ENGINEERING AND DEVELOPMENT STANDARDS

For
The Municipality Of Crowsnest Pass

March, 2005

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1.0 GENERAL

1.1 Purpose

The purpose of this document is to aid in the standardization of the design and construction of municipal services for residential, commercial and industrial developments in the Municipality of Crowsnest Pass.

This document is intended as a guide for developers, builders and the general public in the development process for subdivision, developments by severance and for individual site developments.

1.2 Design Guides

These standards should be followed unless otherwise approved in writing by the Municipality.

Should special conditions occur the Proponent should submit a written request to the Municipality stating the deviation required, the justification and impact of such deviation on the development.

The Municipality reserves the right to require; compliance with one or more of the standards and processes included herein, variations from these standards and additional information in support of the proposed development.

This document and the standards within are to be used in conjunction with good engineering practice and the latest edition of the following standards, regulations, design manuals and guidelines of:

- Transportation Association of Canada (TAC)
- Alberta Transportation and Utilities (AT&U)
- Alberta Environmental Protection Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems
- Environmental Reference Manual for Review of Subdivisions in Alberta
- Environmental Protection and Enhancement Act
- Safety Codes Act of Alberta
- "Alberta Private Sewage Treatment and Disposal Regulations", by Alberta Labour
- Environmental Protection and Enhancement Act
- Appropriate Federal Departments including Fisheries and Oceans

Any proposed development will be subject to the requirements of one or more municipal by-laws, such as:

- the Zoning By-law
- the Official Plan
- the Building By-law

In the event of any conflict between these standards and any legislation the most onerous condition or requirement shall prevail.

It is the 's responsibility to obtain copies of the above documents from the appropriate authorities.

1.3 Approvals

Depending on the location and nature of the development, the Proponent may be required to obtain approvals from various other regulatory agencies in addition to or prior to obtaining approval from the Municipality.

It is the responsibility of the Proponent to provide the Municipality with suitable written documentation of approval from the regulatory agencies.

1.4 Engineering

The Proponent shall retain a professional engineer licensed in the Province of Alberta for the design of all services, preparation of plans and specifications and the supervision and inspection of all construction works.

The developer's engineer and/or planner must consider the overall servicing and development of adjacent lands in the watershed, which may be affected, by the development. Where applicable, such considerations and recommendations concerning existing and/or proposed sanitary sewage treatment plants, water treatment plants, pumping stations, sewage collection systems, water distribution systems, storm water management and traffic impact may be required.

The layout of roads and sizing of water and sewage mains should also consider the future of abutting lands.

Where the nature of the development is more complex or varies from the standards, it will be required that the Proponent's engineer submit proposed preliminary design criteria to the Municipality for review. In any case the minimum requirements of the applicable statures, by-laws, government ministries and regulatory agencies must be satisfied.

1.5 Utilities

The Proponent shall coordinate the installation of utilities including cable TV, electricity, telephone and natural gas.

These utilities shall be installed within the road right-of-way in accordance with the utility locations as shown on the Standard Drawings or within a utility easement.

1.6 Maintenance Period/Completion Certificates

The Municipality requires the Proponent to provide maintenance for the following periods:

- Underground Utilities: One year including sanitary sewers, storm sewers, watermains, fire hydrants, sewer and water connections.

- Surface Works: Two years including hot mix asphalt and concrete structures, subsidence of trenches.

The maintenance period shall begin from the date specified on the Construction Completion Certificate. The term "Maintenance", as used in this document, does not include operation of the works or rectification of problems arising out of systems operation, failures of public utilities, general wear and tear on operational equipment, tools, structures and appurtenances of failures resulting from work performed by others.

After due notification in writing to the, the Municipality may proceed with correction of a fault at the expense of the Proponent and his Surety. In emergency situations endangering life or public property, the Municipality will proceed with repairs and thereupon advise the Proponent of the failure, and the Proponent shall pay resulting costs.

Upon completion of construction, the Proponent shall provide to the Municipality a letter, signed and sealed by the Proponent's engineer, certifying that the Work has been completed in accordance with the Development Agreement and that all construction deficiencies have been rectified.

Upon expiration of the maintenance period, an inspection will be conducted; all deficiencies shall be corrected and maintenance work completed prior to acceptance of the Work by the Municipality.

2.0 ROADS

2.1 General

These road standards are supplemented by the standard cross sections and design elements of the Transportation Association of Canada (TAC) and the Alberta Transportation and Utilities (ATU) documents as noted below.

- Manual of Geometric Design Standards for Canadian Roads, TAC
- Urban Supplement to the Geometric Design Guide for Canadian Roads, TAC
- Highway Geometric Design Guide, ATU

2.2 Design Guidelines

The following design guidelines are to be used for the typical applications as noted in Table 2.2.2.

Where these classifications, applications and design guidelines are inappropriate the shall submit to the Municipality a set of design criteria for review and approval prior to design.

2.2.1 Intersections

- Intersection of more than two streets shall not be permitted.
- Streets should intersect at right angles with each other.
- Jogged intersections shall not be permitted.
- Street intersections shall not be closer than 60 m.
- Road grades at intersections should not exceed 2%.
- The minimum curb radius on urban local roads is 9 m.
- The minimum curb radius on urban collector and arterial roads is 12 m.

2.2.2 Cul-de-Sac's

- The maximum length of a cul-de-sac to the turning circle shall be 105 m. This distance may be increased to 230 m should a 6.0m wide right of way connecting to the next street off the turning circle be provided for emergency vehicles, watermain looping and pedestrian access. If watermains cannot be looped, the maximum length of 105 m will be enforced.
- All roadways should be crowned on a minimum 2% slope.
- Turning circles shall have a minimum turning radius of 13.0 m in residential areas, 15 m in Industrial areas.

2.2.3 Sidewalks

- Sidewalks are required on at least one side for urban local roads.
- Sidewalks are required on both sides for urban collector and arterial roads.
- Sidewalks shall be a minimum of 1.5 m wide.
- Sidewalks and curbs shall be depressed at street intersections to permit easy passage of wheel chairs.

2.2.4 Vertical Curves

- Vertical Curves are required where ever the change in vertical grade is greater than 1%.
- Refer to Table 2.2.2 for minimum 'k' values for vertical curves.

2.2.5 Drainage

- Urban cross-section roads shall have a minimum longitudinal gutter grade of 0.5%.
- Rural cross-section roads may have a minimum longitudinal grade of 0.0%, provided adequate cross fall is provided.
- The minimum allowable culvert size allowed under any municipal road shall be 600 mm.
- The minimum allowable culvert size for driveway accesses shall be 450 mm.
- Ditch bottom shall be a minimum of 0.300 m below the top of subgrade.
- Ditches shall have a minimum grade of 0.3%.

2.2.6 Road Structure and Surfacing

- The shall engage a geotechnical engineer to determine if the minimum requirements as set out in this document are adequate for the purpose intended or if additional road structure is required.
- In no circumstance will the Municipality consider any road structure less than what is contained in these standards.
- The minimum thickness of road structures with asphalt surfacing shall be:

Table 2.2.1 Minimum Asphalt Road Structure

Road Classification		Asphalt Thickness (mm)	Asphalt Mix	Granular Base Course	Sub-Base
Urban					
	Local	75	Type III	100	150
	Collector	35 75	Type III Type II	100	150
	Arterial	35 100	Type III Type II	100	150
Rural					
	Local	75	Type III	100	150
	Collector	35 75	Type III Type II	100	150
	Arterial	35 100	Type III Type II	100	150

- On rural roads where asphalt surfacing is not required, the road shall be surfaced with a minimum of 65 mm of Granular Base Course material but granular base course must be 75mm minus material granular material.

- Crushed gravel used for surfacing shall be in accordance with the material specification for granular base material in Section 2.4.2 of this document.

- Where suitable native materials exist for subgrade construction, the sub-base material may be excluded upon recommendation of the geotechnical engineer.

Table 2.2.2 - General Design Guidelines

	Roadway Classification					
	Urban			Rural		
	Local	Collector	Arterial	Local	Collector	Arterial
Application / Typical Use						
Design Speed (km/h)						
Minimum	30	50	50	50	60	80
Maximum	50	70	100	80	80	100
Maximum Allowable Gradient						
Minimum Design Speed	10	10	10	10	10	7
Maximum Design Speed	10	6	6	7	7	6
Minimum Horizontal Curve Radius (m)						
Minimum Design Speed	30	115	75	120	120	230
Maximum Design Speed	115	290	440	230	230	390
Maximum Super-elevation (m/m)						
Minimum Design Speed	0.02	N/A	0.06	0.06	0.06	0.06
Maximum Design Speed	0.02	N/A	0.06	0.06	0.06	0.06
Vertical Crest Curve Minimum **k**						
Minimum Design Speed	3	7	7	7	15	35
Maximum Design Speed	7	22	85	35	35	75
Vertical Sag Curve Minimum **k**						
Minimum Design Speed	4	11	11	11	20	30
Maximum Design Speed	11	25	50	30	30	50
Minimum Decision Sight Distance (m)						
Minimum Design Speed	90	140	140	140	170	230
Maximum Design Speed	140	200	300	230	230	300
Minimum Pavement/Surface Width (m)	10.5	12.5	15	8	9	10
Minimum Lane Width (m)	3.3	3.5	3.7	3.5	3.5	4
Minimum Shoulder Width (m)	N/A	N/A	N/A	0.5	1.0	1.0
Ditch width (m)	N/A	N/A	N/A	1.0	1.0	1.0
Maximum Side slope Ratio (m)	N/A	N/A	N/A	3:1	3:1	3:1
Maximum Back slope Ratio (m)	N/A	N/A	N/A	2:1	2:1	3:1
Minimum Right of Way Width (m)	20	20	25	20	25	30
Minimum Cross fall (%)	2	2	2	2	2	2

1. Decision Sight Distance is based on driver's decision to stop and stopping distance required.
2. Horizontal Curve Radius is based on reverse crown (+0.02 m/m)
3. These guidelines mat not be appropriate in retrofit or reconstruction projects.
4. If side slopes of less than 3:1 are proposed guard rails may be required
5. Where side slopes are required, the Right-of –Way must be extended to include the side slope

2.3 Street Signs

- They shall apply to the Municipality for street name(s) approval.

- Street name signs are to be located in an approved location at each street intersection and shall have double nameplates lettered on each side and centre mounted on galvanized steel posts 3.5 m long and 50 mm in diameter. The nameplates shall be minimum 14-gauge steel, with blue enameled 100-mm high letters on a white background.

- In downtown areas sign posts are to follow the downtown streetlight standard, See detail drawings.

- Signs are to be mounted 1.0 m to 15 m from the roadway surface.

- All other traffic control signs shall be as per TAC standards and approved by the Municipality.

- All signs are the responsibility of the .

2.4 Materials

2.4.1 Subgrade

- Organic soils, tree stumps and other deleterious materials are not acceptable as subgrade materials.

2.4.2 Granular Sub-Base and Base Course for Asphaltic Concrete Pavement Surfaces

- Granular sub-base and base course shall be crushed stone or gravel consisting of hard, durable, angular particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

- The physical properties of the material shall be as follows:

Physical Property	Granular Sub-base	Granular Base
% Fracture, by weight (2 faces), maximum	N/A	60
Los Angeles Abrasion, maximum loss %	50	45
Liquid Limit, maximum %	25	25
Plasticity Index, maximum %	6	6
Lightweight particles, maximum %	5	5
California Bearing Ration (minimum), when compacted to 100% of ASTM D698	20	80
Crushed particles (1 face plus 5000 sieve fraction), minimum %	25	N/A

- Gradation to be within the following limits when tested to ASTM C-117 with sieve sizes to CAN/CGSBD 8-GP-2M rather than ASTM E11, and to have a smooth curve without sharp breaks when plotted on a semi-log grading chart.

Granular Sub-base

Sieve Size	% Passing by Weight
25 000	100
10 000	40 - 100
5 000	30 - 90
2 500	25 - 65
630	15 - 35
160	5 - 15
80	3 - 10

Granular base

Sieve Size	% Passing by Weight
25 000	100
16 000	73 - 94
10 000	56 - 80
5 000	40 - 66
1 250	24 - 45
315	13 - 27
160	9 - 19
80	4 - 10

2.4.3 Asphaltic Concrete Pavement

- Asphalt Cement shall have the following properties:

Requirements	Method	Values
Kinematics Viscosity at135°C, mm^2 /sec	D2170	200-300
Absolute Viscosity at 60°C, 300 mm, hg Vacuum, Pa.S	D2171	60-100
Penetration at 0°C, 200g, 60 sec; dmm	D5	30 min.
Flash Point (C level and Open Cup), C	D92	201 min.
Thin Film Oven Test Penetration after test at25°C, 100g, 5 sec.; % of Original	D5	50 min.
Ductility at 25°C and 5 cm/min.; cm	D113	100 min.
Solubility in Trichlorethylene, % by Mass	D2042	99.5 min.

- Aggregate Material for Asphaltic Concrete shall have the following properties:

Requirement	ASTM Test Method	Mix Type		
		I	II	III
Sand Equivalent (Mech. Method)	D2419	45 min	40 min	45 min
Magnesium Sulphate Soundness (% Loss) Coarse Aggregate: Fine Aggregate:	 C88 C88	 12 max 12 max	 18 max. 20 max	 12 max 12 max
Los Angeles Abrasion Gradation B % Loss	C131	32 max	35 max	32 max
Lightweight Particles % By Mass	C123	5 max.	3.0 max	1.5 max
Flat & Elongated Particles (length to thickness ratio greater than 5), %		15 max	15 max	15 max.
Crushed Particles (2 faces, plus 5 000 sieve fraction), %		70 min	60 min	70 min

- Aggregate for Asphaltic Concrete shall have the following gradation:

Sieve Size	Mix Type		
	I	II	III
25 000		100	
20 000		85 - 95	
16 000	100	77 - 88	100
12 500	85 - 95	65 - 80	90 - 100
10 000	70 - 85	57 - 72	75 - 90
5 000	50 - 65	40 -55	60 - 75
2 500	40 - 50	30 - 42	45 - 60
1 250	30 - 40	23 - 33	30 - 45
630	20 - 30	17 - 27	22 - 36
315	15 - 23	12 - 22	15 - 27
160	9 - 16	8 - 15	9 - 18
80	4 - 8	4 - 8	4 - 10

- Asphaltic Concrete mix shall have the following physical properties:

Property	Mix Type		
	I	II	III
Marshall Stability 60 C; kN	10.0 min.	10.0 min	5.4 min.
Marshall Flow@60 C; 0.25 mm Units	8 – 14	8 - 15	8 - 14
Voids in Mineral Aggregate, %	13.5 – 5.0	12.5 – 14.0	14.0 – 16.0
Air Voids in Mixture, %: Design Range: @ Design % AC	3 – 5 4.0 ± 0.2	3 – 6 4.5 ± 0.2	2 – 4 3.0 ± 0.2
Asphalt Film Thickness, um	6.5 - 8.0	6.5 – 8.0	7.0 min.

Notes: .1 Percent air voids in compacted trial mixes shall be determined in accordance with ASTM D3203, with asphalt cement absorbed into the aggregate compensated for in the calculation.

- Design of Mix shall be based on 75 blows on each face for Type 1 and II; on 50 blows on each face on Type III. Blows shall be by mechanical compactor.

2.4.4 Sidewalks/Curb & Gutter/Driveways

- Ready mix concrete shall be produced, mixed and delivered in accordance with the latest edition of CAN/CSAA23.1.
- Air content shall be 5.5-8 %.
- Concrete shall have a compressive strength of 32 Mpa at 28 days.
- Maximum aggregate size shall be 25 mm.
- Reinforcing bars, tie bars to CSA G30.12M, grade 300, billet steel, deforming bars, uncoated.
- Reinforcing mesh, cold drawn steel wire to CSA G30.3M, uncoated.

2.5 Construction

2.5.1 Subgrade

- Finished subgrade shall have a minimum cross fall of 3%.
- Prior to placing fill the exposed subgrade surface shall be scarified to a minimum depth of 0.3 m, re-laid and compacted in 0.15m lifts to 98% of Standard Proctor Density at optimum moisture content in accordance ASTM D698 (Method C or D).

2.5.2 Granular Sub-Base and Base Course for Asphaltic Concrete Pavement Surfaces

- Finished granular sub-base and base course shall have a minimum cross fall of 2%.
- Granular sub-base and base course shall be placed in lifts not exceeding 0.150 m and shall be compacted to 98% of Standard Proctor Density at optimum moisture content in accordance ASTM D698 (Method C or D).

2.5.3 Asphaltic Concrete Pavement

- Compaction on Type I and II Asphaltic concrete shall be a minimum of 97% based on 75 blow Marshall.
- Compaction on Type III Asphaltic concrete shall be a minimum of 98% based on 50 blow Marshall.
- The finished ACP surface shall have a cross fall of 2%.

2.5.4 Sidewalks/Curb & Gutter/Driveways

- Concrete shall be bedded on a minimum of 100 mm of granular base (material in accordance with the requirements of Section 2.4.2) compacted to a density of 98% of Standard Proctor Density.

2.6 Quality Control Testing

- All quality control testing will be the responsibility of the .

- The Municipality reserves the right to select a testing firm on its own to conduct visual inspections and testing, compile its own data during or after the construction period. This does not relieve the of their responsibility to conduct their own quality control testing program. Should the tests indicate failure the cost of the tests shall be borne by the and taken from the security held by the Municipality.

2.6.1 Sub-grade

- Density tests shall be taken separately and randomly on all lifts placed.
- Reports shall indicate the dates when fill was placed and testing was done, along with the horizontal and vertical location of tests.
- There shall be at least one soil density and moisture test for each 125 metres of road.
- Prior to placement of Granular Sub-Base and Base Course the subgrade shall be proof rolled under the supervision of the 's Engineer.
- Test shall be distributed across the road section with a minimum of 25% of the tests conducted at or near the road shoulder.

Test reports shall be certified by the 's engineer and submitted to the Municipality within 5 days of completing the subgrade completion.

2.6.2 Granular Sub-Base and Base Course

- Density tests and moisture tests shall be taken on all lifts placed; locations shall be randomly selected.
- Reports shall indicate the dates when fill was placed and testing was done, along with the horizontal and vertical location of tests.
- There shall be at least one soil density and moisture test for each 75 metres of road.
- One complete aggregate gradation analysis report for every 1000 tonnes of each material required or one complete analysis for each production day when the production rate is less than 1000 tonnes. Include percentage of crushed coarse aggregate particles in granular base reports.
- Certification that the physical properties of the aggregates meet the requirements of Section 1.4.2 of this document.

Aggregate gradation analysis and physical properties analysis shall be certified by the 's engineer and submitted to the Municipality 1 week prior to commencing work.

Density and moisture tests shall be submitted to the Municipality 1 week prior to asphalt concrete pavement construction.

2.6.3 Asphaltic Concrete Pavement

- A minimum of 3 cores shall be taken from the finished road surface; locations shall be randomly selected.
- A minimum of 1 core per 250 tonnes placed.
- The average density value determined by the coring procedure shall be used to determine acceptance.
- One complete aggregate gradation analysis report for every 1000 tonnes of each material required or one complete analysis for each production day when the production rate is less than 1000 tonnes. Include percentage of crushed coarse aggregate particles in granular base reports.
- Certification that the physical properties of the aggregates meet the requirements of Section 1.4.3 of this document.
- Upon request submit manufacturer's test data and certification the asphalt cement meet the requirements of Section 1.4.3 of this document.

Asphalt cement properties, aggregate gradation analysis and physical properties analysis shall be certified by the 's engineer and submitted to the Municipality 1 week prior to commencing work.

3.0 SANITARY SEWAGE DISPOSAL

3.1 General

These guidelines are supplemented by:

- Alberta Environmental Protection Standards and Guidelines for Municipal Water Works, Wastewater and Storm Drainage Facilities.
- Environmental Reference Manual for Review of Subdivisions in Alberta, Alberta Environmental Protection.
- Plumbing and Drainage Act of Alberta.
- Alberta Private Sewage Treatment and Disposal Regulations, Alberta labour latest revision.

3.2 Collection System Design Guidelines

Design of sanitary sewage collection systems for disposal to a sewage treatment plant, lagoons, and communal septic fields shall be in accordance with "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems", Alberta Environmental Protection.

3.2.1 Sewer Mains

- Sanitary sewers shall be located in accordance with the Standard Drawings.
- The minimum size of sanitary sewers shall be 200 mm.
- The minimum allowable pipe gradient shall produce a velocity no less than 0.75 m/s when under peak flow.
- The maximum allowable pipe gradient shall produce a velocity no more than 5.5 m/s when under peak flow.
- In curved sewers the minimum slope shall be increased by 50%.
- Gravity pipe sizes shall be determined using the Manning's equation.
- The roughness coefficient used in the Mannings equation shall be 0.013.
- The minimum depth of cover to top of pipe is 2.5 m.
- Where the minimum depth of cover is less than 2.5 the sewer main shall be insulated.
- Trenchless watercourse, rail and highway crossings are to consist of an oversized steel encasement pipe with Polyethylene carrier pipe.

3.2.2 Manholes

- Manholes shall be located at all changes in direction or gradient.
- The maximum allowable distance between manholes is 120 metres for 375 mm diameter sewers and smaller; and 150 m for 450 mm to 750 mm diameter sewers, on straight sections.
- Manholes shall be located at the ends of curved sections and at intervals not more than 90 metres along a curve.
- The minimum size manhole allowed is 1200 mm.
- When larger pipes exit manholes than those entering the elevation of the obverts of the pipes shall match.
- In all cases a manhole shall be required at the upper end of a sewer main.
- Drop manholes are required where a difference in elevation between the incoming pipe invert and the exiting pipe invert exceeds 600 mm.
- A minimum of 2 adjusting rings are permitted per manhole. The maximum thickness of adjusting rings allowed is 400 mm.
- Manholes to be complete with ladder rungs 400 mm on center vertically with no more than 600mm to the first rung from the rim.
- Manholes with pipe greater than 450 mm in diameter shall have the ladder rungs at 90° to direction of flow.
- Manholes are to be placed at either side of a trenchless watercourse, rail or highway crossing installation
- All joints in manholes are to be watertight with flexible butyl resin sealant or approved equal.

3.2.3 Service Connections

- Private Service Connections shall have a minimum diameter of 100 mm.
- Private Service Connections less than one half the diameter of the sewer main may be tapped directly into the main without a manhole by means of PVC Saddle.
- Minimum gradient of a service connection shall be 2%.
- Minimum depth of cover at property line shall be 2.2 metres below finished grade.
- Install sewer cleanout where horizontal deflection is greater than 45°.
- Refer to the Alberta Plumbing Code for Requirements on Private Property.

3.2.4 Sanitary Sewage Flows

- Average daily per capita sewage flows of 365 litres per day shall be used to determine sewer requirements in residential areas.
- Residential population densities shall be determined as noted below:

Dwelling Type	Population Density (people/dwelling)
Single Family	4
Duplex	8
Multi-Family	
Bachelor	1.5
One Bedroom	2.5
Two Bedroom	3.5

- Average daily sewage flows noted below shall be used for non-residential land uses.

Land Use	Average Daily Flow (m3/day/hectare)
Heavy Industrial	50
Medium Industrial	30
Light Industrial	19
Commercial	40
Recreational	55

- Peak sewage flows should be based on the Harmon Equation.

$$M = 1 + \frac{14}{4 + P^{0.5}}$$

Where M= peaking factor

P = population in thousands (i.e. 30,000 people = 30)

- Infiltration allowance must be provided for in the sewage collection system. A general allowance of 0.028 L/s/ha (24.2 m3/day/ha) shall be applied.

3.3 Materials

3.3.1 Sewer Mains

Reinforced Concrete

- All pipe, pipe joints, pipe fittings shall meet the latest revision of ASTM C76M and CAN/CSA-A257.

- All joints to have flexible rubber gaskets meeting the latest revision of ASTM C443M and CAN/CSA-A257.3.

- All concrete products shall be manufactured from Type 50 Sulphate Resistant Portland Cement meeting the latest revision of CAN/CSA-A5.

"Smooth Wall" Polyvinyl Chloride

- All pipe and fittings must be DR35 and meet the latest revision of ASTM F679, ASTM 2412, ASTM3034 and CAN/CSA B182.2.
- All joints shall be integral locked in gasket bell and spigot system. Gaskets shall meet the requirements of the latest revision of ASTM F477 and CAN/CSA B182.2.
- Pipe Bedding to be as per pipe manufacturer specifications.

3.3.2 Manholes

- All cement for Cast in Place or Precast concrete to be Type 50 Sulphate Resistant, Portland Cement, CSA certified as meeting CAN/CSA-A5.
- All concrete for Cast in Place or Precast manholes shall meet CAN/CSA-A23.1.
- Concrete shall produce a minimum compressive strength of 20 MPa at 28 days.
- All mortar to use aggregate meeting the latest revision of CSA A82.56 and cement meeting CSA-A8, Type 50.
- Adjusting rings shall meet the latest revision of ASTM C478.
- Metal castings to be Grey Iron to latest revision of ASTM A48, minimum strength class 30B.
- Manhole frames and covers shall weigh a minim of 160 kg per set and be heavy-duty municipal type for road service. The cover shall be cast without perforations and be complete with two 25 mm square lifting holes.

- Ladder rungs to be drop step type meeting the latest revision of ASTM C478M and shall be manufactured of aluminum (20 mm outside diameter with slip resistant pattern) or coated aluminum (20 mm outside diameter tubing coated with 3mm thick low density polyethylene coating complete with integral slip resistant pattern).

3.3.3 Service Connections

- All pipe and fittings 100 mm and 150 mm in diameter must be DR28 and meet the latest revision of ASTM F679, ASTM 2412, ASTM3034 and CAN/CSA B182.2.
- For Service connections larger than 150 mm diameter pipe shall be in accordance with Section 2.3.1, "Smooth Wall" polyvinyl Chloride, above.
- All joints shall be integral locked in gasket bell and spigot system. Gaskets shall meet the requirements of the latest revision of ASTM F477 and CAN/CSA B182.2.
- Service connections will only be accepted when tapped at an angle between he 10:00 and 2:00 range.

3.4 Construction

3.4.1 Sewer Mains

- Sewer mains shall be installed in accordance with Standard Drawings.

3.4.2 Manholes

- Manholes shall be bedded on a minimum of 150 mm granular bedding compacted to 95% Standard Proctor Density.
- All manholes shall be benched to provide a smooth U-shaped channel. Side height of channel to be 0.75 times the full diameter of the sewer. Slope adjacent floor at 1 in 10. For pipes smaller than 300 mm use standard fitting, braking out upper half of fitting upon completion of manhole.
- Manholes shall be left 5mm below finished grade.

3.4.3 Service Connections

- All service connections shall be bedded in sand compacted to a minimum 95% Standard Proctor Density.
- Service connections to the sewer main shall be by approved PVC saddles.
- Do not extend service connection into interior of sewer main.

3.5 Quality Control

3.5.1 Sewer Mains

- All sewer mains, manholes and lot service lines are required to pass an exfiltration test. The test shall be performed for a period of 2 hours under a hydrostatic head of 1000 mm, above the crown of the lowest pipe or the maximum elevation of groundwater, whichever is greater. The maximum allowable leakage shall be 0.175 L per hour per mm of diameter per 100 metres of pipe.
- All sewers shall be inspected by CCTV after backfilling of the trench to top of Subgrade.
- The 's engineer shall submit certification of successful exfiltration testing along with a copy of the sewer video/report to the Public Works Superintendent.

3.6 Onsite Sewage Disposal Design Guidelines

If a proposed subdivision is not be served by a municipal wastewater system the Municipality requires the Proponent to provide an assessment of characteristics of the land that is to be subdivided, including susceptibility to slumping or subsidence, depth to water table and soil suitability for onsite sewage disposal.

All assessments shall be conducted in accordance with the "Environmental Reference Manual for Review of Subdivisions in Alberta" as published by Alberta Environmental Protection.

The design of individual septic field disposal systems shall be completed in accordance with "Alberta Private Sewage Treatment and Disposal Regulations", Alberta Labour, latest revision.

4.0 STORM WATER MANAGEMENT

4.1 General

This section includes storm drainage engineering design criteria. The dual drainage system concept (minor and major systems) should be followed in developments with an urban street cross-section.

- The minor system (underground pipes, roof leaders, gutters, lot drainage, curb and gutter) provides a basic level of service by conveying flows during minor storm events (1:5 year).

- The major system (lot drainage, roads and gutters, storage facilities) convey runoff from the rainfall events in excess of the minor system capacity.

For developments with rural road cross-section both the minor and major drainage systems consist of ditches, swales, culverts and storage facilities.

These guidelines are supplemented by:

- Alberta Environmental Protection Standards and Guidelines for Municipal Water Works, Wastewater and Storm Drainage Facilities.
- Stormwater Management Guidelines for the Province of Alberta, Alberta Environmental Protection.
- Environmental Reference Manual for Review of Subdivisions in Alberta, Alberta Environmental Protection

The Municipality reserves the right to require the Proponent of a development to submit a storm water management study that:

- Identifies the impact of the proposed development on the watershed
- Demonstrates how runoff from land above the proposed development will be conveyed through the development.
- Demonstrates how runoff from development and lands above the development will be conveyed to the receiving body.
- Identifies measures proposed which will ensure that existing downstream drainage systems and receiving bodies will be capable of conveying and receiving post development runoff.
- Provides details of storm water detention facilities.
- Provides details of water quality enhancement facilities.

4.2 Minor System Design Guidelines

Storm Sewers shall be designed as a separate system from the sanitary sewer system. No cross connections shall be permitted.

4.2.1 Storm Sewer Mains

- The minimum size storm sewer shall be 300 mm
- The minimum grade for storm sewers shall produce a minimum velocity of 0.6 m/s under full flow conditions
- The minimum depth of cover to top of pipe shall be 1.6m.
- In curved sewers the grade shall be increased by 50%
- Gravity pipe sizes shall be determined by using the Manning Equation
- A roughness coefficient of 0.013 shall be used.
- The storm sewer system shall be designed for sufficient capacity to handle runoff from the 1 to 5 storm event

4.2.2 Manholes & Catchbasins

Manholes

- Manholes shall be located at all changes in direction or gradient.
- The maximum allowable distance between manholes is 120 metres on straight sections.
- Manholes shall be located at the ends of curved sections and at intervals not more than 90 metres along a curve.
- The minimum size manhole allowed is 1200 mm.
- When larger pipes exit manholes than those entering the elevation of the obverts of the pipes shall match.
- In all cases a manhole shall be required at the upper end of a sewer main.
-
- A minimum of 2 adjusting rings are permitted per manhole. The maximum thickness of adjusting rings allowed is 400 mm.
- Manholes to be complete with ladder rungs 400 mm on center vertically with no more than 600mm to the first rung from the rim.
- Manholes with pipe greater than 450 mm in diameter shall have the ladder rungs at 90° to direction of flow.
- All joints in manholes are to be watertight with flexible butyl resin sealant or approved equal.

Catch basins

- Catch basin leads shall have a minimum size of 250 mm.
- The maximum length of a catch basin lead shall be 30 metres.
- The minimum grade on a catch basin lead shall be 1%.
- All leads shall be connected to a main line manhole or a catch basin manhole .
- Catch basins shall not be spaced farther than 120 m.
- Maximum length of surface drainage before interception by the sewer system is 150 m.
- All catchbasins shall have a 600 mm sump.

4.2.3 Open Ditches

- The minimum allowable ditch grade is 0.3%.
- Ditches shall be in accordance with Table 2.2.2 of Section 2.2.6.

4.2.4 Storm Water Flows

- The Rational Method shall be used in the design of the minor storm sewer system for drainage areas less than 50 ha.
- The Municipality reserves the right to request that computer modeling is carried out to provide the appropriate analysis.
- The maximum inlet time (time of concentration) at the upper end of the system is 10 minutes.

4.3 Materials

4.3.1 Storm Sewer Mains

Reinforced Concrete

- All pipe, pipe joints, pipe fittings shall meet the latest revision of ASTM C76M and CAN/CSA-A257.

- All joints to have flexible rubber gaskets meeting the latest revision of ASTM C443M and CAN/CSA-A257.3.

- All concrete products shall be manufactured from Type 50 Sulphate Resistant Portland Cement meeting the latest revision of CAN/CSA-A5.

Smooth Wall" Polyvinyl Chloride

- All pipe and fittings must be DR35 and meet the latest revision of ASTM F679, ASTM 2412, ASTM3034 and CAN/CSA B182.2

- All joints shall be integral locked in gasket bell and spigot system. Gaskets shall meet the requirements of the latest revision of ASTM F477 and CAN/CSA B182.2.

"Profile Wall" Polyvinyl Chloride

- For pipe sizing 200 mm to 600 mm all pipe and fittings must be DR35 and meet the latest revision of ASTM F794 and CAN/CSA B182.4.

- All joints shall be integral locked in gasket bell and spigot system. Gaskets shall meet the requirements of the latest revision of ASTM F477 and CAN/CSA B182.2.

4.3.2 Manholes

- All cement for Cast in Place or Precast concrete to be Type 50 Sulphate Resistant, Portland Cement, CSA certified as meeting CAN/CSA-A5.
- All concrete for Cast in Place or Precast manholes shall meet CAN/CSA-A23.1.
- Concrete shall produce a minimum compressive strength of 20 MPa at 28 days.
- All mortar to use aggregate meeting the latest revision of CSA A82.56 and cement meeting CSA-A8, Type 50.
- Adjusting rings shall meet the latest revision of ASTM C478.
- Metal castings to be Grey Iron to latest revision of ASTM A48, minimum strength class 30B.
- Manhole frames and covers shall weigh a minimum of 160 kg per set and be heavy-duty municipal type for road service. The cover shall be cast without perforations and be complete with two 25 mm square lifting holes.
- Ladder rungs to be drop step type meeting the latest revision of ASTM C478M and shall be manufactured of aluminum (20 mm outside diameter with slip resistant pattern) or coated aluminum (20 mm outside diameter tubing coated with 3mm thick low density polyethylene coating complete with integral slip resistant pattern)

4.4 Construction

4.4.1 Sewer Mains

- Sewer mains shall be installed in accordance with Standard Drawings according to pipe manufacturer bedding requirements.

4.4.2 Manholes

- Manholes shall be bedded on a minimum of 150 mm granular bedding compacted to 98% Standard Proctor Density.
- All manholes shall be benched to provide a smooth U-shaped channel. Side height of channel to be 0.75 times the full diameter of the sewer. Slope adjacent floor at 1 in 10. For pipes smaller than 300 mm use standard fitting, braking out upper half of fitting upon completion of manhole.
- Structure backfill shall be compacted to 98% Standard Proctor Density.
- Manholes shall be left 5mm below finished grade.

4.5 Quality Control

4.5.1 Storm Sewer Mains

- All sewer mains, manholes and lot service lines are required to pass an exfiltration test. The test shall be performed for a period of 2 hours under a hydrostatic head of 1000 mm, above the crown of the lowest pipe or the maximum elevation of groundwater, whichever is greater. The maximum allowable leakage shall be 0.175 L per hour per mm of diameter per 100 metres of pipe.
- All sewers shall be inspected by CCTV after backfilling of the trench to top of Subgrade.
- The 's engineer shall submit certification of successful exfiltration testing along with a copy of the sewer video/report to the Public Works Superintendent.

5.0 WATER SUPPLY SYSTEMS

5.1 General

These guidelines are supplemented by:

- Alberta Environmental Protection Standards and Guidelines for Municipal Water Works, Wastewater and Storm Drainage Facilities.
- Environmental Reference Manual for Review of Subdivisions in Alberta, Alberta Environmental Protection.
- Plumbing and Drainage Act of Alberta.
- "Water Supply for Public fire Protection, A Guide to Recommended Practice", Fire Underwriter Survey.

5.2 Communal Systems

Communal systems are generally those systems where more than 15 service connections are served by the same water supply and a common distribution system. Reference should be made to Alberta Regulation 122/93, Potable Water Regulation for a complete definition and requirements.

Communal systems are required to meet the following standards and those set by Alberta Environmental Protection.

Communal water systems can be owned/operated by:

- The Municipality
- A Registered Water Co-op
- A Water Utility

The Municipality reserves the right to refuse to accept ownership of any communal system.

5.2.1 Design Guidelines

5.2.1.1 *Water Supply*

- The water system shall have adequate capacity to supply the peak hourly demand or the maximum day demand plus fire flows, which ever is greater
- Fire flow requirements shall be in accordance with those recommended by the Fire Underwriters Survey.
- Where the water supply source does not have adequate capacity to meet the peak demands and fire flow requirements, storage is required for peak demands and fire flows.
- The system shall be designed for operation pressures between 350 kPa and 550 kPa under average day flow conditions. Pressure between 550kPa and 670kPa will only be allowed when individual PRV's are required on all services.
- The minimum system pressure under any flow condition is 140 kPa

5.2.1.2 *Water Distribution System*

Mains

- The minimum size water main shall be 150 mm.
- Shall be installed to a minimum depth of 2.5 m to top of pipe.
- Where the minimum depth cannot be achieved the water main shall be insulated.
- Dead end water mains shall be avoided.
- Where Dead ends are unavoidable a 50 mm blow off or fire hydrant shall be installed to allow flushing of the mains.
- No more than 30 single family residences may be serviced by a dead end water main.
- There shall be a minimum clearance of 150 mm between the outside diameters of a water main crossing over a sanitary sewer main.
- Thrust blocks are required for all bends, tees, plugs and wyes.

Valves/ Hydrants/Fittings

- Valves shall be the same size as the main.
- Valves shall be located on the projection of the property lines.
- Valves shall be spaced such that no more than three valves are required to shut down the system. Such a system may not contain more than 30 single family residences and no more than one fire hydrant is taken out of service.
- Valves are required at both ends of a utility right of way or easement.

- Valves are required at both ends of a major utility crossing (i.e. highway or railway crossing).
- Valves are required at either end of an steel encasement pipe used for trenchless crossings.
- Hydrants shall be a minimum 150 mm diameter.
- Valves and valve boxes are required on all hydrant leads.
- Hydrants shall be located on lot lines and curb return ends.
- Spacing of hydrants shall be as per the Fire Underwriters Survey.
- All metallic fittings, valves and hydrants shall be cathodically protected.

Pressure Reducing / Air Release Valve Stations

- Water system valve vaults are to be approved on a site specific basis.
- The Municipality shall approve installations to meet the Engineering requirements of the water distribution system.

Pump / Booster Stations

- Water pump stations and booster stations are to be approved on a site specific basis.
- The Municipality shall approve installations to meet the Engineering requirements of the water distribution system.

Valves shall be the same size as the main.

5.2.1.3 ***Service Connections***

- The minimum service size shall be 20 mm.
- Each lot requires its own service connection to the distribution main.
- All water services shall be installed to provide a minimum depth of 2.2 m to top of pipe at property line.
- Water services may be laid in the same trench as the sanitary service with a 0.3 m separation.
- Water service connections shall be spaced a minimum of 1.0 metre apart along the distribution main.
- The curb stop shall be 300mm outside property.

5.2.2 Materials

5.2.2.1 *Water Distribution System*

Mains

- For pipe sizes 100 mm to 300 mm in diameter, all pipe and joints shall be to the latest revision AWWA C900 and CSA 3-B137.3.
- For pipe sizes 350 mm to 900 mm in diameter, all pipe and joints shall be to the latest revision AWWA C905 and CSA 3-B137.3.
- All PVC pipe to be cast iron outside diameter, bell end complete with 1 MPa elastrometric gasket push on joint.
- Polyethylene Pipe for trenchless installations to conform to AWWA C906-99 Standard and shall be PE 3408 according to ASTM D3350 with a dimension ratio (DR) of 11. The outside diameter shall conform to ductile iron or steel pipe standard dimensions.

Resilient Seat Gate Valves

- Valves sized 150 mm to 300 mm diameter shall be resilient wedge gate valves conforming to latest revision AWWA C509, complete with fully rubber encapsulated solid wedge, non rising stem, suitable for direct bury.
- Valves to open left (counter clockwise).
- Valve body to be constructed of cast iron, in accordance with ASTM A126, Class "B". All nuts, bolts and washers to be stainless steel.
- Interior and exterior of valve to be epoxy coated, as per latest revision AWWA C550
- Bronze valve stem to be operated by a 50 x 50 mm square operating nut. The valve stem (stuffing box) shall contain double "O" ring seal0
- Valve ends to be push on "Tyton Joint" conforming to latest revision AWWA C1110
- Approved products: Crane McAvity Resilient Seat0
- An Alignment disc is required on all valves to align the stem.
- A Cover under the lid is require to retain road sand

Tapping Gate Valves.

- 100mm diameter valves are not permitted.
- Valves sized 150 to 300mm diameter shall be resilient seat gate valves conforming to latest revision AWWA C509 c/w solid wedge resilient seated disc, non-rising stem, and suitable for direct bury.
- Valves to open counter clockwise. (Turn left to open).

- Valve body to be constructed of cast iron, in accordance with ASTM A126, Class "B". All nuts, bolts, and washers to be stainless steel. Exterior of valve to be bituminous coated at factory.
- Interior of valve and wedge disc to be epoxy coated, as per latest revision AWWA C550.
- Bronze valve stem to be operated by a 50 x 50 mm square operating nut. The valve stem (stuffing box) shall contain a double "O" ring seal.
- Valve ends to be push-on "Tyton Joint" by flange, or mechanical joint by flange. Push-on and mechanical joints shall conform to latest revision of AWWA C111-85 / ANSI A21.11-85. Flanged valve ends shall meet the requirements of ANSI B16.1, Class 125. Bolts, nuts, washers to be stainless steel.
- Approved Products: Crane McAvity 20695-R: flange x mechanical joint for sizes 150 to 300 mm diameter.

Cast Iron Valve Boxes

- To be completely bituminous coated sliding type, adjustable over a minimum of 450 mm. Bottom casing to be large round type with minimum inside diameter of 240 mm. All castings shall clearly have the manufacturer's identification cast on them.
- Valve operating extension spindle to be 25 x 25 mm square. Spindle length shall be such that the operating nut will not be more than 300 mm below the cover when set on the valve operating nut.
- Bottom of spindle to fit 50 x 50 mm square valve operating nut and shall be riveted to spindle.
- Top of spindle shall have removable 50 x 50 mm square operating nut c/w stone catcher flange.
- Top casing to fit over 133 mm (5.25") inside diameter bottom casing.
- Lid to be marked "WATER".
- Approved Products: Norwood "Type C", Tyton Foundry Valve Casing as supplied by Trojan Industries.

Hydrants

- Hydrants to be dry barrel, compression type conforming to latest revision AWWA C502.
- Hydrants to close with pressure.
- Hydrant Valve opening to be 133 mm.
- Valve seat and valve body to be of bronze construction.
- Pumper and hose nozzles shall be located a minimum of 460 mm above the ground flange.

- Hydrants shall be equipped with one pumper nozzle (150 mm nominal diameter) and two hose nozzles (65 mm nominal diameter).
- Hose nozzles shall be at 90° to pumper nozzle.
- Nozzle threads to conform to the Alberta Mutual Aid Standard.
- Hydrants shall open counter clockwise.
- Operating nut shall be shall be five sided (22 mm on a side).
- Hydrant inlet to be 150 mm diameter push on "Tyton Joint" complete with elastrometric gasket conforming to latest revision of AWWA C111 /ANSI A21.11.
- Hydrants to be red in colour.
- Hydrants to be constructed with Break-a-way Flange complete with safety spindle. Coupling is to be located at ground level.
- All nuts, bolts and washers to be stainless steel.
- Approved products: McAvity M-67, Clow.

PVC Fittings

- PVC fittings are acceptable for main sizes 300 mm and smaller, PVC fittings to the latest revision AWWA C907 and CSA 3-B137.2. Bell ends complete with 1 MPa elastrometric gasket push on joint.

Cast Iron Fittings

- Cast Iron fittings are acceptable for main sizes greater than 300 mm, Cast iron fittings to the latest revision AWWA C110, ANSI A21.10. Fittings to be epoxy coated at factory in accordance with the latest revision of AWWA C213.

Stainless Steel Couplings

- Designed for joining plain end pipes of equal outside diameter. To be flexible, all-stainless steel construction. All welded stainless steel to be "passivated" after welding to eliminate sensitizing of the stainless steel.
- Shell, Sidebars, Nuts, and Bolts to be Type 304 fully passivated stainless steel. Gasket to be continuous ringed S.B.R. rubber conforming to latest revision AWWA C-111 / ANSI A21.11-85.
- Approved Products: Robar 1606 Stainless Steel Couplings.

5.2.2.2 *Service Connections*

Pipe

- For services 20 mm to 50 mm diameter, copper tubing conforming to latest revision ASTM B88M-85, type K, annealed. (As described in AWWA C-800-84 - Appendix - Collected Standards for Service Line Materials). Approved alternate service tubing material series 200 PE municipal tubing manufactured to CSA B137.1 described in AWWA C901-02.
- For service connection sizes 100 mm to 300 mm diameter, pipe to be Polyvinyl Chloride (PVC) Pressure Pipe as specified in Section 2.1, Pipe.
- Fittings for service connection sizes 100 mm to 300 mm diameter to be as specified in Section 2.2, Pipe Joints and Fittings.
- Valves and Valve Boxes for service connection sizes 100 mm to 300 mm diameter to be as specified in Section 4.2.2.1.

Copper Tubing Couplings

- Compression type suitable for 1 MPa working pressure. Couplings shall be supplied **without** internal pipe stop.
- Approved Products: Ford "Pack Joint" couplings, Ford "Grip Joint" couplings.

Corporation (Main) Stops

- Corporation stops to be brass plug or Teflon coated brass ball valve construction, body to be red brass to latest revision ASTM B62-85, compression type outlet fitting, inlet having AWWA thread conforming to latest revision AWWA C800-84. Valves to be full port.
- Approved Products: Ford F1000 c/w "Pack Joint" outlet for sizes 20 mm diameter, Ford FB1000 "Ballcorp" c/w "Pack Joint" outlet for sizes 25, 32, and 40 mm diameter.

Curb Stops

- Curb Stops to be Teflon coated brass ball valve construction, body to be red brass to latest revision ASTM B62-85, compression type inlet and outlet fittings, without drain. Valves to be full port.
- Approved Products: Ford B44 c/w "Pack Joint" outlet for sizes 20, 25, 38, and 50 mm diameter.

Curb Stands (Service Boxes)

- Cap to be cast-iron, ribbed, marked "WATER" c/w 32mm pentagonal head brass plug.
- Curb stand sliders shall be 31.75 mm (1 1/4") O.D., standard Schedule 40, wrought iron pipe conforming to latest revision AWWA C800-84. Distance from top of cap to bottom of slider to be 610 mm minimum, 1000 mm maximum.
- Casing shall be 25 mm O.D. (1"), standard Schedule 40, wrought iron pipe conforming to latest revision AWWA C800-84.
- The exterior of the cap, slider, and casing to be bituminous coated.
- Bottom box to be 127 mm (5") I.D., cast or ductile iron. The exterior and interior of the bottom box shall be bituminous coated.
- The operating rod shall be 12.70 mm (1/2") minimum, 15.875 mm (5/8") maximum, supplied as a single unit comprised of a solid AISI Type 304 stainless steel pinned to a manganese bronze clevis with a brass rivet.
- The operating rod shall be manufactured with a "W" centering bend (standard pigtail).
- The operating rod shall be minimum 30mm and maximum 60mm below grade.
- The manufacturers name shall be embossed onto the clevis, and cast into the bottom boot to the satisfaction of the Engineer.
- The manufacturer shall supply and insert the brass cotter pin into the clevis and apply sufficient bending to prevent the cotter pin from falling out of the clevis during shipping and storage of the rod.
- Approved Products: Western Water and Sewer,Trojan

Service Saddles

- Service saddles to be of two component design with fastening devices on each side of outlet. For 100 mm diameter pipe a single 50 mm wide stainless steel strap is required. For pipe larger than 100 mm, a double stainless steel strap is required. Ends of straps shall have stainless steel 12.70 mm (1/2") NC threads, regular hex nuts, and washers lubricated to prevent galling (c/w thread protectors).
- Body to be heavy cast stainless steel or bronze, tapped with AWWA taper thread conforming to latest revision AWWA C800-84. Neoprene gasket to be cemented to body.
- All welded stainless steel to be "passivated" after welding to eliminate sensitizing of the stainless steel.
- Approved Products: Robar 2706

5.2.3 Construction

5.2.3.1 *Water Distribution System*

- Water mains shall be installed in accordance with Standard Drawings and according to pipe manufacturer bedding requirements.
- All water mains shall be disinfected in accordance with the latest edition of AWWA C651 prior to being placed into service.
- Valve Boxes to be left 5mm below finished grade.

5.2.3.2 *Service Connections*

- Hydrostatic testing is to be completed after service connections are complete.
- All water main taps will be done under full operating pressure in the mains.

5.2.4 Quality Control

5.2.4.1 *Water Distribution Systems*

- Density and moisture tests shall be taken on all trench backfill; locations shall be randomly selected.
- Reports shall indicate the dates when fill was placed and testing was done along with the horizontal and vertical location of tests.
- There shall be at least one soil density and moisture test for each 100 metres of trench.
- All new water mains shall be hydrostatically tested for leakage in accordance with the latest edition of AWWA C600. Hydrostatic testing shall be completed after service installation. The developer's engineer shall certify that the hydrostatic testing was successfully completed.
- Copies of bacteriological and chlorine testing results shall be provided to the Municipality along with certification from the developer's engineer that disinfection was properly done.

5.3 Individual Systems

For the purposes of these guidelines and standards an individual system is considered a system that has less than 15 service connections and less than 3 km of water distribution system.

Individual systems not constructed to the standards in Section 5.2 above will not be considered for operation by the Municipality.

Reference should be made to Alberta Regulation 122/93, Potable Water Regulation for a complete definition and requirements.

5.3.1 Water Supply

Where groundwater is the proposed supply source the developer shall have a groundwater supply evaluation report prepared by hydrogeologist or professional engineer competent in the groundwater field.

The groundwater supply evaluation shall be undertaken in accordance with the "Interim Guidelines for the Evaluation of Groundwater Supply for Unserviced Residential Subdivision Using Privately Owned domestic Water Wells".

Aquifer Testing shall be undertaken in accordance with Appendix B of the "Interim Guidelines for the Evaluation of Groundwater Supply for Unserviced Residential Subdivision Using Privately Owned domestic Water Wells".

Wells which serve 3 or more lots are required to be licensed by Alberta Environmental Protection

6.0 STREET LIGHTING

6.1 General

All urban subdivisions shall be provided with street lights. Rural subdivisions may or may not require street lighting.

Street lighting shall be arranged by the developer to a standard of lighting comparable to existing standards within the Municipality.

The developer's engineer shall review lighting requirements with the Municipality prior to final design.

6.2 Design

Street lights shall be located in accordance with the Standard specifications.

The posts shall be spaced with a spacing of 40 to 55 metres (130 to 180 feet) with posts located opposite the lot lines perpendicular to the street. The first light poles should be installed a maximum of 10 metres (33 feet) from the curb of the intersecting streets.

All lighting systems shall meet the requirements of the Transportation Association of Canada and Fortis.

6.3 Installation

Installation may be mounted or direct burial type. The developer may be required to provide details, specifications of the proposed lighting system and materials including engineer's shop drawings of concrete bases and/or pole embedment. Where direct buried poles are approved for use, the Municipality may require concrete embedment or other means satisfactory to the Municipality to ensure that poles are securely installed. Underground wiring for street lighting shall be used. Standards may vary based on the nature of the development and class of road.

Proposed lighting layout, specifications, and details are subject to approval of the Municipality. For developments abutting collector or arterial roads, special lighting requirements and/or a photometric report may be required.

- Foundation drains cannot be connected to the sanitary sewer system.
- Downspouts shall not be connected to the building foundation drain system or the sanitary sewer by any means.
- Sump pumps and downspouts must discharge to a splash pad or an impervious surface that is graded to convey the discharge a minimum of 2 m horizontally away from the building and adjacent properties.
- Driveways shall be graded at 2% down towards the street on urban cross-sections for the first 2.0 m behind the curb towards the property.
- Driveways shall be graded at 2% down away from the edge of the driving surface for the first 5 metres from the edge of the driving surface on rural cross-sections.
- The maximum allowable driveway grade is 12%.
- Houses shall be landscaped such that the first 4 metres surrounding the foundation drains away from the foundation at a 2% slope.

8.0 SUBMISSION OF PLANS, REPORTS AND STUDIES

8.1 Submission Procedure

All submissions of plans, specifications, documents, reports, studies, design criteria proposals, etc. shall be made to the Public Works Superintendent of the Municipality in sufficient quantities as may be required for distribution by the Public Works Superintendent to such persons as the Building Official, Municipality's Planner, Municipality's Consulting Engineer, etc.

8.2 General Plan Requirement

Unless otherwise approved by the Municipality, all drawings shall be done on polyester film and shall be standard A-1 metric drawing size (594 mm x 841 mm). All drawings are to be signed and sealed by a professional engineer. General plan layout shall be in accordance with standard engineering practice. All elevations on grading plans, site plans, servicing plans, and profiles, etc. shall relate to Geodetic Survey of Canada Datum.

8.3 Drawings to be Submitted

In general, the following drawings are required for subdivision developments. Some of the following may also be required for individual site plan control developments.

- A key plan, to a scale of not less than 1:10,000 showing the general location of the development to be serviced.

- One or more general servicing plans, to a scale of not less than 1:2,000 showing all services to be constructed, including storm sewers, sanitary sewers, the water distribution system, roads, street lighting systems.

- A lot grading plan, to a scale of 1:500 and including sufficient areas of adjacent land where applicable to illustrate total drainage patterns.

- Plan and profile drawings for each street to be constructed, reconstructed, widened, etc. and for each service easement to a scale of 1:500 horizontally and 1:50 vertically.

- A storm drainage area plan to a scale of not less than 1:2,000 and including all interior and exterior tributary areas which contribute to storm sewer and/or storm water management design. Storm sewer design charts shall be included on the storm drainage plan.

- A sanitary drainage area plan, to a scale of not less than 1:2,000 and including all interior and exterior tributary areas. Sanitary sewer design charts shall be included on the sanitary drainage plan.

- Such other drawings showing notes, details, typical sections, etc. as may be necessary for the proper construction of the works, such as:

  - typical road cross-section
  - typical lot grading section
  - typical channel or swale details
  - geotechnical report information
  - legend
  - storm sewer outfall structures/erosion protection
  - materials
  - trench details

One or more of the above drawings which are to become part of the construction drawing package, shall include sufficient legal survey monumentation, dimensions, etc. to enable the contractor and/or engineer to locate and / or layout the road right-of-way, easements, and / or lot corners, as may be required.

Items in the form of a checklist which may be required on subdivision plans and/or individual site developments plans are on the following pages.

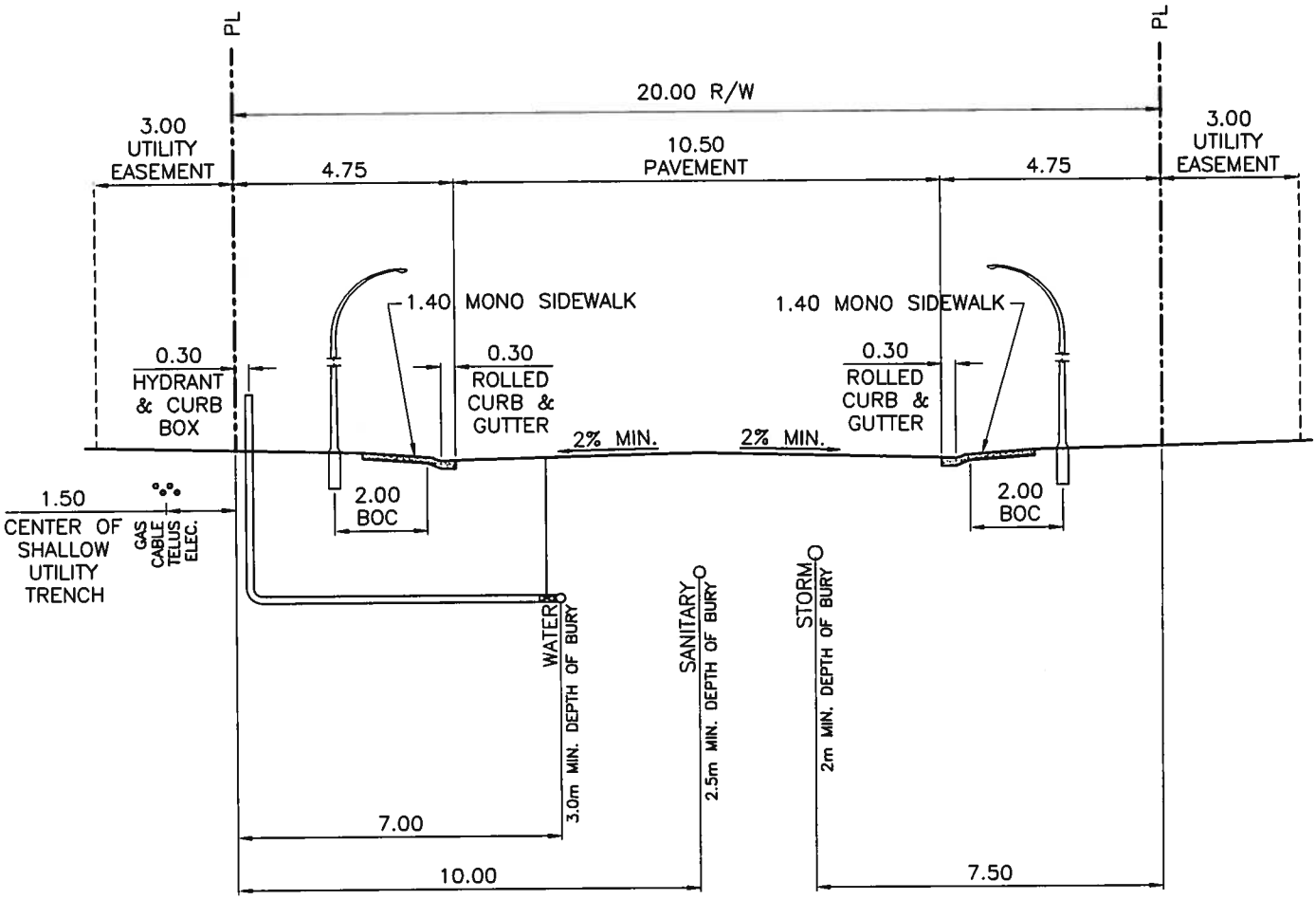
8.4 Record Drawings

Record drawings are to be submitted to the Municipality to show the services and works as they were actually constructed. The developer shall provide the Municipality with one complete set of record polyester film reproductions of all the drawings applicable to the project and three sets of white prints. Record drawings shall include water service locations with ties, and chainages of private connections measured from the nearest downstream manhole. Record drawings shall be stamped/sealed by the 's engineer.

Service Cards are required for each lot that is provided with municipal services.

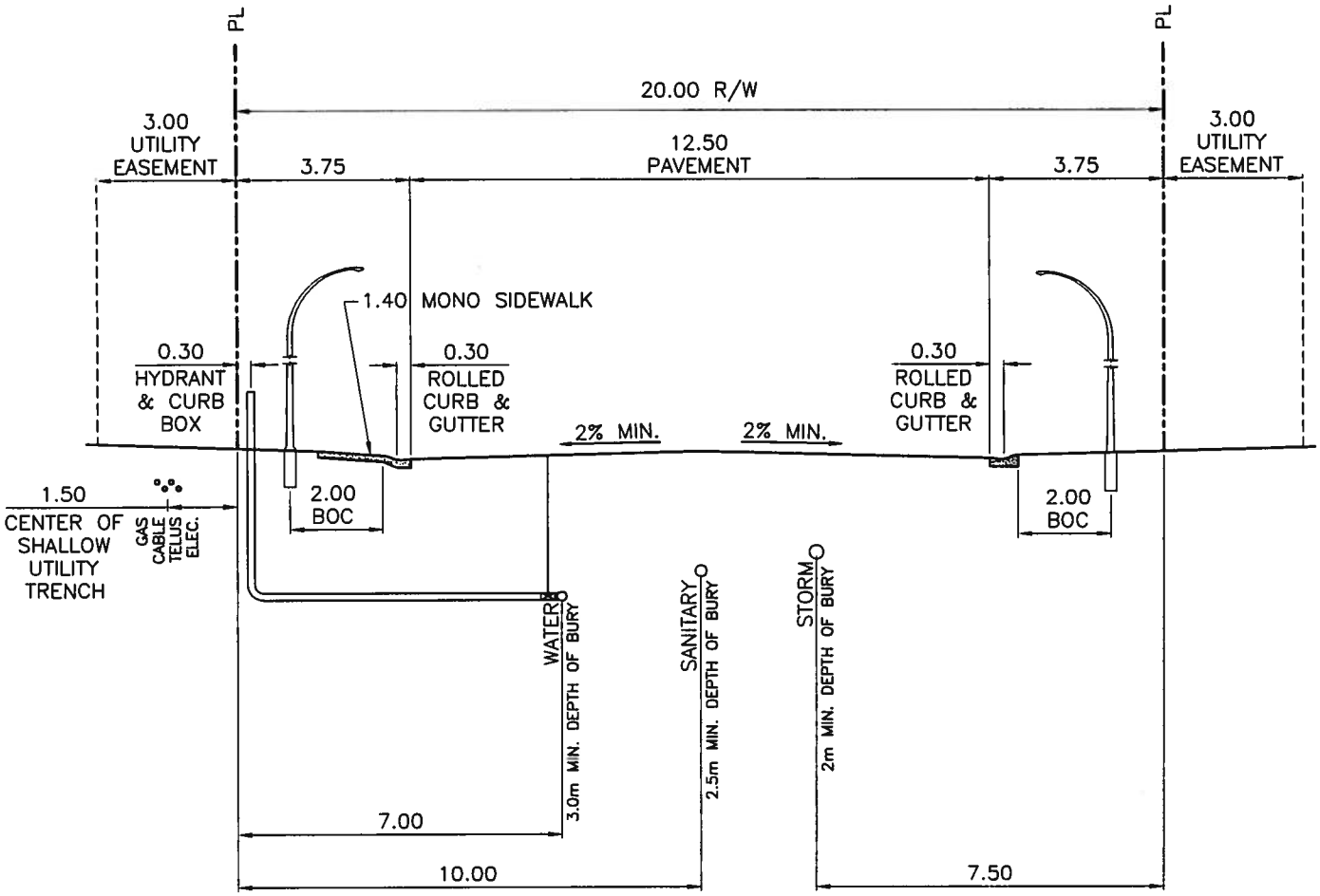
Provide one (1) 3.5" diskette or cd AutoCAD, Version 2000 to the Public Works Superintendent, including a layers' list and pens sizes as used. The record drawings are to be in UTM NAD83 coordinates. The drawings are to include the following x,y,z data at minimum:

1. Top of underground sewer, storm, and water mains at all bends (deflections) and every 100m along its length.
2. Curb stops and service locations.
3. All property pins.
4. Center of all catch basins on the gutter line axis.
5. All high and low points, curb returns and every 100 m along the curb gutter lines.
6. All high and low points and every 100 m along the centerline of roadways and lanes.
7. All high and low points and every 100 m along the centerline of drainage swales or ditches.
8. Inverts on both ends of culverts.



NOTES:
– SEE TYPICAL HYDRANT LOCATION

	DESIGNED BY: –	APPROVED BY: –	CLIENT: MUNICIPALITY OF CROWSNEST PASS	DATE DRAWN: MARCH 2011
	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
	SCALE: N.T.S.		STANDARD DRAWINGS: 20m R/W URBAN LOCAL STREET CROSS SECTION	JOB NO.: –
				REVISION: 0 STATUS
				DRAWING NO.: ST–1



NOTES:
– SEE TYPICAL HYDRANT LOCATION

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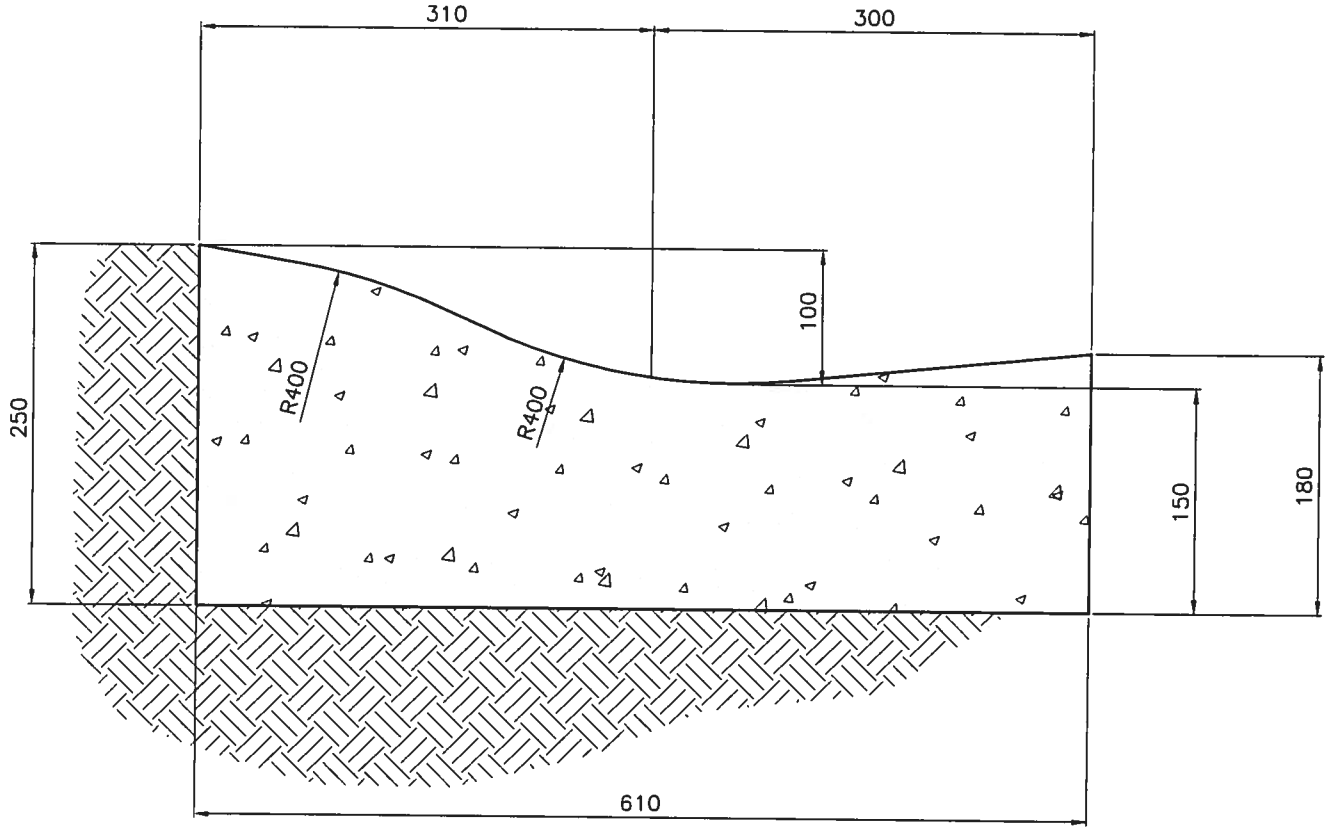

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DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS STANDARD DRAWINGS: ROLLED CURB AND GUTTER	PAGE NO.: –	
SCALE: N.T.S.			JOB NO.: –	
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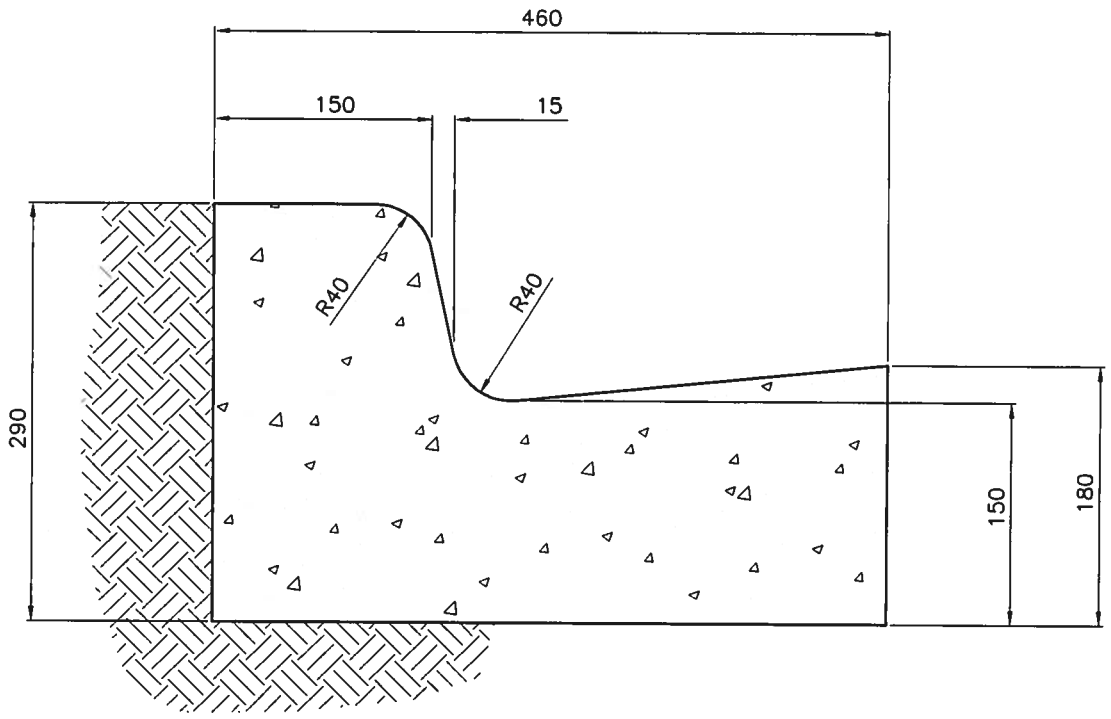

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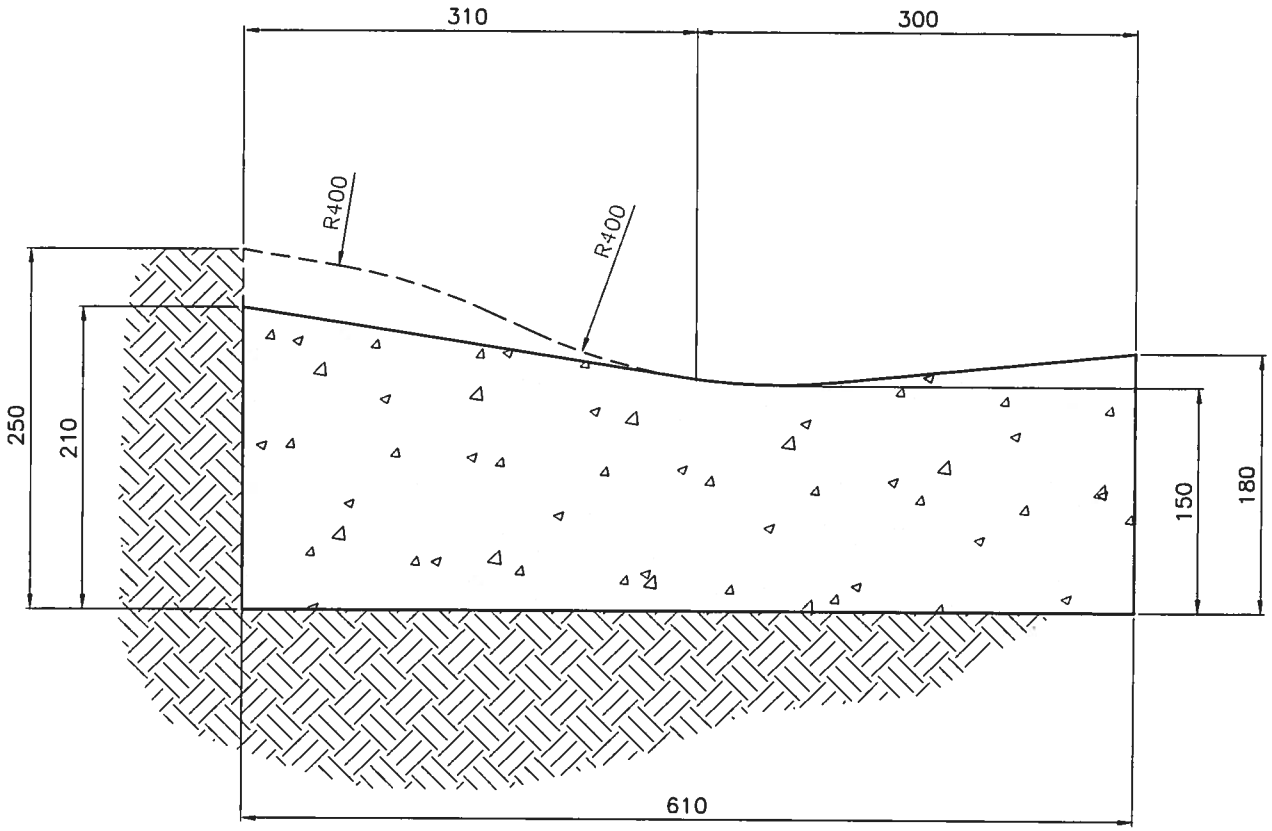

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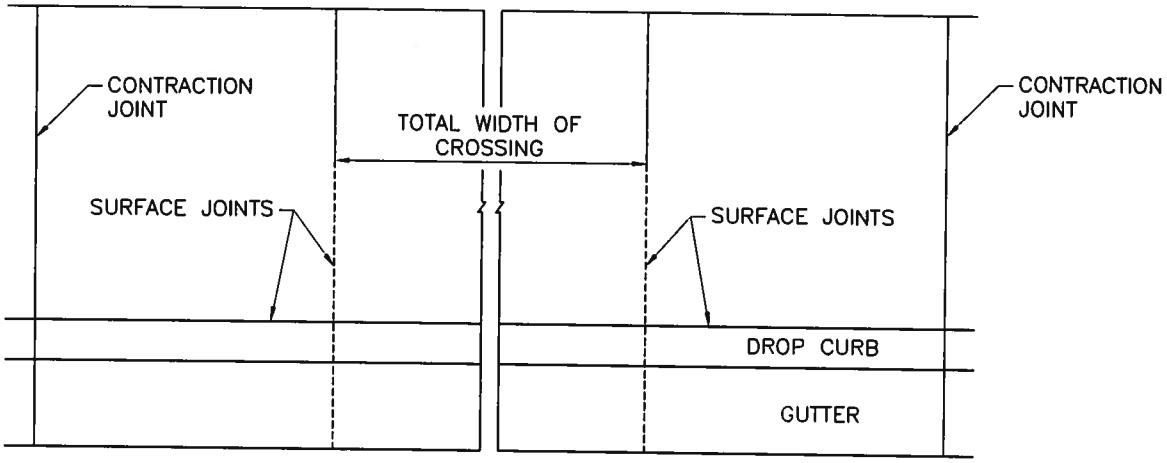
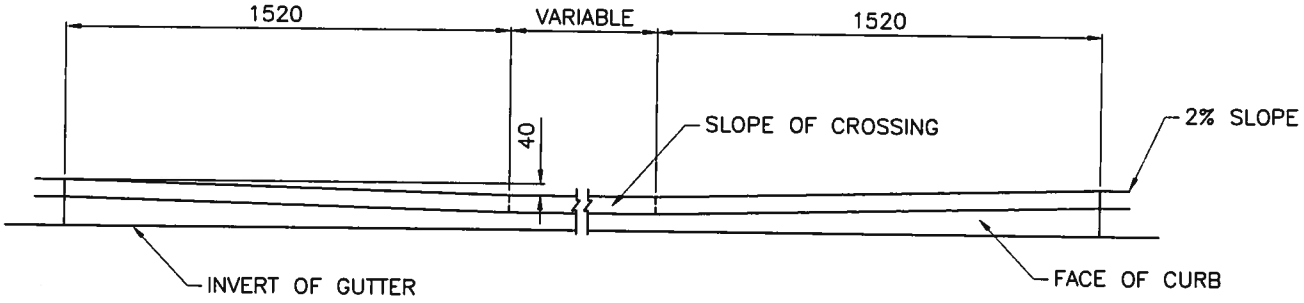
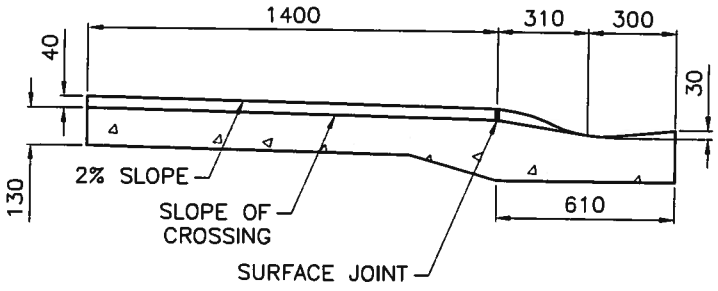


PLAN VIEW



FRONT VIEW



PROFILE

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	SCALE N.T.S.		STANDARD DRAWINGS: DROPPED CURB LANE OR COMMERCIAL DRIVEWAY CROSSING	JOB NO. –	
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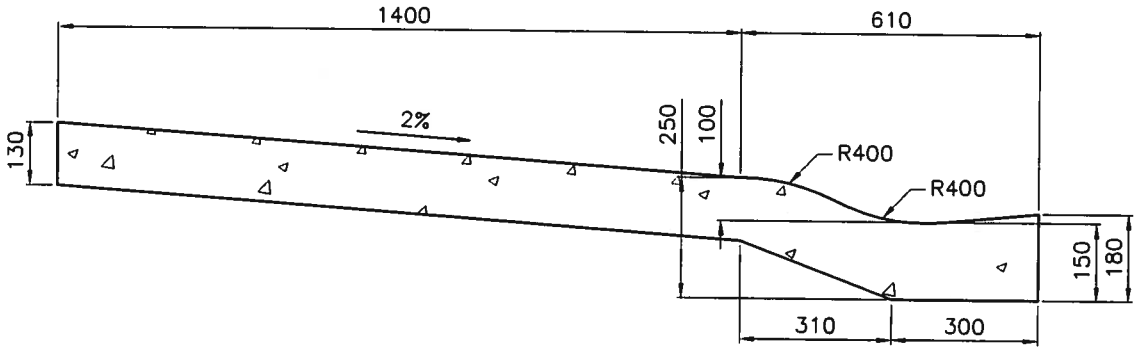
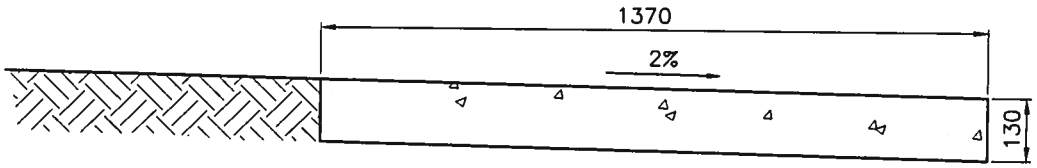


COMBINED SIDEWALK ROLLED CURB AND GUTTER



SEPARATE SIDEWALK

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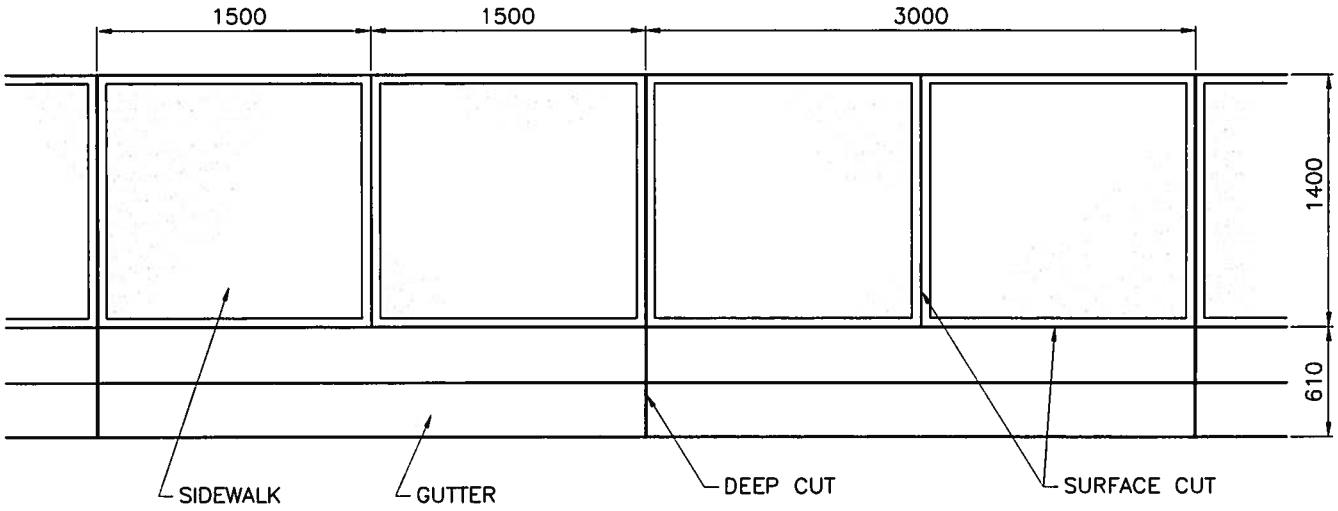

NOTES:
- SIDEWALK SURFACE TO BE BRUSHED FINISHED.
- 6mm X 32mm DEEP EXPANSION JOINT TO BE LOCATED AT 3000mm INTERVAL.

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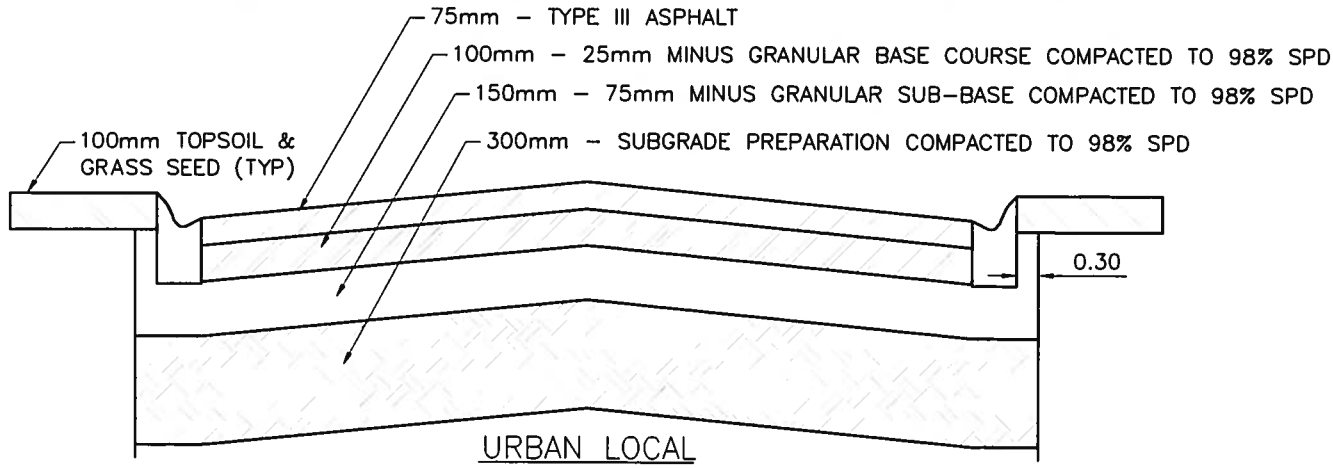
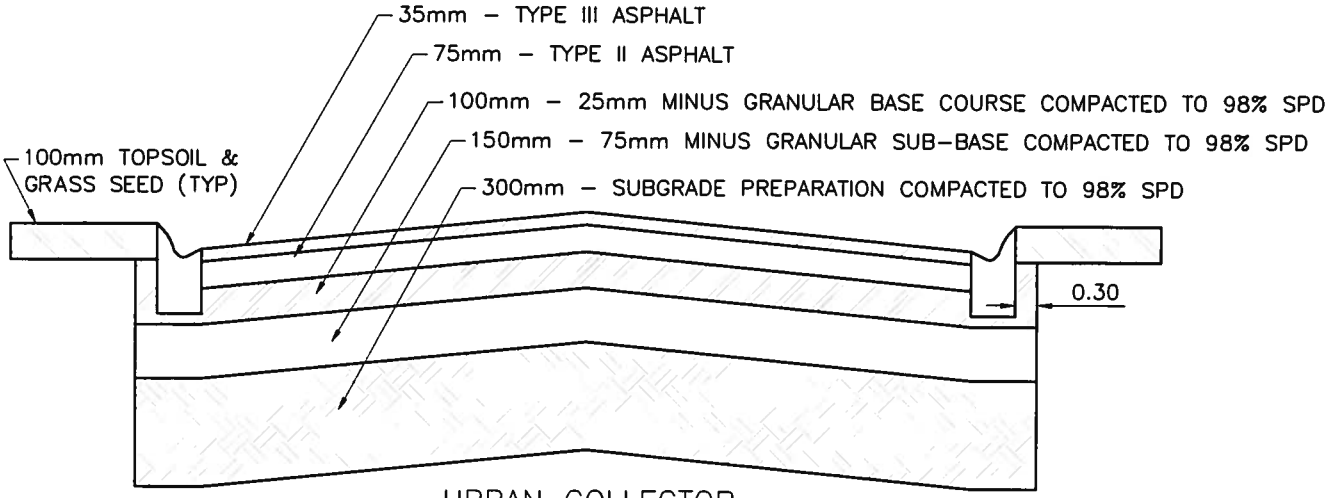
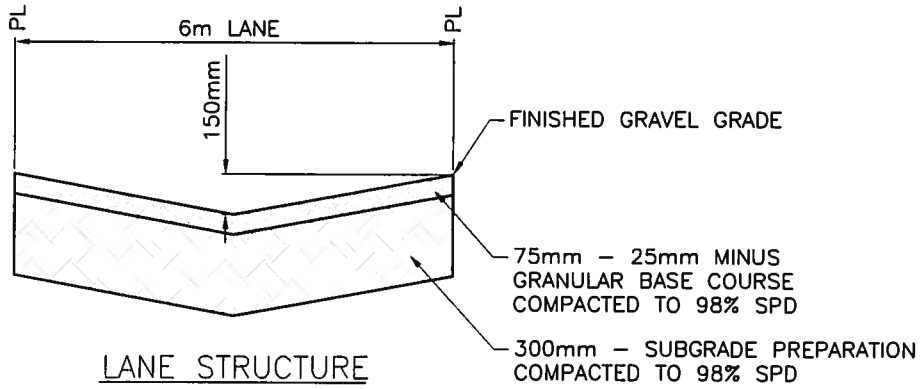


URBAN LOCAL



URBAN COLLECTOR



LANE STRUCTURE

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SCALE: N.T.S.		STANDARD DRAWINGS: ROAD PAVEMENT CROSS SECTIONS & LANE STRUCTURE	JOB NO.: –
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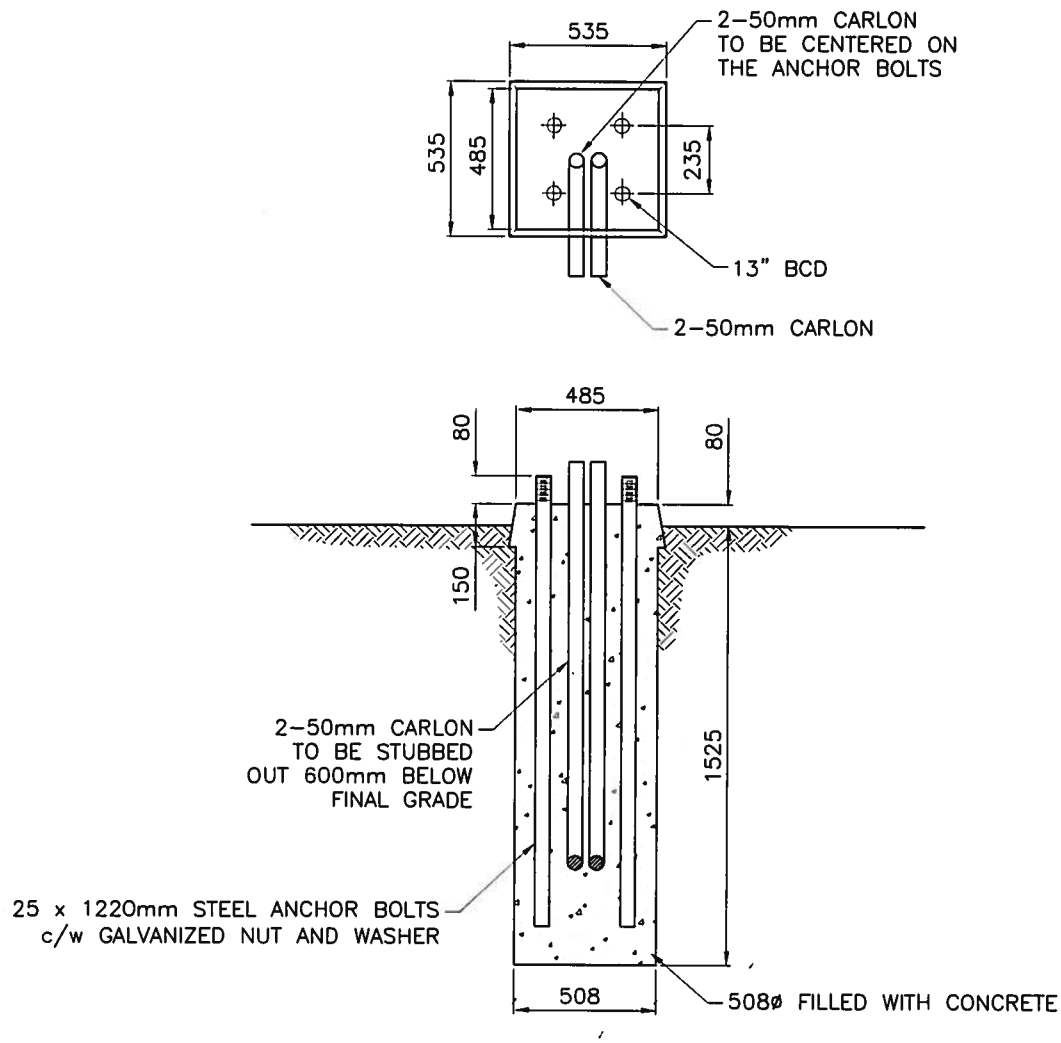

NOTES:
- CONCRETE: S–1, C–1, AIR CLASS 1
  35MPa, .40 W/C, TYPE 50 CEMENT (5–8% AIR WITH 20mm AGGREGATE)
  MAX POST PLASTIZED SLUMP 100.
- ANCHOR BOLTS: STEEL REINFORCING, 25 X 1220mm (SAE/AISI C4140 Fy min=85ksi), TOP 100mm THREADED, TOP 300mm GALVANIZED (CSA GI64).
- ALL DIMENSIONS IN MILLIMETERS (mm) UNLESS UNLESS OTHERWISE NOTED

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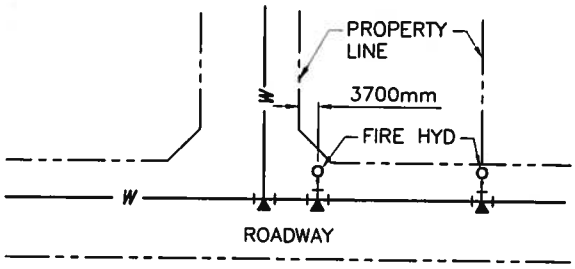
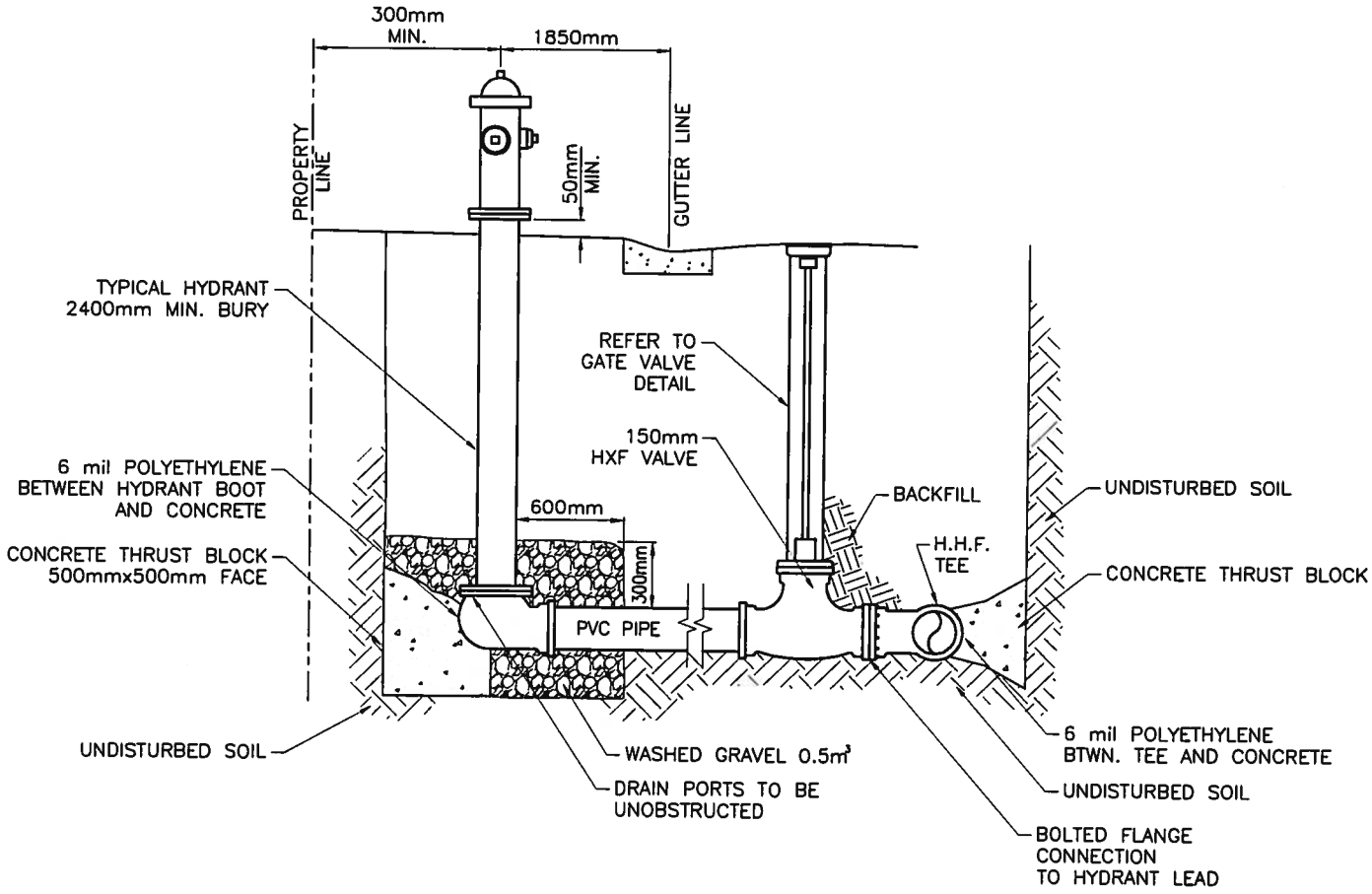


TYPICAL LOCATION



TYPICAL INSTALLATION

NOTES:
- HYDRANT BRANCH TO BE ø150 PVC AWWA C-900, CL 150 PIPE, CSA B137.3-M86.
- THRUST BLOCKS SHALL BE OF CONCRETE OBTAINING A COMPRESSIVE STRENGTH OF AT LEAST 20MPa @28 DAYS. CEMENT TO BE TYPE 50 (SULFATE RESISTANT).
- TO OBTAIN DISTANCE FROM PROPERTY LINE TO HYDRANT AND VALVE, REFER TO ROAD R.O.W.-LINE ASSIGNMENT CORRESPONDING TO R.O.W. WIDTH.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

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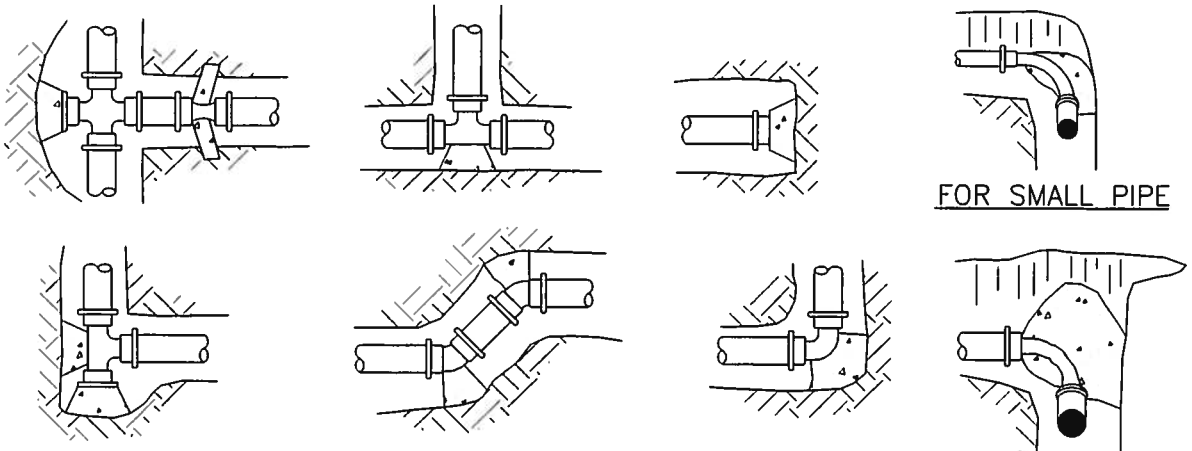

LOCATION OF HORIZONTAL THRUST BLOCKS

NOTES:

1. CONCRETE THRUST BLOCKS ARE TO BE PLACED: AT ALL TEES, BENDS, PLUGS, CAPS, PIPE DEFLECTIONS AND REDUCERS.
2. CONCRETE THRUST BLOCKS SHALL EXTEND INTO UNDISTURBED SOIL. THRUST BLOCKS IN SOFT UNSTABLE SOILS WILL REQUIRE REMOVAL OF SOIL AND REPLACEMENT WITH COMPACTABLE FILL OF SUFFICIENT STABILITY TO RESIST THRUST TO THE SATISFACTION OF THE ENGINEER.
3. THRUST BLOCKS SHALL BE OF CONCRETE OBTAINING A COMPRESSIVE STRENGTH OF AT LEAST 20 MPa @ 28 DAYS. CEMENT TO BE TYPE 50 (SULFATE RESISTANT).
4. CONCRETE SHALL BE KEPT CLEAR OF BELLS AND SHALL NOT CONTACT THE PIPE. USE A MINIMUM OF 6 mil POLYETHYLENE BETWEEN CONCRETE AND ALL FITTING SURFACES.
5. ALL THRUST BLOCKS SHALL HAVE A MINIMUM FACE OF $0.100m^2$.
6. REDUCERS SHALL HAVE A TOTAL BEARING AREA EQUAL TO THAT OF A 11 1/4" BEND BASED UPON LARGEST DIAMETER OF REDUCER.

TABLE A

THRUST BLOCK FACE AREA IN SQ. METRES AT FITTING FOR CL150 PIPE @ 1000 kPa & SOIL BEARING CAPACITY OF 100 kPa

PIPE SIZE	DEAD ENDS & TEES	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
100	0.12	0.17	0.10	0.10	0.10
150	0.25	0.35	0.19	0.10	0.10
200	0.43	0.60	0.33	0.17	0.10
250	0.70	0.99	0.54	0.27	0.14
300	1.00	1.40	0.75	0.39	0.19
350	1.35	1.90	1.03	0.52	0.26
400	1.75	2.47	1.34	0.68	0.34
450	2.24	3.15	1.72	0.87	0.44
500	2.77	3.90	2.12	1.07	0.54
600	4.00	5.64	3.07	1.55	0.78
750	6.26	8.83	4.81	2.44	1.22
900	9.03	12.7	7.58	3.51	1.76

TABLE B

SOIL TYPE	SAFE BEARING LOAD – kPa
SOFT CLAY; LOOSE SAND	50
MED. SOFT CLAY; DENSE SAND	100
DENSE CLAY TILL & GRAVEL	150
HARD SHALE	500

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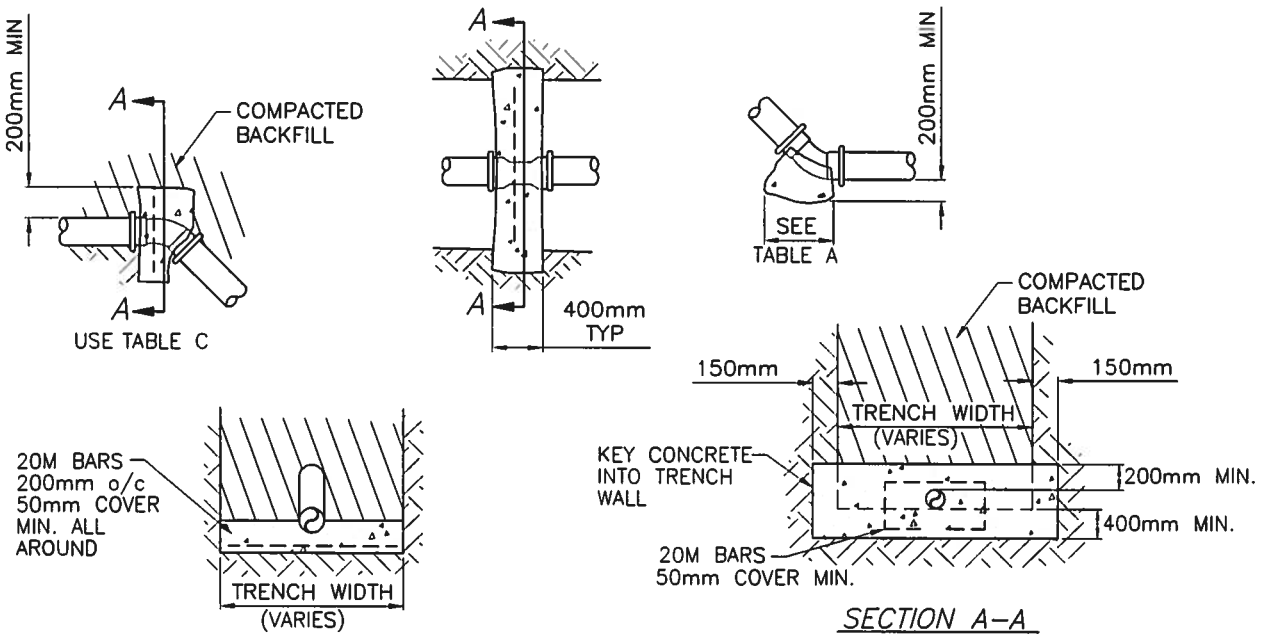

SECTION A–A

LOCATION OF VERTICAL THRUST BLOCKS

TABLE A					
THRUST BLOCK FACE AREA IN SQ. METRES AT FITTING FOR CL150 PIPE @ 1000 kPa & SOIL BEARING CAPACITY OF 100 kPa					
PIPE SIZE		90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND
100		0.17	0.10	0.10	0.10
150		0.35	0.19	0.10	0.10
200		0.60	0.33	0.17	0.10
250		0.99	0.54	0.27	0.14
300		1.40	0.75	0.39	0.19
350		1.90	1.03	0.52	0.26
400		2.47	1.34	0.68	0.34
450		3.15	1.72	0.87	0.44
500		3.90	2.12	1.07	0.54
600		5.64	3.07	1.55	0.78
750		8.83	4.81	2.44	1.22
900		12.7	7.58	3.51	1.76

Notes:

1. VERTICAL BENDS ARE TO BE ANCHORED BY CONCRETE FOR THRUST RESISTANCE BY DEAD WEIGHT. SEE TABLE C.
2. ALL CONCRETE THRUST BLOCKS SHALL EXTEND INTO UNDISTURBED SOIL. THRUST BLOCKS IN SOFT UNSTABLE SOILS WILL REQUIRE REMOVAL OF NATIVE SOILS AND REPLACEMENT WITH COMPACTABLE FILL OF SUFFICIENT STABILITY TO RESIST THRUST TO THE SATISFACTION OF THE ENGINEER.
3. THRUST BLOCKS SHALL BE OF CONCRETE OBTAINING A COMPRESSIVE STRENGTH OF AT LEAST 20 MPa @ 28 DAYS. CEMENT TO BE TYPE 50 (SULFATE RESISTANT).
4. ALL THRUST BLOCKS SHALL HAVE A MINIMUM FACE OF 0.100 m^2.
5. CONCRETE SHALL BE KEPT CLEAR OF BELLS AND SHALL NOT CONTACT THE PIPE. USE A MINIMUM OF 6 mil POLYETHYLENE BETWEEN CONCRETE AND ALL FITTING SURFACES.

TABLE B	
SOIL TYPE	SAFE BEARING LOAD – kPa
SOFT CLAY; LOOSE SAND	50
MED. SOFT CLAY; DENSE SAND	100
DENSE CLAY TILL & GRAVEL	150
HARD SHALE	500

TABLE C							
DEAD WEIGHT REQUIREMENTS FOR VERITCAL BENDS CUBIC METRES OF CONCRETE (m^3)							
TYPE OF BEND	SIZE (mm)						
	100	150	200	250	300	350	400
90° BEND	0.75	1.5	2.75	4.25	6.0	8.50	11.0
45° BEND	0.5	1.0	1.5	2.25	3.5	4.75	6.0
22 1/2° BEND	0.25	0.5	0.75	1.25	1.5	2.25	3.0
11 1/4° BEND	0.25	0.25	0.5	0.75	1.0	1.25	1.5

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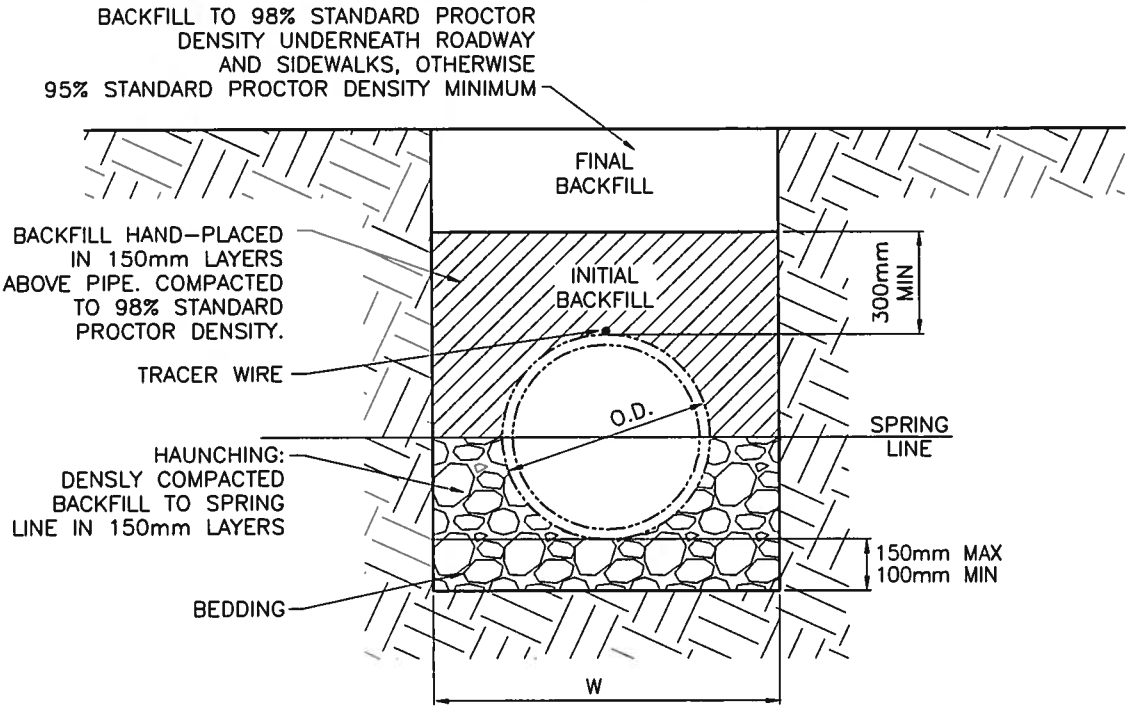

NOTES:

1. GRANULAR MATERIALS ARE TO BE USED IN THE BEDDING AND HAUNCHING ZONES. ALL BEDDING AND HAUNCHING MATERIALS ARE TO BE COMPACTED TO MINIMUM 95% STANDARD PROCTOR DENSITY.

2. GRANULAR OR SELECT 75mm MINUS WELL GRADED NATIVE MATERIALS MAY BE USED IN THE INITIAL BACKFILL ZONE. ALL INITIAL BACKFILL MATERIALS ARE TO BE COMPACTED TO MINIMUM 98% STANDARD PROCTOR DENSITY UNLESS SPECIFIED ELSEWHERE.

3. ALL GRANULAR MATERIALS ARE TO CONFORM TO THE APPROVED GRADATIONS IN THE SPECIFICATION.

4. WHEN COMPACTING IN THE PIPE ZONE, CARE SHOULD BE TAKEN TO AVOID CONTACT BETWEEN THE PIPE AND COMPACTION EQUIPMENT (JUMPING JACKS, TAMPING BARS, ETC.)

5. COMPACTION IN THE HAUNCHING AREA IS TO BE OBTAINED BY USE OF JUMPING JACKS AND TAMPING BARS. CARE SHOULD BE TAKEN TO ENSURE THAT THE PIPE DOES NOT "FLOAT" DUE TO COMPACTIVE METHODS.

6. WHEN COMPACTING INITIAL BACKFILL, JUMPING JACKS ARE TO BE USED ADJACENT TO THE PIPE. JUMPING JACKS SHALL NOT BE USED DIRECTLY ABOVE THE PIPE UNTIL A MINIMUM OF 0.3m OF MATERIAL IS IN PLACE ABOVE THE PIPE.

7. WHEN COMPACTING FINAL BACKFILL, ROLLING EQUIPMENT IS NOT TO BE USED IN TRENCH UNTIL A MINIMUM OF 0.5m OF BACKFILL MATERIAL IS IN PLACE ABOVE THE TOP OF PIPE.

8. IF A HYDRO-HAMMER IS USED TO COMPACT FINAL BACKFILL, A MINIMUM OF 1.0m COVER IS REQUIRED OVER THE PIPE. DO NOT USE A HYDRO-HAMMER ON INITIAL BACKFILL.

9. TRENCH WIDTH IS CRITICAL FOR PROPER PIPE SUPPORT. DO NOT EXCEED THE FOLLOWING TRENCH WIDTH DIMENSIONS W=O.D. + 300mm (MIN)
W=I.D. + 600mm (MAX)
FOR FLEXIBLE PIPES ie. PVC, PE

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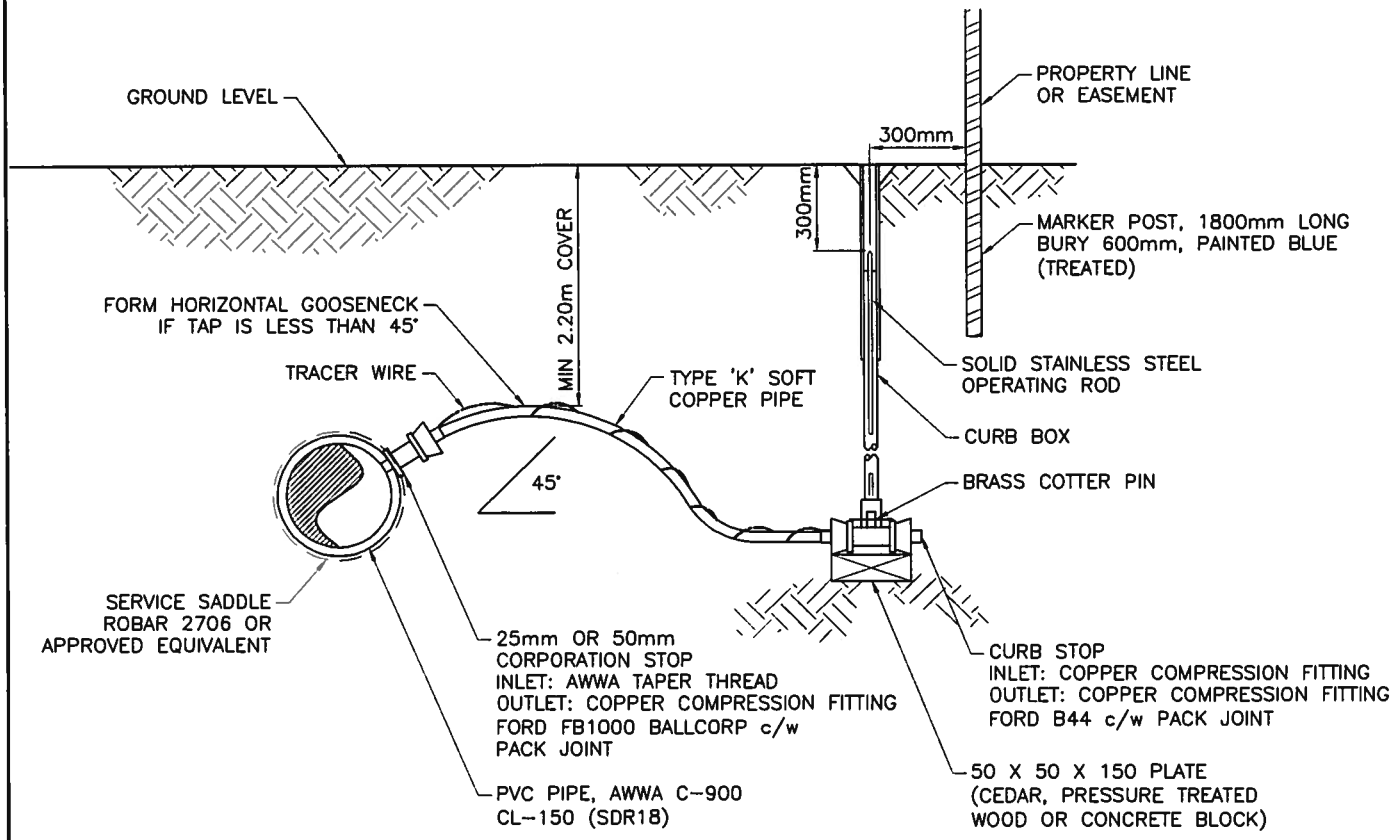

NOTES:
- CORPORATION STOPS TO BE STAGGERED AND AT LEAST 400mm APART
- CORPORATION STOPS TO BE 300mm MIN. FROM END OF PIPE SECTION
- USE AWWA THREAD FOR ALL SERVICE SADDLE CONNECTIONS
- FOR CONNECTIONS IN EXISTING AREAS, HORIZONTAL GOOSENECK TO BE FORMED IF DEPTH IS LESS THAN 1500mm

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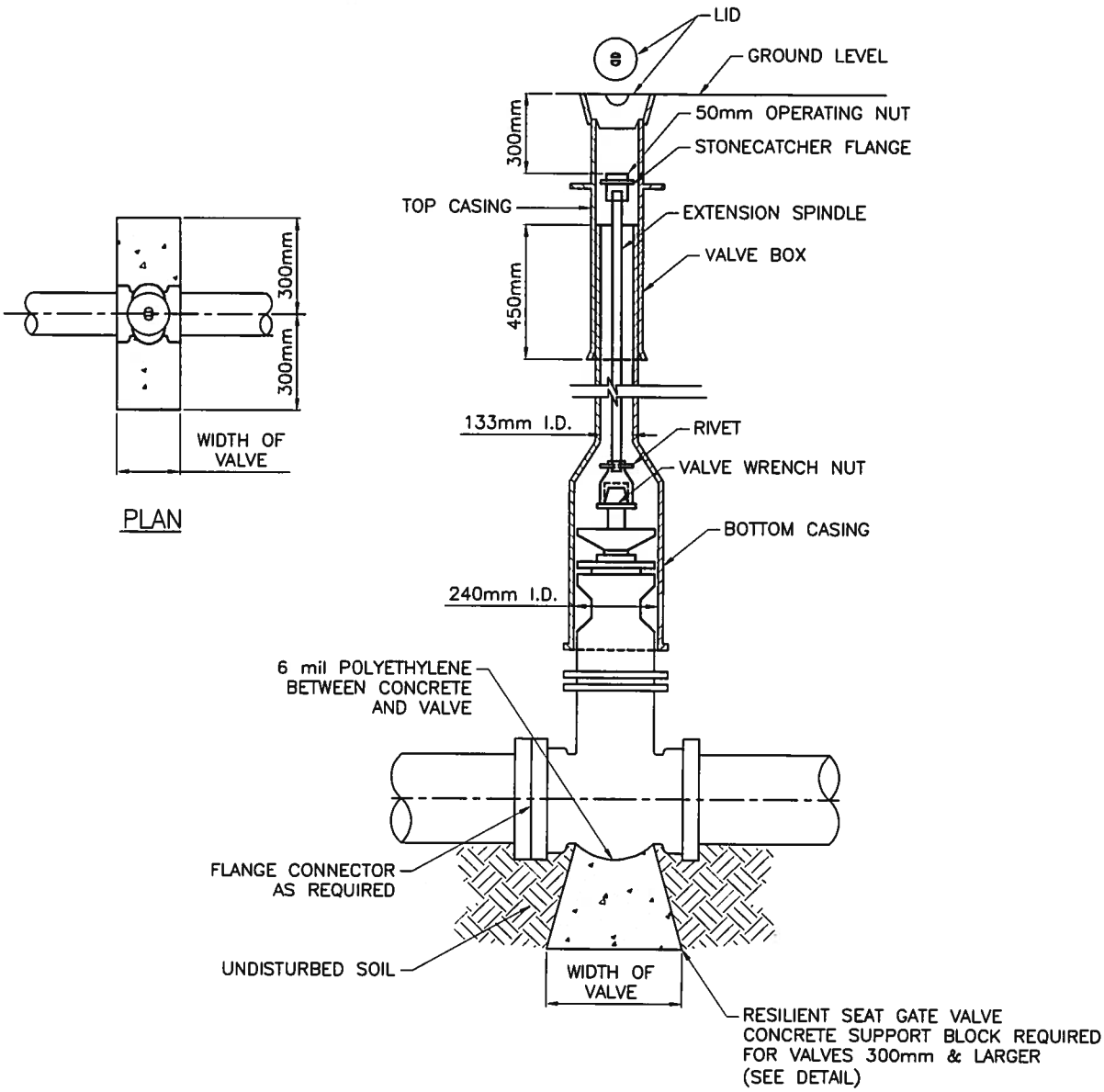

NOTES:
- ALL DIMENSIONS ARE IN MILLIMETERS.
- ALL VALVES LEFT TURN TO OPEN (COUNTER-CLOCKWISE) FOR MAIN SIZES 100mmø TO 300mmø.
- CONCRETE SHALL OBTAIN A MINIMUM COMPRESSIVE STRENGTH OF 20MPa @ 28 DAYS. ALL CEMENT TO BE TYPE 50 (SULFATE RESISTANT).

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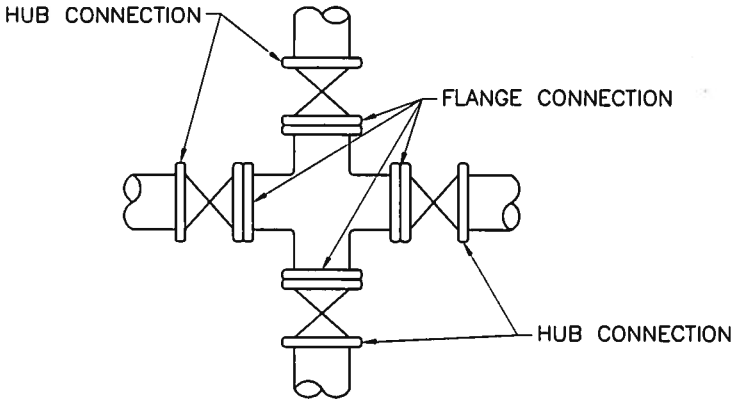
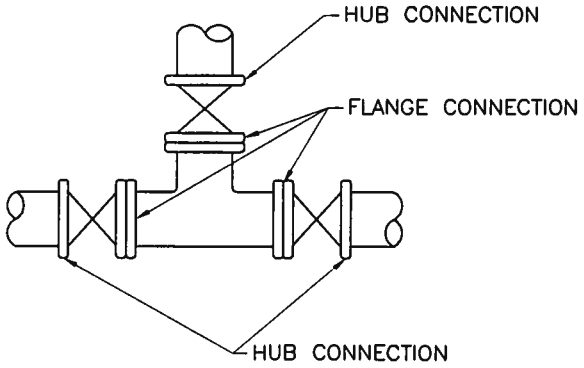
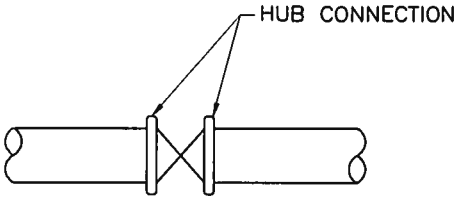


TYPICAL CROSS AND GATE VALVES

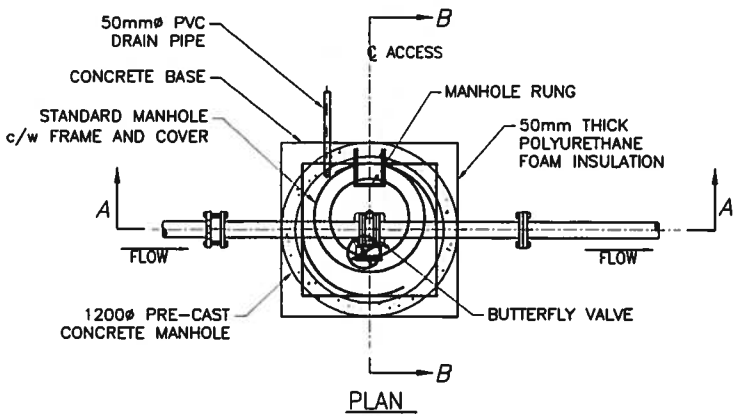


TYPICAL TEE AND GATE VALVES

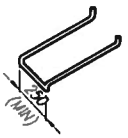


INLINE GATE VALVE

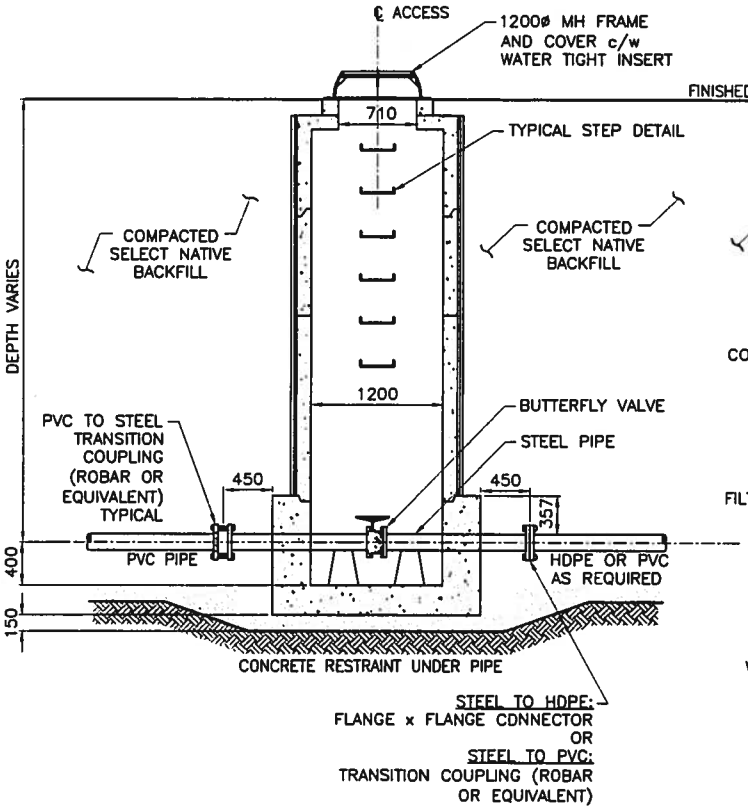
DESIGNED BY: –	APPROVED BY: –	CLIENT: MUNICIPALITY OF CROWSNEST PASS	DATE DRAWN: MARCH 2011
DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
SCALE: N.T.S.		STANDARD DRAWINGS: STANDARD GATE VALVE LOCATIONS AND CONNECTIONS	JOB NO.: –
			REVISION: 0 / STATUS: DRAWING NO.: ST-17



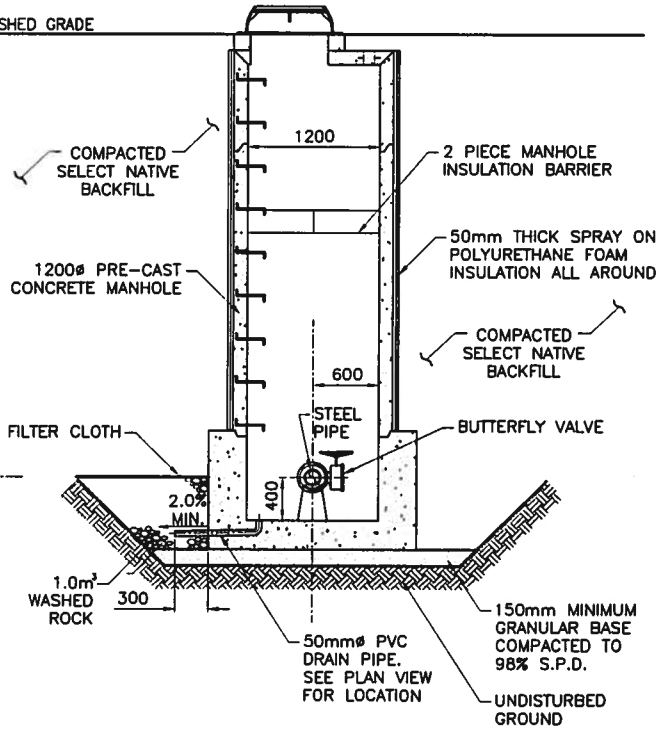
PLAN



TYPICAL STEP DETAIL



FULL SECTION A-A



FULL SECTION B-B

NOTES:
- INTERIOR OF NEW STEEL PIPE TO BE COATED WITH DEVOE COATINGS "BARRUST 233H" EPOXY COATING. MINIMUM FILM THICKNESS 12mm.
- EXTERIOR OF NEW STEEL PIPE TO BE COATED WITH TINTED BLUE DEVOE COATINGS "BARRUST 235H" EPOXY COATING. MINIMUM FILM THICKNESS 12mm.

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DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: -
SCALE: N.T.S.		STANDARD DRAWINGS: BUTTERFLY VALVE AND CHAMBER	JOB NO.: -
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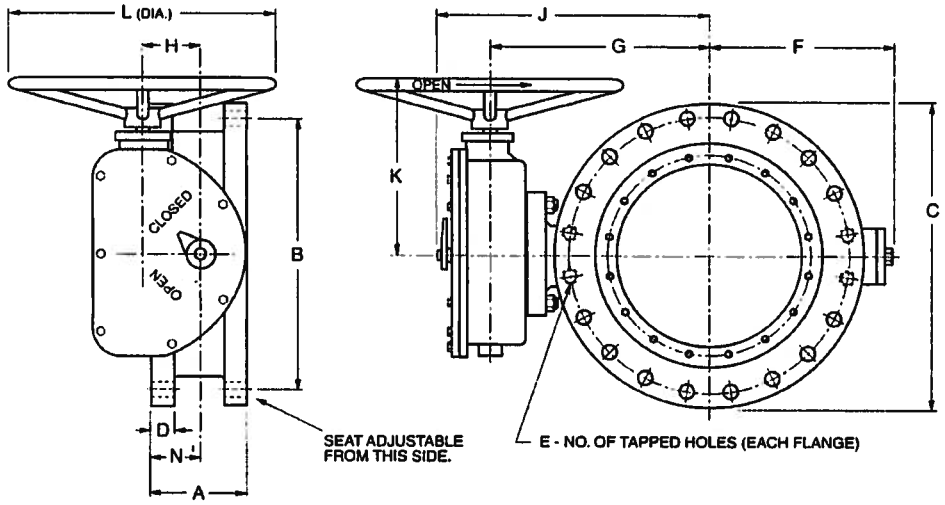

Valve Size	AWWA Press. Class	A	B	C	D	E	F	G	H	J	K	L	N	Turns To Open	No. of Bolts	Bolt Size	Actuator Size	Approx. Shpg. Wt.
6	150B	5	9-1/2	11	1	0	7	8-1/4	1-1/2	10-3/8	9-3/8	12	2-1/2	15	8	3/4	LS-1	90
10	150B	8	14-1/4	16	1-3/16	0	10	11-11/16	2	14-1/8	10-3/8	12	4	20	12	7/8	LS-2	200
16	150B	8	21-1/4	23-1/2	1-7/16	0	14-5/8	16-11/16	3-1/2	20	15-1/16	20	4	35	16	1	LS-3	480

NOTE: ALL DIMENSIONS FOR VALVE ARE IN INCHES

NOTES:

Valves shall be designed, manufactured and tested in accordance with American Water Works Association Standard ANSI/AWWA C504.

Flanged end connections shall fully conform with ANSI B16.1 for Class 125 or Class 250 iron flanges. Both 125 and 250 flanges shall be flat faced.

Mechanical joint end connections shall fully conform with ANSI/AWWA C111/A21.11.

Valve shafts shall be of the through type. Shafts shall be locked to the disc by O-Ring sealed taper pins retained with Stainless Steel nuts.

Valve Discs shall be of the solid type without external ribs or vanes to obstruct flow.

Resilient seats shall be located on the valve disc and shall provide a 360° continuous, uninterrupted seating surface. Seats shall be mechanically retained with stainless steel retaining ring and stainless steel Nylok® cap screws which shall pass through both the resilient seat and retaining ring. The resilient's seat's mating surface shall be to a 360° continuous, uninterrupted stainless steel body seat ring. Resilient seats shall be field adjusted and replaceable and shall not require hypodermic needles or pressure vessels to replace or adjust.

Sleeve Bearings shall be provided in the valve hubs and shall be nylatron or woven Teflon, fiberglass backed. They shall be self lubricating.

Thrust Bearings shall be provided on valve larger than 30" and larger.

Shaft seals shall be of the V-type and shall be replaceable without the removal of the valve from the line or the shaft from the valve.

Disc: Valve disc shall be ASTM A536 Grade 65-45-12 ductile iron.

Shafts: Shafts shall be ASTM A276 Grade 304, or ASTM A564, type 630 Stainless Steel.

Seat: Resilient seat shall be Buna-N and mate to a Type 304 Stainless Steel body seat ring.

Manual wheel actuation shall be provided as specified.

Valves shall be proof of design tested in accordance with ANSI/AWWA C504.

Valve exteriors for above ground service shall be coated with a universal, alkyd primer. Valve interiors shall be coated with an ANSI/NSF 61 epoxy coating approved for potable water.

Valve shall be Val-Matic® Series 2000 or equal.

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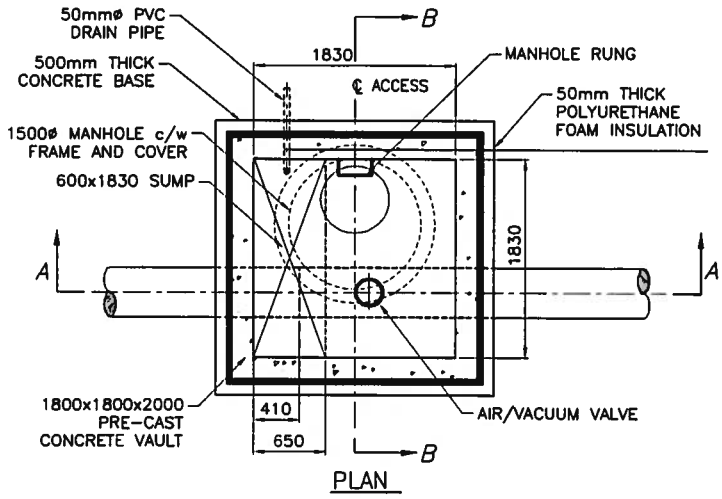
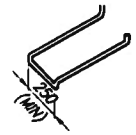
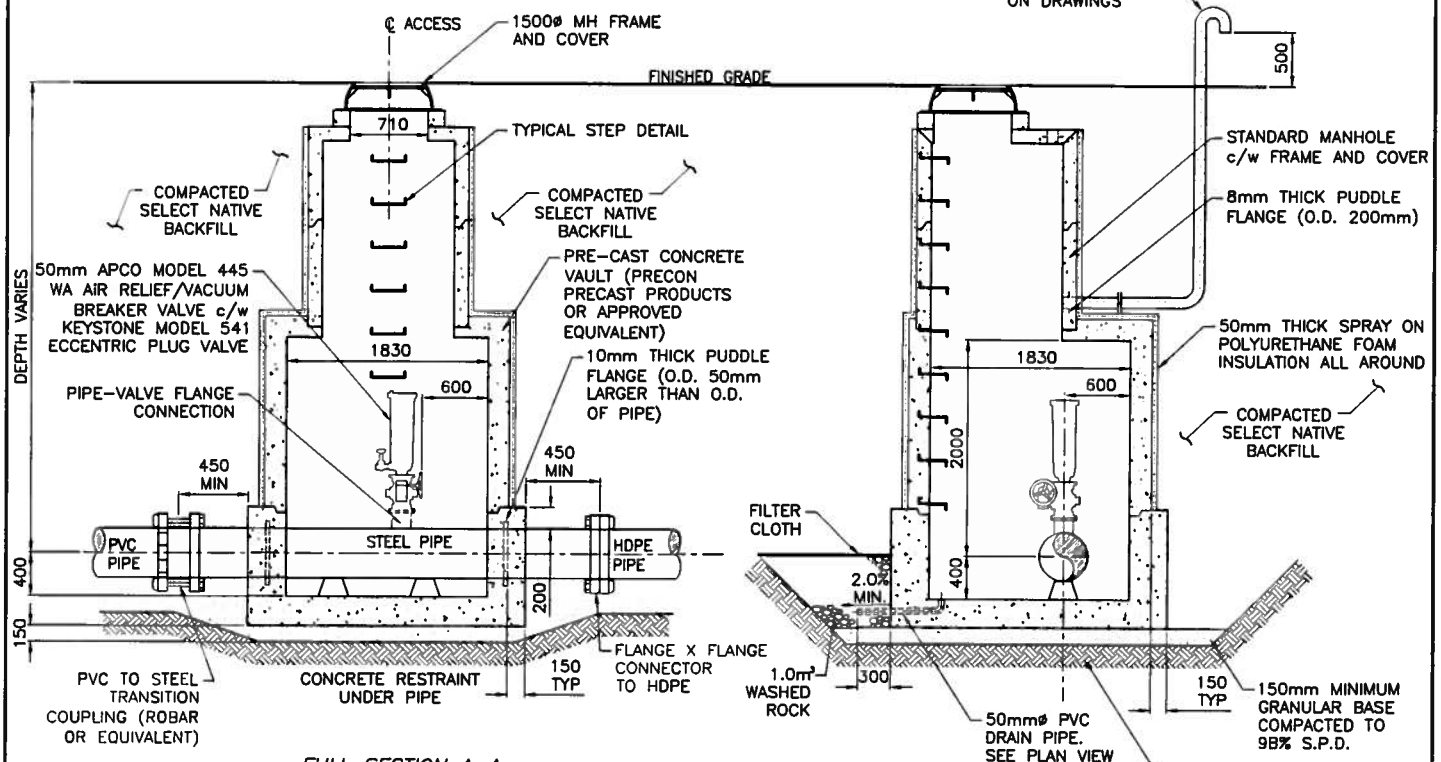
DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.	JOB NO. -
SCALE: N.T.S.		STANDARD DRAWINGS: BUTTERFLY VALVE	REVISION: 0 STATUS	DRAWING NO.: ST-19



PLAN



TYPICAL STEP DETAIL



FULL SECTION A-A

FULL SECTION B-B

NOTES:
- INTERIOR OF NEW STEEL PIPE TO BE COATED WITH DEVOE COATINGS "BARRUST 233H" EPOXY COATING. MINIMUM FILM THICKNESS 12mm.
- EXTERIOR OF NEW STEEL PIPE TO BE COATED WITH TINTED BLUE DEVOE COATINGS "BARRUST 235H" EPOXY COATING. MINIMUM FILM THICKNESS 12mm.

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DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: -
SCALE: N.T.S.		STANDARD DRAWINGS: AIR RELEASE VALVE AND CHAMBER	JOB NO.: -
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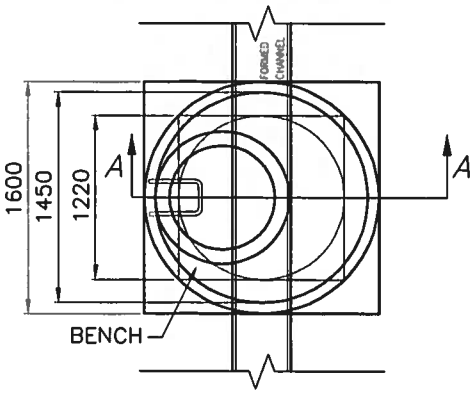
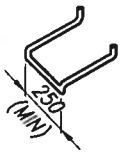
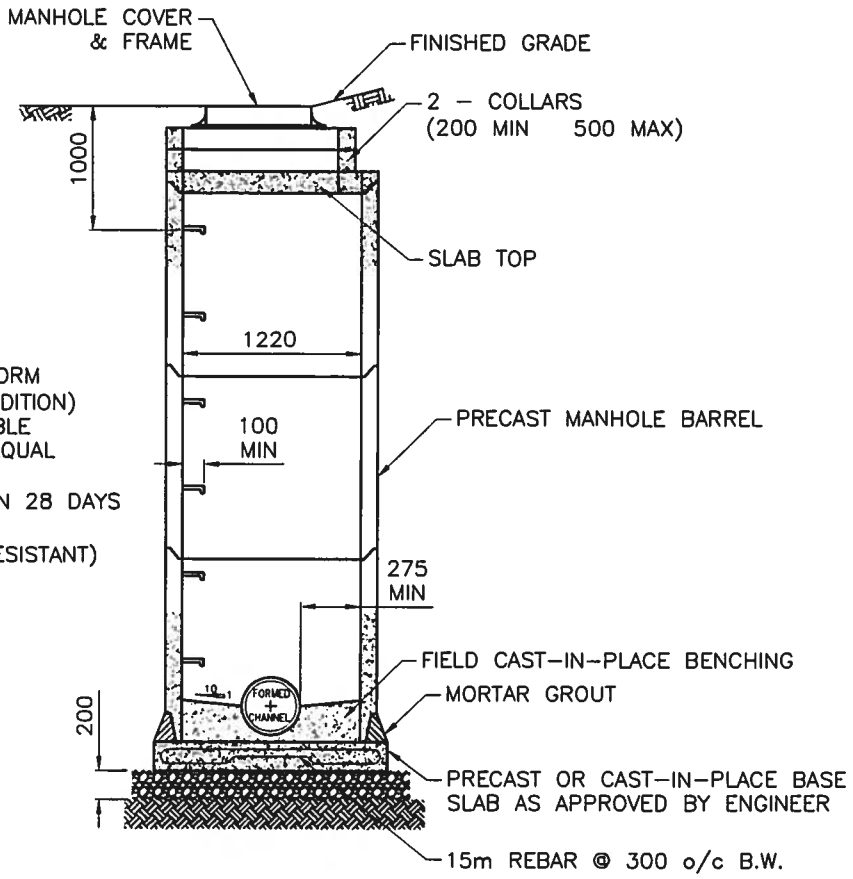


PLAN



TYPICAL STEP DETAIL



SECTION A–A

NOTES:
- PRECAST MANHOLE SECTIONS TO CONFORM TO ASTM DESIGNATION C478 (LATEST EDITION)
- ALL JOINTS TO BE SEALED WITH FLEXIBLE BUTYL RESIN SEALANT OR APPROVED EQUAL
- ALL DIMENSIONS IN MILLIMETERS (mm)
- CONCRETE STRENGTH TO BE 30 MPa IN 28 DAYS
- MANHOLE STEPS AT 400 o/c
- CEMENT TO BE TYPE 50 (SULPHATE RESISTANT)

MAXIMUM SIZE OF CONNECTING PIPE FOR 1220mm – 2440mm DIAMETER MANHOLES

MANHOLE INSIDE DIAMETER	45° DEFLECTION MAXIMUM SIZE OF PIPE[A]	90° DEFLECTION MAXIMUM SIZE OF PIPE[B]
48 in. (1220mm)	24 in. (610mm)	18 in. (460mm)
60 in. (1525mm)	36 in. (915mm)	27 in. (690mm)
72 in. (1830mm)	42 in. (1070mm)	30 in. (760mm)
84 in. (2135mm)	48 in. (1220mm)	36 in. (915mm)
96 in. (2440mm)	60 in. (1525mm)	42 in. (1070mm)

[A] MAXIMUM PIPE SIZE FOR A GIVEN MANHOLE DIAMETER IS BASED ON NORMAL PIPE ALIGNMENT (NO DEFLECTION) TO A DEFLECTION ANGLE OF 45° DEFLECTION

[B] MAXIMUM PIPE SIZE FOR A GIVEN MANHOLE DIAMETER IS BASED ON DEFLECTION ANGLES OF 45° TO 90°, WITHOUT ANY ADDITIONAL PIPE CONNECTIONS

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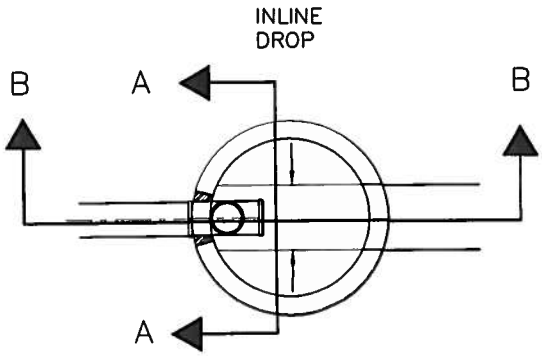
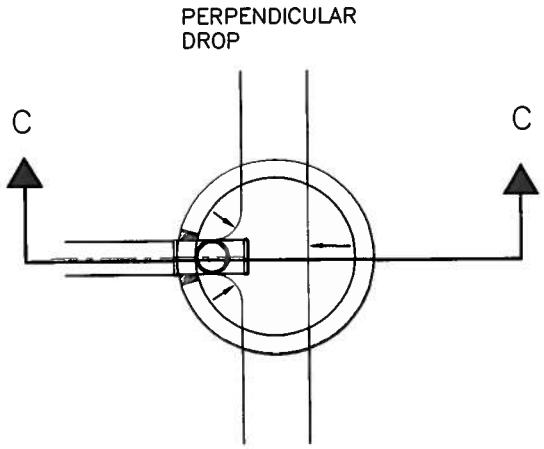


PLAN



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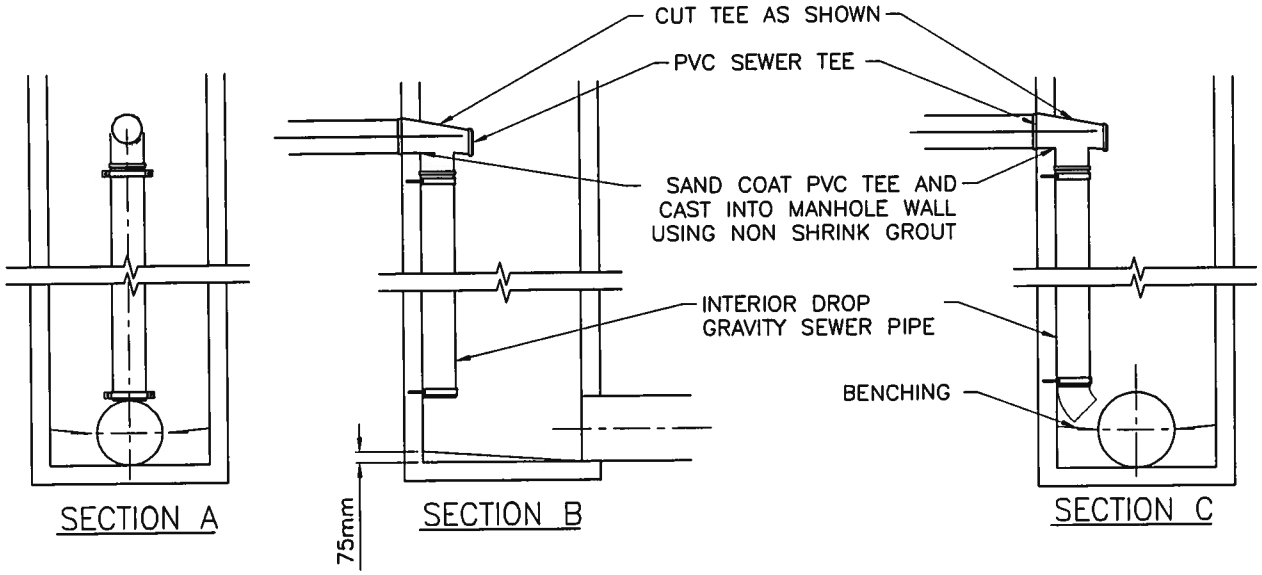
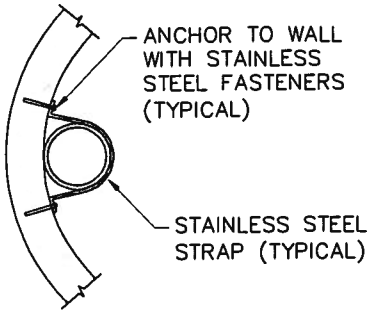


SECTION A

SECTION B

SECTION C



STRAP DETAIL

NOTES:
- DIMENSIONS ARE IN MILLIMETERS (mm)
- BACKDROPS ARE REQUIRED WHEN THE DIFFERENCE BETWEEN OUTGOING INVERT AND INCOMING SANITARY SEWER EXCEEDS 600mm
- ON EXISTING MANHOLES, BACKDROP COMES TO TOP OF BENCHING
- ALL JOINTS TO BE SEALED WITH FLEXIBLE BUTYL RUBBER SEALANT OR TYLOX SUPERSEAL PRELUBRICATED GASKETS
- WHEN INTERIOR DROP FALLS ON MANHOLE BENCHING, A 45° BEND IS TO BE ADDED

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DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS STANDARD DRAWINGS: STANDARD MANHOLE WITH INTERIOR DROP	PAGE NO.: -
SCALE: N.T.S.			JOB NO.: -
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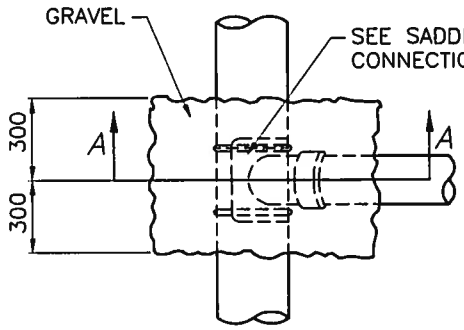

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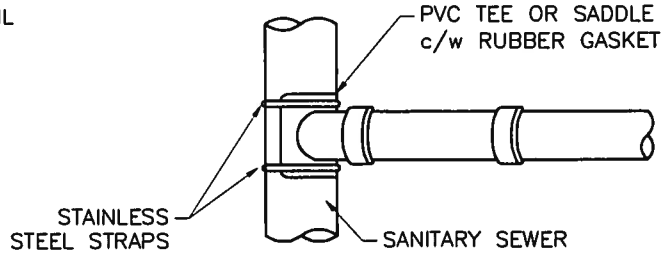
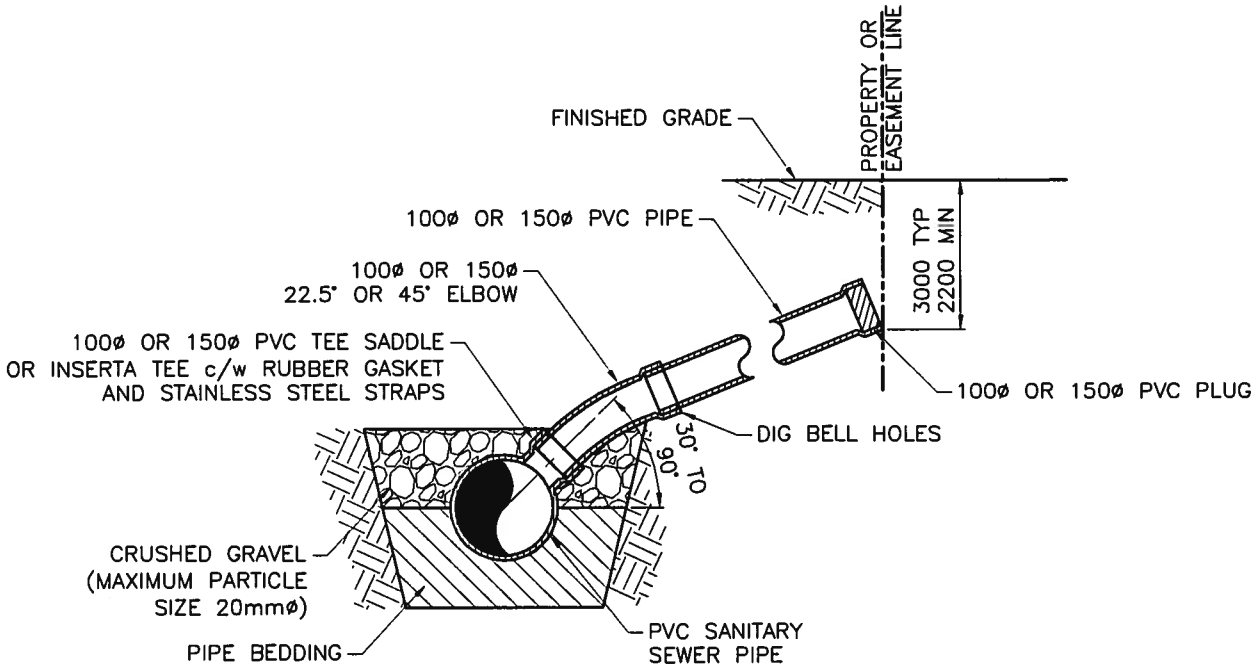


SADDLE CONNECTION DETAIL



SECTION A–A

NOTES:
- 150ø SERVICES AT MINIMUM 1%.
- 100ø SERVICES AT MINIMUM 2%.
- ALL PVC PIPE TO BE MUNICIPAL STUB SEWER PIPE, ASTM D3034, DR28.
- SEWER SERVICES MUST TERMINATE WITH A BELL END.
- SADDLES TO BE 400mm APART MINIMUM.
- ALL DIMENSIONS ARE IN MILLIMETERS (mm).

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DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
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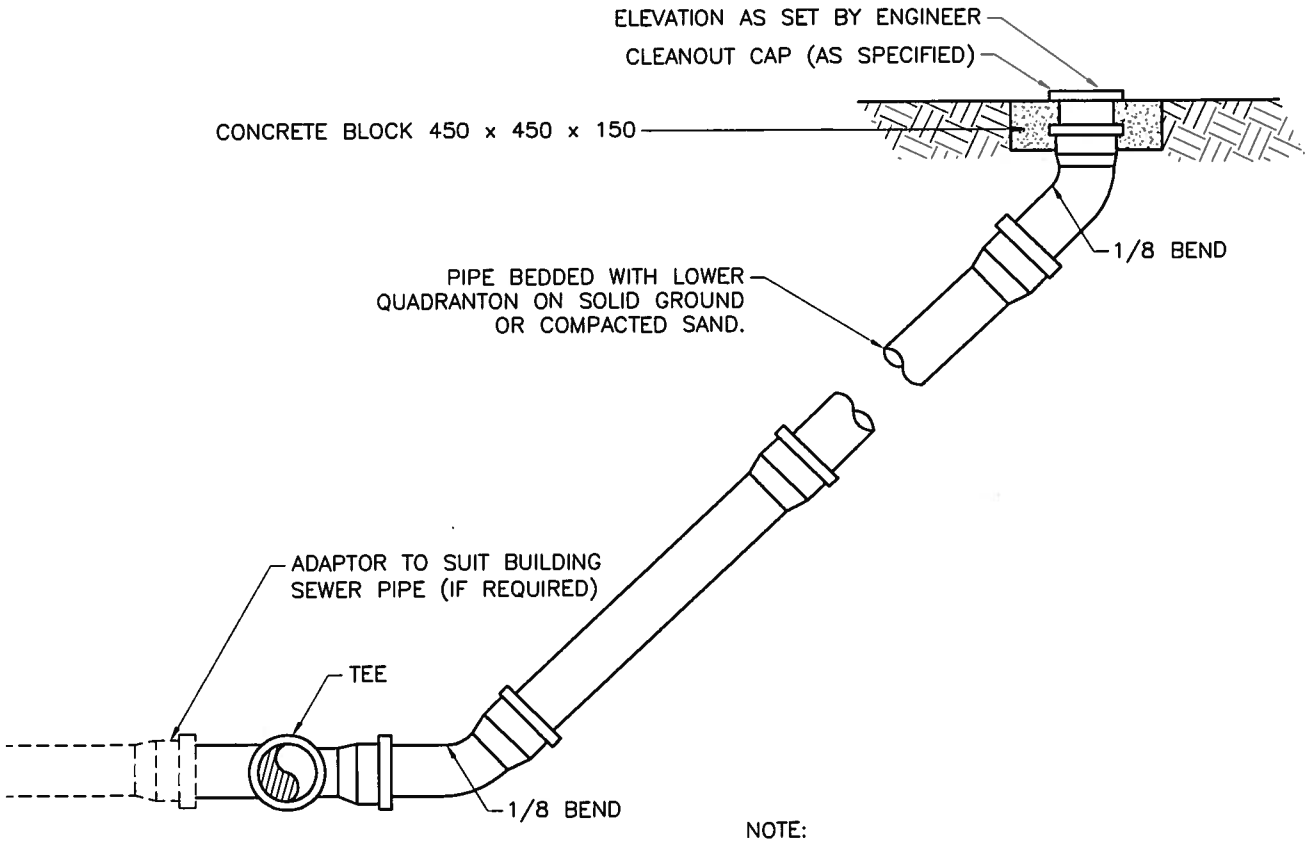

NOTE:
CLEANOUT TO BE INSTALLED ON BUILDING SEWERS WHERE HORIZONTAL DEFLECTION IS GREATER THAN 60° OR WHERE LENGTH OF SEWER SERVICE IS GREATER THAN 30.0 METRES.

SECITON VIEW

	DESIGNED BY: -	APPROVED BY: -	CLIENT: MUNICIPALITY OF CROWSNEST PASS	DATE DRAWN: MARCH 2011
	DRAWN BY: ARB	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: -
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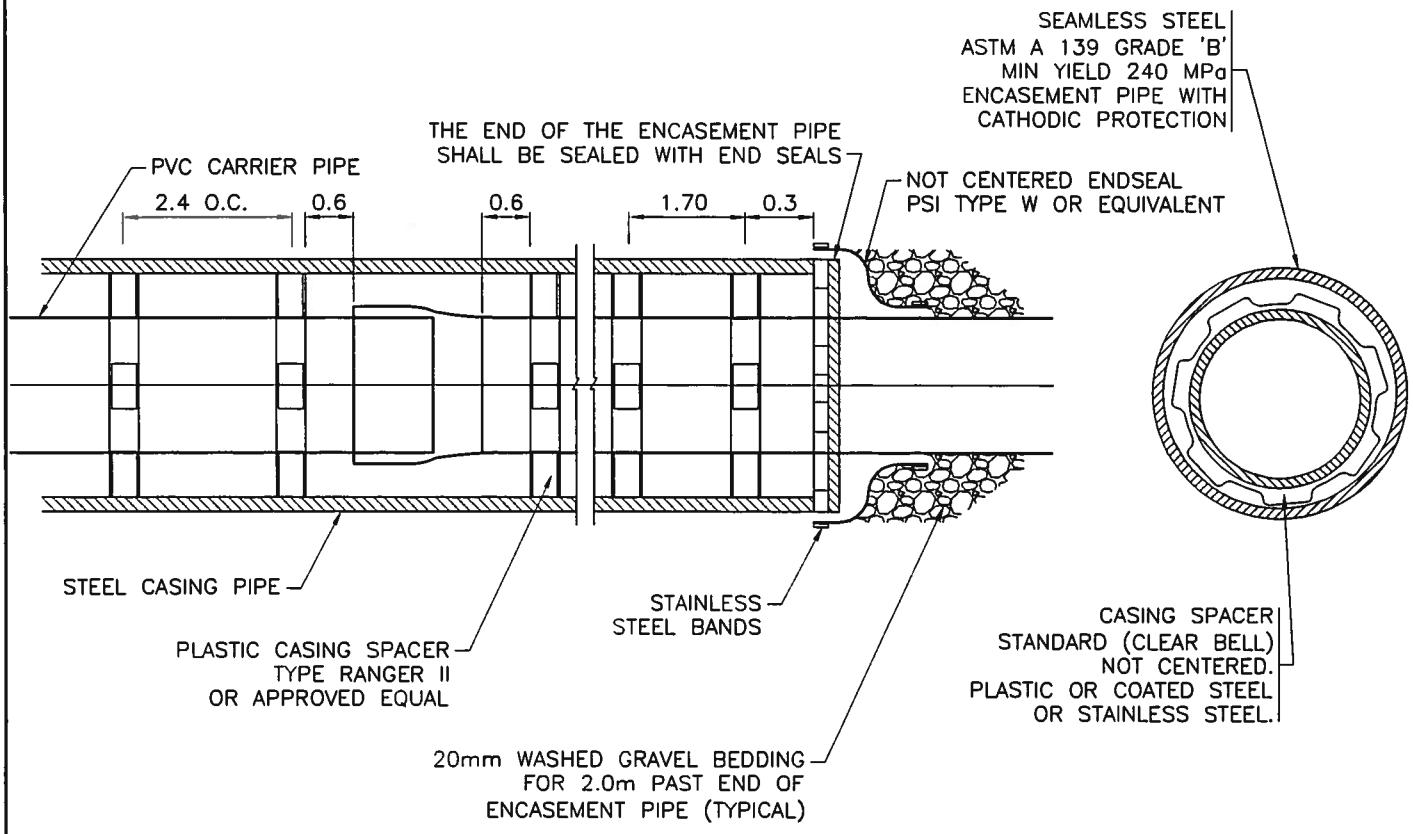

NOTES:

- 10kg ZINC ANODE AT EACH END, PLACED BELOW FROST LINE
- CASING PIPE WILL BE JACKED/BORED, AUGER HEAD COMPLETELY INSIDE PIPE WITH A MINIMUM OF ONE DIAMETER WIDTH FROM FRONT END OF PIPE. NO GROUND DISTURBANCE WITHIN CPR RIGHT OF WAY
- CROSSING TO BE CONSTRUCTED, MAINTAINED AND OPERATED IN ACCORDANCE WITH TRANSPORT CANADA STANDARD (TCE-10), STANDARDS RESPECTING PIPELINE CROSSINGS UNDER RAILWAYS IF CASING PIPE IS INSTALLED UNDER RAILWAY
- INTERIOR OF NEW STEEL PIPE TO BE COATED WITH DEVOE COATINGS "BARRUST 233H" EPOXY COATING. MINIMUM FILM THICKNESS 12.0 mils.

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	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: -
	SCALE: N.T.S.		STANDARD DRAWINGS: TYPICAL STEEL ENCASEMENT AND CARRIER PIPE	JOB NO.: -
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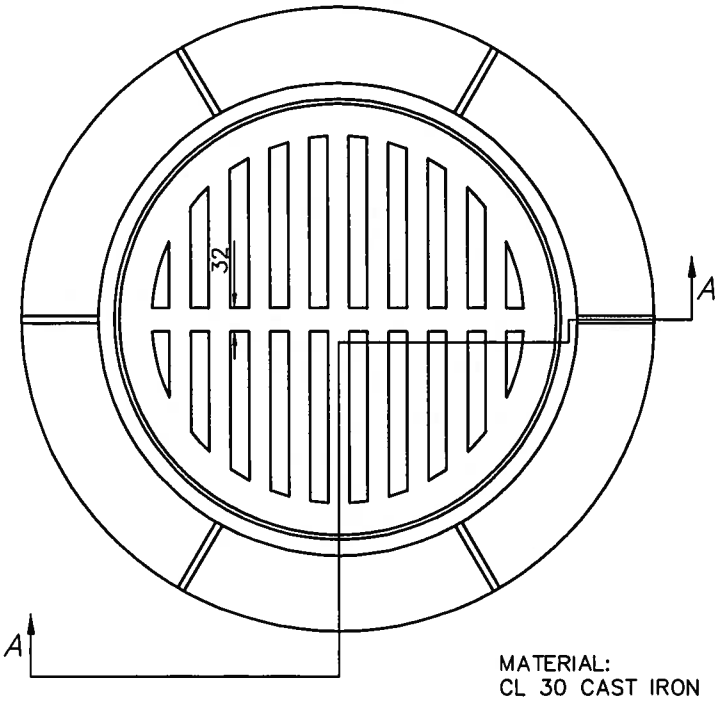
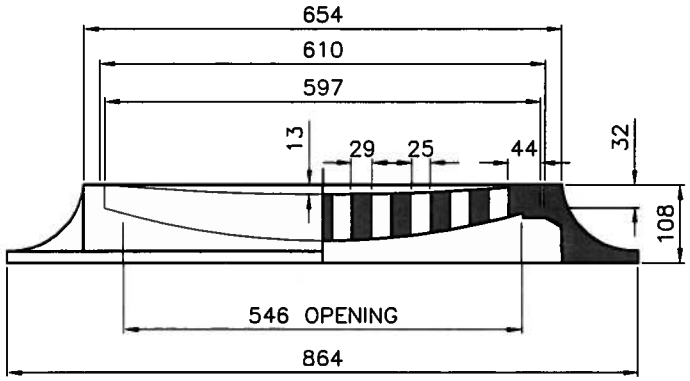
				DRAWING NO.: ST-25



MATERIAL:
CL 30 CAST IRON

PLAN



SECTION A–A

	DESIGNED BY: –	APPROVED BY: –	CLIENT: MUNICIPALITY OF CROWSNEST PASS	DATE DRAWN: MARCH 2011	
	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –	JOB NO.: –
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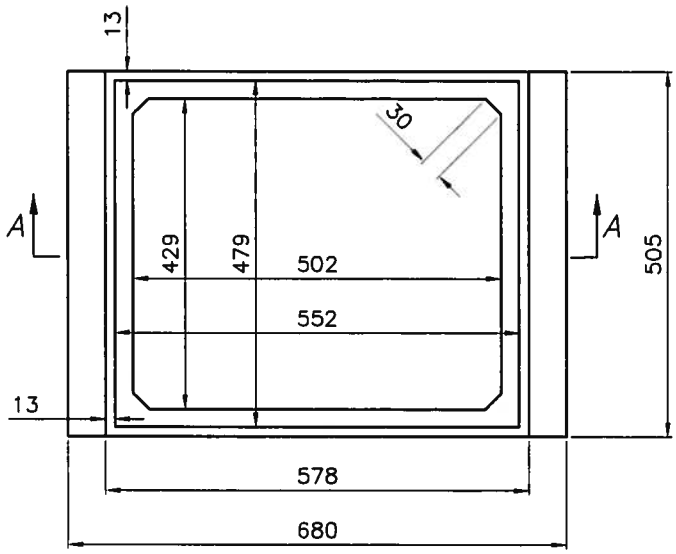
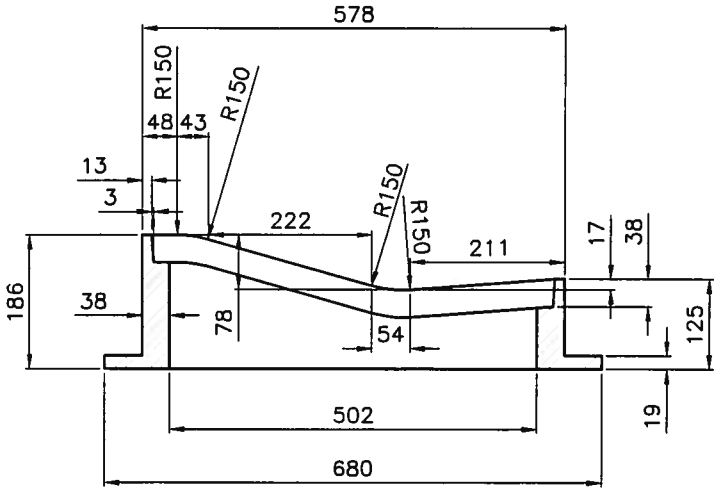


PLAN

FRAME MATERIAL:
CAST IRON
ASTM A48 CL 25B
OR CL 30



SECTION A–A

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	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –	JOB NO.: –
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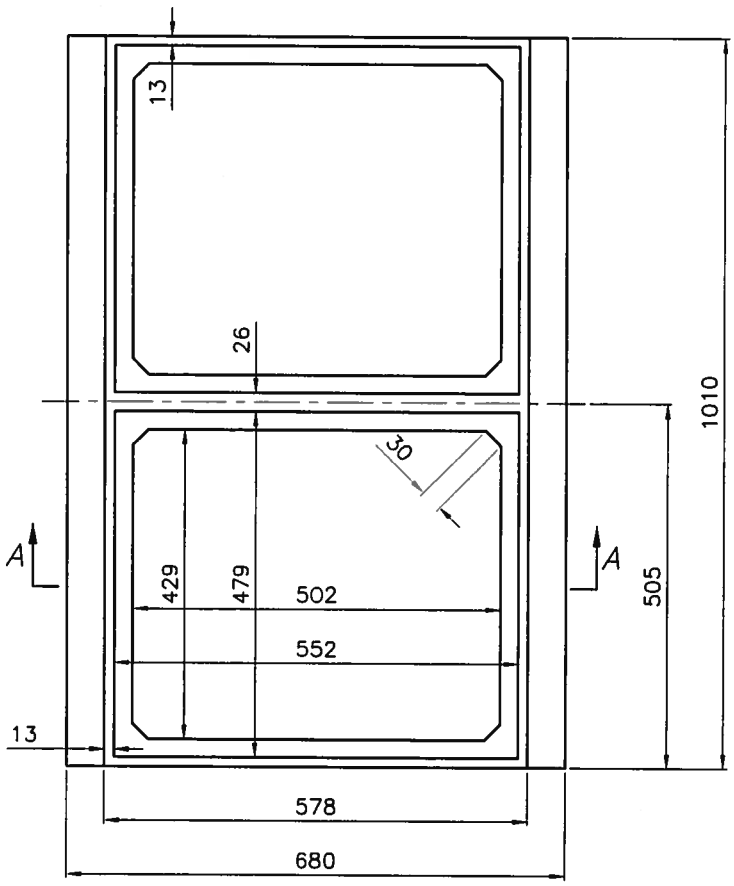
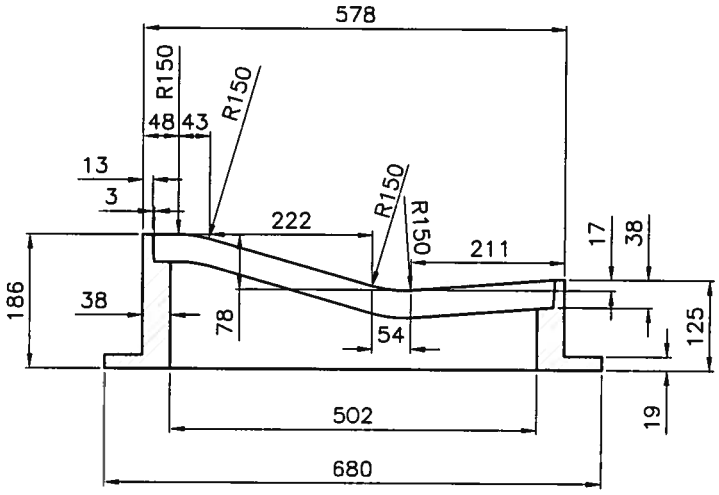


PLAN

FRAME MATERIAL:
CAST IRON
ASTM A48 CL 25B
OR CL 30



SECTION A–A

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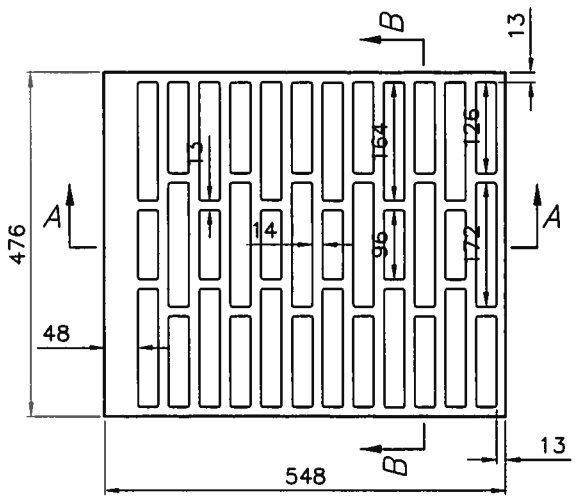
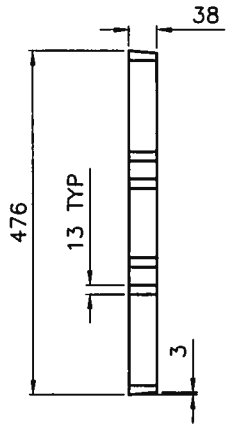
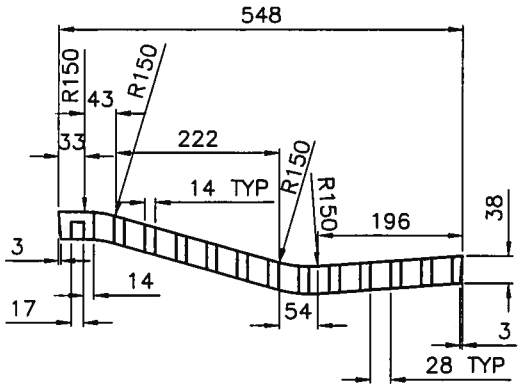
DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –	JOB NO.: –
SCALE: N.T.S.		STANDARD DRAWINGS: DOUBLE CATCHBASIN FRAME ROLLED CURB TYPE	REVISION: 0 STATUS	DRAWING NO.: ST–28



PLAN



SECTION B–B



SECTION A–A

GRATE MATERIAL:
DUCTILE IRON
ASTM A536
GRADE 60–40–18

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	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
	SCALE: N.T.S.		STANDARD DRAWINGS: CATCHBASIN GRATE ROLLED CURB TYPE	JOB NO.: –
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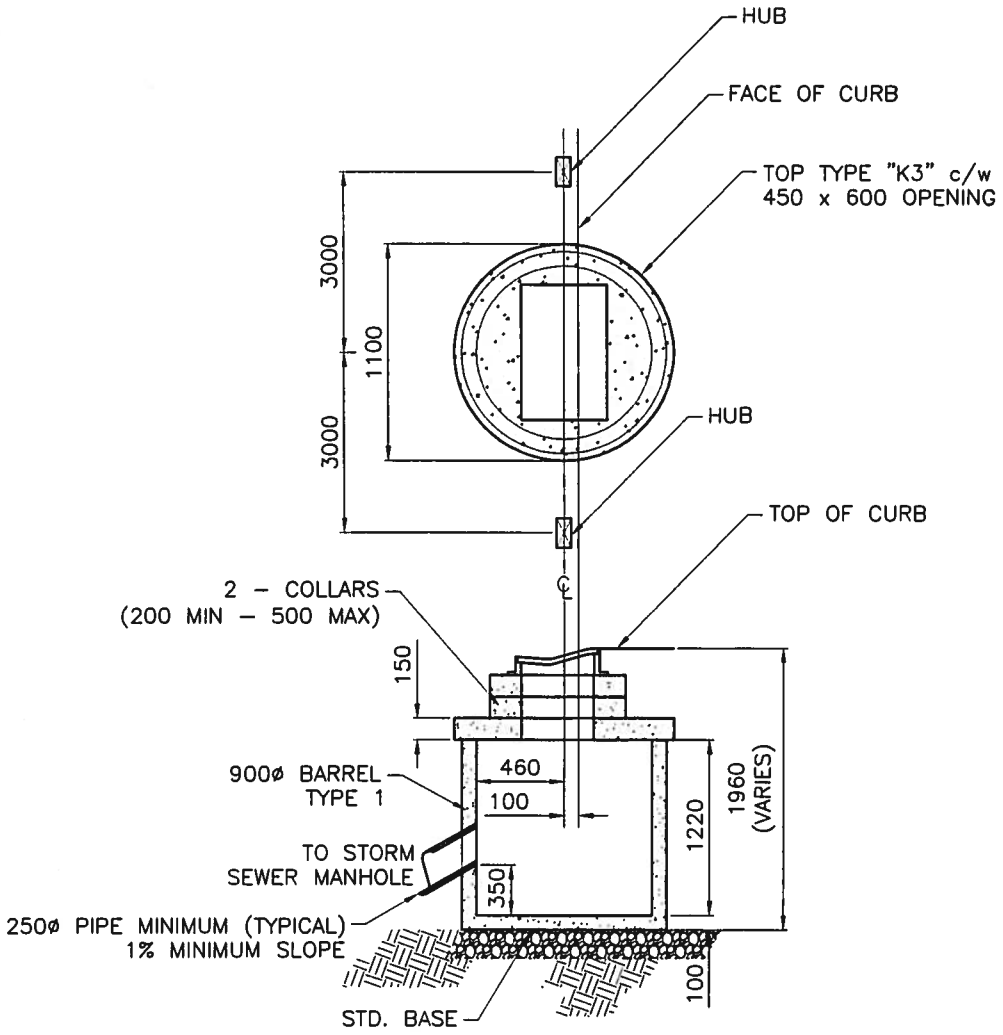

INSTALLING CATCH BASINS

- ALL JOINTS IN PRECAST SECTIONS TO BE SEALED WITH FLEXIBLE BUTYL RUBBER SEALANT (OR APPROVED EQUAL)
- PRECAST SECTION TO CONFORM TO ASTM DESIGNATION C478 (LATEST EDITION)
- NO GRAVEL REQUIRED IF BASE IS SET ON UNDISTURBED SOIL. OTHERWISE 150 MINIMUM THICKNESS
- ALL DIMENSIONS ARE IN MILLIMETRES (mm)
- CEMENT TO BE TYPE 50 (SULPHATE RESISTANT)

	DESIGNED BY: –	APPROVED BY: –	CLIENT: MUNICIPALITY OF CROWSNEST PASS	DATE DRAWN: MARCH 2011
	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
	SCALE: N.T.S.		STANDARD DRAWINGS: CATCHBASIN ROLLED CURB TYPE	JOB NO.: –
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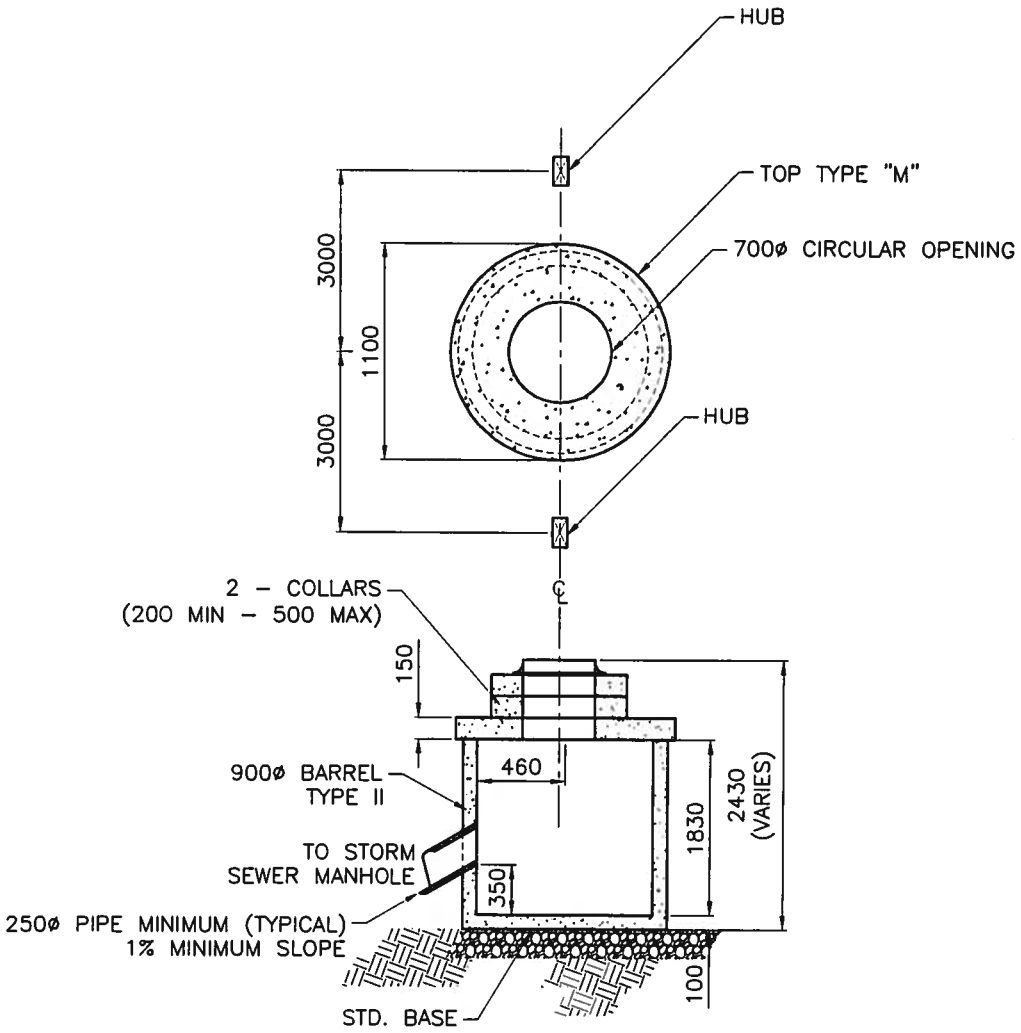

INSTALLING CATCH BASINS

- ALL JOINTS IN PRECAST SECTIONS TO BE SEALED WITH FLEXIBLE BUTYL RUBBER SEALANT (OR APPROVED EQUAL)
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- NO GRAVEL REQUIRED IF BASE IS SET ON UNDISTURBED SOIL. OTHERWISE 150 MINIMUM THICKNESS
- ALL DIMENSIONS ARE IN MILLIMETRES (mm)
- CEMENT TO BE TYPE 50 (SULPHATE RESISTANT)

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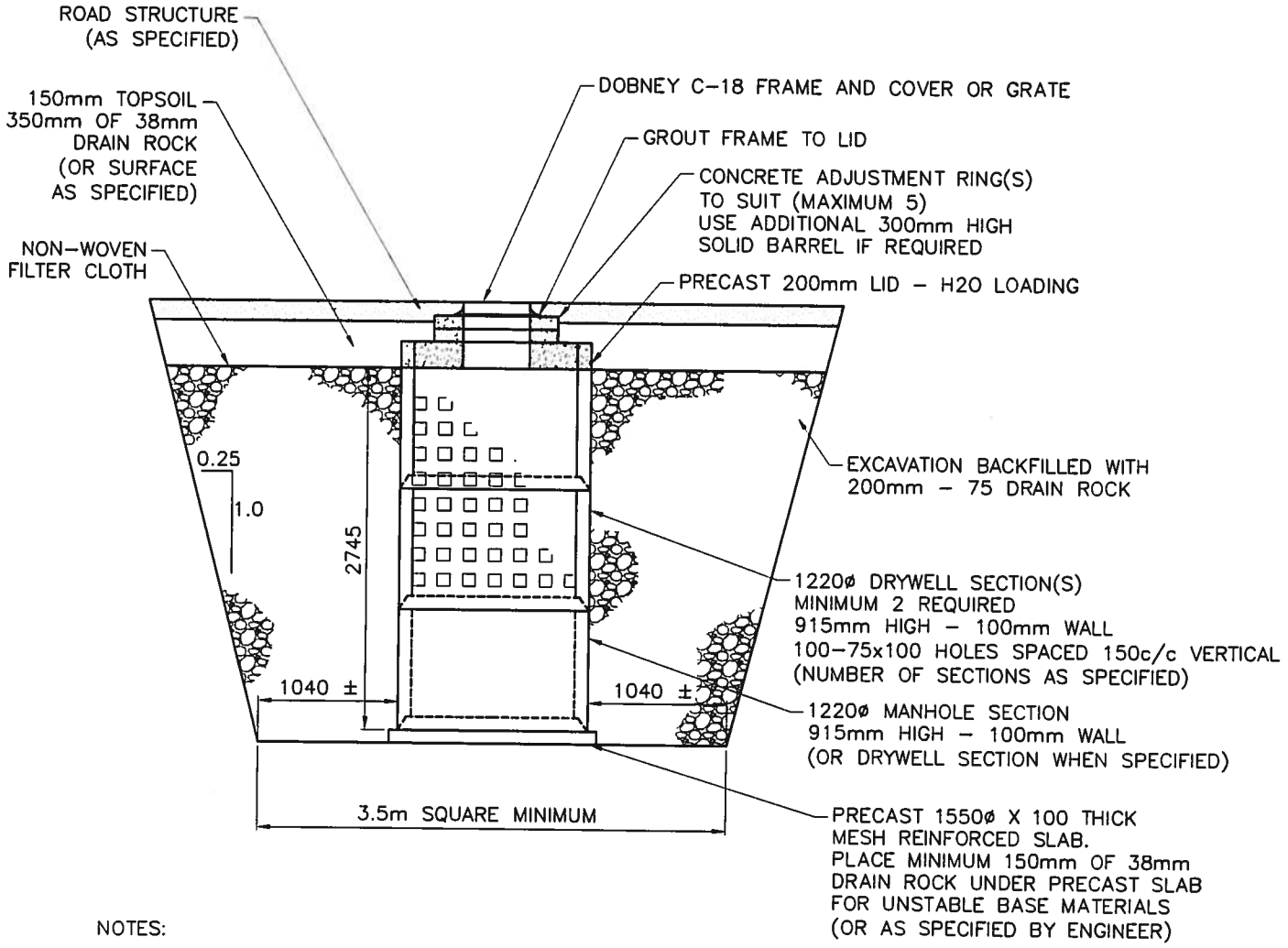
	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
	SCALE: N.T.S.		STANDARD DRAWINGS: CATCHBASIN ROUND TOP TYPE	JOB NO.: –
				REVISION: 0 STATUS
				DRAWING NO.: ST-31



NOTES:

- THE NUMBER OF DRYWELL SECTIONS WILL DEPEND UPON THE AREA BEING DRAINAGED AND THE SOIL CONDITIONS. THE NUMBER OF DRYWELL SECTIONS SHALL BE AS SPECIFIED ON THE DRAWINGS OR SPECIFICATIONS FOR EACH DRYWELL.
- THE NUMBER OF DRYWELL SECTIONS MAY BE MODIFIED, BY THE ENGINEER IN THE FILED, FOR THE EXCAVATED SOIL CONDITIONS.
- WHEN UNSTABLE SOIL CONDITIONS ARE ENCOUNTERED THE EXCAVATION SLOPE MAY BE MODIFIED. WHEN "FLOWING" SANDS OR GRAVELS ARE ENCOUNTERED, THE EXCAVATION SHALL BE LINED WITH FILTER CLOTH TO PREVENT THE MIGRATION OF NATIVE SOILS INTO THE DRAIN ROCK.

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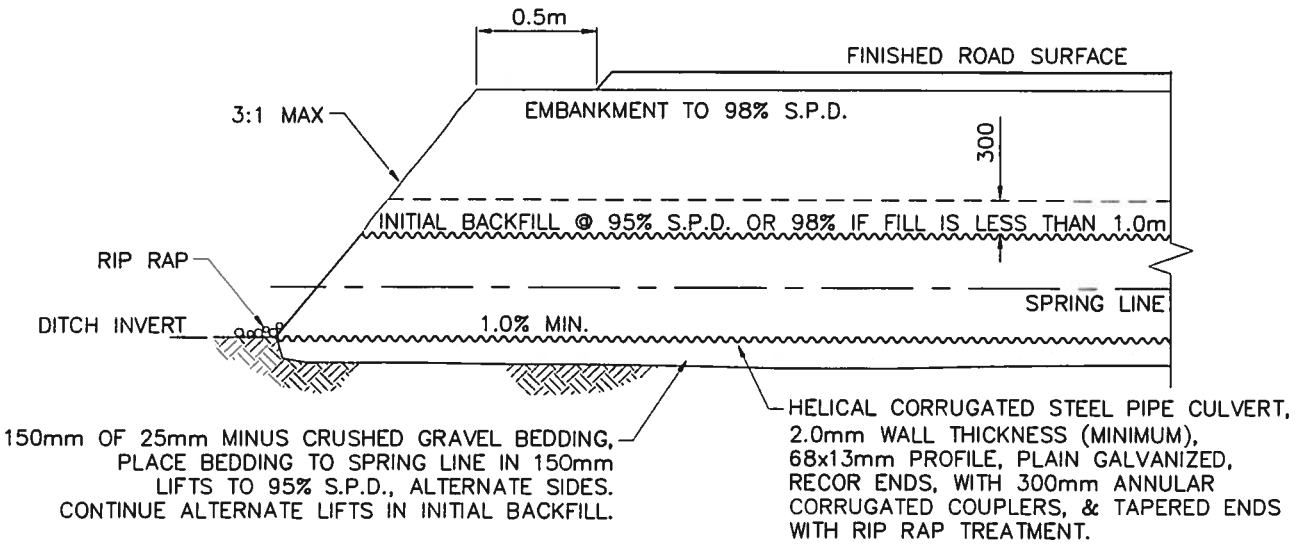
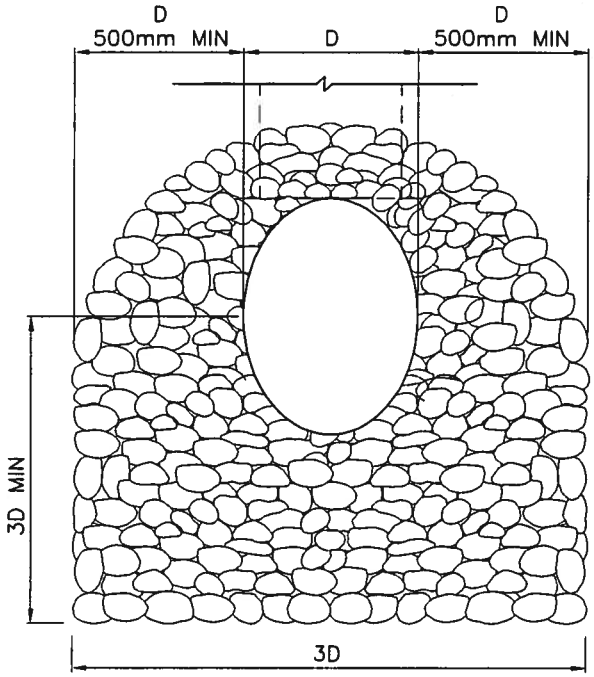
	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.:
	SCALE: N.T.S.		STANDARD DRAWINGS: DRY WELL	JOB NO.: -
				REVISION: 0 STATUS
				DRAWING NO.: ST-32

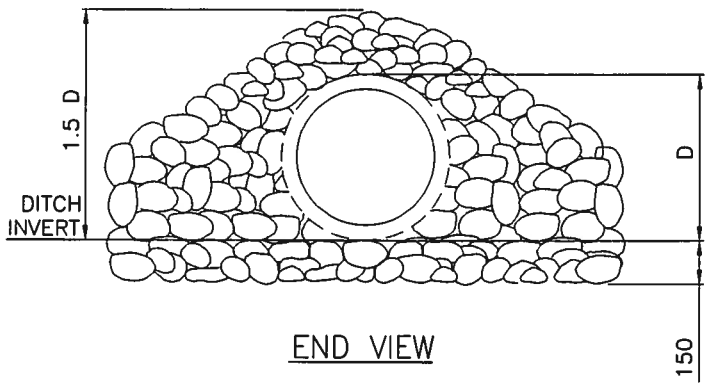


TYPICAL CSP INSTALLATION

CSP CULVERTS – 600ø & 900ø & 1200ø & 1400ø
CSP SHALL BE ARMTEC HEL-COR, 68 X 13 CORRUGATION, 2.0 THICKNESS
COUPLINGS SHALL BE ARMTEC STANDARD ANNULAR CORRUGATED COUPLER
AIT CLASS I RIP RAP TO BE HAND PLACED – MIN. 150ø



PLAN VIEW



END VIEW

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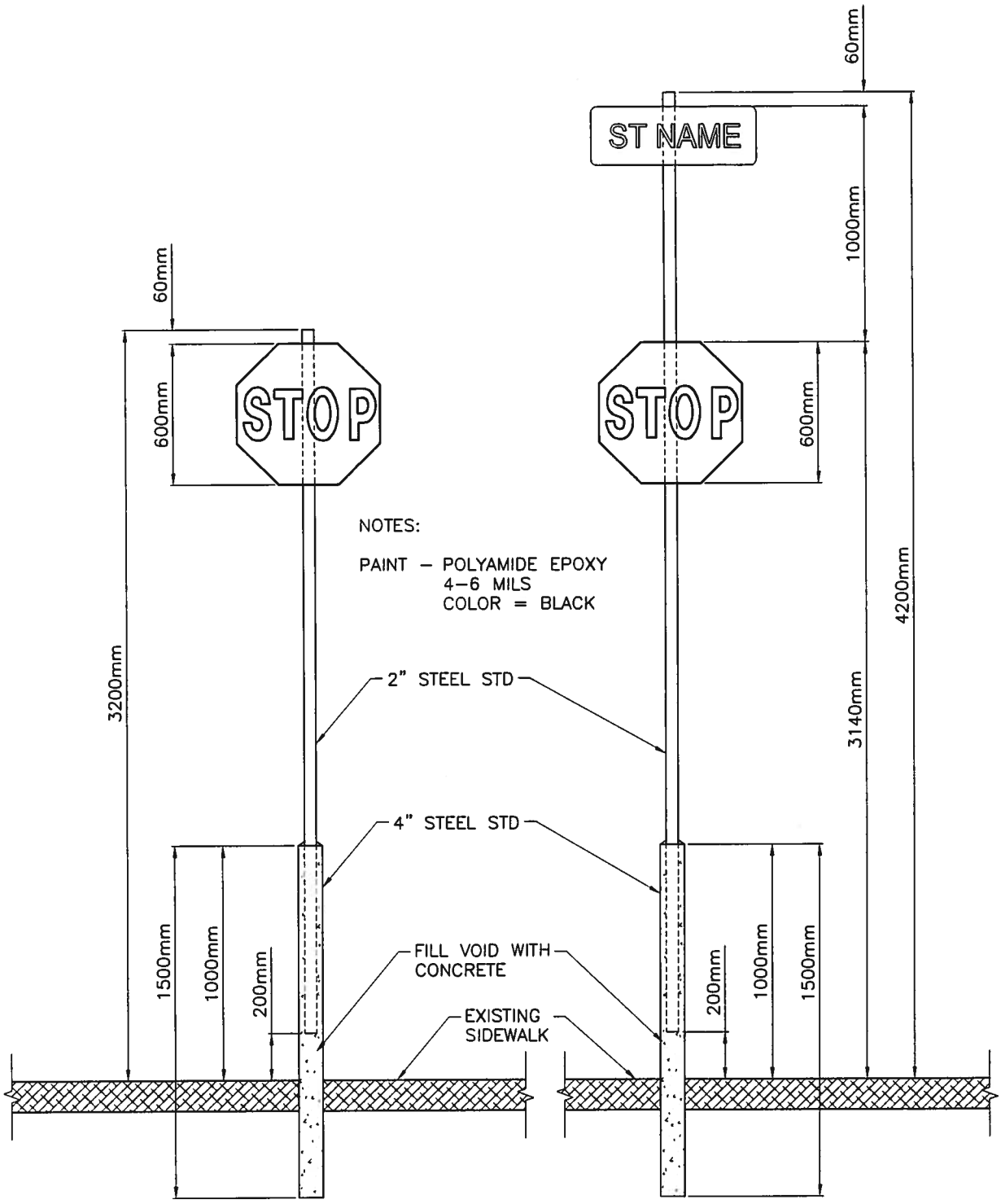
	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
	SCALE: N.T.S.		STANDARD DRAWINGS: CSP CULVERT INSTALLATION	JOB NO.: –
				REVISION: 0 STATUS; DRAWING NO.: ST-33



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	DRAWN BY: RSW	CHECKED BY:	TITLE: ENGINEERING AND DEVELOPMENT STANDARDS	PAGE NO.: –
	SCALE: N.T.S.		STANDARD DRAWINGS: STREET SIGN DETAILS	JOB NO.: –
				REVISION: 0 / STATUS: DRAWING NO.: ST-34