

THE CORPORATION OF THE CITY OF FERNIE



Consolidated Subdivision and Development Servicing Bylaw No. 1727

Consolidated to Bylaw:
1862, Amendment #1
2102, Amendment #2

All persons making use of this consolidated version of the City of Fernie Bylaw No. 1727 are advised that it has no legal sanction; that the amendments have been embodied for convenience of reference only and that the original bylaws must be consulted for all purposes of interpreting and applying the Bylaw. Subsections or sections of the original bylaw and/or amendments which have been repealed have not been included in this consolidation.

Certified copies of all City Bylaws are available from the City Clerk.

Amended 11/04/09

CITY OF FERNIE
SUBDIVISION AND DEVELOPMENT
SERVICING BYLAW NO. 1727

Table of Contents

SECTION 1 -	Authorization and Citation
SECTION 2 -	Interpretation
SECTION 3 -	Subdivision and Development Requirements and Regulations
SECTION 4 -	Provision of Services in Subdivisions and Developments
SECTION 5 -	Servicing Requirements for Subdivisions under Land Title Act
SECTION 6 -	Servicing Requirements for Developments not Requiring Subdivision
SECTION 7 -	Servicing Requirements for Highways Abutting a Site being Subdivided or Developed
SECTION 8 -	Administration and Enforcement
SECTION 9 -	Enactment

SCHEDULES:

SCHEDULE A -	Level of Service
SCHEDULE B -	Regulations, Standards and Specifications for the Design and Construction of Highways
SCHEDULE C -	Regulations, Standards, and Specifications for the Design and Construction of Curbs and Gutters, Sidewalks, and Boulevards
SCHEDULE D -	Regulations, Standards, and Specifications for the Design and Installation of Water Systems
SCHEDULE E -	Regulations, Standards, and Specifications for the Design and Construction of Sanitary Sewers
SCHEDULE F -	Regulations, Standards, and Specifications for the Design and Installation of Drainage Systems
SCHEDULE G -	Regulations, Standards, and Specifications for the Installation of Street Lighting
SCHEDULE H -	Regulations, Standards, and Specifications for the Installation of Electrical and Communications Wiring and Gas Distribution System
SCHEDULE I -	Standards for the Preparation of Engineering Drawings
SCHEDULE J -	Standard Subdivision Servicing Agreement
SCHEDULE K -	Standard Statutory Right-of-Way Agreement
SCHEDULE L -	Confirmation of Commitment by Owner
SCHEDULE M -	Confirmation of Professional Assurance
SCHEDULE N -	Standard Drawings
SCHEDULE O -	Standard Forms

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

SECTION 1 - TITLE

WHEREAS the *Municipal Act*, R.S.B.C., c.290 provides that Council may, by bylaw, regulate and require the provision of works and services in respect of the subdivision and development of land;

NOW THEREFORE, the Municipal Council of the Corporation of the City of Fernie, in open meeting assembled enacts as follows:

- 1.1** This bylaw may be cited as the City of Fernie ***“Subdivision and Development Servicing Bylaw”***
-

SECTION 2 - DEFINITION

DEFINITION

- 2.1** In this bylaw, unless the context requires otherwise:

"Act" means Municipal Act, Land Title Act, Health Act, and any other Act named in this Bylaw and found in the Revised Statutes of British Columbia, 1979, as amended or replaced both before and after the date of this Bylaw.

"Applicant" means a person applying for the approval of a subdivision, pursuant to the provision of the Land Title Act, 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 contractor.

"Approval, Final" means the Approving Officer's affixation of his signature to the subdivision plan pursuant to Section 88 of the Land Title 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 Municipal Council to act as Approving Officer pursuant to the provisions of the Land Title Act.

"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 City of Fernie.

"Building Regulations" means the Building Bylaw No. 1760 as amended or replaced.

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

"City Engineer" means the engineer of the City of Fernie appointed as such by the Municipal Council or his designate.

"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 Section 1 of the Safe Drinking Water Regulations of the Health Act which is owned, operated and maintained by the Municipality, an Improvement District under the Water Act or the Municipal Act, or which is regulated under the Water Utility Act, and authorized by the Municipal Council.

"Council" means the Municipal Council of the City of Fernie.

"Cul-de-sac" means a highway with only one point of intersection with another highway and which terminates in a vehicle-turning area and is designed to be permanently closed except for a lane or a walkway, by the pattern of subdivision.

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

"Development" means an activity that requires a Building Permit or that alters the existing surficial characteristics of the land.

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

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

"Highway" includes a street, road, lane, bridge, viaduct, and any other way open to public use. Except for highways created under Section 4 of the Highways Act, the width of a highway is measured from lot line to lot line. A highway does not include private easements on private property.

"Highway, Arterial" means a street used primarily by fast or heavy traffic of which a significant portion has both its origin and destination outside of the subdivision area.

"Highway, Collector" means a street which carries traffic from local streets to arterial streets and includes the principal entrance streets for circulation of traffic within such a subdivision.

"Highway, Local" means a street used primarily for travel and access to and from the parcels of land contiguous to it.

"Lane" means a highway 6 meters or less in width intended to provide secondary access to parcels of land. A lane is not to be considered a partial street.

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

"Lot" means a parcel.

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

"Municipality" means the City of Fernie or the area within the municipal boundary.

"Owner" in respect of real property means the registered owner of an estate in fee simple, and includes

- (a) the tenant for life under a registered life estate;
- (b) the registered holder of the last registered agreement for sale;
- (c) the holder or occupier of land held in the manner mentioned in Sections 409 and 410 of the Municipal Act;
- (d) an Indian who is an owner under the letters patent of a municipality, incorporated under Section 10 of the Municipal Act.

"Panhandle Parcel" means any parcel which is serviced and gains highway frontage through the use of a narrow strip of land which is an integral part of the parcel (hereinafter called the "Access Strip").

"Parcel" means any lot, block or other area in which land is held or subdivided but does not include a highway.

"Parcel Line" means a legal boundary of a parcel as shown or described on the records of the Land Title Office.

"Parcel Line, Exterior Side" means the side parcel line which abuts a highway or lane.

"Parcel Line, Front" means the parcel line common to a parcel and an abutting highway other than a lane. Where there is more than one such line and such lines are perpendicular, the shortest such line shall be considered the front parcel line, or where the front and rear parcel lines both adjoin a highway, the front parcel line shall be that to which the majority of adjacent buildings face.

"Parcel Line, Interior Side" means the side parcel line which abuts another parcel.

"Parcel Line, Rear" means the parcel line or parcel lines opposite to and most distant from the front parcel line; or where the rear portion of the parcel is bounded by intersecting side parcel lines, it shall be the point of such intersection.

"Parcel Line, Side" means the parcel line or parcel lines other than the front or rear parcel line and common to another parcel or parcels or to a highway.

"Potable Water" means water which is approved for drinking purposes by the Medical Health Officer.

"Professional Engineer" means a person who is registered or duly licensed as such under the

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

provisions of the Engineers and Geoscientists Act of British Columbia.

"Proven Supply" means that a supply of potable water is available and proven with respect to volume, delivery and continuity of supply from an on-site groundwater system, a source requiring a water license from the Ministry of Environment or a community water system.

"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 and other developments not requiring subdivision under the provisions of this bylaw.

"Street" means a highway except a lane, trail, or walkway.

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

"Top of Slope, Embankment or Escarpment" means the natural defined top edge of a slope, embankment or escarpment; or, where a gradual steepening exists, the point at which the slope exceeds 30% grade.

"Walkway" means a highway intended to carry pedestrian and non-motorized traffic.

"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 ground water, whether enclosed in a conduit or not, or as deemed by a designated official of the Province.

"Zone" means an area created by the Zoning Bylaw of the City of Fernie as amended or replaced both before and after the effective date of this bylaw.

SECTION 3 - SUBDIVISION AND DEVELOPMENT REQUIREMENTS AND REGULATIONS

3.1 Compliance with Bylaw

No person shall subdivide or undertake development of land in the City of Fernie except in compliance with the provisions of this Bylaw.

3.2 General Requirements for Design of Subdivisions

No subdivision of land shall be approved which:

- .1 is not suited to the configuration of land being subdivided;
- .2 is not suited to the use to which it is intended; or
- .3 will make impracticable the future subdivision of the land within the proposed subdivision or of any adjacent land.

3.3 Area, Shape and Dimensions of Lots

- .1 No subdivision shall be created in any zone so that any lot created by the subdivision has an area in square metres or hectares or a width in metres less than those set out for the zone in which it is located as set out in the City of Fernie Zoning By-Law No. 1406, as amended or replaced.
- .2 The Approving Officer may exempt a person proposing to subdivide land from any prescribed minimum frontage, or from the limitation provided under the Municipal Act.
- .3 The side lines of parcels to be created by the subdivision shall be as close as practicable at right angles or radial to street lines, and the Approving Officer shall ensure that the parcels to be created are logical in shape and dimension for the use intended.

SECTION 4 - PROVISION OF SERVICES IN SUBDIVISIONS AND DEVELOPMENTS

4.1 Level of Service

Unless otherwise approved by a Development Variance Permit issued by the Council pursuant to the Municipal 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 service level areas as established by Schedule A of this Bylaw.

4.2 Subdivisions Where Servicing Requirements May Be Waived

.1 Notwithstanding section 4.1, the servicing requirements prescribed in Schedule A of this Bylaw may be waived where the lot created is to be used solely for the unattended equipment necessary for the operation of:

- a) a community water system;
- b) a community sewer system;
- c) a community gas distribution system;
- d) a community radio or television receiving antennas;
- e) a radio or television broadcasting antenna;
- f) a telecommunications relay station;
- g) an automatic telephone exchange;
- h) an air or marine navigational aid;
- g) electrical substations or generating stations; or
- h) any other similar public service or quasi public service facility or utility.

.2 Notwithstanding Section 4.1, the servicing requirements prescribed in Schedule A pertaining to provision of community sanitary sewer system, community water supply system or storm sewer system may be waived provided that all of the following conditions are met:

- a) the parcel to be subdivided is wholly contained within the commercial or industrial zones as established by the City of Fernie Zoning Bylaw No. 1406 as amended or replaced.
- b) the maximum width of the lot after subdivision shall be 60 metres and the minimum lot area after subdivision shall be 5,000 square metres;
- c) the subdivision will not create new highways other than widening of existing highways;

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

- d) the parcel to be subdivided does not adjoin a highway or easement that contains one or more of the following services:
 - i) sanitary sewer;
 - ii) water;
 - iii) storm sewer.

4.3 Expense of Services To Be Borne By Owner

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

4.4 Security and Development Agreement Required

- .1 All works and services to be constructed and installed to serve any development or proposed subdivision of any lands shall be constructed and installed 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 completion of the construction and installation of the required works and services where the Applicant deposits a bond or a letter of credit in the form as contained in Schedule O, with the City of Fernie 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 Developer's Engineer before the subdivision plan is finally approved by the Approving Officer, and enters into a form of agreement with the City 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.
- .2 Where the owner of land is required to construct and install works and services in accordance with the provisions of this Bylaw, the owner shall:
 - a) operate and maintain the works constructed and installed for the periods specified in Schedule J.
 - b) provide the City with a bond or a letter of credit in the amount of ten percent (10%) of the cost of installing and paying for all the works and services required as estimated by the Approving Officer. The bond or letter of credit shall be held as security against unsatisfactory operation of the works and services during the maintenance periods specified in Schedule J.

4.5 Excess or Extended Capacity

Pursuant to the Municipal Act, the City may require that the Applicant provide excess or extended services to provide access to or service land other than the land being subdivided or developed.

4.6 Right-of-Way Agreement

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

4.7 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 M 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 City.

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.

4.8 Exception For Service Connection

Notwithstanding section 4.7 above, in a subdivision or development where only service connections to existing works and services are required, the City does not require that the Applicant engage a Professional Engineer to design the service connections.

4.9 Slope Stability/Geotechnical

Geotechnical reports may be required prior to land use redesignation, subdivision, development and/or building approval. A report may be required wherever the slope of the subject lands, or portions thereof exceed 15 percent or where past filling, subsidence, slippage or seepage is evidenced in the vicinity of the site.

The requirement for a geotechnical report may be waived by written authorization from the City Engineer. The City Engineer may also require a geotechnical report for sites with soil conditions, groundwater, or other such conditions which, in the opinion of the City Engineer, require special attention.

.1 Slope stability reports shall contain a minimum of the following information:

- a) Existing property lines shown on plan(s).
- b) Top of slope, embankment or escarpment; and toe of slope.

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

- c) Contour mapping as required by the Geotechnical Engineer.
 - d) Stability limit (S.L.) line(s) shown on plan(s). The S.L. line is defined as the line that corresponds to a Safety Factor (S.F.) of 1.5 and delineates the Developable Area where S.F. is greater than 1.5, from the Undevelopable Area where the S.F. is less than 1.5. To define the S.L. line, the slope is to be analyzed in the existing natural condition using the highest expected groundwater condition, both natural and man-made.
 - e) The effect of and extent of slope failure on the subject land and adjacent properties and the methods for protection of the lands.
 - f) A set-back line, drawn in relation to the S.L. Line and within the developable area, which shall define the point nearest the S.L. Line that structures (including streets, underground utilities, building foundations, swimming pools etc) can be constructed without jeopardizing the slope stability at the S.L. Line. The building set-back line shall be no closer to the top of slope than:
 - i) that line determined by a Geotechnical Engineer using the method described in this section, or
 - ii) the rear yard setback distance as specified in the City of Fernie Zoning Bylaw No. 1406 as amended or replaced, measured from the top of the slope, embankment or escarpment.
 - g) Identification of proposed fill areas and development of a filling plan addressing ultimate topography, fill materials, methodology, inspection, testing, revegetation, slope stability and setbacks as defined in this section.
 - h) Assessment and recommendations regarding the effects of rainfall, runoff and irrigation.
- .2 Existing lands within areas where the S.F. < 1.5 may be considered for development by the City Engineer if the existing slope is modified using recognized remedial procedures which will yield a S.F. greater than 1.5 and the work is certified by the Developer's Engineer.
- .3 Slope stability reports shall be prepared by a Professional Engineer experienced in Geotechnical work.
- .4 It is the responsibility of the Applicant to ensure that slope stability reports are initiated and that development conforms to the recommendations in the report.

4.10 Traffic Impact Analysis

The Approving Officer may require the Applicant to provide a traffic impact analysis.

4.11 Off-Site Utilities Impact Analysis

The Approving Officer may require the Applicant to provide an off-site utilities impact analysis.

4.12 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 City Engineer.

4.13 Off-Site Services

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

4.14 Dust Control

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

- .1 the operation of any equipment causes dust that becomes a nuisance to property owners and residents in the area;
- .2 bare soil conditions are created in performing work;
- .3 should the Applicant not implement dust control procedures as required or as directed by the City's Engineer, the City will undertake the dust control procedures and backcharge the Applicant to recover all costs incurred including such things as engineering and administration costs, wages, equipment costs, etc. If charges are unpaid on Dec 31 in any year, such charges shall be applied as property tax on the parcel on which the charge occurs.

4.15 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 burial on 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.

The burning of non-volatile wastes may be permitted once the Applicant has received approval via the holding of a valid permit from the City and the Province.

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 City 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 City.

**SECTION 5 - SERVICING REQUIREMENTS FOR SUBDIVISIONS
UNDER LAND TITLE ACT**

5.1 Highways

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

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

5.2 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.

5.3 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.

5.4 Electrical and Communications Wiring and Gas Distribution System

In subdivisions where parcels are created, each parcel shall be provided with power supply consistent with the standards set out in Schedule A and Schedule H of this Bylaw. Where cablevision 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.

5.5 Water Distribution System

In subdivisions where parcels are created, each parcel shall be serviced by 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.

5.6 Sanitary Sewer

In subdivisions where parcels are created, each parcel shall be:

- .1 provided with a complete sewage collection system connected to the community sanitary sewer system
[Amended by Bylaw No. 2102]

5.7 Drainage System

In subdivisions where parcels are created, 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.

**SECTION 6 - SERVICING REQUIREMENTS FOR DEVELOPMENTS NOT REQUIRING
SUBDIVISION**

6.1 Developments Not Requiring Subdivision

As a condition of the issuance of a building permit on a site being developed, the City of Fernie 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 City of Fernie 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 are to be approved by the City Engineer.

.1 Domestic Water

Where the provisions of Schedule A require a parcel containing a development to be served by a community water system, the water distribution system on the parcel shall be constructed and connected to the community water system consistent with a site servicing plan approved by the City Engineer and the provision of Schedule D of this Bylaw.

.2 Sanitary Sewer

The sewage collection system on the parcel shall be constructed and connected to the community sewer system consistent with a site servicing plan approved by the City Engineer and the provision of Schedule E of this Bylaw. *[Amended by Bylaw No. 2102]*

.3 Site Drainage

The development shall be provided with site drainage collection and disposal facilities in accordance with a site servicing plan approved by the City Engineer and the provision of Schedule F of this Bylaw.

.4 Access Roads and Parking

For developments where on-site parking or on-site loading facilities are required, the

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

development shall be provided with vehicle access from a highway or highways in accordance with an access permit and a site servicing plan approved by the City Engineer.

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

.5 Hydro, Telephone and Cablevision Wiring

Where the provisions of Schedule A require underground wiring, all hydro, telephone and cablevision wiring shall be installed underground consistent with the provisions of Schedule H of this Bylaw.

6.2 Exceptions for Developments Not Requiring Subdivision

Notwithstanding the requirements of Section 6.1 above, the following exceptions to the servicing standards set out in this bylaw may be permitted for developments not requiring subdivision:

.1 Trench Backfill

Gravel backfill is the preferred material. Native backfill may be allowed provided that the following is provided by the Developer and approved by the City Engineer:

- a) engineering design for a modified road structure;
- b) engineering report for a procedure and equipment required to compact native material to requirements specified;
- c) test results to the satisfaction of the City Engineer to confirm the level of compaction has been achieved.

No road work shall be constructed until the test results have been reviewed and approved by the City Engineer.

.2 Materials

Materials suppliers and manufacturers other than those specified in this Bylaw are acceptable subject to the approval of the City Engineer.

**SECTION 7 - SERVICING REQUIREMENTS FOR HIGHWAYS ABUTTING
A SITE BEING SUBDIVIDED OR DEVELOPED**

7.1 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, the City of Fernie may 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 centerline of the highway for items (.1) and (.2) below only. Works and services which may be required include:

- .1 Highway improvements including clearing, grading, drainage and surfacing in accordance with the standards set out in Schedules A and B and F of this Bylaw.
- .2 Sidewalk, curb and gutter improvements in accordance with the standards set out in Schedules A and C of this Bylaw.
- .3 Water system improvements including construction of water distribution components in accordance with the standards set out in Schedule D of this Bylaw.
- .4 Sewer system improvements including construction of sewage collection system components in accordance with the standards set out in Schedule E of this Bylaw.
[Amended by Bylaw No.2102]
- .5 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.
- .6 Where the provisions of Schedule A require underground wiring, all hydro, telephone and cablevision, ducting and junction facilities shall be installed in accordance with the provisions of Schedule H of this Bylaw.

SECTION 8 - ADMINISTRATION AND ENFORCEMENT

8.1 Application Fee

An applicant for subdivision approval shall submit with the application a fee in the amount prescribed by Bylaw No. 1706 "Land Use Application Procedures and Fees Bylaw", as amended or replaced.

8.2 Preliminary Review

- .1 An Applicant may, before causing a plan of subdivision to be prepared and submitted for approval pursuant to the provisions of the Land Title Act, make a submission for Preliminary Review. This submission shall be accompanied by preliminary plans of the proposal and shall include information as required by the Approving Officer to evaluate the proposed subdivision.
- .2 Preliminary Review of any subdivision shall not be construed as any formal approval for land registration or any other purpose, nor is a submission for Preliminary Review considered an application under the Municipal Act. This review shall not be considered as acceptance by the Municipality or its Approving Officer of anything except the general layout of the proposed subdivision, and a list of minimum conditions which would be taken into consideration on an application for final approval. Preliminary Review is revocable by the Approving Officer at any time before final approval is granted.

8.3 Authorization To Enter On Lands Being Subdivided

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

8.4 Violation

Every person who:

- .1 violates any of the provisions of this bylaw;
- .2 causes or permits any act or thing to be done in contravention or violation of any of the provisions of this Bylaw;
- .3 neglects or omits to do anything required under this Bylaw;
- .4 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;

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

.5 fails to comply with an order, direction or notice given under this Bylaw;

.6 prevents or obstructs or attempts to prevent or obstruct the authorized entry of an officer on property under Section 2;

shall be deemed to be guilty upon summary conviction of an offence under this Bylaw.

8.5 Offence

Each day's continuance of an offence under Section 3 constitutes a new and distinct offence.

8.6 Penalty

Any person who violates any of the provisions of this Bylaw shall, on summary conviction, be liable to a penalty not less than \$2,000 plus the cost of prosecution for each offence.

8.7 Completion

Should any person fail to construct or install any works or services required under this Bylaw, the municipality, its agents or servants may construct or install the works and services at the expense of the person in default, and the expense thereof, with interest at the rate of six percent (6%) per annum. Costs may be recovered by drawing on the Letter of Credit or by Municipal taxes. If charges are unpaid on Dec. 31 in any year, such charge shall be applied as property tax on the parcel on which the charge occurred.

8.8 Severability

If any section, subsection, sentence, clause, phrase or portion 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.

8.9 Schedules Form Part Of Bylaw

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

**CONSOLIDATED SUBDIVISION AND
DEVELOPMENT SERVICING BYLAW No. 1727**

SECTION 9 - ENACTMENT

9.1 Repeal of Previous Bylaw

Subdivision Control Bylaw Number 1376, 1984 and all amendments thereto, is hereby repealed.

9.2 Effective Date

This Bylaw shall take effect upon adoption by the Council of the City of Fernie.

INTRODUCED AND

Read a FIRST time this 25th day of May, 1998.

Read a SECOND time this 8th day of June, 1998.

Read a THIRD time this 8th day of June, 1998.

THIRD reading rescinded this 22nd day of June, 1998.

Read a SECOND and THIRD time as amended this 22nd day of June, 1998.

FINALLY PASSED AND ADOPTED this 13th day of July, 1998.

Mayor

Clerk

SCHEDULE A
LEVEL OF SERVICE

This is Schedule A of the City of Fernie Subdivision and
Development Servicing Bylaw No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE A - LEVEL OF SERVICE

SCHEDULE A

LEVEL OF SERVICE

A.1.1 Establishment of Service Levels

Within the City of Fernie, different service levels may be required for new subdivisions and developments in different areas of the City. These service levels have been established, and the areas to which they apply will be based on the type of land (i.e. residential, commercial, industrial, public institutional and parks and open space), and the location of the land use, as per the Official Zoning Map of the City of Fernie.

These service levels refer to the minimum level of service to be provided. A higher level of service may be required, provided the level of service is consistent with surrounding subdivisions or developments. Any increase in level of service must be approved by the City Engineer.

A.1.2 Service Level 1

The following services shall be provided in all new subdivisions or for developments in areas where the land use is:

- residential except rural residential and where the subdivision or development is to be approved under the Condominium Act;
 - commercial;
 - public institutional;
 - parks and open space.
- .1 Urban highways as specified in Schedule B, including:
 - a) asphaltic concrete paving on roadways, walkways and lanes;
 - b) curb and gutter;
 - c) sidewalks as required in Schedule B and the standard drawings.
 - .2 Underground hydro, telephone and cablevision
 - .3 Street lighting for all highways
 - .4 Water distribution system and connection to community water system.
 - .5 Sanitary sewer collection system and connection to community sanitary sewer system.
 - .6 Storm water drainage in accordance with a drainage plan as required in Schedule F.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE A - LEVEL OF SERVICE

A.1.3 Service Level 2

The following services shall be provided in all new subdivisions and for developments in areas where the land use is industrial:

- .1 Rural highways as specified in Schedule B, including asphaltic concrete paving on roadways, walkways and lanes
- .2 Overhead wiring for hydro, telephone and cablevision.
- .3 Street lighting for all highways as provided by B.C. Hydro on power poles.
- .4 Water distribution system and connection to community water system. The owner may be required to provide an alternate source of supply.
- .5 Sanitary sewer collection system and connection to community sanitary sewer system. The owner may be required to provide alternate treatment and disposal facilities.
- .6 Surface storm water drainage in accordance with a drainage plan as required in Schedule F.

A.1.4 Service Level 3

The following services shall be provided in all new subdivisions or for developments where the land use is to be rural residential:

Bylaw No. 2102

- .1 Rural highways as defined in Schedule B, including asphaltic concrete paving on roadways, walkways and lanes.
- .2 Overhead wiring for hydro, telephone and cablevision.
- .3 Street lighting for all highways as provided by B.C. Hydro on power poles.
- .4 Water distribution system and connection to community water system.
- .5 Sanitary sewer collection system and connection to community sewer system. **Bylaw No. 2102**
- .6 Surface storm water drainage in accordance with a drainage plan as required in Schedule F.

A.1.5 Special Circumstances

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

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

If a property proposed to be subdivided or developed is subject to more than one land use, the higher level of service is assumed to apply unless determined otherwise by the City Engineer.

SCHEDULE B

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND
CONSTRUCTION OF HIGHWAYS**

This is Schedule B of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

SCHEDULE B

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND
CONSTRUCTION OF HIGHWAYS**

B.1 GENERAL

B.1.1 Standards and Specifications of this Schedule to Apply to All Works

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

B.1.2 Approval of Engineering Drawings Required Prior to Construction

Engineering drawings showing detailed design of roads shall be submitted to the City Engineer for approval prior to commencement of construction. These drawings shall show existing ground line and proposed alignment and grade of the highways, 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.

B.1.3 Classification of Highways

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

STANDARD
Rural Urban

CLASSIFICATION
Arterial Collector Local Cul-de-Sac

LAND USE (ZONING)
Commercial Industrial Residential

Note: Where specifications are not specifically noted for Cul-de-Sacs, the requirements are assumed to be the same as for Local highways.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

The following combinations of standard, classification and zoning shall be considered for highways within the City of Fernie:

- Urban Arterial (specifications same for all zones)
- Urban Collector (specifications same for commercial and industrial)
- Urban Collector Residential
- Urban Local Industrial (specifications same for commercial and industrial zones)
- Urban Local Residential
- Urban Cul-de-Sac
- Rural Arterial (specifications same for all zones)
- Rural Collector (specifications same for all zones)
- Rural Local Industrial (specifications same for commercial and industrial zones)
- Rural Local Residential
- Rural Cul-de-Sac (same as Rural Local Residential)

B.1.4 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 City of Fernie Official Community Plan.

B.1.5 Geotechnical Evaluation

The Applicant shall be responsible for engaging the services of a qualified Geotechnical Engineer to investigate surface and sub-surface 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 roads, and any other geotechnical issues affecting road construction within the proposed subdivision.

B.1.6 Mail Boxes *(Requires applicant to specify future locations)*

The Applicant shall indicate on the engineering drawings approved locations for local mail boxes. The applicant is referred to Canada Post for location guidelines and approval. *Bylaw No. 1862*

B.1.7 Street Names and Traffic Signs

Street names shall be assigned by the City of Fernie. Street name signs, traffic signs and road lineage required as a result of constructing or improving streets shall be provided by the City at the expense of the Applicant. Alternate street name signs may be requested by the applicant, but must be approved by the Engineer.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.1.8 **Appurtenances** *(Additional information to be shown on drawings)*

The Developer's Engineer shall detail on the engineering drawings the location of all proposed traffic islands, 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 road allowance.

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

Bylaw No. 1862

B.2 **GENERAL DESIGN CRITERIA**

B.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.

.3 Pedestrian Access

The design and arrangement of highways shall consider and provide pedestrian access routes

.4 Snow Storage and Removal

The design and arrangement of highways shall consider snow removal and storage operations.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.2.2 Local Highways

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

B.2.3 Cul-de-Sacs

Cul-de-sac highways shall not exceed 150 metres in length and shall be provided with an area designed to permit safe and adequate space for the turning of motor vehicles, including all emergency vehicles.

B.2.4 Lanes

Lanes, meeting the standards set out in this bylaw, shall be provided where the City Engineer deems them to be necessary.

B.2.5 Walkways *(Reference to the City's Trail Network as per the OCP)*

Walkways shall be provided where the City Engineer 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 traffic. The surface treatment, width, and other design aspects of the walkway shall be subject to the provisions of The City of Fernie's Official Community Plan – Trail Network, and the approval of the Engineer. *Bylaw No. 1862*

The City may require the installation of chain link fencing on both sides of the walkway in some instances. The City will advise the Applicant of the necessity for fencing at the time engineering drawings are reviewed.

B.2.6 Intersections

Intersections shall be designed as follows:

- .1 Intersecting highways shall meet substantially at right angles (between 70 degrees and 110 degrees);
- .2 Jogs in highway 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;
- .3 Intersections having more than four intersecting legs shall not be permitted.
- .4 Intersections shall provide adequate crossing sight distances and stopping sight distances, whichever is greater.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.3.0 HIGHWAY DESIGN CRITERIA

B.3.1 Vertical Alignment *(Increase cross-fall on roadways to enhance drainage)*

The vertical alignment of highways shall be set so the grades of driveways to adjacent properties will conform to Standard Drawings No. B-10. Where it is impractical to meet this criteria, the City Engineer may approve the use of private access roads.

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%

.1 Design Speeds

The design speeds to be used for design of Highways shall be as per Table B.1.

**TABLE B.1
Design Speed**

HIGHWAY CLASSIFICATION	DESIGN SPEED
Arterial	70 km/h
Collector	60 km/h
Local and Cul-de-Sac	50 km/h

.2 Road Crossfall

Minimum road crossfall shall be 3%, maximum crossfall shall be 4%.

Bylaw No. 1862

.3 Road Grades

Minimum and maximum road centreline grades shall conform to Table B.2 based on the classification of the road:

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

TABLE B.2

HIGHWAY DESCRIPTION	Minimum Grade	Maximum Grade
Arterial	0.5%	8%
Collector	0.5%	8%
Local	0.5%	10%
Cul-de-Sac (entry downhill)	0.5%	8%
Cul-de-Sac (entry uphill)	0.5%	10%
Cul-de-Sac (bulbs)	0.5%	6%
Lane and Walkway	0.5%	10%

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.

.4 Vertical Curves

Vertical curves shall be designed to provide safe stopping sight distances. Minimum stopping sight distance is the least distance required to bring the vehicle to a stop under prevailing vehicle and climatic conditions. Vertical curves shall be provided at all grade changes greater than 0.5%. Vertical curve length is calculated by the equation $L = KA$ where:

L is the length of the vertical curve (Minimum L = 15 m)

K is a constant related to lines and geometry of a parabolic curve

A is the algebraic difference in grades in percent

Minimum K values (in metres) for vertical curve design shall be as described in Table B.3.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

**TABLE B.3
MINIMUM K VALUES (IN METRES) FOR
VERTICAL CURVE DESIGN**

Highway Classification	Crest Curve Minimum	Sag Curve	
		Lighting	No Lighting
Arterial	22	15	25
Collector	15	10	20
Local	7	6	11

B.3.2 HORIZONTAL ALIGNMENT

.1 Centreline Radii

The minimum required centreline radius for various super elevation rates for each classification of roadways are as follows:

**TABLE B.4
MINIMUM CENTRELINE RADIUS**

Highway Classification	Horizontal Curve Radii (metres)			
	<i>Super-elevation (m/m)</i>			
	None	0.02	0.04	0.06
Arterial	N/A	230	200	190
Collector	160	140	130	N/A
Local*	95	N/A	N/A	N/A

** Radius may be reduced at the discretion of the City Engineer*

.2 Curb Return Radii

Curb return radii shall conform to the following and be based on the lesser classified Highway.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

**TABLE B.5
MINIMUM CURB RETURN RADIUS**

Highway Classification	Curb Return Radius
Arterial	11 m
Collector	11 m
Local Residential	9.0 m
Local Industrial (Commercial)	11 m
Cul-de-Sac	12 m

.3 Reverse Curves

If reverse curves are required in a highway alignment, the City Engineer may require that they be separated by means of tangents of sufficient length to prevent super-elevation rotation.

B.3.3 Intersection Design

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

B.3.4 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. 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 using the following K values:

**TABLE B.6
INTERSECTION CURVES**

Intersecting Highway	Minimum K Value	
	Crest Curve	Sag Curve
Arterial	17	15
Collector	7	6
Local	4	4

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.3.5 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 City Engineer when a road is to be constructed and to be widened at a later date.

Highways shall be classified as follows 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.7

Highway Classification	Design Traffic ⁽¹⁾ (EAL'S)	Min. Depth of Hot Mix Asphalt (mm)
Arterial	$> 2.8 \times 10^5$	See Note 2
Collector (all zones)	2.8×10^5	100
Local Industrial	5.6×10^5	100
Local Residential	2.8×10^4	75
Lane	Not Applicable	50
Walkway	Not Applicable	50

Bylaw No. 1862

NOTES:

⁽¹⁾ See Chapter IV of MS-1 of the Asphalt Institute.

⁽²⁾ To be specifically designed, based on projected EAL's, in accordance with MS-1 of the Asphaltic Institute.

Geotextile shall be placed below the sub-base material. This requirement shall only be waived when the applicant submits a geotechnical design by a Professional Engineer showing that geotextile is not required. The approved geotextile material shall be placed using manufacturer's specifications.

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 molded 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

The minimum compacted depth of crushed granular base course, in the total pavement structure, shall be 100 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 sub-base of a thickness which has been calculated to provide the necessary structural improvement to the subgrade.

A minimum pavement structure for roads shall be provided, notwithstanding the structural character of the subgrade. Where the Applicant chooses not to undertake a pavement structural design, the following minimum pavement structures are specified, and will be considered structurally adequate when the subgrade soil exhibits a minimum soaked CBR ≤ 3 :

TABLE B.8

MINIMUM PAVEMENT STRUCTURES (FOR SUBGRADE CBR ≤ 3)

Highway Classification	Sub-base Pitrun (mm)	Crushed Granular Base Course (mm)	Hot Mix Asphalt (mm)	
			Surface Course	Lower Course
Arterial	Structural Design shall be project specific			
Collector (all zones)	400	100	50	50
Local Industrial	400	100	50	50
Local Residential	300	100	75	
Lanes	300	100	50	
Walkways	150	100	50	

Bylaw No. 1862

The design of structural overlays of existing pavements shall be based on the analysis of the results of Benkelman beam tests and/or 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:

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

TABLE B.9

Highway Classification	Maximum Permissible Deflection After Overlay
Arterial	0.6 mm
Collector (all zones)	0.9 mm
Local Industrial	See Note ⁽¹⁾
Local Residential	1.25 mm

NOTES:

⁽¹⁾ *As specified by the City Engineer.*

The Structural design of pavements for roads shall be performed by a qualified pavements engineer. Structural designs of pavements shall be submitted to the City Engineer in an acceptable report format.

B.3.6 Highway Cross-Sections

The standard street cross-section for various classifications of roadways shall be as per Table B.9 and on Standard Drawings No. B-1 to B-7.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

TABLE B.10

HIGHWAY CROSS-SECTIONS

Road Classification	Typical Cross-section (Drawing Number)
Urban Arterial (cross section same for all zones)	B-1 or B-2
Urban Collector (cross section same for all zones except roll-over curb for residential)	B-3
Urban Local Industrial (cross section same for commercial and industrial zones)	B-4
Urban Local Residential	B-5
Urban Cul-de-Sac	B-7
Rural Arterial (cross section same for all zones)	B-6
Rural Collector (cross section same for all zones)	B-6
Rural Local Industrial (cross section same for commercial and industrial zones)	B-6
Rural Local Residential	B-6
Rural Cul-de-Sac (same as Rural Local Residential)	B-6

B.4 MATERIALS

B.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 100% Standard Proctor density (ASTM D698). Fill material shall be moisture re conditioned 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.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.

B.4.3 Rejection of Material

The City Engineer 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.

B.4.4 Granular Aggregates

.1 Granular Sub-base Course

Granular sub-base shall be well graded material within the following gradation limits when tested in accordance with ASTM C136 and ASTM C117 and have a soaked CBR of 40:

**TABLE B.11
SUB-BASE COURSE GRADATION**

USBC Sieve Size	Percent Passing by Weight (Total Sample)
200 mm	100%
150 mm	96 - 100%
75 mm	60 - 80%
USBC Sieve Size	Percent Passing by Weight (Material Passing 75 mm sieve)
25 mm	70 - 100%
4.75 mm	25 - 63%
1.18 mm	14 - 41%
.600 mm	7 - 30%
.150 mm	3 - 16%
.075 mm	2 - 8%

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

.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 following limits 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.12

BASE COURSE GRADATION

USBC Sieve Size	Percent by Weight Passing
25 mm	100 %
20 mm	95 - 100%
10 mm	60 - 80%
4.75 mm	40 - 60%
2.36 mm	28 - 48%
.600 mm	13 - 29%
.300 mm	9 - 21%
.150 mm	6 - 15%
.075 mm	4 - 8%

A minimum of 50% of the material retained on a 4.75 mm sieve shall have at least one fractured face as determined by particle weight.

.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.

The gradation of aggregates, when blended to meet the job mix formula shall be within the limits shown 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

TABLE B.13

**GRADATION OF CRUSHED GRANULAR
AGGREGATE FOR ASPHALTIC CONCRETE**

USBC Sieve Size	Lower Course	Surface Course
	Percent Passing, by Weight	
25 mm	100	
19 mm	85-95	100
12.5 mm	65-95	85-95
9.5 mm		70-85
4.75 mm	40-65	50-65
2.36 mm		38-52
1.18 mm	20-38	28-42
0.600 mm		20-30
0.300 mm	10-20	12-20
0.150 mm	8-15	10-16
0.075 mm	3-8	3-7

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 weight.

SCHEDULE B – HIGHWAYS

TABLE B.14

**TOLERANCE LIMITS FOR CRUSHED GRANULAR
AGGREGATE FOR ASPHALTIC CONCRETE**

Sieve Size	Tolerance Limits (% Passing By Weight)*
4.75 mm	5.0
2.36 mm	4.0
1.18 mm	4.0
0.600 mm	3.0
0.300 mm	3.0
0.150 mm	2.0
0.075 mm	1.5

* *The tolerance limits are in relation to the design aggregate gradation submitted with the Marshall mix design. Aggregate short of material passing the 0.075 mm sieve shall have approved mineral filler added. The Developer's Engineer may be required to submit a proposed gradation for the mineral filler to the City Engineer for approval. 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 aggregate after leaving the drier and before mixing shall be not more than 0.5% by weight.*

B.4.5 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 City Engineer. 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 City Engineer. Traffic shall not be permitted onto primed areas.

B.4.6 Tack Coat

Bituminous tack coat shall be undiluted SS-1H or 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.4.7 Asphalt Cement

TABLE B.15

TYPE OF ASPHALT

REQUIREMENTS	Min.	Max.
Viscosity @ 60° (Pa/s)	65	
Min. Penetration @ 25°C	150	200
% Ret. Pen. after T.F.O.T. @ 25°C - 100 g/5s	50	
Solubility in Trichloroethylene %	99.5	
Flash Point, C.O.C. minimum °C	220	
Ductility at 25°C, 5 cm/min. - cm	100	

The asphalt cement shall be homogenous, free from water, and shall not foam when heated to 175°C.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.4.9 Asphaltic Concrete

Asphaltic Concrete shall conform to the following:

TABLE B.16

Property	Arterial & Collector (all zones) Local (commercial & industrial)		Local Residential
	Lower Course	Surface Course	Surface Course
Marshall blows per face	75	75	50
Marshall Stability @ 60°C (kN)	10 min.	10 min.	8 min.
Marshall Flow, 0.25 mm units	8-16	8-16	8-16
Voids in Mineral Aggregate (%)	12.5-14	13.5-15	14-15.5
Air Voids in Mixture (%) @ design A.C.	4.0 ± 0.2	4.0 ± 0.2	3.5 ± 0.3
Air Voids in Mixture (%) @ Allowable Production Rate	3-5	3-5	3-5
Index of Retained Stability after water immersion for 24 hours @ 60°C	75% min.	75% min.	75% min.
Minimum Film Thickness (microns)	6.5	6.5	7.0

The Applicant shall supply the City Engineer with a current 5 point Marshall mix design, performed in accordance with ASTM D-1559, under the signature of a Professional Materials Engineer. The design asphalt content shall be specified to comply with the requirements of this article.

The asphalt 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.4.10 Cold-Mix Asphaltic Concrete

Cold-mix asphaltic concrete shall not be permitted, unless specifically approved by the City Engineer.

B.4.11 Chain Link Fence (as required on walkways, playground areas, schools, etc.)

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 poles 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) End & Corner Posts - 73 mm O.D., 5.15 mm wall thickness, galvanized steel pipe.
- d) Line Posts - 48 mm O.D., 3.68 mm wall thickness galvanized steel pipe. Height as determined by City Engineer.
- e) Gates - Sizes as required. Frames 42 mm O.D., 3.55 mm wall thickness galvanized steel pipe.
- f) Barbed Arms - Galvanized malleable steel.
- g) Tension Wire - 6 gauge (4.50 mm) galvanized steel.
- h) Tie Wire - 9 gauge (3.55 mm) aluminum.
- i) Tension Bar - 4.76 mm x 19 mm galvanized steel.
- j) Dome Tops - Size as required. Galvanized malleable steel.

B.5 WORKMANSHIP

B.5.1 Notification of City Engineer Prior to Undertaking Road Works

Adequate notice shall be given to the City Engineer by the Applicant prior to the commencement of road works in accordance with Table B.17. The Applicant shall not proceed from one stage as described in Table B.17 to another stage without the approval of the City Engineer. The City Engineer shall not grant approval to proceed with subsequent stages without the submission of field materials testing results.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

TABLE B.17

CONSTRUCTION NOTIFICATION REQUIREMENTS

Stage	Minimum Notice Required
Prior to construction of fills or doing subgrade preparation	24 hours
Prior to placement of sub-base 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 top soiling boulevards	24 hours

B.5.2 Clearing

The road 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 City Engineer. Any burning shall conform to all requirements of the Ministry of Environment and the City of Fernie.

B.5.3 Subgrade Preparation

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

Each layer shall be compacted with approved equipment to 100% Standard Proctor Density.

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.

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.

Over excavations 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 meter and replaced with suitable material for a distance of 15 meters in order to prevent abrupt future differential grade changes.

The upper 300 mm of the subgrade shall be compacted to 100% of Standard Proctor density. Subgrade preparation shall extend a minimum of 300 mm out from back of curb or sidewalk on either side of the road.

B.5.4 Proof Rolling

Upon completion of the subgrade preparation, the subgrade shall be proof rolled in the presence of the City Engineer 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 sub-base, granular material, and compacted to 100% Standard Proctor density.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.5.5 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 100% Standard Proctor density. The finished surfaces shall be within +/- 15 mm of the design grade and cross-section.

B.5.6 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 follows:

TABLE B.18

ASPHALT LIFT THICKNESS LIMITS

Mix Type	Permissible Compacted Lift Thickness (mm)	
	Minimum	Maximum
Lower Course	50	75
Surface Course	40	75

B.5.7 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 Asphalt Paving Manual published by the Asphalt Institute.

B.5.8 Density of Completed Asphaltic Concrete Pavement

The minimum allowable density of the completed pavement shall be not less than 98% of the laboratory compacted Marshall density.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.5.9 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 degrees C.

B.5.10 Restoration of Improvements

Driveways, retaining walls, vegetation and other private or municipal improvements on private or municipal property or highways affected by the road construction shall be restored at minimum to the condition existing prior to construction and to the satisfaction of the City Engineer.

B.6 TESTING

B.6.1 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 roads and streets. The materials testing firm must employ a full time, qualified professional engineer within the firm from which the testing services are provided. He shall review all test data and provide to the City, on a daily basis and in summary form at the completion of each stage of the work, test data at the following minimum frequencies:

.1 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, catch basins, etc.
 - ii) Subgrade construction and preparation - three tests per 50 lineal metres of road per lift, to include dry density and moisture content.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

- .2 For sub-base and base course construction:
(including subgrade enhancement using sub-base material)
 - a) Gradation analysis - one test per 500 m³ or 1100 tonnes of material delivered to the site.
 - b) Moisture - density relationship (Standard Proctor) - ASTM D698; - one test per class of material for each 5000 m³, or 11000 tonnes delivered to site.
 - c) Compaction testing - three tests per 50 lineal metres of road per lift, to include dry density and moisture content.
- .3 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 before or after 12:00 noon. Samples shall be taken 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 m² 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.

B.6.2 Deficient Asphalt

Pavement which is unsatisfactory in the opinion of the City Engineer by reason of faulty materials or methods of mixing and/or placement shall be repaired, removed, replaced or otherwise corrected, as directed by the City Engineer.

B.6.3 Test Results

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE B – HIGHWAYS

B.7 STANDARD DRAWINGS

B.7.1 **The following City of Fernie Standard Drawings shall form part of this schedule.**

<u>Drawing No.</u>	<u>Drawing Description</u>
B-1	Urban Arterial Highway (Undivided) 25.0 m R/W
B-2	Urban Arterial Highway (Divided) 30.0 m R/W
B-3a	Urban Collector Highway With Parking
B-3b	Urban Collector Highway Without Parking
B-4	Urban Local Industrial Highway
B-5	Urban Local Residential Highway
B-6	Rural Highways
B-7	Urban Residential Cul-De-Sac
B-8	Urban Cul-De-Sac Bulb Layout
B-9	Walkway and Lane
B-10	Typical Boulevard Construction
B-11	Private Road – No Parking
B-12	Concrete Swale

SCHEDULE C

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE
DESIGN AND CONSTRUCTION OF CURBS AND GUTTERS,
SIDEWALKS AND BOULEVARDS**

This is Schedule C of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE C - CURBS AND SIDEWALKS

SCHEDULE C

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE
DESIGN AND CONSTRUCTION OF CURBS AND GUTTERS,
SIDEWALKS AND BOULEVARDS**

C.1 GENERAL

C.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.

C.1.2 Approval of Engineering Drawings Required prior to Construction

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

C.1.3 Curb, Gutter and Sidewalk Requirements

For all rural standard highways, curb, gutter and sidewalk are not required. Curb, gutter and sidewalk shall be provided for urban standard highways as follows:

Residential Zones

Highway Classification	Curb Type Required	Minimum Sidewalk Widths
Arterial	Non-mountable concrete	As Per Standard Drawings
Collector	Roll type concrete	As Per Standard Drawings
Local	Roll type concrete	As Per Standard Drawings

Commercial and Industrial Zones

All Highways - Non-mountable concrete

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE C - CURBS AND SIDEWALKS

C.1.4 Location of Sidewalks

Where sidewalk is required on one side of a highway 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.

C.2 DESIGN CRITERIA

C.2.1 Design Gradient

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

C.2.2 Curb Return

The minimum curb return radius shall be as set out in Section B.3.2.2 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.

C.2.3 Grading of Boulevards

Upon completion of road, curb and gutter and sidewalk constructions, boulevards shall be shaped and graded as shown on Standard Drawing B-10. Native material and 100 mm of top soil shall be placed flush with the top of curb or back of walk and shaped to conform with general parcel grading. Unless otherwise approved, boulevards shall be graded to drain to the curb at a minimum slope of 3% and a maximum slope of 8%. The first metre of boulevard directly behind the curb shall be essentially flat to facilitate snow removal operations.

C.2.4 Sidewalk Cross Section

Concrete sidewalks shall have a thickness not less than 100 mm and shall be constructed consistent with the Standard Drawing C-5. Cross fall shall be 2% towards roadway. In localized sidewalk repair sections where there is no existing curb and gutter with approval of the City Engineer the sidewalk rehabilitation section shown on drawing C-6 may be used.

C.2.5 Driveway Access

Maximum driveway access grade shall be 8% for City boulevards in accordance with Standard Drawing No. B-10.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE C - CURBS AND SIDEWALKS

C.2.6 **Curb and Gutter Cross Section**

Curb and gutter shall be constructed consistent with Standard Drawing C-1 and C-2.

C.2.7 **Curb and Gutter Commercial Crossovers**

Commercial crossovers shall be provided at all access locations for usage other than residential. Commercial crossovers shall be constructed consistent with Standard Drawing C-3.

C.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 Drawing C-4.

C.3 **MATERIALS**

C.3.1 **Base Material**

Base material shall be granular 25 mm crushed gravel base course conforming to gradation limits as referenced in Schedule B, Section B.4.5.2.

C.3.2 **Concrete** (Amend concrete specifications to reduce chance of unacceptable products)

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

- a) 30 MPA at 28 days;
- b) Maximum aggregate size 19 mm for hand-formed; 10 mm for extruded;
- c) Maximum Slump - 80 mm for hand-formed; 25 mm for extruded;
- d) Air entrainment shall be between 6% and 8%.
- e) Minimum Portland Cement Content of 350 mg/m³

Bylaw No. 1862

C.3.3 **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 manufacture.

C.3.4 **Boulevards Top Soil**

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE C - CURBS AND SIDEWALKS

C.3.5 Driveway Approaches *(Add reinforcement to driveways to reduce cracking)*

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 and suitable granular base material. All driveway approaches shall be reinforced as directed by the City Engineer.

Bylaw No. 1862

C.4 WORKMANSHIP

C.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 City Engineer or granular aggregate. All fill material shall be compacted to 100% Standard Proctor density.

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

C.4.2 Sidewalk 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 10M bars on 300 mm centres both ways. 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 Standard Drawings C-3.

C.4.3 Placing and Finishing Concrete

The City Engineer shall be notified forty-eight 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 and contraction joints shall be trowelled smooth to a width of 50 mm and rounded to a radius of 25 mm.

During hot, cold, or dry 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, gutter shall be monolithic unless otherwise approved by the City Engineer.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE C - CURBS AND SIDEWALKS

Curb and gutter contraction joints shall be made at a maximum of 3.0 m intervals.

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 walk is adjacent to an improvement constructed with rigid materials.

Contraction joints shall be cut at every 3.0 metres by means of a marking tool or other approved method. Joints shall not be less than half the slab thickness in depth, or sawcut full depth, and 6 mm in width. The edges of the joint shall be rounded off with an edger having a radius of 25 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 catch basins shall be cut through the full width of the sidewalk in line with both outside edges of the catch basin 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 City Engineer.

Expansion joint material, 15 mm thick, and the full depth of the sidewalk, shall be placed around all rigid structures which are adjacent to, 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; or at 100 m intervals. If the construction begins or terminates within the middle of the block, also mark these locations or as directed by the City Engineer. In addition, a similar mark shall be embossed on the corner on each apron and driveway.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE C - CURBS AND SIDEWALKS

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. Similarly, the letter "C" shall be marked at the back of sidewalk where the sidewalk crosses a water service.

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.

C.4.4 Curing Concrete

Between April 1 and October 1, concrete shall be sprayed with two coats of an approved membrane curing compound as soon as the concrete has obtained its initial set. Prior to April 1, or after October 1, alternate methods of curing concrete must be used and the method approved by the City Engineer.

C.4.5 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.

C.4.6 Boulevard Improvement

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

C.5 TESTING

C.5.1 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 shall 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 City Engineer for review and approval.

C.5.2 Concrete Conformance

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE C - CURBS AND SIDEWALKS

C.6 STANDARD DRAWINGS

C.6.1 The following City of Fernie Standard Drawings shall form part of this schedule.

<u>Drawing No.</u>	<u>Drawing Description</u>
C-1	Non-Mountable Curb & Gutter
C-2	Mountable Curb & Gutter
C-3	Typical Crossover
C-4	Typical Wheelchair Ramp
C-5	Standard Separate Sidewalk
C-6	Sidewalk Rehabilitation with no Curb and Gutter

SCHEDULE D

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND
INSTALLATION OF WATER SYSTEMS**

This is Schedule D of the City of Fernie
Subdivision and Development Servicing Bylaw
No.1727

Clerk

SCHEDULE D - WATER SYSTEMS

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

D.1 GENERAL

D.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 water mains, 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 City Engineer.

D.1.2 Approval of Engineering Drawings Required prior to Construction

Engineering drawings showing detailed design of the necessary works shall be submitted to the City Engineer for approval. Engineering drawings shall also be submitted for approval to the regional Public Health Engineer of the Ministry of Health of the Province of British Columbia. The Ministry of Health's Final Certificate shall be submitted to the City Engineer prior to construction of any water system. No construction shall commence until the engineering drawings have been approved by the City Engineer and the 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 City of Fernie at the Applicant's expense.

D.2 DESIGN CRITERIA

D.2.1 Capacity of System and Sizing of Water Mains

Water distribution systems shall be designed to deliver water in adequate quantities and 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 C=130 and 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

D.2.2 Domestic Demand Criteria

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

Average day: 1000 litres/capita/day

Maximum Day: 2100 litres/capita/day

Peak Hour/Maximum day Consumption Ratio: 2.0

For other than residential areas, the demand criteria shall be selected to suit the particular circumstances subject to the Approval of the City Engineer.

D.2.3 Fire Flow Requirements

Water distribution systems shall also be designed to ensure that fire flows as required by the Insurers' Advisory Organization (IAO) are available for required durations. Fire flows shall not be less than 3640 litres per minute. The amount and duration of design fire flows shall be provided to the City Engineer for his approval prior to final design of the water distribution system.

D.2.4 Design Pressures

Water systems shall be designed for pressures in the range of 280 KPa to 670 KPa, with 280 KPa measured under peak hourly conditions and 670 KPa measured under static conditions. The minimum pressure shall be measured or calculated at the main floor elevation of the highest proposed house and an allowance made for pressure loss in the service line to the house wall. Minimum residual pressure at any hydrant shall not be less than 140 KPa under maximum day domestic consumption plus fire conditions. Reservoir level shall be assumed at mid point for calculation of minimum pressures and full for calculation of maximum static pressures.

D.2.5 Minimum Pipe Size

Watermain pipe size shall be determined by sizing to provide adequate fire protection.

The minimum pipe size for all water mains shall be 150 mm diameter. The City may require water mains larger than 150 mm in diameter if the watermains are on large distribution or transmission routes.

D.2.6 Location and Grade of Water Mains

Water mains shall be located in the road right-of-way as shown on Standard Drawings of the road cross sections, unless otherwise approved by the City Engineer.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

There shall be a minimum lineal horizontal clearance of 1 metre between a water main and other existing or proposed underground services, except sanitary sewer mains. A minimum of 3 metre horizontal distance between a watermain and a sanitary sewer main shall be maintained. In special cases such as installations in rock or hardpan, the horizontal clearance may be reduced, with the approval of the City Engineer and the Ministry of Health, provided the invert of the water main is a minimum of 450 mm above the crown of the sanitary sewer. On side-hill streets, the main shall, where possible, be located on the cut side of the centerline of the street.

Water mains shall be normally designed to follow a straight alignment between intersections, at grades parallel to the road centerline.

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 engineering drawings shall indicate the method for achieving the curvature. Joint deflection shall only be permitted when undertaken according to the pipe manufacturer's specifications.

Water mains shall be designed with a rising grade wherever possible to minimize high points in the main. Where a high point is unavoidable, either a hydrant, or air release valve shall be installed at that point.

Installation of supplementary mains of a minimum of 150 mm diameter may be required at the discretion of the City Engineer and may necessitate the provision of rights-of-way in favour of the City of Fernie. Supplementary mains shall be installed at the Applicant's cost.

No gas main, electric or telephone duct or other utility line shall be installed in the same trench with water mains, except as permitted by the City Engineer (eg. control cables).

Where it is necessary for the water main to cross other underground services, the crossing shall be made at an angle greater than 20 degrees and the vertical clearance between services at the crossing point shall be not less than 300 mm except for sanitary sewers where the clearance shall be 450 mm between the exterior walls of the pipes.

The drawings shall indicate whether the water main passes over or under other underground services which it is crossing.

D.2.7 Spacing of Fire Hydrants

Fire hydrants, shall be located, in general, at highway intersections and at 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 City Engineer at schools, multiple family developments, commercial buildings or other major developments consistent with the current fire

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

flow requirements of the Canadian Underwriters' Association (CUA). Whenever possible, hydrants shall be located near the highest and/or lowest point of the water main.

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 fire fighting equipment 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, within 1 m of the back of curb or back of sidewalk, or within 1 m of the property line of a road right of way.

D.2.8 Line 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 30 single family services and no more than one hydrant taken out of service. Valves should not be spaced more than 250 m apart on a continuous mains.

A line valve may be required on a new pipe line near each point of connection to an existing main. Where a water main is located in a right of way on private property, a line valve may be required where the main enters and exits the property.

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

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

D.2.9 Blow Offs

Permanent blow offs shall be installed at all dead-ends as required by the Ministry of Health and as shown on Standard drawing No. D-5.

Temporary blow offs (usually a corporation cock) may be installed to facilitate chlorination and flushing of any part of the system. After flushing, the temporary blow off shall be removed as directed by the City Engineer.

D.2.10 Air Relief Valves

Provisions for air release shall be made at all critical high points throughout the water system. 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. Where required, air valves shall be installed as shown on standard drawing No. D-6.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

D.2.11 Fittings and Appurtenances

Fittings and appurtenances with other than standard hub ends shall be so indicated on the engineering drawings.

Where practical, all fittings shall be located in respect to each other so that flanges or standard pipe lengths can be used to connect them.

The centre-to-centre dimension between fittings near each other shall be shown on the final engineering drawing.

D.2.12 Services

The diameter of water services shall be determined by the City Engineer. In no case shall the diameter be less than 19 mm.

Water services shall be installed to the property in accordance with Standard Drawing No. D-1 and shall be installed, whenever possible, in a common trench with the sanitary sewer service.

The curb stop at the end of each service pipe shall be 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 City Engineer.

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

D.2.13 Pipe Alignment and Depth of Cover

Pipe shall be installed true to the alignment shown on the approved engineering drawings and to a depth sufficient to provide all services with a minimum cover of 2.4 m to the top of the service anywhere within the Right-of-Way unless approved by the City Engineer.

D.2.14 Rights-of-Way

Where the location of the water main within the road right-of-way is not practical due to topography or other factors, the water main shall be located in a utility right-of-way registered in favour of the City of Fernie and having a width of not less than 6.0 metres. The City Engineer may require a utility right-of-way wider than 6.0 metres in the case where services in addition to water mains will be placed in the same right-of-way or where the depth of the water main requires a wider easement.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

D.2.15 Reservoirs

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

Total Storage Requirement = A + B + C

where A = Fire Storage
 B = Equalization Storage (25% of maximum day demand)
 C = Emergency Storage (15% of A + B)

.1 Reservoir design shall incorporate the following features:

- a) structures to be below ground, covered and protected from freezing unless specifically approved otherwise;
- b) material - reinforced concrete;
- c) 2 cells, each containing one-half of total required volume and capable of being drained and filled independently;
- d) 1 access opening in roof of each cell for cleaning and maintenance - minimum dimension 1 m x 1 m each.
- e) ventilation pipes or openings;
- f) slope floor to sump;
- g) sub-drain under floor to collect and drain any leakage and/or groundwater;
- h) interior wall ladder from roof access to floor (no exterior ladder required); above ground reservoirs require ground level manway;
- i) inlet, outlet pipe to be perforated and designed to disperse water throughout the reservoir;
- j) overflow drain to be provided and sized to bypass the maximum pump discharge. The overflow drain shall be connected to an acceptable point of disposal;
- k) access roads;
- l) SCADA monitoring and alarm system connected to the City's systems.
- m) 3 sets of equipment and operations manuals.
- n) Remote operation of valves, controls and operating devices.

Bylaw No. 1862

.2 Reservoir valve chamber design shall incorporate:

- a) sump in valve chamber floor, connected to overflow pipe or drain system;
- b) valves shall be OS & Y (with hand wheel) when located in a valve chamber, valves shall be NRS complete with valve boxes for buried valves.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

D.2.16 Pump Stations *(Enhance requirements to connect to City SCADA System and WCB Requirements)*

Pump stations, where required, shall be designed to suit the particular circumstances. In general, pump stations which feed an on line equalization reservoir shall be designed to meet maximum daily demands with the largest pump out of service. If equalization storage is not on line, pump station capacity must meet peak hour demand with the largest pump out of service.

.1 Pump station design shall incorporate the following features:

- a) reinforced concrete, blockwork or brick construction, or an alternate which is aesthetically pleasing, as approved by the City Engineer;
- b) access doorways sized so that the largest single piece of equipment may be safely removed and replaced. Lifting hooks or rails with pulley blocks as required;
- c) pumps to start and stop individually. Start and stop to be based on water levels in control reservoir (for pumps supplying reservoirs). Automatic alternation of pump sequence. Alternate switch between pumps #1 and #2;
- d) power failure protection with automatic reset with staggered pump restarts;
- e) high water override start plus alarm;
- f) high pressure (discharge) override start;
- g) low pressure (discharge) override start plus alarm;
- h) low pressure/no flow (suction) override start;
- i) H-O-A switch to override emergency shutdowns,
- j) alarms to be audible and visible;
- k) control valves to minimize starting and stopping surges;
- l) solid-state reduced voltage starters with motor ramp -down capability,
- m) pump stations providing pressure to a distribution system require variable frequency drives and PLC control,
- n) duplicate control cables (without splices) between pump stations and reservoirs unless otherwise controlled through B.C. Tel connections;
- o) power factor correction as required by Power Authority;
- p) hour meters on each pump;
- q) digital recording flow meter at each pump station;
- r) digital recording suction and discharge pressure gauges at each pump station;
- s) automatic heating, ventilating and dehumidifying systems;
- t) in-station lighting;
- u) drainage to be provided for all areas of the pump station;
- v) SCADA and alarm system to be connected to the existing City system;
- w) electrical phase loss protection;
- x) electrical drawing schematics for control panels;
- y) paved access roads;
- z) high efficiency motors.
- aa) Remote operation of valves, control and operating devices.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

For each design submission to the City, an extra set of engineering drawings pertaining to the design of the pump station, key plan, and a location plan shall be submitted for the maintenance department to review.

Before commencement of construction, the Applicant shall provide five sealed sets of mechanical shop drawings and five sealed sets of electrical line diagrams for review by the City Engineer. Two sealed copies of design calculations shall be provided for documentation. Before acceptance of the completed station, by the City, the

.2 The Applicant shall provide 3 copies of an Operation and Maintenance Manual to the City. The manual shall contain:

- a) As constructed shop drawings.
- b) Equipment layout drawings.
- c) Electrical, control, and alarm wiring diagrams.
- d) Operating instructions for the station and for all equipment.
- e) Maintenance instructions for all equipment, including frequency of maintenance tasks.
- f) Equipment data sheets.
- g) Certified head/capacity curves for pumps.
- h) Equipment part lists.
- i) Emergency operating procedures.
- j) Operating Procedures, as required by the Workman's Compensation Board, Province of British Columbia.
- k) SCADA Design information.

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

D.2.17 Access

Vehicular access shall be provided to all reservoirs and pump stations. The minimum standard shall be as for a Rural Local Highway, as shown on Standard Drawing No. _B-6, except with a minimum width of 6.0 metres and with curbing and drainage provisions as may be required by the City Engineer.

D.2.18 Cathodic Protection

Corrosive soils have been encountered in Fernie and the City Engineer may require a geotechnical report on soil and ground water conditions in the development or subdivision area.

SCHEDULE D - WATER SYSTEMS

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.

Subsequent engineering drawings submitted to the City for approval would clearly show the location of all anodes as well as any test points required by the City. Wiring schematics will be shown on the drawings.

D.3 MATERIALS

D.3.1 Pipe

Pipe for water mains shall be polyvinyl chloride (PVC). PVC pipe shall conform with the latest edition of AWWA C-900 and CSA CAN3-B137.3 for mains 100 - 300 mm dia. and with the latest edition of AWWA C-905 and CSA CAN3-B137.3 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.

D.3.2 Fittings

.1 Cast Iron and Ductile Iron Fittings

Cast and ductile iron fittings (i.e. tees, crosses, bends, reducers) sizes 100 mm to 400 mm shall conform to the latest edition of ANSI/AWWA C110 and ANSI/AWWA C153. Fittings shall have bell-ends and shall be supplied complete with vulcanized synthetic rubber gaskets conforming to the latest edition of ANSI/AWWA C111. Flanges, if approved, shall conform to the latest editions of ANSI/AWWA C110 and ANSI B16.1. The exterior of all fittings, shall be factory coated with a 100% solid, thermosetting, fusion bonded, dry powder epoxy resin, conforming to the latest edition of AWWA C213.

.2 Polyvinyl Chloride (PVC) Fittings

PVC injection-molded fittings i.e. tees, elbows, single and double tapped couplings, line and repair couplings, reducers, and plugs, shall be Class 150 conforming to the latest editions of UNI-B-12, AWWA C907 and CSA B137.2.

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

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

D.3.3 Buried Gate Valves

Buried gate valves shall conform to:

- .1 The latest edition of AWWA C-509 epoxy coated iron body, resilient seated valves with non-rising stem, O-ring stem seal, suitable for 1 MPa minimum; or
- .2 The latest edition of AWWA C-500 iron body, bronze mounted wedge 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.

D.3.4 Valve Boxes

Valve boxes shall be Nelson type with anchored flanges approximately 100 mm from the top of the box.

For gate valves under 200 mm, the riser pipe shall be 150 mm diameter PVC (SDR 35) pipe.

For 200 mm or larger gate valves, a cast iron bottom box or a PVC (SDR 35) reducer shall be used in conjunction with a 150 mm diameter PVC (SDR 35) riser pipe.

In no case shall either the riser pipe or bottom box bear on the valve or water pipe.

Extension rods are required for valve nuts greater than 2.7 m deep.

Rock guards shall be installed with all valve boxes and operation rods.

D.3.5 Hydrants (Amend color of hydrant for “dry” hydrants)

All hydrants shall be Canada Valve "Century" or McAvity "Brigadere", and shall be equipped with two 64 mm (nominal I.D.), 8 thread per inch (B.C. Standard) hose ports and one 130 mm O.D. pumper port.

Hydrants are to be painted red.

Hydrants in high water table areas may be required to have drains plugged. The hydrants with drains plugged shall have the tops and caps painted yellow and be marked FOR FIRE USE ONLY. These hydrants will have to be pumped after use.

The minimum depth of bury shall be 2.4 m and is defined as the distance from the invert of the suction elbow to the underside of the gradeline flange.

Bylaw No. 1862

D.3.6 Service Connection Pipe, Saddles, and Joints

All pipe for underground services 50 mm diameter and smaller shall be Type K annealed copper conforming to the latest edition of ASTM B88 or Kypex when approved by the City Engineer. Pipe for services 100 mm and 150 mm diameter shall be as specified for the watermain pipe.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

Service connections to PVC pipe shall be made using bronze saddles with either bronze or stainless steel fasteners tapped for AWWA threads. 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.

For ductile iron water mains, 19 mm diameter service connections may be tapped directly into mains 150 mm diameter and greater; 25 mm diameter service connections may be tapped directly into mains 200 mm diameter and greater; and 40 mm and 50 mm diameter service connections shall be made using double strap service saddles. For PVC water mains all service connections must be made with double strap service saddles. Multiple corporation stops shall be staggered and not less than 600 mm apart. Joint fittings shall be compression type suitable for 1 MPa working pressure.

D.3.7 Corporation Stops

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

D.3.8 Curb Stop and Boxes

In non high water table areas, curb stops shall be ball-type Mueller or Ford with a stop and drain.

In high water table areas, curb stops shall be ball-type Mueller or Ford with a stop only.

D.3.9 Coupling Clamps

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

D.3.10 Meters

Meters are required, and shall be installed indoors for single family dwellings or in an outdoor enclosure for parcels containing multiple units at the Applicant's expense. Location shall be as approved by the City Engineer. All meters shall be easily accessible to the City.

.1 Outside meter chambers, vaults or enclosures shall include:

- a) watertight underground structures
- b) drainage and ventilation
- c) protection from freezing
- d) adequate access and interior space for maintenance and equipment removal
- e) minimum headroom of 2.0 m
- f) permanent ladder to WCB standards
- g) piping primed and painted with a rust-inhibiting paint

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

- h) metering and readout devices as required
- i) meter bypass

D.3.11 Concrete

All concrete shall conform to CSA:A23.1 with a minimum 28-day compressive strength of 20 MPa for unshrinkable fill, thrust blocks and all other non-structural concrete works associated with Schedule D. 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 City Engineer or dictated otherwise by soil conditions.

Admixtures shall not be included in the concrete mix without the approval of the City Engineer.

D.3.12 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-9 is required unless the City Engineer specifically approves class C bedding. Pipe class and bedding class must be identified on all engineering drawings.

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 for Class B Bedding.

D.3.13 Backfill Material Above Pipe Zone

Backfill material above the pipe zone shall be as shown on Standard Drawings No. D-10.

D.4 WORKMANSHIP

D.4.1 Trench Excavation

Trenches shall be excavated to suit the cross-section shown on Standard Drawing D-10. Open trenches through existing paved surfaces will be allowed only with the prior express consent of the City Engineer. 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 centerline.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

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 the Workers' Compensation Board.

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 City Engineer.

The attention of the Applicant is directed to the provisions of the Workers' Compensation Board 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 98% Standard 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 is soft and is, in the Developer'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 Developer's Engineer.

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

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 Workers' Compensation Act. 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 City Engineer, 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 sub-base road 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 City Engineer 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 roads or walks, or injury to the public or damage to the environment.

D.4.2 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. When pipes are not being installed, the open end of the newly laid pipeline shall be protected to prevent the entry of any foreign material.

D.4.3 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

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.

D.4.4 Backfill Above Pipe Zone

.1 In Travelled Areas

In road areas trench backfill material shall be placed in layers not exceeding 300 mm in thickness and compacted by mechanical means to a minimum of 100% Standard Proctor density as shown on Standard Drawing D-10.

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.

.2 In Non-Road Areas

In easements and other non-roads 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 as shown on Standard Drawing D-10.

D.4.5 Thrust Blocking

Concrete thrust blocking shall be provided at fittings as shown on Standard Drawing No. D-3 and on hydrants as shown on Standard Drawing No. D-4. 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-3.

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.

D.4.6 Valves, Fittings and Hydrants

Valves, fittings and hydrants shall be set plumb and directly on the centerline of the pipe. A valve box shall be provided for every valve. The valve box shall not transmit shock or strain to the valve and shall be centered and plumb over the nut of the valve. The 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 City Engineer generally at 150 mm above finished curb grade. When set in a permanent sidewalk or

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

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.

D.4.7 Blow-Offs

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

D.4.8 Service Connections *(Increase distance of services stub into private property)*

Service connections shall be installed as shown on Standard Drawing No. D-1.

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

Service connection pipe shall be connected to the Corporation stop and a gooseneck formed as shown on Standard Drawing No. D-1. 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 600 mm. No tappings shall be made at an angle of greater than 30 degrees above the horizontal centerline plane of the pipe.

Service boxes shall be set flush with ground or road surface. 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 3000 mm into private property. ***Bylaw No. 1862***

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.

D.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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

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

D.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.

D.4.11 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 Developer's Engineer shall submit a report to the City Engineer indicating that flushing was performed in conformance with this section.

D.4.12 Chlorination

On completion of the flushing operation, main pipes and services shall be chlorinated. Chlorination procedures shall conform to AWWA C651. 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, the chlorine solution shall be injected at a measured rate such as to fill the main with a 50 mg/l available chlorine solution.

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. Any water with residual greater than 2.5 mg/L shall be diluted prior to discharging to an open ditch. 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 not be discharged to a recognized water course without the 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

A log of all test results and disinfection procedures shall be submitted to the City Engineer.

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 City Engineer.

D.4.13 Tie-ins to Existing Water Mains

Tie-ins to existing water mains shall not be made until after the new lines have been flushed and tested. Connection of a new pipe to an existing water main shall be done by the Applicant and supervised by the City. 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 engineering drawings. Only the City may operate valves on the existing water mains. Application for tie-in shall be made at least one week in advance of the proposed work.

D.5 TESTING

D.5.1 Leakage Tests

Following final trench backfilling, leakage tests shall be performed on all installed piping according to AWWA Standard C600, latest edition. Tests shall be conducted in the presence of the City Engineer with 24 hour notice provided to the City 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 1 1/2 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 shall be shut off at the hydrant such that the hydrant is not placed under test. The shut-off valve on the line valve to the hydrant shall be open. 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 kPa

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE D - WATER SYSTEMS

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.

D.5.2 Compaction Test

The City shall be provided with copies of all sieve and compaction test results pertaining to bedding backfill and road 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.

D.6 STANDARD DRAWINGS

D.6.1 The following City of Fernie Standard Drawings shall form part of this schedule.

<u>Drawing No.</u>	<u>Drawing Description</u>
D-1	Typical Water Service Connection Detail
D-2	Standard Watermain Realignment
D-3	Standard Pressure Main Thrust Block Details
D-4	Standard Hydrant Detail
D-5	Standard Blow-off Detail
D-6	Combination Air Release Valve
D-7	Standard Valve Box Assembly
D-8	Standard Watermain and Sewermain Anchors
D-9	Standard Classes of Pipe Bedding and Surround within Pipe Zone
D-10	Typical Trench Section for Underground Utility Installation
D-11	Typical Water, Sanitary and Storm Service in Common Trench
D-12	Concrete Encasement Detail
D-13	Standard Underground Utility Paint Markings
D-14	Encasement & Carrier Pipe Detail

SCHEDULE E

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND
CONSTRUCTION OF SANITARY SEWERS**

This is Schedule E of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

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

E.1 GENERAL

E.1.1 General Requirements

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 City Engineer.

Bylaw No. 2102

E.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 City of Fernie. All standards not specifically covered in these standards shall be as directed by the City Engineer.

E.1.3 Approval of Engineering Drawings Required Prior to Construction

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

E.2. DESIGN CRITERIA

E.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 City Engineer.

Sewage design flows shall be based on the equivalent population of the contributing area as determined by the City Engineer but no less than the permitted density in accordance with the City

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

of Fernie Zoning Bylaw with an average per capita flow of 550 litres per day. A peaking factor calculated using the Harmon Peak Factor curve shall be applied to the average flow as follows:

$$\text{Peak Factor} = \frac{18 + \text{square root of } p}{4 + \text{square root of } p}$$

Where p = equivalent contributing population in thousands.

An infiltration rate of 33 L/mm diameter/km of main/day including manholes shall be used.

The peaking factor shall be applied to the sanitary contribution only and not to the infiltration allowance.

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

E.2.2 Minimum Velocity and Grade

Minimum velocity for pipe flowing full or half full shall be 0.75 metres per second. Minimum grades are as follows assuming a Manning's pipe roughness coefficient "n" of 0.013.

Diameter	Minimum Grade	Diameter	Minimum Grade
100 mm	2.00%	375 mm	0.23%
150 mm	1.00%	400 mm	0.21%
200 mm	0.60%	450 mm	0.18%
250 mm	0.40%	525 mm	0.15%
300 mm	0.32%	600 mm	0.13%
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.

E.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.

E.2.4 Depth of Cover

The depth of the main shall be sufficient to provide all service connection piping with a minimum cover of 1.5 m to top of the service piping anywhere within the finished right-of-way. Sanitary

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

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 City Engineer. Where the cover over the pipe is less than 1.5 m., the main will be insulated as directed by the City Engineer. Sewer mains shall be protected from freezing in all instances including occasion when a sanitary sewermain crosses over a culvert exposed to ambient air temperatures.

E.2.5 Manhole Spacing

Manholes shall be installed at a maximum spacing of 125 m for 375 mm diameter and smaller sewers, 155 m for 450 to 750 mm diameter sewers, 185 m for 900 mm diameter and larger sewers and in the following locations:

- .1 at the end of each line where clean outs are not provided;
- .2 at all changes in grade and/or alignment (for non curvilinear sewers);
- .3 at all changes in pipe size;
- .4 at all pipe junctions and intersections;
- .5 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-2. In cases where these details will not suffice, a detailed design drawing must be approved by the City Engineer.

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-3.

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.

E.2.6 Clean outs

Clean outs, rather than manholes, may be permitted at the end of non-extendable sewer mains in non-travelled areas with the consent of the City Engineer. Clean outs shall be constructed in conformance with Standard Drawing E-8.

E.2.7 Service Connections

The diameter of sewer services shall be determined by the City Engineer but in no case shall the diameter be less than 100 mm. The pipe grade for sewer service pipes shall be a minimum of 2%.

Sewer services shall be installed in accordance with Standard Drawings E-1 and shall be installed, wherever possible, in a common trench with the water service.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

Service connections shall be made with an approved branch wye or saddle and be installed in a straight line and at a uniform grade from the terminus at the property line to the 45 degree long radius bend at the main. In high ground water areas, determined by the City Engineer, service saddles are not permitted, services wyes shall be used.

In areas where the depth of the service pipe at the main is less than that of the pipe main, service risers shall be constructed consistent with Standard Drawing E-1.

For services 200 mm and larger, a manhole shall be installed at the intersection of the main and the service. A wye or saddle will not be accepted for services 200 mm or larger.

E.2.8 Location of Sewer Mains

Sanitary sewer mains shall, wherever possible be located in the road right-of-way as shown on the Standard Drawings for the road cross-sections.

E.2.9 Rights-of-Way

Where the location of the sewer main within the road 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 City of Fernie and having a width of not less than 6.0 metres. The City Engineer 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

E.2.10 Alignment of Sewer Mains

Sewer mains shall generally be designed to follow a straight alignment between manholes. Curved alignments within rights-of-way may be approved by the City Engineer, provided that the pipe is set at a grade greater than the specified minimum and the pipe alignment is at a parallel offset with an established boundary. In these cases, the radius of curvature shall be not less than 30 metres, or twice the minimum radius recommended by the pipe manufacturer, whichever is the greater.

E.2.11 Sanitary Forcemains and Lift Stations

(Enhance requirements to connect to City SCADA System and WCB Requirements)

.1 Pre-design Requirements

The objective of the City of Fernie is to minimize the number of sewage lift stations required and thoroughly consider other options to avoid lift stations wherever practical. The designer shall obtain approval from the City Engineer as to the siting of the lift station.

Prior to commencing detailed design of a lift station, the designer shall submit a pre-design report

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

that addresses the design considerations of this criteria to the City Engineer. Approval of the pre-design concepts must be obtained prior to the designer commencing detailed design. The City Engineer will determine if standby power will be required at the lift station.

This criteria covers both dry well and submersible sewage lift stations. Larger capacity sewage lift stations or lift stations with special design or siting requirements may require additional assessment and review of criteria.

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

- a) Lift stations shall be designed to handle the flows of the designated catchment area.
- b) Type of station and impact on neighbours.
- c) Construction dewatering requirements.
- d) Access for construction and maintenance complete with asphalt driveway or approved equivalent of sufficient strength to handle heavy trucks and with enough space to turn around.
- e) Aesthetics, noise, odour, and landscaping requirements.
- f) Security against vandalism and theft.
- g) Flood elevations. Station uplift design shall be based on maximum flood level.
- h) Proximity of receiving sewers, watermains, and adequate power supply.
- i) Minimizing energy requirements.
- j) Standby power and its requirements and compatibility.
- k) Soils investigation shall be undertaken prior to site approval being given.
- l) Convenience of operation and maintenance.
- m) Safety of operators and the public.
- n) Capital costs and operation and maintenance costs.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

.2 Design Requirements

All sewage lift stations shall meet the following design requirements.

- a) Pumps shall meet maximum flow condition with one pump in failure mode. The pump shall handle the maximum flow with the smallest impeller for that pump size to allow for any future expansion.
- b) Pumps shall operate alternately. However, a further safety feature shall allow for both pumps to operate at the same time during extreme flows.
- c) Pumps shall have non-clog impellers that will pass a 60 mm minimum spherical solid.
- d) Control panel shall be mounted in the dry well or in a suitable kiosk on a concrete pad and it shall contain a Crouse Hinds (or equivalent) receptacle with reverse contacts and manual transfer switch suitable for connecting standby power at 347/600 volts and should be capable of handling the pumps with the largest impeller installed and running simultaneously. Also an extra power outlet for small hand tools operating at 110/220 volts.
- e) Sloping bottom and filleted corners in wet well to direct the flow to the pump suction inlet and prevent solids deposition.
- f) Minimum 19 mm water service as shown in Standard Drawing No. S-2 for wash down complete with a pressure reducer and hose bib. An approved back flow preventer must be installed.
- g) Liquid level sensing system shall be by ultrasonic as provided by Milltronics (or equivalent) or EHN-10 float switches as provided by Flygt Canada Ltd. or an equivalent acceptable to the City Engineer.
- h) PCL controlled complete with SCADA monitoring and alarm system connected to the City systems. **Bylaw No. 1862**
- i) Emergency pump-out arrangement approved by the City Engineer.
- j) Sufficient access to remove components for repair.
- k) Minimum 150 mm diameter steel pipe vent with vandal proof screen on outlet for the ventilation of the wet well, Explosion-proof exhaust fan which has sufficient capacity to air exchange requirements of the Workman's Compensation Board.
- l) A check valve and a shut-off valve for each pump must be provided to quality and type suitable to the City Engineer. Locate the shut-off valve and where possible the check valve in a horizontal position. Where surge pressures for check valve would be excessive, an electric activated slow closing resilient seated eccentric plug valve, with battery standby may be required.
- m) A Workers' Compensation Board approved aluminum or galvanized steel ladder

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

- for access to wet well and dry well.
- n) Sump pump for the interior of the dry well discharging above the TWL in the wet well.
 - o) If standby power is not determined to be required by the City engineer, a minimum 2 hour storage between the high level alarm and the start of overflow to be provided within the wet well and influent pipes at peak wet weather flow.
 - p) The wet well shall be sized to allow a minimum of 3 minutes to elapse between successive pump starts at peak flow conditions to prevent pump burn-out.
 - q) Emergency overflow should prevent flooding of buildings connected to the sewer system and prevent damage of components in the lift station. Overflow should be to a confined storage area.
 - r) All equipment must be CSA approved.
 - s) An explosion proof light with protective cover activated by a switch inside the kiosk should be provided.
 - t) A gate valve on the pressure line outside of the pump station is required.
 - u) Bell mouth on pump intake required on all dry well pumps.
 - v) Inside deck plates to be light weight fibre glass or aluminum complete with stainless steel hinges. Open grate deck plates preferred.
 - w) Special flex joints shall be used at the inlet and outlet pipe such as Flex-Tend by EBAA Iron Inc. or an approved equivalent.
 - x) The outlet pipe and all other connections to the station shall be brought to within 1.5 m of the expected ground line around the pump station by the use of risers either on the inside of the station or attached to the outside of the station.
 - y) Particular criteria for submersible and for dry well stations are to be reviewed with the City Engineer.
 - z) Particular additional criteria for major lift stations may be required by the City Engineer.
 - aa) Remote operation of valves, controls and operating devices.

.3 Design Submissions:

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

Before commencement of construction, the Developer's Engineer shall provide five sealed sets of mechanical shop drawings and five sealed sets of electrical line diagrams for review by the City

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

Engineer. Two sealed copies of design calculations shall be provided for documentation. Before acceptance of the completed lift station, by the City, the Developer's Engineer shall provide 3 copies of an Operation and Maintenance Manual to the City. The manual shall contain:

- a) As constructed shop drawings.
- b) Equipment layout drawings.
- c) Electrical, control, and alarm wiring diagrams.
- d) Operating instructions for the station and for all equipment.
- e) Maintenance instructions for all equipment, including frequency of maintenance tasks.
- f) Equipment data sheets.
- g) Certified head/capacity curves for pumps.
- h) Equipment part lists.
- j) Emergency operating procedures.
- k) Operating Procedures, as required by the Workman's Compensation Board, Province of British Columbia.
- l) SCADA Design information.

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

.4 Access

Paved vehicular access shall be provided to sewage pumping stations. The minimum standard shall be as for a Rural Local Highway, except with a minimum paved width of 6.0 m and with curbing and drainage provisions as may be required by the City Engineer.

.5 Force Mains

At the lowest pump delivery rate anticipated to occur at least once per day, a cleansing velocity of at least 0.9 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 at a point not more than 600 mm above the flow line of the gravity sewer.

The minimum size for mains discharging raw sewage shall be 100 mm diameter, unless otherwise approved by the City Engineer.

Ductile iron or steel shall be used from the pump station to the edge of the station excavation and under creeks or ditches, or, if desirable, a carrier pipe shall be used.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

Other than for metallic force mains, 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.

E.4 MATERIALS

E.4.1 Pipe and Fittings

- .1 Pipe for gravity sanitary sewer mains and for services of 200 mm in diameter and larger shall be polyvinylchloride pipe up to 600 mm in diameter, SDR 35, conforming to ASTM D3034 and CSA B182.2 (latest edition), 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.
- .2 Pipe for sanitary sewer connections of 100 mm and 150 mm diameter and for 150 mm diameter sewer mains shall be one of the following Polyvinylchloride pipe, SDR 28, conforming to ASTM D3034 and CSA B182.1 (latest edition), complete with rubber gasket joints. Maximum pipe length shall be 4 metres.
- .3 Pipes and fitting for sanitary sewer force mains shall be as approved for watermains in accordance with Schedule D or may be other types of pressure piping as approved by the City Engineer.

In all cases, other types of pipe shall be used only with the written consent of the City Engineer.

E.4.2 Pipe and Fitting Joints

Sewer pipe and fittings shall be jointed with a rubber gasket or other preformed, factory-manufactured gasket or approved material. Sewer fittings shall correspond with the respective main and service pipes and shall conform with consistent specifications for main pipe.

E.4.3 Service Junctions

Connection of services to the sewer shall be made using wye or service saddle fittings. The type of joint of the service connection pipe to the sewer main shall conform with the type of joints on the sewer main.

Preference is given to wye fittings. Where service saddles are used, however, they shall be equipped with stainless steel straps. Service saddles shall only be used with the approval of the City Engineer.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

E.4.4 Manholes

Precast concrete manhole sections shall conform to ASTM C478 and shall be minimum 1050 mm diameter with 115 mm wall thickness for mains less than 450 mm diameter; and minimum 1200 mm diameter with 125 mm wall thickness for mains 450 mm diameter and larger. Concrete for cast-in-place manholes shall have a minimum compressive strength of 20 Mpa at 28 days.

Concrete for cast-in-place manhole bases and benching shall have a minimum compressive strength of 20 Mpa at 28 days.

Precast and prebenched manhole bases of a design and construction quality acceptable to the City Engineer 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.

E.4.5 Manholes Frames and Covers

Covers shall be Trojan Country style #TF 39-C (or approved equal) with 571 mm diameter covers. Frames shall be Trojan Country Style #TF 39-F (or approved equal).

E.4.6 Pipe Class and Bedding Class

Notwithstanding other provisions of this Bylaw, 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 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 City Engineer specifically approves Class C bedding, as defined by Standard Drawing No. B-1.

Backfill from 50 mm above the springline of the pipe to the top of the pipe zone cover (pipe surround) shall be with the same material as used for pipe bedding material.

E.4.7 Backfill Material Above Pipe Zone

Backfill material above the pipe zone shall as shown on Standard Drawing No. D-10.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

E.5 WORKMANSHIP

E.5.1 Trench Excavation

Trenches shall be excavated to suit the cross-section shown on the Standard Drawing No. D-10. Open trenches through existing paved surfaces will be allowed only with the prior express consent of the City Engineer. 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 the Workers' Compensation Board.

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 City Engineer 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 City Engineer.

The attention of the Applicant is directed to the provisions of the Workers' Compensation Board 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 98% Standard 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 is soft and is, in the Developer'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 Developer's Engineer.

When the bottom of a trench is found to consist of unstable material which, in the opinion of the Developer's Engineer, cannot be removed and replaced with bedding material, a pile foundation or

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

other structural support in accordance with plans prepared by the Developer'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 Workers' Compensation Act. 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 City Engineer, 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 sub-base road 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 City Engineer 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 roads or walks, or injury to the public.

E.5.2 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.

Connection of a new pipe to an existing sewer main shall be done by the Applicant and supervised by the City. 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 engineering drawings. Application for tie-in shall be made one week in advance of the proposed work.

E.5.3 Pipe Installation

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

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 to prevent the entry of any foreign material.

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:

- .1 Horizontal deviation from the approved alignment shall not exceed 60 mm and the rate of deviation shall not exceed 40 mm in 10 metres.
- .2 Vertical deviation from true grade varies with the grade and shall not exceed the limits shown in the following table:

Grade	Max. Departure from Design Elevation	Max. Rate of Deviation
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

E.5.4 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.

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.

E.5.5 Backfill Above Pipe Zone

- .1 In Travelled Areas

In road areas trench backfill material shall be placed in layers not exceeding 300 mm in thickness and compacted by mechanical means to a minimum of 100% Standard Proctor density, as shown on Standard Drawing D-10.

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

the material aerated until the required water content is obtained.

.2 In Non-Travelled Areas

In easements and other non-roads 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 walkways are located over the pipe, compact to 100% Standard Proctor Density, as shown on Standard Drawing D-10.

E.5.6 Manholes

Manholes shall be constructed as shown on Standard Drawings No. E-2, E-3, E-5, and E-6.

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 as shown on Standard Drawing E-4. The channel 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 City Engineer. Prebenched monolithic bases are the preferred method of construction.

Precast sections shall be placed plumb with all joints sealed with flexible mastic sealant gasket to exclude the entrance of groundwater. The manholes shall be grouted at all joints inside and outside of the manhole.

Drop structures shall be constructed as shown on Standard Drawing E-3. Service connection details for sanitary manholes in cul-de-sacs are shown on Standard Drawing E-9.

E.5.7 Stubs

Blind stub sections for connection of future City sewers to the manholes shall be installed as directed by the City Engineer. The stub shall be plugged at the end with a watertight removable plug and marked by a P.W. 2" x 4" post installed to 600 mm below finish grade and extending 300mm above grade.

E.5.8 Service Connections

Service connections shall be installed as shown on Standard Drawing E-1.

Service connections shall be capped and 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 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 "red", 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

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

E.5.9 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.

E.5.10 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.

E.5.11 Cleaning and Flushing

Prior to testing, 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 acceptance, the sanitary lines shall be flushed to remove any deleterious material deposited by associated construction works.

E.5.12 Force Mains

Force mains shall be constructed and tested in accordance with Schedule D or as specified by the City Engineer.

E.6.0 TESTING

E.6.1 Lamping

Sewer mains shall be tested from manhole to manhole to check alignment and grade of the sewer pipe. Variations in line or grade from that shown on the approved engineering drawings and any jointing, pipe cleaning, or other deficiencies discovered shall be rectified. Manholes shall be inspected and any defects or deficiencies found shall be rectified.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

E.6.2 Leakage Tests

.1 Sewer Mains

Sewer mains shall be tested by a low pressure air test.

Pipe mains and services shall be clean and plugged in preparation for the test. An air supply system should have adequate valves to isolate the test section and to vent off excess air. Pressure gauges should be clean and functional. Adequate blocking shall be placed behind all plugs to prevent plugs from blowing out.

If the ground water level with respect to the pipe is not known, this level shall first be determined at the lowest point of the line under test. The external ground water pressure shall then be calculated (depth of ground water in meters above invert of pipe multiply by 9.8 = pressure in KPa).

The section of pipeline under test shall be gradually surcharged to a pressure of 27.6 KPa above ground water pressure as determined above. Time will be allowed for the air temperature to stabilize (not less than 5 minutes). If the pressure drops below 24.2 KPa (pressure refers to the amount of pressure above ground water pressure), the 24.2 KPa pressure shall be maintained from the make-up air supply. If the pressure does not drop to 24.2 KPa during the period of stabilization, the air shall be released slowly until the pressure drops to 24.2 KPa.

The time is then measured for the period that the resultant air pressure drops 6.9 KPa ie. from 24.2 to 17.3 KPa. If the time measured equals or exceeds the specified time, the test may be stopped, the readings recorded, including pressure readings, and the test considered satisfactory.

The time specified shall be as per Table E.1. If the time measured does not equal or exceed the specified time, the section of sewer main shall be checked for excessive leakage, and after repairs are made the pipeline shall be retested in the same manner.

TABLE E.1

Pipe Diameter (mm)	Time In Minutes
100	5 min. 04 sec.
150	7 min. 40 sec.
200	10 min. 12 sec.
250	12 min. 44 sec.
300	15 min. 18 sec.
350	17 min. 52 sec.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

375	19 min. 10 sec.
400	20 min. 24 sec.
450	23 min. 08 sec.
500	25 min. 30 sec.
525	27 min. 00 sec

.2 Manholes

Upon the completion of the manhole installations, watertight plugs or seals shall be inserted on inlets and outlets of each new sanitary sewer manhole. The manhole filled to the underside of the top concrete slab. The water level shall be recorded at the beginning and end of the 2 hour test period and the leakage shall not exceed 0.3% of the manhole volume per hour. If the permissible leakage is exceeded, defects shall be corrected and the test repeated until the installation is acceptable. Plugs and water shall be removed after the test.

E.6.3 Compaction Testing

The City 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.

E.6.4 Video Inspection Tests

Before paving of asphalt surfaces, all sewer mains shall require a closed circuit televised inspection to check jointing, possibility of debris in the pipe, leakage, alignment and grade of the sewer pipe. The video inspection will be completed at the expense of the applicant. Any deficiencies discovered shall be rectified, and the repaired section of pipe shall be re-videoed to ensure compliance. Additional inspection (such as may be required if mains have not been properly cleaned or flushed) shall be paid by the applicant as additional charges.

The Applicant is advised that should there be problems develop with the mains during the maintenance period, the City reserves the right to request the Applicant to conduct another video inspection for the Final Acceptance Certificate. This inspection and remedy of problems discovered would be at the Applicant's cost.

Picture quality shall be such to produce a continuous 500 line resolution picture showing the entire periphery of the pipe. Picture quality and definition shall be to the satisfaction of the City Engineer.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

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.

Measurement of defects shall be made by devices having a proven accuracy of plus or minus one percent. Cable markings if used, shall not be spaced at a distance of more than 600 mm along the length of the cable. Any type of measurement system used shall be subject to inspection by the City Engineer.

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.

Three copies of a final typewritten report with corresponding photographs and one copy of video tapes shall be furnished to the City Engineer within two weeks after the completion of the inspection. This report shall contain no less than one photograph per manhole section inspected and additional photographs as required to show line faults and representative line conditions.

Full colour video tapes shall be of a format acceptable to the City Engineer. All video tapes shall be numbered and cross indexed to the typewritten report. Video tape footage 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. Tapes shall be in the VHS format.

If, during the inspection procedures the television camera will not pass through the entire manhole section, the Applicant shall re-set 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.

E.7 STANDARD DRAWINGS

E.7.1 The following City of Fernie Standard Drawings shall form part of this Schedule:

<u>Drawing No.</u>	<u>Drawing Description</u>
D-8	Standard Watermain and Sewermain Anchors
D-9	Standard Classes of Pipe Bedding and Surround Within Pipe Zone
D-10	Typical Trench Section For Underground Utility Installation

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE E - SANITARY SEWERS

D-11	Typical Water, Sanitary and Storm Service in Common Trench
D-12	Concrete Encasement Detail
D-13	Standard Underground Utility Paint Markings
D-14	Encasement & Carrier Pipe Detail
E-1	Typical Sewer Service Connections
E-2	Typical Manhole and Base Details for Sewer Up to 400 mm Diameter
E-3	Manhole Drop Structures (400 mm Dia. Max.)
E-4	Invert Channelling in Manhole
E-5	Manhole and Base Details for Sewers 450 mm to 900 mm Dia.
E-6	Manhole Details for Sewers 1050 Dia. and Over
E-7	Sanitary and Storm Sewer Manhole Requirements
E-8	Sewer Cleanout for 150 mm & 200 mm Sanitary Sewer Terminals
E-9	Service Connection Details For Sanitary Manhole in Cul-De-Sac
E-10	PVC Inspection Chamber

SCHEDULE F

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND
INSTALLATION OF DRAINAGE SYSTEMS**

This is Schedule F of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

SCHEDULE F

**REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND
INSTALLATION OF DRAINAGE SYSTEMS**

F.1 GENERAL

F.1.1 Drainage Plan

For each new subdivision, a drainage plan shall be submitted to and approved by the City Engineer prior to the construction of any works. The drainage plan shall be presented on a contour map at a scale of not less than 1:2500 with contour intervals of not more than 0.5 meters. The drainage plan will show how storm drainage will be handled within the subdivision, including:

- .1 proposed method of handling surface drainage, including discharge points to natural drainage courses;
- .2 provisions of drainage right-of-way where required;
- .3 measures to prevent ponding of water on highways and parcels within the subdivision;
- .4 measures to prevent erosion and other forms of property damage;
- .5 major and minor system routing;
- .6 final site grades, fill areas including the depth of fill;
- .7 all easements, discharge points and other such details as may be required by the City Engineer.
- .8 alignment, type and size of all pipes, including proposed grades, bedding requirements, manhole, catch basin and drywell locations.
- .9 detailed drainage calculations shall be provided at the time of the drawing submission.

F.1.2 Standards and Specifications of this Schedule to Apply to Sewer Works

Standards and specifications contained in this Schedule shall apply to all storm sewer installations constructed for or in the City of Fernie. All standards not specifically covered in these standards shall be as directed by the City Engineer.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.1.3 Approval of Engineering Drawings Required Prior to Construction

Engineering drawings showing detailed design of the necessary works shall be submitted to the City Engineer for approval. No construction of storm sewers shall commence until the drawings have been approved by the City Engineer. 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, pipe bedding requirements, storm calculations and all other details which may be required by the City Engineer. The drawings shall also be submitted to Ministry of Environment (MOE) for approval unless MOE has stated in writing that no approval is required.

F.2 DESIGN CRITERIA

F.2.1 General

The drainage system in the City shall consist of two components, the "minor" and the "major" systems and the system design must take these components into account.

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.

The "major system" consists of those surface flood paths, roadways, drainage courses and water courses to convey the 100 year return flows.

The presence of an existing City 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 City. 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 City Engineer.

Where drywells are used to discharge surface water to ground, the City Engineer may require the Applicant to provide a report prepared by the Developer'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 City Engineer is satisfied that appropriate steps have been taken to drain the land or otherwise remedy such wet or flooding conditions.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.2.2 Standards That Apply To All Drainage Works

All new subdivisions and developments shall be provided with drainage works and services that comply with the following standards:

- .1 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.
- .2 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

Driveways	Maximum Gradient	1:10	10%
	Minimum Gradient	1:100	1%
Parking	Maximum Gradient	1:17	6%
	Minimum Gradient	1:66	1.5%
Walkways	Maximum Gradient	1:10	10%
	Minimum Gradient	1:50	2%
Paved Utility Areas	Maximum Gradient	1:17	6%
	Minimum Gradient	1:50	2%
Grass Areas	Maximum Gradient	1:3	33%
	Minimum Gradient	1:100	1%

- .3 The site shall be graded and planted in a manner that will prevent erosion of the ground.
- .4 Site runoff shall not flow onto adjacent properties.
- .5 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.
- .6 Where disposal is to a natural drainage course, the drainage system shall be designed and sealed by a Professional Engineer and submitted for approval to the Ministry of Environment.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

- .7 Disposal of drainage water shall be achieved by one of the following methods:
- a) 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;
 - b) 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;
 - c) 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;
 - d) discharge to a natural drainage course, where they run adjacent to or through a site and other disposal methods are not available.
- .8 The Applicant shall note that meeting standards set out in this bylaw does not preclude the necessity to apply for permits from other agencies.
- .9 All drainage disposal systems are to conform to the latest requirements of the Ministry of Environment.

F.2.3 Natural Drainage Courses

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

- .1 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 City Engineer.
- .2 provision made for an alternate drainage system to the satisfaction of the City Engineer.

No natural drainage course shall be altered or diverted unless in accordance with a drainage plan approved by the City Engineer.

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.2.4 Design Flow

The design flow at any point in a storm water collection system shall be calculated by the Rational Formula:

$$Q = 2.78 \times C \times I \times A$$

in which,

Q = Design Flow (Litres/second)

C = Run-off Coefficient

I = Rainfall Intensity (Millimetres/hour)

A = Area drained (Hectares)

Industrial, commercial, institutional and high density residential drainage systems shall be designed for a Return Period of 10 years. Low density residential systems shall be designed for a Return Period of 5 years. The rainfall intensity shall be derived from the intensity curves included on Drawing F-1.

F.2.5 Time of Concentration

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 catch basins shall be assumed to be 10 minutes in residential and commercial areas.

F.2.6 Run-Off Coefficient

Run-off coefficients for storm sewer design shall be calculated for each site but shall not be less than the values given in the following tabulation:

Description of Area	Run-Off 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	0.15

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

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

F.2.7 Overland Flow

In no case shall the overland flow distance for storm water within the storm sewer design area exceed 150 meters. Storm water contributions from natural drainage features including hillsides shall be collected by inlet structures at the point where the natural drainage features enters the piped system of 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 road, 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 Developer's Engineer and approved by the City Engineer. In residential areas, the City Engineer may approve swale drainage

F.2.8 Outfalls

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

F.2.9 Minimum Pipe Diameters for Storm Sewers

Minimum pipe diameters shall be:	Mains	300 mm
	Catch basin 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 meters per second.

F.2.10 Depth of Bury

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

F.2.11 Location of Sewer Mains

Storm sewer mains shall, wherever possible be located in the road right-of-way as shown on the Standard Drawings of highway cross sections.

F.2.12 Rights-of-Way

Where the location of the sewer main within the road 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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

favour of the City of Fernie and having a width of not less than 6.0 metres. The City Engineer may require a utility right-of-way wider than 6.0 metres in the case where services in addition to storm 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

F.2.13 Alignment of Sewer Mains

Sewer mains shall generally be designed to follow a straight alignment between manholes. Curved alignments within rights-of-way may be approved by the City Engineer, provided that the pipe is set at a grade greater than the specified minimum and the pipe alignment is at a parallel offset with an established boundary. In these cases, the radius of curvature shall be not less than 30 metres, or twice the minimum radius recommended by the pipe manufacturer, whichever is the greater.

F.2.14 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 follows assuming a Manning's pipe roughness coefficient, $n = 0.013$. Steeper grades are desirable.

100 mm	2.00%	375 mm	0.23%
150 mm	1.00%	400 mm	0.21%
200 mm	0.60%	450 mm	0.18%
250 mm	0.40%	525 mm	0.15%
300 mm	0.32%	600 mm	0.13%
350 mm	0.28%		

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.2.15 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:

$$Q = \frac{A K i}{100}$$

where

Q = rate of flow (m³/s)

A = cross-sectional area of soil through which flow takes place (m²)
(consider wall area only in calculations)

K = coefficient of permeability (cm/s)

i = gradient or headloss over a given flow distance

Coefficients of Permeability (K)

Typical Soil	Value of K cm/sec *	Relative Permeability
Coarse gravel	over 1 x 10 ⁻¹	very permeable
Sand, fine sand	1 x 10 ⁻¹ to 1 x 10 ⁻³	Medium permeability
Silty sand, dirty sand	1 x 10 ⁻³ to 1 x 10 ⁻⁵	Low permeability
Silt	1 x 10 ⁻⁵ to 1 x 10 ⁻⁷	very low permeability
Clay	Less than 1 x 10 ⁻⁷	practically impervious

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 (m)
 l = flow distance (m)

Drainage drywells shall, unless otherwise approved by the City Engineer, be located in the road boulevard or in other lands dedicated to the City for the purpose of drainage disposal.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

Drainage drywells shall be constructed of precast 1200 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 No. F-10.

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

F.2.16 Culverts

Where an open ditch system is required to cross a road, 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").

F.2.17 Manhole Spacing

The maximum distance between storm sewer manholes shall be 120 m

Manholes shall also be provided at the following locations:

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

F.2.18 Catch Basin Spacing

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

Catch basins 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.

Catch basins 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.

Catch basins at intersections shall be located in such a manner to minimize interference with crosswalks. Catch basins in driveways shall be avoided wherever possible.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

Type II side inlet catch basins are not to be installed without the approval of the City Engineer.

F.2.19 Catch Basin Leads

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

Catch basin leads shall have a minimum cover of 0.9 m.

F.2.20 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-9.

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-9.

F.2.21 Major Flow Routing

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

F.2.22 Head Walls and Aprons

Head walls and aprons to storm sewer and culvert inlets and outlets shall be constructed as per Standard Drawing F-7, unless variations are designed by the developer's engineer and approved by the City Engineer.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.2.23 **Service Connections** *(Add requirement for Storm Sewer Services)*

The diameter of storm sewer services shall be determined by the City Engineer but in no case shall the diameter be less than 100 mm. The pipe grade for sewer services pipes shall be a minimum of 2%.

Sewer services shall be installed in accordance with Standard Drawings E-1 and shall be installed, wherever possible, in a common trench with the water services.

Service connections shall be made with an approved branch wye or saddle and be installed in a straight line and at a uniform grade from the terminus at the property line to the 45 degree long radius bend at the main. In high ground water areas, determined by the City Engineer, service saddles are not permitted, services wyes shall be used.

In areas where the depth of the service pipe at the main is less than that of the pipe main, service risers shall be constructed consistent with Standard Drawing E-1.

For services 200 mm and larger, a manhole shall be installed at the intersection of the main and the service. A wye or saddle will not be accepted for services 200 mm or larger. Service connections shall be capped and shall be tested with mains where main testing is required.

A 50 x 50 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 "red", and the depth from the top of the 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 service shall also be indicated on the stake.

F.2.24 **Roadway Subdrainage** *(Add requirement for roadway drainage system)*

In areas of spring action or as recommended by the geotechnical engineer, the roadway or portions thereof will require the installation of a drainage subdrainage system. The size and extent of the subsurface water shall be shown on detailed design drawings prior to construction approval. Drainage systems shall connect to a storm sewer system or an alternate location as approved by the City Engineer.

Bylaw No. 1862

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.3 MATERIALS

F.3.1 Pipe and Fittings

- .1 Pipe for gravity storm sewer mains and for catch basins leads may be one of the following:
 - a) polyvinylchloride pipe up to 600 mm in diameter conforming to ASTM D3034 and CSA B182.2 (latest edition), 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;
 - b) Galvanized corrugated steel pipe (culverts only) designed to carry H-20 loading in accordance to AASHTO.

Other types of pipe shall be used only with the written consent of the City Engineer.

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

F.3.3 Manholes

Precast concrete manhole sections shall conform to ASTM C478 and shall be minimum 1050 mm diameter with 115 mm wall thickness for mains less than 450 mm diameter; and minimum 1200 mm diameter with 125 mm wall thickness for mains 450 mm diameter and larger. Concrete for cast-in-place manholes shall have a minimum compressive strength of 20 Mpa at 28 days.

Concrete for cast-in-place manhole bases and benching shall have a minimum compressive strength of 20 Mpa at 28 days.

Precast and prebenched manhole bases of a design and construction quality acceptable to the City Engineer 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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

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.

F.3.4 Manholes Frames and Covers

Covers shall be Trojan Country style #TF 39-C, (or approved equal), with 571 mm diameter covers. Frames shall be Trojan Country Style #TF 39-F (or approved equal).

F.3.5 Pipe Class and Bedding Class

Notwithstanding other provisions of this Bylaw, 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 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 corrugated steel pipe, class and bedding specifications shall follow the methods outlined in the American Iron and Steel Institute publication, "Handbook of Steel Design Drainage and 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, unless the City Engineer specifically approves Class C bedding, as defined by Standard Drawing No. D-9.

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.

F.3.6 Backfill Material Above Pipe Zone

Backfill material above the pipe zone shall as shown on Standard Drawing No. D-10.

F.3.7 Catch Basins

Catch basins shall be 900 mm diameter precast concrete as shown on Standard Drawing No. F-2, F-3, F-4, and F-8. Frames and grates shall be as shown on the Standard Drawings.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.4 WORKMANSHIP

F.4.1 Trench Excavation

Trenches shall be excavated to suit the cross-section shown on the Standard Drawing No. D-10. Open trenches through existing paved surfaces will be allowed only with the prior express consent of the City Engineer. 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 the Workers' Compensation Board.

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 City Engineer 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 City Engineer.

The attention of the Applicant is directed to the provisions of the Workers' Compensation Board 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 98% Standard 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 is soft and is, in the Developer's Engineer's opinion, unfit to support the pipes or structures, a further depth shall be excavated and refilled to the correct shape,

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

grade and elevation as directed by the Developer's Engineer.

When the bottom of a trench is found to consist of unstable material which, in the opinion of the Developer's Engineer, cannot be removed and replaced with bedding material, a pile foundation or other structural support in accordance with plans prepared by the Developer'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 Workers' Compensation Act. 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 City Engineer, 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 sub-base road 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 City Engineer 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 roads or walks, or injury to the public.

F.4.2 Tie-Ins to Existing Storm Sewer

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

Connection of a new pipe to an existing sewer main shall be done by the Applicant and supervised by the City. 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 engineering drawings. Application for tie-in shall be made one week in advance of the proposed work.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.4.3 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 to prevent the entry of any foreign material.

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:

- .1 Horizontal deviation from the approved alignment shall not exceed 60 mm and the rate of deviation shall not exceed 40 mm in 10 metres.
- .2 Vertical deviation from true grade varies with the grade and shall not exceed the limits shown in the following table:

Grade	Max. Departure from Design Elevation	Max. Rate of Deviation
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

F.4.4 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.

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.

F.4.5 Backfill Above Pipe Zone

- .1 In Travelled Areas

In road areas trench backfill material shall be placed in layers not exceeding 300 mm in thickness and compacted by mechanical means to a minimum of 100% Standard Proctor density, as shown on Standard Drawing D-10.

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

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

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.

.2 In Non-Travelled Areas

In easements and other non-roads 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 walkways are located over the pipe, compact to 100% Standard Proctor Density, as shown on Standard Drawing D-10.

F.4.6 Manholes

Manholes shall be constructed as shown on Standard Drawings No. E-2, E-3, E-4, E-5, E-6, and E-7.

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 as shown on Standard Drawings E-2 and E-4. The channel 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 City Engineer. 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.

Drop structures shall be constructed as shown on Standard Drawing E-3.

F.4.7 Stubs

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

F.4.8 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.4.9 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.

F.4.10 Cleaning and Flushing

Prior to testing, the storm 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 acceptance, the storm lines shall be flushed to remove any deleterious material deposited by associated construction works.

F.5.0 TESTING

F.5.1 Lamping

Sewer mains shall be lamped from manhole to manhole to check alignment and grade of the sewer pipe. Variations in line or grade from that shown on the approved engineering drawings and any jointing, pipe cleaning, or other deficiencies discovered shall be rectified. Manholes shall be inspected and any defects or deficiencies found shall be rectified.

F.5.2 Compaction Testing

The City 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE F - DRAINAGE SYSTEMS

F.6 STANDARD DRAWINGS

F.6.1 The following City of Fernie Standard Drawings shall form part of this Schedule:

<u>Drawing No.</u>	<u>Drawing Description</u>
D-8	Standard Watermain and Sewermain Anchors
D-9	Standard Classes of Pipe Bedding and Surround Within Pipe Zone
D-10	Typical Trench Section For Underground Utility Installation
D-11	Typical Water, Sanitary and Storm Service in Common Trench
D-12	Concrete Encasement Detail
D-13	Standard Underground Utility Paint Markings
D-14	Encasement & Carrier Pipe Detail
E-2	Typical Manhole and Base Details for Sewer Up to 400 mm Diameter
E-3	Manhole Drop Structures (400 mm Dia. Max.)
E-4	Invert Channelling in Manhole
E-5	Manhole and Base Details for Sewers 450 mm to 900 mm Dia.
E-6	Manhole Details for Sewers 1050 Dia. and Over
E-7	Sanitary and Storm Sewer Manhole Requirements
F-1	Rainfall Intensity Curves
F-2	Standard Catchbasin Detail
F-3	Mountable Curb & Gutter at Catch Basin
F-4	Non-Mountable Curb & Gutter at Catch Basin
F-5	Typical Perforated Drain Installation for Lowering Groundwater Table
F-6	Concrete Invert Through Easement
F-7	Concrete Outlet and Inlet Structure
F-8	Catch Basin Place in an Open Ditch
F-9	Landing for Deep Manhole
F-10	Drainage Drywell
F-11	Typical Lot Grading Detail

SCHEDULE G
REGULATIONS, STANDARDS AND SPECIFICATIONS
FOR THE INSTALLATION OF STREET LIGHTING

This is Schedule G of the City of Fernie
Subdivision and Development Servicing
Bylaw No. 1727

Clerk

SCHEDULE G - STREET LIGHTING

SCHEDULE G

**REGULATIONS, STANDARDS AND SPECIFICATIONS
FOR THE INSTALLATION OF STREET LIGHTING**

G.1 GENERAL

G.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 Inspector of Electrical Energy.

G.1.2 Approval of Engineering Drawings Required Prior To Construction

Engineering drawings showing detailed design of the necessary works shall be approved by the City Engineer before commencement of construction.

The street lighting system shall be laid out in accordance with the Canadian Standard Practice for Street and Highway Lighting.

G.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 and inspections.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE G - STREET LIGHTING

G.2 **DESIGN CRITERIA**

G.2.1 **Recommended Average Horizontal Illumination***

AREA CLASSIFICATION

Roadway Classification	Commercial Areas Average Illumination Level (Lux)	Residential Areas Average Illumination Level (Lux)
Arterial	22	12
Collector	13	10
Local	10	6
Lanes	6	4
Pedestrian Walkways and Sidewalks	10	6
Bike Ways	--	6

* The levels recommended represent average illumination on the roadway when the light source is at its lowest output and when the luminaire is in its dirtiest condition.

Recommended Uniformity Ratio

The maximum average to minimum uniformity ratio of horizontal illumination for roadways shall be as follows:

3:1 for arterial roads and commercial areas;
6:1 for residential areas

G.2.2 **Pole Locations**

In general, poles shall be installed as follows:

- .1 Arterial Highways - opposite or staggered spacing;
- .2 Collector Highways - staggered spacing;
- .3 Local Highways - spaced one side of streets behind the sidewalk.

Poles shall be located within 0.6 metres of the property corners and shall not conflict with driveways, underground services and fire hydrants. Street lighting shall be located on the same side of the street as the sidewalk where sidewalk exists on one side only.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE G - STREET LIGHTING

G.2.3 Rules and Regulations

Equipment, installation, wiring methods, and materials used shall be in accordance with the latest edition, including amendments, of the Rules and Regulations for the installation and maintenance of electrical equipment as issued by the Ministry of Municipal Affairs Recreation and Culture, Province of British Columbia and all bulletins issued thereto. Work shall also be in accordance with all applicable Municipal codes and regulations, Provincial Statutes in effect at the site, the Fire Marshall and the Workmen's Compensation Acts, hereinafter called the Rules and Regulations. Maintain all clearances from hydro poles as required by the Canadian Electrical Code.

The Applicant shall obtain, and pay for all permits, and arrange for all electrical inspections covering his work, and pay all other fees and charges, and make all deposits that are in any way connected with the installation of the systems specified as shown on the Drawings. He shall give all necessary notices to authorities having jurisdiction, and shall be responsible for keeping all applicable public ordinances.

Scheduling the work of B.C. Hydro and Power Authority shall be the Applicant's responsibility. Systems shall be compatible with power services available. Where costs are incurred with B.C. Hydro and Power Authority in installing the light system, these shall be considered as part of the cost of the system.

Before acceptance of any part or all of the system, it shall meet the requirements of Schedule H. As-constructed drawings of the street lighting system shall be furnished to the City Engineer prior to acceptance. The information shown shall be pole locations and locations of all conduits, together with any other pertinent information.

Before acceptance of any work by the City Engineer, he shall have received a Certificate of Inspection by the governing electrical authorities showing that the installation is unconditionally approved. The job site copy of the Electrical Inspection Bulletin 2.10.0 to be provided or otherwise approved as per Rule 2.04 of the Canadian Electrical Code.

G.2.4 Connection to Utility

An allowance for a minimum of 8 street lights per electrical connections shall be made and future extension of the street lighting system should accommodate this requirement.

B.C. Hydro will provide the design for connection of the street lights to their system.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE G - STREET LIGHTING

G.3 MATERIALS

G.3.1 General

Electrical materials used in the street lighting system shall be new and shall be approved by and bear the label of the Canadian Standards Association.

G.3.2 Street Light Standards and Luminaires – Arterial and Industrial Roadways only

The following standards apply to arterial and industrial roadways only:

Street light standards as shown in Standard Drawing G-2 shall be utilized in areas serviced with underground power and shall be Lincoln Steel or Barber octagonal section, 11 gauge mild steel standards 8 m high.

The davit arm length shall be 2.5 meters unless otherwise approved by the City Engineer. Standards shall be zinc chromate primed at the factory and painted after erection with one coat of green Trem Clad.

Street light luminaires shall be 150 watt 120/240 volt H.P.S. Powerlite LXBC2227S-150 c/w Sylvania LU150/55D lamp (or approved equal), complete with photoelectric controller.

Double davit street light standards, as shown on Standard Drawing G-4 shall be used on divided arterial roads where required by the City Engineer.

Where average illumination levels do not meet the requirements of section G.2.1, the applicant may be required to make variations to the above standard to achieve the required illumination.

G.3.2.2 Decorative Street Light Standards and Luminaries – Residential Subdivisions and Commercial

The following standards apply to all residential and commercial subdivisions, (save and except for arterial roadways which are covered by paragraph G.3.2 above):

Decorative street light standards, as shown in standard Drawing G6 to G10, may be used as an alternative to G.3.2.1 in areas of service with underground power and shall be Lumec Steel, .188 mild steel standards 4.9 m (16') or 6.7 m (22') high.

The davit arm length (if required) shall be 3.0 meters unless otherwise approved by the City Engineer. Standards shall be finished with thermosetting polyester powder coat paint at the factory. Color should be black BK textured.

Street light luminaries shall be 100 watt 120/240 volt metal halide, ED 17 bulb, medium base (or

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE G - STREET LIGHTING

approved equal), complete with photoelectric controller.

Double davi street light standards shall be used on divided arterial roads where required by the City Engineer.

Where average illumination levels do not meet the requirements of section G.2.1, the applicant may be required to make variations to the above standard to achieve the required illumination.

Bylaw No. 1862

G.3.3 Conductors

Conductors to street lamp standards shall be sized as required and specified on the design drawings. All underground conductors shall be type TWU-40 or RWU conforming to -40° rating unless specified otherwise. Conductors in the standard shall be #12 solid RWU90XL.

All insulated conductors shall be color coded. White shall be used for the neutral conductor.

G.3.4 Grounding

Each standard shall be grounded by means of a continuous #8 x-link green conductor installed in the conduit and connected to a grounding plate or to a 19 mm diameter grounding rod 3 meters long at each service in accordance with the Provincial Electrical Code.

G.3.5 Conduit

Conduit size shall be minimum 32 mm diameter. Rigid PVC conduit and fittings shall bear a CSA Certification label or other proof of CSA certification. PVC conduit shall be installed in strict accordance with the manufacturer's recommendations, using CSA certified cement. The conduit shall not be bent in the field. Only factory bends shall be acceptable.

G.3.6 Lamp Standard Bases

Bases for light standards shall be precast or cast in place trapezoidal bases as shown on standard drawing G-1. The base shall be 475 mm square at the top and 1000 mm square at the bottom and 1500 mm deep.

G.3.7 Offsets

Lamp standard bases shall be located as per the standard drawings for road cross sections. Line assignments for fixtures attached to wooden poles will be determined by BC Hydro. M.O.T.H. will provide the line assignment for poles or ornamental fixtures along the Highway No. 3 as required.

G.3.8 Painting

Standards shall be zinc chromate painted at the factory and painted after erection with one coat of green Trem Clad paint to City standards.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE G - STREET LIGHTING

G.3.9 Frangible Bases

The City Engineer may require frangible bases be used for lamp standards installed on roads not requiring curb and gutter. Frangible bases shall conform to Standard Drawing G-5.

G.3.10 Fusing

There shall be one circuit breaker or fused disconnect per street light, located within the pole and accessible through the handhole. See Standard Drawing G-6.

G.4 WORKMANSHIP

G.4.1 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 roads, driveways or sidewalks shall be installed by tunnelling, unless the City Engineer 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 B.C. Electrical Code. A conduit under curb or sidewalk shall be buried in a trench with the centre line 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 road; and all road, lane and industrial and commercial driveway crossings, the conduit shall be buried not less than 1200 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.

G.4.2 Restoration

All roadways, lanes, driveways, boulevards, and other areas traversed by trenches shall be returned to their original conditions or better by the Applicant.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE G - STREET LIGHTING

G.5 STANDARD DRAWINGS

G.5.1 The following City of Fernie Standard Drawings shall form part of this schedule.

<u>Drawing No.</u>	<u>Drawing Description</u>
G-1	Standard Light Pole Base
G-2	Street Light Pole
G-3	Street Light Junction Box
G-4	Double Davit Street Light
G-5	Frangible Base Details
G-6	Handhole Wiring Schematic 120 V Street Light
G-7	Decorative Street Light Standards and Luminaries
G-8	Decorative Street Light Standards and Luminaries – Description of Components
G-9	Decorative Street Light Standards and Luminaries – Type A
G-10	Decorative Street Light – Type A – Description of Components
G-11	Decorative Street Light Arm Banner Detail

SCHEDULE H

REGULATIONS, STANDARDS AND SPECIFICATIONS FOR THE INSTALLATION OF ELECTRICAL AND COMMUNICATIONS WIRING AND GAS DISTRIBUTION SYSTEM

This is Schedule H of the City of Fernie Subdivision
and Development Servicing Bylaw No. 1727

Clerk

SCHEDULE H - ELECTRICAL, COMMUNICATIONS, GAS

SCHEDULE H

**REGULATION, STANDARDS AND SPECIFICATIONS FOR THE
INSTALLATION OF ELECTRICAL AND COMMUNICATIONS WIRING
AND GAS DISTRIBUTION SYSTEM**

H.1 GENERAL

H.1.1 Standards and Specifications to Apply to All Electrical and Communications Works

Electrical, telephone and cablevision systems shall be provided to serve each lot 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.

H.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 City Engineer for approval. No construction of the works shall commence until the design drawings have been approved by the City Engineer. The engineering drawings shall clearly indicate the locations of poles, structures, conduits, pipes and any other facilities required.

H.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 City Engineer.

H.1.4 Construction In Accordance With B.C. Hydro, B.C. Telephone, Cablevision Company, and B.C. Gas Requirements

Electrical, Telephone and Cablevision services shall be installed in accordance with the requirements of the B.C. Hydro and Power Authority, the B.C. Telephone Company, the cablevision company supplying the development or subdivision and the Inspector of Electrical Energy of the Province of B.C. Gas distribution works shall be installed in accordance with the requirements of B.C. Gas.

3Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE H - ELECTRICAL, COMMUNICATIONS, GAS

H.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 B.C. Hydro and Power Authority and approved by the City Engineer and the Inspector of Electrical Energy of the Province of B.C.

Buried utility warning tape shall be placed @ 300 mm below final grade.

H.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 B.C. Telephone Company and the cablevision company serving the subdivision and approved by the City Engineer.

Buried utility warning tape shall be placed @ 300 mm below final grade.

H.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 B.C. Gas and shall be approved by the City Engineer 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.

Buried utility warning tape shall be placed @ 300 mm below final grade.

H.2 DESIGN CRITERIA

H.2.1 Horizontal Location

Horizontal location of underground ducting and gas main piping shall be as shown on Standard Drawings. Systems shall be laid out with due regard for other utilities, and shall have the approval of the City Engineer as well as the utility company involved. Where overhead distribution is specified, pole locations and any anchor easements shall be approved by both the City Engineer and the appropriate utility company. Care shall be taken to eliminate any aerial trespass.

H.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.

4Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE H - ELECTRICAL, COMMUNICATIONS, GAS

H.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 B.C. Hydro and Power Authority, the B.C. Telephone Company, the cablevision company and B.C. Gas.

H.3 MATERIALS

H.3.1 B.C. Hydro

All materials used in the underground or overhead electrical distribution system shall be as specified by the B.C. Hydro and Power Authority.

H.3.2 B.C. Telephone Company

All materials used shall be as specified by the B.C. Telephone Company.

H.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.

H.3.4 B.C. Gas

All materials used in the underground gas distribution system shall be specified by B.C. Gas.

H.4 WORKMANSHIP

H.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:

BC Gas - Yellow
BC Hydro - Red

5 Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE H - ELECTRICAL, COMMUNICATIONS, GAS

BC Tel - Orange and Marked B.C. Tel
Cablevision - Orange and Marked CCTV

H.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.

H.5 STANDARD DRAWINGS

H.5.1 The following City of Fernie Standard Drawings shall form part of this schedule.

<u>Drawing No.</u>	<u>Drawing Description</u>
D-13	Standard Underground Utility Paint Markings
D-14	Property Service Connection Record

SCHEDULE I
STANDARDS FOR THE PREPARATION OF
ENGINEERING DRAWINGS

This is Schedule I of the City of
Ferne Subdivision and
Development Servicing Bylaw No.
1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

SCHEDULE I

STANDARDS FOR THE PREPARATION OF ENGINEERING DRAWINGS

I.1 GENERAL REQUIREMENTS

- I.1.1** These requirements pertain to the preparation of drawings for: sanitary sewers, storm sewers, water, gas, underground power, telephone, cablevision, street lighting, roads, curbs and gutters, sidewalks, culverts, bridges, and other permanent structures.
- I.1.2** Where no standard is defined in this schedule 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 City Engineer.
- I.1.3** As-built plans are to be completed and approved before securities are released.
- I.1.4** As-built drawings are to be submitted within four (4) weeks of the completion of all services to be installed by the Applicant. The Design Engineer shall deliver as-built drawings as specified in this schedule to the City Engineer. These drawings shall be signed and sealed by the Developer's Engineer. Individual service cards for each lot shall be submitted with the as-built drawings. Blank service cards can be obtained from the City 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. One set of mylars and four sets of paper prints are required.

If AutoCAD or compatible computer graphic system is used, an updated disk is to be supplied with the drawings in a format that is compatible with AutoCAD on 3.5" or 5.25" diskettes.

- I.1.5** The plan profile is divided into two parts:
- .1 The top plan view shows all surface features, legal descriptions and bordering property data, and all underground utilities and their locations within the public right-of-way and related data.
 - .2 The bottom profile shows, elevations, chainages, surface and utility grades with related data.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

I.2 DRAWING STANDARDS

I.2.1 Sheet Size

Pre-cut sheets to be 594 X 840 mm (A-1 sheet size).

I.2.2 Sheet Material

3 mil mylar matte both sides with half plan and half profile.

I.2.3 Grid Standards

2 mm x 10 mm.

I.2.4 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.

I.2.5 Title Block

- .1 Located in the lower right hand corner of the sheet.
- .2 Title block should be pre-printed. Stick-on type is not acceptable.
- .3 Title block shall describe the contents of the drawing (eg. key plan, roadworks, etc.) and shall clearly indicate the location of the works by road name(s) and/or legal description.
- .4 Lettering to be an open style of Leroy or Autocad. If using Autocad, use text font Romans. If using some other computer graphic system, it should be compatible with Autocad.
- .5 The Engineer's seal is to be placed on the right hand side of the sheet adjacent to the right hand border.

I.3 PREPARATION OF DRAWING

I.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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

- .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 and to 3 decimal places.
- .5 Show pipe sizes in mm as per A.S.T.M. specifications using 1" = 25 mm.
- .6 Existing imperial dimensions except for pipe sizes are to be soft converted using the factor:
1 inch (1") = 25.4 cm
1 foot (1') = 0.3048 m

I.3.2 **Lettering**

- .1 Lettering is to be an open style of Leroy or Autocad (Romans) minimum height being 1.5 mm. The standard lettering height is 2.0 mm.
- .2 Lettering to be applied by using a Leroy, a computer graphics system compatible to Autocad, or equivalent.
- .3 Use BLACK ink on all as-built drawings.

I.3.3 **Scales**

Use metric scales:

PLAN VIEW SCALE		1:500
PROFILE VIEW SCALE	Horizontal	1:500
	Vertical	1:50

A vertical scale of 1:100 may be permitted for steep profiles where approved by the City Engineer.

I.3.4 **Plan View**

- .1 Show utility and utility access R.O.W.'s.
- .2 In case of R.O.W.'s less than 6.0 m larger scales may be permitted.
- .3 The PLAN VIEWS should not be fragmented or broken due to slight curves in the road right-of-way.
- .4 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.
- .5 Show the legal layout, dimensions, bearings, lot numbers, block numbers, legal plan

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

- numbers, street names, sidewalks with related data and catch basin installations with elevations.
- .6 All lots need not be numbered providing they are in sequence. Show first and second and next to last and last lots. If not in sequence, all lots shall be numbered.
 - .7 All lot dimensions shall be given in metres and to three (3) decimal places. If the lots are of same dimensions and side by side, only the two outside lots need have the dimensions shown, the remainder with ditto marks.
 - .8 Curb information should be shown and should include radius, delta angle, tangent length, and arc length
 - .9 Face of curb information must be complete.
 - ie. Rollover Face of Curb - Roll F.C.
 - If other than concrete face of curb specify material used.
 - ie. Rollover Asphalt Face of Curb - Roll Asph F.C.
 - .10 Show Right of Way widths and the actual roadway widths between curbs or between curbs and edge of pavement.
 - .11 Show all utilities such as sanitary and storm sewers, water, hydro, telephone, gas, cable TV, manholes, valves, cleanouts, hydrants, service boxes, etc.
 - .12 Reference each utility to the nearest property line or boundaries of right-of-ways.
 - .13 Show flow directions of sewers.
 - .14 Manholes in midblock shall be referenced to the nearest lot line.
 - .15 Lot services (sanitary, storm, water) shall be shown and referenced to the nearest or convenient lot line of said lot. Depth and invert elevation of each service shall be given at property line relative to the top of curb.
 - .16 Show rim elevations on plan view.
 - .17 Show benchmark locations and elevations.

I.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 groundline (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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

- .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:
 - a) the chainage and elevations of B.C., E.C., and V.P.I.
 - b) the external value, "e"
 - c) the length of vertical curve
 - d) the chainage and elevation of the low spot of sag curves or high point of crest curves
 - e) 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 water mains as well as length, size, type, grade, class of pipe (eg. 75 mm - 200 mm SAN SDR 35 PVC) and design capacity of the pipe. ***Bylaw No. 1862***
- .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 City Engineers.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

I.4 DRAFTING ABBREVIATIONS

TECHNICAL LEGEND

ABANDONED
ABBREVIATION
ACRE
ASBESTOS CONCRETE
ASPHALT
ASPHALT CURB
ASPHALT WALK
AIR VALVE
AVENUE
AVERAGE

BACK OF CURB
BACK OF WALK

TECHNICAL LEGEND

BASEMENT
BC HYDRO
BC GAS
BC TELEPHONE
BEARING
BEDDING
BEGINNING OF CURVE
BENCH MARK
BETWEEN
BLOCK
BLOW OFF
BOTTOM
BOTTOM OF PIPE
BOULEVARD
BOUNDARY
BUILDING
BEGINNING OF VERTICAL CURVE

CABLE TELEVISION
CALCULATED
CANADIAN PACIFIC RAILWAY
CANADIAN STANDARDS ASSOCIATION
CAPACITY

PLAN PROFILE ABBREVIATIONS

ABAND.
ABBREV.
AC.
A.C.
ASPH.
ACC
ASPH.W.
A.V.
AVE.
AVG.

B.O.C.
B.O.W. or B.W.

PLAN PROFILE ABBREVIATIONS

BSMT
BCH
BCG
TEL
BRG.
BED.
B.C.
B.M.
BTWN
BLK
B/O
BTM
B.O.P.
BLVD.
BDY
BLDG
B.V.C.

CCTV
CALC
C.P.R.
C.S.A.
CAP

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

CAST IRON
CATCH BASIN
CATHODIC PROTECTION
CENTIMETER
CENTRE LINE
CHECKED
CHECK VALVE
CHORD
CIRCLE
CLASS
CLEAN OUT
CONCRETE
CONCRETE WALK
CONDUIT
CONSTRUCTION/CONSTRUCT
CONTOUR
CONTRACTOR
CONTROL VALVE
CONTROL (TRAFFIC SIGNAL)
TECHNICAL LEGEND

COPPER
CORNER
CORRUGATED METAL PIPE
COUPLING
COURT
CREEK
CRESCENT
CROSSFALL
CROSS SECTION
CULVERT
CURB AND GUTTER

DEGREE
DELTA
DEPARTMENT
DIAMETER
DIMENSION
DISTANCE
DITCH
DOUBLE
DRAIN

C.I.
C.B.
C.P.
CM
C/L
CHKD
C.V.
CH
CIR
CL
C.O.
CONC
C.W.
COND
CONSTR or CONST
CONT
CONTR
CV
CTR
PLAN PROFILE ABBREVIATIONS

CU
COR.
C.M.P.
CPLG
CT
CR
CRES
X-FALL
X-SECTION
CULV
C & G

DEG or °

DEPT
DIA. or
DIM
DIST
D
DBL
DRN

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

DRAWING	DWG
DRIVEWAY	DWY
DRY WELL	D.W.
DRIVE	DR
DUCTILE IRON	DI
DWELLING	DWLG
EASEMENT	ESMT
EAST	E
EDGE OF MEDIAN	E.M.
EDGE OF PAVEMENT	E.P.
EDGE OF SHOULDER	E.S.
ELBOW	ELBW
ELECTRIC	ELEC
ELECTRIC LIGHT	E.L.
ELEVATION	ELEV
END OF CURVE	E.C.
END OF VERTICAL CURVE	E.V.C.
ESTIMATE	EST.
EXISTING	EXIST

TECHNICAL LEGEND

FACE OF CURB (Rolled, Standard, Asphalt)
FACE OF WALK
FEET OR FOOT
FLANGE
FLANGED OUTLET
FLOOR
FOOTING
FORCE MAIN
FOUND

GALVANIZED
GAS SERVICE
GAS VALVE
GARAGE
GARDEN
GEDDETIC BENCH MARK
GRAVEL
GRADE
GRATE

PLAN PROFILE ABBREVIATIONS

F.C. (Roll F.C., Std. F.C., Asph. F.C.)
F.W.
FT
FLG
F/O
FLR
FTG
F.M.
FD

GALV
GS
GV
GAR
GDN
GBM
GRAV
GR
GRT

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

GROUND	GRND
GUARD RAIL	GDR
GUTTER	GUT
HECTARE	HA
HECTOMETRE	HM
HEIGHT	HT
HIGHWAY	HWY
HORIZONTAL	HOR
HORIZONTAL CURVE	HOR
HOSPITAL	HOSP
HYDRANT	HYD

INCH	IN or "
INLET CHAMBER	I.C.
INSIDE DIAMETER	I.D.
INTERSECTION	INT
INVERT	INV
IRON PIN, FOUND IRON PIN	I.P., F.I.P.
INSULATE	INS
INTAKE STRUCTURE	I.S.

TECHNICAL LEGEND

JOINT
JUNCTION BOX

KILOGRAM
KILOMETRES
KILOMETRES PER HOUR
KIOSK

LATERAL
LEAD
LENGTH
LENGTH OF CURVE
LIFT STATION
LIGHT STANDARD
LIP OF GUTTER

MAIN VALVE
MANHOLE

PLAN PROFILE ABBREVIATIONS

JT
JB

KG
KM
KM/H
KSK

LAT
L
LGTH
L.C.
L.STA
L.S.
L.G.

M.V.
M.H.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

MANHOLE RIM	M.H.R.
MAXIMUM	MAX
MECHANICAL JOINT	M.J.
METRE	m
METRE CHAMBER	M.C.
MEDIAN	M. or MED
MILES PER HOUR	M.P.H.
MILLIMETRE	mm
MINIMUM	min
MINISTRY OF TRANSPORTATION & HIGHWAYS	M.O.T.H.
MONOLITHIC SIDEWALK	MONO
MONUMENT	MON
MORTAR JOINT	M.J.
MINUTES	MIN or '
NORTH	N
NORTH SIDE	N/S
NOT TO SCALE	N.T.S.
NUMBER	NO. or #
OBLITERATED	OBL
ON CENTRE	O.C. or O/C
ORIGINAL GROUND	O.G.
OPPOSITE FACE	O.F.
<u>TECHNICAL LEGEND</u>	<u>PLAN PROFILE ABBREVIATIONS</u>
ORNAMENTAL STREET LIGHT	OSL
OUTLET CHAMBER	O.C.
OUTSIDE DIAMETER	O.D.
OVERHEAD	OVH
PARALLEL	PAR
PARKWAY	PKWY
PAVEMENT	PVMT
PEDESTRIAN LIGHT	PDL
PER	/
PERCENT	%
PERFORATED PIPE	PRF
PHASE	PH
PIPE	P
PLACE	PL
PLAN PROFILE	P.P.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

PLUG
POINT
POINT ON CURVE
POINT ON COMPOUND CURVE
POINT ON TANGENT
POINT ON INTERSECTION
POLE WITH STREET LIGHT
POUNDS
POUNDS PER SQUARE INCH
POWER POLES
PRESSURE REDUCING VALVE
PROPERTY LINE
PROPOSED
PUMP STATION

QUANTITY

RADIUS
RAILWAY
RAISED FACE
RECTIFIER
REDUCER
REFERENCE
REGISTERED PLAN
REINFORCED
RESTORED
TECHNICAL LEGEND

REPLACEMENT
RESERVOIR
REVISION
RIGHT
ROAD
ROUND
RIGHT OF WAY

SANITARY
SANITARY SERVICE
SECOND
SECTION
SERVICE
SERVICE BOX

PLUG
PT
P.C.
P.C.C.
P.T.
P.I.
PP/SL
lbs
P.S.I.
P-P
P.R.V.
or P.L.
PROP
P.S.

QTY

RAD OR R
R/R
R.F.
RECT
RED
REF
R.P.
REIN
RSTD

PLAN PROFILE ABBREVIATIONS

REPL
RES
REV
RT
RD
RND
R/W or R.O.W.

SAN
SNS
SEC
SECT
SERV
SB

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

SERVICE ROAD	SERV.RD.
SET IN FIELD	S.I.F.
SIDEWALK	SWK
SLOPE	SLP
SOUTH	S
SOUTH SIDE	S/S
SPECIFICATION	SPEC
SPIRAL TO CURVE	S.C.
SQUARE	SQ
STANDARD	STD
STATION	STA
STEEL	STL
STORM	STM
STORM SERVICE	STS
STREET	ST
STREET LIGHT	SL
STRUCTURE	STR
SUPPLY	SUP
SURVEY MONUMENT	MON
SWALE	SWL
SYMBOL	SYM
TANGENT	TAN
TANGENT TO SPIRAL	T.S.
TECHNICAL	TECH
TEE	TEE
TEMPERATURE	TEMP
TEMPORARY	TEMPO
<u>TECHNICAL LEGEND</u>	<u>PLAN PROFILE ABBREVIATIONS</u>
TEST HOLE	T.H.
TONGUE AND GROOVE	T.G.
TOWNSHIP	T.W.P.
TOP OF CURB	T.O.C.
TOP OF PIPE	T.O.P.
THRUST BLOCK	TBL
TONGUE AND GROOVE	TG
TOP OF BANK	TOB
TRAFFIC CONTROL	T.C.
TRAIL	TR.
TRANSFORMER	TRANSF
TRANSITE	TRANS

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE I - ENGINEERING DRAWINGS

TYPICAL	TYP
UNDERGROUND	U.G. or U/G/
UNDER CONSTRUCTION	U/C
VAULT	VLT
VELOCITY	VEL
VERTICAL	VERT
VERTICAL CURVE	V.C.
VOLUME	VOL
WALL THICKNESS	W.T.
WASH OUT	W/O
WATER	W
WATER SERVICE	WS
WEST	West
WEST SIDE	W/S
WEEPING TILE	W.TILE
WEIGHT	Wt
WHEELCHAIR RAMP	WHCR
WIDTH	WDTH
WITNESS PIN	W.PIN
WOODEN POST	W.P.
YARD	YD

SCHEDULE J
SUBDIVISION SERVICING AGREEMENT

This is Schedule J of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

THIS AGREEMENT made this _____ day of _____ A.D., 199_.

BETWEEN:

THE CORPORATION OF THE CITY OF FERNIE

(the "Municipality")

OF THE FIRST PART

AND:

[name of owner]

(the "Owner")

OF THE SECOND PART

WHEREAS the Owner desires to subdivide lands within the Municipality, more particularly known and described as:

Parcel Identifier #:

Lot _____, Block _____, District Lot _____, _____ District, Plan

Lot _____, Block _____, District Lot _____, _____ District, Plan

(the "Lands")

AND WHEREAS the Owner, as a condition of subdivision approval, is required under the Subdivision and Development Servicing Bylaw No. 1727 of the Municipality (the "Subdivision Servicing Bylaw") to construct certain works and services (the "Works") as more particularly described in Schedules "A" and "B" annexed hereto;

AND WHEREAS the Owner has requested subdivision approval of the Lands prior to construction and installation of the Works and is agreeable to entering into an agreement pursuant to the *B. C. Municipal Act* and to deposit a security herein specified;

NOW THIS AGREEMENT WITNESSETH that in consideration of the premises and in consideration of the agreement by the Municipality to approve the subdivision plan prior to completion of the construction of the Works, the Municipality and the Owner herein covenant and agree as follows:

1. In this Agreement:

Approving Officer means the person appointed by Council pursuant to section 77 of the Land Titles Act as the Approving Officer;

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

Complete or Completion or any variation of these words when used with respect to the Works shall mean completion to the satisfaction of the Municipal Engineer when so certified by him in writing;

Municipal Engineer means the person appointed by Council pursuant to the *B. C. Municipal Act* as the Engineer of the Municipality, regardless of the words used to describe the position, and his duly authorized assistants and such consulting or professional engineers as may be appointed to act for the Municipality; and

Owner's Engineer means the Professional Engineer whom the developer has engaged to carry out surveys, design, field inspection and preparation and certification of as-built drawings.

2. The Owner shall complete the Works to the satisfaction of the Municipal Engineer by the _____ day of _____, 19 ____.

3. As security for the due and proper performance, during the construction period, of all of the covenants, terms and conditions in this Agreement and the subdivision contemplated, the Owner has deposited with the Municipality:

cash or a certified cheque in the amount of one hundred twenty-five percent (125%) of the estimated cost of the works determined from the design drawings; as a Security within the meaning of the *Municipal Act* (the "Security");

[or]

an irrevocable Letter of Credit in the amount of one hundred twenty-five percent (125%) of the estimated cost of the works determined from the design drawings bearing even date herewith, a copy of which is attached hereto (the "Security") to be valid for a period of twelve (12) months from the date specified in paragraph 2 hereof, PROVIDED HOWEVER, that the Municipality shall be at liberty to make demands on this Letter of Credit at any time after the date hereof with the Owner being entitled to renew this Agreement as hereinafter provided if such Letter of Credit shall not have been demanded upon in the manner hereinafter provided and provided also that the amount of such security may be reduced at any time with approval of the Municipality.

4. The Construction Period shall terminate upon the issuance of an approved construction Completion Certificate, signed by the Municipal Engineer, which has no deficiencies to be completed or corrected. The Maintenance Period shall terminate upon issuance of an approved Final Acceptance Certificate, signed by the Municipal Engineer, which has no deficiencies to be completed or corrected.
5. The owner agrees that if the Works are not completed pursuant to paragraph 2 hereof, the Municipality may complete the Works, at the cost of the Owner, and for that purpose may draw down upon the Security and should there be insufficient monies contained in the Security, the Owner shall pay the balance of such insufficiency forthwith upon invoice therefore or should the Owner complete the Works or should the completion of the Works cost less than the amount of the Security, the Security or such part thereof shall be returned by the Municipality to the Owner. The cost of the Works shall include the actual cost of construction and installation thereof plus engineering, supervision, legal survey, and other costs in connection therewith, together with an administration fee of ten percent (10%) of such cost which shall be payable to the Municipality. It is understood that the Municipality may do such work either by itself or by contractors employed by it.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

6. The Owner shall complete the Works to the standards set out in the “Subdivision Servicing Bylaw” and to the approval of the Municipal Engineer. Should such Works prove to be in any way defective or not operate, then the Owner shall, at its expense, modify and reconstruct the Works so that they shall be fully operative and function to the satisfaction of the Municipal Engineer, such satisfaction is to be indicated by a Construction Completion certificate signed by the Municipal Engineer. The decision of the Municipal Engineer 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. The owner covenants and agrees to grant to the Municipality all rights-of-way required for works and services. The Owner shall, at his expense, provide the necessary plans and forms of Agreement required to register at Land Titles Office the rights-of-way.
8. The Owner covenants and agrees to comply with the provisions of all Municipal Bylaws throughout the construction of the Works. In the event that any material or debris should be left upon any road after the construction of the Works, the Owner covenants and agrees that the Municipality may forthwith remove such material or debris at the expense of the Owner, the cost of such removal to be determined by the Municipal Engineer. In the event that any invoice of the Municipality for the removal of such material or debris shall remain unpaid after thirty (30) days of receipt for the same by the Owner, the Municipality is authorized to deduct the amount of such invoice from the Security.
9. The Owner shall, at all times in connection with the Works, keep and employ a competent general superintendent with the authority to act on behalf of the Owner and capable of speaking, reading and writing the English language and any explanations, orders, instructions, directions and requests given by the Municipality to such superintendent shall be held to have been given to the Owner.
10. 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.
11. Where the installation of the Works will result in the temporary disruption of municipal or non-municipal services to surrounding residents (e.g., sewer, water, road access, electricity, telephone, etc.), the Owner will notify the affected residents at least 24 hours in advance so as to reduce any inconvenience. The timing of the advance notification shall be extended when the length of the disruption will be longer than 3 hours.
12. The Owner covenants and agrees to the following conditions of maintenance and final acceptance:
 - (a) The owner shall, upon being satisfied that all of the requirements of the Municipal Engineer are met, submit to the Municipal Engineer four (4) copies of a Construction Completion Certificate signed by the owner’s Engineer for each of the following utilities installed:
 - (i) sanitary sewers;
 - (ii) waterworks;
 - (iii) sewer and water lot service laterals;
 - (iv) street lighting;
 - (v) curbs, gutters, and sidewalks;

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

- (vi) drainage works and services;
- (vii) surface improvements;
- (viii) landscaping;
- (ix) shallow utilities, natural gas mains and laterals;
- (x) on-site road and fire truck turnaround;
- (xi) offsite sidewalk;
- (xii) boulevards;
- (xiii) underground electrical, telephone and cable works; and
- (xiv) any other works shown on the approved engineering plans.

The Municipal Engineer shall, within one (1) month of receipt of the Construction Completion Certificate, inspect the Work with representatives of the Owner and its Engineer.

- (b) If the inspection shows to the satisfaction of the Municipal Engineer that the utility or improvement is complete, the Municipal Engineer shall sign the Construction Completion Certificate and shall indicate thereon the date when the Owner shall cease to be responsible for maintenance. If however, defects or deficiencies are apparent to the Municipal Engineer in the utility or improvements, the Certificate will be returned to the owner unsigned with a report of the defects.
- (c) After the issuance of the Construction Completion Certificate, the Owner shall be responsible for any and all repairs and replacements to any utilities and improvements which may become necessary from any cause whatever, up to the end of the maintenance periods mentioned in the said Construction Completion Certificate.
- (d) If during the Construction Period or Maintenance Period any defects become apparent in any of the utilities or improvements installed or constructed and the Municipal Engineer requires repairs or replacements to be done, the owner shall, within a reasonable time after notice cause such repairs or replacements to be done, and if the Owner defaults, or any emergency exists, the Municipal Engineer may have the repairs or replacements carried out and the Municipality may recover the cost from the Owner or from the Security.
- (e) The owner will, from the date of the Construction Completion Certificate, flush and clean out the sanitary sewers as required in ordinary maintenance procedures. The cost of removing obstructions caused by gravel, rocks, or silt which other than that deposited from sewage, shall be borne by the Owner. All blocked sewers attributable to faulty construction shall be corrected at the expense of the Owner. Prior to the issuance of the Final Acceptance Certificate, the Municipal Engineer may carry out, at the cost of the Owner, a television survey of all sanitary and storm sewer lines which are to be accepted by the Municipal Engineer. Should the television survey show any defects, these are to be remedied by the Owner and the Owner shall carry out, at his cost, any further television surveys necessary to show proof that defects are corrected. The Municipal Engineer will not issue a Final Acceptance Certificate until he is satisfied that defects are remedied.
- (f) The Owner shall be responsible for adjusting all hydrants, hydrant and main valve boxes and all service valve boxes to established grades as they are developed, and maintaining valves and appurtenances in operating condition until such time as the Municipal Engineer issues a Final Acceptance Certificate for the Works.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

- (g) Maintenance, without limiting the generality of the term, for which the Owner shall be responsible, includes:
- (i) failure of, or damage to, underground utilities resulting from defective materials or improper installation;
 - (ii) settlement of culverts, ditches, sidewalks, roadways or service trenches;
 - (iii) grading, gravelling, repairs and/or replacement of road and lane surfaces including access roads;
 - (iv) adjustments and repairs to watermains, main valves, water hydrants, hydrant valves, service lines and valves and valve operating mechanisms including the casing enclosing these mechanisms;
 - (v) repairs, replacements and adjustments to sewer mains, sewer services, manholes, manhole frames and covers;
 - (vi) repairs, replacements and adjustments to street lighting fixtures and appurtenances.
- (h) The Owner agrees that maintenance is a continuous operation which shall be carried on until the date of issuance of the Final Acceptance Certificate for each and every utility, and no releases from liability of any kind will be given until all repairs or replacements required by the Municipal Engineer in final inspection reports have been made.
- (i) The Owner shall maintain each of the following utilities for the periods listed below from the date(s) shown in the construction Completion Certificate(s):
- | | |
|---|----------------------|
| – sanitary sewer | 2 years |
| – storm sewer | 2 years |
| – watermains and hydrants | 2 years |
| – water and sewer service connections | 2 years |
| – <u>sidewalks, curb and gutter</u> | <u>3 years</u> |
| – catch basins | 2 years |
| – <u>paved roads, lanes and walkways</u> | <u>3 years</u> |
| – <u>gravel lanes</u> | <u>1 year</u> |
| – <u>overland drainage control</u> | <u>1 year</u> |
| – landscaping and boulevards | 2 full growing years |
| – <u>sound attenuation fencing</u> | <u>1 year</u> |
| – pump stations and pressure control facilities | 2 years |
| – <u>streetlights and cables</u> | <u>1 year</u> |
| – <u>top lift asphalt paving:</u> | |
| <u>> major roads</u> | <u>3 years</u> |
| <u>> other roads</u> | <u>3 years</u> |
| – <u>underground works related to any and all non-municipal utility companies</u> | <u>2 year</u> |

The above dates may be extended by the Municipal Engineer when compaction test results or other documented observations indicated substandard construction.

Bylaw No. 1862

- (j) Two months before expiration of the period specified in paragraph 12(i) above for each of the utilities or improvements, or earlier if weather conditions dictate, the Owner's Engineer, following a complete inspection of the utility or improvement accompanied by his Contractor, shall correct all

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

defects not due to damage and other causes. For each utility, four (4) copies of the Final Acceptance Certificate, duly signed by the Owner's Engineer, will then be submitted to the Municipal Engineer.

- (k) After receipt of the Final Acceptance Certificate, the Municipal Engineer shall make an inspection within one month of the receipt thereof, if weather conditions permit a proper inspection. If the inspection shows to the satisfaction of the Municipal Engineer that the utility or improvement is acceptable, the Municipal Engineer shall approve the final Acceptance Certificate. If, however, defects or deficiencies are apparent to the Municipal Engineer in the utility or improvement, the Final Acceptance Certificate will be returned to the Owner unsigned with a report of the defects and deficiencies listed and with a statement of the length of time in which the defects and deficiencies shall be corrected by the Owner at his own expense.
 - (l) Should the Owner fail to correct deficiencies or defects listed or pay for any damage resulting therefrom the Municipality may deduct the cost of completing the works, correcting deficiencies or defects, or paying the damage from the Security referred to in paragraph 3 hereof.
 - (m) Notwithstanding (l) herein, the Municipality will not refund an amount whichever is the lesser 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.
13. As soon as the Owner is satisfied that he has caused the works to be completed, and prior to final approval, the Owner shall submit to the Municipal Engineer one complete set of final as-built mylar drawings and four complete sets of paper prints of all work constructed hereunder, sealed by a Professional Engineer. Where the as-built drawings have been completed using AUTOCAD or a similar computer drafting software, one copy of the diskette containing the as-built drawing files shall also be provided. Until the owner submits the final as-built mylar drawings, the Municipality will hold \$500 per sheet for drafting deficiencies.
14. The Owner:
- (a) agrees to pay all arrears or taxes outstanding against the property herein described before approval of any subdivision plans;
 - (b) further undertakes to pay all current or estimated current taxes levied on the said lands on the basis and in accordance with assessment and collector's roll entries;
 - (c) in addition to the Security referred to in paragraph 3 hereof, 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 roads required for the new subdivision as approved by the Engineer; 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

15. The owner covenants to save harmless and effectually indemnify the Municipality, its officers, elected officials, servants, agents and employees against:
 - (a) all actions and proceeding costs, damages, expenses, claims and demands whatsoever and by whomsoever brought by reason of the subdivision and the construction, installation and maintenance of the Works;
 - (b) all expenses and costs which may be incurred by reason of this Agreement resulting in damage to any property owned in whole or in part by the Municipality, or which the Municipality by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, repair or maintain; and
 - (c) all expenses and costs which may be incurred by reason of liens or non-payment of labour or materials, Workers' Compensation Board assessments, unemployment insurance, Federal or Provincial Tax, or any other fees, licenses or permits resulting from the Works.
16. The Municipality covenants and agrees with the Owner to permit the Owner to perform the Works upon terms and conditions herein contained.
17. The Municipality covenants and agrees that upon satisfactory completion by the Owner of all covenants and conditions in this Agreement, and without limiting the generality of the foregoing, including maintenance of the Works constructed pursuant to this Agreement and keeping the same in complete repair for a period of time as specified in paragraph 12 hereof, to provide the Owner with a Final Acceptance Certificate for the Works, signed by the Municipal Engineer.
18. The owner covenants and agrees that the Municipality may withhold the granting of a building permit or the granting of an occupancy permit for the occupancy or use of any building or part thereof constructed upon the Lands until all works herein have been completed to the satisfaction of the Municipal Engineer, as evidenced by the Construction Completion Certificate provided to the Owner by the Municipal Engineer.
19. It is understood and agreed that the Municipality has made no representations, covenants, warranties, guarantees, promises or agreements with the Owner other than those in this Agreement.
20. Wherever the singular or the masculine are used in this Indenture, the same shall be construed as meaning the plural or the feminine or body corporate or politic where the context or the parties hereto so require.
21. If any section, or lesser portion of this Agreement is held invalid by a court of competent jurisdiction, the invalid portion shall be severed and the invalidity of such section or portion shall not affect the validity of the remainder.
22. Time is of the essence of this Agreement.
23. This Agreement shall enure to the benefit of and be binding upon the parties hereto, their respective heirs, executors, administrators and assigns.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

24. The Works required to be constructed pursuant to provisions of this Agreement shall, upon issuance of the Final Acceptance Certificate, become the property of the Municipality free and clear of any claim by the Owner or any person claiming through the Owner.

IN WITNESS WHEREOF the parties have set their hands and seals and caused their corporate seals to be affixed in the presence of their duly authorized officers as of the day and year first above written.

The corporate seal of the *[name of municipality]*)
was hereunto affixed in the presence of:)

_____)
Mayor)

_____)
Clerk)

The corporate seal of the *[name of owner]*)
was hereunto affixed in the presence of:)

_____)
Authorized Signatory)

_____)
Authorized Signatory)

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

SCHEDULE “A”

Works and Services Checklist

The Owner undertakes to provide, construct and install the following works and services, at the locations shown, and in accordance with the approved design and specifications shown in engineering drawings no. [number] (attached to and forming part of this Agreement in Schedule “B”) and in compliance with the design criteria and specifications of the Subdivision and Development Servicing Bylaw.

Waterworks:	_____	lin. metres
Sanitary sewerage:	_____	lin. metres
Storm sewerage:	_____	lin. metres
Roads	_____	lin. metres
Lanes:	_____	lin. metres
Curbs, gutters and boulevards:	_____	lin. metres
Sidewalks	_____	lin. metres
Underground electrical and telephone:	_____	lin. metres
Street lighting:	_____	light standards
etc.		

Wherever in this Agreement the approved design and specifications are in conflict with the standards and requirements set out in the Subdivision and Development Servicing Bylaw, the Subdivision and Development Servicing bylaw shall govern; provided that, where the approved design and specifications are to a standard greater than, higher than or more onerous than the standards and requirements of the Subdivision and Development Servicing bylaw, they shall not be deemed to be in conflict, and the approved design and specifications shall govern.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

SCHEDULE “B”

[design and specifications in the form of engineering drawings]

The corporate seal of <i>[name of owner]</i>	)
was hereunto affixed in the presence of:	)
	)
	)
	)
	)
	)
_____	)
Authorized Signatory	)
	)
	)
	)
_____	)
Authorized Signatory	)

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

CONSTRUCTION COMPLETION CERTIFICATE

SUBDIVISION:

Parcel Identifier #: _____
Lot _____, Block _____, Plan _____, District Plan
Lot _____, Block _____, Plan _____, District Plan

WORKS:

[describe in general terms: e.g., sanitary sewerage; a water supply system; a surface water drainage system, including concrete curbs and gutters, concrete sidewalks, hot mix asphalt pavement and underground utilities for electricity, telephone and cablevision]

OWNER: *[name]*

CONTRACTOR: *[name]*

This Construction Completion Certificate does not constitute a certification of any work not in accordance with the applicable requirements of the Subdivision and development Servicing Bylaw No. 1727 (and not listed as a deficiency on the attached list) whether or not such deficiency or defect could have been observed or discovered during construction.

I, *[name of owner's engineer]*, P. Eng., of , *[name of engineering firm, if applicable]* certify to the best of my knowledge, information and belief that the works referred to above have been installed substantially in compliance with the design drawings which were approved by the *[name of municipality]* and are complete as far as can be practically ascertained. I recommend these works for acceptance by the municipality. I undertake to provide detailed "as-constructed" drawings of these works and will sign and affix my professional seal to these drawings.

Dated this ____ day of _____, 199__ in the *[name of municipality]*, B.C.

[name of engineer], P. Eng. (seal)

Accepted/Rejected on behalf of the *[name of municipality]* this ____ day of _____, 199_.

[signature of municipal official]

A list of deficiencies, dated _____, 199__, to be completed or corrected is appended hereto.

I certify that the items listed as deficiencies have now been completed or corrected.

Date *[name of engineer]*, P. Eng.

Accepted: _____
[signature of municipal official]

Date Maintenance Period to Expire: _____

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

FINAL ACCEPTANCE CERTIFICATE

SUBDIVISION:

Parcel Identifier No. _____
Lot _____, Block _____, Plan _____, District Plan
Lot _____, Block _____, Plan _____, District Plan

OWNER: [name]

CONTRACTOR: [name]

The works required as a condition of subdivision approval – specifically *[sanitary sewerage, watermains, hot mix asphalt pavement, etc.]* – as set out in the subdivision servicing agreement entered into between the owner and the municipality on *[date]*– have been certified by *[name of owner’s engineer]*, P. Eng. of *[name of engineering firm, if applicable]* as being constructed and installed in accordance with the requirements of Subdivision and Development Servicing Bylaw No. 1727 of the *[name of municipality]* and are more particularly illustrated on the “as-built” drawing(s) number

The maintenance period expired on _____, 199__ .

This certificate confirms acceptance by the municipality of the works and authorizes the release to the owner of the security, together with any earned interest.

Dated this _____ day of _____, 199__.

[signature of municipal official]

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

WAIVER

In consideration of the Approving Officer for the *[name of municipality]* reviewing my subdivision application prior to the submission of an actual survey plan as required under the ***Land Title Act*** and the ***Municipal Act***, I agree that I will waive the provisions of section 943 of the ***Municipal Act*** and be bound by any amendments to the bylaws of the municipality which may effect my proposed subdivision, notwithstanding that they are introduced within one year of my application for subdivision review, with the following exceptions:

- (a) *a bylaw to designate property to a different zoning district;*
- (b) *a bylaw to designate property to a different subdivision area; and*
- (c) *a bylaw which alters the minimum required parcel area and dimensions with respect to the subdivision of land.*

Signed, Sealed and Delivered this _____ day of _____, 199 _.

Witness

Owner/Developer

Witness

Owner/Developer

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

LATECOMER CHARGE WAIVER AGREEMENT

THIS AGREEMENT made the ____ day of _____, 19

BETWEEN:

[name of owner]

(the “Owner”)

OF THE FIRST PART

AND:

[name of “Municipality”]
Province of British Columbia

(the “Municipality”)

OF THE SECOND PART

WHEREAS:

- A. The Owner is the owner of and proposed to develop certain lands and premises located within the Municipality, more particularly known and described as:

Parcel Identifier:

Lot ____, Block ____, District Lot ____, _____ District, Plan
(the “Lands”)

for *[describe use]* use:

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

- B. Such development is in accordance with the future plans of the Municipality but is presently premature as a portion of the municipal works and services required to be installed by the Owner to serve the proposed development may provide access to or serve land other than the Lands and thus may be eligible for a contribution towards the cost of such works and services from the Municipality or from the owners of other land who may connect to or use those works and services; however, the Municipality does not have sufficient funds, either on hand or anticipated from development cost charges, to make a contribution towards the cost of the works and services, nor does the Municipality at this time have a system in place to levy latecomer charges against the owners of other lands who may connect or use the said works and services; and
- C. The Owner has voluntarily agreed to waive any right the Owner may have to a contribution toward the cost of such works and services which are necessary to serve the proposed development of the Lands and has requested that the Municipality enter into the Agreement with the Owner.

NOW THIS AGREEMENT WITNESSETH that in consideration of the covenants and agreements contained in this Agreement and \$1.00 now paid to the Owner by the Municipality (the receipt and sufficiency of which are acknowledged), and for other valuable consideration:

1. The Owner waives, relinquishes and abandons any right which the Owner now has or may at any time have for any contribution from the Municipality or any other person toward the Owner's cost of installing those works and services shown on Drawing No. [number] (the "Works").
2. The Owner releases and forever discharges the Municipality, its officers, employees, elected officials, servants, agents, successors, and assigns from all manner of actions, contracts, claims and demands against the Municipality which the Owner ever had, now has or may have in future by reason of the installation of the Works by the Owner with no contribution toward the cost of the Works by the Municipality or any other person, and without limiting the generality of the foregoing, by reason of the failure by the Municipality to impose or collect any latecomer charges from the owners of any lands which may connect to or use the Works.
3. The parties agree that:
 - (a) The Municipality has made no representations, covenants, warranties, guarantees, promises or agreements (oral or otherwise) with the Owner other than those contained in this Agreement.
 - (b) Nothing contained or implied in this Agreement shall prejudice or affect the rights and powers of the Municipality in the exercise of its functions under any public and private statutes, bylaws, orders and regulations, all of which may be fully and effectively exercised in relation to the Lands as if this Agreement had not been executed and delivered by the Owner.
 - (c) Whenever the singular or masculine is used in this Agreement, the same shall be construed as meaning the plural, feminine or the body corporate or politic where the context of the parties so require and, where the Owner consists of more than one person, the term "Owner" shall mean all such persons jointly and severally.
 - (d) This agreement shall enure to the benefit of and be binding upon the parties and their respective heirs, executors, administrators, successors, assigns; and

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE J – SUBDIVISION SERVICING AGREEMENT

- (e) The parties shall do and cause to be done all things and execute and or cause to be executed all documents which may be necessary to give proper effect to the intention of this Agreement.

IN WITNESS WHEREOF the parties have set their hands and seals and caused their corporate seals to be affixed in the presence of their duly authorized officers as of the day and year first above written.

The corporate seal of *[name of owner]* was)
hereunto affixed in the presence of:)
)
)
)
)
)
)
_____)
Authorized Signatory)
)
)
)
)
)
_____)
Authorized Signatory)

The corporate seal of the *[name of municipality]*)
was hereunto affixed in the presence of:)
)
)
)
)
)
_____)
Mayor)
)
)
)
)
_____)
Clerk)

SCHEDULE K

**STANDARD STATUTORY
RIGHT-OF-WAY AGREEMENT**

This is Schedule K of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE K – STATUTORY RIGHT-OF-WAY AGREEMENT

THIS AGREEMENT is dated for reference the _____ day of _____, 199__.

BETWEEN:

(the "Grantor")

OF THE FIRST PART

AND:

(the "Municipality")

OF THE SECOND PART

WHEREAS:

- (a) The Grantor is the registered owner in fee simple of land within the (name of municipality), legally described as:

Parcel Identifier:

Lot _____, Block _____, District Lot _____, _____ District, Plan _____ (the "Lands")

- (b) To facilitate the establishment, construction, operation, maintenance, repair, extension, addition, alteration, protection or improvement of one or more systems of:

- (i) sewer works and related fixtures and equipment for the collection, conveyance and disposal of sewage, (and/or)
- (ii) drainage works and related fixtures and equipment for the impounding, conveying and discharging of surface and other waters, (and/or)
- (iii) water works and related fixtures and equipment for the collection, storage and distribution of water,

(collectively the "[Sewer Works/Drainage Works/Water Works]")

the Grantor has agreed to grant a statutory right-of-way to the Municipality.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE K – STATUTORY RIGHT-OF-WAY AGREEMENT

- (c) The statutory right-of-way is necessary for the operation and maintenance of the Municipality's undertaking.

NOW THEREFORE in consideration of \$1.00 paid by the Municipality to the Grantor (the receipt and sufficiency whereof is acknowledged) and in consideration of the terms herein:

1. THE GRANTOR:

(1) Grants in perpetuity unto the Municipality, the full, free and uninterrupted right to lay down, install, construct, entrench, maintain, inspect, alter, remove, replace, bury, use, protect and otherwise establish and operate one or more systems of:

- (a) Sewer Works for the collection, conveyance and disposal of sewage;
- (b) Drainage Works for the impounding, conveying and discharging of surface and other waters;
- (c) Water Works for the collection, storage and distribution of water;

in, upon, under and across that part or parts of the Lands as shown outlined in heavy black on the *[Explanatory/Reference]* Plan of a portion of Lot _____, Block _____, District Lot _____, _____ District, Plan _____ deposited in the Land Title Office under section 99(1)(e) of the *Land Title Act* and certified correct on the *[date]*, 199__ by the *[name of surveyor]*, B.C.L.S. (the "Right of Way Area").

(2) Agrees that for the purposes of section 1(1), the Municipality by its employees, agents, workers, contractors and licensees is entitled at all times to enter the Lands with or without machinery, vehicles, equipment or materials and to remove soil and clear trees or other obstruction, as may be necessary or convenient in relation to the *[Sewer/Drainage/Water]* Works.

(3) Will not erect, place, install, or maintain any building, structure, mobile home, concrete, asphalt or other surfacing, pipe, wire or other conduit on, over, or under any portion of the Right-of-Way Area that interferes with, damages, or obstructs access to, or is likely to cause harm to the *[Sewer/Drainage/Water]* Works.

(4) Will not do nor knowingly permit to be done anything which will interfere with or injure the *[Sewer/Drainage/Water]* Works. and in particular will not carry out any blasting on or adjacent to the Right-of-Way area without prior consent in writing of the Municipality, provided that such consent shall not be unreasonably withheld.

(5) Will not substantially diminish the soil cover over any of the *[Sewer/Drainage/Water]* Works. installed in the Right-of-Way Area and in particular, without limiting the generality of the foregoing, will not construct open drains or ditches along or across any of the *[Sewer/Drainage/Water]* Works.

(6) Will upon reasonable request and at the cost of the Municipality do and execute all further lawful acts, deeds and assurances for the better assuring unto the Municipality of the rights hereby granted.

2. THE MUNICIPALITY:

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE K – STATUTORY RIGHT-OF-WAY AGREEMENT

(1) Will not bury any debris or rubbish of any kind in excavation or backfill and will remove shoring and like temporary structures as backfilling proceeds.

(2) Will thoroughly clean the Lands of all rubbish and construction debris created or placed thereon by the Municipality.

(3) Will, as soon as weather and soil conditions permit, and so often as it may exercise its right of entry to the Lands, 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 Municipality to restore any trees or other surface growth, but the Municipality shall leave such lands in a condition which will not inhibit natural regeneration of such growth.

(4) Will, as far as reasonably possible, carry out all work in a proper and workerlike manner so as to do as little injury to the Lands as possible.

(5) Will make good, at its own expense, all damage or disturbances which may be caused to the surface soil of the Lands in the exercise of its rights hereunder.

3. THE PARTIES AGREE as follows:

(1) Notwithstanding any rule of law or equity to the contrary, the [*Sewer/Drainage/Water*] Works within the Right-of-Way Area shall remain the property of the Municipality and may be removed in whole or in part by the Municipality.

(2) In the event that the Municipality abandons the [*Sewer/Drainage/Water*] Works or any part thereof, the Municipality may with the consent of the Grantor, leave the whole or any part of the [*Sewer/Drainage/Water*] Works in place and will, at its expense, file the required documentation to release this Agreement and any related charge against the title to the Lands in the Nelson Land Title Office.

(3) No part of the title in fee simple to the Lands shall be vested in the Municipality under this Agreement and the Grantor may fully use and enjoy all of the Lands subject only to the rights and restrictions herein.

(4) The covenants herein shall run with the land and none of the covenants herein shall be personal or binding upon the Grantor, save and except during the Grantor's ownership of the Lands.

(5) If at the date hereof the Grantor is not the sole registered owner of the Lands, this Agreement shall nevertheless bind the Grantor to the full extent of its interest in fee simple, and this Agreement shall extend to any after acquired interest.

(6) This Agreement shall enure to the benefit of and be binding upon the parties and their respective heirs, administrators, executors, successors, and assigns.

(7) This Agreement is a Statutory Right-of-Way as provided for in section 214 of the *Land Title Act* of British Columbia.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE K – STATUTORY RIGHT-OF-WAY AGREEMENT

IN WITNESS WHEREOF the parties have *[caused their hand and seal and/or caused their corporate seal(s)]* to be affixed in the presence of their duly authorized officers as of the day and year first above written.

The Corporate Seal of *[the Grantor]*)
was hereunto affixed in the presence of:)
)
)
)
_____)
Authorized Signatory)
)
_____)
Authorized Signatory)

- or -

SIGNED, SEALED and DELIVERED by)
[name of the Grantor] in the presence of:)
)
)
_____)
Name)
)
)
_____)
Address)
)
_____)
)
_____)
Occupation)

The Corporate Seal of the *[name of*)
the municipality] was hereunto affixed)
in the presence of:)
)
_____)
Mayor)
)
_____)
Clerk)

SCHEDULE L

CONFIRMATION OF COMMITMENT BY OWNER

This is Schedule L of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE L - COMMITMENT BY OWNER

SCHEDULE L

Note: To be submitted prior to

**CONFIRMATION OF
PROFESSIONAL ASSURANCE**

**CONFIRMATION OF "COMMITMENT BY OWNER"
RE: DESIGN AND FIELD REVIEW OF CONSTRUCTION
BY A REGISTERED PROFESSIONAL**

The City of Fernie
P.O. Box 190
Ferne, B.C.
V0B 1M0

Attention: City Engineer

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 City of Fernie Subdivision and Development Servicing Bylaw No. 1727 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 City of Fernie. This will include keeping records of all site visits and any corrective actions taken as a result thereof.

CONFIRMATION OF "COMMITMENT BY OWNER" (cont'd)

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 City Engineer.

NOTE: The Owner will notify the City Engineer 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 City.

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:

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.

CONFIRMATION OF "COMMITMENT BY OWNER" (cont'd)

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:

SCHEDULE M

CONFIRMATION OF PROFESSIONAL ASSURANCE

This is Schedule M of the City of Fernie
Subdivision and Development Servicing Bylaw
No. 1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE M - CONFIRMATION OF PROFESSIONAL ASSURANCE

SCHEDULE M

**CONFIRMATION OF
PROFESSIONAL ASSURANCE**

The City of Fernie
P.O. Box 190
FERNIE, B.C.
V0B 1M0

Attention: City Engineer

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 City of Fernie.

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 City Engineer.

.1 Storm Drainage System including, but not restricted to, the following:

- a) the location, alignment, size and grade of all pipes and culverts;
- b) the spacing of manholes and catch basins;
- c) the construction of drywells;
- d) materials used for pipes, culverts, manholes, catch basins, pipe and fitting joints, service connections;
- e) materials used for pipe bedding and backfilling of trenches;
- f) workmanship in the construction and installation of all materials.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE M - CONFIRMATION OF PROFESSIONAL ASSURANCE

.2 Sanitary Sewer System including, but not restricted to, the following:

- a) location, alignment, size and grade of all pipes;
- b) spacing of manholes and catch basins;
- c) materials used for pipes, manholes, pipe and fitting joints, service connections;
- d) materials used for pipe bedding and backfilling of trenches;
- e) workmanship in the construction and installation of all materials.

.3 Water Distribution System including, but not restricted to, the following:

- a) location, alignment, size and grade of all pipes;
- b) spacing of hydrants and valves;
- c) construction of pumping stations and reservoirs;
- d) materials used for pipes, fittings, gate valves, valve boxes, hydrants, service connections, corporation stops, curb stop and boxes, air valves, stops and drains.
- e) materials used for pipe bedding and backfill of trenches;
- f) workmanship in the construction and installation of all materials.

.4 Roads including, but not restricted to, the following:

- a) alignment, width and grade of all roads;
- b) materials used for preparation of road bases and road surfaces;
- c) workmanship in the installation of materials.

.5 Curb and Gutter, Sidewalks, and Boulevards including, but not restricted to, the following:

- a) width and grade of sidewalks and boulevards;
- b) alignment and grade of curbs and gutters;
- c) materials used for preparation of subgrades and surfaces;
- d) workmanship in the installation of materials.

.6 Street Lighting, Electrical and Communications Wiring and Gas Installations including, but not restricted to, the following

- a) number and spacing of street light poles and luminaires;
- b) materials used for street lighting, electrical and communications wiring and gas installations;
- c) materials used for backfilling of trenches;
- d) workmanship in the installation of materials.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE M - CONFIRMATION OF PROFESSIONAL ASSURANCE

.7 Appurtenances including, but not restricted to the following

- a) dykes;
- b) retaining walls;
- c) avalanche barriers.

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 City of Fernie.

In addition, significant revisions to the accepted plans and supporting documents have been submitted to the City 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.

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE M - CONFIRMATION OF PROFESSIONAL ASSURANCE

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

SCHEDULE N
STANDARD DRAWINGS

This is Schedule N of the City of
Fernie Subdivision and
Development Servicing Bylaw No.
1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE N – STANDARD DRAWINGS

**SCHEDULE N
STANDARD DRAWINGS**

N.1 SCHEDULE B - HIGHWAYS

- B-1 Urban Arterial Highway (Undivided)
- B-2 Urban Arterial Highway (Divided)
- B-3a Urban Collector Highway With Parking
- B-3b Urban Collector Highway Without Parking
- B-4 Urban Local Industrial Highway
- B-5 Urban Local Residential Highway
- B-6 Rural Highways
- B-7 Urban Residential Cul-De-Sac
- B-8 Cul-De-Sac Bulb Layout
- B-9 Walkway and Lane
- B-10 Typical Boulevard Construction
- B-11 Private Road Without Parking
- B-12 Concrete Swale

N.2 SCHEDULE C - CURBS, SIDEWALKS, BOULEVARDS

- C-1 Non-Mountable Curb and Gutter
- C-2 Mountable Curb and Gutter
- C-3 Typical Crossover
- C-4 Typical Wheelchair Ramp
- C-5 Standard Separate Sidewalk
- C-6 Typical Sidewalk Rehabilitation without Curb and Gutter

N.3 SCHEDULE D - WATER SYSTEMS

- D-1 Typical Water Service Connection Detail
- D-2 Standard Watermain Realignment
- D-3 Standard Pressure Main Thrust Block Details
- D-4 Standard Hydrant Detail
- D-5 Standard Blow-Off Detail
- D-6 Combination Air Release Valve or Air & Vacuum Release Valve
- D-7 Standard Valve Box Assembly
- D-8 Standard Watermain and Sewermain Anchors
- D-9 Standard Classes of Pipe Bedding and Surrounding Pipe Zone
- D-10 Typical Trench Section for Underground Utility Installation
- D-11 Typical Water, Sanitary and Storm Service in Common Trench

Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE N – STANDARD DRAWINGS

- D-12 Concrete Encasement Detail
- D-13 Standard Underground Utility Paint Markings
- D-14 Encasement & Carrier Pipe Detail

N.4 SCHEDULE E - SANITARY SEWERS

- E-1 Typical Sewer Service Connections
- E-2 Typical Manhole and Base Details for Sewer up to 400 mm Dia.
- E-3 Manhole Drop Structures (400 mm Dia. Max.)
- E-4 Invert Channeling in Manhole
- E-5 Manhole and Base Details for Sewers 450 mm to 900 mm Dia.
- E-6 Manhole Details for Sewers 1050 Dia. and Over
- E-7 Sanitary and Storm Sewer Manhole Requirements
- E-8 Sewer Cleanout for 150 mm & 200 mm Sanitary Terminals
- E-9 Service Connection Details for Sanitary Manhole in Cul-De-Sac
- E-10 PVC Inspection Chamber

N.5 SCHEDULE F - DRAINAGE SYSTEMS

- F-1 Storm Intensity Duration Frequency Curves
- F-2 Standard Catch Basin Detail
- F-3 Catch Basin Frame and Grate
- F-4 Non-Mountable Curb and Gutter at Catch Basin
- F-5 Typical Perforate Drain Installation for Lowering Groundwater Table
- F-6 Concrete Invert Through Easement
- F-7 Concrete Outlet and Inlet Structure
- F-8 Catch Basin Placed in an Open Ditch
- F-9 Landing for Deep Manhole
- F-10 Drainage Dry Well
- F-11 Typical Lot Grading Detail

N.6 SCHEDULE G - STREET LIGHTING

- G-1 Standard Light Pole Base
- G-2 Street Light Pole
- G-3 Street Light Junction Box
- G-4 Double Davit Street Light
- G-5 Frangible Base Detail
- G-6 Hand Hole Wiring Detail
- G-7 Decorative Street Light Standards and Luminaries
- G-8 Decorative Street Light Standards and Luminaries – Description of Components

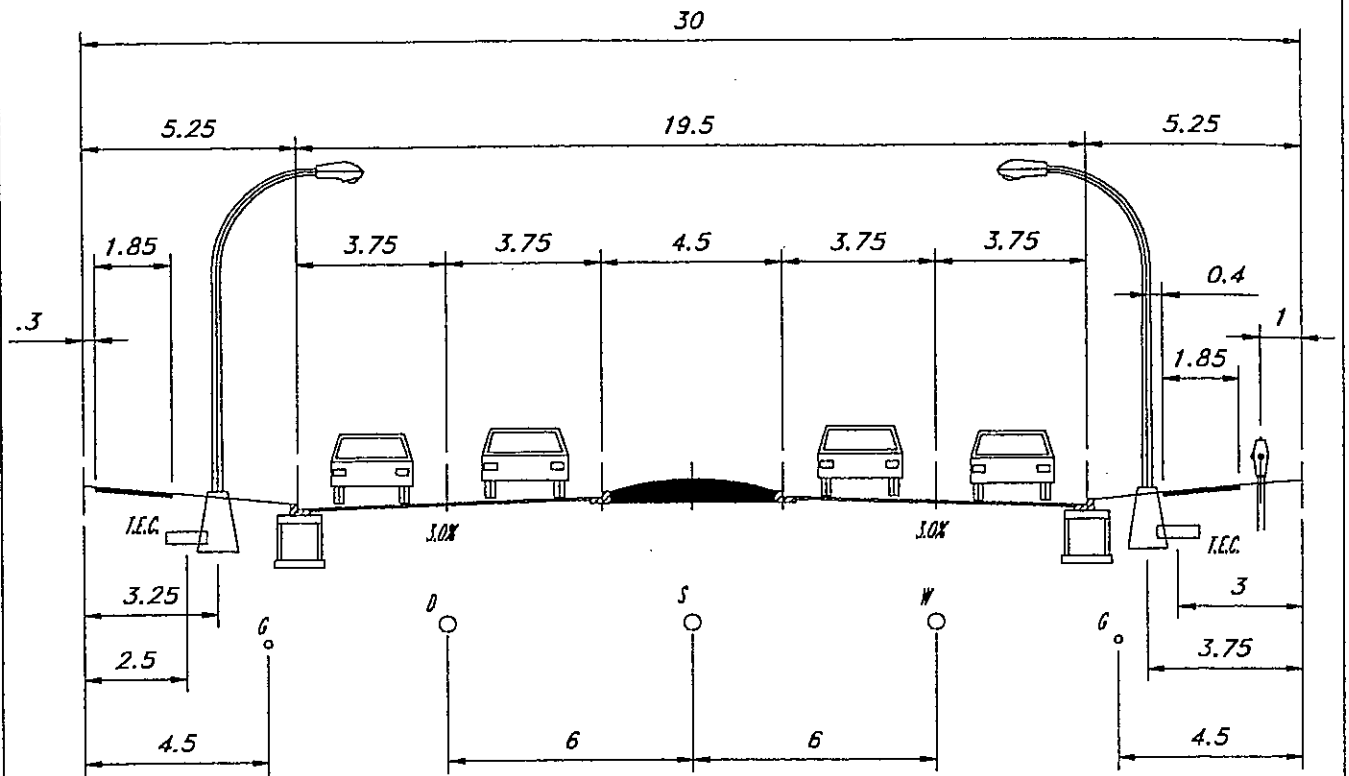
Consolidated Subdivision and Development Servicing Bylaw No. 1727

SCHEDULE N – STANDARD DRAWINGS

- G-9 Decorative Street Light Standards and Luminaries – Type A
- G-10 Decorative Street Light – Type A – Description of Components
- G-11 Decorative Street Light Banner Arm Detail

Bylaw No. 1862

ORAC. No.
8-1



LEGEND

C - CABLEVISION
 T - TELEPHONE
 G - GAS
 E - ELECTRICAL
 W - WATER
 S - SANITARY
 D - STORM SEWER
 HYD - FIRE HYDRANT
 P/L - PROPERTY LINE
 C/L - CENTER LINE
 R/W - RIGHT OF WAY
 SWK - SIDEWALK
 C - CURB
 FOC - FACE OF CURB
 CB - CATCH BASIN
 OSL - STREET LIGHT

NOTES :

1. WATER SERVICE VALVES 0.3 FROM P/L
2. USE 5mm THICK EXPANSION JOINT MATERIAL AROUND BASE AND HYDRANT.
3. MINIMUM R/W SHOWN OR TO EXTEND 1.0 m PAST TOP OF CUT SLOPE OR TOE OF FILL SLOPE
4. ALL ROAD GRADES C/L TO FOC ARE 3.0%

UNITS ARE IN METERS
 UNLESS OTHERWISE NOTED



NO.	DATE	REVISIONS	BY	APPROD

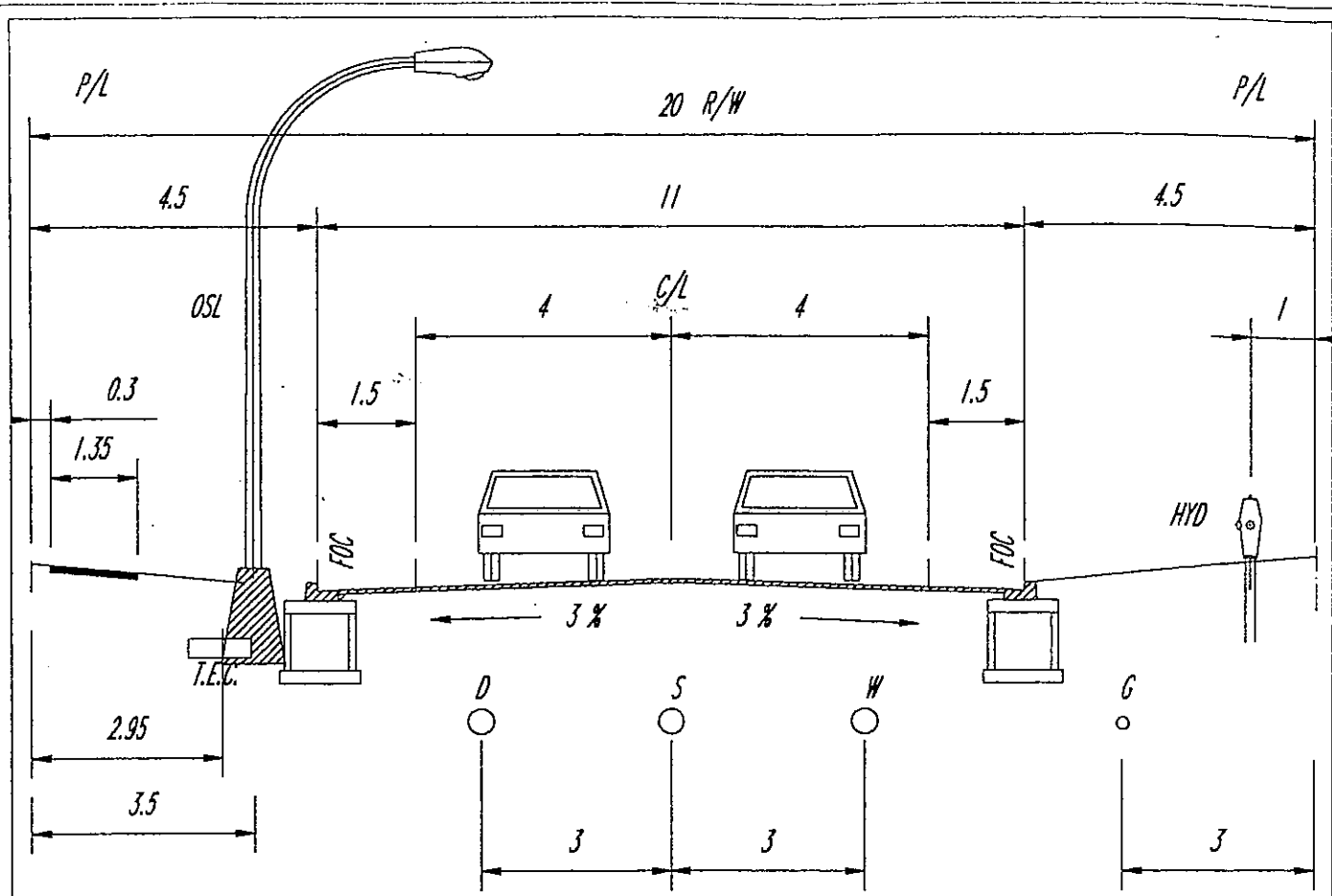
URBAN
 ARTERIAL HIGHWAY
 (DIVIDED)
 30.0m RIGHT OF WAY

DATE
 FEB/2000

SCALE
 NTS

CAD FILE
 FERB-2

DWG. No.
 B-2



LEGEND

C - CABLEVISION
 T - TELEPHONE
 G - GAS
 E - ELECTRICAL
 W - WATER
 S - SANITARY
 D - STORM SEWER
 HYD - FIRE HYDRANT
 P/L - PROPERTY LINE
 C/L - CENTER LINE
 R/W - RIGHT OF WAY
 SWK - SIDEWALK
 C - CURB
 FOC - FACE OF CURB
 CB - CATCH BASIN
 OSL - STREET LIGHT

UNITS ARE IN METERS
 UNLESS OTHERWISE NOTED

NOTES:

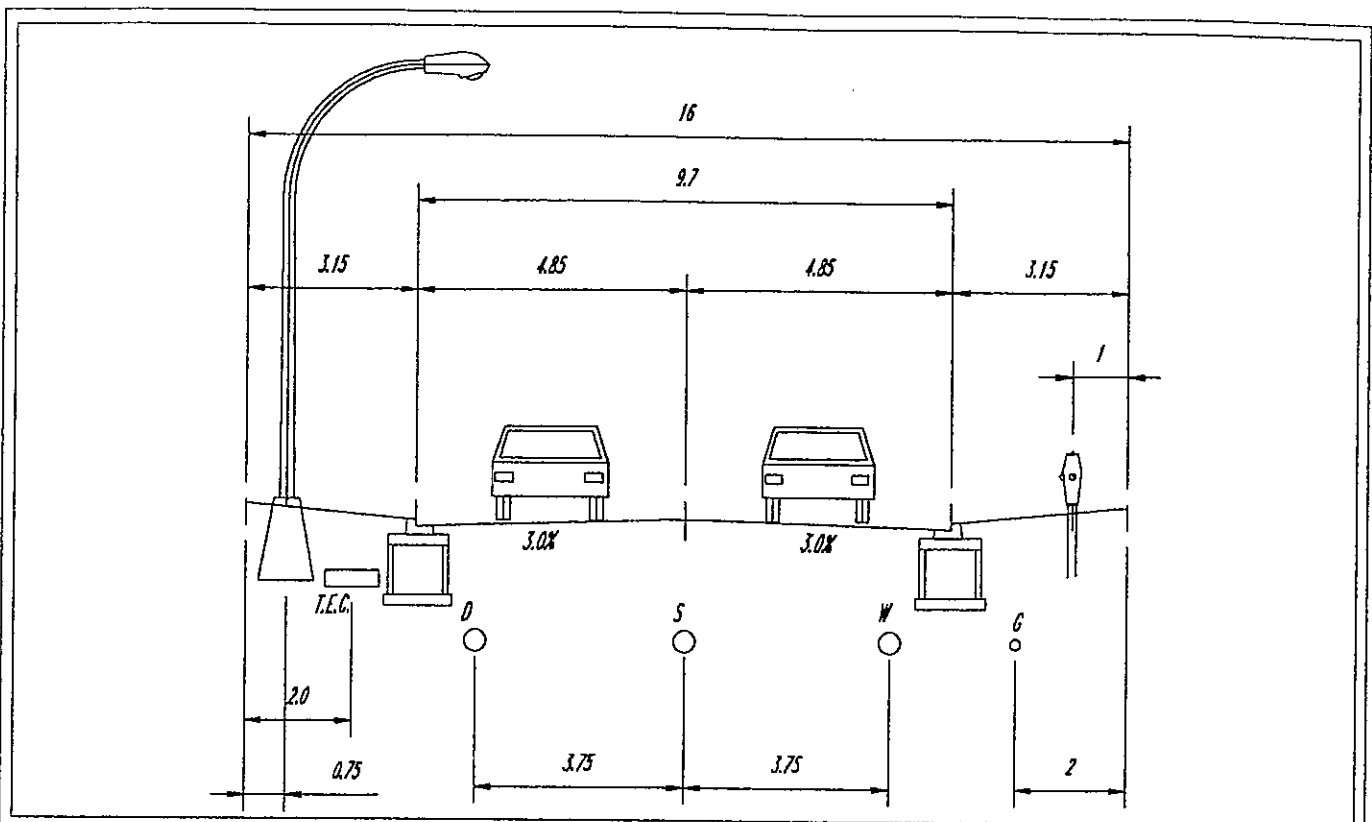
1. WATER SERVICE VALVES 0.3 FROM P/L
2. USE 5mm THICK EXPANSION JOINT MATERIAL AROUND BASE AND HYDRANT.
3. MINIMUM R/W SHOWN OR TO EXTEND 1.0 m PAST TOP OF CUT SLOPE OR TOE OF FILL SLOPE
4. ROAD GRADE FROM C/L TO FOC IS 3.0%



NO.	DATE	REVISIONS	BY	APP'D

URBAN
 COLLECTOR HIGHWAY
 WITHOUT PARKING
 20.0m RIGHT OF WAY

DATE	SCALE	CAD FILE	DWG. No.
JUL/99	NTS	FERB-3b	8-3b



LEGEND

C - CABLEVISION
 T - TELEPHONE
 G - GAS
 E - ELECTRICAL
 W - WATER
 S - SANITARY
 D - STORM SEWER
 HYD - FIRE HYDRANT
 P/L - PROPERTY LINE
 C/L - CENTER LINE
 R/W - RIGHT OF WAY
 SWK - SIDEWALK
 C - CURB
 FOC - FACE OF CURB
 CB - CATCH BASIN
 OSL - STREET LIGHT

NOTES :

1. WATER SERVICE VALVES 0.3 FROM P/L
2. MINIMUM R/W SHOWN OR TO EXTEND 1.0 m PAST TOP OF CUT SLOPE OR TOE OF FILL SLOPE
3. ROAD GRADE FROM C/L TO FOC IS 3.0%

UNITS ARE IN METERS
 UNLESS OTHERWISE NOTED



NO.	DATE	REVISIONS	BY	APP'D

URBAN LOCAL
 INDUSTRIAL HIGHWAY
 16.0m RIGHT OF WAY

DATE FEB/2000	SCALE NTS	CAD FILE FERB-4	DWG. No. P-2
------------------	--------------	--------------------	-----------------

OWG. No.
B-5

OWE No.
8-7

DATE MAY/98	SCALE NTS	CAD FILE FERB-8	DWG. No. 8-8
----------------	--------------	--------------------	-----------------



1. REMOVABLE LOCKED BOLLARD TO BE
INSTALLED AT BOTH ENDS OF THE WALKWAY
WHERE IT JOINS OTHER HIGHWAYS.

[illegible]

WALKWAY AND
LANE

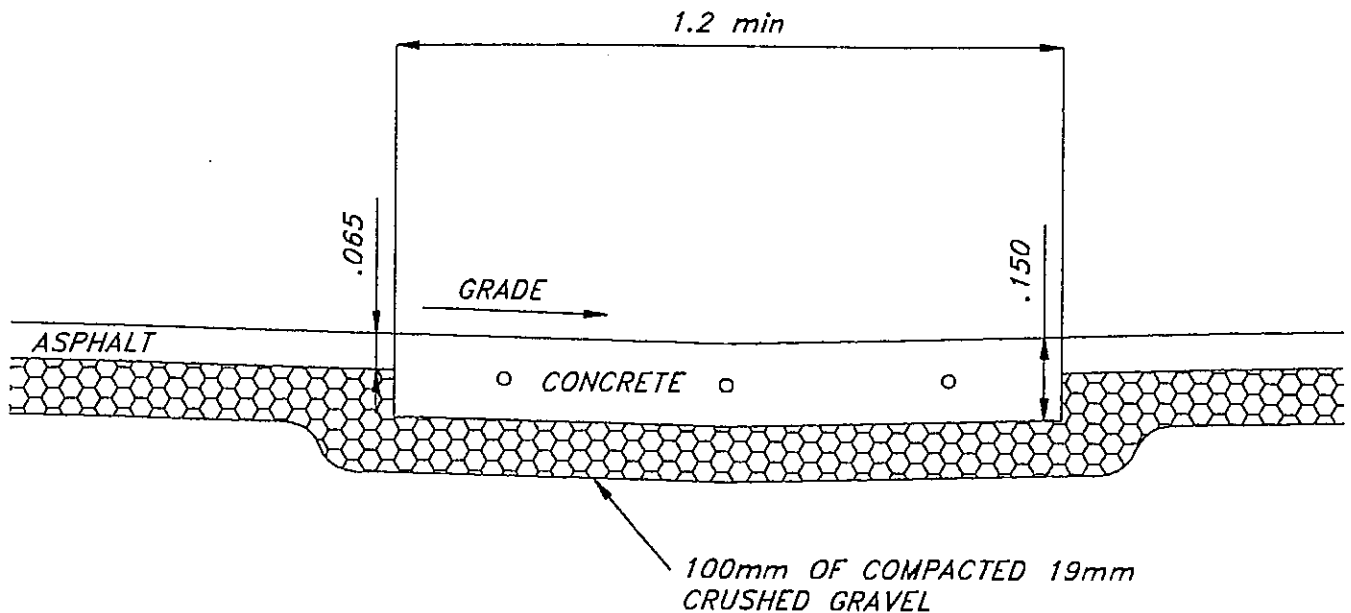
DATE
MAY/98

SCALE
NTS

CAD FILE
FERB--9

DISC. No.
B-9

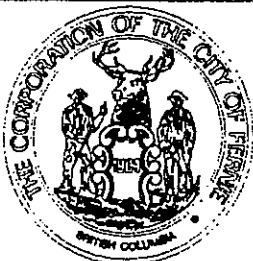
Doc. No.
B--10



NOTES:

1. CROSSINGS REQUIRE 12M BARS 400mm o/c EACH WAY
2. 30MPA AT 28 DAYS
3. SLUMP - 80mm FOR HAND-FORMED; 25mm FOR EXTRUDED
4. AIR ENTRAINMENT SHALL BE GREATER THAN 5%
5. 3% GRADE OR MATCH EXISTING ROAD GRADE

ALL DIMENSIONS IN METERS



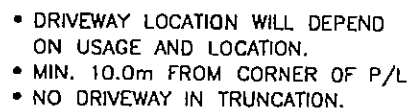
NO.	DATE	REVISIONS	BY	APP'D	

CONCRETE
SWALE

DATE FEB/2000	SCALE NTS	CAD FILE FERB-12	DWG. No. B-12
------------------	--------------	---------------------	------------------

[illegible]

DWDL No.
C-2



SECTION A-A

25mm

2 - 15M BARS LONGITUDINALLY TO OUTSIDE EXTREMITIES OF FLARE (ONLY FOR COMMERCIAL AND INDUSTRIAL CROSSINGS)

NOTES:

1. INDUSTRIAL AND COMMERCIAL CROSSINGS
REQUIRE 12M BARS 300mm o/c EACH WAY.
2. WHEN INSTALLING CROSSOVER ON EXISTING
CURB, GUTTER AND SIDEWALK 12M BARS
TO BE DRILLED AND GROUTED INTO
EXISTING CONCRETE 300mm o/c.

[illegible]

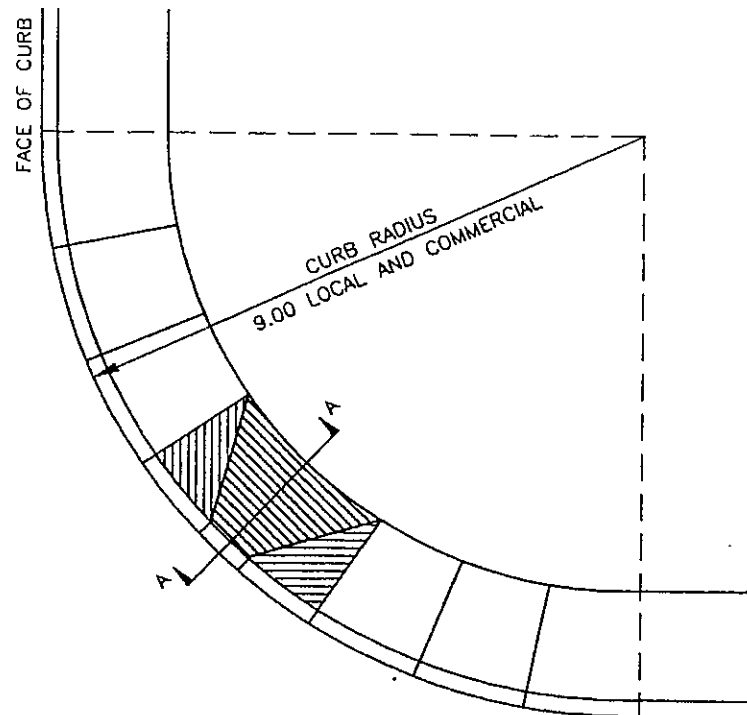
TYPICAL CROSSOVER

DATE
MAY/98

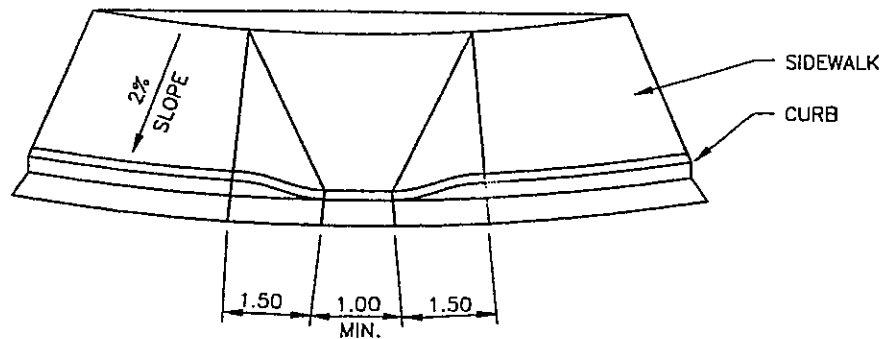
SCALE
NTS

CAD FILE
FERC-3

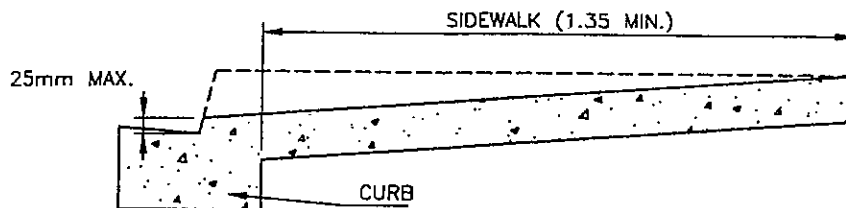
ORG. No.
C-3



PLAN



ISOMETRIC VIEW



SECTION A-A

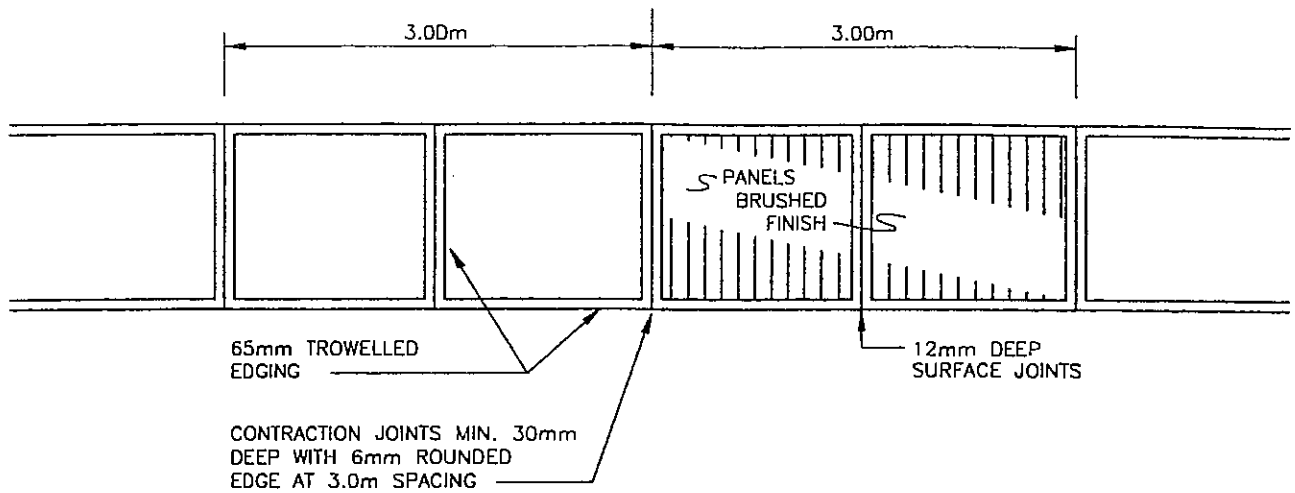
UNITS ARE IN METERS
UNLESS OTHERWISE NOTED



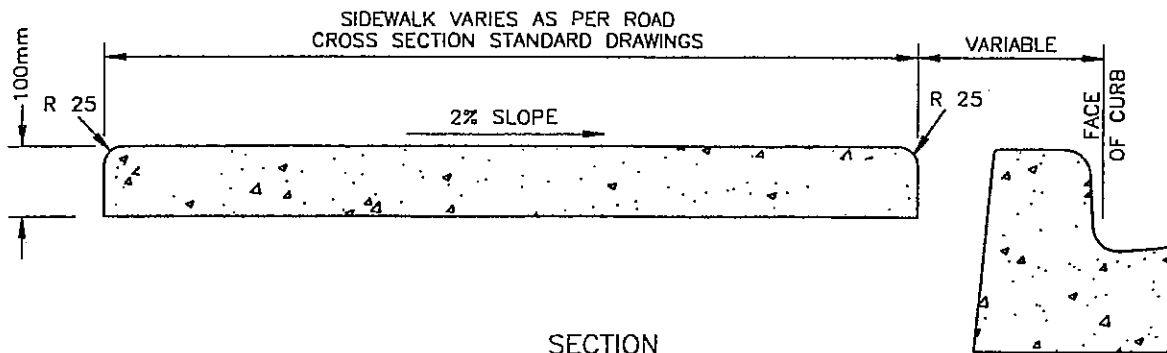
NO.	DATE	REVISIONS	BY	APP'D.

TYPICAL WHEELCHAIR RAMP

DATE MAY/98	SCALE NTS	CAD FILE FERC-4	DWG. No. C-4
----------------	--------------	--------------------	-----------------



PLAN



SECTION

NOTES:

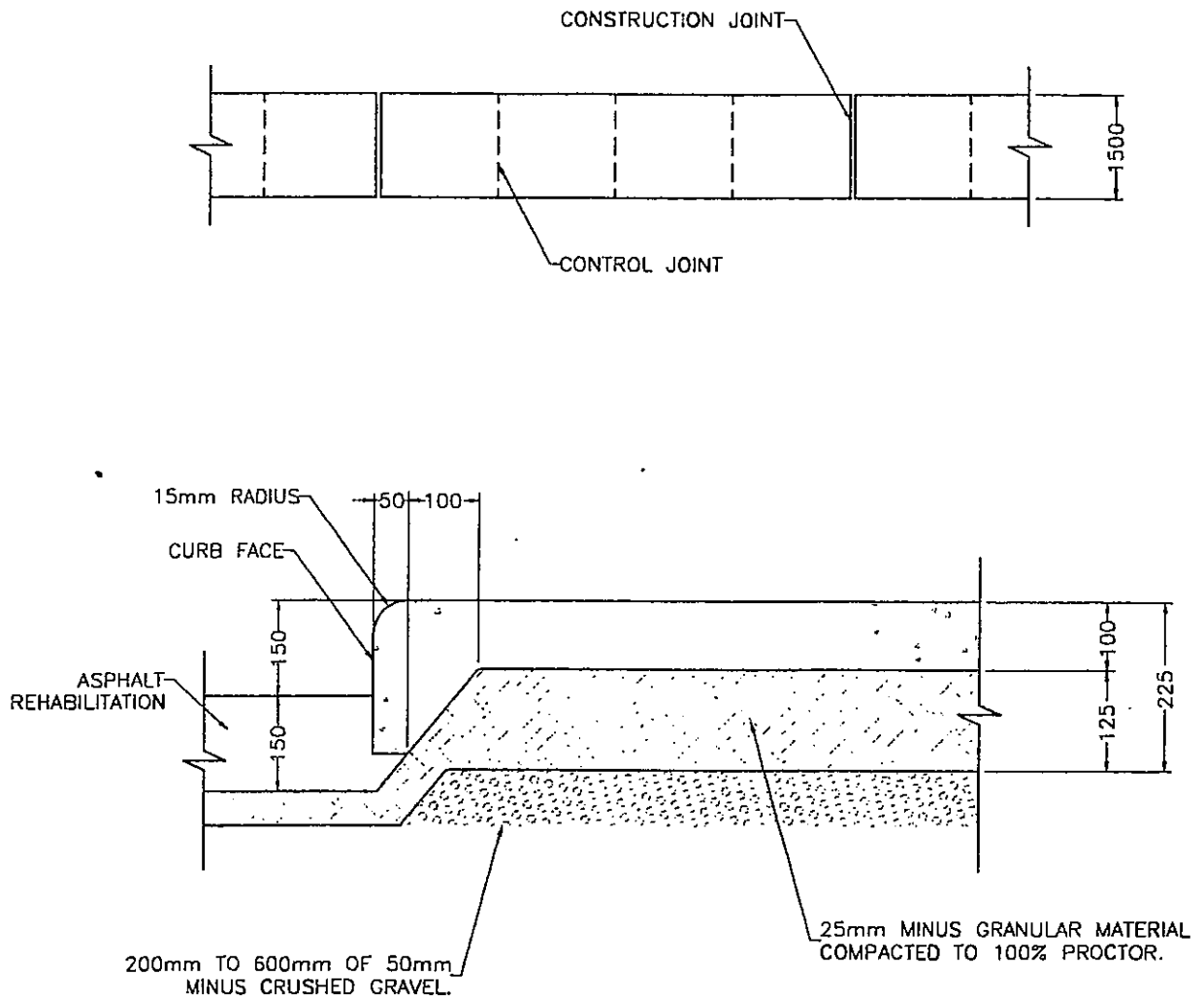
- 1) CONCRETE TO HAVE A 28 DAY COMPRESSIVE STRENGTH OF 30 MPa.
- 2) 13mm EXPANSION JOINTS AT TANGENT POINTS, AND AT THE END OF EACH DAYS POUR.
- 3) MINOR VARIATION IN CROSS SECTION WILL BE CONSIDERED TO ACCOMMODATE EXTRUDING OR SLIPFORM MACHINES.



NO.	DATE	REVISIONS	BY	APP'D	

STANDARD SEPARATE
SIDEWALK

DATE MAY/98	SCALE NTS	CAD FILE FERC-5	DWG. No. C-5
----------------	--------------	--------------------	-----------------



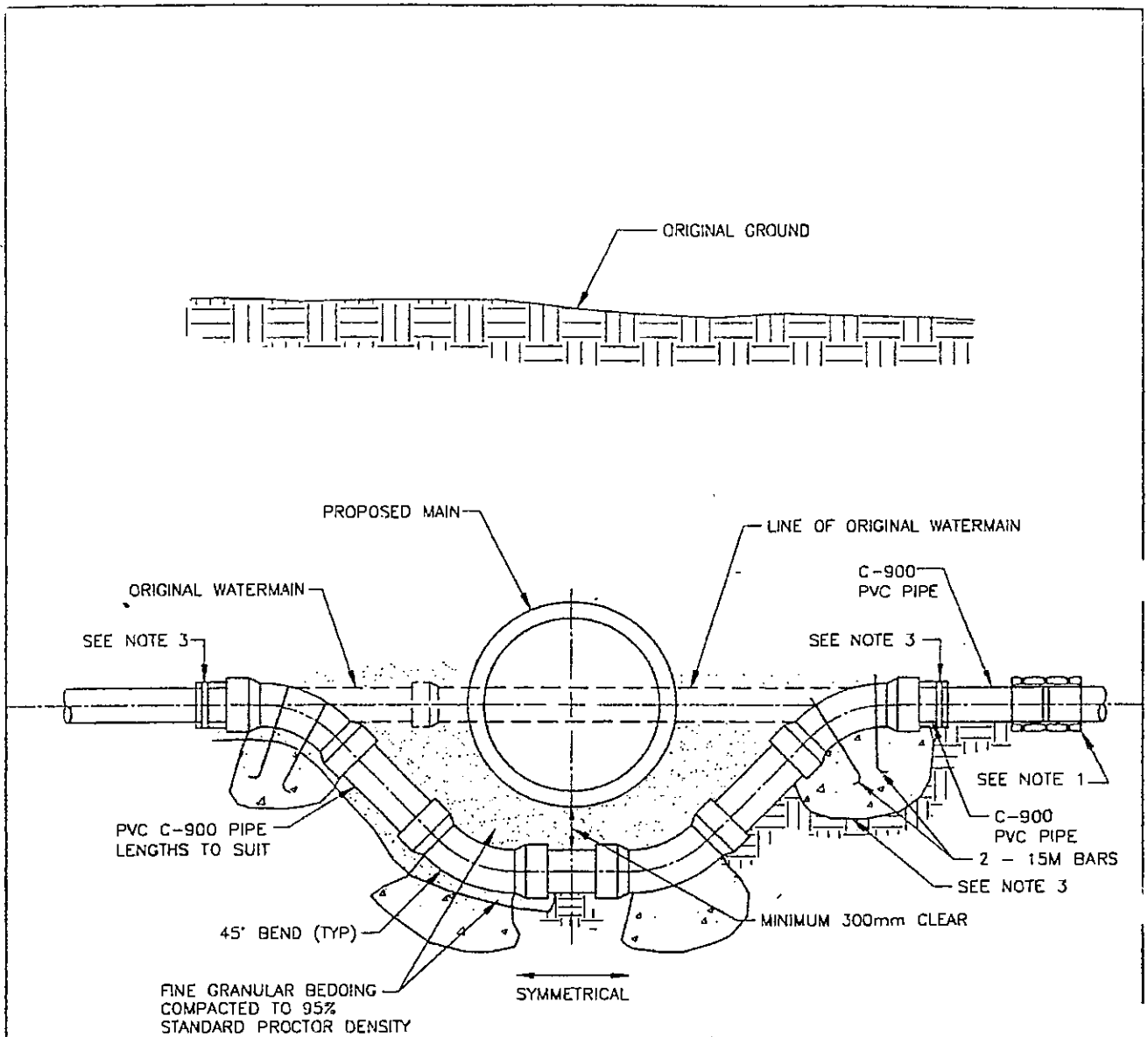
NOTE: CONTROL JOINTS EVERY 1.50m.
 CONSTRUCTION JOINTS EVERY 3.00m.
 CONCRETE 30 MPa AT 28 DAYS.
 AIR ENTRAINMENT 6 TO 8%.
 MINIMUM 100% STD. PROCTOR
 DENSITY FOR ALL FILL IN TRAVELLED
 AREAS.

UNITS ARE IN MILLIMETERS
 UNLESS OTHERWISE NOTED



TYPICAL SIDEWALK REHABILITATION WITHOUT CURB AND GUTTER

NO.	DATE	REVISIONS	BY	APP'D	DATE	SCALE	CAD FILE	DWG. No.
					MAY/98	NTS	FERC-6	C-6



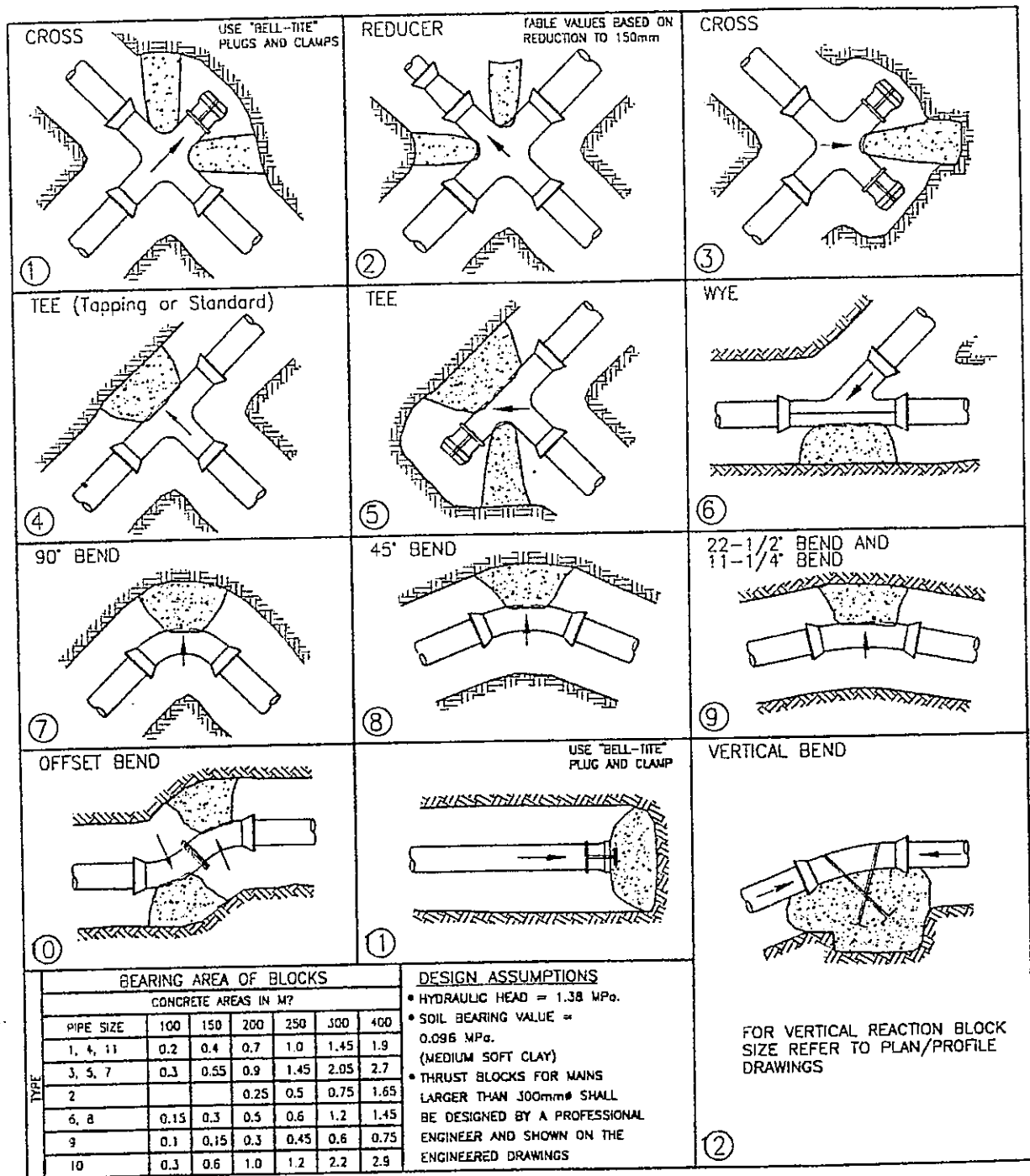
NOTES:

1. APPROVED STAINLESS STEEL REPAIR CLAMPS MAY BE USED TO FACILITATE CONNECTION TO EXISTING WATERMAINS.
2. CONNECTIONS SHALL BE LEFT EXPOSED UNTIL WATERMAIN JOINTS ARE PROVEN DRIP-TIGHT.
3. SERIES 1390 UNIFLANGE JOINT RESTRAINER OR APPROVED EQUAL.



**STANDARD
WATERMAIN REALIGNMENT**

						STANDARD WATERMAIN REALIGNMENT			
						DATE	SCALE	CAD FILE	ORIG. NO.
NO.	DATE	REVISIONS	BY	APP'D		MAY/98	NTS	FERD-2	0-2



STANDARD PRESSURE MAIN THRUST BLOCK DETAILS

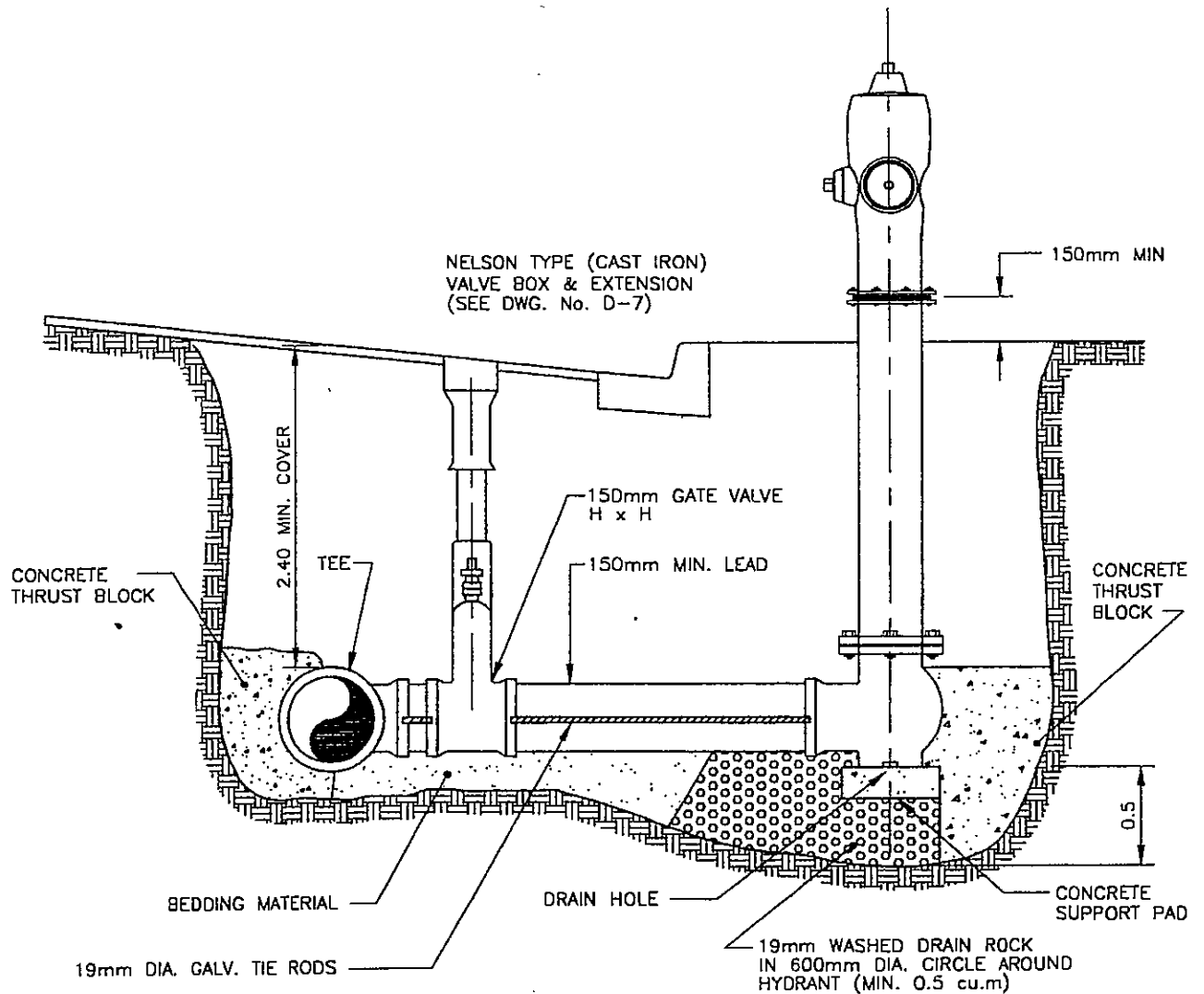
NO.	DATE	REVISIONS	BY	APP'D

DATE
MAY/98

SCALE
NTS

CAD FILE
FERD-3

DWG. No.
D-3



NOTES:

1. HYDRANTS - COMPRESSION TYPE AS MANUFACTURED BY:
CANADA VALVE (CENTURY) OR McAVITY (BRIGADERE)
LEFT HAND OPENING B.C. STANDARD THREAD
2. HYDRANTS SHALL HAVE 2 - 65mm OUTLETS (B.C. STANDARD THREAD)
1 - 130mm O/D PUMPER OUTLET
3. PUMPER OUTLET MUST FACE CURB OR AWAY FROM PROPERTY LINE
4. HYDRANT BOOT, SIZED FOR 150mm PIPE
5. HYDRANT BODY COLOR - RED
6. ALL PIPE AND FITTINGS SHALL CONFORM TO AWWA SPEC.
7. VALVE TO BE LOCATED A MINIMUM 2.0m FROM THE HYDRANT
AND WITHIN THE ASPHALT OF THE ROAD.
8. FOR LOCATION OF HYDRANT SEE HIGHWAY STANDARD DRAWINGS
9. GALVANIZED TIE RODS OR CONCRETE THRUST BLOCK REQUIRED.

UNITS ARE IN METERS
UNLESS OTHERWISE NOTED



STANDARD HYDRANT DETAIL

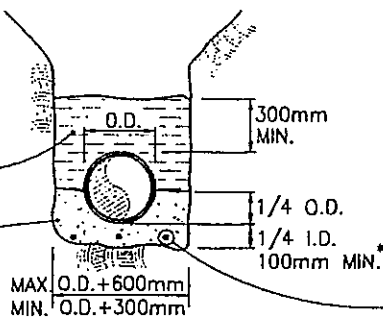
NO.	DATE	REVISIONS	BY	APP'D	DATE	SCALE	CAD FILE	DWG. No.
					MAY/98	NTS	FERD-4	D-4

DATE MAY/98	SCALE NTS	CAD FILE FERD-7	DWG. NO. D-7
----------------	--------------	--------------------	-----------------

CLASS "A" BEDDING

PIPE SURROUND GRANULAR
BEDDING MATERIAL PLACED
IN MAXIMUM 150mm LIFT.
COMPACT TO 95% S.P.D.

CONCRETE - 20MPa.
IN ALKALI SOILS, SULFATE
RESISTANT CEMENT SHALL
BE USED

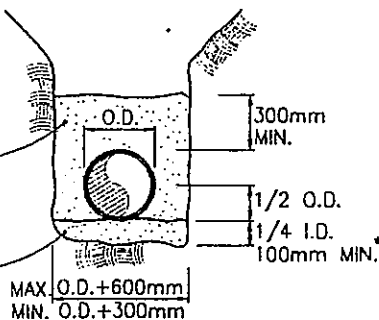


REQUIRED REINFORCEMENT
- AS NOTED ON CONTRACT
DRAWINGS

CLASS "B" BEDDING

PIPE SURROUND GRANULAR
BEDDING MATERIAL PLACED
IN MAXIMUM 150mm LIFT.
COMPACT TO 95% S.P.D.

GRANULAR BEDDING MATERIAL
COMPACTED TO 95% S.P.D.

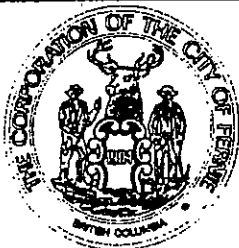
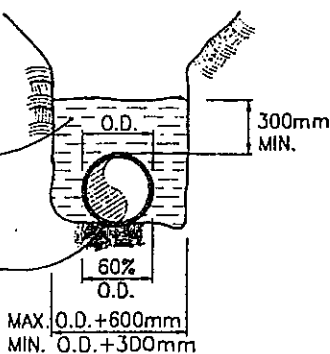


- * INCREASE TO BYLAW REQUIREMENTS IN TRENCH ROCK

CLASS "C" BEDDING

PIPE SURROUND SUITABLE
MATERIAL PLACED IN
MAXIMUM 150mm LIFT.
COMPACTED TO 95% S.P.D.

BOTTOM OF TRENCH SHAPED TO
ACCEPT LOWER EXTERIOR OF PIPE



NQ.	DATE	REVISIONS		BY APP'D

STANDARD CLASSES OF PIPE BEDDING AND SURROUND WITHIN PIPE ZONE

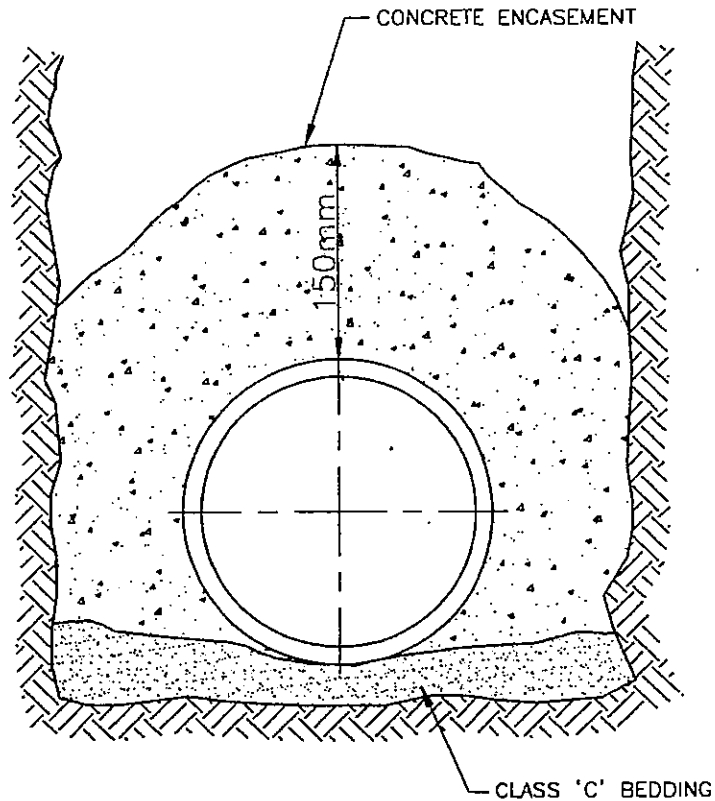
DATE
MAY/98

SCALE
NTS

CAD FILE
FERD-9

OWFC No.
D-9

DATE MAY/98	SCALE NTS	CAD FILE FERD-10	DWG. No. D-10
----------------	--------------	---------------------	------------------



NOTES:

1. THE PLACEMENT OF THE CONCRETE ENCASEMENT NEED NOT BE DONE BY FORMING
2. MIN. THICKNESS OF THE CONCRETE ENCASEMENT TO BE 150mm
3. CONCRETE ENCASEMENT TO BE CONTINUOUS FOR DUCTILE IRON PIPE
4. ENCASEMENT ON PVC AND AC SEWERS TO STOP 0.3m EACH WAY OF COUPLING



NO.	DATE	REVISIONS	BY	APP'D	

**CONCRETE ENCASEMENT
DETAIL**

DATE
MAY/98

SCALE
NTS

CAD FILE
FERD-12

OWE. No.
D-12

UTILITY	MARKING	COLOUR
B.C. HYDRO	H	RED
B.C. TELEPHONE	BC TEL	ORANGE
B.C. GAS	G	YELLOW
CABLE TELEVISION	CCT.V.	ORANGE
• WATER	• W	BLUE
SAN SEWER	SAN.	GREEN
STORM SEWER	STO.	SILVER

NOTE:

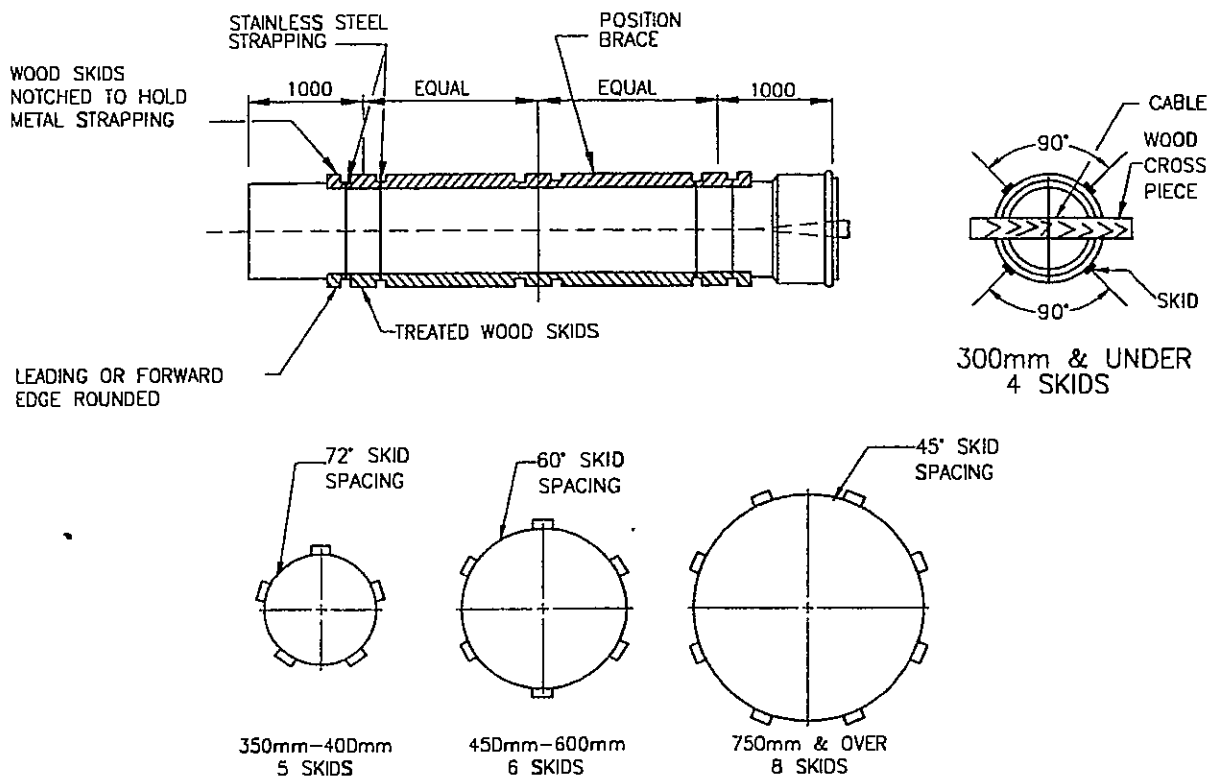
- COLOUR CODE AS ADOPTED BY A.P.T.W.A. FOR UNDERGROUND UTILITIES.
- INDICATE SERVICE MARKING AND DEPTH WHERE APPLICABLE.



NO.	DATE	REVISIONS	BY	APP'D	

STANDARD UNDERGROUND
UTILITY
PAINT MARKINGS

DATE MAY/98	SCALE NTS	CAD FILE FERD-13	DWG. No. D-13
----------------	--------------	---------------------	------------------



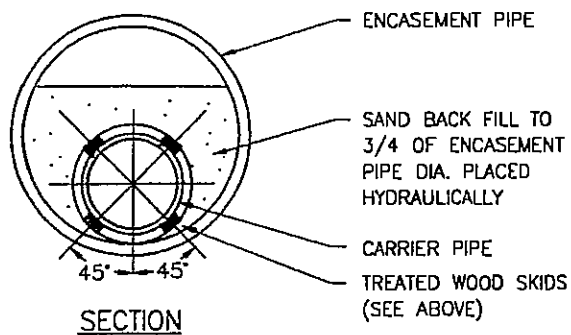
SKID ARRANGEMENT FOR VARIOUS PIPE SIZES

NOTES:

1. CARRIER PIPE JOINTS SHALL BE SET 1000mm BEYOND THE ENDS OF THE ENCASEMENT PIPE.

2.

CARRIER PIPE SIZE mm	ENCASEMENT PIPE SIZE mm
100	250
125	300
150	300
200	400
250	450
300	500
375	600



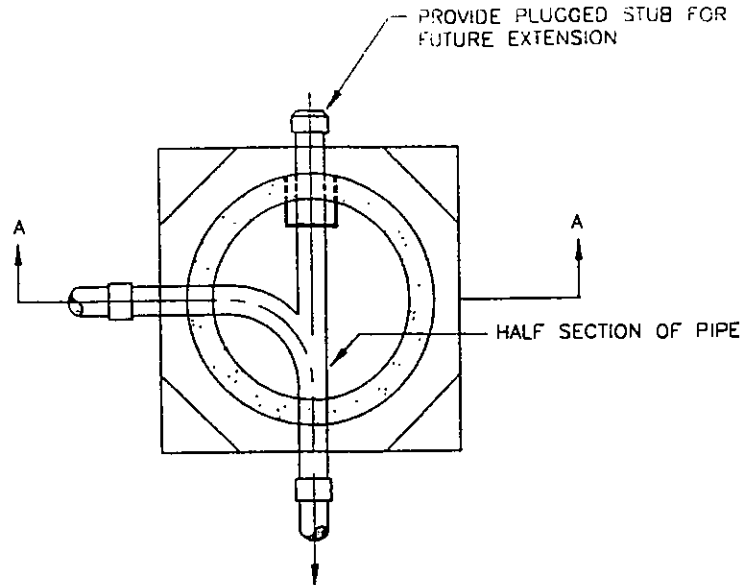
UNITS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED



ENCASEMENT & CARRIER PIPE DETAIL

NO.	DATE	REVISIONS	BY	APP'D	DATE	SCALE	CAD FILE	DWG. No.
					MAY/98	NTS	FERD-14	D-14

PROVIDE JOINT
MAXIMUM I.D. OUTSIDE
MANHOLE BARREL.

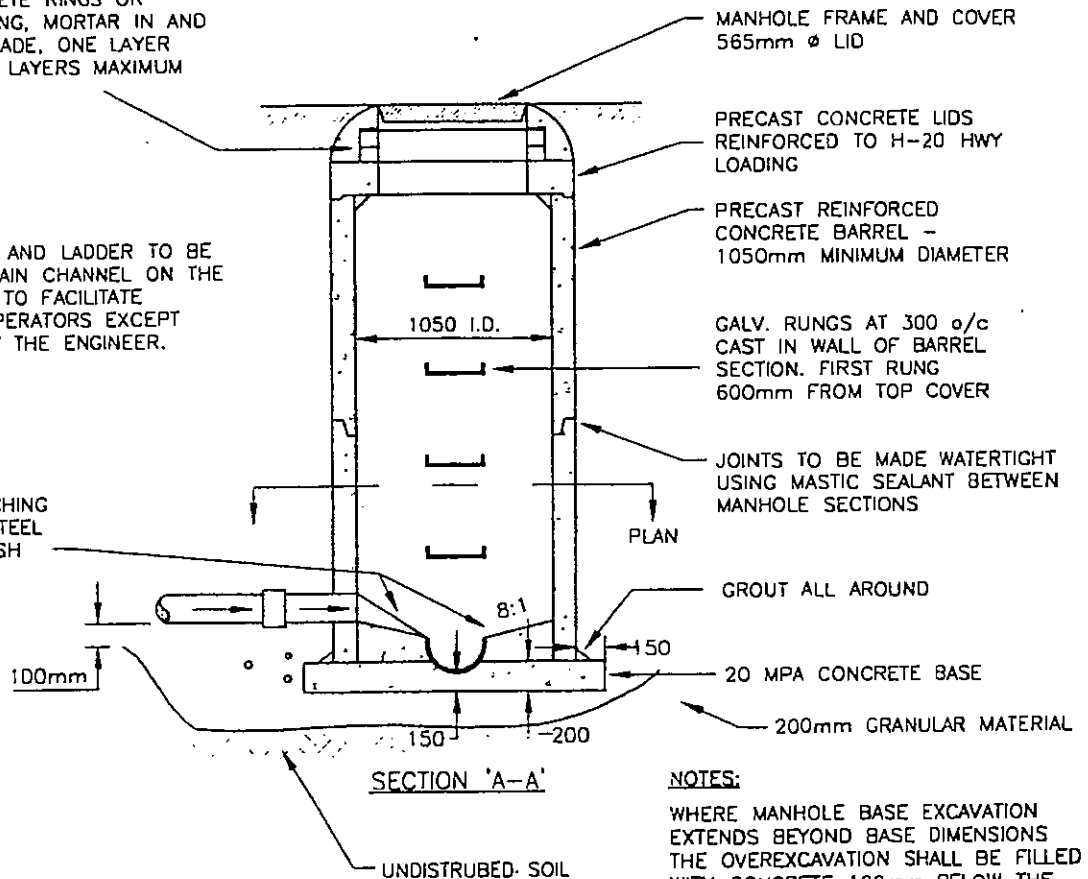


PLAN

PRECAST CONCRETE RINGS OR
BRICK FILLER RING, MORTAR IN AND
OUT TO SUIT GRADE, ONE LAYER
MINIMUM, THREE LAYERS MAXIMUM

ENTRANCE TUBE AND LADDER TO BE
PLACED OVER MAIN CHANNEL ON THE
UPSTREAM SIDE TO FACILITATE
MAINTENANCE OPERATORS EXCEPT
AS DIRECTED BY THE ENGINEER.

CONCRETE BENCHING
WITH SMOOTH STEEL
TROWELLED FINISH



SECTION 'A-A'

UNITS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

NOTES:

WHERE MANHOLE BASE EXCAVATION
EXTENDS BEYOND BASE DIMENSIONS
THE OVEREXCAVATION SHALL BE FILLED
WITH CONCRETE 100mm BELOW THE
BOTTOM OF THE PIPE AND THE WIDTH
OF THE TRENCH. ALL POURED IN
PLACE CONCRETE TO BE 20 MPA.



TYPICAL MANHOLE AND
BASE DETAILS FOR SEWER
UP TO 400mm DIA.

NO.	DATE	REVISIONS	BY	APP'D

DATE
MAY/98

SCALE
NTS

CAD FILE
FERE-2

DWG. NO.
E-2



NOL	DATE	REVISIONS	BY	APP'D

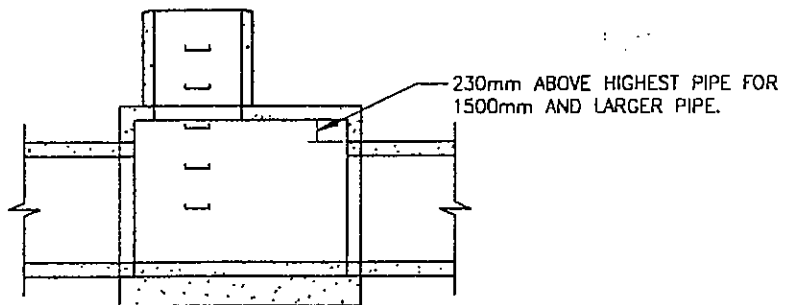
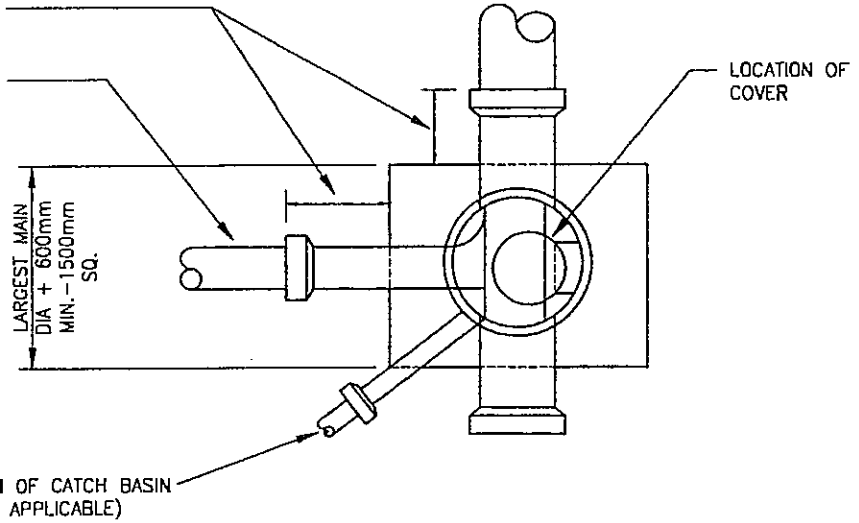
INVERT CHANNELLING IN MANHOLE

DATE
MAY/98

SCALE
NTS

CAD FILE
FERE-4

DWG. No.
E-4



BASE SECTION THRU MANHOLES
FOR PIPE 600mm DIA TO
900mm DIA

NOTES:

WHERE MANHOLE BASE EXCAVATION EXTENDS BEYOND
BASE DIMENSIONS, THE OVEREXCAVATION SHALL BE FILLED
WITH CONCRETE 100mm BELOW THE BOTTOM OF THE PIPE
AND THE WIDTH OF THE TRENCH.
ALL POURED IN PLACE CONCRETE TO BE 20 MPa.

UNITS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED



						MANHOLE AND PIPE DETAILS FOR SEWERS 450mm TO 900mm DIA.			
						DATE	SCALE	CAD FILE	DWG. No.
						MAY/98	NTS	FERE-5	E-5
No.	DATE	REVISIONS	BY	APP'D					



-230mm ABOVE HIGHEST PIPE FOR
1500mm AND LARGER PIPE.

[illegible]

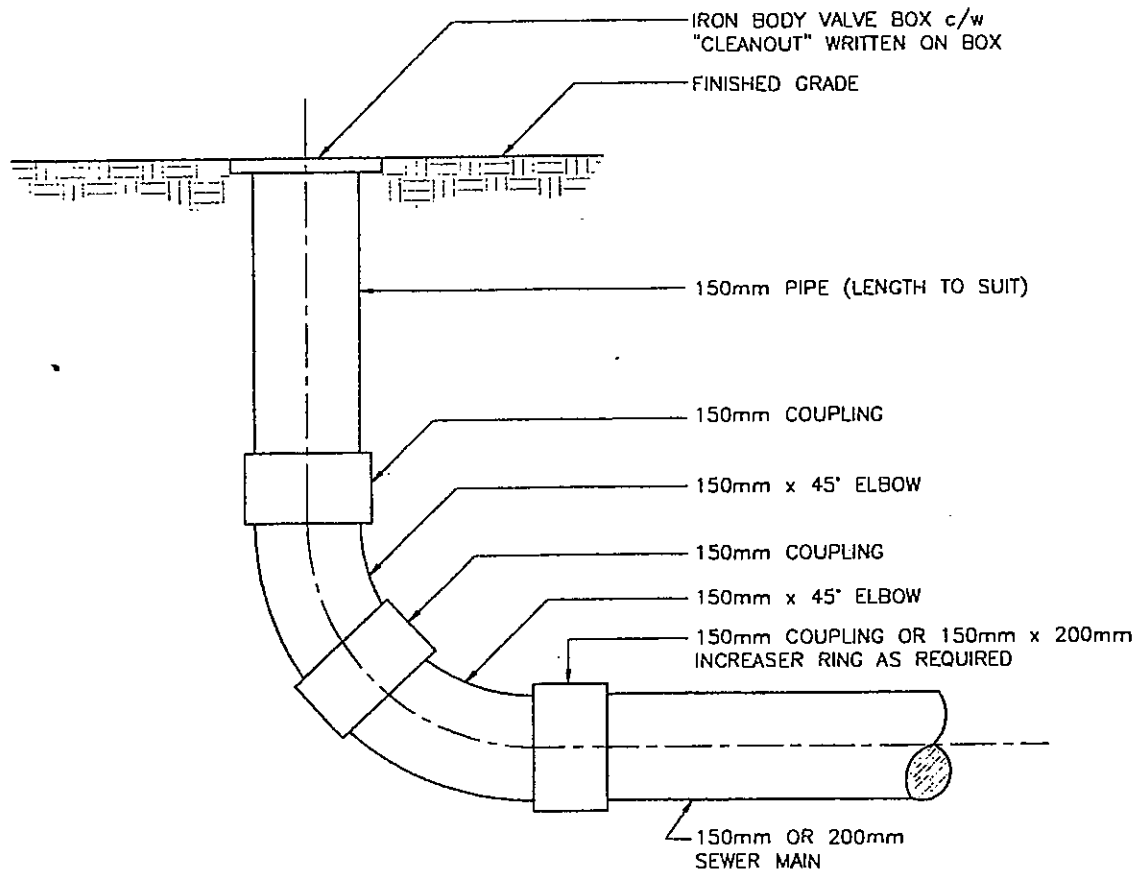
MANHOLE DETAILS FOR
SEWERS 1050 DIA
AND OVER

DATE
MAY/98

SCALE
NTS

CAD FILE
FERE-6

DWG. No.
E-6



NOTES:

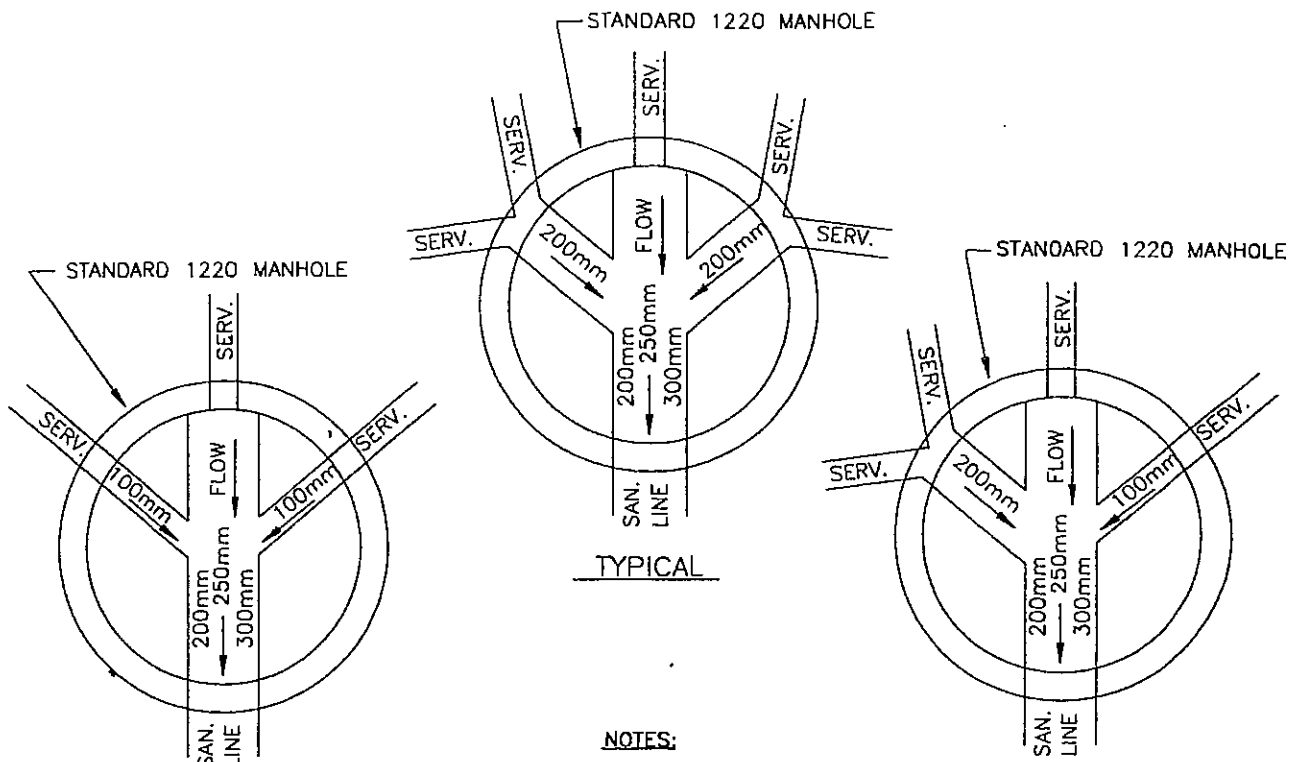
1. ALL PIPE MATERIALS SHALL BE P.V.C.



**SEWER CLEANOUT
FOR 150mm & 200mm
SANITARY SEWER TERMINALS**

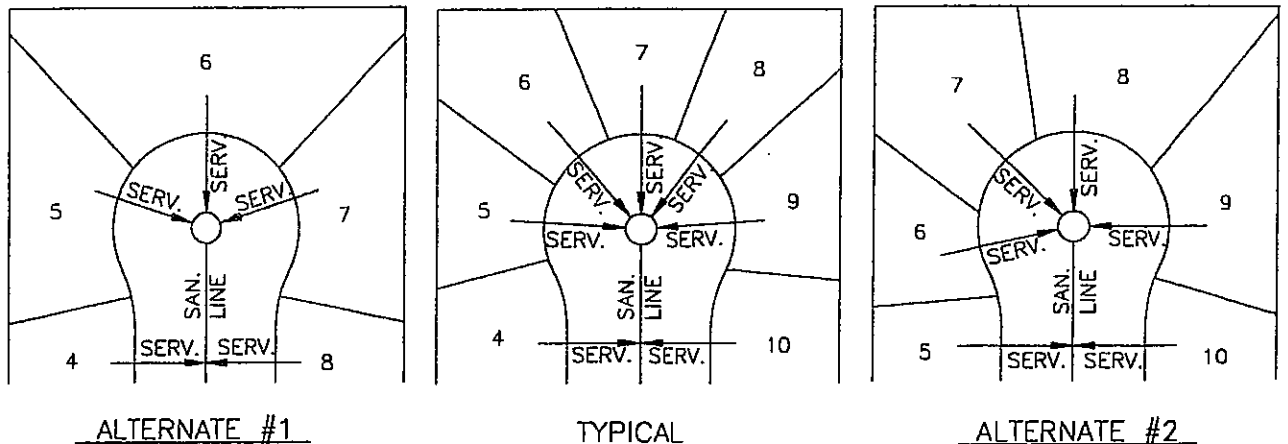
NO.	DATE	REVISIONS	BY	APP'D	

DATE MAY/98	SCALE NTS	CAD FILE FERE-8	DWG. No. E-8
----------------	--------------	--------------------	-----------------



NOTES:

1. IN CASE OF MORE THAN 5 CONNECTION INTO A MANHOLE, A DETAIL DRAWING SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. SANITARY MAIN TO GO STRAIGHT THROUGH MANHOLE WITH 0.50 PIPE TO OPPOSITE WALL.
3. MAXIMUM HEIGHT OF INLET 300mm ABOVE INVERT OF OUTLET.
4. 0.50 PIPE BENCHING TO ACCOMMODATE BRANCH CONNECTIONS.
5. SERVICE CONNECTIONS INTO BARRELL TO BE MACHINE CORED.



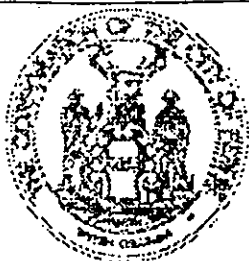
NO.	DATE	REVISIONS	BY	APP'D

SERVICE CONNECTION DETAILS
FOR SAN. MANHOLE
IN CUL-DE-SAC

DATE	SCALE	CAD FILE	DWG. No.
MAY/98	NTS	FERE-9	E-9



- UNITS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED



NO.	DATE	NOVISENS	BY	APPR

PVC INSPECTION CHAMBER
FOR RESIDENTIAL SEWER
SERVICES

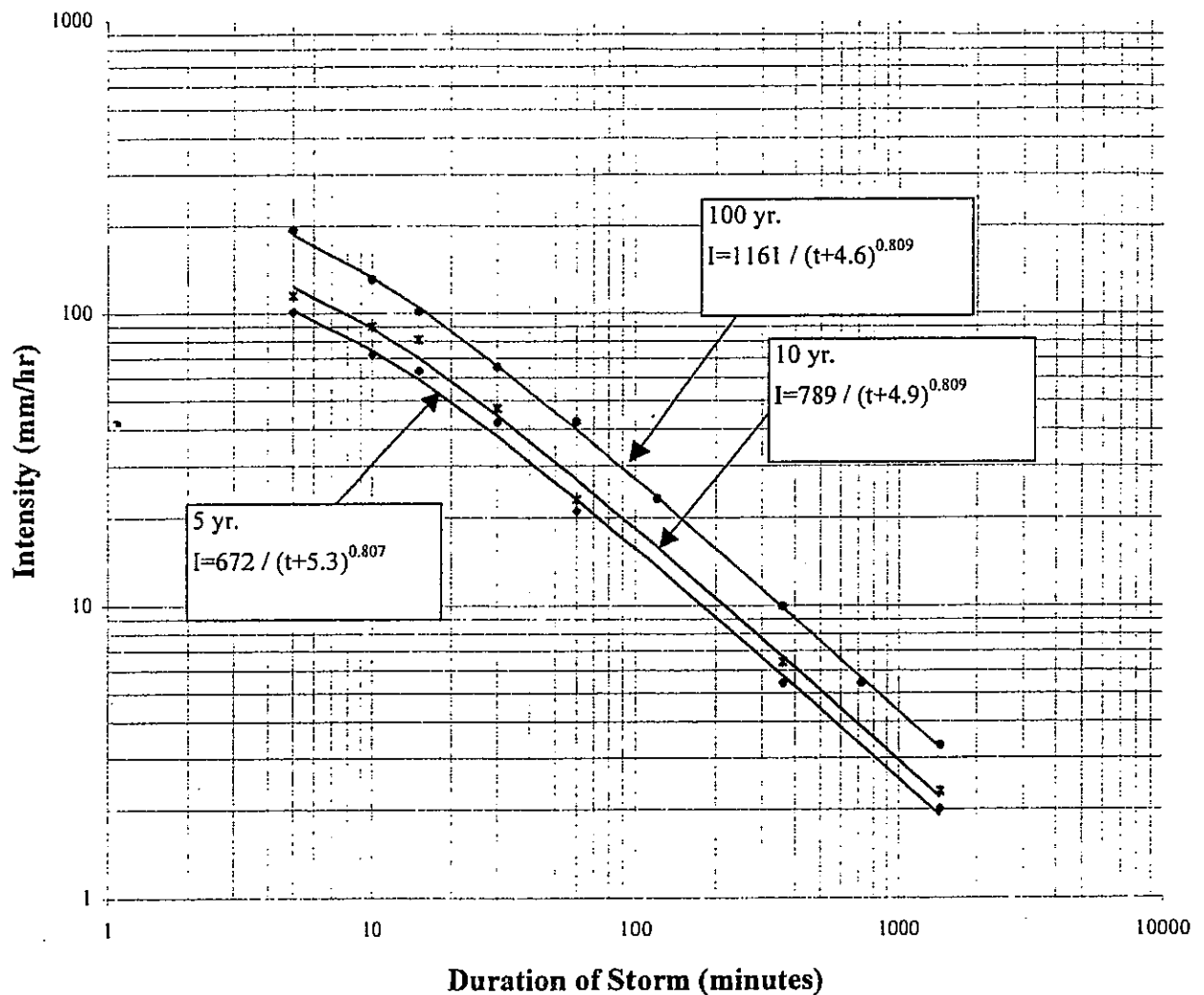
DAT
MAY/98

NTS

CAD FILE
FERE-10

E-10

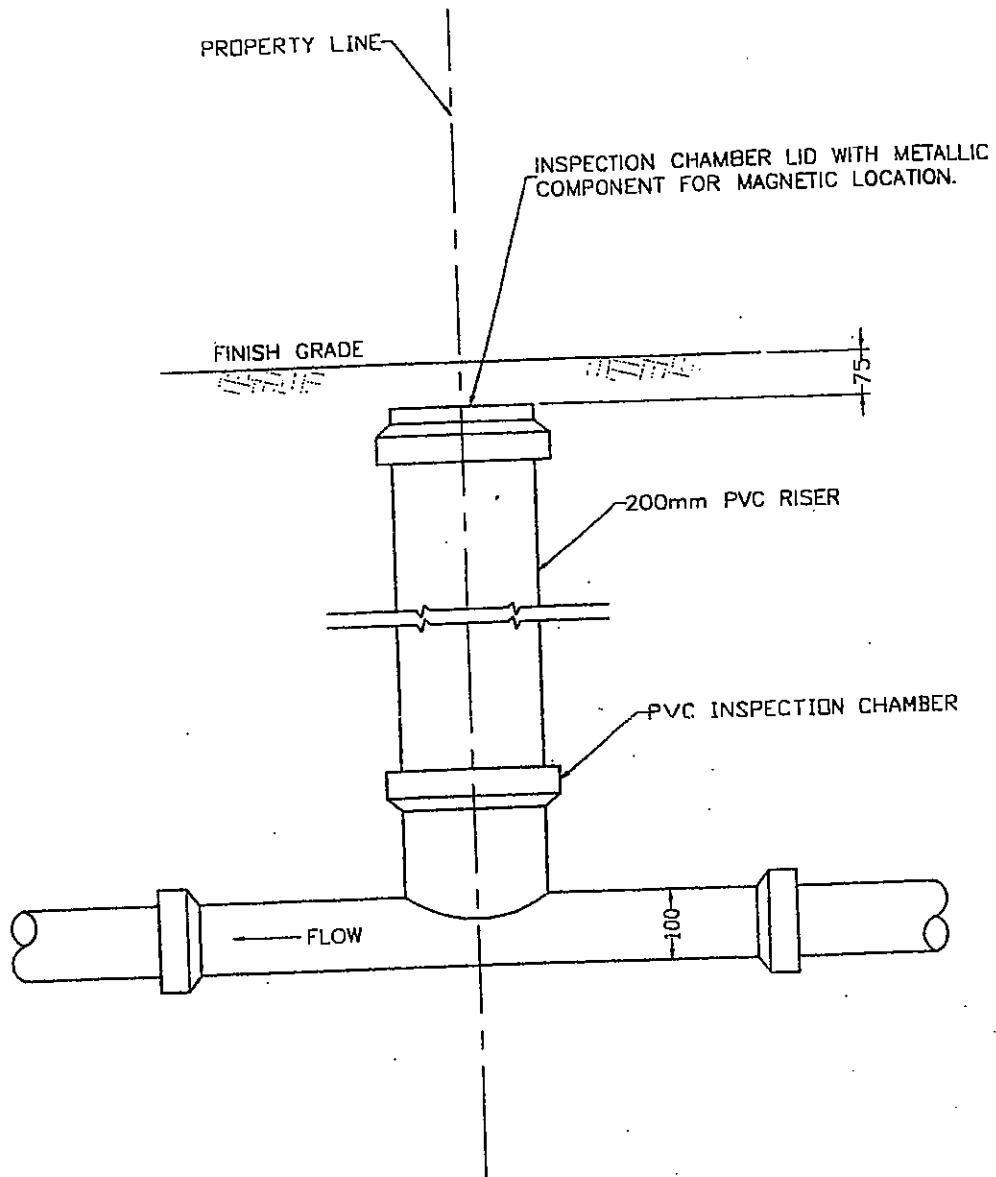
City of Fernie - Storm Intensity Duration Frequency



STORM INTENSITY DURATION FREQUENCY CURVES

NO.	DATE	REVISIONS	BY	APP'D	DATE	SCALE	CAD FILE	DWG. No.
					MAY/98	NTS	FERF-1	F-1

-Replaced Sept 20/00
as per JB's inst.



NOTES:

1. WHERE INSPECTION CHAMBER TOP IS IN CONCRETE PROVIDE A BOX FOR ENCASEMENT IN THE POURED CONCRETE. THE INSPECTION CHAMBER TOP SHALL NOT BE FASTENED TO THE BOX RIGIDLY.

UNITS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED



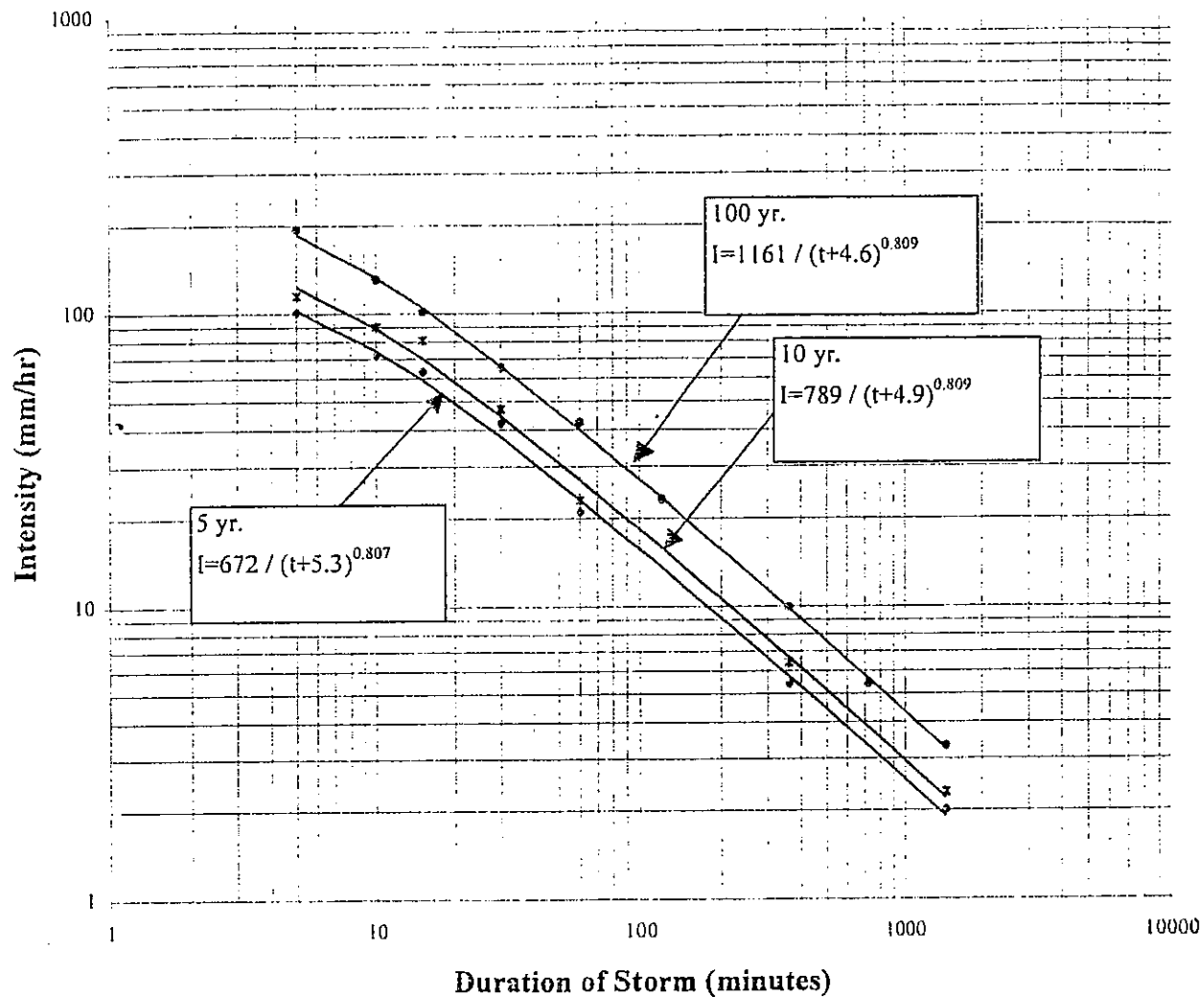
DESIGN & DEVELOPMENT SERVICING BY LAW NO. 172 SERVICES
CONSOLIDATED TO BYLAW 1862, AMENDMENT #1
This document has been prepared for administrative convenience only and is not to be used for official purposes.

PVC INSPECTION CHAMBER
FOR RESIDENTIAL SEWER

DATE	REVISED	BY	CHKD	DATE	CHKD
MAY/98		NTS		FERE-10	

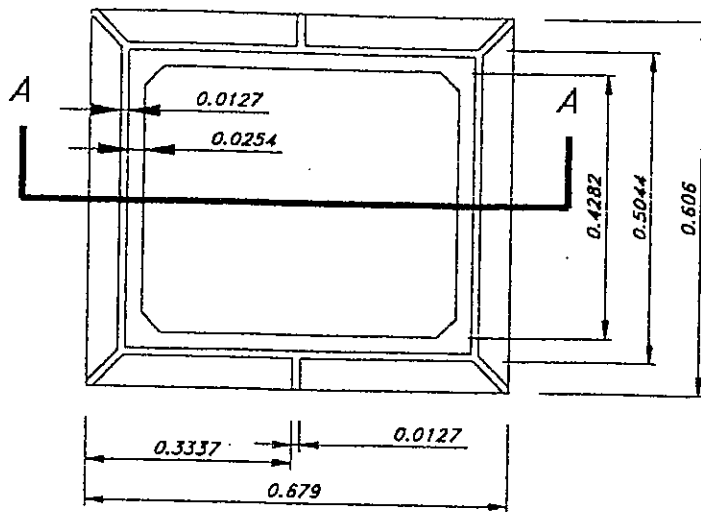
DWG. No. E-10

City of Fernie - Storm Intensity Duration Frequency

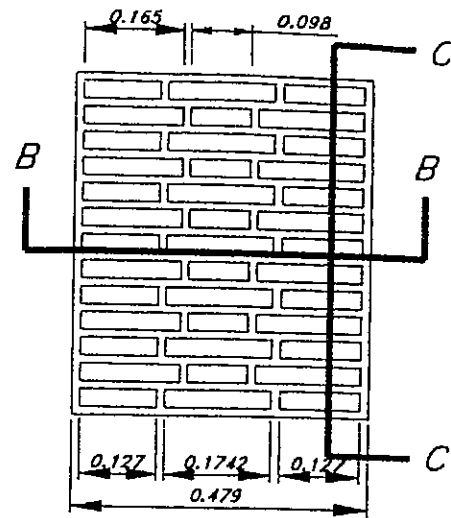


STORM INTENSITY DURATION FREQUENCY CURVES

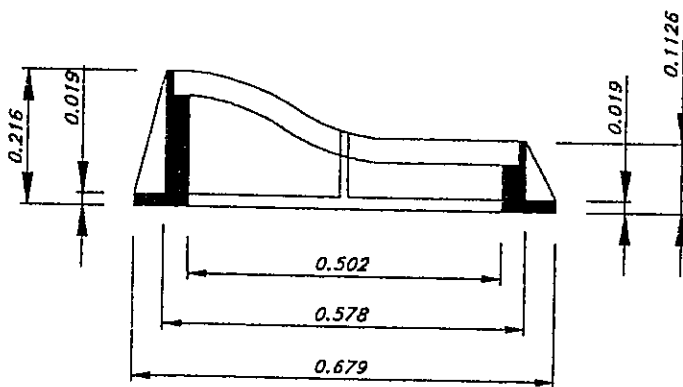
NO.	DATE	REVISIONS	BY	APPROVED	DATE	SCALE	CAD FILE	DWG. No.
					MAY/98	NTS	FERF-1	F-1



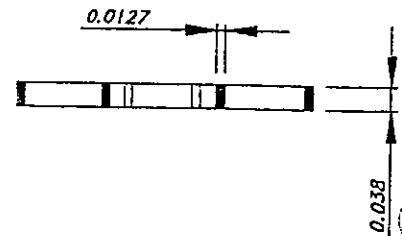
FRAME



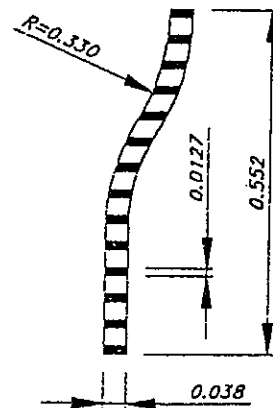
GRATE



SECTION A--A



SECTION B--B



SECTION C--C

MATERIAL SPECIFICATION
 FRAME -- GREY CAST IRON
 GRATE -- DUCTILE IRON

UNITS ARE IN METERS
 UNLESS OTHERWISE NOTED

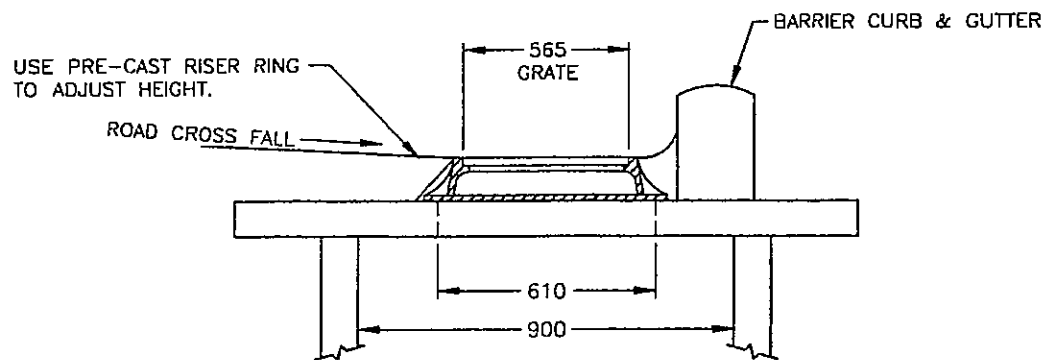
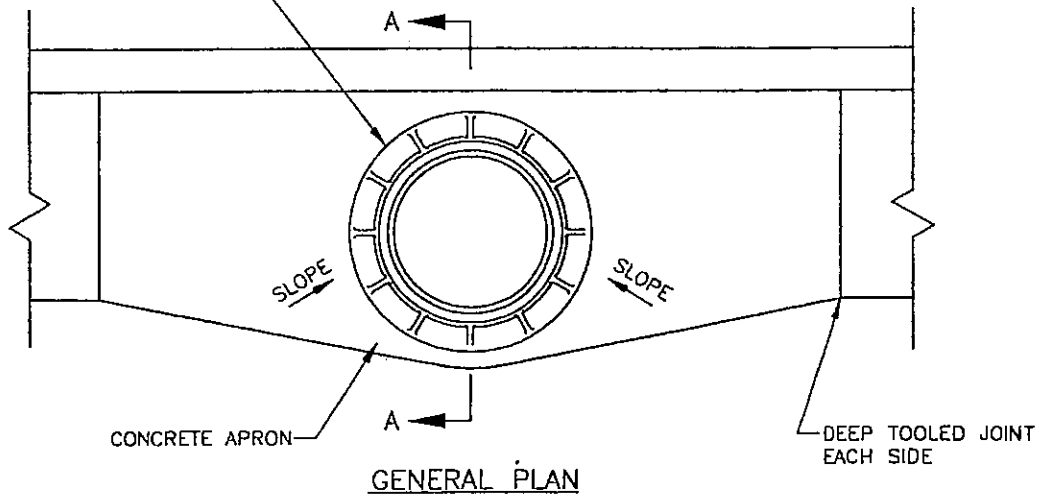


NO.	DATE	REVISIONS	BY	APP'D

SOVEREIGN CASTINGS LTD.
 K-5 CATCH BASIN FRAME
 AND GRATE

DATE	SCALE	CAD FILE	CWG NO.
JUL/99	NTS	FERF-3	F-3

CATCH BASIN ADJACENT TO
BARRIER CURB AND GUTTER



NOTES:

CATCH BASIN TOP SLAB TO HAVE
635mm DIAMETER ROUND OPENING.



NO.	DATE	REVISIONS	BY	APP'D

NON-MOUNTABLE, CURB
& GUTTER AT
CATCH BASIN

DATE
MAY/98

SCALE
NTS

CAD FILE
FERF-4

DRWG. No.
F-4

DATE MAY/98	SCALE NTS	CAD FILE FERF-5	DWG. No. F-5
----------------	--------------	--------------------	-----------------

DWG. No.
F-6

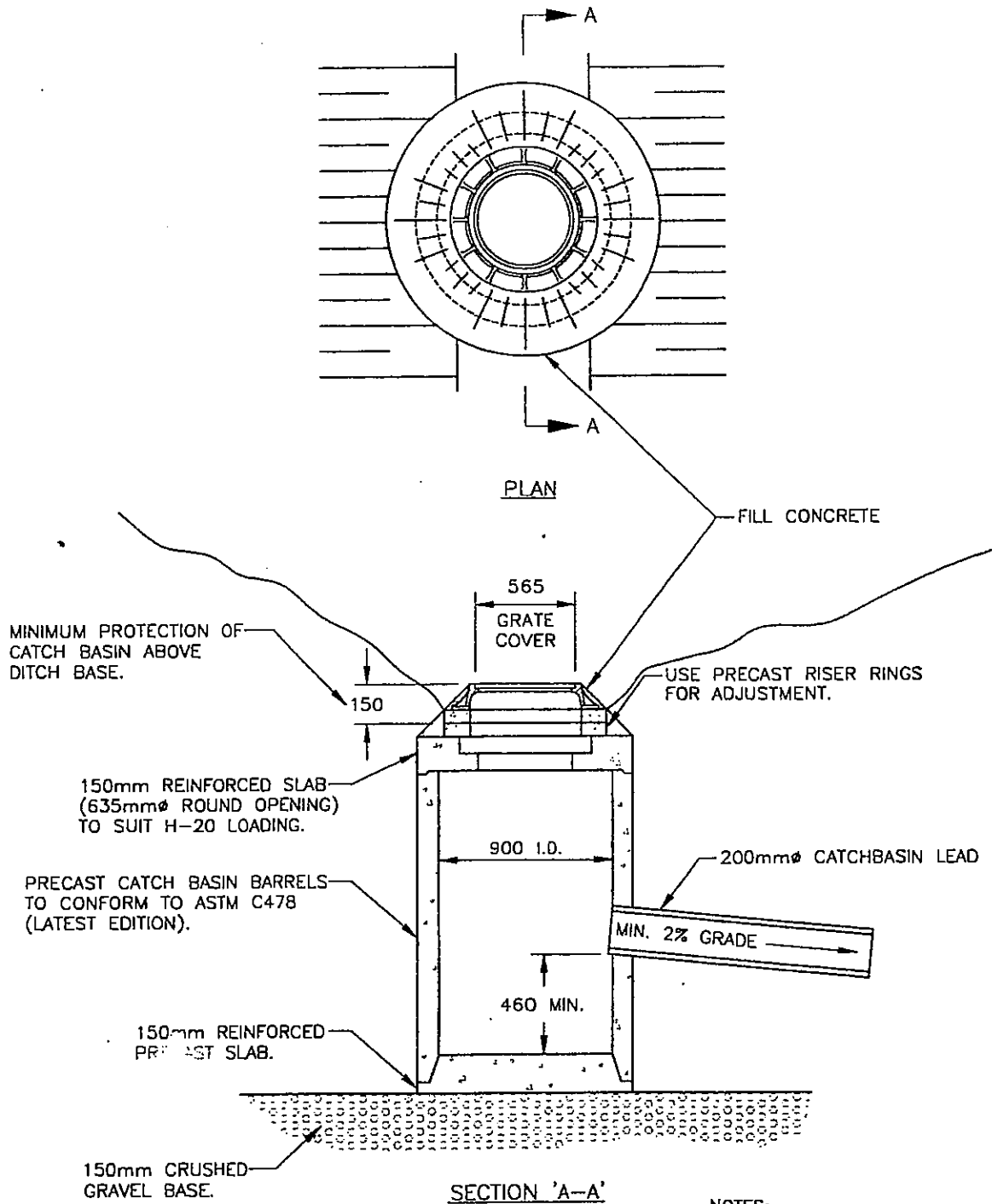


1. ALL WALLS & SLABS 200mm
2. CONCRETE MIN. 25 MPa
3. BASE SHALL BE 150mm
COMPACTED PIT RUN
4. REINFORCING WALL SHALL BE
15M @300 EACH WAY. EACH
WALL & SLAB. MIN. BOND
LENGTH ON CORNER BARS 460mm
5. PLACE CONCRETE RIP RAP
300mm THICK FOR 5m FROM
INLET & OUTLET STRUCTURE

[illegible]

CONCRETE OUTLET
AND
INLET STRUCTURE

DATE MAY/98	SCALE NTS	CAD FILE FERF-7	ORIG. No. F-7
----------------	--------------	--------------------	------------------



UNITS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

NOTES:

1. A FLEXIBLE JOINT IS REQUIRED ON ALL SEWER LEADS, MAX. 0.5m FROM CATCH BASIN.



NO.	DATE	REVISIONS	BY	APP'D

CATCH BASIN PLACED
IN AN OPEN DITCH.

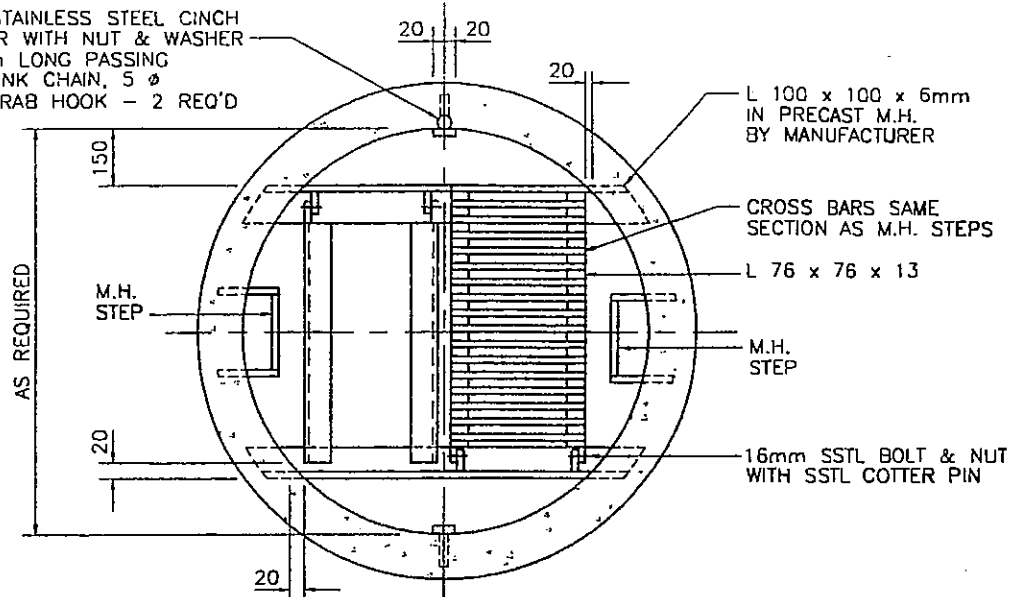
DATE
JUNE/96

SCALE
NTS

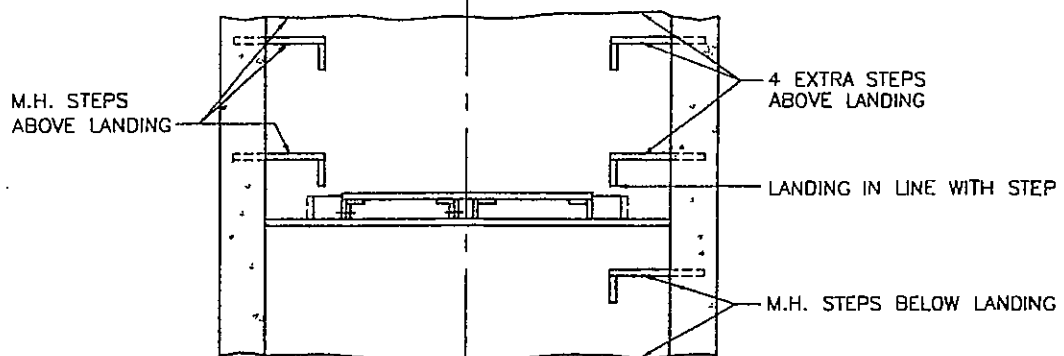
CAD FILE
FERF-8

DRWG. No.
F-8

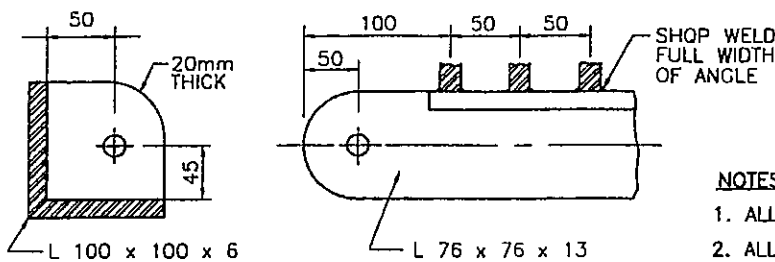
16 ϕ STAINLESS STEEL CINCH
ANCHOR WITH NUT & WASHER
500mm LONG PASSING
SSTL LINK CHAIN, 5 ϕ
WITH GRAB HOOK - 2 REQ'D



PLAN



SECTION



PIVOT DETAIL

UNITS ARE IN MILLIMETERS
UNLESS OTHERWISE NOTED

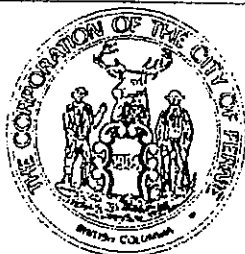
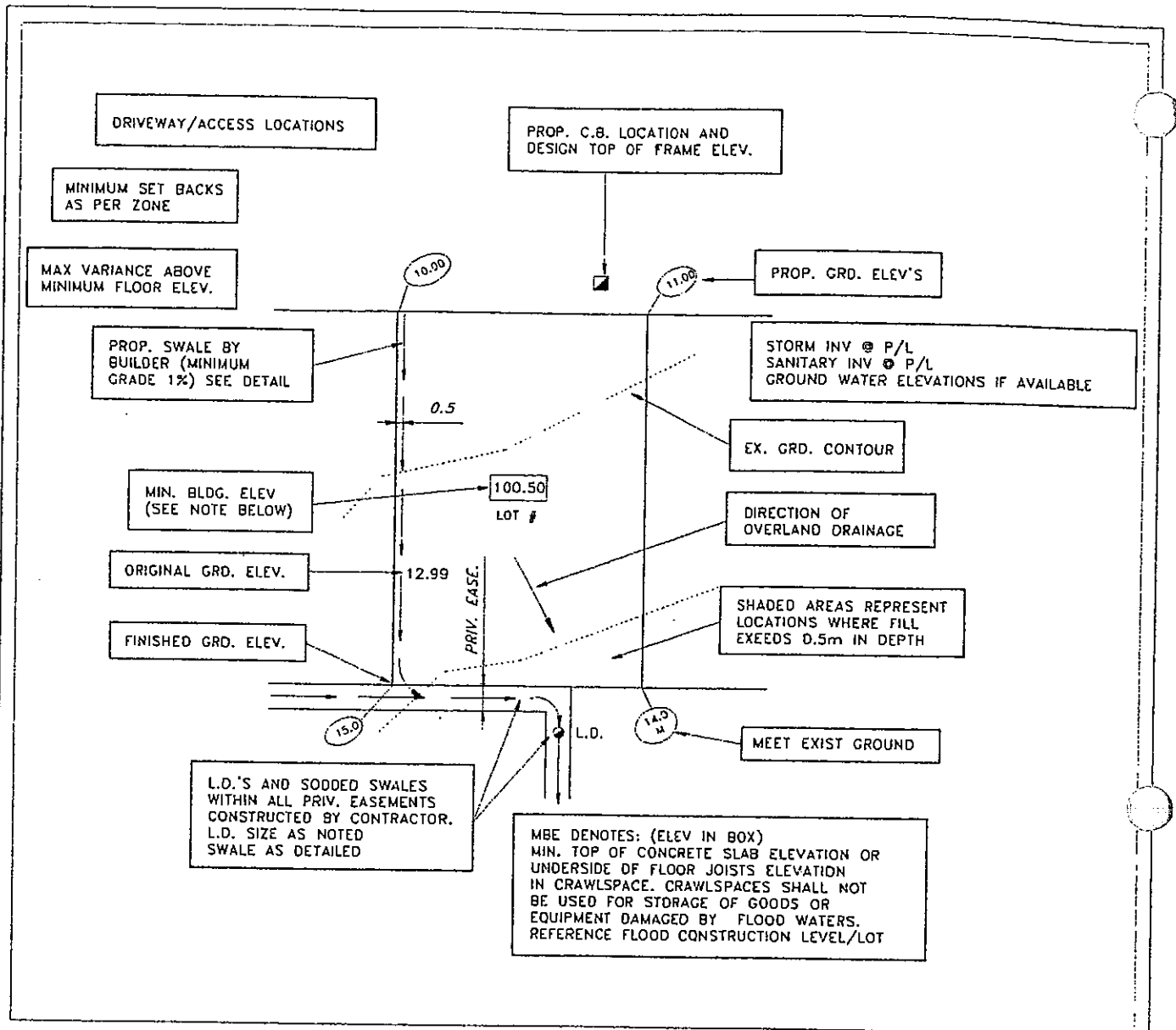
NOTES:

1. ALL MATERIAL SHALL BE ALUM ALLOY 6061-T6.
2. ALL BOLTS, NUTS, WASHERS, AND PINS SHALL BE SSTL TYPE 304.
3. ONE COAT OF BITUMINOUS PAINT SHALL BE APPLIED TO ALL ALUM SECTIONS IN CONTACT WITH CONCRETE.
4. PLATFORM TO CONFORM WITH WORKER'S COMPENSATION BOARD REGULATIONS.



LANDING
FOR DEEP MANHOLE
AS REQUIRED BY W.C.B.
REGULATIONS

NO.		DATE	REVISIONS	BY	APP'D	DATE	SCALE	CAD FILE	DWG. No.
		MAY/98					NTS	FERF-9	F-9



NO.	DATE	REVISIONS	BY	APP'D

TYPICAL LOT GRADING DETAIL

1. DIFFERENT LIGHT STANDARDS
HAVE DIFFERENT BOLT CIRCLES.
CHECK BEFORE POURING.

Technical drawing of a tapered structure, likely a mold or a component. The drawing shows a cross-section with the following dimensions:

- Top width: 0.475
- Inner vertical distance: 0.1
- Inner vertical distance (from the top of the tapered section): 1.1
- Total height: 1.5
- Bottom width: 1

The structure features a central vertical channel with a flared bottom section. A leader line points to the top edge of the tapered section.

ANCHOR BOLTS
4-25mm DIA REDD ROD X 900mm
LONG TO BE SET WITH TEMPLATE AS
PER BOLT CIRCLE PROJECTION

TOP SECRET S40074
DOGS BEVELLED

50mm CONDUIT POURED IN PLACE

1. PROPOSE 150mm DEPTH OF GRANULAR
BASE COMPACTED TO 100% STANDARD
DENSITY BELOW BASE

שנת ה'תשס"ב
 תשס"ב



NO.	DATE	REVISIONS	BY	APP'D

STANDARD LIGHT
POLE BASE

DATE
JUL/99

SCALE
NTS

CAO FILE
FERG--1

CWG Feb.
G-1

CHIC. No.
G-4

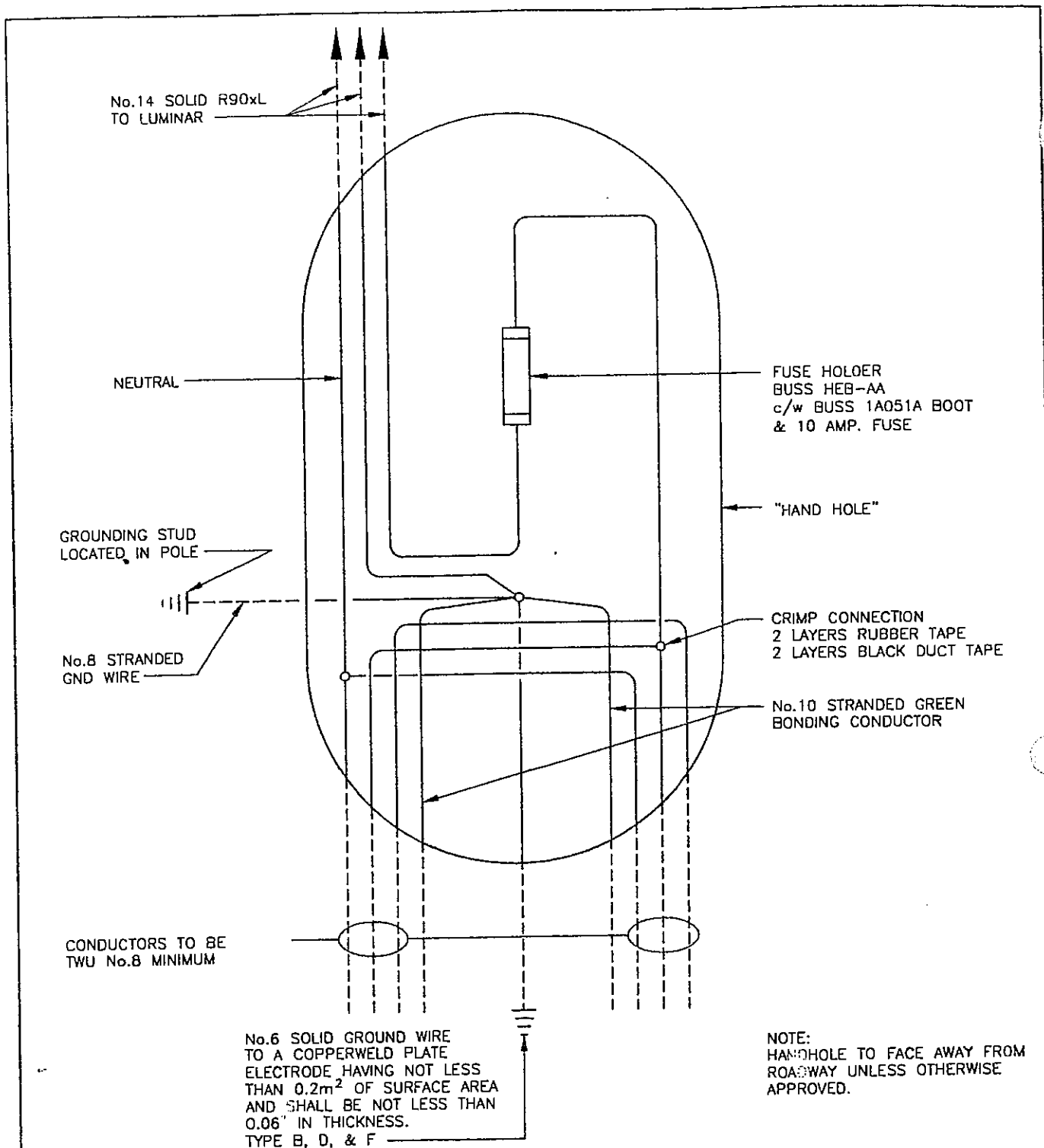


Diagram illustrating the components of a hand hole assembly, labeled as follows:

- HAND HOLE IN STANDARD
- OCTAGONAL STANDARD
- NUT COVER
- CUP WASHER (IF REQUIRED)
- GALVANIZED BOLT c/w LOCKWASHER & NUT
- TRIANGULAR WASHER
- HAND HOLE COVER PLATE
- ALUMINUM FRANGIBLE BASE
- TRIANGULAR WASHER
- LEVELLING SHIM (IF REQUIRED)
- CONCRETE PEDESTAL
- ANCHOR BOLTS c/w NUTS

1. USE LUBRIPLATE OR OTHER SUITABLE GREASE ON ALL THREADS.

[illegible]



STREET LIGHTING HAND HOLE WIRING SCHEMATIC

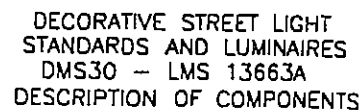
NO.	DATE	REVISIONS	BY	APP'D	DATE	SCALE	CAD FILE	DWG. No.
					MAY/98	NTS	FERG-6	G-6

DESCRIPTION OF COMPONENTS:

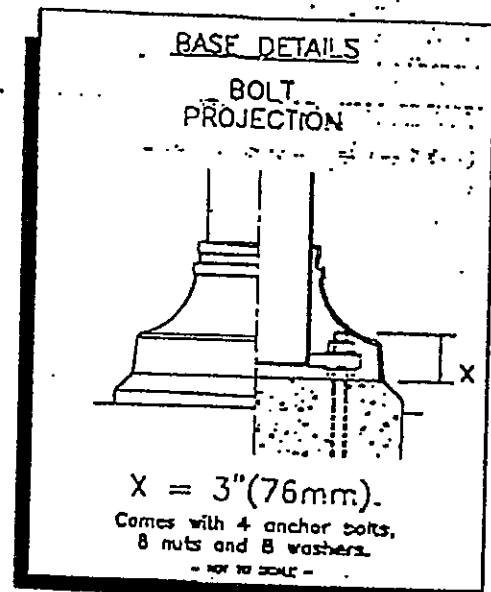
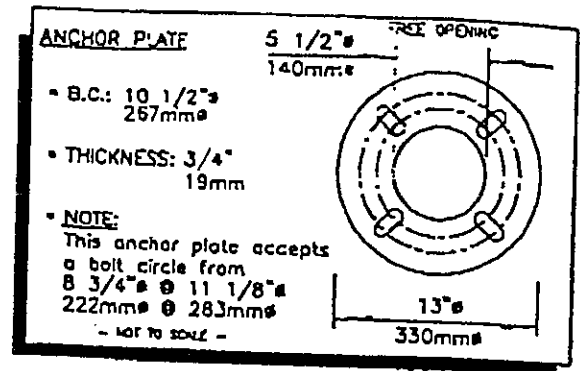
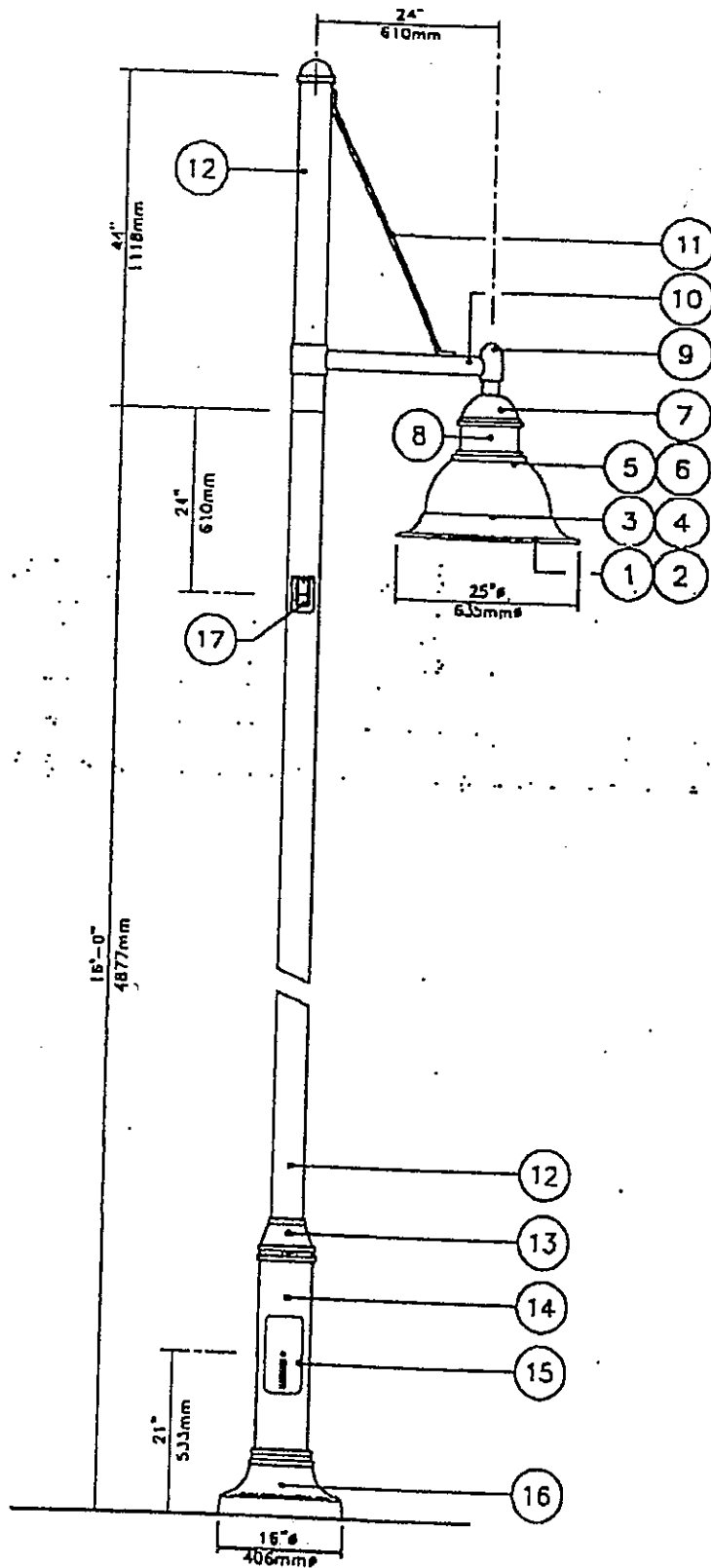
BRACKET:

100MH-DMS30-SG3-120-BKTX-LMS13663A (qty: 4)
LMS13663A-1A-BKTX (qty: 4)
SSM8V-22-8AS22-BAA122-DR-BKTX-LMS13663A (qty: 4)

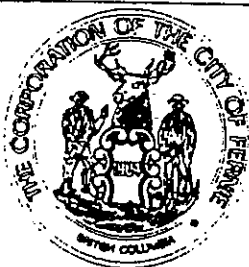
- FINISH:** An application of a thermosetting polyester powder coat paint, applied by means of an electrostatic process, color to be black BK textured. (This finish is applicable for "LUMEC" standard colors only, special color finish supplied will be liquid polyurethane).



NO.	DATE	REVISIONS	BY	APP'D	DATE FEB/2000	SCALE NTS	CAD FILE FERG-8	DWG. No. G-8
-----	------	-----------	----	-------	------------------	--------------	--------------------	-----------------



• ANCHORING BOLTS
STEEL, $\frac{3}{4}" \times 20"$
(supplied by LUMEC inc).



NO.	DATE	REVISIONS	BY	APP'D

DECORATIVE STREET LIGHT
STANDARDS AND LUMINAIRES
DMS30 - TYPE A

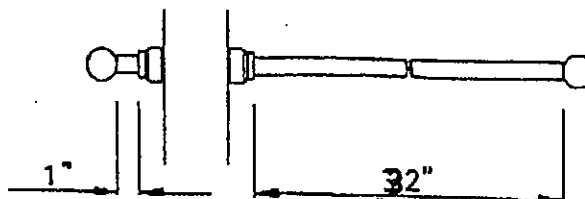
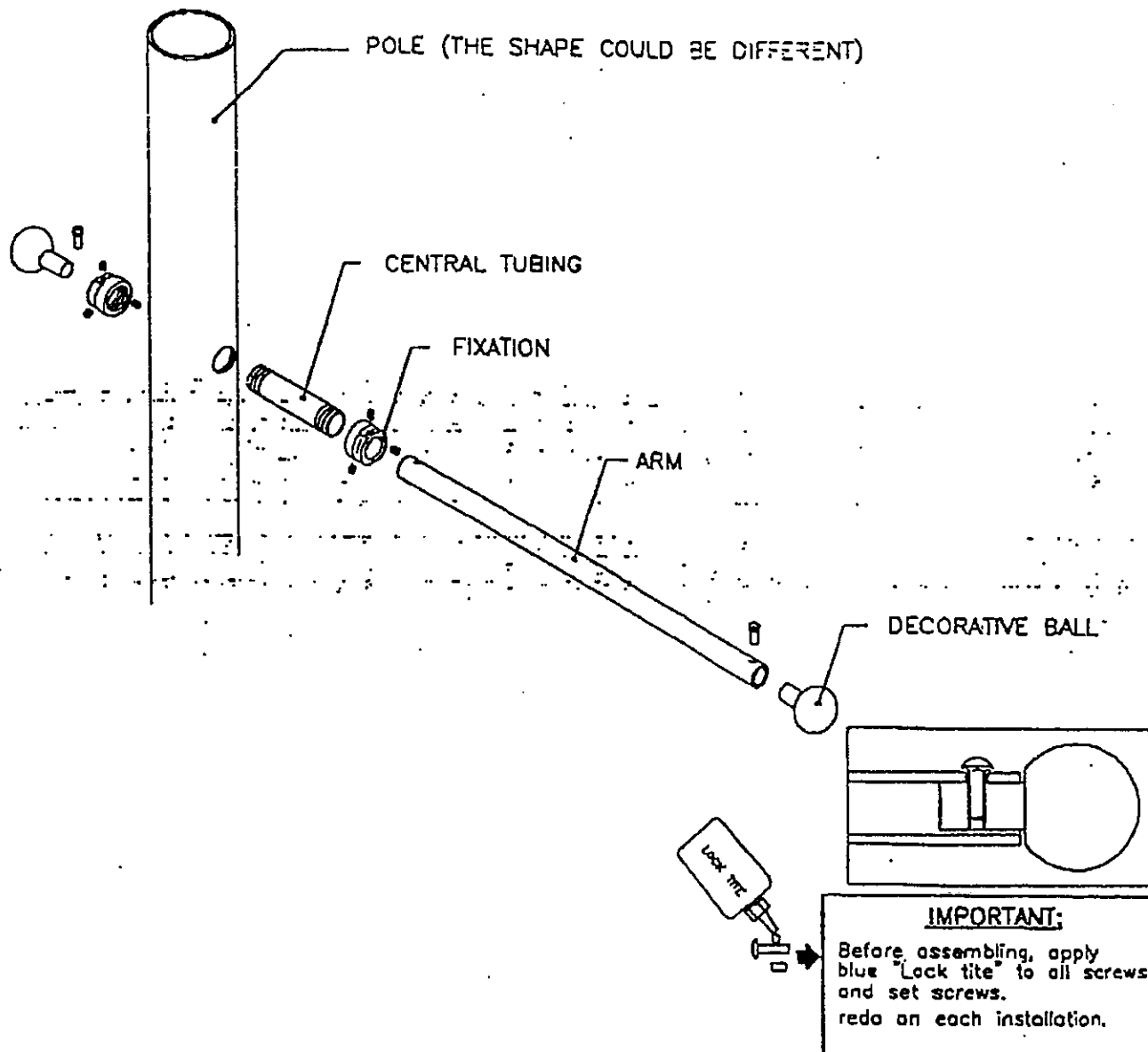
DATE	SCALE	CAD FILE	DWG. No.
FEB/2000	NTS	FERG-9	G-9

DESCRIPTION OF COMPONENTS:

SM6N-16-DR-BKTX. (qty: 15)

- | | | | | | | | | | | | |
|-----|--|-----------|--|------|--|----------|--|----------|--|----------|--|
| | | | | DATE | | SCALE | | CAD FILE | | DWG. No. | |
| NO. | | DATE | | REV | | FEB/2000 | | NTS | | FERG-10 | |
| | | REVISIONS | | BY | | APR 03 | | | | G-10 | |

BANNER ARM



NO.	DATE	REVISIONS	BY	APP'D

DECORATIVE STREET LIGHT
BANNER ARM DETAIL

DATE
FEB/2000

SCALE
NTS

CAD FILE
FERG-11

DWG No.
G-11

SCHEDULE O
STANDARD FORMS

This is Schedule O of the City of
Fernie Subdivision and
Development Servicing Bylaw No.
1727

Clerk

Consolidated Subdivision and Development Servicing Bylaw No. 1727
SCHEDULE O – STANDARD FORMS

LETTER OF CREDIT
(SAMPLE)

(Name of Bank
(Address)

Dear Sir:

At the request of _____ we hereby establish in your favour our irrevocable (Name of Owner) credit for a sum not exceeding _____ dollars (\$_____).

This credit shall be available to you upon demand at the (Bank), (Address of Bank) when supported by your written demand for payment made upon us.

This Letter of Credit is required in connection with an undertaking by the Owner to perform certain works and services required by you.

You may make partial drawings or full drawings at any time.

We shall honour your demand without enquiring whether you have a right as between yourself and our customer.

If you have not demanded on this Letter of Credit in full by (Expiry Date) it will be considered cancelled unless other arrangements or a renewal have been made with the Bank prior to the aforementioned date.

Our reference for this Letter of Credit is (_____)

(Name and Address of Bank)

Letter of Credit No. (_____)

(Name of Bank)

(Signature of Bank Officer)

The Owner hereby specifically agrees that it shall not take any action to dispute the validity of this Letter of Credit unless it shall have expired prior to demand.

We hereby agree to indemnify the (Bank) against any costs of actions relative to this Letter of Credit. We also authorize the (Bank) to make any necessary payments and debit our account accordingly.

(Owner)

Consolidated Subdivision and Development Servicing Bylaw No. 1727
SCHEDULE O – STANDARD FORMS

Form of Statutory Right of Way Agreement

THIS AGREEMENT dated this ____ day _____ of 199

BETWEEN:

(the "Grantor")

AND:

THE CORPORATION OF THE CITY OF FERNIE

Post office Box 190
Ferne, British Columbia
VOB 1M0

(the "City")

WHEREAS the Grantor is the registered owner of the Lands defined therein;

AND WHEREAS the City requires and the Grantor has agreed to grant to the city the Statutory Right of Way defined herein;

AND WHEREAS this Statutory Right of Way is necessary for the operation and maintenance of the City's undertaking;

NOW THEREFORE in consideration of the premises, of the sum of one dollar (\$1.00) receipt of which from the City is hereby acknowledged by the Grantor and other good and valuable consideration
THE PARTIES AGREE AS FOLLOWS:

1. The Grantor grants in perpetuity to the City the right at all times to:
 - (a) enter over, on, in and under that portion of ALL AND SINGULAR that certain parcel of land situate in Fernie, British Columbia which is more particularly known as:

which is shown outlined on

(the "Statutory Right of way")

and

Consolidated Subdivision and Development Servicing Bylaw No. 1727
SCHEDULE O – STANDARD FORMS

- (i) conduct surveys and examinations;
- (ii) dig up, remove and replace soil; and
- (iii) construct, install, operate, maintain, clean, cover with soil, alter, relocate, renew, inspect and replace power poles, transmission lines, pipes, culverts, retaining walls, wing walls, manholes, meters, pipes, valves and similar equipment, or any of them, together with all ancillary attachments and fittings (all of which are collectively called the "Works");

for the purpose of conveying, draining, containing, protecting, metering or disposing of water, gas, sewage, liquid waste, electrical energy, communication services, or any of them;

- (b) bring on to the Statutory Right of Way all materials and equipment it requires or desires for any of the foregoing purposes;
 - (c) clear the Statutory Right of Way and keep it clear of anything, which in the opinion of the City constitutes or may constitute, an obstruction to the use of the Statutory Right of way or to the Works;
 - (d) cross over the Lands for reasonable access to the Statutory Right of Way and make reasonable ancillary use of the Lands in respect of the Works; and
 - (e) do all acts which in the opinion of the City are incidental to the foregoing.
2. The Grantor grants in perpetuity to the City, and to every member of the public for the period during which the City accepts this grant but not beyond the day if ever on which the City releases this grant, a universal right:
- (a) of passage at all times to enter over, on and in the Statutory Right of Way to the same extent as if the Statutory Right of Way was a public highway or other way open to public use; and
 - (b) to do all acts which are in the opinion of the City incidental to the foregoing.

Consolidated Subdivision and Development Servicing Bylaw No. 1727
SCHEDULE O – STANDARD FORMS

3. The Grantor shall:

- (a) not do or permit to be done any act or thing which in the opinion of the City might interfere with, injure, impair the operating efficiency of , or obstruct access to or the use of the Statutory Right of Way or to the works;
- (b) trim, or, if necessary, cut down any tree or other growth on the Lands which in the opinion of the City constitutes or may constitute a danger or obstruction to those using the, statutory Right of Way or to the Works;
- (c) execute all further documents and things whatsoever for the better assuring unto the City of the Statutory Right of way hereby granted;
- (d) permit the City, and the general public for that period in which the City accepts the grant contained in Section 2 hereof but not beyond the day if ever on which the City releases the grant contained in Section 2 hereof, to peaceably hold and enjoy the rights hereby granted; and
- (e) maintain, care for and clean the surface of the Statutory Right of Way and remove grass and other growth from the surface of the Statutory Right of Way as required by the City and do all other things deemed by the City to be reasonably necessary for the safe use and preservation of the Statutory Right of Way.

4. The City shall:

- (a) use the Statutory Right of Way and carry out the Works in a good and workmanlike manner in order to cause no unnecessary damage or disturbance to the Grantor, the Lands or any improvement on the Lands;
- (b) not bury, without the prior written consent of the Grantor, debris or rubbish in excavations or backfill;
- (c) remove shoring and like temporary structures as back-filling proceeds;
- (d) rake up all rubbish and construction debris it creates in order to leave the Statutory Right of Way in a reasonably neat and clean condition;
- (e) exercise the utmost care not to damage the Lands or any improvement on the Lands AND IF the city should cause any such damage RESTORE such damaged Lands or improvements thereon to as close to their pre-damaged condition as is reasonably practical with reasonable dispatch OR WHERE the City deems restoration to be impractical REIMBURSE the Grantor f or all damage the City has caused but not restored;
- (f) accept sole responsibility for carrying out the Works; and
- (g) not be unreasonable in its opinions herein.

Consolidated Subdivision and Development Servicing Bylaw No. 1727
SCHEDULE O – STANDARD FORMS

5. If the City deems it necessary or convenient to alter the location of the Statutory Right of Way or of the Works THE GRANTOR AGREES to execute a new statutory right of way agreement in the form of this Agreement to authorize and protect the statutory right of way in its new location and the Works in their new location and, on execution and registration of the new agreement, this Agreement shall to the extent that the new agreement provides for what if granted herein be deemed to be null and void AND IF the alteration is at the request of the Grantor, the cost of the physical relocation of the Works and preparation and execution of the amending statutory right of way agreement and plan shall be borne by the Grantor.
6. All chattels and fixtures installed by the City over, on, in or under the Statutory Right of Way are and shall remain owned by the City, any rule of law or equity to the contrary notwithstanding.
7. THE GRANTOR INDEMNIFIES, SAVES HARMLESS, RELEASES and FOREVER DISCHARGES the City from and against all manner of actions, causes of action, claims, debts, suites, demands and promises whatsoever, whether known or unknown, which the Grantor now has or may at any time have by reason of the granting, existence or use of the Statutory Right of Way or of the works or of the carrying out or failing to carry out of any of the Works or of the flooding of the Lands or any improvement thereon SAVE AND EXCEPT FOR NEGLIGENCE by the City.
8. NOTWITHSTANDING ANYTHING HEREIN CONTAINED the City reserves all rights and powers of expropriation otherwise enjoyed by the City.
9. Waiver of any default by either party shall not be deemed to be a waiver of any subsequent default by that party; this Agreement runs with the Lands; whenever it is required or desired that either party shall deliver or serve a notice on the other, delivery or service shall be deemed to be satisfactory if and deemed to have occurred when:
 - (a) that party has been served personally, on the date of service; or
 - (b) mailed by pre-paid receipted mail, on the date received or on the sixth day after receipt of mailing by any Canada post office, whichever is the earlier, so long as the notice is mailed to the party at the most recent address shown on title to the Lands in the records of the Nelson Land Title Office for that party or to whatever address the parties from time to time may in writing agree to;

whenever the singular or masculine is used in this Agreement, the same is deemed to include the plural or the feminine or the body politic or corporate as the context so requires; every reference to each party is deemed to include the heirs, executors, administrators, successors, assigns employees agents, officers and invitees of such party whenever the context so requires or allows; any opinion which the City is entitled by virtue of this Agreement to form may be formed on behalf of the City by the Administrator in which event the opinion of the Administrator shall be deemed to be the opinion of the City for the purposes of this agreement; nothing herein grants to the City any

Consolidated Subdivision and Development Servicing Bylaw No. 1727
SCHEDULE O – STANDARD FORMS

interest in the riparian or littoral rights of the Grantor to any lands which may accrete to the Lands; if any section, subsection, sentence, clause or phrase in this Agreement is for any reason held to be invalid by the decision of a 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 Agreement; this Agreement shall ensure to the benefit of and be binding on the parties hereto NOTWITHSTANDING any rule of law or equity to the contrary; and this Agreement shall be governed and construed in accordance with the laws with the Province of British Columbia.

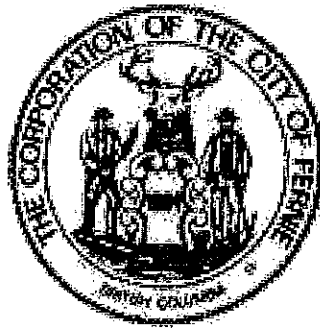
IN WITNESS WHEREOF the parties hereto have hereunto executed these presents.

SIGNED by the Grantor in the	)
presence of:	)
	)
_____	)
Signature	)
	)
_____	)
Name (printed)	)
	)
_____	)
Street Address	)
	)
_____	)
City, Province, Postal Code	)
	)
_____	)
Occupation	)
(as to all signatures)	)

IN WITNESS WHEREOF the Corporate Seal	)
of the Grantor was hereunto affixed	)
in the presence of:	)

IN WITNESS WHEREOF the Corporate Seal	)
of the City was hereunto affixed	)
in the presence of:	)

THE CORPORATION OF THE CITY OF FERNIE



EROSION CONTROL GUIDELINES

Guidelines to Accompany the Consolidated Subdivision
and Development Servicing Bylaw No.1727

Erosion Control Guidelines

Nets and Matting

Introduction

Nets and matting are placed on the ground surface to stabilize the soil. They may also be used in combination with mulch materials. Generally, nets and mats are inexpensive, easily placed and not subject to wind blow providing they are properly anchored.

Application

Mats used without other stabilization techniques are suitable for use on level areas, in waterways, or on slopes. Primary use is on steep slopes and where newly established vegetation in swales and channels requires protection. Matting is used in areas where soil moisture is high, as soil moisture is not retained by the nets or mats. Mats can also be applied to areas where a high velocity of runoff tends to scour newly established vegetation. When used in combination with mulch materials, mats acts as an anchor binding the mulch material and preventing wind blow.

Description

Net and mat materials include jute, twisted paper mesh, fiberglass, cotton, finely woven plastics, excelsior, and woven metal wire. Staples, usually made of plain iron wire, are used to hold the mats in place.

Installation

Obtaining a firm, continuous contact between the soil surface and the mat is the most important aspect to consider during installation (Figure 1). Failure to maintain that contact renders the process useless and results in further erosion. The area that is to be protected should be shaped or graded to provide a good surface for mat placement. Material that will prevent a good contact between the mat and the soil surface, such as rock or debris larger than 4.5 cm in diameter, must be removed.

The mat should be laid from the top of the slope and allowed to roll down the slope. It should be placed loosely over the soil. Stretching of the mat should be avoided.

When the mat has been stapled and the seed has been applied, the mat should be rolled to make certain there is good contact between the mat and the soil.

Maintenance

The protected area should be regularly inspected, especially after a rainfall, to check for mat separation and breakage. If breakage does occur, any damage should be repaired immediately.

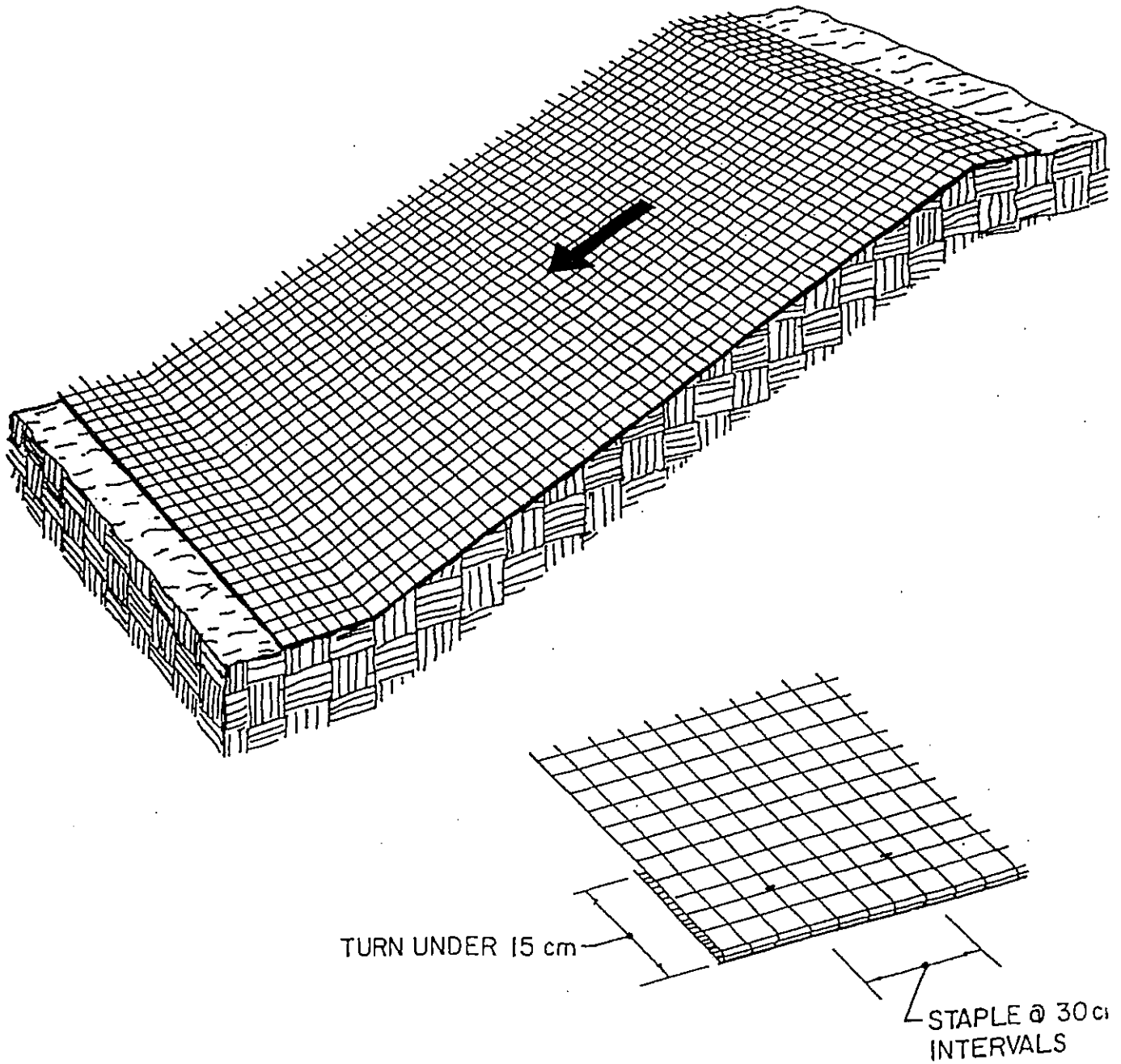
The temporary inspection should continue until the grasses have become well established. After a year, a top dressing of fertilizer may be applied to improve the vegetation covering and assist the degradation of the temporary matting.

Specifications

1. In areas where the soil is highly erodible or when mulching is carried out in summer or in late fall, mats shall only be used with organic mulch.
2. The mats shall be installed over the mulch, except if the mulch is wood fibre, Wood fibre may be applied over the installed mat.
3. Excelsior matting may be used at all times of the year and may be applied alone on erodible soils, as they are considered to be protective mulches.
4. The ends of the mat shall be buried in a trench at least 15 cm deep, at the top of the slope. Earth shall be tampered over the anchor slot and staples shall be applied every 30 cm across the top and every 1 m along the mat edge.
5. The adjacent edges of two adjoining mats shall be overlapped 10 cm and stapled together.
6. Staples shall be applied at 1 m intervals down the center of the mat.
7. In areas where strips are to be joined, a new roll of mat shall be inserted into an anchor slot, in the same manner as the up-slope end. The end of the previous mat shall overlap the new mat by 50 cm and then it shall be turned under 15 cm.
8. The staples shall be applied every 30 cm across the end of the roll at the end of the turned under mat, just below the trench or anchor slot.
9. At the bottom of the slope, the mats shall be led out to a level area before it is anchor and the ends turned under 15 cm. Staples shall be applied every 30 cm across the end.
10. Erosion check slots shall be made on areas which are highly erodible or where the slopes exceed 4:1. A fold of mat shall be inserted into a trench or anchor slot every 5 m and tamped firmly. Staples shall be applied every 1 m across the downstream portion of the mat.
11. Staples will be made of 4 mm diameter, or heavier, plain iron wire and will be at least 15 cm in length.

FIGURE 1

NETTING AND MATTING



Erosion Control Guidelines

Stormwater Channels and Ditches

Stormwater channels are watercourses designed to safely convey excess stormwater runoff from the developing area. These channels shaped and lined with vegetation or structural material will ensure that the concentrated surface runoff from the site will be conveyed without causing any erosion or sedimentation.

The minimum design criterion for the drainage ditches should be at least the peak flow from the two-year frequency storm. In cases where the flooding and the resulting damage could be severe, the capacity of the channel should be further increased.

The design of the channel should be such that the flow velocity expected from the selected design frequency storm shall not exceed the permissible velocity for the soil or type of grass used.

The advantage of open ditches is that they are usually less expensive than other types of drains, and inspection is easy. The disadvantage of open ditches is that the maintenance costs usually exceed the cost of other types of installations. The construction specifications require that:

- All trees, brush, stumps, roots, obstructions and other unsuitable material shall be removed and properly disposed of.
- The final channel should have the proper grade and shape of the cross section in order to discharge the design flow.
- Where fill is used to construct the waterway, fills shall be compacted to prevent unequal settlement that could cause damage in the waterway.
- Stabilization, if required, shall be done as specified under vegetative practices.

Erosion Control Guidelines

Construction Roads and Parking Areas

Temporary stabilization of construction roads and parking areas with stone immediately after the grading will reduce the amount of erosion and sedimentation.

Temporary roads should follow the contour of the natural terrain. Temporary parking during the construction activity should be located on flat areas where possible, and grades should be sufficient to provide drainage. Immediately after grading is completed, a 15 cm course of aggregate should be applied. Filter fabric may be used to provide additional stability. The temporary roads and parking areas may require periodic maintenance by providing gravel. Roadside ditches and adjacent cut or fill areas should be stabilized with temporary or permanent vegetation.

Erosion Control Guidelines

Strawbale and Rock Filters and Brush Barriers

Introduction

Filters remove sediment and reduce the velocity of flowing water. They can be constructed from any stabilized porous material. Such material includes straw (or hay) bales and crushed rock.

Brush barriers are used as temporary filters. They impede surface runoff and stop the movement of sediment.

Application

Filters are used around drain inlets, along the tops of slopes, on small slopes, on sediment basins dams, between water bodies and next to downhill adjacent properties. They are used below disturbed areas subject to erosion. They should not be constructed in live streams or in swales when there is the possibility of a washout. Thus, they require an existing drainage system and are for relatively small drainage areas only.

Description

Filters may take the form of small dams and barriers. They may be linear or they may completely surround the location being protected (i.e. drain inlets). Strawbale filters are inexpensive. They provide an effective but temporary barrier with a life expectancy of three months or less (Figure 2).

Filters using rock as a filtering medium in place of strawbales have a longer useful life. However, their construction and repair may not be as simple, considering that rocks will not have the same consistent shape and will not hold together as well.

If a filter fabric is used, it is laid across the barrier with edges overlapping and secured with stakes in a trench immediately uphill from the barrier. The trench is then backfilled and soil compacted over the filter fabric. The fabric is also anchored with twine to stakes on the downhill edge of the barrier.

Maintenance

Filters shall be inspected after each rainfall. Close attention shall be paid to the prompt repair of damage, undercutting, end runs, and erosion of the filter. Sediment deposits must be removed when the level of deposition reached about one half the height of the filter and preferably sooner.

Temporary filters shall be removed when they have served their purpose, but not before the areas up the slope have cleaned up and permanently stabilized. Any sediment deposits shall be graded, prepared and seeded.

Specification

Strawbale Filter

1. Straw (or hay) bales shall be of one size, with straight sides and square corners, tightly packed and bound with at least two loops of wire or twine. Each bale should weigh at least 12 kilograms and preferably more.
2. Strawbales shall be placed in a single row, lengthwise, with ends tightly abutting adjacent bales. The wire or string bindings should be oriented around the sides rather than along the tops and bottoms in order to prevent early deterioration of the bindings.
3. The filter shall be embedded in the soil to a minimum depth of 10 cm. After the bales are staked and chinked, the excavated soil shall be backfilled against the filter.
4. Each bale shall be securely anchored by at least two stakes or re-bars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together.

Various combinations of strawbales, gravel, and wire fences have been successfully used in small, temporary applications. Installations, particularly with straw, need to be removed prior to final channel stabilization. Certain types may remain semi-permanent with some regrading.

There is no predetermined shape for filters. They may, for example, surround storm drain inlets. Water must be forced to go through the filter and should never flow around it.

Brush barriers can generally be constructed from clean organic material made available from site clearing operations that is usually discarded. The filtration ability of the barrier is enhanced if a filter fabric is anchored over it.

Installation

Strawbale filters must be embedded in the soil with ends tightly abutting adjacent bales. In sheet flow applications, bales shall be placed on the contour. Any gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a filter tends to increase filter efficiency. Gravel filters can be constructed by placed concrete building blocks on the inside to keep stones from being washed away. Rock filters can also be constructed in a form similar to check dams for drainage areas up to 4 ha.

Brush Barrier

The size of a brush barrier will vary depending upon the amount of material available and the condition of the site.

The barrier shall be constructed by piling brush, stone and root mat into a mounded row on the contour. During clearing and grubbing operations, equipment can push or dump the mixture of limbs, small vegetation and root mat along with minor amounts of soil and rock into windrows along the toe of a slope where erosion and accelerated runoff are expected.

1. The material in the brush barrier shall be piled as thickly as possible, with no large opening or sharp projection.
2. The height of a brush barrier shall be a minimum of 1 m. The width of a brush barrier shall be a minimum of 1.5 m at its base.

If filter fabric is used:

3. Filter fabric used must have adequate strength for its porosity and filtering capability. The pores should be relatively large to prevent excessive siltation and impoundment of large quantities of water.
4. The filter fabric shall be cut into lengths sufficient to lay across the barrier from its upslope base to just beyond its peak.
5. A trench shall be excavated 15 cm wide and 10 cm deep immediately uphill from the barrier and along its length.
6. The filter fabric shall be draped across the width of the barrier with the uphill edge placed in the trench and the edges of adjacent places overlapping each other.
7. The filter fabric shall be secured in the trench with stakes set about 1 m apart.
8. The trench shall be backfilled and soil compacted over the filter fabric.
9. Stakes shall be set into the ground along the downhill edge of the brush barrier and the fabric anchored by tying twine from the fabric to the stakes.

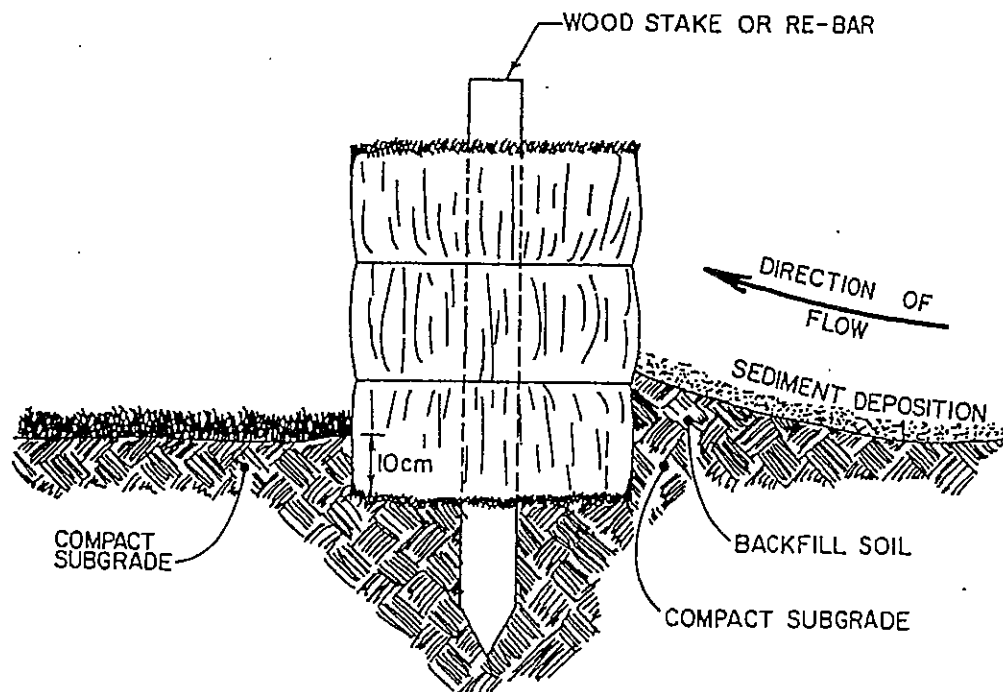
Note: Filter fabric is not recommended for brush barriers in channels.

Rock Filter

1. Aggregate for rock filters shall be composed of clean, hard, durable mineral particles free from organic matter, clay balls, soft particles or other substances that would interfere with their free-draining properties. Not more than 15 per cent, by weight, shall be flat, elongated particles. Aggregates may be accepted or rejected based on past field performance. Smaller sized gravel will need to be supported by concrete building blocks.
2. In channel flow applications, the center of the rock filter shall be about 15 cm lower than the outer edges.

FIGURE 2

STRAW BALE FILTER



TYPICAL SECTION OF STRAW
BALE USED TO FILTER OVERLAND
FLOW.

Erosion Control Guidelines

Silt Fences

Introduction

A silt fence is a sediment barrier that utilizes a standard-strength or extra-strength filter fabric attached to a wire support fence. Silt fences slow the flow rate of runoff substantially and act as a filter to remove suspended sediment.

Application

Silt fences can be used to control sediment below disturbed areas where erosion would likely occur as sheet or rill erosion. They can also be used in areas where the size of the drainage area is not more than 0.1 ha/30 m of silt fence length; the maximum slope length behind the barrier is 30 m; the maximum gradient is 2:1; and in small swales and along ditches where 1 ha is the maximum contributing drainage area. Silt fences are not to be constructed in areas where flows are expected to exceed $0.03\text{m}^3/\text{sec}$.

Description

Silt fence fabric may be composed of natural or synthetic material. Woven and non-woven fabrics are commercially available with the woven fabrics generally having higher strength. Permeability rates vary and there is considerable variation when filtering the finer silt and clay particles (Figure 3).

Silt fences of low permeability have a high filtering capacity. However, such fabrics may not have sufficient structural strength to support the weight of water ponded behind the fence line.

Posts of either wood or steel may be used to support the fence. Wire fencing may be used to help support the fabric, depending upon the fabric's strength. Standard wire and wood is generally recommended.

The height of a silt fence should not exceed 1 m, so as not to impound dangerously large quantities of water. A silt fence is a temporary barrier with a usable life of about six months.

Installation

The posts are first set firmly into the ground. An anchor trench is then excavated along the post line, on the upslope side of the barrier.

The wire mesh or standard snow fencing support fence (if used) is then fastened securely to the upslope sides of the posts, extending into the trench and not exceeding 1 m above ground surface.

The fabric is then extended into the trench and stapled or wired to the fence. The reinforced fence may be eliminated if an extra strength filter fabric and a closer post spacing pattern is used. The filter shall then be stapled or wires directly to the support posts.

The trench is then backfilled and the soil is compacted over the filter fabric to ensure that no gaps between ground and fabric exist.

Maintenance

1. Inspection of the silt fence must be conducted immediately after rainfall and daily during prolonged rainfall. Repairs to the fence must be completed immediately, and any section of the fence that decomposes before the end of its expected use shall also be replaced immediately.
2. Sediment trapped in the filter should be removed following each storm, and when these deposits reach one half the height of the barrier, they must be removed. Once their useful purpose has been fulfilled, silt fences should be removed. However, this shall not occur until after the upslope area has been permanently stabilized. After removal of the silt fence, the sediment that remains in place must be graded, prepared and seeded.
3. Specifications
4. The post used for supporting a silt fence shall be either 10 cm diameter wood or 2kg per linear meter steel, minimum length of 1.5 m. The steel posts must also have projections to enable the fastening of wire to them.
5. The posts shall be set at a maximum spacing of 3 m and driven at least 35 cm into the ground. When a wire support fence is not used, posts shall not be spaced more than 2 m apart.
6. The anchor trench shall be approximately 10 cm by 10 cm and shall be excavated along the post line on the upslope side of the barrier.
7. For silt fences using a standard strength filter cloth, the reinforcement fence, if used, shall be a minimum of 1.1 m in height, have a maximum mesh spacing of 15 cm, and have a minimum wire diameter of 2 mm. It shall be fastened securely to the upslope sides of the posts with heavy duty staples of a minimum of 25 cm in length, or with tie wires or hog rings, providing standard strength fabric is used. The fence shall extend a minimum of 5 cm into the trench and shall not exceed 1 m above the ground surface.
8. A previous sheet of propylene, nylon, polyester or ethylene yarn may be the synthetic fabric used. The fabric, in order to provide a construction life of a minimum of six

months, at a temperature range of -18°C to 50°C, shall contain ultraviolet ray inhibitors and stabilizers. Previous and closely woven natural fiber fabric may be used in place of synthetic fabric, however, porosity and filtering capability must be comparable to synthetic material. In order to avoid the use of joints, the fabric shall be a continuous roll, cut to the length of the barrier.

9. 20 cm of the fabric, standard strength, shall be extended into the trench and shall be stapled or wired to the fence (or directly to the posts if a fence is not used). However, the fabric shall not extend more than 1 m above the ground surface and it shall not be stapled to existing trees.
10. The trench shall be backfilled and the soil compacted over the filter fabric.

FIGURE 3.

SILT FENCE

