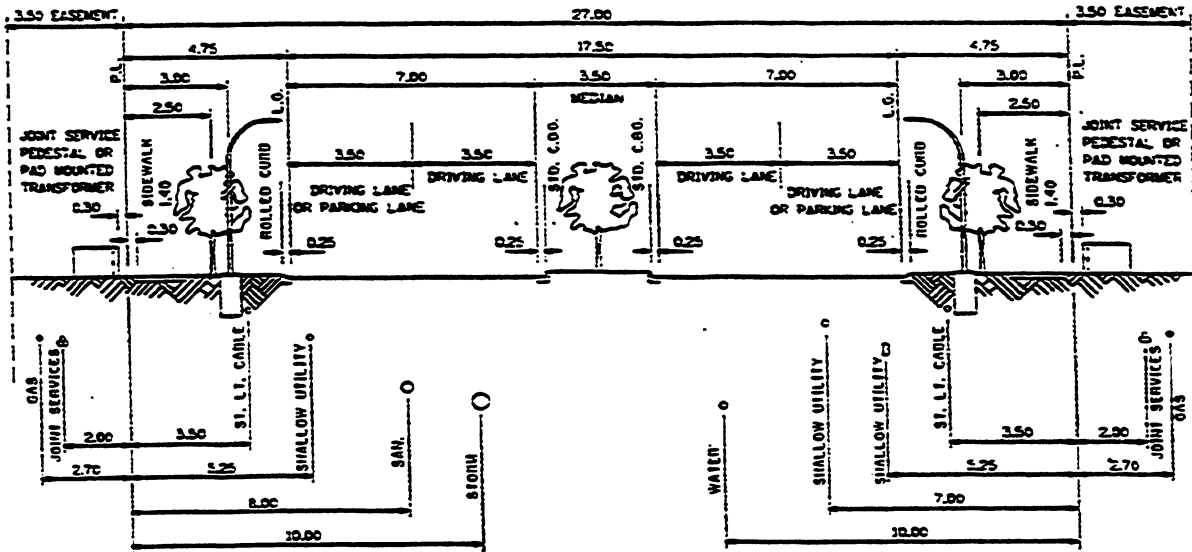
		Drawn R.B.T.	Date JULY '94	THE CITY OF CALGARY METRIC	Sheet 8	
3	00-04	REVISE SHALLOW UTILITY O/S AND ADD ENV. CAPACITY NOTE		Scale: NTS	RESIDENTIAL ENTRANCE STREET 22.50m R/W. 2x6.50m ROAD	
2	98-12	REVISE SHALLOW UTILITY O/S		Approved for <i>[Signature]</i> City Engineer		File Number 454.1008.032
1	97-09	CHANGE TO SHALLOW UTILITY COMMENT		No. Date Revision		



- NOTES:
- HYDRANTS ON 3.00 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. 2.50 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.
 - ALL 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 10,000 VEHICLES PER DAY
- RESIDENTIAL STREET FRONTAGE PERMITTED

Drawn: J.T.R.		Date: 94 - 20	 THE CITY OF CALGARY <small>City of Calgary</small>	Sheet: 9
Scale: NTS		Approved for: <i>[Signature]</i>		File Number: 454.1008.041
3 00 - 04 REVISE SHALLOW UTILITY O/S. CHANGE UTIL. COMPANY NAMES				
2 96 - 10 REVISE SHALLOW UTILITY O/S				
1 95 - 05 NOTE REVISED				
No. Date	Revision			

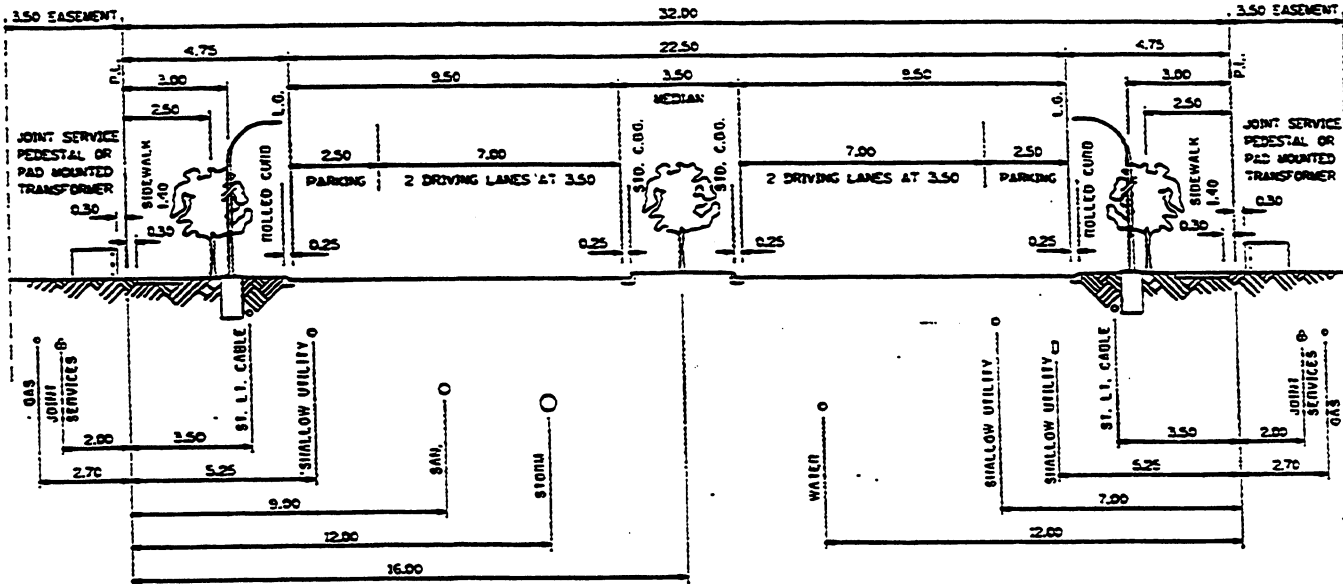


- NOTES:
- HYDRANTS ON 3.00 LINE.
 - HYDRANT VALVES ON 5.00 LINE.
 - SERVICE VALVES ON 2.50 LINE.
 - TREES ON 2.50 LINE IN BOULEVARD AND ON CENTRE LINE IN MEDIAN.
 - TREES SHALL BE SHALLOW ROOTED DECIDUOUS SPECIES AS APPROVED BY PARKS / RECREATION DEPARTMENT.
 - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 2.50 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 10,000 VEHICLES PER DAY

No.	Date	Revision
5	100 - 04	REVISE SHALLOW UTILITY O/S
4	198 - 20	REVISE SHALLOW UTILITY O/S
3	195 - 05	NOTE REVISED
2	195 - 03	LIP TO LIP DIMENSION REDUCED & NOTE ADDED
1	195 - 01	MEDIAN & R.L.W. REDUCED

Drawn J.T.R. Date 25 - 01
 Scale: MTS
 Approved for [Signature] City Engineer

THE CITY OF CALGARY
 METRIC
 Sheet 10
 PRIMARY COLLECTOR
 27.00m R/W. 2x7.00m ROAD
 File Number 4541008.042



OPTION WITH ADDITIONAL PARKING LANE

- NOTES**
- HYDRANTS ON 3.00 LINE.
 - HYDRANT VALVES ON 2.00 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. 2.50 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.

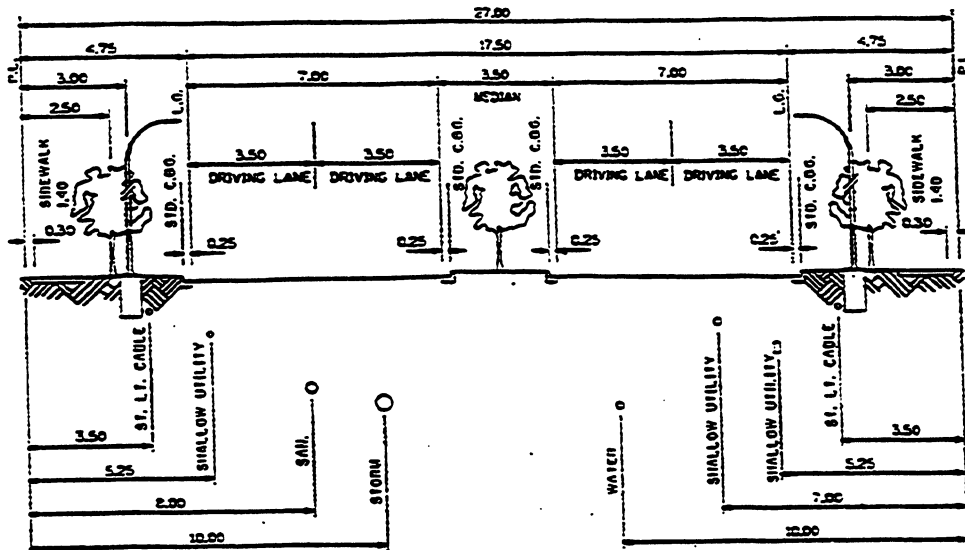
- ENVIRONMENTAL CAPACITY 10.000 VEHICLES PER DAY

5 100 - 04	REVISE SHALLOW UTILITY O/S AND COMPANY NAMES	1/25
4 198 - 10	REVISE SHALLOW UTILITY O/S	
3 195 - 05	NOTE REVISED	
2 195 - 03	LIP TO LIP DIMENSION REDUCED & NOTE ADDED	
1 195 - 01	MEDIAN & R.O.W. REDUCED	
No.	Date	Revision

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

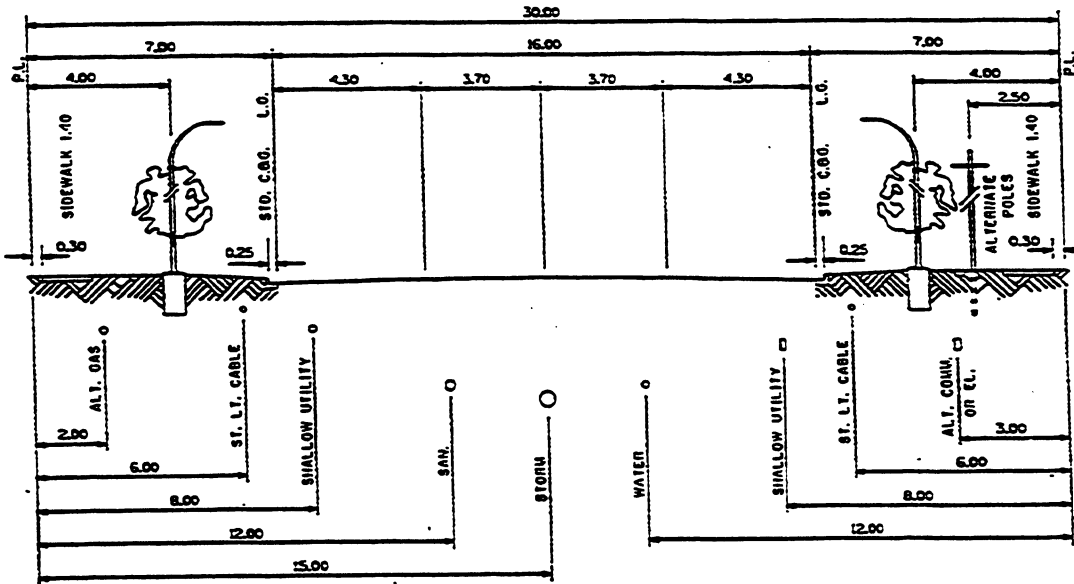
THE CITY OF CALGARY
 PRIMARY COLLECTOR
 (OPTIONAL)
 32.00m R/W. 2x9.50m ROAD

Sheet: **11**
 File Number: 4541008.043



- NOTES:
- HYDRANTS ON 3.00 LINE.
 - HYDRANT VALVES ON 3.50 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. 2.50 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.
 - NO RESIDENTIAL FRONTAGE
 - NO TRUCK ROUTES
 - ENVIRONMENTAL CAPACITY 15,000 VEHICLES PER DAY

		THE CITY OF CALGARY <small>City of Calgary</small>		Sheet 12
		LOCAL MAJOR 27.00m R/W. 2x7.00m ROAD		File Number 454.1008.044
3 100 - 04 REVISE UTILITY COMPANY NAMES		Drawn J.T.R.		Date 95 - 01
2 198 - 10 REVISE SHALLOW UTILITY D/S		Scale: NTS		Approved for
1 195 - 05 NOTE REVISED		App'd 		City Engineer
No.	Date	Revision		App'd

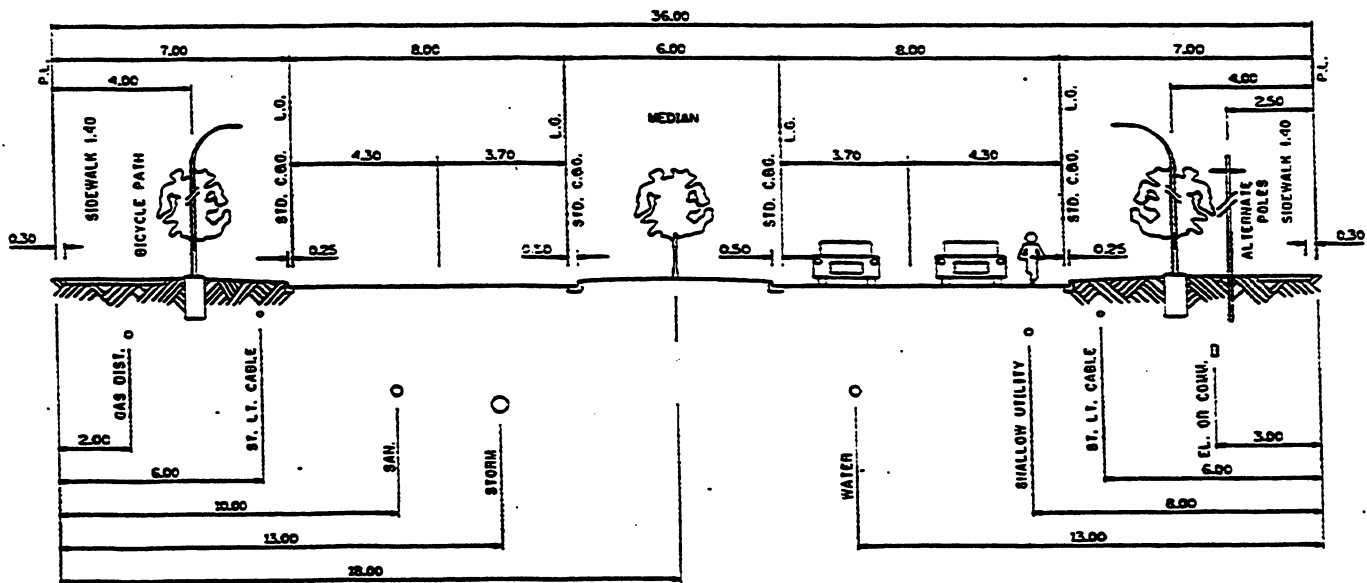


- NOTES:-
- HYDRANTS ON 4.00 LINE.
 - HYDRANT VALVES ON 11.00 LINE.
 - SERVICE VALVES ON 2.50 LINE.
 - TREES ON 4.00 LINE
 - POWER POLES, STREET LIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT.
 - GAS FEEDER MAINS IN CARRIAGE WAY, DISTRIBUTION LINE IN BOULEVARD, OPPOSITE SIDE FROM OVERHEAD.
 - ALL TREES TO BE SHALLOW ROOT SPECIES.

No.	Date	Revision
3	03-12	REVISED DRIVING LANE WIDTHS
2	10-04	ADD CAPACITY NOTE, CHANGE UTIL. COMPANY NAMES
1	98-09	CHANGE SHALLOW UTILITY O/S

Drawn R.B.T. Date JULY 34
 Scale: NTS
 Approved for [Signature]
 City Engineer

THE CITY OF CALGARY
 METRIC
 Sheet 13
 File Number 454.1008.025
 UNDIVIDED MAJOR
 30.00m R/W. 14.80m ROAD



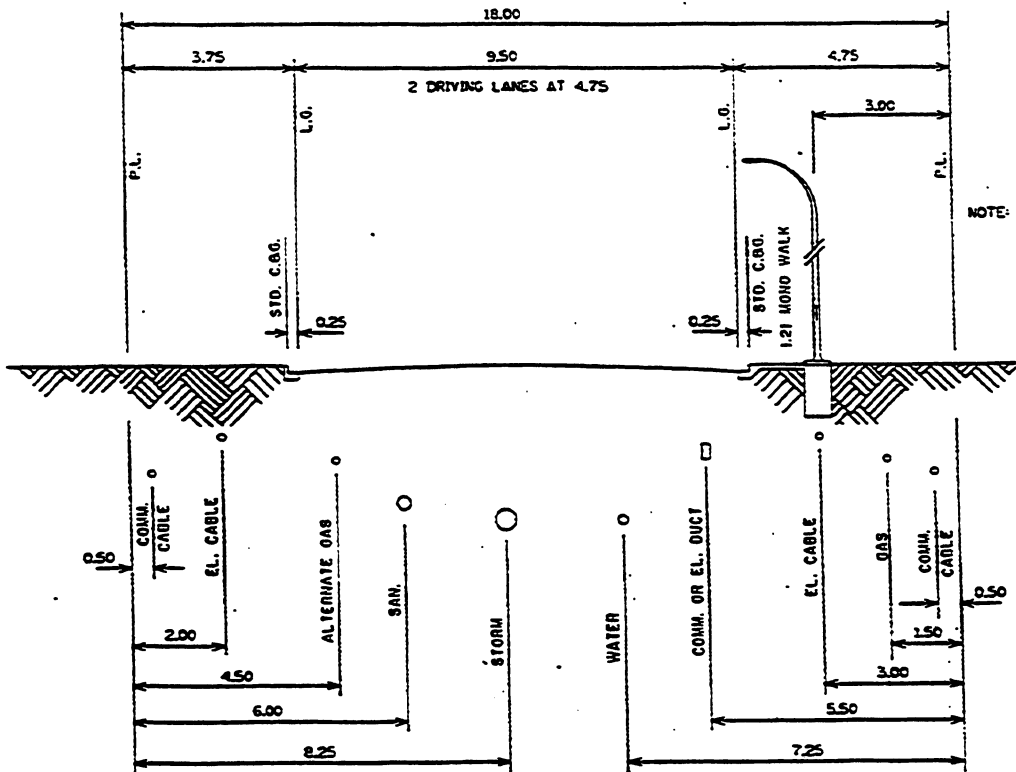
- NOTES:
- HYDRANTS ON 4.50 LINE.
 - HYDRANT VALVES ON 1.00 LINE FROM WATER MAIN.
 - SERVICE VALVES ON 4.00 LINE.
 - TREES ON 4.00 LINE IN BOULEVARD AND 18.00 LINE IN MEDIAN.
 - TREES SHALL BE OF A SPECIES AS APPROVED BY PARKS / RECREATION.
 - ALL TREES TO BE SHALLOW ROOT SPECIES.
 - POWER POLES, STREET 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.B.G. CAN BE REPLACED WITH 0.25m STD. C.B.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.B.G.

4	03-12	REVISED LANE WIDTHS AND ADDITIONAL NOTE
3	10-11	ADDED SIDEWALK/BICYCLE PATH DIMENSION
2	00-04	REVISED UTILITY COMPANY NAMES
1	98-10	REVISE SHALLOW UTILITY O/S
No.	Date	Revision

Drawn R.B.T. Date JULY '94
 Scale: NTS
 Approved for [Signature]
 City Engineer

THE CITY OF CALGARY
 DIVIDED MAJOR
 36.00m R/W
 2x8.00m ROAD WITH WIDE CURB LANE

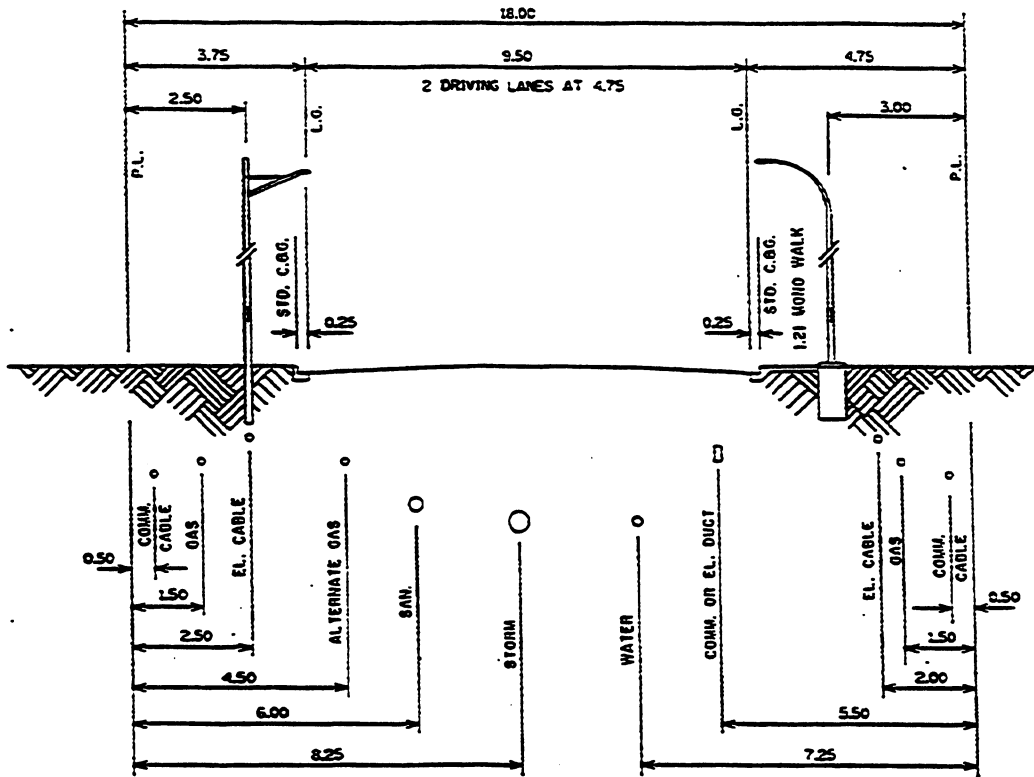
Sheet 14
 File Number 454.1008.026



NOTE: - THIS LAYOUT FOR INDUSTRIAL DEVELOPMENTS NOT USING OVERHEAD FACILITIES.

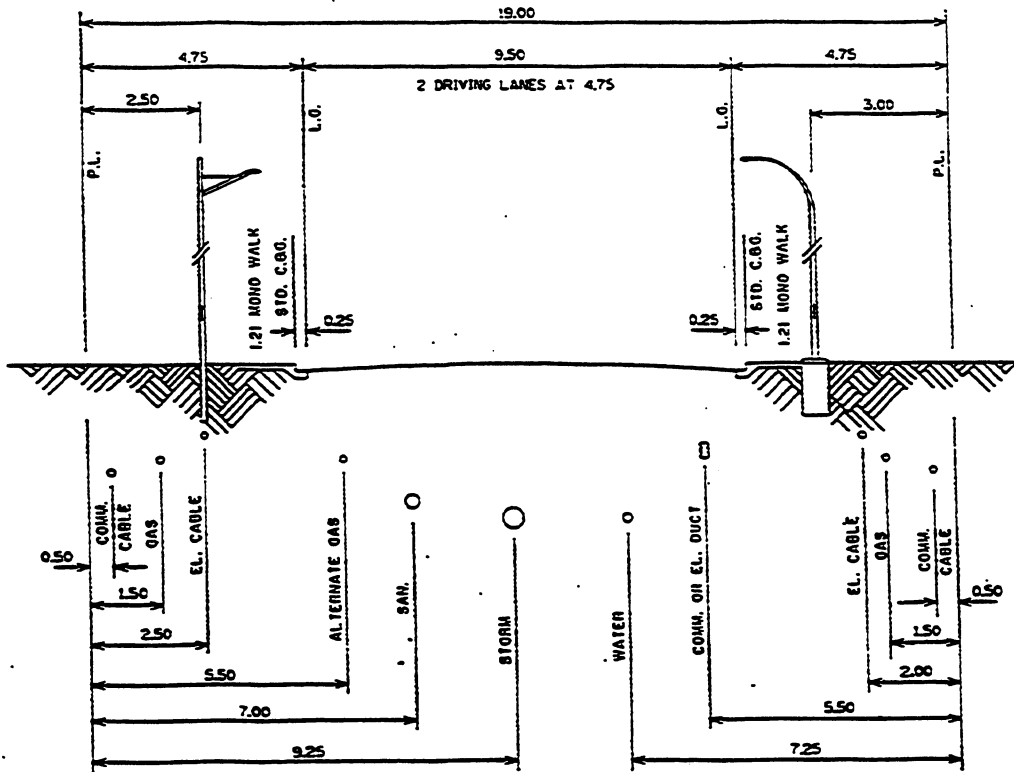
- HYDRANTS ON 2.50 LINE.
- OPPOSITE SIDE TO EL. POWER POLE
- HYDRANT VALVES 1.00m FROM MAIN
- SERVICE VALVE @ 2.50m OR 1.00m FROM MAIN AT WATERWORKS DISCRETION
- POWER POLES, STREET LIGHT POLES, TRANSFORMER BOXES AND ALL OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT AND SERVICES.
- ADD 2.50m PAVEMENT FOR PARKING ON ONE SIDE

No.		Date		Revision		App'd		THE CITY OF CALGARY ENGINEERING & COMMERCIAL SERVICES DEPARTMENT 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	
		Drawn D.J.L.				Date 03-12					
		Scale: NTS				Approved for <i>P. Brey</i> City Engineer					



- 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.
 - ADD 2.50m PAVEMENT FOR PARKING ON ONE SIDE

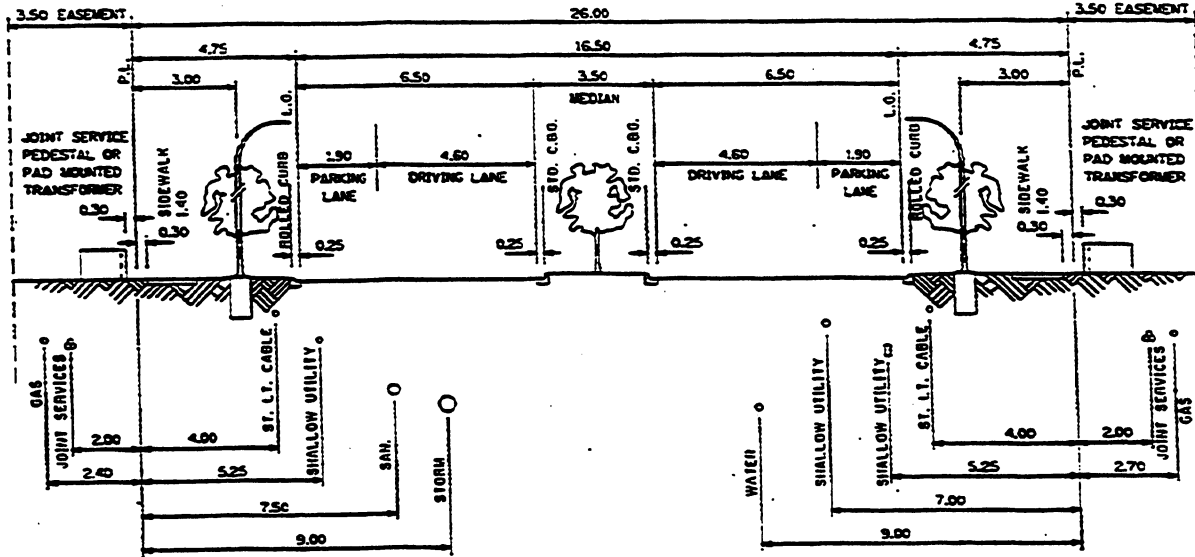
		Drawn R.B.T.	Date DEC '97	 THE CITY OF CALGARY <small>Engineering & Construction</small>	Sheet 16
		Scale: NTS			STANDARD INDUSTRIAL STREET WITH SIDEWALK ON ONE SIDE-NO PARKING 18.00m R/W. 9.50m ROAD
2	03-12	ADDITIONAL PARKING NOTE			
1	01-01	REVISE TITLE BLOCK			
No.	Date	Revision	App'd		



- 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.
 - ADD 2.50m PAVEMENT FOR PARKING
 ON ONE SIDE

Drawn		Date		 THE CITY OF CALGARY <small>Engineering & Construction</small>	
S.P.G.		01-01			
Scale:		NTS		Sheet	
Approved for		City Engineer		17	
No. Date		Revision		File Number	
1 03-12		ADDITIONAL NOTE		454.1008.052	

ALTERNATIVE STREET DESIGN STANDARD



- NOTES:**
- HYDRANTS ON 2.00 LINE.
 - HYDRANT VALVES ON 10.00 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. 2.50 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, POLE 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 10.00 FROM P.L. (10m FROM WATER LINE).

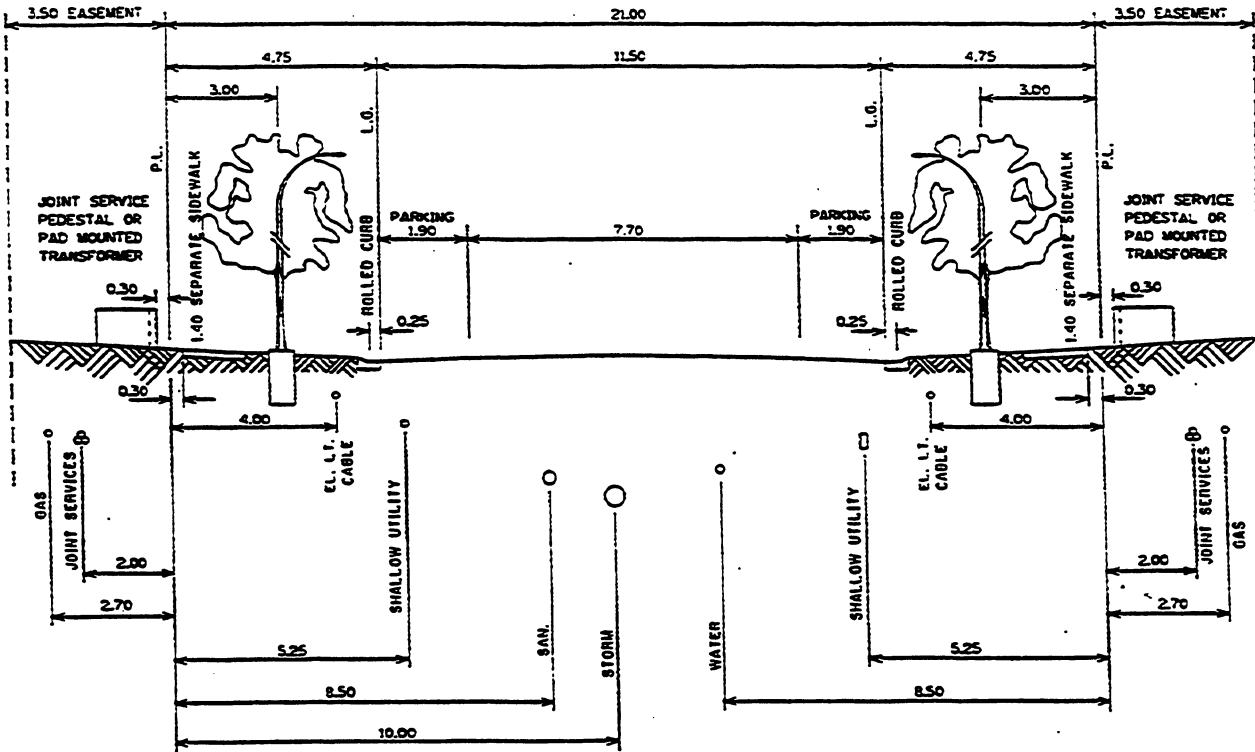
- ENVIRONMENTAL CAPACITY .10.000 VEHICLES PER DAY
- MUST HAVE A BACK LANE •
- NO FRONT DRIVEWAYS •

• RESIDENTIAL

THE CITY OF CALGARY ENGINEERING & COMMERCIAL SERVICES DIVISION		SHEETING AND NOTES (SEE DRAWING TITLES)	
Drawn: SPG Date: 99-07 Scale: NTS Approved for: <i>[Signature]</i> App'd: <i>[Signature]</i>	GRAND BOULEVARD 26.00m R/W. 2x6.5m ROAD.	Sheet # 18 File Number 454.1008.050	
1 03-12 ADDITIONAL NOTE AND REVISED WATER LINE LOCATION No. Date Revision App'd			

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ALTERNATIVE STREET DESIGN STANDARD

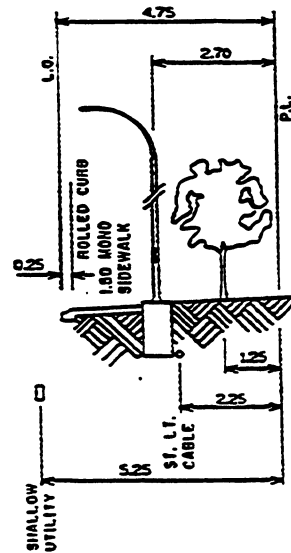


- NOTE:
- HYDRANTS ON 2.00 LINE.
 - HYDRANT VALVES ON 7.50 LINE.
 - SERVICE VALVES ON 2.50 LINE.
 - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
 - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 2.50 SEPARATION 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 3.5m FROM P.L. (1.0m FROM WATER LINE).

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

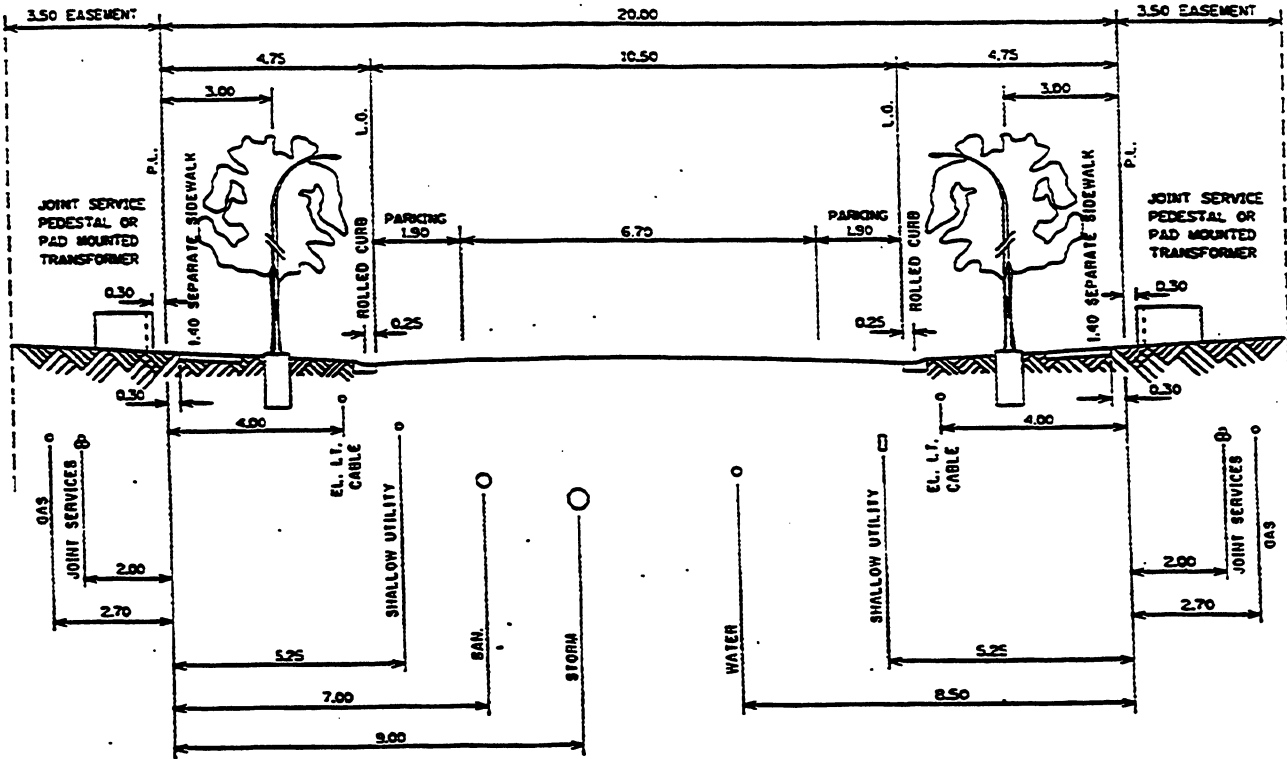
ALTERNATIVE WITH MONOLITHIC SIDEWALK

- SERVICE VALVES ON 1.25m LINE.



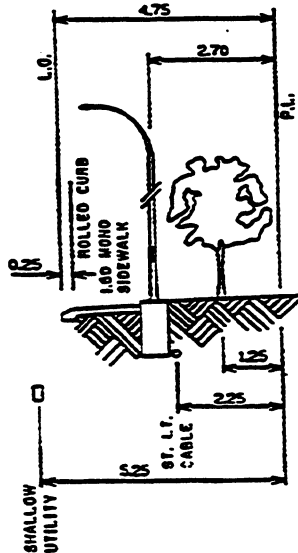
Drawn: SPG		Date: 95-07	<p>THE CITY OF CALGARY Engineering & Construction Utility Engineering</p>	Sheet: 19
Scale: NTS		Approved for: <i>Esrey</i>		File Number: 454.1008.049
1 03-12 ADDITIONAL NOTE		App'd: <i>Esrey</i>	City Engineer	
No.	Date	Revision		

ALTERNATIVE STREET DESIGN STANDARD



ALTERNATIVE WITH MONOLITHIC SIDEWALK

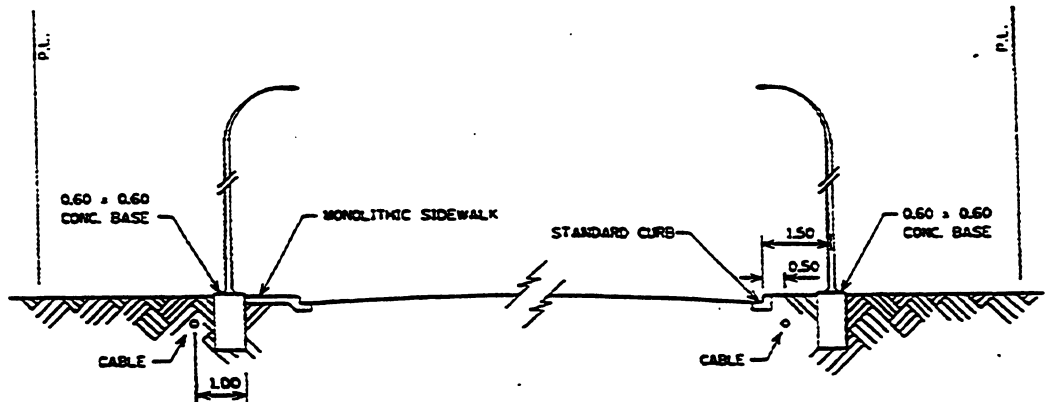
- SERVICE VALVES ON 1.25m LINE.



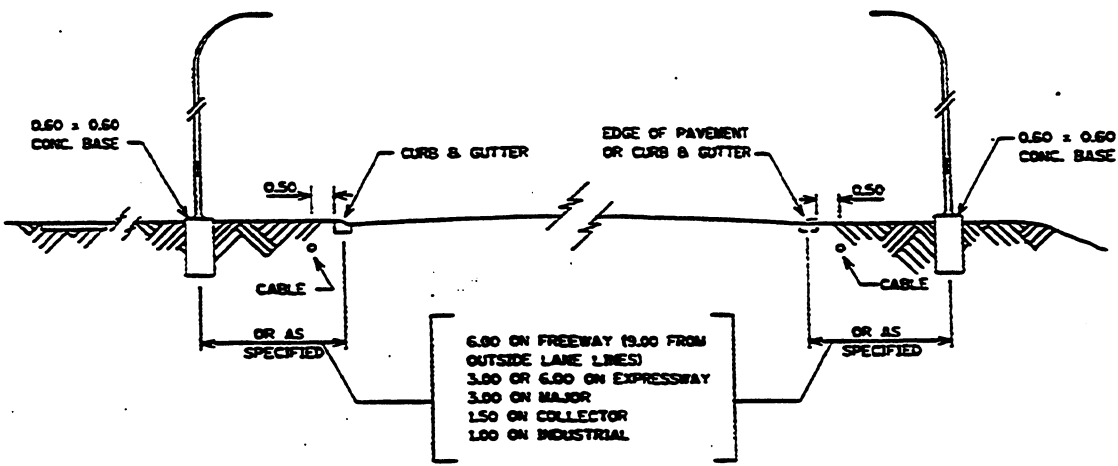
- NOTE:
- HYDRANTS ON 2.00 LINE.
 - HYDRANT VALVES ON 7.50 LINE.
 - SERVICE VALVES ON 2.50 LINE.
 - PRE-INSTALLED SERVICE CONNECTIONS TO BE INSTALLED 3.50m INSIDE P.L. OR 5.00m INSIDE THE P.L. WHEN CROSSING GAS AND ONE OTHER SHALLOW UTILITY.
 - HYDRANT & SERVICE VALVES SHALL MAINTAIN A MIN. 2.50 SEPARATION 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. 11.0m FROM WATER LINE.

- ENVIRONMENTAL CAPACITY 5.000 VEHICLES PER DAY

Drawn: SPG Date: 99-07 Scale: NTS Approved for: [Signature] City Engineer		THE CITY OF CALGARY Planning & Development 2000	Sheet: 20 File Number: 454.1008.048
2	03-12	ADDITIONAL NOTE	
3	02-01	REVISED STORM DIMENSION TO 9.0m	
No.	Date	Revision	



RESIDENTIAL WITH STANDARD CURB OR MONOLITHIC SIDEWALK



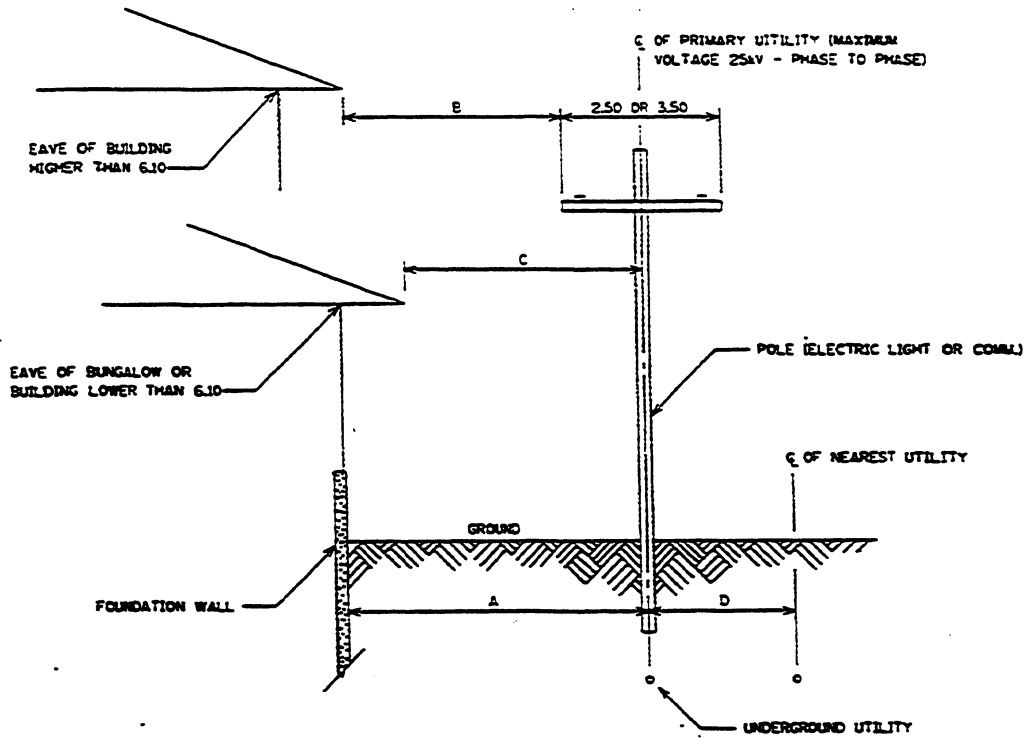
THOROUGHFARE STANDARD WITH ROLLED CURB & GUTTER (OR EDGE OF PAVEMENT)

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	THE CITY OF CALGARY ENGINEERING & SURVEYING	Sheet 22 File Number 454.1008.005
No. Date Revision		Scale: NTS Approved for [Signature] City Engineer	STANDARD STREET POLE LINE ASSIGNMENT	METRIC



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 122 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.

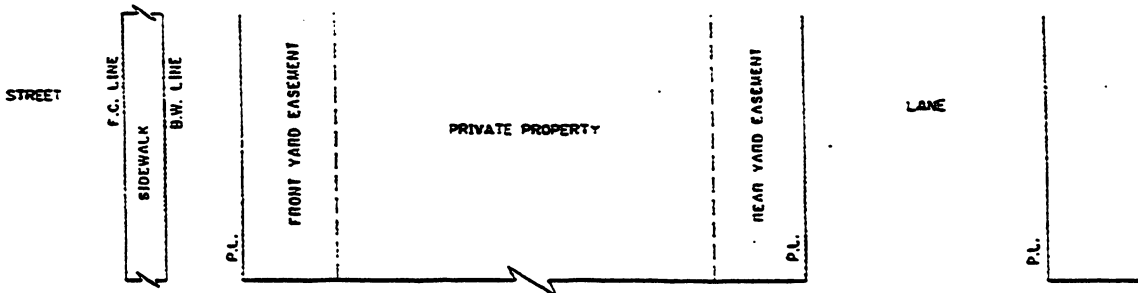
NEW UTILITY RIGHTS-OF-WAY PROPOSED
ON RESERVE PARCELS SHALL BE APPROVED
BY THE PLANNING SUB-COMMITTEE.

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

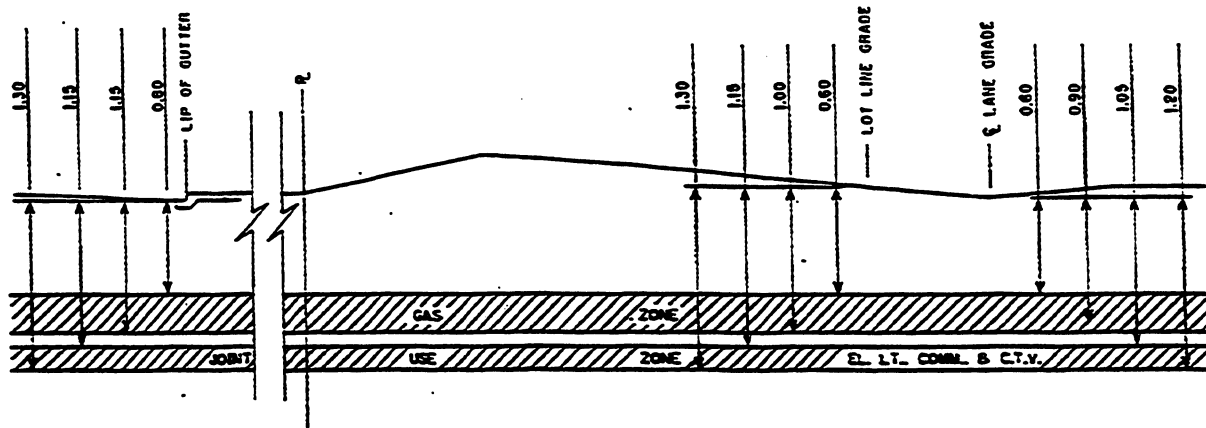
• E.C.U.S.R. IS ELECTRICAL PROTECTION
ACT : ELECTRICAL & COMMUNICATIONS
UTILITY SYSTEM REGULATION.

Drawn R.L.T.		Date AUG. '94	THE CITY OF CALGARY <small>PLANNING & DEVELOPMENT DEPARTMENT</small>	Sheet 23
Scale: N.T.S.		Approved for <i>[Signature]</i> City Engineer		File Number 454.1008.006
No.	Date	Revision		
1	00-04	REVISE SHALLOW UTILITY COMPANY NAMES		

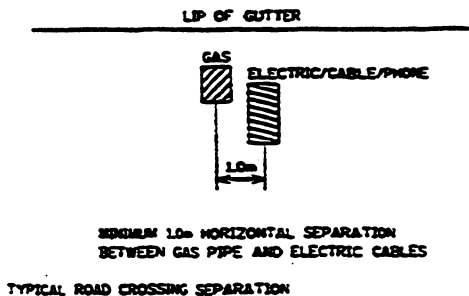
FILE EXTENSION: *[illegible]*
DATE CHANGED: *[illegible]*



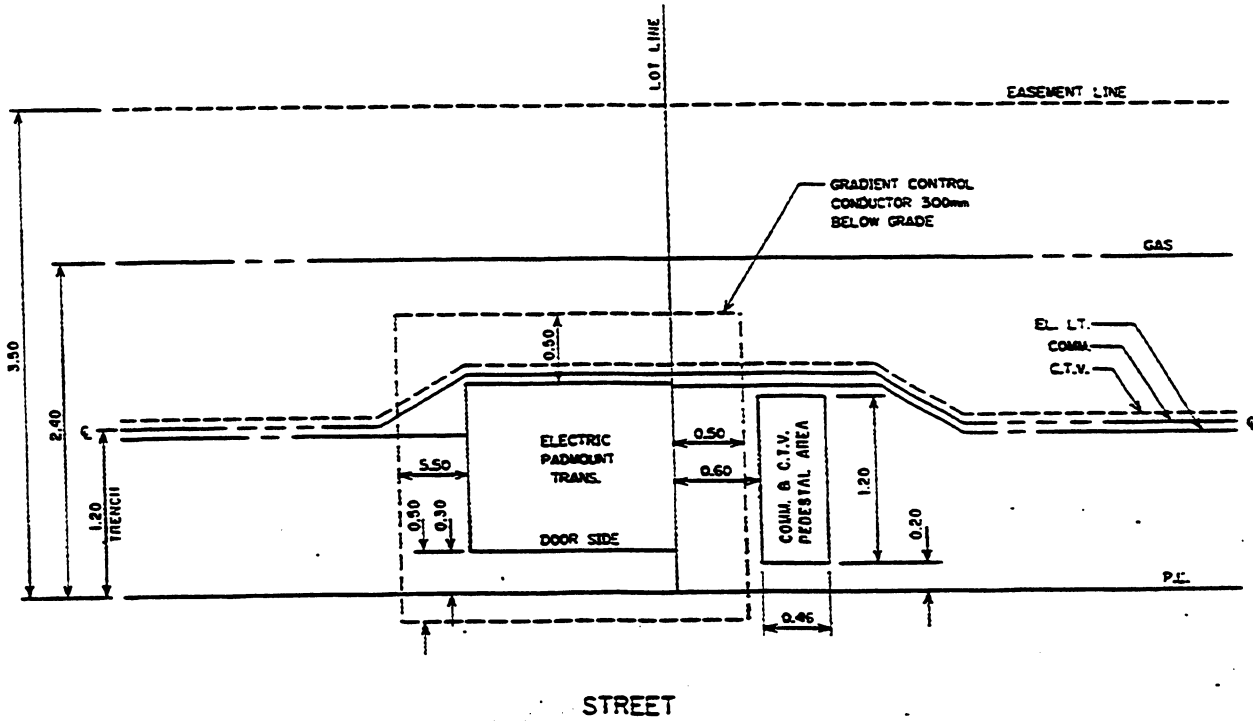
PLAN



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.



		Drawn R.B.T.	Date AUG '94	THE CITY OF CALGARY METRIC	Sheet 24
		Scale: N.T.S.	Approved for <i>[Signature]</i>		File Number 454.1008.007
2	00-04	REVISED UTILITY COMPANY NAMES			
1	1970922	ADD TYPICAL ROAD CROSSING SEPARATION			
No.	Date	Revision	App'd	City Engineer	



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**

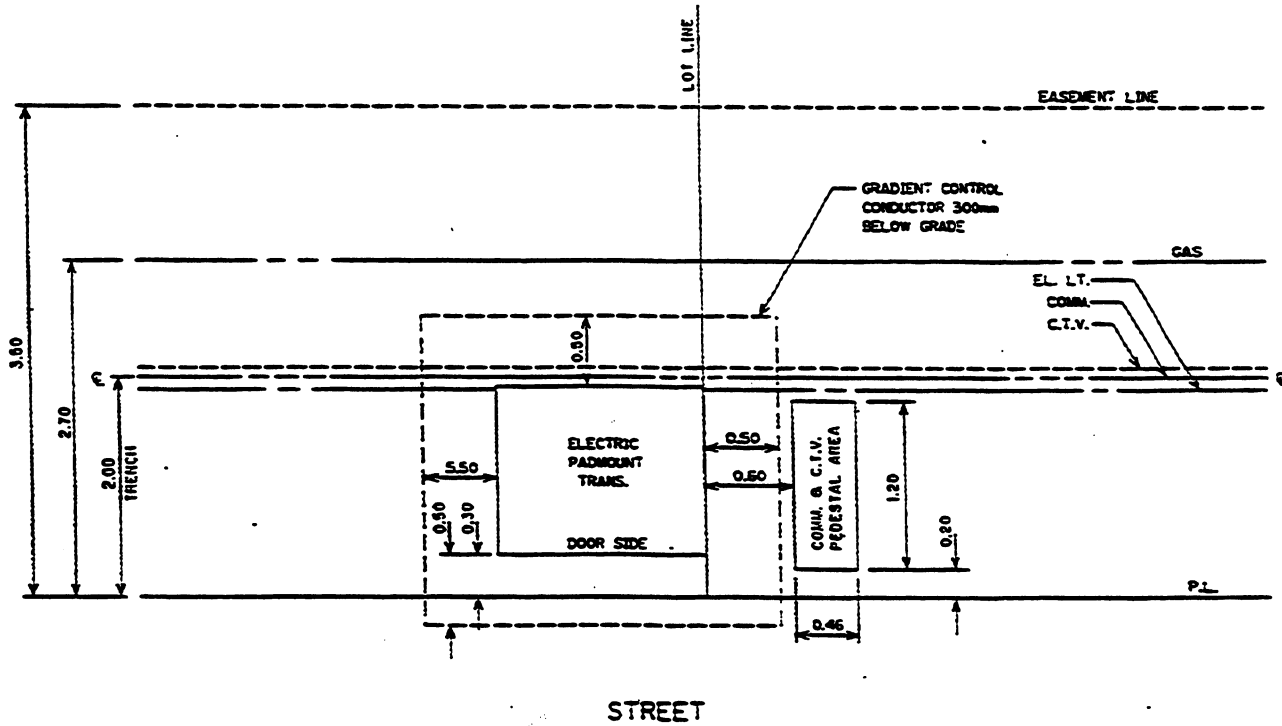
NOT USED IN NEW DEVELOPMENTS

No.	Date	Revision
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	88/00	NOTE ADDED

Drawn R.B.T. Date AUG. '94
 Scale: N.T.S.
 Approved for [Signature]
 City Engineer

THE CITY OF CALGARY
 STANDARD PLACEMENT-3 PARTY JOINTSERVICE PEDESTAL AND TRANSFORMER 3.5m FRONT YARD U.R.W.

Sheet 25
 File Number 454.1008.033

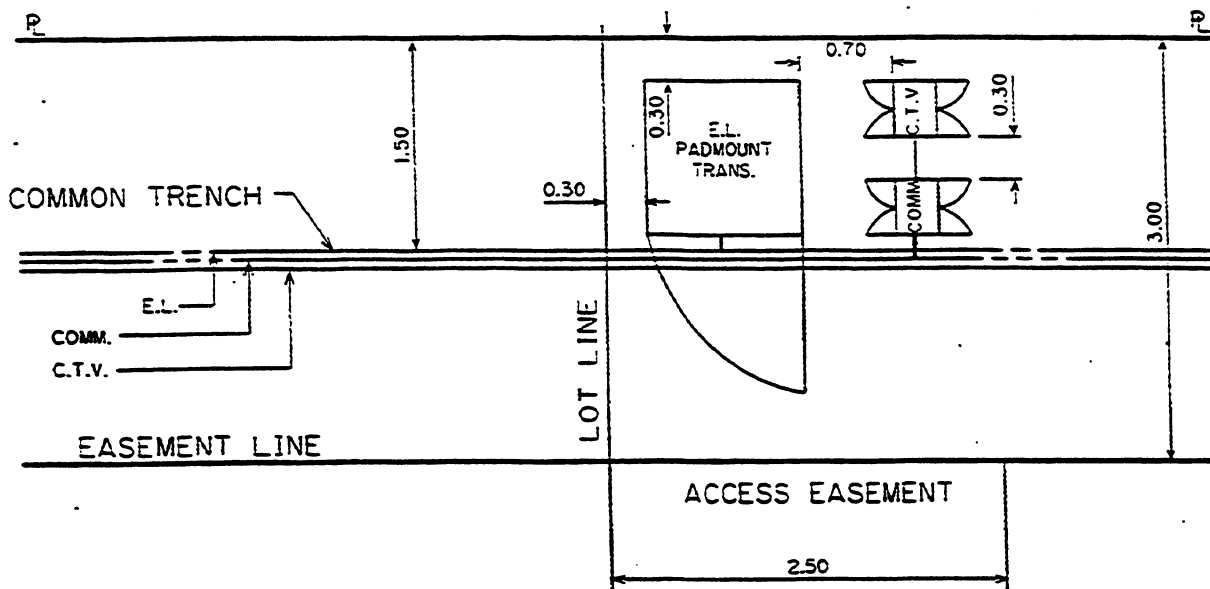


NOTE: POWER POLES, STREET LIGHTING POLES, TRANSFORMER BOXES AND OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.00m CLEARANCE FROM HYDRANT.

ELECTRIC PADMOUNT • 1.168 ± 1.016
 COMM. PEDESTAL • 0.330 ± 0.406
 C.T.V. PEDESTAL • 0.330 ± 0.406

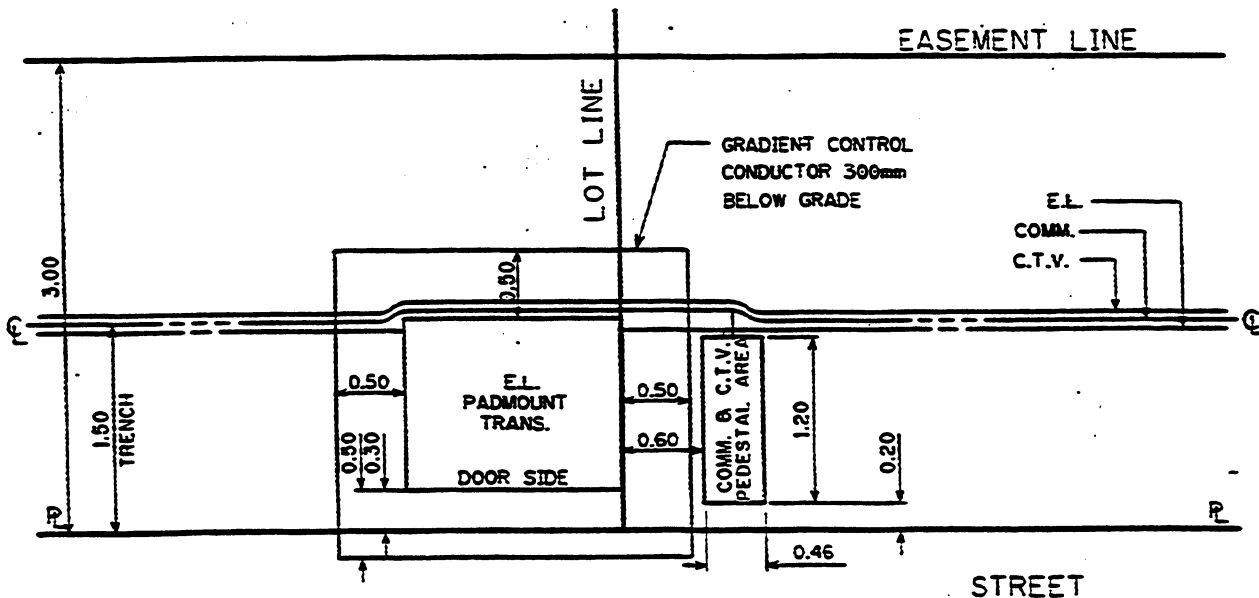
**4 PARTY JOINT SERVICE
 3.50 FRONT YARD EASEMENT**

No.		Date		Revision		App'd		Drawn S.P.G.	Date 00/04	THE CITY OF CALGARY ENGINEERING & SURVEILLANCE CIVIL ENGINEERING	Sheet 26
								Scale: N.T.S.		Approved for City Engineer	File Number 4541008.051
								STANDARD PLACEMENT-4 PARTY JOINTSERVICE PEDESTAL AND TRANSFORMER 3.5m FRONT YARD U.R.W.			



REAR YARD EASEMENT SHALLOW UTILITIES ONLY

* NOTE: NOT TO BE USED
IN NEW CONSTRUCTION.

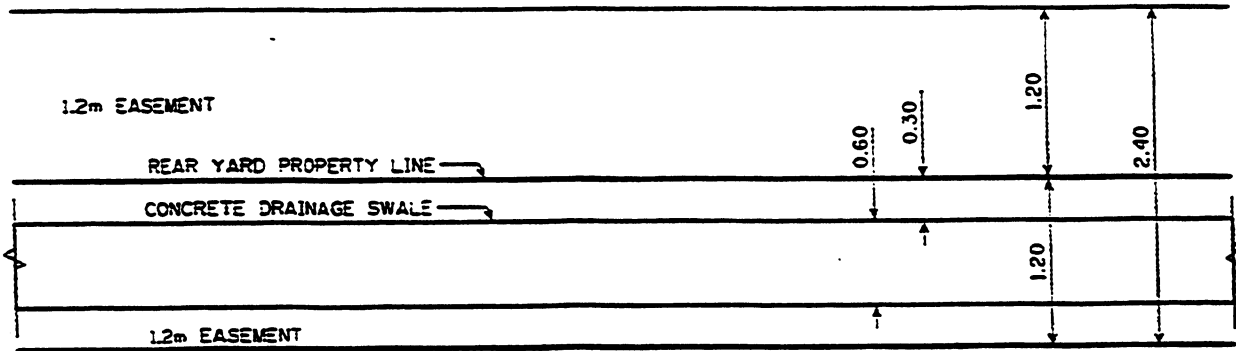


3.00m FRONT YARD EASEMENT

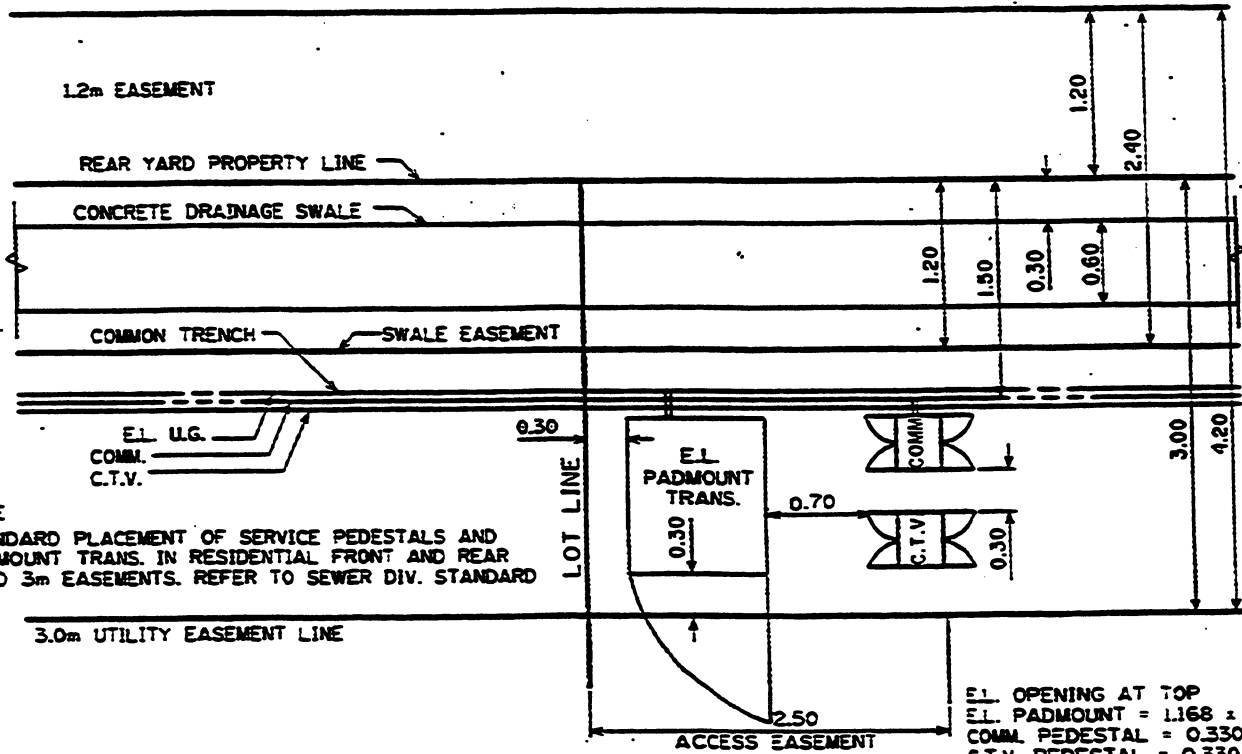
NOTE - POWER POLES, STREET LIGHTING POLES, TRANSFORMER BOXES AND OTHER SURFACE STRUCTURES SHALL MAINTAIN A MIN. OF 3.0m CLEARANCE FROM HYDRANT.
- STANDARD PLACEMENT OF SERVICE PEDESTALS AND PADMOUNT TRANS. IN RESIDENTIAL FRONT AND REAR YARD 3m EASEMENTS. ADDITIONAL WIDTH WOULD BE REQUIRED IF GAS IS IN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

2100-041 REVISED UTILITY COMPANY NAMES		Drawn B.DORE	Date 12-93	THE CITY OF CALGARY METRIC STANDARD PLACEMENT SERVICE PEDESTAL AND TRANS- FORMER 3.0m FRONT U.R.W.	Sheet: 27 File Number 454.1008.034
1195-121 REVISED WITH NEW PEDESTAL AREA & NOTE		Scale: N.T.S.	App'd for <i>[Signature]</i>		
No.	Date	Revision	App'd <i>[Signature]</i>	City Engineer	



CONCRETE SWALE TYPICAL



NOTE
STANDARD PLACEMENT OF SERVICE PEDESTALS AND
PADMOUNT TRANS. IN RESIDENTIAL FRONT AND REAR
YARD 3m 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.

		Drawn B.DORE	Date 12-93	 THE CITY OF CALGARY 	Sheet 28
2 100-04 REVISED UTILITY COMPANY NAMES				Scale: N.T.S.	STANDARD PLACEMENT 1.20m REAR YARD EASEMENT WITH SWALE.
1 112-93 ADD NOTE FOR NEW CONSTRUCTION				App'd for <i>[Signature]</i>	
No.	Date	Revision	App'd	City Engineer	

TREE SEPARATIONS TO UTILITIES WITHIN ROAD RIGHTS-OF-WAY

UTILITIES:	DECIDUOUS			CONIFEROUS			POPLAR	
	SERVICES MEDIANS	BLVD	MAINS (parallel to tree line)	SERVICES MEDIANS	BLVD	MAINS (parallel to tree line)	SERVICES	MAINS (parallel to tree line)
DEEP:								
SANITARY & STORM ($<4.5\text{M DEEP}$)	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*
AGT	1.5m		1.5m	2.0m*		2.0m*	2.0m*	2.0m*
CTV	1.5m		1.5m	2.0m*		2.0m*	2.0m*	2.0m*
CCES	1.5m		1.5m	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.L. Waterworks, Sewers, COMM.

Show 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.

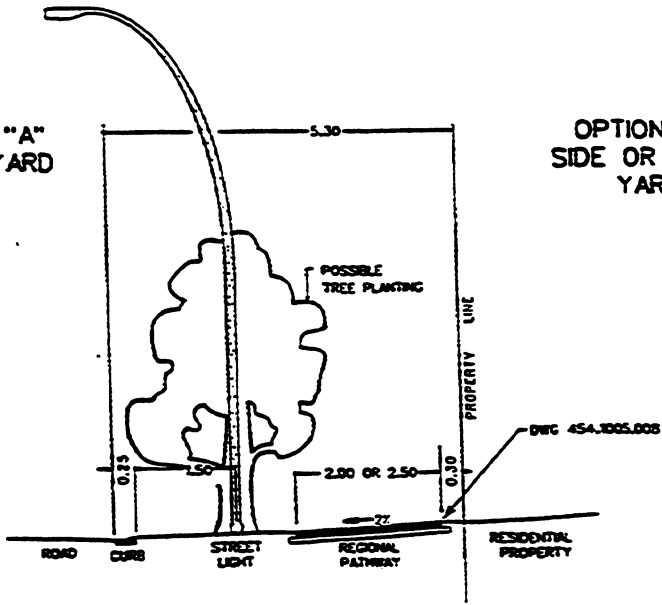
Poplar - Trees of the Populus family having rapid growth.

No trees are to be planted within 4.5m of the median bullnose on a divided street.

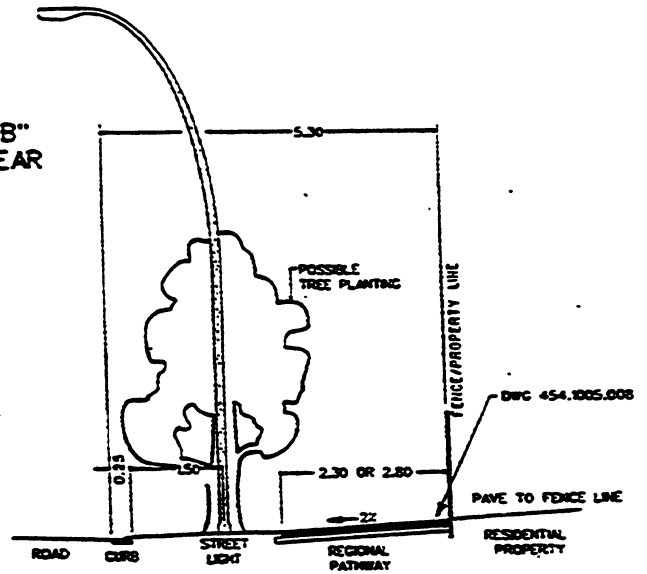
FILE EESDESES37028: Y: \PERMANENT\451030\4541008\4541008038.DGN
DATE: 13-APR-2000 13:37

	Drawn D.J.L.	Date 99-04	THE CITY OF CALGARY <small>CONSERVATION & DEVELOPMENT</small> <small>PLANNING DEPARTMENT</small>	Sheet 29
	Scale N.T.S.		TREE SEPARATIONS TO UTILITIES	File Number 454.1008.038
1 198-12-15 Add note No. Date Revision App'd			Approved for City Engineer	


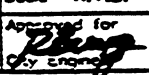
OPTION "A"
FRONT YARD



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. 2.50 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.

 THE CITY OF CALGARY <small>Planning & Development</small>		SHEET NO. 30 PROJECT NO. 454.1008.046
Drawn B. DORE	Date 99-01	Scale: N.T.S. Approved for  City Engineer
No. Date Revision App'd		
PATHWAYS 2.0m LOCAL & 2.50m REGIONAL PATHWAY		Sheet 30 File Number 454.1008.046

SECTION III: WATERWORKS

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WATERWORKS

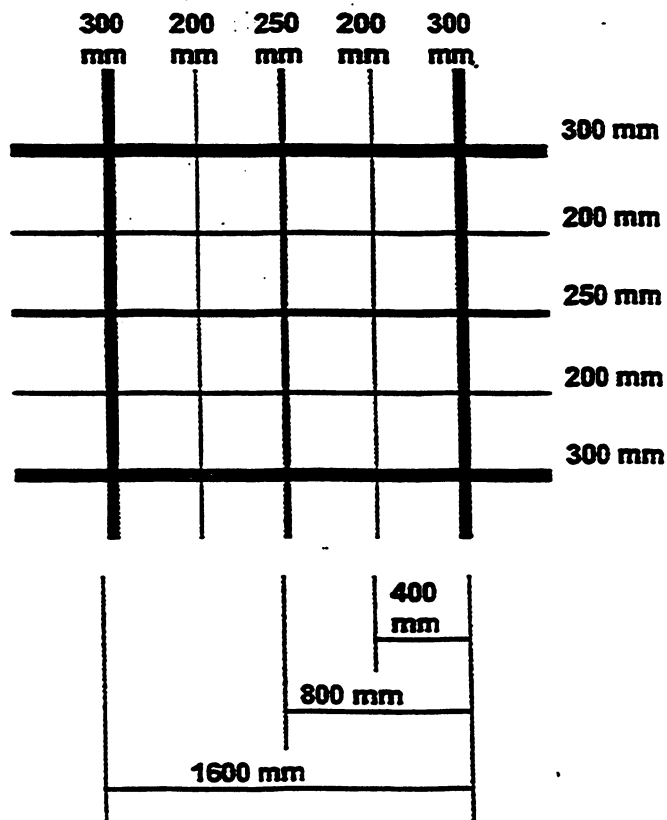
A. GENERAL

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 *Calgary Waterworks*, 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 the General Manager, Waterworks, the increase in size is required to hydraulically compensate for dead end mains or high density developments.

2) Oversize

- a) Notwithstanding Clauses 1(d) and 1(e), oversize payments will be made on mains larger than 250 mm in diameter in residential subdivisions and larger than 300 mm in diameter in industrial 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.
- b) The City will make no payment for oversize watermains or permanent pressure reducing valve chambers unless these facilities are specifically designated for compensation by the City on the Final Construction Drawings for approval by the General Manager, Waterworks. No oversize will be paid for temporary PRV chambers.

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(ii) 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 included in **Appendix III-A**.

4) Looped mains

- a) Distribution mains shall be continuous (looped) whenever possible.
- b) Where a closed system is approved (dead end):

Maximum number of single dwelling units (R1 or R2)

= 45 on a permanent basis; or

= 75 on a temporary basis.

5) Mains in Easements

- a) Grid mains and distribution mains shall not be placed in easements unless approved by the General Manager, Waterworks.
- 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 bends in the watermain will be permitted within the easement.
- d) The minimum easement width is 9 m with the main located in the centre of the easement.

-
- e) Services shall not be connected to a watermain located in an easement. Sufficient valves shall be provided to permit isolation of the main in the easement without disruption of services outside the easement.
 - f) A watermain (excluding 400 mm mains) located in an easement between two single or duplex residential dwellings shall be on pipe size larger than the two adjoining mains without compensation to the Developer.
 - g) 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.

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.

D. HYDRANTS

1) Location

- a) Hydrants are to be located on standard line assignments as indicated in **Appendix II-B**. 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 *Appendix II-B*. 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:

- The maximum allowable spacing between fire hydrants shall be 300 m and shall be separated by a line valve.
- The maximum allowable distance from the back of the houses at the end of a cul-de-sac to a hydrant shall be 150 m and 300 m to a backup hydrant.

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

- The maximum allowable spacing between fire hydrants shall be 150 m. Hydrants shall be separated by a line valve.
- The maximum allowable distance from the end of a cul-de-sac to a hydrant shall be 75 m and 150 m to a backup 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, Mechanical*

Site Plans and Sanitation Plans, and the Standard Specifications for Waterworks Construction.

- b) The horizontal separation between a catch basin and a water and/or sewer service line shall be 2 m or greater.

2) Residential

- a) Residential water services shall be 20 mm except that 25 mm services shall be installed for those lots having a "Lowest Top of Footing" grade within the upper 10 m of the pressure zone (Static pressure between 42 psi and 57 psi). Pressure Reducing Valves are required in the lower 14 m of the zone (static pressure greater than 80 psi). *See Appendix III-A for pressure zone related maps.* 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 lots with lane service and 5 m inside the property line for lots with street services.

3) Parks

- a) Parks water services to be under the control of *Parks Development & Operations* must be:
- Shown on the Waterworks cover sheet and plan-profile drawings of the Subdivision Construction Drawings, and
 - Approved by the Parks Development & Operations prior to the submission of the Final Construction Drawings.
- b) Service connections for the irrigation of the entrance lots and common park areas are to be metered complete with approved backflow preventors. Irrigation meters must be protected from freezing to the satisfaction of the General Manager, Waterworks. If the irrigation system is only temporary, the developer will have to sever the connection prior to the FAC being issued.

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.

F. CATHODIC PROTECTION

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 ² (length x m ² /m)						

Total Surface Area _____ m²
 Bare Metal (Multiply x 1.5) _____ m²
 Current (m² x 22 mA/ m²) _____ mA
 Total Number of Anodes _____ Anodes Required

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

PIPE SIZE	m ² /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 *Calgary Waterworks*, 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) *Calgary Waterworks* 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 *Calgary Waterworks* 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 the General Manager of *Calgary Waterworks*. No development on the Joint Use Reservoir Site shall commence without the written approval of the General Manager of *Calgary Waterworks*.
- d) Access to the Joint Use Reservoir Site shall be acceptable to *Calgary Waterworks*.
- e) All utilities on Joint Use Reservoir Sites shall be protected by registered easements of suitable width, as determined by *Calgary Waterworks*, centered over the utility. Easements shall be left unencumbered with no substantial change in grade on the easements without the written approval of *Calgary Waterworks*.
- 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 *Calgary Waterworks* at no cost to *Calgary Waterworks*.
- g) A chain link fence acceptable to *Calgary Waterworks* 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 chainlink 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.

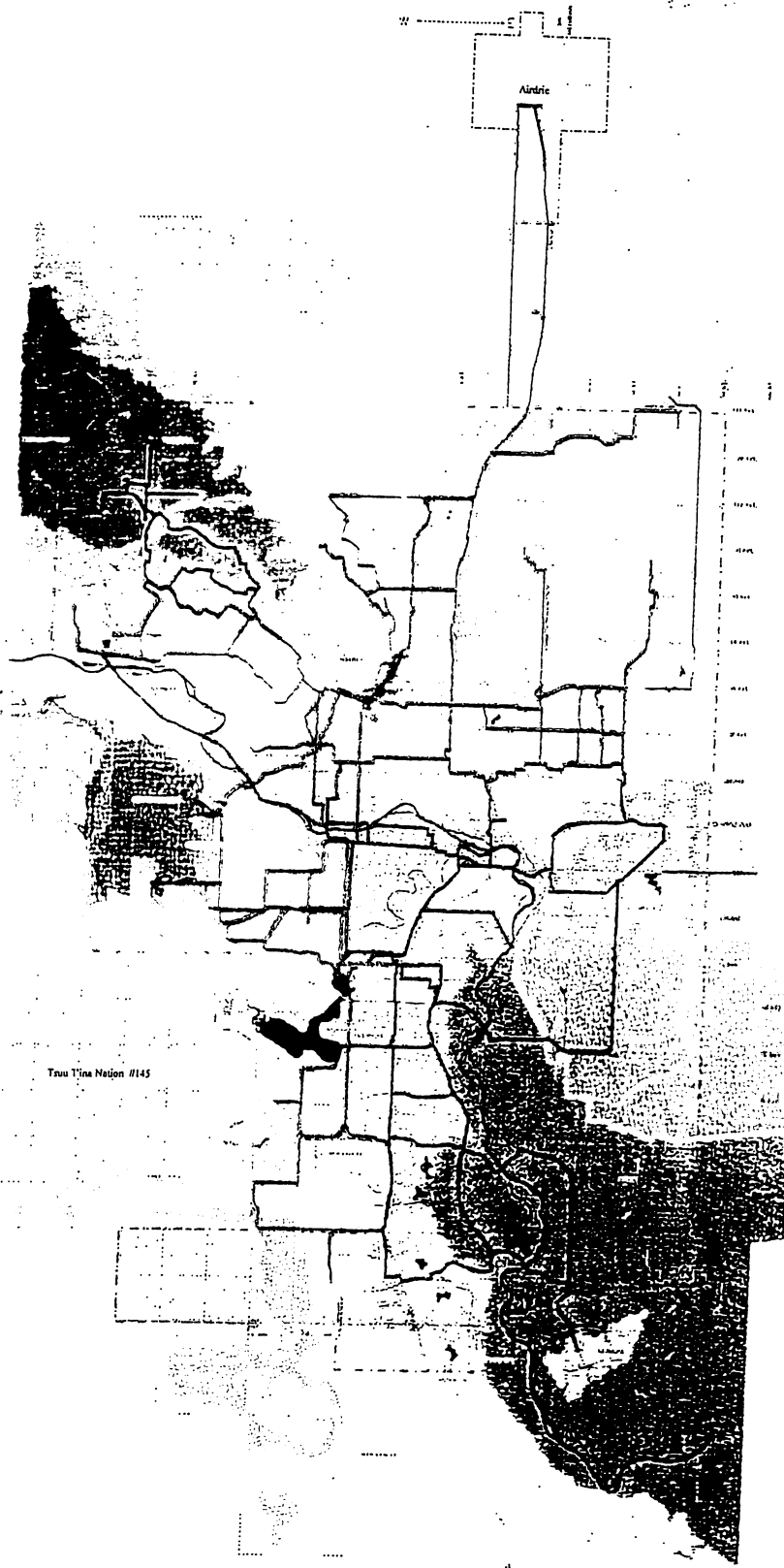
- l) The proposed location of trees, shrubs, fences, special recreational surfaces or any other structure on the Joint Use Reservoir Site requires the written approval of the General Manager of *Calgary Waterworks* before installation.
- m) *Parks Development & Operations* shall remove trees, shrubs, fences or any structure on the Joint Use Reservoir Site required to accommodate additional waterworks or ancillary facilities at no cost to *Calgary Waterworks*.
- 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 *Calgary Waterworks*.

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





















APPENDIX III-A

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PRESSURE ZONES AND WATER SUPPLY SYSTEM



LEGEND

-  Water Main
-  Sewer Main
-  Gas Main
-  Storm Sewer
-  Fire Water Main
-  Fire Water Valve
-  Fire Water Hydrant
-  Fire Water Tank
-  Fire Water Pump
-  Fire Water Station
-  Fire Water Reservoir
-  Fire Water Dam
-  Fire Water Dam Breaker
-  Fire Water Dam Gate
-  Fire Water Dam Lock
-  Fire Water Dam Weir
-  Fire Water Dam Spillway
-  Fire Water Dam Outlet
-  Fire Water Dam Intake
-  Fire Water Dam Structure
-  Fire Water Dam Foundation
-  Fire Water Dam Abutment

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R2 W5

R1 W5

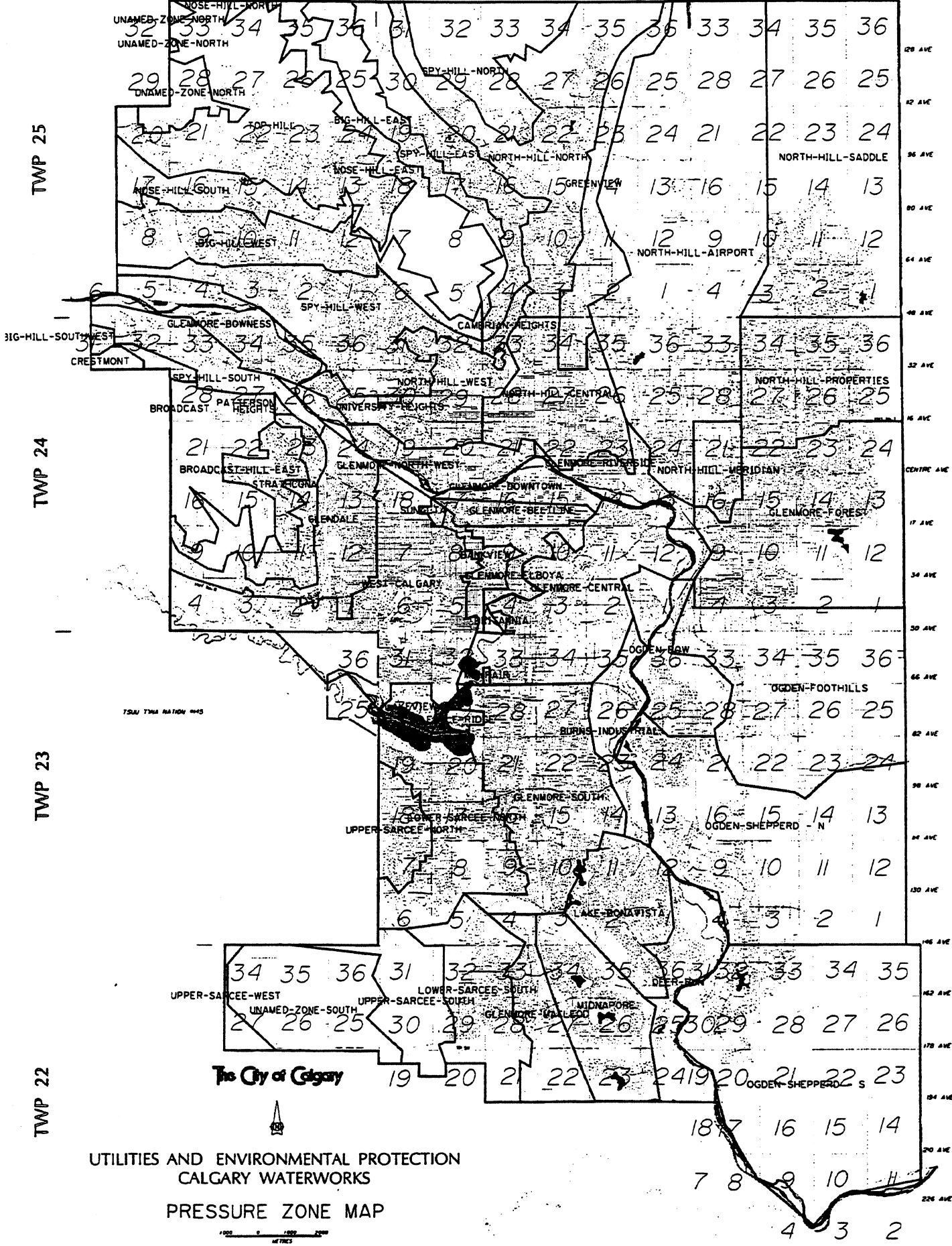
R29 W4

TWP 25

TWP 24

TWP 23

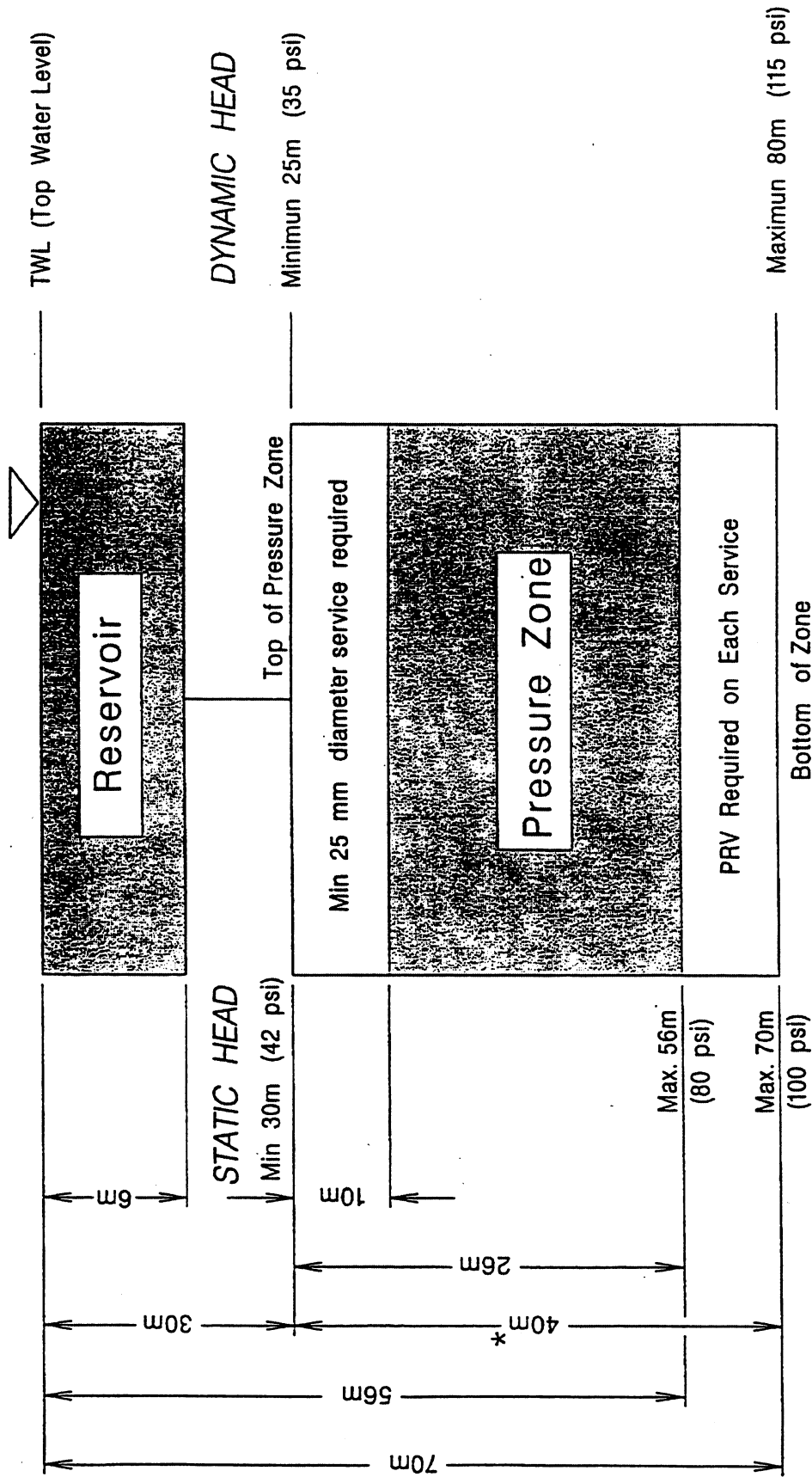
TWP 22



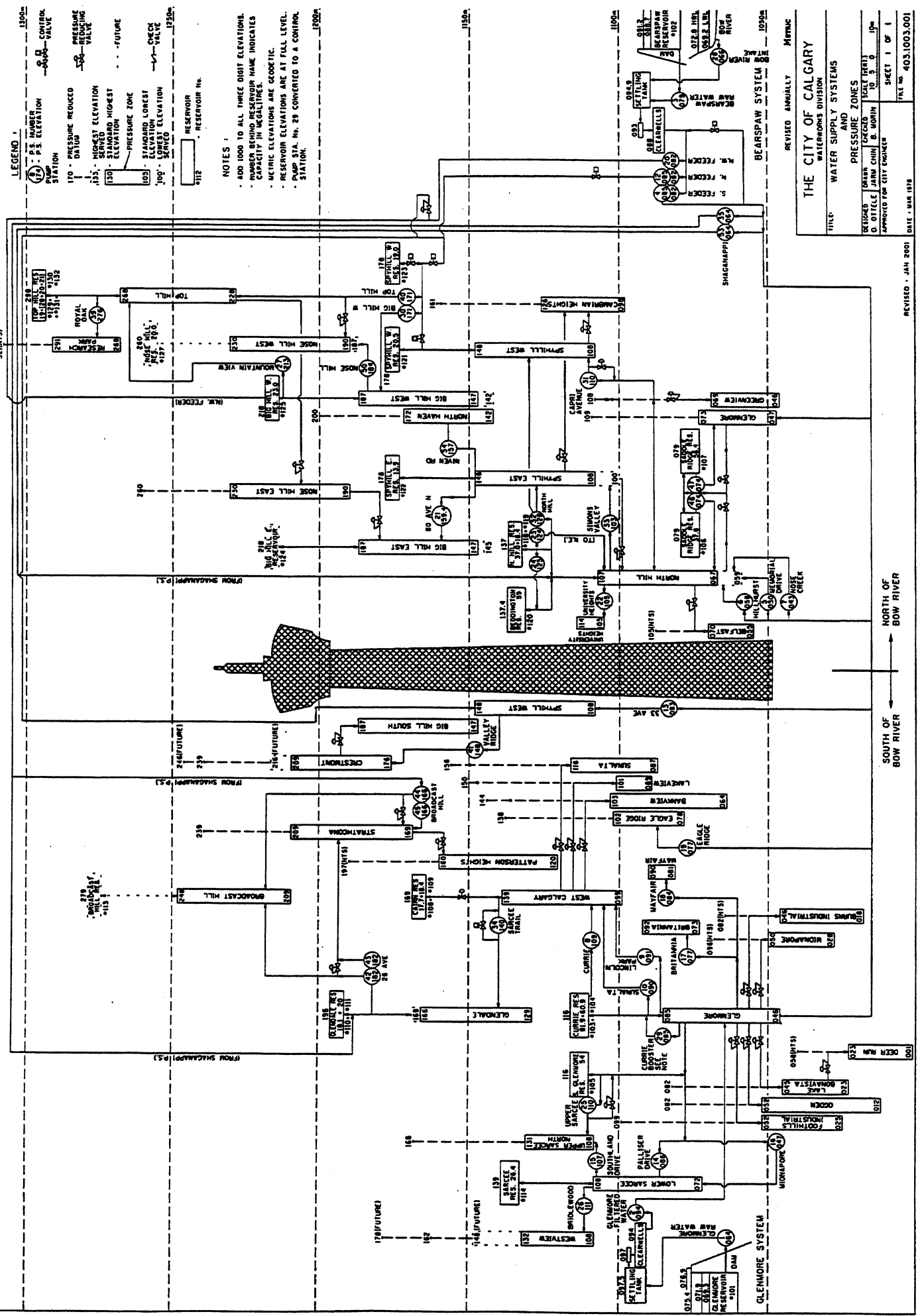
UTILITIES AND ENVIRONMENTAL PROTECTION
 CALGARY WATERWORKS
 PRESSURE ZONE MAP

0 1000 2000 METERS

City of Calgary Pressure Zone Criteria



- * Some of the smaller zones (i.e., pressure reduced) may have a difference of less than 40 metres between the Top and Bottom of the zones to suit local topographic conditions.
- 1. Minimum dynamic head at a fire hydrant during fire flow conditions is 15 metres (20 psi).
- 2. Maximum variation of head at any service is 20 metres (28 psi).
- 3. For zones without a reservoir, the pumps would be selected to match the TWL.
- 4. For pressure reduced zones, the top of the zone shall be set at 30 metres static head. As a general rule, the PRV in homes would be set at 43 metres (60 psi).
- 5. The zone may be extended below 70 metres static head for small isolated areas which are difficult to service.
- 6. Canadian Plumbing Code Requires a PRV (Pressure Reducing Valve) where head exceeds 56m (80 psi).



LEGEND

- 170 - PRESSURE REDUCED DATUM
- 155 - HIGHEST ELEVATION SERVED
- 100 - STANDARD HIGHEST ELEVATION
- 103 - STANDARD LOWEST ELEVATION
- 100' - STANDARD ELEVATION SERVED
- RESERVOIR No. 112
- 17000 - BEARS PAW SYSTEM
- 10000 - GLENMORE SYSTEM

NOTES

- ADD 1000 TO ALL THREE DIGIT ELEVATIONS.
- NUMBER BEHIND RESERVOIR NAME INDICATES CAPACITY IN MEGALITRES.
- METRIC ELEVATIONS ARE GEODETIC.
- RESERVOIR ELEVATIONS ARE AT FILL LEVEL.
- PUMP STA. No. 29 CONVERTED TO A CONTROL STATION.

REVISED ANNUALLY MARCH

THE CITY OF CALGARY
WATERWORKS DIVISION

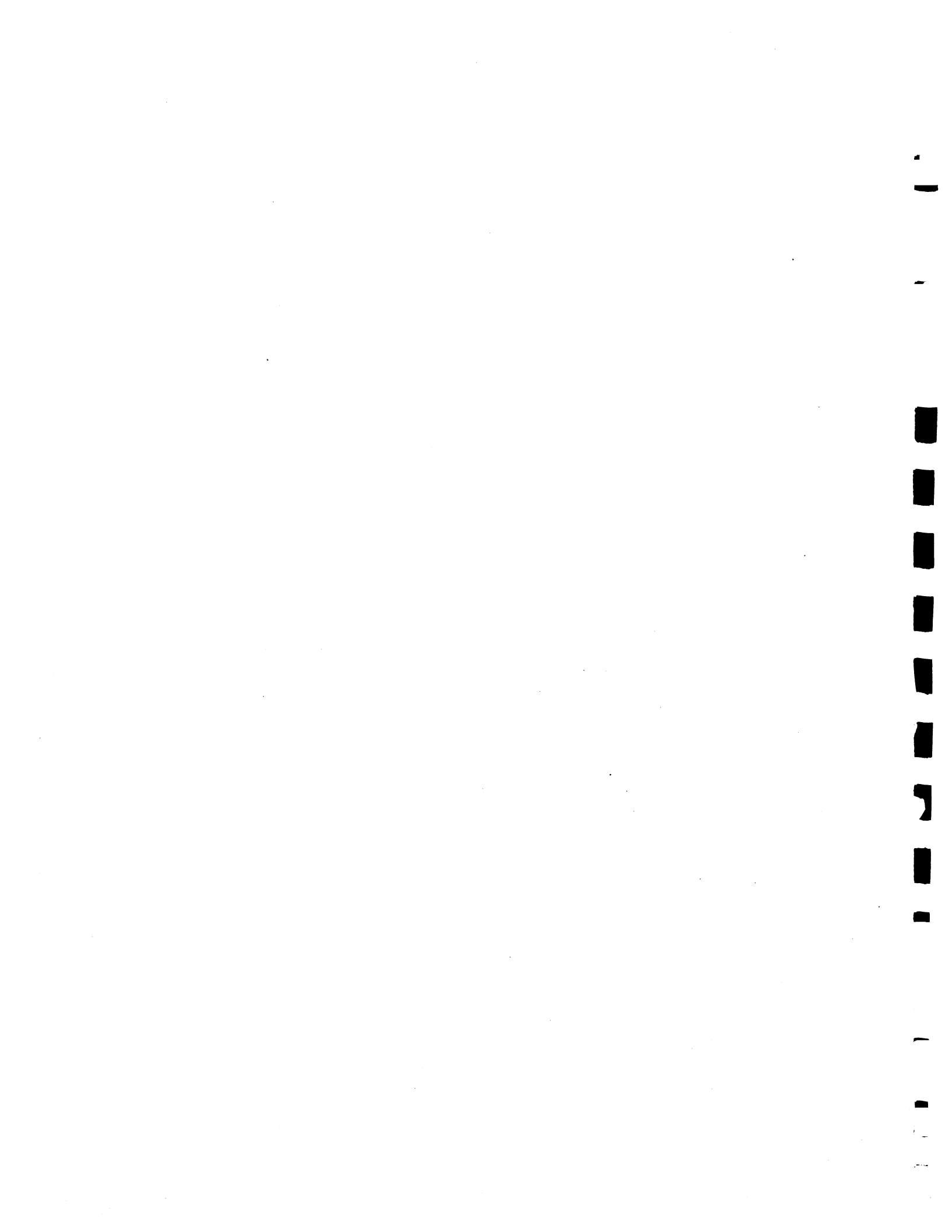
TITLE: WATER SUPPLY SYSTEMS AND PRESSURE ZONES

DRAWN BY: J. CHHIBI
CHECKED BY: J. CHHIBI
APPROVED BY: J. CHHIBI

SHEET 1 OF 1

DATE: MAR 1978

FILE NO: 403.1003.001



SECTION IV: WASTEWATER & DRAINAGE

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WASTEWATER & DRAINAGE

A. 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 are required to be submitted and approved by *Wastewater and Drainage* prior to the release of underground construction permission.

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 of Calgary* shall pay 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 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. 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.

B. 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. Where no change in pipe diameter occurs, allow a drop of 30 mm in a straight through manhole and 60 mm in the presence of a bend.
- e) 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 millimetre. Set rims to match the finished grade.

4) Manhole Type

- a) For 600 mm diameter pipe and smaller use a Type 5A manhole except where a 3 or 4 way junction occurs, in which case a Type 1 or Type 1-S manhole may be required.
- b) Pre-cast T-Riser manholes will be accepted for sewers 1200 mm diameter or larger trunks 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 5 service leads can be tied directly to the upper manhole. These leads must enter the manhole less than 600 mm above the outgoing invert.

C. MAINS AND SERVICES

1) General

- a) All pipe shall conform to and be installed as 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 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*.

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

NOMINAL PIPE DIAMETER (mm)	CONCRETE PIPE (2.4 m LENGTHS - BASED ON 25 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	27 m	23 m (5 ° per joint)	46 m (5 ° per joint)
250	32 m	23 m (5 ° per joint)	46 m (5 ° per joint)
300	40 m	23 m (5 ° per joint)	46 m (5 ° per joint)
375	49 m	38 m (3 ° per joint)	76 m (3 ° per joint)
450	57 m	38 m (3 ° per joint)	76 m (3 ° per joint)
525	66 m	38 m (3 ° per joint)	76 m (3 ° per joint)
600	75 m	38 m (3 ° per joint)	76 m (3 ° per joint)
675	83 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
750	92 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
900	109 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
1050	127 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
1200	144 m	76 m (1.5 ° per joint)	153 m (1.5 ° per joint)
1350	162 m		
1500	179 m		
1650	196 m		
1800	214 m		
1950	231 m		
2100	249 m		
2400	284 m		
2700	318 m		
3000	353 m		

5) 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		WEAVING TILE	
	Concrete n = 0.013	PVC n = 0.011	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	0.60	0.32	0.24
250	0.40		0.56	0.40	0.24	0.18
300	0.32		0.44	0.32		
375	0.24		0.32	0.24		
450	0.18		0.26	0.18		
525	0.16		0.22	0.16		
600	0.12		0.18	0.12		
675	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		

SUPERSEDED
See Addenda

6) 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, Mechanical Site Plans and Solid Waste Services Plans*.

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 General Manager, Wastewater and Drainage.

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.

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

Residential Lots

Developers shall install service connections to all R1 and R2 lots. These services shall extend either 3.5 m (no shallow utility easement) or 5 m (with shallow utility easement) into the lot.

Pre-servicing of lots zoned other than R1 or R2 will not be permitted without prior approval from *Wastewater and Drainage*.

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.

D. PIPE BEDDING

- a) All pipe bedding shall conform to and be installed as per *The City of Calgary Standard Specifications, Sewer Construction*.
- b) Normal pipe embedment material classification for PVC pipe shall be Class III with a minimum compaction of 90% Standard Proctor Density.
- c) Normal pipe bedding for concrete pipe shall be Class "C".
- d) Maximum depth of installation of concrete pipe shall be as shown in *Table IV-D.1*.

Table IV-D.3: Maximum Installation Depth of Concrete Pipe (Depth to Invert in (m))

PIPE DIAMETER (mm)	C14 CL II	C14 CL III	C76 CL I	C76 CL II	C76 CL III	C76 CL IV	C76 CL V
200	4.0	5.0					
250	3.5	3.9					
300	3.0	3.3				3.9	5.8
375						4.0	5.9
450					3.0	4.3	6.1
525					3.1	4.3	6.1
600					3.3	4.6	6.5
675					3.4	4.8	6.6
750				2.8	3.5	4.8	6.7
900				3.1	3.7	5.0	6.8
1050				3.4	3.9	5.2	7.2
1200				3.6	4.1	5.4	7.4
1350				3.8	4.4	5.6	7.5
1500			3.7	4.0	4.7	5.8	7.7
1650			3.9	4.3	4.9	6.0	8.0
1800			4.1	4.5	5.1	6.2	8.2
2100			4.5	4.9	5.6	6.8	8.6
2400			4.9	5.4	6.1	7.3	9.0
2700			5.3	5.8	6.6	7.8	9.4
3000			5.7	6.2	7.0	8.3	10.0

Notes:

- Class C Bedding (Load Factor = 1.5)
- Width of Trench (Bd) = Transition Width
- Soil Unit Weight = 2082 kg/m³
- Tables 14 through 38 of the *Concrete Pipe Design Manual (Fifth Printing)* prepared by The American Concrete Pipe Association were used in setting up this table.

E. FLOODPLAIN GUIDELINES

- a) Developments in floodplain and floodway areas are subject to the regulations described in the Bylaw 5P85.
- b) In general, all landowners or developers proposing construction within the 1:100 year floodplain of Bow River, Elbow River and Nose Creek drainage basins are required to follow Bylaw 5P85.

Refer to Bylaw 5P85 for more information.

F. SANITARY SEWER FLOWS

- a) *Wastewater and Drainage* is currently reviewing the parameters for the determination of design flows in sanitary sewer systems.
- b) Prior to designing a trunk sewer, the consultant shall contact *Wastewater and Drainage* for the current design parameters.

G. STORMWATER MANAGEMENT & 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 design.

