

7.0 ROADWORKS

7.1 GENERAL

For City Centre projects, refer to City Centre Area Plan (CCAP) Implementation Strategy and associated bylaws. Refer to this document for items not addressed in the CCAP Implementation Strategy and associated bylaws

The City Centre Transportation Plan, Official Community Plan, Cycling Network Plan, and any other related planning documents shall be consulted to ensure long-term transportation plans and objectives are addressed by each design.

The design of roads and highways shall conform to these guidelines:

- Geometric Design Guide for Canadian Roads published by the Transportation Association of Canada (TAC), latest edition
- City of Richmond Bylaws
- Provincial legislation including the Motor Vehicle Act

The Consultant shall submit a geotechnical report with each road design that outlines the existing road conditions and recommended road structure. Due to the unique soil and topographic conditions of Richmond, it is essential that roads be designed to provide adequate drainage and added safety in areas having unstable soil stratas. If the underlying material is peat, a special stabilization method should be investigated, i.e., pre-load or peat removal. For this reason, the City stipulates the basic minimum required asphalt-concrete, gravel and road base thicknesses (Table 7.4 on page 7-15). The Consultant shall verify road structure design based on the geotechnical report, to the satisfaction of the General Manager. The General Manager reserves the right to change the asphalt-concrete and road base thicknesses, if deemed necessary, as the result of unstable sub-grade.

The surface course of asphalt-concrete is usually placed at a later date (one year) after all the service connections, etc., are completed.

7.2 ROAD CLASSIFICATION

The City has the following road classifications:

- Major Arterial Road (divided and undivided)
- Minor Arterial Road
- Collector Street
- Local Street (residential; commercial; industrial)

Note:

1. *Within the pedestrian-oriented areas (e.g. City Centre), enhanced features may be required (e.g. wider sidewalks)*

Refer to the City of Richmond Website (<http://www.richmond.ca/>) for the road classification map.

Refer to the latest version of the Official Community Plan (OCP) and Policy Planning for designated areas (e.g., City Centre, Oval area, Steveston area).

For subdivision planning purposes, the Developer will be advised in writing of the classification of each road, particularly collector roads which include high generator single and multi-family residential, commercial and industrial roads.

7.3 ROAD CROSS SECTIONS

The “Typical Road Cross Sections” and Table 7.1 act as a guideline for road cross section requirements. The Consultant shall also consult the relevant local area plans for area specific requirements and obtain approval for the proposed road cross section with the General Manager.

Refer to the following drawings (at the end of this section) for the typical cross sections of the corresponding road classifications:

- R-1-DS Arterial
- R-2-DS Collector - Residential
- R-3-DS Local/Collector - Industrial/Commercial
- R-4-DS Local - Residential (Multi-family)
- R-5-DS Local - Residential (Single-family)
- R-6-DS Lane - Outside City Centre
- R-7-DS Lane - City Centre
- R-8-DS Typical Asphalt Walkway

For roads that are designated or proposed as bicycle routes in the Cycling Network Plan, the dedicated rights-of-way shown in Table 7.1 (page 7-3), shall be widened to accommodate cyclists in accordance with section 7.16.

If the proposed works involve extending an existing road, at the General Manager's discretion the existing road width and characteristics may take precedence over these cross sections for the remainder of the block.

Table 7.1- Road Cross Section Requirements

Road Classification	Road Dedication	Pavement Width *	Sidewalks/ Edge Treatment	Curb/Gutter
1. Arterial (Undivided)	24.0 m (min) at mid-block + 1.8 m (per Bike lane) + 3.0 m (per parking bay) + 3.3 m (at intersection per left turn bay) + 1.2 m (divided arterial per centre median)	14.0 m (min) at mid-block + 1.8 m (per Bike lane) + 3.0 m (per parking bay) + 3.3 m (at intersection per left turn bay) + 1.2 m (divided arterial per centre median)	Both sides with lighting/planting strips. Sidewalk to be on the outside of the lighting/planting strips, away from pavement.	Barrier curb on both sides and raised median
2. Collector (Residential)	20.4 m	11.2 m	Both sides with boulevards	Barrier curb on both sides
3. Local/Collector (Industrial/Commercial)	21.2 m	12.0 m	Both sides with boulevards	Barrier curb on both sides
4. Local Residential (Multi Family/Townhouse)	20.4 m	11.2 m	Both sides with boulevards	Barrier curb on both sides
5. Local Residential (Single Family)	17.7 m	8.5 m	Both sides with boulevards	Barrier curb on both sides
6. Cul-de-sac Residential (Single Family)	17.7 m at throat and 17.7 m bulb radius	8.5 m at throat and 13m bulb radius	Both sides and around the radius. Blvds on both sides	Barrier curb on both sides around bulb
7. Cul-de-sac Residential (Multi Family/Townhouse)	20.4 m at throat and 19 m bulb radius	11.2 m at throat and 13m bulb radius	Both sides and around the radius. Blvds on both sides	Barrier curb on both sides around bulb
8. Cul-de-sac (Industrial/Commercial)	21.2 m at throat and 19 m bulb radius	12 m at throat and 15m bulb radius	Both sides and around the radius. Blvds on both sides	Barrier curb on both sides around bulb
9. Service Lane (City Centre)	9.0 m	7.5 m	One Side with lighting strip	Rollover curbs on both sides
10. Service Lane (Non-City Centre)	6.0 m	5.1 m		Rollover curbs on both sides
11. Emergency Fire/Access Lane	6.0 m (7.5m in City Centre)	As required	Fence on both sides **	

Road Classification	Road Dedication	Pavement Width *	Sidewalks/ Edge Treatment	Curb/Gutter
12. Walkway	3.0 m	3.0 m	Fence on both sides **	
13. Partial Road	12.65 m	6.0 m	Sidewalk and boulevard on one side	Barrier curb on one side

* Refer to Section 7.16 for additional road width on designated and proposed cycling routes

** Type of fence to be approved by the General Manager

Note:

- The amount of road dedication assumes a 1.5 m wide sidewalk (where applicable). Additional road dedications will be required in pedestrian-oriented area, where sidewalk widths of 2.0 m (minimum) are required*

7.4 NEW ROADS

All new roads shall be designed in accordance to the latest version of the TAC guideline. Intersections on arterial roads shall be limited to other arterial roads and collector roads and shall be at right angles, unless otherwise approved by the General Manager. In order to facilitate efficient traffic operations and signal coordination along arterial roads, major traffic intersections between arterial roads and collector roads shall typically only be allowed at the midpoint between section lines.

Minimum Intersection Spacing shall be in accordance with the TAC Geometric Design Guide. Except under special circumstances that benefits overall traffic flow, no new cul-de-sacs or local access roads, including laneways, shall be allowed to intersect directly with any major arterial road.

More frequent intersection spacing may be approved by the General Manager or the Transportation Division to provide adequate access to adjacent land uses and developments.

7.5 TIE INTO EXISTING ROAD

Minimum asphalt flare to meet existing edge of pavement (based on minimum horizontal taper 1:30 for arterial roads, 1:20 for all other roads), with a 1.0 m wide gravel shoulder.

At all sidewalk termini, a minimum 4.5 m asphalt taper length beyond the limit of the development frontage is required.

7.6 CUL-DE-SACS

Requirements for a cul-de-sac shall be in accordance with BC's Building Code. For City requirements on cul-de-sac design, refer to Table 7.1 (page 7-3).

Where space permits in residential areas, on-site parking may be provided at the central island of the cul-de-sac on a local residential road.

The central island shall be complete with selected trees, paving blocks or a combination of both. The proposed treatment shall reflect a low maintenance cost.

7.7 LOOP ROADS

Loop roads shall be limited to 860 m in length. Such loop roads shall have the length of the panhandle entrance road limited to 230 m, and at least one emergency access lane as alternate access for emergency vehicles.

7.8 LANES

Lanes should be provided in accordance with the City Limited Access Bylaws and the City of Richmond Lane Policy.

Lanes are generally required for all residential properties outside of the City Centre that front an arterial road. Refer to Table 7.1 (page 7-3) for road dedication and width for lanes in City Centre and outside City Centre.

All lane entrances shall be constructed with continuous sidewalk and letdown. Under certain circumstances, corner cuts (e.g., 3.0 m by 3.0 m) might be required to accommodate for service vehicles including garbage/recycling trucks.

7.9 CURB/GUTTER

All roads shall be complete with wide base barrier concrete curbs with gutters as indicated on the "Typical Road Cross Sections".

Curb with gutter requirements of traffic circle and lane shall be approved by the General Manager.

7.9.1 Medians

Medians shall be sized in accordance with the Road Cross Sections and landscaped as outlined in Section 8.0.

7.10 GEOMETRIC DESIGN REQUIREMENTS

7.10.1 Design Speeds

The following minimum design speeds must be provided for both vertical and horizontal alignment, unless otherwise approved by the General Manager:

<u>Road Classification</u>	<u>Design Speed</u>
Major Arterial Road – Divided	70 kph
Major Arterial Road – Undivided	60 kph
Minor Arterial Road	60 kph
Collector Street	50 kph
Local Street	50 kph
Lanes	30 kph

7.10.2 Design Gradients

A smooth grade line with gradual changes, consistent with the class of road and the character of the terrain, is preferable to an alignment with numerous breaks and short lengths of grade. The “roller-coaster” or “hidden dip” type of profile shall be avoided.

At intersections of roads of unequal classification

- The grade of the road centreline of higher designation will be maintained and the grade of the other road centreline will be altered to conform to the crown of the more major road

At intersections of roads of equal classification

- The grade of the road centreline of each road will be constructed level for the width of the intersection

7.10.3 Cross Slopes and Superelevation

Cross slopes for all roadways shall not be less than 2% or more than 4% in the direction indicated on the appropriate Road Cross Sections. The crown shall be in the centre of the pavement. A standard crowned cross section shall be used for lane design.

Superelevation is to be provided as per appropriate TAC Standards unless otherwise directed by the General Manager.

7.10.4 Vertical Curves

Vertical curves shall be designed in accordance with the latest edition of TAC, governed by the design speed of the road or laneway.

7.10.5 Horizontal Curves

Horizontal curves shall also be designed in accordance with the latest version of TAC, governed by the design speed of the road or laneway.

7.11 INTERSECTIONS

7.11.1 General

Geometric design of all intersections shall be in accordance with the latest version of TAC.

For the requirements of visibility clearance at intersections, refer to Bylaw 5780 and along medians, refer to the latest version of TAC.

Intersection designs shall ensure that pedestrian, bicycle, transit and vehicular concerns are addressed.

7.11.2 Major Intersections

Major intersections are those of two adjoining arterial roads or one arterial and one collector road.

Vehicular accesses to corner sites at Major Intersections shall be strictly controlled pursuant to the City's current Access Control Bylaw. Specifically:

- Consolidation of lands at Major Intersections is encouraged and subdivision of lands is discouraged
- Where re-development occurs at a Major Intersection, the Developer shall minimize the number of access points to the road network
- Vehicular accesses off arterial roads are to be minimized or avoided
- On or approaching an intersection with an arterial or a collector road, no access within 35 m of the real or imaginary stop line on the arterial or collector street approach to the intersection
- For sites located at the intersection of two roads of different hierarchical ranks, vehicular access shall be allowed only off the lower ranked road

- Where a development is on an arterial road and near a Major Intersection, it shall allow for future road widening at the intersection. Unless otherwise determined by the City, a minimum right-of-way width of half the R.O.W requirement (specified in Table 7.1 on page 7-3) from future centre line will be required for a distance of 100 m from the intersection for each road classified as Major Arterial and for a distance of 70 m from the intersection for each road classified as Minor Arterial.

7.11.3 Intersections at Major Arterial Roads

Major arterial road intersections shall be improved in accordance to the standards mentioned in Section 1.0.

The Transportation Division shall be consulted with regards to the need for traffic signals, enhanced pedestrian/accessible treatments, right turn lane and pre-ducts for future traffic signals.

If pre-ducting is necessary for future traffic signal installation, the pre-ducting layout should be shown on the traffic signals drawing.

7.11.4 Curb Returns

The Curb return radii noted below are "effective turning radii." The Consultant is to confirm the proposed curb return radii will accommodate vehicle maneuvering for transit vehicles, emergency vehicles, and/or trucks, as necessary. The General Manager based on traffic calming and pedestrian safety issues may approve reduced diameter curb returns.

Table 7.2 Curb Return Radii

Intersection with				
Vehicle Movements to:	Vehicle Movements from:			
	Local	Collector ⁽¹⁾	Arterial ⁽²⁾	Industrial Local
Local	5.5	5.5	5.5	5.5
Collector ⁽¹⁾	5.5 - 7.0 ⁽³⁾	5.5 - 7.0 ⁽³⁾	5.5 - 7.0 ⁽³⁾	7.0 - 9.0 ⁽⁵⁾
Arterial ⁽²⁾	5.5 - 7.0 ⁽³⁾	5.5 - 7.0 ⁽³⁾	5.5 - 9.0 ⁽⁴⁾	7.0 - 9.0 ⁽⁵⁾
Industrial Local	5.5 - 7.0 ⁽³⁾	7.0 - 9.0 ⁽⁵⁾	7.0 - 9.0 ⁽⁵⁾	7.0 - 9.0 ⁽⁵⁾

⁽¹⁾ Collector includes Minor Streets in City Centre

⁽²⁾ Arterial includes Major Thoroughfares and Major Streets in City Centre

- (3) May increase up to 7.0m if the total effective width of receiving lanes is less than 6.0m. Vehicle turning templates are to be provided for SU-9 and other design vehicles as required by the City.
- (4) May increase up to 9.0m if the total effective width of receiving lanes is less than 6.0m. Vehicle turning templates are to be provided for SU-9 and other design vehicles as required by the City.
- (5) May increase up to 9.0m if the total width of receiving lanes is less than 6.0m. Vehicle turning templates are to be provided for SU-9, WB-17, and other design vehicles as required by the City.

Notes:

1. *Curb return radii to be measured from the back of the curb*

7.11.5 Corner Cuts

At intersections of all functional roadways, corner cuts shall be sufficient to provide landing areas on sidewalk for pedestrians and for signal equipment.

- Typical corner cuts are 4.0 m by 4.0 m at 90° intersections
- Larger corner cuts may be required to address safety concern and transportation needs and at skewed intersections
- Under the circumstances where public right of passage is provided, corner cuts shall be measured from the public right of passage

7.12 RAILWAY CROSSINGS

Whenever roadworks cross an existing railway or railway right-of-way appropriate permits and approvals must be obtained.

If these roadworks involve improvements to arterials, collectors, or roadways with designated bicycle routes, a rubber or pre-cast concrete railway crossing shall be used at the railway crossing.

7.13 DRIVEWAYS

Bylaws including Zoning Bylaw 5300 restrict access onto certain Major Arterial roads. New driveway access onto such arterial roads will not be permitted. Alternate access via lanes or the lowest hierarchy fronting road. New driveway access maybe subject to directional movement restrictions, as determined by the Transportation Division. Single-family residential driveways shall also conform to the Residential Lot (Vehicular) Access Regulation Bylaw No. 7222.

In addition to the standards mentioned in Section 1.0, driveways are to be designed in accordance with the latest version(s) of the Driveway Regulation Bylaw, associated bylaws, and the driveway guidelines in Table 7.3 and drawing R-9-DS in the Supplementary Specifications and Detail Drawings.

7.13.1 Two-way Driveways

See Table 7.3.

7.13.2 One-way Driveways

The width for one-way driveways will depend on the road width, centreline location, etc. Applicant to design as per Note 1 on page 7-11.

Table 7.3 Driveway Crossing Types and Widths

Access Type	Driveway Type	Driveway Width W (metres)	
		On Local Roads	On Arterial Roads
Residential (SF) as per Bylaw 7222	two-way	4.0	5.0
Residential (SF) - shared (with cross-access easement registered on title)	two-way	n/a	6.0 min & 7.5 max (applicable to collectors/arterial roads)
Residential (TH, MF)	two-way	6.0 min. 7.5 max. ^(1a)	6.0 min. 7.5 max. ^(1b)
Single Commercial	two-way	7.5	7.5
Multiple Commercial	two-way	n/a	9.0 to 11.0
Industrial	two-way	13.0	13.0

^(1a) This width could be tapered from the property line at 5:1 to a minimum 6 m width within the site.

^(1b) This width is needed for a length of 5 m from the property line, then 5:1 taper to a minimum 6 m width within the site.

Notes:

1. Applicant to apply industry standard vehicle turning templates (e.g. Transportation Association of Canada):
 - to ensure vehicles do not cross centreline of road in order to manoeuvre into and out of the site, and
 - if required, to ensure that fire trucks, garbage/recycling trucks, moving vans, delivery trucks, etc. can manoeuvre the driveway (typical standards: City of Richmond fire trucks = WB12, standard moving semi-truck = WB 17, City of Richmond garbage/recycling trucks = SU 9)
2. Continuous sidewalk shall be provided at the back of boulevard and curb, adjacent to the property line.
3. When boulevard width exceeds 2 metres, design of driveway letdown may include extended throat.

Landing Area

To be included at the entrance is to be 3.0 m long, measured from the furthest of the existing or future rear sidewalk or curb edge into the site

Grade

- Driveway letdown: 8% maximum (as per TAC)
- Landing area and remainder of the driveway for existing and new driveways: refer to drawing R-11-SD in the Supplementary Specifications and Detail Drawings

The Consultant must ensure that grade transitions provide for all reasonable vehicle clearances so that vehicles will not “hang-up” or “bottom out”. Vertical curves may be required.

Material

All driveways are to be asphalt or concrete. Existing driveways are to be reinstated with asphalt to property line on City rights of way and with material to match existing on the private property side.

Separation

- The minimum distance between the start of the curb letdown:
 - 1.5 m to the nearest street light pole and nearest hydrant
 - 2.0 m to the nearest tree
- The minimum distance between two driveways (flare to flare):
 - Residential: 1.0 m
 - Commercial: 3.0 m
 - Industrial: 5.0 m

7.14 PEDESTRIANS AND DISABLED ACCESS

The design of pedestrian safety features shall be in accordance with the TAC Geometric Design Guide.

Adequate consideration should be given to the needs of pedestrians and transit passengers.

The internal pedestrian circulation system should be designed, in consultation with City staff; to channel pedestrians to identified pedestrian crosswalk facilities rather than allowing them to cross intersection approach roads at other locations.

7.14.1 Wheelchair Ramps

Standard wheelchair ramps shall be provided as follows:

- At the curb returns at all road intersections. Two separate sidewalk letdowns are preferred to the single wrap around letdown design.
- Wherever walkways or crosswalks intersect roads
- Wherever possible, continuous sidewalk shall be provided at the back of boulevard and curb, ideally adjacent to the property line

Wheelchair ramps shall be designed to maximize pedestrian safety. Locations and details of ramps including the maximum slope and related pedestrian safety features shall be in accordance with the TAC Geometric Design Guide. The maximum slope of the wheelchair ramp shall not exceed 6% and appropriate landing pads be provided (as per TAC).

In addition to pedestrian-oriented area (such as City Centre, Oval area, Steveston area and areas identified in the OCP), dual ramps (i.e., two separate sidewalk letdowns) shall be provided at all intersections involving an arterial road unless physically deemed infeasible by the City. Design of sidewalk and related pedestrian facilities shall address concerns on wheelchair accessibility and safety, including continuous sidewalks at driveways.

For the design of dual wheelchair ramps for 7.0 m and 9.0 m curb radius, refer to drawing R-12-SD in the Supplementary Specifications and Detail Drawings.

7.14.2 Sidewalks

- Sidewalk width shall be a minimum of 1.5 m
 - Minimum 2.0 m wide sidewalks shall be used in pedestrian-oriented area (e.g., City Centre, Oval area, Steveston Area and areas identified in the OCP)
 - Where local area plans exist, the requirements outlined therein shall govern
- Sidewalks shall be designed to maximize pedestrian safety
- No obstructions, including hydrants or utility poles/above ground equipment, shall be placed within existing or proposed sidewalks
- Design of sidewalk and related pedestrian facilities shall address concerns on wheelchair accessibility and safety
- Sidewalk slope design shall be in accordance with the latest version of TAC
 - Longitudinal grades on sidewalks shall remain constant where possible
- Sidewalks shall be separated from the travel lane with boulevard
- Finished sidewalk elevation at the back of the sidewalk shall be shown on the construction plan at locations corresponding to the gutter high and low point
 - Intermediate finished grade elevation shall also be shown at 10.0 m intervals corresponding to roadway cross-sections

7.14.3 Walkways

For City requirements for typical walkway design, refer to the following:

- Table 7.1 (page 7-3)
- Table 7.4 (page 7-15)
- R-7-DS (page 7-28)

7.15 TRAFFIC CALMING

All traffic calming measures shall be as directed or as approved by the General Manager.

Traffic calming design shall conform to the latest edition of the Transportation Association of Canada (TAC) / Canadian Institute of Transportation Engineers (CITE) “Guide to Neighbourhood Traffic Calming” with the following exceptions.

- Raised intersections, rumble strips, and speed humps/bumps are not to be used unless approved by the General Manager
- Curb extension (Figure 4.6 in 1998 version of guide) revisions:
 - Angle of taper to be 30 degrees (to maximize parking)
- Raised median (Figure 4.9 in 1998 version of guide) revisions:
 - Minimum length for raised medians to be 5.0 m
 - 30:1 taper is appropriate for arterial roads, but for local roads, this should be reduced to 20:1 or less as deemed necessary by the City

7.16 BICYCLES

All bicycle lanes or pathways shall be designed in accordance with the Geometric Design Guide for Canadian Roads published by the Transportation Association of Canada (TAC), latest edition, and all regional or provincial bicycle facility guidelines (i.e. TransLink Regional Bike Plan and Provincial Cycling Design Guidelines). Requirements for bicycle facilities shall be confirmed with the General Manager.

In a situation where an off-street bike path intersects a roadway or sidewalk at midblock, bollards or other equivalent speed deterrent measures (to prevent cyclists or inline skaters from speeding and from suddenly emerging without slowing down or yielding to the sidewalk) shall be installed at the merge of a bike lane and a pedestrian sidewalk. City staff is to be consulted on the appropriate type of measures in each case.

Where designated cycling facilities are provided, a smooth surface treatment should be applied for such facilities. Any pavement surface treatment that would cause unsafe and disruptive travel for cyclists should be avoided.

7.17 TRANSIT

The Consultant shall confirm the requirements for transit service, as outlined by TransLink and in the latest version of “Transit Infrastructure Design Guidelines”, for all roads designated as existing or future bus routes. The Consultant shall also identify areas where other design objectives, including traffic calming, bicycle and pedestrian access that may conflict with the requirements of TransLink. These requirements shall be reviewed and approved by the General Manager.

7.18 PAVEMENT STRUCTURE DESIGN REQUIREMENTS

The basic road pavement structural design shall be adequate for an expected road life of 20 years under the expected traffic conditions for the class of road. This shall be determined by the results of soils tests and analysis of the results of deflection testing performed on the surface of the road base gravel by a registered Professional Engineer. The minimum total flexible pavement structure thickness for any road shall be in accordance with standard drawings or greater if determined by the testing.

The General Manager may require the submission of a geotechnical report to confirm the structural adequacy of any existing or proposed street.

7.18.1 Existing Pavement

Overlay of existing pavement shall be based on analysis of the results of Benkleman Beam tests, or other approved method, carried out on the existing road, which is to be upgraded.

The Benkleman Beam testing shall be carried out in accordance with current standards, published by the Roads and Transportation Association of Canada (RTAC).

The maximum Benkleman Beam deflection corrected for seasonal variation shall not be greater than:

- Industrial and Arterial streets 1.00 mm
- Collector and Commercial streets 1.25 mm
- All other road classifications 1.50 mm

The overlay thickness shall be determined by both the Benkleman Beam testing and by the shape of the cross-section of the existing pavement, so that an adequate crossfall on the existing pavement is obtained. The structure and/or grade of the existing pavement may indicate complete removal and reconstruction, which shall be carried out at the discretion of the General Manager.

In addition the standards mentioned in Section 1.0, road restoration is to be completed as per the Roadway Restoration Regulation Bylaw.

7.18.2 Asphalt-Concrete Pavement

The following minimum pavement, gravel and sand thickness presented in Table 7.4 shall be maintained.

Table 7.4 Pavement, Gravel and Sand Thickness

ROAD CLASSIFICATION	GRANULAR		ASPHALT-CONCRETE	
	SubBase (mm)	Base (mm)	Lower Course (mm)	Upper Course (mm)
Major Arterial				
Divided	500	230	100	50
Undivided	500	230	100	50
Industrial	500	230	100	50
Collector	500	230	100	50
Local Residential	300	230	50	35
Cul-de-Sac				
Industrial Area	380	230	100	50
Residential Area	300	230	50	35

ROAD CLASSIFICATION	GRANULAR		ASPHALT-CONCRETE	
	SubBase (mm)	Base (mm)	Lower Course (mm)	Upper Course (mm)
Laneway	300	230	50	35
Walkway		230	50	25
Emergency	300		2-1.22 m x 200 Concrete Strip or 2-1.4 m paving stone Emergency	

7.19 UTILITY RELOCATIONS

Many utilities (surface and sub-surface) must be relocated as the result of road widening and reconstruction.

It will be the responsibility of the Consultant/contractor to liaise with the utility company at the preliminary design stage/construction stage, to resolve the new locations and offsets of the utilities and to meet the requirements of all parties.

7.20 ROAD EMBANKMENT GRADING

Road embankment shall be shaped to a slope of 3 horizontal to 1 vertical with sand fill and shall be finished with a seeded topsoil meeting the existing ground level or suitable alternative in accordance with Section 8.0.

If the embankment slope is causing inconvenience to property owners and is adversely affecting drainage and driveways, retaining walls complete with top handrail shall be used. The use of retaining walls should be avoided except in extreme cases.

7.21 POSTAL BOXES

The Developer shall set the location of community mailboxes within the development and shall obtain agreement in writing from Canada Post regarding the location(s). The Developer shall provide the required additional street right-of-way at the community box locations to enable Canada Post to install the box.

7.22 TRAFFIC SIGNALS

All designs shall meet or exceed requirements set forth in the BC Motor Vehicle Act, MUTCD of Canada, ITE Manual of Traffic Signal Design, and the Pedestrian Crossing Manual of B.C. If traffic signal control devices, pre-ducting of future traffic signal control devices or traffic signal communications conduit/cable are required for a proposed development, at the discretion of the General Manager (or his/her delegate) these may be designed by City staff and their construction may be included with other City work related to the project. If the City wishes the Developer to

retain an electrical consulting firm to prepare the design drawings then it is assumed that the Consultant has sound knowledge of traffic signal design. All design and construction costs shall be the responsibility of the Developer whether covered off by development cost charges for the project or separate charges to the Developer.

All new conduit crossing existing roadways shall be installed using trenchless technology and shall be a minimum of 1.0 m deep unless otherwise specified.

All drawings submitted to the City for review and approval shall be sealed by a Professional Engineer registered with the Association of Professional Engineers and Geoscientists of British Columbia.

All traffic signal poles standards and luminaries to be used shall be confirmed with the General Manager. Decorative traffic signal poles shall be used in designated areas, as directed by the General Manager.

The City requires that every effort be made to incorporate the traffic signal controller cabinet/base into the architecture and/or the landscaping of the new development without losing

sight of the need to have the cabinet located so that clear visibility can be maintained between the signalized intersection and the cabinet.

For traffic signal communications conduit/cable, refer to Roadway Lighting Section 6.12.

7.23 TRAFFIC SIGNS AND STREET MARKINGS

In addition to the standards mentioned in Section 1.0, traffic signs and street markings for a proposed development, if required, shall be designed in accordance to TAC Manual of Uniform Traffic Control Devices (MUTCD), and the British Columbia Motor Vehicle Act, as appropriate.

If pavement markings are required for proposed developments, these will be designed by the Developer and their construction will be included with the installation of the City services.

7.24 TRANSPORTATION IMPACT STUDY

Major development proposals may require the Developer to engage the services of a traffic engineering consultant for the preparation of a Transportation Impact Study of the proposed development.

Typically, developments that generate a total of more than or equal to 100 veh/hr or significant number of person trips that may impact the adjacent land use (in the opinion of the City staff) in the peak periods will require a Transportation Impact Study. Discussion with Transportation Division staff prior to commencing the study is recommended to identify any development specific requirements. Under special circumstances or for developments, which, in the opinion of the Transportation Division, impede general traffic flow or result in potential traffic safety concerns, such studies maybe required at the discretion of the Transportation Division. Prior to commencing the study, the Consultant will submit a proposed terms of reference for approval and may include all or some of the following requirements.

7.24.1 General Requirements

- General description of location; local area (surrounding roads) and distribution system (regional transportation system leading to location)
- Identification of other development sites using same distribution system
- Focus should be on City issues but regional facilities must be critically analyzed as well

7.24.2 Data Requirements

- Data requirements should be identified along with availability and sources (Richmond, Translink, GVRD, MOT, etc.)
- Data collection from sources or unavailable data may have to be gathered by the Consultant

7.24.3 Transportation Analysis

The Proposed Development

- Description of proposed development
- Identification of study area
- Identification of intersections for analysis
- Context map and description of neighbouring land uses
- Site plan: interaction with surrounding road system
- Description of existing zoning
- Staging plan
- Trip generation (outline procedure for establishing trip generation)
- Documentation of trip generation adjustments (where applicable)
- Mode split (document modal split assumptions)
- Trip distribution (outline procedure to establish trip distribution)
- Trip assignment (outline procedure to assign site traffic to network)
- Establishment of site traffic (include figure)
- Parking, internal circulation, loading design and pickup/drop off

Existing Situation

- Description of study area road network
- Geometric parameters of existing roads and form of traffic control
- Existing traffic volumes (peak hour and ADT as necessary)
- Transportation System performance (intersection, laning configuration, capacity analysis)
- Identification of existing problems (delays, both local and regional, e.g., bridges)
- Transit service
- Cycling facilities/routes
- Pedestrian facilities
- Traffic safety issues

Traffic Generation

- By site
- By other area developments
- Identify distribution of trips (origin and destination within City and external)
- Growth rates based on population, land use, labour force and employment projections
- Mode split

Future Situations

- Establish horizon years
- Establish analysis periods
- Establish method of projecting growth in background traffic
- Identify any specific developments within study area that contribute to background traffic
- Establish Background traffic for each horizon year (include figure)
- Establish Total (combined) traffic volumes (include figure)
- Identify planned (funded) roadway improvements within the study area
- Identify any constraints on the existing road system
- Distribution of projected traffic volumes and origin and destination of trips
- Transportation System performance (intersection, laning configuration, progression and capacity) under projected volume conditions
- Identification of transportation system requirements for future conditions
- Future transit needs/services
- Cycling Facilities
- Pedestrian Facilities
- Design Drawings showing recommended requirements
- Traffic safety mitigating measures and traffic calming requirements
- Mode split

Traffic Analysis

- Description of method of traffic operations analysis
- Existing capacity analysis (existing condition)
- Capacity analysis without development (no build condition) for each phase
 - Intersection capacity analysis
 - Signal and other special warrant analysis as applicable
 - Turning vehicle storage space (queuing) analysis
- Capacity analysis with development (build condition) for each phase
 - Intersection capacity analysis
 - Signal and other special warrant analysis as applicable
 - Turning vehicle storage space (queuing) analysis
- Capacity analysis with development and improvements (mitigated build condition) for each phase
 - Intersection capacity analysis
 - Signal and other special warrant analysis as applicable
 - Turning vehicle storage space (queuing) analysis

Other Modes

- Discussion of proposed transportation demand management measures

- Review / discussion of pedestrian facilities and connectivity and identification of recommended improvements
- Review / discussion of cycle facilities and connectivity and identification of recommended improvements
- Review / discussion of transit facilities and connectivity and identification of recommended improvements
- Review/discuss means to promote the use of alternative modes of transportation

Parking/Loading Analysis and On-site Layout Review

- Establish parking demand and compare with bylaw rates
- Parking demand reduction (if applicable): Shared parking (justify by site parking utilization on different land uses and peak characteristics)
- Parking Variances on Zoning Bylaw: confirm other bylaw requirements including % small stalls, handicapped stalls, aisle width, stall dimensions, etc.
- Parking availability: accessible commercial and visitor stalls, minimum reserve parking, etc.
- Loading space: commercial and residential uses, turning path, should not require backing onto public roads
- Site circulation analysis: magazine length, internal road width, on-site traffic flow, passenger drop-off/pick-up, locations of driveways & stalls, etc.
-
- Neighbourhood parking issues: with/without on-street parking, neighbourhood intrusion, etc.
- Mitigating measures to address neighbourhood parking issues; and identify additional on-site/off-site parking requirements and traffic management plan for special events that may be held by specific developments, e.g. religious assemblies

Conclusions and Recommendations

- Impact on transportation system both in Richmond and externally
- Transportation System requirements
- Off-site transportation impacts
- Identify required on-site improvements, parking requirements and access scheme (include drawings)
- Identify required off-site improvements (include functional designs)
- Identify improvements required to support other modes
- Identify traffic calming improvements required in the local area

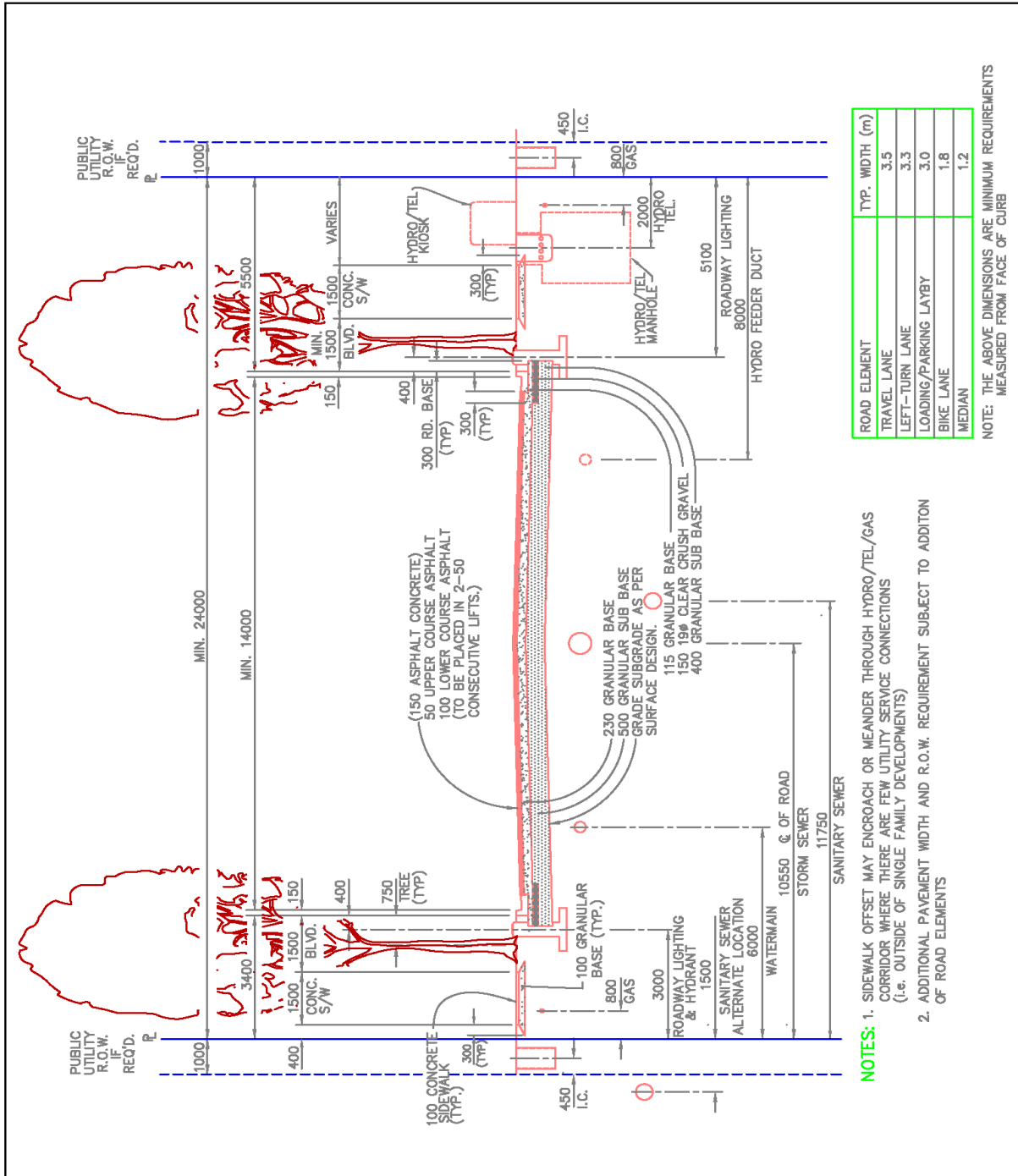
Documentation

- Raw traffic count data
- Trip generation summary
- Capacity analysis printouts
- Signal warrant worksheets

Report

- Prepare Draft Report for City review and comment
- Provide Final Report incorporating City comments

Periodic reviews should accompany the progress of the study so that periodic evaluation by the General Manager can contribute to the various study stages.



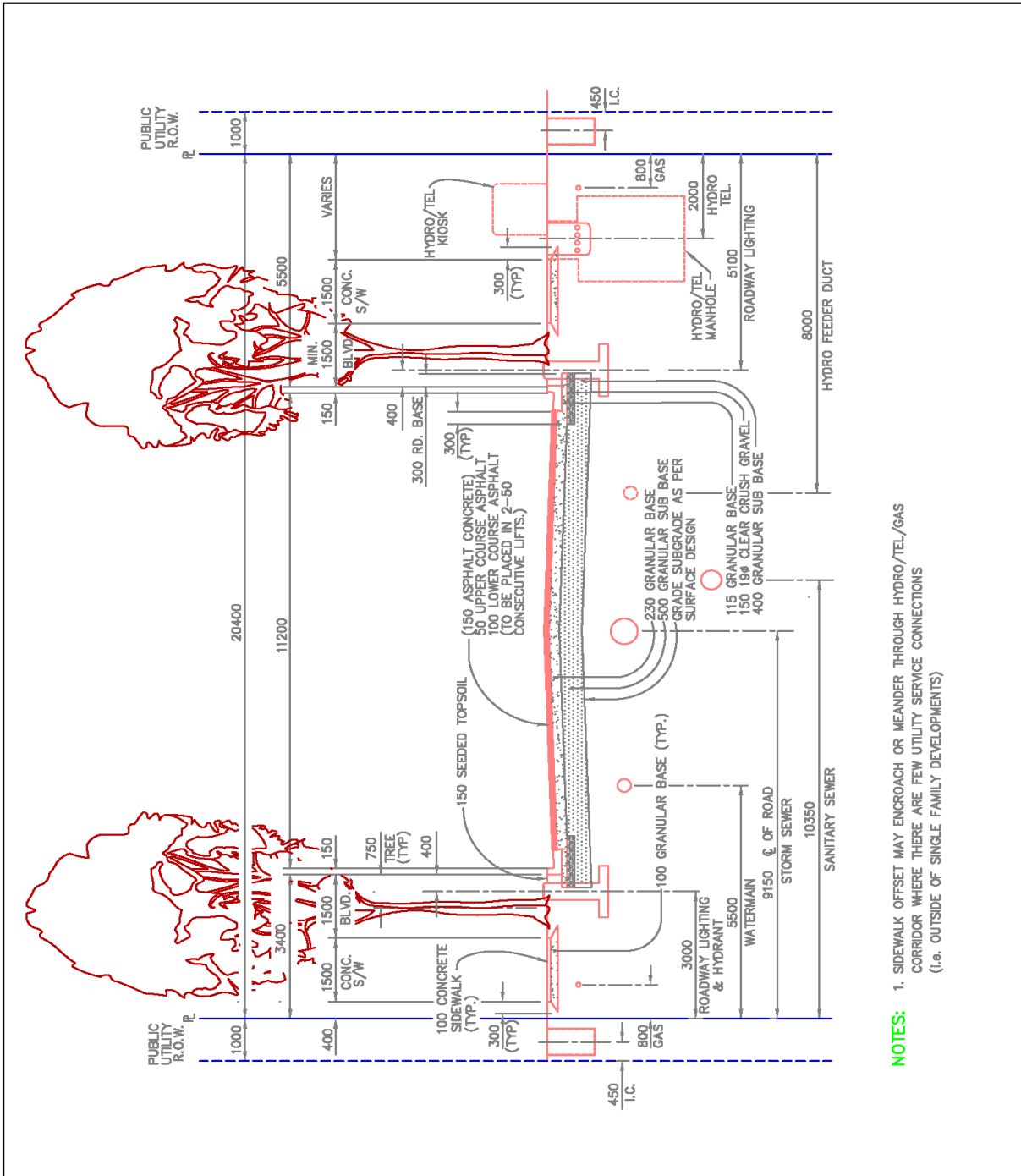
NOTES:

1. SIDEWALK OFFSET MAY ENCRUCH OR MEANDER THROUGH HYDRO/TEL/GAS CORRIDOR WHERE THERE ARE FEW UTILITY SERVICE CONNECTIONS (I.e. OUTSIDE OF SINGLE FAMILY DEVELOPMENTS)
2. ADDITIONAL PAVEMENT WIDTH AND R.O.W. REQUIREMENT SUBJECT TO ADDITION OF ROAD ELEMENTS



6911 No. 3 Road Richmond B.C. V6Y 2C1

TITLE: TYPICAL CROSS SECTION ARTERIAL ROAD - UNDIVIDED 4-LANE MIN. 24.00m R.O.W. - MIN. 14.0m ROADWAY		
DESIGN:		
DRAWN: S.M/T.S/P.S	DWG. No.	R-1-DS
CHECKED:	SCALE: N.T.S.	DATE: JUNE 2008
ENGINEER:	SEC. No.	SHT. No. 1 OF 1

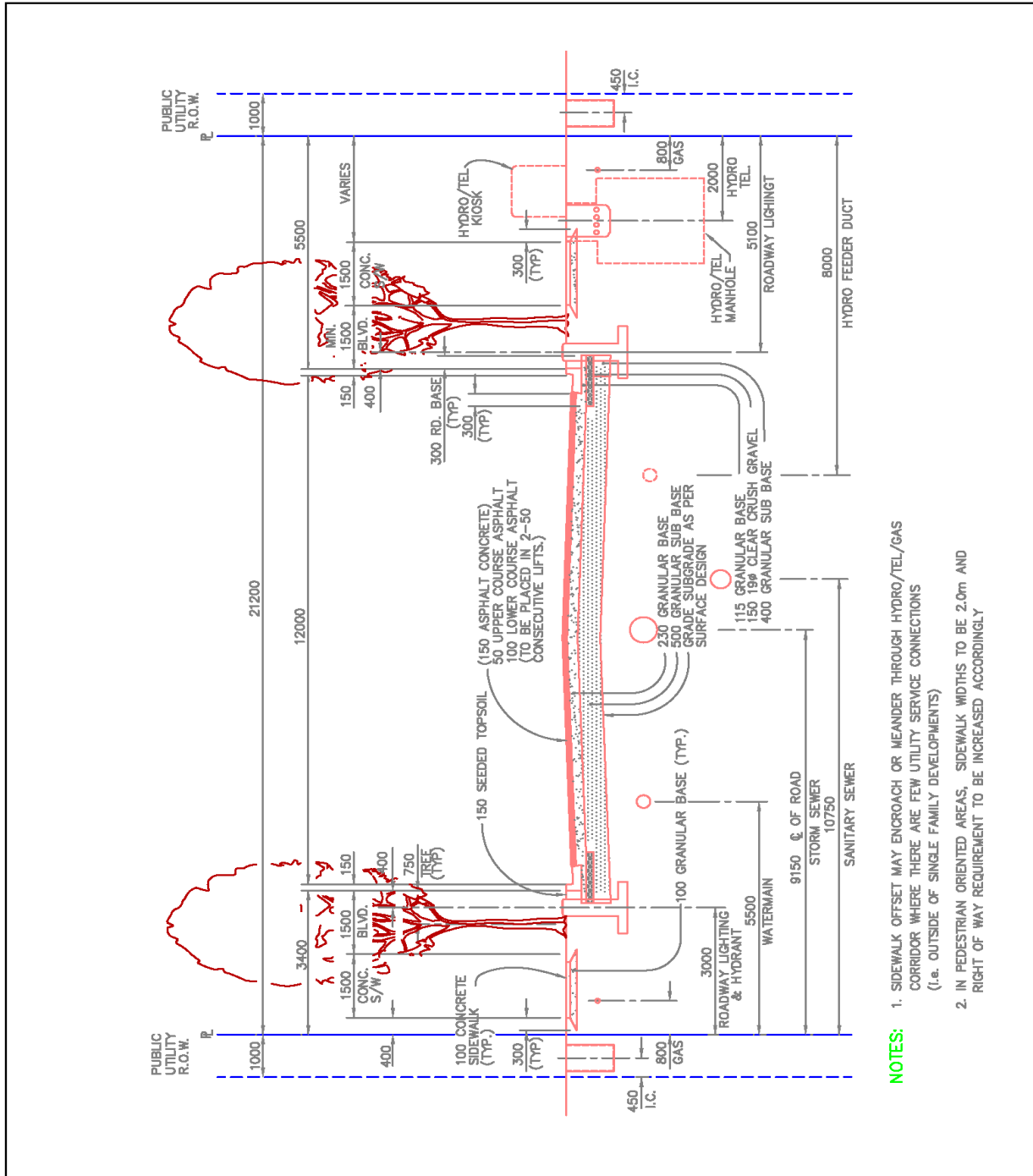


NOTES:
1. SIDEWALK OFFSET MAY ENCR OACH OR MEANDER THROUGH HYDRO/TEL/GAS CORRIDOR WHERE THERE ARE FEW UTILITY SERVICE CONNECTIONS (I.e. OUTSIDE OF SINGLE FAMILY DEVELOPMENTS)

City of Richmond

6911 No. 3 Road Richmond B.C. V6Y 2C1

TITLE: TYPICAL CROSS SECTION COLLECTOR ROAD – RESIDENTIAL 20.40m R.O.W. – 11.20m ROADWAY		
DESIGN:		
DRAWN: S.M./T.S./P.S	DWG. No. R-2-DS	
CHECKED:	SCALE: N.T.S.	DATE: JUNE 2008
ENGINEER:	SEC. No.	SHT. No. 1 OF 1

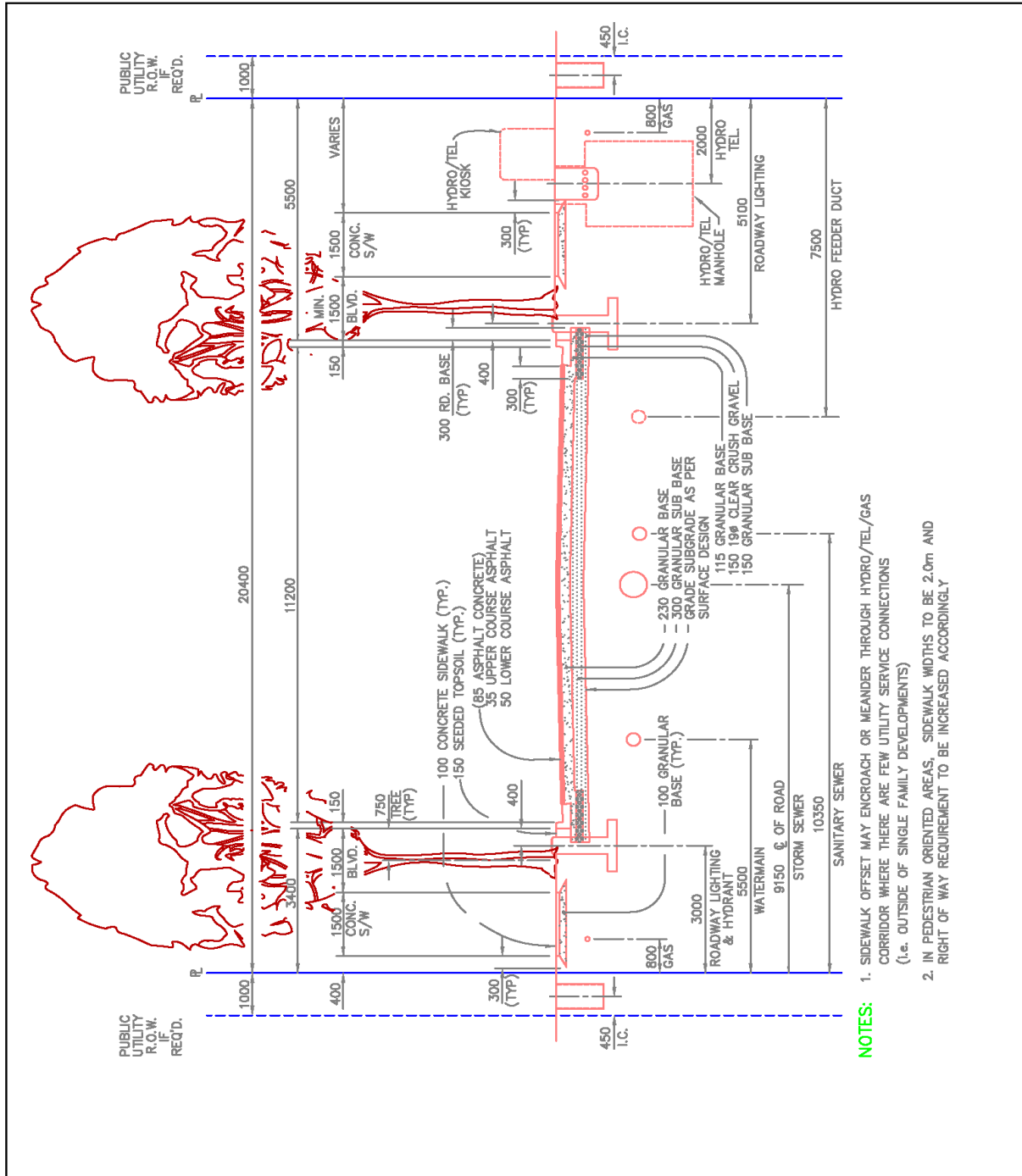


- NOTES:**
1. SIDEWALK OFFSET MAY ENCRANCH OR MEANDER THROUGH HYDRO/TEL/GAS CORRIDOR WHERE THERE ARE FEW UTILITY SERVICE CONNECTIONS (i.e. OUTSIDE OF SINGLE FAMILY DEVELOPMENTS)
 2. IN PEDESTRIAN ORIENTED AREAS, SIDEWALK WIDTHS TO BE 2.0m AND RIGHT OF WAY REQUIREMENT TO BE INCREASED ACCORDINGLY

City of Richmond

6911 No. 3 Road Richmond B.C. V8Y 2C1

TITLE:		TYPICAL CROSS SECTION LOCAL/COLLECTOR ROAD - INDUSTRIAL/COMMERCIAL 21.20m R.O.W. - 12.0m ROADWAY	
DESIGN:		DWG. No.	R-3-DS
DRAWN:	S.M/T.S/P.S	SCALE:	N.T.S.
CHECKED:		DATE:	JUNE 2008
ENGINEER:		SHT. No.	1 OF 1

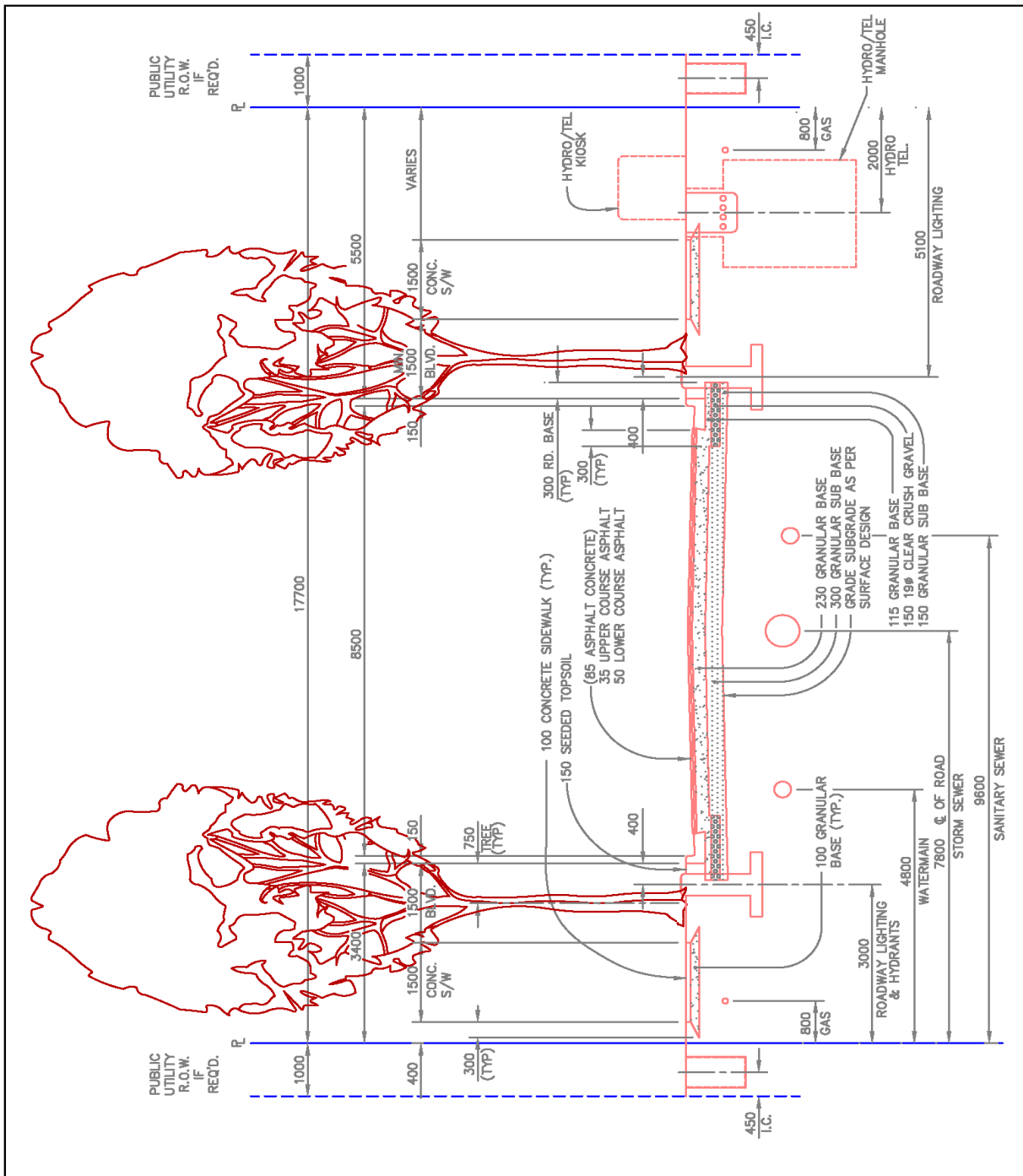


- NOTES:**
1. SIDEWALK OFFSET MAY ENCR OACH OR MEANDER THROUGH HYDRO/TEL/GAS CORRIDOR WHERE THERE ARE FEW UTILITY SERVICE CONNECTIONS (i.e. OUTSIDE OF SINGLE FAMILY DEVELOPMENTS)
 2. IN PEDESTRIAN ORIENTED AREAS, SIDEWALK WIDTHS TO BE 2.0m AND RIGHT OF WAY REQUIREMENT TO BE INCREASED ACCORDINGLY



6911 No. 3 Road Richmond B.C. V6Y 2C1

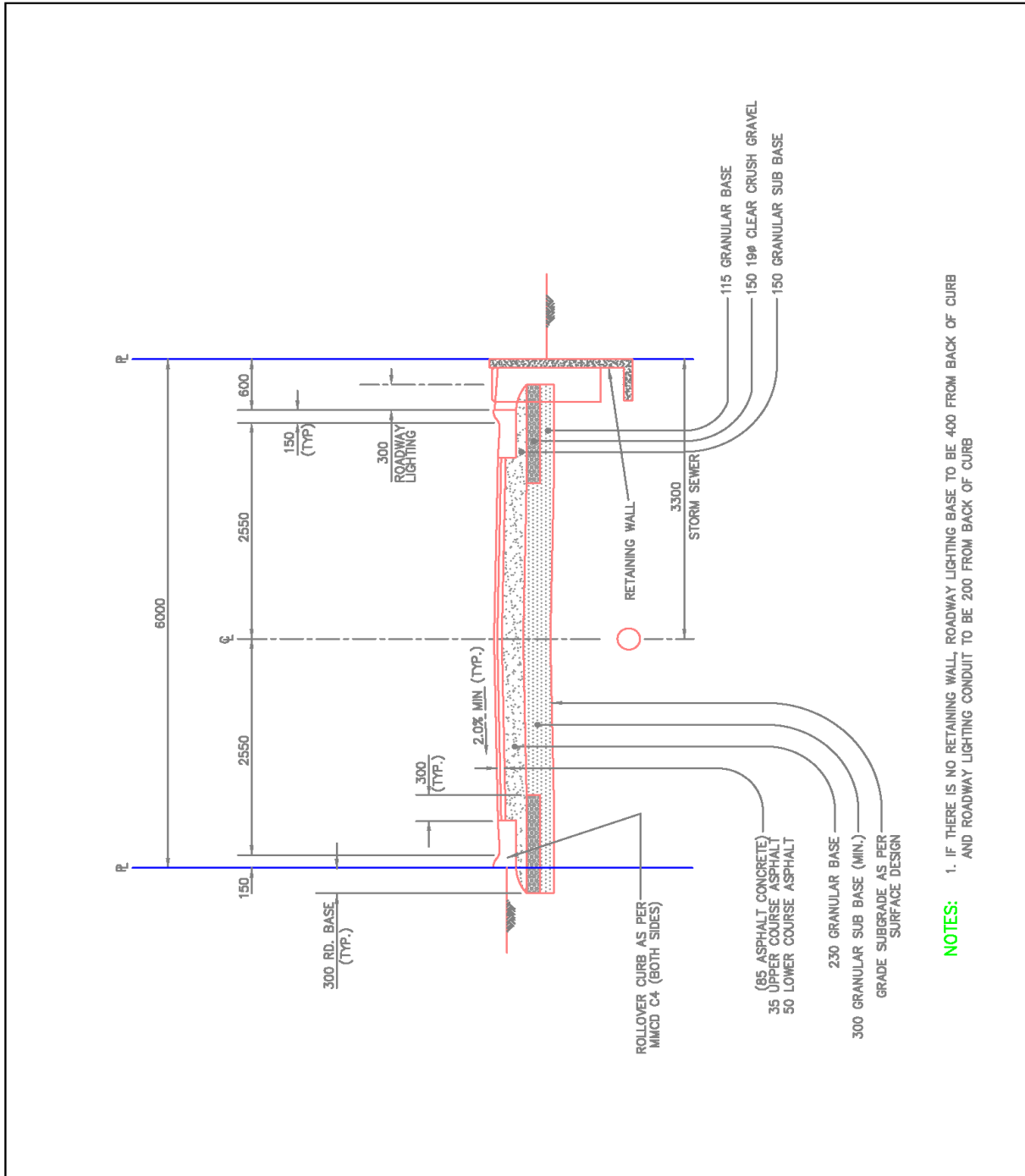
TITLE: TYPICAL CROSS SECTION LOCAL ROAD – RESIDENTIAL (MULTI-FAMILY) 20.40m R.O.W. – 11.20m ROADWAY		
DESIGN:		
DRAWN: S.M/T.S/P.S	DWG. No. R-4-DS	
CHECKED:	SCALE: N.T.S.	DATE: JUNE 2008
ENGINEER:	SEC. No.	SHT. No. 1 OF 1



City of Richmond

6911 No. 3 Road Richmond B.C. V6Y 2C1

TITLE: TYPICAL CROSS SECTION LOCAL ROAD - RESIDENTIAL (SINGLE FAMILY) 17.70m R.O.W. - 8.50m ROADWAY		
DESIGN:		
DRAWN: S.M/M.S/P.S	DWG. No. R-5-DS	
CHECKED:	SCALE: 1:100	DATE: JUNE 2008
ENGINEER:	SEC. No.	SHT. No. 1 OF 1

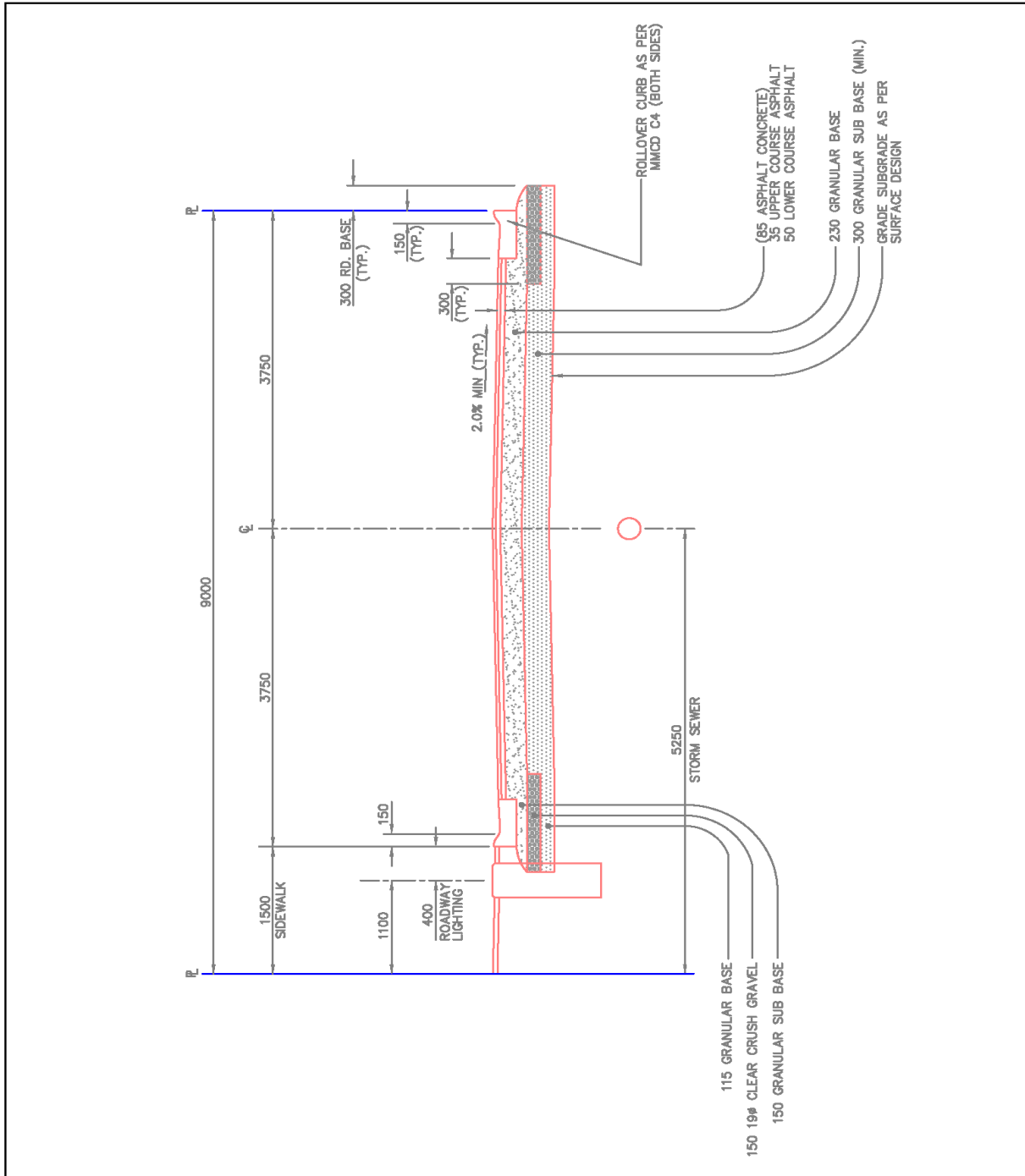


NOTES:
 1. IF THERE IS NO RETAINING WALL, ROADWAY LIGHTING BASE TO BE 400 FROM BACK OF CURB AND ROADWAY LIGHTING CONDUIT TO BE 200 FROM BACK OF CURB

City of Richmond

6911 No. 3 Road Richmond B.C. V6Y 2C1

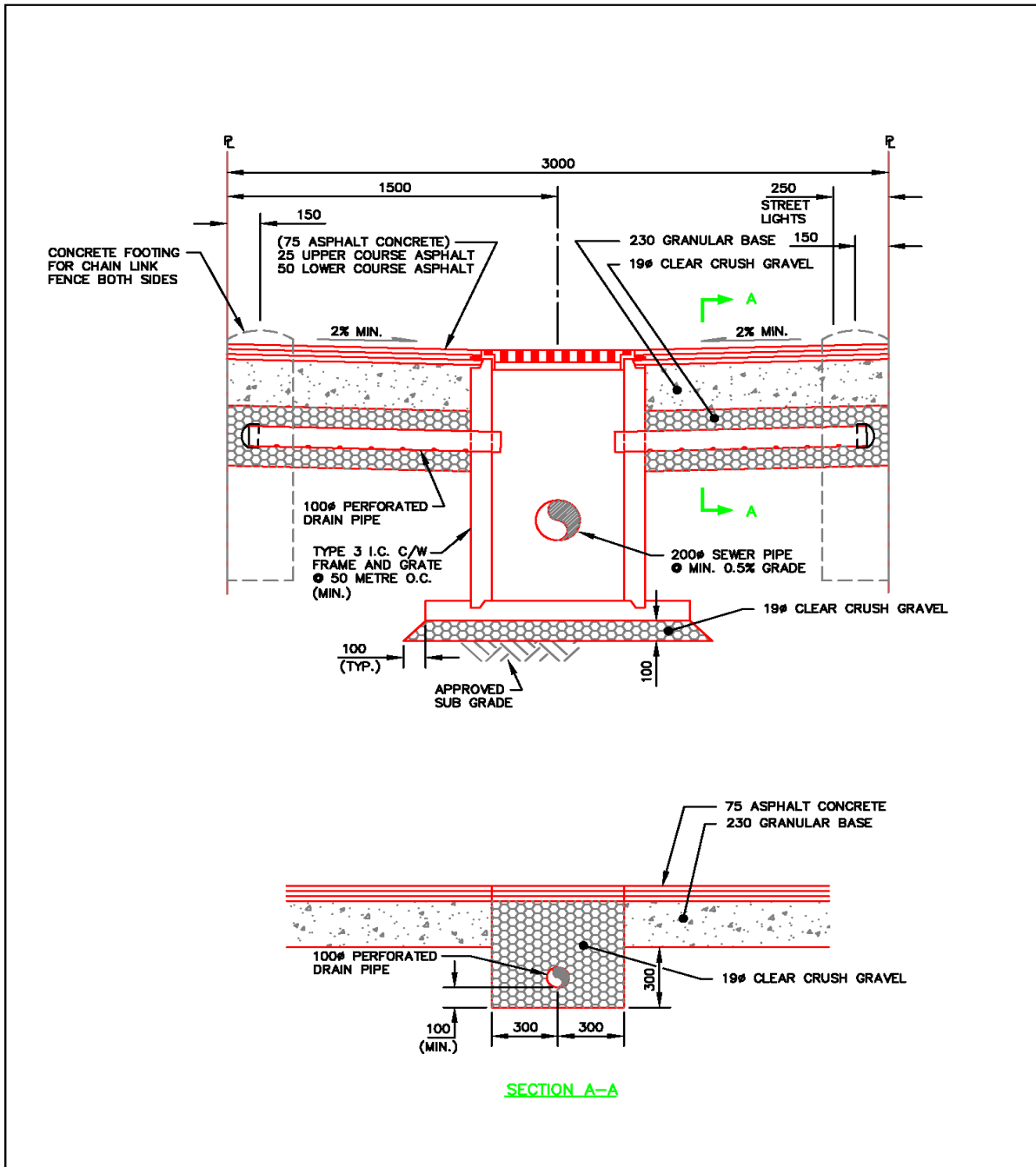
TITLE:		TYPICAL CROSS SECTION LANE - OUTSIDE CITY CENTRE 6.0m R.O.W. - 5.1m ROADWAY	
DESIGN:		DWG. No. R-6-DS	
DRAWN:	T. S/P.S	SCALE:	N.T.S.
CHECKED:		DATE:	JUNE 2008
ENGINEER:		SEC. No.	SHT. No. 1 OF 1



City of Richmond

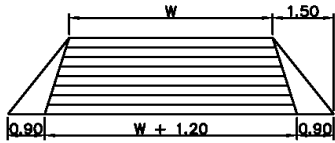
6911 No. 3 Road Richmond B.C. V6Y 2C1

TITLE:		TYPICAL CROSS SECTION LANE - CITY CENTRE 9.0m R.O.W. - 7.2m ROADWAY	
DESIGN:		DWG. No. R-7-DS	
DRAWN:	T.S./P.S.	SCALE:	N.T.S.
CHECKED:		DATE:	JUNE 2008
ENGINEER:		SEC. No.	SHT. No. 1 OF 1

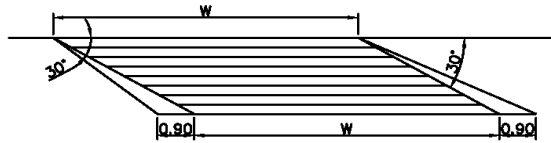


<p>6911 No. 3 Road Richmond B.C. V6Y 2C1</p>	TITLE: TYPICAL ASPHALT WALKWAY 3.00m R.O.W.		
	DESIGN:		DWG. No. R-8-DS
	DRAWN: M.S		SCALE: N.T.S.
	CHECKED:		DATE: JUNE 2008
	ENGINEER:		SEC. No. SHT. No. 1 OF 1

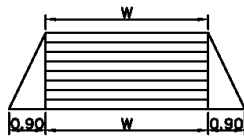
W = WIDTH, REFER TO TABLE 7.3 (PAGE 7-10)



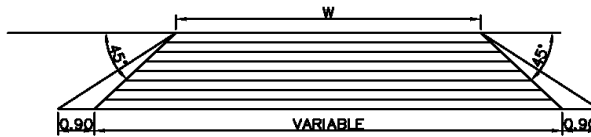
SF RESIDENTIAL
 ARTERIAL/COLLECTOR ROADS
 FIG. 2



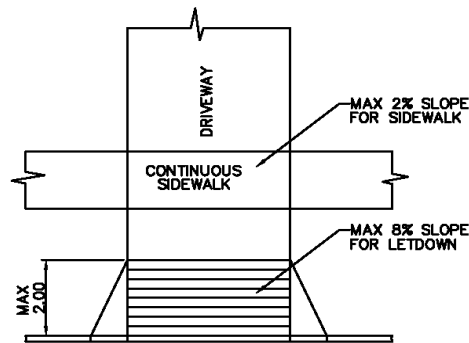
COMMERCIAL / INDUSTRIAL
 DIRECTIONAL
 ALL CLASSIFICATION OF ROADS
 FIG. 3



SF RESIDENTIAL
 LOCAL ROADS
 FIG. 1



MULTIFAMILY / COMMERCIAL / INDUSTRIAL
 ALL CLASSIFICATION OF ROADS
 FIG. 4



TYPICAL LAYOUT

City of Richmond

6911 No. 3 Road Richmond B.C. V6Y 2C1

TITLE: DRIVEWAY GUIDELINES		
DESIGN:	DWG. No. R-9-DS	
DRAWN: D.N/P.S	SCALE: N.T.S.	DATE: JUNE 2008
CHECKED:	SEC. No.	SHT. No. 1 OF 1
ENGINEER:		