



# **Subdivision and Development Servicing Bylaw**

Bylaw Number 1223, 2008



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## 1.0 BYLAW

### TOWN OF GOLDEN

#### **Subdivision and Development Servicing Bylaw Number 1223, 2008**

WHEREAS the Town of Golden wishes to revise the provisions of the present Subdivision Servicing Bylaw No. 922, 1993 as amended;

AND WHEREAS pursuant to Section 938 of the Local Government Act of British Columbia, a local government, may by bylaw, regulate and require the provision of works and services in respect of the subdivision or development of land;

NOW THEREFORE, the Council of the Town of Golden, in open meeting assembled, enacts as follows:

#### PURPOSE

The primary purpose of this bylaw is to establish standards for works and services which must be constructed and installed to service any subdivision or development of lands in the area within the municipal boundaries of the Town of Golden for the benefit of the community as a whole.

## **2.0 TITLE**

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This Bylaw may be cited as the "Subdivision and Development Servicing Bylaw No. 1223, 2008".

### 3.0 DEFINITIONS

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In this Bylaw, unless the context requires otherwise:

"Applicant" means a person applying for the approval of a subdivision or a person applying for development other than subdivision, whether as the owner of the property proposed to be subdivided or developed or as agent for the owner or his or her contractor.

"Approval, Final" means the Approving Officer's affixation of his or her signature to a subdivision plan pursuant to an Act.

"Approval, Preliminary Layout" means written notification of a review of information presented to the Approving Officer previous to submission of a subdivision plan for final approval.

"Approving Officer" means any person duly authorized by the Council to act as Approving Officer pursuant to the provisions of the Land Title Act.

"Arterial Street" means a roadway with the primary function of carrying all types of through traffic from one area to another and a secondary function of providing access to adjacent parcels of land.

"Boulevard" means that portion of a highway between the curb lines or the lateral boundary lines of a roadway and the adjoining property or between curbs on median strips or islands, but does not include curbs, sidewalks, ditches, or driveways.

"Building Inspector" means the Building Inspector of the Municipality.

"Building Regulations" means Building Regulation Bylaw No. 864 as amended.

"Collector Street" means a roadway with equal priority functions of:

- a) distributing traffic between arterials and lower classifications of roadways such as other collectors and local roadways; and
- b) providing access to adjacent parcels of land

"Community Sewer System" means a sanitary sewer or a system of sewage disposal works which is owned, operated and maintained by the municipality.

"Community Water System" means a waterworks system, within the meaning of the Drinking Water Protection Regulation of the Drinking Water Protection Act, which is owned, operated and maintained by the Municipality, an Improvement District, or which is regulated under the Water Utility Act, and authorized by the Council.

"Council" means the Council of the Town of Golden.

"Cul-de-sac" means a local street that is connected to the remainder of the roadway network at only one point and that terminates in a vehicle-turning area.

"Development" includes an activity that requires or includes a subdivision, a development permit and in some cases a Building Permit.

"Drainage System" means a system of works designed and constructed to control the flow of storm water and/or ground water.

"Final Acceptance" means all works and services are complete, all deficiencies identified over the maintenance period have been rectified and the Manager of Operations certifies that the subdivision is finally accepted by the Municipality in accordance with Section 4.8 of the Bylaw.

"Frontage" means the length of a parcel boundary which immediately adjoins a highway other than a lane or a pathway.

"Highway" means a highway as defined in the Transportation Act.

"Industrial Street" means a local street that provides access to adjacent parcels of industrial zoned land.

"Lane" means a roadway which provides secondary access to adjacent parcels of land and is generally located at the rear of the property.

"Letter of Credit" means a clean, unconditional and irrevocable letter of credit in an amount required by the Bylaw and provided in a form and for a term satisfactory to the Manager of Operations, made in favour of the Municipality, issued in a Canadian Chartered Bank or other Financial institution acceptable to the Manager of Operations and which may be presented and drawn down at any bank of financial institution in the Municipality.

"Local Street" means a roadway with the primary function of providing direct access to adjacent parcels of land and generally connects to other local roadways and collector roadways.

"Manager of Operations" means the manager of operations as appointed by the Town of Golden Council or his or her designate and is responsible for administration this bylaw.

"Medical Health Officer" means the Medical Health Officer appointed under the Health Act.

"Municipality" means the Town of Golden or the area within the municipal boundaries thereof as the context may require.

"Owner" shall be interpreted as defined in the Local Government Act.

"Owner's Engineer" means the Professional Engineer engaged by the Owner to design and prepare drawings for construction of works in a subdivision or development, or his authorized representative.

"Parcel" means any parcel as defined in the Land Titles Act.

"Parcel Line" means a legally defined boundary of any parcel.

"Pathway" means a path which follows routes independent of motor vehicle roadways, sidewalks and bike lanes, intended for use by pedestrians and other non-motorized modes of travel. Pathways include walkways and bikeways.

"Potable Water" means water which is approved for drinking purposes in accordance with the Drinking Water Protection Act.

"Preliminary Layout Review Information" means such drawings, plans, information and documents as the Approving Officer requires, and in such form as is required by the Municipality, to determine, on a preliminary basis:

- a) whether the proposed Subdivision would be against the public interest or otherwise unsuitable for Subdivision; and
- b) if not against the public interest or otherwise unsuitable for Subdivision, what the Owner must include in the Application for Subdivision Approval.

"Professional Engineer" means a person who is registered or duly licensed as such under the provisions of the Engineers and Geoscientists Act of British Columbia.

"Roadway" means the portion of the highway that is improved, designed or ordinarily used for vehicular traffic.

"Service Level" means the standard of municipal services required for development of subdivisions under the provisions of this Bylaw.

"Street" means a roadway except a lane, trail, or pathway.

"Subdivision" means the division of land into two or more parcels by plan or apt descriptive words.

"Total Performance" means 100% completion of all works and services without defects or deficiencies.

"Watercourse" means any natural or man-made drainage course or source of water, whether usually containing water or not, and includes any lake, river, creek, spring, ravine, swamp, gulch, or source of groundwater, whether enclosed in a conduit or not, or as required by a designated official of the Ministry of Environment

"Zone" means an area created by the Zoning Bylaw of the Town of Golden as amended or as replaced from time to time both before and after the effective date of this Bylaw.

## **4.0 SUBDIVISION AND DEVELOPMENT REQUIREMENTS AND REGULATIONS**

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### **4.1 COMPLIANCE WITH BYLAW**

No person shall subdivide or develop land in the Municipality except in compliance with the provisions of this Bylaw.

### **4.2 PRELIMINARY LAYOUT REVIEW**

An Owner who wishes to subdivide land, must provide, prior to making an Application for Subdivision Approval, the Municipality with Preliminary Layout Review Information and non-refundable fees in connection therewith. Following receipt of the Preliminary Layout Review Information, the Approving Officer will provide the Owner with a Preliminary Layout Review Letter advising the Owner of the Approving Officer's preliminary determination. The provision, by the Owner, of Preliminary Review Layout information, will not constitute an Application for Subdivision Approval under this Bylaw or the *Land Title Act*, and the Approving Officer's response, whether in the form of a Preliminary Layout Review Letter or otherwise, will not constitute approval, conditional or otherwise, of an application for Subdivision Approval under this Bylaw or the *Land Title Act*, or require the Approving Officer to approve an Application for Subdivision Approval.

### **4.3 MINIMUM FRONTAGE**

The Approving Officer may exempt a person proposing to subdivide land from any prescribed minimum frontage, or from the limitation provided under Subsection (1) of Section 944 of the Local Government Act.

## **5.0 PROVISION OF SERVICES IN SUBDIVISIONS AND DEVELOPMENTS**

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### **5.1 LEVEL OF SERVICE**

Unless otherwise approved by a Development Variance Permit issued by the Council pursuant to Section 938 of the Local Government Act, all subdivisions and developments shall be provided with services as prescribed in Schedule A of this Bylaw and the level of services required may be different for different zones as established by the Zoning Bylaw in accordance with the provisions of Schedule A of this Bylaw.

### **5.2 SUBDIVISIONS WHERE SERVICING REQUIREMENTS MAY BE WAIVED**

Notwithstanding Subsection 4.1, the servicing requirements prescribed in Schedule A of this Bylaw are not required where the parcel created is to be used solely for the unattended equipment necessary for the operation of any one of the following:

- a community water system;
- a community sewer system;
- a community gas distribution system;
- a community radio or television receiving antennas;
- a radio or television broadcasting antenna;
- a telecommunications relay station;
- an automatic telephone exchange;
- an air or marine navigational aid;
- electrical substations or generating stations;
- any other similar public service or quasi public service facility or utility;
- surface parking parcels;
- common parcel accesses;
- a park; or
- a cemetery

Where the servicing requirements for parcels have been waived under this section, all parcels must be included in a Section 219 covenant.

### **5.3 EXPENSE OF SERVICES TO BE BORNE BY OWNER**

Unless otherwise provided in this Bylaw, all works and services required to be provided by this Bylaw shall be constructed and installed at the expense of the Owner or Applicant.

### **5.4 INSURANCE**

The Owner must provide and maintain, at the Owner's expense, at all times until the Certificate of Final Acceptance is issued, Comprehensive General Liability Insurance coverage, covering premises and operations liability, contingency liability with respect to the operations of contractors and sub-contractors, completed operations liability, contractual liability and automobile liability for owned, non-owned and hired units. The limits of liability must be not less than \$5,000,000 for each occurrence for bodily injury, death and damage to property. Each policy must provide that it cannot be cancelled, lapsed, or materially altered without at least thirty (30) days' notice in writing to the Municipality by registered mail, must name the Municipality and its officials and employees as an additional insured, and must contain a cross-liability clause. The insurance coverage required to be provided by the Owner may be embodied in a blanket insurance policy obtained by the Owner. The Owner must deliver a copy of each insurance policy to the Municipality prior to the commencement of Construction of the Works and Services. If the Owner fails to obtain and maintain the said insurance or deliver the said policy or policies to the Municipality, the Municipality may but will not be obliged to obtain and maintain such insurance at the expense of the Owner.

### **5.5 SUBDIVISION APPROVAL PRIOR TO COMPLETION OF WORKS AND SERVICES**

All works and services to be constructed and installed to serve any development or proposed subdivision of any lands shall be constructed and installed in strict compliance with the regulations standards and specifications as prescribed in Schedules A to H hereto at the expense of the Applicant prior to the approval of such subdivision by the Approving Officer. A plan of subdivision may be finally approved prior to the Total Performance of the construction and installation of the required works and services where the Applicant deposits a letter of credit with the Town of Golden in the amount of One Hundred and Twenty Five Percent (125%) of the cost of installing and paying for all the works and services required as estimated by the Owner's Engineer and approved by the Manager of Operations before the subdivision plan is approved by the Approving Officer, and enters into a form of agreement with the Municipality as contained in Schedule J hereto for subdivisions

pursuant to the Land Title Act of the Province of British Columbia, to do all things required to carry out and construct the necessary works and services.

## **5.6 MAINTENANCE**

Where the Owner of the land is required to construct and install works and services in accordance with the provisions of this Bylaw, the owner shall:

- .1 operate and maintain the works constructed and installed for twenty-four (24) months.
- .2 provide the Municipality with a maintenance bond or letter of credit as security against unsatisfactory operation and maintenance of the works and services during the maintenance period in an amount no less than 10% of the cost of all works associated with the development or subdivision and approved by the Manager of Operations.

## **5.7 TOTAL PERFORMANCE**

Upon 100% completion of the works, the Owner's Engineer must schedule a field inspection with the Manager of Operations. Prior to verification by the Manager of Operations that Total Performance of all the Works has been achieved, the Owner must provide the Municipality with:

- .1 a Certificate of Total Performance prepared by the Owner's Engineer with respect to all Works and Services;
- .2 a confirmation of Professional Assurance in the form specified in Schedule M;
- .3 confirmation in writing from the Land Surveyor (B.C.L.S.) that all survey pins have been installed on the Parcel;
- .4 as-built drawings of the Works and Services in the form specified in Schedule I; and
- .5 all copies of required manuals, videos, testing reports and results, and completed Building Grade Slips in the form specified in Schedule N.

## **5.8 FINAL ACCEPTANCE**

Upon the expiration of the Maintenance Period, receipt from the Owner of a Statutory Declaration and verification by the Manager of Operations that all information, documents, agreements, covenants, and fees required from the Owner and Consulting Engineer pursuant to this Bylaw have been provided to the Municipality, the Municipality will:

- .1 provide the Owner with a Final Acceptance Certificate of all Works and Services; and
- .2 release to the Owner the balance of the Maintenance Bond or letter of credit.

## **5.9 RIGHT-OF-WAY AGREEMENT**

Where the provisions of this Bylaw require an Owner to grant a utility or drainage right-of-way to the Municipality, the Owner shall be required to enter into an agreement as prescribed in Schedule K of this Bylaw and shall pay all associated costs.

## **5.10 DESIGN AND FIELD REVIEW OF CONSTRUCTION BY A PROFESSIONAL ENGINEER**

All engineering drawings required in this Bylaw for works and services, shall be prepared by a Professional Engineer registered to practice in the Province of British Columbia.

The Applicant shall engage a Professional Engineer to carry out all necessary field reviews and inspections during the construction of works and services required as a condition of subdivision or development approval. The Professional Engineer shall submit a report in the format set out in Schedule N of this Bylaw certifying that the works and services have been carried out in compliance with this Bylaw and the plans, drawings and supporting documents submitted in support of the subdivision or development application which were accepted by the Municipality.

All applications for subdivision or development shall include a letter of commitment from the Applicant in the format set out in Schedule L of this Bylaw, that a Professional Engineer has been engaged to carry out all necessary design works and undertake all field services for the subdivision or development.

### **5.11 EXCEPTION FOR SERVICE CONNECTION**

Notwithstanding Section 4.10 above, in a subdivision or development where only service connections to existing works and services are required, no Professional Engineer is required to be engaged.

### **5.12 SITE PREPARATION**

In no case shall land be excavated, filled, paved or gravelled or the surface features of land otherwise be altered for the purpose of development without the prior written approval of the Approving Officer or Manager of Operations.

### **5.13 OFF-SITE SERVICES**

The Applicant may be required to contribute towards the cost of upgrading or upsizing of off-site roadways and utilities.

### **5.14 DUST CONTROL**

During construction of works and services, the Applicant shall be responsible for providing for and maintaining dust control at all times wherever:

- a) the operation of any equipment causes dust that becomes a nuisance to property owners and residents in the area;
- b) bare soil conditions are created in performing work;
- c) should the Applicant not implement dust control procedures as required or as directed by the Manger of Operations, the Municipality will undertake the dust control procedures and back charge the Applicant to recover all costs incurred including such things as engineering and administration costs, wages, equipment costs, etc.

### **5.15 CLEAN-UP**

During construction of works and services within the subdivision or development, the Applicant shall be responsible for ensuring that the construction area shall be maintained free of accumulation of excess waste material and debris.

The disposal of waste materials and rubbish by burning or burial on the site will not be permitted. The disposal of volatile wastes such as mineral spirits, oil, gasoline or paint thinner into storm or sanitary sewer drains will not be permitted.

During and after construction of works and services, the Applicant shall be responsible for ensuring that all access streets into the subdivision or development are maintained free of accumulation of excess waste material and debris. The Municipality reserves the right to carry out the maintenance of such access streets and charge the cost of such work to the Applicant, if the Applicant fails to restore the street(s) to normal levels within a week of being notified in writing by the Municipality.

#### **5.16 MASTER MUNICIPAL SPECIFICATIONS, 2000 GOLD BOOK EDITION**

The provisions of this Bylaw are to be applied in conjunction with the *Master Municipal Specifications, 2000 Gold Book Edition*, which otherwise apply to all Works and Services constructed within the Municipality.

The provisions of this Bylaw supersede the provisions of the Master Municipal Specifications.

Where the provisions of this Bylaw are in conflict with the Master Municipal Specifications, the provisions of this Bylaw take precedence, unless otherwise agreed to in writing by the Manager of Operations.

#### **5.17 MASTER MUNICIPAL CONSTRUCTION DOCUMENT, DESIGN GUIDELINE MANUAL 2005**

The provisions of this Bylaw are to be applied in conjunction with the *Master Municipal Design Guideline Manual, 2005*, which otherwise applies to all Works and Services constructed within the Municipality.

The provisions of this Bylaw supersede the provisions of the Master Municipal Design Guideline Manual.

Where the provisions of this Bylaw are in conflict with the Master Municipal Design Guideline Manual, the provisions of this Bylaw take precedence, unless otherwise agreed to in writing by the Manager of Operations.

## **5.18 ALTERNATIVE DEVELOPMENT STANDARDS**

Despite the standards outlined in this bylaw, the Town of Golden supports the use of Alternative Development Standards that are designed by a Professional Engineer and are climate specific to Golden. These standards must be approved by the Manager of Operations.

## **6.0 SERVICING REQUIREMENTS FOR SUBDIVISIONS UNDER THE LAND TITLE ACT**

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### **6.1 HIGHWAYS**

All highways created by plan of subdivision, including the widening of highways, shall:

- .1 comply with the dimensions, location, alignment, and gradient requirements set out in Schedules A and B of this Bylaw; and;
- .2 be cleared, graded and surfaced in accordance with standards set out in Schedules A and B of this Bylaw.

### **6.2 SIDEWALKS, CURBS AND GUTTERS**

In subdivisions where highways are created, sidewalks and curbs and gutters shall be provided as required in Schedule A and constructed in accordance with the standards set out in Schedule C of this Bylaw.

### **6.3 STREET LIGHTING**

In subdivisions where highways are created, street lighting shall be provided as required in Schedule A and constructed in accordance with the standards set out in Schedule G of this Bylaw.

### **6.4 ELECTRICAL AND COMMUNICATIONS WIRING AND GAS DISTRIBUTION SYSTEM**

In subdivisions, each parcel shall be provided with power supply consistent with the standards set out in Schedule A and Schedule H of this Bylaw. Where telephone, cablevision, fibre optics and gas service are to be provided, such services shall be provided consistent with the standards set out in Schedule A and Schedule H of this Bylaw.

### **6.5 WATER DISTRIBUTION SYSTEM**

In subdivisions, each parcel shall be supplied with a complete water distribution system connected to a community water system as required in Schedule A, and all

system components shall be installed in accordance with the standards set out in Schedule D of this Bylaw.

## **6.6 SANITARY SEWER**

In subdivisions, each parcel shall be provided with a complete sewage collection system connected to the community sanitary sewer system as required in Schedule A of this Bylaw and all system components shall be installed in accordance with the standards set out in Schedule E of this Bylaw.

## **6.7 DRAINAGE SYSTEM**

In subdivisions, each parcel shall be provided with a complete and fully operative drainage system as required in Schedule A of this Bylaw and constructed in accordance with the standards set out in Schedule F of this Bylaw.

## **7.0 SERVICING REQUIREMENTS FOR DEVELOPMENTS NOT REQUIRING SUBDIVISION**

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### **7.1 DEVELOPMENTS NOT REQUIRING SUBDIVISION**

As a condition of the issuance of a building permit on a site being developed, the Council may require that the Applicant provide works and services which are directly attributable to the development consistent with the provisions of this section.

Prior to issuing a building permit on a site being developed, the Council may require the Applicant to prepare a site servicing plan and details prepared by a Professional Engineer which shall identify how the Applicant intends to construct services on the site. All site servicing plans must provide for works and services that comply with the regulations, standards and specifications for works and services provided by this Bylaw. Where in any case, Council does require works and services as the condition of an issuance of a building permit, such services as required shall be provided as follows:

#### **6.1.1 Domestic Water**

Where community water is required by Council, the water distribution system on the parcel shall be constructed and connected to the community water system consistent with a site servicing plan reviewed by the Manager of Operations and in accordance with the provisions of Schedule D of this Bylaw.

#### **6.1.2 Sanitary Sewer**

Where Council requires a community sewer system, the sewage collection system on the parcel shall be constructed and connected to the community sewer system consistent with a site servicing plan reviewed by the Manager of Operations and in accordance with the provision of Schedule E of this Bylaw.

#### **6.1.3 Site Drainage**

Where Council requires site drainage collection and disposal facilities, such facilities shall be provided in accordance with a site servicing plan reviewed

by the Manager of Operations and in accordance with the provision of Schedule F of this Bylaw.

**6.1.4 Access Roadways and Parking**

Where Council requires on-site parking or on-site loading facilities, the development shall be provided with vehicle access from a highway or highways reviewed by the Manager of Operations.

For developments located on sites fronting on a controlled access highway designated pursuant to the Transportation Act, the proposed method of providing access to the site shall also be subject to the approval of the Ministry of Transportation.

**6.1.5 Power, Telephone, Cablevision, Gas and Fibre Optics**

Where required by Council, all power, telephone, cablevision, gas and fibre optics wiring and/or ducts shall be installed consistent with the provisions of Schedule A and Schedule H of this Bylaw.

## **8.0 SERVICING REQUIREMENTS FOR HIGHWAYS ABUTTING A SITE BEING SUBDIVIDED OR DEVELOPED**

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### **8.1 SERVICING REQUIREMENTS FOR HIGHWAYS ABUTTING A SITE BEING SUBDIVIDED OR DEVELOPED**

As a condition of the approval of a subdivision or development or the issuance of a Building Permit, Council may by resolution in any case, require that the Applicant provide works and services directly attributable to the development on that portion of a highway immediately adjacent to the site being subdivided or developed, up to the centreline of the highway for items (a) and (b) below only. Works and services which may be required include:

- a) Highway improvements including clearing, grading and surfacing in accordance with the standards set out in Schedules A and B and F of this Bylaw.
- b) Sidewalk, curb and gutter improvements in accordance with the standards set out in Schedules A and C of this Bylaw.
- c) Water system improvements including construction of water distribution components in accordance with the standards set out in Schedule D of this Bylaw.
- d) Sewer system improvements including construction of sewage collection system components in accordance with the standards set out in Schedule E of this Bylaw where Schedule A of this Bylaw requires the development of a sewer system.
- e) Drainage system improvements including the provision of drainage facilities as required in Schedule A of this Bylaw, and construction of specific drainage system improvements in accordance with the standards set out in Schedule F of this Bylaw.
- f) Where the provisions of Schedule A require underground wiring, all power, telephone and cablevision, ducting and junction facilities shall be installed in accordance with the provisions of Schedule H of this Bylaw.

## **9.0 ADMINISTRATION AND ENFORCEMENT**

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### **9.1 APPLICATION FEE**

An applicant for subdivision approval shall submit with the application a fee in the amount prescribed by the "Town of Golden Development Application Fees Bylaw" as amended from time to time.

### **9.2 OTHER FEES**

Where the Owner of land is required to construct and install works and services in accordance with the provisions of this Bylaw, the Owner will pay to the Municipality all administration fees, engineering fees and legal fees that are incurred by the Municipality attributable to all enquiries related to servicing standards and capacities, submissions for preliminary layout approval and submissions for final approval of a subdivision and the Inspection Fees as specified in Schedule J.

### **9.3 AUTHORIZATION TO ENTER ON LANDS BEING SUBDIVIDED OR DEVELOPED**

Officers of the Municipality, or their designates, are authorized to enter, at all reasonable times, upon the lands for which application to subdivide has been made or for which development is proposed, in order to ascertain whether the provisions of this Bylaw are being met.

### **9.4 VIOLATION**

Every person who:

- a) violates any of the provisions of this Bylaw;
- b) causes or permits any act or thing to be done in contravention or violation of any of the provisions of this Bylaw;
- c) neglects or omits to do anything required under this Bylaw;
- d) carries out, causes or permits to be carried out any development in a manner prohibited by or contrary to any of the provisions of this Bylaw;
- e) fails to comply with an order, direction or notice given under this Bylaw;

- f) prevents or obstructs or attempts to prevent or obstruct the authorized entry of an officer on property under Section 8.3;

commits an offence and upon summary conviction be subject to the penalties provided in this Bylaw.

## **9.5 OFFENCE**

Each day's continuance of an offence under Section 8.4 constitutes a new and distinct offence.

## **9.6 PENALTY**

Any person who violates any of the provisions of this Bylaw shall, on summary conviction, be liable to a penalty not exceeding \$10,000 plus the cost of prosecution for each offence.

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## **9.7 SEVERABILITY**

If any section, subsection, sentence, clause or phrase of this Bylaw is for any reason deemed to be invalid by the decision of any court of competent jurisdiction, the invalid portion shall be severed and the decision that it is invalid shall not affect the validity of the remainder of this Bylaw.

## **9.8 SCHEDULES FORM PART OF BYLAW**

Schedules "A" through "O" are attached to and form part of this Bylaw.

**10.0 ENACTMENT**

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**10.1 REPEAL OF PREVIOUS BYLAW**

Subdivision Control Bylaw Number 922, 1993 and all amendments thereto, is hereby repealed.

**10.2 BYLAW ADOPTION**

This Bylaw shall take effect upon adoption by the Council of the Town of Golden.

READ A FIRST TIME THIS 18<sup>th</sup> DAY OF March, 2008.

READ A SECOND TIME THIS 18<sup>th</sup> DAY OF March, 2008.

READ A THIRD TIME THIS 18<sup>th</sup> DAY OF March, 2008.

ADOPTED THIS 1<sup>st</sup> DAY OF April, 2008.

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MAYOR

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CORPORATE OFFICER

**11.0 SCHEDULE A - LEVEL OF SERVICE**

## 1.0 ESTABLISHMENT OF SERVICE LEVELS

Within the Municipality, different service levels will be required for new subdivisions and developments in different areas of the Municipality. Two service levels have been established, and the area to which each service level is to be applied is delineated in Map A-1 which forms part of Schedule A.

### 2.0 SERVICE LEVEL 1

The following services shall be provided in all new subdivisions or developments requiring a development permit under the Town of Golden Official Community Plan in areas delineated in Map A-1 as "Service Level 1".

Highway Standard 1 as defined in Schedule B including:

- .1 asphaltic concrete paving on roadways, pathways and lanes
- .2 curb and gutter
- .3 sidewalks as required in Schedule B
- .4 underground power, telephone and cablevision
- .5 ornamental street lighting unless non-ornamental street lighting is approved by the Manager of Operations in writing

Water distribution system and connection to community water system.

Sanitary sewer collection system and connection to community sanitary sewer system.

Stormwater drainage in accordance with a drainage plan as required in Schedule F.

### 3.0 SERVICE LEVEL 2

The following services shall be provided in all new subdivisions or developments requiring a development permit under the Town of Golden Official Community Plan in areas delineated in Map A-1 as "Service Level 2".

Highway Standard 2 as defined in Schedule B including:

- .1 asphaltic concrete paving on roadways, pathways and lanes
- .2 overhead wiring for power, telephone and cablevision
- .3 street lighting

Water distribution system and connection to community water system for domestic purposes; for industrial water usage, the Owner may be required to provide an alternate source of supply.

Sanitary sewer collection system and connection to community sanitary sewer system for domestic purposes; for sewage generated by industrial use, the Owner may be required to provide alternate treatment and disposal facilities.

Surface stormwater drainage in accordance with a drainage plan as required in Schedule F.

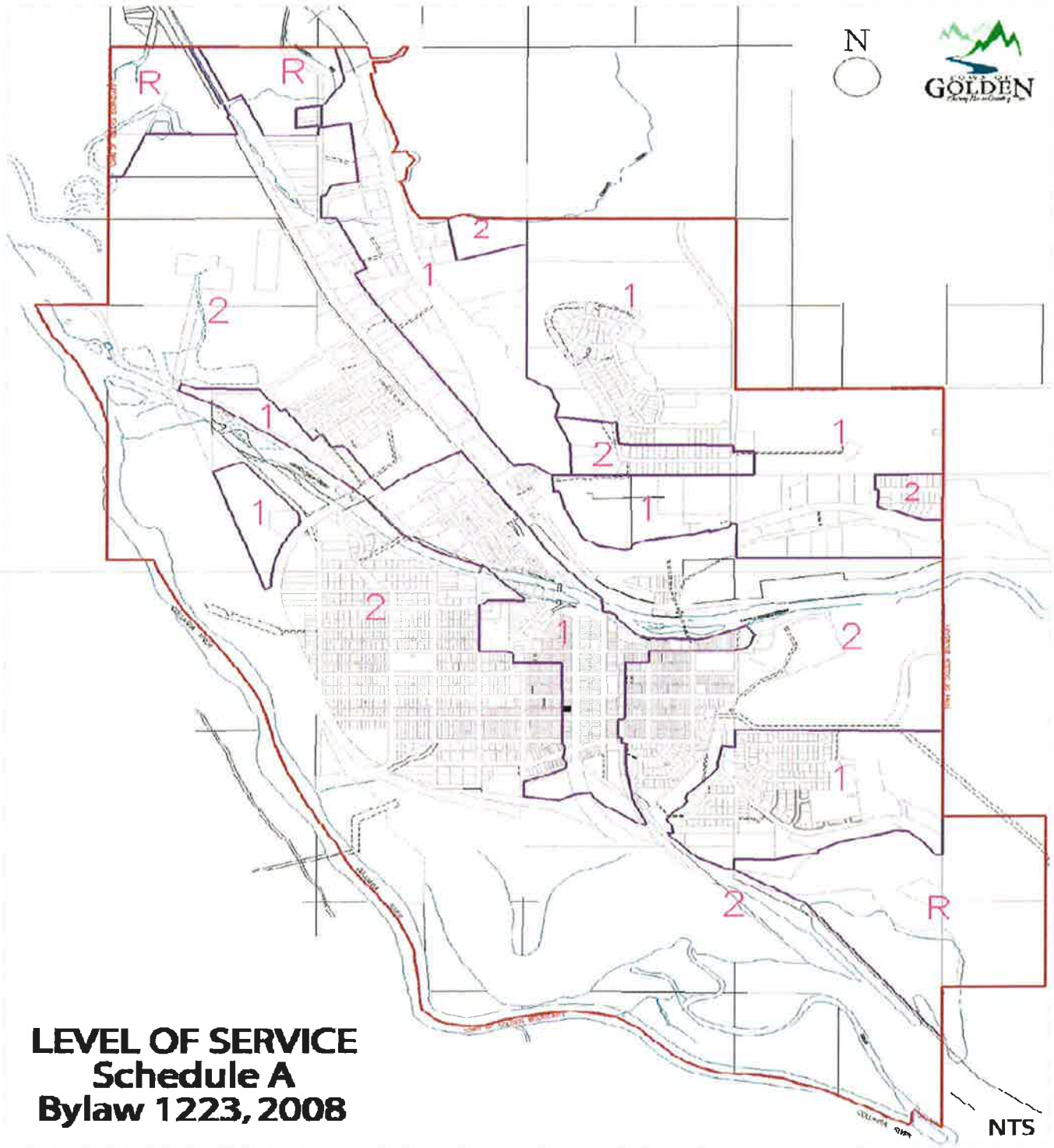
#### **4.0 RESERVE AREAS**

On Map A-1, parts of the municipality are designated as "Reserve". Reserve areas have a zoning description which does not permit the subdivision of land prior to a Zoning Bylaw amendment. The service level for each Reserve area will be established at the time of rezoning.

#### **5.0 SPECIAL CIRCUMSTANCES**

There are some areas of Golden where the roadways and services presently constructed exceed the standards set out in the various service level areas. The Municipality may require that this higher standard be continued to adjacent developments for the sake of continuity and the Applicant will be so advised when applications are reviewed by the Municipality.

The Applicant is responsible for the cost of providing this higher level of service within the various service level areas.



**LEVEL OF SERVICE  
Schedule A  
Bylaw 1223, 2008**

**12.0 SCHEDULE B - REGULATIONS, STANDARDS AND SPECIFICATIONS  
FOR THE DESIGN AND CONSTRUCTION OF HIGHWAYS**

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**1.0 GENERAL DESIGN**

**1.1** Where the provisions of Schedule A of this Bylaw require the construction of highways, the Applicant shall construct such highways consistent with the regulations, standards and specifications set out in this Schedule.

**1.2 Approval of Engineering Drawings Required Prior to Construction**

Engineering drawings showing detailed design of roadways shall be submitted to the Manager of Operations for approval prior to commencement of construction. These drawings shall show existing ground line and proposed alignment and grade of the roadways, horizontal and vertical curve information, and all other details as may be required. Grades shall be given at all changes in vertical and horizontal alignments for centreline and gutter lines. Elevations shall be shown on the drawings at all changes in vertical alignments.

**1.3 Classification and Standards for Roadways**

Prior to design of the roadway system, the Manager of Operations shall classify each roadway proposed within the subdivision and stipulate the required standards in accordance with the provisions of this Bylaw.

**.1 Roadway Classifications**

For the purpose of establishing standards, roadways are classified into the following categories:

- a) arterial streets
- b) collector streets
- c) local streets
- d) industrial streets
- e) cul-de-sacs, consisting of two parts - the entrance and the terminus
- f) lanes
- g) pathways

.2 Highway Standards

Different highway standards will be required for different classes of roadways and for different service level areas as defined and delineated in Schedule A of this Bylaw. The required standards for right-of-way width, pavement width, roadway lane widths, curb and gutter, sidewalks and shoulders are set out in Table B.1 following.

**1.4 Geotechnical Evaluation**

The Applicant shall be responsible for engaging the services of a qualified Geotechnical Engineer to investigate surface and subsurface conditions within the proposed subdivision. The Geotechnical Engineer shall prepare a report outlining his findings and shall provide clear, definitive recommendations on the geometry and placement of fill sections, compaction requirements over and above those stipulated in this Bylaw, cut slope geometry, pavement structures for roadways, and any other geotechnical issues affecting roadway construction within the proposed subdivision.

**2.0 GENERAL DESIGN CRITERIA**

**2.1 General Design Requirements**

In the preparation of engineering plans for highways, the Applicant shall take into account the following general design considerations:

.1 Continuation of Existing Streets

The design and arrangement of highways within a subdivision shall provide for the continuation or projection of existing streets in the surrounding area. In no case shall the arrangement of highways within a proposed subdivision make impractical the subdivision of adjoining parcels.

.2 Topography to be Taken into Account

The design and arrangement of highways shall be suited to the topography of the land proposed to be subdivided.

**2.2 Consistency with Official Community Plan**

The location, classification and standard of all highways proposed within a subdivision shall take into account the proposed use of the land and shall conform to the provisions of the Town of Golden Official Community Plan.

**Table B.1**

**HIGHWAY STANDARD 1 -** These highway standards are required in new subdivisions and developments in all Service Level 1 areas delineated in Schedule A.

Roadway Classification	Right-of-Way Width	Pavement Width	Lane Widths	Curb & Gutter	Sidewalks	Shoulder Width
Arterial (4 lane undivided)	27 m	15 m	3.75 m	both sides	2.0 m both sides	not req'd
Collector (2 lane)	21 m	12 m	3.75 m	both sides	1.5 m both sides	not req'd
Local (2 lane)	20 m	9.5 m	4.75 m	both sides	1.5 m one side*	not req'd
Cul-de-sac						
a) entrance	18 m	8.5 m	4.25 m	both sides	1.35 m one side*	not req'd
b) terminus	15 m radius	11.5 m radius		around bulb	1.35 m one side* (halfway around bulb)	
Industrial (2 lane)	20 m	11 m	5.5 m	both sides	1.35 m one side	not req'd
Lanes	6 m	6 m	3.0 m	not req'd	not req'd	not req'd

\* Developments in High Density Residential Zones shall be required to provide sidewalks on both sides of the street unless otherwise approved by the Approving Officer.

**HIGHWAY STANDARD 2 -** These highway standards are required in new subdivisions and developments in all Service Level 2 areas delineated in Schedule A.

Roadway Classification	Right-of-Way Width	Pavement Width	Lane Widths	Curb & Gutter	Sidewalks	Shoulder Width
Arterial (2 lane)	27 m	10 m	4.0 m	not req'd	not req'd	2 m
Collector	20 m	8 m	3.5 m	not req'd	not req'd	1.5 m
Local	20 m	7 m	3.5 m	not req'd	not req'd	1.0 m
Cul-de-sac						
a) entrance	16 m	7 m	3.5 m	not req'd	not req'd	1.0 m
b) terminus	15 m radius	11.5 m radius				
Industrial (2 lane)	20 m	9 m	3.5 m	not req'd	not req'd	1.5 m
Lanes	6 m	6 m	3.0 m	not req'd	not req'd	1.5 m



### **2.3 Local Roadways**

Local roadways within a proposed subdivision shall be arranged so that their use by through traffic will be discouraged.

### **2.4 Cul-de-Sacs**

Cul-de-sac streets shall not exceed 200 m in length from the edge of the intersecting roadway to the centre of the cul-de-sac. Cul-de-sac streets shall be provided with an area designed to permit safe and adequate space for the turning of motor vehicles, including all emergency vehicles.

### **2.5 Lanes**

Lanes, meeting the standards set out in this Bylaw, shall be provided where the Manager of Operations deems them to be necessary.

### **2.6 Pathways**

Pathways shall be provided where the Manager of Operations deems them to be necessary to provide access through a subdivision to schools, parks, playgrounds, commercial areas or other community facilities, or for the safe and efficient circulation of pedestrian and other non-motorized traffic.

The Municipality may require the installation of chain link fencing or an alternative on both sides of the pathway in some instances. The Municipality will advise the Applicant of the necessity for fencing at the time design drawings are reviewed.

### **2.7 Intersections**

Intersections shall be designed as follows:

- intersecting streets shall meet substantially at right angles (between 75 degrees and 105 degrees);
- jogs in street alignment at intersections shall be avoided except where the distance between centrelines is sufficient to ensure traffic safety. The minimum spacing between tee intersections along a street shall be 60 m;

- intersections having more than four intersecting legs shall not be permitted;
- intersections shall provide adequate crossing sight distances and stopping sight distances, whichever is greater;
- at all intersections, corner cut-offs shall be provided. Such corner cut-offs shall be a minimum of 4.5 metres x 4.5 metres in dimension in residential areas and 6.0 metres x 6.0 metres in industrial and commercial areas.

## **2.8 Reverse Curves**

If reverse curves are required in a street alignment, the Manager of Operations may require that they be separated by means of tangents of sufficient length to allow super-elevation to be properly developed.

## **2.9 Street Names and Traffic Signs**

Street names shall be assigned by the Municipality. Street name signs, traffic signs and pavement markings required as a result of constructing or improving streets shall be provided by the Municipality at the expense of the Applicant.

## **2.10 Appurtenances**

The Owner's Engineer shall detail on the engineering drawings the location of all proposed traffic islands, mail boxes, retaining walls, guardrails, and permanent barricades. These structures shall be designed in accordance with good engineering practices.

The design shall show the location of all traffic signs, street signs, and other traffic control devices required to be placed in the highway right of way.

Drawings must show all utility poles, ducts, junction boxes and pipelines. The Owner's Engineer shall indicate those utilities which require relocating prior to roadway construction, and shall confirm with the utility the feasibility of their relocation prior to design completion. For underground systems, design drawings shall show the location of underground wiring, and appurtenances including the connections to properties.

### 3.0 ROADWAY DESIGN CRITERIA

#### 3.1 Horizontal and Vertical Alignments

All horizontal and vertical alignment of streets shall be designed to good engineering practices using the latest edition of the Transportation Association of Canada (TAC) Geometric Design Guidelines.

#### 3.2 Design Speeds

The design speeds to be used for design of Roadways shall be as per Table B.2.

Table B.2

	<b>Posted Speed</b>	<b>Design Speed</b>
Arterial (A)	50 kph	60 km/h
Collector (C)	50 kph	60 km/h
Local (L)	50 kph	50 km/h

#### 3.3 Roadway Crossfall

Minimum roadway crossfall shall be 2%, maximum crossfall shall be 4%. Preferred roadway crossfall is 3%.

#### 3.4 Roadway Grades

The vertical alignment of roadways shall be set so the grades of driveways to adjacent properties do not exceed 8%. Where it is impractical to meet these criteria, the Manager of Operations may approve the use of private access roadways.

The minimum longitudinal gradient at the gutter line shall be 0.50% for all classifications of streets. The minimum longitudinal gradient around cul-de-sacs and curb returns shall be 0.80%

Minimum and maximum roadway centreline grades shall conform to Table B.3 based on the classification of the roadway:

Table B.3

<b>Roadway Classification</b>	<b>Minimum Grade</b>	<b>Maximum Grade</b>
Arterial	0.5%	6%
Collector	0.5%	8%
Industrial	0.5%	8%
Local	0.5%	10%
Cul-de-sac	0.5%	10%
Cul-de-sac (bulbs)	0.5%	4%
Lane	0.5%	10%
Pathway	0.5%	15%

Maximum grades are to be reduced by 1% for each (or part of each) 30 metres that the centreline radius is less than 150 m.

### **3.5 Curb Return Radii**

Curb return radii shall conform to Table B.4 and be based on the higher classified Roadway.

Table B.4

<b>Roadway Classification</b>	<b>Curb Return Radii</b>
Arterial	11 m
Collector	11 m
Local	9 m
Cul-de-Sac	11.5 m and 18 m
Industrial	11 m

### **3.6 Intersection Design**

Unless indicated elsewhere herein, all intersection design standards shall conform to those outlined in the latest edition of "Geometric Design Standards for Canadian Roads and Streets" as published by the Transportation Association of Canada (TAC).

### **3.7 Intersection Grades**

Approach grades of minor streets at intersections to major streets shall not exceed 75% of the maximum grade allowed for that street classification for

50 m upstream of the intersection. The minor street shall be designed to intersect the major street with a vertical curve of minimum length required for that street classification. The vertical curve shall terminate at the curb line of the major street.

Signalized intersections on major streets or other intersection controls that may require major street traffic to stop shall not exceed 4% grade for 100 m on either side of the control device.

**3.8 Pavement Structure**

The pavement structure shall be designed in accordance with Manual Series MS-1 of the Asphalt Institute (current edition). The pavement structure shall be designed for a twenty (20) year design life. Staged construction may be considered in the structural design by the Manager of Operations when a roadway is to be constructed and to be widened at a later date.

Roadways shall be classified as per Table B.5 for purposes of structural design of the total pavement structure; design traffic values and minimum depths of hot mix asphalt are defined as well:

Table B.5

<b>Roadway Classification</b>	<b>Design Traffic (EALs)</b>	<b>Min. Depth of Hot Mix Asphalt (mm)</b>
Arterial	> 2.8 x 10 <sup>5</sup>	See Note (1)
Collector	2.8 x 10 <sup>5</sup>	100
Industrial	5.6 x 10 <sup>5</sup>	100
Residential	2.8 x 10 <sup>4</sup>	50
Lanes	Not Applicable	50
Pathways	Not Applicable	50

NOTES:

(1) To be specifically designed, based on projected EALs, in accordance with MS-1 of the Asphaltic Institute.

Soils used to construct the roadway subgrade shall be evaluated in accordance with MS-1 (see Chapter V) to determine the load bearing capacity of the subgrade. For this purpose, the California Bearing Ratio (CBR)

test value shall be obtained using soil moulded to the minimum specified compaction level. The design CBR values shall be determined in the soaked condition in accordance with ASTM Des. D1883. This value shall be used for structural design purposes. The minimum compacted depth of crushed granular base course, in the total pavement structure, shall be 50 mm.

If the soaked CBR value of the subgrade soil is less than 3, subgrade enhancement shall be provided to create a soaked CBR of 3, and the pavement structure shall be designed using a soaked CBR of 3. Subgrade enhancement shall be provided by placement of an initial layer of granular subbase of a thickness which has been calculated to provide the necessary structural improvement to the subgrade.

A minimum pavement structure for roadways shall be provided, notwithstanding the structural character of the subgrade. Where the Applicant chooses not to undertake a pavement structural design, the minimum pavement structures specified in Table B.6 will be considered structurally adequate when the subgrade soil exhibits a minimum soaked CBR of  $\leq 3$ :

**Table B.6**  
Minimum Pavement Structures (For Subgrade CBR  $\leq 3$ )

Roadway Classification	Subbase Pit-Run (mm)	Crushed Granular Base Course (mm)	Hot Mix Asphalt (mm)	
			Surface Course	Lower Course
Arterial	Pavement Structural Design shall be project specific			
Collector	400	75	50	50
Industrial	400	75	50	50
Residential	300	75	50	
Lanes	300	75	50	
Pathways	150	75	50	

The design of structural overlays of existing pavements shall be based on the analysis of the results of Benkelman beam tests and test hole information acquired from the existing road which is to be upgraded.

The Transportation Association of Canada procedure for designing structural design of overlays of existing pavements, as published in "The Pavement Management Guide", shall be used. The maximum permissible

Benkelman beam deflections to be used for overlay design are as specified in Table B.7.

Table B.7

<b>Roadway Classification</b>	<b>Maximum Permissible Deflection After Overlay</b>
Arterial	0.60 mm
Collector	0.90 mm
Industrial	See Note (1)
Residential	1.25 mm

NOTES:

(1) As specified by the Manager of Operations.

The Structural design of pavements for roadways shall be performed by a qualified pavements engineer. Structural designs of pavements shall be submitted to the Manager of Operations in an acceptable report format.

### **3.9 Cold-Mix Asphaltic Concrete**

Cold-mix asphaltic concrete shall not be permitted, unless specifically approved by the Manager of Operations.

### **3.10 Roadway Cross-Sections**

The standard street cross-section for various classifications of roadways shall be as shown in the Standard Drawings.

## **4.0 MATERIALS**

### **4.1 Subgrade Fill Material**

Subgrade fill material shall be free of rock detrimental to proper compaction and free of organic or other deleterious matter. Fill material shall be compacted to a minimum of 98% Standard Procter density (ASTM D698). Fill material shall be moisture reconditioned to within 3% of its optimum moisture content, as determined by the Standard Test Methods for Moisture Density Relations of Soils and Soils-Aggregate Mixtures ASTM D698, at the time compaction is undertaken.

## 4.2 **Rock Fill**

Rock, by definition, shall mean any material excepting hardpan or glacial till over 0.75 cu. m. in volume requiring continuous drilling and blasting. It shall mean masonry or concrete, as well as natural boulders fitting this definition.

Rock fill shall be any material containing more than 15% by volume of rock larger than 150 mm in size.

It shall only be used in approved areas and by approved methods to provide maximum stability of the fill.

## 4.3 **Rejection of Material**

The Manager of Operations reserves the right to reject any material delivered to the site which has no prior approval. All sampling and testing shall be done in accordance with ASTM or CSA standards.

## 5.0 **GRANULAR AGGREGATES**

### 5.1 **Granular Subbase Course**

Granular subbase shall be well graded material within the gradation limits specified in Table B.8 when tested in accordance with ASTM C136:

Table B.8  
Granular Subbase Gradation

<b>Sieve Size</b>	<b>Percent by Weight Passing</b>
75 mm	100
37.5 mm	60 - 100
19 mm	35 - 80
9.5 mm	25 - 60
4.75 mm	20 - 40
2.36 mm	15 - 30
1.18 mm	10 - 20
0.300 mm	3 - 10
0.075 mm	0 - 5 (wet sieving)

## 5.2 Crushed Granular Base Course

Crushed base course shall be composed of inert, durable aggregate, reasonably uniform in quality, and free from soft or disintegrated pieces, wood wastes, roots, organic material or other deleterious materials. The gradation shall be within the limits specified in Table B.9 when tested to ASTM C-136 and C-117, using the designated sieve sizes, and to have a smooth curve without sharp breaks when plotted on a semi-log grading chart.

Table B.9  
Granular Base Course

<b>Sieve Size</b>	<b>Percent by Weight Passing</b>
25.00 mm	100
19.00 mm	80 - 100
9.50 mm	50 - 100
4.75 mm	35 - 70
2.36 mm	25 - 50
1.18 mm	15 - 35
0.300 mm	5 - 20
0.075 mm	0 - 5 (wet sieving)

A minimum of 60% of the material retained on a 4.75 mm sieve shall have at least two freshly fractured faces as determined by particle count.

## 5.3 Crushed Granular Aggregate for Asphaltic Concrete

Crushed granular aggregate for asphaltic concrete shall be composed of hard, durable, crushed gravel free from shale, clay, silt balls, loose coatings, and other deleterious materials.

When blended, the gradation of aggregates to meet the job mix formula (JMF) shall be within the limits designated in Table B.10 when tested to ASTM C-136 and C-117, using the designated sieve sizes, and to have a smooth curve without sharp breaks when plotted on a semi-log grading chart.

Table B.10  
JMF Gradation Limits of Blended Aggregate for  
Asphalt Concrete Pavements

<b>Sieve Size</b>	<b>Percent Passing by Weight</b>
19 mm	100
12.5 mm	84 - 95
9.5 mm	73 - 90
4.75 mm	50 - 75
2.36 mm	35 - 57
1.18 mm	26 - 45
0.600 mm	18 - 34
0.300 mm	10 - 26
0.150 mm	6 - 17
0.075 mm	3 - 7 (wet sieving)

A minimum of 70% of the material retained on a 4.75 mm sieve shall have at least two freshly fractured faces as determined by weight.

Table B.11  
Tolerance Limits (% Passing By Weight\*)

<b>Sieve Size</b>	<b>Percent Passing by Weight</b>
4.75 mm	±5.0
2.36 mm	±4.0
0.600 mm	±3.0
0.300 mm	±2.5
0.150 mm	±1.5
0.075 mm	±1.0

\* The tolerance limits specified in Table B.11 are in relation to the design aggregate gradation JMF submitted with the Marshall mix design. Aggregate short of material passing the 0.075 mm sieve shall have approved mineral filler added. Mineral filler shall be material passing the 0.075 mm sieve and shall be non-plastic when tested in accordance with ASTM D424. The moisture content of the asphalt mix shall be not more than 0.5% by weight.

#### 5.4 Primer

Asphalt primer shall be anionic emulsified asphalt, slow setting (SS-1) and shall be diluted with clean water at two (2) parts emulsion to one (1) part water for application, and thoroughly mixed by pumping. The diluted asphalt emulsion shall be applied at a rate of 2 litres per square metre, or as approved by the Manager of Operations. The prepared granular base shall be clean and free of "float" prior to application of prime. Allow prime to absorb and cure for 24 hours prior to paving, unless otherwise approved by the Manager of Operations. Traffic shall not be permitted onto primed areas.

#### 5.5 Tack Coat

Bituminous tack coat shall be undiluted SS-1 asphalt emulsion, and shall be applied at a rate not greater than 0.5 litres per square metre to a clean pavement surface, and provide for adequate curing time prior to placing asphalt paving mixtures. The temperature of the material shall be maintained between 30°C and 40°C at the time of application. Tack coat shall only be applied to a surface that is 5°C or above.

#### 5.6 Asphalt Binder

Asphalt binder shall be 200/300A penetration grade and shall conform to the requirements specified in Table B.12 (not withstanding manufacturer's specifications).

Table B.12  
200/300A Asphalt Binder

<b>Requirements</b>	<b>Min.</b>	<b>Max.</b>
Penetration @ 25°C, 100 g, 5 sec, dmm	200	300
Absolute Viscosity @ 60°C, Pa.s	45	
Kinematic Viscosity @ 135°C, cSt	150	
% Ret. Pen. after T.F.O.T. @ 25°C, 100 g, 5 sec, dmm	45	
Solubility in Trichloroethylene %	99.5	
Flash Point, C.O.C. °C	175	
Water %		0.5

## 5.7 Hot Mix Asphaltic Concrete (HMAC)

HMAC shall conform to the requirements specified in Table B.13.

Table B.13

<b>Asphalt Mix Property</b>	<b>Arterial &amp; Collector Streets</b>	<b>Residential Streets</b>
Marshall blows per face	75	50
Marshall Stability @ 60°C, kN	10	8
Marshall Flow, 0.25 mm units	8 - 14	8 - 16
Voids in Mineral Aggregate (VMA) %	13.5 min.	14.0 min.
Voids fill with Asphalt (VFA) %	65 - 75	65 - 75
Air Voids in Mixture, %		
- at design asphalt content	4.0	3.5
- allowable production range	3.0 - 5.0	3.0 - 5.0
Minimum Theoretical Film Thickness (µm)	6.2	6.5
Index of Retained Stability after water immersion for 24 hours @ 60°C	75%	75%

The Applicant shall supply the Manager of Operations with a current 5 point Marshall mix design, performed in accordance with ASTM D-1559, under the signature of a Professional Engineer. The design asphalt content shall be specified to comply with the requirements of this article. The contractor shall provide, upon request, a plant produced sample prior to the commencement of paving operations to a designated engineering firm to verify mixture properties.

The asphalt binder content of hot mix asphalt which is produced in accordance with the approved Marshall design shall be maintained within plus or minus 0.3% of the approved design asphalt content.

## 5.8 Testing

The Applicant shall retain an independent materials testing firm to carry out comprehensive testing to frequencies defined below, for each stage of construction of roadways and streets. The materials testing firm must employ a full time, qualified professional engineer within the office from which the testing services are provided. The Engineer shall review all test

data and provide to the Municipality, on a daily basis and in summary from at the completion of each stage of the work, test data at the following minimum frequencies:

For subgrade construction:

- a) Moisture - density relationship (Standard Proctor) - ASTM D698; - one test for each soil type incorporated into the subgrade.
- b) Moisture and density tests.
  - i) Trench backfill - one test per lift per 50 lineal metres of trench and one test per lift around manholes, valves, catchbasins, etc.
  - ii) Subgrade construction and preparation - three tests per 50 lineal metres of roadway per lift, to include dry density and moisture content.

For subbase and base course construction:

(including subgrade enhancement using subbase material)

- a) Gradation analysis - one test per 500 m<sup>3</sup> or 1,100 tonnes of material delivered to the site with a minimum of 1 test per day of placement.
- b) Moisture - density relationship (Standard Proctor) - ASTM D698; - one test per class of material for each 5,000 m<sup>3</sup>, or 11,000 tonnes delivered to site.
- c) Compaction testing - three tests per 50 lineal metres of roadway per lift, to include dry density and moisture content.

For hot mix asphalt pavement production and placement:

- a) Asphalt content and gradation of extracted aggregate - one test per production period, where a production period is defined as that part of the working day either before or after 12:00 Noon local time. In a full working day, the times of test shall be not less than two hours apart.

- b) Marshall analysis of hot mix asphalt - one per work week per mix type; additional tests shall be performed when any of the specified Marshall properties are not met in the initial analysis.
- c) Asphalt cement tests - one complete analysis per project or one every two work weeks, whichever is the lesser in timing; plus one penetration (ASTM D5) test per work week from product obtained from the Contractor's asphalt cement storage tanks.
- d) Density, air voids and pavement thickness tests - 3 cores (100 mm dia.) per 500 m<sup>2</sup> of paved area per lift. Air void tests shall be performed in accordance with ASTM D3203.
- e) Tests on prime and tack coat products - one test per product per project.

#### **5.9 Chain Link Fence (as required on pathways)**

All frames to be welded and covered with two coats of zinc rich paint. Each knuckle to be independently tied and set flush with the top rail. Dome tops to be riveted or welded to end posts. All galvanizing shall be minimum of 488 gm/M. All posts to be set in concrete.

- a) Fabric - 9 gauge (3.55 mm) galvanized 50 mm mesh.
- b) Top Rail - 42 mm O.D., 3.55 mm wall thickness, galvanized steel pipe.
- c) Line Posts - 48 mm O.D., 3.68 mm wall thickness galvanized steel pipe. Height as determined by Manager of Operations.
- d) Gates - Sizes as required. Frames 42 mm O.D., 3.55 mm wall thickness galvanized steel pipe.
- e) Barbed Arms - Galvanized malleable steel.
- f) Tension Wire - 6 gauge (4.50 mm) galvanized steel.
- g) Tie Wire - 9 gauge (3.55 mm) aluminum.
- h) Tension Bar - 4.76 mm x 19 mm galvanized steel.
- i) Dome Tops - Size as required. Galvanized malleable steel.

Alternatives to chain link fencing may be requested depending on location.

## 6.0 WORKMANSHIP

### 6.1 Notification of Manager of Operations Prior to Undertaking Roadway Works

Adequate notice shall be given to the Manager of Operations by the Applicant prior to the commencement of works in accordance with Table B.14. The Applicant shall not proceed from one stage as described in Table B.14 to another stage without the approval of the Manager of Operations.

Table B.14  
Construction Notification Requirements

Stage	Minimum Notice Required
Prior to construction of fills or doing subgrade preparation	24 hours
Prior to placement of subbase materials	24 hours
Prior to placement of concrete for curbs and sidewalks	48 hours
Prior to placement of base course (19 mm crushed gravel)	24 hours
Prior to paving	48 hours
Prior to topsoiling boulevards	24 hours

### 6.2 Clearing

The highway right-of-way shall be cleared of all trees, stumps, logs, roots, and any other objectionable material likely to cause settlement for the full width of the highway, and for such additional width as may be required to contain cut and fill slopes. In addition, buildings, fences, superfluous culverts, or any other structures within the highway shall also be removed. Trees may be left within the highway only where they do not conflict with utility services and where they are not deemed a hazard at the discretion of the Manager of Operations.

### 6.3 Subgrade Preparation

Prior to placing of any granular aggregate on the roadway, all existing topsoil or other deleterious matter shall be removed from the full width of the highway right-of-way and the roadway surface graded to the desired cross-section.

Embankments shall be constructed by placing, shaping and compacting approved materials as classified in this Bylaw. All material placed in embankments shall be bladed smooth in level layers not exceeding 300 mm uncompacted depth over the entire embankment area and placed in successive uniform layers.

When embankments are to be made on hillsides or where a new fill is to be applied upon an existing embankment, the slopes of the original ground or embankment (except rock embankments) shall be terraced or stepped before filling is commenced.

Each layer shall be compacted with approved equipment to 98% Standard Proctor Density.

Sufficient amounts of watering and compaction equipment required to efficiently and properly compact the material for the rate at which the material is being hauled into the embankment area shall be provided.

The embankment shall be constructed to provide adequate drainage. Should the embankment material become damaged or saturated by rain, flooding, or other effects, repair, scarification, or whatever other measures required to restore the embankment to the moisture and compaction requirements this Bylaw shall be undertaken

Unsuitable materials encountered in the excavation areas, or at the subgrade elevation, shall be excavated, and wasted.

Overexcavations shall be rebuilt to grade with an approved compacted material and compacted to the satisfaction of the Engineer.

At transition sections where the profile grade changes from embankment to cut, the natural slope (excepting solid rock) shall be excavated to a depth of 1 metre and replaced with suitable material for a distance of 15 metres in order to prevent abrupt future differential grade changes.

Where frost susceptible soil is encountered (i.e. ML, SM, OL, SC as defined by the USCS), an assessment by a Professional Engineer shall be completed. If the soil is deemed unacceptable, it shall be wasted and the excavation filled

with suitable granular material. The quantity and depth of the excavation shall be determined by a Professional Engineer.

**6.4 Proof Rolling**

Upon completion of the subgrade preparation, the subgrade shall be proof rolled in the presence of the Manager of Operations with a loaded single axle truck with a rear axle load of 8165 Kg.

Any areas found to be soft or wet shall be excavated and backfilled with select granular subbase, granular material, and compacted to 98% Standard Proctor density.

**6.5 Spreading and Compaction of Granular Aggregate**

Granular aggregate shall be placed in maximum 150 mm lifts and shall be spread in an approved manner such that the aggregate is neither segregated nor contaminated with foreign material. Segregated materials shall be remixed until uniform. Immediately following spreading, granular aggregate shall be compacted to a Standard Proctor density of 98% for subbase gravel and 100% for base course gravel. The finished surfaces shall be within  $\pm 15$  mm of the design grade and cross-section.

**6.6 General Paving Requirements**

Priming or paving shall not be undertaken during snow, heavy rain, temperatures below 5 degrees C or other unsuitable conditions. Asphaltic concrete shall not be placed on a frozen, muddy or rutted base. Asphaltic concrete shall be constructed in lifts of compacted thickness as specified in Table B.15.

Table B.15  
Permissible Compacted Lift Thickness (mm)

<b>Mix Type</b>	<b>Minimum</b>	<b>Maximum</b>
Lower Course	50	100
Surface Course	50	50

## **6.7 Placing and Compacting Asphaltic Concrete**

Surfaces onto which bituminous concrete pavement is placed shall be dry, above 5 degrees C and cleaned of all loose and foreign materials. Mixtures shall not normally be laid when the atmospheric temperature is less than 5 degrees C and falling. An approved self-propelled mechanical paver shall be used to spread the mixture to the specified thickness. Compaction shall commence immediately after the bearing capacity of the course is adequate to support the compaction equipment without undesirable displacement or cracking. Compaction methods shall be carried out as specified in the BC Ministry of Transportation and Highways "Standard Specifications for Highway Construction".

## **6.8 Density of Completed Asphaltic Concrete Pavement**

The minimum allowable density of the completed pavement shall be not less than 97% of the laboratory compacted Marshall density.

## **6.9 Deficient Asphalt**

Pavement which is unsatisfactory in the opinion of the Manager of Operations by reason of faulty materials or methods of mixing and/or placement shall be repaired, removed, replaced or otherwise corrected, as directed by the Manager of Operations. Areas to be removed shall be sawcut as necessary.

## **6.10 Tie-Ins to Existing Pavement**

Tie-ins to existing pavement shall be made by cutting back the existing pavement to sound material as necessary to produce a neat, vertical face with a straight edge. Prior to placing asphaltic concrete, exposed faces and other abutting structures shall be painted with liquid asphalt and heated to 66°C.

## **6.11 Restoration of Improvements**

Driveways, retaining walls, vegetation, and other private or municipal improvements on private or municipal property or highways affected by the roadway construction shall be restored at minimum to the condition

existing prior to construction and to the satisfaction of the Manager of Operations.

**6.12 Testing**

The Municipality shall be provided with copies of all compaction test results pertaining to subgrade, granular base and pavement structure.

**6.13 As Constructed Drawings**

Prior to Total Performance, the Applicant shall deposit with the Municipality as-constructed drawings in the format conforming to Schedule I.

**7.0 STANDARD DRAWINGS**

**7.1** The following Town of Golden Standard Drawings shall form part of this schedule.

<u>Drawing No.</u>	<u>Drawing Description</u>
B-1	Local Street Urban Residential
B-2	Local Street Urban Residential Cul-de-Sac
B-3	Local Street Urban Industrial
B-4	Collector Street Urban (21.0 m R/W)
B-5	Arterial Street Urban Undivided (27 m R/W)
B-6	Typical Cross-Section of a Paved Lane
B-7	Rural Streets

**13.0 SCHEDULE C - REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF CURBS AND GUTTERS, SIDEWALKS AND BOULEVARDS**

**1.0 GENERAL**

**1.1 Standards and Specifications of this Schedule to Apply to all Works**

Where the provisions of Schedule A of this Bylaw require the provision of curbs and gutters, sidewalks and boulevards, the Applicant shall construct such services in a manner consistent with the regulations, standards and specifications set out in this Schedule.

**1.2 Approval of Engineering Drawings Required Prior to Construction**

Engineering drawings showing detailed design of the necessary works shall be submitted to the Manager of Operations for approval. No construction of the works shall commence until the design drawings have been approved by the Manager of Operations.

**1.3 Curb, Gutter and Sidewalk Requirements**

Curb, gutter and sidewalk shall be provided as specified in Table C.1.

Table C.1

<b>Roadway Classification</b>	<b>Curb Type Required</b>	<b>Minimum Sidewalk Widths</b>
<b>Residential Zones</b>		As Per Standard Detail Drawings
Arterial	Non-mountable concrete	
Collector	Non-mountable concrete	
Local	Roll type concrete	
<b>Commercial Zones</b>		
All Roadways	Non-mountable concrete	
<b>Industrial Zones</b>		
All Roadways	Non-mountable concrete	

#### **1.4 Location of Sidewalks**

Where sidewalk is required on one side of a roadway only, the sidewalk shall be located on the same side as the street lights. Sidewalk location relative to the curb shall be as shown in the Standard Drawings.

### **2.0 DESIGN CRITERIA - CURBS, GUTTERS AND SIDEWALKS**

#### **2.1 Design Gradient**

The design gradient shall be as specified for roadways in Schedule B of this Bylaw, except that the minimum gradient around curb returns and around cul-de-sacs shall be 0.8%.

#### **2.2 Curb Return**

The minimum curb return radius shall be as set out in Section 3.5 of Schedule B of this Bylaw. Elevations shall be shown on the engineering drawings for the beginning and end of the curb return, as well as at any changes in grades in between. Engineering drawings shall provide all geometric details, both vertically and horizontally, of curb returns.

#### **2.3 Grading of Boulevards**

Upon completion of roadway, curb and gutter and sidewalk constructions, boulevards shall be shaped and graded as shown on the Standard Drawings. Native material and 150 mm of topsoil shall be placed flush with the top of curb or back of walk and shaped to conform with general parcel grading. The boulevards shall be seeded or sodded with seed mixture approved by the Manager of Operations. Unless otherwise approved, boulevards shall be graded to drain to the curb at a minimum slope of 3% and a maximum slope of 8%

#### **2.4 Sidewalk Cross Section**

Concrete sidewalks shall have a thickness not less than 100 mm and shall be constructed consistent with the Standard Drawings. Cross fall to be as shown on the Standard Drawings.

## **2.5 Driveway Access**

Maximum driveway access grade shall be 8% within the Highway right-of-way.

## **2.6 Curb and Gutter Cross Section**

Curbs and gutters shall be constructed consistent with the Standard Drawings.

## **2.7 Commercial Crossovers**

Commercial crossovers shall be provided at all access locations for usages other than residential. Commercial crossovers shall be constructed consistent with Standard Drawings.

## **2.8 Wheelchair Ramps**

Wheelchair ramps shall be provided at all intersections on streets provided with sidewalks. Wheelchair ramps shall be constructed consistent with Standard Drawings.

## **3.0 MATERIALS**

### **3.1 Base Material**

Base material shall be granular 25 mm crushed gravel base course conforming to gradation limits as referenced in Schedule B, Article 5.2.

### **3.2 Concrete**

Concrete shall conform to CSA CAN3-A23.1 Latest Edition; the mix design shall include the following:

- a) Minimum compressive strength 35 MPa at 28 days;
- b) Maximum aggregate size 19 mm for hand-formed; 10 mm for extruded;
- c) Slump - 80 mm for hand-formed; 25 mm for extruded;

- d) Air entrainment 6% - 8%.
- e) Water/Cement Ratio - 0.35 maximum.

### **3.3 Testing**

The Applicant shall retain an independent materials testing firm to carry out comprehensive testing of concrete which shall be taken to include determination of unit weight of the plastic concrete, performing slump and air content tests and casting of test cylinders. One test consisting of three standard cylinders may be made for each 175 m of curb and gutter or sidewalk installed. In no case, however, will there be less than one test for concrete placed in one day. One cylinder shall be tested at seven days, and two at twenty-eight days. All test results shall be submitted to the Manager of Operations for review and approval.

### **3.4 Curing Compound**

Curing compound shall be spray-applied of liquid type conforming to ASTM C309 containing a fugitive dye applied at a rate recommended by the manufacturer.

### **3.5 Boulevards Topsoil**

Topsoil used for boulevard improvement shall be loam, free from any rock, clay lumps, roots or any other deleterious material.

### **3.6 Driveway Approaches**

Base for driveway approaches shall consist of a minimum of 100 mm of 25 mm minus gravel placed on compacted subgrade. Approaches shall be paved using 50 mm hot mix asphalt.

## **4.0 WORKMANSHIP**

### **4.1 Base Preparation**

All topsoil, organic soils, peat, frozen materials, roots, branches or other deleterious material shall be removed to a minimum depth of 300 mm below the bottom of the sidewalk and replaced with either earth fill

acceptable to the Manager of Operations or granular aggregate. All fill material shall be compacted to 98% Standard Proctor density.

A minimum of 100 mm of granular aggregate shall be placed and compacted to 98% Standard Proctor density and moistened immediately prior to placing concrete.

#### **4.2 Commercial Crossovers**

Commercial and industrial crossovers shall be built on a base with the same construction as the roadway they border. Commercial sidewalk crossovers shall have a minimum concrete thickness of 150 mm and be reinforced with 150 mm x 150 mm x 10/10 welded wire mesh. Commercial crossovers shall have the concrete curb and gutter reinforced by two 10M bars running the full length between the extremities of the flare of the crossovers. Expansion joints shall be made at the side crossover. All bars shall be supported off the granular base. Score lines shall be made parallel to gutter line at 150 mm interval over the crossover. Crossovers shall be constructed consistent with the Standard Drawings.

#### **4.3 Placing and Finishing Concrete**

The Manager of Operations shall be notified 48 hours in advance of any concrete pour for curb and gutter or sidewalks. Concrete shall be prepared, delivered, and placed in conformance with CSA CAN3-A23.1-M90 "Concrete Materials and Methods of Concrete Construction". The surface of the curb, gutter and sidewalk shall be finished prior to final set by brushing to provide a uniform non-skid finish. Both edges of the sidewalk shall be trowelled smooth to a width of 50 mm and rounded to a radius of 12 mm.

During hot, cold, or drying weather conditions, special attention shall be given to preparation, delivery, placement, and curing of concrete to ensure that the requirements of CSA CAN 3-23.1-M90 are met.

Curb and gutter and sidewalk contraction joints shall be made at a maximum of 3.0 m intervals. Contraction joints shall be cut by means of a marking tool or other approved method. Joints shall not be less than 30 mm in depth and 6 mm in width. The edges of the joint shall be rounded off with an edger having a radius of 6 mm.

Contraction joints in medians, traffic islands and gores shall extend the full width of the median, traffic island, curb and gutter and gore. If because of irregular shapes the matching of joints is not possible, the Engineer may approve an alternate jointing pattern.

Contraction joints in monolithic sidewalk shall extend through the full width of the sidewalk and curb and gutter.

Contraction joints at catchbasins shall be cut through the full width of the sidewalk in line with both outside edges of the catchbasin side inlet.

Saw cuts as specified are made with a concrete saw capable of producing a true straight joint of constraint depth as specified.

Surface joints shall be 15 mm in depth and 6 mm in width. The edge of the joint shall be rounded off with an edger having a radius of 6 mm.

Carefully fit, cut and mark the sidewalk around all openings, iron covers, manholes, vaults, waterworks stop cock boxes, lamp standards, hydrants, poles and other surface installations. The surface joint shall be neatly tooled and marked to the satisfaction of the Manager of Operations.

Lateral expansion joints are required at the beginning and end of every corner. The joint shall consist of an approved mastic preformed material, 15 mm by 90 mm cross-section, laid plumb and straight, 6 mm below the finished sidewalk grade. Expansion joints shall be installed wherever the sidewalk is adjacent to an improvement constructed with rigid materials.

Expansion joint material, 15 mm thick, and the full depth of the sidewalk, shall be placed around the base of all poles and hydrants which encroach upon or are within the sidewalk.

Mark the sidewalk, curb and gutter with a suitable marking tool approved by the Engineer, showing the name of the Contractor and the year of construction. The letters and numerals of the marking tool shall be 40 mm high. Marks are placed at the end of curb of each corner of the block; i.e. there shall be a minimum of eight marks per block. If the construction begins or terminates within the middle of the block, also mark these

locations or as directed by the Manager of Operations. In addition, a similar mark shall be embossed on the corner on each apron and driveway.

All sections containing reinforcing rods shall be marked at their extreme limits with a marking tool showing the letter "R". This letter shall be 40 mm high.

Where bull noses are to be constructed at the ends of medians, reinforcing rods may be left extending from the median in order to tie-in to the bull nose.

**4.4 Boulevards Driveway Approaches**

Construction of driveway approaches shall be according to specifications set out in Schedule B of the Bylaw. Care shall be taken to avoid damage to existing utilities such as curb and gutter and water curb stops.

**4.5 Boulevard Improvement**

Prior to placing of topsoil, boulevard areas shall be pre-graded to suit the specified grades. The topsoil shall be carefully placed to the specified depth and the surface shall be raked if necessary to remove any rocks and roots.

**4.6 Concrete Strength**

In any case where the compressive strength of the test cylinders for any portion of the work falls below specified requirements, the Manager of Operations may direct that all concrete be removed and replaced or that the Applicant take other remedial action prescribed.

**5.0 STANDARD DRAWINGS**

**5.1** The following Town of Golden Standard Drawings shall form part of this schedule.

Drawing No. Drawing Description

C-1	Mountable Curb and Gutter
C-2	Non-Mountable Curb and Gutter

- C-3 Mountable Curb, Gutter and Sidewalk
- C-4 Sidewalk Crossing for Non-Mountable Curbs
- C-5 Standard Wheelchair Ramp for Non-Mountable Curb, Gutter & Sidewalk

**14.0 SCHEDULE D - REGULATIONS, STANDARDS AND SPECIFICATIONS  
FOR THE DESIGN AND INSTALLATION OF WATER SYSTEMS**

**1.0 GENERAL DESIGN**

**1.1 Water Distribution System to be Constructed by Applicant**

Where the provisions of Schedule A of this Bylaw require the construction of a water distribution system, the Applicant shall provide a water distribution system and storage facilities including watermains, valves, hydrants, service connections, pump stations and reservoirs consistent with the regulations, standards and specifications set out in this Schedule. All standards not specifically described in this schedule shall be in accordance with appropriate AWWA standards or as directed by the Manager of Operations.

**1.2 Approval of Engineering Drawings Required Prior to Construction**

Engineering drawings showing detailed design of the necessary works shall be submitted to the Manager of Operations for approval. Engineering drawings shall also be submitted for approval to the Public Health Engineer of the Interior Health Authority of the Ministry of Health of the Province of British Columbia. A Waterworks Construction Permit shall be submitted to the Manager of Operations prior to construction of any water system. No construction shall commence until the engineering drawings have been approved by the Manager of Operations and Ministry of Health. These drawings shall show alignment, size and depths of pipes, pipe bedding requirements, existing ground line, and proposed final ground line over the pipe, location and detail of all fittings, valves and hydrants, location of all service connections, location, access to, size and details of any pump stations and reservoirs, all easements and all such other details as may be required. Where a water system is not yet available, rights-of-way may be required to be provided by the Applicant to allow for the eventual installation of this facility. Such rights-of-way shall be registered in favour of the Municipality at the Applicant's expense.

## 2.0 DESIGN CRITERIA

### 2.1 Capacity of System and Sizing of Watermains

Water distribution systems shall be designed to deliver water in adequate quantities at adequate pressures for both domestic use under peak consumption conditions and fire flows. Mains shall be sized to carry the peak hourly flow rate or the maximum daily flow rate plus the fire flow rate, whichever is the greater. Mains shall be sized using the Hazen-William formula with a maximum flow velocity for peak hourly demand rate of 2.0 m per second. For fire flow, plus the maximum day rate, the flow velocity shall not exceed 4.0 m per second.

### 2.2 Demand Criteria

#### Residential

For residential areas, the daily domestic demand criteria for purposes of designing water distribution systems shall be assumed to be:

Average day: 700 litres/day/capita

Maximum Day: 1,700 litres/day/capita

Peak Hour/Maximum day Consumption Ratio: 1.5

#### Non-Residential

Commercial, industrial and institutional demands should be determined using specific data related to the development or zoning. In the absence of such data, or municipal regulations, use the following for maximum day demands:

Commercial or institutional: 600 litres per person or unit/day

Industrial: 100,000 litres per hectare per day

### 2.3 Fire Flow Requirements

Water distribution systems shall also be designed to ensure that fire flow requirements as determined by the current edition of "Water Supply for

Public Fire Protection - A Guide to Recommended Practice”, published by Fire Underwriters Survey, are available for required durations.

Fire flows shall also be subject to the minimum requirements specified in Table D.1.

Table D.1

<b>Developments (without sprinklers)</b>	<b>Minimum Fire Flow</b>
Single family residential	60 L/s
Apartments, townhouses	90 L/s
Commercial	150 L/s
Institutional	150 L/s
Industrial	225 L/s

The amount and duration of design fire flows throughout the development shall be provided to the Manager of Operations for his approval prior to final design of the water distribution system.

#### **2.4 Design Pressures**

Water systems shall be designed for pressures in the range of 300 kPa to 850 kPa, with 300 kPa measured under peak hourly conditions and 850 kPa measured under static conditions. Where the maximum pressure exceeds 515 kPa, service connections should be individually protected by pressure reducing valves located in the buildings being served. Minimum residual pressure in the system shall not be less than 140 kPa under maximum day domestic consumption plus fire conditions. Reservoir level shall be assumed at mid point for the calculation of minimum pressures and full for calculation of maximum static pressures.

The design minimum and maximum design pressures throughout the development shall be provided to the Manager of Operations for his approval prior to final design of the water distribution system.

Installation of supplementary mains of a minimum of 150 mm diameter to provide a looped distribution system may be required at the discretion of the Manager of Operations and may necessitate the provision of

rights-of-way in favour of the Municipality. Supplementary mains shall be installed at the Applicant's cost.

## **2.5 Minimum Pipe Size**

Watermain pipe size shall be determined by sizing to provide the design pressures required above.

The minimum pipe size for all watermains shall be 150 mm diameter. The Municipality may require watermains larger than 150 mm diameter mains if on main distribution or transmission routes. Such oversized mains to a maximum of 250 mm diameter shall be provided by the Applicant at the Applicant's expense.

## **2.6 Dead End Mains**

Watermains must be looped wherever possible. Where dead ends are unavoidable, and approved by the Manager of Operations, a blow-off should be provided. Where practical and approved by the Manager of Operations, a hydrant may serve a secondary function as a blow-off.

## **2.7 Minimum Depth of Cover**

Watermains and services must be installed at sufficient depth to prevent freezing. Soil type and groundwater levels should be considered when determining the minimum depth of installation. The depth of the watermain shall be sufficient to provide all services with a minimum cover of 2.6 m to the top of the service anywhere within the right-of-way. There shall be a minimum cover of 3.0 m on any dead end main, and services from that dead end main. Alternately, the Manager of Operations may approve the installation of insulation to protect the mains and services from freezing.

## **2.8 Watermain Line Assignments**

Watermain line assignments shall be in accordance with the standard drawings provided for the various road classifications unless otherwise approved by the Manager of Operations. Where it is necessary to install a watermain in a lane, the Manager of Operations shall determine the line assignment.

Curved alignments may be accepted provided that the pipe alignment is at a parallel offset with an established boundary and the radius of curvature is not less than 60 m or twice the minimum radius of curvature recommended by the pipe manufacturer, whichever is the greater. The design drawings shall indicate the method for achieving the curvature.

## **2.9 Utility Separation**

The following are the requirements for the separation of sanitary and storm sewers from watermains, unless otherwise indicated by the Public Health Engineer.

At least three (3) m horizontal separation should be maintained between a watermain and a sanitary or storm sewer.

In special circumstances, specifically in rock or where the soils are determined to be impermeable, lesser separation than 3.0 m may be permitted provided that:

The sewer main and watermain are installed in separate trenches and the watermain invert is at least 0.5 m above the crown of the sanitary sewer or storm sewer and the joints are wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of AWWA Standards C217, and C214 or C209; or,

The pipes are installed in the same trench with the watermain located at one side on a bench of undisturbed soil at least 0.5 m above the crown of the sanitary sewer or the storm sewer and the joints of the watermain are wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

No gas main, electric or telephone duct or other utility line shall be installed in the same trench with watermains, except as permitted by the Manager of Operations (e.g. control cables).

## **2.10 Utility Crossings**

Where a sanitary sewer or storm sewer crosses a watermain, the sewer should be below the watermain with a minimum clearance of 0.5 m and the joints of the watermain, over a length extending 3 m either side of the sewer main, are to be wrapped with heat shrink plastic or packed with compound and wrapped with petrolatum tape in accordance with the latest version of the AWWA Standards C217, and C214 or C209.

Where it is not possible to obtain the vertical separation indicated above, and subject to local authority approval, the following details may be used:

The water pipe joints should be wrapped as indicated above, and the sewer should be constructed of pressure pipe such as high density polyethylene (HDPE) with fused joints and pressure tested to assure watertightness.

## **2.11 Hydrants**

Fire hydrants, shall be located, in general, at street intersections and at a maximum spacing of 150 metres in residential areas and 90 metres in high density residential, commercial and industrial areas. Additional hydrants may be required by the Manager of Operations at schools, major multiple family developments, commercial buildings or other major developments consistent with the current fire flow requirements of the "Water Supply for Public Fire Protection - A Guide to Recommended Practice: published by Fire Underwriters Survey. Where hydrants are located other than at intersections, they should be located on the projection of the property line dividing two parcels. In selecting the location of a hydrant, the probable route of the fire engine shall be considered.

A hydrant shall not be located within 3 m of a utility pole or light standard, within 1.5 m horizontally of underground service pipes or open ditches, or within 1 m of the curb line or back of sidewalk.

## **2.12 Valves**

The placement of valves is to be such that any section of the system can be isolated by the closing of a maximum of four valves. This isolated section in

a looped system may contain up to a maximum of 20 single family services and no more than one hydrant taken out of service. Valves should not be spaced more than 250 m apart on continuous mains.

There shall be a line valve of the same diameter as the pipe on each downstream branch off all tee and cross fittings. Each tee fitting shall have two valves and each cross fitting shall have three valves.

Valves at intersections shall be located on the projection of property lines.

A line valve may be required on a new pipeline near the point of connection to an existing main.

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

Line valves shall be resilient seated gate valves.

### **2.13 Air Valves**

Combination air valves should be installed at the summits of all mains of 200 mm diameter and larger, except as follows:

Where the difference in elevation between the summit and valley is less than 600 mm.

Where it can be shown that air pockets will be carried by typical flows.

Where active service connections are suitably located to dissipate entrapped air.

Typical air valve sizes, subject to design analysis, are as specified in Table D.2.

Table D.2  
Typical Air Valve Sizes

<b>Watermain Size</b>	<b>Valve Size</b>
250 mm to 300 mm	25 mm
350 mm to 600 mm	50 mm
Larger than 600 mm	Special design

Air valves must be vented to an appropriate above-grade location to eliminate any potential for cross connection in a flooded or contaminated chamber.

Where practical, and approved by the local authority, a hydrant may serve a secondary role as a blow-off.

## **2.14 Services**

Service connection size should be calculated on the basis of the designated land use including sprinkler systems and/or on-site hydrants, where applicable. The minimum service size is 19 mm diameter.

Water services shall be installed to the property in accordance with Standard Drawings D-7 and D-8 and shall be installed, whenever possible, in a common trench with the sanitary sewer service.

A water service shall be installed where required to provide a connection to each parcel created by the subdivision and to any other existing or possible future parcel which can be serviced from mains installed by or for the subdivision.

Each service pipe shall have a shut-off located 0.3 m in front of the street/property boundary line, and at the centre of each parcel. Where such location will conflict with other services, the location may be revised with the approval of the Manager of Operations.

## **2.15 Corrosion Protection**

Corrosive soils have been encountered in Golden and the Manager of Operations may require a geotechnical report on soil and groundwater conditions in the development or subdivision area.

This report would, address among other things, the necessity of using sulphate resistant cement in concrete in contact with native soils and the necessity of installing cathodic protection on water system components. The report would identify the size and type of sacrificial anodes required. A 25 year life expectancy is required for the anodes specified.

## **2.16 Tie-ins to Existing Watermains**

Connection of a new pipe to an existing watermain shall be done by the Applicant under supervision by the Municipality. The Applicant shall pay for the supply of all materials required and shall pay the full cost of making the tie-in. Only the Municipality may operate valves on the existing watermains. Notification for tie-ins shall be made at least one week in advance of the proposed work.

## **2.17 Reservoirs**

Reservoir design should include a preliminary design which is to be approved by the local authority before detailed design begins. Preliminary design should cover the following issues:

- Materials Selection
- Design Standards
- Volume
- Shape and type of construction
- Number of cells
- Geotechnical report on foundation conditions
- Appearance
- Summary of design features including: sizing, design elevations, control mechanisms, SCADA.

Reservoirs, where required, shall be designed to suit the particular circumstances. In general, reservoir capacity shall be not less than:

$$\text{Total Storage Requirement} = A + B + C$$

where      A = Fire Storage (In accordance with Fire Underwriters Survey)  
              B = Equalization Storage (25% of maximum day demand)  
              C = Emergency Storage (25% of A + B)

Reservoir design shall incorporate the following features.

## Structural Design

Design in accordance with the latest edition of the BC Building Code and one of the following specialty codes:

American Concrete Institute (ACI) 350/350R: Code Requirements for Environmental Engineering Concrete Structures, and Commentary.

Portland Cement Association (PCA): Circular Concrete Tanks Without Prestressing

ACI 350.3/350.3R: Seismic Design of Liquid Containing Concrete Structures, and Commentary

American Waterworks Association (AWWA) D110: AWWA Standard for Wire and Strand-Wound Circular Prestressed-Concrete Water Tanks

AWWA D115: AWWA Standard for Circular Prestressed Concrete Water Tanks with Circumferential Tendons

AWWA D100: AWWA Standard for Welded Steel Tanks for Water Storage

AWWA D103: AWWA Standard for Factory-Coated Bolted Steel Tanks for Water Storage

## Design Features

- .1 Two cells, each containing one-half of total required volume and capable of being drained and filled independently. A single cell reservoir may be considered under the following circumstances:

Total volume less than 4,500 m<sup>3</sup>

Alternative storage available (another reservoir in system)

Alternative supply source available

Alternative storage or supply source scheduled to be available within five years

- .2 Overflow drain sized to handle the maximum design inflow.
- .3 Separate inlet and outlet pipes, located and oriented to provide circulation within the reservoir.
- .4 Independent drain outlet at bottom.

- .5 Roof access hatch sized and located for safe and convenient access for personnel, parts, temporary ventilation facilities, and cleaning equipment into each cell.
- .6 Hatches: watertight aluminum, complete with hinges and related hardware, drains, locks, and intrusion alarms.
- .7 Ventilation pipes or openings sized to handle appropriate intake and exhaust air volumes for filling and draining the reservoir. Include security considerations.
- .8 Reservoir floor to slope to drain sump in concrete structures and in steel structures where possible. Drain as low as possible in steel reservoirs.
- .9 Drain sump in concrete reservoirs to be minimum 1,000 mm x 1,000 mm x 400 mm; invert of drain pipe to be flush with sump floor; grating to be installed over sump.
- .10 Zoned sub-drains under floor to collect, drain and allow monitoring of any leakage.
- .11 Stairways or stainless steel or aluminum interior wall ladder from roof access to floor. All ladders and stairs to meet THE OCCUPATIONAL HEALTH AND SAFETY regulations, including attachment points for fall arrest equipment.
- .12 Fall prevention railings.
- .13 All pipework within the reservoir to be PVC, stainless steel, fibreglass or steel or ductile iron coated to AWWA standards.
- .14 All metal parts within the reservoir including bolts, nuts, screws, anchors, ladders, etc., to be stainless steel.
- .15 Pressure transducer or ultrasonic level controls for each cell.

- .16 Sample lines for at least one sample per 1,000 m<sup>3</sup> volume within each cell.
- .17 Washdown connection in each cell, complete with backflow preventer and 65 mm diameter pipe.
- .18 Convenient maintenance access.
- .19 Fencing, lighting, locks, alarms, and other security facilities to minimize vandalism and prevent water contamination.

### Valve Chamber

Reservoir piping should incorporate a valve chamber with the following features:

- .1 All valves associated with the reservoir operation.
- .2 Entrance at grade large enough to permit safe removal of largest equipment.
- .3 Lifting beams and hoists where necessary to enable removal of equipment.
- .4 Interior and exterior of all steel piping to be coated to AWWA standards, or use stainless steel.
- .5 Floor drains and drainage system.

Additional features, which may be required subject to system operations details, include the following:

Sampling ports for inlet, outlet and reservoir water.

Flow measurement and recording.

Heat, light and ventilation to local and Occupational Health and Safety Regulations.

PLC controls with connection to SCADA system if applicable, including:

Security switches

Discharge and suction pressure systems

Level monitoring system  
Flow meter  
Uninterruptible power supply (UPS)  
Operator interface panel, modem and antennae  
2-20 ma output on instruments, switches and gauges  
Chlorine residual analyzer.  
Provision for rechlorination facilities.

## **2.18 Pump Stations**

Pump stations, where required, shall be designed to suit the particular circumstances. In general, pump stations shall be designed to meet maximum daily demands with the largest pump out of service with balancing storage on line. If balancing storage is not on line, pump station capacity must meet peak hour demand with the largest pump out of service and stand-by power should be provided to allow the greater of maximum day demand plus fire flow or peak hour demand during a power outage.

Pump station design shall incorporate the following features:

- .1 Structure, piping and mechanical systems designed in accordance with seismic requirements.
- .2 Reinforced concrete, blockwork or brick construction; aesthetically pleasing.
- .3 Access doorways sized for safe and convenient removal and replacement of the largest piece of equipment. Lifting hooks or rails with pulley blocks as required.
- .4 Adequate HVAC and lighting.
- .5 Standby power, unless fire storage and balancing and/or emergency storage is available without pumping.
- .6 Electric motors to be 600 volt, 3 phase, premium efficiency, with thermal protection. Lower voltage (208 V, 3 phase) may be considered, depending upon service voltage available from power company.

- .7 Motors 100 hp and above to have analogue vibration recording and protection.
- .8 Air relief discharge and pilot lines to be piped with air gap to floor drains.
- .9 Housekeeping pads for MCCs.
- .10 Hydraulically operated or motorized pump control valves with isolation valves, unless pumps have variable speed drives which control transient pressures.
- .11 Flow meters and totalizers.
- .12 Spring return "Silent" check valves.
- .13 High pressure and surge relief valves with isolation valves, if warranted by system characteristics and transient analysis.
- .14 Suction and discharge pressure gauges for each pump with isolation valves.
- .15 Mechanical pump seals.
- .16 Water quality sampling ports.
- .17 Interior and exterior of pipework coated to AWWA standards, or use stainless steel.
- .18 Pump system to be PLC controlled with connection to SCADA system if applicable, including:
  - Security switches
  - Discharge and suction pressure systems
  - Level monitoring system
  - Flow meter
  - Uninterruptible power supply (UPS)
  - Operator interface panel, modem and antennae
  - 2-20 ma output on instruments, switches and gauges
- .19 Hour meters and ammeters for each pump.

- .20 Power factor correction if required by power company.
- .21 Noise attenuation to suit the location and local authority standards.
- .22 Equipment to be CSA approved and have minimum one-year guarantee on parts and labour. Owner's Engineer is to provide three sets of Operating and Maintenance Manuals. All equipment must be tested prior to Total Performance and Final Acceptance.

## **2.19 Access**

Paved vehicular access shall be provided to all reservoirs and pump stations. The minimum standard shall be as for a Rural Roadway, except with a minimum width of 6.0 m as shown on Standard Drawing No. B-7, curbing and drainage provisions as may be required by the Manager of Operations, depending on the location of the access roadway.

## **2.20 Pressure Reducing Valve (PRV) Stations**

PRV station design parameters should be reviewed and approved by the local authority before detailed design proceeds.

### Preliminary Design Parameters

- .1 Design Flows
  - Peak hour
  - Maximum day plus fire
- .2 Continuous, emergency or fire flow operation.
- .3 Location.
- .4 Chamber details
  - Controls and monitoring
  - HVAC

### Design Features

- .1 Minimum chamber size: 3 x 2 x 2 m (inside height).
- .2 Structure in accordance with Chambers section.
- .3 Parallel pressure reducing valves.

- .4 Isolating valves.
- .5 Air release valves.
- .6 Upstream and downstream pressure gauges.
- .7 Interior and exterior of pipework coated to AWWA standards, or use stainless steel.
- .8 Forced air ventilation plus heat and light, subject to local authority review.
- .9 External kiosk, if electrical and electronic equipment is included.
- .10 PLC controls with connection to SCADA system if applicable, including:
  - Security switches
  - Discharge and suction pressure systems
  - Level monitoring system
  - Flow meter
  - Uninterruptible power supply (UPS)
  - Operator interface panel, modem and antennae
  - 2-20 ma output on instruments, switches and gauges

### **3.0 MATERIALS**

#### **3.1 Pipe**

Pipe for watermains shall be polyvinyl chloride (PVC) unless an alternate pipe material is approved or specified by the Manager of Operations. Steel and Ductile iron pipe may be approved for use in high pressure applications.

PVC pipe shall conform with AWWA C-900-81 and CSA CAN3-B1373M-86 for mains 100 - 300 mm dia. and with AWWA C-905 CSA CAN3-B137.3-M86 for mains 350 mm to 600 mm dia. Joints shall be wall thickened and sleeve reinforced bell and spigot ends with formed groove for elastomeric gasket seal conforming to ASTM D2122.

#### **3.2 Fittings**

##### Cast Iron and (CI) Fittings

Cast and ductile iron fittings (i.e. tees, crosses, bends, reducers) sizes 100 mm to 400 mm shall conform to the AWWA C110-87 Standards. Fittings shall have bell-ends and shall be supplied complete with vulcanized synthetic

rubber gaskets conforming to the AWWA C111-90 Standards. Flanges, if approved, shall conform to ANSI B 16.1 Class 125. The exterior of all fittings, shall be factory coated with a 100% solid, thermosetting, fusion bonded, dry powder epoxy resin, conforming to the AWWA C213-91 Standards.

#### Polyvinyl Chloride (PVC) Fittings\*

PVC injection-moulded fittings, i.e. tees, elbows, single and double tapped couplings, sizes 100 - 200 mm and line and repair couplings, reducers, plugs, sizes 100 - 300 mm shall be Class 150 conforming to UNI-Bell B-12-87 Standard and AWWA C907-91 Standards. Tees, elbows, single and double tapped couplings and reducers sizes 100 - 200 mm shall also conform to CSA CAN/CSA - B137.2-M89.

PVC extruded fittings, i.e. long body 5 elbows, sizes 100 - 400 mm shall be Class 150, DR 18, conforming to AWWA C900-89.

\* PVC fittings shall not be installed in an organic compound (i.e. organic solvents or petroleum products) contaminated or potentially contaminated area (i.e. near buried petroleum fuel tanks, abandoned gas stations, petro storage areas or petro refinery sites).

### **3.3 Buried Gate Valves**

Buried gate valves shall conform to:

AWWA C-509 epoxy coated iron body, resilient seated valves with non-rising stem, O-ring stem seal, suitable for 1 MPa minimum.

Valves shall be equipped with a 50 mm square operating nut and tie-lugs where restraining is required. Valves to open counterclockwise.

Solid shaft nut extensions shall be equipped with a large top nut (rock plate).

### **3.4 Hydrants**

1. Hydrants shall conform to American Water Works Association Standard for dry barrel fire hydrants (AWWA C502).

2. Hydrants shall be Canada Valve Century or equivalent. Equivalency shall be determined by the Fire Chief through the Manager of Operations.
3. Hydrants shall be compression type.
4. Hydrants shall be two 2½" (65 mm) outlet and one 4" (100 mm) Storz type pumper outlet with caps on each outlet.
5. The internal main valve must be a minimum of 133 mm.
6. The main opening stem, hose and pumper outlet threads must conform to the British Columbia Standard fire hose thread for 65 mm fire hose couplings and allied fittings. The threads of the 100 mm pumper outlet shall have an outside diameter of 118 mm and six threads per 25 mm.
7. The hydrant shall be automatic draining.
8. The minimum clearance between finished grade and the hydrant flange shall be 150 mm, the minimum clearance between the centre of the lowest outlet must be at least 450 mm.
9. The main operating stem must operate in a counterclockwise direction.
10. The main 100 mm pumper outlet shall be installed, stortz or equivalent self locking twist on fitting complete with cap and securing chain. The stortz or equivalent self locking twist on fitting shall be equipped with Allen set screws to prevent removal without a special tool, special tools must be supplied to the Municipal Public Works Department and the Fire Department.
11. The operating spindle nut must be a 38 mm pentagon nut that operates in a counterclockwise direction.
12. Municipal hydrant barrels are to be red. Private hydrants barrels are to be chrome yellow.

13. The tops and nozzle caps shall be painted with the following capacity-indicating colour scheme to provide simplicity and consistency with colours used in signal work for safety, danger, and intermediate conditions:

Class AA	1,500 GPM/5,680 L/min or greater	Light Blue
Class A	1,000 GPM/3,785 L/min to 1,499 GPM/5,765 L/min	Green
Class B	500 GPM/1,900 L/min to 900 GPM/3,780 L/min	Orange
Class C	Less than 500 GPM/1,900 L/min	Red

14. For rapid identification at night, it is recommended that the capacity colours be of a reflective-type paint.
15. The hydrant identification number shall be stencilled on the edge of the top, directly over the 100 mm street port, facing the main fire department access route. Number shall be 65 mm or 2.5 inches size and of a reflective-type paint or decal.

### **3.5 Service Connection Pipe, Saddles and Joints**

All pipe for underground services 50 mm diameter and smaller shall be Type K annealed copper conforming to ASTM B88 or series 160 municipal polytubing as approved by the Manager of Operations. Pipe for services 100 mm and 150 mm diameter shall be as specified for the watermain pipe.

Service connections to PVC pipe shall be made using bronze saddles with either bronze or stainless steel fasteners tapped for AWWA thread. Saddles shall provide full support around the circumference of the pipe and shall provide a minimum bearing width of 50 mm measured along the axis of the pipe.

Joint fittings shall be compression type suitable for 1 MPa working pressure.

### **3.6 Corporation Stops**

Corporation stops shall be Mueller or Ford standard brass with inverted key. The outlet shall be a compression fitting.

### **3.7 Curb Stop and Boxes**

In non high water table areas, curb stops shall be Mueller or Ford with a stop and waste (e.g. Mueller H15219).

In high water table areas, curb stops shall be Mueller or Ford with a stop only (e.g. Mueller H15209).

Compression type fittings are required.

### **3.8 Air Valves**

Should conventional means for air release not be sufficient or non-existent on the designed system, installation of air and vacuum release valves shall be required. (Apco standard-single body combination air valve or equal.)

Where required, air valves shall be installed as shown on Standard Drawing No. D-10.

### **3.9 Coupling Clamps**

The joining of two plain end pipes may be done using Robar stainless steel clamps or equivalent approved by the Manager of Operations. All fasteners shall be stainless steel.

### **3.10 Meters**

Meters shall be installed indoors or in an outdoor enclosure at the Applicant's expense. Location shall be as approved by the Manager of Operations. All meters shall be easily accessible to the Municipality. Outside meter chambers, vaults or enclosures shall include:

- watertight underground structures
- drainage and ventilation
- protection from freezing
- adequate access and interior space for maintenance and equipment removal
- minimum headroom of 2.0 m
- permanent ladder to Occupational Health and Safety Regulations

- piping primed and painted with a rust-inhibiting paint
- metering and readout devices as required
- meter bypass

### **3.11 Concrete**

All concrete shall conform to CSA:A23.1 with a minimum 28-day compressive strength of 14 MPa for unshrinkable fill and thrust blocks, and 20 MPa for all other purposes. Concrete slump shall be in the range of 50 mm to 100 mm.

Cement shall be Portland cement conforming to CSA:A.5, and shall be normal type unless specified by the Manager of Operations or dictated otherwise by soil conditions.

Admixtures shall not be included in the concrete mix without the approval of the Manager of Operations.

## **4.0 WORKMANSHIP**

### **4.1 Trench Excavation**

Trenches shall be restored in accordance with Standard Drawing D-11. Open trenches through existing paved surfaces will be allowed only with the prior express consent of the Manager of Operations. When trenches through existing pavement are allowed, the pavement shall first be saw-cut by mechanical means in straight continuous lines parallel to the trench centreline.

If trenches are excavated wider than the specified widths, a higher class of pipe or special bedding may be required.

Rock excavation in trenches shall provide a minimum clearance of 150 mm below the pipe for pipes 600 mm in diameter or less, and 250 mm for pipes larger than 600 mm in diameter.

The top of the trench at ground level shall be kept to the minimum width consistent with the depth, natural angle of repose of the material and the regulations of WorksafeBC.

Excavation for manholes, fittings and other appurtenances shall be to the lines which will permit the assembly of these sections. Concrete for bases may be cast against the walls of the excavation, if the soil conditions are suitable.

Where an existing structure or underground installation may be affected by the works, it is the responsibility of the Applicant to inform the owner of such facility sufficiently in advance that the owner may make an inspection and specify the protective measures to be undertaken.

Where an unforeseen or other obstruction is encountered which interferes with the designed alignment or grade, the construction shall cease until such time as revised proposals are approved by the Manager of Operations.

The attention of the Applicant is directed to the provisions of the Occupational Health and Safety Regulation. All municipal employees have been instructed not to enter excavations which are not properly braced or which otherwise do not conform with the requirement of the Board. It follows, therefore, that approvals cannot be given to installations not inspected because of unsafe working conditions.

Any over-excavation of the trench subgrade beyond the specified depth shall be backfilled with select material and compacted to 95% Modified Proctor density.

Where the bottom of any excavation as uncovered is soft and is, in the Owner's Engineer's opinion, unfit to support the pipes or structures, a further depth shall be excavated and refilled to the correct shape, grade and elevation as directed by the Owner's Engineer.

When the bottom of a trench is found to consist of unstable material which, in the opinion of the Owner's Engineer, cannot be removed and replaced with bedding material, a pile foundation or other structural support in accordance with plans prepared by the Owner's Engineer shall be constructed.

In areas of clay or other impermeable soils, where over excavation of the trench subgrade is required, the over excavation shall continue to a point where ponding of water in the trench bottom will be avoided.

Open cut trenches shall be sheeted and braced as required by the Worker's Compensation Act, as may be necessary to protect life, property, or the work, unless the trench excavation is sufficiently wide at the top to be naturally stable. When close sheeting is required, it shall be driven so as to prevent the soil from entering the trench either from below or through such sheeting. A minimum distance of 150 mm from the closest point of the pipe to the sheeting shall be maintained.

When possible, vertical trench timber or sheeting shall be placed so that it does not extend below the level of the bottom of the excavation. Sheeting driven below the pipe grade shall not be removed unless the sheeting can be removed without causing settlement or lateral displacement of the pipe. Sheeting thus left in place shall be cut off 100 mm above the top of the pipe.

Unless otherwise indicated in the drawings or specifications, or unless approval to leave it in place is received from the Manager of Operations, trench sheeting and bracing shall be removed when backfilling has been completed or has reached a level which will permit its safe removal without causing injury to persons or damage to the works. When sheeting and bracing is left in place, it shall be cut such that no sheeting remains closer than one metre to the established subbase roadway grade or the existing ground surface, whichever is the lower.

Particular caution will be taken to ensure that pipe bedding is not disturbed such that settlement of the pipe results.

Timber supports or sheeting shall be left in place when its removal would endanger adjacent structures or result in a shifting of pipe bedding material and a displacement of the pipe. The Manager of Operations may require the pipe to be bedded in concrete (Class A Bedding) when, in his opinion, the removal of sheeting would disturb the pipe bedding. Discharge from trench pumps, well points, or other dewatering aids, shall be located and controlled in such a manner as to not cause loss or damage to public or private property, nuisance on roadways or walks, or injury to the public.

#### **4.2 Pipe Class and Bedding Class**

Notwithstanding other provisions of this Bylaw, the quality of the pipe and bedding shall be so selected such that the installation will adequately support the loads to be placed on it during construction and in operation. For ductile iron pipe, the calculations shall follow the method shown in CSA B131.12, latest edition. For PVC pipe, the calculations shall follow the methods outlined in the Uni-Bell Plastic Pipe Association publication "Handbook of PVC Pipe - Design and Construction", latest edition.

For all pipe, a minimum Class B bedding, as defined by Standard Drawing D-1, is required unless the Manager of Operations specifically approves Class C bedding. Pipe class and bedding class must be identified on all engineering drawings.

#### **4.3 Pipe Installation**

Prior to installing pipe, all standing water shall be drained or pumped from the trench. Pipe shall be carefully offloaded and lowered into the trench in a manner that will prevent damage to the pipe. The pipe shall be jointed in strict accordance with the manufacturer's recommended practice.

Service connection pipe shall be connected to the Corporation stop and a gooseneck formed as shown on Standard Drawings No. D-7 and D-8. Pipe shall be installed in a straight line between the gooseneck and the terminus of the service.

Compression joints shall be required for connecting service piping. Service tapping shall be spaced along the length of pipe and staggered around the circumference to avoid cracking of pipe between tappings. Minimum distance between two tappings and between the end of a pipe and the tapping shall be 300 mm. A marker stake shall be set over the end of the service and the top projecting 1.0 m above the ground. The depth from top of marker to water service shall be clearly marked on the stake. Marker stake tops shall be painted blue with white painted numbers and letters.

Service boxes shall be set flush with ground or roadway surface. A blue marker stake with appropriate identification shall be installed to identify the curb stop. A length of copper flattened on one end shall be installed on the

private property side of the curb stop to prevent entrance of foreign material and this pipe shall extend 1,500 mm into private property.

#### **4.4 Thrust Blocking**

Concrete thrust blocking shall be provided at fittings as shown on Standard Drawing No. D-4 and on hydrants as shown on Standard Drawing No. D-2. Concrete shall be placed between undisturbed ground and the fitting to be anchored such that the pipe and the fitting joints are accessible for repair. Bolts on flanged fittings shall be left free. The area of thrust block bearing on pipe and on ground shall be no less than that shown on Standard Drawing No. D-4.

Temporary blocking or support of valves and fittings shall be with concrete, fabricated steel, durable rock, sand or gravel and in no case shall temporary or permanent wood blocking be used.

#### **4.5 Valves, Fittings and Hydrants**

Valves, fittings and hydrants shall be set plumb and directly on the centreline of the pipe. A Nelson type valve box shall be provided for every valve. The valve box shall not transmit shock or strain to the valve and shall be centred and plumb over the nut of the valve. The 150 mm riser pipe must be placed in such a manner as to permit the use of long-handled angle wrenches through the box to tighten packing gland nuts. On valves 200 mm and over, a cast bell bottom fitting shall be used over the valve.

Hydrants shall be plumb and shall have their nozzles parallel with or at right angles to the curb. Hydrants shall be set with ground flange above the ground at the elevation directed by the Manager of Operations generally at 150 mm above finished curb grade. When set in a permanent sidewalk or other solid structure, a suitable expansion joint material shall be placed around the hydrant to allow for movement between hydrant and structure. All hydrants shall be supplied with drains. Sufficient drain gravel shall be placed to allow for proper hydrant drainage, generally a minimum of 0.50 cubic metres.

#### **4.6 Blow-Offs**

Blow-offs shall be installed as shown on Standard Drawing D-5.

#### **4.7 Backfill Above Pipe Zone**

##### In Travelled Areas

In roadway areas, trench backfill material shall be placed in layers not exceeding 300 mm in thickness and compacted by mechanical means to a minimum of 98% Standard Proctor density.

The water content of the material shall be controlled to achieve the required density. When the natural water content of the material is less than the required value, water shall be added during the placing of the fill materials. When the water content of the material is greater than the required value, all compaction and placement operations shall cease and the material aerated until the required water content is obtained.

##### In Non-Roadway Areas

In easements and other non-roadways areas, native trench material may be used for trench backfill above the pipe zone. Backfill shall be placed and compacted to 95% Standard Proctor Density.

#### **4.8 Service Connections**

Service connections shall be installed as shown on Standard Drawing No. D-6.

Service connections shall be tested with mains where main testing is required.

A 50 x 100 mm marker stake shall be set flush with the invert of the service connection with the top projecting 1.0 m above the ground surface. Marker stakes shall be painted blue and the depth from top of stake to the invert of the service pipe shall be clearly marked on the stake with white painted letters and numbers.

Information as to size of service pipe and type of service shall also be indicated on the stake.

#### **4.9 Pipe Casings**

Pipe casings shall be installed as shown on the engineering drawings. The water pipe shall be blocked at each joint to ensure line and grade is maintained and the casing is to be sealed at both ends with joint filler with proper care taken to ensure that the pipe remains on line and grade and does not float. The annular space between the water pipe and the casing pipe shall be filled with sand or otherwise secured from floating and movement.

A length of 6 mm polypropylene rope shall be laid alongside the carrier pipe inside the casing to assist future retrieval.

#### **4.10 Pavement Restoration**

If the edges of the cut pavement become ragged as a result of the construction operation, the pavement shall be re-cut to form a straight line prior to placing new pavement. The edges of the existing pavement shall be thoroughly clean and coated with an approved bituminous bonding agent prior to placing the hot asphalt mix. The finished grade of the asphalt surface shall conform with that of the existing surface such that no rises, depressions or ridges result from the repaving process.

### **TESTING**

#### **4.11 Leakage Tests**

Following final trench backfilling, leakage tests shall be performed on all installed piping according to AWWA Standard C600. Tests shall be conducted in the presence of the Manager of Operations with 24 hours notice provided to the Municipality in advance of the test. The leakage test shall be conducted after all mains and service connections have been completely installed and backfilled. The Applicant shall furnish all necessary apparatus, test water and labour to conduct test. Leakage tests shall be performed in the following manner:

The section to be tested shall be filled with water and all air expelled from the piping. It is recommended that the test section be filled with water for at least 24 hours prior to testing. By pumping water into the test section, the pressure within the piping shall be increased to the pressure rating of the main or 1½ times the operating pressure, whichever is greater. This pressure shall be maintained constantly in the pipe throughout the duration of the test by the addition of make-up water. The duration of the test shall be a minimum of 2 hours. Hydrant leads shall be shut off at the hydrant such that the hydrant is not placed under test. The quantity of water pumped into the test section to maintain the specified pressure over the period of the test shall be considered to be the leakage. Piping will not be accepted until the leakage is less than the maximum allowable leakage determined from the following formula:

$$L = \frac{ND \times \text{the square root of } P}{131,000}$$

in which L = the allowable leakage in L/hr.

N = the number of joints in the test section.

D = the nominal diameter of the pipe in mm

P = the average test pressure during the leakage test in kP

Should any test disclose leakage greater than that specified above, the source of the leakage shall be located and the defect repaired or the necessary replacement made and the section retested until a satisfactory test is obtained. All repairs to the work shall be made with new material equivalent to that requiring repair or replacement. The use of repair and maintenance aids such as clamps will not be permitted.

Leakage tests shall be carried out between valved sections of the installation such that every valve in the system is tested for leakage in the shut-off position.

Testing through hydrants is not permitted.

#### **4.12 Flushing**

The pipe shall be cleaned of dirt and other foreign materials. The pipe shall be flushed at water velocities of 1 m/s or as high a velocity as can be

obtained from the available water source. Flushing time shall be at least five times the time required to travel the main at 1.5 m/s velocity. Flushing shall continue for the required time or until 10 minutes after the water has cleared, whichever is greater.

The Owner's Engineer shall submit a report to the Manager of Operations indicating that flushing was performed in conformance with this section.

#### **4.13 Chlorination**

On completion of the flushing operation, main pipes and services shall be chlorinated. Chlorination procedures shall conform to AWWA C601. No pills, powders or solids shall be placed in the main during installation or for chlorination purposes. Chlorination shall be applied by the continuous feed method.

After preliminary flushing, a solution of calcium hypochlorite or liquid chlorine shall be injected while sufficient water is being discharged through the main to bring the chlorine content to a concentration of 50 mg/L.

All appurtenances shall be operated in this solution to disinfect them. All measures shall be taken to prevent the disinfectant solution from flowing into existing water supply system. The disinfecting solution shall remain in the main for 24 hours and shall have no less residual than 25 mg/l at the end of that period. Following disinfection of lines to the required standard, the line shall have a final flushing to completely purge all disinfecting solution. Flushing shall continue for 15 minutes after a concentration of 1 mg/L is reached. Water with a chlorine concentration greater than 1 mg/L shall be discharged to a sanitary sewer or alternate means of disposal and requires approval of the Ministry of Environment. Bacteriological samples must be submitted to a qualified testing laboratory and indicate that satisfactory disinfection has been achieved prior to putting the main into service.

A log of all test results and disinfection procedures shall be submitted to the Manager of Operations.

On completion of chlorination, the entire piping system shall be thoroughly flushed, filled with water and left in a condition ready for use, unless otherwise directed by the Manager of Operations.

#### **4.14 Compaction Test**

The Municipality shall be provided with copies of all sieve and compaction test results pertaining to bedding backfill and roadway restoration.

Compaction tests shall be taken at a frequency of one test per lift for every 75 m of trench length and one test per lift for any trench less than 75 m.

### **5.0 STANDARD DRAWINGS**

**5.1** The following Town of Golden Standard Drawings shall form part of this schedule.

Drawing No.   Drawing Description

D-1	Standard Classes of Pipe Bedding & Backfill within the Pipe Zone
D-2	Standard Hydrant Detail
D-3	Nelson Type Valve Box & Riser
D-4	Pressure Main Trust Blocks
D-5	Standard Blow-Off Detail
D-6	Larger Diameter Sewer and Water Services
D-7	Typical Water Service Connection
D-8	Sewer and Water Services Common Trench Installation
D-9	Watermain and Sewer Main Anchors
D-10	Combination Air Release Valve or Air & Vacuum Release Valve
D-11	Trench Restoration Detail

**15.0 SCHEDULE E - REGULATIONS, STANDARDS AND SPECIFICATIONS  
FOR THE DESIGN AND CONSTRUCTION OF SANITARY SEWERS**

**1.0 GENERAL DESIGN**

**1.1 General**

Where a sanitary sewage collection and disposal system is required, sanitary sewer facilities including gravity sewer mains, pump stations and force mains if required, manholes, service connections and all related appurtenances shall be provided.

A sewer service lateral shall be installed where required to provide a connection to each parcel to be created by the subdivision and to any other existing or possible future parcel which can be serviced from mains installed by or for the subdivision. The routing of sewers shall be in accordance with the directions of the Manager of Operations.

Where sanitary sewer facilities are not required, rights-of-way may be required to be provided by the Applicant to allow for the eventual installation of this facility. Such rights-of-way shall be registered in favour of the Municipality at the Applicant's expense.

Where a subdivision is located in a zone where on-site disposal is permitted, the individual treatment systems (e.g. septic tanks) shall be designed to facilitate connection of the individual service lines to a future sanitary sewer system, should it become available.

On-site disposal systems shall be designed, constructed and inspected in accordance with current provincial government regulations and standards as set out in the Health Act.

**1.2 Standards and Specifications of this Schedule to Apply to Sewer Works**

Standards and specifications contained in this Schedule shall apply to all sanitary sewer installations constructed for or in the Municipality. All standards not specifically covered in these standards shall be as directed by the Manager of Operations.

### 1.3 **Approval of Engineering Drawings Required Prior to Construction**

Engineering drawings showing detailed design of the necessary works shall be submitted to the Manager of Operations for approval. No construction of sanitary sewers shall commence until the drawings have been approved by the Manager of Operations. These drawings shall show alignment and size of pipes, proposed grades, distances between manholes, manhole invert elevations, existing ground line and proposed final ground line over pipe, location of all service connections to the property line, all easements, lift stations, force mains, pipe bedding requirements, and all other details which may be required by the Manager of Operations.

## 2.0 **DESIGN CRITERIA**

### 2.1 **Pipe Capacity**

Sanitary sewer facilities constructed in a subdivision shall be designed to provide sufficient capacity to carry the required quantity of sewage flow from the full contributing area as defined by the Manager of Operations.

#### Per Capita Flow

Sanitary sewer system design should be based on an average daily dry weather flow (ADWF) of 350 litres per day per capita (L/d/c).

#### Non-Residential Flows

Average dry weather flows (ADWF) for non-residential areas should be based on specific data related to the development or zoning. In the absence of such data or local regulations, use the above residential per capita flow and the equivalent population factors specified in Table E.1.

Table E.1

<b>Land Use</b>	<b>Equivalent Population/Hectare (gross)</b>
Commercial	75 people/ha
Institutional	50 people/ha
Industrial	75 people/ha

### Peaking Factor

The peaking factor is the ratio of peak dry weather flow (PDWF) to the average dry weather flow (ADWF). The peaking factor should be applied to the design residential population and the non-residential equivalent population. The peaking factor is to be calculated using the Harman formula:

$$PF = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where: PF = peaking factor  
P = population in thousands

### Infiltration

Design flow should include an infiltration allowance to cover groundwater infiltration and system inflows. The allowance should be based on the gross tributary area and the allowances provided in Table E.2.

Table E.2

	<b>Infiltration Allowance</b>
New system with pipes above groundwater table:	0.06 L/s/ha
Old system (25 years or older) and/or pipes below groundwater table	0.12 L/s/ha

### Design Flow

Design flow Q (= PWWF) = population and equivalent x per capita flow x peaking factor + infiltration allowance.

Pipe sizes shall be selected so that sewers flow 2/3 to 3/4 full at peak hour design flow.

## 2.2 Minimum Velocity and Design Grade

Minimum velocity for pipe flowing full or half full shall be 0.6 metres per second. Minimum grades are as specified in Table E.3 assuming a Manning's pipe roughness coefficient "n" of 0.013.

Table E.3

<b>Pipe Diameter</b>	<b>Min. Grade</b>	<b>Pipe Diameter</b>	<b>Min. Grade</b>
100 mm	2.00%	375 mm	0.23%
150 mm	1.00%	400 mm	0.20%
200 mm	0.60%	450 mm	0.18%
250 mm	0.40%	525 mm	0.15%
300 mm	0.32%	600 mm	0.12%
350 mm	0.28%		

Grade shall be increased where pipes are not expected to flow full or half full. There shall be no change in the grades of pipe between manholes.

## 2.3 Sizing of Sewer Mains

The minimum pipe size for all sewer mains shall be 200 mm. No reduction of pipe size shall be made downstream irrespective of pipe grade.

## 2.4 Depth of Cover

The depth of the main shall be sufficient to provide all service connection piping with a minimum cover of 1.8 m to top of the service piping anywhere within the finished right-of-way. Sanitary mains shall be designed such that gravity sanitary sewer drainage is possible from the full basement level of all parcels. In no instance shall the minimum cover over the crown of the main be less than 1.5 m, unless approved by the Manager of Operations. Where the cover over the pipe is less than 1.5 m, the main may require insulation as directed by the Manager of Operations.

## 2.5 Manhole Spacing

Manholes shall be installed at a maximum spacing of 150 m:

- at the end of each line where cleanouts are not provided;

- at all changes in grade, alignment or direction (for non curvilinear sewers);
- at all changes in pipe size;
- at all existing and future pipe junctions and intersections;
- at the beginning and end of pipe curvature for curvilinear sewers

Manholes are normally constructed in accordance with the details as shown on Standard Drawings E-1, E-2 and E-3. In cases where these details will not suffice, a detailed design drawing must be approved by the Manager of Operations.

Drop manholes on sanitary sewers may be allowed where particular circumstances preclude the use of normal manholes and where invert elevations differ by more than 60 cm. Drop manholes shall be constructed in accordance with the details as shown on the Standard Drawing E-2.

The relative elevations of sanitary sewers entering and leaving a manhole are to be such as to ensure that the manhole does not substantially reduce the hydraulic capacity of the system. Minimum fall through the manhole shall be 30 mm for straight through flows and 60 mm where there is a change in the direction of flow.

## **2.6 Cleanouts**

Cleanouts, rather than manholes, may be permitted at the end of non-extendable sewer mains in non-travelled areas with the consent of the Manager of Operations. Cleanouts shall be constructed in conformance with Standard Drawing E-4.

## **2.7 Service Connections**

Every parcel and each unit of a residential duplex should be provided with a separate service connection.

Unless otherwise approved by the local authority, connections are to serve all plumbing by gravity. Building elevations should be established accordingly. Pumped connections may be permitted if requested prior to sewer design and if appropriate covenants are provided.

### Size

Pipe size is to accommodate peak design flow.

Minimum pipe size is 100 mm diameter.

### Grade

Minimum grade from property line to sewer main:

100 mm diameter pipe      1.50%

150 mm diameter pipe:    1.00%

Larger sizes: Grade based on minimum velocity of 0.75 m/s.

### Details

Use standard wye fittings for connections to new mains. For connections to existing mains, use wye saddles or insertable tees. Services must enter mains at a point just below the springline.

Service connections may be permitted into manholes if:

The connection is not oriented against the flow in the main.

Manhole hydraulic requirements are met.

Inspection chambers are required on residential connections unless the service is less than 2.5 m long and connects to a manhole.

Control manholes are required on all industrial connections and on commercial connections where required by the local authority.

Manholes are required on service connections larger than 250 mm diameter.

Connections exceeding 30 m in length will be treated as mains.

## **2.8 Location of Sewer Mains**

Sanitary sewer mains shall be installed along the centreline of roadways unless otherwise permitted by the Manager of Operations. Line

assignments for sewer mains installed in lanes will be established by the Manager of Operations.

## **2.9 Rights-of-Way**

Where the location of the sewer main within the highway right-of-way is not practical due to topography or other factors, the sewer main shall be located in a utility right-of-way registered in favour of the Municipality and having a width of not less than 6.0 metres. The Manager of Operations may require a utility right-of-way wider than 6.0 metres in the case where services in addition to sanitary sewer will be placed in the same right-of-way or where the depth of the sewer main requires a wider easement. There shall be a minimum clear lateral distance between the outside walls of sanitary sewers and storm sewers of 1.0 m

## **2.10 Alignment of Sewer Mains**

Sewer mains shall generally be designed to follow a straight alignment between manholes. Where permitted by the local authority, horizontal and vertical curves may be formed using pipe joint deflections as follows:

Minimum radius = 60 m.

Constant radius throughout curve.

Joint deflection not to exceed 75% of maximum recommended by pipe manufacturer.

Minimum design velocity = 0.9 m/s.

Joint locations to be recorded.

## **2.11 Sanitary Force Mains and Lift Stations**

The objective of the Municipality is to minimize the number of sewage lift stations required and thoroughly consider other options to avoid lift stations wherever practical. The Owner's Engineer shall obtain approval from the Manager of Operations as to the siting of the lift station.

Prior to commencing detailed design of a lift station, the Owner's Engineer shall submit a pre-design report that addresses the design considerations of these criteria to the Manager of Operations. Approval of the pre-design concepts must be obtained prior to the Owner's Engineer commencing detailed design.

The location and layout of a lift station shall include an assessment of the following basic pre-design considerations.

#### Pre-Design Requirements

- System Layout: Select location(s) to minimize long term total number of pump stations.
- Location: Within right-of-way adjacent to roadway.
- Capacity: Dependent upon the development and catchment area. Designs must consider short, intermediate and long term future flows.
- Configuration: Submersible duplex pump system unless otherwise approved in advance.

Other basic criteria include:

- Construction dewatering requirements.
- Access for construction and maintenance.
- Aesthetics, noise, odour control, and landscaping.
- Security against vandalism and theft.
- Flood elevations and station uplift design.
- Proximity of receiving sewers, watermains and power supply.
- Minimizing energy requirements.
- Standby power.
- Soils (subsurface investigations must be undertaken prior to site approval).
- Convenience of operation and maintenance.
- Safety for operators and public including HVAC.
- Capital costs and operation and maintenance costs.

#### Design Features

- .1 Pump stations should be designed with a minimum of two pumps, each capable of handling the maximum flow condition. A mixer

should be provided, or one pump equipped with an automatic flush valve.

Where the design flow exceeds the capacity of a single, commonly available pump, use three or more pumps with capacities such that there is always one pump available for standby.

.2 Pump requirements:

- Capable of passing solids up to 75 mm in size. For small flows (< 10 L/s), recessed impeller type pumps with 50 mm solids capability may be considered, subject to local authority approval.
- Maximum motor speed: 1,750 rpm. For small flows (< 10 L/s), 3,500 rpm may be considered, subject to local authority approval.
- 600 volt, 3 phase electrical power. Lower voltage (208 V, 3 phase) may be considered depending upon service voltage available from the power company.
- Easily removed for maintenance.
- Able to operate alternately and independently of each other.
- Able to meet maximum flow condition with one pump in failure mode.
- Sized so that each motor does not cycle more than six times in one hour under normal operating conditions.

.3 Minimum wet well size: 2.4 m diameter.

.4 Check valves and plug valves required on each pump discharge.

.5 Wet well bottom to be benched to direct solids to pump suction.

.6 Gate valve required on influent line outside pump station.

.7 Pump station lids to be waterproof and provided with locks. Covers may be either aluminum or fibreglass. Fasteners to be 316 stainless steel. Lids to be 200 mm to 300 mm above ground level.

.8 Station access to be by aluminum ladder. Ladder to be located to avoid interference with removal and installation of pumps. Ladder to be provided with extension and lock at least 600 mm above station

lid. Fibreglass grating platform to be provided above high water level for wet well access. Access, ladder and platform to meet Occupational Health and Safety regulations.

- .9 Metal stations to be provided with impressed current cathodic protection.
- .10 Steel and fibreglass surfaces to receive minimum two coats of two-component white epoxy enamel. Concrete stations to be designed to prevent sulphide attack.
- .11 Auxiliary equipment and control panels to be housed in weatherproof kiosk adjacent to station. Kiosk to be located not less than 2.0 m and not more than 4.0 m from station lid.
- .12 Kiosk to contain separate compartment for pump station ventilation fan.
- .13 Explosion-proof intake fan, activated by a manual switch, and of sufficient capacity to exchange the total volume of air inside the station with fresh air within 3 minutes. Fan to be located in kiosk. Intake duct to terminate near maximum water level. Exhaust vent to be provided in top of pump station.
- .14 Wiring in station and fan compartment to be explosion-proof, Class 1, Division 2. Electrical design and installation subject to approval by the Provincial Safety Inspector.
- .15 Power and control cables to be continuous from within the pump station to within the kiosk.
- .16 Levels to be controlled by ultrasonic level transmitter, plus emergency high and low level floats.
- .17 Controls to be PLC based and connected to the SCADA system.
- .18 Station to be complete with an Uninterruptible Power Supply (UPS) to serve alarms and controls.

- .19 Control panel to include hour meter and ammeter for each pump.
- .20 Station to include magnetic flow meter with totalizer and connection to SCADA.
- .21 Pump control panel to incorporate operator interface with indicator lamps.
- .22 Control kiosk to be designed to contain control and SCADA equipment on front panel and power equipment on rear panel. Concrete base to be minimum 75 mm above finished grade.
- .23 Pump stations to include automatic generator sets for standby power in case of power failure. Provision for SCADA system to be included. Generator set enclosures to be weatherproof and to include noise control. For small pump stations, emergency storage may be considered in place of standby power. Emergency storage is to be based on 8 hours of average day flows plus infiltration.
- .24 Area around station and related equipment or building is to be graded, asphalted and fenced. Size of area to be determined by maintenance requirements and minimum 1.2 m clearance to structures with doors opened. Layout of structures and gates is to provide for clearances for pump removal by hoist truck.
- .25 Odour control to standard set by Manager of Operations.
- .26 Design in accordance with appropriate seismic standards.
- .27 Equipment to be CSA approved and have minimum one-year guarantee on parts and labour.

For each design submission to the Municipality, an extra set of drawings and equipment manuals pertaining to the design of the pump station, the sanitary mains and force mains, key plan, and a location plan shall be submitted for the maintenance department to check.

Before commencement of construction, the Owner's Engineer shall provide three sealed sets of mechanical shop drawings and electrical line diagrams

for review by the Manager of Operations. Two sealed copies of design calculations shall be provided for documentation. Prior to Total Performance of the completed lift station, by the Municipality, the Owner's Engineer shall provide three copies of an Operation and Maintenance Manual to the Municipality. The manual shall contain:

- As constructed shop drawings.
- Equipment layout drawings.
- Electrical, control, and alarm wiring diagrams.
- Operating instructions for the station and for all equipment.
- Maintenance instructions for all equipment, including frequency of maintenance tasks.
- Equipment data sheets.
- Certified head/capacity curves for pumps.
- Equipment part lists.
- Emergency operating procedures.

The maintenance manuals shall be hard backed bound documents with the name of the facility embossed on the cover.

### **2.13 Access**

Paved vehicular access shall be provided to sewage pumping stations. The minimum standard shall be as for a Rural Roadway as shown on Standard Drawings, with curbing and drainage provisions except with a minimum paved width of 6.0 m Standard Drawing No. B-7. Curbing and drainage provisions may be required by the Manager of Operations, depending on the location of the pumping station.

### **2.14 Force Mains**

At the lowest pump delivery rate anticipated to occur at least once per day, a cleansing velocity of at least 0.75 m/s should be maintained. Maximum velocity should not exceed 3.5 m/s.

An automatic air relief valve shall be placed at high points in the force main to prevent air locking.

Force mains should enter the gravity sewer system via a manhole and at a point not more than 600 mm above the flow line of the gravity sewer.

The minimum size for force mains discharging raw sewage shall be 100 mm diameter, unless otherwise approved by the Manager of Operations.

The materials selected for force mains shall meet Municipal standards and shall adapt to local conditions, such as character of industrial wastes, soil characteristics, exceptionally heavy external loadings, abrasion and similar problems.

A trailing wire shall be installed for the purpose of locating the force main.

All force mains shall be designed to prevent damage from superimposed loads, or from water hammer or column separation phenomena.

### **2.15 Tie-ins to Existing Sewer Mains**

Connection of a new pipe to an existing sewer main shall be done by the Municipality unless the existing main has an acceptable provision for a direct extension. The Applicant shall pay for the supply of all materials required and shall pay the full cost of making the tie-in. This portion of the work, including details of materials required, shall be clearly indicated on the design drawings. Application for tie-in shall be made one week in advance of the proposed work.

## **3.0 MATERIALS**

### **3.1 Pipe and Fittings**

Pipe for gravity sanitary sewer mains shall be:

- polyvinylchloride pipe up to 600 mm in diameter, SDR 35, conforming to ASTM D3034 and CSA B182.2, stiffness (F/Y) of 320 kPa at 5% deflection conforming to ASTM D2412, complete with approved rubber gasket joints. Maximum pipe length shall be 4 metres.

Pipe for sanitary sewer connections of 100 mm and 150 mm diameter and for 150 mm diameter sewer mains shall be:

- Polyvinylchloride pipe, SDR 28, conforming to ASTM D3034 and CSA B182.1, complete with rubber gasket joints. Maximum pipe length shall be 4 metres.

Sewer fittings shall correspond with the respective main and service pipes and shall conform to consistent specifications for main pipe.

Pipes and fitting for sanitary sewer force mains shall be pressure rated pipe designed to meet pressure requirements of the force main. Force main materials must be approved by the Engineer.

Other types of pipe shall be used only with the written consent of the Manager of Operations.

### **3.2 Pipe and Fitting Joints**

Sewer pipe and fittings shall be jointed with a rubber gasket or other preformed, factory-manufactured gasket or approved material.

### **3.3 Manholes**

Precast concrete manhole sections shall conform to ASTM C478 and shall be 1,200 mm diameter. Concrete for cast-in-place manholes shall have a minimum compressive strength of 27.6 MPa at 28 days. Cement to be Type 10 normal unless soils are alkaline and then Type 50 sulphate resistant cement shall be used.

Concrete for cast-in-place manhole bases and benching shall have a minimum compressive strength of 27.6 MPa at 28 days.

Precast and prebenched manhole bases of a design and construction quality acceptable to the Manager of Operations are preferred over cast-in-place bases and benching.

Cover slabs may be precast or cast-in-place concrete reinforced to withstand H-20 loading conditions.

Manhole rungs shall be 20 mm diameter steel, hot-dipped galvanized after bending, or an approved aluminum alternate, at 300 mm o.c. cast in the wall

of the manhole section, or set in 30 mm holes filled with epoxy cement. Rungs shall protrude 125 to 150 mm from the manhole wall. The top step shall be located no more than 600 mm below the manhole rim elevation. If precast manhole barrels are used having inset wire lifting lugs, the lugs shall be galvanized.

### **3.4 Manholes Frames and Covers**

Covers and frames shall be cast iron of an approved pattern to withstand H20 loading. The cover shall have a weight of 66 kg and the frame shall be of the round base pattern having a weight of 84 kg. Bearing faces of the cover to frame shall be machined for a non-rocking fit. The cover shall have 2 only 22 mm diameter lifting holes (Dobney C-20 or approved equal).

## **4.0 WORKMANSHIP**

### **4.1 Trench Excavation**

Trenches shall be excavated to suit the cross-section shown on Standard Drawings No. D-1 and D-11. Open trenches through existing paved surfaces will be allowed only with the prior express consent of the Manager of Operations. When trenches through existing pavement are allowed, the pavement shall first be saw-cut by mechanical means in straight continuous lines parallel to the trench centreline.

If trenches are excavated wider than the specified widths, a higher class of pipe or special bedding may be required.

The top of the trench at ground level shall be kept to the minimum width consistent with the depth, natural angle of repose of the material and the regulations of the WorksafeBC.

Excavation for manholes, fittings and other appurtenances, shall be to the lines which will permit the assembly of these sections. Concrete for bases may be cast against the walls of the excavation, if the soil conditions are suitable and the Manager of Operations so approves.

Where an existing structure or underground installation may be affected by the works, it is the responsibility of the Applicant to inform the owner of

such facility sufficiently in advance that the owner may make an inspection and specify the protective measures to be undertaken.

Where an unforeseen or other obstruction is encountered which interferes with the designed alignment or grade, the construction shall cease until such time as revised proposals are approved by the Manager of Operations.

The attention of the Applicant is directed to the provisions of the Occupational Health and Safety regulations. All municipal employees have been instructed not to enter excavations which are not properly braced or which otherwise do not conform with the requirement of the Board. It follows, therefore, that approvals cannot be given to installations not inspected because of unsafe working conditions.

Any over-excavation of the trench subgrade beyond the specified depth shall be backfilled with select material and compacted to 100% Modified Proctor density.

In rock excavation the depth of compacted bedding material below the pipe shall be a minimum of 150 mm for pipe of 600 mm diameter or less and 250 mm for pipe in excess of 600 mm diameter. This depth shall exist for the full wall-to-wall width of the trench.

Where the bottom of any excavation as uncovered is soft and is, in the Owner's Engineer's opinion, unfit to support the pipes or structures, a further depth shall be excavated and refilled to the correct shape, grade and elevation as directed by the Owner's Engineer.

When the bottom of a trench is found to consist of unstable material which, in the opinion of the Owner's Engineer, cannot be removed and replaced with bedding material, a pile foundation or other structural support in accordance with plans prepared by the Owner's Engineer shall be constructed.

In areas of clay or other impermeable soils, where overexcavation of the trench subgrade is required, the overexcavation shall continue to a point where ponding of water in the trench bottom will be avoided.

Open cut trenches shall be sheeted and braced as required by the Worker's Compensation Act, as may be necessary to protect life, property, or the work, unless the trench excavation is sufficiently wide at the top to be naturally stable. When close sheeting is required, it shall be driven so as to prevent the soil from entering the trench either from below or through such sheeting. A minimum distance of 150 mm from the closest point of the pipe to the sheeting shall be maintained.

When possible, vertical trench timber or sheeting shall be placed so that it does not extend below the level of the bottom of the excavation. Sheeting driven below the pipe grade shall not be removed unless the sheeting can be removed without causing settlement or lateral displacement of the pipe. Sheeting thus left in shall be cut off 100 mm above the top of the pipe.

Unless otherwise indicated in the drawings or specifications, or unless approval to leave it in place is received from the Manager of Operations, trench sheeting and bracing shall be removed when backfilling has been completed or has reached a level which will permit its safe removal without causing injury to persons or damage to the works. When sheeting and bracing is left in place, it shall be cut such that no sheeting remains closer than one metre to the established subbase roadway grade or the existing ground surface, whichever is the lower.

Particular caution will be taken to ensure that pipe bedding is not disturbed such that settlement of the pipe results.

Timber supports or sheeting shall be left in place when its removal would endanger adjacent structures or result in a shifting of pipe bedding material and a displacement of the pipe. The Manager of Operations may require the pipe to be bedded in concrete (Class A Bedding) when, in his opinion, the removal of sheeting would disturb the pipe bedding. Discharge from trench pumps, well points, or other dewatering aids, shall be located and controlled in such a manner as to not cause loss or damage to public or private property, nuisance on roadways or walks, or injury to the public.

#### **4.2 Pipe Class and Bedding Class**

The quality of pipe and bedding shall be so selected such that the installation will adequately support the loads to be placed on it during

construction and in operation. For concrete pipe, the calculations shall follow the method shown in Water Pollution Control Federation Manual of Practice No. 9, latest edition. A safety factor of 1.5 shall be used for concrete pipe and the bedding classifications shall be as identified in Standard Drawing No. D-1.

For PVC pipe, the calculations shall follow the methods outlined in the Uni-Bell Plastic Pipe Association publication "Handbook of PVC Pipe - Design and Construction", latest edition.

Pipe class and bedding class must be identified on all engineering drawings. Pipe shall have at least Class B bedding, unless the Manager of Operations specifically approves Class C bedding, as defined by Standard Drawing No. D-1.

#### **4.3 Tie-Ins to Existing Sanitary Sewer**

Tie-ins to existing sanitary sewer mains shall not be made until after lines have been flushed and tested.

All work and costs associated with tie-ins shall be the responsibility of the Applicant. The Applicant shall install plugs in the nearest manhole to each connection so that no water enters the existing sewer system. The plugs shall be left in place until final connection and Total Performance of the new works by the Municipality. No turning in of sewage to the new system shall be done until the new works have been flushed and approval obtained from the Municipality. The Applicant shall be charged a minimum of \$500.00 for each time he allows water or sewage from the new system to enter the existing system plus any additional costs for cleaning the existing sewers.

#### **4.4 Pipe Installation**

Prior to installing pipe, all standing water shall be drained or pumped from the trench.

Pipe shall be carefully lowered into the trench in a manner that will prevent damage to the pipe. Pipe shall be jointed in strict accordance with the manufacturer's recommended practice. When pipes are not being installed,

the open end of the newly laid pipeline shall be protected with a suitable bulk head to prevent the entry of any foreign material.

Trench conditions shall be such that pipe jointing can be accomplished without getting muck, silt, gravel and other foreign material into the pipe.

The grade of every pipe length shall be checked before the pipe is backfilled. Any part of the trench excavated below grade shall be regraded with approved material thoroughly compacted.

All pipe must be laid to the design lines and grades within the following tolerances:

- Horizontal deviation from the approved alignment shall not exceed 60 mm and the rate of deviation shall not exceed 40 mm in 10 metres.
- Vertical deviation from true grade varies with the grade and shall not exceed the limits shown in Table E.4.

Table E.4

<b>Grade</b>	<b>Max. Departure from Design Elevation</b>	<b>Max. Rate of Deviation</b>
Over 5%	30 mm	20 mm in 10 metres
2% to 5%	15 mm	10 mm in 10 metres
Less than 2%	6 mm	10 mm in 10 metres

#### **4.5 Backfill in Pipe Zone**

The pipe zone is considered as being the depth of trench between the trench bottom and a level 300 mm above the top of the pipe.

Backfill from 50 mm above the springline of the pipe to the top of the pipe zone cover shall be with the same material as used for pipe bedding material. The pipe zone backfill shall be hand placed and thoroughly compacted to a density of 98% Standard Proctor Density in layers not exceeding 150 mm using hand tampers.

#### **4.6 Backfill Above Pipe Zone**

##### In Travelled Areas

In roadway areas, trench backfill material shall be placed in layers not exceeding 300 mm in thickness and compacted by mechanical means to a minimum of 98% Standard Proctor density.

The water content of the material shall be controlled to achieve the required density. When the natural water content of the material is less than the required value, water shall be added during the placing of the fill materials. When the water content of the material is greater than the required value, all compaction and placement operations shall cease and the material aerated until the required water content is obtained.

##### In Non-Travelled Areas

In easements and other non-roadways areas, native trench material may be used for trench backfill above the pipe zone. Backfill shall be placed and compacted to 95% Standard Proctor Density except where structures or pathways are located over the pipe, compact to 98% Standard Proctor Density.

#### **4.7 Manholes**

Manholes shall be constructed as shown on Standard Drawings No. E-1, E-2, and E-3.

All water shall be removed from the excavation prior to placing concrete, precast base or approved prebenched monolithic base. Concrete shall be placed only on a firm base. If the bottom of the excavation is unsuitable for support, it shall be excavated to a firm base and backfilled to the required grade with pipe bedding material.

Manhole channelling shall be constructed to form a smooth transition through the manhole. Channelling is to be formed using half pipe or fittings whenever possible. Where it is impossible to use half sections of pipe or fittings, the channel will be formed in the manhole base in a manner

approved by the Manager of Operations. Prebenched monolithic bases are the preferred method of construction.

Precast sections shall be placed plumb with all joints sealed to exclude the entrance of groundwater. Manhole barrel jointing material to be Rub'r-Nek as supplied by National Coupling, Kitchener, Ontario, or approved equal.

Drop structures shall be constructed as shown on Standard Drawing E-2

#### **4.8 Stubs**

Blind stub sections for connection of future Municipal sewers to the manholes shall be installed as directed by the Manager of Operations. The stub shall be plugged at the end with a watertight removable plug.

#### **4.9 Service Connections**

Service connections shall be installed as shown on Standard Drawings No. D-6, D-8 and E-5.

A 50 x 100 mm marker stake shall be set flush with the invert of the end of the service connection and against the cap and with the top projecting 1.0 m above the ground surface. Marker stakes shall be painted "green", and the depth from top of stake to the invert of pipe shall be clearly marked on the stake with white painted letters and numbers.

Information as to size of service pipe and type of service shall also be indicated on the stake.

#### **4.10 Pipe Casings**

The sewer pipe shall be blocked at each joint to ensure line and grade is maintained and the casing is to be sealed at both ends with joint filler with proper care taken to ensure that the pipe remains on line and grade and does not float. The annular space between the sewer pipe and the casing pipe shall be filled with sand or otherwise secured from floating and movement.

A length of 6 mm polypropylene rope shall be laid alongside the carrier pipe inside the casing to assist future retrieval.

#### **4.11 Pavement Restoration**

If the edges of the cut pavement have become ragged as a result of the construction operation, pavement shall be recut to form a straight line prior to placing new pavement. The edges of the existing pavement shall be thoroughly cleaned and coated with an approved bituminous bonding agent prior to placing the hot asphalt mix. The finished grade of the asphalt surface shall conform with that of the existing surface such that no rises, depressions or ridges result from the repaving process.

#### **4.12 Cleaning and Flushing**

Prior to video inspection, the sanitary sewer pipe shall be cleaned by flushing, or the use of mechanical equipment as necessary to remove all foreign material from the pipe. After paving and landscaping and before subdivision construction Total Performance, the sanitary lines shall be flushed to remove any deleterious material deposited by associated construction works.

#### **4.13 Force Mains**

Force mains shall be constructed and tested in accordance with Schedule D or as specified by the Manager of Operations.

#### **4.14 Compaction Testing**

The Municipality shall be provided with copies of all compaction test results pertaining to bedding, backfill and trench.

Compaction tests shall be taken at a frequency of one test per lift for every 75 m of trench length and one test per lift for any trench less than 75 m.

#### **4.15 Video Inspection Tests**

Prior to the inspection for the Total Performance Certificate (TPC), the Applicant shall, at no cost to the Municipality, flush all sanitary sewers installed and have a video inspection undertaken by a firm skilled in such

inspections may be required by the Manager of Operations. Two copies of the video inspection and written report shall be submitted prior to Total Performance being issued.

Any deficiencies discovered during this inspection shall be rectified at no cost to the Municipality.

A television work report, in log form, shall be maintained during the inspection. This log shall show the exact location of each leak or fault discovered by the television - e.g. open joints, broken, cracked or collapsed pipe, presence of grease, roots, debris, accumulation, obstructions, infiltration, water depth variations, and other points of significance. The reference location shall include the distance away from the reference manhole and also the position of the leak or fault as referenced to the crown of the pipe using clock face notation.

The report shall include the location of all service connections together with a statement of opinion as to whether or not the service connections are leaking. Protrusions of the service connections into the mainline shall be noted with reference to the degree of protrusion.

Photographs of all sewer defects shall be taken. The photographs shall be coordinated with the written report by reference numbers. A minimum of one photograph per line shall be taken to show a representative view of the workmanship, as well as additional photographs of deficiencies as required.

Each manhole section of pipe shall be located on the report form in such a way as to be readily identifiable. Identify such items as name of subdivision, street names, manhole numbers, type of pipe, joint length, direction of flows, pipe diameter, manhole depth, inspection date, names of the inspection technician, persons viewing, and video tape identification numbers.

Full color video tapes shall be of a format acceptable to the Manager of Operations. All video tapes shall be numbered and cross indexed to the typewritten report. Video tape footages to fault locations shall also be cross indexed to the typewritten report, as well as referenced to the description of the fault included on the video tape.

If, during the inspection procedures the television camera will not pass through the entire manhole section, the Applicant shall reset his equipment in a manner so that the inspection can be performed from the opposite manhole.

Prior to inspection, all lines shall be cleaned thoroughly to remove dirt, grease, sand and other foreign and objectionable debris from inside the pipe and manholes so that cracks and other faults may be observed.

## 5.0 STANDARD DRAWINGS

5.1 The following Town of Golden Standard Drawings shall form part of this Schedule:

Drawing No.   Drawing Description

D-1	Standard Classes of Pipe Bedding and Backfill within the pipe zone.
D-6	Larger Diameter Sewer and Water Services
D-8	Sewer and Water Services Common Trench Installation
D-11	Trench Restoration Detail
E-1	Typical Manhole for Sewer Main up to 400 mm Diameter
E-2	Interior Drop Manhole
E-3	Landing for Deep Manhole
E-4	Sewer Cleanout for 150 mm and 200 mm Diameter Sanitary Sewer Terminals
E-5	Typical Sewer Service Connections

**16.0 SCHEDULE F - REGULATIONS, STANDARDS AND SPECIFICATIONS  
FOR THE DESIGN AND INSTALLATION OF STORMWATER  
MANAGEMENT SYSTEMS**

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**1.0 GENERAL DESIGN**

**1.1 Stormwater Management**

Stormwater management involves the planning and design necessary to mitigate the hydrological impacts of land development or land use changes. Adverse hydrological impacts include such things as increased peak stormwater flows, erosion, sedimentation, flooding, reduced surface infiltration, reduced minimum groundwater levels and stream flows, water quality deterioration, and degradation of aquatic and wildlife habitats. Mitigation measures include, but are not limited to the following:

- Appropriate sizing and routing of pipes and channels
- Major flow path routing
- Detention storage
- Sediment removal
- Biofiltration
- Landscaping
- Erosion protection
- Groundwater infiltration
- Subsurface disposal
- Parcel grading

**1.2 Standards That Apply To All Drainage Works**

All new subdivisions and developments shall be provided with stormwater management systems that comply with the following standards:

- a) The site shall be graded to ensure positive drainage of water not absorbed by the ground. The site shall drain to the point of water discharge.
- b) The recommended minimum and maximum gradients to ensure positive drainage are set out in Table F.1. If the drainage design is certified by a professional engineer, gradients that do not conform to the recommendations in Table F.1 may be accepted.

Table F.1

Area	Grade		
	Maximum Gradient	Minimum Gradient	Grade
Driveways	Maximum Gradient	1:10	10-15%*
	Minimum Gradient	1:100	1%
Off-Street Parking	Maximum Gradient	1:17	4%
	Minimum Gradient	1:66	1.5%
Pathways	Maximum Gradient	1:12	8%
	Minimum Gradient	1:50	2%
Paved Utility Area	Maximum Gradient	1:17	6%
	Minimum Gradient	1:50	2%
Grass Areas	Maximum Gradient	1:3	33%
	Minimum Gradient	1:100	1%

\* Driveway access grades should be designed to permit the appropriate vehicular access for the zone without “bottoming-out” or “hanging-up”. From edge of pavement to property line, the driveway should follow proper boulevard slope to drain towards the roadway. For the first 10 m on private property, the maximum driveway grade is 15% if accessing a local or collector roadway. This maximum grade is limited to 10% if accessing an arterial roadway.

- c) The site shall be graded and planted in a manner that will prevent erosion of the ground.
- d) Site runoff shall not flow onto adjacent properties.
- e) For sites where any foreign material other than natural storm drainage might enter the drainage system, facilities to remove the foreign material shall be designed and sealed by a Professional Engineer and submitted for approval to the Ministry of Environment.
- f) Where disposal is to the Columbia River, the Kicking Horse River, or Hospital Creek, the drainage system shall be designed and sealed by a Professional Engineer and submitted for approval to the Ministry of Environment.

- g) Disposal of drainage water shall be achieved by one of the following methods:
1. connection to the municipal storm sewer system where the system exists in a roadway adjacent to the parcel, or where the municipality requires the storm sewer system to be extended to the parcel;
  2. discharge to a surface drainage course (ditches) where a storm sewer system is not available and a surface drainage course runs adjacent to the site;
  3. discharge to a dry well where a storm sewer system or ditching is not available and soil conditions and water table level facilitate effective operation of a dry well. Where dry wells are required, they must conform to the standards set out in this Bylaw;
  4. discharge to a natural drainage course, the Columbia River, the Kicking Horse River, or Hospital Creek, where they run adjacent to or through a site and other disposal methods are not available.
- h) The Applicant shall note that meeting standards set out in this Bylaw do not preclude the necessity to apply for permits from other agencies.

### **1.3 Stormwater Management Plan**

A stormwater management plan is required for all developments larger than 4 ha. The stormwater management plan is to include the following:

1. Tributary areas in the catchment based on existing and ultimate land uses.
2. Contours at 1.0 m elevation intervals.
3. Existing watercourses including environmental classifications and/or fish presence information.
4. Layouts of existing and proposed drainage systems.
5. Major flow paths.
6. Preliminary parcel grading patterns.

7. Locations, sizes and hydraulic grade line (HGL) elevations of any proposed detention facilities.
8. Any proposed mitigation measures, if appropriate.
9. Proposed minimum building elevations (MBE) and 100 year HGL of major flow path.
10. Construction sedimentation control plan.
11. Pre and post-development flows with and without the impact mitigation measures.
12. Current and future upstream and downstream flows and system capacities.

The stormwater management plan shall be submitted to the Manager of Operations for approval.

#### **1.4 Minor and Major Systems**

Each drainage system consists of the following components:

1. The "minor system" consists of those works necessary to handle a 5 year return flow for low density residential areas and a 10 year return flow for industrial, commercial, institutional, and high density residential areas.
2. The major system consists of surface flood paths, roadways, roadway culverts, watercourses, and stormwater management facilities designed to carry flows of a 100 year return frequency.

The presence of an existing municipal drainage facility does not imply that it has adequate capacity to receive the design flow, nor does it indicate that the drainage pattern of this facility is necessarily acceptable to the Municipality. Existing undersized drainage facilities shall be upgraded to accommodate the appropriate flow as described in the following sections. The upgrading work may be deferred only when approved by the Manager of Operations.

Where drywells are used to discharge surface water to ground, the Manager of Operations may require the Applicant to provide a report prepared by the Owner's Engineer attesting to the ability of the in situ soils to receive these waters.

All subdivisions shall be adequately drained throughout the year. Where the whole or part of any proposed subdivision is wet or subject to intermittent or periodic flooding, approval of the subdivision will be withheld until the Manager of Operations is satisfied that appropriate steps have been taken to drain the land or otherwise remedy such wet or flooding conditions.

Where unsatisfactory soil or drainage conditions exist or may develop on part or all of the subdivision area, the Applicant may be required to furnish such information as will allow the determination of the area, shape and dimensions of the parcels which will be adequate in view of the nature of the ground and the anticipated use of the land.

### **1.5 Natural Drainage Courses**

Where a parcel to be subdivided is traversed by a natural drainage course, there shall be provided either:

- a) a drainage right-of-way conforming to the general alignment of the existing or proposed drainage course of such width as may be designated by the Manager of Operations.
- b) provision made for an alternate drainage system to the satisfaction of the Manager of Operations.

No natural drainage course shall be altered or diverted unless in accordance with a drainage plan approved by the Manager of Operations.

Where approval of the Ministry of Environment is required for such an alteration or diversion, the Manager of Operations must be in possession of the Ministry approval prior to the applicant undertaking any work.

### **1.6 Site and Parcel Grading**

Grading is to comply with the BC Building Code and the following:

Grade parcels to drain to a municipal minor or major drainage system, natural drainage path or roadway.

Avoid drainage across adjacent parcels. If cross-parcel drainage is unavoidable, provide a swale to divert runoff away from the lower parcels.

Grade areas around buildings away from foundations.

Where parcels are lower than the adjacent roadways, direct highway runoff away from buildings and driveways and into a municipal drainage system.

Set building elevations above the hydraulic grade line (HGL) of the major drainage system. See Minimum Building Elevations (MBE) guidelines.

### **1.7 Minimum Building Elevations (MBE)**

The MBE applies to the elevation of the lowest floor slab in a building or the underside of the floor joists where the lowest floor is constructed over a crawl space. Crawl space is as defined in the British Columbia Building Code. Generally it is the space between a floor and the underlying ground having not more than a height of 1.8 m to the underside of the joists and not used for the storage of goods or equipment damageable by floodwaters.

For sites near a watercourse for which a floodplain elevation has been established, the MBE is 0.91 m above the 200 year return period instantaneous flood elevation.

## **2.0 DESIGN STANDARDS**

### **2.1 Runoff Analysis**

Storm drainage designs are to be carried out using one or both of the following methods as indicated below. Calculations are to be submitted with designs.

Rational Method: Applicable to preliminary design and to detailed design of minor drainage systems in urban areas where detention or other runoff controls are not required.

Hydrograph Method: Applicable to design of complex minor drainage systems and all storage calculations and major drainage systems. The computer program proposed for use is subject to approval by the Manager of Operations.

## **2.2 Rainfall Data**

Rainfall Intensity Duration Frequency (IDF) curves are from the Golden Airport AES Station.

Rainfall hyetographs for use with hydrograph method analyses are summarized Schedule N, Section 7.0.

## **2.3 Discharge Rates and Quality**

Drainage systems should include runoff controls to limit post-development peak discharge to the pre-development rates for 5 year return period storms.

Runoff quality treatment should be considered for flows up to 50% of the 2 year post-development peak flow or the 5 year pre-development peak flow, whichever is greater. Quality treatment facilities include such things as oil/grit separators for service stations, silt traps, detention storage facilities, grassed swales, and constructed wetlands. Treatment facilities shall include provisions for maintenance equipment access.

## **2.4 Rational Method Design**

The following applies to areas where the design flow is to be calculated by the Rational Formula:

$$Q = C \times I \times A$$

in which,

Q = Design Flow

C = Runoff Coefficient

I = Rainfall Intensity

A = Area drained

Low density residential systems shall be designed for industrial, commercial, institutional, and high density residential rainfall intensities which are expected to return on the average once every two years (Return Period - 5 years). Systems shall be designed for a Return Period of 10 years. The rainfall intensity shall be derived from the intensity curves included in the Standard Drawing Schedule N.

The time of concentration shall be the estimated time required for rain falling on the farthest point in the drainage area to reach a point in the sewer system under design. The inlet time for rain to reach catchbasins shall be assumed to be 10 minutes in residential subdivisions and commercial areas.

Runoff coefficients for storm sewer design shall be calculated for each site, but shall not be less than the values given in Table F.2.

Table F.2

Description of Area	Runoff Coefficient
Commercial-Downtown	0.80
Residential-single family	0.40
Residential-multi-family	0.60
Apartment Areas	0.70
Parks and Playgrounds	0.25
Unimproved Areas including hillsides	0.30

The derivation of runoff coefficients to be used for storm sewer design shall include consideration of relative areas of roofs and pavement.

Ground slope and soil permeability shall also be considered, however, the runoff coefficients shall in no case be less than the values outlined in these standards.

## 2.5 Hydrograph Method Design

Drainage designs using the Hydrograph Method require computer models capable of modelling the hydrologic characteristics of the watershed and of

generating flow hydrographs from each subcatchment for a critical storm or a series of storms and routing the hydrographs through the drainage network pipes, channels and storage facilities.

Selection of computer programs requires review of the historical application of each program in watersheds similar to those under consideration. Local authority approval of computer program selection should be obtained before design is commenced.

The following programs are considered suitable for the applications indicated, but it should be noted that the list of programs is not intended to be comprehensive or to exclude other suitable programs. Also note that the list of programs is current (February 2003) and should be reviewed annually.

OTTHYMO: Suitable for preliminary design of rural and urban areas, especially where backwater and surcharge effects are not significant. Also suitable for generating design flows in cases where pipes are being designed using manual methods.

MIDUSS and HYDSYS: Suitable for design of systems with no surcharge or backwater effects.

EPA SWMM RUNOFF and EXTRAN: Suitable for detailed evaluation of the operation of drainage networks and storage facilities.

QUALHYMO and SWMM TRANSPORT: Suitable for evaluating the performance of storage facilities over long winter wet weather periods.

Whenever possible, modelling results should be calibrated using observed rainfall and flow data from the design watershed or a similar watershed. Sensitivity of the model predictions to variations of key parameters should be tested and the findings used to develop realistic and conservative models.

Post-development hydrographs shall be generated at key points of the major drainage systems for a 5 year and 100 year design storm with durations of 2, 6, 12, and 24 hours for each development condition. A different range of storm durations may be appropriate, subject to local

authority approval. This will identify the critical storm event to be used in designing the system component. Note that the storm durations that generate the critical peak flow may be different from the durations that generate the critical storage volume. Systems with a number of interconnected ponds or with restricted outlet flow capacity may require analysis for sequential storm events or modelling with a continuous rainfall record.

Detailed designs should include maximum hydraulic grade lines (HGLs) of the minor and major systems plotted on profiles of the minor system components and compared with minimum building elevations (MBE) to demonstrate flood protection.

Modelling results are to be submitted to the local authority in a report containing at least the following information:

Plans showing catchment and subcatchment boundaries, slopes, soil conditions, land uses, and flow control facilities.

Name and version of modelling program(s).

Design storm details.

Pre-development and post-development hydrographs.

## **2.6 Overland Flow**

In no case shall the overland flow distance for stormwater within the storm sewer design area exceed 150 metres. Stormwater contributions from natural drainage features including hillsides shall be collected by inlet structures at the point where the natural drainage features enter the subdivision. The ditching of drainage from hillside drainage features through residential or other proposed parcels to storm facilities on roadways will not be permitted.

Where an open drainage system is required to cross a roadway, street or driveway, the ditch shall be enclosed by means of a culvert, the size, line and grade of which shall be determined by the Owner's Engineer and approved by the Manager of Operations.

## 2.7 Outfalls

Outfalls shall be located and constructed such that the outfall stormwater will not cause or present the potential of, erosion of Crown, private or municipal property.

## 2.8 Minimum Pipe Diameters for Storm Sewers

Table F.3  
Minimum Pipe Diameters

	<b>Min. Diameter</b>
Mains	300 mm
Catchbasin leads	200 mm

Pipe shall be designed, using the Manning Formula with roughness coefficient  $n = .013$ , to flow full (or less than full) at the design flow with a velocity of not less than 0.75 metres per second.

## 2.9 Main Offsets and Depth of Bury

Storm sewer mains shall be on the opposite side of the roadway from the water line and 3.5 m from the roadway centreline.

The minimum depth of bury from finished ground elevation to the top of pipe for mains shall be 1.2 metres. Minimum cover for catchbasin leads shall be determined by the sump requirements and pipe diameter, but under no circumstances shall be less than 0.9 metres.

## 2.10 Minimum Velocity and Grade

Minimum velocity for pipes flowing full or half full shall be 0.75 m/s. Some corresponding minimum grades are as specified in Table F.4 assuming  $n = 0.013$ . Steeper grades are desirable.

Table F.4

<b>Pipe Diameter</b>	<b>Min. Grade</b>	<b>Pipe Diameter</b>	<b>Min. Grade</b>
100 mm	2.00%	375 mm	0.23%
150 mm	1.00%	400 mm	0.20%

200 mm	0.60%	450 mm	0.18%
250 mm	0.40%	525 mm	0.15%
300 mm	0.32%	600 mm	0.12%
350 mm	0.28%		

## 2.11 Drainage Drywells

Where drainage drywells are used as a means for disposal, drainage drywell wall surface areas shall be sized using Darcy's empirical law:

$$Q = A K i$$

Where: Q = rate of flow

A = cross-sectional area of soil through which flow takes place  
(consider wall area only in calculations)

K = coefficient of permeability

I = gradient or headloss over a given flow distance

Table F.5  
Coefficients of Permeability (K)

Typical Soil	Value of K cm/sec*	Relative Permeability
Coarse gravel	over $1 \times 10^{-1}$	Very permeable
Sand, fine sand	$1 \times 10^{-1}$ to $1 \times 10^{-3}$	Medium permeability
Silty sand, dirty sand	$1 \times 10^{-3}$ to $1 \times 10^{-5}$	Low permeability
Silt	$1 \times 10^{-5}$ to $1 \times 10^{-7}$	Very low permeability
Clay	Less than $1 \times 10^{-7}$	Practically impervious

\* To convert to feet per minute, multiply above values by 1.97; to convert to feet per day, multiply by  $2.88 \times 10^3$ .

Upon determination of permeability factor, a safety factor of 2 shall be applied.

Hydraulic Gradient (i)

$$i = \frac{h}{l}$$

Where: h = average available head

l = flow distance

Drainage drywells shall, unless otherwise approved by the Manager of Operations, be located in the highway boulevard or in other lands dedicated to the Municipality for the purpose of drainage disposal.

Drainage drywells shall be constructed of precast 1,200 mm diameter concrete sections with 75 mm x 150 mm holes spaced 150 mm c/c vertically and 200 mm c/c horizontally in accordance with the standard drawings. One length of solid walled pipe shall form a sump for deposition of silts. See Standard Drawing F-5.

The depth of the drywell will vary in accordance with the requirements derived from Darcy's law.

## **2.12 Culverts**

Where an open ditch system is required to cross a roadway, street or driveway, the ditch shall be enclosed by means of a CMP culvert. All culverts shall be of sufficient size to properly drain all of the area naturally draining into the channel or ditch feeding into the culvert. Allowance shall be made for increasing runoff due to paving and other land development anticipated.

The minimum diameter for culverts shall be 450 mm (18").

## **2.13 Manhole Spacing**

The maximum distance between storm sewer manholes shall be 120 m.

Manholes shall also be provided at the following locations:

- at all changes in grade and/or alignment (for non curvilinear sewers);
- at all changes in pipe size;
- at all pipe junctions;
- at the beginning and end of pipe curvature for curvilinear sewers.

## **2.14 Catchbasin Spacing**

Catchbasin spacing, in general, shall range from 90 to 150 m with closer spacing on flat grades in the drainage path and at all intersections.

Catchbasins shall be located at all low points, or spaced at intervals such that not more than 10% of the gutter flow reaching each inlet will pass on to the next inlet downstream, provided this carry-over is not objectionable to pedestrian or vehicle traffic and the inlet is not in a sump.

Catchbasins shall be located at intervals such that surface drainage does not exceed gutter or flow channel capacities, to eliminate overflow to driveways, boulevard, margins, sidewalks, or private property.

Catchbasins at intersections shall be located in such a manner to minimize interference with crosswalks.

Type II side inlet catchbasins are not to be installed without the approval of the Manager of Operations.

## **2.15 Catchbasin Leads**

Catchbasin leads shall discharge into a manhole or drywell and not directly into the sewer pipe wherever possible.

Catchbasin leads shall have a minimum cover of 0.9 m.

## **2.16 Pipe Class and Bedding Class**

The quality of pipe and bedding shall be so selected such that the installation will adequately support the loads to be placed on it during construction and in operation. For concrete pipe, the calculations shall follow the method shown in Water Pollution Control Federation Manual of Practice No. 9, latest edition. A safety factor of 1.5 shall be used for concrete pipe and the bedding classifications shall be as identified in Standard Drawing No. D-1.

For PVC pipe, the calculations shall follow the methods outlined in the Uni-Bell Plastic Pipe Association publication "Handbook of PVC Pipe - Design and Construction", latest edition.

For CSP pipe, the calculations shall follow the methods outlined in the American Iron and Steel Institute publication "Handbook of Steel Drainage & Highway Construction Products", latest edition.

Pipe class and bedding class must be identified on all engineering drawings. Pipe shall have at least Class B bedding, as defined by Standard Drawing No. D-1.

### **2.17 Major Flow Routing**

At present, the Town of Golden does not have a Stormwater Management Plan in place. The Applicant's Engineer shall review proposed major flow routes with the Manager of Operations and obtain the Municipality's approval of these flow routes prior to finalizing the Drainage Plan required under item 1.2 of this Schedule.

## **3.0 MATERIALS**

Materials shall meet the standards specified in Schedule E - Sanitary Sewers, except as modified herein.

### **3.1 Pipe**

The following pipe material conforming to the appropriate specifications are acceptable for storm sewers:

- reinforced concrete pipe conforming to ASTM C76. Pipe strength (Class III min.) shall be specified for the trench conditions under which the pipe will be installed and operated. Joints shall conform to ASTM C443;
- polyvinylchloride pipe up to 600 mm diameter conforming to ASTM D3034 and CSA B182.2, stiffness (F/Y) of 320 kPa at 5% deflection conforming to ASTM D2412, complete with approved rubber gasket joints. Maximum pipe length shall be 4 metres and sizes 200 mm diameter and larger shall have a minimum SDR of 35;
- CSP (culverts only) galvanized corrugated steel pipe designed to carry H-20 loading in accordance with AASHO.

### **3.2 Manholes**

As per Schedule E, Section 3.3.

### **3.3 Catchbasins**

Catchbasins shall be 900 mm diameter precast concrete as shown on Standard Drawing Nos. F-1, F-2, F-3 and F-4. Frames and grates shall be as shown on the Standard Drawings.

## **4.0 WORKMANSHIP**

Storm sewer systems shall be installed in the manner described in Schedule E of this Bylaw except as modified herein.

### **Catchbasins**

- Catchbasins shall be constructed as shown on Standard Drawings F-1, F-2, F-3, and F-4. They shall be installed with the longer side against the front of the curb and parallel to it. Catchbasin grate to be flush with final surface grade.

### **Testing**

#### **- Compaction Testing**

As per Schedule E, Section 4.16.

#### **- Video Inspection Tests**

Prior to the inspection for the Total Performance Certificate (TPC), the Applicant shall, at no cost to the Municipality, flush all storm sewers installed and have a video inspection undertaken by a firm skilled in such inspections may be required by the Manager of Operations. Two copies of the video inspection and written report shall be submitted prior to Total Performance being issued.

The requirements for the video inspection shall be as per Schedule E, Section 4.17.

## **Head Walls and Aprons**

- Head walls and aprons to storm sewer and culvert inlets and outlets shall be constructed as designed by the Owner's Engineer.

## **5.0 STANDARD DRAWINGS**

- 5.1** The following Town of Golden Standard Drawings shall form part of this Schedule:

Drawing No.   Drawing Description

D-1	Standard Classes of Pipe Bedding & Backfill within the Pipe Zone
D-11	Trench Restoration Detail
E-1	Typical Manhole for Sewer Main up to 400 mm Diameter
E-3	Landing for Deep Manhole
F-1	Typical Storm Sewer Catchbasin - Type 1
F-2	Standard Catchbasin Detail for Mountable Curbs
F-3	Catchbasin Placed in and Open Ditch
F-4	Standard Catchbasin Detail - Type 2
F-5	Drainage Drywell
F-6	Typical Concrete Invert Roadway Crossing
F-7	Concrete Invert Through Easement
F-8	Concrete Outlet and Inlet Structure
F-9	Typical Manufactured End Sections

**17.0 SCHEDULE G - REGULATIONS, STANDARDS AND SPECIFICATIONS  
FOR THE INSTALLATION OF STREET LIGHTING**

**1.0 GENERAL DESIGN**

**1.1 Street Lighting To Be Provided By Applicant**

Where the provisions of Schedule A require the provision of street lighting, the Applicant shall provide street lighting including all service wiring, bases, poles, luminaires, lamps, photo cells, control equipment, and all related appurtenances consistent with the regulations, standards and specifications set out in this Schedule and the requirements of the Provincial Electrical Inspector.

Where underground electrical power is to be provided, ornamental street lighting shall be provided on all streets within the subdivision, perimeter roadways, and pedestrian pathways through parks or in instances where total separation between vehicular and pedestrian traffic has been provided. Provision shall also be made for providing power for future lighting in parks by installing the necessary ducts across highways to the parks property lines as required by the Manager of Operations.

Where overhead electrical power is to be provided, installation of street lights on the poles may be permitted.

The Applicant should be aware that ownership of the street lighting systems in Golden is divided between the Municipality, the power company and the Ministry of Transportation (MoT). Generally speaking, the ownership is divided as shown in Table G.1 following:

Table G.1

<b>System</b>	<b>Owner</b>
Ornamental street lights with underground wiring	Town of Golden
Fixtures attached to wooden poles	BC Hydro
Street lights and street light fixtures attached to poles along the TransCanada Highway and Highway 95	MoT

## **1.2 Approval of Engineering Drawings Required Prior To Construction**

Engineering drawings showing detailed design of the necessary works shall be approved by the Manager of Operations, as well as BC Hydro and MoT if so required before commencement of construction.

Where overhead power is to be provided, it is the responsibility of the Owner to conduct liaison with the power company prior to the submission of the subdivision drawings to the Manager of Operations to ensure that pole locations will not conflict with other underground utilities. Further, the Owner shall provide written confirmation from the power company that complete street lighting services can be provided from power poles. Written confirmation of serviceability from power poles shall be submitted complete with design drawings for the subdivision roadways and services.

Where underground power is to be provided, it is the responsibility of the Owner to liaise with the Power Company prior to the submission of the subdivision drawings to the Manager of Operations to ensure that street light locations and power boxes do not conflict with underground facilities or driveways.

The street lighting system shall be laid out in accordance with the Canadian Standard Practice for Street and Roadway Lighting.

## **1.3 Permit Fees To Be Paid By Applicant**

The Applicant shall be responsible for obtaining all required electrical permits, arranging for all electrical inspections covering his work and paying all fees for such permits.

## **2.0 DESIGN CRITERIA**

### **2.1 Codes, Rules, Standards, and Permits**

Roadway lighting systems are to be designed in general conformance with the following:

### **2.1.1 Codes**

Canadian Electrical Code, latest edition, and bulletins issued by Electrical Safety Branch of the Province of British Columbia.

### **2.1.2 Rules**

WorksafeBC,  
Canadian Standards Association,  
Utility Companies,  
Regulations issued by municipal, provincial and federal authorities.

### **2.1.3 Standards**

ANSI/IES Standard RP-8, American National Standard for Roadway Lighting  
IES-DG-5 Recommended Lighting for Walkways and Class 1 Bikeways  
TAC - Guide for the Design of Roadway Lighting - 1983  
- Illumination of Rural Intersections  
AASHTO - Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals  
CAN/CSA-S6-00 Canadian Highway Bridge Design Code  
CAN3-CSA22.3 No. 7 Underground Systems  
CAN3-CSA22.3 No. 1 Overhead Systems  
Master Municipal Construction Document (MMCD) Specifications and Standard Detail Drawings, plus Supplementary Specifications and Drawings.

### **2.1.4 Permits**

Electrical Permits as required by provincial and/or municipal inspection authorities.

## **2.2 Roadway Classifications**

Roadway classifications for lighting purposes are in accordance with ANSI/IES RP-8. The following three basic classifications are covered by these guidelines. Roadway classifications such as freeway and expressway are excluded.

Major: Serves a continuous route primarily for inter-community through traffic. The equivalent term under TAC guidelines is “arterial”.

Collector: Performs the dual function for traffic of land access and movement between major and local roadways.

Local: Provides direct land access and is not intended to carry through traffic.

Walkways and Bikeways: Adjacent to or independent from roadways.

The basic classifications are further divided according to the levels of vehicle/ pedestrian interaction as follows:

High (H): Commercial areas such as those adjacent to shopping centres, hotels, central business districts, and village town centres.

For Walkways and Bikeways, this classification is further divided as follows:

P: Pedestrians and bicycles only.

S: Sidewalk adjacent to roadway.

Medium (M): High density multi-family residential and local commercial industrial and public areas.

Low (L): Medium density multi-family, single family and rural residential areas.

For Walkways and Bikeways, this classification is further divided as follows:

MDR: Medium density residential.

LDR: Low density residential.

SR: Semi-rural or rural.

### **2.3 Design Methods**

Acceptable design methods and criteria are indicated below. The details are shown in Table G.2.

**Table G.2**  
**Design Criteria - Roadway Lighting**

Roadway	Pedestrian Conflict Area	Maintained Luminance Criteria				Maintained Illuminance Criteria (R3 Pavement)				Small Target Visibility (Luminance)			
		Avg	Uniformity Ratio (U/R)		Veiling Luminance (Lv)	Avg	Uniformity Ratio (U/R)		Veiling Luminance (Lv)	Weighted Average	Median <7.3 m	Median >7.3 m	Uniformity Ratio (U/R)
		cd/m <sup>2</sup>	Ave/Min (Max)	Max/Min (Max)	Lv Max/Lv avg	Lux	Ave/Min (Max)	Max/Min (Max)	Lv Max/Lv avg	Lv Max/Lv avg	Lav (cd/m <sup>2</sup> )	Lav (cd/m <sup>2</sup> )	Max/Min (Max)
Major	*H	1.2	3:1	5:1	0.3	17	3:1	4:1	0.3	4.9	1.0	0.8	6.0
	*M	0.9	3:1	5:1	0.3	13	3:1	6:1	0.3	4.0	0.8	0.7	6.0
	*L	0.6	3.5:1	6:1	0.3	9	3:1	6:1	0.3	3.2	0.6	0.6	6.0
Collector	*H	0.8	3:1	5:1	0.4	12	4:1	6:1	0.4	3.8	0.5	0.5	6.0
	*M	0.6	3.5:1	6:1	0.4	9	4:1	6:1	0.4	3.2	0.4	0.4	6.0
	*L	0.4	4:1	8:1	0.4	6	4:1	6:1	0.4	2.7	0.4	0.4	6.0
Locals	*H	0.6	6:1	10:1	0.4	9	6:1	6:1	0.4	2.7	0.4	0.4	10.0
	*M	0.5	6:1	10:1	0.4	7	6:1	12:1	0.4	2.2	0.3	0.3	10.0
	*L	0.3	6:1	10:1	0.4	4	6:1	12:1	0.4	1.6	0.3	0.3	10.0
Walkways Bikeways	*H**					20 10	4:1 4:1						
	*M					5	4:1						
	*L***					2 3 4	10:1 6:1 4:1						

\* H, M and L designations refer to High, Medium and Low levels of potential vehicle/pedestrian conflict, see Roadway Classification section.

\*\* Upper number denotes Mixed Vehicle and Pedestrian (sidewalk adjacent to roadway).

Lower number denotes Pedestrian Only.

\*\*\* Upper number denotes Rural or Semi-Rural area.

Middle number denotes Low Density Residential.

Lower number denotes Medium Density Residential.

### **2.3.1 Illuminance**

Illuminance refers to the average maintained horizontal illumination level measured in lux. Recommended levels are related to pavement types as detailed in RP-8. Additional design criteria include uniformity ratio and veiling luminance (disability glare).

The illuminance method of design is suitable for all roadway classifications, particularly collector and local roads, and bikeways and lanes.

### **2.3.2 Luminance**

Luminance refers to the average light intensity reflected off the roadway measured in candelas per square metre ( $\text{cd}/\text{m}^2$ ). Uniformity ratios and veiling luminance are also included in the design criteria.

The luminance design method is suitable for most roadway classifications, particularly major roadways, freeways and parkways. Recommended luminance levels have not been established for walkways and bikeways.

### **2.3.3 Small Target Visibility (STV)**

Small target visibility design was introduced in the 2000 edition of RP-8.

The STV design method determines the visibility of an array of targets on the roadway considering the following factors:

- Luminance of the targets.
- Luminance of the immediate background.
- Adaptation level of the adjacent surroundings.
- Visibility glare.

The weighted average of the visibility level (VL) of the targets results in the STV.

The uniformity ratio is also considered. Suitability of the STV design method is similar to that of the luminance method.

#### **2.4 Verification**

While the above design methods are all acceptable as indicated, the illuminance method is currently the only one for which the actual lighting level can be readily verified in the field using economical measurement equipment and procedures. The Owner's Engineer should obtain local authority approval of the design method before proceeding with detailed design.

#### **2.5 Light Sources**

Unless otherwise directed or approved by the local authority, use High Pressure Sodium lamps. These lamps have been accepted as giving the best lumen/watt ratio, which translates to lower operating costs. Typically, 100, 150 and 250 watt lamps are used.

Speciality lighting in designated areas may use Metal Halide lamps, or other light sources as approved on a case by case basis.

#### **2.6 Light Loss Factor (LLF)**

The Light Loss Factor is a combination of several factors representing deterioration of the lamp and luminaire over their life-spans. These factors include environmental conditions, as well as operating factors. Ambient environmental conditions range from 1 - Very Clean to 2 - Clean, 4 - Moderate, 8 - Dirty, and 16 - Very Dirty.

Refer to Table G.3 for Recommended Light Loss Factors. Unless otherwise approved, use Ambient Category 2 and a Cleaning Interval of 5 years.

**Table G.3**  
Light Loss Factors

Lamp Type	Ambient Category	Cleaning Interval In Years		
		1.25	2.5	5
Clear HPS (150 - 1000 W)	1	0.71	0.70	0.69
	2	0.69	0.68	0.66
	4	0.66	0.64	0.61
	8	0.60	0.56	0.50
	16	0.48	0.43	0.32

**2.7 Pavement Surface Classifications**

The IES has identified four pavement classifications which define the surface reflectance characteristics of common pavements.

Typically, R3 is representative of the most common pavement (asphaltic concrete) type used in Canada. Pavement reflectance is required when calculating Roadway Illuminance. Refer to the standards (RP-8-00) for definitions of roadway surface classifications.

**2.8 Intersection Lighting**

Increased lighting levels are required at intersections. Refer to Table G.4 for details.

**Table G.4**  
Intersection Lighting Design Criteria

Illuminance Criteria - Class R3 Roadway Surface				
Functional Classification	Average Maintained Illumination at Pavement by Pedestrian Area Classification (Lux)			Uniformity Eavg/Emin
	High	Medium	Low	
Major/Major	34	26	18	3:1
Major/Collector	29	22	15	3:1
Major/Local	26	20	13	3:1
Collector/Collector	24	18	12	4:1
Collector/Local	21	16	10	4:1
Local/Local	18	14	8	6:1

## **2.9 Calculations**

### **2.9.1 Lighting System**

Lighting system design generally requires a computer model which uses RP-8 calculation methods. Example of a suitable computer program is LUMEN MICRO and AGI32.

Manual calculations may be approved by the local authority for small, simple or rural systems.

### **2.9.2 Electrical Details**

Design requirements include:

Maximum voltage drop in branch feeders: 3%.

Allow for possibility of future extension circuits.

Conductor sizes: maximum #6 RW90; minimum #10 RW90.

Circuit load not to exceed 80% of feeder breaker rating.

Use single pole breakers.

Use VA load of the luminaire ballast.

Include loads for pole receptacles (300 W/receptacle), tree lights and traffic signal controllers.

### **2.9.3 Submission of Design Details**

Calculation and design details are to be submitted to the Manager of Operations as follows:

Completed design summary similar to Figure G.2.

Design drawings to include summary table and circuit loading schedule showing the following information:

Roadway classification

Lighting level (lux or cd/m<sup>2</sup>)

Uniformity ratio (Avg/Min)

Luminaire and lamp details

Phases

Lighting load in VA

Receptacle loads

Tree light loads  
Main and branch breaker sizes  
Number of luminaries on each circuit.

## **2.10 Poles**

### **2.10.1 Type and Details**

Poles are to be davit type unless otherwise directed or approved by the local authority. Davit pole heights are to be 7.5 m, 9.0 m, 11.0 m, or 13.5 m.

Post-top poles, where approved, are to be 6.0 m or 7.5 m high. Post-top poles may be suitable for roadways not exceeding 11 m width.

Pole details are to be in accordance with MMCD Standard Detail Drawings and as follows:

Octagonal, tapered, unpainted, galvanized steel.

Where poles are to be painted, the powder coating process is to be used.

Davits to be 2.5 m with 60 mm diameter x 180 mm tenon.

Pole shafts and davits are to be separate with bolted flange connections.

Poles to have 100 mm x 175 mm hand hole with cover plate, bolt and backing bar.

For rural roadways, if approved by the local authority and the power company, lights may be installed on power poles.

### **2.10.2 Locations**

Poles are to be located at the outer edges, or in special circumstances, in the median of the roadway. Acceptable location patterns include staggered, opposite and one side arrangements, depending on the roadway classification and system design details. Suitable pole arrangements are typically as follows:

One Side:     Local Roadways

Bike and Walkways  
 Urban Trails  
 Staggered: Collector Roadways  
 Major Roadways  
 Opposite: Major Roadways with Medians

Maintain clearances from features and utilities as follows:

1.5 m: Pole to curb return or driveway let-down  
 3.0 m: Overhead electrical lines. Dimension varies with the voltage; refer to power company for details.

### 2.10.3 Offsets

Standard pole offsets for roadways with barrier curbs or other forms of protection of poles from vehicle traffic are as specified in Table G.5.

Table G.5

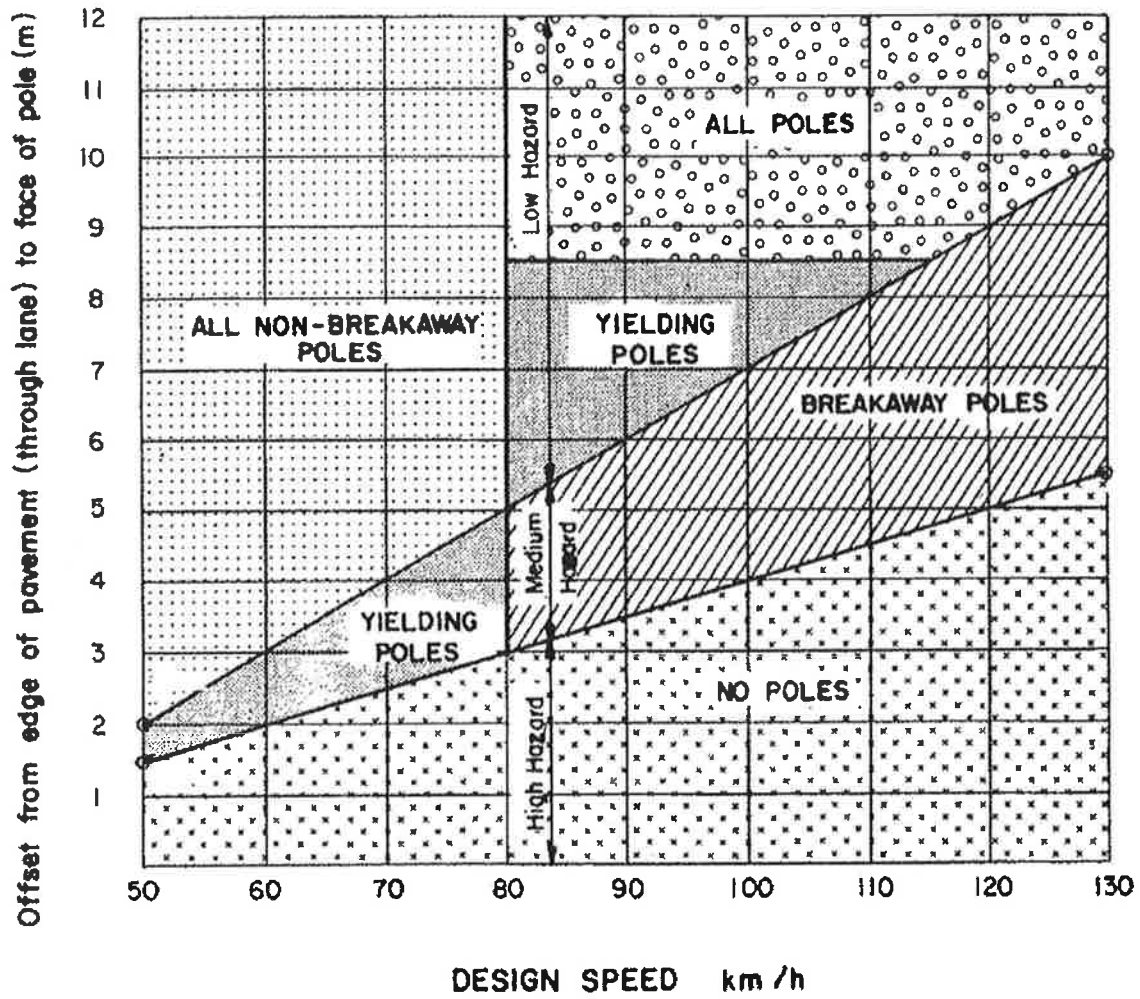
Roadway Configuration	Minimum Pole Centreline to Curb Face Offset
Width 14 m or more and sidewalk adjoining curb	0.5 m
Width 11 m or less and sidewalk adjoining curb	2.0 m
Sidewalk separated from curb	1.5 m

For roadways without curbs or other barriers, use offsets indicated on Figure G.1. If the offsets indicated cannot be obtained, and if approved by the local authority, use frangible pole bases.

### 2.10.4 Alternative Development Standards

Wherever possible, lighting shall be downcast, low level and non-polluting. Alternative Development Standards can be proposed for lighting and must be approved by the Manager of Operations.

Figure G.1  
Pole Types and Offsets



NOTES:

1. Does not apply to high mast poles (RTAC Guide Section 6.3.3.1).
2. May not apply to special pole location RTAC (Guide Section 2.2.1.4).

SOURCE: "Guide for the Design of Roadway Lighting" (RTAC - 1983)

## 2.11 Luminaires

Luminaires are to be energized at 120 Volt or 347 Volt.

Luminaires are to have a minimum Ingress Protection Rating of 65.

Cobra head luminaries are to be either cut off or semi cut off, with glass refractors or lenses, and distribution as specified in Table G.6.

Table G.6

<b>Roadway</b>	<b>IES Distribution</b>
Width less than 14 m	Type II
Width 14 m or greater	Type III
Cul-de-sacs	Type IV
Urban trails or walkways in treed areas	Type V

Ballasts are to be as follows:

Constant Wattage Isolated Winding (CWI) or Magnetic Regulator (Mag Reg) type, with grounded socket shell.

High Power Factor type.

## 2.12 Power Supply and Distribution

Roadway lighting systems are typically serviced from a 120/240 Volt single phase 3 wire system. Alternately, 120/208 volt 3 phase 4 wire or 347/600 Volt systems may be used if necessary and if approved by the local authority.

Power is generally supplied by the power company through an unmetered service when servicing only street lights and traffic signals. Where tree lights and pole receptacles are included, the power company may require a metered service.

Where new lighting systems are replacing existing lights on power poles, submit a list of the poles from which lights are to be removed.

Unmetered services are to have a maximum 60 Amp 2 or 3 Pole main breaker in a service base in accordance with MMCD standard detail drawings

and specifications. A 100 Amp service is required where a traffic signal is also being serviced.

Services are to be underground dip type.

Power distribution requirements include:

Wiring to be installed in Rigid PVC conduit; minimum 32 MTD (metric trade designator).

Wiring to be stranded copper with RW90 insulation.

Wiring to be colour coded per Canadian Electrical Code (CEC).

Conduit burial depth to be per the CEC and MMCD standard drawings.

A 78 MTD conduit may be required for future communication needs; confirm with the local authority.

**Figure G.2**  
**Lighting Design Summary Sheet**

Project Name				Page		of	
Contract No.	Lighting Reference Drawing (s)						
Consultant	Project Number			Date			
<b>SPECIFIC ROADWAY DESCRIPTION</b>	FROM (Station or Block)			TO (Station or Block)			
<b>LIGHTING REQUIREMENTS</b>							
Roadway Classification							
Pedestrian Conflict Area							
Roadway Design Speed							
<b>LIGHTING DESIGN CRITERIA</b>	Level	Uniformity			Veiling		
	Lavg	Eavg/min	Emin/max	Lvmax/Lavg			
<b>GENERAL CONFIGURATION</b>							
Roadway Width (m)							
Median Width (m)							
Pole Offset of Classification (A, B, C)							
Pole Height (m)							
Pole Davit Length (m)							
Calculated Luminaire Mounting Height (m)							
Pole Arrangement							
Pole Cycle Distance							
<b>LIGHTING CONFIGURATION</b>							
Full Luminaire Description (with options)							
Complete Catalogue or Identification Number							
Photometric File Number							
Light Loss Factor							
Luminaire Tilt or Spin (if applicable)							
Lamp Wattage				Type			
<b>PREDICTED LIGHTING PERFORMANCE</b>	Level Lux or cd/m <sup>2</sup>	Uniformity			Veiling Luminance		
	Lavg	Eavg/min	Emin/max	Lvmax/Lavg			
<b>ACTUAL LIGHTING PERFORMANCE</b> (as measured in field at completion)	Level Lux or cd/m <sup>2</sup>	Uniformity			Veiling Luminance		
	Lavg	Eavg/min	Emin/max	Lvmax/Lavg			
<b>NOTES AND COMMENTS</b>							



## **3.0 WORKMANSHIP**

### **3.1 Installation**

Conduits shall be installed as nearly as possible at a constant depth under sidewalks wherever possible or on the alignment shown on the approved construction drawings. Conduits under existing paved roadways, driveways or sidewalks shall be installed by tunnelling, unless the Manager of Operations gives his express written consent for open trench construction. Service line conductors and all other electrical components shall be installed in conformance with the standard drawings in the BC Electrical Code. A conduit under curb or sidewalk shall be buried in a trench with the centreline not less than 750 mm below top of curb or sidewalk. If no curb or sidewalk is installed, the conduit shall be buried 900 mm below finished grade of centreline of roadway, and all roadway, lane and industrial and commercial driveway crossings, the conduit shall be buried not less than 1,200 mm below top of crossing. If the top of crossing is covered by concrete slab, the depth of trench may not be less than 750 mm below the top of crossing.

In all trenches, the conduit shall be snaked slightly to permit expansion and contraction.

All ducts shall be sand bedded.

Bases shall be constructed and installed as shown on the standard drawings. The standards shall be erected plumb, using shims if required.

Luminaires shall be securely fastened to the lighting poles and oriented to produce the required light distribution.

### **3.2 Restoration**

All roadways, lanes, driveways, boulevards, and other areas traversed by trenches shall be returned to their original conditions or better by the Applicant.

## 4.0 STANDARD DRAWINGS

- 4.1 The following Town of Golden Standard Drawings shall form part of this schedule.

Drawing No.   Drawing Description

G-1	Typical Commercial Street Lighting - Type 'A' & Type 'B'
G-2	Typical Ornamental Residential Street Lights - Type 'C' & Type 'D'
G-3	Double Davit Street Light - Type 'E'
G-4	Double Davit Street Light - Type 'F'
G-5	Typical Street Light Anchor Base - Type 'B', & 'F'
G-6	Typical Street Light Anchor Base - Type 'A', & 'E'
G-7	Cylindrical Street Light Pole Base - Type 'C' & 'D'
G-8	Street Light Underground Conduit Installation and Power Connection
G-9	Frangible Base Details
G-10	Service Base Schematic 120 V Street Light
G-11	Hand Hole Wiring Schematic 120 V Street Light

**18.0 SCHEDULE H - REGULATIONS, STANDARDS AND SPECIFICATIONS  
FOR THE INSTALLATION OF ELECTRICAL AND COMMUNICATIONS  
WIRING AND GAS DISTRIBUTION SYSTEM**

**1.0 GENERAL**

**1.1 Standards and Specifications to Apply to All Electrical and Communications Works**

Electrical, telephone and cablevision systems shall be provided to serve each parcel within the development or subdivision consistent with the standards and specifications set out in this Schedule and Schedule A. Where it is proposed to develop a gas distribution system, the system shall be designed and constructed consistent with the provisions of this Schedule.

**1.2 Approval of Engineering Drawings Required Prior to Construction**

The Applicant shall be responsible for meeting all the requirements of the utility companies and government agencies concerned in the installation of underground power, cable television, telephone and gas distribution systems. The Applicant shall obtain permits which may be required to carry out the system installation.

Engineering drawings showing detailed design of the necessary works shall be submitted to the Manager of Operations for approval. No construction of the works shall commence until the design drawings have been approved by the Manager of Operations. The engineering drawings shall clearly indicate the locations of poles, structures, conduits, pipes and any other facilities required.

**1.3 Construction In Compliance With Engineering Drawings**

All poles, structures and facilities shall be constructed or installed in compliance with the engineering drawings approved by the Manager of Operations.

**1.4 Construction In Accordance With the Power Company, Telephone Company, Cablevision Company, and Gas Company Requirements**

Electrical, telephone and cablevision services shall be installed in accordance with the requirements of the power company and the Power Authority, the telephone company, the cablevision company supplying the development or subdivision, and the Provincial Electrical Inspector. Gas distribution works shall be installed in accordance with the requirements of the gas company and the Provincial Gas Inspector.

**1.5 Underground Electrical Systems**

Underground systems shall include the supply and installation of all necessary conduits, wiring, transformers, service runs, and connections for a complete and fully operative underground electrical system as laid out by the power company and the Power Authority and approved by the Manager of Operations and the Provincial Electrical Inspector.

**1.6 Underground Telephone and Cablevision**

Underground systems shall include the supply and installation of all necessary conduits, wiring, service runs, and connections for a complete and fully operative underground telephone system as laid out by the telephone company and the cablevision company serving the subdivision and approved by the Manager of Operations.

**1.7 Gas Distribution System**

Where the proposed subdivision is to be served by a gas distribution system, the location of such a system shall be designed by the gas company and shall be approved by the Manager of Operations and the Provincial Gas Inspector prior to the construction and installation of such a system. All mains forming part of a gas distribution system shall be buried at a minimum depth of 900 mm. The system or extension shall be installed following installation of sewer and water mains. Rehabilitation of boulevards shall be the responsibility of the Applicant.

## **2.0 DESIGN CRITERIA**

### **2.1 Horizontal Location**

Horizontal location of underground ducting and gas main piping shall be as shown on the Standard Drawings. Systems shall be laid out with due regard for other utilities, and shall have the approval of the Manager of Operations, as well as the utility company involved. Where overhead distribution is specified, pole locations and any anchor easements shall be approved by both the Manager of Operations and the appropriate utility company. Care shall be taken to eliminate any aerial trespass.

### **2.2 Vertical Location**

All conduit and gas main piping to have a minimum of 750 mm cover. Pre-installed street crossings shall have a minimum of 1.2 m cover over the encasement pipe.

### **2.3 Detailed Design**

Details of design such as vertical and horizontal location of service boxes, size and type of conduits and gas mains, kiosk dimensions, and ducting and all wiring details shall be as per specifications and drawings provided by the power company and the Power Authority, the telephone company, the cablevision company, and the gas company.

## **3.0 MATERIALS**

### **3.1 The Power Company**

All materials used in the underground or overhead electrical distribution system shall be as specified by the power company and the Power Authority.

### **3.2 The Telephone Company**

All materials used shall be as specified by the telephone company.

### **3.3 Cablevision**

All materials used shall be specified by the cablevision company and supplied by the Applicant unless otherwise directed by the cablevision company.

### **3.4 The Gas Company**

All materials used in the underground gas distribution system shall be specified by the gas company and approved by the Provincial Gas Inspector.

## **4.0 WORKMANSHIP**

### **4.1 Underground Installation**

Installation requirements such as trenching, installation of ducting and backfilling shall be according to specifications supplied by the appropriate utility company.

Each end of the duct crossings installed shall be marked with a 50 X 100 mm post extending from the bottom of the trench to a height of 1.0 m above the existing grade. The top 300 mm of these posts shall be painted the following colours:

Gas - Yellow

Power - Red

Telephone company - Orange and Marked Tel

Cablevision - Orange and Marked Cable

Fibre Optics - Orange and Marked Comm

### **4.2 Clean-up**

After installation of all underground ducting service boxes, kiosks, etc., the boulevard area shall be shaped to grade and all debris shall be removed.

**19.0 SCHEDULE I - STANDARDS FOR THE PREPARATION OF  
ENGINEERING DRAWINGS**

**1.0 GENERAL REQUIREMENTS**

- 1.1** These requirements pertain to the preparation of drawings for: sanitary sewers, storm sewers, water, gas, underground power, telephone, cablevision, street lighting, roadways, curbs and gutters, sidewalks, culverts, bridges, and other permanent structures.
- 1.2** Where no standard is defined in this schedule, the standard for the preparation of a drawing to portray a particular service, structure, or other items, instructions and requirements may be obtained by discussion with the Manager of Operations.
- 1.3** As-built plans are to be completed and approved before securities are released.
- 1.4** As-built drawings are to be submitted prior to the issuance of the Total Performance Certificate. The Owner's Engineer shall deliver as-built drawings as specified in this schedule to the Manager of Operations. These drawings shall be signed and sealed by the Owner's Engineer.

The as-built package shall contain all of the drawings originally submitted for approval which include cover sheet, schedules, legends, index, overall plans, plan profiles, detail sheets, and all other related drawings. The as-built submission shall include:

- 2 sets of paper prints
- 1 set digital AutoCAD files
- 1 set digital Adobe Acrobat (.pdf) files

**2.0 DRAWING STANDARDS**

**2.1 Sheet Size**

Pre-cut sheets to be 594 X 840 mm (A-1 sheet size). Larger drawings (B-1) will be accepted only with the prior approval of the Manager of Operations.

## **2.2 Grid Standards**

2 mm x 10 mm.

## **2.3 Sheet Border**

Border line width to be 1.0 mm. Top, bottom and right border to be 15 mm, respectively, from edge of sheet. Left border to be 42 mm from edge of sheet.

## **2.4 Title Block**

- .1 Located in the lower right hand corner of the sheet.
- .2 Title block shall describe the contents of the drawing (e.g. key plan, roadworks, etc.) and shall clearly indicate the location of the works by roadway name(s) and/or legal description.
- .3 The Engineer's seal is to be placed on the right hand side of the sheet adjacent to the right hand border.

## **3.0 PREPARATION OF DRAWING**

### **3.1 Sheet Layout**

- .1 Maintain a minimum clearance of 40 mm from all borders.
- .2 Place north arrow close to the right hand side of the sheet whenever possible. In case of a fragmented view, place north arrow close to the right of each fragment when possible.
- .3 North arrow shall point either towards the top of the page or towards the left hand edge of the page. The north arrow may point not more than 60 to the right hand side of the page.
- .4 Show distances and location dimensions in metres.
- .5 Show pipe sizes in mm as per ASTM specifications using 1" = 25 mm.

### **3.2 Scales**

Use metric scales:

PLAN VIEW SCALE	1:500
PROFILE VIEW SCALE	Horizontal 1:500
	Vertical 1:50

### **3.3 Plan View**

- .1 Show utility and utility access ROWs.
- .2 The PLAN VIEWS should not be fragmented or broken due to slight curves in the highway right-of-way.
- .3 The PLAN VIEWS shall be fragmented or broken if the vertical alignment of the utilities in the PROFILE SECTION when shown at true length and when projected above to the utilities in the PLAN VIEW cannot be maintained in as close a relationship as possible without too much discrepancy.
- .4 Show the legal layout, dimensions, bearings, parcel numbers, block numbers, legal plan numbers, street names, sidewalks with related data, and catchbasin installations with elevations.
- .5 All parcels need not be numbered providing they are in sequence. Show first and second and next to last and last parcels. If not in sequence, all parcels shall be numbered.
- .6 All parcel dimensions shall be given in metres and to three (3) decimal places. If the parcels are of same dimensions and side by side, only the two outside parcels need have the dimensions shown, the remainder with ditto marks.
- .7 Curb information should be shown and should include radius, delta angle, tangent length, and arc length.
- .8 Face of curb information must be complete.  
i.e. Rollover Face of Curb - Roll F.C.

If other than concrete face of curb specify material used.  
i.e. Rollover Asphalt Face of Curb - Roll Asph F.C.

- .9 Show right-of-way widths and the actual roadway widths between curbs or between curbs and edge of pavement.
- .10 Show all utilities such as sanitary and storm sewers, water, power, telephone, gas, cable TV, manholes, valves, cleanouts, hydrants, service boxes, etc.
- .11 Reference each utility to the nearest property line or boundaries of rights-of-way.
- .12 Show flow directions of sewers.
- .13 Manholes in midblock shall be referenced to the nearest parcel line.
- .14 Parcel services (sanitary, storm, water) shall be shown and referenced to the nearest or convenient parcel line of said parcel. Depth and invert elevation of each service shall be given at property line relative to the top of curb. Minimum Basement Elevation to be identified on each parcel.

### **3.5 Profile**

- .1 The profile and related data are shown on the bottom half of the sheet. Establish 0+00 station on accented vertical grid line.
- .2 The original ground line (centreline) and related data prior to construction should be shown, along with date surveyed.
- .3 The profile shall be shown at true centreline length and projected above to the PLAN VIEW in as close a relationship as possible.
- .4 Show as constructed centreline for streets and lanes and date constructed.
- .5 Show centreline percent grade to two (2) decimal places, together with the following information on vertical curves:

- the chainage and elevations of BC, E.C., and V.P.I.
  - the external value, "e"
  - the length of vertical curve
  - the chainage and elevation of the low spot of sag curves or high point of crest curves
  - on superelevated curves and crossfall sections, percent crossfall, transition length and crown should be noted.
- .6 Show profiles of invert and crown of pipes for sanitary, storm, and watermains, as well as length, size, type, grade, and class of pipe (e.g. 75 m - 200 mm SAN SDR 35 PVC).
  - .7 Show manholes with rim elevations, and invert elevations at both inlet and outlet.
  - .8 Crown of pipes shall be shown at all locations where there is the possibility of conflicts with other utilities.
  - .9 Bedding requirements shall be noted.
  - .10 Show location type and elevation of all crossing utilities.
  - .11 Elevations are placed at the right and left hand side of the profile and repeated when there is a break in the profile.
  - .12 Elevations are to be shown at every even metre graduation and placed on the heavy accented line.
  - .13 All elevations shall be relative to GEODETIC DATUM and in metric. Benchmark locations and elevations can be obtained from the Manager of Operations.

## **4.0 DRAFTING GUIDELINES**

- 4.1** The format of the Technical Legend places the symbol as it appears on the drawing on the left hand page with drafting guidelines on the right hand page.
  
- 4.2** The symbols presented in the Legend are sized for use on Plan Profile drawings. Dimensions used are given in millimetres. Metric pen and template sizes are given in millimetres along with their imperial equivalent.

**20.0 SCHEDULE J - STANDARD DEVELOPMENT AGREEMENT DOCUMENT  
FOR SUBDIVISIONS**

THIS AGREEMENT made this     day of           A.D., 20\_\_.

**BETWEEN:**    THE TOWN OF GOLDEN, a body corporate, duly  
incorporated under the laws of the Province  
of British Columbia, having an office at  
810 9<sup>th</sup> Avenue S, in the Town of Golden,  
Province of British Columbia, VOA 1H0

(hereinafter called the "Municipality")

OF THE FIRST PART

**AND:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(hereinafter called the "Owner")

OF THE SECOND PART

**WHEREAS:**

A.    The Owner is the registered owner of lands and premises situate, lying and being in the Town of Golden, Province of British Columbia, and more particularly known and described as:

(hereinafter called the "Land");

B.    The Owner wishes to subdivide the Land, or part thereof, in the manner shown on a Plan of Subdivision which has been submitted by the Owner to the Approving Officer of the Municipality for approval, a copy of which such plan is attached hereto as Schedule "One", and is hereinafter called the "Subdivision Plan";

- C. The Owner is desirous of entering into this Agreement with the Municipality pursuant to the provisions of Section 940 of the Local Government Act, in order to obtain approval from the Approving Officer of the Subdivision Plan prior to Total Performance of the construction and installation on the Land of all works and services required by the Municipality to be constructed and installed on the Land by the Owner.

NOW THIS AGREEMENT WITNESSETH that in consideration of the premises and of the mutual covenants and agreements herein contained, the parties hereto covenant and agree as follows:

1. In this Agreement, unless the context otherwise requires:

"Work" shall be construed to mean and include all works, services, roadways and any other improvement required to be constructed and erected or installed, both on and off the Land, by the Owner under provisions of this Agreement.

"Complete" or "Completion" or any variation of these words, when used with respect to the work referred to herein, shall mean completion of the work, or a part thereof as the context requires, in accordance with the provisions of this Agreement and to the satisfaction of the Manager of Operations when so certified by him in writing.

"Manager of Operations" shall mean the manager of operations as appointed by the Council or his or her designate and is responsible for administration this bylaw.

"Approving Officer" shall mean the Approving Officer or his deputy as appointed by the Council.

"Contractor" shall mean and include contractors and sub-contractors employed by the Owner, directly or indirectly, in the construction and installation of the work.

2. The Owner covenants and agrees to construct and install the Works on the Land and off-site as the case may be, in accordance with the "Approved Engineering Plans", standards, and specifications initialled by each of the parties hereto for identification. Each of the parties hereto acknowledge having in its or his possession a true copy of the "Approved Engineering Plans", and acknowledge and agree that the Approved Engineering Plans are hereby incorporated into and made part of this Agreement and are attached as Schedule "Two".

3. All work shall be carried out by the Owner or his contractors in accordance with the Approved Engineering Plans, and in accordance with the provisions of the Subdivision and Development Servicing Bylaw of the Municipality from time to time in force. Wherever the provisions of the plans and specifications and the said Subdivision and Development Servicing Bylaw shall conflict so that it is impossible to comply with both, the Subdivision and Development Servicing Bylaw shall prevail.
4. The cost of all work herein shall be borne by the Owner, and the Owner shall employ only bonded contractors to carry out and complete the work.
5. The Owner shall obtain and provide to the Municipality upon request and free of charge true copies of all contracts and sub-contracts entered into by the Owner or its contractors and relating to the work.
6. The decision of the Manager of Operations shall be final and binding on all parties hereto in determining whether or not the work or any part thereof has been carried out and completed in accordance with the provisions of this Agreement.
7. As soon as the Owner is satisfied that he has caused the work to be completed, and prior to confirmation of Total Performance by the Manager of Operations, the Owner shall submit to the Manager of Operations as-built drawings in accordance with the Subdivision and Development Servicing Bylaw.
8. The Owner shall cause all work herein to be carried out and completed not later than the \_\_\_ day of \_\_\_\_\_, 20\_\_ (hereinafter called the "Completion Date").
9. Prior to obtaining approval of the Subdivision by the Approving Officer, the Owner:
  - (a) Shall pay all arrears of property taxes chargeable against the Land by the Municipality; and
  - (b) Shall pay all current assessed property taxes levied against the Land by the Municipality.
10. The Owner further covenants and agrees to pay to the Municipality, prior to commencement of the subdivision, charges for the inspection of the works equal to 3% on the first \$500,000.00; 2% on the second \$500,000.00 and 1% on the balance over \$1,000,000.00 of the estimated cost of constructing utilities and roadways required for the new subdivision as approved by the Manager of Operations; and further, to pay when the same are billed by the Municipality, administration fees,

engineering fees and legal costs incurred by the Municipality and relating to the Subdivision of the Land and construction and installation of the work, and the cost of connecting the work to the Municipality's drainage and sewage collection systems and, where applicable, the Municipality's waterworks.

11. Prior to approval of the Subdivision Plan by the Approving Officer, and as security for the due and proper performance by the Owner of all his covenants and agreements herein contained, the Owner shall deposit with the Municipality a bond, cash, certified cheque or an unconditional, irrevocable Letter of Credit drawn on a chartered bank in Canada for a term extending 90 days beyond the completion date, but not less than twelve (12) months, in the amount of (\$           ), which is equal to the cost of constructing and providing all of the work required to be constructed and installed by the Owner under the terms of this Agreement, as estimated by the Manager of Operations, and containing such terms and provisions as may be required by the Manager of Operations. The Owner agrees that if the work or any part thereof is not completed in accordance with the provisions of this Agreement and by the Completion Date, or if the Owner shall be in default of any of his covenants herein contained, and such default shall continue for a period of fourteen (14) days after notice thereof has been given by the Municipality to the Owner, the Municipality may call for draw down on the Owner's security and the Municipality may complete the work at the cost of the Owner and deduct from any fund held by the Municipality as security hereunder, the cost of such completion, and the balance of the deposit, if any, shall be returned to the Owner less any administration fees required by the Municipality. If there is insufficient money on deposit with the Municipality under the Owner's security, then the Owner shall pay such deficiency to the Municipality immediately upon receipt of the Municipality's bill for completing the work. It is understood and agreed that the Municipality may do such work either by itself, or by contractors employed by the Municipality. Any bill rendered by the Municipality to the Owner under the provisions of this paragraph, shall be regarded as charges for work done or service provided under the provisions of the Community Charter, Section 258, and may in addition to any other remedy available to the Municipality, be collected in the same manner and with the like remedies as ordinary taxes upon Land and improvements are collected under the said Community Charter. Despite any obligation to give notice, if the works are not be completed by the specified completion date, the Owner, on seven (7) days notice, may draw down on the letter of credit or other security and hold the same in cash regardless of whether the Owner is otherwise in default. Should the Owner fail to extend the security, the

Municipality reserves the right to call for and receive the Owner's security prior to its expiry and hold those monies until the Owner provides the extended security.

12. The Owner covenants and agrees to fully maintain, repair and as necessary replace the Works for a period of twenty-four (24) months after receipt by the Municipality of the Certificate of Total Performance required by Section 4.7(a) of the Subdivision and Development Servicing Bylaw and all such repair, maintenance and replacement shall be done forth with and diligently prosecuted and to the standards and specifications for the works provided herein.
13. The Municipality will consent to reduction in the amount secured by the Owner's security, or cash, from time to time, and in accordance with the following:
  - (a) The percentage of the credit reduction will be equal to the percentage of the cost of the work done and approved by the Manager of Operations; and
  - (b) No reduction will be allowed for any amount less than 10% of the total cost of the construction and installation of the work; and
  - (c) Notwithstanding (a) and (b) herein, the Municipality will not refund an amount whichever is the lessor of 10% of the total cost of the constructing and installing of the work or \$50,000.00 until the expiry of the maintenance period following the full and final completion of all the work; and
  - (d) Upon the expiry of the aforesaid maintenance period, and provided that the Owner is not then in default under any of his covenants herein contained, and upon final approval of the work by the Manager of Operations, the Municipality will as soon as possible, reduce the remaining security to zero (nil); and
  - (e) The maintenance period for works constructed under this agreement shall be two years.
14. The Owner covenants and agrees to indemnify and save harmless the Municipality and its servants, agents and employees from and against all actions, proceedings, costs, damages, expenses, claims, and demands whatsoever and by whomsoever brought or made against the Municipality or its said servants, agents and employees, resulting directly or indirectly from the construction or installation of the work.

15. In consideration of due and proper performance by the Owner of his covenants herein contained, the Municipality covenants and agrees to permit the Owner to carry out and perform the work.
16. Any demand or notice required or permitted to be given under the provisions of this agreement shall be in writing and may be given by personal delivery or by mailing such notice by prepaid registered post to the party concerned at the address for such party first above-recited, and any such notice or demand mailed as aforesaid shall be deemed to have been received by the party to whom it is addressed on the second business day after the date of posting thereof and, if personally delivered, shall be deemed received on the day delivered.
17. The Owner acknowledges and agrees that immediately upon issuance by the Manager of Operations of his certification stating that the work has been completed, all right, title and interest in and to the work shall immediately pass to and vest in the Municipality, but nothing herein contained shall derogate from the obligation of the Owner to maintain the works for the specified periods following completion as aforesaid.
18. It is understood and agreed that the Municipality has made no representations, covenants, warranties, guarantees, promises or agreements (oral or otherwise) with the Owner other than those contained in this Contract.
19. Wherever the singular or masculine is used herein, the same shall be construed as meaning the plural, feminine or body corporate or politic where the context or the parties so require.
20. This Agreement and the terms, covenants and conditions herein contained shall ensure to the benefit of and be binding upon the parties hereto and their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF the parties hereto have executed this Agreement at the Town of Golden, Province of British Columbia, the day and year first above written.

THE TOWN OF GOLDEN )  
)  
)  
)  
)  
)  
\_\_\_\_\_ )

Mayor: )  
)  
)  
)  
)  
)  
)  
\_\_\_\_\_ )  
Corporate Officer: )

C/S

)  
)  
\_\_\_\_\_ )  
Owner: )  
)  
)  
)  
)  
\_\_\_\_\_ )  
Owner: )

C/S  
(if a corporation)

**21.0 SCHEDULE K - STANDARD STATUTORY RIGHT-OF-WAY DOCUMENT**

---

THIS INDENTURE made the        day of        , 20\_\_.

BETWEEN:

(hereinafter called the "Grantor")

OF THE FIRST PART

AND:

(hereinafter called the "Grantee")

OF THE SECOND PART

WHEREAS the Grantor is the registered owner or is entitled to become the registered owner of an estate in fee simple of ALL AND SINGULAR those certain parcels or tracts of land and premises situate, lying and being in the Town of Golden, in the Province of British Columbia, and being more particularly known and described as:

(hereinafter called the "Lands of the Grantor")

AND WHEREAS the Grantor and Grantee have agreed to enter into this agreement pursuant to Section 218 of the Land Title Act of British Columbia;

AND WHEREAS it is necessary for the operation and maintenance of the Grantee's undertaking, hereinafter described, to install and maintain a system of sewerage works, and/or water works, and/or drainage works, and/or gas works including all pipes, valves, fittings, buildings, and facilities in connection therewith and/or electric works including all wires, poles, conduits, and other facilities in connection therewith, and/or communication works including all wires, poles, conduits, and other facilities in connection therewith;

(hereinafter called the "Works")

The Grantor has agreed to permit the construction by the Grantee of the aforementioned works on a portion of the said Land and to grant for that purpose the right-of-way hereinafter described;

NOW THEREFORE THIS INDENTURE WITNESSETH that in consideration of the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) of lawful money of Canada, now paid by the Grantee to the Grantor (the receipt and sufficiency of which is hereby acknowledged by the Grantor), and in consideration of the covenants and conditions hereinafter contained to be observed and performed by the Grantee and for other valuable consideration:

1.00 THE GRANTOR DOTH HEREBY:

1.01 Grant, convey, confirm and transfer, in perpetuity, unto the Grantee the full, free and uninterrupted right, licence, liberty, privilege, permission, and right-of-way to lay down, install, construct, entrench, operate, maintain, inspect, alter, remove, replace, bury, cleanse, string, and otherwise establish one or more systems of Works upon, over, under and across that part of the Land of the Grantor as shown outlined in heavy black on right-of-way Plan Number: \_\_\_\_\_ and designated as

(hereinafter called the "Perpetual Right-of-Way")

1.02 Covenant and agree to and with the Grantee that for the purposes aforesaid and upon, over, under and across the Perpetual Right-of-Way the Grantee shall for itself and its servants, agents, workmen, machinery, vehicles, equipment, and materials be entitled at all time to enter, use, pass and repass, labour, construct, erect, install, dig, carry away soil or other surface or subsurface materials, clear of all trees, growth, buildings or obstruction now or hereafter in existence, as may be necessary, useful, or convenient in connection with the operations of the Grantee in relation to the Works;

1.03 Grant, convey, confirm, and transfer unto the Grantee for itself and its servants, agents, workmen, contractors, and all other licensees of the Grantee, together with machinery, vehicles, equipment, and materials the right at all reasonable times to enter upon and to pass and repass over such of the Lands of the Grantor as may reasonably be required for the purpose of ingress to and egress from the Perpetual Right-of-Way;

1.04 Grant, convey, confirm, and transfer unto the Grantee for itself and its servants, agents, workmen, contractors, and all other licensees of the Grantee, together with machinery, vehicles, equipment and materials for a period of \_\_\_\_ days only from the date of this Agreement, the full, free and uninterrupted right, licence, liberty, privilege, permission, and right-of-way to enter upon, pass and repass, clear, labour, and use for the purpose of ingress to and egress from the Perpetual Right-of-Way and for the purpose of storing machinery, equipment, material or supplies used or to be used in connection with the construction of the Works herein described, and for the purpose of placing or storing the surface or subsurface material to be excavated from the Perpetual Right-of-Way upon and over, but not under that part or parts of the Lands of the Grantor, shown outlined in green on Right-of-Way Plan Number:

(hereinafter called the "Working Right-of-Way")

Provided always, and it is hereby agreed that the Grantee shall only clear such trees and growth and interfere and disturb the surface of the Working Right-of-Way in a manner that is reasonably necessary in the conduct of its operations thereon;

2.00 THE GRANTOR HEREBY COVENANTS TO AND AGREES WITH THE GRANTEE, as follows:

2.01 That the Grantor will not, nor permit any other person, to erect, place, install or maintain any building, structure, mobile home, concrete driveway or patio, pipe, wire or other conduit on, over or under any portion of the Perpetual Right-of-Way so that it in any way interferes with or damages or prevents access to, or is likely to cause harm to Works authorized hereby to be installed in or upon the Perpetual Right-of-Way;

2.02 That the Grantor will not do nor knowingly permit to be done any act or thing which will interfere with or injure the said Works, and in particular, will not carry out any blasting on or adjacent to the Perpetual Right-of-Way without the consent in writing of the Grantee, provided that such consent shall not be unreasonably withheld;

2.03 That the Grantor will not substantially diminish the soil cover over any of the Works installed in the Perpetual Right-of-Way, and in particular, without in any way limiting the generality of the foregoing, will not construct open drains or ditches along or across any Works installed in the Perpetual Right-of-Way;

2.04 That the Grantor will from time to time and at all times upon every reasonable request, and at the cost of the Grantee do and execute or cause to be made, done or executed all such further and other lawful acts, deeds, things, devices, conveyances, and assurances in law whatsoever for the better, assuring unto the Grantee of the rights hereby granted;

3.00 THE GRANTEE HEREBY COVENANTS TO AND AGREES WITH THE GRANTOR, as follows:

3.01 That the Grantee will not bury any debris or rubbish of any kind in excavations or backfill, and will remove shoring and like temporary structures as backfilling proceeds;

3.02 That the Grantee will thoroughly clean all lands to which it has had access hereunder of all rubbish and construction debris created or placed thereon by the Grantee, and will leave such lands in a neat and clean condition;

3.03 That the Grantee will, as soon as weather and soil conditions permit, and so often as it may exercise its right of entry hereunder to any of the lands of the Grantor, replace the surface soil as nearly as may be reasonably possible to the same condition as it was prior to such entry, in order to restore the natural drainage to such lands;

PROVIDED, HOWEVER, that nothing herein contained shall require the Grantee to restore any trees or other surface growth, but the Grantee shall leave such lands in a condition which, subject to the existence of the works, will not inhibit natural regeneration of such growth;

3.04 That the Grantee will, as far as reasonably possible, carry out all work in a proper and workmanlike manner so as to do as little injury to the Lands of the Grantor as possible;

3.05 That the Grantee will make good at its own expense all damage or disturbance which may be caused to the surface soil of the Lands of the Grantor in the exercise of its rights hereunder;

3.06 That the Grantee will, as far as reasonably possible, restore any fences, lawns, flower beds, at its costs as nearly as may be reasonably possible to the same condition that they were in prior to any entry by the Grantee upon the Lands.

- 4.00 THE PARTIES HERETO EACH HEREBY COVENANT TO AND AGREE WITH THE OTHER, as follows:
- 4.01 The said Works referred to above, together with all pipes, manholes, valves, conduits, wires, casings, fittings, lines, meters, appliances, facilities, attachments or devices used in connection therewith shall constitute the Works;
- 4.02 Notwithstanding any rule of law or equity to the contrary, the Works brought on to, set, constructed, laid, erected in, upon or under the Perpetual Right-of-Way by the Grantee shall at all times remain the property of the Grantee, notwithstanding that the same may be annexed or affixed to the freehold and shall at any time and from time to time be removable in whole or in part by the Grantee;
- 4.03 In the event that the Grantee abandons the Works or any part thereof the Grantee may, if it so elects, leave the whole or any part thereof in place;
- 4.04 That no part of the fee of the soil shall pass to or be vested in the Grantee under or by virtue of these presents and the Grantor may fully use and enjoy all of the Lands of the Grantor subject only to the rights and restrictions herein contained;
- 4.05 That the covenants herein contained shall be covenants running with the land and that none of the covenants herein contained shall be personal or binding upon the parties hereto, save and except during the Grantor's seizing or ownership of any interest in the Lands of the Grantor, and with respect only to that portion of the Lands of the Grantor of which the Grantor shall be seized or in which he shall have an interest, but that the Lands of the Grantor, nevertheless, be and remain at all times charged therewith;
- 4.06 If at the date hereof the Grantor is not the sole registered owner of the Lands of the Grantor, this agreement shall nevertheless bind the Grantor to the full extent of his interest therein, and if he shall acquire a greater or the entire interest in fee simple this Agreement shall likewise extend to such after-acquired interests;
- 4.07 Where the expression "Grantor" includes more than one person, all covenants herein on the part of the Grantor shall be construed as being several as well as joint;
- 4.08 This agreement shall endure to the benefit of and be binding upon the parties hereto and their respective heirs, administrators, executors, successors and assigns,

as the case may be; and wherever the singular or masculine is used, it shall be construed as if the plural or the feminine or neuter, as the case may be, had been used; where the parties or the context hereto so require and the rest of the sentence shall be construed as if the grammatical and terminological changes thereby rendered necessary had been made.

As evidence of their agreement to be bound by the above terms and conditions, the Grantor and the Grantee have executed the Land Title Act Form C to which this agreement is attached and which forms part of the agreement.

#### CONSENT AND PRIORITY AGREEMENT

KNOW ALL MEN BY THESE PRESENTS THAT \_\_\_\_\_ is the registered holder of a charge by way of \_\_\_\_\_ against the within-described property, which said charge is registered in the Land Title Office, City of Kamloops, under Numbers \_\_\_\_\_, for and in consideration of the sum of One dollar (\$1.00) paid by the Municipality to the said chargeholder (the receipt whereof is hereby acknowledged), consent to the within Right-of-Way and agrees with the Municipality, its successors and assigns, that the within Right-of-Way shall be an encumbrance upon the within-described property in priority to the said charge in the same manner and to the same effect as if it had been dated and registered prior to the said charge.

IN WITNESS WHEREOF the parties hereto have executed the Land Title Act Form C to which this agreement is attached and which forms part of the agreement.

**22.0 SCHEDULE L - CONFIRMATION OF COMMITMENT BY OWNER**

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Note: To be submitted prior to commencement of construction

CONFIRMATION OF PROFESSIONAL ASSURANCE  
CONFIRMATION OF "COMMITMENT BY OWNER" RE: DESIGN AND FIELD REVIEW OF  
CONSTRUCTION BY A REGISTERED PROFESSIONAL

The Town of Golden  
PO Box 350  
GOLDEN BC V0A 1H0

Attention: Manager of Operations

Dear Sir:

Re: \_\_\_\_\_  
(Description and Address) of Subdivision or Development

The undersigned has retained as his Professional Engineer, \_\_\_\_\_ (the "Consultant"), to undertake and/or coordinate and review all associated design criteria and "field reviews" required for this Project. It is understood that he will take all such steps as regulated under the Provincial Statute for his profession and by the definition of "field reviews" hereinafter set forth, to ascertain that the design will comply and construction of the project will substantially conform in all material respects with the provisions of Town of Golden Subdivision and Development Servicing Bylaw No. \_\_\_\_\_, and other applicable Permits, Bylaws, Acts and Regulations which apply to the Project. This representative will ascertain that only qualified personnel are retained to carry out tests, inspect or carry out design work, detailing or "field reviews."

As used herein, "field reviews" shall mean such reviews of the work at the project site and at fabrication locations, where applicable, as the "Consultant", in his professional discretion, considers to be necessary in order to ascertain that the work substantially conforms in all material respects to the plans and supporting documents "accepted" by the Municipality. This will include keeping records of all site visits and any corrective actions taken as a result thereof.

The undersigned has given a contractual mandate to the "Consultant" to review reports of other testing and inspection agencies and disciplines where necessary, comment on their

acceptability, determine the corrective action to take if unacceptable, and maintain a detailed record of every such report and comments. The "Consultant" will automatically submit a monthly summary progress report to the Manager of Operations.

NOTE: The Owner will notify the Manager of Operations in writing 30 days prior to any intended termination of or by the "Consultant". It is understood that work on the above project will cease as of the effective date of such termination, until such time as a new appointment is made, and a "Stop Work Order" shall be posted upon the said project by the Municipality.

\_\_\_\_\_  
Witness Name (Print)

\_\_\_\_\_  
Owner's Name (Print)

\_\_\_\_\_  
Witness Signature

By: \_\_\_\_\_  
(Owner or Owner's appointed Agent)  
Signature

\_\_\_\_\_  
Address (Print)

Date: \_\_\_\_\_

\_\_\_\_\_  
Occupation

\_\_\_\_\_  
Title of Agent (if applicable)

\_\_\_\_\_  
Address (Print)

The Corporate Seal of

\_\_\_\_\_  
was hereunto affixed in the presence of:

\_\_\_\_\_  
\_\_\_\_\_

The above must be signed by the Owner or his appointed Agent. The signature must be witnessed. If the Owner is a company, the corporate seal of the company must be affixed to the document in the presence of its duly authorized officers. The officers must also sign, setting forth their positions in the company.

This "Consultant" acknowledges that he has been retained to ascertain that the design will comply and construction of the project will substantially conform in all material respects with Bylaws as set out above and will submit letters of Confirmation of Professional Design Assurance from others, as needed, for the approval of the subdivision. Furthermore, the "Consultant" hereby covenants that he or his firm presently carries liability insurance in the amount of \_\_\_\_\_.

\_\_\_\_\_  
Name of Professional (Print)

\_\_\_\_\_  
Signature of Professional

Date: \_\_\_\_\_

\_\_\_\_\_  
Mailing Address (Print)

Phone: \_\_\_\_\_

**23.0 SCHEDULE M - CONFIRMATION OF PROFESSIONAL ASSURANCE**

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**CONFIRMATION OF PROFESSIONAL ASSURANCE**

The Town of Golden  
PO Box 350  
GOLDEN BC V0A 1H0

Attention: Manager of Operations

Dear Sir:

Re:  
(Description and Address of Project)

This is to advise that I am a Professional Engineer licensed to practice in the Province of British Columbia and was retained by the Owner to undertake and coordinate all field reviews and inspections required with respect to this project and took all steps as regulated under The Engineers and Geoscientists Act of British Columbia and required by good practices and by the definition of "field reviews" hereinafter set forth in order to issue the following certification.

As used herein, "field reviews" shall mean such reviews of the work at the project site and at fabrication locations where applicable as the Professional Engineer, in his professional discretion, considered to be necessary in order to ascertain that the work substantially conformed in all material aspects to the plans and drawings accepted by the Municipality.

The following aspects have been reviewed by me or under by direction and have been found to comply with the engineering drawings and plans submitted and accepted by the Manager of Operations.

1.00 Storm Drainage System including, but not restricted to, the following:

- the location, alignment, size and grade of all pipes and culverts;
- the spacing of manholes and catchbasins;
- the construction of drywells;
- materials used for pipes, culverts, manholes, catchbasins, pipe and fitting joints, service connections;

- the completion of erosion control measures;
- materials used for pipe bedding and backfilling of trenches;
- workmanship in the construction and installation of all materials.

2.00 Sanitary Sewer System including, but not restricted to, the following:

- location, alignment, size and grade of all pipes;
- spacing of manholes and catchbasins;
- materials used for pipes, manholes, pipe and fitting joints, service connections;
- materials used for pipe bedding and backfilling of trenches;
- workmanship in the construction and installation of all materials.

3.00 Water Distribution System including, but not restricted to, the following:

- location, alignment, size and grade of all pipes;
- spacing of hydrants and valves;
- construction of pumping stations and reservoirs;
- materials used for pipes, fittings, gate valves, valve boxes, hydrants, service connections, corporation stops, curb stop and boxes, air valves, stops and drains;
- pressure testing and disinfection;
- materials used for pipe bedding and backfill of trenches;
- workmanship in the construction and installation of all materials.

4.00 Highways including, but not restricted to, the following:

- alignment, width and grade of all roadways;
- materials used for preparation or roadway bases and roadway surfaces;
- workmanship in the installation of materials.

5.00 Curb and Gutter, Sidewalks, and Boulevards including, but not restricted to, the following:

- width and grade of sidewalks and boulevards;
- alignment and grade of curbs and gutters;
- materials used for preparation of subgrades and surfaces;
- workmanship in the installation of materials.

6.00 Street Lighting, Electrical and Communications Wiring and Gas Installations including, but not restricted to, the following

- number and spacing of street light poles and luminaires;
- materials used for street lighting, electrical and communications wiring and gas installations;
- materials used for backfilling of trenches;
- workmanship in the installation of materials.

I certify that the foregoing areas substantially comply in all material respects with the plans and supporting documents, including all amendments thereto, which supported the application for subdivision approval File No. \_\_\_\_\_ which were "accepted" by the Municipality.

In addition, significant revisions to the accepted plans and supporting documents have been submitted to the Municipality in order to depict, as nearly as possible, given my "field reviews" as defined herein, the services as finally designed and built.

\_\_\_\_\_  
Name of Professional Engineer (Print)

(PROFESSIONAL  
SEAL)

\_\_\_\_\_  
Signed

\_\_\_\_\_  
Date

\_\_\_\_\_  
Address (Print)

\_\_\_\_\_  
Phone

Attached hereto you will find the appropriate "field review" assurance from each of the associated Professional consultants, who are registered in the Province of British Columbia as members in good standing of the Association of Professional Engineers.



ASSURANCE OF "ENGINEERING" FIELD REVIEW

Re: \_\_\_\_\_ (Project Address)

This is to assure that I/We provided "field reviews" as defined herein of all engineering work including checklist items 1.0 to 6.0, inclusive, except as specifically noted below.

EXCEPTIONS

(PROFESSIONAL  
SEAL)

Name (Print) \_\_\_\_\_

Signed \_\_\_\_\_

Date \_\_\_\_\_

Address (Print) \_\_\_\_\_

Representing \_\_\_\_\_

\_\_\_\_\_

**24.0 SCHEDULE N - STANDARD DRAWINGS**

**24.1 DRAWINGS FOR SCHEDULE B - HIGHWAYS**SCHEDULE B - HIGHWAYS

- B-1 Local Street - Urban Residential
- B-2 Local Street - Urban Residential Cul-de-Sac
- B-3 Local Street - Urban Industrial
- B-4 Collector Street - Urban (21.0 m R.O.W.)
- B-5 Arterial Street - Urban Undivided (27.0 m R.O.W.)
- B-6 Typical Cross-Section of a Paved Lane
- B-7 Rural Streets
- B-8 Local Trail

**24.2 DRAWINGS FOR SCHEDULE C - CURBS, SIDEWALKS, BOULEVARDS**SCHEDULE C - CURBS, SIDEWALKS, BOULEVARDS

- C-1 Mountable Curb and Gutter and Monolithic Sidewalk
- C-2 Non-Mountable Curb and Gutter
- C-3 Non-Mountable Monolithic Curb, Gutter and Sidewalk
- C-4 Sidewalk Crossing for Non-Mountable Curbs
- C-5 Standard Wheelchair Ramp for Non-Mountable Curb, Gutter & Sidewalk

**24.3 DRAWINGS FOR SCHEDULE D - WATER SYSTEMS**SCHEDULE D - WATER SYSTEMS

- D-1 Standard Pipe Bedding Classes and Backfill within the Pipe Zone
- D-2 Standard Hydrant Detail
- D-3 Valve Box & Riser - Nelson Type Lockable
- D-4 Standard Pressure Main Thrust Block Details
- D-5 Standard Blow Off Detail
- D-6 Larger Diameter Sewer and Water Services
- D-7 Typical 19mm Water Service Connection

- D-8 Sewer and Water Services Common Trench Installation
- D-9 Watermain and Sewer Main Anchors
- D-10 Combination Air Release Valve or Air & Vacuum Release Valve
- D-11 Trench Restoration Detail

#### **24.4 DRAWINGS FOR SCHEDULE E - CONSTRUCTION OF SANITARY SEWERS**

##### SCHEDULE E - CONSTRUCTION OF SANITARY SEWERS

- E-1 Typical Manhole for Sewer Mains up to 400 mm Diameter
- E-2 Interior Drop Manhole
- E-3 Landing for Deep Manhole
- E-4 Sewer Cleanout for 150 mm & 200 mm Sanitary Sewer Terminals
- E-5 Typical Sewer Service Connections

#### **24.5 DRAWINGS FOR SCHEDULE F - DRAINAGE SYSTEMS**

##### SCHEDULE F - DRAINAGE SYSTEMS

- F-1 Typical Storm Sewer Catchbasin - Type 1
- F-2 Mountable Curb Standard Catchbasin Detail
- F-3 Open Ditch Standard Catchbasin Detail
- F-4 Standard Drywell Detail
- F-5 Typical Concrete Invert Road Crossing
- F-6 Concrete Outlet Structure
- F-9 Typical Manufactured End Sections

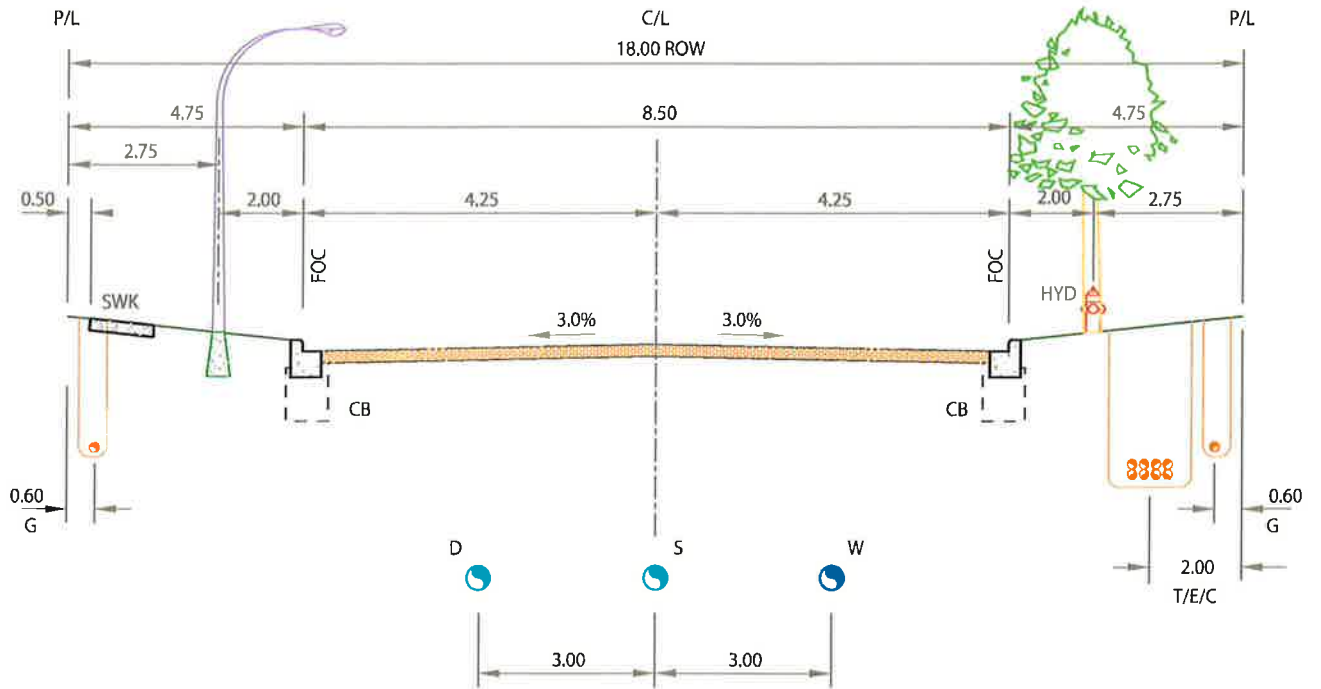
#### **24.6 DRAWINGS FOR SCHEDULE G - STREET LIGHTING**

##### SCHEDULE G - STREET LIGHTING

- G-1 Typical Commercial Street Lighting - Type 'A' & Type 'B'
- G-2 Typical Residential Street Lights - Type 'C' & Type 'D'
- G-3 Double Davit Street Light - Type 'E'
- G-4 Double Davit Street Light - Type 'F'
- G-5 Typical Street Light Anchor Base - Type 'A', 'B', 'E' & 'F'
- G-6 Cylindrical Street Light Pole Base - Type 'C' & 'D'
- G-7 Street Light Underground Conduit Installation and Power Connection

- G-8 Frangible Base Details
- G-9 Service Base Schematic 120 V Street Light
- G-10 Hand Hole Wiring Schematic 120 V Street Light





**LEGEND**

- C CABLEVISION
- CB CATCHBASIN
- C/L CENTER LINE
- D STORM SEWER
- E ELECTRICAL
- FOC FACE OF CURB
- G GAS
- HYD FIRE HYDRANT
- OSL STREET LIGHT
- P/L PROPERTY LINE
- ROW RIGHT OF WAY
- S SANITARY SEWER
- SWK SIDEWALK
- T TELEPHONE
- W WATER

**NOTES:**

- 1. WATER SERVICE VALVES 0.3 FROM P/L

UNITS ARE IN METERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

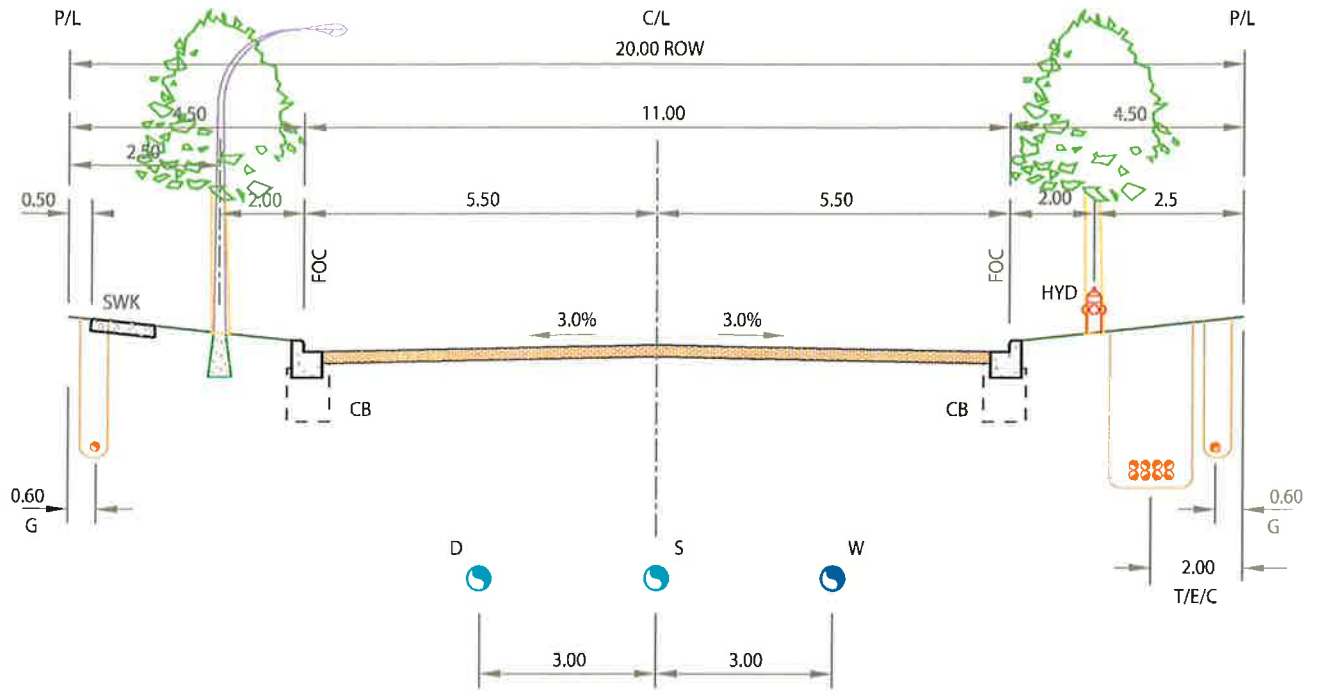


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**LOCAL STREET  
URBAN RESIDENTIAL  
CUL-DE-SAC**

DATE	SCALE	FILE ID
2008-03-13	NTS	B-2



**LEGEND**

- C CABLEVISION
- CB CATCHBASIN
- C/L CENTER LINE
- D STORM SEWER
- E ELECTRICAL
- FOC FACE OF CURB
- G GAS
- HYD FIRE HYDRANT
- OSL STREET LIGHT
- P/L PROPERTY LINE
- ROW RIGHT OF WAY
- S SANITARY SEWER
- SWK SIDEWALK
- T TELEPHONE
- W WATER

**NOTES:**

1. WATER SERVICE VALVES 0.3 FROM P/L

UNITS ARE IN METERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

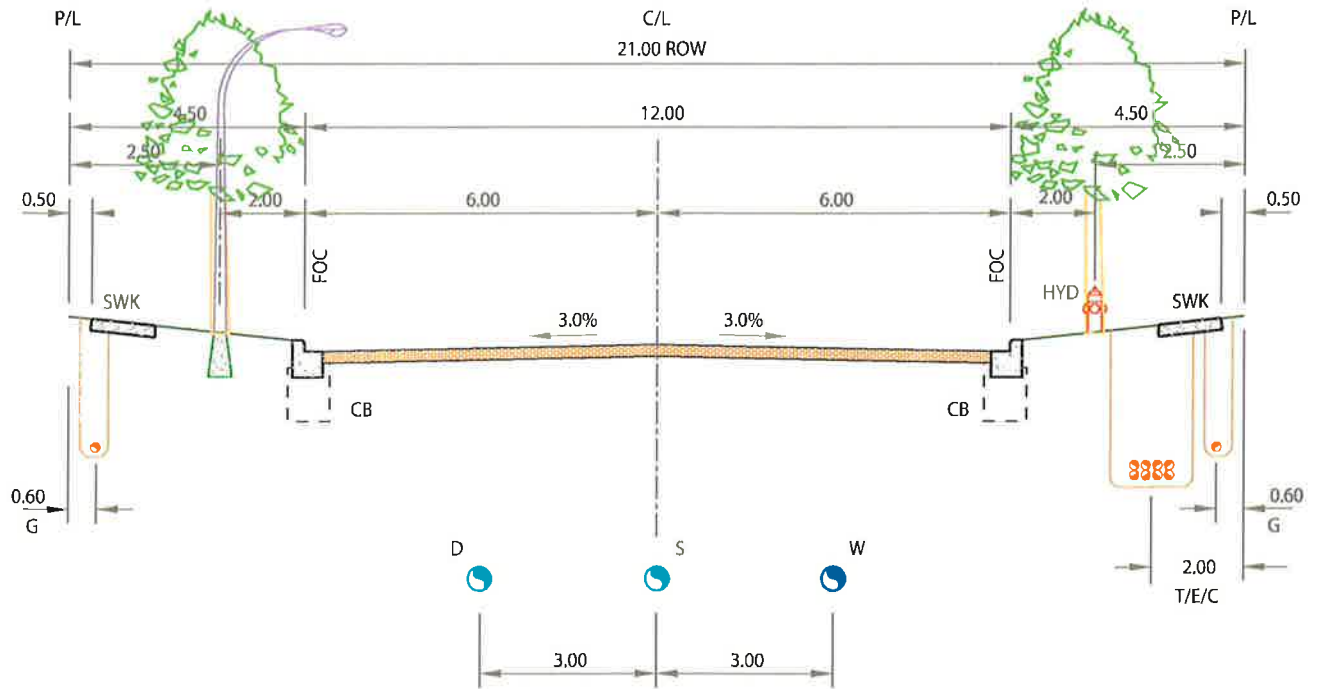


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**LOCAL STREET  
URBAN INDUSTRIAL**

DATE	SCALE	FILE ID
2008-03-13	NTS	B-3



**LEGEND**

- C CABLEVISION
- CB CATCHBASIN
- C/L CENTER LINE
- D STORM SEWER
- E ELECTRICAL
- FOC FACE OF CURB
- G GAS
- HYD FIRE HYDRANT
- OSL STREET LIGHT
- P/L PROPERTY LINE
- ROW RIGHT OF WAY
- S SANITARY SEWER
- SWK SIDEWALK
- T TELEPHONE
- W WATER

**NOTES:**

1. WATER SERVICE VALVES 0.3 FROM P/L

UNITS ARE IN METERS.  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

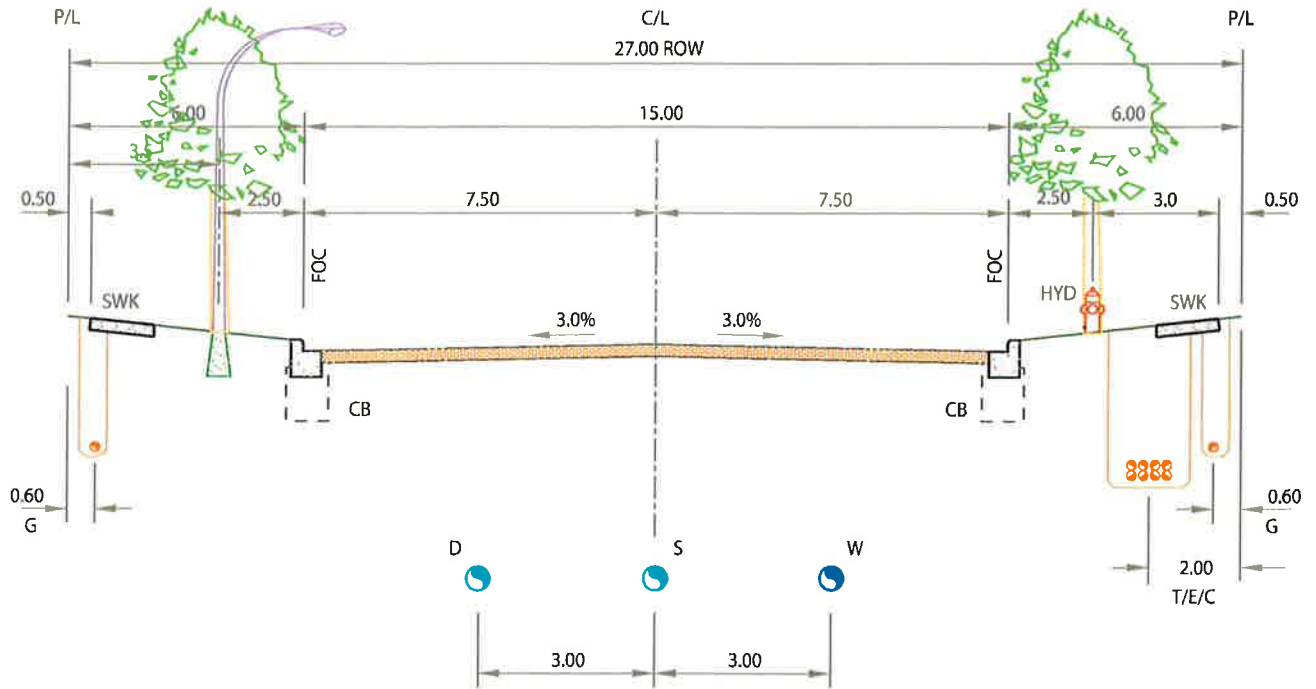


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**COLLECTOR STREET  
URBAN  
21.0m RIGHT OF WAY**

DATE	SCALE	FILE ID
2008-03-13	NTS	B-4



**LEGEND**

- C CABLEVISION
- CB CATCHBASIN
- C/L CENTER LINE
- D STORM SEWER
- E ELECTRICAL
- FOC FACE OF CURB
- G GAS
- HYD FIRE HYDRANT
- OSL STREET LIGHT
- P/L PROPERTY LINE
- ROW RIGHT OF WAY
- S SANITARY SEWER
- SWK SIDEWALK
- T TELEPHONE
- W WATER

**NOTES:**

1. WATER SERVICE VALVES 0.3 FROM P/L

UNITS ARE IN METERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

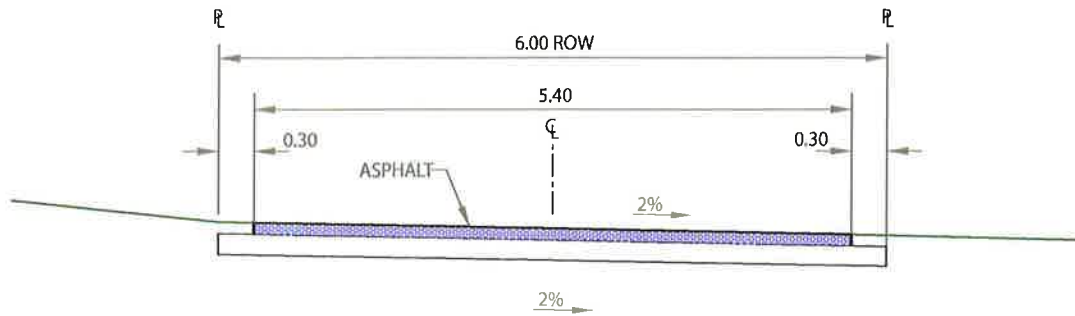


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Subdivision & Development Servicing Bylaw 1223, 2008

**ARTERIAL STREET  
URBAN UNDIVIDED  
27.0m RIGHT OF WAY**

DATE	SCALE	FILE ID
2008-03-13	NTS	B-5



**NOTES**

1. ROAD SURFACE TO BE 2% CROWN SLOPED IN KEEPING WITH EXISTING DRAINAGE.
2. ALL CATCHBASINS TO BE LOCATED ON THE DOWNSTREAM SIDE OF LANE AND PLACED TO FACILITATE EASE OF INSTALLATION AND REDUCE INTERFERENCE WITH EXISTING OR FUTURE SERVICES.
3. SUBGRADE TO BE SLOPED AT 2%.

UNITS ARE IN METERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

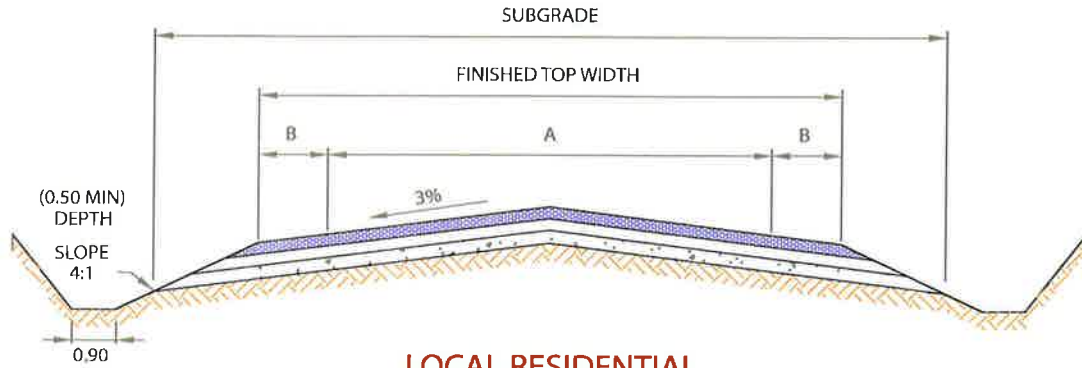


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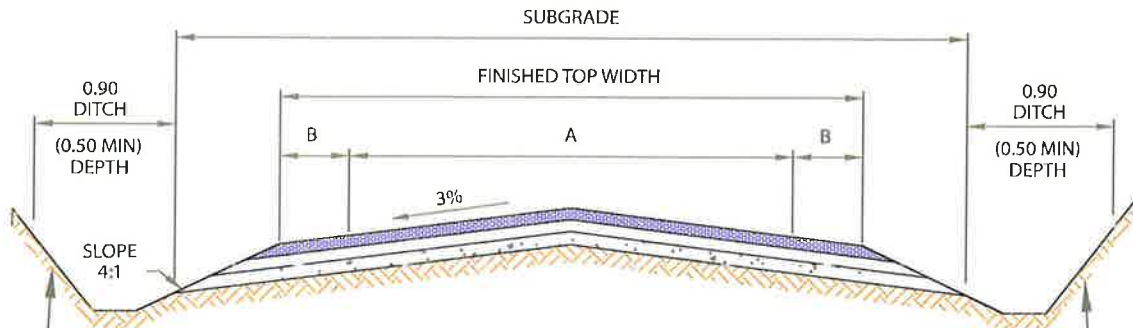
Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL  
CROSS-SECTION OF A  
PAVED LANE**

DATE	SCALE	FILE ID
2008-03-13	NTS	B-6



**LOCAL RESIDENTIAL**



**COLLECTOR, ARTERIAL, INDUSTRIAL**

3:1 PREFERRED  
MAY VARY DEPENDING  
ON LOCAL CONDITIONS

3:1 PREFERRED  
MAY VARY DEPENDING  
ON LOCAL CONDITIONS

STREET CLASSIFICATION	ROAD WIDTH 'A'	PAVED SHOULDER
LOCAL	7.00m	0.50m
COLLECTOR	8.00m	1.00m
ARTERIAL	10.00m	2.00m
LOCAL INDUSTRIAL	9.00m	1.00m

**NOTES:**

1. RIGHT OF WAY TO BE 20.0m, OR 3.0m BEYOND TOP OF CUT OR TOE OF FILL WHICHEVER IS GREATER.
2. SWALES MAY BE USED INSTEAD OF A DITCH UNLESS DITCHES ARE REQUIRED TO CARRY STORM WATER VOLUME.

UNITS ARE IN METERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

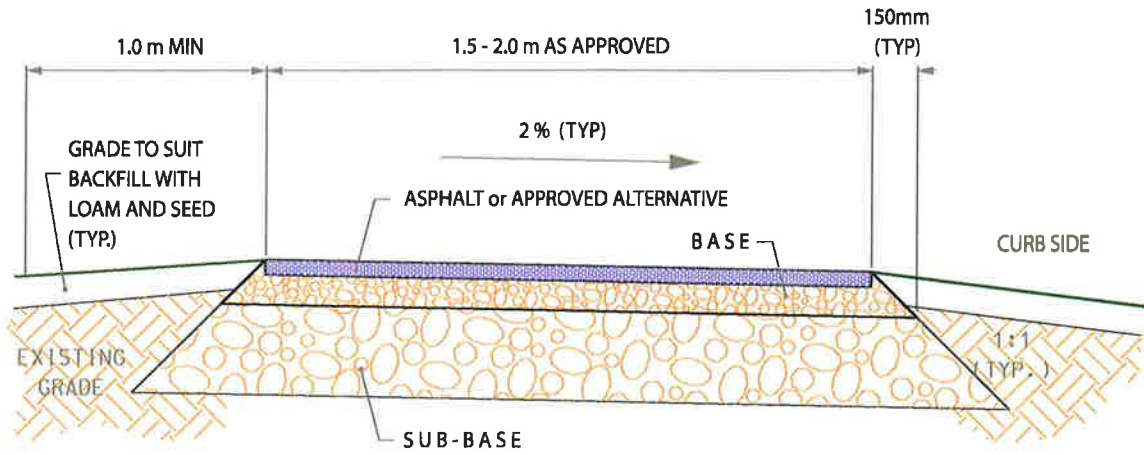


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**RURAL STREETS**

DATE	SCALE	FILE ID
2008-03-13	NTS	B-7



## LOCAL TRAIL


### SUB-BASE NOTES:

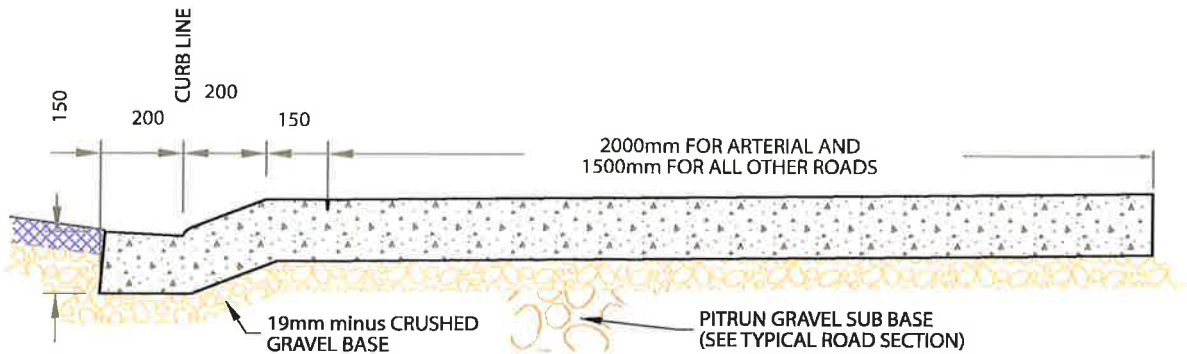
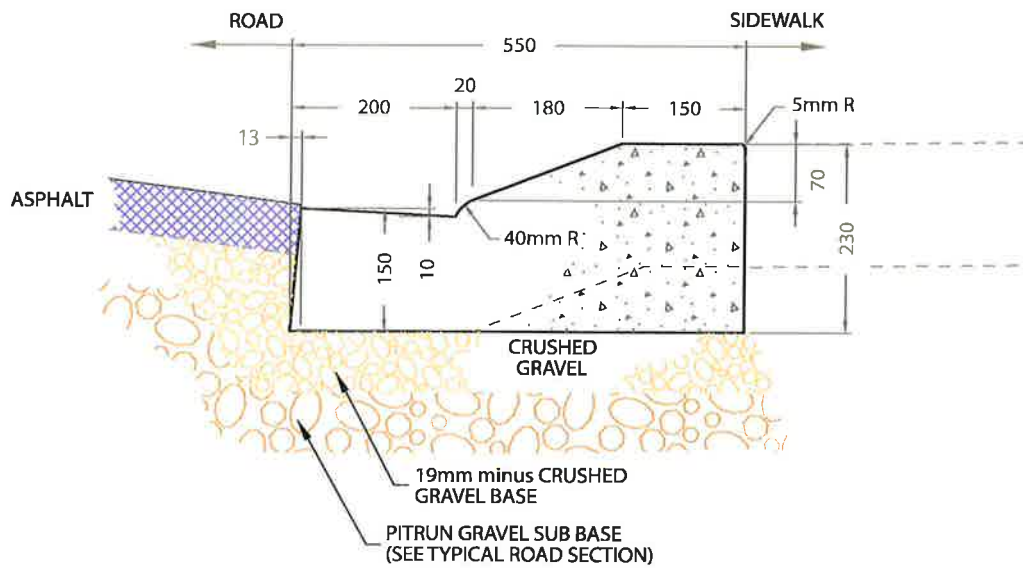
1. DEPTH SUBJECT TO SOIL CONDITIONS AND MANAGER OF OPERATIONS APPROVAL. NEW MATL COMPACTED TO 98% MIN.
2. REMOVE ORGANIC SOILS, RECOMPACT EXPOSED MATL TO 98% MIN.
3. GEOTEXTILE MAY BE REQUIRED AT THE DISCRETION OF MANAGER OF OPERATIONS.

ASPHALT - 50mm COMPACTED TO 98% min EDGES ROLLED OR TAMPED  
 BASE - 100mm OF 25mm CRUSHED GRAVEL COMPACTED TO 98%

UNITS ARE IN METERS  
 UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
 CONFIRMATION SHOULD BE MADE PRIOR  
 TO CONSTRUCTION.


	//				Subdivision & Development Servicing Bylaw 1223, 2008  <h2 style="margin: 0;">LOCAL TRAIL</h2>	
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DATE	REVISIONS	BY	APP'D	DATE	SCALE	FILE ID
				2008-03-13	NTS	<b>B-8</b>

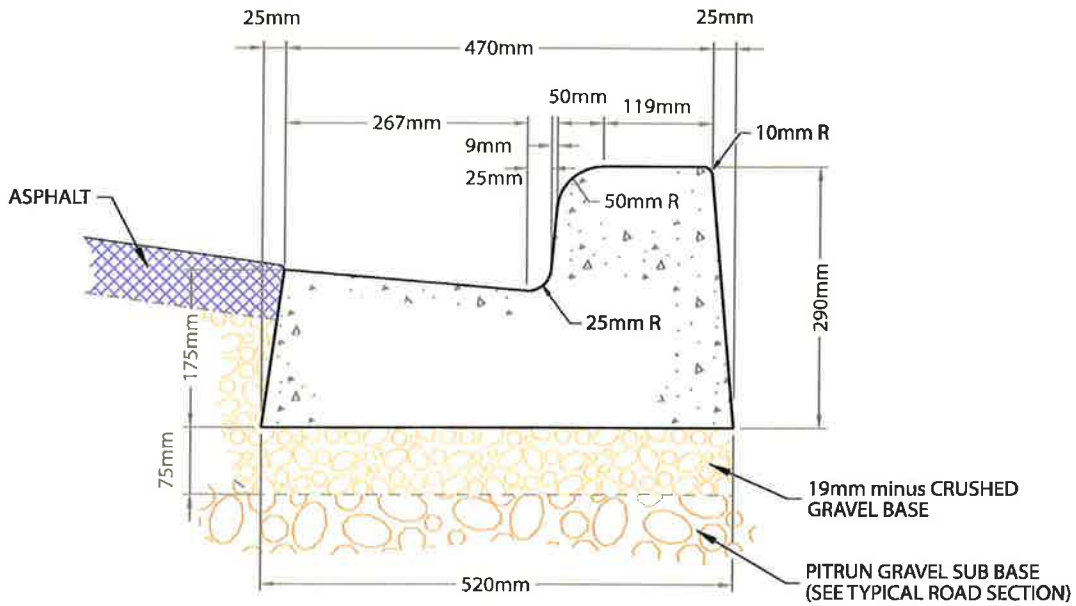


**MOUNTABLE MONOLITHIC CURB, GUTTER AND SIDEWALK**

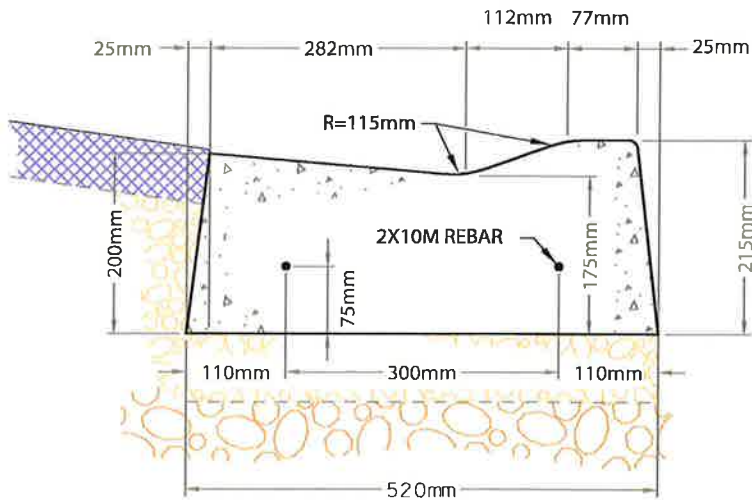
UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

 <p><b>TOWN OF GOLDEN</b> Kicking Horse Country™</p>	//				Subdivision & Development Servicing Bylaw 1223, 2008  <b>MOUNTABLE CURB &amp; GUTTER AND MONOLITHIC SIDEWALK</b>
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	DATE	REVISIONS	BY	APP'D	DATE: 2008-03-13 SCALE: NTS FILE ID: C-1



**CURB & GUTTER**



**CURB & GUTTER CROSSING**

UNITS ARE IN MILIMETERS  
UNLESS NOTED OTHERWISE.

SEE SCHEDULE F SECTION 301.8 FOR  
BACKFILLING REQUIREMENTS FOR  
CURB, GUTTER AND SIDEWALK.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

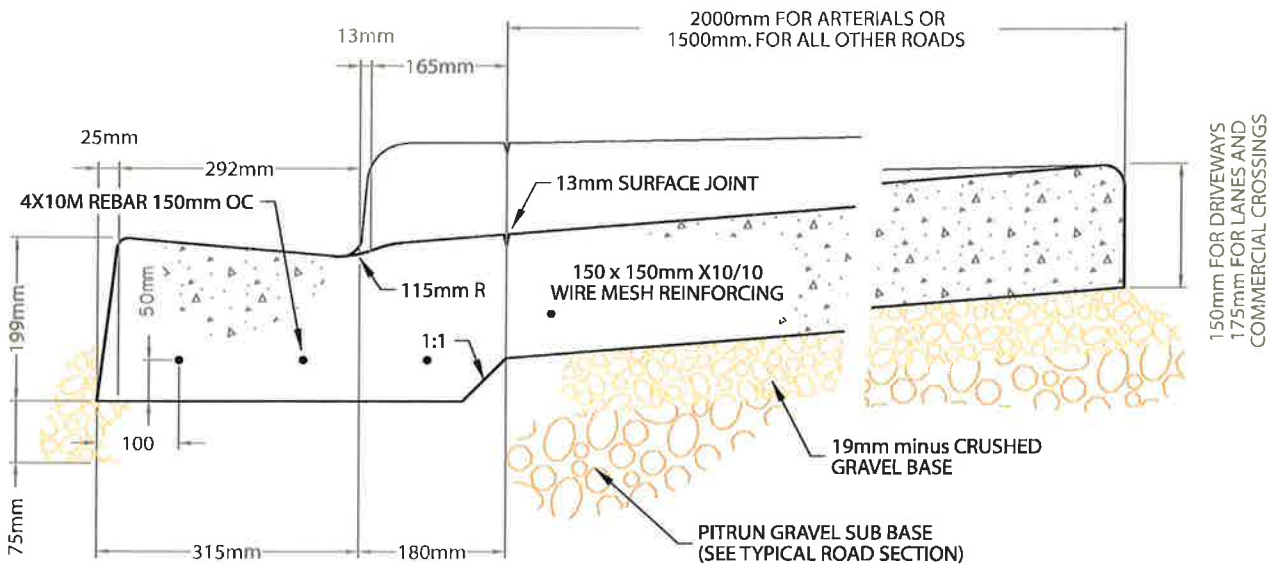
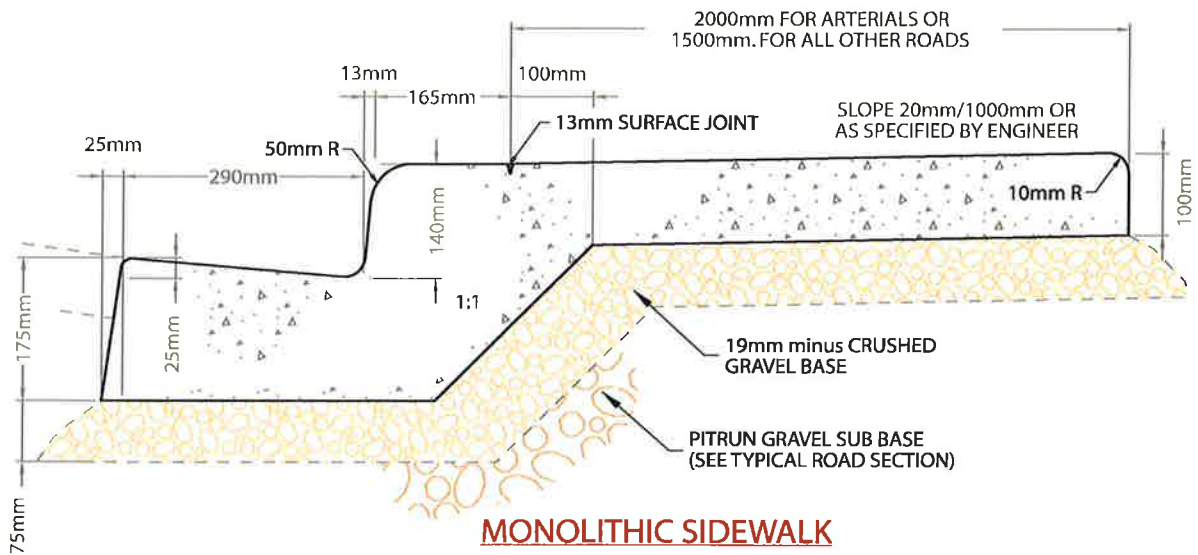


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**NON-MOUNTABLE  
CURB & GUTTER**

DATE	SCALE	FILE ID
2008-03-13	NTS	C-2



UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

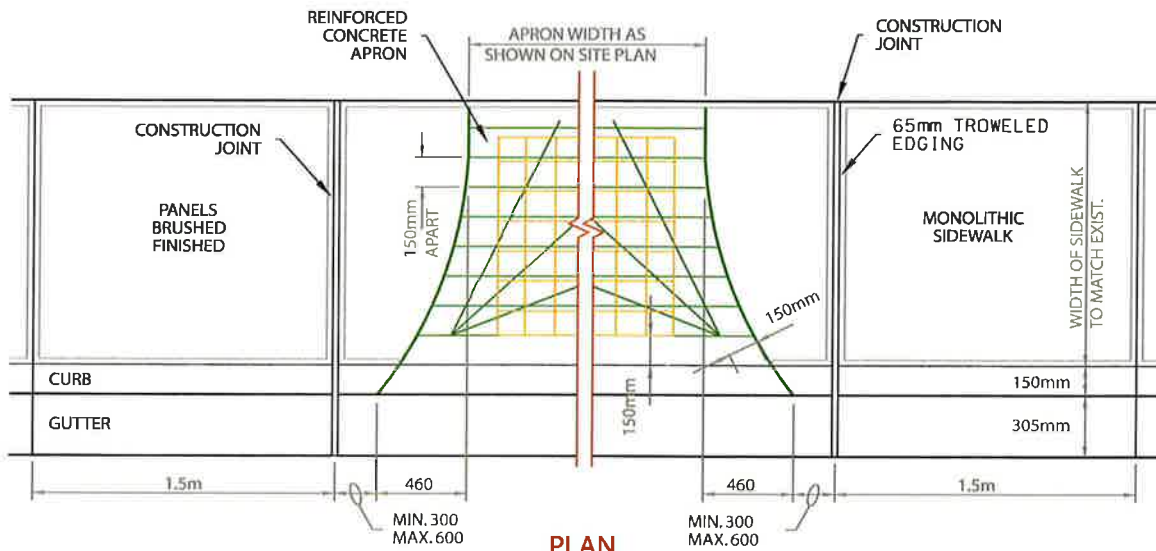


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

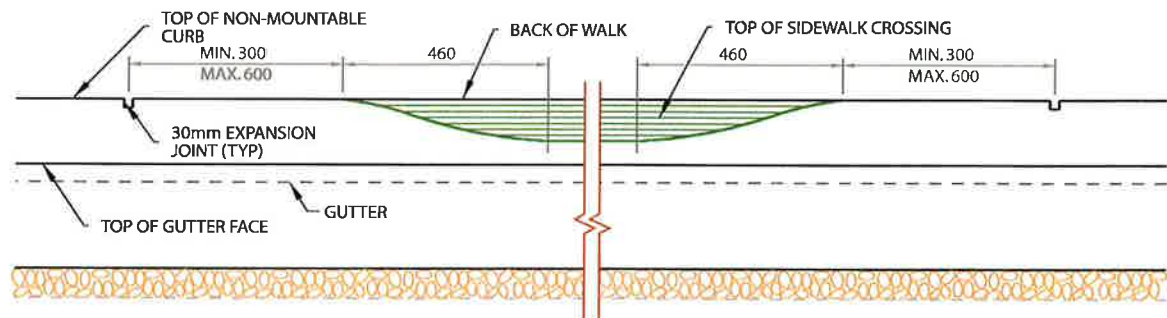
**NON-MOUNTABLE  
MONOLITHIC CURB  
GUTTER & SIDEWALK**

DATE	SCALE	FILE ID
2008-03-13	NTS	C-3



**PLAN**

**CONCRETE REINFORCEMENT**  
 150mm X 150mm X 10/10  
 WIRE MESH REINFORCING  
 EXTRA REINFORCING IN CORNERS =90°  
 4 - 10M BARS 1.2m LONG PLACED AS  
 SHOWN  
 50mm FROM BOTTOM OF CONCRETE



**FORMED CURB & SIDEWALK ELEVATION**

UNITS ARE IN MILLIMETERS  
 UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
 CONFIRMATION SHOULD BE MADE PRIOR  
 TO CONSTRUCTION.

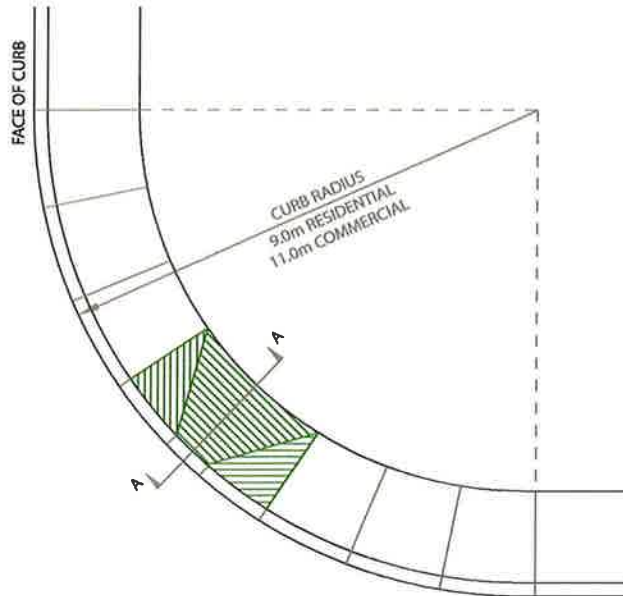


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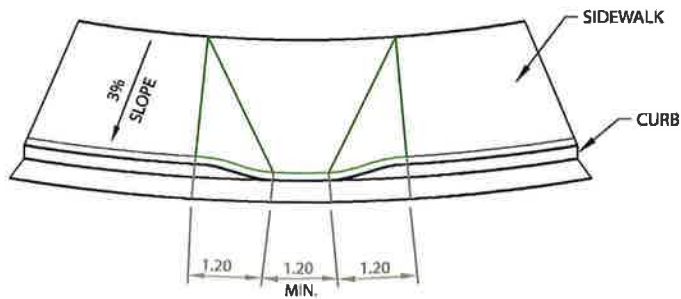
Subdivision & Development Servicing Bylaw 1223, 2008

**SIDEWALK CROSSING FOR  
 NON-MOUNTABLE CURBS**

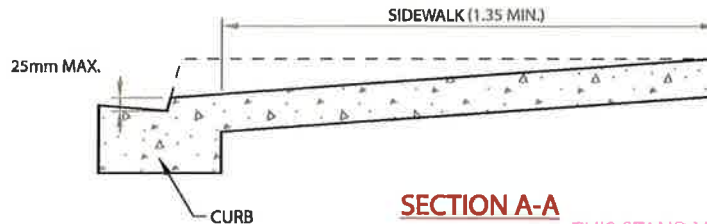
DATE	SCALE	FILE ID
2008-03-13	NTS	C-4



**PLAN**



**ISOMETRIC VIEW**



**SECTION A-A**

UNITS ARE IN METERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.



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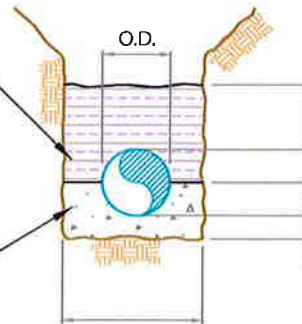
Subdivision & Development Servicing Bylaw 1223, 2008

**STANDARD WHEELCHAIR  
RAMP FOR NON-  
MOUNTABLE CURB**

DATE	SCALE	FILE ID
2008-03-13	NTS	C-5

SELECT EXCAVATED OR IMPORTED GRANULAR MATERIAL, PLACED IN 100mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY

CONCRETE - 20 MPa IN ALKALI SOILS, SULFATE RESISTANT CEMENT SHALL BE USED



**CLASS "A" BEDDING**

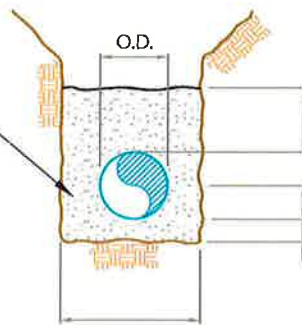
300mm MIN.

1/4 O.D.

1/4 I.D.  
100mm MIN.

O.D.+ 300mm MIN  
O.D.+ 760mm MAX

FINE GRANULAR MATERIAL PLACED IN 100mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY



**CLASS "B" BEDDING**

300mm MIN.

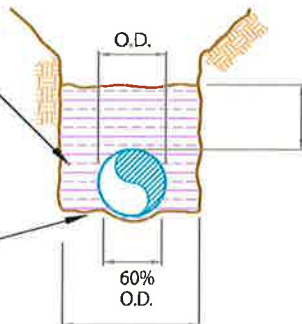
1/4 O.D.

1/4 I.D.  
100mm MIN.

O.D.+ 300mm MIN  
O.D.+ 760mm MAX

SELECT EXCAVATED OR IMPORTED GRANULAR MATERIAL, PLACED IN 100mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY

BOTTOM OF TRENCH SHAPED TO ACCEPT LOWER EXTERIOR OF PIPE



**CLASS "C" BEDDING**

300mm MIN.

60%  
O.D.

O.D.+ 300mm MIN  
O.D.+ 760mm MAX

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

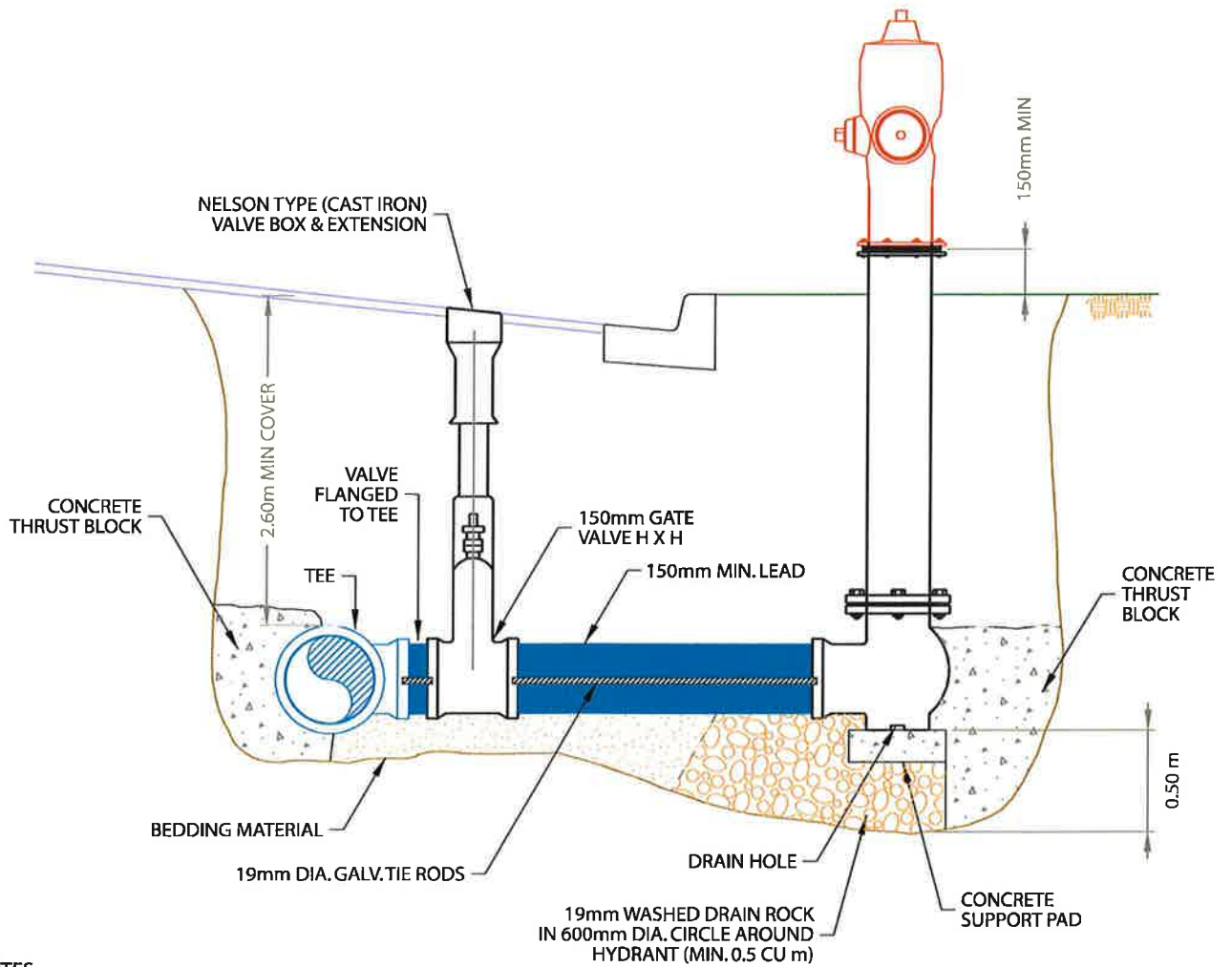


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**STANDARD PIPE  
BEDDING CLASSES  
AND BACKFILL WITHIN  
PIPE ZONE**

DATE	SCALE	FILE ID
2008-03-13	NTS	D-1



**NOTES**

1. HYDRANTS - AS PER SCHEDULE D
2. PUMPER OUTLET MUST FACE CURB OR AWAY FROM PROPERTY LINE WITH STORZ PUMPER PORT FITTING
3. HYDRANT BOOT, SIZED FOR 150mm PIPE
4. HYDRANT BODY COLOR - RED
5. ALL PIPE AND FITTINGS SHALL CONFORM TO AWWA SPECS
6. VALVE TO BE LOCATED A MINIMUM 2.0m FROM THE HYDRANT AND WITHIN THE ASPHALT OF THE ROAD
7. FOR LOCATION OF HYDRANT SEE HIGHWAY STANDARD DRAWINGS

**SECTION**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

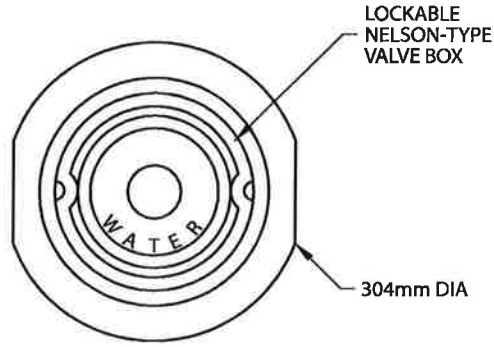


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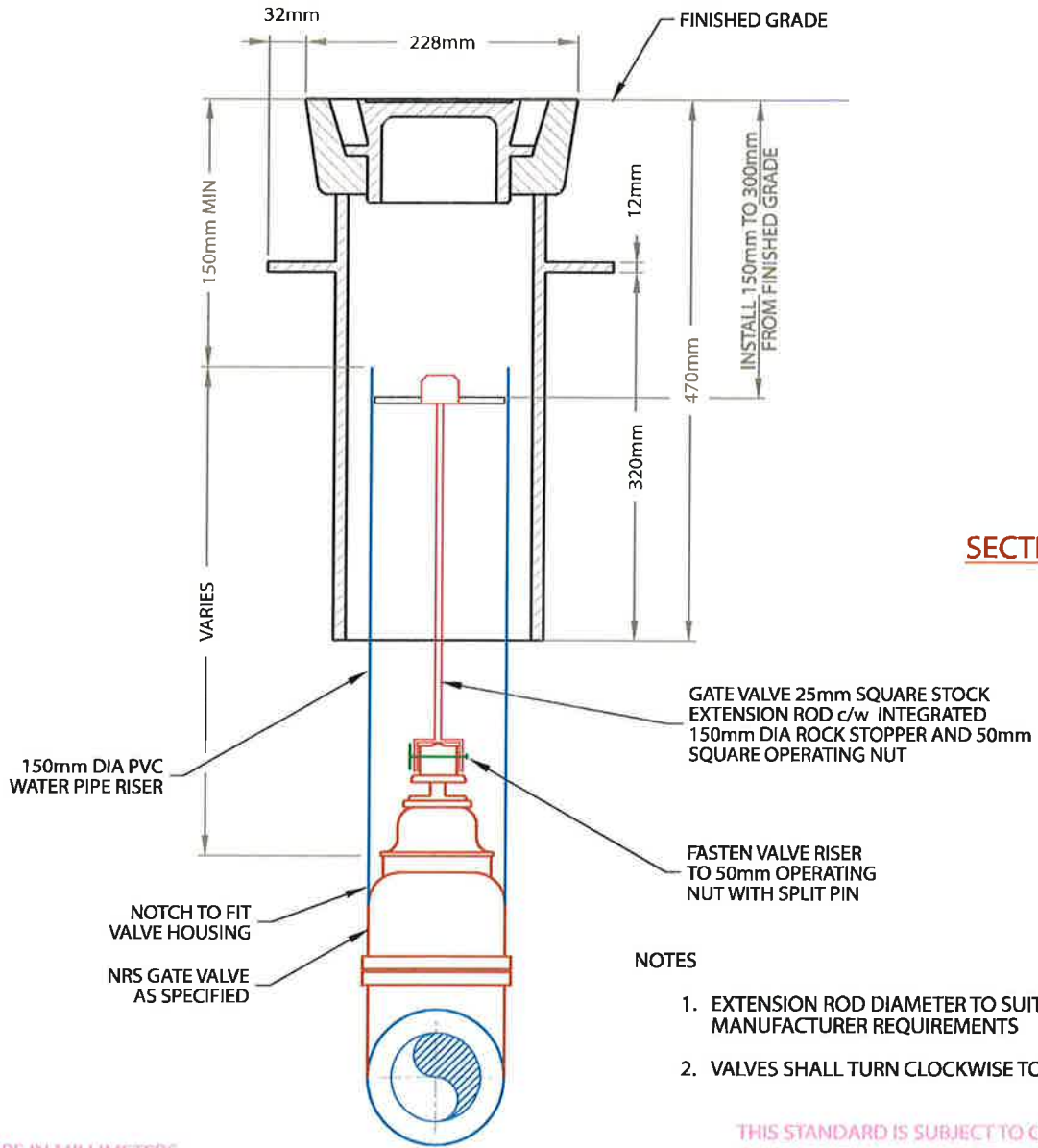
Subdivision & Development Servicing Bylaw 1223, 2008

**STANDARD HYDRANT DETAIL**

DATE	SCALE	FILE ID
2008-03-13	NTS	D-2



**PLAN**



**SECTION**

**NOTES**

1. EXTENSION ROD DIAMETER TO SUIT VALVE MANUFACTURER REQUIREMENTS
2. VALVES SHALL TURN CLOCKWISE TO CLOSE

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

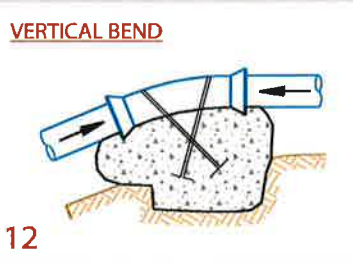
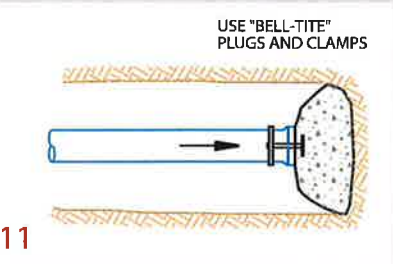
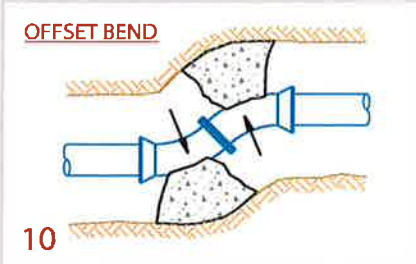
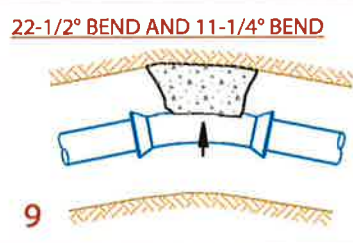
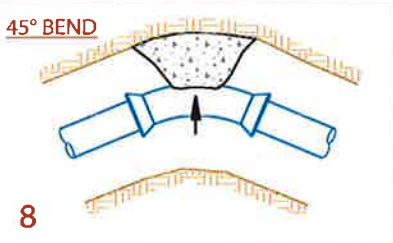
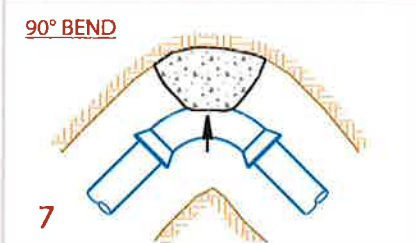
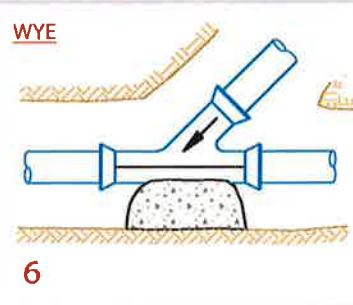
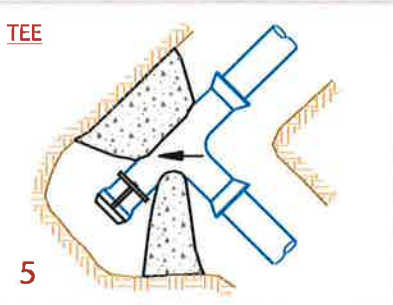
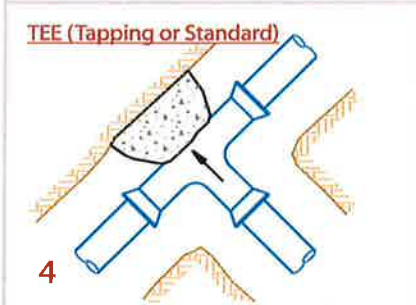
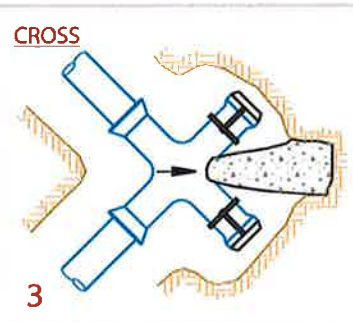
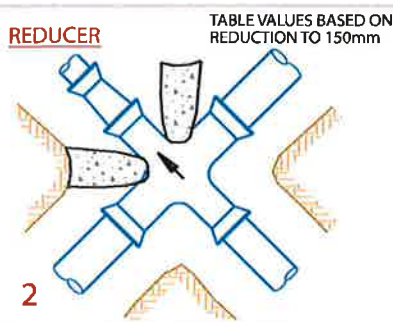
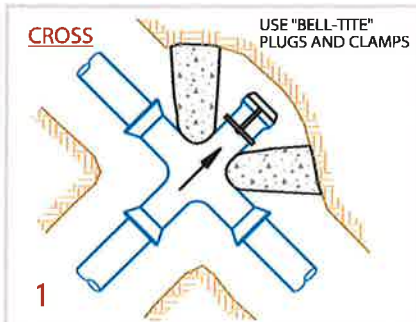


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Subdivision & Development Servicing Bylaw 1223, 2008

**VALVE BOX & RISER  
NELSON TYPE LOCKABLE**

DATE	SCALE	FILE ID
2008-03-13	NTS	



**BEARING AREA OF BLOCKS**  
CONCRETE AREAS IN m<sup>2</sup>

PIPE SIZE	100	150	200	250	300	400
1, 4, 11	0.2	0.4	0.7	1.0	1.45	1.9
3, 5, 7	0.3	0.55	0.9	1.45	2.05	2.7
2			0.25	0.5	0.75	1.65
6, 8	0.15	0.3	0.5	0.6	1.2	1.45
9	0.1	0.15	0.3	0.45	0.6	0.75
10	0.3	0.6	1.0	1.2	2.2	2.9

**DESIGN ASSUMPTIONS**

1. HYDRAULIC HEAD = 1.38 MPa.  
SOIL BEARING VALUE = 0.096 MPa.  
(MEDIUM SOFT CLAY)
2. THRUST BLOCKS FOR MAINS LARGER THAN 300mm dia SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER AND SHOWN ON THE ENGINEERED DRAWINGS

**NOTE**

FOR VERTICAL REACTION  
BLOCK SIZE REFER TO  
PLAN/PROFILE DRAWINGS

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

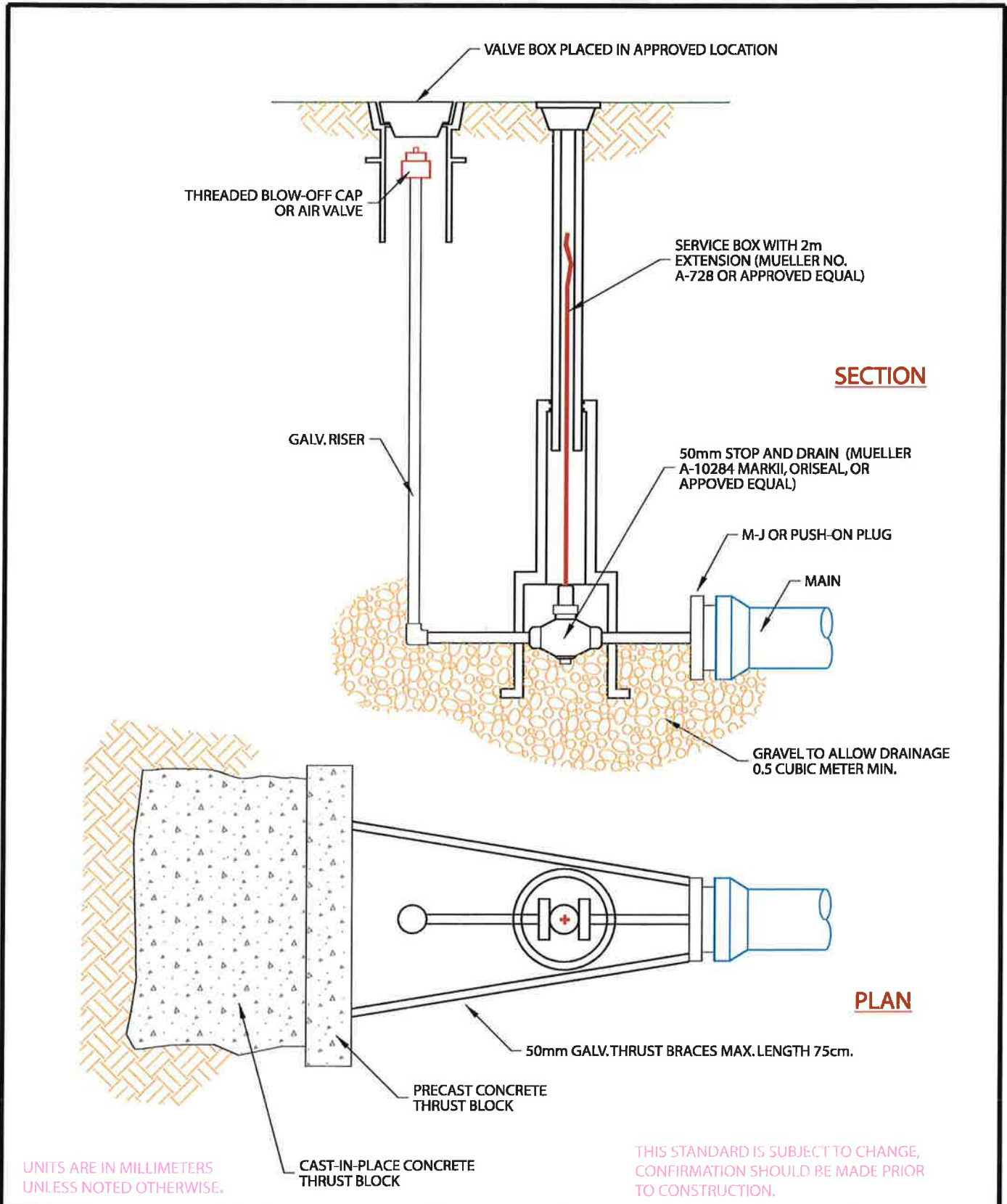


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**STANDARD PRESSURE  
MAIN THRUST BLOCK  
DETAILS**

DATE	SCALE	FILE ID
2008-03-13	NTS	

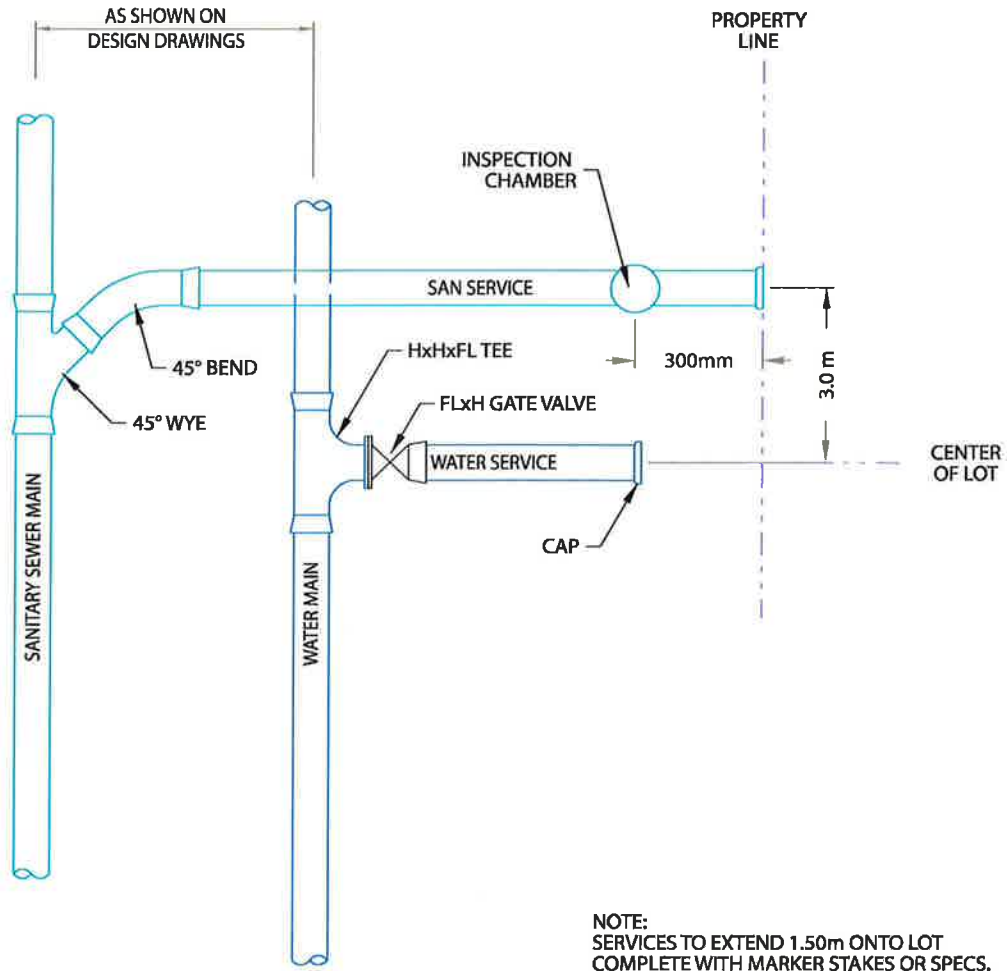


DATE	REVISIONS	BY	APP'D

Subdivision & Development Servicing Bylaw 1223, 2008

**STANDARD BLOW-OFF  
DETAIL**

DATE	SCALE	FILE ID
2008-03-13	NTS	D-5



**PLAN**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

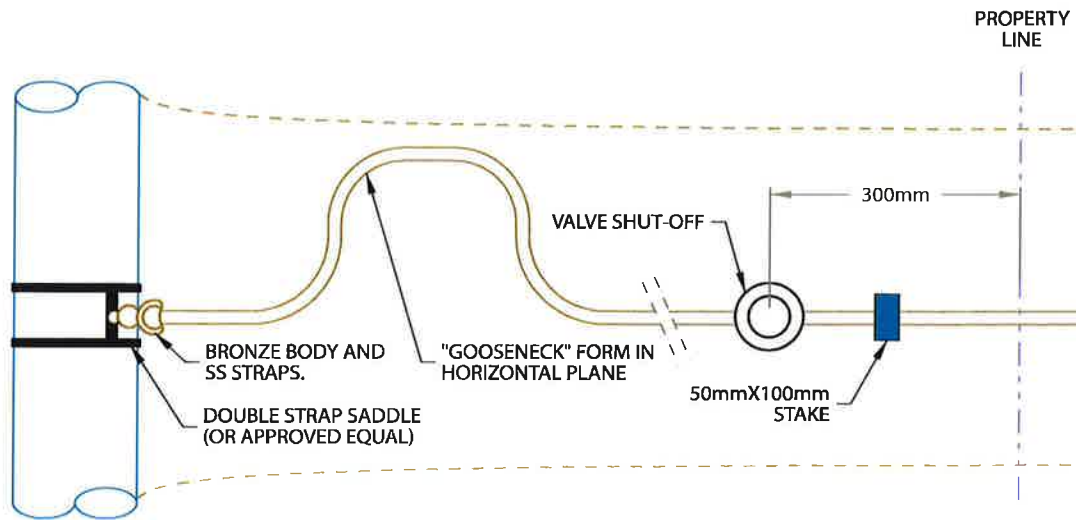


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**LARGE DIAMETER  
SEWER AND WATER SERVICES**

DATE	SCALE	FILE ID
2008-03-13	NTS	D-6

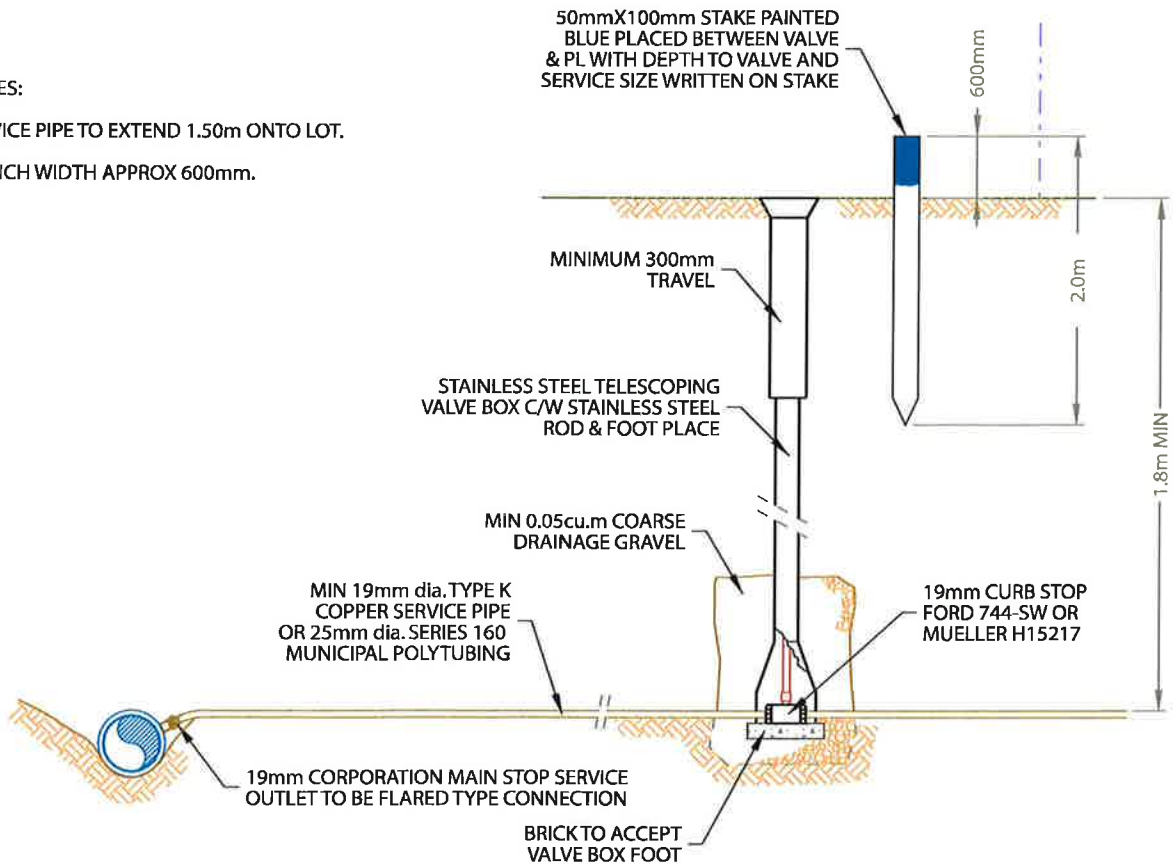


**PLAN**

**NOTES:**

SERVICE PIPE TO EXTEND 1.50m ONTO LOT.

TRENCH WIDTH APPROX 600mm.



**SECTION**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

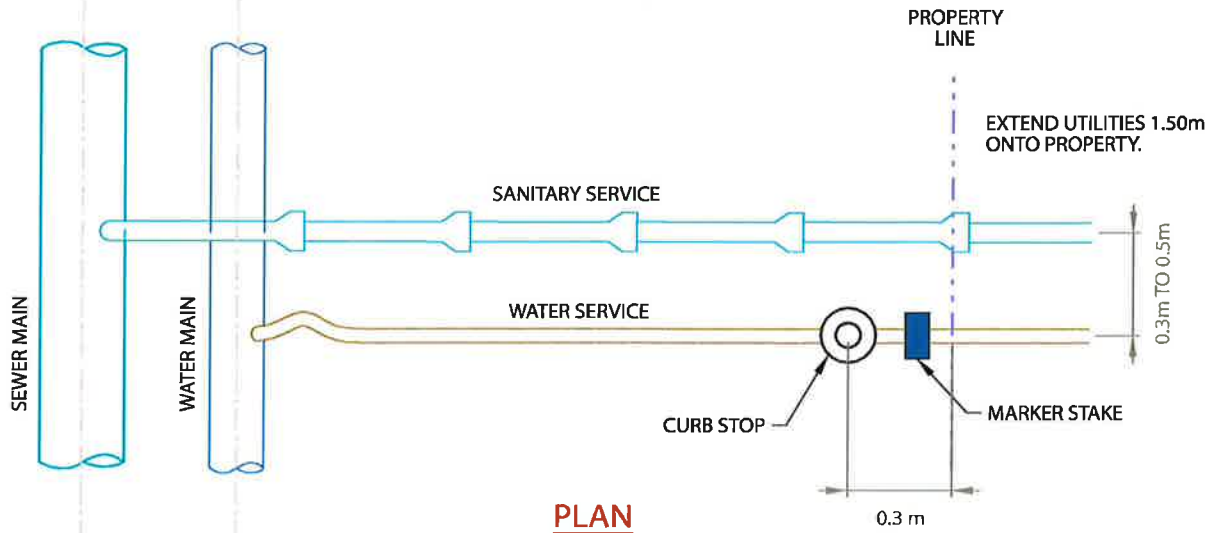


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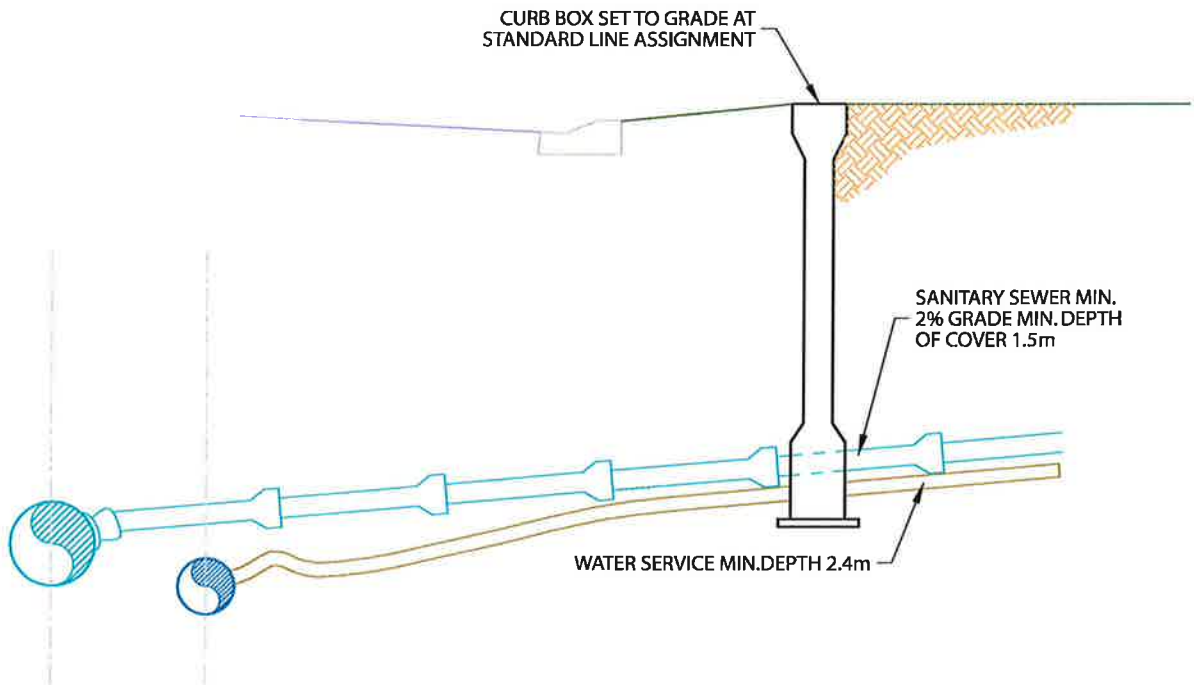
Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL 19mm WATER  
SERVICE CONNECTION**

DATE	SCALE	FILE ID
2008-03-13	NTS	D-7



**PLAN**



**ELEVATION**

**NOTES:**

CURB BOX LOCATED ON CENTRE LINE OF LOT UNLESS SPECIFIED OTHERWISE.

VIEWING THE TRENCH FROM THE ROAD, THE SANITARY SEWER SERVICE IS LOCATED TO THE LEFT OF THE CURB BOX.

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

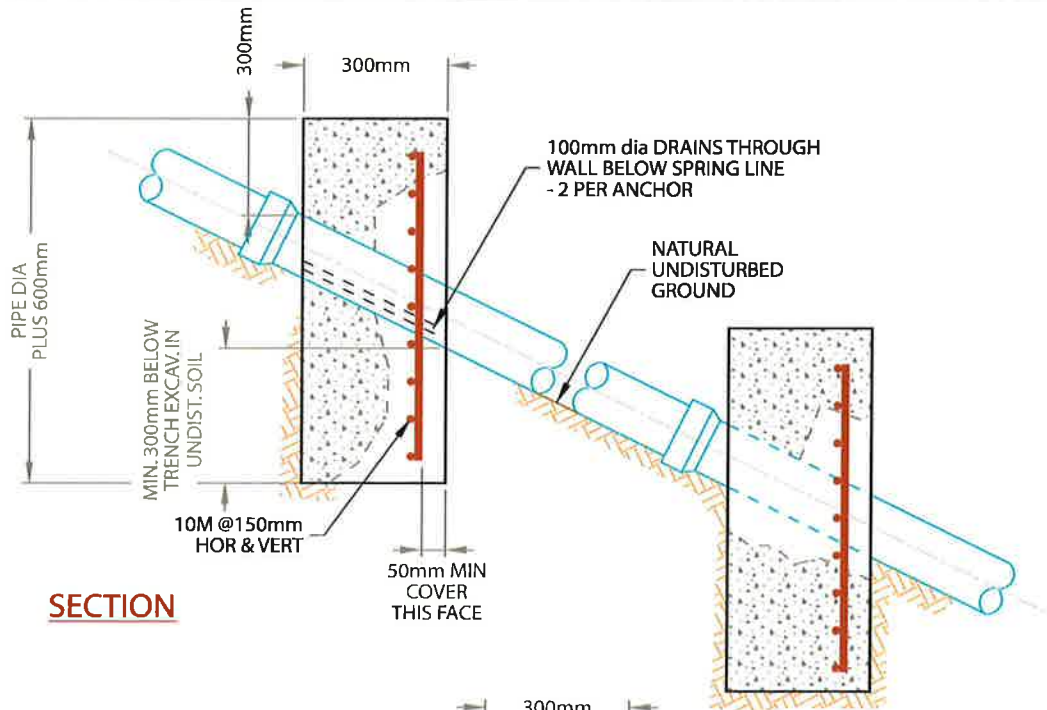


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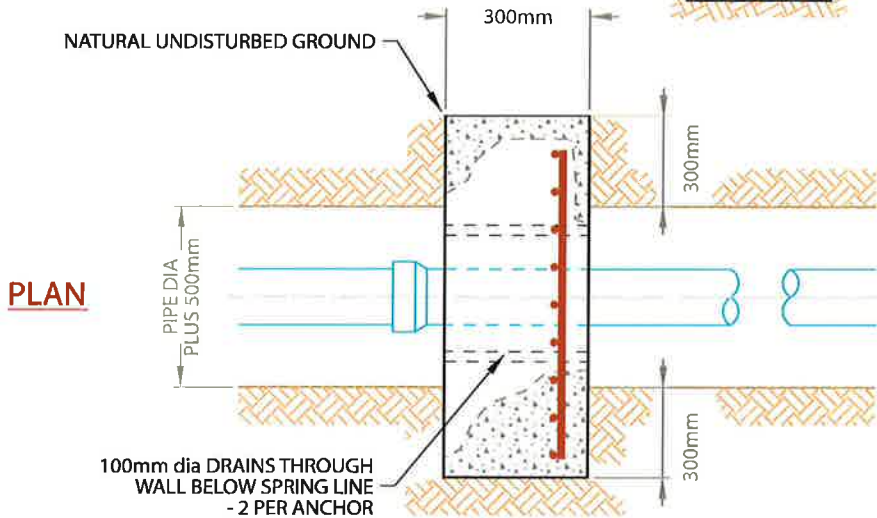
Subdivision & Development Servicing Bylaw 1223, 2008

**SEWER & WATER SERVICES  
COMMON TRENCH  
INSTALLATION**

DATE	SCALE	FILE ID
2008-03-13	NTS	D-8



**SECTION**



**PLAN**

**NOTES**

1. CONCRETE SHALL BE 20MPa, 28 DAY STRENGTH WHERE REQUIRED  
CONCRETE USED SHALL BE SULPHATE RESISTANT.
2. ANCHORAGE REQUIRED WHERE SLOPE EXCEEDS:  
20 - 35% LOCATE EVERY 11m  
35 - 50% LOCATE EVERY 7.3m  
GREATER THAN 50% LOCATE EVERY 5m.
3. NO REBAR IS TO BE PLACED WITHIN 150mm OF MAINS.
4. ANCHORS ARE TO BE PLACED AGAINST AND ON THE DOWNHILL  
SIDE OF THE BELL OF THE PIPE, BUT MUST NOT SURROUND IT.
5. DOWNHILL FACE OF ANCHORS TO BE BEARING ON UNDISTURBED SOIL.

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

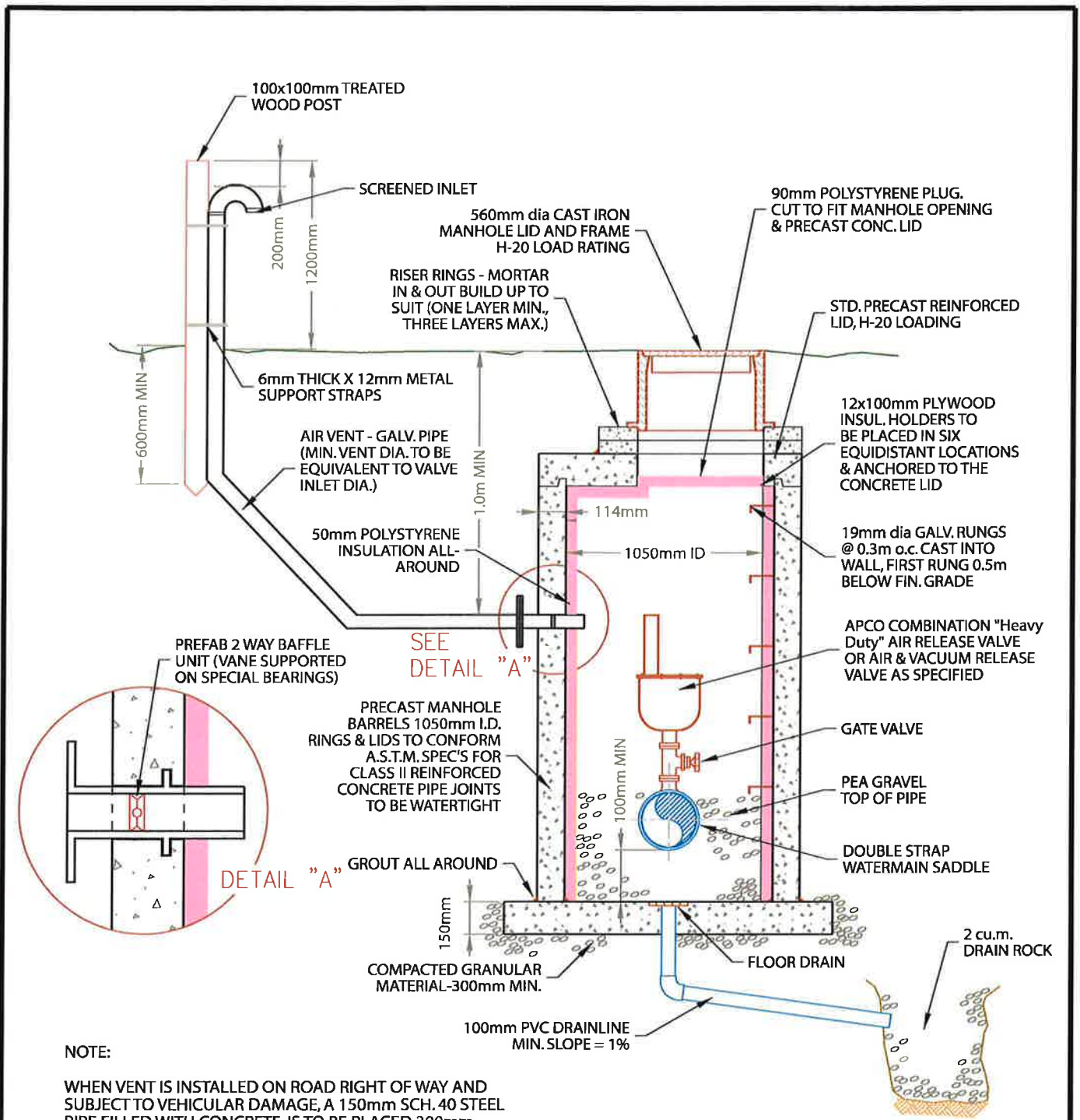


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**STANDARD WATERMAIN  
AND SEWERMAIN ANCHORS**

DATE	SCALE	FILE ID
2008-03-13	NTS	



**NOTE:**

WHEN VENT IS INSTALLED ON ROAD RIGHT OF WAY AND SUBJECT TO VEHICULAR DAMAGE, A 150mm SCH. 40 STEEL PIPE FILLED WITH CONCRETE, IS TO BE PLACED 300mm IN FRONT OF THE VENT & ANCHORED IN 0.15 cu.m. OF CONCRETE. THE PIPE SHOULD PROJECT 1.2m ABOVE GROUND & PAINTED YELLOW.

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

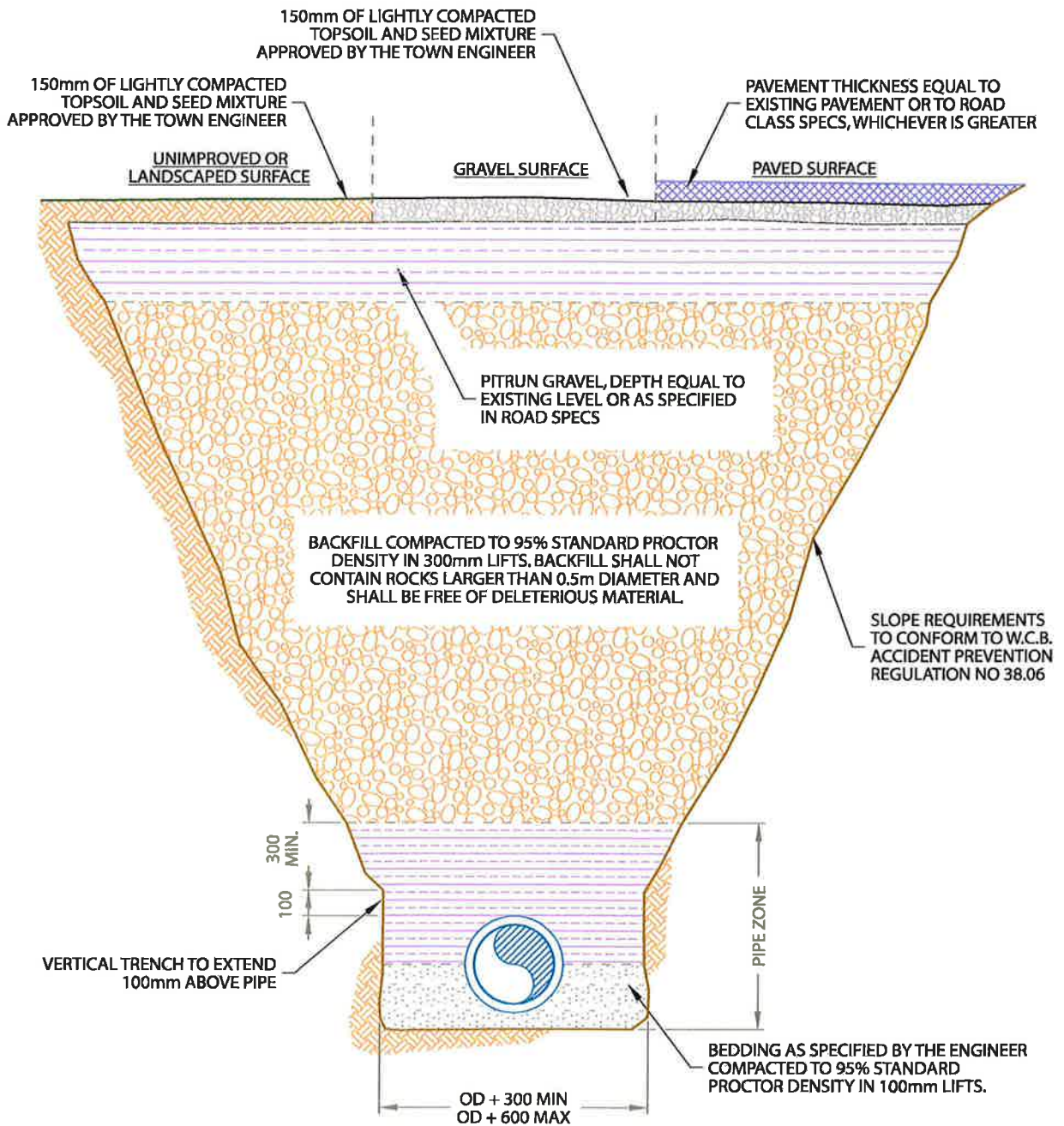


DATE	REVISIONS	BY	APP'D

Subdivision & Development Servicing Bylaw 1223, 2008

**COMBINATION AIR PRESSURE VALVE OR AIR AND VACUUM RELEASE VALVE**

DATE	SCALE	FILE ID
2008-03-13	NTS	D-10



UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.



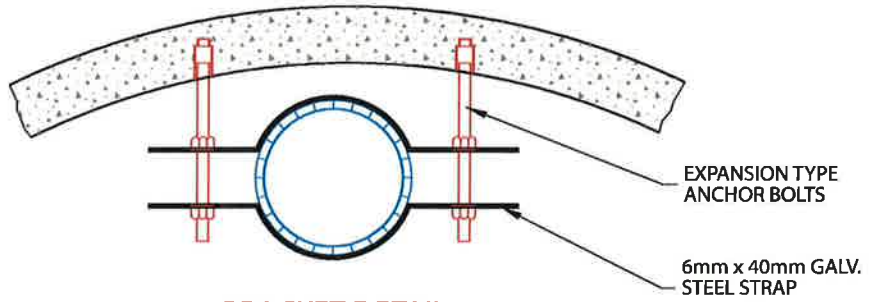
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Subdivision & Development Servicing Bylaw 1223, 2008

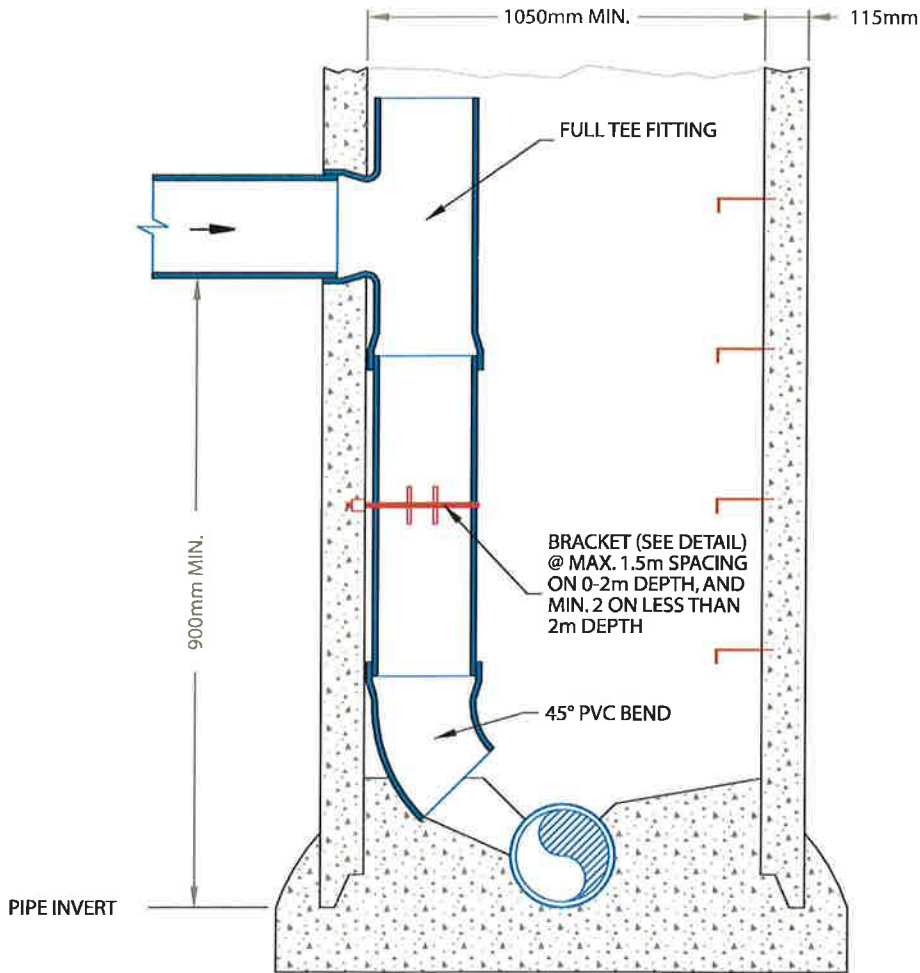
### TRENCH RESTORATION DETAIL

DATE	SCALE	FILE ID
2008-03-13	NTS	D-11





**BRACKET DETAIL**



**INSIDE DROP TYPE**

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.



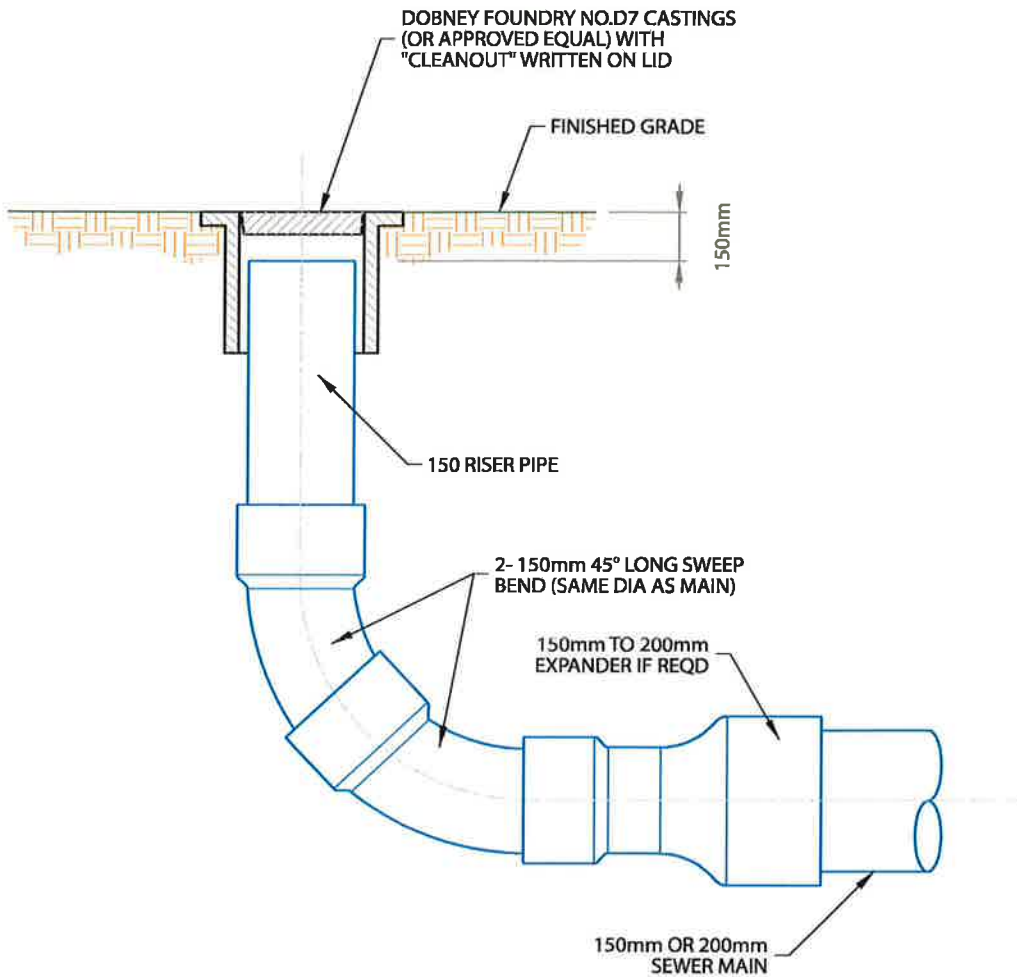
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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**INTERIOR DROP MANHOLE DETAIL**

DATE	SCALE	FILE ID
2008-03-13	NTS	E-2





NOTE:  
ALL PIPE MATERIALS TO BE PVC.

**SECTION**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

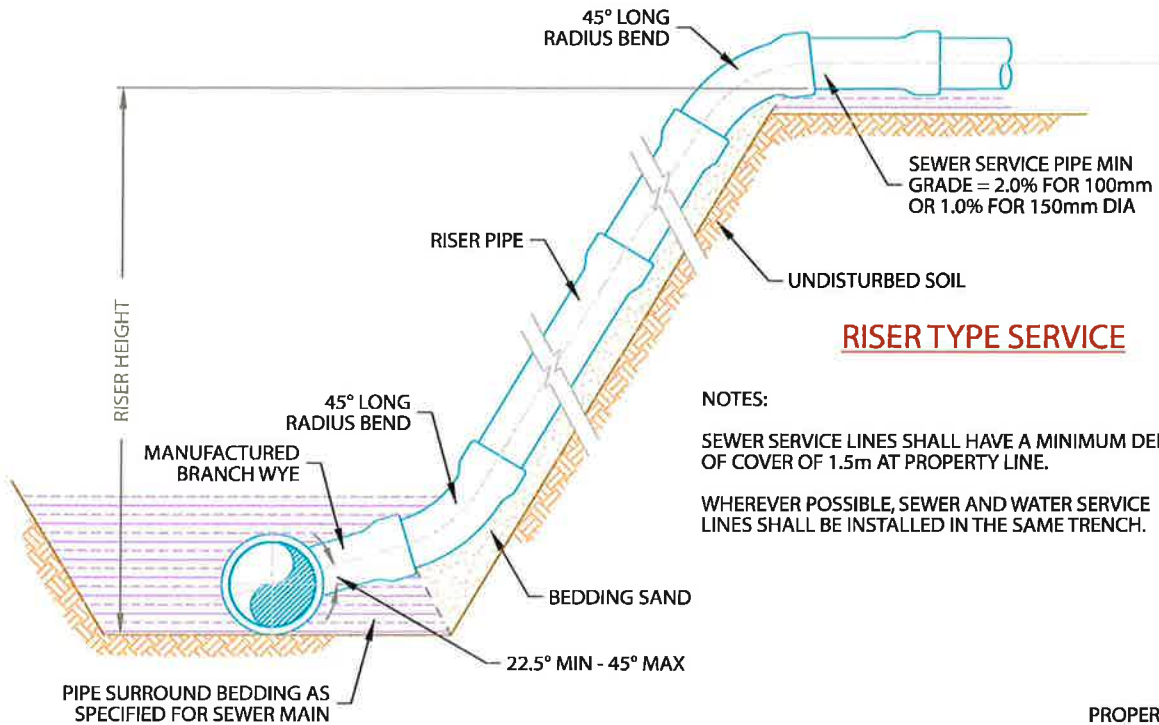


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**SEWER CLEANOUT DETAIL  
FOR 150mm & 200mm DIA  
SANITARY SEWER TERMINALS**

DATE	SCALE	FILE ID
2008-03-13	NTS	E-4



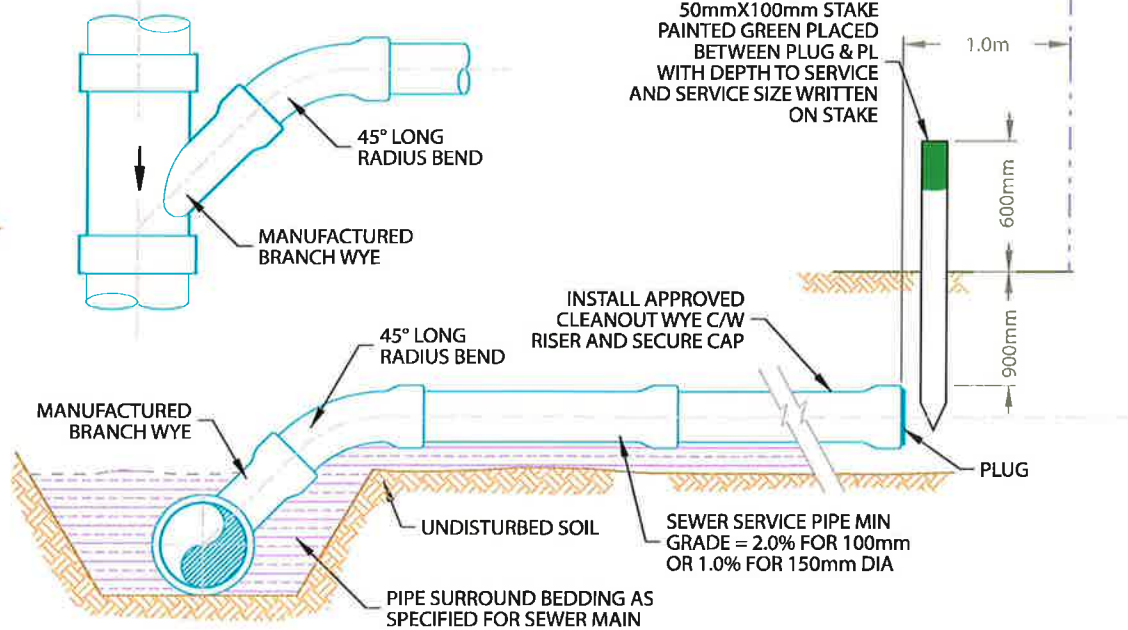
**RISER TYPE SERVICE**

**NOTES:**

SEWER SERVICE LINES SHALL HAVE A MINIMUM DEPTH OF COVER OF 1.5m AT PROPERTY LINE.

WHEREVER POSSIBLE, SEWER AND WATER SERVICE LINES SHALL BE INSTALLED IN THE SAME TRENCH.

**PLAN**



**NON-RISER TYPE SERVICE**

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

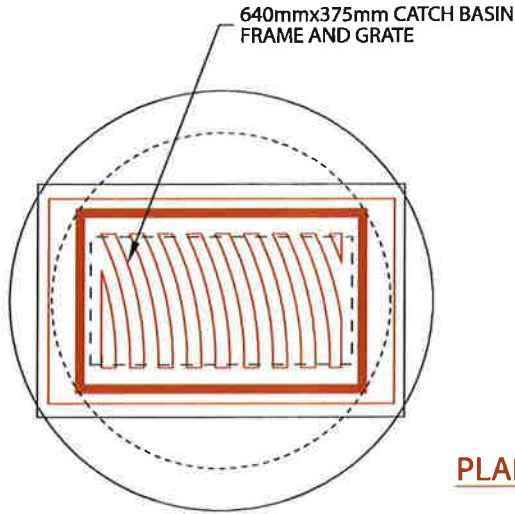


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL SEWER SERVICE CONNECTION**

DATE	SCALE	FILE ID
2008-03-13	NTS	E-5



**PLAN**

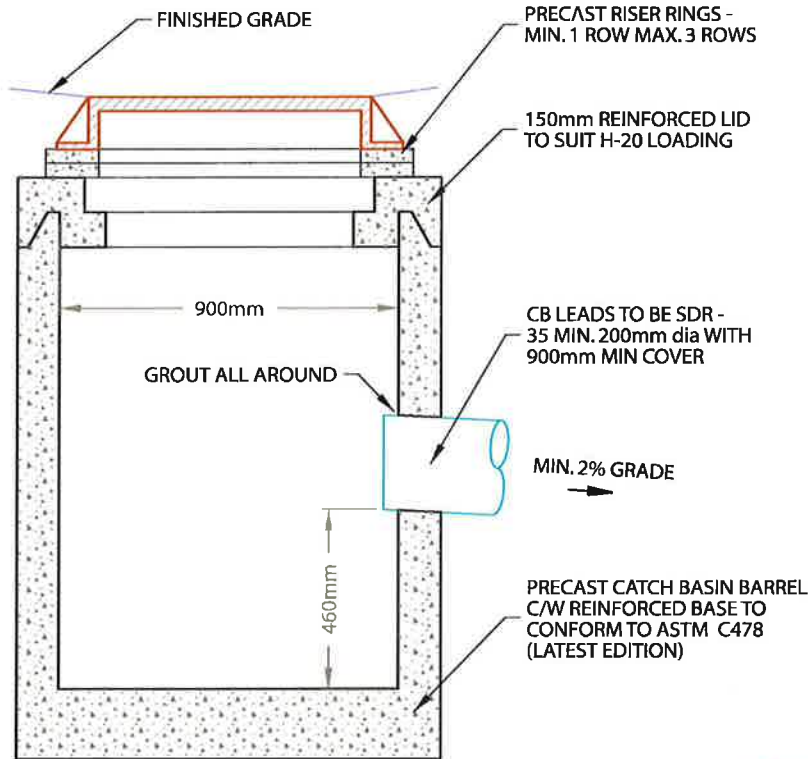
**NOTES:**

**APPROVED PATTERNS;**  
 DOBNEY B19A FRAME AND GRATE OR APPROVED EQUAL  
 MIN. WT. GRATE 68kg. (150lbs)  
 MIN. WT. FRAME 86kg (190lbs)  
 GRATES AVAILABLE IN BOTH LEFT AND RIGHT HAND

**CASTING SPECIFICATIONS;**  
 THE CASTING SHALL BE TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS, AND EXCESSIVE SHRINKAGE. SURFACES OF THE CASTING SHALL BE FREE FROM BURNT ON SAND, AND SHALL BE REASONABLY SMOOTH. RUNNERS, RISERS, FINS, AND OTHER CAST ON PIECES SHALL BE REMOVED IN OTHER RESPECTS. THE CASTINGS SHALL CONFORM TO WHATEVER POINTS MAY BE SPECIALLY AGREED UPON BETWEEN THE MANUFACTURER AND THE ENGINEER

**FRAME MATERIAL SPECIFICATION;**  
 CAST IRON A.S.T.M. A48-64 CLASS 20

**GRATE MATERIAL SPECIFICATION;**  
 DUCTILE IRON A.S.T.M. A-445-63T OR CAST STEEL-  
 GRADE 60-90 (TABLE II A.S.T.M. DES. A-148-46T)



**SECTION**

UNITS ARE IN MILLIMETERS  
 UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
 CONFIRMATION SHOULD BE MADE PRIOR  
 TO CONSTRUCTION.

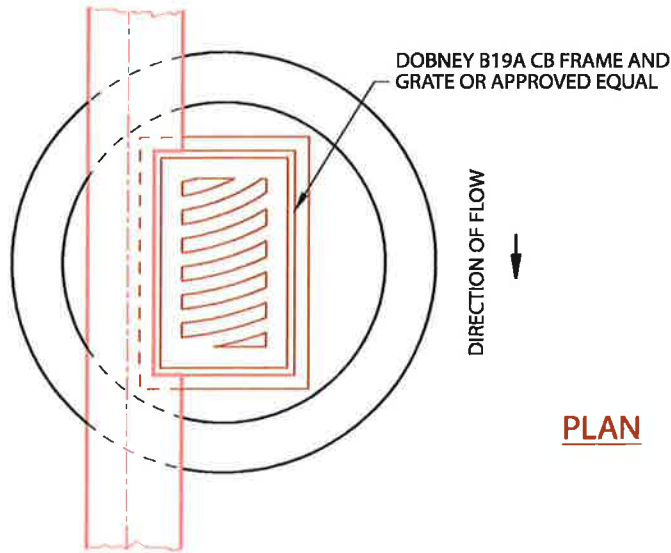


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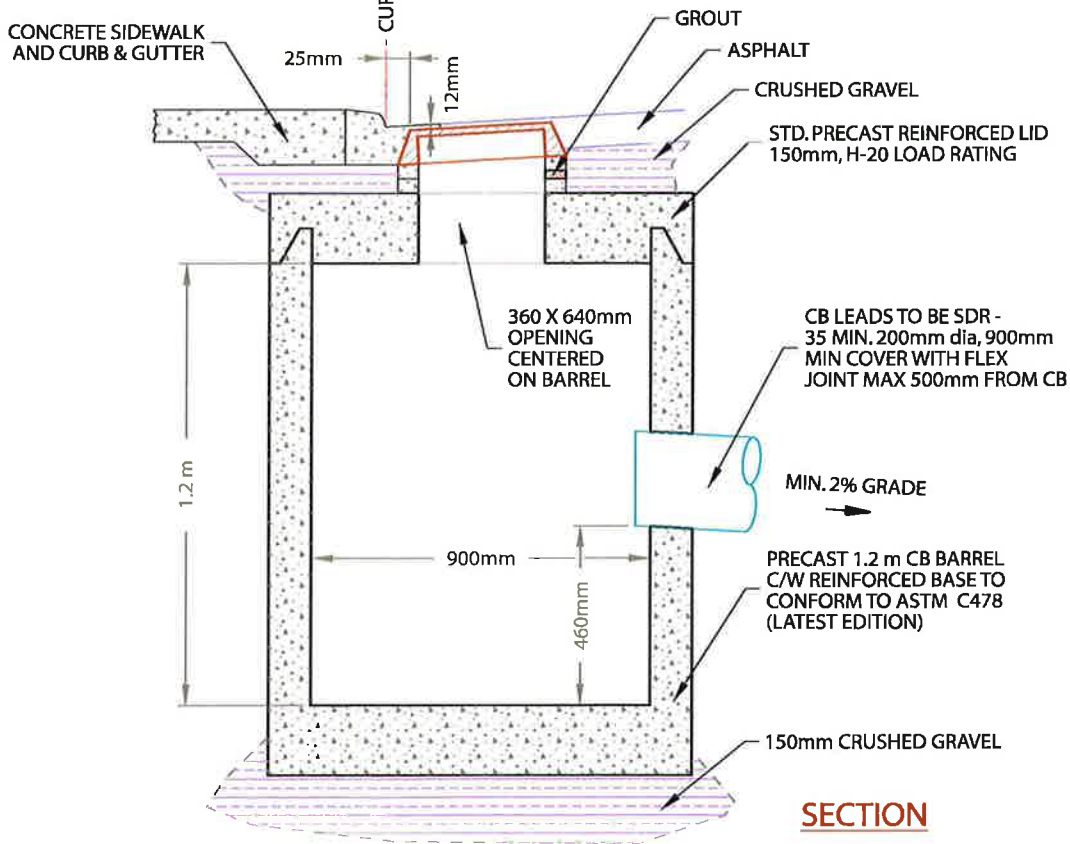
Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL STORM  
 SEWER CATCHBASIN  
 TYPE I**

DATE	SCALE	FILE ID
2008-03-13	NTS	F-1



**PLAN**



**SECTION**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

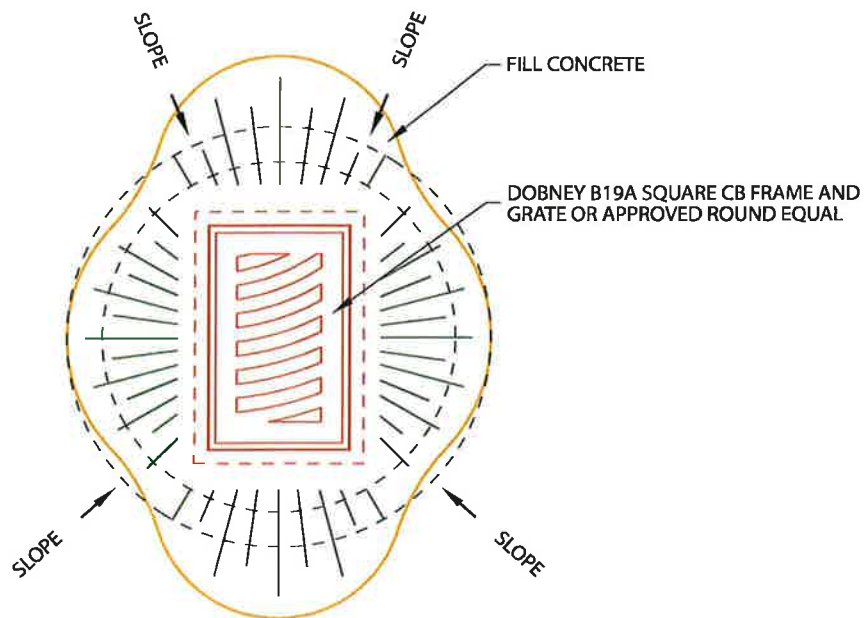


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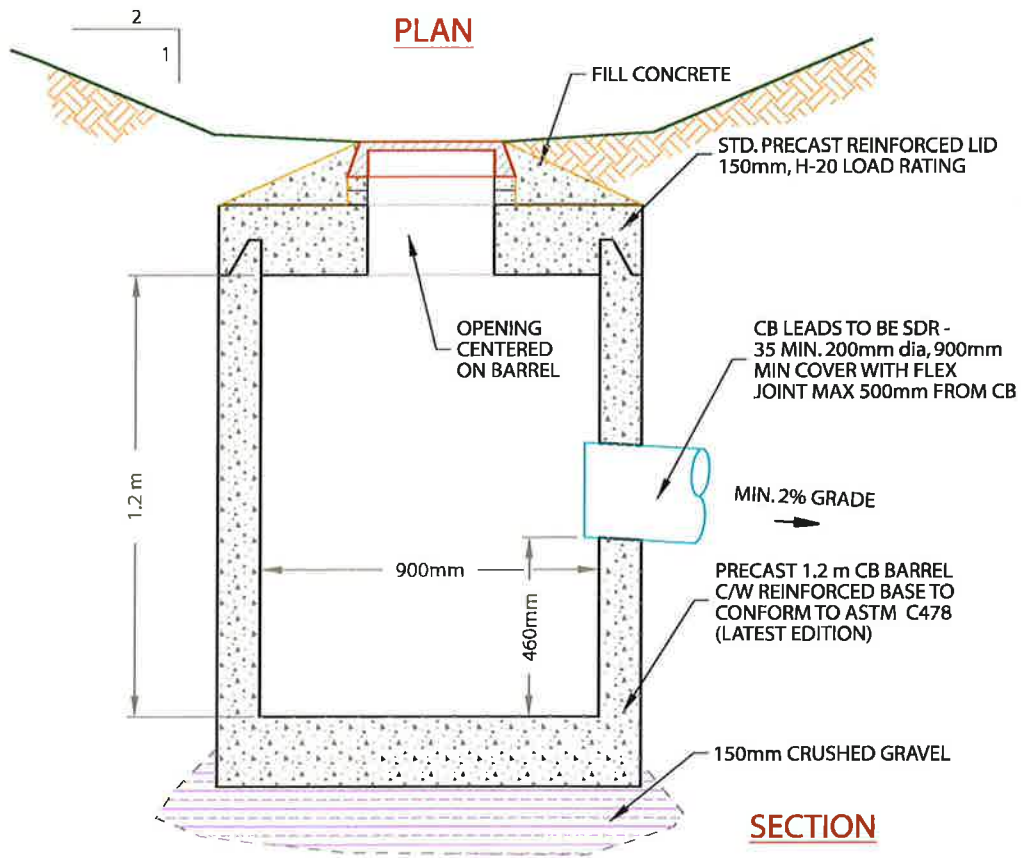
Subdivision & Development Servicing Bylaw 1223, 2008

**MOUNTABLE CURB  
STANDARD CATCHBASIN  
DETAIL**

DATE	SCALE	FILE ID
2008-03-13	NTS	



**PLAN**



**SECTION**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

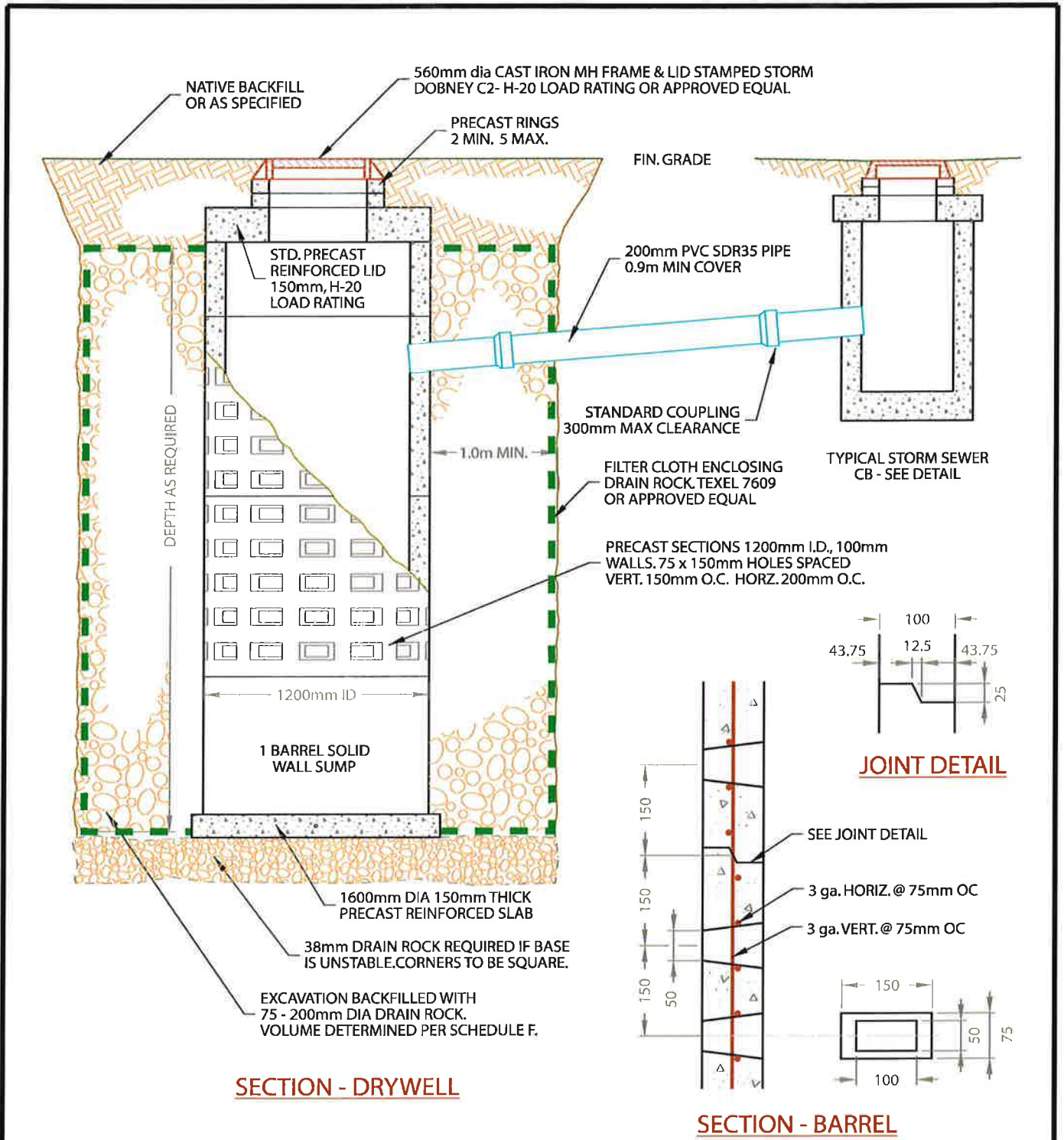


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Subdivision & Development Servicing Bylaw 1223, 2008

**OPEN DITCH  
STANDARD CATCHBASIN  
DETAIL**

DATE	SCALE	FILE ID
2008-03-13	NTS	F-3



UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

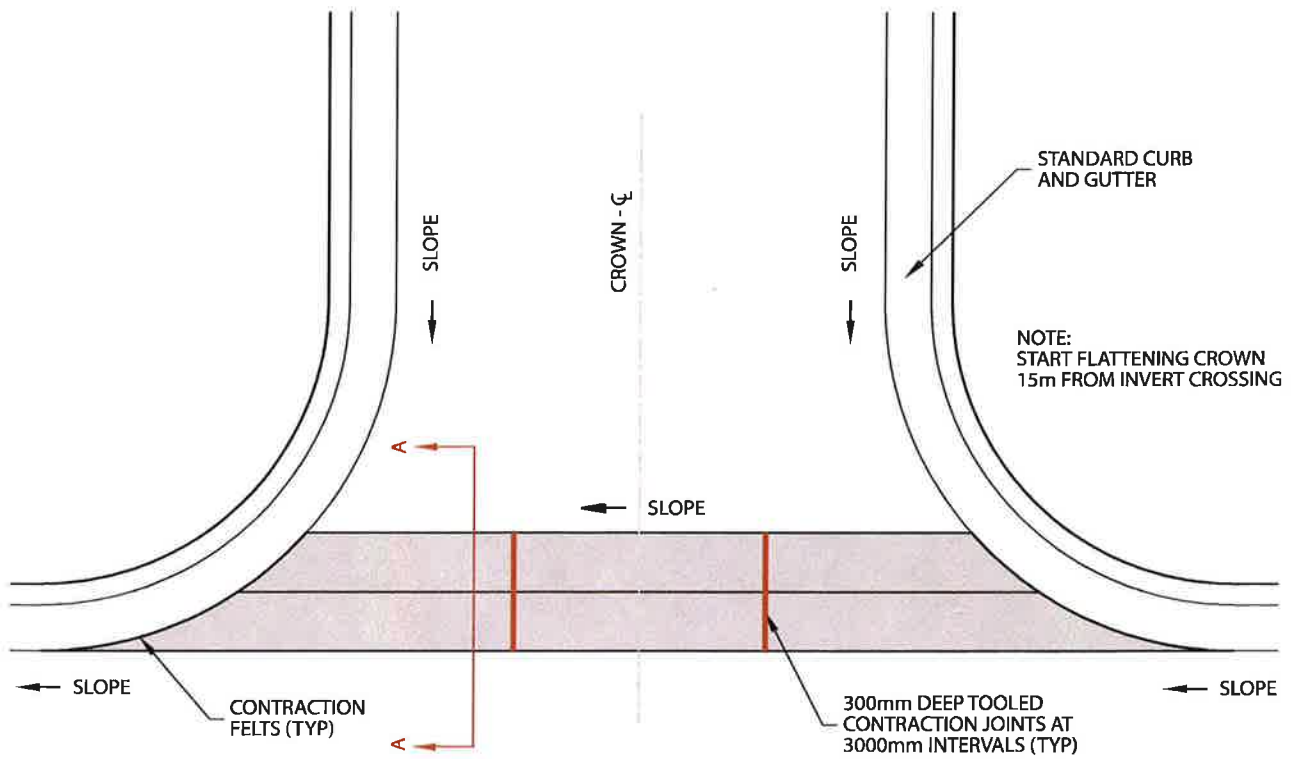


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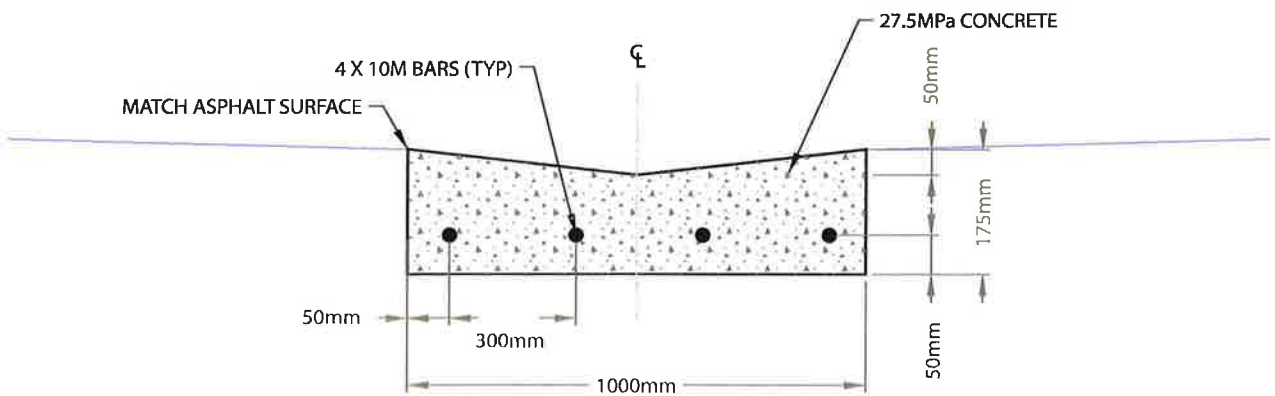
Subdivision & Development Servicing Bylaw 1223, 2008

**STANDARD DRYWELL  
DETAIL**

DATE	SCALE	FILE ID
2008-03-13	NTS	



**PLAN VIEW**



**SECTION A-A**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

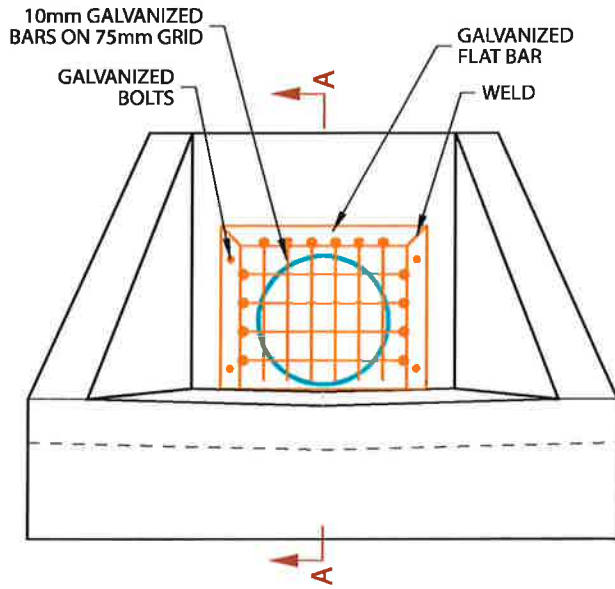


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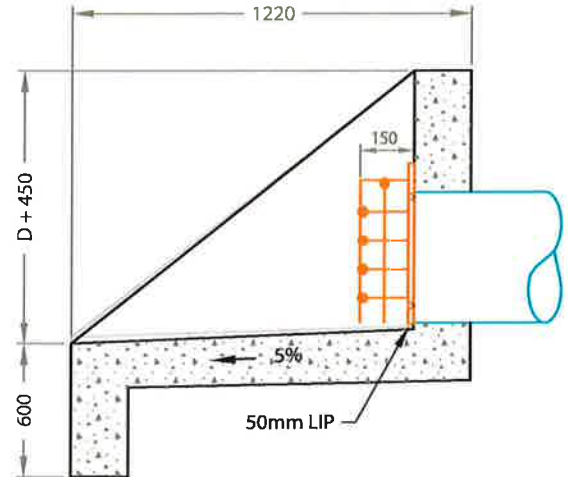
Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL CONCRETE  
INVERT ROAD CROSSING**

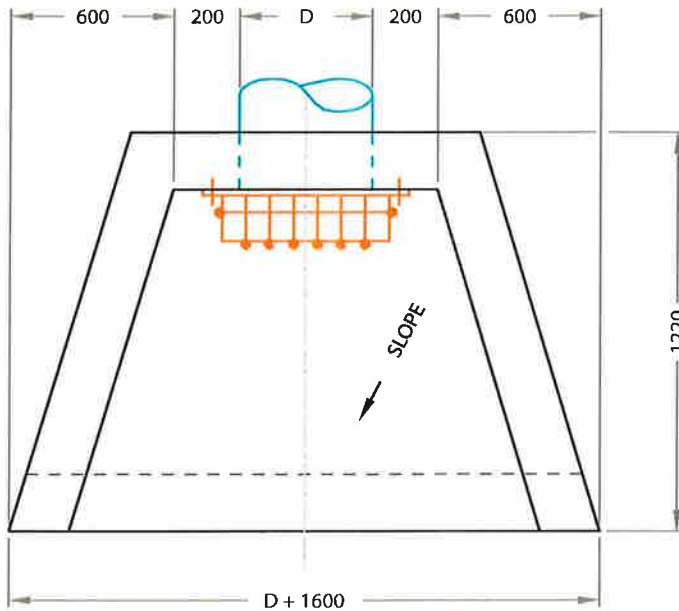
DATE	SCALE	FILE ID
2008-03-13	NTS	F-5



**ELEVATION**



**SECTION A-A**



**PLAN**

**NOTES**

1. ALL WALLS & SLABS 200mm.
2. CONCRETE MIN. 20 MPa.
3. BASE SHALL BE 150mm COMPACTED PIT RUN.
4. REINFORCING WALL SHALL BE 15M @ 300 EACH WAY. EACH WALL & SLAB MIN. BOND LENGTH ON CORNER BARS 460mm.
5. PLACE RIP RAP 300mm THICK FOR MIN 5m FROM INLET & OUTLET STRUCTURE. RIP RAP REQUIREMENTS SHALL BE CONFIRMED BY DESIGN ENGINEER.

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

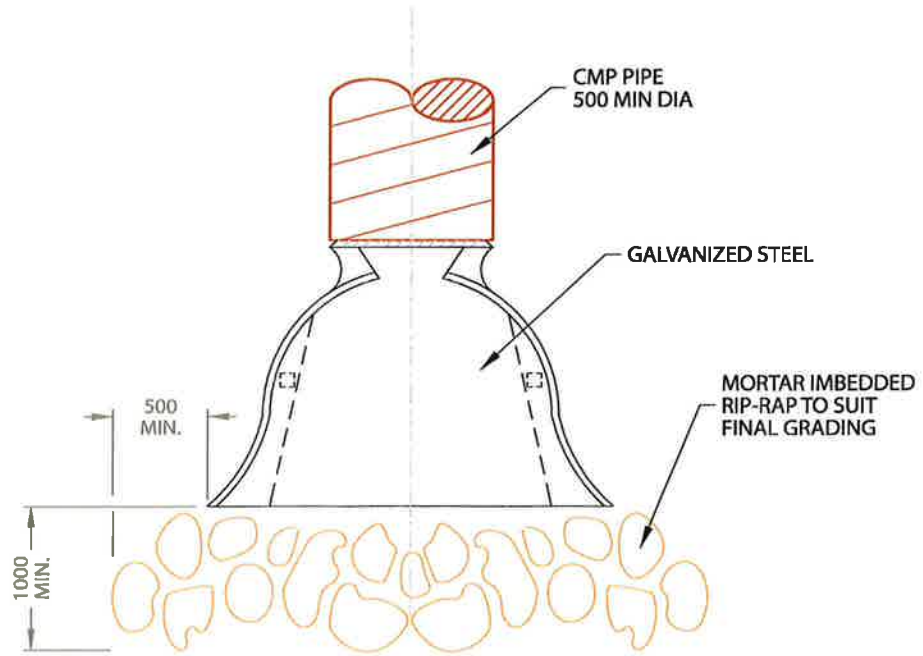


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**CONCRETE OULET  
STRUCTURE**

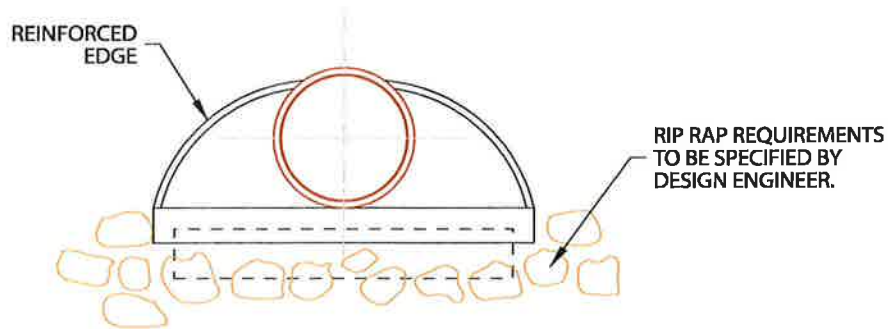
DATE	SCALE	FILE ID
2008-03-13	NTS	F-6



**PLAN VIEW**

NOTE:

END SECTIONS SHALL BE AS FABRICATED BY CMP PIPE MANUFACTURER



**ELEVATION**

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

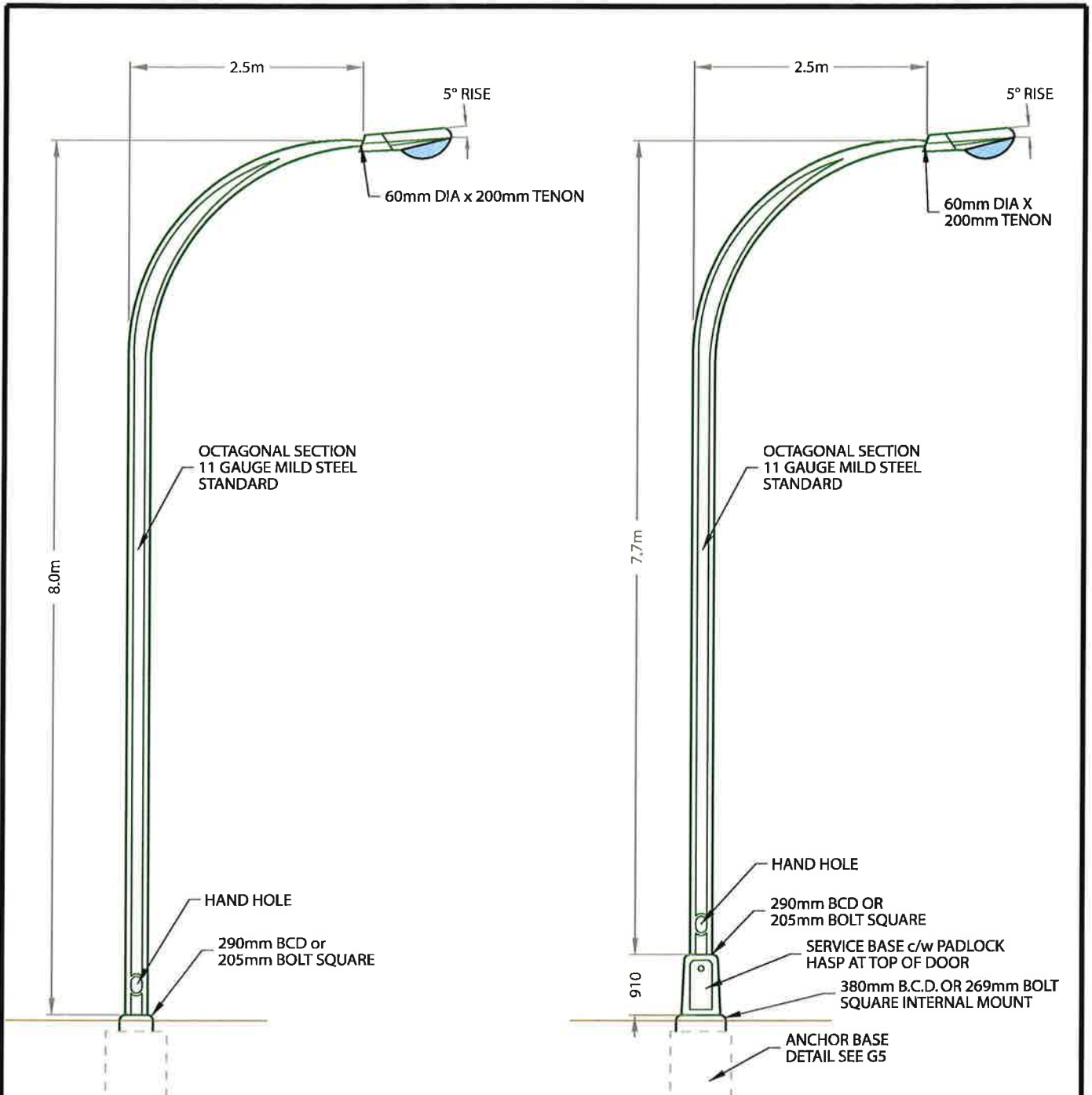


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL MANUFACTURED END SECTION**

DATE	SCALE	FILE ID
2008-03-13	NTS	F-7



**TYPE A**

**TYPE B**

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

**NOTES**

1. POLES AND SERVICE BASES TO BE ZINC CHROMATE PRIMED AT FACTORY AND PAINTED AFTER ERECTION WITH ONE COAT OF GREEN TREMCLAD.
2. BASE BOLT COVERS TO BE USED ON TYPE 'B' POLES ONLY.
3. INSTALLATION OF CONCRETE POLES WILL BE CONSIDERED UPON REQUEST.

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

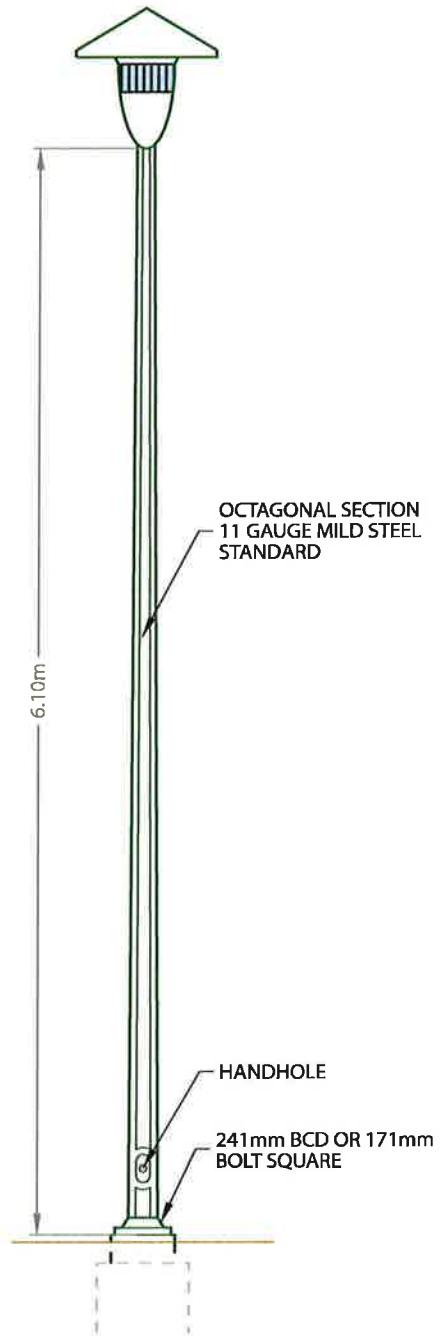


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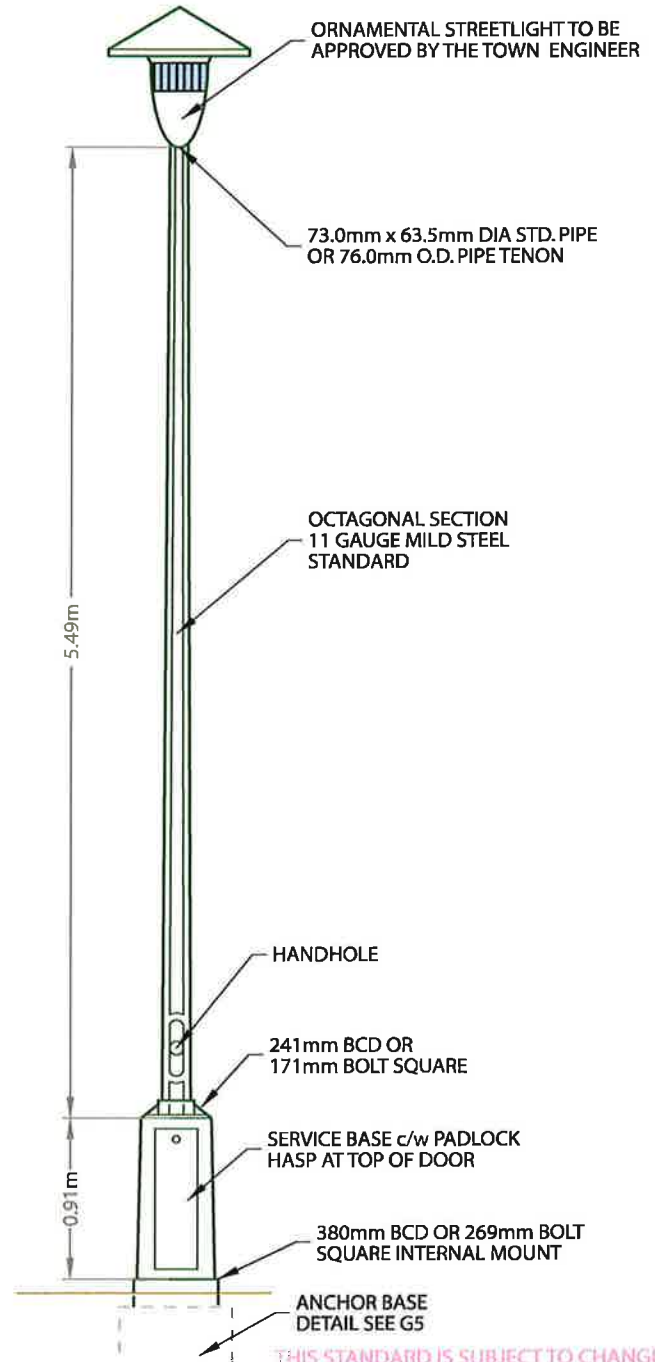
Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL COMMERCIAL STREET LIGHTING TYPE 'A' & TYPE 'B'**

DATE	SCALE	FILE ID
2008-03-13	NTS	



**TYPE C**



**TYPE D**

**NOTES**

1. POLES AND SERVICE BASES TO BE ZINC CHROMATE PRIMED AT FACTORY & PAINTED AFTER ERECTION WITH ONE COAT OF GREEN TREMCLAD.
2. INSTALLATION OF POST-TOP STREET LIGHTING REQUIRES APPROVAL IN ADVANCE.

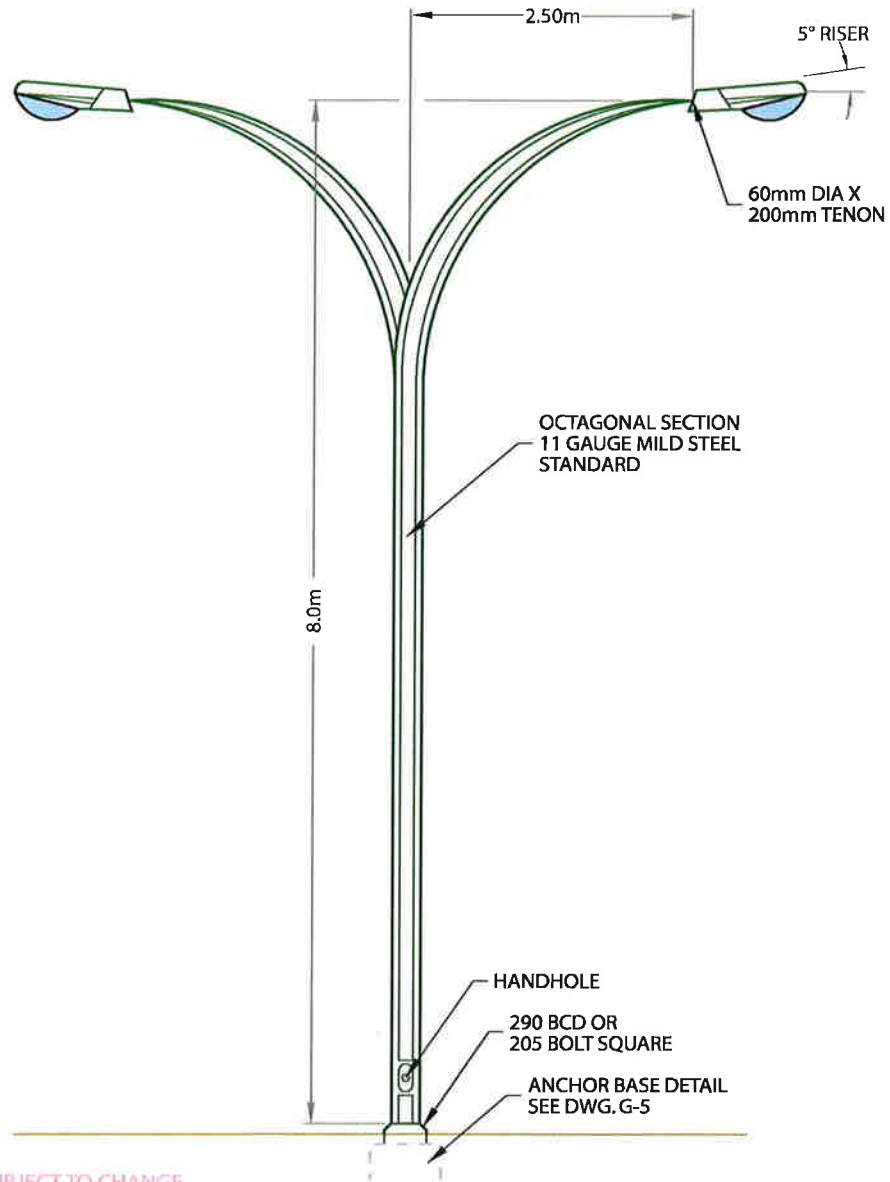
THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



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Subdivision & Development Servicing Bylaw 1223, 2008		
<b>TYPICAL RESIDENTIAL STREET LIGHTING TYPE 'C' &amp; TYPE 'D'</b>		
DATE	SCALE	FILE ID
2008-03-13	NTS	
		<b>G-2</b>



THIS STANDARD IS SUBJECT TO CHANGE,  
 CONFIRMATION SHOULD BE MADE PRIOR  
 TO CONSTRUCTION.

**TYPE E**

NOTES

1. POLES AND SERVICE BASES TO BE ZINC CHROMATE PRIMED AT FACTORY & PAINTED AFTER ERECTION WITH ONE COAT OF GREEN TREMCLAD.
2. BASE BOLT COVERS TO BE USED ON TYPE 'F' POLE ONLY.
3. INSTALLATION OF CONCRETE POLES WILL BE CONSIDERED UPON REQUEST.

UNITS ARE IN MILLIMETERS  
 UNLESS NOTED OTHERWISE.

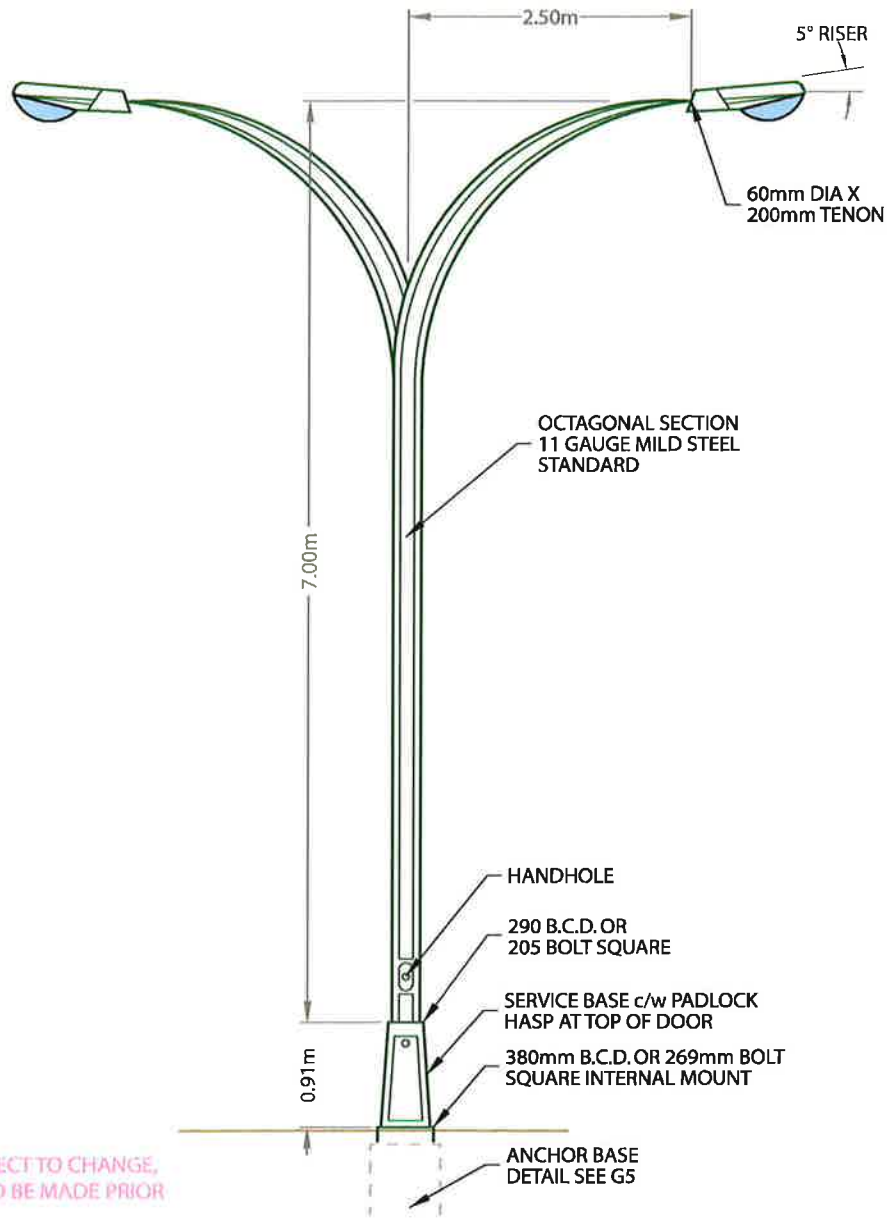


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**DOUBLE DAVIT  
 STREET LIGHT  
 TYPE 'E'**

DATE	SCALE	FILE ID
2008-03-13	NTS	



THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

**TYPE F**

**NOTES**

1. POLES AND SERVICE BASES TO BE ZINC CHROMATE PRIMED AT FACTORY & PAINTED AFTER ERECTION WITH ONE COAT OF GREEN TREMCLAD.
2. BASE BOLT COVERS TO BE USED ON TYPE 'F' POLE ONLY.
3. INSTALLATION OF CONCRETE POLES WILL BE CONSIDERED UPON REQUEST.

UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.



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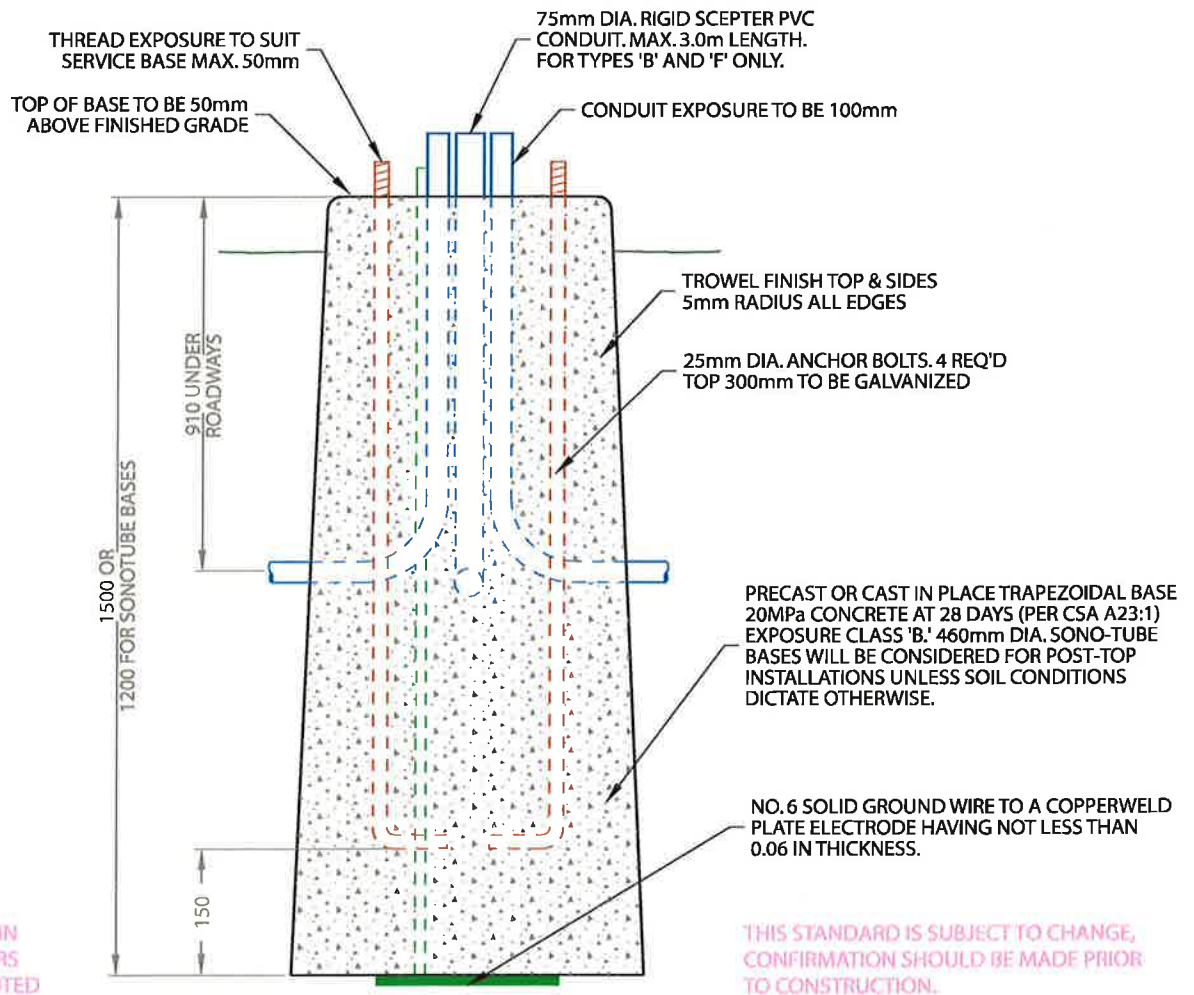
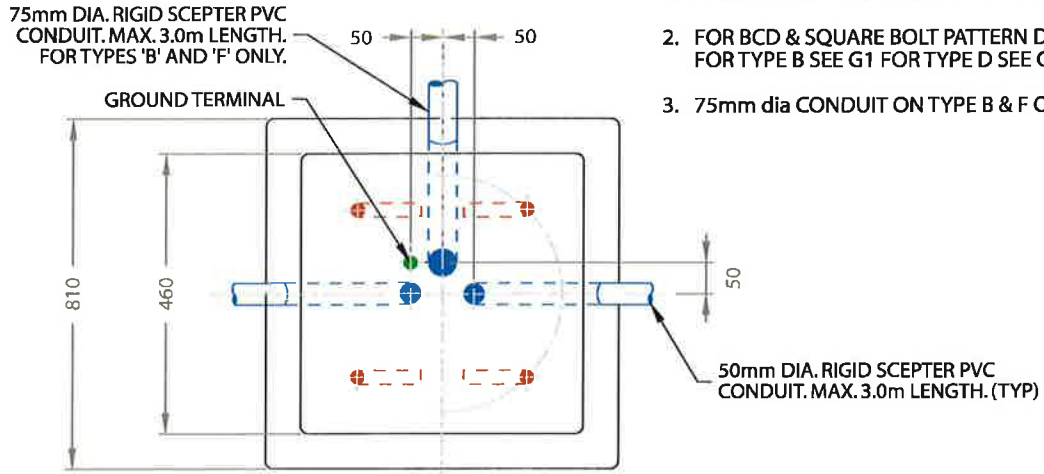
Subdivision & Development Servicing Bylaw 1223, 2008

**DOUBLE DAVIT  
STREET LIGHT  
TYPE 'F'**

DATE	SCALE	FILE ID
2008-03-13	NTS	

**NOTES**

1. INCOMING SERVICE INSTALLED TO BC HYDRO STDS.
2. FOR BCD & SQUARE BOLT PATTERN DIMENSIONS FOR TYPE B SEE G1 FOR TYPE D SEE G2.
3. 75mm dia CONDUIT ON TYPE B & F ONLY.



UNITS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

PRECAST OR CAST IN PLACE TRAPEZOIDAL BASE 20MPa CONCRETE AT 28 DAYS (PER CSA A23:1) EXPOSURE CLASS 'B.' 460mm DIA. SONO-TUBE BASES WILL BE CONSIDERED FOR POST-TOP INSTALLATIONS UNLESS SOIL CONDITIONS DICTATE OTHERWISE.

NO. 6 SOLID GROUND WIRE TO A COPPERWELD PLATE ELECTRODE HAVING NOT LESS THAN 0.06 IN THICKNESS.

THIS STANDARD IS SUBJECT TO CHANGE, CONFIRMATION SHOULD BE MADE PRIOR TO CONSTRUCTION.

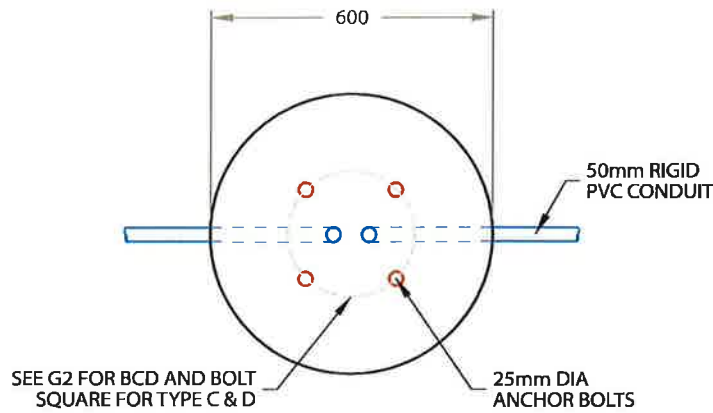


DATE	REVISIONS	BY	APP'D

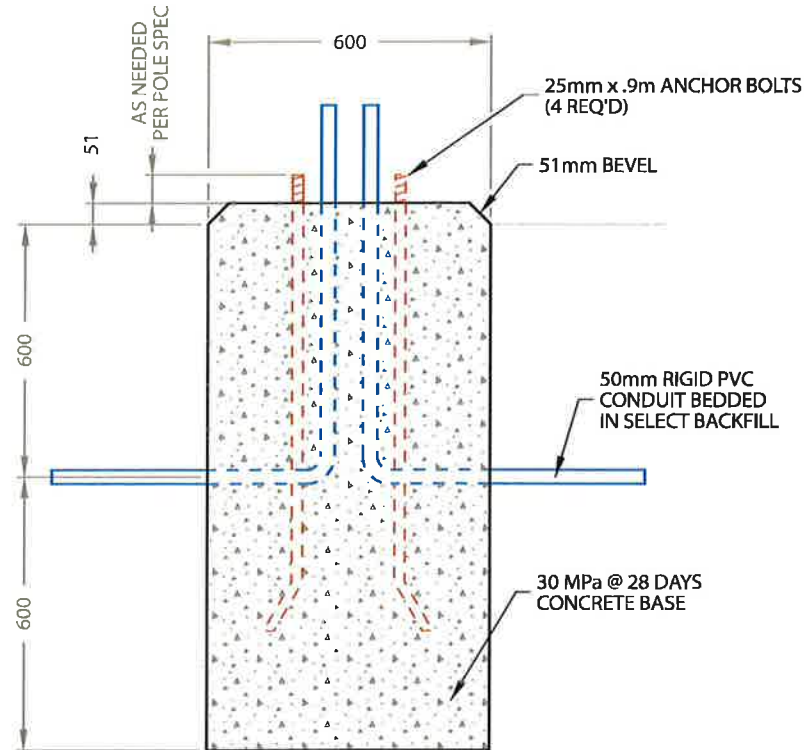
Subdivision & Development Servicing Bylaw 1223, 2008

**TYPICAL STREET LIGHT ANCHOR BASE TYPES A, B, E & F.**

DATE	SCALE	FILE ID
2008-03-13	NTS	G-5



**PLAN**



**SECTION**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

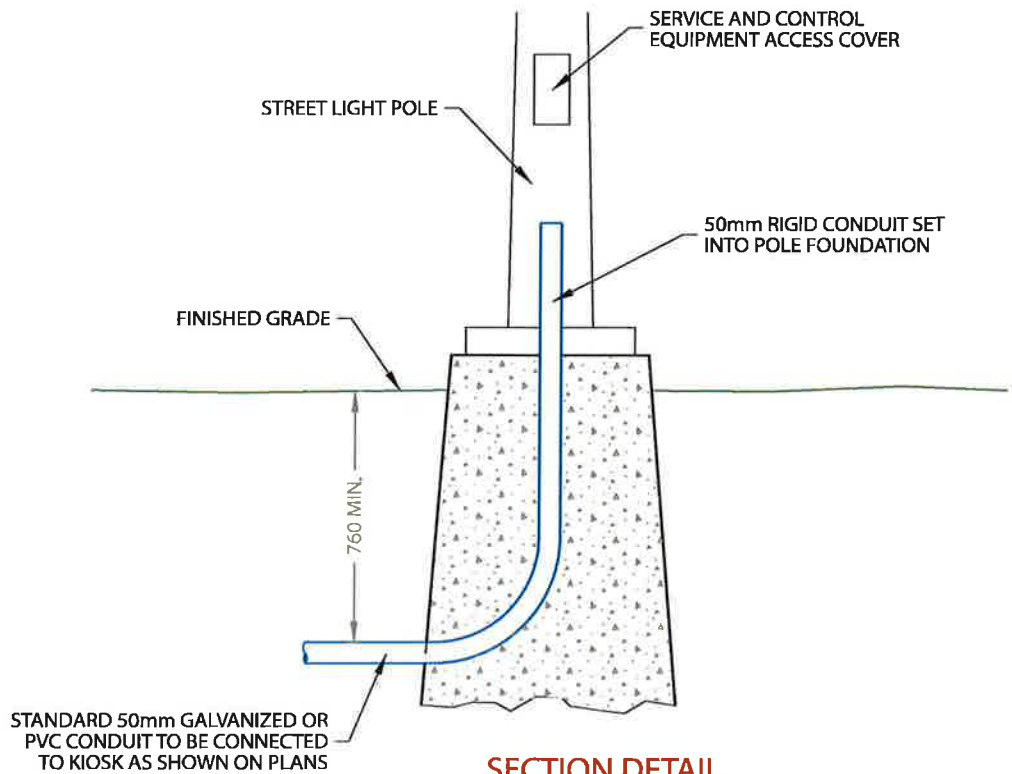


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DATE	REVISIONS	BY	APP'D	

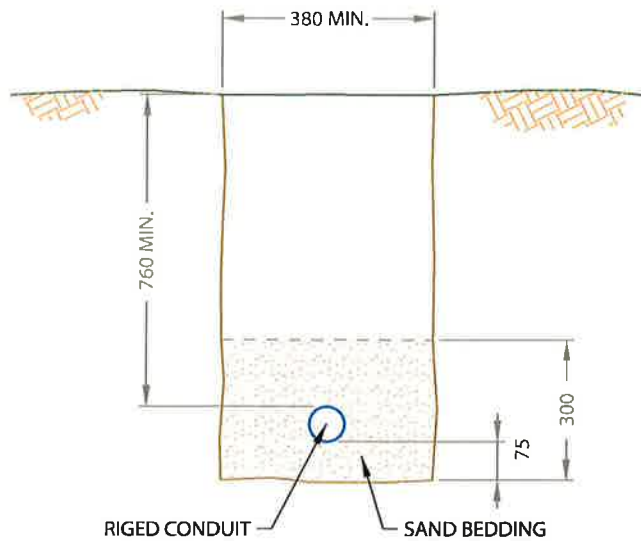
Subdivision & Development Servicing Bylaw 1223, 2008

**CYLINDRICAL STREET LIGHT  
POLE BASE  
TYPE C & D STREET LIGHTS**

DATE	SCALE	FILE ID
2008-03-13	NTS	G-6



**SECTION DETAIL  
AT POLE**



**TRENCH SECTION**

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.



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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

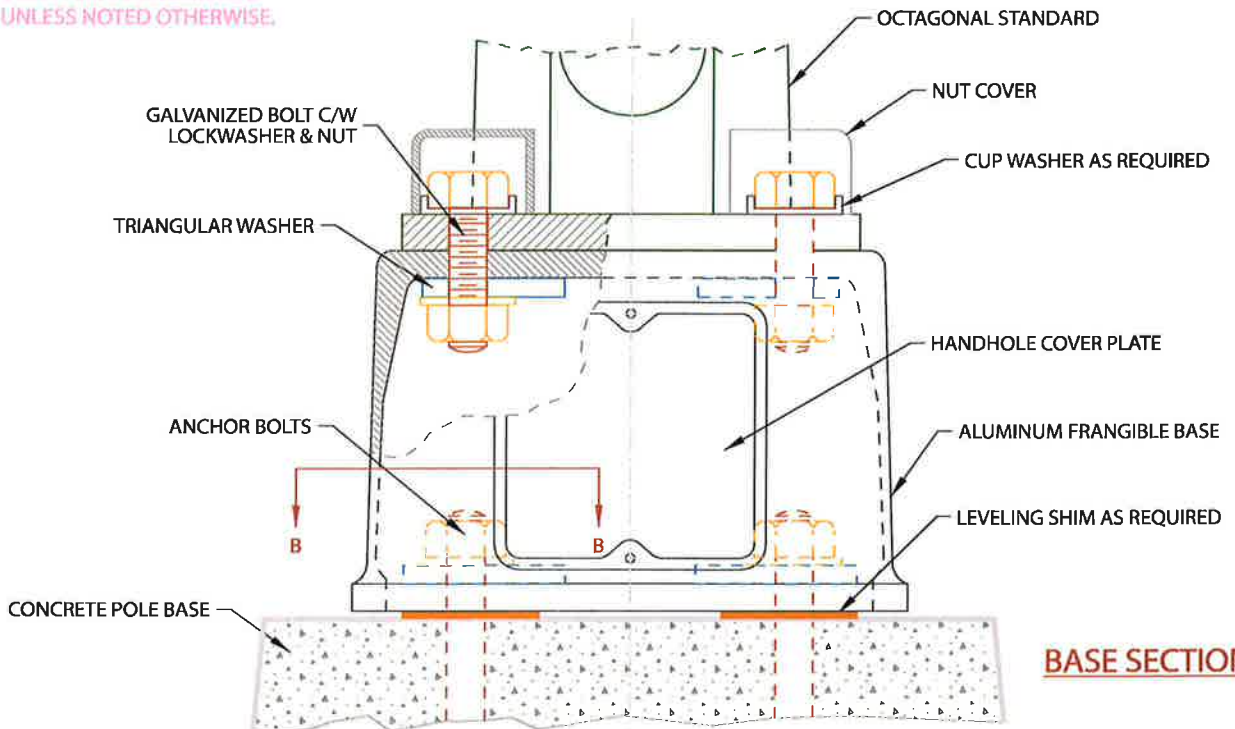
**STREET LIGHT UNDERGROUND  
CONDUIT INSTALLATION AND  
POWER CONNECTION**

DATE	SCALE	FILE ID
2008-03-13	NTS	

TRIANGULAR WASHER

**SECTION B-B**

UNITS ARE IN MILLIMETERS  
UNLESS NOTED OTHERWISE.



**BASE SECTION**

**NOTE**

USE LUBRIPLATE OR OTHER APPROVED GREASE ON ALL THREADS.

THIS STANDARD IS SUBJECT TO CHANGE,  
CONFIRMATION SHOULD BE MADE PRIOR  
TO CONSTRUCTION.



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DATE	REVISIONS	BY	APP'D	

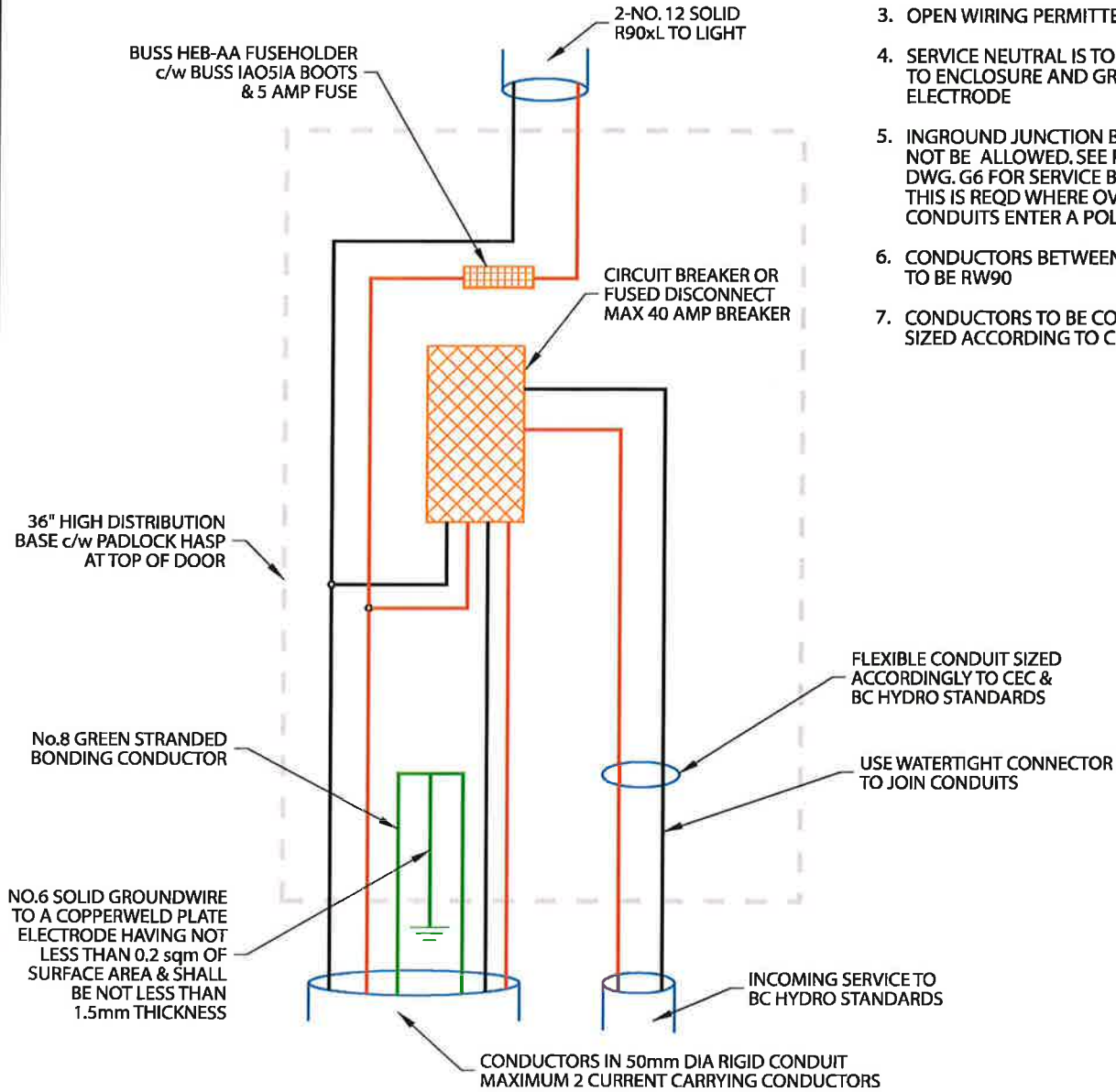
Subdivision & Development Servicing Bylaw 1223, 2008

**FRANGIBLE BASE  
DETAILS**

DATE	SCALE	FILE ID
2008-03-13	NTS	

NOTES

1. WHERE MORE THAN ONE CIRCUIT REQUIRED USE COMBINATION PANEL ABOVE AS SUPPLIED BY SQUARE D
2. POLE SYSTEM CAT. NO. TBH 4191
3. OPEN WIRING PERMITTED
4. SERVICE NEUTRAL IS TO BE BONDED TO ENCLOSURE AND GROUNDED TO ELECTRODE
5. INGROUND JUNCTION BOXES WILL NOT BE ALLOWED. SEE POLE & BASE DWG. G6 FOR SERVICE BASE SPECS. THIS IS REQD WHERE OVER 2 CONDUITS ENTER A POLE
6. CONDUCTORS BETWEEN POLES TO BE RW90
7. CONDUCTORS TO BE COPPER AND SIZED ACCORDING TO CEC. MIN No.8

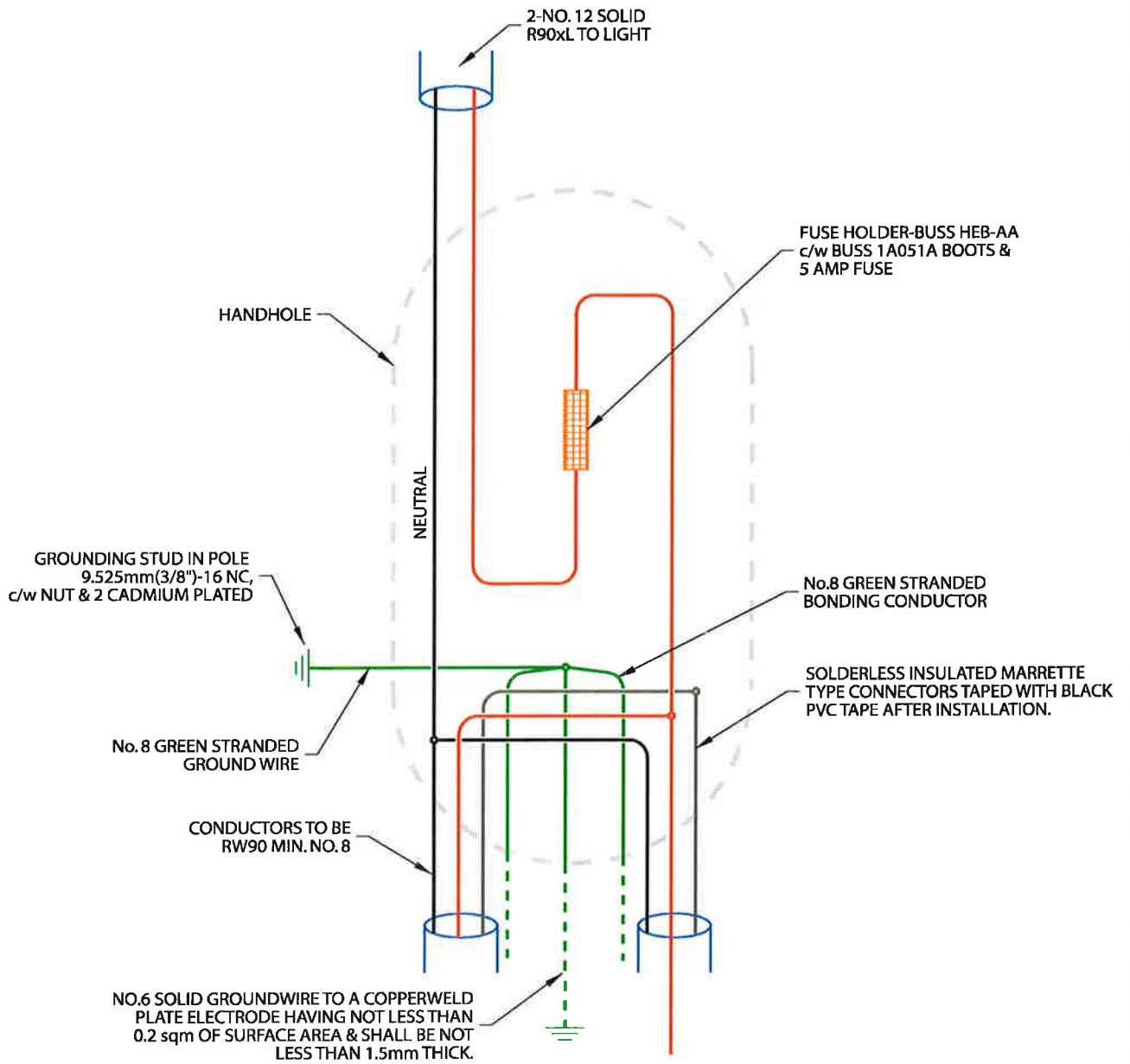


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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**SERVICE BASE WIRING  
SCHEMATIC FOR  
120V STREET LIGHT**

DATE	SCALE	FILE ID
2008-03-13	NTS	G-9



**NOTES**

1. MAXIMUM 2 CURRENT CARRYING CONDUCTORS
2. INGROUND JUNCTION BOXES WILL NOT BE ALLOWED. SEE POLE & BASE DWG. G6 FOR SERVICE BASE SPECS. REQUIRED WHERE OVER 2 CONDUITS ENTER A POLE.
3. CONDUCTORS TO BE COPPER AND SIZED ACCORDING TO CEC. MIN No.8 STRANDED.



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DATE	REVISIONS	BY	APP'D	

Subdivision & Development Servicing Bylaw 1223, 2008

**HAND HOLE WIRING  
SCHEMATIC FOR  
120V STREET LIGHT**

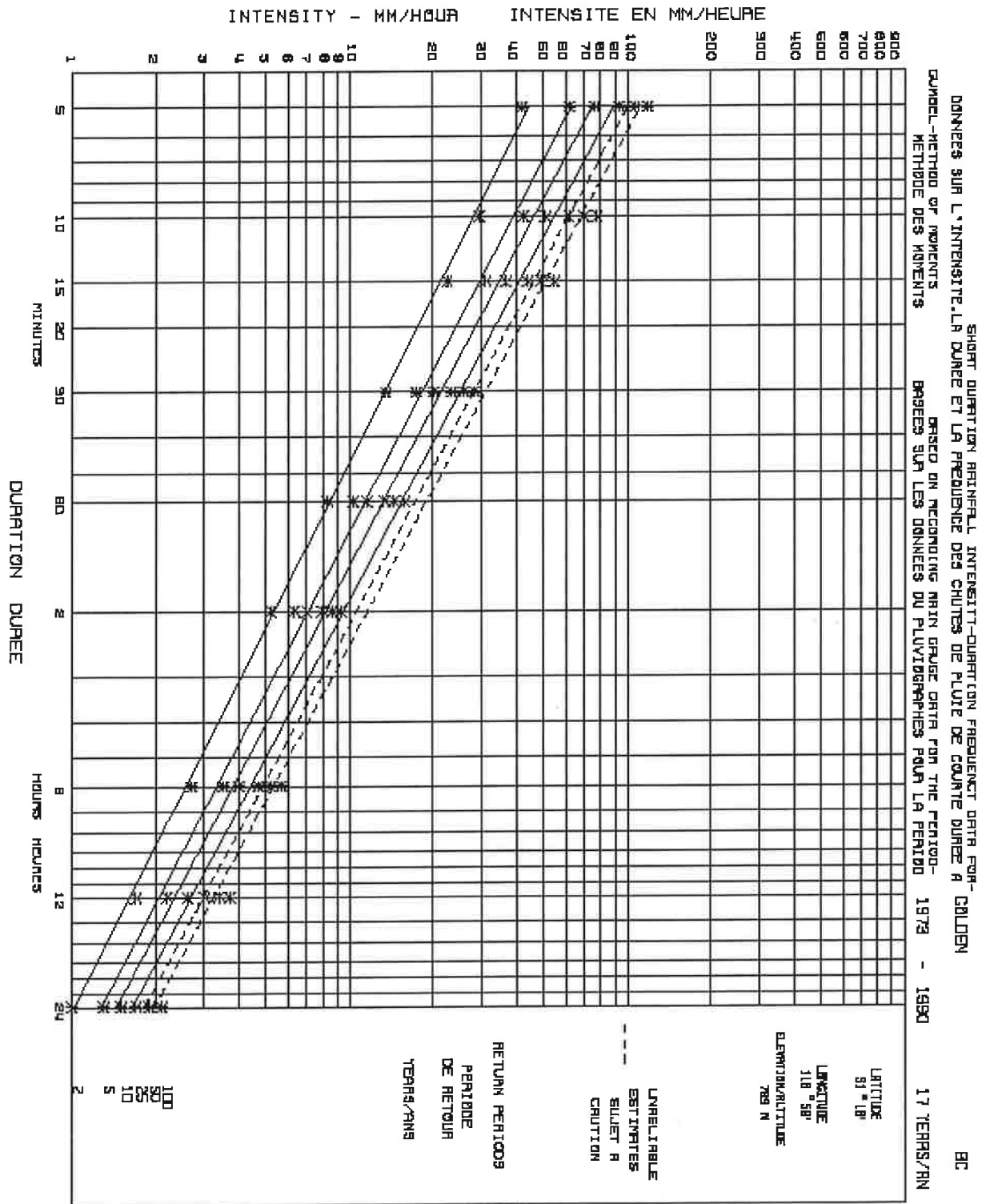
DATE	SCALE	FILE ID
2008-03-13	NTS	G-10

## **24.7 STANDARD FORMS a) - e)**

- a) Climate Data and Intensity-Duration-Frequency (IDF)
- b) Digital Data Standards Specifications
- c) Total Performance Certificate
- d) Final Acceptance Certificate
- e) Service Sheet



**(a) Climate Data and Intensity-Duration-Frequency (IDF)**



1173210.txt  
 ATMOSPHERIC ENVIRONMENT SERVICE  
 SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES  
 INTENSITE, DUREE ET FREQUENCE DES PLUIES

DATA INTEGRATION DIVISION  
 LA DIVISION DU TRAITEMENT DES DONNEES

GUMBEL - METHOD OF MOMENTS/METHODE DES MOMENTS - 1990

\*\*\*\*\*

TABLE 1	GOLDEN				B.C.			1173210		
	LATITUDE 5118		LONGITUDE 11659		ELEVATION/ALTITUDE 783 M					
	YEAR	5 MIN	10 MIN	15 MIN	30 MIN	1 H	2 H	6 H	12 H	24 H
	ANNEE									
1973	3.6	6.9	8.6	9.4	9.7	13.0	18.5	23.6	35.8	
1974	1.8	2.0	2.3	3.6	3.8	4.8	10.7	12.7	13.5	
1975	2.8	5.3	6.1	7.9	8.1	8.9	11.9	14.0	23.6	
1976	6.9	11.9	12.4	12.4	12.4	12.7	21.6	22.4	26.4	
1977	1.8	3.6	4.3	5.6	7.4	9.4	14.5	17.3	18.0	
1978	4.6	5.3	6.2	7.3	13.2	14.7	14.7	19.8	20.8	
1979	2.1	3.7	5.4	7.4	8.2	8.5	9.6	10.4	12.0	
1981	2.2	3.0	3.5	4.7	7.7	13.7	30.3	34.8	37.0	
1982	2.3	4.2	5.4	6.2	9.4	14.4	18.8	19.2	21.8	
1983	4.3	5.8	6.2	6.2	7.9	11.1	15.9	26.0	31.4	
1984	6.6	7.2	7.8	10.0	10.4	11.2	25.2	36.7	38.0	
1985	8.4	9.1	9.3	9.6	9.6	9.7	16.0	16.8	17.8	
1986	2.1	2.8	4.0	5.8	7.3	10.7	18.8	25.0	28.6	
1987	3.8	4.6	5.2	8.1	10.6	10.8	13.6	21.5	26.0	
1988	4.2	5.1	5.3	5.7	6.8	9.5	17.5	24.3	29.4	
1989	3.9	5.0	5.2	5.2	6.2	10.6	21.2	25.0	25.4	
1990	3.3	4.3	5.2	6.2	8.2	8.7	11.2	12.1	16.7	
	NOTE: -99.9	INDICATES MSG DATA DONNEES MANQUANTES								
# YRS.	17	17	17	17	17	17	17	17	17	17
ANNEES										
MEAN	3.8	5.3	6.0	7.1	8.6	10.7	17.1	21.3	24.8	
MOYENNE										
STD. DEV.	1.9	2.4	2.4	2.2	2.3	2.5	5.4	7.3	7.9	
ECART-TYPE										
SKEW	1.13	1.38	1.20	0.76	0.14	-0.37	0.87	0.57	0.14	
DISSYMETRIE										
KURTOSIS	4.10	5.72	5.43	3.88	4.06	4.11	4.23	3.62	2.65	
KURTOSIS										

NOTE: -99.9 INDICATES LESS THAN 10 YEARS OF DATA AVAILABLE  
 INDIQUE MOINS DE 10 ANNEES DE DONNEES DISPONIBLES

ATMOSPHERIC ENVIRONMENT SERVICE  
 SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES  
 INTENSITE, DUREE ET FREQUENCE DES PLUIES

\*\*\*\*\*

TABLE 2                      GOLDEN                                      B.C.                                      1173210

LATITUDE 5118                      LONGITUDE 11659                      ELEVATION/ALTITUDE 783 M

\*\*\*\*\*

RETURN PERIOD RAINFALL AMOUNTS (MM)  
PERIODE DE RETOUR QUANTITIES DE PLUIE (MM)

DURATION DUREE	2 YR/ANS	5 YR/ANS	10 YR/ANS	25 YR/ANS	50 YR/ANS	100 YR/ANS	# YEARS ANNEES
5 MIN	3.5	5.2	6.3	7.7	8.8	9.9	17
10 MIN	4.9	7.0	8.5	10.3	11.6	12.9	17
15 MIN	5.6	7.7	9.2	10.9	12.2	13.5	17
30 MIN	6.8	8.7	10.0	11.7	12.9	14.1	17
1 H	8.3	10.3	11.6	13.3	14.5	15.8	17
2 H	10.3	12.5	14.0	15.8	17.2	18.5	17
6 H	16.2	21.0	24.1	28.2	31.1	34.1	17
12 H	20.1	26.5	30.8	36.2	40.3	44.2	17
24 H	23.5	30.5	35.2	41.0	45.4	49.7	17

RETURN PERIOD RAINFALL RATES (MM/HR)-95% CONFIDENCE' LIMITS  
INTENSITE DE LA PLUIE PAR PERIODE DE RETOUR (MM/H)-LIMITES DE CONFIANCE DE 95%

DURATION DUREE	2 YR/ANS	5 YR/ANS	10 YR/ANS	25 YR/ANS	50 YR/ANS	100 YR/ANS
5 MIN	41.9	62.3	75.9	93.0	105.7	118.3
10 MIN	+/- 10.1	+/- 17.0	+/- 23.0	+/- 31.0	+/- 37.1	+/- 43.2
15 MIN	+/- 6.4	+/- 10.7	+/- 14.5	+/- 19.6	+/- 23.4	+/- 27.3
30 MIN	+/- 4.2	+/- 7.0	+/- 9.5	+/- 12.8	+/- 15.3	+/- 17.9
1 H	+/- 1.9	+/- 3.3	+/- 4.4	+/- 6.0	+/- 7.1	+/- 8.3
2 H	+/- 8.3	+/- 10.3	+/- 11.6	+/- 13.3	+/- 14.5	+/- 15.8
6 H	+/- 1.0	+/- 1.7	+/- 2.3	+/- 3.0	+/- 3.6	+/- 4.2
12 H	+/- 5.2	+/- 6.3	+/- 7.0	+/- 7.9	+/- 8.6	+/- 9.3
24 H	+/- 0.5	+/- 0.9	+/- 1.2	+/- 1.7	+/- 2.0	+/- 2.3
	+/- 2.7	+/- 3.5	+/- 4.0	+/- 4.7	+/- 5.2	+/- 5.7
	+/- 0.4	+/- 0.7	+/- 0.9	+/- 1.2	+/- 1.4	+/- 1.7
	+/- 1.7	+/- 2.2	+/- 2.6	+/- 3.0	+/- 3.4	+/- 3.7
	+/- 0.3	+/- 0.4	+/- 0.6	+/- 0.8	+/- 1.0	+/- 1.1
	+/- 1.0	+/- 1.3	+/- 1.5	+/- 1.7	+/- 1.9	+/- 2.1
	+/- 0.1	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.5	+/- 0.6

ATMOSPHERIC ENVIRONMENT SERVICE  
SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES  
INTENSITE, DUREE ET FREQUENCE DES PLUIES

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TABLE 3                      GOLDEN                                      B.C.                                      1173210

LATITUDE 5118                      LONGITUDE 11659                      ELEVATION/ALTITUDE 783 M  
 \*\*\*\*\*

INTERPOLATION EQUATION / EQUATION D'INTERPOLATION:  $R = A * T ** B$   
 R = RAINFALL RATE / INTENSITE DE LA PLUIE (MM /HR)  
 T = TIME IN HOURS / TEMPS EN HEURES

STATISTICS STATISTIQUES	2 YR ANS	5 YR ANS	10 YR ANS	25 YR ANS	50 YR ANS	100 YR ANS
MEAN OF R MOYENNE DE R	14.0	19.6	23.3	28.0	31.5	34.9
STD. DEV. R ECART-TYPE	14.3	21.3	25.9	31.8	36.1	40.4
STD. ERROR ERREUR STANDARD	1.1	1.5	2.2	3.3	4.2	5.1
COEFF. (A) COEFFICIENT (A)	8.5	11.3	13.1	15.5	17.2	18.9
EXPONENT (B) EXPOSANT (B)	-0.666	-0.687	-0.696	-0.703	-0.707	-0.711
MEAN % ERROR % D'ERREUR	3.7	5.9	7.7	9.5	10.5	11.4

## **(b) Digital Data Standards Specifications**

### **TOWN OF GOLDEN DIGITAL DATA STANDARDS SPECIFICATIONS FOR SUBDIVISION SERVICING SUBMISSIONS**

The Town of Golden Digital Submission Requirements requires all digital data submitted in a format to be compatible with the Town's Geographic Information System (GIS) in addition to the Engineering and Plans library system. This also includes video inspection information in video files and related database files. It is the intent of these requirements to allow CAD and other data to be integrated into the Town's GIS while preserving the referential and positional accuracy of the original measurements made. Prior to data submission it is recommended to discuss these requirements with the Development Technician to facilitate problem free data transfer.

#### **1.0 GIS data building and Archiving Purpose**

- Assist in implementing the town's GIS through the inclusion of improvements, developments, subdivisions and other services related to the town works including development proposals, parcel mapping, Infrastructure, Study and Report Results relative to the subdivision.
- To provide data that meets accuracy standards required for parcels and infrastructure improvements consistent with the geodetic control network.
- Provide information needed to maintain the 911 emergency dispatches.
- To allow for building and maintaining a digital data retrieval system or library.

#### **2.0 Geodetic Control**

Data shall be tied to Geodetic control network. The Town of Golden will make available all Geodetic Control information to be used for survey purposes. All coordinate values for these survey points shall be in UTM, North American Datum (NAD83), Zone 11. All measurements shall be in Meters. BC control data can be found at; Integrated Land Management Bureau (ILMB) on the web at; <http://ilmbwww.gov.bc.ca/bmgs/>. The surveyor or engineer preparing the plans shall tie into at least two of the above survey control network features. Positional accuracy of any digital submission should be +/- 0.5m.

#### **3.0 Data Formats**

In addition to standard paper documents, each engineering document/plan delivered to the Town of Golden will be accompanied by digital files relating to that submission. Digital files to be submitted include:

##### **Metadata File**

A text file containing the following data:

- Project Name and Id
- Project Status (As-Constructed, Proposed, Design)
- Street name and limits
- Data Collection or Survey method, (Total Station, GPS)
- Surveying Company and Surveyor's name
- Collected date (YMD)
- Filename of CAD and Library files

### **CAD File**

This file shall include all layers and graphic elements included in the submitted paper document (geography, text, legend, scale, labels, etc.). This file will include features classified in the standard layers defined in Section 4 Data Layering Requirements. If the drawing contains layers that are not included in Section 4, then a list of these layers shall also be submitted. The completed CAD drawing file shall contain text in standard fonts that can be read without third-party software.

Data submission may be made in one of the following formats,

DGN V8 (Microstation design file)  
 DXF (drawing exchange file)  
 DWG R2002(AutoCAD drawing file)

Submissions may be considered in ArcView compatible format including SHP and Personal Geodatabases at the discretion of the Development Technician. All digital files must be mapped to scale and submitted to the Town on DVD, CD-ROM, or via e-mail.

### **Library file**

Library submission files shall be TIFF plus PDF format files containing the paper version of the all submitted As-Constructed plans. PDF format data may include layering. TIFF files may be multipage TIFF format files. The resolution should be sufficient to reproduce clear plans to-scale and include all features shown on hard copy.

### **Video File**

Video data should be in Windows Media player format and have the file id indexed in the Access database. First video "frames" should include the Street, Date, MH from and to, Pipe reference, Pipe Diameter and Pipe material.

### **Video Database File**

Video Database shall be in an Access format file with two main tables and will conform to accepted inspection standards. The Header table and the Details table are the main tables. The Header table contains the pipe information between MHs, a TOG unique Pipe ID and reference to the Video data File ID. The Details table is related to the Header via the Pipe ID field and contains the pipe information including connections and physical defects. Data format should be discussed with Town of Golden prior to inspection.

## **4.0 Data Layering Requirements**

In order to evaluate the accuracy and promote the efficient use of the data in the Town's GIS, digital file layering has been standardized for incoming data. The digital data shall use the Town of Golden layering scheme:

<b>DIGITAL DATA LAYERING SCHEME</b>		
<b>LEVEL/LAYER NAME</b>	<b>DESCRIPTION</b>	<b>LEVEL/LAYER</b>

The Town of Golden layering scheme is subject to updates without notice. Updates may be found at [www.town.golden.bc.ca](http://www.town.golden.bc.ca)

### **5.0 Annotation**

Annotation must be identical to the annotation submitted on the hardcopy filed with the Town of Golden. All other miscellaneous annotation and information shall be placed on a unique layer enabling it to be filtered out.

### **6.0 Private Utilities**

Private utilities will be accepted for any submission but shall be clearly labeled and put on a level identifying it as private ownership.

### **7.0 Topologically Clean Data.**

Vectors shall be topologically clean. Submissions will be rejected if not clean and therefore hamper the data transition into the GIS.

### **8.0 Adjustments to these requirements**

The Town of Golden may waive or adjust requirements specified in the Digital Data Standards Specifications upon finding these requirements do not apply or is contrary to the long-term maintenance of the Geographic Information System or Digital Library of the Town of Golden.

*(c) Total Performance Certificate*

# Replace with TPC form

*(d) Final Acceptance Certificate*

# Replace with FAC Form

*(e) Service Sheet*

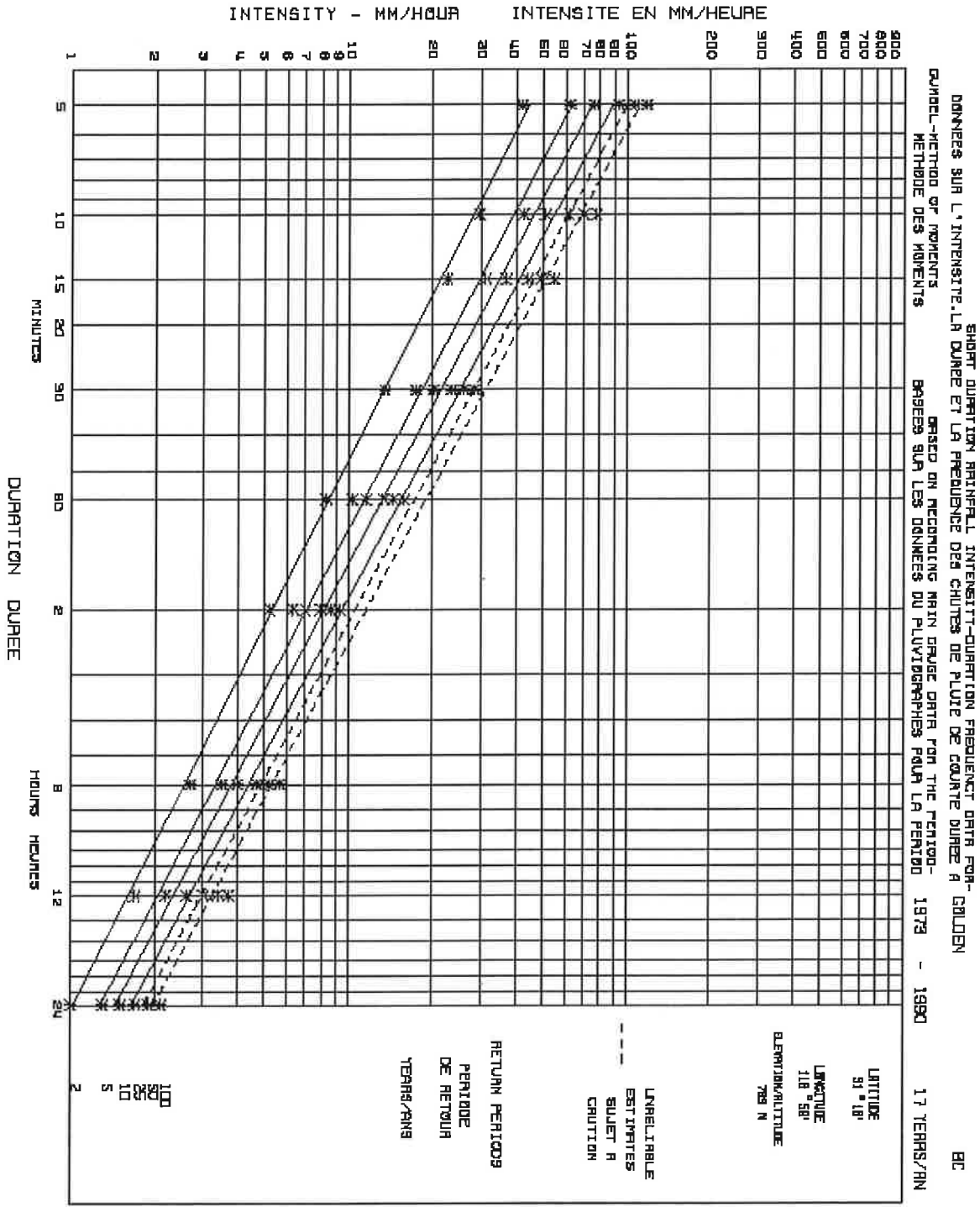
# **Replace with Service Sheet Form**

**24.7 STANDARD FORMS a) - e)**

- a) Climate Data and Intensity-Duration-Frequency (IDF)
- b) Digital Data Standards Specifications
- c) Total Performance Certificate
- d) Final Acceptance Certificate
- e) Service Sheet



**(a) Climate Data and Intensity-Duration-Frequency (IDF)**



1173210.txt  
 ATMOSPHERIC ENVIRONMENT SERVICE  
 SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES  
 INTENSITE, DUREE ET FREQUENCE DES PLUIES

DATA INTEGRATION DIVISION  
 LA DIVISION DU TRAITEMENT DES DONNEES

GUMBEL - METHOD OF MOMENTS/METHODE DES MOMENTS - 1990

\*\*\*\*\*

TABLE 1                    GOLDEN                    B.C.                    1173210  
 LATITUDE 5118                    LONGITUDE 11659                    ELEVATION/ALTITUDE 783 M  
 \*\*\*\*\*

YEAR ANNEE	5 MIN	10 MIN	15 MIN	30 MIN	1 H	2 H	6 H	12 H	24 H
1973	3.6	6.9	8.6	9.4	9.7	13.0	18.5	23.6	35.8
1974	1.8	2.0	2.3	3.6	3.8	4.8	10.7	12.7	13.5
1975	2.8	5.3	6.1	7.9	8.1	8.9	11.9	14.0	23.6
1976	6.9	11.9	12.4	12.4	12.4	12.7	21.6	22.4	26.4
1977	1.8	3.6	4.3	5.6	7.4	9.4	14.5	17.3	18.0
1978	4.6	5.3	6.2	7.3	13.2	14.7	14.7	19.8	20.8
1979	2.1	3.7	5.4	7.4	8.2	8.5	9.6	10.4	12.0
1981	2.2	3.0	3.5	4.7	7.7	13.7	30.3	34.8	37.0
1982	2.3	4.2	5.4	6.2	9.4	14.4	18.8	19.2	21.8
1983	4.3	5.8	6.2	6.2	7.9	11.1	15.9	26.0	31.4
1984	6.6	7.2	7.8	10.0	10.4	11.2	25.2	36.7	38.0
1985	8.4	9.1	9.3	9.6	9.6	9.7	16.0	16.8	17.8
1986	2.1	2.8	4.0	5.8	7.3	10.7	18.8	25.0	28.6
1987	3.8	4.6	5.2	8.1	10.6	10.8	13.6	21.5	26.0
1988	4.2	5.1	5.3	5.7	6.8	9.5	17.5	24.3	29.4
1989	3.9	5.0	5.2	5.2	6.2	10.6	21.2	25.0	25.4
1990	3.3	4.3	5.2	6.2	8.2	8.7	11.2	12.1	16.7

NOTE: -99.9 INDICATES MSG DATA  
 DONNEES MANQUANTES

# YRS. ANNEES	17	17	17	17	17	17	17	17	17
MEAN MOYENNE	3.8	5.3	6.0	7.1	8.6	10.7	17.1	21.3	24.8
STD. DEV. ECART-TYPE	1.9	2.4	2.4	2.2	2.3	2.5	5.4	7.3	7.9
SKEW DISSYMETRIE	1.13	1.38	1.20	0.76	0.14	-0.37	0.87	0.57	0.14
KURTOSIS	4.10	5.72	5.43	3.88	4.06	4.11	4.23	3.62	2.65

NOTE: -99.9 INDICATES LESS THAN 10 YEARS OF DATA AVAILABLE  
 INDIQUE MOINS DE 10 ANNEES DE DONNEES DISPONIBLES

ATMOSPHERIC ENVIRONMENT SERVICE  
 SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES  
 INTENSITE, DUREE ET FREQUENCE DES PLUIES

GUMBEL - METHOD OF MOMENTS/METHODE DES MOMENTS - 1990

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TABLE 2 GOLDEN B.C. 1173210

LATITUDE 5118 LONGITUDE 11659 ELEVATION/ALTITUDE 783 M

\*\*\*\*\*

RETURN PERIOD RAINFALL AMOUNTS (MM)  
PERIODE DE RETOUR QUANTITIES DE PLUIE (MM)

DURATION	2	5	10	25	50	100	# YEARS
DUREE	YR/ANS	YR/ANS	YR/ANS	YR/ANS	YR/ANS	YR/ANS	ANNEES
5 MIN	3.5	5.2	6.3	7.7	8.8	9.9	17
10 MIN	4.9	7.0	8.5	10.3	11.6	12.9	17
15 MIN	5.6	7.7	9.2	10.9	12.2	13.5	17
30 MIN	6.8	8.7	10.0	11.7	12.9	14.1	17
1 H	8.3	10.3	11.6	13.3	14.5	15.8	17
2 H	10.3	12.5	14.0	15.8	17.2	18.5	17
6 H	16.2	21.0	24.1	28.2	31.1	34.1	17
12 H	20.1	26.5	30.8	36.2	40.3	44.2	17
24 H	23.5	30.5	35.2	41.0	45.4	49.7	17

RETURN PERIOD RAINFALL RATES (MM/HR)-95% CONFIDENCE' LIMITS  
INTENSITE DE LA PLUIE PAR PERIODE DE RETOUR (MM/H)-LIMITES DE CONFIANCE DE 95%

DURATION	2 YR/ANS	5 YR/ANS	10 YR/ANS	25 YR/ANS	50 YR/ANS	100 YR/ANS
DUREE						
5 MIN	41.9	62.3	75.9	93.0	105.7	118.3
	+/- 10.1	+/- 17.0	+/- 23.0	+/- 31.0	+/- 37.1	+/- 43.2
10 MIN	29.3	42.2	50.8	61.6	69.6	77.6
	+/- 6.4	+/- 10.7	+/- 14.5	+/- 19.6	+/- 23.4	+/- 27.3
15 MIN	22.5	31.0	36.6	43.7	48.9	54.2
	+/- 4.2	+/- 7.0	+/- 9.5	+/- 12.8	+/- 15.3	+/- 17.9
30 MIN	13.5	17.5	20.1	23.4	25.8	28.3
	+/- 1.9	+/- 3.3	+/- 4.4	+/- 6.0	+/- 7.1	+/- 8.3
1 H	8.3	10.3	11.6	13.3	14.5	15.8
	+/- 1.0	+/- 1.7	+/- 2.3	+/- 3.0	+/- 3.6	+/- 4.2
2 H	5.2	6.3	7.0	7.9	8.6	9.3
	+/- 0.5	+/- 0.9	+/- 1.2	+/- 1.7	+/- 2.0	+/- 2.3
6 H	2.7	3.5	4.0	4.7	5.2	5.7
	+/- 0.4	+/- 0.7	+/- 0.9	+/- 1.2	+/- 1.4	+/- 1.7
12 H	1.7	2.2	2.6	3.0	3.4	3.7
	+/- 0.3	+/- 0.4	+/- 0.6	+/- 0.8	+/- 1.0	+/- 1.1
24 H	1.0	1.3	1.5	1.7	1.9	2.1
	+/- 0.1	+/- 0.2	+/- 0.3	+/- 0.4	+/- 0.5	+/- 0.6

ATMOSPHERIC ENVIRONMENT SERVICE  
SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES  
INTENSITE, DUREE ET FREQUENCE DES PLUIES

GUMBEL - METHOD OF MOMENTS/METHODE DES MOMENTS - 1990

\*\*\*\*\*

TABLE 3 GOLDEN B.C. 1173210

1173210.txt

LATITUDE 5118                      LONGITUDE 11659                      ELEVATION/ALTITUDE 783 M  
\*\*\*\*\*

INTERPOLATION EQUATION / EQUATION D'INTERPOLATION:  $R = A * T ** B$   
R = RAINFALL RATE / INTENSITE DE LA PLUIE (MM /HR)  
T = TIME IN HOURS / TEMPS EN HEURES

STATISTICS STATISTIQUES	2 YR ANS	5 YR ANS	10 YR ANS	25 YR ANS	50 YR ANS	100 YR ANS
MEAN OF R MOYENNE DE R	14.0	19.6	23.3	28.0	31.5	34.9
STD. DEV. R ECART-TYPE	14.3	21.3	25.9	31.8	36.1	40.4
STD. ERROR ERREUR STANDARD	1.1	1.5	2.2	3.3	4.2	5.1
COEFF. (A) COEFFICIENT (A)	8.5	11.3	13.1	15.5	17.2	18.9
EXPONENT (B) EXPOSANT (B)	-0.666	-0.687	-0.696	-0.703	-0.707	-0.711
MEAN % ERROR % D'ERREUR	3.7	5.9	7.7	9.5	10.5	11.4

## ***(b) Digital Data Standards Specifications***

### **TOWN OF GOLDEN DIGITAL DATA STANDARDS SPECIFICATIONS FOR SUBDIVISION SERVICING SUBMISSIONS**

The Town of Golden Digital Submission Requirements requires all digital data submitted in a format to be compatible with the Town's Geographic Information System (GIS) in addition to the Engineering and Plans library system. This also includes video inspection information in video files and related database files. It is the intent of these requirements to allow CAD and other data to be integrated into the Town's GIS while preserving the referential and positional accuracy of the original measurements made. Prior to data submission it is recommended to discuss these requirements with the Development Technician to facilitate problem free data transfer.

#### **1.0 GIS data building and Archiving Purpose**

- Assist in implementing the town's GIS through the inclusion of improvements, developments, subdivisions and other services related to the town works including development proposals, parcel mapping, Infrastructure, Study and Report Results relative to the subdivision.
- To provide data that meets accuracy standards required for parcels and infrastructure improvements consistent with the geodetic control network.
- Provide information needed to maintain the 911 emergency dispatches.
- To allow for building and maintaining a digital data retrieval system or library.

#### **2.0 Geodetic Control**

Data shall be tied to Geodetic control network. The Town of Golden will make available all Geodetic Control information to be used for survey purposes. All coordinate values for these survey points shall be in UTM, North American Datum (NAD83), Zone 11. All measurements shall be in Meters. BC control data can be found at; Integrated Land Management Bureau (ILMB) on the web at; <http://ilmbwww.gov.bc.ca/bmgs/>. The surveyor or engineer preparing the plans shall tie into at least two of the above survey control network features. Positional accuracy of any digital submission should be +/- 0.5m.

#### **3.0 Data Formats**

In addition to standard paper documents, each engineering document/plan delivered to the Town of Golden will be accompanied by digital files relating to that submission. Digital files to be submitted include:

##### **Metadata File**

A text file containing the following data:

- Project Name and Id
- Project Status (As-Constructed, Proposed, Design)
- Street name and limits
- Data Collection or Survey method, (Total Station, GPS)
- Surveying Company and Surveyor's name
- Collected date (YMD)
- Filename of CAD and Library files

### **CAD File**

This file shall include all layers and graphic elements included in the submitted paper document (geography, text, legend, scale, labels, etc.). This file will include features classified in the standard layers defined in Section 4 Data Layering Requirements. If the drawing contains layers that are not included in Section 4, then a list of these layers shall also be submitted. The completed CAD drawing file shall contain text in standard fonts that can be read without third-party software.

Data submission may be made in one of the following formats,

DGN V8 (Microstation design file)  
 DXF (drawing exchange file)  
 DWG R2002(AutoCAD drawing file)

Submissions may be considered in ArcView compatible format including SHP and Personal Geodatabases at the discretion of the Development Technician. All digital files must be mapped to scale and submitted to the Town on DVD, CD-ROM, or via e-mail.

### **Library file**

Library submission files shall be TIFF plus PDF format files containing the paper version of the all submitted As-Constructed plans. PDF format data may include layering. TIFF files may be multipage TIFF format files. The resolution should be sufficient to reproduce clear plans to-scale and include all features shown on hard copy.

### **Video File**

Video data should be in Windows Media player format and have the file id indexed in the Access database. First video "frames" should include the Street, Date, MH from and to, Pipe reference, Pipe Diameter and Pipe material.

### **Video Database File**

Video Database shall be in an Access format file with two main tables and will conform to accepted inspection standards. The Header table and the Details table are the main tables. The Header table contains the pipe information between MHs, a TOG unique Pipe ID and reference to the Video data File ID. The Details table is related to the Header via the Pipe ID field and contains the pipe information including connections and physical defects. Data format should be discussed with Town of Golden prior to inspection.

#### 4.0 Data Layering Requirements

In order to evaluate the accuracy and promote the efficient use of the data in the Town's GIS, digital file layering has been standardized for incoming data. The digital data shall use the Town of Golden layering scheme:

DIGITAL DATA LAYERING SCHEME		
LEVEL/LAYER NAME	DESCRIPTION	LEVEL/LAYER

The Town of Golden layering scheme is subject to updates without notice. Updates may be found at [www.town.golden.bc.ca](http://www.town.golden.bc.ca)

#### 5.0 Annotation

Annotation must be identical to the annotation submitted on the hardcopy filed with the Town of Golden. All other miscellaneous annotation and information shall be placed on a unique layer enabling it to be filtered out.

#### 6.0 Private Utilities

Private utilities will be accepted for any submission but shall be clearly labeled and put on a level identifying it as private ownership.

#### 7.0 Topologically Clean Data.

Vectors shall be topologically clean. Submissions will be rejected if not clean and therefore hamper the data transition into the GIS.

#### 8.0 Adjustments to these requirements

The Town of Golden may waive or adjust requirements specified in the Digital Data Standards Specifications upon finding these requirements do not apply or is contrary to the long-term maintenance of the Geographic Information System or Digital Library of the Town of Golden.

# C-TOTAL PERFORMANCE CERTIFICATE



Project: \_\_\_\_\_  
 Owner: \_\_\_\_\_  
 Engineer: \_\_\_\_\_

ToG File ID: \_\_\_\_\_  
 Project ID: \_\_\_\_\_  
 Contractor: \_\_\_\_\_

## **A - BY OWNERS ENGINEER**

I, \_\_\_\_\_, Peng. of the firm of \_\_\_\_\_ hereby certify that the works as constructed generally conform to plans and specifications approved pursuant to the Town of Golden Subdivision and Development Bylaw No. 1223 and that it is complete. I hereby recommend this work for approval by this Total Performance Certificate.

Drawing ID: \_\_\_\_\_ *Inspector*  
 \_\_\_\_\_ *Signing Officer*  
 \_\_\_\_\_ *Date*

*Peng Stamp*

## **B - BY THE TOWN OF GOLDEN**

Recommended for Approval \_\_\_\_\_, 20\_\_ *Field Services*

Approved on \_\_\_\_\_, 20\_\_ *Manager of Operations*

List of Deficiencies (to be completed before a release of security and start of maintenance period)

_____	Agreed Value (\$) _____	<input type="checkbox"/> See Attached Deficiencies List
_____	Agreed Value (\$) _____	
_____	Agreed Value (\$) _____	
_____	Agreed Value (\$) _____	
_____	Agreed Value (\$) _____	

\_\_\_\_\_ List Name

## **C - BY OWNERS ENGINEER**

I hereby certify that the items listed as deficiencies have now been corrected.

\_\_\_\_\_ *Peng* \_\_\_\_\_ *Date*

*Peng Stamp*

## **D - BY THE TOWN OF GOLDEN**

Recommended for Approval \_\_\_\_\_, 20\_\_ *Field Services*

Approved on \_\_\_\_\_, 20\_\_ *Manager of Operations*

Maintenance Period to Expire \_\_\_\_\_ *Date (YMD)*

## **E- TOWN OF GOLDEN INTERNAL**

Maintenance Bond/Letter of Credit **Filed and Date flagged** with Manager of Finance

Maintenance Bond/Letter of Credit **Released** by Manager of Finance

\_\_\_\_\_ *CFO* \_\_\_\_\_ *Date*

\_\_\_\_\_ *CFO* \_\_\_\_\_ *Date*

# D-FINAL ACCEPTANCE CERTIFICATE



Project: \_\_\_\_\_ ToG File ID: \_\_\_\_\_  
 Owner: \_\_\_\_\_ Project ID: \_\_\_\_\_  
 Engineer: \_\_\_\_\_ Contractor: \_\_\_\_\_  
 Maintenance Period Expiry Date: \_\_\_\_\_

## **A - BY OWNERS ENGINEER**

I, \_\_\_\_\_, Peng. of the firm of \_\_\_\_\_ hereby certify that any deficiencies which have occurred during the Maintenance Period which are attributable to faulty materials or workmanship have been satisfactorily corrected. I hereby recommend this work for approval by this Final Acceptance Certificate.

Drawing ID: \_\_\_\_\_ *Inspector*  
 \_\_\_\_\_ *Signing Officer* *PEng Stamp*  
 \_\_\_\_\_ *Date*

## **B - BY THE TOWN OF GOLDEN**

Recommended for Approval \_\_\_\_\_, 20\_\_ *Field Services*  
 Approved on \_\_\_\_\_, 20\_\_ *Manager of Operations*

List of Deficiencies (to be completed prior to issuance of Final Acceptance Certificate.)

	Agreed Value (\$)	<input type="checkbox"/> See Attached
	Agreed Value (\$)	Deficiencies List
	Agreed Value (\$)	
	Agreed Value (\$)	
	Agreed Value (\$)	List Name

## **C - BY OWNERS ENGINEER**

I hereby certify that the items listed as deficiencies have now been corrected.

\_\_\_\_\_ *Peng* \_\_\_\_\_ *Date* *PEng Stamp*

## **D - BY THE TOWN OF GOLDEN**

Recommended for Approval \_\_\_\_\_, 20\_\_ *Field Services*  
 Approved on \_\_\_\_\_, 20\_\_ *Manager of Operations*

## **E- TOWN OF GOLDEN INTERNAL**

Maintenance Bond/Letter of Credit **Filed and Date**  
**flagged** with Manager of Finance

Maintenance Bond/Letter of Credit **Released by**  
 Manager of Finance

\_\_\_\_\_ *CFO* \_\_\_\_\_ *Date*                      \_\_\_\_\_ *CFO* \_\_\_\_\_ *Date*

