

**VILLAGE OF KASLO
SUBDIVISION SERVICING
BYLAW NO. 1039, 2006**

Originally prepared by
Stanley Associates Engineering Ltd.
Kelowna, BC
February, 1996

**VILLAGE OF KASLO
SUBDIVISION SERVICING BYLAW NO. 1039, 2006**

WHEREAS the Council of the Village of Kaslo wishes to adopt a Bylaw to regulate and require the provision of services in respect to subdivision of land pursuant to The Local Government Act and/or The Community Charter;

AND WHEREAS the Council of the Village of Kaslo wishes to consider requiring the provision of works and services under The Local Government Act and/or The Community Charter as a condition of the issue of a Building Permit;

NOW THEREFORE, the Council of the Village of Kaslo, in open meeting duly assembled, **ENACTS AS FOLLOWS**:

1.0 TITLE

This Bylaw may be cited as "The Village of Kaslo Subdivision Servicing Bylaw No. 1039, 2006". Text and figures enclosed by brackets (---) are included for information only and do not form part of this Bylaw.

2.0 APPLICABILITY

The provisions of this Bylaw apply to Fee Simple Subdivision development and subdivision development under the Condominium Act within the incorporated area of the Village of Kaslo.

3.0 REPEAL

The "Bylaw to Regulate the Subdivision and Development of Land of the Village of Kaslo No. 883", and all amendments thereto, is hereby repealed.

4.0 DEFINITIONS

In this Bylaw, unless the context otherwise requires:

"APPROVAL" means written approval of a subdivision by the Approving Officer or issuance of building permit by the Building Inspector.

"APPROVING OFFICER" means a person appointed under the Land Titles Act as an Approving Officer for the Village of Kaslo.

"BUILDING INSPECTOR" means a person appointed as a Building Inspector for the Village of Kaslo.

"COMMUNITY DRAINAGE SYSTEM" means a system of works owned, operated and maintained by the Municipality, designed and constructed to control the collection, conveyance and disposal of surface and other water.

"COMMUNITY SANITARY SEWAGE SYSTEM" means a system owned, operated and maintained by the Municipality for the collection and disposal of sanitary sewage.

"COMMUNITY WATER SYSTEM" means a system of waterworks, within the meaning of the "Health Act", which is owned, operated and maintained by the Municipality.

"HIGHWAY" means and includes any street, road, lane, walkway, bridge, viaduct and any other way open to the use of the public, but does not include a private right-of-way on private property.

"LANE" means a narrow highway which provides vehicular access to any abutting parcel, so that the parcel may be serviced or accessed by vehicles using that highway.

"MEDICAL HEALTH OFFICER" means the official appointed under the Health Act who has jurisdiction over the area in which the subdivision is located.

"MUNICIPALITY" means the Village of Kaslo.

"OWNER" means a person, registered in the Land Titles Office as owner of land or a charge on land whether entitled to it in his own right or in a representative capacity or otherwise, and includes "registered owner".

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

"POTABLE WATER" means water which is accepted for drinking purposes by the Medical Health Officer.

"PROFESSIONAL ENGINEER" means a person who is registered or duly licensed as such, under the provisions of the "Engineers and Geoscientists Profession Act" of the Province of British Columbia.

"SUBDIVISION" means the division of land into two or more parcels, whether by plan, apt descriptive words, or otherwise.

"WALKWAY" means a narrow highway for the predominant use of pedestrian traffic.

"WORKS AND SERVICES" means any public service, facility or utility which is required or regulated by this Bylaw and without restricting the generality of the foregoing includes: the supply and distribution of water; collection and disposal of sanitary sewage and drainage water; street lighting; access roadways, curbs, gutters, and sidewalks; and natural gas, power, telephone and cablevision services.

"ZONE" means a zone as provided for in the Land Use Bylaw of the Village of Kaslo, and amendments thereto.

All words or expressions used in the Bylaw shall have the same meaning assigned to them as like words or expressions contained in the "Land Title Act", "The Community Charter" and the "Local Government Act".

5.0 GENERAL PROVISIONS

5.1 Severability

The provisions of this Bylaw are severable. If any provision is for any reason held to be invalid by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining provisions of this Bylaw.

5.2 Administration

This Bylaw shall be administered by:

- a) The Approving Officer of the Village of Kaslo where works and services are to be provided because of subdivision of land; or
- b) The Building Inspector of the Village of Kaslo where works and services are to be provided or because of an application for a building permit who shall forward the proposed requirements for works and services to the Approving Officer for approval; or
- c) Some other officer appointed by Council.

5.3 Record Kept

1. The Approving Officer shall maintain a record of all applications submitted under this Bylaw with respect to subdivisions, which record shall indicate the final disposition of all such applications thereon.
2. The Building Inspector shall maintain a record of all occasions when the provisions of this Bylaw are used to require the provision of works and services in accordance with the standards of this Bylaw and this record will show what works and services were provided and where.

5.4 Authorization for Entry

Employees of the Municipality are hereby authorized to enter at all reasonable times upon such any property or premises to inspect the same in connection with their duties under this Bylaw and to ascertain whether the provisions of this Bylaw are being complied with.

5.5 Measurements

All measurements in this Bylaw are expressed in the Metric System.

5.6 Compliance with Other Regulations

- .1 (Applications for subdivision will be reviewed for compliance with the requirements of this Bylaw and other Municipal and Provincial legislation. Nothing contained in this Bylaw shall relieve the owner of a subdivision from the responsibility to seek out and comply with legislation applicable to his undertaking.)

- .2 (Except where a setback of a building or structure in respect to a highway is concerned, no subdivision shall be approved which would cause any existing building or structure, sewage disposal installation or used source of potable water to contravene any zoning, building or other regulation in force.)

6.0 REQUIRED WORKS AND SERVICES

6.1 Works and Services

Schedules "B" and "C" reflect levels of works and services required.

6.2 Highway Width

Throughout the Municipality and in accordance with the following uses of highways, the subdivider or developer shall provide land for highways without compensation:

- a) for motor vehicle use, land not exceeding 18.3 metres in width; or
- b) to widen an existing local highway that borders on or is within the subdivision or development no more than the lesser of:
 - i) 9.15 metres in width; or
 - ii) the difference between the current width of a local highway and 18.3 metres; but
- c) notwithstanding subsection (a) of this section additional width may be required ; and
- d) for motor vehicle use, lanes where deemed necessary pursuant to the Land Title Act which shall have a minimum width of six (6) metres; but
- e) for pedestrian use only, walkways shall have a minimum width of three (3) metres.

6.3 Roads

Highways, sidewalks and boulevards shall be provided in all subdivisions and developments in accordance with Schedules "B" and "C" which are attached to and form part of this bylaw; and all highways, sidewalks and boulevards shall be located, constructed and otherwise meet the standards found in Schedule "A" which is attached and forms part of this bylaw.

6.4 Water

In all subdivisions and developments where a water distribution system and fire hydrant system is required or, where no community water system is required and each newly created parcel is to be provided with a source of potable water, each shall be located, constructed and otherwise meet the standards found in Schedules "A" and "B" which are attached to and form part of this Bylaw.

6.5 Effluent Disposal

In all subdivisions and developments where a sewage collection system is required or where no community sewage collection system is required and each newly created parcel is to be provided with an area of soil capable of disposing of a specified amount of effluent, each shall be located, constructed and otherwise meet the standards found in Schedules "A" and "B" which are attached to and form part of this Bylaw.

6.6 Drainage

In all subdivisions and developments where a drainage collection system or a drainage disposal system is required, each shall be located, constructed and otherwise meet the standards found in Schedules "A" and "B" which are attached to and form part of this Bylaw.

6.7 Streetlighting

In all subdivisions and developments where a streetlighting system is required, each shall be located, constructed and otherwise meet the standards found in Schedules "A" and "B" which are attached to and form part of this Bylaw.

6.8 Underground Wiring

In all subdivisions and developments where underground wiring is required, each shall be located, constructed and otherwise meet the standards found in Schedules "A" and "B" which are attached to and forms part of this Bylaw.

6.9 Overhead Wiring and Natural Gas

1. Overhead wiring may be considered at the discretion of the Approving Officer for some subdivisions; and, where such overhead wiring is to be provided, it shall be located, constructed and otherwise meet the standards found in Schedule "A" which is attached to and form part of this Bylaw.
2. Natural gas services may, at the owner's option, be provided for some subdivisions; and, where such natural gas services are to be provided, they shall be located, constructed and otherwise meet the standards found in Schedule "A" which is attached to and forms part of this Bylaw.

7.0 SECURITY

Where:

- a) all works and services required to be constructed or installed at the expense of the subdivider are not constructed or installed, before the Approving Officer approves the subdivision, security in the form of a cash deposit, or an irrevocable letter of credit from a financial institution acceptable to the Municipality, in the amount of 120% of the estimated construction cost as estimated by the Approving Officer and satisfactory to the Approving Officer, shall be deposited with the Municipality; and

b) where all works and services required to be constructed and installed at the expense of the developer are not constructed or installed, before the Building Inspector issues the building permit, security in the form of a cash deposit, or an irrevocable letter of credit from a financial institution acceptable to the Municipality, in the amount of 120% of the estimated construction cost as estimated by the Building Inspector and satisfactory to the Building Inspector, shall be deposited with the Municipality.

*Bylaw 1062
March 25, 2008*

8.0 FEES

8.1 Application Fees

Pursuant to the Local Government Act a fee of Fifty ^{500.00} ~~(\$50.00)~~ Dollars for the first parcel created by subdivision and Twenty ^{250.00} ~~(\$20.00)~~ Dollars for each additional parcel is payable to the Municipality.

8.2 Examination Fee

An examination fee as required under the Land Title Act and set out in regulations thereto is payable to the Municipality.

8.3 Inspection Fee

An inspection fee of 3% (three percent) of the actual construction cost of all off-site and on-site services required by this bylaw as estimated by the Municipality with a minimum of ^{1500.00} ~~\$500.00~~ (Five Hundred Dollars) is payable to the Municipality. The inspection fee relates only to the periodic inspection of the works under the jurisdiction of the Municipality.

8.4 Administration Fee

An administration fee of 3% (three percent) of the actual construction cost of all off-site and on-site services required by this bylaw or a minimum of ^{1500.00} ~~\$500.00~~ (Five Hundred Dollars), whichever is greater is payable to the Municipality.

This fee is calculated at 3% (three percent) of the actual construction costs of all off-site and on-site services including:

New roads and existing frontage roads including clearing, grubbing, blasting, cuts, fills, gravel, compaction, asphalt, curbs, gutters and sidewalks, ditches, boulevard landscaping and pedestrian underpasses; all deep utilities including storm drainage works, sanitary sewer works, water system works and creek culverts; and cost of civil works for shallow utilities including power, telephone, cable TV and street lighting.

This fee is calculated at 3% (three percent) of the actual construction costs as determined using the above identified items, substantiated by contractor unit prices or payment invoices, or if levied before construction is complete, by using the Developer's Consulting Engineer's construction cost estimates. The construction cost estimates may be adjusted up or down at the sole discretion of the Municipality, if in the Municipality's opinion an adjustment is warranted.

8.5 Preliminary Layout Review

1000.00

Pursuant to Municipal legislation a fee of ~~\$100~~ (one hundred dollars) for preliminary layout review is payable to the Municipality upon application.

9.0 OVERSIZING OF WORKS

9.1 Where an owner in accordance with this Bylaw provides a highway or water, sewage or drainage facilities that serve land other than the land being subdivided or developed, and

- a) The Municipality has required that the owner provide excess or extended highway, water, sewage or drainage facilities; and
- b) The Municipality has considered the cost of the Municipality providing such facilities in whole or in part would be excessive; and
- c) The Municipality has
 - i) determined the portion of the cost of providing excess or extended services,
 - ii) determined which part of excess or extended services will benefit each parcel served; and
 - iii) imposed, as a condition of an owner connecting to or using the excess or extended service, a charge related to the benefit under (ii)

all in accordance with Municipal legislation; the interest rate on the charge payable under c(iii) shall be at prime plus 2 percent at the time of execution of the Latecomer Agreement, calculated annually.

10.0 SUBDIVISIONS WHERE SERVICING REQUIREMENTS MAY BE WAIVED

Notwithstanding the above, the servicing requirements prescribed in Schedule "B" of this Bylaw may be waived where the parcel 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 antenna;
- e) a radio or television receiving antenna;
- f) a telecommunication relay station;
- g) an automatic telephone exchange;
- h) an air or marine navigational aid;
- i) electrical substations or generating stations; or
- j) any other similar public service or quasi-public service facility or utility.

11.0 BYLAW SCHEDULES

11.1 The following is a list of schedules attached hereto and **which form a part of this Bylaw:**

Schedule "A" - Design Criteria, Specifications, and Standard Drawings

Schedule "B" - Level of Works and Services

Schedule "C" - Level of Highway Works and Services

11.2 The following is a list of appendices attached hereto for the purpose of providing information only and **which do not form a part of this Bylaw.**

Appendix "A" - Drawing Submissions - Acceptable Standards

Appendix "B" - Typical Forms and Agreements

Appendix "C" - Administrative Provisions

11.3 ADOPTION

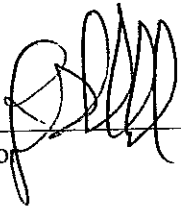
READ A FIRST TIME this 30th day of October, 2006.

READ A SECOND TIME this 30th day of October, 2006.

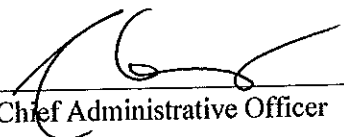
READ A THIRD TIME this 30th day of October, 2006.

Reconsidered, Finally Passed and Adopted by

Council this 14th day of November, 2006.



Mayor



Chief Administrative Officer

SCHEDULE "A"

VILLAGE OF KASLO

SUBDIVISION SERVICING BYLAW NO. 1039

SCHEDULE "A"

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

Schedule "A" to the Subdivision Servicing Bylaw identifies the Design Criteria, Specifications, and Standard Drawings acceptable to the Municipality.

This Schedule is to be referred to in the design, construction and acceptance of Engineering Works within the Municipality. Additional information, clarification and suggestions for changes and amendments should be directed to:

Village of Kaslo
P.O. Box 576
Kaslo, B.C.
VOG 1M0

1.2 DEFINITIONS

In this Schedule, unless the context otherwise specifies:

"ACCEPTED" means as accepted by the Approving Officer or Building Inspector employed by the Municipality.

"CONSIDERED" means considered for acceptance by the Approving Officer or Building Inspector.

"CONTRACTOR" means the person or persons or the company undertaking the construction of works in a subdivision development, and/or on municipal property, or their employees, subcontractors or other duly authorized representative.

"DEVELOPER" means the owner of land or the holder of a bona-fide interim agreement or option to purchase land, who has made application to the Municipality for or is engaged in undertaking the development or subdivision of such land and shall include his duly authorized representative.

"DEVELOPER'S ENGINEER" means the Professional Engineer engaged by the Developer to design and/or prepare drawings for the construction of works in a subdivision, development, and/or on municipal property, or his duly authorized representative.

"ENGINEER" means the Municipal Engineer of the Village of Kaslo or a duly authorized representative of the Municipality.

"MUNICIPALITY" means the Village of Kaslo

"PROFESSIONAL ENGINEER" means a person who is registered or duly licensed as such in British Columbia under the provision of the Engineers and Geoscientists Professional Act.

"THIS SCHEDULE" means the "Design Criteria, Specifications and Standard Drawings" prepared by the Village of Kaslo.

"THE WORK" means and includes anything and everything to be done for the setting out, the execution and fulfilment of the requirements in this Schedule.

1.3 SCOPE AND USE

This schedule shall be taken to mean the Design Criteria, Specifications and Standard Drawings to be referred to, and incorporated in, subdivisions, developments, and on municipal properties or rights-of-way, in the Village of Kaslo.

1.4 NON-MUNICIPAL CODES AND STANDARDS

Where non-Municipal codes and standards, such as A.S.T.M., C.S.A., A.W.W.A., etc., are referred to in this Schedule, the latest adopted revision, including amendments, of these codes and standards at the date of commencement of construction shall apply, except that the Approving Officer may vary requirements under certain circumstances in the interest of public health or safety.

When references to the following capitalized abbreviations are made, they refer to Specifications, Standards, or Methods of the respective Association.

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
BCBC	British Columbia Building Code
CEC	Canadian Electrical Code
CEMA	Canadian Electrical Manufacturers Association
CGSB	Canadian General Standards Board
CSA	Canadian Standards Association
CSPI	Corrugated Steel Pipe Institute
IES	Illumination Engineering Society
LEMA	Lighting Equipment Manufacturers Association
NBC	National Building Code of Canada
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
TAC	Transportation Association of Canada
WCB	Workers' Compensation Board

2.0 ROAD AND WALKWAYS

2.1 INTRODUCTION

All roads in the Municipality shall be designed in accordance with the recommended practice as outlined in "Geometric Design Standards for Canadian Roads and Streets", as published by the Road and Transportation Association of Canada (R.T.A.C.) or as stated elsewhere in this Schedule or as accepted.

2.2 ROAD AND WALKWAYS CLASSIFICATIONS

Roadway classification throughout the Municipality shall be as indicated in this Bylaw.

Arterial Streets - Controlled by the Ministry of Transportation and Highways

Arterial Streets fall under the jurisdiction of the Ministry of Transportation and Highways and are shown in Schedule "C", Plan 1. All works and services affecting arterials are subject to Ministry of Transportation and Highways Standards and requirements.

Schedule "C" Plan 2 shows roads identified in the Ministry of Transportation and Highways, Major Street Network Plan as it affects the Municipality. All road design and construction affecting these roads must be constructed to Ministry of Transportation and Highways standards. Ministry standards for utility services and access would also apply in these cases.

Where a subdivision borders or contains a controlled access highway, as defined in the Highway Act, the Approving Officer shall withhold approval until it has first been approved by the Ministry of Transportation and Highways.

Collector Streets

Collector streets provide both traffic service and land service functions. The traffic service function of this type of street is to carry traffic between local and arterial streets. Controlled access to adjacent properties will be allowed on collectors. Trip lengths are commonly in the range of 0.75 - 1.5 km. Average daily traffic (ADT) volumes generally range from 1,000 - 12,000 vehicles.

Local Streets, Cul-de-Sacs

The main function of a local street is to provide land access. Direct access is allowed to all abutting properties. Local streets are not intended to move large volumes of traffic. Trip lengths are short, generally under 0.75 km in length. Cul-de-sacs shall not exceed 120 m unless accepted.

Commercial and Industrial Streets

Commercial and Industrial streets provide vehicle and pedestrian access to and through commercial and industrial shopping areas. Pedestrian volume and vehicle parking volume are greater than on residential streets.

Lanes

Lanes provide a secondary service access to parcels. Lanes shall not exceed a length of 150 m unless accepted. Dead-end lanes shall not be encouraged, but, when accepted, shall include a turn-around area. Due consideration shall be given to the continuation of lanes from block to block in order to facilitate pole lines and other utility construction.

Walkways

Functional walkways provide pedestrian access to transit, shopping and school sites. Leisure walkways provide pedestrian access to parks and open public areas.

2.3 DESIGN PARAMETERS

2.3.1 Design Speed

Unless otherwise specified, roadways shall be designed to the following minimum standards as specified in the Road and Transportation Association of Canada Geometric Design Standards for Canadian Roads and Streets Manual:

Arterials	Ministry of Transportation and Highways Standards
Collectors	60 km/hr.
Locals	50 km/hr.

2.3.2 Cross Section Elements

All right-of-way and roadway widths shall be as outlined in Table 2.3.2 Right-of-way and Roadway Widths.

Table 2.3.2 - Right-of-Way and Roadway Widths

<u>Road Classification</u>	<u>Minimum Right-of-Way Width</u>	<u>Minimum Roadway</u>
Arterial:		
Controlled by the BC Ministry of Transportation and Highways	As per BC M.O.T.H. Requirements	As per BC M.O.T.H. Requirements
Collector:		
Urban	20.0 m	13.5 m paved, c/c
Rural	20.0 m	7.0 m paved, 2.5 m shoulders
Local Street:		
Urban	18.3 m	8.5 m paved c/c
Rural	18.3 m	6.0 m paved, 1.5 m shoulders
Cul-de-Sac	18.3 m (15.0 m bulb radius)	8.5 m paved c/c (8.5 m bulb radius)
Lane	6.0 m	5.5 m paved
Walkways:		
Leisure	6.0 m	3.0 m paved
Functional	3.0 m	2.0 m paved

The developer shall either dedicate sufficient right-of-way to cover all road embankments or complete all road construction and site grading prior to registration of the subdivision plan. Where a cut or fill slope exceeds 1.5m in vertical height, additional right-of-way may be required at the discretion of the Approving officer.

For details of cross-sectional elements refer to the standard drawings.

Roll-over curbs will be permitted only on local roads and only where the adjoining land use is designated as single family residential.

2.3.3 Horizontal Alignment

Curvature

Table 2.3.3.1 illustrates the minimum required centreline radius for various superelevation rates for each classification of roadway. All designs to be in accordance with RTAC Standards.

Table 2.3.3.1 - Minimum Horizontal curve Radii (Metres)

Roadway Classification	Horizontal Curve Radii			
	No Superelevation	Superelevation (m/m)		
		0.02	0.04	0.06
Arterial - MOTH	MOTH Standards	MOTH Standards		
Collector	120	110	100	-
Local	65	-	-	-

The maximum superelevation rate for collectors shall be 0.04 m/m. No superelevation will be permitted on local streets.

Table 2.3.3.2 illustrates the minimum curb or pavement return radius for various roadway classifications.

Table 2.3.3.2 - Curb Return Radii

Road Classification	Return Radii (metres)
Arterial	MOTH STDS
Collector	8
Local	8
Cul-de Sac	6
Industrial/Commercial	9

Cul-de-sac bulb radius for paved or gravelled surface shall be a minimum of 8.5 m.

All roadways shall be constructed using a 2% centreline crown except under adverse topographic conditions, offset crowns may be permitted for local or collector streets at the discretion of the Approving Officer, in which case the location of the crown shall be approximately 2.5 metres from high side curb with a minimum cross slope of 2% and a maximum of 4%.

Overall curb-to-curb crossfalls will not be permitted except in cases where superelevation is required.

Lanes shall be constructed using an inverted 2% crown.

2.3.4 Vertical Alignment

Roadway Grades

Minimum grades for urban and rural roadways shall be 0.50% with 2% crossfall.

Curb return grades shall be minimum 1.0%

Maximum grades shall be as shown in Table 2.3.4.1.

Table 2.3.4.1 - Maximum Roadway Grades

<u>Roadway Classification</u>	<u>Maximum Grade</u>
Arterial	MOTHSTDS
Collector	9%
Local	10%
Cul-de-sac (Uphill Roadway)	10%
Cul-de-sac (Downhill Roadway)	8%
Lanes	10%

Consideration may be given to allowing increased grades where short sections of steeper grades can be utilized to improve the geometric design of intersections for increased safety.

Vertical Curvature

Vertical curves shall be designed to provide safe stopping sight distances and shall be provided where centreline grades change is in excess of 1%. Stopping sight distance is the distance separating a vehicle from an object, measured the instant that an object (for which the driver decides to stop) comes into view. Minimum stopping sight distance is the least distance required to bring the vehicle to a stop, under prevailing vehicle and climatic conditions. Vertical curve length is calculated by the equation $L = KA$:

Where: L = length of the vertical curve
 K = a constant related to lines and geometry of a parabolic curve
 A = algebraic difference in grades in percent

Table 2.3.4.2. shows the minimum K values to be used for vertical curve design.

All vertical curves are to be symmetrical.

Table 2.3.4.2. - Minimum K Values (metres) for Vertical Curve Design

Roadway Classification	Crest Curve	Sag Curve	
	Minimum	With Street Desirable Lighting	Without Street Lighting
Arterial - M.O.T.H. Requirements			
Collector	10	15	9
Local	7	10	6

Vertical Alignment

The vertical alignment of roads shall be such that an access driveway having a maximum 15% grade can be achieved from the property line to the proposed building area.

2.3.5 Intersections

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

Intersection Grades

Approach grades of local roads at intersections to major streets shall not exceed 75% of the maximum allowable road grade for that street classification.

Consideration may be given to increased approach grades where topographic or other conditions dictate the use of maximum or near maximum grades.

Intersection Vertical Curves

The minimum K values for vertical curves on local roads at intersection shall be as shown in Table 2.3.5.

Table 2.3.5 - Minimum Intersection K Values

Minor Intersecting Street	Minimum K Value, Metres	
	Crest Curb	Sag Curve
Collector	7	6
Local	4	4

Grades of major roads through intersecting local approaches shall be constant and shall not exceed 75% of the maximum allowable grade for that street classification. Consideration may be given to allowing increased grades where topographic or other conditions dictate the use of maximum or near maximum grades.

2.3.6 Road Base

Minimum road base requirements shall be as outlined in Table 2.3.6.1.

Table 2.3.6.1 - Pavement Structure Requirements

Road Classification	Compacted Sub-base Thickness	Compacted Base Thickness	Compacted Asphalt Thickness
Arterial	MOTH STANDARDS		
Collector	300 mm	75 mm	65 mm
Local	300 mm	75 mm	65 mm
Cul-de-sac	300 mm	75 mm	65 mm
Commercial	300 mm	75 mm	65 mm
Lane	300 mm	75 mm	65 mm

Pavement structure requirements refer to both rural and urban road classifications.

Increases in sub-base thickness where poor soil conditions exist shall be at the discretion of the Approving Officer. Pavement structure requirements shall be confirmed by the Developer's Engineer following completion of a geotechnical investigation.

Where a "half-road" is to be installed, the asphalt thickness for all road classifications shall be a minimum of 75 mm with 45 mm to be installed during initial construction and the 30 mm remaining thickness to be installed when the roadway is completed by the subsequent developer.

2.3.7 Sidewalks and Walkways

Sidewalks shall be installed in accordance with the minimum requirements outlined in Table 2.3.7.

Table 2.3.7 - Minimum Sidewalk Requirements and Widths and Curb Types

Road Classification	Requirement	Width	Curb Type
Arterial	MOTH STANDARDS		
Collector Urban	* One Side	1.8 m	non-mountable
Local Urban	* One Side	1.5 m	varies
Cul-de-sac Urban	N/A	N/A	varies
Commercial/Industrial	Both Sides	varies	non-mountable
Walkway Functional	Centred	3.0 m	N/A
Leisure	Centred	2.0 m	N/A

*Additional sidewalk shall be installed in areas deemed necessary by the Approving Officer. Such cases shall include areas with multi-family, institutional and commercial development and proposed bus routes.

Where a walkway exists on a cul-de-sac, a sidewalk, 1.5 m wide, shall be extended to the walkway entrance.

Sidewalks shall not be required for rural roads.

Sidewalks shall at all times drain towards the gutter with a cross slope of 2%.

Wheelchair ramps shall be installed at all intersections and at cross-walks.

Where non-mountable curbing is used, access to properties and to lanes shall be in the form of sidewalk crossings and shall conform to municipal standards. Breaks in a sidewalk and use of curb returns for access will not be permitted. Widths for crossings may vary depending on the development's requirements. Minimum crossing width for residential driveways shall be 3.5 m. Maximum crossing width for industrial and commercial driveways shall be 15.0 m.

Where mountable curbing is used, sidewalk crossings will not be required and access shall be directly over the sidewalk. Transition from mountable to non-mountable curbing shall in all cases be made at the nearest wheelchair ramp.

Sidewalk crossings for private residential driveways shall be 150 mm thick. Sidewalk crossings for lanes, industrial, commercial or multiple dwelling developments shall be 180 mm thick. Curing compound and sealing compound shall be applied according to the manufacturer's recommendations.

Sidewalks and walkways shall be designed to provide an overall pedestrian traffic system throughout the area and locations shall be subject to the acceptance of the Approving Officer.

Pedestrian walkway patterns in newly developed areas shall be designed on the basis of functional and leisure usage and shall be subject to the acceptance of the Approving Officer.

Functional walkways for pedestrian access to transit, shopping and school sites shall be constructed to Municipal specifications to a full 3.0 m width with a minimum of 100 mm pit-run gravel base and surfaced with a minimum of 50 mm asphaltic concrete or a minimum of 100 mm of concrete.

Leisure walkways for pedestrian access to and in parks and open public areas shall be constructed to Municipal specifications to a full 2.0 m width with a minimum of 100 mm pit-run gravel base and surfaced with a minimum of 50 mm asphaltic concrete or a minimum of 100 mm of concrete.

(Fencing of walkways shall be the responsibility of the adjacent property owners who will ensure that construction of such is carried out in accordance with Municipal standards.)

Walkways in excess of 9% are not to be encouraged. Where walkway grades exceed 9% but are less than 12%, an accepted stepped walkway shall be constructed, complete with a handrail. Where walkway grades exceed 12%, accepted stairs with handrail shall be constructed. All walkways with steeper than 8% grades shall be provided with an accepted handrail.

Walkways shall be graded to the full width between property lines to provide proper access and drainage.

2.3.8 Boulevards and Restoration

Unless otherwise accepted, all boulevards shall be graded to drain to the curb or ditch, as applicable, at a minimum slope of 2% and a maximum slope of 10%.

The top 100 mm of soil shall be good quality topsoil raked free of any debris which is not conducive to the growing of grass and shall be seeded. Hydroseeding may be required.

Driveway gradients shall have a maximum slope of 15% from the back of curb, back of sidewalk, or edge of shoulder, as applicable.

2.3.9 Geotechnical Requirements

The developer's engineer shall in all cases ensure that the structural integrity of the on-site soils are adequate to accommodate the expected loading. The Approving Officer may require provision of evaluation prepared by a qualified geotechnical engineer.

Modifications to the Municipality's minimum pavement structure requirements shall be as outlined in Section 2.3.6, "Road Base".

2.3.10 Street Names

Street names for new streets must be accepted by the Municipality Council who shall have absolute discretion in this regard.

2.3.11 List of Standard Drawings

The following drawings form part of Section 2:

<u>Title</u>	<u>No.</u>	<u>Title</u>	<u>No.</u>
Local Urban Road	R-1	Hydrant Access Path	R-6
Local Rural Road	R-2	Paved Lane	R-7
Collector Urban Road	R-3	Paved Walkway	R-8
Collector Rural Road,	R-4	Curb and Gutter	R-9
Commercial Urban Road	R-5		

2.4 MATERIALS

2.4.1. Roadway Embankment Materials

Earthfill for roadway embankment shall be native material with the exception of overburden, topsoil and rockfill. Earthfill shall be capable of being compacted to form a stable embankment, and shall be free of organic or deleterious material.

2.4.2. Select Granular Sub-Base Material

Select granular sub-base material shall be a pit-run gravel, or crushed gravel, screened if necessary, composed of inert, durable aggregate, uniform in quality and free from soft or disintegrating particles, clay or silt balls, organic material or other deleterious material, and shall be well graded from coarse to fine particles within the following gradation limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
75 mm	100
25 mm	60 - 85
No. 4	30 - 60
No. 200	2 - 10

That portion of the aggregate which passes the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity limit of not more than 6.

2.4.3. Crushed Granular Base Material

Crushed granular base material shall consist of inert, durable crushed aggregate, screened if necessary, uniform in quality and free from soft or disintegrating particles, clay or silt balls, organic material or other deleterious materials, and shall be well graded from coarse to fine particles within the following gradation limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
19 mm	100
12.5 mm	70 - 100
No. 4	40 - 80
No. 8	30 - 60
No. 16	20 - 45
No. 50	8 - 20
No. 200	2 - 8

Not less than 60 percent (60%) of the material retained on the No. 4 sieve shall be crushed particles with at least one fractured face. That portion of the material which passes the No. 40 sieve shall have a liquid limit of not more than 25 and plasticity limit of not more than six.

2.4.4. Hot Mix Asphaltic Concrete

Hot mix asphaltic concrete mix design shall be prepared by a Professional Engineer and satisfy the following criteria, in accordance with ASTM D-1559, Marshall Test Procedure:

- Blows per face	50
- Marshall stability, kg at 60EC	450
- Flow index, mm	8 - 14
- % voids in mineral aggregate	
- 20 mm max.	14 min.
- 12.5 mm max.	14 min.
- % voids in total mix	3 - 5
- % voids filled with asphalt	75 - 85

Prime coat shall be MC-0 (MC-30) or as accepted.

Asphalt cement shall be prepared by refining petroleum, uniform in character, shall not foam if heated to 177 E Celsius, and shall conform to grade 120 - 150 penetration when tested in accordance with ASTM-D5.

Tack coat shall be RC-0 (RC-30) or as accepted.

Coarse mineral aggregate shall consist of hard, clean, durable, crushed aggregate, in conformance with ASTM D692.

Fine mineral aggregate shall consist of natural sand or hard, clean, durable crushed aggregate.

Gradation of mineral aggregate, graded in accordance with ASTM C136 shall conform to the following, and shall form a smooth concave shaped curve when plotted on a semi-log chart:

<u>Sieve Size</u>	<u>Base Course</u>	<u>% Passing</u>	<u>Surface Course</u>
19.0 mm	100		-
12.5 mm	75 - 90		100
9.5 mm	62 - 82		78 - 94
No. 4	44 - 63		58 - 60
No. 8	-		52 - 74
No. 10	31 - 50		42 - 64
No. 20	23 - 41		28 - 48
No. 40	17 - 34		19 - 38
No. 100	10 - 20		10 - 24
No. 200	3 - 10		5 - 14

A minimum of 60% of the particles by weight retained on the No. 40 sieve shall have two or more fractured faces.

2.4.5 Concrete

The design of concrete mixes shall be prepared by a Professional Engineer and shall suit the local site conditions.

Cement shall be normal Portland Cement Type 10 or sulphate resistant Portland Cement Type 50, conforming to CSA A.5.

Water and aggregates shall conform to CSA A.23.1. Air entraining admixtures shall conform to CSA A.266.1. Chemical admixtures shall conform to CSA A.266.2 and shall be used only if accepted.

Concrete for curb and gutter and sidewalks shall be ready mix concrete designed to achieve a 28 day compressive strength of 25 KPa, with a maximum aggregate size of 25 mm, air entrainment 5 - 7%, water-cement ratio 0.50 maximum and slump of 25 - 75 mm. Pre-moulded expansion joint filler material shall be minimum 13 mm thick, cut to suit.

2.4.6 Grass Seed Mixture

Grass seed shall be premium quality with a purity of 95% or better and a germination rate of 85% or better. The species and percentages of the seed mixture shall be:

Creeping Red Fescue	50%
Canada Blue Grass	50%

2.5 INSTALLATION

2.5.1 General

Copies of compaction test results, granular materials sieve analyses, asphaltic concrete and concrete design mixes, asphaltic concrete and concrete test results shall be submitted to the Municipality.

The working area and haul roads shall be maintained in an orderly fashion and shall not be encumbered with equipment, materials or debris.

Dust control shall be maintained at all times by watering or other approved means.

The work shall be scheduled such that disruption of normal traffic and inconvenience to residents shall be kept to a minimum.

Proof rolling of the subgrade, subbase or base course may be required by the Approving Officer.

2.5.2. Clearing and Grubbing

The roadway right-of-way shall be cleared and grubbed of all standing or fallen trees, brush, timber, stumps or other debris and organic materials and these materials shall be disposed of by burning or other approved means. Burning shall be done in accordance with B.C. Forest Act and Municipal By-laws. Topsoil and overburden shall be stripped to a minimum depth of 300 mm.

2.5.3. Grading

The entire roadway right-of-way width shall be graded to the approved profile and cross-section, and uniformly compacted to a minimum 98% Standard Proctor. The completed profile and cross-section shall be accurate to a tolerance of 30 mm, with no soft, spongy or unstable areas, and free from ruts, waves and undulations.

2.5.4 Select Granular Sub-Base

Select granular sub-base material shall be placed on dry, firm sub-grade, and compacted in uniform layers not exceeding 150 mm in uncompacted thickness, to a minimum 100% Standard Proctor Density. The completed profile and cross-section shall be accurate to a tolerance of 15 mm, free from ruts, waves and undulations.

2.5.5 Crushed Granular Base

Crushed granular base course material shall be placed on dry, firm sub-base, and compacted in uniform layers to a minimum 100% Standard Proctor Density. The completed profile and cross-section shall be accurate to a tolerance of 12 mm, free from ruts, waves and undulations.

2.5.6 Culverts

Culverts shall be concrete or galvanized corrugated steel pipe designed for H20 loading for local roads and HS25 loading for arterial and collector roads in accordance with A.A.S.H.O.

Culvert sizes shall be designed for the anticipated run-off, 25 year return period, and shall be minimum 300 mm diameter. Driveway culverts shall be a minimum 7.0 m long.

In areas where culverts cross under major roadways or are located in critical or sensitive areas, culverts shall be sized for a 100 year return period.

Culverts shall be installed to true line and grade, with a minimum 300 mm bury. End walls shall be concrete-sandbagged.

2.5.7 Boulevards

Boulevard areas lying between the curb and property line of the road right-of-way shall be graded to drain to the curb and fill sections shall be compacted. The topsoil shall be raked free of roots and other debris and the boulevard shall be seeded.

2.5.8 Curb and Gutter, Sidewalk

All concrete work shall conform to the applicable CSA Standards. All curb and gutter and sidewalk shall be plant mixed Portland Cement concrete installed to true line and grade, placed on dry, firm granular base course. Alternative materials and methods of construction such as extruded curb and gutter may be considered and in some instances will be requested by the Approving Authority.

Concrete placed in forms shall be consolidated using mechanical vibration to achieve the required strength.

Expansion joint material shall be placed at each expansion joint, construction joint, beginning and end of curb with radius less than 15 m, around all structures such as poles, valve boxes, and hydrants and adjacent to any building or structure. Contraction joints shall be provided at intervals of 3 m in curb and gutter and 1.5 m in sidewalks. Finish shall be dimple finish with tooled, rounded edges.

Cold weather installation of concrete shall conform to CSA A23.1.19. Hot weather installation of concrete shall conform to CSA A23.1.20.

2.5.9 Hot-Mix Asphaltic Concrete

Priming and paving shall be carried out only on dry, smooth, compacted base course. Granular base courses and asphaltic concrete base courses shall be kept clean and un-contaminated until covered. Priming shall include granular and asphaltic base courses, edges of buildings, structures, gutters and pavement and shall not be carried out when the ambient temperature is less than 10 degrees Celsius.

Hot-mix asphaltic concrete shall be produced in a batch plant capable of drying and heating the mineral aggregate, heating the asphalt cement and accurately proportioning all materials to produce an asphaltic concrete possessing the required characteristics and within designated tolerances in accordance with ASTM D-99.

Hauling of asphaltic concrete shall be done in a manner such that the hot-mix is delivered to the site at the specified temperature and that no damage to surfaces of roadway occurs.

Hot-mix asphaltic concrete shall be placed, spread and compacted to produce a true profile and cross-section, of the specified thickness and density and with a uniform textured surface, free from roller marks. Minimum final densities shall be:

Prior to October 1	- 97% of laboratory design density
After October 1	- 98% of laboratory design density

Test results indicating conformance with the approved detailed design drawings and specifications shall be submitted.

3.0 WATER SUPPLY

3.1 INTRODUCTION

Water distribution design and construction shall conform to the requirements of the B.C. Ministry of Health Safe Drinking Water Regulations, The Guidelines for Canadian Drinking Water Quality and this schedule.

The system shall be designed to provide day-to-day requirements and also shall provide adequate flows for fire protection. The required flow shall be the sum of the maximum daily flow plus the required fire flow.

3.2 DESIGN PARAMETERS

3.2.1 Per Capita Flows, Fire Flow Demands

Minimum design flows for domestic demand shall be:

Maximum daily domestic flow	8,000 l/single family unit/day
Peak hour domestic flow	13,600 l/single family unit/day

Additional design flows may be required for industrial, institutional or commercial developments.

Fire flow shall be in accordance with the criteria outlined in "Water Supply for Public Fire Protection - A Guide to Recommended Practice", published by Public Fire Protection Survey Services.

The following minimum fire flows shall be met for the noted development types:

<u>Zone</u>	<u>Required Fire Flow</u>
Single Family Residential	60 litres/sec
Apartments, Townhouses	90 litres/sec
Commercial	150 litres/sec
Institutional	150 litres/sec
Industrial	225 litres/sec

Design populations used in calculating water demand shall be computed in accordance with the Municipality's population predictions or with the planned development in the area to be served, whichever is larger.

3.2.2 Pressure and Hydraulic Network Considerations

Water Pressure: Unless otherwise accepted, the following standards shall be used:

Minimum pressure at peak hour demand 265 kPa (40 psi)

Maximum allowable pressure 620 kPa (90 psi) (865 kPa (125 psi) with individual PRV'S)

Minimum fire protection residual 140 kPa (20 psi)
(at hydrant, maximum day demand)

As a basic guideline, the following criteria may be used:

Design for maximum of (a) fire flows, plus maximum day demand or (b) peak hour demand, whichever is greater.

Hazen Williams formula to be used.

Demand requirements shall be based on the Municipality's present water consumption records and the projected trends. Demand may vary for different locations within the Municipality.

Where there is an existing hydraulic network in place, the Municipality may provide information for design calculations.

Depending on the complexity and extent of the proposed distribution system, the Approving Officer may require a hydraulic analysis design showing minimum flows and pressures.

The maximum desirable length of any permanent non-interconnected watermain shall be 150 m. All mains exceeding 150 m, unless it is a temporary situation, shall be looped unless otherwise accepted. Dead-end mains shall not be promoted.

In residential areas, watermains servicing fire hydrants shall be 150 mm diameter or larger. Watermains 100 mm in diameter may be permitted for domestic service on dead end roads where no further extension is planned, no fire hydrant is required and the dead end main is less than 75 m long. Where a dead-end main is longer than 200 m or services more than one hydrant, watermain shall be 200 mm diameter or larger. In commercial/industrial/ institutional areas, the minimum watermain size shall be 200 mm diameter. However, should the hydraulic analysis indicate a need for larger size watermains, the larger size watermain shall be used.

Watermains shall generally be located in the road right of way as shown on the Standard Drawings. When watermains must cross private property, a registered utility right-of-way, minimum 6.0 m wide, shall be provided.

Design of pumping stations and control valving such as pressure reducing valves require the acceptance of the Approving Officer. Good engineering practice and consideration of operation and maintenance requirements should be considered in the design of these facilities.

3.2.3 Cover, Grades, Clearance

The minimum cover over any watermain shall be 1.5 metres.

The minimum grade for a main shall be 0.1%. The maximum grade shall be 10.0% unless provisions are made to anchor the pipe to the bottom of the trench with concrete poured in place. Watermain grades shall generally be consistent with the roadway grade.

The minimum vertical clearance between a watermain and any sanitary sewer shall be 450 mm unless the watermain is adequately protected to B.C. Health requirements. The minimum vertical clearance to piping other than sanitary sewer shall be 300 mm unless the watermain is adequately protected to B.C. Health requirements.

The minimum horizontal clearance between a watermain and any sewer shall be 3.0 m unless the watermain is adequately protected to B.C. Health Standards or installed in a carrier pipe.

3.2.4 Valving

In general, valves shall be located as follows:

- a) In intersections, in a cluster at the pipe intersection or at the projection of property lines, to avoid conflicts with curbs and sidewalks:
 - i) 3 valves at "X" intersection
 - ii) 2 valves at "T" intersectionso that specific sections of mains may be isolated.
- b) Not more than 240 m apart, or 20 services, whichever is less, for single family residential. All other zones shall require special designs.
- c) Not more than 1 hydrant isolated.
- d) In gravel surfaced roads, outside the travelled portion of the roadway or with valve boxes set 25 mm lower than the roadway surface.

Valves shall be the same diameter as the main up to 300 mm diameter. Gate valves may be used up to and including 300 mm diameter. Butterfly valves shall be required in mains larger than 300 mm.

3.2.5 Hydrants

Fire hydrants shall generally be located at street intersections and shall be installed at a 850 mm offset from the centre of corner cuts. Where hydrants are required at mid-block locations, they shall be installed opposite property pins at an offset as shown on the Standard Drawings. In no case shall fire hydrant spacing exceed a distance of 150 m nor should any residence be more than 90 m from a hydrant.

In high density residential, commercial, and industrial areas, hydrants shall be located at a maximum spacing of 100 m or as accepted. Additional hydrants may be required in high risk areas.

It shall be the Developer's responsibility to ensure the design and proposed locations of the fire hydrants will not conflict with existing or proposed street lights, power poles, etc.

All hydrants shall be installed with the pumper port facing the street and in no case shall the port be less than 450 mm above ground level.

Gate valves shall be installed with a flanged connection at the main to isolate all hydrants.

Hydrant access paths shall be installed as shown on the standard drawings on all roads with ditches.

3.2.6 Air Valves, Blow-Offs, Chamber Drainage

Air release valves shall be installed at the summit of all mains of 150 mm diameter and larger except where the difference in grade between the summit and valley is less than 300 mm. Chamber insulation and drainage shall conform to that specified for butterfly valve chambers.

A 50 mm diameter standpipe shall be installed on all dead-end mains. Standpipes shall be installed in a box below grade and shall not be located in the travelled portion of the roadway.

3.2.7 Thrust Blocking

Concrete thrust blocking shall be provided at bends, tees, wyes, reducers, plugs, caps, and blow-offs. The area of thrust block bearing on pipe and ground shall be as shown on the standard drawings or as accepted. For mains 300 mm diameter and larger or in areas of poor soils, special designs may be required.

3.2.8 Service Connections

In addition to the Municipal requirements, service connections shall be subject to the requirements of the BC and National Plumbing Codes. Service connections 50 mm and larger in diameter may be installed using a gate valve flanged to the tee at the main and a gate valve, temporary cap and thrust block at property line. Service connections 19 mm to 50 mm diameter shall include a corporation stop at the main, a service saddle as accepted, and a curb stop and box at the property line.

The minimum size water service connections shall be as follows:

Residential	20 mm diameter
Other	25 mm diameter.

Whenever possible all water service connections shall be located within 1 metre of the corner of the lot.

Connections shall be installed up to the property line at a minimum depth of 1.5 m. All services shall be marked with a 40 mm x 90 mm stake at the property line with the top 150 mm painted blue and marked with the length of the stake in meters. Curb stops shall be located at a 300 mm offset from property line and the curb boxes shall be extended to ground level.

3.2.9 List of Standard Drawings

<u>Title</u>	<u>No.</u>
19 mm Water Service Detail	W-1
Valve Box Detail	W-2
Hydrant Detail	W-3
Watermain Blow Off Detail	W-4
Thrust Block Details	W-5
50 mm Valve Chamber Detail	W-6
Pipe Anchoring Detail	S-1
Trench Detail	S-2
Trench Bedding Detail	S-6

3.2.10 Private Water Source

Where not possible to connect to Municipal Water System every parcel in the subdivision must have proven source of water satisfactory to Approving Officer and meeting requirement of Provincial Ministry of Health.

A private water source is a system which serves a single residence only, the Owner of which is responsible for quantity and quality. Where a private water supply is to be used, a minimum lot size of 1 Ha is required.

Where a private water source is required, the water provided must be potable water certified for drinking purposes by the Medical Health Officer and must comply with the Canadian Drinking Water Quality Guidelines and the Safe Drinking Water Regulations.

3.3. MATERIALS

3.3.1 Pipe

The materials outlined in Table 3.3.1 on the following page shall be considered acceptable for installation throughout the Municipality.

Table 3.3.1 - Pipe Materials and Specifications

<u>MATERIAL</u>	<u>SIZE RANGE (mm)</u>	<u>SPECIFICATION</u>	<u>USE</u>
soft copper	19 - 50	ASTM, B88, Type K	Service Connection
polybutylene	19 - 50	Municipal Tubing	Service Connection
polyvinyl chloride	100 - 900	AWWA C900, Class 150 (bell & spigot joints)	distribution mains and service connections
ductile iron*	300 and larger	AWWA C151 cement mortar lined C104 rubber gasket on mechanical joints C111	distribution and trunk mains

*Corrosion protection must be considered

Consideration may be given to use of alternate materials for major trunk mains or where main pressures exceed 750 kPa (110 psi).

3.3.2 Pipe Joints

Jointing of pipe shall be in accordance with manufacturer's recommendations.

A flexible joint shall be provided at locations where pipe is held in a fixed position by a rigid structure or support.

Unless otherwise approved, the amount of pipe deflection at joints and couplings shall not exceed 3 degrees, or one half the limit specified by the manufacturer, whichever is less.

3.3.3 Valves, Valve Boxes and Fittings

Solid wedge resilient seal gate valves, iron body, bronze mounted, clockwise closure, manufactured in Canada, with non-rising stems, conforming to A.W.W.A. C500 specifications and combined with extension spindles and valve boxes shall be installed on all watermains up to and including 300 mm diameter and may be installed on 300 mm diameter water mains. Valve manufacturer must be acceptable to the Approving Officer.

On mains larger than 300 mm in diameter, butterfly valves, flanged type conforming to A.W.W.A. C504 specifications along with an insulated valve chamber shall be installed and may be installed on 300 mm diameter mains. Valves larger than 300 mm shall have a 100 mm diameter bypass line.

Where air release valves are required they shall be double acting, vacuum type, with cast iron bodies and 860 KPa flanges. A ball valve or gate valve with activator shall be installed beneath each air valve assembly. All air release valves shall be protected from frost by insulating the valve chambers.

Valve boxes shall be Terminal City NT Type 1, or as approved, and shall be locking unless otherwise accepted. Valve box risers shall be PVC C-900 pipe or as approved, suitable for the valve and valve box.

Fittings for PVC pipe shall be:

- a) Cast iron fittings manufactured to AWWA C110 designed for a working pressure of 1035 kPa.
- b) Asphalt coated ductile iron compact fittings manufactured to ANSI/AWWA C153/A21.53-84.

Mechanical seal joints on fittings to pipe shall be formed by a bell and preformed rubber gasket suitable for the pipe to which the joint is made.

Flanged joints on fittings shall be flat faced conforming in dimension and drilling to ANSI B16.1.

Ends shall be flanged or belled to suit pipe ends.

3.3.4 Hydrants

Hydrants shall be compression type Terminal City Model C-71P or approved equal and shall conform with A.W.W.A. Specification C502 and shall be flanged at 50 mm above the ground line. Hydrants shall have two hose nozzles and one pumper nozzle complete with caps. Hose nozzles

shall be 63 mm (2.5 inches) in diameter and pumper nozzles 100 mm (4 inches) in diameter. Nozzle threads shall conform with British Columbia Fire Hose Thread Specification, 6 threads per inch on hose port and 8 threads per inch on the pumper port.

Hydrant stems shall be turned counterclockwise to open. Stem seals shall be resilient "O-Ring".

Hydrants shall be supplied complete with nuts, bolts, flange gaskets, operator extension and coupling.

Hydrants shall be installed using hub joints and shall be held in place by tie rods. Thrust blocks shall be installed for thrust restraint in addition to tie rods.

3.3.5 Service Connections

Corporation stops shall be in accordance with AWWA C800, with fittings ends suitable for use with compression fittings. For 19 mm dia. Mueller H-15028 or Ford F-1100 unless otherwise accepted; for 50 mm dia. Ford FB 1100 unless otherwise accepted. Service saddles for connections to PVC and existing A.C. shall be double strap type.

Corporation couplings shall be in accordance with AWWA C800.

Copper pipe with compression type fittings with stainless steel inserts shall be used for all connections up to 50 mm diameter and polyvinyl chloride with fittings in accordance with Section 3.3.3 for connections 100 mm diameter and larger. 50 mm diameter connections may be silver soldered. Service connections between 50 mm and 100 mm in diameter shall not be permitted.

19 mm curb stops shall be Mueller H15219 or Ford B44-333 or as accepted, with drain; 50 mm curb stops shall be Ford B44-444 or Mueller H15209 with drain, or as accepted. Curb boxes shall be adjustable type, Trojan or Terminal City, and have a sidewalk pattern top casting. Stationary rods shall be provided.

3.3.6 Pipe Bedding

Pipe bedding specifications shall conform to Municipal standards for Class "A", Class "B" or Class "C" bedding. Pipe bedding selection may vary for different material installed and for different locations within the Municipality.

3.4 INSTALLATION

3.4.1 Excavation, Bedding, Backfill, Restoration

The trench shall be excavated so that pipe can be laid to the specified alignment and depth with allowance for the specified trench wall clearances and bedding. Wall clearances shall be minimum 150 mm, maximum 400 mm, from the bottom of the trench to 100 mm above the top of the pipe.

Bracing, sheeting and trench side slopes shall be in accordance with Worker's Compensation Board safety requirements. Dewatering may be required to control trench water.

Bedding material shall be sand, select native material or concrete. Bedding shall be compacted to 95% Standard Proctor Density.

Backfill material shall be approved select native material or pitrun gravel and shall be placed in such a manner to prevent damage to the pipe.

Backfill materials in travelled surfaces shall be compacted to 95% Standard Proctor Density, except for the upper 750 mm which shall be compacted in accordance with the adjacent travelled surface design requirements.

Surface restoration shall conform to the original condition or as accepted.

3.4.2 Pipe Laying

Pipe shall be installed in accordance with the applicable AWWA specifications, the manufacturer's recommendations and requirements of this Schedule.

Pipes shall be handled with the greatest care and with equipment designed so that no damage occurs to pipe or fittings.

All pipes shall be laid to horizontal line, with a tolerance of plus or minus 10 mm of the design line; and grade, with a tolerance of plus or minus 25 mm for water mains and services. The pipes shall be jointed in accordance with the manufacturer's recommendations except that joint deflections shall be allowed only up to one-half of the manufacturer's recommended tolerances. Particular care must be taken to see that the ends of the pipes are kept clean. Care shall be taken to properly align the pipe once the joints are forced home. Movement of the pipe once the joints is made shall be kept to an absolute minimum. Jumping on or dropping of pipe to obtain grade shall not be permitted.

Care shall be taken to prevent the entrance of trench water or other material into the pipe during installation.

3.4.3 Valves, Hydrants and Appurtenances

Valves shall be installed at the specified locations, in the vertical position. Valve boxes shall be installed plumb, centred over the valve, and such that traffic loads are not transmitted to the valve.

Hydrants shall be installed at the specified locations, set plumb and such that the pumper port faces, and is at right angles to, the road centreline, unless otherwise accepted. Drain outlets with drain rock shall be provided and kept free of obstructions. The ground flange shall be 50 mm above finished ground or sidewalk grade unless otherwise accepted.

Fittings shall be installed at the specified locations in accordance with the manufacturer's recommendations.

3.4.4 Thrust Blocking

Thrust block bearing areas shall be to Municipal standards. Concrete shall be 25 MPa minimum at 28 days.

Care shall be taken to ensure that concrete does not interfere with the operation of flange bolts and nuts or prevent proper operation of hydrant drains.

3.4.5 Service Connections

Service connections shall be installed at the specified locations and depths with the same tolerances as specified for pipe laying.

Curb stop boxes shall be set plumb and adjusted to finish grade.

3.4.6 Testing

Prior to testing, all new water mains are to be cleaned of debris by "pigging" and flushing or by flushing and video inspection and immediately afterwards the pipe ends shall be capped in preparation for testing and disinfection.

All water mains shall be tested in accordance with the appropriate AWWA specifications and the following criteria:

- a) The test pressure shall be 1035 kPa or 1.5 times the operating pressure, whichever is greater. The pressure test shall be maintained for a minimum of two hours.
- b) The allowable leakage shall be determined by AWWA formula:

$$L = \frac{N D P^{0.5}}{131,000} \quad L = \text{allowable leakage in litres per hour}$$

N = number of joints in test section

D = inside diameter of pipe in millimetres

P = test pressure in kilopascals

Service connections shall be tested with the watermain.

The Approving Officer shall be notified 24 hours in advance of the leakage testing and may elect to witness the test. All test data and leakage calculations are to be submitted to the Approving Officer.

3.4.7 Flushing and Disinfection

All water mains shall be disinfected by chlorination, after the system has been "pigged" or flushed of dirt and other debris and video inspected. Chlorination methods shall conform A.W.W.A. C601 and all disinfection shall be acceptable to the Approving Officer and Public Health Inspector.

Upon completion of disinfection, the entire piping system shall be thoroughly flushed, filled with water and left in a condition ready for use.

Care shall be taken to ensure chlorinated water from the testing procedure is not discharged into fish bearing streams. Dechlorination may be required prior to discharge.

4.0 SANITARY SEWERS

4.1 INTRODUCTION

Sanitary sewer systems shall be designed and installed in accordance with the requirements of the B.C. Ministry of Environment, Waste Management Branch, "Guidelines for Assessing Sewage Collection Facilities", and the requirements noted in this Schedule.

4.2 DESIGN PARAMETERS

4.2.1 Design Flows

The sanitary sewer system shall be designed using the following minimum average daily flows for the zone noted:

Residential/institutional = 450 litres/capita/day

An infiltration rate of 30,000 litres/day/km of sewer main shall be added to the above flows.

The design flows shall be calculated using the peak daily flows plus the infiltration rate.

Peak flows shall be 4 times the average daily flow for contributing areas with populations less than 1,000; and 3.5 times the average daily flow for contributing areas with populations between 1,000 and 3,000. For populations of more than 3,000 persons, following the formula

$$M = 1 + \frac{14}{4 + P^{0.5}} \text{ shall be used.}$$

Where: M = ratio of peak to average flow
P = population in thousands

Design populations used in calculating average daily flows shall be computed in accordance with the Municipality's population predictions or with the planned development in the area to be served, whichever is larger.

4.2.2 Pipe Flow Formulas

Capacities of gravity sanitary sewer mains shall be determined using Mannings' Formula:

$$Q = \frac{A \times R^{0.667} \times S^{0.5}}{N}$$

Where: Q = Design Flow in m³/sec
A = Cross Sectional Area in m²
R = Hydraulic Radius in m
S = Slope of hydraulic grade line in m/m
N = Roughness coefficient
= 0.013 for Conc. Pipe
= 0.011 for P.V.C. Pipe

Calculations for capacities of sanitary sewer force mains shall use the Hazen - Williams Formula:

$$Q = 0.278 CD^{2.63} S^{0.54}$$

Where: Q = Rate of flow in m³/sec
D = Internal pipe diameter in mm
S = Slope of hydraulic grade line in m/m
C = Friction coefficient
= 120 for all pipe

4.2.3 Manholes and Hydraulic Losses

Manholes shall be required at:

- all changes in grade
- all changes in direction
- all changes in pipe sizes
- all intersecting sewers
- all terminal sections
- downstream end of curvilinear sewers

Manholes shall be placed where future extensions are anticipated and shall be spaced no greater than 120 m apart. Manholes should not be located in wheel paths.

Pipe intersections in manholes shall utilize smooth hand formed concrete channels to maintain uniform flows.

The invert of the downstream pipe shall not be higher than that of the upstream pipe. However, both pipes may be placed at the same elevation.

The springline of the downstream pipe shall not be higher than that of the upstream pipe.

Minimum drop in invert levels across manholes:

- i) Straight run - no drop required
- ii) Deflections up to 45E - 25 mm drop
- iii) Deflections 45E to 90E - 30 mm drop

A drop pipe shall be installed when the drop between inverts exceeds 0.6 m.

Inside ramps will be permitted up to 450 mm from invert to channel bed.

Where a small pipe joins a larger pipe, the energy gradient shall be maintained through the transition.

Manholes deeper than 4.25 m shall be provided with safety platforms in accordance with the Worker's Compensation Board requirements.

4.2.4 Temporary Cleanouts

Temporary clean-outs may be provided at terminal sections of a main provided that:

- a) Future extension of the main is proposed or anticipated.

- b) The length of sewer to the downstream manhole does not exceed 45.0 m.
- c) The depth of the pipe does not exceed 2.0 m at the terminal point, and
- d) No more than two (2) service connections are to be installed between the cleanout and the downstream manhole.

Clean-outs shall not be considered a permanent structure.

4.2.5 Minimum Pipe Diameter, Velocity, Grades and Cover

The minimum diameter for sanitary sewer installations shall be as follows:

- a) Sanitary Sewer Mains = 200 mm
(except last upstream portion which cannot be extended in the future, may be 150 mm diameter if less than 45 m long.)
- b) Sanitary Sewer Connections = 100 mm
(a minimum 150 mm diameter service shall be used for all commercial and industrial services)
- c) Sanitary Sewer Forcemains = 100 mm

The minimum velocity shall be 0.6 m/sec. There is no maximum velocity, however, consideration must be given to scour problems where flow exceed 2.5 m/sec., and anchoring must be incorporated where the grade(s) of the sewer are 15% or greater.

The grade of any sewer shall be governed by the minimum velocity required. However, the last section of a main that will not be extended in the future, shall have a minimum grade of 1.0% where 150 mm diameter pipe is proposed.

The minimum cover over any main shall be 1.5 m. The desired cover over any sewer forcemain is 1.5 m. Consideration must be given to both dead and live loads for pipe material being utilized.

The depth of the sewer must be sufficient to provide 'gravity flow' service connections to both sides of the roadway and must allow for future extension(s) to properly service all of the upstream tributary lands for ultimate development.

Where it is not feasible to service by gravity connection to a sewer in the frontage street, a sewer in a rear yard or lane may be required.

Where permitted, horizontal curves will require a constant offset and/or shall be uniform throughout the curve. The radius of the curve shall not be less than 60 m. The design velocity must exceed 0.91 m/sec., the minimum grade shall be 1.0% and each joint is to be located by survey.

Sanitary sewers shall generally be located in the road right-of-way, with offsets from property line as shown on the standard drawings. When sanitary sewers must cross private property, a registered utility right-of-way, minimum 6.0 m wide, shall be provided.

4.2.6 Service Connections

In addition to the Municipal requirements, service connections shall be subject to the requirements of the BC and National Plumbing Code.

Service connections shall be provided to each lot fronting the main. All services shall enter the main at a point just above the springline. Each service connection shall have a cleanout installed at the property line as shown on the standard drawings.

Separate service connections shall be installed for each dwelling unit of a duplex, townhouse or row housing development for individual ownership.

Connections to new mains shall be made using wye fittings; connections to existing mains shall be made using saddles.

The minimum size for sanitary sewer service connections shall be 100 mm.

The minimum grade of 100 mm diameter service connection from the main to the property line shall be 2.0%. Where this grade cannot be met, a 150 mm diameter service connection at a minimum grade of 1.0% may be installed.

Desirable depth shall be 1.5 m at the property line or as accepted.

Single family and duplex residential service connections may be permitted into manholes provided that:

- i) The connection is not in an adverse direction to the flow in the sewer main.
- ii) The provisions noted in 4.2.3 are met.

Service connections, 150 mm and larger, except single family or duplex, shall be connected to manholes and; shall comply with the provisions of Section 4.2.3. All services shall be marked with a 40 mm x 90 mm stake at the property line. The top 150 mm of the stake shall be painted red, and the depth from the top of the stake to the invert of the service piping shall be noted in metres.

4.2.7 Pumping Stations and Force Mains

If at all possible, the use of sanitary pump stations is to be discouraged. Any proposed use of pump stations must receive prior approval from the Municipality. Any sanitary pump station must be located within a right-of-way outside of the road dedication.

The size, capacity and type of these stations will be dependent upon the development and catchment area involved.

All pumping station and force main design and installation shall be as accepted for the specific installation.

In conjunction with sanitary pumping facilities, the following criteria shall be noted in the design of force main systems.

a) **Velocity**

At the lowest pump delivery rate anticipated to occur at least once per day, a cleansing velocity of at least 0.9 m/sec should be maintained. Maximum velocity should not exceed 3.5 m/s.

b) **Air Relief Valve**

An automatic air relief valve suitable for sewerage applications, installed in an insulated manhole, shall be placed at high points in the force main to prevent air locking. If requested by the Municipality and within reasonable depths, the sewer shall be graded to eliminate air relief valves.

c) **Termination**

Force mains should enter the gravity sewer system at a point not more than 600 mm above the flow line of the receiving manhole. An inside drop pipe shall be incorporated on all forcemains entering manholes.

d) **Size**

The minimum size for force mains shall be 100 mm diameter. All force mains shall be designed to prevent damage from superimposed loads, or from water hammer or column separation phenomena.

Consideration must be given to maintenance requirements in the design of all sewage pumping stations. Pump selection, wetwell volumes, control system, etc., shall be reviewed with the Approving Officer on a project by project basis.

4.2.8 List of Standard Drawings

The following drawings form part of Section 4:

<u>Title</u>	<u>No.</u>	<u>Title</u>	<u>No.</u>
Pipe Anchoring Detail	S1	Exterior Drop Manhole Detail	S5
Trench Detail	S2	Trench Bedding Details	S6
Sanitary and Storm Sewer Connections	S3	Service Connection Detail for	
Manhole Detail	S4	Sanitary Manhole in Cul-de-Sac	S7

4.2.9 On Site Sewage Disposal

Where a parcel is not required to be served by a community sewer system, such parcel shall be served by individual on-site sewage disposal. Installations involving flows less than 22.7 m³/day (5000 Igpd) are subject to permits issued by the British Columbia Ministry of Health and flows greater than or equal to 22.7 m³/day by the British Columbia Ministry of Environment.

4.2.9(a) Flows less than 22.7 m³/day

An area, suitable for construction of on-site sewage disposal facilities and certified by the Medical Health Officer, shall be located on each parcel, and not smaller than the following as determined by the percolation rate, slopes, soil profiles and source of water supply:

Slope	Percolation Rate - Min./in.		
	0.5	5 - 15	15 - 30
0 - 15	520 m ²	740 m ²	930 m ²
5 - 15	620 m ²	890 m ²	1115 m ²
15 - 30	780 m ²	1115 m ²	1400 m ²

Maximum slope of disposal area is 30%.

Percolation tests less than 5 min./inch will not be acceptable unless a hydrogeological assessment by a professional geologist indicates that:

- a) there is no risk of contamination to a community water system source or any ground water aquifer; and/or
- b) there is not any likelihood of breakout points.

In areas where a liquid waste management plan has been implemented and a community sewer system is to be installed within the next ten years, the area for sewage disposal can be reduced to the following:

Slope	Percolation Rate - Min./in.		
	0 - 5	5 - 15	15 - 30
0 - 15	300 m ²	450 m ²	600 m ²
5 - 15	350 m ²	500 m ²	650 m ²
15 - 30	400 m ²	600 m ²	700 m ²

The minimum area for sewage disposal is based on the criteria that each lot is served by a Health approved community water system.

All requirements of the Sewage Disposal Regulations are to be complied with.

There shall be a minimum of 120 cm of natural porous topsoil above the ground water table or any impervious layer in such area of soil and a representative number of test holes shall be dug in that area to a minimum depth of 120 cm to demonstrate this.

The area of soil required for sewage disposal shall be capable of meeting the siting and setback requirements for absorption fields in the Sewage Disposal Regulations, B.C. Reg. 411/85.

Percolation tests are subject to the certification of the Medical Health Officer, B.C. Ministry of Health, who will make a recommendation to the Approving Officer.

Percolation tests to test the area of soil are to be undertaken as follows:

- a) Percolation testholes shall be dug at points and elevations selected as typical in the area of proposed disposal field;
- b) One of these testholes shall be dug at each end of the area of the disposal field. Further holes may be required depending on the nature of the ground and the result of the first test and the size of the proposed field;
- c) Testholes shall be 300 mm square and excavated to the depth of the proposed absorption trench;
- d) To make the percolation test more accurate, any smeared solid should be removed from the walls of the testhole;
- e) If the soil contains considerable amounts of silt and/or clay, the testhole shall be presoaked before proceeding with the test. To do this, keep the hole as fully filled with water as possible for four (4) hours. Proceed with the test immediately after presoaking.
- f) To undertake the test, fill the testhole with water. When the water level is thirteen (13) centimetres or less from the bottom of the hole, refill the hole to the top. No recording of time need be done for these two fillings.
- g) When the water level after the second filling (step (f)) is thirteen (13) centimetres or less from the bottom of the hole, add enough water to bring the depth of water to fifteen (15) centimetres or more;
- h) Observe the water level until it drops to the fifteen (15) centimetre depth. At precisely fifteen (15) centimetres commence timing. When the water level reaches precisely twelve and one-half (12.5) centimetres depth, stop timing;
- i) repeat procedures (g) and (h) until the last 2 rates of fall do not vary more than 2 minutes per 2.5 cm;
- j) The time in minutes for the water level to drop 2.5 centimetres is the percolation rate for that hole and is recorded in minutes per 2.5 centimetres. The percolation rate of the absorption field is the average of the slowest rates of the percolation tests made for that field;
- k) Cover the holes, flag their location and repeat the test in other locations. Record the results and submit to the local authorities.

4.2.9(b) Flows greater or equal to 22.7 m³/day

On site sewage installations involving flows greater than or equal to 22.7 m³/day are subject to permits issued by the British Columbia Ministry of Environment under Waste Management Act prior to approval by the Local Authority.

4.3 MATERIALS

4.3.1 Gravity Main Pipe

The materials outlined in Table 4.3.1 shall be considered acceptable for installation throughout the Municipality.

Table 4.3.1 - Gravity Sewer Pipe Materials and Specifications

<u>Material for Gravity Sewers</u>	<u>Size Range (mm)</u>	<u>Minimum Specification</u>	<u>Use</u>
Polyvinyl Chloride	100 - 150	CSA B182.1, SDR 28*	service connections
	100 - 375	ASTM, D3034, SDR 35*	mains, service connections
Reinforced Concrete	375 & larger	ASTM C76, Class as req'd	trunks

*SDR shall be suitable for depth of bury

4.3.2 Force Main Pipe

The materials outlined in Table 4.3.2 shall be considered acceptable for installation throughout the Municipality.

Table 4.3.2 - Force Main Sewer Pipe Materials and Specifications

<u>Material for Forcemains</u>	<u>Size Range (mm)</u>	<u>Minimum Specification</u>	<u>Use</u>
Polyvinyl Chloride	100 & Larger	AWWA C900	minor forcemains
Polyethylene	100 & Larger	ASTM PE 2036 Series 160, CSA 137-1	minor force mains

4.3.3 Pipe Joints

All gravity sewer pipe shall be jointed using rubber gaskets or gasket fittings and couplings. All sewer force main piping shall be jointed as specified for water main piping.

4.3.4 Manholes

All manholes shall be precast concrete, minimum 1,050 mm inside diameter and shall conform to A.S.T.M. C478. Manhole slabs shall be precast or cast in place on compacted material to Municipal Standards using 20 MPA concrete and shall be 1,600 mm square.

Precast concrete lids shall be designed to withstand H-20 loading conditions. Cast iron frames and covers and manhole ladder rungs shall conform to Municipal Standards.

4.3.5 Temporary Cleanouts

Temporary cleanout barrels, covers, base and lids shall conform to standards for manholes, or as accepted.

4.3.6 Service Connections

Polyvinyl chloride pipe and fittings shall be used for all service connections.

4.3.7 Pipe Bedding

Pipe bedding classifications shall conform to Municipal standards for Class "A", Class "B" or Class "C" bedding. Pipe bedding selection may vary for different materials installed and for different locations within the Municipality.

4.4 INSTALLATION

4.4.1 Excavation, Bedding, Backfill, Restoration

Excavation, bedding, backfill and restoration shall conform to the requirements of Section 3.4.1 of this Schedule.

4.4.2 Pipe Laying

Batter boards shall be erected over the trench or trench line at intervals of not more than 20m. The centre line of the required pipe line shall be marked on these boards and string or wire stretched between the boards and on this centre line. The pipe shall be kept to proper line by plumbing down from this string line. Each pipe shall be laid to grade by means of batter boards and a boning rod with a shoe which will enter the pipe and stand on the invert. A minimum of three (3) batter boards shall be in place at all times during excavation and pipe laying. Sufficient batter boards shall be placed so that sighting is possible along these boards from one manhole to the next. Alternate methods of grading and aligning the pipe may be considered.

Pipe jointing and force main piping installation shall conform to the requirements of Section 3.4.2 of this Schedule. Vertical tolerance shall be 7 mm, plus or minus, for sanitary sewer gravity mains and 25 mm, plus or minus for sewer force mains.

4.4.3 Manholes, Cleanouts, and Appurtenances

Manholes, cleanouts and appurtenances shall be installed at the locations shown on the approved design drawings and in accordance with the Standard Drawings.

Manholes shall be set plumb and shall be constructed concurrently with the laying of the pipe. Manholes shall be constructed so as to be free from both ground water infiltration and exfiltration of sewage. All joints shall be butter mortared, including base, barrel, cover, bricking and frame.

Inlet and outlet elevations shall be as shown on the approved design drawings with tolerances as specified for pipe laying.

4.4.4 Service Connections

Service connections shall be installed at the locations and depths shown on the approved drawings with the same tolerances as specified for pipelaying. Cleanouts shall be installed on all service connections as shown on the standard drawings.

4.4.5 Flushing and Testing

Prior to testing, all new mains are to be cleaned of debris by passing a line sized "pig" through the main, or by flushing and T.V. inspection and immediately afterwards capping the pipe ends in preparation for testing. This procedure will help to identify any misalignments on curved mains. All sanitary sewers shall be visually inspected to determine that they are straight.

Exfiltration tests shall be carried out on gravity sewers with either air or water as outlined below.

Testing for sanitary sewer forcemains shall conform to the testing criteria for watermains, but need not include disinfection.

Exfiltration Test for Gravity Sewers:

The allowable exfiltration (water method) shall be 10 litres per millimetre of pipe diameter per kilometre per day.

The allowable exfiltration (air method) shall be determined by filling the test section with air to a constant pressure of 25 kPa and maintaining a pressure above 20 kPa for a minimum of 5 minutes. After the stabilization period, the air supply shall be cut off and the pressure allowed to drop to 20 kPa. Timing shall commence at 20 kPa and shall continue until the pressure reaches 15 kPa. The minimum acceptable time period shall be determined by the formula:

Minimum Time in min. = $0.040 \times \text{pipe dia. in millimetres}$

Where prevailing groundwater is above the sewer line being tested, the test pressure shall be increased 10 kPa for each metre of groundwater above the pipe.

An infiltration test may be required in areas of high groundwater, at the discretion of the Approving Officer.

The Approving Officer shall be notified 24 hours in advance of the leakage testing and may elect to witness the test. All test data and leakage calculations are to be submitted to the Approving Officer.

5.0 STORM DRAINAGE

5.1 INTRODUCTION

All storm drainage facilities shall be designed and installed as stated in this Schedule or as accepted, and shall be in conformance with the latest edition of the Municipality's Master Drainage Plan if available. The drainage system shall generally conform to the B.C. Environment "Urban Runoff Quality Control Guidelines" June 1992 document.

5.2 DESIGN PARAMETERS

5.2.1 Design Methods and Flows

Design flows shall be based on the concept of the major and minor drainage systems and must attempt to maintain zero increase in peak flows over the pre-development flows. A drainage study to determine downstream impacts may be required at the discretion of the Approving Officer.

a) Minor System

The minor system consists of localized areas of development serviced by a localized piping or ditching system which discharges to the major component.

This system shall be designed to accommodate a five year storm event. However, in doing so, it is mandatory that a comprehensive flood routing plan be developed which analyses the impact of surcharging flows on adjacent services and property.

b) Major System

The major component of the system consists of trunk mains which intercept flows from the minor system, natural drainage channels, overland flood routes and retention or detention facilities designed to reduce peaks. Overland flow through easements on private property is to be discouraged.

This system shall be designed for a 100 year storm based on a recognized calculation method. It shall further conform to any stormwater management plan which may have been established by the Municipality for each particular basin. Amendments to this program may only be permitted upon consultation with a detailed analysis by the Municipality.

In areas of potential flood plain, the major system hydraulic grade line shall be identified and, to prevent flooding, minimum basement elevations shall be identified and established by covenant.

5.2.2 Flow Capacities for Storm Sewers and Open Channels:

Capacities for storm sewer mains and open channels shall be determined using Mannings' Formula:

$$Q = \frac{A \times R^{0.667} \times S^{0.5}}{N}$$

- Q = Design Flow in m³/sec
- A = Cross Sectional Area in m²
- R = Hydraulic Radius in m
- S = Slope of hydraulic grade line in m/m
- N = Roughness coefficient
 - = 0.01 for P.V.C. pipe
 - = 0.013 for Conc. pipe
 - = 0.024 for unpaved corrugated steel pipe
 - = 0.013 for concrete and asphalt line channels
 - = 0.02 for gravel lined channels
 - = 0.05 for natural and grassed channels

5.2.3 Minimum Pipe Diameters, Velocities and Cover

The minimum diameter for storm sewer installations shall be as follows:

- a) Storm Sewer Mains = 300 mm
- b) Catch Basin Leads = 200 mm
- c) Storm Sewer Service Connections = 150 mm
- d) Driveway Culverts = 300 mm

Storm sewer mains shall be installed with a minimum clear cover above the pipe crown of 1.2 m.

Unless otherwise accepted, the minimum velocity for pipes flowing full or half full shall be 0.60 m/s.

Where grades for storm sewers exceed 15%, pipe anchors shall be installed.

Offsets for storm sewer mains shall be as shown on the standard drawings. Offsets may be changed where existing services require otherwise.

5.2.4. Manholes and Catch Basins

Manholes shall be installed at all vertical grade changes and on horizontal alignment changes where no curves are used. The maximum allowable spacing between storm sewer manholes shall be 120 m.

Catch basins shall be placed at regular intervals along roadways, at intersections and at low points. Wherever possible, the leads should be connected directly to a storm manhole. Saddle or wye connections shall be used where leads tie directly to the main.

The maximum allowable spacing for catch basins shall be 120 m.

5.2.5 Inlet and Outlet Structures

Inlet and outlet structures shall be designed to meet the requirements of each particular installation, however, the following guidelines shall be used as a basis for the minimum design requirements:

a) Endwall

Used to retain embankment fill over pipe. End walls shall be designed with a minimum height of 300 mm above the pipe crown and a minimum width of 300 mm on either side of the pipe.

b) Wingwalls

Used to transition outlet and inlet to existing channel shape. Wingwall heights shall match the endwall height, however, sloping may be used depending on the installation requirements. Wingwall lengths shall be a minimum of 1.5 times the endwall width. Wingwalls shall be installed on a 30E or 45E angle from a perpendicular to the endwall.

c) Aprons or Spillways

Used to prevent erosion of channel bottoms at inlet and outlet structures and shall be located to meet the requirements of each particular installation.

d) Energy Dissipators

Used to reduce intake or discharge velocities. Energy dissipators shall be installed as required.

e) Trash Grate

To be bolted and removable with a normal maximum 150 mm spacing of vertical bars.

f) Sedimentation devices shall be installed on all outlets to a creek.

All designs for inlet and outlet structures shall be subject to acceptance by the Approving Officer.

5.2.6 Ditches

Where ditching has been approved either alone or in conjunction with an underground system, all ditching shall be constructed to Municipal Standards for each particular road classification and shall be hydro-seeded in the following manner:

- a) A grass mixture in accordance with Section 2.4.6 shall be applied at a rate of 170 kg/ha.
- b) Fertilizer (28-16-8) or approved formula at a rate of 170 kg/ha.
- c) The hydro seeding solution should contain a mulch of wood cellulose fibre free of growth and germination inhibiting ingredients, and dyed green for visual metering during application. This mixture shall be applied at a rate of 2,250 kg/ha.

Energy dissipators may be required if deemed necessary to prevent erosion. Sediment control devices may be required.

Erosion protection may be required by Approving Officer in fill area ditching.

5.2.7 Service Connection

Storm sewer connections to single family and duplex residential lots are not required unless indicated otherwise by the Approving Officer. Where required, they shall be installed to the property line at a minimum depth of 1.2 m.

Storm sewer connections for multi-family, commercial, institutional or industrial lots shall be a minimum 150 mm diameter and shall be installed up to property line at a minimum depth of 1.2 m. All services shall be marked with a 40 mm x 90 mm stake at the property line. The top 150 mm of the stake shall be painted green.

Storm sewer service connections do not require a cleanout at property line.

5.2.8 Trench Drains and Rock Pits

To promote interception of pollutants and reduction in storm flows, groundwater recharge systems are to be used where shown to be appropriate. The use of groundwater recharge systems will be based on geotechnical evaluation of the native soils ability to absorb storm runoff.

5.2.9 Natural Watercourses

Natural watercourses shall be protected as directed by the Approving Officer.

5.2.10 List of Standard Drawings

<u>Title</u>	<u>No.</u>	<u>Title</u>	<u>No.</u>
Catch Basin Detail	ST-1	Sanitary and Storm Sewer Connections	S-3
Storm Drainage Drywell	ST-2	Manhole Detail	S-4
Pipe Anchoring Detail	S-1	Exterior Drop Manhole Detail	S-5
Trench Detail	S-2	Trench Bedding Details	S-6

5.3 MATERIALS

5.3.1. Pipe

The materials outlined in Table 5.3.1 shall be considered acceptable for drainage installation throughout the Municipality.

Table 5.3.1 - Acceptable Storm Drainage Pipe

<u>Material</u>	<u>Size Range (mm)</u>	<u>Minimum Specification</u>	<u>Use</u>
Reinforced Concrete	300 & Larger	ASTM C76, Class III	Major trunk mains, culverts
Polyvinyl Chloride	150	CSA B182.2 SDR28*	Service Connections only
	200 - 900	CSA B182.3 SDR 35*	Minor collection mains & service connections
	200 - 600 (ultrarib)	CSA B182.4	
Corrugated Steel Pipe	300 & Larger	CAN 3 - G401-M81	Culverts only
HDPE Corrugated Pipe	300 & Larger	ASTM D3350, ASTM F405	Culverts only

*SDR shall be given suitable for depth of bury

Consideration may be given to use of asphalt coated corrugated steel pipe for short major trunk mains.

5.3.2 Pipe Joints

All pipe shall be jointed with rubber gaskets or gasketed fittings and couplings.

5.3.3 Manholes

Manhole barrels shall be precast concrete, 1,050 mm min. inside diameter and shall conform to ASTM C478 for all mains up to 380 mm in diameter. For mains 400 mm and larger in diameter cast in place structures combined with precast sections shall be utilized.

Manhole slabs shall be precast or cast in place on compacted material to Municipal Standards using 20 MPa concrete and shall be 1,600 mm square.

Pipe intersections in manholes shall utilize smooth hand formed concrete channels to maintain uniform flows. Minimum invert drops shall be as follows:

Straight Run	=	no drop required
Deflections to 45E	=	20 mm drop
Deflections of 45E - 90E	=	30 mm drop

5.3.4 Catch Basins

All catch basins shall be precast concrete 750 mm inside diameter. Precast barrels shall conform to ASTM C478.

Catch basin slabs shall be precast or cast in place on compacted material to Municipal Standards.

Catch basins leads shall be 200 mm diameter and shall be installed a minimum of 460 mm from the upper side of the precast slab to allow for sediment collection. Catch basin leads shall be installed at a minimum 2% slope from the catch basin to the main.

5.3.5 Inlet and Outlet Structures

Endwalls and wingwalls shall be constructed using concrete filled sandbags, reinforced concrete or prefabricated sections. Aprons and spillways shall be constructed of reinforced concrete or rip-rap.

5.3.6 Service Connections

Polyvinyl chloride pipe shall be used for all service connections.

5.4 INSTALLATION

5.4.1 Excavation, Bedding, Backfill, Restoration

Excavation, bedding, backfill and restoration shall conform to the requirements of Section 3.4.1. of this Schedule.

5.4.2 Pipe Laying

Storm sewer piping installation shall conform to the requirements of Section 4.4.2 of this Schedule. Vertical tolerances shall be 7 mm, plus or minus for storm sewer gravity mains.

5.4.3 Manholes, Catch Basin and Appurtenances

Manholes, catch basins and appurtenances shall be installed at the locations shown on the approved design drawings and in accordance with the Standard Drawings and Section 4.4.3 of this Schedule.

5.4.4 Service Connections

Service connections shall be installed at the locations and grades shown on the approved drawings with the same tolerances as specified for pipe laying.

5.4.5 Flushing and Testing

All storm sewers shall be "pigged" or video inspected and flushed to determine that they are straight and free from silt, sand, earth or other debris. Exfiltration tests may be required with either air or water as outlined in Section 4.4.5. at the discretion of the Approving Officer.

An infiltration test may be required in areas of high groundwater at the discretion of the Approving Officer.

5.4.6 Ditching

Ditches shall be graded to line, width and grade as shown on the approved drawings. Culverts, inlet and outlet structures, energy dissipators and other appurtenances shall be as shown on the approved drawings.

6.0 STREET LIGHTING

6.1 INTRODUCTION

All street lighting systems shall be designed by a Professional Engineer competent in lighting design, and in accordance with the International Illuminating Engineering Society and Municipal standards.

All materials, equipment and specifications shall be subject to approval of the Provincial Electrical Inspector prior to submission to the Approving Officer for consideration.

The developer shall be responsible for obtaining all permits and payment of any fees required by the Provincial Electrical Inspector or the power utility company prior to start of construction.

Upon completion, the consulting engineer or contractor shall make provision to energize the system for inspection purposes and notify the Approving Officer the system is ready to inspect. After completion of such inspection by the Approving Officer or his appointed agent and correction of remaining deficiencies, the Municipality will then make application to energize the system when service is required.

Street lighting voltages shall be compatible with Local and Power Authority service voltages.

Provision for future lighting of parks shall be made by installing ducts from the nearest street-light or junction to the park property line.

6.2 DESIGN PARAMETERS

6.2.1 Minimum Levels of Illumination

The levels of average horizontal illumination, in lux, for roadways and pedestrian walkways shall not be less than those outlined in Table 6.2.1.1.

Table 6.2.1.1 - Average Horizontal Illumination (LUX)

Road Classification	Main Commercial Areas	Industrial & Intermediate Commercial Areas	Residential Areas
Collector	13	10	* 6
Local	10	6	4
Pedestrian Walkways	6	6	4

*Average horizontal illumination shall apply only to arterial or collector roads abutting residential properties. Arterial or collector roads traversing a residential area but not abutting residential properties shall be designed to meet industrial and intermediate commercial area standards.

Differentiation between areas shall be at the discretion of the Approving Officer.

The maximum uniformity ratio of horizontal illumination for roadways and pedestrian walkways using a maintenance factor of 0.90 shall be as outlined in Table 6.2.1.2.

Table 6.2.1.2 - Uniformity Ratios

<u>Road Classification</u>	<u>Uniformity Average: Minimum</u>
Collector	4:1
Local	5:1
Pedestrian Walkways	5:1

6.2.2 Pole Locations

For collector roadways, pole installations shall utilize a staggered arrangement on both sides of the roadways and where possible be located on lot lines, away from driveways and underground services. On local roadways, pole installations shall utilize a one-side arrangement along the sidewalk side, however a staggered arrangement may be considered provided private utility companies are satisfied that no conflicts exist.

Illumination levels differ for different classifications of roadways and where these roads meet, a transition area shall be incorporated. These shall have a gradual increase in illumination level until the higher level is reached.

On curves the luminaire spacing shall be reduced to ensure uniformity of illumination. Where poles are situated on the inside of bends the spacing must be reduced to $\pm 55\%$ of the spacing on straight sections. On the outside of bends the spacing must be reduced to $\pm 70\%$ of the normal spacing. Reduction figures are general guidelines and uniformity levels should dictate the required spacing.

Consideration shall be given to the relative positions of luminaries and trees to ensure that a uniform light distribution is maintained.

6.2.3 Underground Ducting Locations

In general, conduit shall be placed on the light side of the roadway. However, where a staggered type lighting pattern is utilized, conduit shall be placed on both sides of the roadway.

6.2.4 Lamp Standards and Luminaries

The types of standards and luminaries for different road classifications shall be as per Table 6.2.4.

Table 6.2.4 - Standards and Luminaries

<u>Road Classification</u>	<u>Standard Luminaire</u>	<u>Type</u>	<u>Height</u>	<u>Description</u>
Collector	Davit Arm NAPCO #29180-110-000		7.62 m	150 watt high pressure sodium
Local	Davit Arm NAPCO #29180-110-000		7.62 m	100 Watt high pressure sodium,
	as per Std. Dwg. E-1 or accepted post top		as per Std. Dwg. E-2	
			6.0 m	

6.2.5 List of Standard Drawings

The following drawings form part of Section 6:

Title	No.
Davit Streetlights	E-1
Post Top Streetlights	E-2

6.3 MATERIALS

All materials shall be C.S.A. approved and conform to the following specifications:

6.3.1 Poles

Poles shall be one piece octagonal tapered, factory primed steel to A.S.T.M. Standard A153 (610 gms/m² inside and outside) designed to withstand 160 km/h wind loading. All poles shall be painted prior to installation and touched up to cover damaged areas after erection. Street light poles and accessories shall be as detailed on the standard drawings. Breakaway bases may be required at the discretion of the Approving Officer.

6.3.2 Pole Bases

Precast concrete trapezoidal bases shall be installed on all pole installations. Under certain situations cast in place bases may be considered.

6.3.3 Conduit

All conduit, couplings, adapters and bends for street lighting shall be Scepter Manufacturing Co. Ltd. or equivalents, rigid unplasticized polyvinyl chloride, 50mm diameter minimum, Canadian Electrical Code, with maximum 30% conduit fill, unless otherwise accepted. Installation shall be in strict accordance with the manufacturer's recommendations using C.S.A. certified cement. Steel conduit for power service shall be hot-dipped galvanized malleable iron.

6.3.4 Grounding

Grounding of neutral wire to grounding rod at each pole and service kiosk and installation of a continuous ground conductor in the conduit system shall be provided in accordance with the Provincial Electrical Code, #8 size, colour coded green.

6.3.5 Conductors

All conductors shall be type RW 90 X-link or RWU 90 X-link stranded copper. Minimum conductor size shall be #12. Conductor minimum size for advance warning flashers shall be #12. High traffic heads shall be wired with cabtire.

6.3.6 Connectors

Connectors shall be solderless insulated connectors of the Marrette type, taped with black P.V.C. tape. Full compression lugs shall be used for connecting ground conductors to ground studs in hand-holes.

6.3.7 Luminaries

All luminaries shall be acrylic type II, III or IV with cut-off or semi-cut-off distributions, in accordance with Section 6.2.4.

Polycarbonate vandal resistant refractors are required.

6.3.8 Lamps

All lamps shall be 150 watts or 100 watt high pressure sodium as applicable, colour corrected, deluxe coated.

6.3.9 Conduit Bedding

Bedding for buried conduit shall be sand or crushed granular aggregate as specified for PVC water piping. Utility warning tape shall be installed above all buried conduit.

6.3.10 Junction Boxes

Junction boxes shall be cast aluminum, P.V.C. or concrete. Cast aluminum boxes shall be used in sidewalks in commercial areas; concrete boxes may be used in all other areas.

6.3.11 Service Panels

Service panels shall be C.S.A. approved of the pole mounting or kiosk type as shown on the Standard drawings.

6.3.12 Photo-Cell Units

Photo-cell units shall be cadmium sulphide type having externally adjustable sensitivity, thermal on and off delay type for 120 volt operation and an integrally contained control relay capable of switching at least 1000 volt-amperes. The unit shall be provided with a twist-lock base to match the receptacle provided in the luminaire and the action shall be such that in daylight the relay is energized, holding open its normally closed contacts. The unit shall have a built-in surge protector and a lightning arrester.

One photo-cell unit shall be installed for each 10 or less streetlights on a circuit.

Where pole mounting is required an outdoor receptacle with wall mounting bracket shall be provided.

6.3.13 Ground Rods

Ground rods shall be 19 mm diameter steel with hot forged point. Top ends shall be galvanized for a minimum distance of 250 mm for 1500 mm rods and 450 mm for 3 metre rods. Ground rods shall be full length copper clad.

6.3.14 Paint

Primer shall be factory applied and any marks touched up with an accepted primer prior to painting. Paint shall be "Tremclad Dark Blue", or accepted equal.

6.4 INSTALLATION

6.4.1 Layout and Positioning

Poles, pole bases, conduit and appurtenances shall be accurately located in accordance with the accepted drawings. Conduit shall be installed parallel or perpendicular to the road centreline and routed so as to run in a direct line between adjacent poles or junction boxes.

6.4.2 Conduit Installation

Conduit shall be installed in accordance with the manufacturer's recommendations.

Empty conduits shall be provided with an insulated #12 AWG copper wire and capped immediately after installation of the pull wire.

6.4.3 Poles, Bases and Luminaries

Bases shall be set plumb and oriented such that one side of the bolt square layout is parallel to the road centreline.

Poles shall receive one coat of paint prior to erection. Poles shall be set plumb with no more than 6 shims per pole.

Luminaries shall be securely fastened to the poles, levelled and cleaned after pole erection. Paint on poles shall be touched up after erection. If paint is badly scarred during installation, a second coat of paint shall be applied.

6.4.4 Wiring and Equipment

Wiring and equipment installation shall conform to the B.C. Electrical Code and manufacturer's recommendations.

6.4.5 Inspection and Testing

Inspection and testing shall conform to the provisions of the B.C. Electrical Code and the provisions of Section 6.1 hereof.

6.4.6 Installation on Power Utility Poles

Where street lighting is to be installed on power utility poles, the installations shall conform to the lighting level requirements of this Schedule and to the materials and installation requirements of the utility owner.

7.0 NON-MUNICIPAL UTILITIES

7.1 INTRODUCTION

Non-municipal utilities include natural gas, power, telephone and cablevision services.

7.2 NATURAL GAS

Natural gas services are not required as a condition of subdivision, however, where natural gas services are to be installed, natural gas main and service installations shall conform to the requirements of the utility owner and natural gas mains shall be installed on both sides of new or upgraded roadways and located in accordance with the standard drawings herein. Installation of natural gas services, where available, is to be encouraged.

7.3 POWER

Electrical power services are required in accordance with Section 5 of this Bylaw. Where underground or overhead power services are to be installed, the installations shall conform to the requirements of the utility owner. Underground and overhead installations shall be located in accordance with the standard drawings herein.

7.4 TELEPHONE AND CABLEVISION

Telephone services are required in accordance with Section 5 of this Bylaw. Cablevision services are not required as a condition of subdivision, however, where cablevision service is available, installation of cablevision services is to be encouraged.

Where underground or overhead telephone and cablevision services are to be installed, the installations shall conform to the requirements of the respective utility owners and shall be located in accordance with the standard drawings herein.

8.0 STANDARD DRAWINGS

8.1 GENERAL NOTES

1. Where ASTM, AWWA or other non-Municipal Standard Specifications are referred to, the most recent edition at the date of commencement of construction will apply.
2. All castings shall be true to pattern and free from cracks, gas holes, flaws, and excessive shrinkage. Surfaces of the castings shall be free from burnt on sand and shall be reasonably smooth. Runners, risers, fins, and other cast on pieces shall be removed. In other respects, the castings shall conform to whatever points may be specially agreed upon between the manufacturer and the Approving Officer.

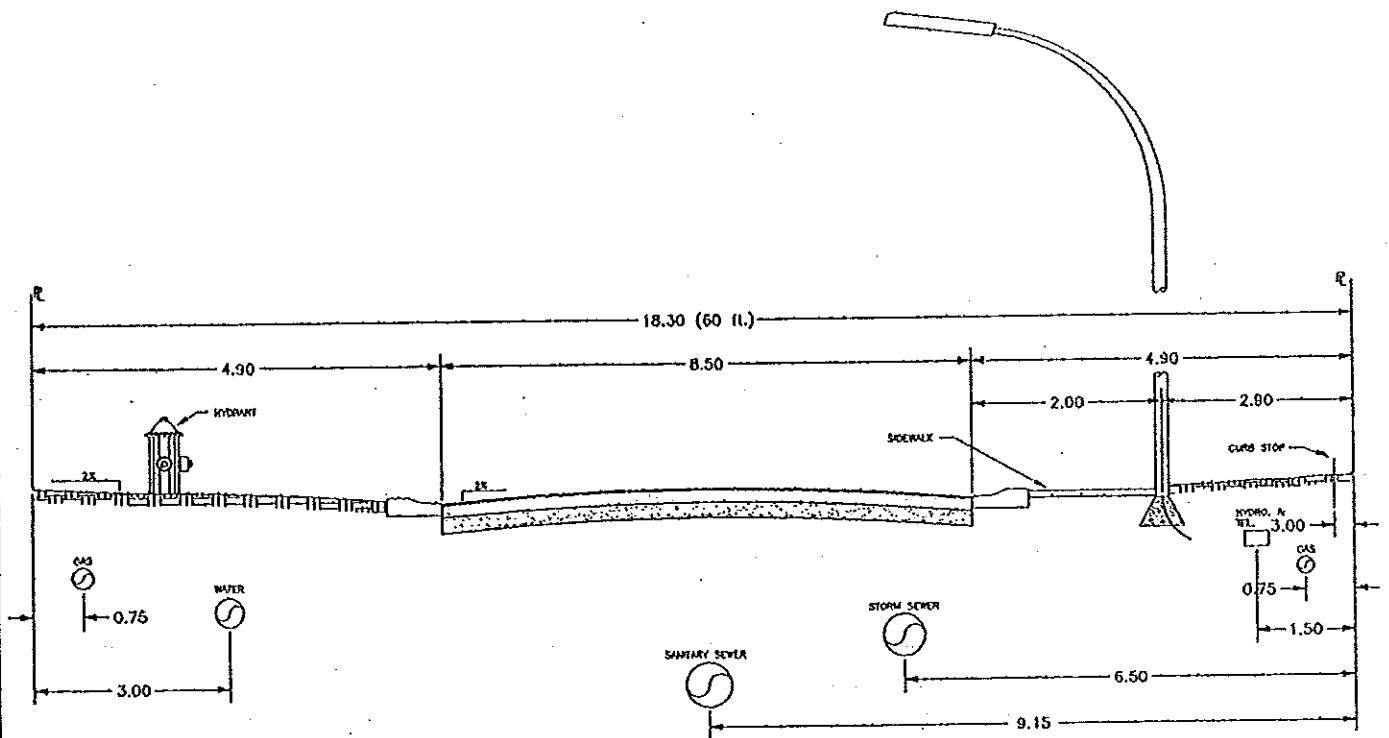
Frame material specification - Cast Iron ASTM A48 - Class 20

Grate and cover material specification - Ductile Iron ASTM A445
or cast steel grade 60 - 90 (Table 11 ASTM A 148)

3. "as approved" means as accepted for the specific application by the Approving Officer.
4. All valve boxes, manholes and catch basin covers or grates to be set 5 - 10 mm below finished paved asphalt road grade, and 20-25 mm below finished gravel surface grade.
5. Standard drawings are to represent the preferred methodology under standard conditions and are to be used wherever practical. This does not rule out the development or use of other methods after appropriate approvals have been obtained from the Municipality. Any special conditions or deviations from standard drawings must be submitted as design details and will, after approval, take precedence over the standard drawing. Therefore, any standard drawing developed for non-standard situation must specify on the drawing the specific use intended.
6. It is not the purpose of the standard drawings to detail a manufacturer's product but only the conditions of the Municipality's use of such product.

8.2 LIST OF STANDARD DRAWINGS

<u>Title</u>	<u>No.</u>
Local Urban Road	R1
Local Rural Road	R2
Collector Urban Road	R3
Collector Rural Road	R4
Industrial Urban Road	R5
Hydrant Access Path	R6
Paved Lane	R7
Paved Walkway	R8
Curb and Gutter	R9
19 mm Water Service Detail	W1
Valve Box Detail	W2
Hydrant Detail	W3
Watermain Blow off Detail	W4
Thrust Block Details	W5
50 mm Air Valve Chamber Detail	W6
Catch Basin Detail	ST1
Storm Drainage Drywell	ST2
Pipe Anchoring Detail	S1
Trench Detail	S2
Sanitary and Storm Sewer Connections	S3
Manhole Detail	S4
Exterior Drop Manhole Detail	S5
Trench Bedding Details	S6
Service Connection Detail for Sanitary	
Manhole in Cul-de-Sac	S7
Davit Street Lights	E1
Post Top Street Lights	E2



NOTE:

1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
2. SIDEWALK MAY BE REQUIRED BOTH SIDES
3. ROLLED TYPE CURB TO BE USED WHERE SINGLE FAMILY OR DUPLEX RESIDENTIAL PROPERTIES FRONT ON STREET
4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 8 LUX.
5. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.

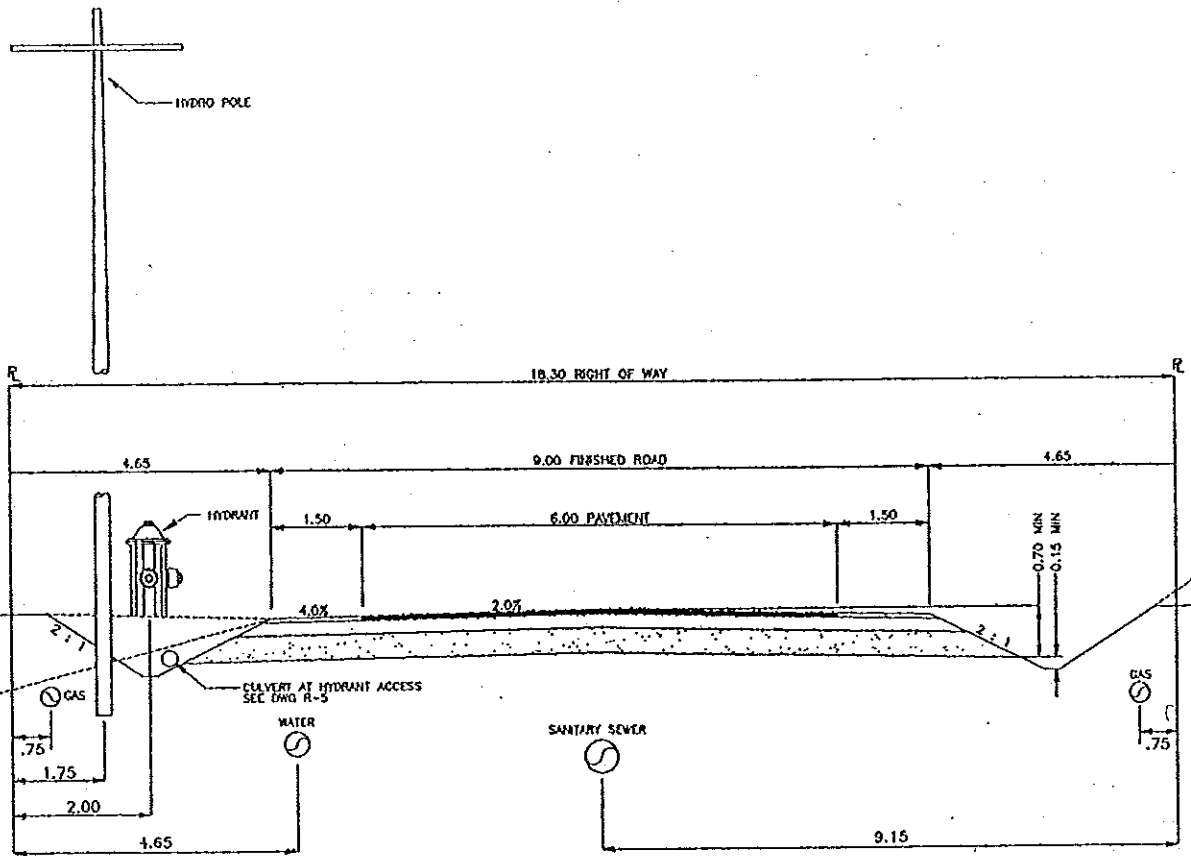
VILLAGE OF KASLO

LOCAL URBAN ROAD

SCALE: N.T.S.

DWG. NO:

R1



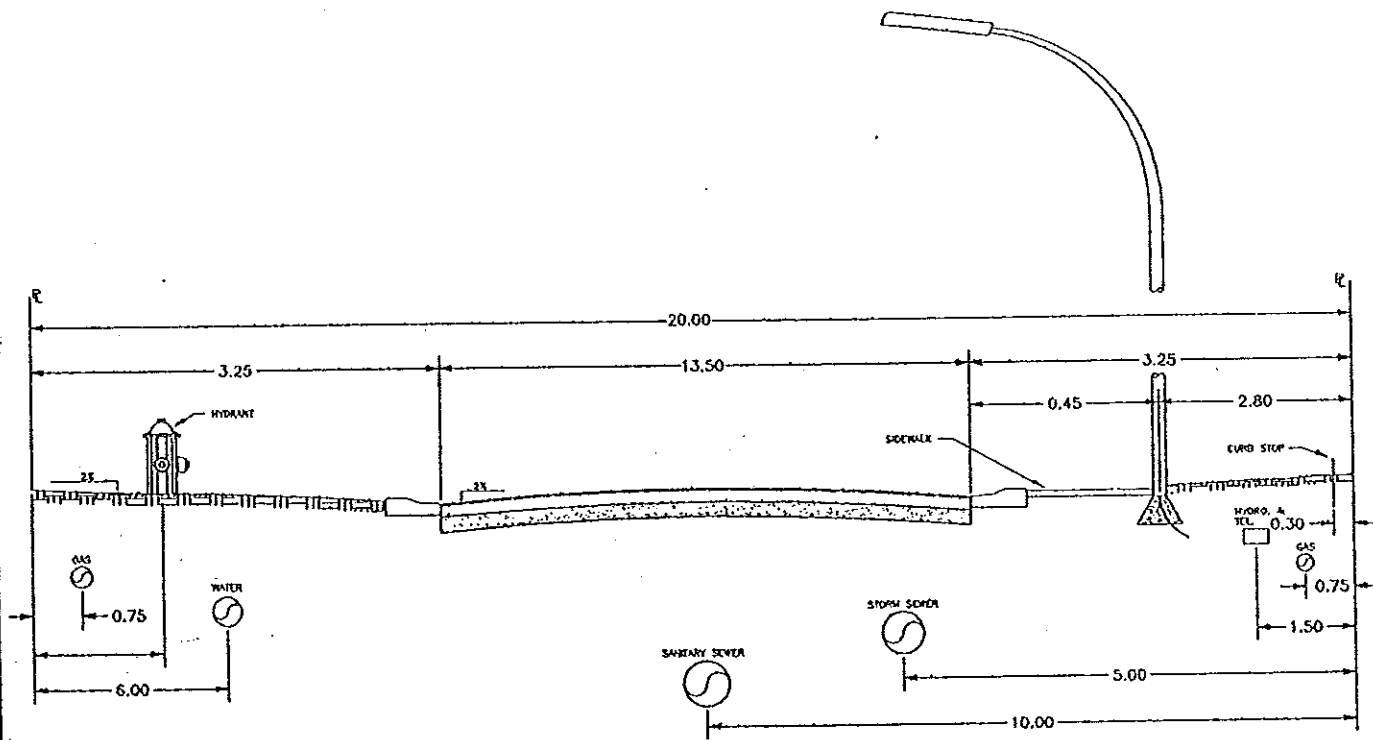
VILLAGE OF KASLO

LOCAL RURAL ROAD

SCALE: N.T.S.

DWG. NO:

R2



NOTE:

1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
2. SIDEWALK MAY BE REQUIRED BOTH SIDES
3. BARRIER TYPE CURB.
4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 10 LUX.
5. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.

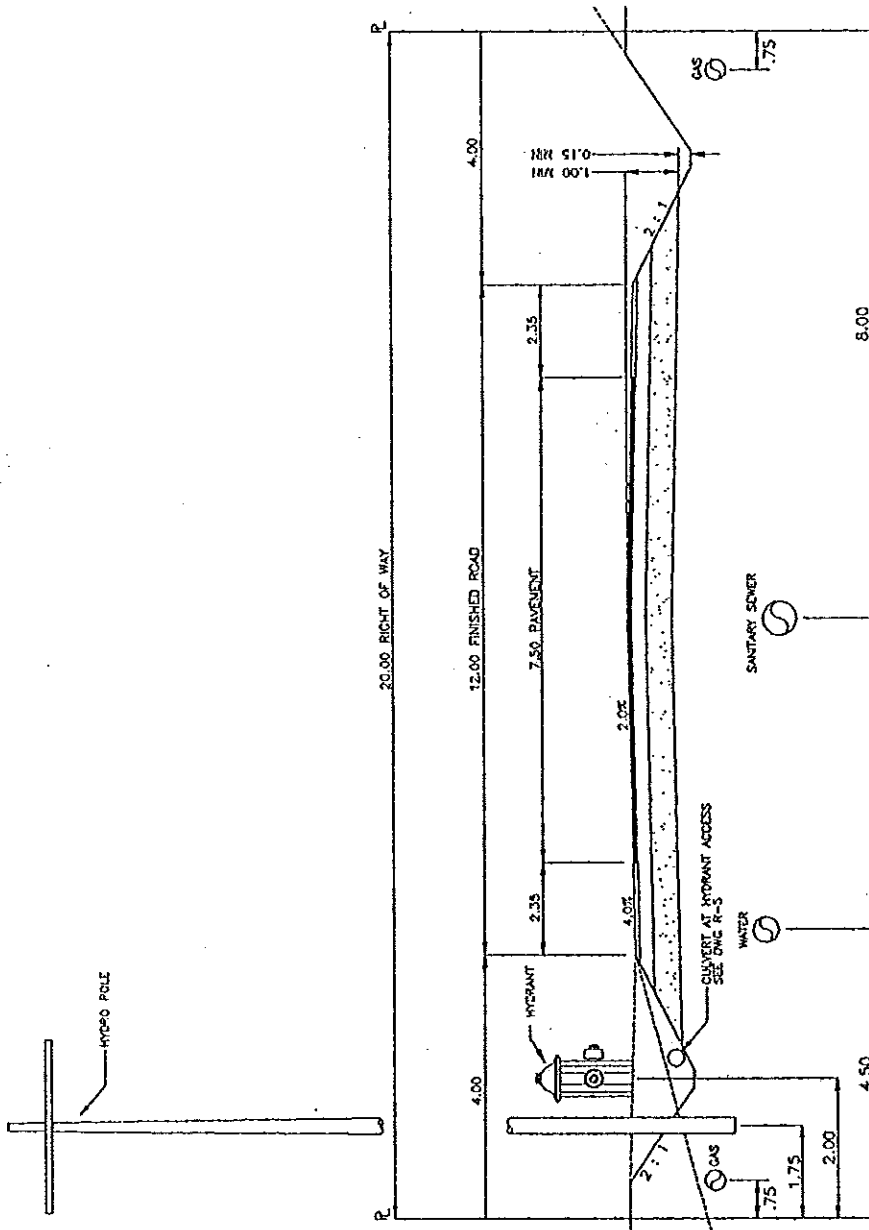
VILLAGE OF KASLO

COLLECTOR URBAN ROAD

SCALE: N.T.S.

DWG. NO:

R3



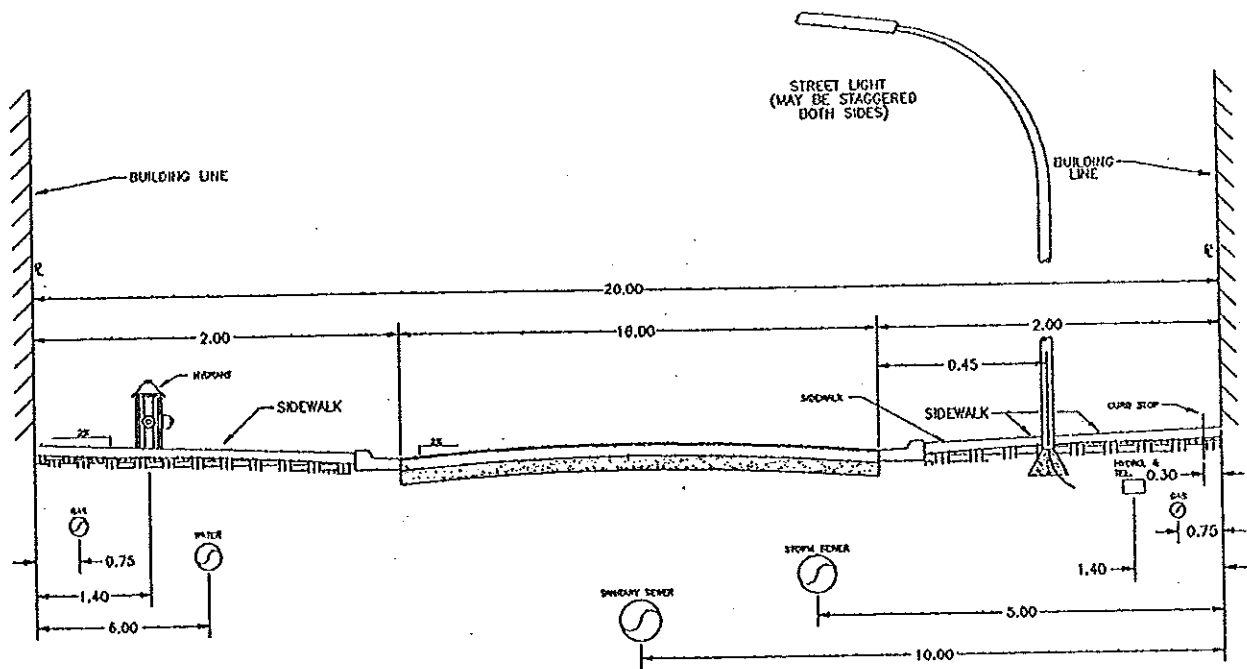
VILLAGE OF KASLO

COLLECTOR RURAL ROAD

SCALE: N.T.S.

DWG. NO:

R4



NOTE:

1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
2. SIDEWALK MAY BE REQUIRED BOTH SIDES
3. BARRIER TYPE CURB.
4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 13 LUX.
5. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.
6. HYDRO & TEL MAY BE INSTALLED IN LANES.

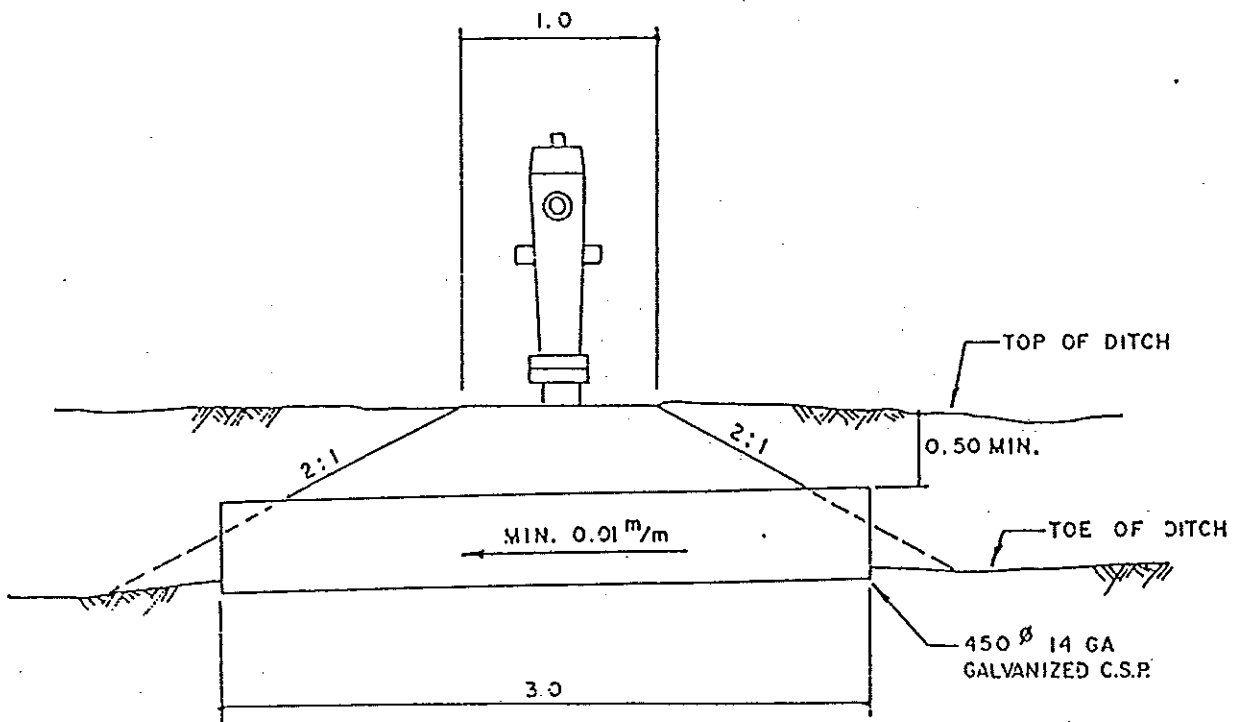
VILLAGE OF KASLO

INDUSTRIAL URBAN ROAD

SCALE: N.T.S.

DWG. NO:

R5



ELEVATION

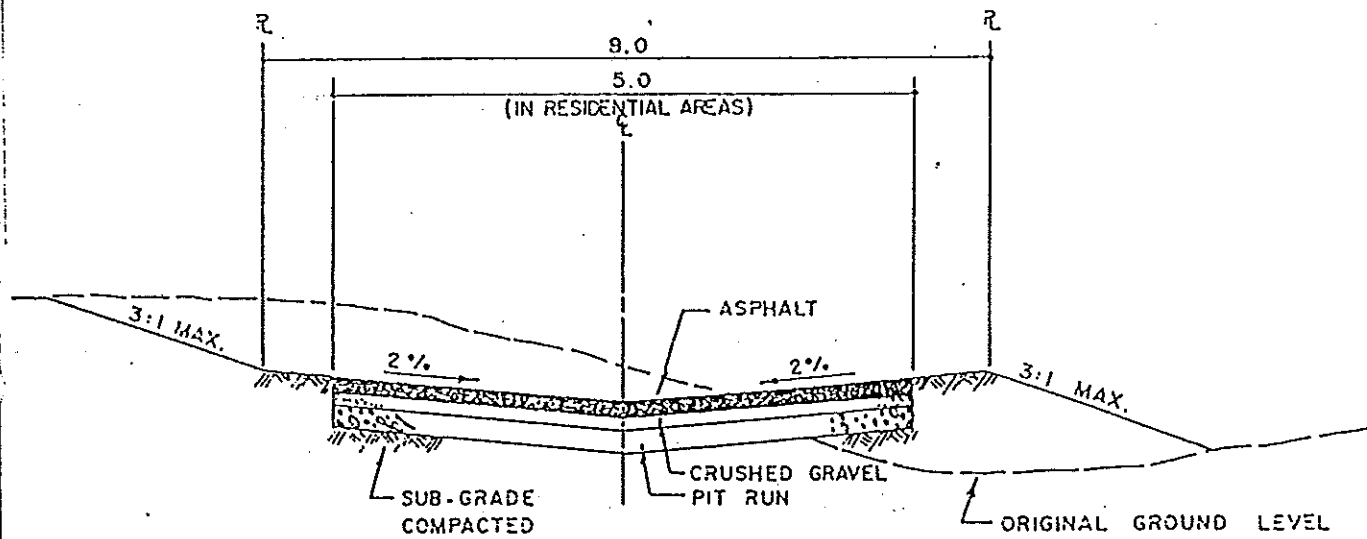
VILLAGE of KASLO

HYDRANT ACCESS PATH

SCALE: N.T.S.

DWG. NO:

R6



NOTES:

1. SIDE SLOPES IN CUT & FILL TO BE DONE AT TIME OF SUBDIVISION ROUGH GRADING.
2. DESIGN OF ROAD STRUCTURE TO SUIT LOCAL CONDITIONS.
3. IN COMMERCIAL & MULTIPLE RESIDENTIAL AREAS, PAVE FULL WIDTH OF LANE.

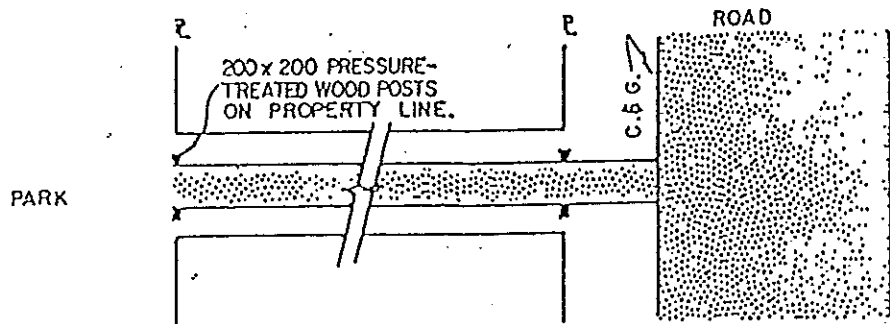
VILLAGE of KASLO

PAVED LANE

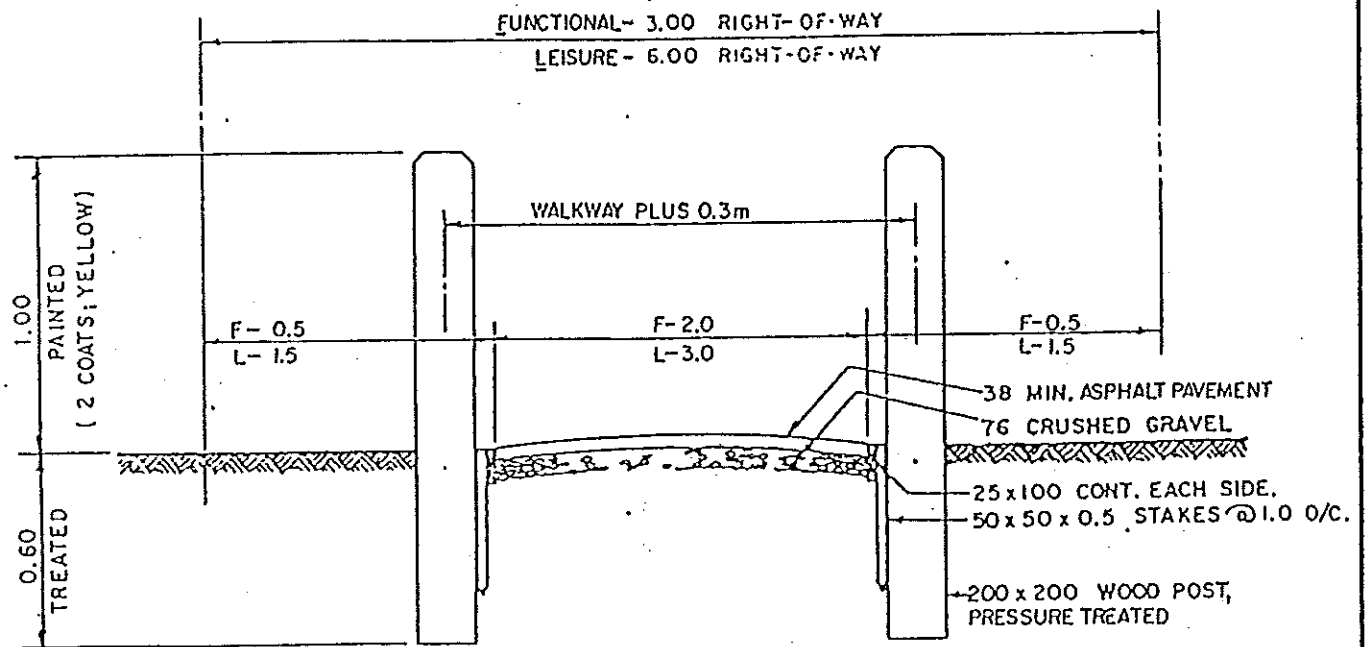
SCALE: N.T.S.

DWG. NO:

R7



PLAN



SECTION

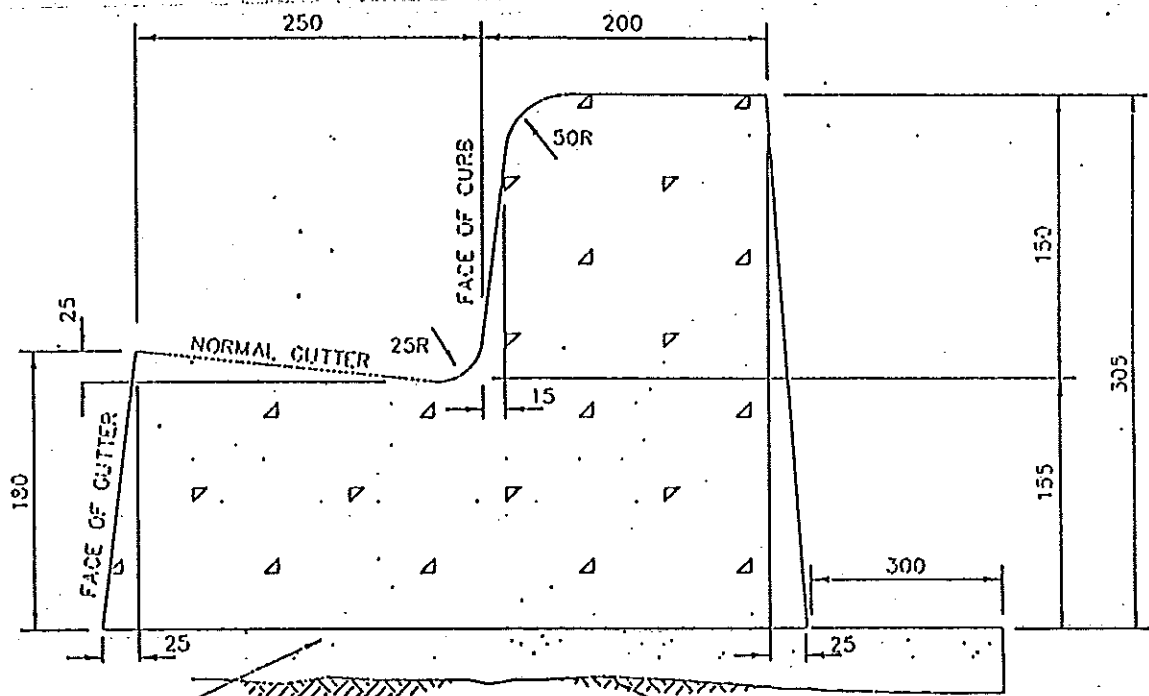
VILLAGE of KASLO

PAVED WALKWAY

SCALE: N.T.S.

DWG. NO:

R8

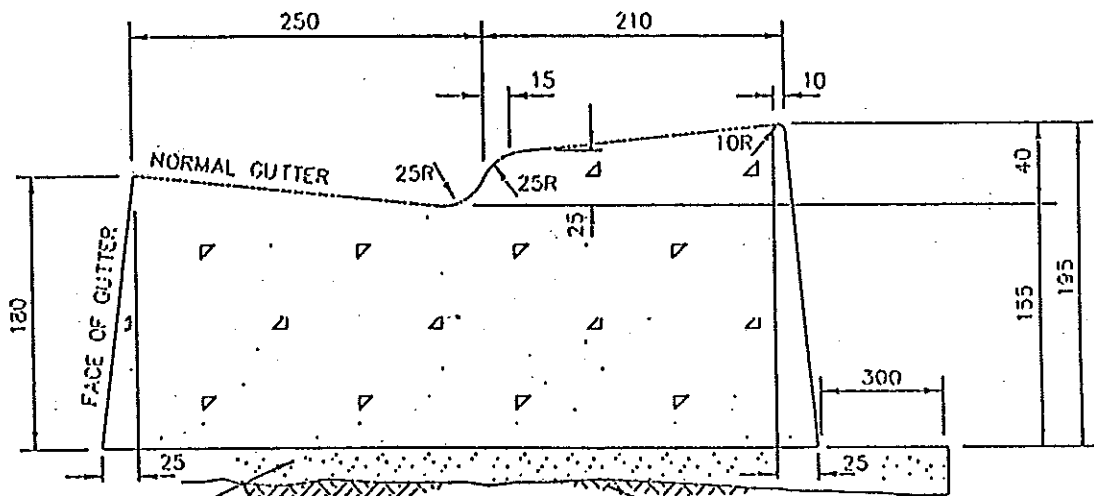


COMPACTED GRANULAR
BASE COURSE
OR SUB-BASE

COMPACTED SUBGRADE
OR SUB-BASE

BARRIER CURB & GUTTER

N.T.S



COMPACTED GRANULAR
BASE COURSE
OR SUB-BASE

COMPACTED SUBGRADE
OR SUB-BASE

ROLLED CURB & GUTTER

N.T.S

NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETRES

VILLAGE of KASLO

CURB AND GUTTER

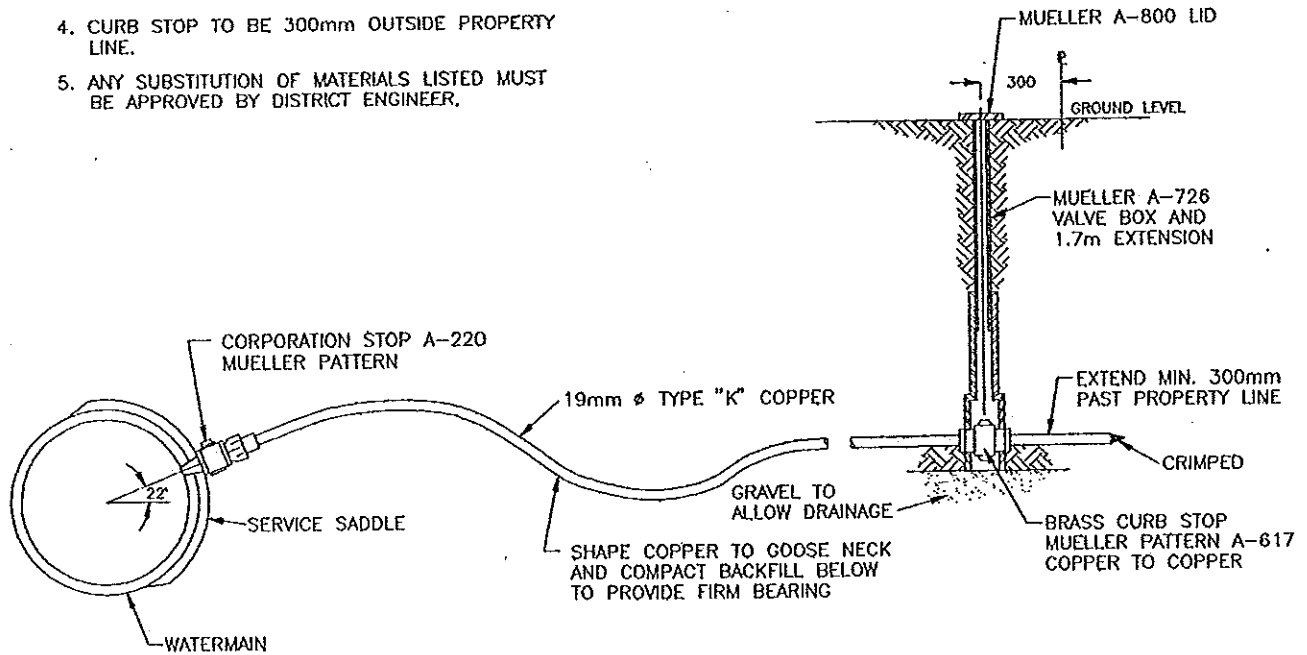
SCALE: N.T.S.

DWG. NO:

R9

NOTES:

1. SERVICE SADDLES REQUIRED ON ALL PVC PIPE. SADDLES TO BE WIDEBAND STAINLESS STEEL.
2. CONNECTIONS TO BE AT LEAST 450mm APART AT MAIN.
3. SERVICES SHOULD RUN PERPENDICULAR FROM MAIN AND BE 1.5m OFF CORNER OF PROPERTY (MINIMUM)
4. CURB STOP TO BE 300mm OUTSIDE PROPERTY LINE.
5. ANY SUBSTITUTION OF MATERIALS LISTED MUST BE APPROVED BY DISTRICT ENGINEER.



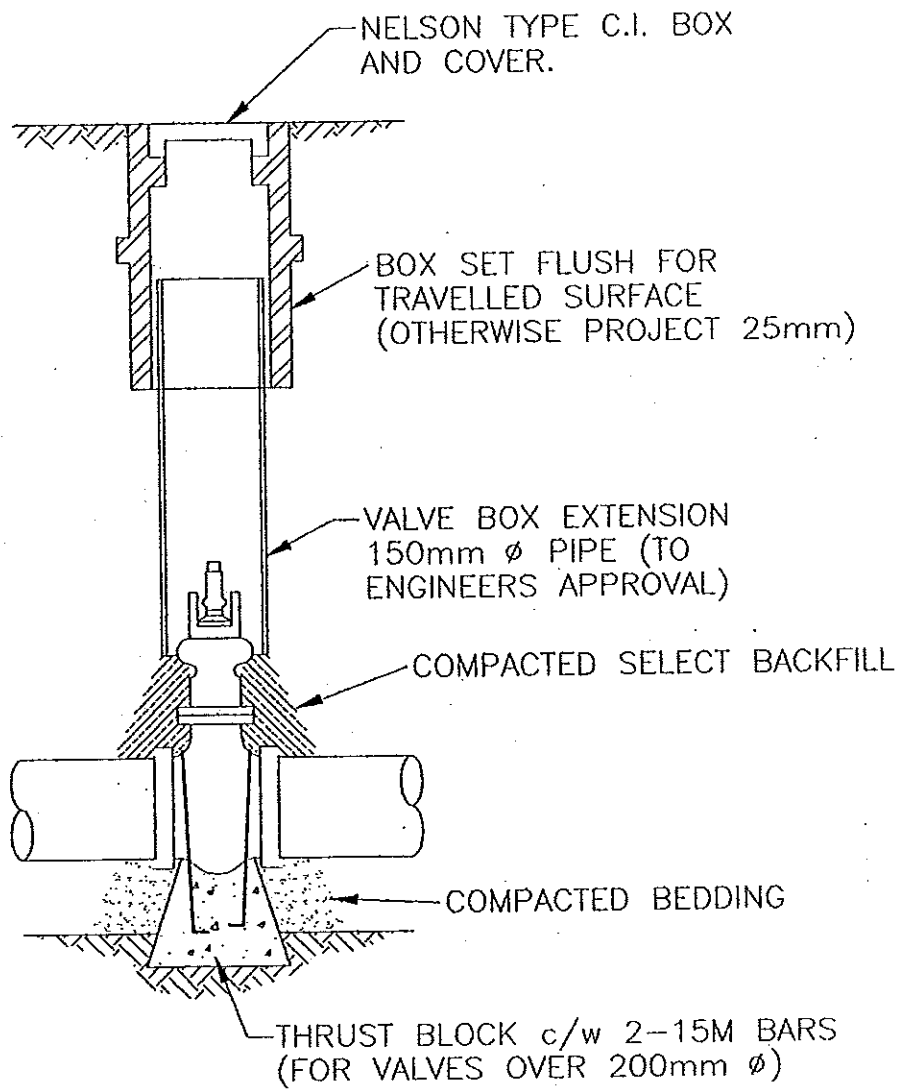
VILLAGE of KASLO

19mm WATER SERVICE DETAIL

SCALE: N.T.S.

DWG. NO:

W1



VILLAGE of KASLO

VALVE BOX DETAIL

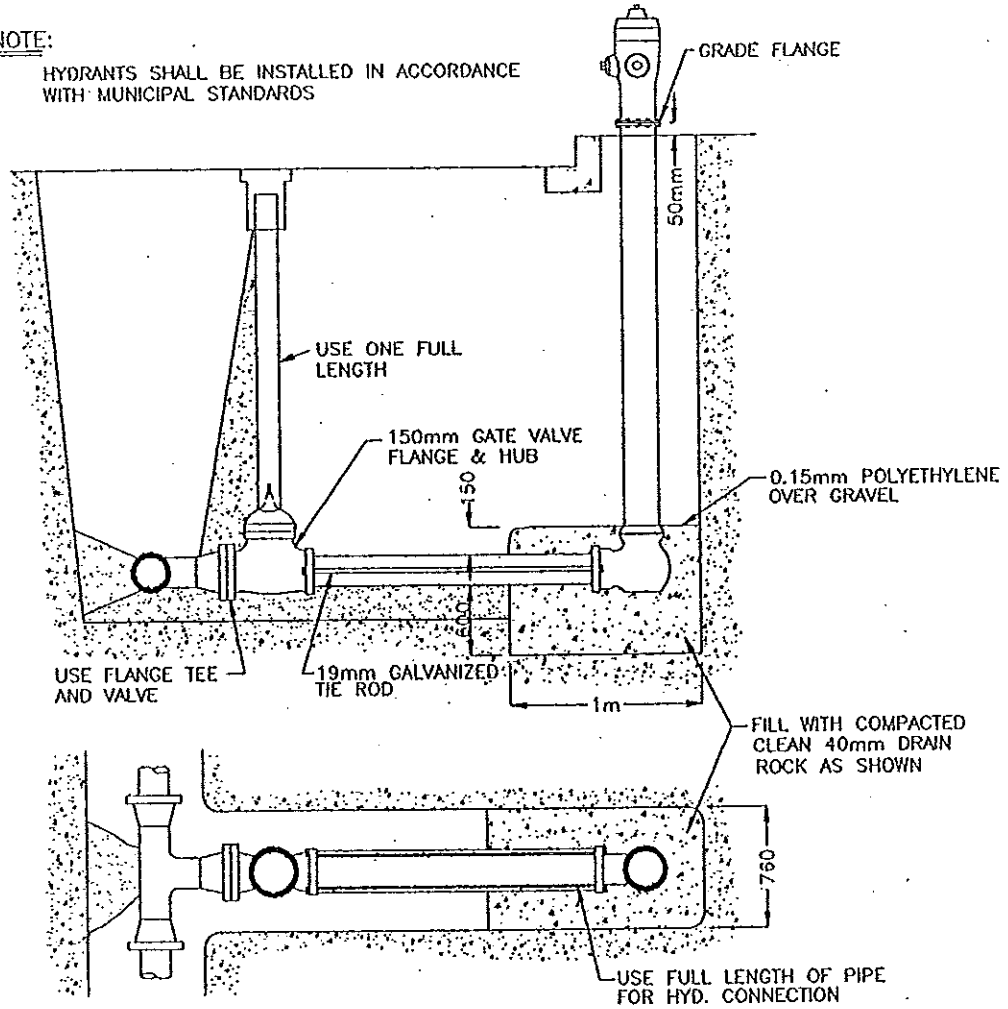
SCALE: N.T.S.

DWG. NO:

W2

NOTE:

HYDRANTS SHALL BE INSTALLED IN ACCORDANCE WITH MUNICIPAL STANDARDS



VILLAGE OF KASLO

HYDRANT DETAIL

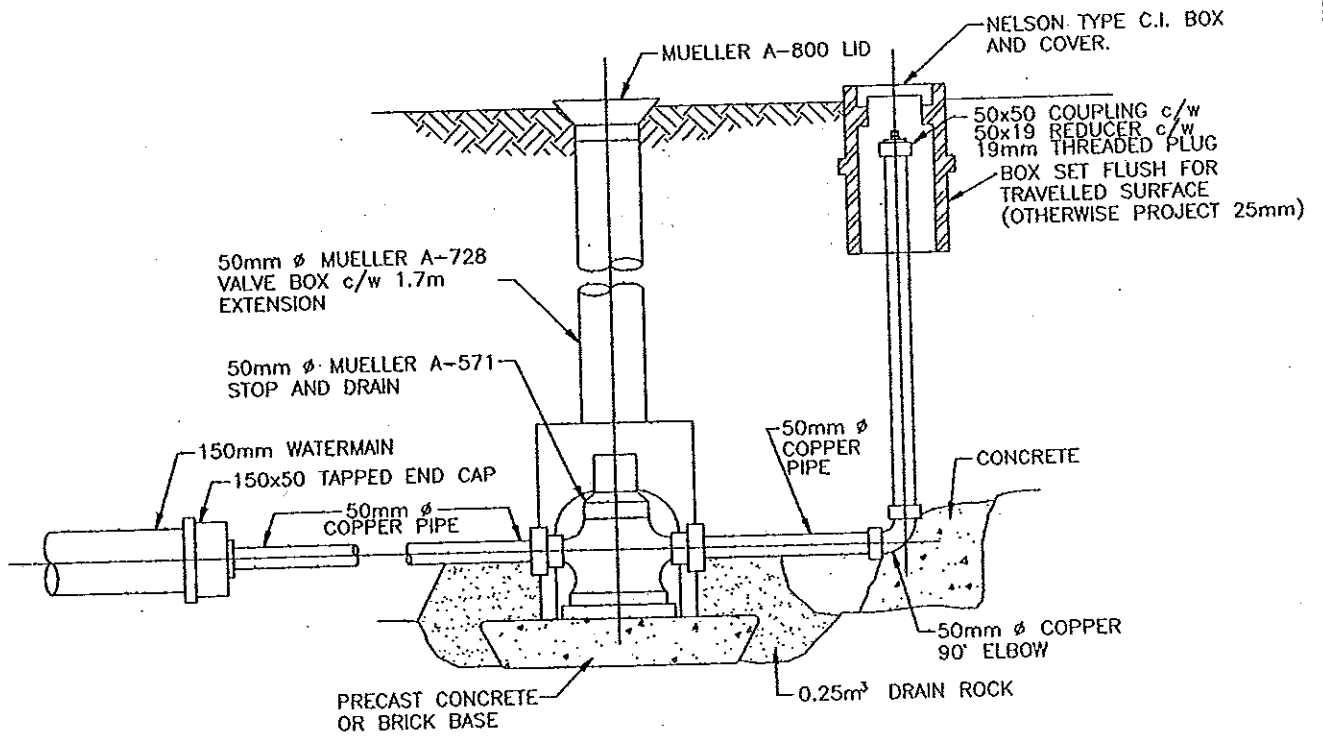
SCALE: N.T.S.

DWG. NO:

W3

NOTES:

1. ALL COPPER PIPE UNDERGROUND OR APPROVED EQUAL.
2. ANY SUBSTITUTIONS OF MATERIALS LISTED MUST BE APPROVED BY DISTRICT ENGINEER.



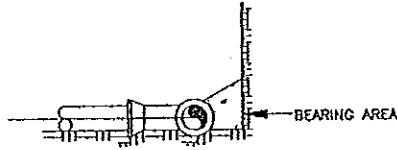
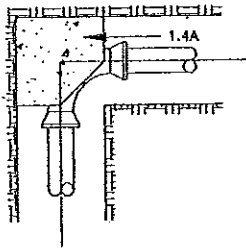
VILLAGE of KASLO

WATER MAIN BLOW OFF DETAIL

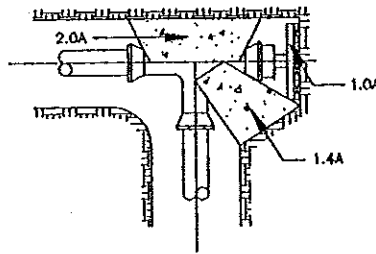
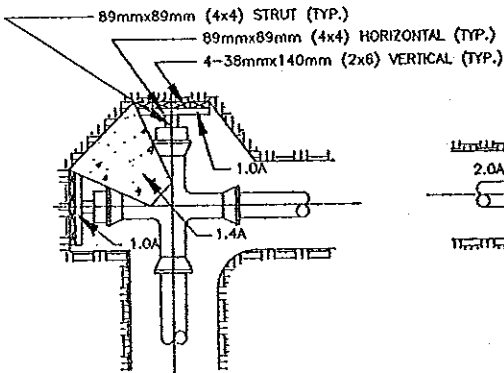
SCALE: N.T.S.

DWG. NO:

W4



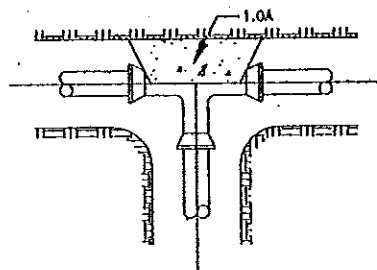
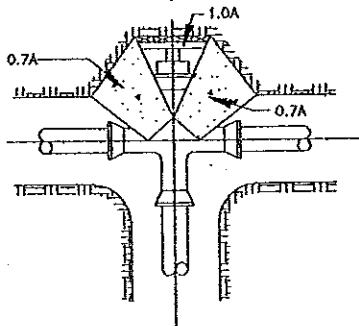
SIDE VIEW
(TYPICAL SCHEMATIC)



NOTES:

THRUST BLOCK BEARING AREAS FOR:
 - WATER PRESSURE 103.2kPa (150 psi)
 - MINIMUM COVER OVER WATERMANS 1.5m (5'-0")
 BASIC THRUST BLOCK BEARING AREA
 (SOIL CONSIDERED TO BE SAND - 4882 kg/m²)

PIPE SIZE	Emm	150	200	250	300
AREA (m ²)		0.450	0.751	1.201	1.70



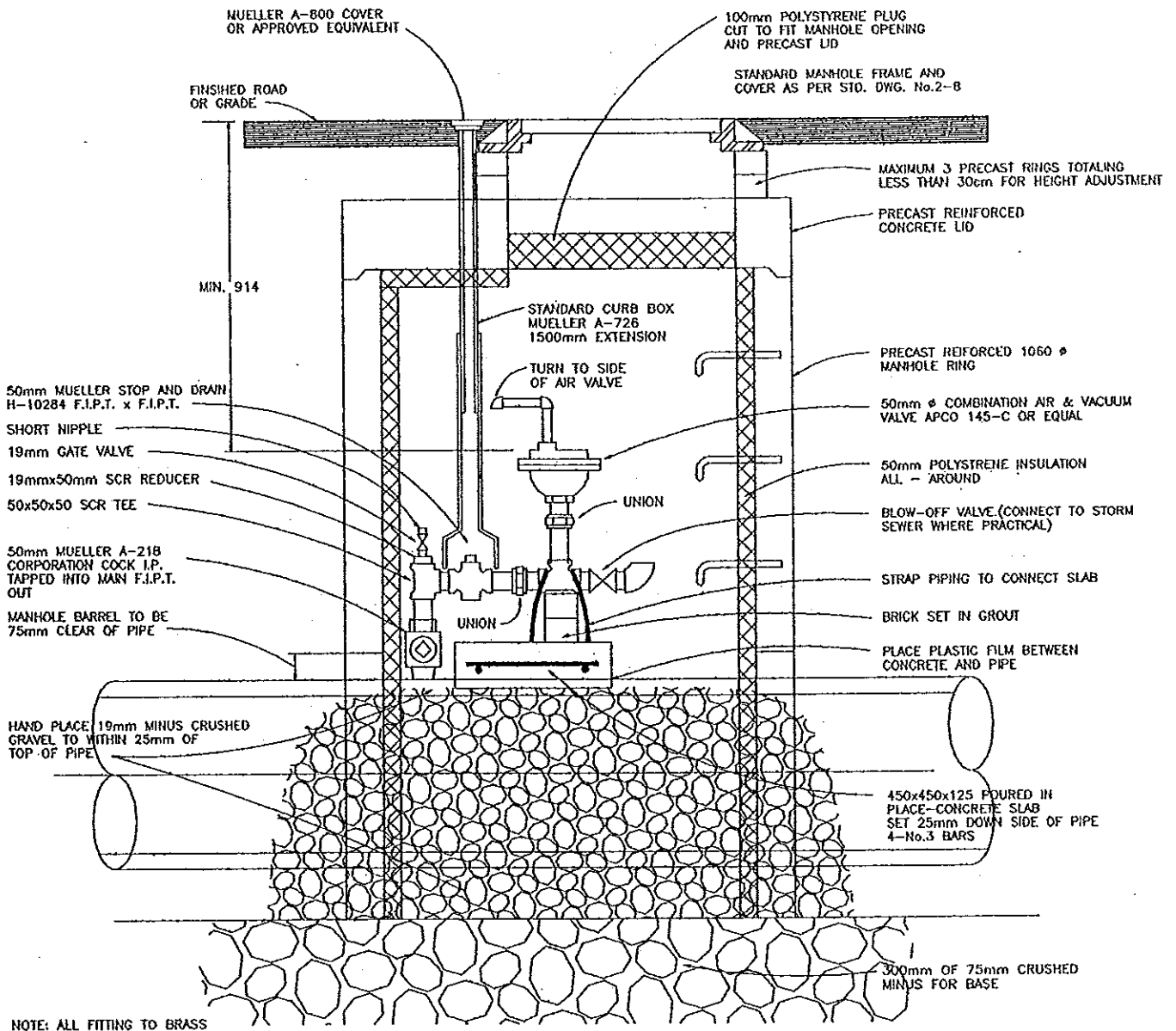
VILLAGE of KASLO

THRUST BLOCK DETAILS

SCALE: N.T.S.

DWG. NO:

W5



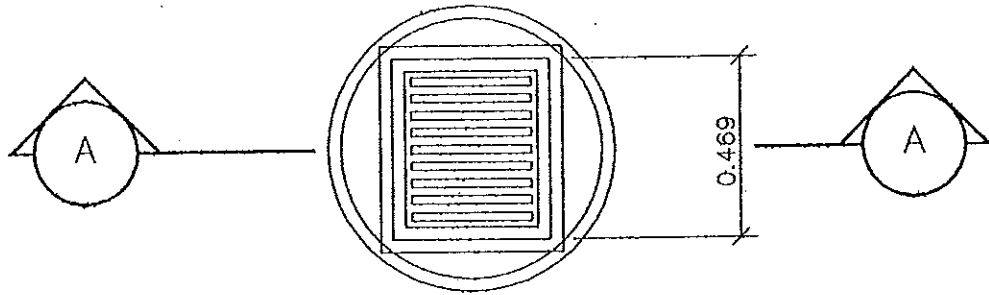
VILLAGE of KASLO

50mm AIR VALVE CHAMBER DETAIL

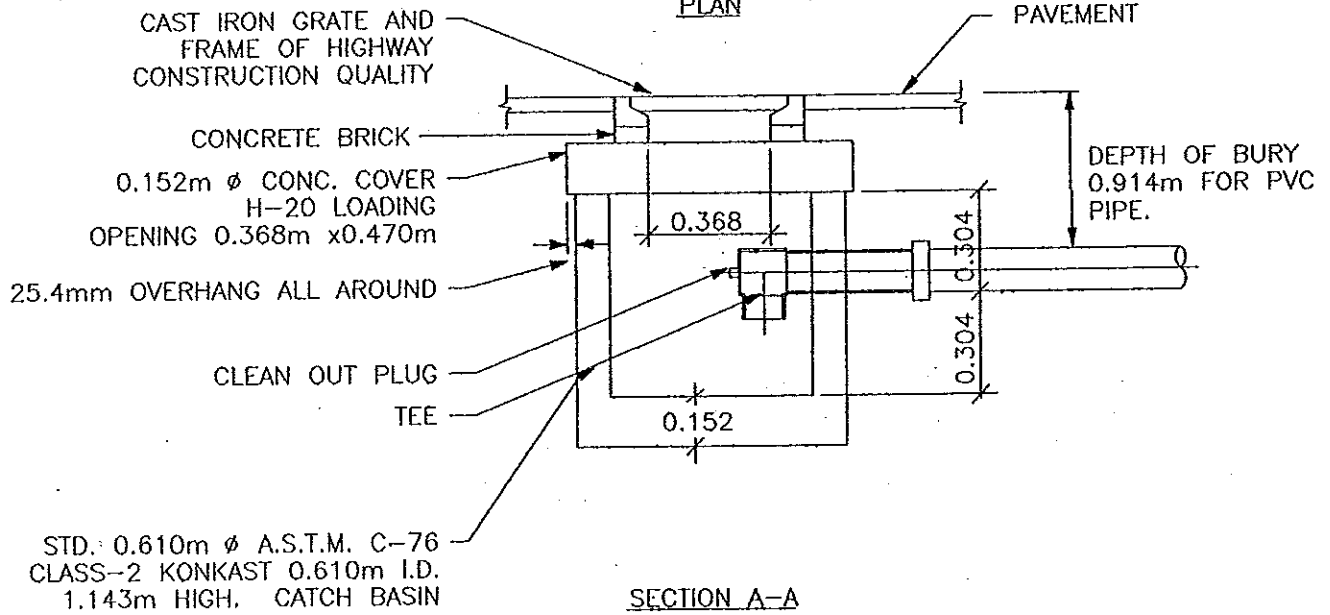
SCALE: N.T.S.

DWG. NO:

W6



PLAN



SECTION A-A

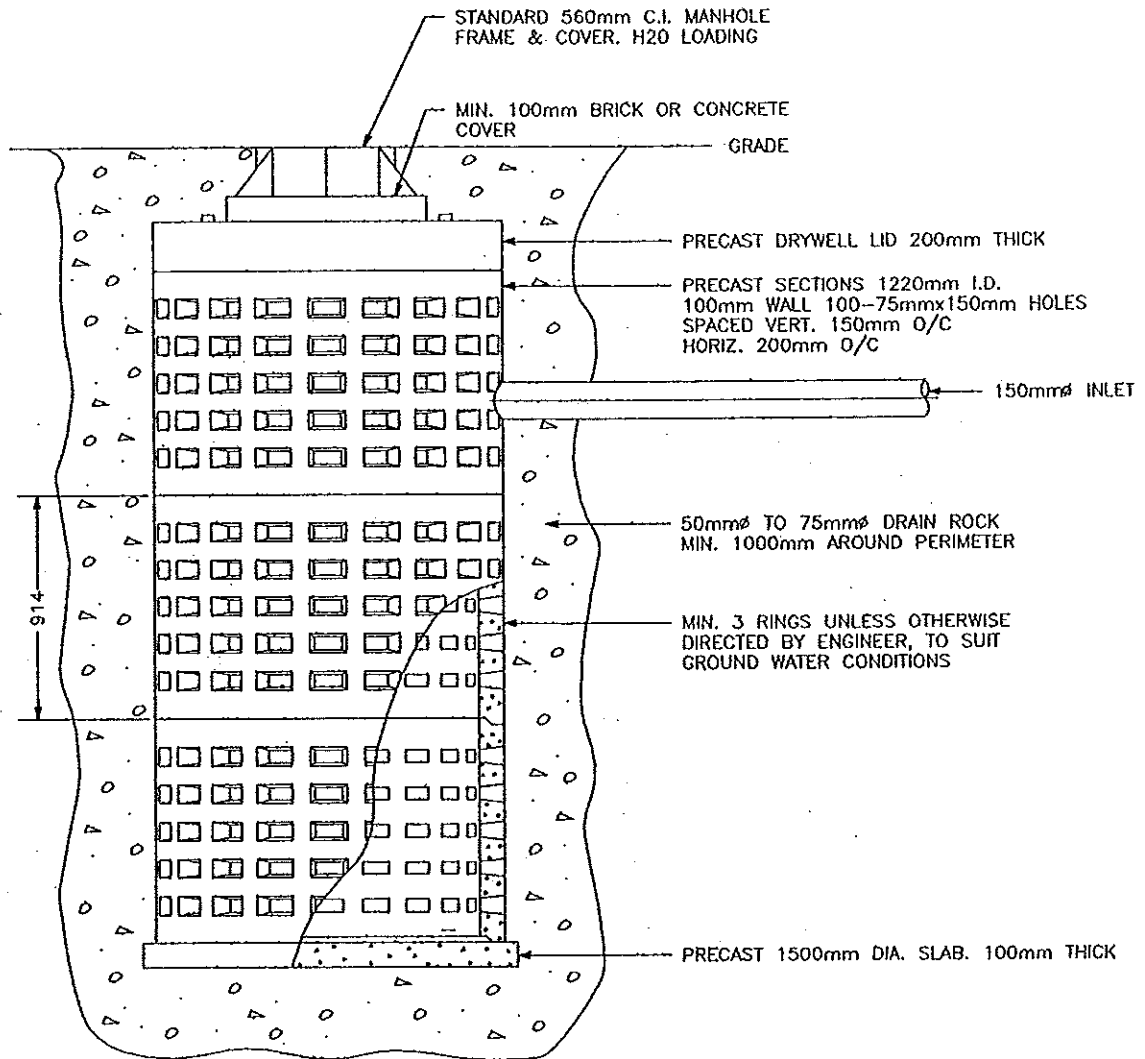
VILLAGE of KASLO

CATCH BASIN DETAIL

SCALE: N.T.S.

DWG. NO:

ST1



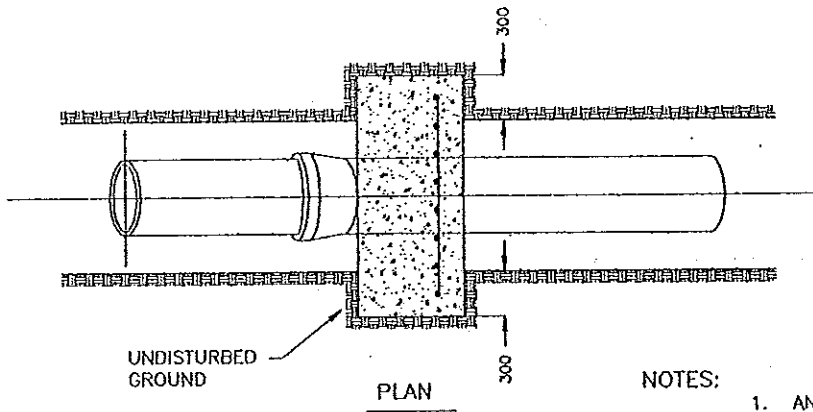
VILLAGE of KASLO

STORM DRAINAGE DRYWELL

SCALE: N.T.S.

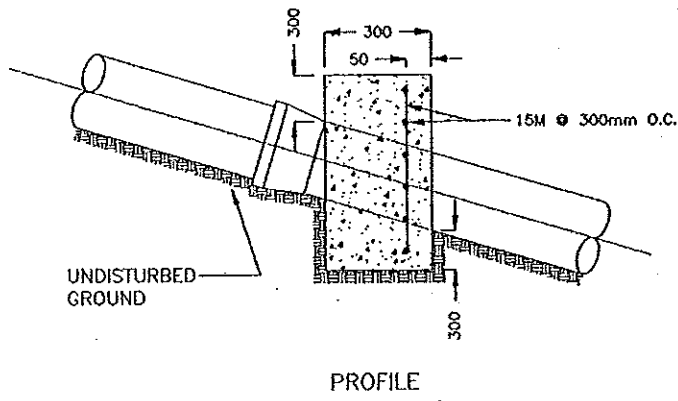
DWG. NO:

ST2



NOTES:

1. ANCHORAGE REQUIRED AS PER PROFILE.
2. ANCHOR PIPE EVERY JOINT
3. CONCRETE SHALL BE 20 MPa AT 28 DAY STRENGTH
4. CONCRETE SHALL BE TYPE 10 NORMAL
5. PLACE 2 PLY OF 0.015mm POLYETHYLENE BETWEEN PIPE AND CONCRETE



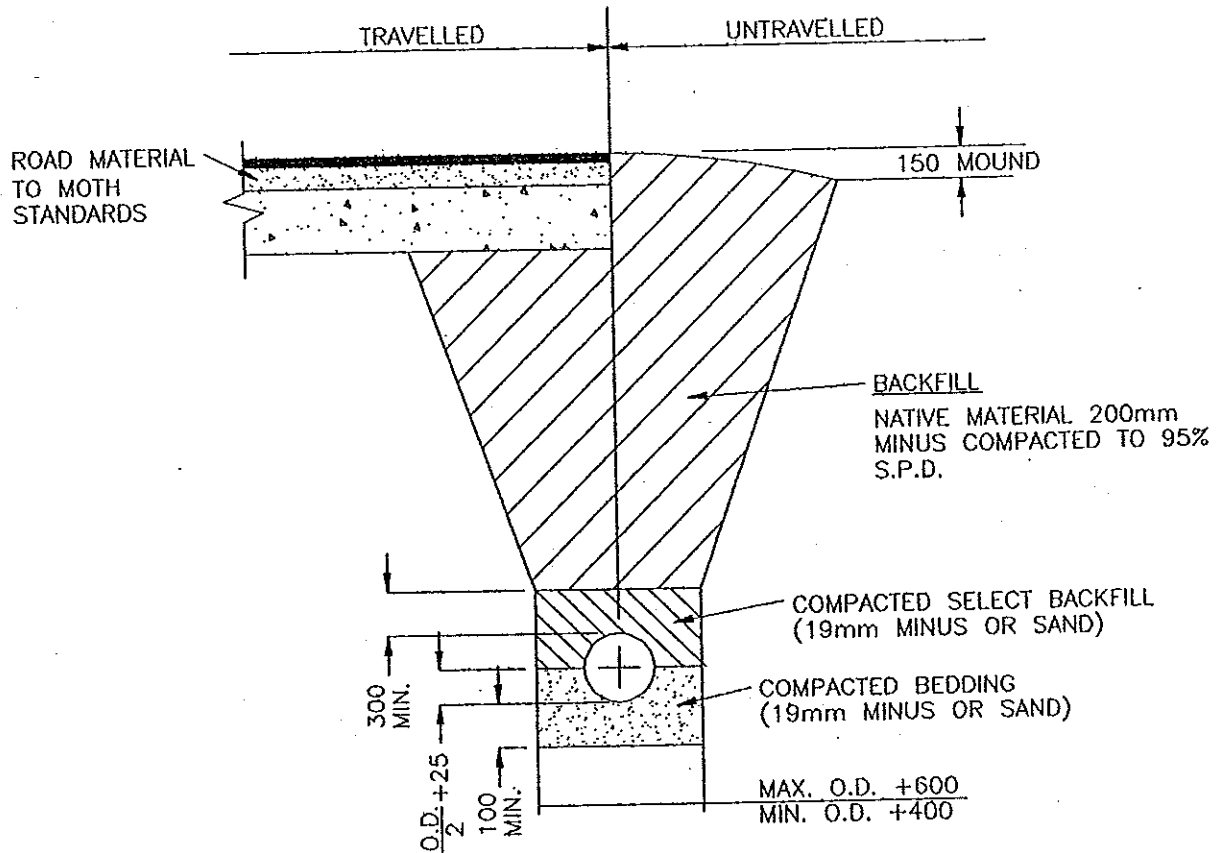
VILLAGE of KASLO

PIPE ANCHORING DETAIL

SCALE: N.T.S.

DWG. NO:

S1



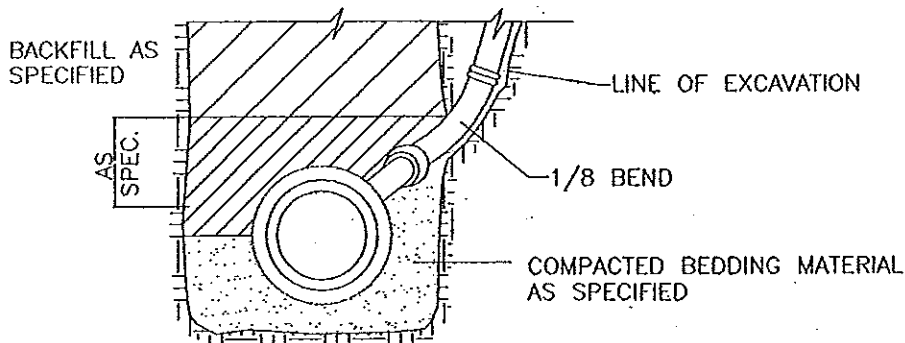
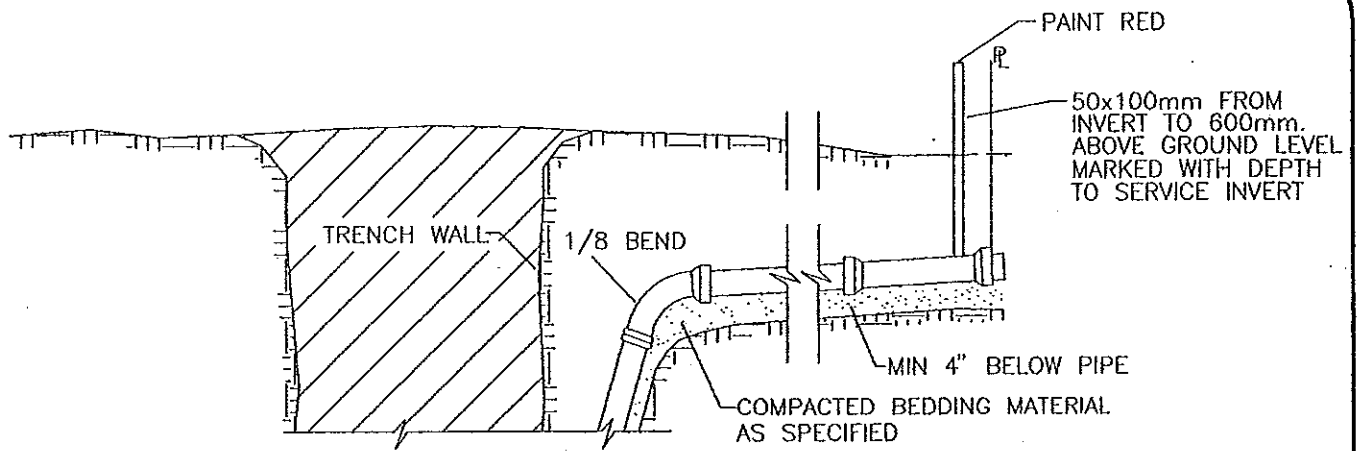
VILLAGE of KASLO

TRENCH DETAIL

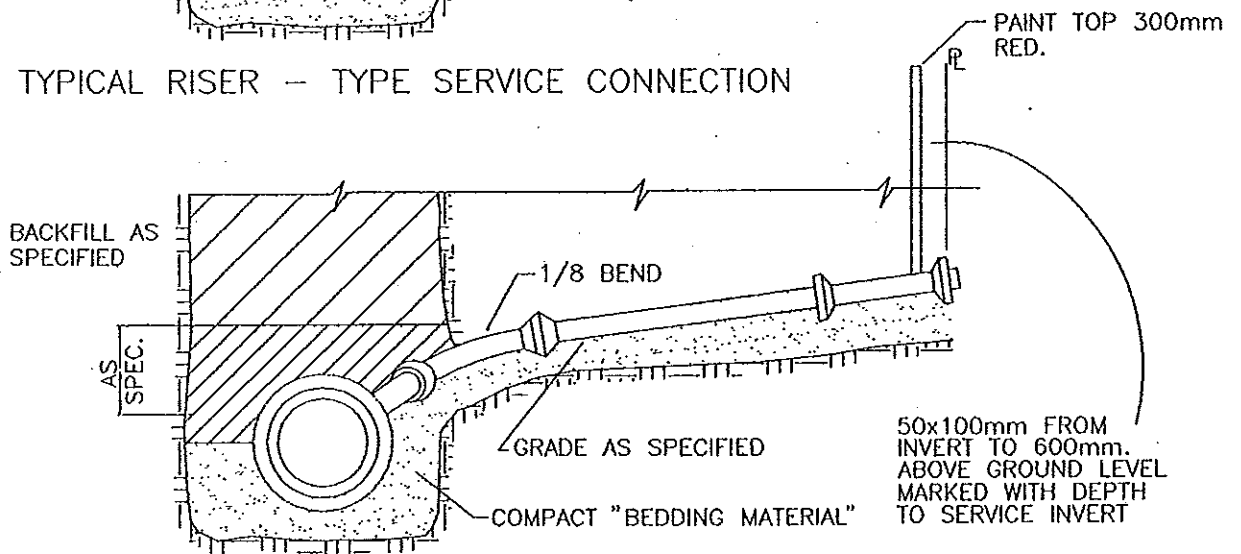
SCALE: N.T.S.

DWG. NO:

S2



TYPICAL RISER - TYPE SERVICE CONNECTION



TYPICAL NON - RISER SERVICE CONNECTION

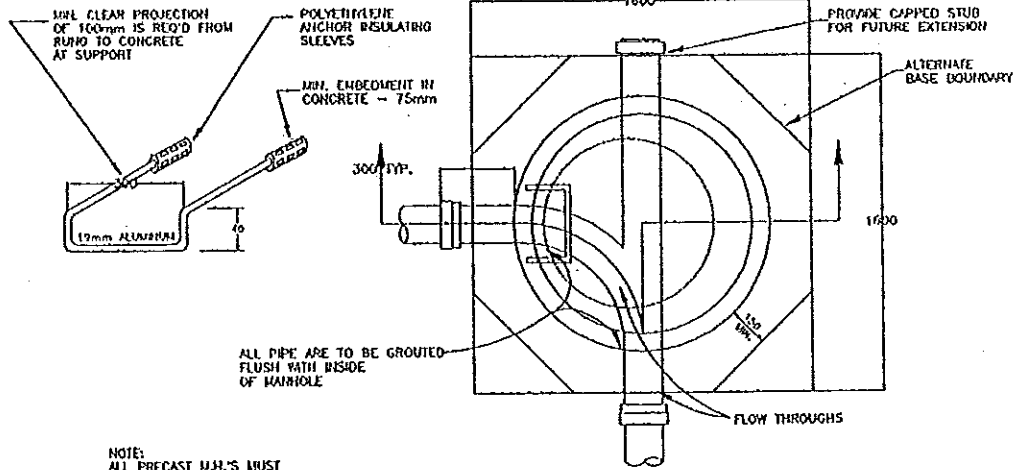
VILLAGE of KASLO

SANITARY AND STORM SEWER CONNECTIONS

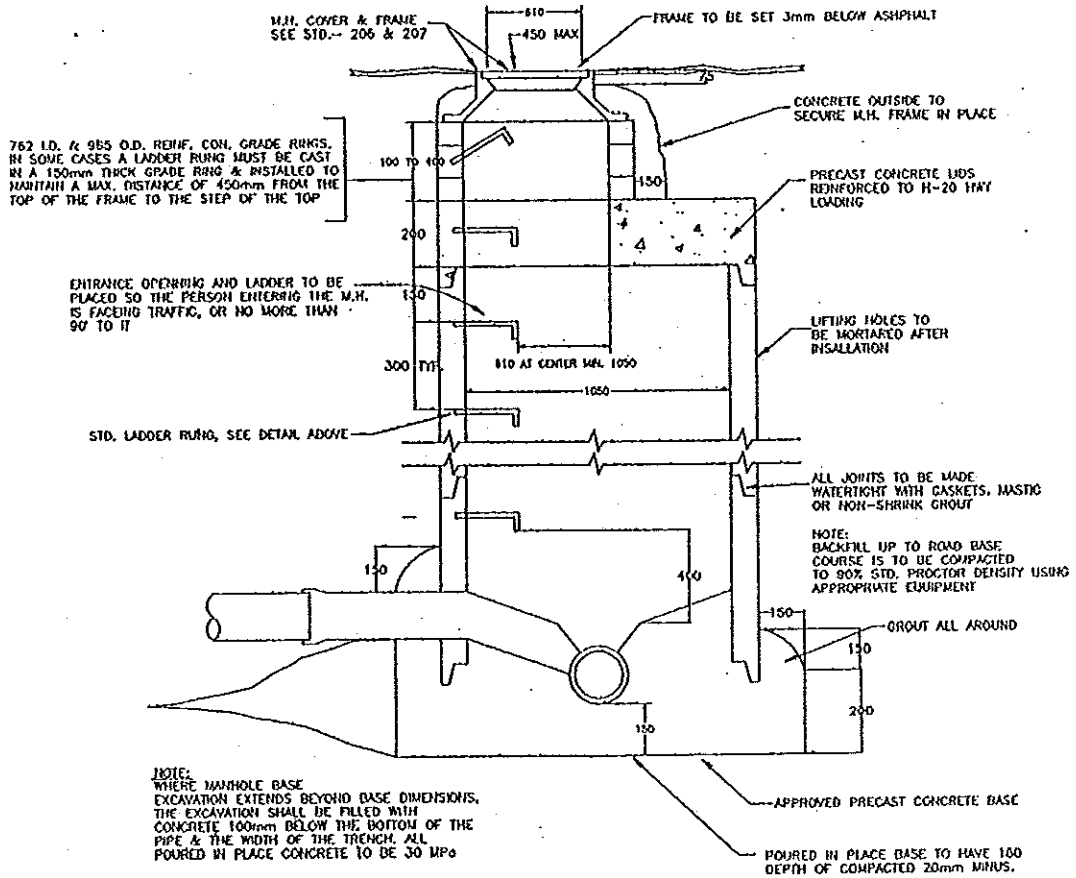
SCALE: N.T.S.

DWG. NO:

S3



NOTE:
ALL PRECAST M.H.'S MUST
CONFORM TO A.S.T.M & CSA SPECIFICATIONS
AND HAVE A MIN. 114mm WALL THICKNESS.



NOTE:
WHERE MANHOLE BASE
EXCAVATION EXTENDS BEYOND BASE DIMENSIONS,
THE EXCAVATION SHALL BE FILLED WITH
CONCRETE 100mm BELOW THE BOTTOM OF THE
PIPE & THE WIDTH OF THE TRENCH. ALL
POURED IN PLACE CONCRETE TO BE 30 MPa

POURED IN PLACE BASE TO HAVE 100
DEPTH OF COMPACTED 20mm MINUS.

VILLAGE OF KASLO

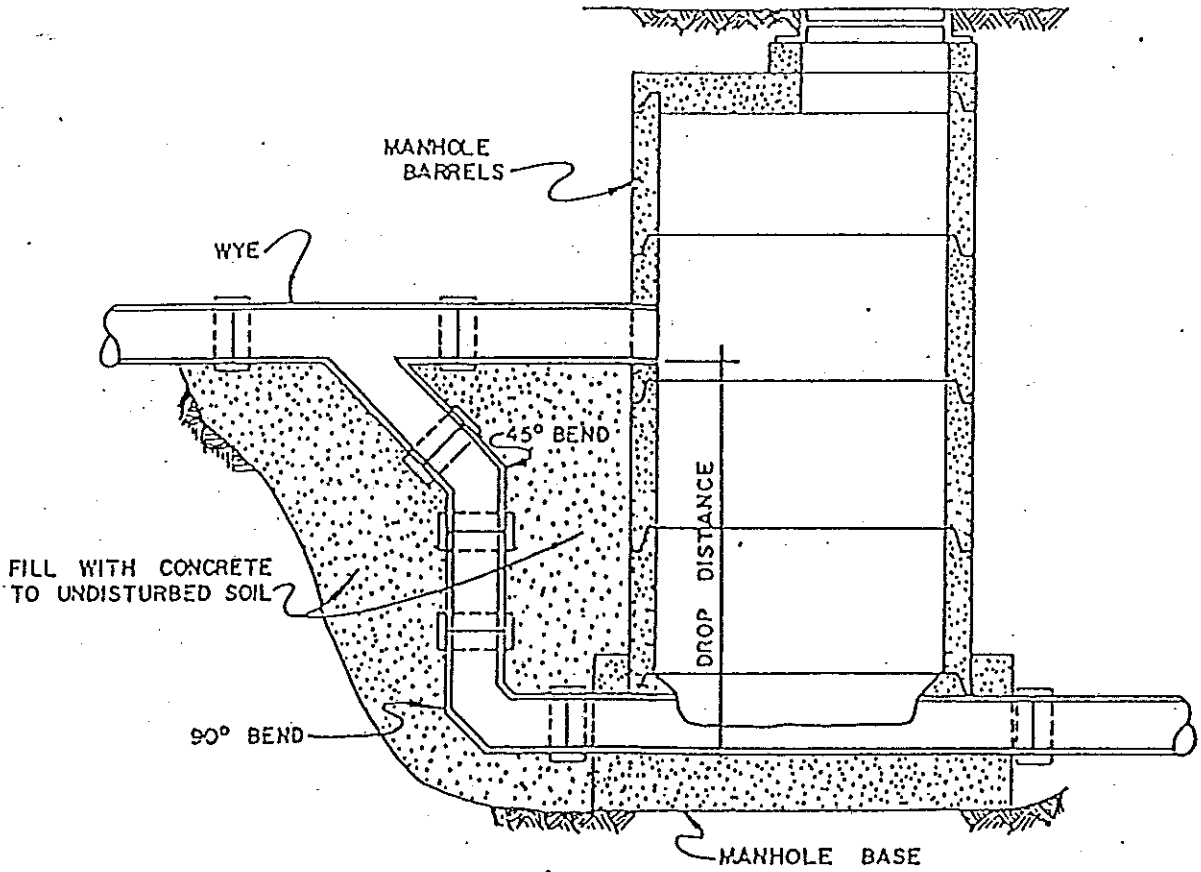
MANHOLE DETAIL

SCALE: N.T.S.

DWG. NO:

S4

PIPE	
INFLOW	EXT. DROP
200 TO 450	200
525 TO 750	250
900 TO 1200	450



NOTES:

1. THIS DRAWING ONLY APPLIES TO THE DROP SECTION (SEE STANDARD MANHOLE DETAILS).
2. AN EXTERIOR DROP IS REQUIRED WHERE THE DROP DISTANCE IS MORE THAN 0.6 . FOR SANITARY AND 2.5 FOR STORM.

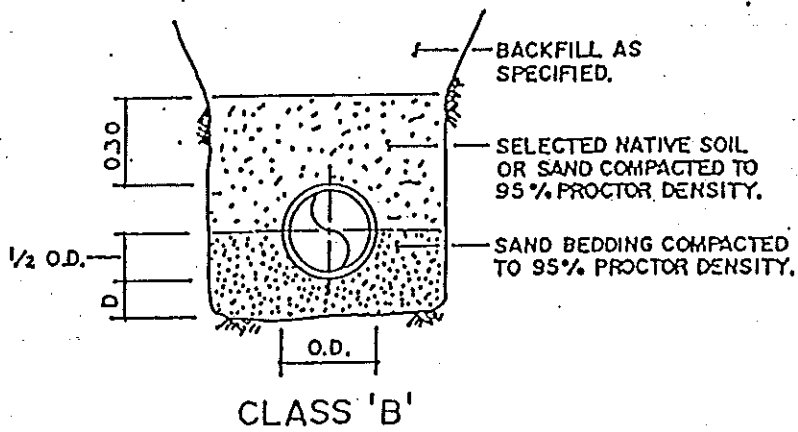
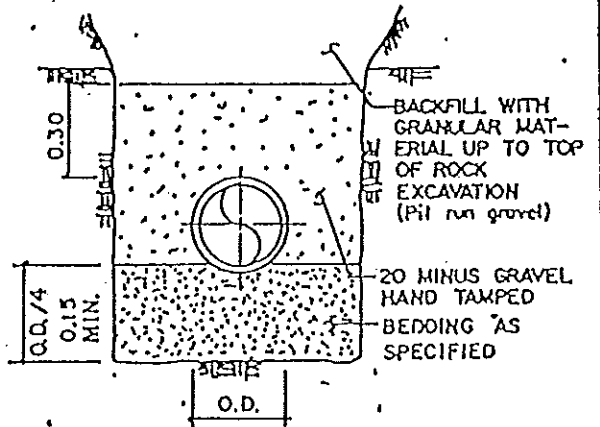
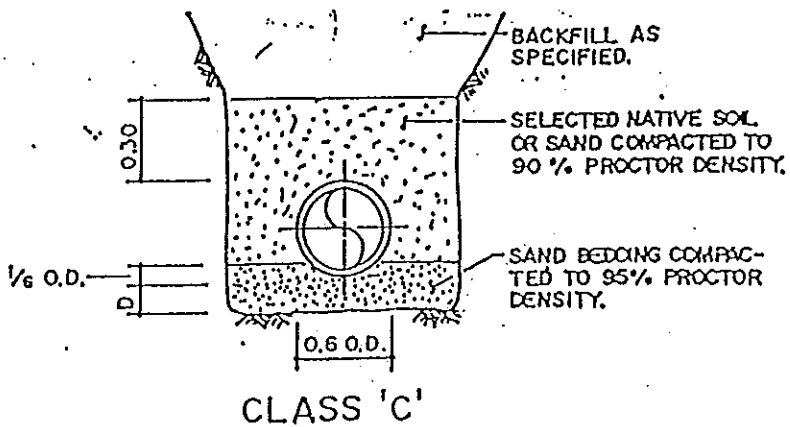
VILLAGE of KASLO

EXTERIOR DROP MANHOLE DETAIL

SCALE: N.T.S.

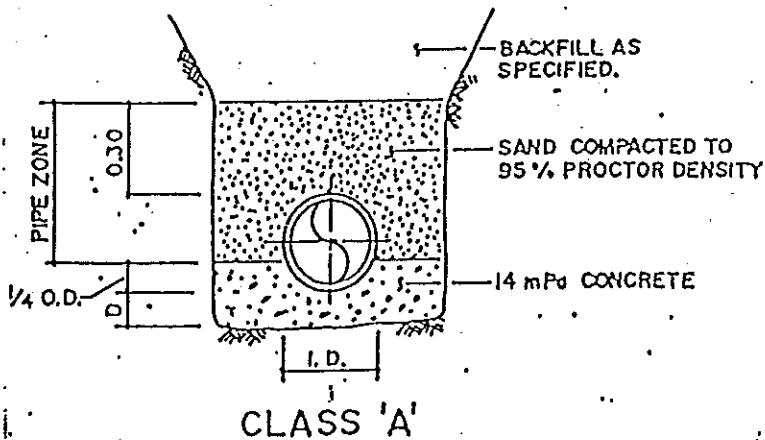
DWG. NO:

S5



ROCK TRENCH

PIPE SIZE	D (MIN)
675 or smaller	75
750 to 1500	100
1650 and larger	150
PIPE SIZE	TRENCH WIDTH
750 or smaller	O.D. + 600 MAX.
825 to 1200	O.D. + 750 MAX.
1350 and over	O.D. X 1.5 MAX.



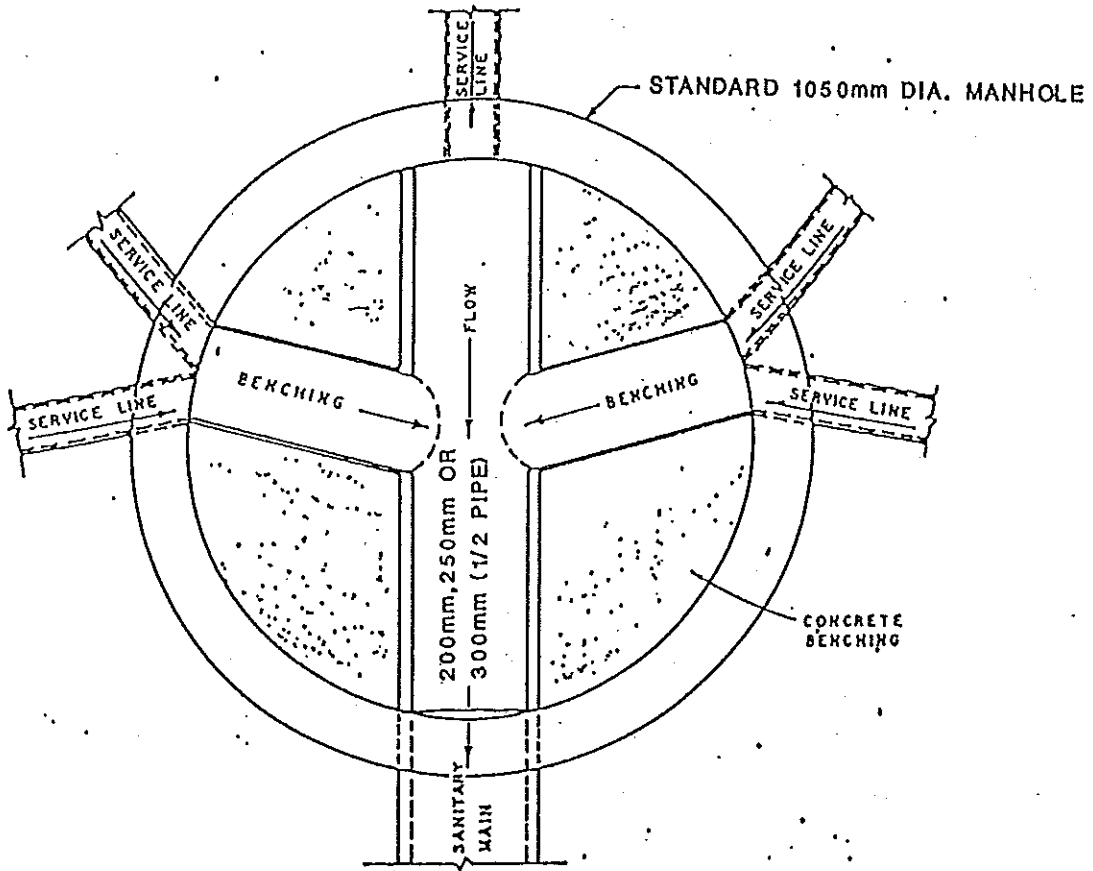
VILLAGE of KASLO

TRENCH BEDDING DETAILS

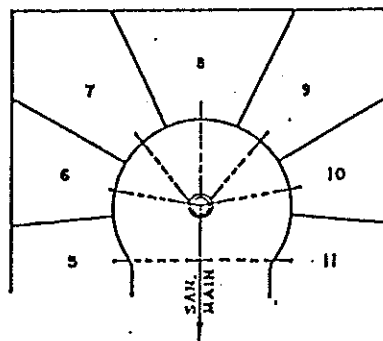
SCALE: N.T.S.

DWG. NO:

S6



NOTE: SANITARY MAIN TO GO STRAIGHT THROUGH MANHOLE WITH 1/2 PIPE TO OPPOSITE WALL.
 -MAXIMUM HEIGHT OF INLET 300mm ABOVE INVERT OF OUTLET.



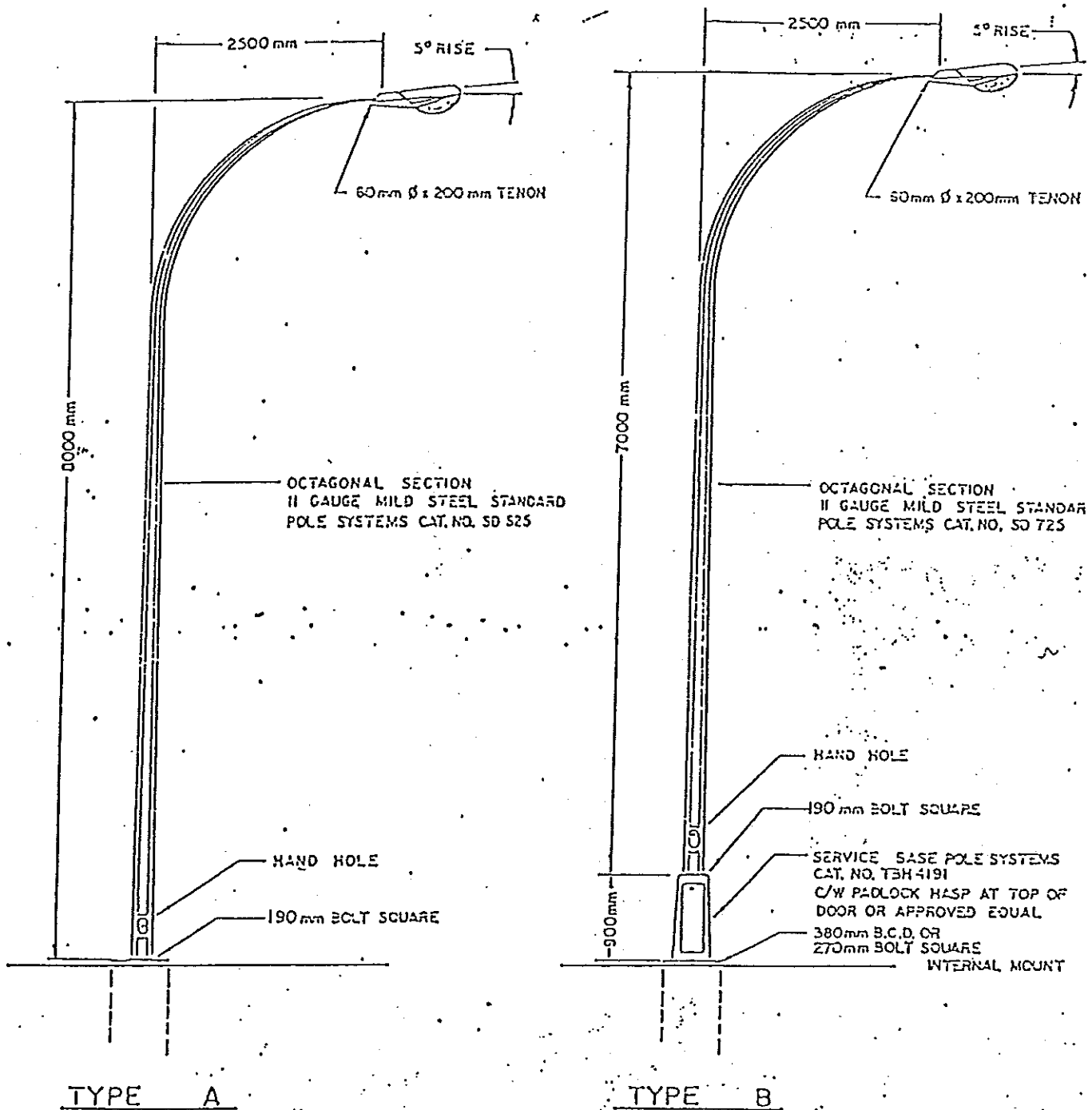
TYPICAL SITE PLAN

VILLAGE of KASLO

SERVICE CONNECTION DETAIL FOR
 SANITARY MANHOLE IN CUL-DE-SAC

SCALE: N.T.S.
 DWG. NO:

S7



1. POLES AND SERVICE BASES TO BE PRIMED AT FACTORY AND PAINTED AFTER ERECTION WITH ONE COAT OF DARK BLUE TREM CLAD.
2. BASE BOLT COVERS TO BE USED ON TYPE 'B' POLES ONLY.

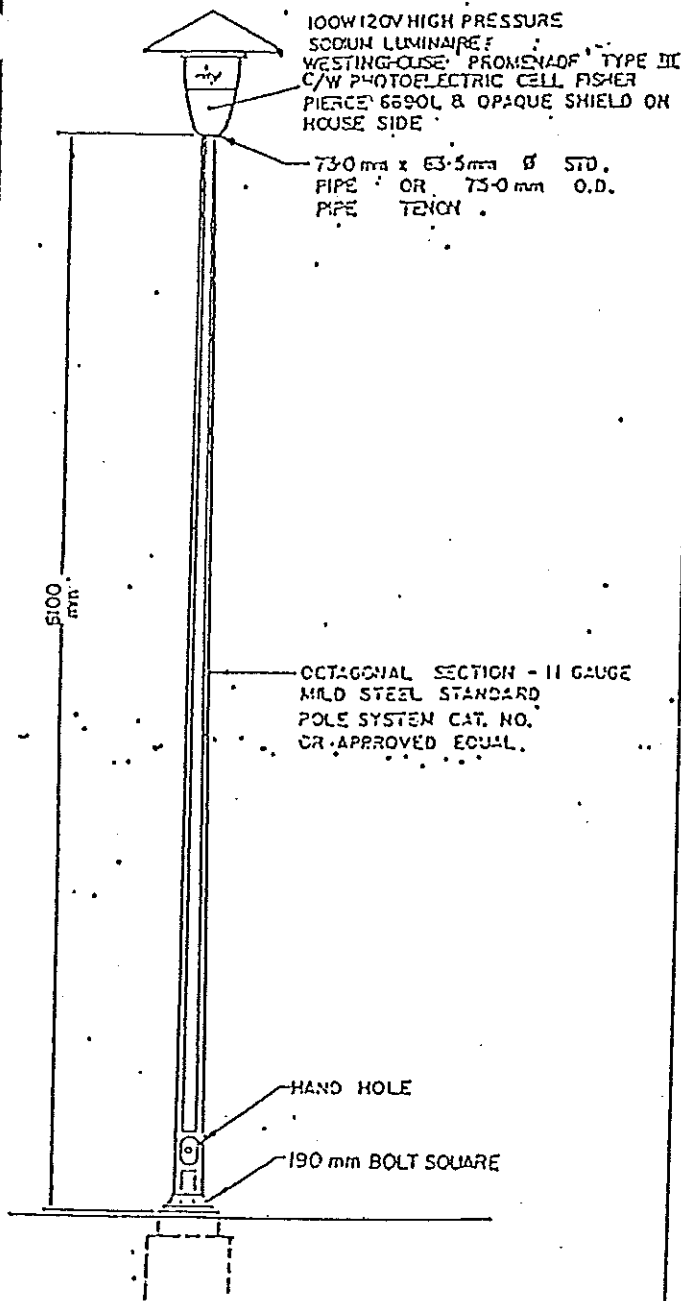
VILLAGE of KASLO

DAVIT STREET LIGHTS

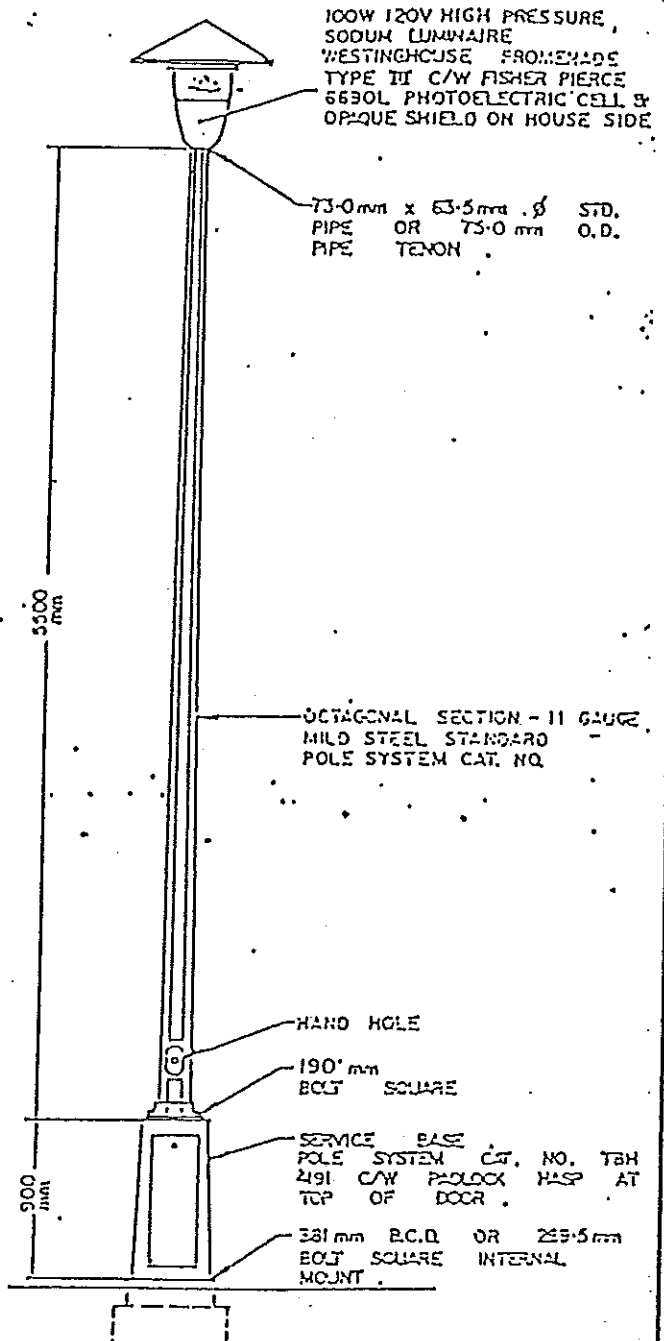
SCALE: N.T.S.

DWG. NO:

E1



TYPE C



TYPE D

NOTE:

1. POLES AND SERVICE BASES TO BE PRIMED AT FACTORY AND PAINTED AFTER ERECTION WITH ONE COAT OF DARK BLUE TREM CLAD.
2. INSTALLATION OF POST-TOP STREET LIGHTING REQUIRES APPROVAL IN ADVANCE FROM THE APPROVING OFFICER.

VILLAGE of KASLO

POST TOP STREET LIGHTS

SCALE: N.T.S.

DWG. NO:

E2