THE CORPORATION OF THE TOWNSHIP OF ESQUIMALT
SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

INDEX

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

BYLAW NO. 2175

BEING a Bylaw to regulate and control the Subdivision of land and to establish standards for Works and Services that must be installed to serve Subdivisions approved under the Land Title Act, the Bare Land Strata Regulations and building projects which are required to be serviced in accordance with Council Policy No. Plan - 27.

WHEREAS the Council may by bylaw regulate and require the provisions of Works and Services in respect of the Subdivision of land and may also require as a condition of Subdivision approval or the issuance of a building permit that the Owner provide Works and Services on that portion of a Highway immediately adjacent to the site, up to the centre line of the Highway;

WHEREAS it is deemed necessary and desirable to replace "Subdivision Plans Bylaw 1981, No. 1669" as amended;

NOW THEREFORE the Council of The Corporation of the Township of Esquimalt, in Open Meeting Assembled, ENACTS AS FOLLOWS:

1.0 This Bylaw may be cited as the "SUBDIVISION AND DEVELOPMENT CONTROL BYLAW 1997, NO. 2175.

PART 1

INTERPRETATION

2.0 DEFINITIONS

In this Bylaw:

APPLICANT means a person who has applied for approval of a proposed subdivision whether as the Owner or as the agent of the Owner of the land included therein.

APPROVING OFFICER means the officer so appointed by Council resolution according to the provisions of the Land Title Act.

COLLECTOR STREET means a street designated, from time to time, as a collector street in the Official Community Plan.

CONTRACTOR means the person or the company undertaking the construction of the Works and Services in a Development, or on municipal property, and includes the Contractor's employees, subcontractors and other duly authorized representatives.

CUL-DE-SAC means a Highway which terminates with a vehicular turning area.

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 of such land and shall include their duly authorized representative.

DEVELOPER'S ENGINEER means the Professional Engineer or Consulting Engineer engaged by the Developer to design and/or prepare drawings for the construction of Works and Services, or their duly authorized representative.

DEVELOPMENT means the subdivision of land or the construction of a building on land, which results in a requirement for the installation of Works and Services under this Bylaw.

DIRECTOR, PLANNING AND ENGINEERING SERVICES means that person appointed by Council as head of the Planning and Engineering Services Department, or designate, and is referred to as the Municipal Engineer in the Schedules of this Bylaw.

DOUBLE FRONTING LOT means a lot fronting on two streets, neither of which is a flanking or side street.

EXCESS OR EXTENDED SERVICES means those Works and Services which provide access to or serve land other than the land being subdivided or developed.

FINAL APPROVAL means that approval of a subdivision plan granted by the Approving Officer when all relevant requirements of this Bylaw, the Municipal Act, the Land Title Act and any other relevant Bylaws and legislation have been fulfilled.

FRONTAGE means that length of a Parcel boundary which immediately joins a Highway other than a Lane or Walkway. On a Parcel where more than one of the Parcel boundaries continuously adjoins a Highway, the shortest Parcel boundary shall be considered its Frontage.

INSPECTOR means that person appointed by Council to administer the Building and Plumbing Bylaw.

HIGHWAY means a public street, road, Lane, 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.

LANDSCAPE ARCHITECT means a person who is registered as a member of the British Columbia Society of Landscape Architects under the provisions of the Landscape Architects Act.

LANE means a Highway less than 10m wide.

MAJOR STREET means a street designated, from time to time, as a major street in the Official Community Plan.

MUNICIPAL DRAINAGE SYSTEM means a system owned, operated and maintained by the Municipality for the collection, conveyance and disposal of storm water.

MUNICIPAL SANITARY SYSTEM means a system owned, operated and maintained by the Municipality for the collection and conveyance of sanitary sewage.

MUNICIPAL WATER SYSTEM means a system of waterworks, within the meaning of the Health Act, which is owned, operated and maintained by the City of Victoria within the boundaries of the Township of Esquimalt.

OFFICIAL COMMUNITY PLAN means the official community plan of the Municipality as adopted by Bylaw, and amended from time to time.

OWNER - in respect of real property, means the registered Owner of an estate in Fee simple, and includes:

(a) the tenant for life under a registered life estate;

(b) the registered holder of the last registered agreement for sale;

(c) the holder or occupier of land held in the manner mentioned in Sections 356 and 357 of the Municipal Act;

PANHANDLE means a Parcel with an access strip and a Frontage of less than 10% of its perimeter.

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.

PRELIMINARY PLAN means a dimensioned sketch or plan submitted with an application for preliminary review of a proposed subdivision.

PUBLIC UTILITY means any utility facilities installed within any Highway or statutory right of way by a government or by a utility company under government control, including without limitation water, sewage, drainage, street light, electricity, telephone, cable television and gas distribution facilities

ROADWAY means that portion of a street which is improved, designed and used for vehicular traffic.

SECURITY DEPOSIT means cash, certified cheque, or an unconditional irrevocable Letter of Credit issued by a Canadian chartered bank or credit union.

STREET means a Highway which affords the principal means of vehicular access to abutting Parcels.

SUBDIVISION means the division of land into two or more Parcels, whether by plan or apt descriptive words and shall include a plan consolidation of two or more Parcels into a fewer number of Parcels.

SUBDIVISION APPLICATION REVIEW REPORT or the REPORT
means the compilation of a detailed list of requirements based on the review of an application for a proposed Subdivision. The requirements of the Report must be fulfilled to secure Final Approval of a Subdivision.

SURVEYOR means a land surveyor currently licensed and registered in the Province of British Columbia.

WALKWAY means a Highway not more than 6m wide for the use of the walking public and non - motorized vehicles, except that a walkway may be designed to afford emergency vehicle use.

WATERCOURSE means any natural drainage course or source of water, whether usually containing water or not, and includes any lake, river, stream, creek, spring, ravine, swamp, gulch, or source of ground water whether it is open or enclosed in a conduit.

WORKS AND SERVICES means all public services, facilities and utilities which are required to be installed as a condition of Subdivision or building permit approval and without limitation includes: Highways, sidewalks; boulevards, boulevard crossings; Street lighting; underground wiring; water distribution system; fire hydrant system; sewage collection system; drainage collection system; and drainage disposal system pursuant to Section 938 of the Municipal Act

PART 2

APPLICATION, COMPLIANCE AND SEVERABILITY

3.0 APPLICATION

This Bylaw shall apply to all land and the surface of waters within the boundaries of the Corporation of the Township of Esquimalt subject to Provincial and Federal Statutes.

4.0 COMPLIANCE

No land, including the surface of the water, shall be developed or subdivided except in conformity with this Bylaw.

5.0 SEVERABILITY

Any section, subsection, sentence, clause or phrase of this Bylaw which is for any reason held to be invalid by the decision of any Court of competent jurisdiction, may be severed from the balance of this Bylaw without affecting the validity of the remaining portions of this Bylaw.

PART 3

ADMINISTRATION

6.0 ADMINISTRATION

6.01 The Approving Officer shall maintain a record of all Subdivision applications submitted under this Bylaw, which shall indicate the final disposition of all such applications thereon.

6.02 All employees and officers of the municipality are authorized to enter at all reasonable times upon any property which is subject to this bylaw, to ascertain whether the provisions of this bylaw are being complied with.

6.03 The following Subdivisions are excluded from the scope of the Works and Services requirements of this Bylaw:

(a) Land which is subdivided for the purpose of creating public parkland or Parcels to support the installation of public facilities, utilities, structures and associated equipment.

(b) For applications where:

(i) no additional land registry Parcels are proposed and where the smallest of the proposed new Parcels is greater in size than the smallest of the original lots;

(ii) the Subdivision proposes a lot line adjustment, and each Parcel affected is serviced by an existing water and sewer and drain system and where no future Subdivision potential exists.

(iii) Subdivisions under the Condominium Act, provided that Works and Services on Highways immediately adjacent to condominium buildings and on the site being developed shall be provided in accordance with Council policy.

PART 4

APPROVALS

7.0 APPLICATIONS FOR SUBDIVISION OR DEVELOPMENT

7.01 An application for Subdivision shall be submitted to the Planning and Engineering Services Department (on behalf of the Municipal Clerk) on the form supplied by the Municipality. The application form is to be signed by the Owner or by his Agent.

7.02 The Owner will be required to pay Subdivision Fees as provided in the Subdivision Fee Bylaw 1991, No. 2018 as amended from time to time and may be required to provide payments and security as detailed in Schedule "A", Development Procedures and Policies of this Bylaw.

7.03 Every Owner shall, prior to Subdivision approval and subject to Section 15.01, provide Works and Services in accordance with the requirements and standards in this bylaw, within the subdivided land and on that portion of every Highway immediately adjacent to the land being subdivided, up to the centre line of the Highway.

8.0 APPROVALS

8.01 Applications for Subdivision will be reviewed for compliance with the requirements of this Bylaw and other relevant Municipal and Provincial legislation. Approval of a Subdivision plan does not imply that the Municipality will expend municipal funds on Works and Services in support of the Subdivision.

8.02 The Subdivision Application Review Report for any proposed Subdivision shall not be construed as ensuring Final Approval of Subdivision for Land Title purposes. The Report may be revoked by the Approving Officer at any time in the event that new information becomes available subsequent to review by the Approving Officer or in the event that any change in legislation, regulations or bylaws which would render the proposed Subdivision unlawful takes effect prior to the granting of Final Approval.

PART 5

GENERAL PROVISIONS

9.0 GENERAL PROVISIONS

9.01 An application to subdivide shall be in the form prescribed by Schedule 'F-4'.

9.02 Land within the Agricultural Land Reserve cannot be subdivided unless:

(a) approval has been received from the Agricultural Land Commission excluding the land from the Agricultural Land Reserve or granting relief to permit the Subdivision within the Agricultural Land Reserve; or

(b) the Subdivision can be approved by the Approving Officer pursuant to Section 1 of BC Regulation 7/81.

9.03 Applicants for Subdivision approval shall comply with the Development procedures and policies set out in Schedule "A".

PART 6

SERVICING

10.0 HIGHWAYS

10.01 All Highways shall be dedicated and constructed in accordance with the standards contained in Schedule "C" of this Bylaw.

11.0 DRAINAGE COLLECTION AND DISPOSAL SYSTEM

11.01 The Owner of any lands which are proposed to be Subdivided shall provide each Parcel of land within the proposed Subdivision with a drainage collection and disposal system including a service connection thereto, constructed in accordance with the standards contained in Schedule "B" hereto, and the said drainage system shall be connected by drainage mains to the existing Municipal Drainage System.

11.02 If no drainage collection system fronts the property to be subdivided, the Developer shall pay the cost of extending such services to the proposed Subdivision in accordance with the requirements of Schedule "E".

12.0 WATER DISTRIBUTION SYSTEM

12.01 The Owner of any lands which are proposed to be Subdivided shall provide each Parcel of land within the proposed Subdivision with a water distribution system and a fire hydrant system, including service connections thereto, which shall be constructed in accordance with the Master Municipal Construction Document, Volume II, Printed 1996, as adopted by the City of Victoria and shall be connected to the existing City of Victoria Water System.

12.02 Where proposed Subdivisions front an existing water main, or where the proposed Development constitutes an infill within an existing water service area, connection to the existing water main or extension of water mains shall be secured from the City of Victoria.

12.03 If no water main fronts the property to be subdivided, the Developer shall pay the cost of extending such services to the proposed Subdivision in accordance with the requirements of Schedule "E".

13.0 SEWAGE COLLECTION AND DISPOSAL SYSTEM

13.01 The Owner of any lands which are proposed to be Subdivided shall provide each Parcel of land within the proposed Subdivision with a sanitary sewage collection system including the standard service connection thereto, constructed in accordance with Schedule "B"_of this Bylaw, and the said sewerage system shall be connected by sewer mains to the existing Municipal Sanitary System.

13.02 If no sewer main fronts the property to be subdivided, the Developer shall pay the cost of extending such services to the proposed Subdivision in accordance with the requirements of Schedule "E".

14.0 UNDERGROUND WIRING AND STREET LIGHTING

14.01 The Owner of any lands which are proposed to be Subdivided shall provide each Parcel of land within the proposed Subdivision with underground wiring in accordance with Schedule "D & E" of this Bylaw.

14.02 The Owner of any lands which are proposed to be Subdivided shall provide all Highways and footpaths with Street lighting serviced by underground wiring in accordance with Schedule "D & E" of this bylaw.

15.0 COMPLETION OF THE WORKS AND SERVICES

15.01 All Works and Services required to be constructed and installed at the expense of the Owner shall be constructed and installed to the standards prescribed in this Bylaw before the Approving Officer approves the Subdivision or (where required as a condition of building permit issuance) the Inspector issues the building permit unless the Owner:

(a) deposits with the Municipality a Security Deposit in the amount of 120% of the estimated construction cost, as estimated by the Municipality, for installing and paying for all Works and Services required under the Bylaw; and

(b) Enters into a Servicing Agreement with the Municipality to construct and install the required Works and Services by a specified date or forfeit to the Municipality the amount secured by the Security Deposit.

(c) Building Permits within a subdivided Parcel will not be issued until all underground works are completed and all road construction has been completed to structurally adequate levels for emergency vehicle access.

16.0 SERVICE LEVELS

16.01 All single family and two-family residential zoned properties, at the time of Subdivision approval, shall be serviced to the Service Level 1 requirements in accordance with Schedule "E" .

16.02 All multi-family, commercial, industrial, public use, marine use and comprehensive Development zoned properties, at the time of Subdivision approval, shall be serviced to Service Level 2 requirements in accordance with Schedule "E".

PART 7

VIOLATIONS

18.0 VIOLATIONS

18.01 No person shall contravene this bylaw or suffer or permit any act or thing in contravention of this bylaw.

19.0 PENALTY

19.01 Every person who violates any of the provisions of this bylaw or who suffers or permits any act or thing to be done in contravention of this bylaw, commits an offence, and shall be liable to the penalties hereby imposed.

19.02 Any person who violates any of the provisions of this bylaw shall be liable upon summary conviction to a penalty of not more than ten thousand dollars ($10,000).

19.03 Each day that violation of this bylaw is caused to continue constitutes a separate offence.

PART 8

SCHEDULES

20.0 BYLAW SCHEDULES

20.01 The following is a list of Schedules attached hereto and which form a part of this Bylaw:

Schedule "A"	Development Procedures and Policies
Schedule "B"	Regional Specifications — Design and Construction Specifications — Sewer and Drain
Schedule "C"	Design and Construction Specifications — Roadways
Schedule "D"	Design and Construction Specifications — Street Lighting
Schedule "E"	Service Levels
Schedule "F"	Standard Forms and Agreements

PART 9

REPEAL OF PREVIOUS BYLAW

21.0 CITATION

21.01 "Subdivision Plans Bylaw 1981 No. 1669" as amended is hereby repealed.

22.0 BYLAW EFFECTIVE DATE

22.01 This Bylaw shall come into force and have effect on

Read a first time by the Municipal Council on December 8, 1997.

Read a second time by the Municipal Council on December 8, 1997.

Read a third time by the Municipal Council on December 8, 1997.

ADOPTED by the Municipal Council on January 12, 1998.

R. T. RICE
MAYOR

R. SERIGHT
MUNICIPAL CLERK

[bylaws/subdiv3]

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'A'

DEVELOPMENT PROCEDURES AND POLICIES

INDEX

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'A'

DEVELOPMENT PROCEDURES AND POLICIES

1.0 Introduction

1.01 This section contains Development Procedures and Policies that are particular to the Township of Esquimalt.

2.0 General Information and Policies

2.01 Development in the Township of Esquimalt is the responsibility of private enterprise. The entire cost of Works and Services is usually at the Applicant's expense.

2.02 Topographical surveys, design and preparation of drawings for all services shall be carried out by Consulting Engineers engaged by the Applicant.

2.03 If approval of a subdivision plan is requested prior to completion of the Works and Services required by this bylaw, a covenant under Section 219 of the Land Title Act shall be registered against the properties that prohibits building permit issuance until water, sanitary sewer, and drainage works together with a road capable of supporting emergency and service vehicles are installed and approved by the Director, Planning and Engineering Services, as ready for use. In addition, all road cuts and underground service work which might restrict use of the road shall be completed and as-built drawings for the water, sewer, and drain works must have been delivered to, and approved by the Municipality.

3.0 Right-of-Way or Easement Documents

3.01 The Applicant shall prepare all Right-of-Way documents for Sewer, Drain and Water as required by the Approving Officer where the Municipality will assume responsibility for maintenance. A sample document will be provided and all clauses and conditions shall be included.

(a) Documents for Rights-of-Way outside of the Subdivision shall be deposited in the Land Title Office by the Applicant for registration prior to Design Approval.

(b) Any private easement documents must also be prepared by the applicant's lawyer and must be submitted for review by the Approving Officer prior to plan approval. A lawyer's letter of undertaking to register the Municipal Right-of-Way and private easement documents with the Subdivision Plan is required prior to finalization of the Subdivision Plan for registration.

3.02 Right-of-Way documents for power, telephone and cablevision facilities shall be prepared and registered by the respective Utility companies.

3.03 Where a single storm drain, sanitary sewer or water Right-of-Way is required, the minimum acceptable width is 3.1 m.

3.04 Where more than one service is installed in a Right-of-Way, the width of the Right-of-Way must be increased sufficiently to accommodate the pipe sizes required together with no less than 1.2 m of clearance between pipes and edge of Right-of-Way. The minimum acceptable width is 3.7 m.

3.05 Rights-of-Way shall be located within a single property adjacent and parallel to property boundaries and shall be clear of proposed building sites.

3.06 Rights-of-Way shall be provided by the Applicant for the eventual extension of the sanitary sewer and/or storm drains required by the Approving Officer.

4.0 Engineering Supervision

4.01 The Consulting Engineer shall be responsible for the layout, inspection and approval of materials and the supervision of installation of all services which are the responsibility of the Applicant, all in accordance with the requirements and standards of this bylaw.

4.02 Engineering Supervision shall consist of general and sufficient resident inspection to ensure that the works and services are constructed in accordance with the approved design drawings. Sufficient inspection shall range from a minimum of one site visit per day during construction to full-time resident inspection for major developments. The Consulting Engineer shall submit copies of his inspection reports, when requested, to the Municipal Engineer.

4.03 In addition to the Consulting Engineer carrying out supervision, the Municipality may periodically inspect the work and assist in co-ordinating Subdivision construction with any related Municipal works. Any use of unacceptable materials or practices shall be brought to the attention of the Contractor and the Consulting

Engineer. If remedial action is not taken to the satisfaction of the Director, Planning and Engineering Services, he may issue instructions to the Consulting Engineer to cease construction until remedial action is taken.

4.04 If the Consulting Engineer wishes to make any changes in approved design either before or during the execution of the work, he shall first submit a marked print showing proposed revisions to the Director, Planning and Engineering Services. If approval is granted for revision, the original drawing shall be immediately revised, signed by the Director, Planning and Engineering Services and new prints issued. These two operations may be carried out simultaneously.

4.05 The attention of the Consulting Engineer is directed to the safety regulations of the Workers Compensation Board.

4.06 All Municipal employees have been instructed not to enter excavations which are not properly braced and, therefore, no approval will be given to installations which cannot be inspected because of unsafe working conditions.

5.0 Circulation and Approval of Design Drawings

5.01 Design drawings must be submitted to and approved by the Director, Planning and Engineering Services before the construction of any Works and Services within any Highway or municipal Right-of-Way commences. All pertinent design information must be completed on the design drawing submission by the Consulting Engineer. Design Drawing Numbers must be obtained from the Municipal Engineering Department prior to submission.

5.02 If the drawings are not satisfactory for circulation, a marked set and correction sheet will be returned to the Consulting Engineer.

5.03 After circulation and review by Municipal Departments, a comment sheet is compiled. This is returned to the Consulting Engineer for revisions to the design drawing.

5.04 When all items have been corrected the Consulting Engineer shall submit estimates, drawings and other required data for final approval. If all items are not received, drawing approval will be withheld.

5.05 Approval by Parks and Recreation Department must be obtained prior to Design Drawing Approval for any tree removal within the boulevard or works within parkland.

5.06 A letter of confirmation to the Municipal Engineer, in the form set out in Schedule F-1 to this bylaw, that an Engineer Client agreement is in force must be received prior to design approval by the Municipality. The Engineer Client Agreement must provide for the level of engineering service required in this specification.

5.07 A print of the registerable plan of Subdivision must be submitted to the Approving Officer prior to design approval.

5.08 Any right-of-way outside of the proposed Subdivision plan must be obtained and registered by the Applicant or his agent prior to Design Approval. See section 3.0 of this specification for Right-of-Way preparation procedure.

5.09 Where authorization and/or permits are required from Senior Governments or other agencies, it is the Applicant's responsibility, through his agents, to obtain these. Developments adjacent to, affected by, or affecting the following, will require plans to be submitted to the appropriate non-municipal agency:

(a) Provincial Highways
(b) Railway, B.C. Hydro, Centra Gas, B.C. Telephone, Shaw Cable rights-of-way
(c) Main water courses
(d) Drain outfalls
(e) Canada Post Super Mail Box locations

The above approvals are required prior to design approval except for Super Mail Box locations which must be obtained prior to Subdivision approval.

5.10 Upon completion of all drawings and estimates to the satisfaction of the Director, Planning and Engineering Services as being in accordance with good engineering practice, he shall approve the design of all drawings (four prints).

5.11 A covering letter is prepared detailing the costs of Works and Services to be completed by the Applicant and payments required for those Works and Services to be completed by Municipal forces at the Applicant's expense.

5.12 Following approval, the covering letter and an approved print of the design are returned to the Consulting Engineer.

6.0 Service Installation

6.01 The following steps shall be carried out prior to start of construction of the Works and Services:

(a) Design drawings must have approval of the Director, Planning and Engineering Services.

(b) The Consulting Engineer shall make arrangements to inspect the site of the work in the company of the Municipal Engineer, or his designate, and Contractor 24 hours prior to start of construction.

If work proceeds without Municipal inspection, the Director, Planning and Engineering Services may require that works to be exposed for an inspection prior to approval.

(c) Proof of Public Liability Insurance in the amount of $5 million per occurrence, with a deductibility of not more than $10,000 shall be provided to the Director, Planning and Engineering Services prior to work on a Municipal road allowance and/or right-of-way.

(d) Works and Services that must be carried out by Municipal crews are subject to prepayment of the estimated or fixed costs. Two weeks must be allowed after payment for preparation of work order and scheduling of the work.

(e) Every effort must be made to protect boulevard trees from harm during service installation. No tree root over 25 mm in diameter may be cut or damaged on any boulevard tree.

6.02 A copy of the approved Design Drawing and Municipal Specifications and Standard Drawing shall be maintained by the Contractor at the construction site during the installation of all services.

6.03 Underground Subdivision services shall not be permitted to operate as part of existing Municipal services until the respective Subdivision services have been inspected, tested and approved in writing by the Director, Planning and Engineering Services.

7.0 Approval for Registration of a Subdivision or Issuance of a Building Permit

7.01 To facilitate early registration of the Subdivision plan or issuance of a Building Permit prior to service installation the following criteria must be completed:

(a) Development Servicing Agreement between the Applicant and the Municipality shall be executed.

(b) Materials and Workmanship Warranty Agreements shall be executed.

(c) State of Title Certificate of each legal description involved shall be delivered to the Director, Planning and Engineering Services.

(d) Certified cheque or irrevocable letter of credit equal to 120 % of the deposit total. Irrevocable letters of credit will not be accepted for deposit totals less than $3,000.00.

(e) Payment by cheque or cash for the Works and Services to be installed by Municipal crews.

(f) Legal descriptions and references to ownership on all documents must conform exactly to that appearing on the State of Title Certificate.

7.02 Should service installation be completed prior to Subdivision Plan registration or building permit issuance, the following criteria must be completed:

(a) Submission and approval of as-built drawings.

(b) Posting of Material and Workmanship Warranty bonding.

(c) Completion of sections (b), (c), and (e) of Section 7.01.

7.03 Right-of-Way documents (if applicable) must be prepared and registered to the satisfaction of the Municipality. See Section 3.0 of this specification for details.

8.0 Municipal Acceptance of Works and Services

8.01 Upon the authorization of the Director, Planning and Engineering Services and after receipt of satisfactory as-built drawings, warranty security and the acceptance of the required Works and Services, any relevant deposits guaranteeing the satisfactory installation of the Works and Services shall be returned to the Applicant.

8.02 Warranty security shall be held by the Municipality in the form of an irrevocable letter of credit or cash deposit for the one (1) year period of warranty for all services. The security shall be 5% of the deposit total, with a minimum of a five hundred dollar ($500.00) deposit.

8.03 The Director, Planning and Engineering Services may release a portion of any deposit for work requiring an extended period to construct provided that:

(a) The Consulting Engineer certifies in writing the extent and value of work completed, as well as itemizing the outstanding work and cost of same (including outstanding engineering fees for as-built submission if applicable), and that the completed Works and Services meet the specifications of the Municipality.

(b) Verification is obtained from the Municipality that the work to date is acceptable.

8.04 Deposits may be released according to the following schedule:

(a) If the total estimated value of construction is less than $10,000., no reductions will be permitted.

(b) If the total estimated value of construction is $10,000. or greater, but less than $100,000., up to 75 % may be released to a minimum of $10,000.

(c) If the total estimated value of construction is $100,000. or greater, up to 85 % may be released to a minimum of $25,000.

8.05 As-built drawings are checked for field deficiencies, drafting requirements, agreement with the site layout and adherence to Regional Specification B-2 in Schedule B. If the drawings are unacceptable, a correction list is prepared and sent to the Consulting Engineer.

(a) Construction Completion Certificate - When all field deficiencies and as-built drawing corrections have been rectified, a Construction Completion Certificate shall be prepared for signature of the Director, Planning and Engineering Services. The period of the Material and Workmanship Warranty will begin on the date the as-built drawing is approved.

9.0 Warranty of Works and Services

9.01 The Owner/Applicant shall be responsible for and at his own expense execute all work, repair, alteration, reconstruction or replacement required to remedy any defect, fault or deficiency in or developing in the completed work not only up to the receipt and approval of the Consulting Engineer's as-built drawing but also during the period of warranty of twelve (12) months after the date of approval of each as-built drawing.

9.02 All such works of rectification, repair and warranty shall be executed upon the written request of the Director, Planning and Engineering Services. Should the Applicant neglect or fail to commence the execution of such works within the time period given by the Director, Planning and Engineering Services, the Municipality shall complete the remedial works according to the terms of the Warranty Agreement.

9.03 Final Acceptance by the Municipality

(a) The Municipality shall inspect the Works and Services prior to the expiration of the warranty period. Any deficiencies shall be corrected as noted above prior to release of deposits.

(b) If rectification or repair does not take place within the time allowed by the Municipality, the Municipality may complete the remedial works according to the terms of the Warranty Agreement.

(c) If no deficiencies have developed during the warranty period, deposits shall be released.

10.0 Testing

10.01 After the sewer pipe has been laid and the trench has been backfilled, the Contractor shall test all sanitary sewer for water-tightness, improper jointing, fractures, broken pipes and other defects in the presence of the Consulting Engineer and Municipal representative.

10.02 Air testing will be the primary means of testing sewer lines up to and including 750 mm in diameter, a modified air test will be the primary acceptance test. Infiltration or exfiltration tests shall be substituted for air testing if required by the Director, Planning and Engineering Services

10.03 If the sewer being tested fails to pass the pressure test, the Contractor shall, at his own expense, determine the cause of failure and make all required repairs. The main shall be re-tested after being repaired.

10.04 The Consulting Engineer shall, at his direction, arrange for periodic compaction testing within the trench where trenches are over one metre deep. Test results shall be submitted to the Director, Planning and Engineering Services.

10.05 The Municipality shall flush all sewer and drain mains prior to use as a municipal system. The cost of such flushing will be borne by the applicant.

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'B'

REGIONAL SPECIFICATIONS - SEWERS AND DRAINS

INDEX

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'B'

REGIONAL SPECIFICATIONS - SEWERS AND DRAINS

A. ESQUIMALT EXCEPTIONS TO REGIONAL SPECIFICATIONS

1.0 Introduction

1.01 Except as otherwise provided in this schedule, the Regional Municipal Specifications and Standard Drawings developed by Greater Victoria municipalities and dated July 1991 shall be followed in the design and construction of underground services.

2.0 Exceptions

2.01 Reference to water distribution system and water connection design and construction shall be exempted. Design and construction of water shall conform to City of Victoria requirements.

2.02 Mylar copies of as-built drawings specified in B2, 2.01 are not required. In their place, a digital copy of the revised design drawings (as-built), in a current version of AutoCad, shall be supplied.

REGIONAL SPECIFICATION B 1

SPECIFICATION OF DESIGN DRAWINGS

1.0 Scope

1.01 This specification shall govern the preparation of all engineering drawings for design of services within the Municipality.

2.0 General

2.01 Any information received from the Municipality on existing services shall be used as a guide only. Verification of locations and elevations must be checked by actual survey. The Municipality takes no responsibility for the exactness of service information obtained from plates and drawings. Confirm underground locations with utility companies.

2.02 Vertical control shall be shown in metric geodetic datum (mean sea level 0). Bench mark numbers, locations and elevations can be obtained from the Municipality. The reference bench mark and elevation shall be shown on the design drawing. Elevations below 0 geodetic shall be hi-lighted

2.03 Show the elevation of all: iron pins, existing basement floors and, where the building site is less than 1m above the road level, any proposed basement floor elevation. This information and connection information may be in pencil at the design stage but shall be to inked standards for as-built drawing submission. For subdivisions, indicate by shading the potential building envelope and, where land is below the calculated minimum floor elevation, show elevations at corners of the envelope or show a centre of lot profile to determine the amount of fill required for building.

2.04 All existing statutory rights-of-way or easements and their permitted uses must be checked through the Land Titles Office and be shown lightly shaded on the design drawing. Registration numbers shall be shown.

2.05 All proposed rights-of-way for new services are to be shown as a dashed line. These shall be tied to the iron pin in each lot, together with their width, permitted use, and the note "acquire" or "proposed". Right-of-way documents shall be prepared as detailed in these specifications.

2.06 A north arrow, existing and proposed street names shall be shown on the design drawing. The north shall be generally orientated towards the top of the sheet.

2.07 All services shall generally be shown on one plan with curbs (mountable or non-mountable), sidewalks, sewers, drains, gas, water, and underground wiring and poles identified as MC or NMC, S/W, S, D, G, W, and U/G, H or T respectively. Other services shall be clearly designated on the drawing.

2.08 Existing watermains, sanitary sewer mains, storm drains (including all appurtenances), ditches, pavement, curbs, sidewalks, underground wiring, gas, poles, trees, service connections and other underground utilities shall be indicated in plan and profile where applicable.

2.09 All proposed utilities shall be fully dimensioned as specified.

3.0 Drawing Information

3.01 Standard sheet size is A1 metric size 594mm x 841mm.

3.02 Use transparent plan/profile paper complete with standard Municipal title block in the lower part of the sheet. This paper may be purchased from the Municipality. Personalized Company plan/profile paper may be used provided it can meet the following requirements:

1) Plan view shall be in the lower half of the page with Municipal title block added in the lowest 50 mm of the page.

2) Profile view shall be 1 x 5 lines to the centimeter and occupy the upper half of the page.

The use of plan on one sheet and profile on a second sheet shall not be allowed.

3.03 Dimensioning of drawing shall be given from an existing or proposed iron pin or lot line.

3.04 Proposed construction shall shown as dashed lines and the existing shown as solid lines.

3.05 Lines and printing shall be in Leroy and be of uniform size using the following weights for:Lot lines #.25; Road lines #.5; Sewer, drain, water lines #.35. Construction notes shall be confined to a separate "note" column, wherever possible, with numbered references in plan or profile.

3.06 Road chainage shall be tied to an iron pin from the start of construction.

4.0 Scales

Normally:	Horizontal 1:500	Vertical 1:100 or 1:50
Details: *	Horizontal 1:200	Vertical 1:20 or 1:50
Cross Sections:	Horizontal 1:100	Vertical 1:100
Structural Details	1:20	

* e.g.:a detail of piping around two closely spaced manholes

5.0 Requirements for Subdivision Key Plan

5.01 A key plan, when required, shall be on the right side of the design drawing and shall include the following information:

a) Plan of adjacent streets and existing lots with streets named and legals of adjacent lots given;

b) Civic address with the property being subdivided shown shaded;

c) North arrow;

d) The location of existing and proposed hydrants;

e) Contours at 1, 2 or 5 m intervals;

f) Title "Proposed Subdivision of (give the full legal) ";

g) If the subdivision is to be developed in stages, each proposed stage shall be clearly outlined and order of development indicated.

5.02 If a key plan is not required, the house number of existing houses shall be shown on the detailed design plan.

6.0 Requirements for Roads or Parking Areas

6.01 Show all iron pins adjacent to the works and the existing ground elevation at each pin or proposed pin.

6.02 Both plan and profile shall be tied to an iron pin, preferably near or at 0 + 0 chainage. If the chainage exceeds 120 m, a second tie shall be shown.

6.03 Show the road width, curb and sidewalk offsets measured from the property line.

6.04 Road profiles shall show gutter elevations. Except centre line profiles will be used where there are no curbs.

6.05 Detail the road construction with a cross sectional view of construction when circumstances require special consideration. In all cases the standard drawing section shall be referenced on the drawing.

6.06 The profile shall be shown at true centreline length and provided in as close relationship as possible to the plan.

6.07 Locate catch basins.

6.08 Locate barricades.

6.09 Locate ditches and centre of pavement in minimum road construction by offsetting to property line.

6.10 Existing and proposed critical driveway locations within the subdivision shall be shown as well as a profile of each driveway from the road centreline to the end of the driveway within the property.

6.11 Chainage of the BC and EC of horizontal curves shall be shown together with the internal angle, tangent length, arc and centreline radius. Curb radii shall be shown.

6.12 The percent grade to two decimal places shall be shown on the profile together with the following information on vertical curves:

a) The chainage and elevations of BVC, EVC, and VPI;

b) The external value, e;

c) The length of vertical curve;

d) The elevation and chainage of the low spot of sag curves.

6.13 On superelevated curves and cul-de-sacs on vertical and horizontal curves, show a gutter profile (no centreline profile).

7.0 Requirements for Sewer and Drain

7.01 The following information shall be shown on the profile:

a) Size, type, class of pipe, class of bedding:

b) Percent grades to two decimal places. If critical, mark "CR" after the grade, if not critical, show the minimum grade thus:(1.08% min.);

c) Invert elevations at both inlet and outlet of manholes;

d) Information on vertical curves as detailed in paragraph 6.12;

e) Existing utilities.

7.02 The following information shall be shown on the plan:

a) Information on horizontal curves as detailed in paragraph 6.11;

b) Pipe offsets from property line;

c) The grade of the connection from the upper end to the drop to the main if other than two percent.

7.03 The following additional information shall also be shown on the appropriate part of the drawing:

a) Letter sanitary sewer manholes and cleanouts;

b) Number storm drain manholes, cleanouts and silt traps;

c) Structural detail of all manholes not covered by Municipal Standard Drawings D-1, D-2, S-1, and S-2.

8.0 Requirements for Water

8.01 Drawings shall indicate whether the watermain passes over or under other underground utilities which it is crossing, shown --⌒-- or --⌣--

8.02 The following information shall be shown on the profile:

a) The size, type and class of pipe, and class of bedding.

b) For mains 200 mm and larger, profile grades to 2 decimal places.

8.03 The following information shall be shown on the plan:

a) The offset of the main centreline from the property line.

b) Where the short pipe lengths are required on curves, refer to Municipal Specification W-1, paragraph 3.11.

c) Extent of work required of the Municipality in making the connection to the existing watermain.

9.0 Requirements for Other Utilities

9.01 Complete details of other utilities shall be obtained from the appropriate utility company.

9.02 The following information shall be shown on the plan:

a) Existing utilities.

b) Utility offset from property line and/or iron pin.

c) Lot connections and other appurtenances.

d) Existing and proposed poles shall be dimensioned from the pole road face to property line and/or pin.

9.03 Underground hydro, telephone and gas shall be shown schematically.

10.0 Requirements for Street Lighting

10.01 The following information shall be shown on the plan:

a) Location of existing luminaires.

b) Location, type and wattage of proposed luminaires.

b) Line diagram and junction boxes.

11.0 Electronic Data Storage Systems

New section to be written.

REGIONAL SPECIFICATION B 2

AS-BUILT DRAWINGS

1.0 Scope

1.01 This spectification governs as-built drawings of the following services:drains, sewers, water, gas, roads, curbs, lighting, sidewalks, underground power, telephone and cablevision, culverts, bridges, and other miscellaneous permanent structures.

2.0 General

2.01 As-built drawings shall consist of one paper print of the approved design drawing with changes or corrections made as required in Section 2.02. This shall be followed after approval by a mylar of the original design drawing, revised as required to show services as constructed.

2.02 The as-built drawings shall clearly show the location of all services as installed using offsets from survey pins. The extent shall be shown by inking the constructed service in the appropriate colour. The locations will be shown either by check-marking any original dimension on the drawing(if they are correct) or by showing the revised dimension beside the original dimension. In addition, the location to the end of underground pipe shall be shown.

Sanitary sewer	red
Storm drains and culverts	green
Water dark	blue
Gas	brown
Curb, sidewalk and road	orange
Lighting	pale blue
Underground - Power	purple
Telephone	purple
Cablevision	purple

2.03 Within two weeks of completion of water and within four weeks of completion of all other services to be installed by the Applicant, the Consulting Engineer shall deliver "as-built" drawings to the Municipal Engineer. These drawings shall include the following statement signed, sealed and dated by the Consulting Engineer:

"I certify that the following services (name them)

were inspected during construction and to the best of my knowledge, were installed in accordance with Municipal Specifications and Standard Drawings and as shown on this drawing."

3.0 Tolerances

3.1
a) All horizontal dimensions shall be to the nearest 150 mm;
b) All vertical elevations to the nearest 3 mm except that ground elevations and service connection inverts at property line shall be to the nearest 30 mm;
c) Road horizontal locations shall be to the nearest 30 mm;
d) Road vertical locations shall be to the nearest 15 mm.

4.0 Additional Required Details

4.01 Drain and Sewer

a) Location of rock cuts and hardpan requiring blasting, and depth of the rock excavation;

b) The invert elevation at both inlet and outlet of manholes;

c) Tie locations of manholes, cleanouts and other appurtenances to iron pins;

d) Locate catch basin leads at the main by measurement from the centre of the downstream manhole;

e) Locate service connections at property line showing distance from the nearest I.P. and at the main by chainage from the centre of the downstream manhole.

f) Show ground and invert elevations of sewer and drain service connections at the property line or edge of right-of-way.

4.02 Water

a) Show domestic water services and tie to corner iron pin;

b) Location of rock cuts and maximum depth of rock excavation;

c) Profile of main indicating numerically the invert at 15 m stations;

d) Tie locations of fire hydrants to main valve and I.P.;

e) Locate all valves and tie to iron pin.

4.03 Gas

a) Locate rock cuts and maximum depth of rock excavation.

b) Locate valves, service connections, and other surface appurtenances, tied to iron pins.

c) Profile of main indicating numerically the invert at 15 m stations for mains 200 mm and larger.

4.04 Road, Curb and Sidewalk

a) Locate end of curb, sidewalk and pavement.

4.05 Underground Power, Telephone and Cablevision

a) Location and dimensions of service connections and all surface appurtenances, tied to iron pins.

4.06 Bridges, Etc.

a) Location of structure;

b) Elevation of deck.

4.07 Lighting and Traffic Control

a) Location of luminaires tied to an I.P.;

b) Line diagram;

c) Connection points to B.C Hydro and photo electric controllers.

4.08 New section for Electronic Data As-builts to be written.

REGIONAL SPECIFICATION S/D 1

DESIGN OF SANITARY SEWERS, STORM DRAINS AND SERVICE CONNECTIONS

1.0 Scope

1.01 This specification shall govern the design of all sewer and drain pipe and their appurtenances within the Municipality.

2.0 General

2.01 The Municipality reserves the right to make all connections or alterations to existing sanitary sewer and storm drain systems at the expense of the Applicant where it can be demonstrated that such works are necessary to accommodate the Applicant's development.

2.02 Upstream sewerage areas and other criteria required to accommodate upstream sewerage is normally specified.

2.03 Sanitary sewer design shall conform with the current "Guidelines for Assessing Sewerage Works" as prepared by the Ministry of the Environment of the Province of British Columbia.

2.04 In areas subject to excessive overland flows, or in seepage areas, french drains, diversion ditches, catch basins, etc. as required shall be installed and connected to acceptable outlets.

2.05 Only one single catch basin shall be connected to each 150 mm lead.

2.06 Catch basins shall be located in accordance with Regional Specification R-1 and installed in accordance with Regional Specifications R-2.

2.07 Discharge from commercial garages shall be intercepted by combination silt trap/grease interceptors prior to entering the Municipal storm drain system.

2.08 Open ditches shall enter an enclosed storm drain system through a silt trap.

2.09 Driveway culverts shall be a minimum 300 mm diameter and 6.0 m in length.

3.0 Drainage Design Criteria: Runoff Prediction

3.01 Upstream drainage areas and other criteria required to accommodate upstream drainage will be specified by the Municipal Engineer.

3.02 It shall be the responsibility of the Consulting Engineer to summarize drainage computations pertaining to that project on the standard forms provided by the Municipality and submit this data for approval together with a contour plan (scale 1:2500 where available) showing the drainage boundaries.

3.03 Subject to the approval of the Municipal Engineer, the principles of stormwater management - "zero increase in runoff" may be incorporated into the design of storm drains.

3.04 The recurrence interval used in designing storm drains up to and including 900 mm shall be ten years. Drains greater than 900 mm shall be designed to 25 years.

3.05 The intensity-duration curve to be used will be provided by the Municipality.

3.06 The following minimum values shall be used for the inlet time to the upstream end of nonextendable storm drain lines and for the coefficient of runoff (R)

a) Unimproved areas, parks, playgrounds, cemeteries, etc - inlet time to be determined using standard engineering practice and R = 0.35.

b) Residential areas - low density, single family dwelling neighbourhoods - inlet time = 10 minutes and R = 0.60.

c) High density and largely impervious areas - inlet time = 5.0 minutes and 0.90 <R <1.0.

The above standards are minimum values only. Composite values based on percentages of different types of contributary areas may be established from the above figures. Future land use, as detailed in the Community Plan, shall be incorporated in the design.

4.0 Sewer and Drain Design Criteria: Pipe Capacity

4.01 Pipes shall be designed to carry the required design flow when flowing full except for pipes carrying flows less than that required for the minimum pipe size.

4.02 Pipe capacity shall be determined by the Manning Formula using the following roughness coefficients:

n = 0.013 for concrete pipes
n = 0.011 for P.V.C. pipe.

4.03 The minimum grade for storm drains shall be that which produces a velocity of 0.9 metre per second in the pipe when flowing full.

The minimum grade of sanitary sewers shall be that which produces a minimum velocity of 0.61 metres per second in the pipe. However, a velocity of 0.9 metres per second must be obtained in the pipe above the last manhole of a non-extendable system.

4.04 Drain service connections for other than single family dwellings shall be sized according to the criteria contained in the B.C. Plumbing Code. Manholes shall be installed at the junction with the main line of all service connections greater than or equal to 200 mm in diameter.

4.05 Sewer service connections for other than single family dwellings shall be designed according to criteria contained herein for main lines.

4.06 Main sanitary sewer or storm drains shall not be less than 200 mm in diameter, except that sanitary sewers in the upper 360 m (total amount of upstream pipe) of a non-extendable system shall be 150 mm in diameter.

5.0 Materials

5.01 The following pipe is permitted for sanitary sewers and storm drains.

Diameter	Material and Class	Use	Current Standard
200mm to 900mm	Concrete - non reinforced class 3	main storm drains main sanitary sewers	ASTM C14
300mm to 3600	Concrete - reinforced	main storm drain Driveway culverts main sanitary sewers	ASTM C76
250mm and up	CMP (galvanized)	Driveway culverts	CGSB 34GP-96
150mm to 400mm	Ductile Iron - 1035 kPa	for main storm drains or catch basin leads main sanitary sewer	AWWA C151-76
100mm and 150mm	PVC Gravity Sewer Pipe DR 28, pipe stiffness of not less than 690 kPa with rubber gasket and integral bell.	100mm and 150mm for service connections 150mm for catch basin leads	CSA B182.1 ASTM D2412-73
200mm to 375mm	PVC Gravity Sewer Pipe DR 35, pipe stiffness of not less than 320 kPa with rubber gasket and integral bell	main storm drains 200mm for double catch basin leads main sanitary sewers	ASTM D3034- CSA B182.2 ASTM D2412-73
200mm to 1200mm	Ribbed PVC gravity sewer pipe with rubber gasket, pipe stiffness of not less than 320 kPa	main storm drains	CSA B182.4 ASTM F-794 UNI-B-9-82

6.0 Field Support Strength

6.01 The class and type of pipe and fittings, together with required class of bedding and trench widths shall be so selected that the pipe will support the anticipated gravity earth and any surface dead and live loads with a safety factor of 1.5.

6.02 Minimum cover for PVC pipe shall be 750 mm. For installation under areas used for vehicular traffic, minimum cover shall be 1.0 m.

Minimum cover for rigid pipe shall be 500 mm. For installation under areas used for vehicular traffic, minimum cover shall be 1.0 m., except for catch basin leads.

7.0 Alignment and Grade

7.01 Pipe lines shall normally be designed to follow a straight alignment and constant grade between manholes.

7.02 a) Curves will normally only be acceptable when a straight alignment and constant grade between manholes is not feasible.

b) The radius of a horizontal curve shall be not less than 60 m, or that radius recommended by the pipe manufacturer, whichever is the greater.

c) A vertical curve must not be less than 30 m in length. The curve must be designed so that the pipe deflection does not exceed the manufacturer's specifications.

d) Only one curve, either horizontal or vertical, will be permitted between manholes, unless approved by the Municipal Engineer.

8.0 Location of Services

8.01 Sanitary sewers and storm drains should be located within the road allowance where possible. Service connections shall be installed to each proposed lot, connected to the main, and where feasible in a common trench with other services. Connections shall be made at right angles to the main within the frontage of the lot being served.

8.02 Service connections shall be extended to the edge of any right-of-way.

8.03 Where sanitary sewers or storm drains can be extended to accommodate future subdivisions upstream, the main shall be extended to the limits of the subdivision, and cleanouts installed at those locations.

9.0 Manholes and Cleanouts

9.01 The maximum distance between sanitary sewer and storm drain manholes may vary according to the pipe diameters as shown in the table below:

Pipe Diameter	Maximum Spacing
200 mm up to and including 375 mm	120 metres
400 mm up to and including 1200 mm	180 metres
over 1200 mm	300 metres

9.02 Manholes shall be provided at the following additional locations:

a) At all changes of grade and/or alignment, except as provided in section 7.0 of this specification;

b) At all changes of pipe size;

c) At all pipe junctions other than service connections and catch basin leads. See 4.04 for exception..

d) Where service connection is the same size as the main.

9.03 Drop manholes will be allowed only where particular circumstances preclude the use of normal manholes. These shall be constructed wherever the change in invert elevations through the manhole is greater than 600 mm. Allowance shall be made in the design for the effect of the resulting turbulence on the hydraulic capacity of the system.

9.04 The relative elevations entering and leaving a manhole are to be such as to ensure that the manhole does not reduce the hydraulic capacity of the system.

a) Allowances for energy losses or changes in velocity are to be determined in accordance with sound hydraulic principles.

b) Junctions will require special treatment as will all situations involving a pipe flowing into a smaller pipe at a steeper grade.

9.05 All manholes with pipes 450 mm or larger shall be individually designed.

9.06 Stubs shall be placed in manholes to allow for future connections. The length of the stubs shall be 600 mm maximum from the outside of the manhole. The end shall be securely capped.

9.07 Cleanouts shall be installed at the upstream end of all sanitary sewer and storm drain lines.

REGIONAL SPECIFICATION S/D 2

INSTALLATION OF SANITARY SEWERS, STORM DRAINS AND SERVICE CONNECTIONS

1.0 Scope

1.01 This specification shall govern the installation of all sanitary and storm drain pipe and their appurtenances within the Municipality.

2.0 General

2.01 Provision shall be made to maintain the flow of all drains, ditches, watercourses, and service connections which may be encountered with during the progress of the work. Where substandard systems are anticipated or located during construction, the substandard system shall be connected to the new installation or replaced. In every case the contractor and/or Consultant Engineer shall notify the Municipality when substandard systems are found. The contents of any sewer, drain or service connection shall not be allowed to flow into the trench or into the main. All offensive matter shall be immediately removed from the proximity of the work.

2.02 The Contractor shall ensure debris and mortar droppings do not enter any part of the sanitary sewer or storm drain system and shall leave all pipe lines, manholes, cleanouts, silt traps, catchbasins, and other appurtenances in a thoroughly clean condition.

3.0 Bedding

3.01 The class of bedding shall be as indicated on the approved design drawing.

3.02 All small diameter non-rigid (PVC) pipe to be provided with minimum Class B bedding compacted to 95% Standard Proctor Density.

3.03 All non-rigid (PVC) catch basin leads must be bedded according to the latest ASTM D 2321 Class II or better, compacted to 95%.

3.04 Ribbed PVC pipe must be bedded in accordance with the latest ASTM D2321, Class II or better.

4.0 Installation

4.01 Pipes shall be handled, stored and laid in accordance with the recommendations of the pipe manufacturer. In all cases gaskets shall be installed unless otherwise specified by the Municipal Engineer.

4.02 All pipe shall be laid to the designed grades and alignment within the following tolerances:

a) Horizontal tolerance from true alignment shall not be greater than 60 mm from the designed location and the rate of deviation shall not exceed 40 mm in 10 m.

b) Vertical tolerance from true grade shall not exceed the limitations as detailed in the table below:

Grade	Maximum departure from design elevation	Maximum rate of deviation
over 5%	30 mm	6 mm in 3 m
2% to 5%	15 mm	3 mm in 3 m
less than 2%	6 mm	3 mm in 3 m

4.03 Where a sanitary sewer is being constructed as an extension to an existing Municipal system, the end of the existing pipe shall remain sealed until the sewer extension is completed, flushed, tested and accepted by the Municipality. Upon acceptance, the seal may be removed and one length of pipe installed to connect the extension to the existing system.

4.04 Service connections over 26 m in length shall be provided with a buried cleanout every 26 m. A buried cleanout shall be provided when the service crosses a street boundary.

4.05 Where storm drains and sanitary sewers are installed in a common trench, there shall be a minimum 150 mm lateral clearance between the walls of adjacent pipes and between the walls of the pipes and the trench walls.

5.0 Manhole, Cleanout, Silt Trap and Catch Basin Construction

5.01 Manholes other than standard manholes shall be constructed as shown on the approved design drawings.

5.02 Cast-in-place manholes shall be allowed provided that the following criteria are observed:

a) Concrete shall attain a minimum strength of 20 MPA at 28 days;

b) Minimum wall thickness shall be 150 mm;

c) Minimum internal dimensions shall be as detailed on Municipal Standard Drawings for standard manholes.

5.03 The manhole frames shall sit on at least one course of mortared concrete brick or approved alternate which shall be parged on both sides with a mortar paste composed of one part cement and three parts of sand and only sufficient water for workability.

a) Grade adjustment of this type shall not exceed 250 mm. Bricks laid for adjustment shall be laid in headers.

5.04 Within the travelled portion of the road, heavy duty 200 mm frames and covers shall be installed on manholes, silt traps and cleanouts.

5.05 Within sewer or drain rights-of-way:

a) Heavy duty 200 mm frames and covers shall be installed on manholes, silt traps and clean outs in travelled areas where it is known at the time of construction.

b) Light duty 100 mm frames and covers shall be used in non-travelled areas.

5.06 All manholes and cleanouts not within the travelled portion of the road shall be set to finished landscaped elevation or 75 mm above existing grade if landscaped elevation is not available.

5.07 The area around a silt trap shall be graded so that surface runoff enters the grilled lid. The ditch sides and bottom around an inlet or outlet shall be rip-rapped for a minimum length of 1.5 m beyond the end of the pipe.

6.0 Testing

6.01 Sanitary Sewer pipe other than P.V.C. shall be tested at an average internal air pressure of 3.0 pounds per square inch greater than the back pressure of any ground water that may submerge the pipe. Ground water pressure shall be measured at the crown of the pipe at the lower end of the section under test. The maximum rate of air loss shall not be greater than 0.0030 cubic feet of free air per minute per square foot of internal pipe surface.

6.02 The requirements of paragraph 6.01 shall be considered satisfied if the time, in seconds, required for the pressure to a decrease of 3.5 pounds to 2.5 pounds per square inch greater than the back pressure of ground water as measured in paragraph 6.01 is not less than the allowable time calculated as follows:

a) List diameters and lengths of all pipe under test.

b) Calculate for $K = 0.011d^2 L$ where d = diameter of pipe in inches and L = length in feet of pipe of diameter "d".

c) Calculate a value for $C = 0.0003882dL$ where d=diameter of pipe and L = length of pipe of diameter "d".

d) Add all up to the values of K.

e) Add up all the values of C.

f) If the total of all C values is less than one, the total of all K values is the allowable time in seconds.

g) If the total of all C values is greater than one, divide the total of all K values by the total of all C values. The result is the allowable time in seconds.

6.03 Alternate Tests - Sanitary Sewer

a) Infiltration - The maximum allowable amount of infiltration from ground water or other sources into the section under test shall be 100 gallons per inch of pipe diameter per mile per 24 hours.

b) Exfiltration - The maximum allowable amount of exfiltration from the section of sewer under test shall be a rate not greater than the manufacturer's specification for the pipe being tested.

c) Modified Air Test - The test length shall be subjected to air pressure equivalent to a four-inch head of water. Leakage from the pipe shall be considered acceptable if, after disconnecting the air source, the pressure drop in five minutes is not more than a one-inch head of water.

6.04 Air Test for P.V.C. Sanitary Sewer Pipe

The air test shall conform to the procedures outlined in Uni-Bell Plastic Pipe Association "Handbook for P.V.C. Pipe" -Appendix Uni-B-6-79 or subsequent issues and is generally as follows:

The duration permitted for a prescribed low pressure air exfiltration pressure drop between two consecutive manholes shall be not less than that shown in Table A. The prescribed drop shall not exceed 0.5 psi from 3.5 to 3.0 psi in excess of the ground water pressure above the top of the sewer.

Table A

Minimum Duration for Air Test Pressure Drop

Pipe Size Inches	mm	Time Minutes
4	100	2 1/2
6	150	4
8	200	5
10	250	6 1/2
12	300	7 1/2
15	380	9 1/2

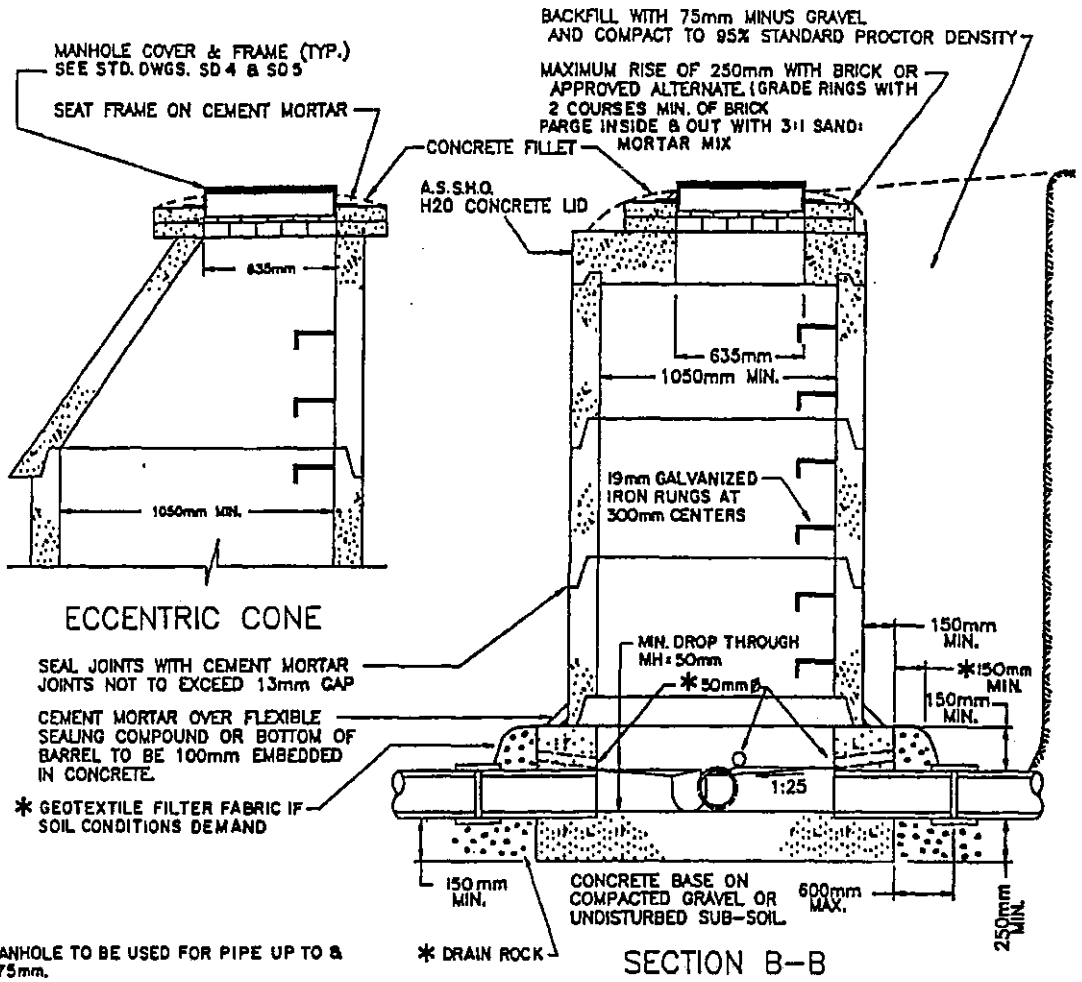
6.05 It is noted that the foregoing calculations are made using Imperial units of measurement.

6.06 The Consulting Engineer shall, at his direction, arrange for periodic compaction testing within the pipe zone where trenches are over one metre deep. Test results shall be submitted to the Municipal Engineer.

6.07 Video Camera inspection, Sanitary Sewer or Storm Drain

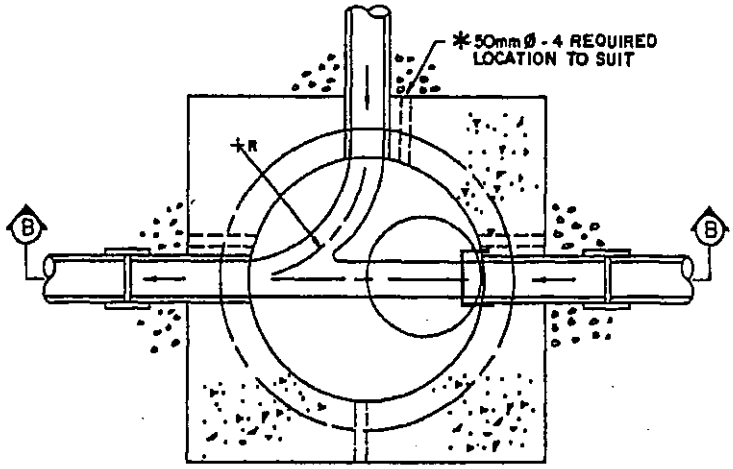
Prior to acceptance of any sewer or drain line, the Consulting Engineer shall arrange for a video camera inspection of the line. The recording tape shall be provided to the Municipal Engineer complete with the camera operator's written report. If any deviations from standards are noted, during the camera work, the work shall be repaired and re-tested.

Where blasting is required in proximity to existing mains, a video camera inspection of the existing main shall be required prior to and after blasting as detailed for new mains.



NOTES

1. STANDARD MANHOLE TO BE USED FOR PIPE UP TO & INCLUDING 375mm.
2. MIN. 150mm CONCRETE BELOW CHANNEL BASE. MANHOLE TO BE CONSTRUCTED ON COMPACTED GRAVEL OR UNDISTURBED SUB-SOIL SO THAT NO SETTLEMENT OCCURS.
3. TRIM PIPE ENDS FLUSH WITH INNER WALL OF MANHOLE.
4. SEWER MANHOLE TO BE WATERTIGHT.
5. PRECAST CONE OR LID & PIPE SECTIONS TO CURRENT A.S.T.M. C 478.
6. BRICK GRADE ADJUSTMENT TO BE LAID IN HEADERS.
7. FOR MANHOLE COVER & FRAME DETAILS SEE STD. DWGS. SD4 & SD5.
8. CAST-IN-PLACE CONCRETE, SEE SPEC. SD2, 5.02.
9. REINFORCEMENT TO BE SIZED & POSITIONED BY P.ENG.
10. VITREOUS PIPING - ALL JOINTS TO BE SLIP SEAL OR EQUAL.
11. CHANNELLING TO TOP OF PIPE TO CONSIST OF EITHER BOTTOM HALF OF PIPE PLUS VERTICAL WALLS OF CONCRETE OR ALL OF CONCRETE WITH SIMILAR X-SECTIONS.
12. CHANNELLING & BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
13. R- RADIUS NOT TO BE LESS THAN 3 TIMES BRANCH PIPE DIAMETER.



PLAN

* APPLICABLE TO DRAIN MANHOLES ONLY

* TRENCH DRAINAGE AT MANHOLES: FOR USE IN AREAS WITH HIGH WATER TABLES, EXCESSIVE GROUND WATER FLOW, OR TRENCHES THROUGH CLAY CUTS, BACKFILLED WITH FULL DEPTH GRAVEL.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

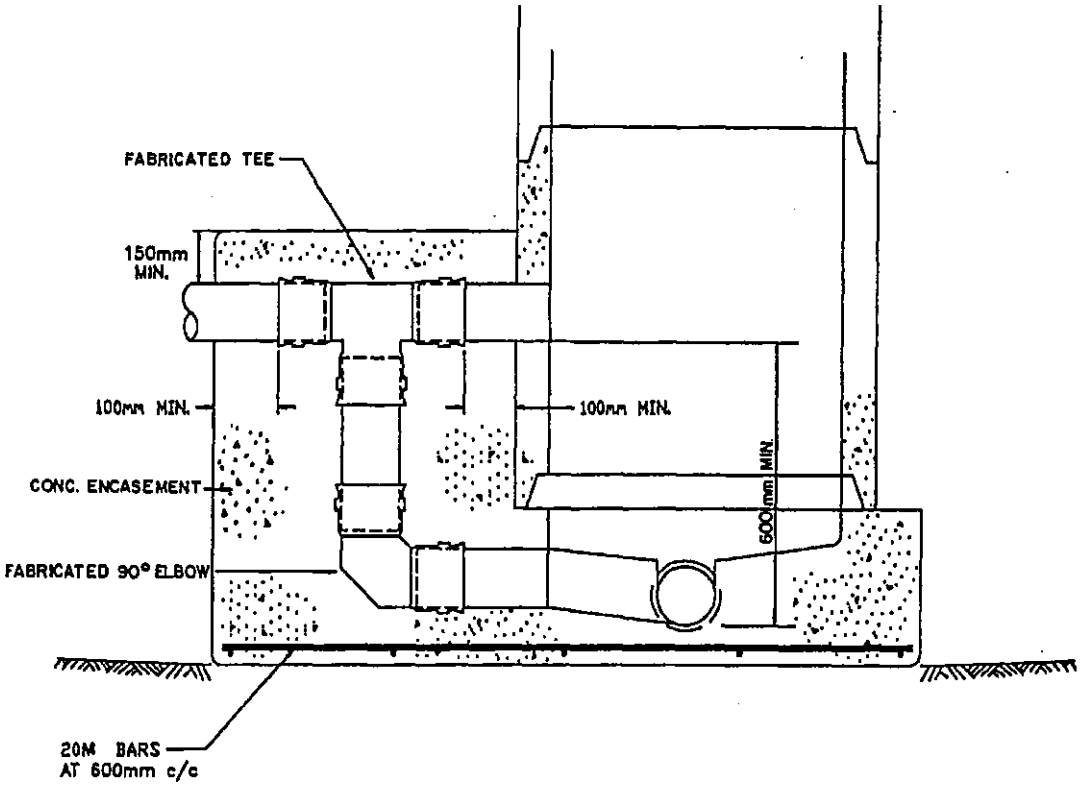
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

STANDARD MANHOLE FOR UP TO & INCLUDING 375 mm PIPE

STD. DWG. NO.

SD1



NOTES:

SEE STANDARD DRAWING NO. SD1 FOR TYPICAL MANHOLE DETAILS.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

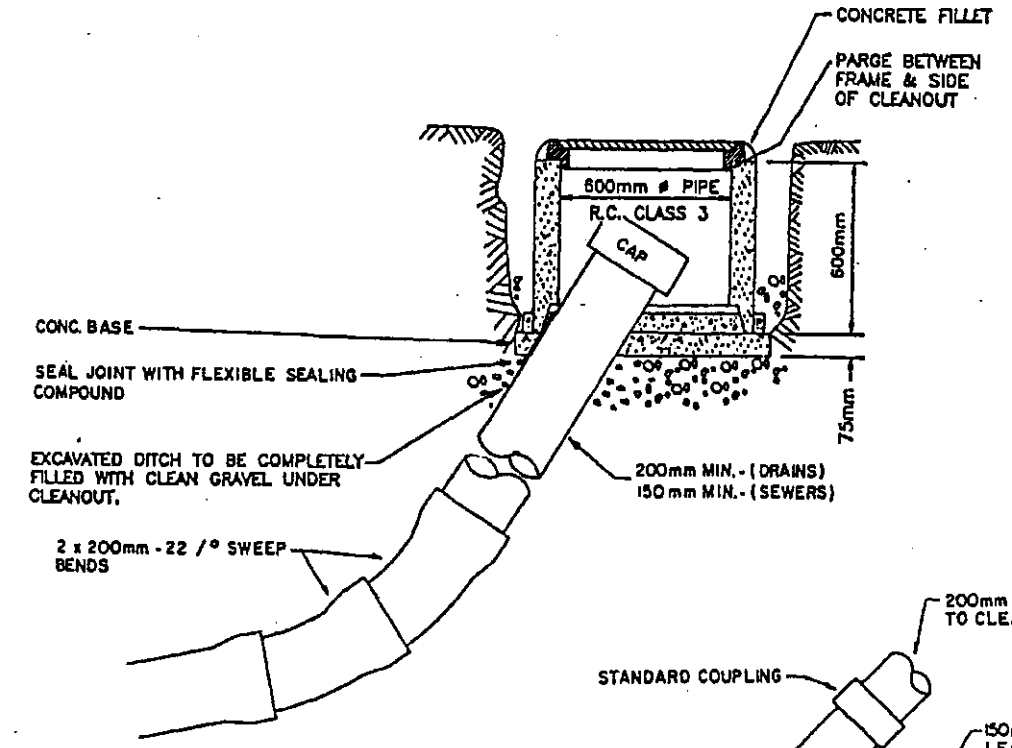
DATE	REVISIONS	APPROVED

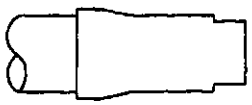
REGIONAL MUNICIPAL SPECIFICATION

DROP MANHOLE

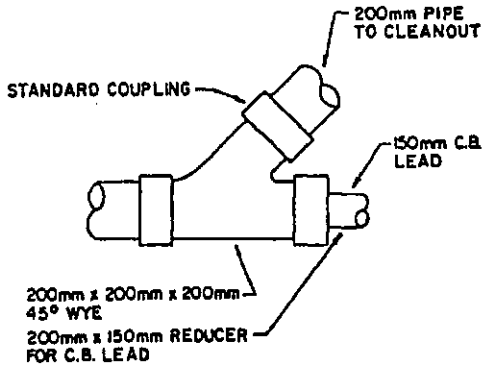
STD. DWG. NO.

SD2





INCLUDE REDUCER IF DOWNSTREAM PIPE IS LARGER THAN 200mm.



RECOMMEND 'WYE' BE INCLUDED FOR USE BY C.B.' LEADS ONLY (NOT H.C.'S).

NOTES:

1. MANHOLE COVER AND FRAME: REFER TO STANDARD DWGS. SD 4 & SD5.
2. TOP OF COVER TO BE 75mm± ABOVE EXISTING GROUND ON EASEMENTS OR BOULEVARDS WITH SOIL PLACED SLOPING AWAY FROM THE COVER.
3. TOP OF THE COVER TO BE FLUSH WITH THE SURFACE WHEN INSTALLED WITHIN TRAVELLED PORTION OF THE ROAD.
4. BACKFILL WITH CLEAN GRAVEL AND COMPACT.
5. CAP TO BE INSTALLED WITHOUT GASKET.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

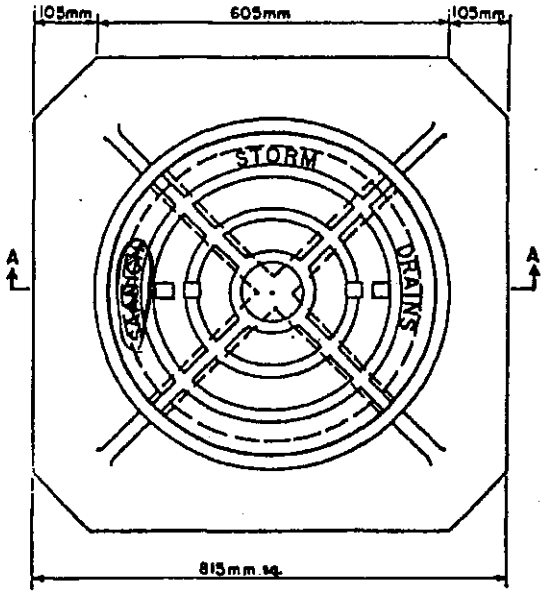
DATE	REVISIONS	APPROVED

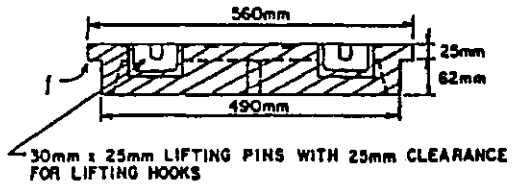
REGIONAL MUNICIPAL SPECIFICATION

CLEANOUT

STD. DWG. NO

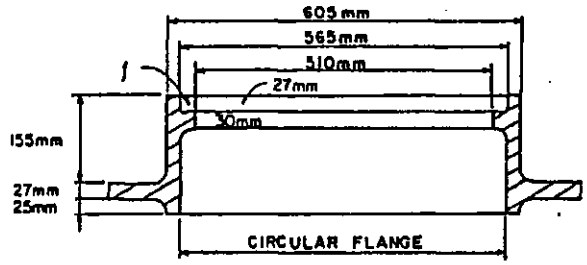
SD3





SECTION OF LID THROUGH A-A

Delete "Sanitary" SD4 SD5



SECTION OF FRAME THROUGH A-A

HEAVY DUTY 100mm COVERS & FRAMES WILL BE ACCEPTED ON APPROVAL, WHERE 200mm SIZES DO NOT FIT.

NOTE: SEWER M.H.'S TO BE IDENTIFIED AS "SANITARY SEWERS"

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

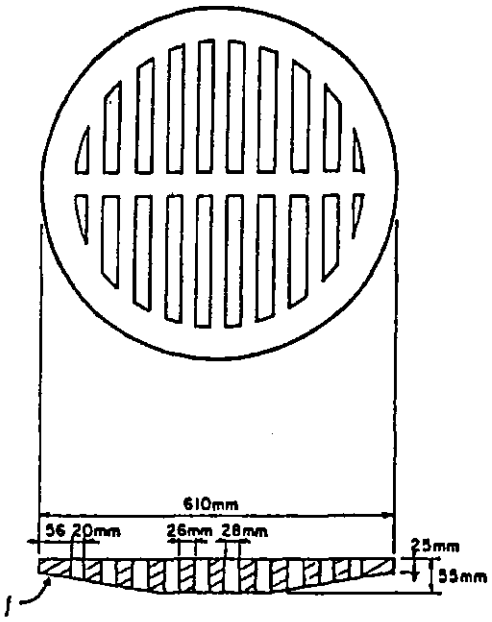
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

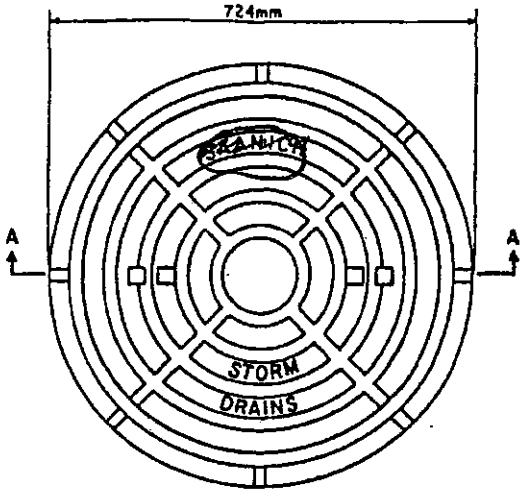
200mm MANHOLE COVER & FRAME

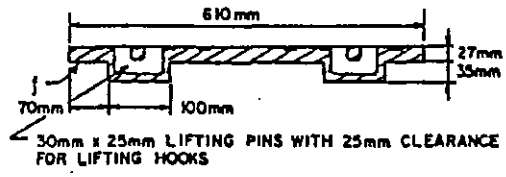
STD. DWG. NO.

SD4



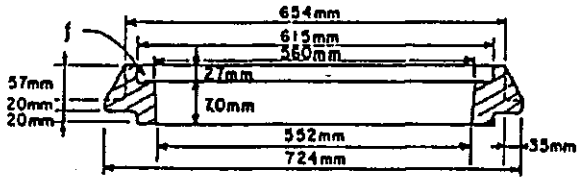
GRATED STORM DRAIN LID
(FOR USE WITH SILT TRAPS)





30mm x 25mm LIFTING PINS WITH 25mm CLEARANCE FOR LIFTING HOOKS

SECTION OF LID THROUGH A-A



SECTION OF FRAME THROUGH A-A

NOTE: SEWER M.H.'S TO BE IDENTIFIED AS "SANITARY SEWERS"

REFER TO SPECIFICATIONS FOR FUTHER DETAILS

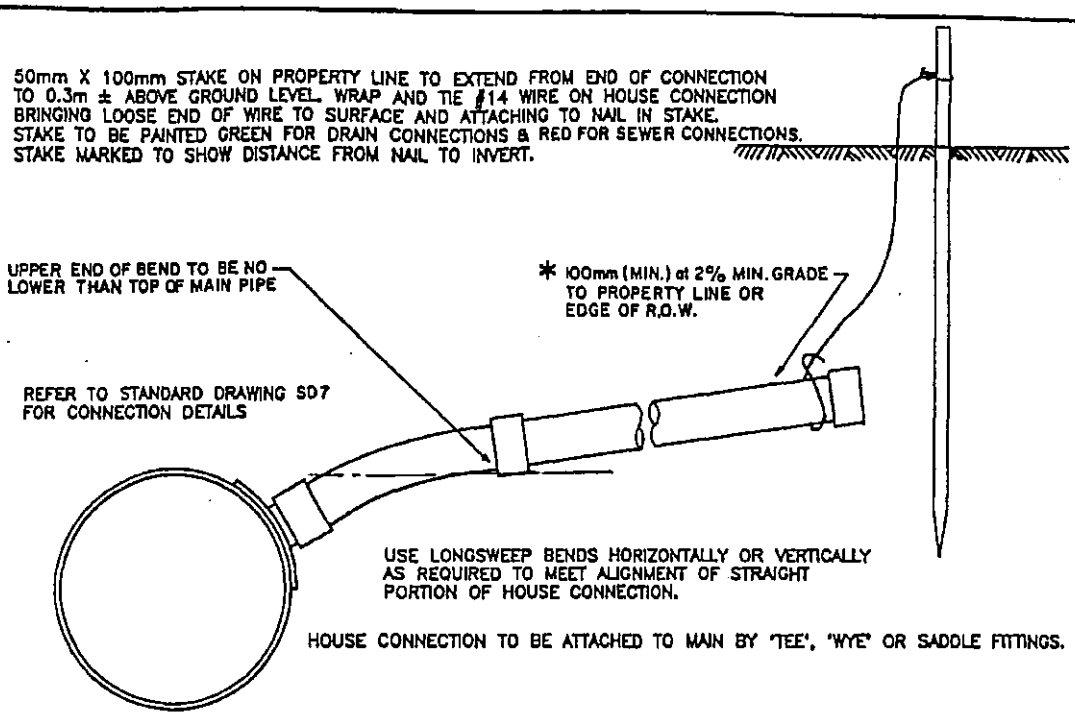
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

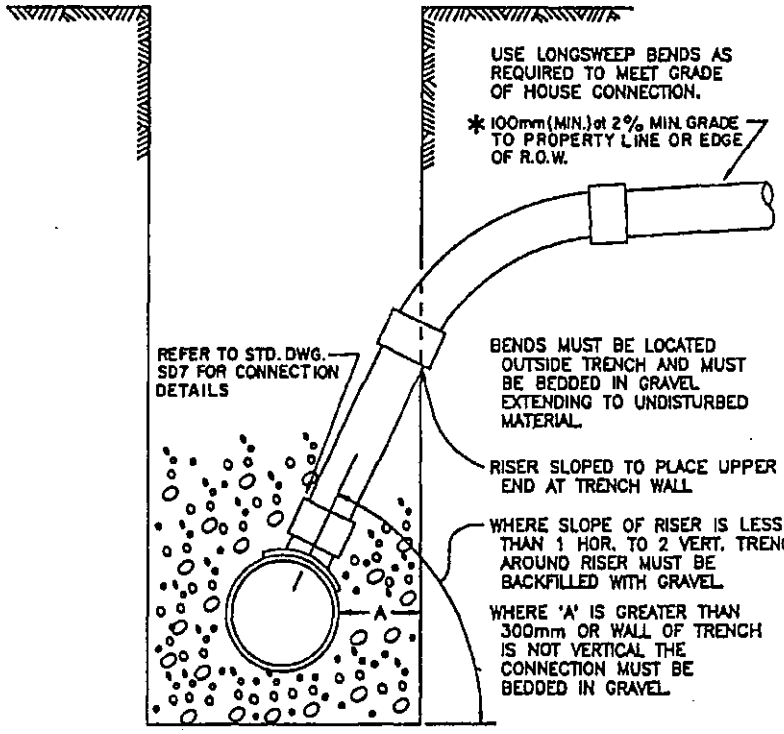
100mm MANHOLE COVER & FRAME

STD. DWG. NO

SD5



TYPICAL HOUSE CONNECTION



CONNECTION IN A DEEP TRENCH

*FOR CONNECTIONS OTHER THAN SINGLE FAMILY DWELLINGS, SIZE ACCORDING TO B.C. PLUMBING CODE.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

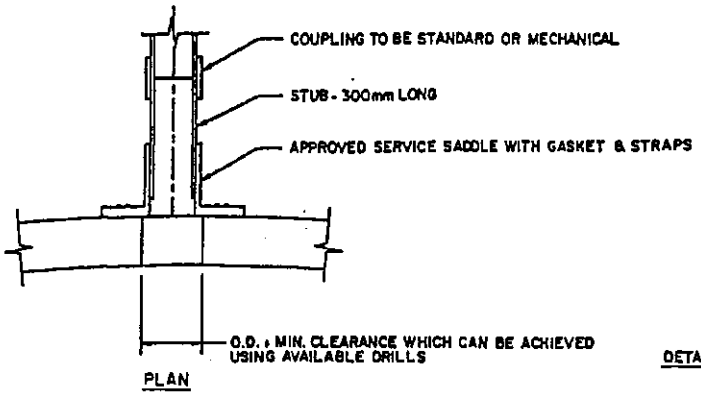
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

GENERAL SERVICE CONNECTION DETAILS

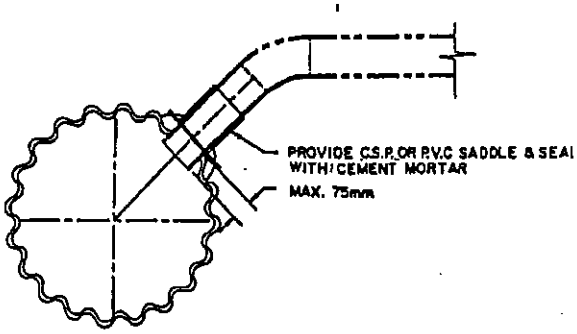
STD. DWG. NO.

SD6



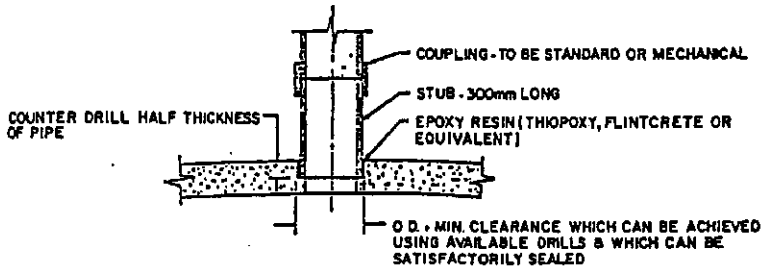
DETAIL OF SERVICE CONNECTION TO P.V.C. MAIN

NOTE: ALL HOLES IN MAIN TO BE CUT WITH APPROVED CUTTER. FOR SMALLER MAINS CONNECTION CAN BE MADE WITH APPROVED FABRICATED TEE OR WYE FITTINGS.



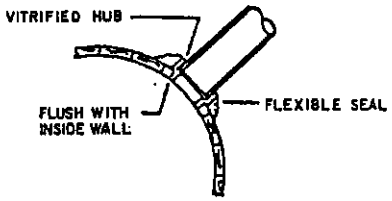
DETAIL OF SERVICE CONNECTION TO CORRUGATED STEEL OR RIBBED POLYETHYLENE PI

NOTE: SERVICE PIPE TO BE TRIMMED SO AS NOT OBSTRUCT FLOW IN MAIN



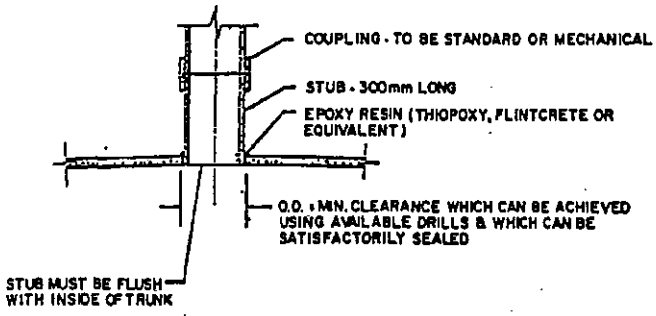
DETAIL OF LATERAL CONNECTION TO CONCRETE TRUNK

NOTE: ALL HOLES IN CONCRETE TRUNK TO BE DIAMOND DRILLED



DETAIL OF LATERAL CONNECTION TO WOODSTAVE TRUNK

NOTES: ALL CUTS & ABRASIONS ON WOODSTAVE PIPE TO BE COATED WITH HOT CREOSOTE



DETAIL OF LATERAL CONNECTION TO ASBESTOS-CEMENT TRUNK

NOTE: ALL HOLES IN ASBESTOS-CEMENT TRUNK TO BE DRILLED WITH PILOT A.C. CUTTER OR SIMILAR DEVICE

NOTE: FOR SMALLER DIA. MAINS, CONNECTION CAN BE MADE WITH APPROVED, FABRICATED TEE OR WYE FITTINGS

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

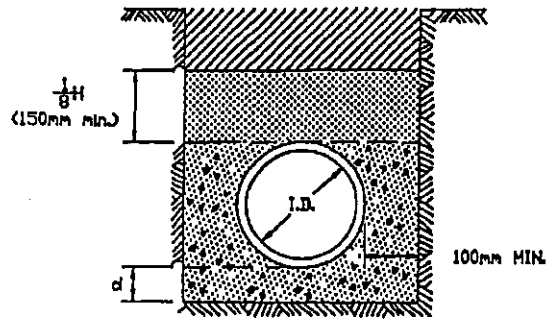
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

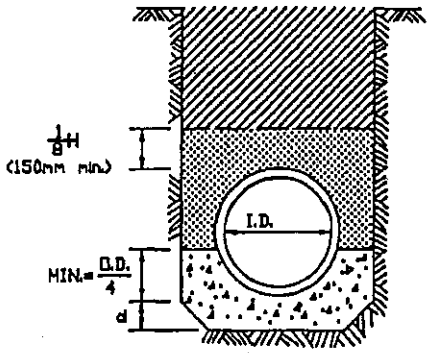
SERVICE CONNECTION DETAILS

STD. DWG. NO

SD7



CLASS B
FIRST CLASS BEDDING
LOAD FACTOR 1.9



CLASS A
CONCRETE CRADLE
LOAD FACTOR 2.8
(RIGID PIPE ONLY)

DEPTH OF MATERIAL BELOW PIPE

I.D.	d(MIN.)
≤ 675mm	100mm
750mm - 1500mm	100mm
> 1500mm	150mm

O.D. – OUTSIDE DIAMETER
I.D. – INSIDE DIAMETER
H – DISTANCE FROM GROUND TO TOP OF PIPE.

CONCRETE

28 DAY STRENGTH TO BE 20 MPa OR MORE.

PIT-RUN GRAVEL (MINUS 25mm) OR SAND

IN LAYERS NOT OVER 150mm AND COMPACTED BY SLICING WITH A SHOVEL OR TAMPING BAR.

HAND PLACED BACKFILL

FINELY DIVIDED MATERIAL FREE FROM DEBRIS, STONES AND LARGE LUMPS.

MACHINE PLACED BACKFILL

FREE FROM DEBRIS, LARGE LUMPS OR STONES OVER 150mm SIZE.

NOTES:

1. UNDER SIDEWALKS, THE TRAVELLED PORTION OF THE ROAD & DRIVEWAYS, OR WITHIN 1.5m OF THE EDGE OF THE TRAVELLED ROAD, THE TRENCH WILL BE BACKFILLED WITH COMPACTED PIT-RUN GRAVEL OR EQUAL, TO WITHIN 300mm OF GROUND LEVEL. THE REMAINING 300mm TO BE BACKFILLED WITH ROAD GRAVEL.
2. FOR ROCK OR OTHER INCOMPRESSIBLE MATERIALS, THE TRENCH SHOULD BE OVER-EXCAVATED A MIN. OF 150mm FROM THE OUTSIDE OF COUPLINGS OR BELLS OF THE PIPES AND REFILLED WITH GRANULAR MATERIAL. (MAX. AGGREGATE SIZE – 25mm)
3. FOR P.V.C. PIPES, BEDDING TO BE COMPACTED TO A MINIMUM OF 95% STD. PROCTOR DENSITY WITHIN THE "HAUNCHING AREA".
4. THIS SECTION SHOWS THE MIN. STANDARD. MANUFACTURER'S RECOMENDED BEDDING & BACKFILLING SPECIFICATIONS WILL GOVERN.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

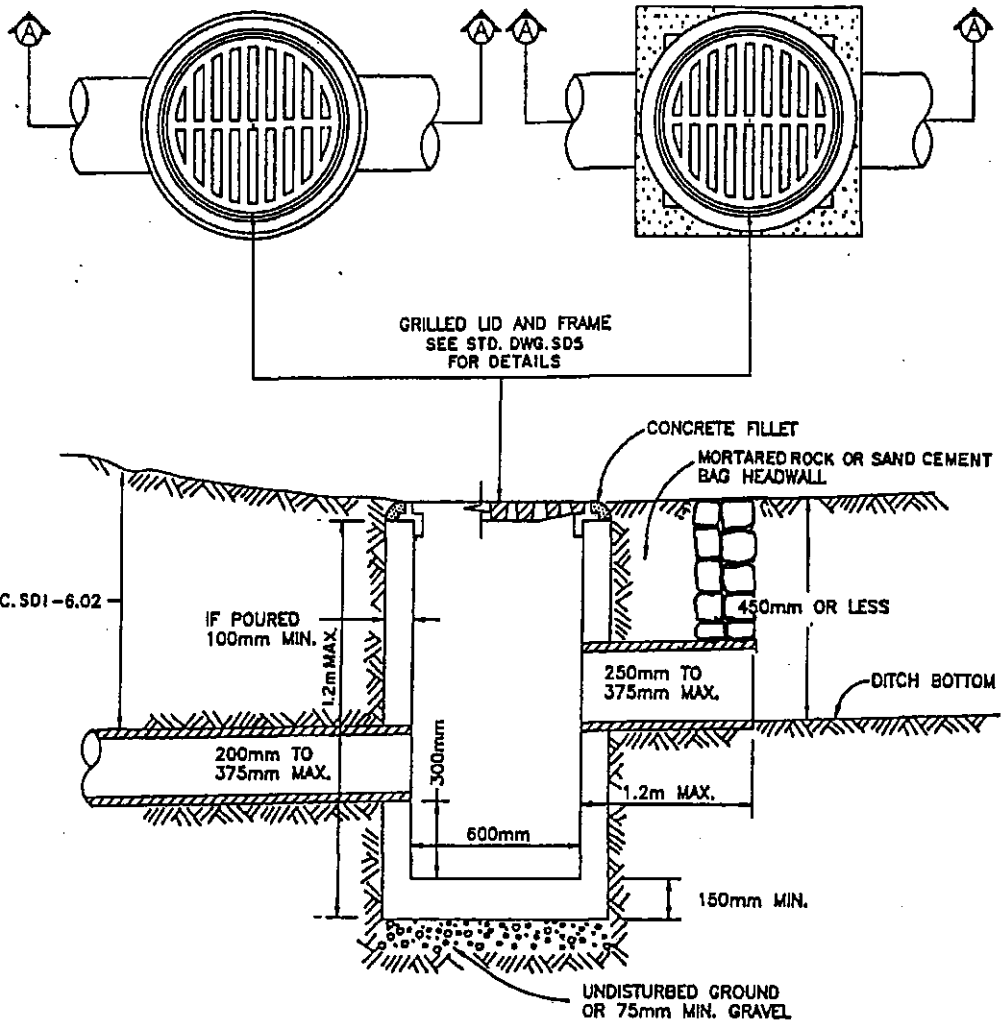
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

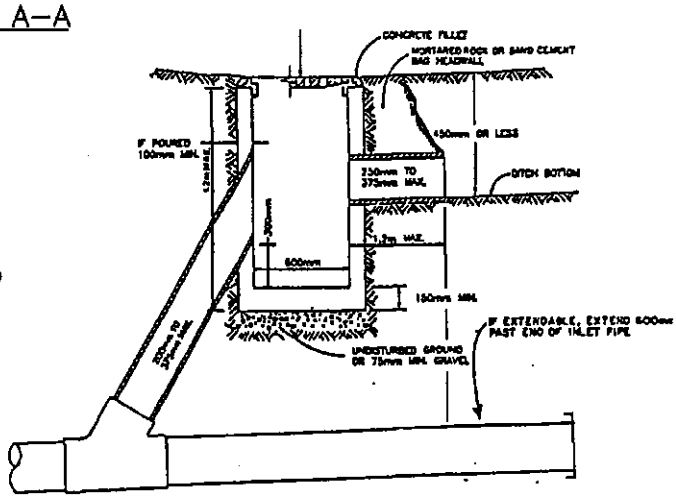
CLASSES OF PIPE BEDDING

STD. DWG. NO.

SD8



SECTION A–A



CONNECTION TO DEEP DRAIN

NOTES:

A 1.2m VERTICAL LENGTH OF 600mm III R.C. PIPE AS PER CURRENT ASTM C 76 SPECIFICATIONS SET ON END IS ACCEPTABLE IN LIEU OF MIN. 100mm THICKNESS OF POURED CONC. AS SHOWN.

FOR PIPES GREATER THAN 375mm, SPECIAL DESIGNED S.T.'S WITH OVERSIZED BARRELS WILL BE ACCEPTED.

TOP OF GRILL TO BE SET A MIN. OF 50mm BELOW SURRONDING GROUND LEVEL.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

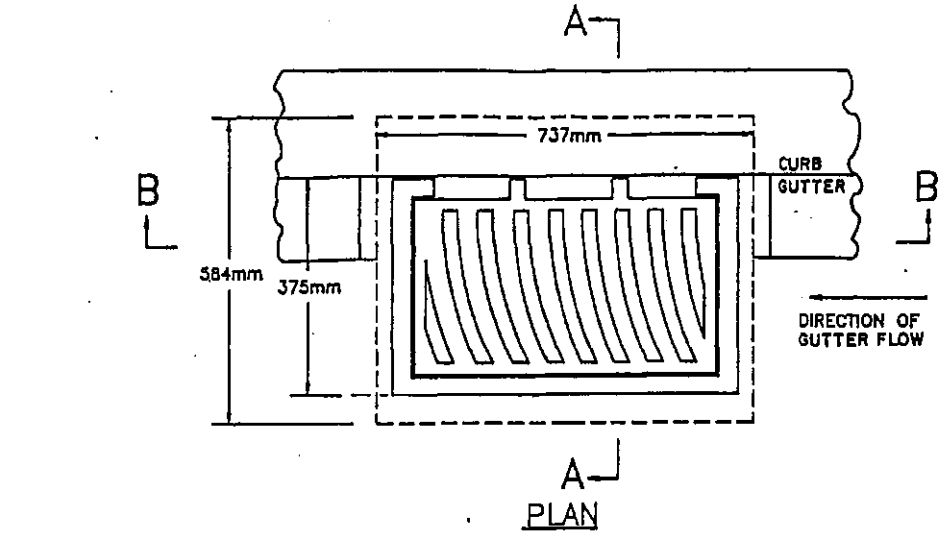
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

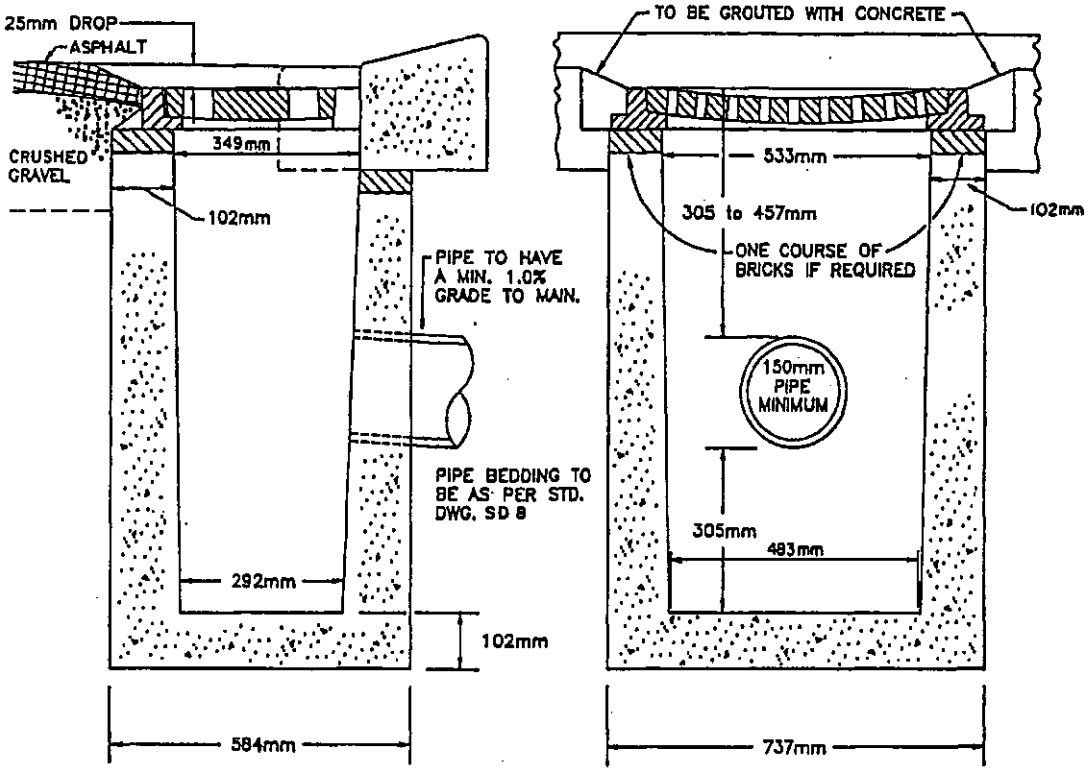
SILT TRAP

STD. DWG. NO

SD9



PLAN



SECTION A–A

SECTION B–B

NOTES:

1. CATCH BASIN GRATE AND FRAME, SEE STD. DWG. SD13 FOR DETAILS.
2. TRENCHES AND CATCH BASINS UNDER TRAVELLED PORTION OF THE ROAD TO BE BACKFILLED WITH GRAVEL AND COMPACTED AS PER SPECIFICATIONS.
3. FOR DETAILS OF CURBS SEE STANDARD DRAWINGS R13, R13A, R14 & R15.
4. BASE TO BE COMPACTED GRANULAR MATERIAL (98% STANDARD PROCTOR) OR CONCRETE SLURRY.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

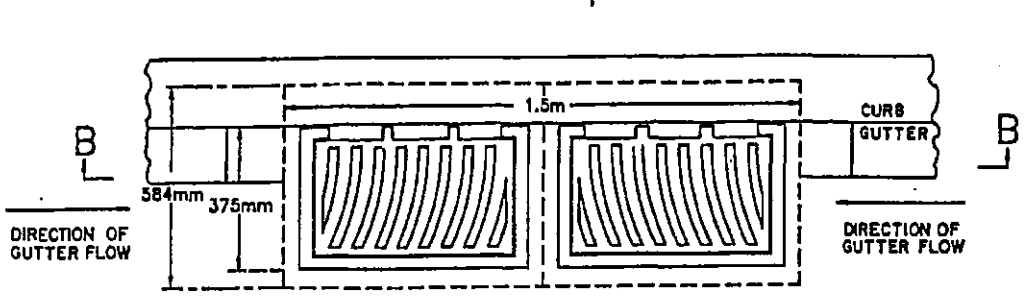
DATE	REVISIONS	APPROVED

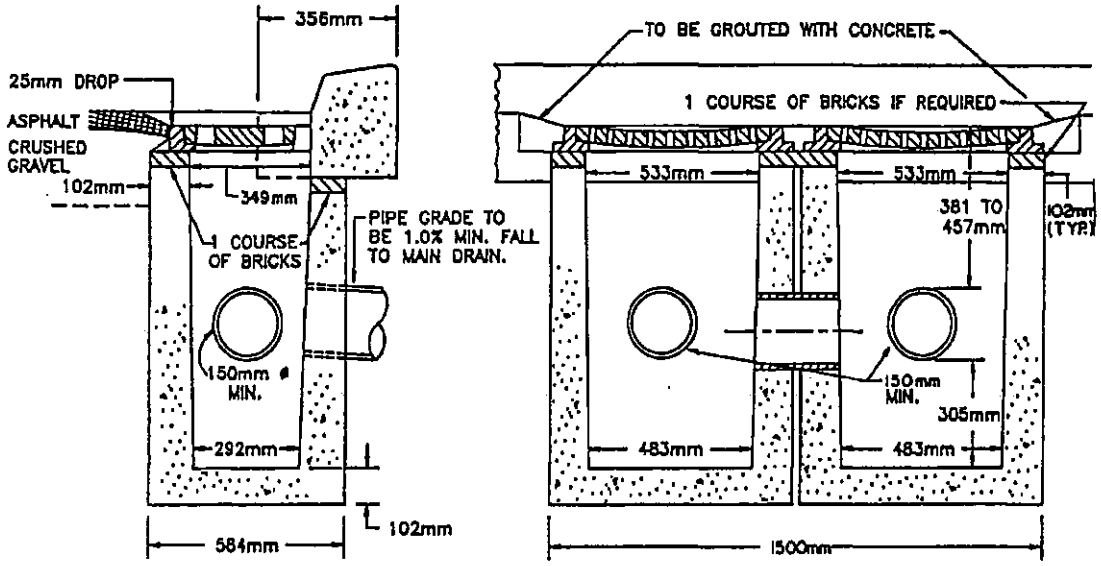
REGIONAL MUNICIPAL SPECIFICATION

RECTANGULAR CATCH BASIN
(FOR USE WITH CURB & GUTTER)

STD. DWG. NO.

SD10





SECTION A–A

SECTION B–B

NOTES:

1. CATCH BASIN GRATE AND FRAME, SEE STD. DWG. SD13 FOR DETAILS.
2. TRENCHES UNDER TRAVELLED PORTION OF THE ROAD TO BE BACKFILLED WITH COMPACTED GRAVEL AS PER SPECIFICATIONS.
3. FOR DETAILS OF CURBS SEE DWGS. R13, R13A, R14 & R15.
4. BASE TO BE COMPACTED GRANULAR MATERIAL (98% STANDARD PROCTOR) OR CONCRETE SLURRY.
5. CATCH BASINS TO HAVE SEPARATE 150mm LEADS TO MAIN PLUS 150mm CONNECTION BETWEEN BASINS.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

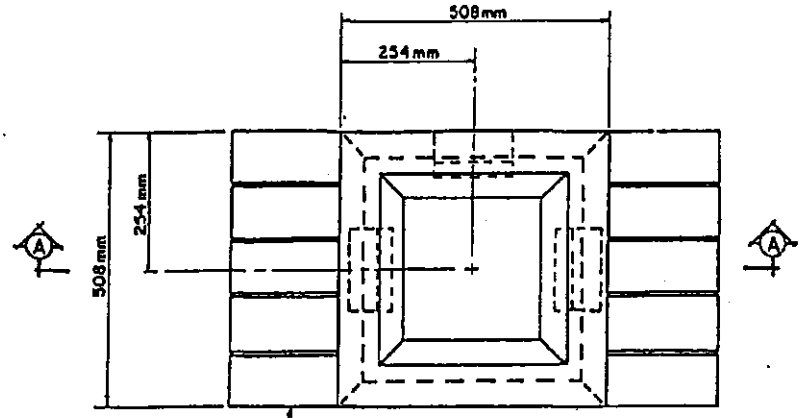
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

DOUBLE CATCH BASIN
(FOR USE WITH CURB & GUTTER)

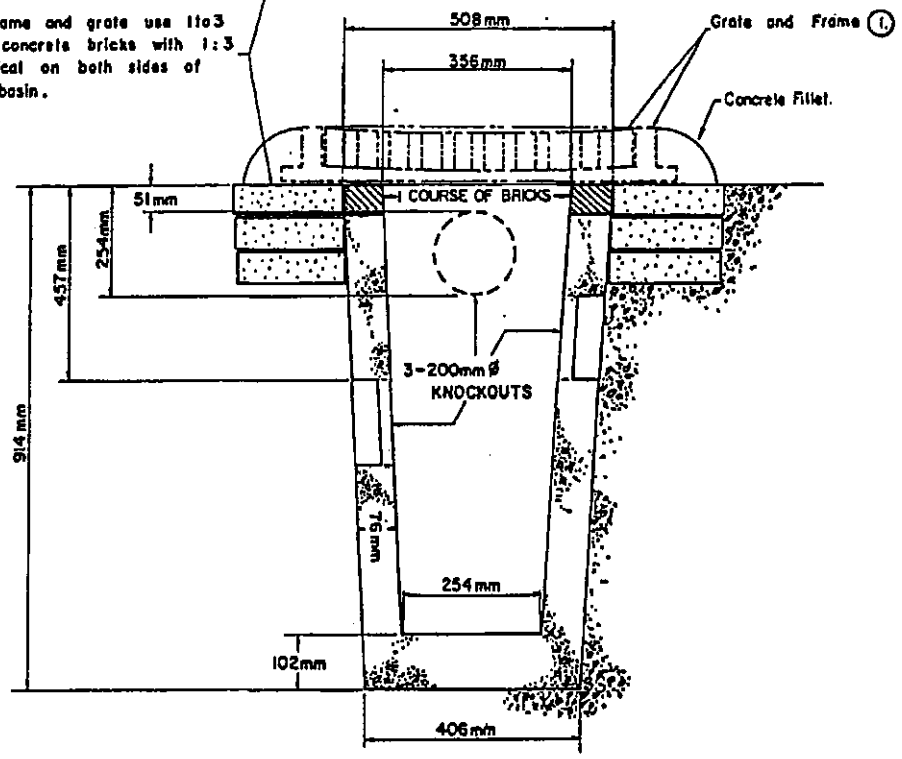
STD. DWG. NO.

SD11



PLAN

To retain frame and grate use 1 to 3 courses of concrete bricks with 1:3 mortar. Typical on both sides of the catch basin.



SECTION, A-A

NOTES

1. FOR DETAILS OF GRATES SEE STD. DWG. SD14.
2. FOR DETAILS OF CATCH BASINS TO DRAIN CURB & GUTTERED ROADWAYS SEE STD. DWG. SD10 & SD11.
3. BACKFILL TO BE COMPACTED GRAVEL.
4. FOR USE IN AREAS WITHOUT CURB & GUTTER.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

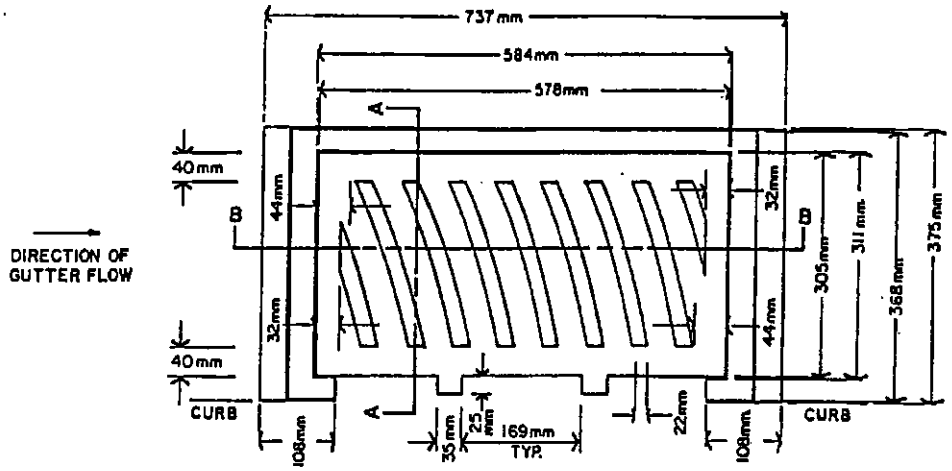
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

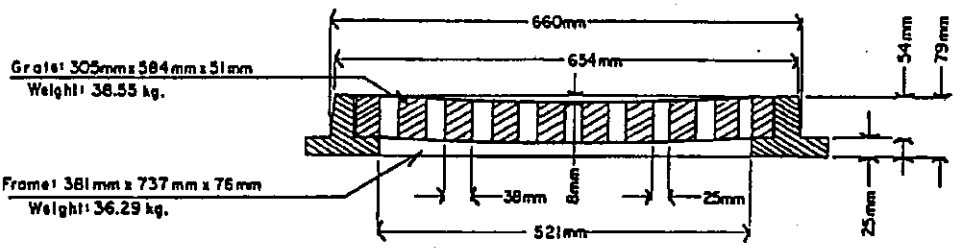
SQUARE CATCH BASIN

STD. DWG. NO.

SD12



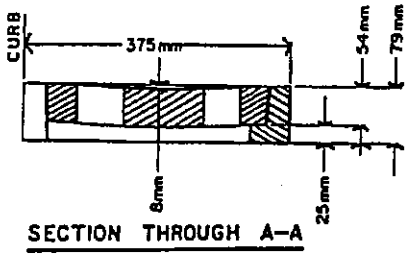
PLAN



SECTION THROUGH B–B

NOTES

1. For use with catch basins in conjunction with curbs & gutters.
2. For details of catch basin see Std. Dwg. SD10 & SD11.



SECTION THROUGH A–A

MATERIAL: CAST IRON

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

DATE	REVISIONS	APPROVED

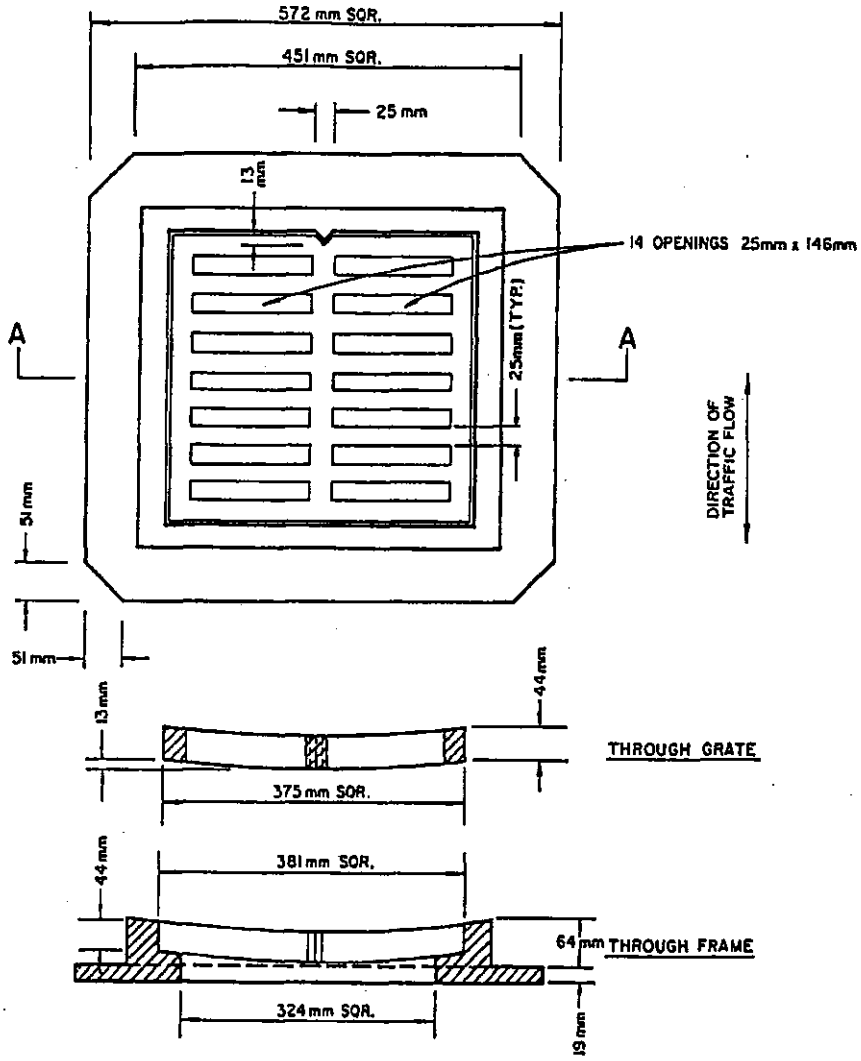
REGIONAL MUNICIPAL SPECIFICATION

RECTANGULAR CATCH BASIN FRAME & GRATE

STD. DWG. NO.

SD13

PLAN



SECTION A–A

NOTES: FOR DETAILS OF CATCH BASIN, SEE STD DWG. SD 12
FOR USE IN AREAS WHERE CURB & GUTTERS NOT USED.

LONGITUDINAL AXIS OF GRATE OPENINGS TO BE PLACED PERPENDICULAR TO THE DIRECTION OF TRAFFIC FLOW.

MATERIAL: CAST IRON

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

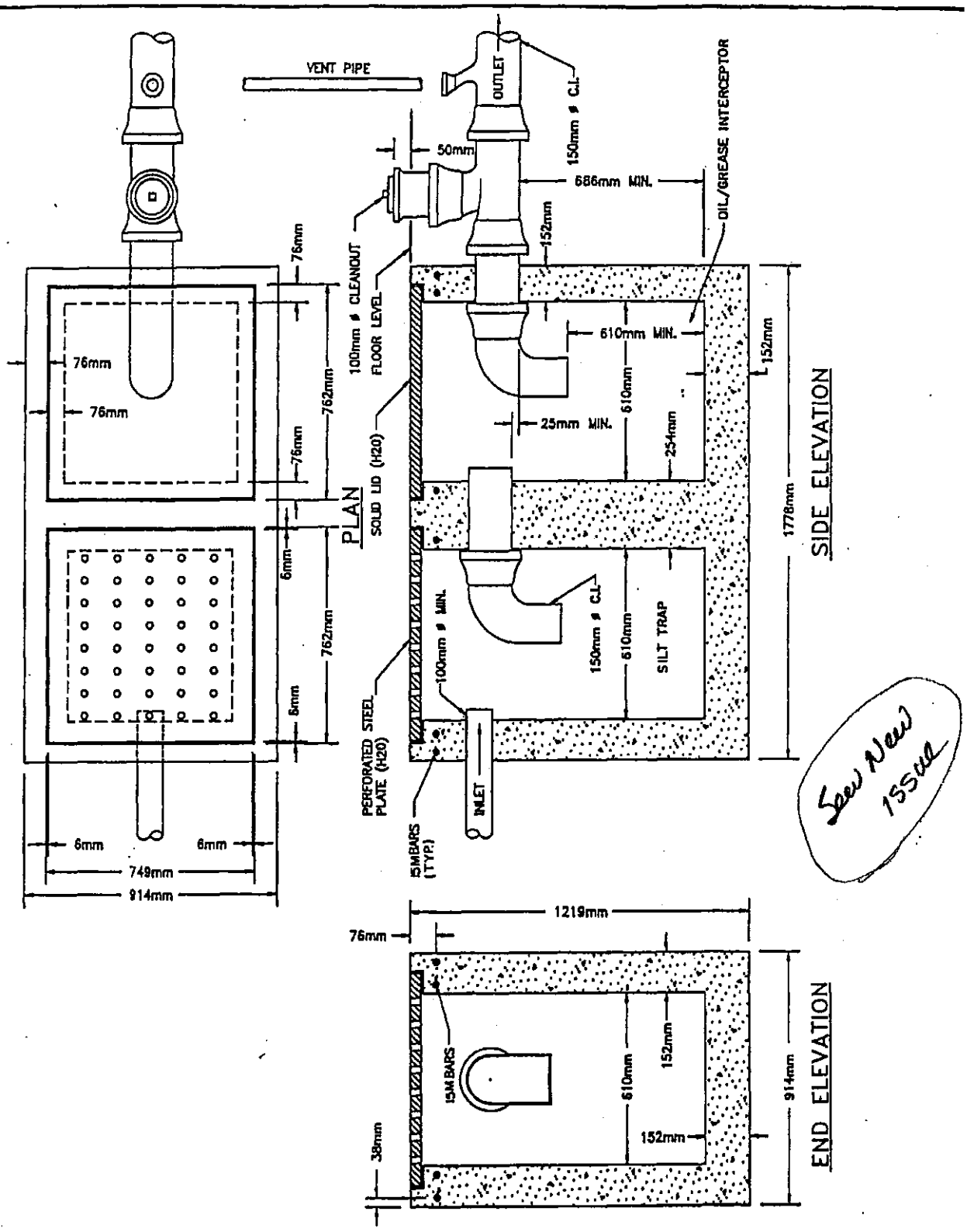
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

SQUARE CATCH BASIN FRAME & GRATE

STD. DWG. NO.

SD14



REFER TO SPECIFICATIONS FOR FURTHER DETAILS

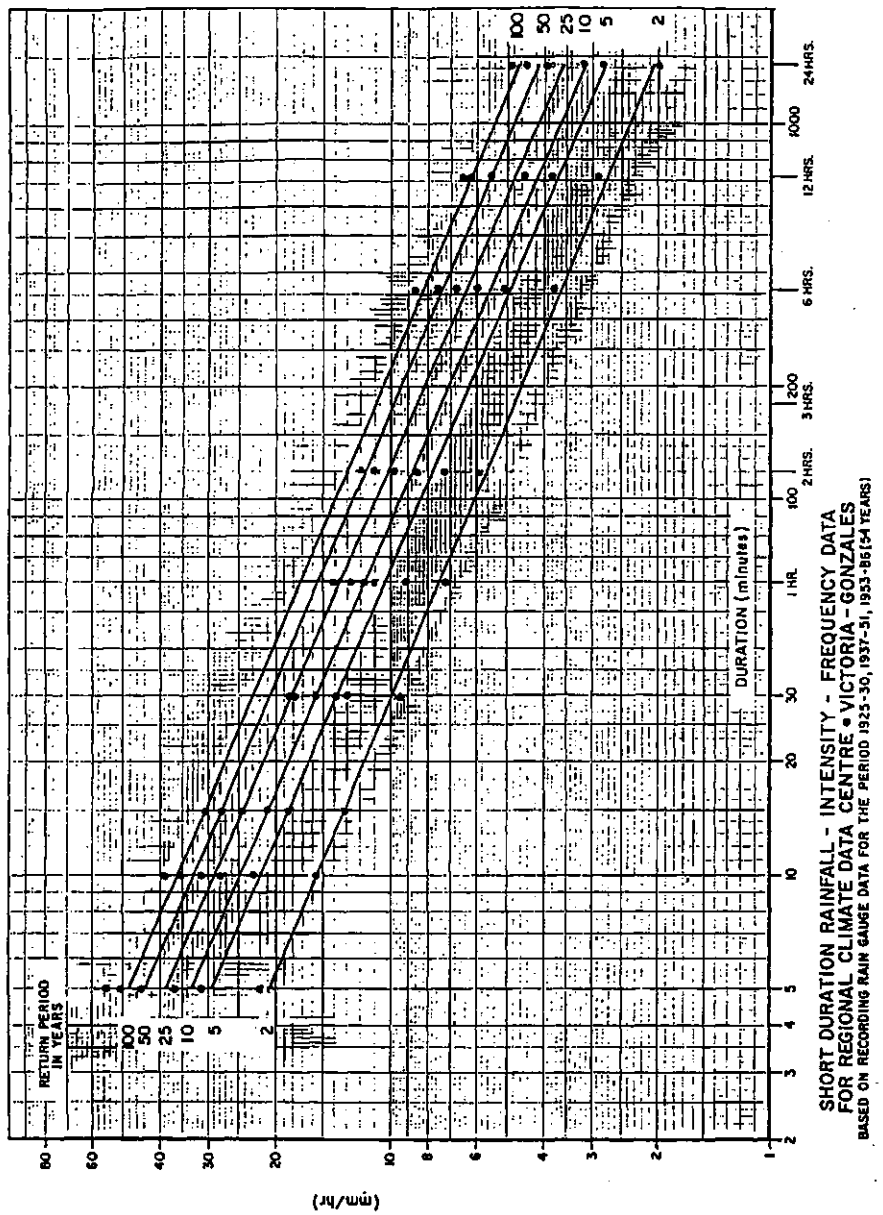
DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

COMBINATION SILT TRAP & GREASE INTERCEPTORS FOR COMMERCIAL GARAGES

STD. DWG. NO.

SD15



REFER TO SPECIFICATIONS FOR FURTHER DETAILS

DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

INTENSITY DURATION CURVE

STD. DWG. NO.

SD16

REGIONAL SPECIFICATION T 1

FOR UTILITY TRENCH EXCAVATION, BACKFILL AND CLEAN UP

1.0 Scope

1.01 This specification shall govern the excavation, backfilling and clean up for utility trenches within the Municipality. This relates to backfill above the pipe zone and below the finished surface.

2.0 Excavation

2.01 The trench shall be excavated to the required alignment, width, depth, and grade as shown on the approved design drawing.

2.02 Excavated material shall not be stockpiled on the roadway.

2.03 Where the maximum trench width is exceeded, reference must be made to the Consulting Engineer who shall obtain the approval of the Municipal Engineer before further construction may continue.

2.04 If the bottom of the trench is organic or other unsuitable material, the trench shall be over excavated to firm ground and backfilled with suitable compacted material for pipe support, unless otherwise specified by the Consulting Engineer.

2.05 Trench water must be removed.

2.06 All solid rock boulders and large stones shall be removed to provide a minimum clearance of 150 mm around the pipe.

2.07 Where an existing structure or underground installation may be affected by the works, it is the responsibility of the Consulting Engineer to inform the owner of such utility sufficiently in advance to enable the owner to specify what protective measures must be taken.

3.0 Backfill

3.01 Where a pipe or conduit is installed beneath an existing or foreseeable future pavement, sidewalk, driveway or gravel shoulder, the backfill shall be pitrun gravel or equal, compacted to a minimum 95% Standard Proctor Density, except for the top 300 mm which shall be 100%.

3.02 Suitable native materials may be used as backfill where the pipe or conduit is installed in non-travelled areas. Backfill in these cases shall be free of stones over 150 mm size, frozen material, organic, or other perishable or objectionable material that would prevent proper consolidation or which might cause subsequent settlement.

3.03 Controlled density backfill may be used in lieu of compacted gravel backfill. Controlled density or unshrinkable fill shall be manufactured and placed in accordance with Canadian Portland Cement Association publication CP004.01P.

3.04 Where it is required to replace topsoil it shall occupy the upper 300 mm of the trench and shall be mounded on top to allow for settlement. If the installation is under a developed lawn, the soil shall be fine raked during the appropriate season and sown with a top quality grass seed at the rate of 50 grams of seed per square metre and rolled.

4.0 Cleanup

4.01 Gravel filled trenches shall be maintained to within 25 mm of the original surface prior to final paving.

4.02 Patching cuts in existing pavement.

a) Cuts must be hot mix paved within 3 days of backfilling.

b) If weather conditions do not permit hot-mix asphalt, cuts shall be paved within 3 days of backfilling using cold-mix asphalt and replaced as weather permits.

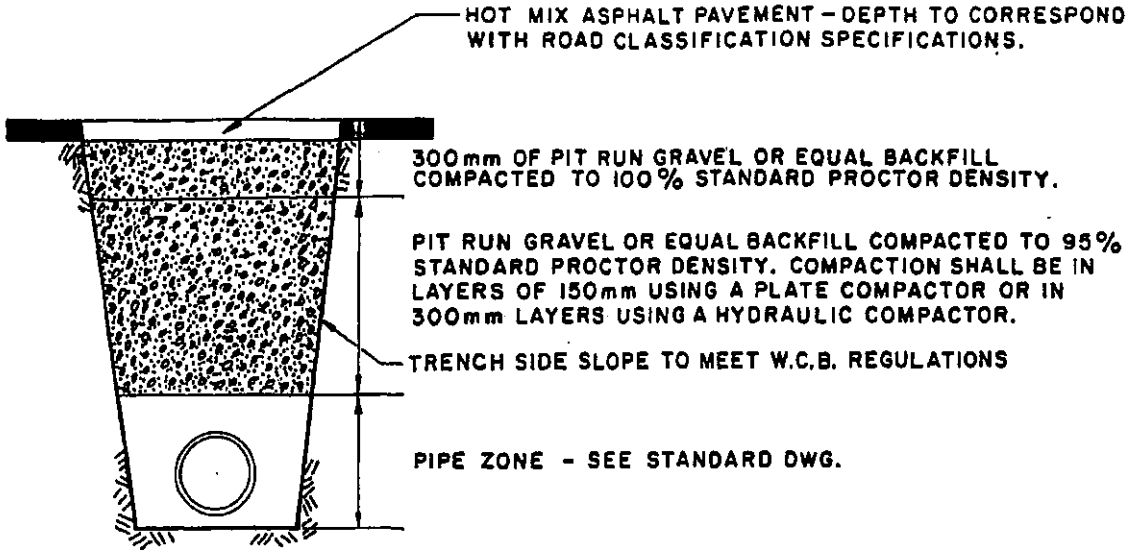
c) Where the excavation is on the shoulder or under the travelled portion of the street, the surface material shall be cut in neat straight lines at the edges of the trench by means of an asphalt cutting wheel, milling machine or pneumatic pavement breaker. Where the edges of any area requiring repaving extend outside the straight lines cut, further cuts shall be made so that the final patch will have a neat appearance.

d) Any area of pavement adjacent to the excavation which has become undermined or deformed due to excavation practices or blasting shall be removed and repaved as above.

e) The pavement of cuts which have settled shall be removed, the trench shall be recompacted and repaved.

5.0 Testing

5.01 The Consulting Engineer shall, at his direction, arrange for periodic compaction testing within the trench where trenches are over one metre deep. Test results shall be submitted to the Municipal Engineer.



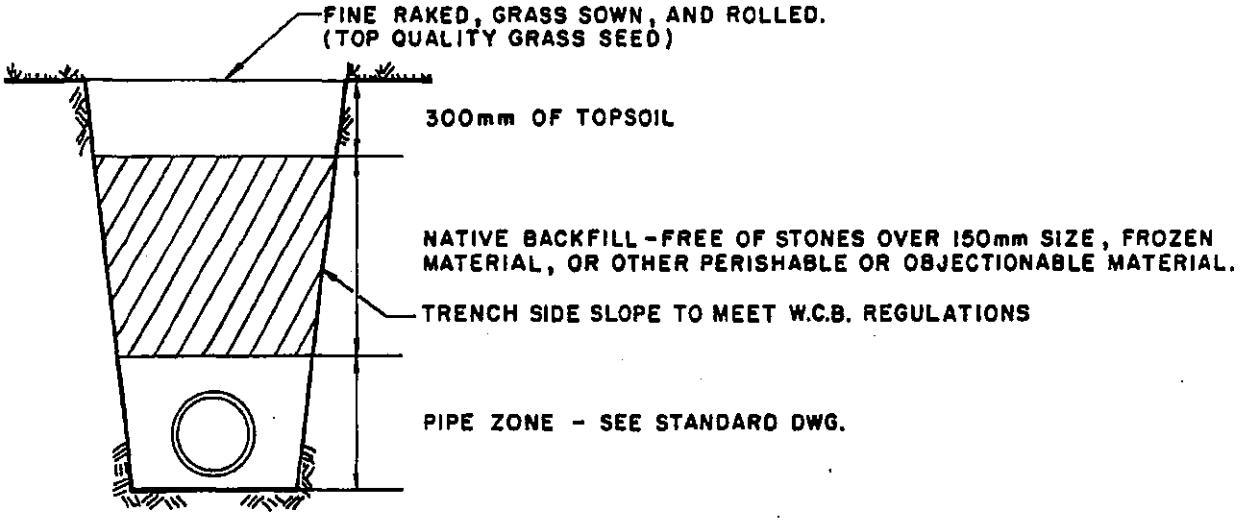
NOTE:

1 Unshrinkable fill may be used in lieu of compacted gravel backfill.

2 This specification shall include the travelled portion of the road and driveways or within 1.0m of the edge of the travelled road.

3 Within new road construction, the trench is to be backfilled up to 300mm of ground level with the remaining 300mm backfilled / compacted road gravel.

UNDER THE TRAVELLED PORTION OF THE ROAD AND DRIVEWAY



NON-TRAVELLED AREAS

DATE	REVISIONS	APPROVED

REGIONAL MUNICIPAL SPECIFICATION

TRENCH CONDITIONS ABOVE THE PIPE ZONE

STD. DWG. N·

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CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'C'

DESIGN AND CONSTRUCTION SPECIFICATIONS

ROADWAYS

INDEX

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'C'

DESIGN AND CONSTRUCTION SPECIFICATIONS

ROADWAYS **R**

1.0 Standards for Street Configurations

1.01 Major and collector streets are to be continued without jogs through the area being subdivided. Collector streets shall have a minimum width of 20 m. Major streets shall have a minimum width of 25 m.

1.02 Local streets shall conform in alignment to existing adjacent streets, where practical, and shall have a minimum width of 20 m.

1.03 Cul-de-sac streets shall be provided at the closed end with an area designated to permit safe and adequate space for turning of motor vehicles. A landscaped island shall be made in the turning area. Maximum slope on a cul-de-sac is 5%.

1.04 The minimum property line radius of turning areas at the end of cul-de-sac streets shall be 15 m.

1.05 Intersecting street boundaries shall be rounded to a 6 m radius curve.

1.06 Jogs in street alignment at intersections shall be permitted, provided the distances between centre lines at the jog is a minimum of 80 m., unless it is impractical to comply because of the existing street configuration.

1.07 Where bends occur in an existing street alignment, the angle shall be replaced by a curve.

1.08 Streets are to be laid out with due regard to the topography so as to avoid flat or excessive grades. The maximum allowable road grade is 12%. The minimum allowable road grade is 0.5%.

1.09 Intersecting streets shall meet substantially at right angles. In no case shall streets intersect at an angle of less than 70 degrees.

1.10 Street classification is as follows:

Road Type	Minimum Right-of-Way	Service Function	Principles of Intersection and Access control
Provincial Arterial	30m	Carrying of inter-regional traffic. New arterial should offer optimum mobility for through traffic, with minimum service to adjacent lands.	New arterial should intersect with secondary highways but minimize intersections with other roads. Access to adjacent properties should be minimized.
Major Roads (Provincial Secondaries/ Major Municipal streets)	25m	Carrying of major traffic flows within the community. Ensuring protection of neighbourhoods from through traffic. Access to adjacent properties should not interfere with the primary function of moving through traffic.	Where appropriate, should intersect with the Provincial Highway. Intersections with other secondary highways and collector roads are acceptable. Minimize direct access to adjacent property and connections to local roads.
Collector	20m	Providing for distribution of moderate traffic volumes within neighbourhoods and providing access to adjacent properties.	Should intersect with secondary highways, collectors and local roads. Some direct access to adjacent property is permissible.
Local	15m	Providing access to adjacent properties and carrying light volumes of traffic between points of origin and the collector road system.	Should intersect only with collectors and local roads. Constitute main providers of access to adjacent properties.

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'C'

DESIGN OF ROADS AND SIDEWALKS R-1

1.0 Scope

1.01 This specification shall govern the design of all roads, sidewalks, and appurtenances within the Municipality of Esquimalt. This specification should be read in conjunction with the latest version of the District of Saanich Material Specifications as appended.

2.0 Classification and Width

2.01 Prior to design, the Municipal Engineering Department shall classify and stipulate widths for the particular road under consideration.

	Road Width	Design Speed km/h	Water Control	Shoulders Boulevard
Local Street	10.0 m	50	Concrete curb and gutter	2.5 m
Collector	12.0 m	50	Concrete curb and gutter	2.5 m
Major Road	14.0 m	50	Special design	2.5 m

3.0 Vertical Alignment

3.01 The vertical alignment of the road shall be set to serve adjacent properties with access driveways at a grade not steeper than 15% and conforming to the requirements as shown in Standard Drawing R-8.

3.02 The length of a vertical curve shall be calculated using Standard Drawing R-9.

3.03 Vertical Control

Maximum grade - Local	12.0%	
Maximum grade - Collector		12.0%
Minimum grade	0.5%	
Minimum grade at curb returns	0.5%	
Maximum grade on turn around at cul-de-sac	5.0%	
Maximum grade at local	5.0%	for 15 m tangent approach to collector length back from intersecting road edge.
Maximum grade at local or	3.0%	for 15 m tangent collector approach to major length back from intersecting road edge.
Normal Crown	2.0%	

3.04 Crossfall - the practice of crossfalling a road is acceptable at intersections and where required because of topographical features.

3.05 Superelevation - horizontal curves on local roads shall not be super elevated. Collector and arterial roads shall be superelevated in keeping with the good engineering practices.

3.06 Transition - the length of a transition from a normal cross-sectioned road to a section of road where there is superelevation shall in no case be less than 45 metres for every 4% grade change.

3.07 Extensions - evidence that vertical alignments are satisfactorily extendable for at least 50 m will be required.

4.0 Horizontal Alignment

4.01 The horizontal alignment of the road shall be centred in the road allowance. Typical locations of services for new local and collector roads are shown on Standard Drawings R-3 and R-4.

4.02 Centerline chainage stations shall be referenced and dimensioned from an identifiable iron pin.

4.03 Minimum radius of curve and maximum superelevation:

	Design Speed km/h	Minimum Radius	Maximum Centerline Elevation
Local Street	50	90 m*	Normal Crown
Collector	50	100 m	0.06
Major Road	Special Design		

*Subject to the approval of the Municipal Engineer, curves on crescent shaped local roads may be reduced to a minimum centerline radius equal to 30 m.

4.04 A horizontal curve shall be fully described showing: internal angle, radius, tangent length, and arc.

4.05 Curb returns of 8 m radius are required for local road intersections. Curb returns located on bus routes and on roads within industrial and commercial districts require a 10 m or larger radius to facilitate trucks and bus traffic.

4.06 When a new local road with curbs intersects an existing road without curbs, the curb returns shall not be constructed. However, curb returns shall be constructed at the intersection of two curbed roads.

5.0 Cross Section

5.01 The cross section of roads shall be designed in accordance with the dimensions and requirements shown on the following Standard Drawings:

PAVEMENT WIDTH	DWG. NO.	SERVICE LEVEL
8.5 m local road	R-I	I
10 m local road	R-1	2
12 m collector road	R-2	2
14 m major road	R-2	2

5.02 Reference to or details of the cross-section dimensions and requirements must be shown on each design drawing submitted.

5.03 The toe of a fill slope or top of a cut slope shall not encroach on private property. The containment of these slopes within the road allowance may require the design of a retaining wall or the widening of the right-of-way to contain the cut or fill slope.

5.04 Where cut slopes are to be made into ground seepage zones or where the extent of the slope would generate surface runoff, curtain drains shall be required at the base of the slopes and connected to the road drainage system or other suitable point of discharge.

6.0 Geometric Layout of Turn-arounds

6.01 The design of the turn-around shall conform to Standard Drawing R-5. The dimensions may be increased to meet traffic and vehicular requirements, or where the turn-around is skewed. Under special circumstances the Municipal Engineer may permit a temporary turn-around type of design.

6.02 The design of a temporary turn-around shall conform to Standard Drawing R-7.

7.0 Curb, Gutter and Sidewalks

7.01 Mountable concrete curb and gutter shall conform to Standard Drawing R-10.

7.02 Non-mountable concrete curb and gutter shall conform to Standard Drawing R-12.

7.03 Asphalt water control shall be a minimum 50 mm high by 300 mm wide.

7.04 Concrete invert gutter shall conform to Standard Drawing R-10.

7.05 Mountable curbs and non-mountable curb returns shall be specified for residential streets and non-mountable curbs elsewhere, except as required by the Municipal Engineer.

7.06 Sidewalks, where required, are normally located adjacent to the curb and shall be 1.5 m wide. Sidewalks are to be crossfalled towards the road at 2%.

7.07 Gutters having widths less than those shown on Standard Drawings R-10 and R-12 may be permitted subject to the Municipal Engineer's approval.

7.08 Integrated Survey monuments shall be installed in curbs as required by the Municipal Engineer. These are to be tied in to the Provincial Integrated Survey by a B.C. Land Surveyor at the developer's expense.

8.0 Catch Basins

8.01 Catch basins shall be constructed as shown on Regional Municipal Specification Standard Drawings SD-10 and D-11.

8.02 Double catch basins should be installed at locations of high runoff and sag curves.

8.03 Catch basins shall be located at the higher end of the curb returns of intersections, at the lowest point of the sag vertical curves, and at a spacing not greater than the following:

MAXIMUM SPACING OF CATCH BASINS	
ROAD WIDTH	SPACING
10.0 m	75 m
12.0 m	70 m
14.0 m	60 m

On roads with superelevation crossfall the maximum spacing shall be one half of the above figures. Adequate allowance shall be made to handle runoff from turn-arounds.

Exceptions to the above maximum spacing of catch basins may be allowed, where paving is to be installed on existing streets and where houses are drained in a manner satisfactory to the Municipal Engineer.

9.0 Appurtenances

9.01 a) The Consulting Engineer shall detail on the design drawing the location of all retaining walls, guardrails, handrails and fences. These structures shall be designed in keeping with good engineering practices;

b) The design of barricades, chain link fence and sidewalk handrails shall conform to Standard Drawings R-14, R-17, R-18 and R-19.

9.02 Utility Poles - the Consulting Engineer shall indicate utility poles which require relocating prior to road construction and he shall confirm with the appropriate utility representatives the feasibility of their relocation prior to design completion.

9.03 Underground Wiring and Gas Mains - the Consulting engineer shall indicate on their design drawing the designs supplied by B.C. Hydro or B.C. Telephone for all underground wiring and gas mains which require relocation or are proposed including the connection to properties.

9:04 Survey monuments shall be installed as per Ministry of Environment and Municipality of Esquimalt specifications.

10.0 Structural Design of Roads

10.01 All road base and paving design shall be in accordance with District of Saanich Material Specifications Appendix 1 to 7 inclusive.

10.02 The minimum compacted gravel base and asphalt pavement thickness requirements for various road classifications are shown on the following Standard Drawings.

R/W Minimum Width	Pavement Width	Drawing No.	Service Level
15m R/W	8.5m Local Road	R-1	1
20m R/W	10m Local Road	R-2	2
20m R/W	12m Collector	R-2	2
25m R/W	14m Major Road	R-2	2

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'C'

CONSTRUCTION OF ROADS AND SIDEWALKS R-2

1.0 Scope

1.01 This specification shall govern the construction of roads, sidewalks, and appurtenances within the Municipality of Esquimalt.

2.0 Clearing

2.01 The full width of the roadway and shoulders will be cleared of timber and bush which will be removed. Any trees on existing road rights-of- way will not be removed unless approved by the Municipal Engineer. All topsoil and turf will be removed from at least 2.5 m clear of the curbs. Sufficient topsoil must be retained on site for 100mm of topsoil on the boulevard. Surplus topsoil which may have to be removed from an existing road allowance is the property of the City and shall be deposited at a stock pile site approved by the Municipal Engineer.

2.02 The remaining portion of road allowance will be cleared of stumps, rubble, loose rock and rough graded to the satisfaction of the Consulting Engineer. Finished grading, seeding of grass and rolling adjacent to any road construction on established boulevards or where otherwise required by the Consulting Engineer shall be done upon completion of all construction.

3.0 Setting of Grades

3.01 Grade hubs will be set at not more than 10 m intervals on tangents and 5m intervals on curves on both sides of the road and at the same chainage points. Hubs will be located so that they are not disturbed by the construction equipment.

3.02 On horizontal curves the increased or decreased arc shall be calculated to compensate for the radius so that the hubs on both sides of the road will bear the same centre line chainage.

3.03 Where the road is to be superelevated it may be necessary to calculate the difference in elevation due to the offset of the hub to enable the sub-grade to be graded. Care should be taken to ensure that this compensated elevation is not used when the concrete curbs are being formed.

3.04 Sturdy hubs of sufficient length to give firm footing shall be used with nails driven in the top for fine alignment, and suitably identified which chainage, cut or fill, and offset to curb face. Cut or fill information will face the hub and will be related to the elevation of the top of curb.

3.05 Cross heads may be erected at a suitable height at every station, clearly marked for the amount of cut of fill required to finish grade. Cuts or fills should be adjusted to even vertical intervals above required grade. Grades should be checked with a boning rod by sighting across these cross heads.

3.06 Alternate methods of layout and construction may be used providing the curbs or centreline are within 15mm of the design elevation and 30mm of the design horizontal alignment.

4.0 Subgrade Construction

4.01 Where clay or other material is acceptable to the Consulting Engineer for constructing a compacted subgrade in fills, the subgrade is constructed over the native ground up to the bottom of the base coarse.

4.02 The subgrade, in cuts, is the native ground lying below the gravel base course.

4.03 The subgrade, will be constructed of clay or granular material placed in layers not exceeding 150mm and compacted to 95% of the laboratory density obtained by following A.S.T.M. Specification 698, Method C, or latest revision thereof with exception of the top 300mm which shall be compacted to 100%. The fill section shall conform to Standard Drawing R-1 and R-2.

4.04 In cuts, the top 300mm of the subgrade will be compacted to 100% of the laboratory density obtained by following A.S.T.M. Specification 698, Method C, or latest revision thereof, when required by the Consulting Engineer. The cut section shall conform to Standard Drawings R-1 and R-2.

4.05 The toe of the fill slope or the top of a cut slope shall not extend outside the right-of-way. The containment of these slopes may require the construction of retaining walls, rip-rap, or the right-of-way could be widened.

4.06 Where the Consulting Engineer deems native ground material to be unsatisfactory, excavation will be required to such depths as he may direct.

4.07 No topsoil, trees, stumps or any organic matter will be buried in the subgrade, sub-base or base course.

4.08 Rock shall be excavated to depths shown on Standard Drawings R-1 and R-2.

5.0 Base Course and Granular Fill

5.01 Where clay or other material is unacceptable to the Consulting Engineer for constructing a compacted subgrade in cuts or fills, acceptable granular materials will be placed between the subgrade and base course. Select granular material from road cuts or 80mm minus pit run gravel either being acceptable to the Municipal Engineer may be used as fill material.

5.02 The fill be constructed of clay or granular material placed in layers not exceeding 150mm and compacted to 95% of the laboratory density obtained by following A.S.T.M. Specification 698, Method C, or latest revision thereof with exception of the top 300mm which shall be compacted to 100%. The fill section shall conform to Standard Drawings R-1 and R-2.

5.03 Granular surfacing, base course and fill preparation shall conform to District of Saanich Specification appended to these Specifications.

5.04 In addition to the requirements of Appendix 2 the field density of soils shall be determined by A.S.T.M. designation D2922, determining density of soil and soil aggregate in place by nuclear methods (shallow depth).

For spot checks, the following methods are also acceptable:

A.S.T.M. Designation D 1556 - Density of soils in place by sand cone method.

A.S.T.M. Designation D 2167 - Density of soils in place by rubber balloon method.

5.05 No base course gravel shall be placed until all underground services have been installed unless otherwise approved by the Consulting Engineer.

5.06 The 80mm crushed pit run as described in District of Saanich Specification Appendix 2, Section 2.02 may be specified by the Consulting Engineer for the road base course and/or sub-base, on slopes of large embankments, on areas of poor sub-grades, and special conditions where increased stability is required.

6.0 Sidewalks, Curbs and Gutters and Catch Basins

6.01 Concrete - concrete shall conform to the requirements outlined in District of Saanich Specification Appendix 8 as appended to these Specifications.

6.02 Concrete sidewalks, curb and gutter, and driveway crossings will be constructed in accordance with the following Standard Drawings:

Curb and Gutter - Mountable	R-10
Curb and Gutter - Non Mountable	R-12
Curb, Gutter and Sidewalk - Combined	R-13
Sidewalk - Concrete	R-13
Walkway - Concrete	R-14

The type of construction to be used and the location will be as shown on the construction design drawings or as directed by the Consulting Engineer.

6.03 Extruded Curb and Gutter

a) The Contractor will be given the option of constructing extruded curb and gutter. Prior to use, the specifications for the extrusion equipment shall be submitted for written approval from the Consulting Engineer. Automatic grade and line control will be required.

b) Extruded concrete shall be finished as shown in the applicable drawings, with a surface grade brush finish; a dense uniform surface will be required on curb and gutter.

6.04 Placing of Concrete

a) After mixing, the concrete shall be transported rapidly to the job site, and shall be delivered as close as possible to the point of deposit. Rehandling of concrete will not be permitted.

b) Concrete operations shall be continuous until the section, panel, or scheduled pour is completed. Should the operation be unavoidably interrupted, full depth construction joints shall be formed at the proper locations as herein specified.

c) The concrete shall be placed in such a manner as to prevent separation of the ingredients. Special care shall be taken to place the concrete against the forms, particularly in corners, in order to prevent voids, rough areas, and honey combing.

d) The concrete shall be placed to the full specified depth. After spreading, the concrete shall be struck-off and compacted by means of an approved screed. Vibrators or vibrating screens are recommended and shall be operated at a minimum of 5000 cycles per minute. The technique and use of vibrators or vibrating screens shall be at the discretion of the Consulting Engineer.

e) Freshly placed concrete shall be protected in an approved manner against damage from the elements, and construction operations harmful to concrete.

6.05 Trowelling and Brushing Finish

a) After placing, the concrete shall be adequately worked with wood and steel trowels to a smooth finish with the required edges neatly rounded. Excessive trowelling is to be avoided.

b) The use of grid tampers or "Bird Cages" will not be allowed.

c) If there is evidence of concrete bleeding, finishing shall cease until the excess water has evaporated to the satisfaction of the Consulting Engineer. Failure to comply with the above will result in complete replacement of the sections involved.

d) Brush finish shall be applied with a nylon bristle brush approved by the Consulting Engineer. The brushing shall be carried out in accordance with applicable drawings and in such a manner and at such a time as to minimize the depth and quantity of brush marks. All surplus water must be removed from the bristles before brushing commences. No mortar coat or water wash shall be used.

e) Catch basin gutter grates shall be removed while finishing the adjacent gutter, and replaced following completion of finishing.

f) After trowelling, the surface grade along the lip of gutter shall be checked by the Contractor with straight edges, to an accuracy of plus or minus 10mm in 3 metres. The maximum allowable variation across the gutter shall be 3mm.

6.06 Forms

6.06.1 Construction of Formwork

Forms shall be of metal or timber properly seasoned and free from warps or other defects. The type and section of the metal forms shall require the approval of the Municipal Engineer. **The face of curb forms shall be removable without disturbing back and gutter forms.** The forms shall be smooth and clean on the surface(s) next to the concrete and shall be oiled with Parvelube No. 30 or approved equal. The forms shall be rigidly held true to the established lines and grades.

6.06.2 Stripping of Forms

a) Face of curb forms shall be removed after the initial set. Adequate care shall be taken in removing forms to avoid spoiling or marring the concrete. Such patching as may be necessary shall be started immediately after removal of the forms.

b) Immediately after form removal and/or patching, the exposed surfaces shall be sprayed with the membrane curing material.

6.07 Joints

6.07.1 Contraction Joints

a) Contraction joints shall be cut at every 3 metres by means of a marking tool or other approved method. Joints shall not be less than 30mm in depth and 7mm in width.

b) The edges of the joint shall be rounded off with an edger having the arc of a circle of 7mm radius.

c) Contraction joints in a monolithic sidewalk must extend through the full width of the sidewalk and curb and gutter.

d) Contraction joints at catch basins shall be cut through the full width of the sidewalk in line with both outside edges of the catch basin gutter frame.

6.07.2 Expansion Joints

Lateral expansion joints are required at the beginning and end of every corner. The joint shall consist of an approved mastic preformed material, 13mm by 90mm cross-section, laid plumb and straight, 7mm below the finished sidewalk grade.

6.07.3 Surface Joints - Surface joints 13mm in depth and 7mm in width will be cut in sidewalk sections only every 3 metres in between the contraction joints. The edge of the joint shall be rounded off with an edger having an arc or a circle of 7mm radius.

6.07.4 Sawed Joints - Saw cuts as specified are to be made with a special concrete saw capable of producing a true straight joint of constant depth as required.

6.07.5 Breaking Out - All breakout shall end at a contraction, expansion or surface joint. The edge of a surface joint is to be sawn to a depth of 22mm minimum, while contraction joints may be neatly hand chiselled.

6.07.6 Obstructions

a) The contractor will be required to carefully fit, cut and mark a surface joint in the sidewalk around all openings, iron covers, manholes, vaults, valves or metre boxes, lamp standards, hydrants, poles and other surface installations. The surface joint must be neatly tooled to the satisfaction of the Consulting Engineer.

b) Expansion joints material, 13mm thick and the full depth of the sidewalk, shall be placed around the base of all poles, hydrants, and where the work abuts existing buildings or other structures, including existing sidewalks.

6.08 Reinforcing

6.08.1 General

a) Reinforcing shall be clean and free from defects, kinks, loose rust of mill scale at the time the concrete is places. Any coatings of hardened mortar shall be removed from the steel.

b) Bar reinforcing shall meet A.S.T.M. Specification A184 and A.S.T.M. Specification A304, intermediate grade new billet deformed steel and C.S.A. standard 930.12m.

c) Cold-drawn steel wire shall meet the requirements of A.S.T.M. Specification A82 and the wire mesh shall meet the requirements of A.S.T.M. Specification A185 and C.S.A. standard 930.3.

6.08.2 Reinforced Driveway Crossings

a) In separate sidewalk, combined sidewalk, and curb and gutter, a single layer of 150mm by 150mm by 10/10 gauge wire mesh, in a minimum concrete depth of 150mm, as shown on Standard Drawing R-13 shall be placed at public lanes, apartments, and commercial driveways. The mesh shall extend to the full width of the crossing.

b) In separate curb and gutter, two 10m reinforcing bars, as shown on Standard Drawings R-10, R-11 and R-12, shall be placed at apartments and commercial driveways.

6.08.3 Reinforcing in Fill Areas

Where the sidewalk, curb and gutter, combined sidewalk curb and gutter, is constructed on more than 300mm of fill, or where poor soil conditions are evident, reinforcing steel shall be used.

a) In separate curb and gutter, two 10m reinforcing bars shall be placed, as shown on Standard Drawings R-10, R-11 and R-12.

b) In separate sidewalk, a single layer of 150mm by 150mm by 10/10 gauge wire mesh shall be placed as shown on Standard Drawing R-13.

c) In combined sidewalk, curb and gutter, a single layer of 150mm by 150mm by 10/10 gauge wire mesh shall be placed as shown on Standard Drawing R-13.

6.08.4 Placing of Reinforcement

Reinforcing mesh shall be rolled or otherwise straightened to make a perfectly flat surface before placing. The mesh or bar reinforcing shall be supported above the compacted gravel base so as to ensure a 50mm cover of concrete. The manner of supporting the reinforcing shall be approved by the Consulting Engineer. Overlapping of mesh reinforcing shall be a minimum of 300mm, and shall be wired together. Overlapping of bar reinforcing shall be thirty (30) bar diameters and shall be wired together.

6.08.5 Reinforcing Markings - All sections containing reinforcing shall be marked at their extreme limits with a marking tool showing the letter R and arrow pointing in direction of reinforcing. This letter shall be 4 cm high.

6.09 Protection of Work

6.09.1 Covering - the Contractor shall supply and place all tarpaulins, or other necessary materials to protect the work from rain, dust, frost or other similar weather action, for such time as the Engineer may consider necessary. Failure of the Consulting Engineer to order protection does not relieve the Contractor of the responsibility.

6.09.2 Barricades - The Contractor shall also barricade the work and keep all humans, animals, and vehicles off the work for a period of five (5) days after the finishing of the concrete has been completed. Any damage occurring to the work during this five (5) day period regardless of origin shall be repaired by the Contractor to the satisfaction of the Consulting Engineer within one (1) month after notice is given to the Contractor.

6.09.3 Pedestrian and Vehicular Access - The Contractor shall ensure that the property owners are warned at least one day prior to the pouring of concrete and that alternate pedestrian access is provided. With respect to commercial properties, access must be maintained as directed by the Consulting Engineer. Inconvenience to the public shall be minimized.

6.10 Catch Basins

a) Construction of catch basins in the locations shown on the design drawing shall be undertaken prior to the construction of curbs.

b) Mountable concrete curb will have two 10m reinforcing bars placed as shown in Standard Drawing R-11 behind catch basins.

6.11 Curb and Gutter Transitions - Where dissimilar sections join, a uniform gutter grade shall be maintained and a suitable transition effected by adjusting the height of the curb within one metre.

7.0 Asphalt Paving

7.01 Asphaltic Materials - Asphaltic materials shall conform with the requirements in Appendix 1 - Asphaltic Materials.

7.02 Surface Preparation for Asphalt Paving - The surface for asphalt paving shall be prepared in accordance with District of Saanich Specification Appendix 3 - Surface Preparation for Asphalt Paving.

7.03 Asphaltic Concrete Paving - Asphaltic Concrete Paving shall be placed in accordance with District of Saanich Specification Appendix 4 - Asphaltic Concrete Paving.

7.04 Surface Treatment - Aggregate Seal Coats, Sand Seal Coats, Fog Seal Coats and Slurry Seal Coats shall be placed in accordance with Appendix 5 - Surface Treatments.

7.05 Inspection and Testing - All asphalt paving shall be tested by a qualified laboratory in accordance with District of Saanich Specification Appendix 6 - Inspection and Testing and District of Saanich Specification Appendix 7 - Asphalt Methods of Test. The testing laboratory shall be retained by the Consulting Engineer and shall send reports to the Municipal Engineer within 10 days of the test commencement. A minimum of one set of three (3) asphalt cores per 500 tonnes of pavement or at least one set per day of paving is to be taken by the approved testing laboratory. Test results are to be made available to the Municipal Engineer.

8.0 Appurtenances

8.01 Retaining walls, guardrails, handrails, fences and barricades shall be installed in accordance with the design drawing and these specifications.

8.02 Handrails shall be used on retaining walls with greater than 0.5 m drop.

9.0 Traffic Control and Street Identification

9.01 All signs and pavement markings shall be installed by the Municipality at the expense of the applicant.

10.0 Cul-de-sac Islands

10.01 The cul-de-sac islands shall be constructed as detailed on standard drawing #R6.

10.02 A minimum of 200mm of top soil to be placed in the areas designated for landscaping with a minimum 1% grade upward from the curb.

10.03 Within the specified landscaped area eight junipers of two different varieties and two dwarf trees are to be planted. The stock is to originate form five gallon pots and is to be both hardy and disease free. Planting material is to be fertilized at time of installation.

10.04 Subsequent to planting, the entire landscaped area is to be covered by a blanket of landscape filter fabric and then surfaced with 50mm of fine screened bark mulch.

10.05 The applicant is responsible for fertilizing, watering, weeding, and other related maintenance for a period of one year subsequent to subdivision approval by the Approving Officer.

11.0 Cleaning up

11.01 All surplus material, tools, temporary structures, debris, dirt and rubbish shall be promptly removed by the Contractor immediately following completion of the construction work.

11.02 The site shall also be left clean and tidy to the satisfaction of the Municipal Engineer.

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

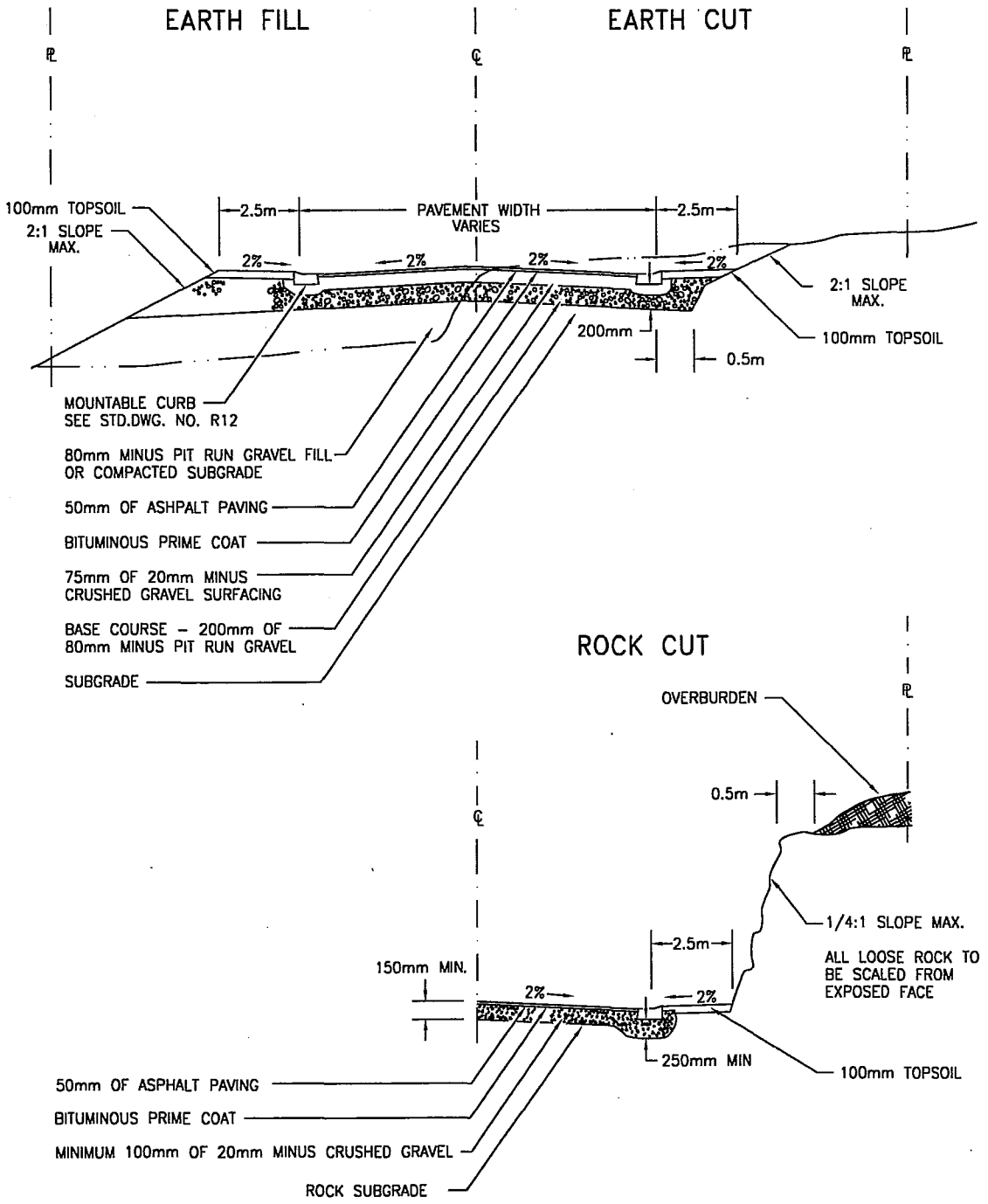
SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'C'

DESIGN AND CONSTRUCTION SPECIFICATIONS

ROADS — STANDARD DRAWINGS

15m, 18m & 20m ROAD ALLOWANCE



NOTE: DEPTHS OF SURFACING AND BASE GRAVELS ARE MINIMUM AND IN SOME CASES WILL HAVE TO BE INCREASED TO PROVIDE A STABLE ROAD BED.

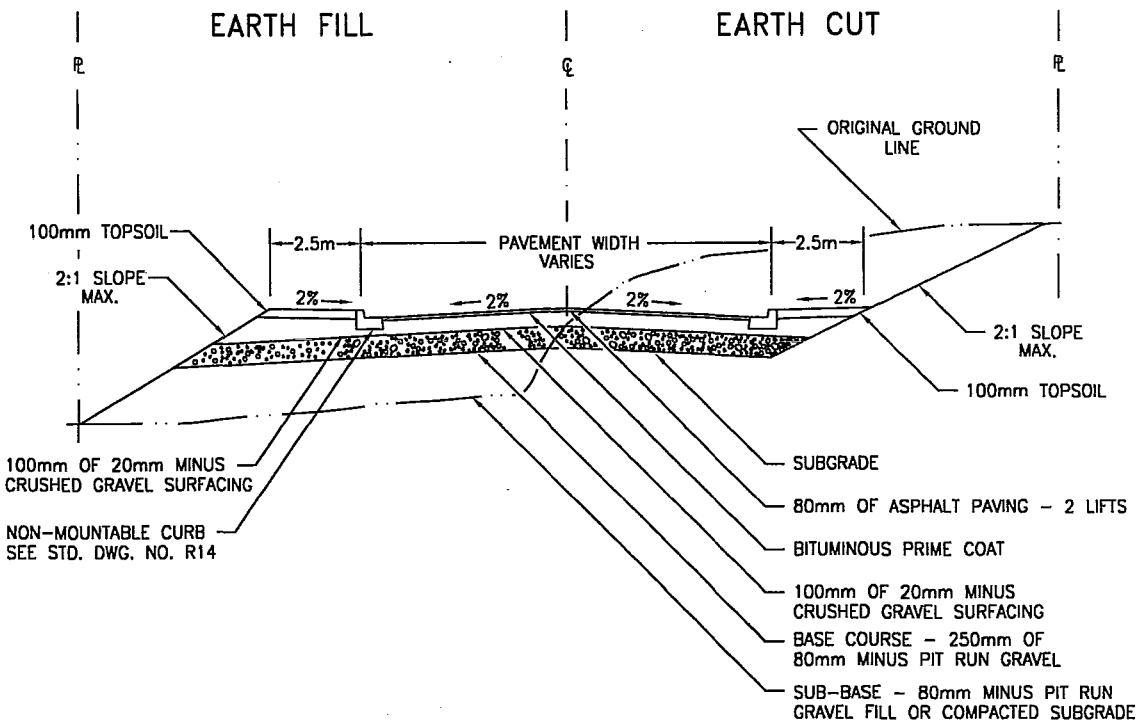
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

TYPICAL SECTION LOCAL ROAD SERVICE LEVEL 1

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R1
APPROVED BY :	FILE NO. : 10.1.2.17	



NOTE: DEPTHS OF SURFACING AND BASE GRAVELS ARE MINIMUM AND IN SOME CASES WILL HAVE TO BE INCREASED TO PROVIDE A STABLE ROAD BED.

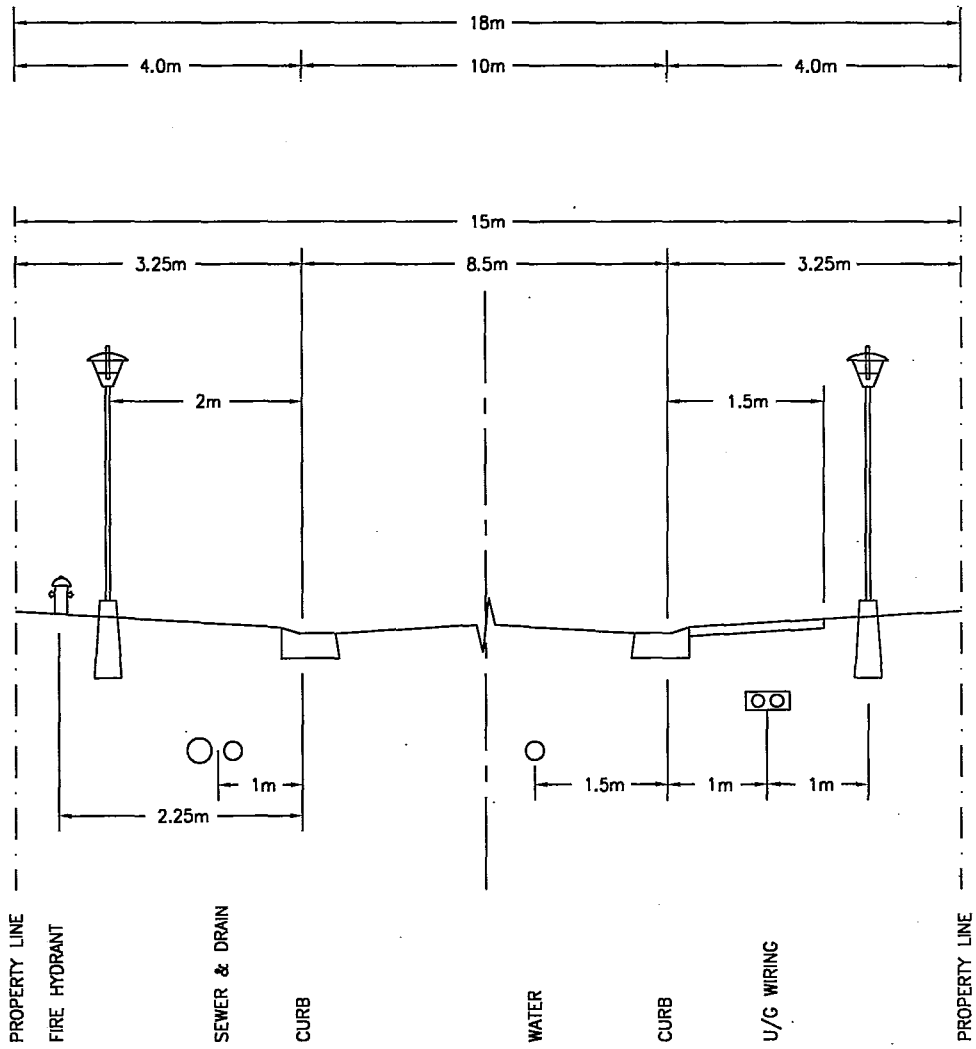
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

TYPICAL SECTION COLLECTOR & MAJOR ROAD, SERVICE LEVEL 2

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R2
APPROVED BY : _____	FILE NO. : 10.1.2.17	



SERVICES TO BE LOCATED IN THE POSITIONS SHOWN IN DRAWING.

SEWERS & DRAINS
- MAY BE IN THE SAME TRENCH IF THERE IS A MINIMUM 150mm LATERAL CLEARANCE BETWEEN THE OUTSIDE COUPLINGS OR BELLS OF THE PIPES AND IF THE ELEVATIONS ARE SIMILAR.
- MUST BE 1.0m CLEAR OF POLES.

WATER
- MUST BE 1.5m CLEAR OF UNDERGROUND HYDRO.
- MUST BE 3.0m CLEAR OF SEWER.
- MUST BE 1.0m CLEAR OF LAMP STANDARD BASES.

HYDRANTS
- MUST BE 3.0m CLEAR OF ANY UTILITY POLES AND LAMP STANDARDS.

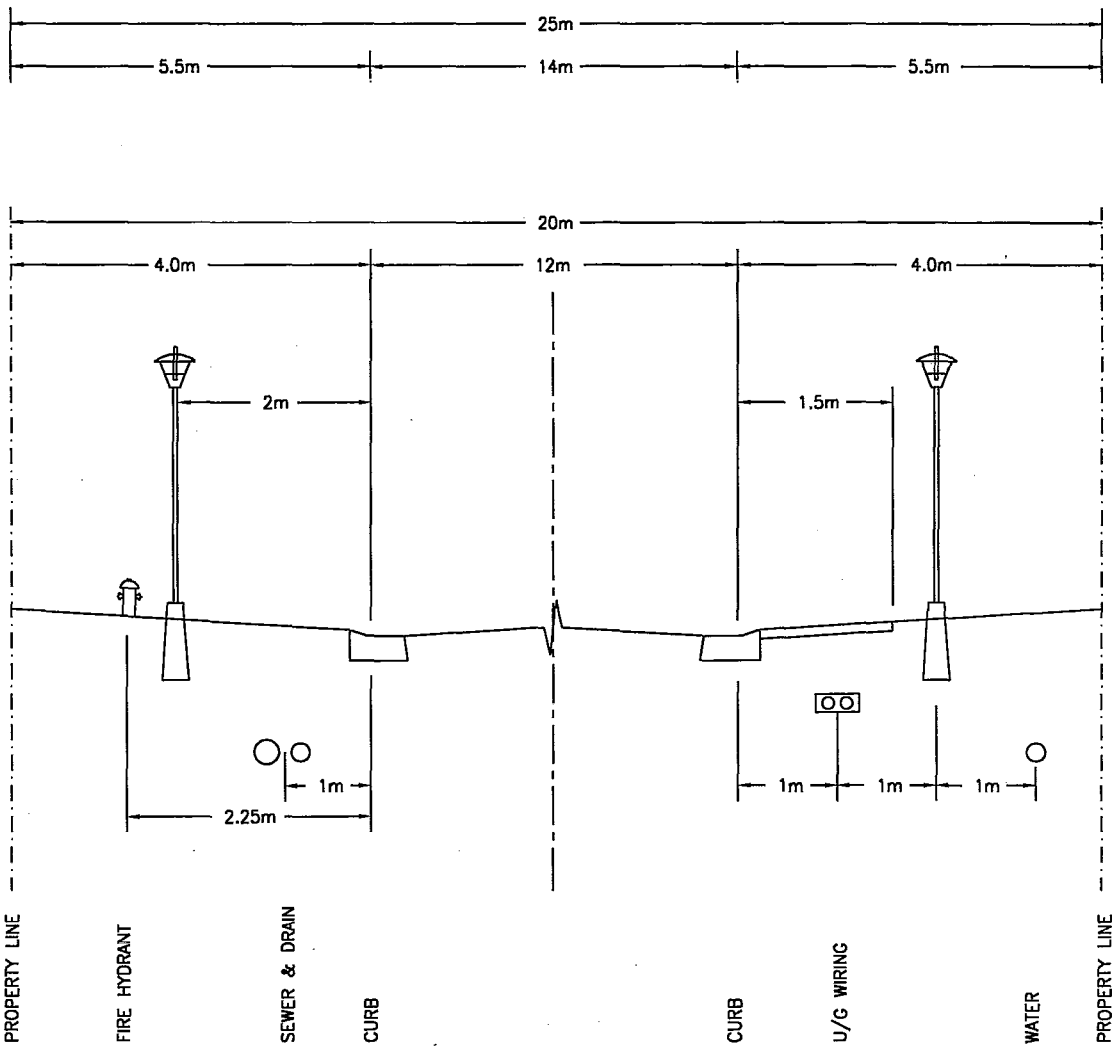
REFER TO SPECIFICATIONS FOR FURTHER DETAILS.

TYPICAL LOCATION OF SERVICES CUL-DE-SAC, 15m R/W AND 18m R/W

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R3
APPROVED BY : _____	FILE NO. : 10.1.2.17	



SERVICES TO BE LOCATED IN THE POSITIONS SHOWN IN DRAWING.

SEWERS & DRAINS
- MAY BE IN THE SAME TRENCH IF THERE IS A MINIMUM 150mm LATERAL CLEARANCE BETWEEN THE OUTSIDE COUPLINGS OR BELLS OF THE PIPES AND IF THE ELEVATIONS ARE SIMILAR.
- MUST BE 1.0m CLEAR OF POLES.

WATER
- MUST BE 1.5m CLEAR OF UNDERGROUND HYDRO.
- MUST BE 3.0m CLEAR OF SEWER.
- MUST BE 1.0m CLEAR OF LAMP STANDARD BASES.

HYDRANTS
- MUST BE 3.0m CLEAR OF ANY UTILITY POLES AND LAMP STANDARDS.

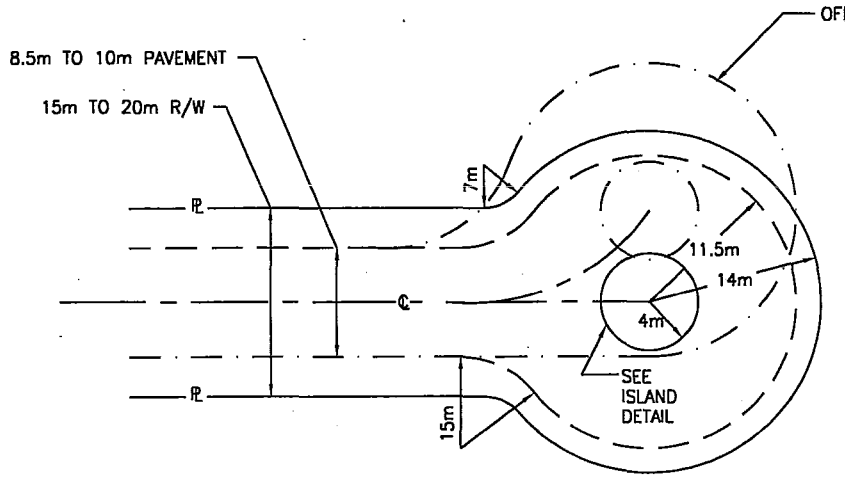
REFER TO SPECIFICATIONS FOR FURTHER DETAILS.

TYPICAL LOCATION OF SERVICES 25m R/W AND 20m R/W

TOWNSHIP OF ESQUIMALT

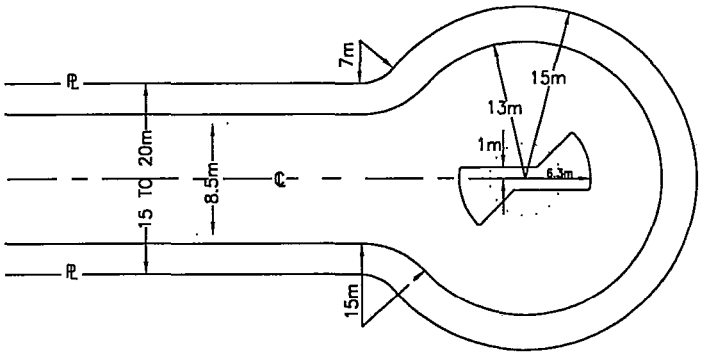
ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R4
APPROVED BY : _____	FILE NO. : 10.1.2.17	



TYPE 1

FOR LANDSCAPE DETAIL SEE R6



TYPE 2

NOTES

1 THESE STANDARDS APPLY TO TURN-AROUNDS ON RESIDENTIAL ROADS FOR SINGLE FAMILY DWELLINGS.

2 CHAINAGE FOR PROFILE TO BE ALONG CENTRE LINE. SHOW SPOT ELEVATIONS FOR TOP OF CURBS AS WELL AS CENTRE LINE PROFILE.

3 FOR CUL-DE-SAC ISLAND DETAIL REFER TO STD. DWG. NO. R6
DWELLINGS.

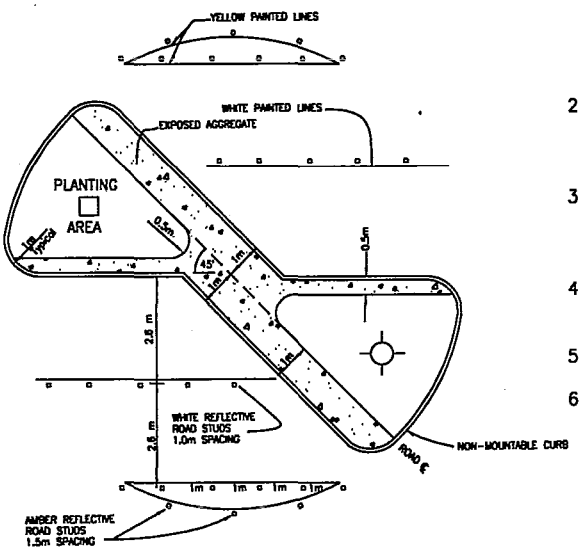
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

TYPICAL CUL-DE-SAC DETAIL

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE: NOV 1992	SCALE: N.T.S.	DWG.NO. R5
APPROVED BY:	FILE NO. 10.1.2.17	



NOTES

1 WHEN POST TOP LUMINAIRE IS TO BE USED STANDARD BASE TO BE CONSTRUCTED AS PER STANDARD DRAWING TOGETHER WITH NECESSARY UNDERGROUND WIRING.

2 WATERING FACILITY – SUPPLY AND INSTALL 19 mm HOSE– BIB HOUSE IN A STANDARD METER BOX.

3 PARTITION MATERIAL TO BE 50mm x 100mm STANDARD CONSTRUCTION GRADE CEDAR, STAINED DARK BROWN.

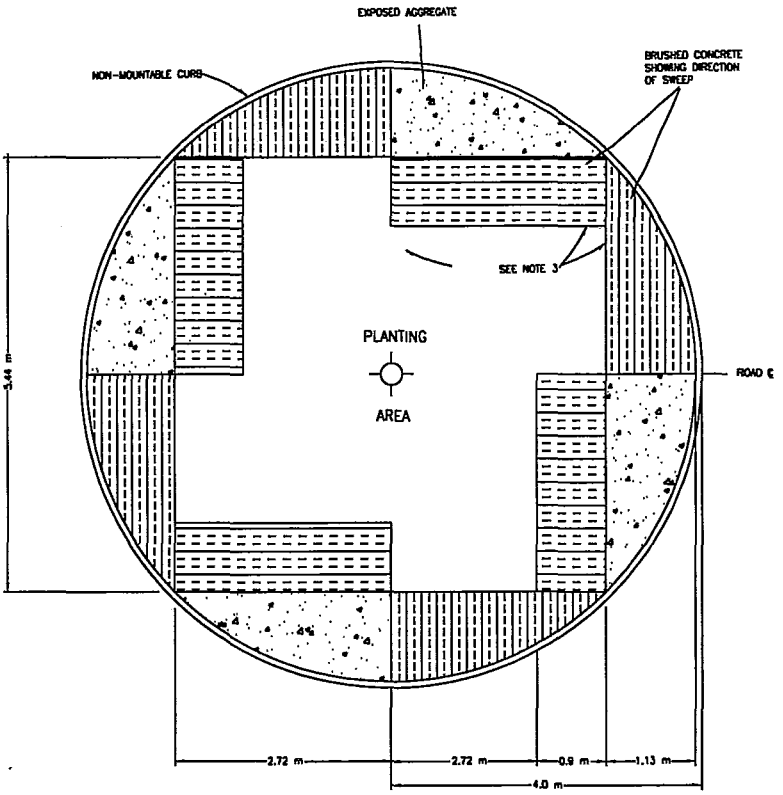
4 ALL AGGREGATE TO BE 20mm MINUS 3mm EXPOSURE.

5 MINIMUM CONCRETE DEPTH TO BE 100mm

6 PAINT LINES OR REFLECTIVE STUDS WILL BE INSTALLED TO DELINEATE PARKING SPACES.

□ – TYPICAL KIOSK LOCATION

– TYPICAL LUMINAIRE LOCATION



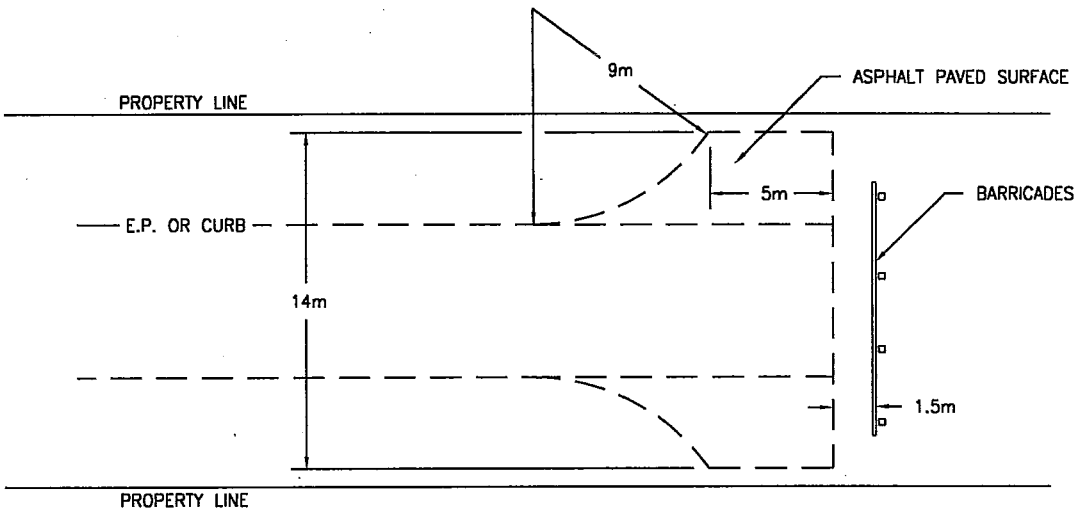
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

CUL–DE–SAC ISLAND DETAILS

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE: NOV 1992	SCALE: N.T.S.	DWG.NO. R6
APPROVED BY:	FILE NO. 10.1.2.17	



HAMMERHEAD TYPE

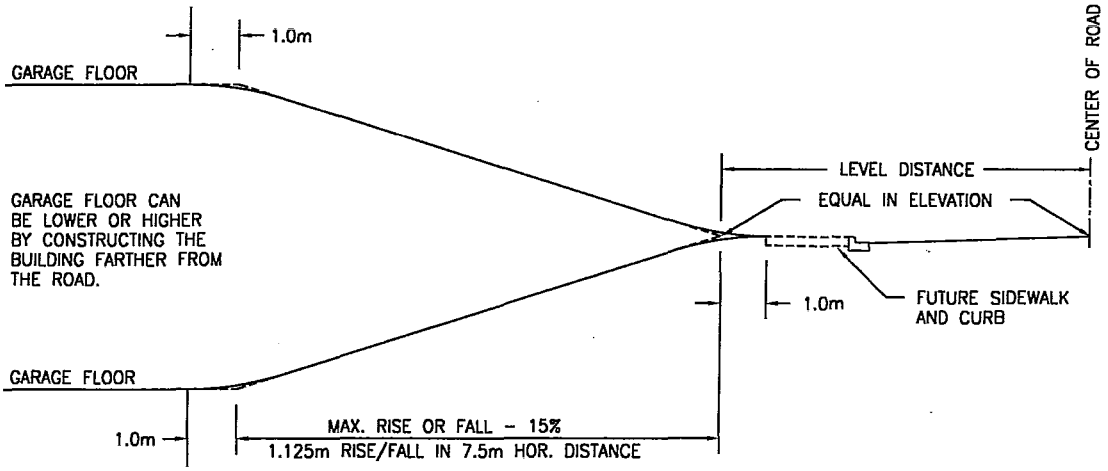
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

TEMPORARY TURNAROUND DETAILS

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R7
APPROVED BY : _____	FILE NO. : 10.1.2.17	



NOTES

1. TO ALLOW FOR FUTURE ROAD WIDENING AND SIDEWALK CONSTRUCTION, THE DRIVEWAY AND FINISHED BOULEVARD GRADE MUST BE AT THE SAME ELEVATION AS THE CENTER OF THE EXISTING ROAD SURFACE AT THE FOLLOWING LEVEL DISTANCE FROM THE PAVEMENT CENTERLINE:

	MINIMUM LEVEL DISTANCE
RESIDENTIAL ROADS	7.5m
COLLECTOR ROADS	8.5m
MAJOR ROADS	TO BE DETERMINED BY MUNICIPAL ENGINEER

2. THE MAXIMUM GRADE OF DRIVEWAY IS 15% (1.125m RISE OR FALL IN 7.5m).
3. WHERE THE CENTER OF AN EXISTING ROAD SURFACE IS MORE THAN 1.5m OFF THE CENTER OF THE ROAD ALLOWANCE, MEASURE THE LEVEL DISTANCE FROM THE CENTER OF THE ROAD ALLOWANCE.
4. EXCEPTIONS TO THESE STANDARDS WILL BE ALLOWED ONLY AT THE DISCRETION OF THE MUNICIPAL ENGINEER.

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

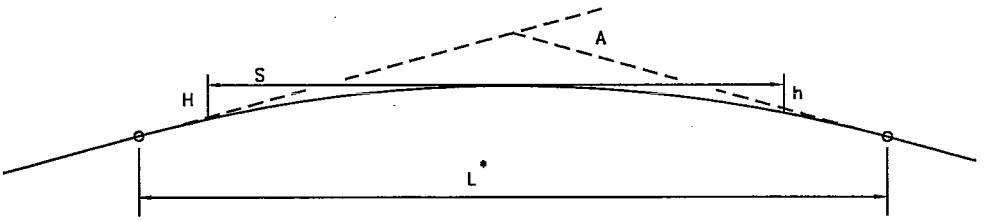
DRIVEWAY GRADES

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R8
APPROVED BY :	FILE NO. : 10.1.2.17	

CREST CURVES



DESIGN SPEED (km/h)	STOPPING SIGHT DISTANCE (m)		CREST, K (m)	
	(a) MINIMUM	(b) DESIRABLE	(c) COLLECTOR AND MAJOR ROADS	(d) RESIDENTIAL ROADS
50	65	65	7	10
60	85	90	15	20
70	110	120	22	35

* L IN METERS SHOULD NOT BE LESS THAN DESIGN SPEED IN KILOMETERS PER HOUR

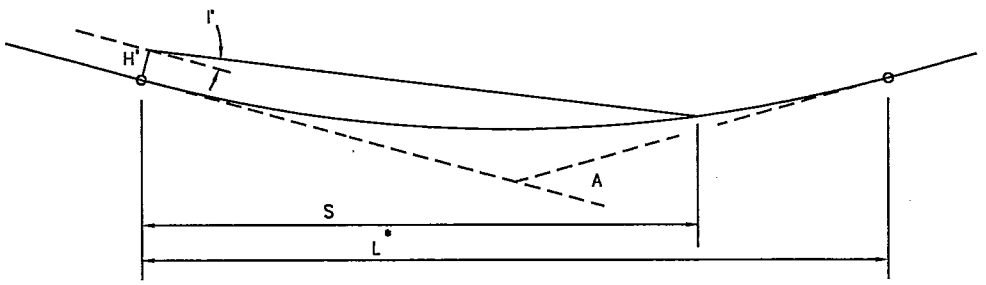
(a) BASED ON FIXED PERCEPTION REACTION TIME OF 2.5 s.
(b) BASED ON VARIABLE PERCEPTION REACTION TIME OF 2.5 s AT 40km/h TO 3.5 s AT 140km/h
(c) BASED ON FIXED PERCEPTION REACTION TIME AND TAIL LIGHT HEIGHT OF 380mm
(d) BASED ON VARIABLE PERCEPTION REACTION TIME AND OBJECT HEIGHT OF 150mm

LEGEND

L- LENGTH OF VERTICL CURVE IN METERS
A - ALGEBRAIC DIFFERENCE IN GRADE PERCENT
S - STOPPNIG SIGHT DISTANCE IN METERS
H - HEIGHT OF DRIVERS EYE 1.05m
H' - HEIGHT OF HEAD LAMPS 0.6m
h - HEIGHT OF OBJECT
I' - ANGLE OF LIGHT BEAM UPWARD FROM THE PLANE OF THE VEHICLE

$$L = KA$$

SAG CURVES



DESIGN SPEED (km/h)	STOPPING SIGHT DISTANCE (m)	SAG, K (m) MINIMUM	
		WITHOUT STREET LIGHTING	WITH STREET LIGHTING
50	65	11	6
60	85	20	10
70	110	25	15

* L IN METERS SHOULD NOT BE LESS THAN DESIGN SPEED IN KILOMETERS PER HOUR

CENTRIPETAL ACCELERATION $0.3m/s^2$

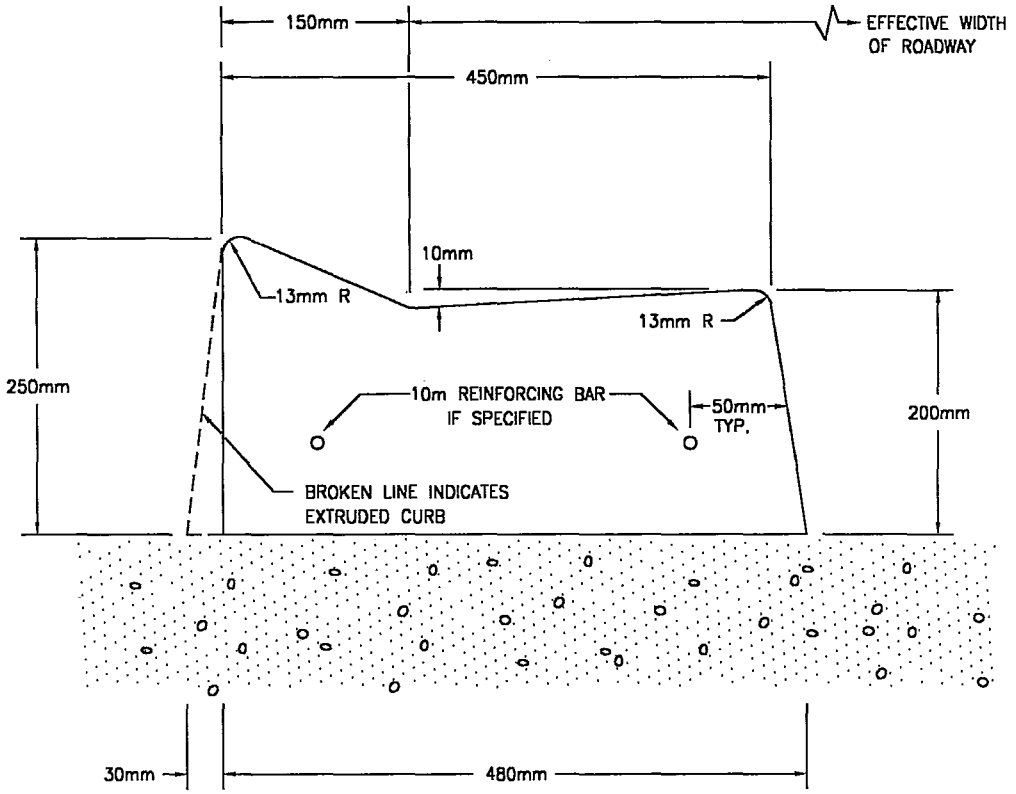
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

VERTICAL CURVES FOR MINIMUM STOPPING SIGHT DISTANCE

TOWNSHIP OF ESQUIMALT

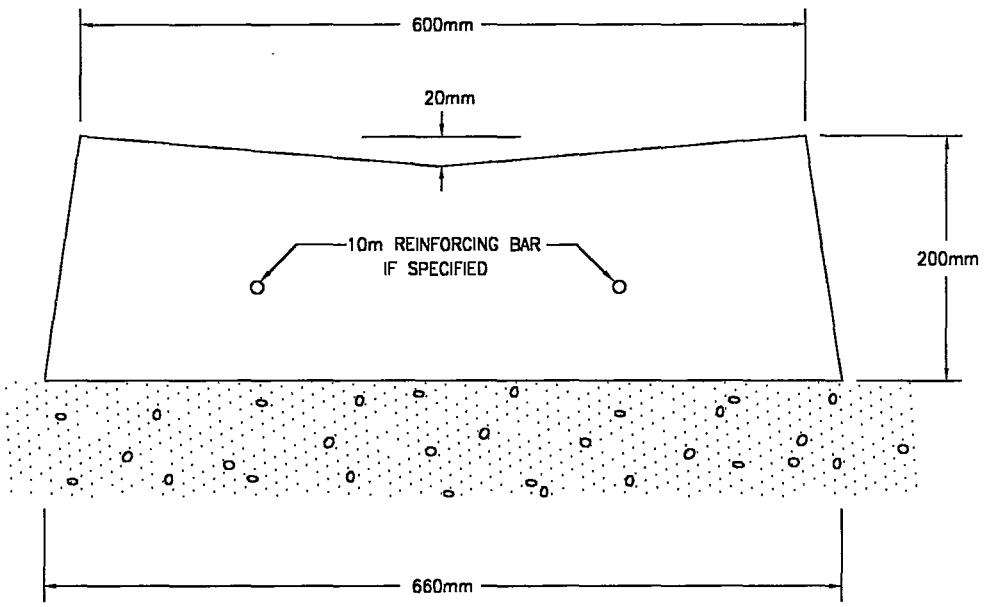
ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R9
APPROVED BY : _____	FILE NO. : 10.1.2.17	



MOUNTABLE CURB (WIDE SECTION)

REFER TO STANDARD DRAWING R11 FOR REINFORCING AT CATCH BASINS



INVERT GUTTER

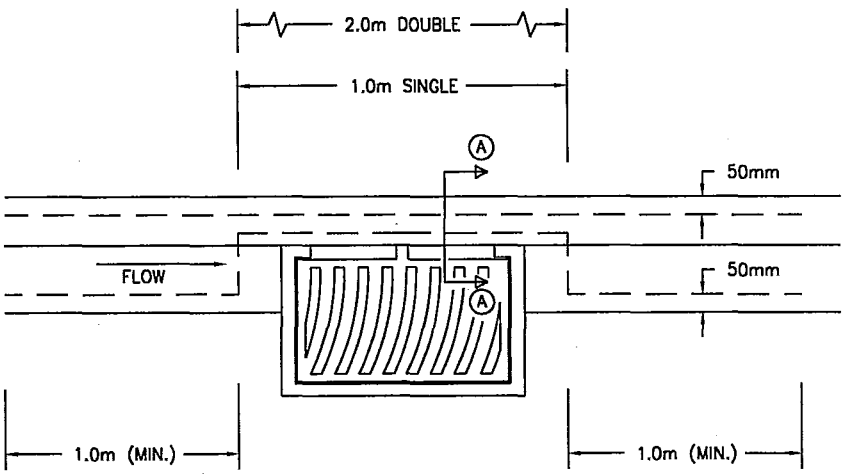
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

MOUNTABLE CURB (WIDE SECTION) & INVERT GUTTER

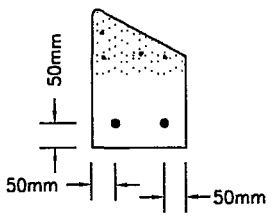
TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R10
APPROVED BY :	FILE NO. : 10.1.2.17	



CURB REINFORCING AT CATCH BASINS



SECTION A–A

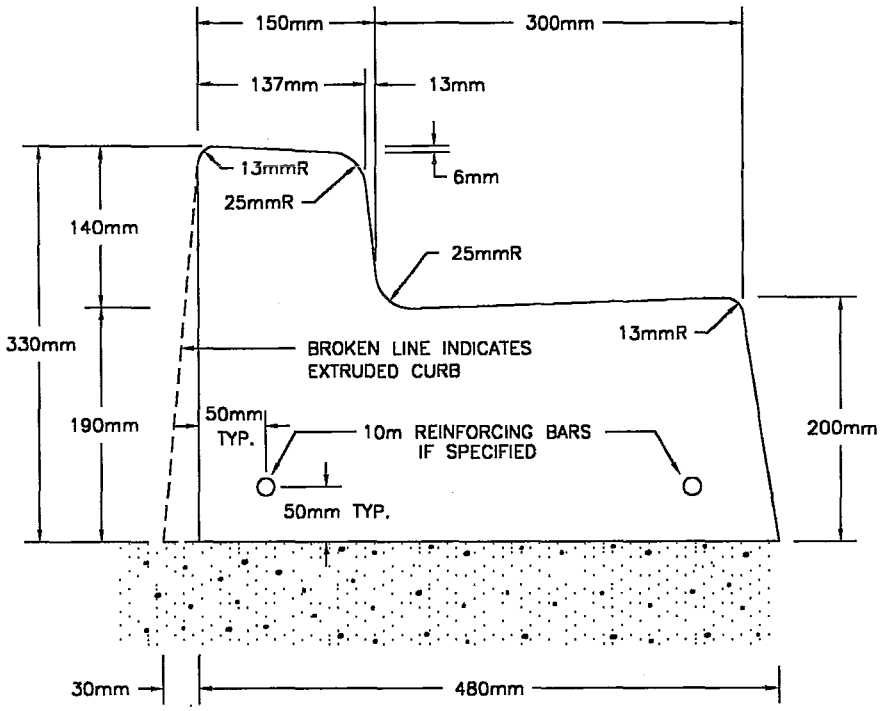
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

MOUNTABLE CURB CURB REINFORCING AT CATCH BASINS

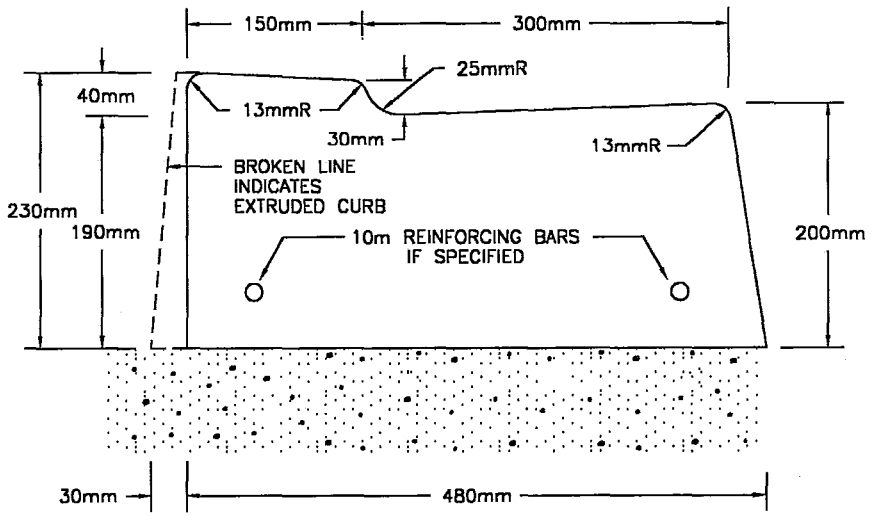
TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

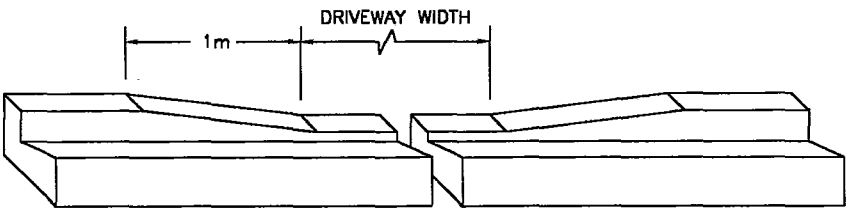
DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R11
APPROVED BY :	FILE NO. : 10.1.2.17	



NON–MOUNTABLE



REINFORCED DRIVEWAY CROSSING



REFER TO SPECIFICATIONS FOR FURTHER DETAILS

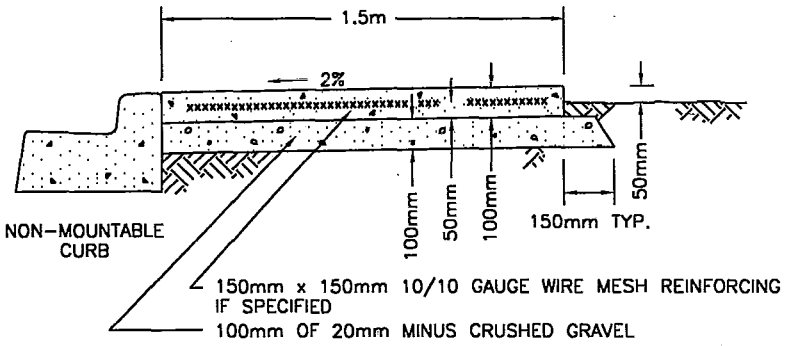
NON–MOUNTABLE CURB & GUTTER

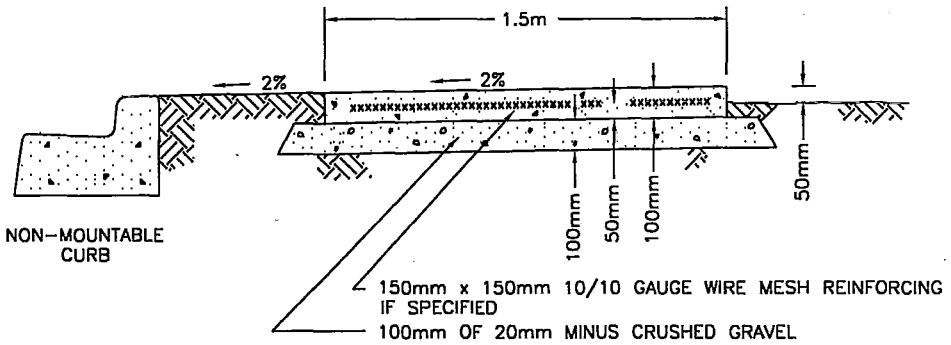
TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

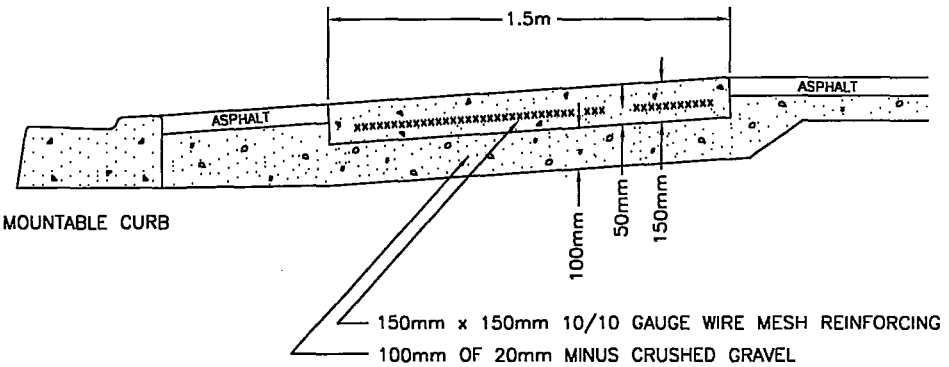
DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R12
APPROVED BY :	FILE NO. : 10.1.2.17	

SIDEWALK ABUTTING CURB





SEPARATED SIDEWALK



REINFORCED DRIVEWAY CROSSING

NOTES:

1. REMOVE ALL SOD & ORGANIC MATERIALS FROM PROPOSED SIDEWALK LOCATION APPLY APPROVED WEED KILLER LIBERALLY PRIOR TO INSTALLATION OF GRAVEL IN EXCAVATION. BACKFILL ANY LOW AREAS WITH PITRUN SAND OR GRAVEL.

2. WHERE PRACTICAL KEEP SIDEWALK APPROXIMATELY 50mm ABOVE NATURAL GROUNDS.

3. GRADING & SEEDING IS REQUIRED FOR REMAINING LANE WIDTH.

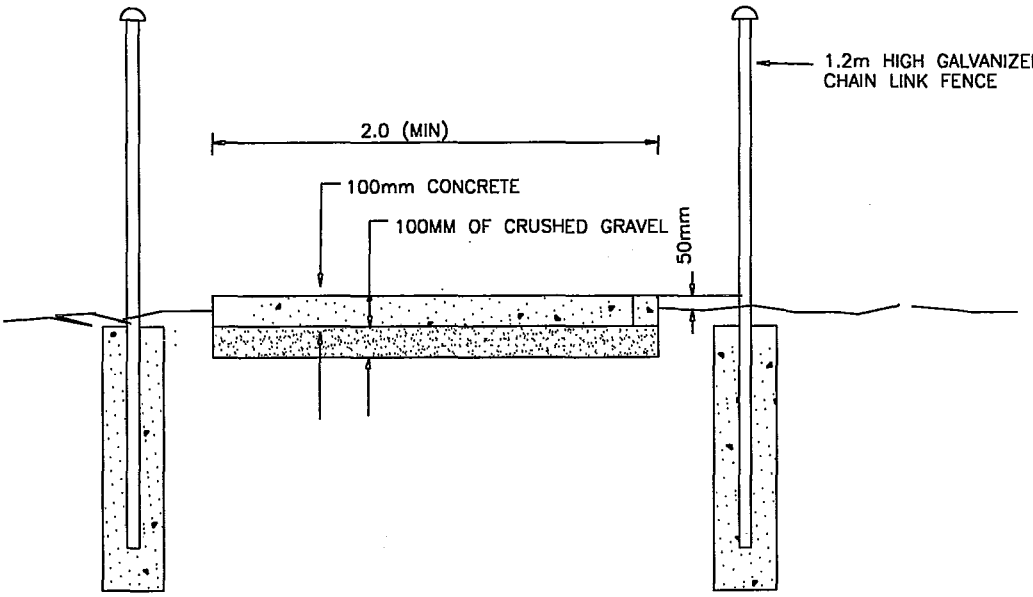
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

SIDEWALK-CONCRETE

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R13
APPROVED BY :	FILE NO. : 10.1.2.17	



NOTES

1 FENCE SHALL BE CONSTRUCTED IN ACCORDANCE WITH FENCE MANUFACTURERS RECOMMENDATIONS

2 TERMINAL POSTS SHALL BE SCHEDULE 40 NOM. 60mm OD, LINE POSTS 48mm OD, TOP RAIL 35mm OD AND TENSION BARS 5mm x 19mm.

3 POSTS TO BE SET ON MAX 2.5m CENTERS, WITH MINIMUM 750mm SET IN CONCRETE AND MIN 150mm AROUND POST, TOPSOIL ABOVE CONCRETE

4 CHAIN LINK MESH SHALL BE 50mm WITH 3.55mm WIRE TO ASTM A392 CLASS I, GALVANIZED, INSTALLED ON TRAFFIC SIDE OF FENCE.

5 ALL FENCING MATERIALS SHALL BE GALVANIZED

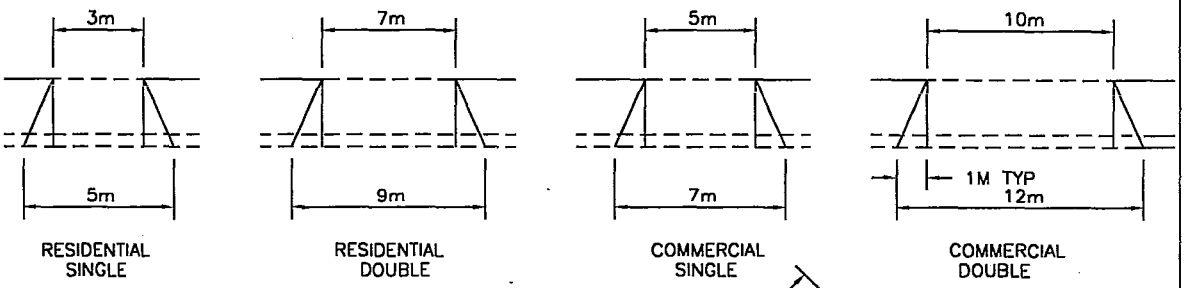
FOOT PATH CONSTRUCTION

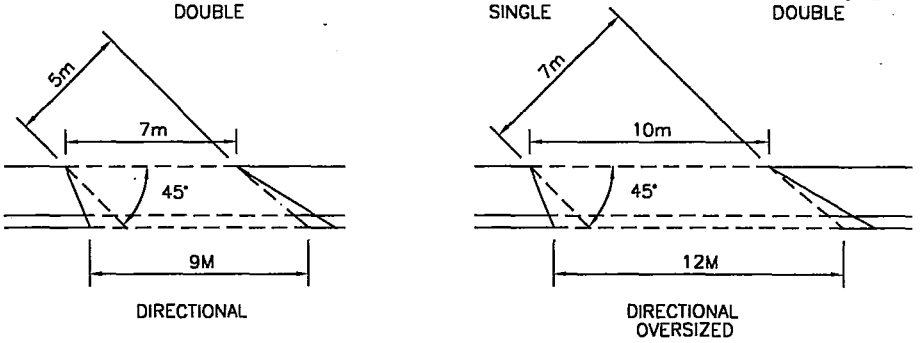
TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

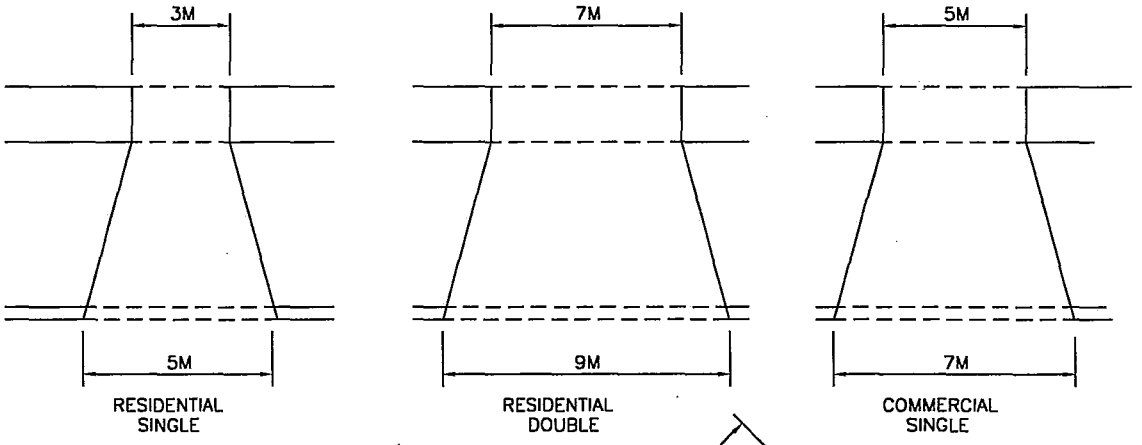
DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R14
APPROVED BY : _____	FILE NO. : 10.1.2.17	

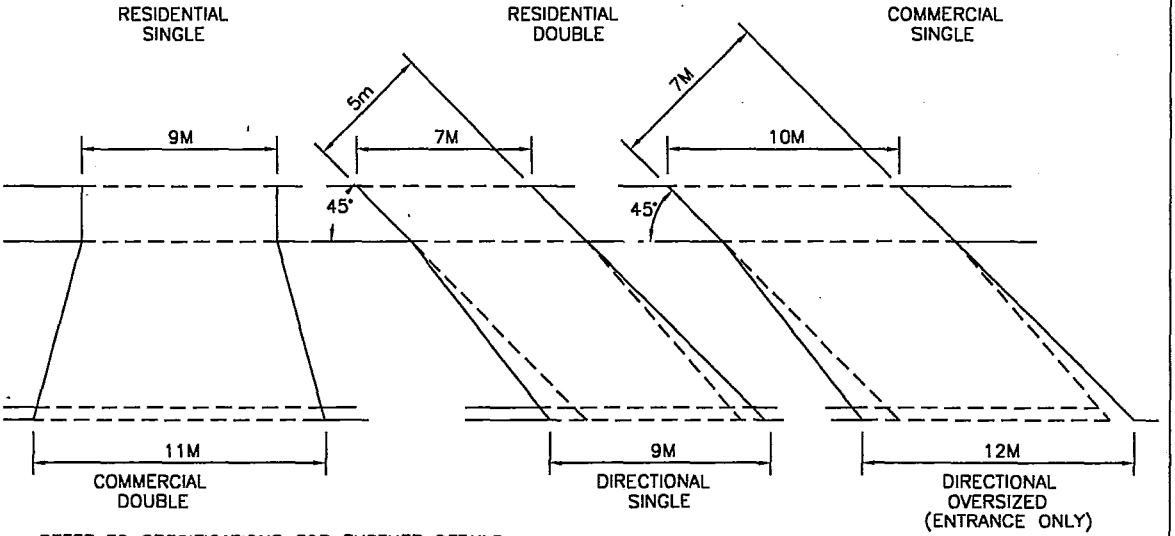
MONOLITIC SIDEWALK CROSSING





SEPARATE SIDEWALK CROSSINGS





REFER TO SPECIFICATIONS FOR FURTHER DETAILS

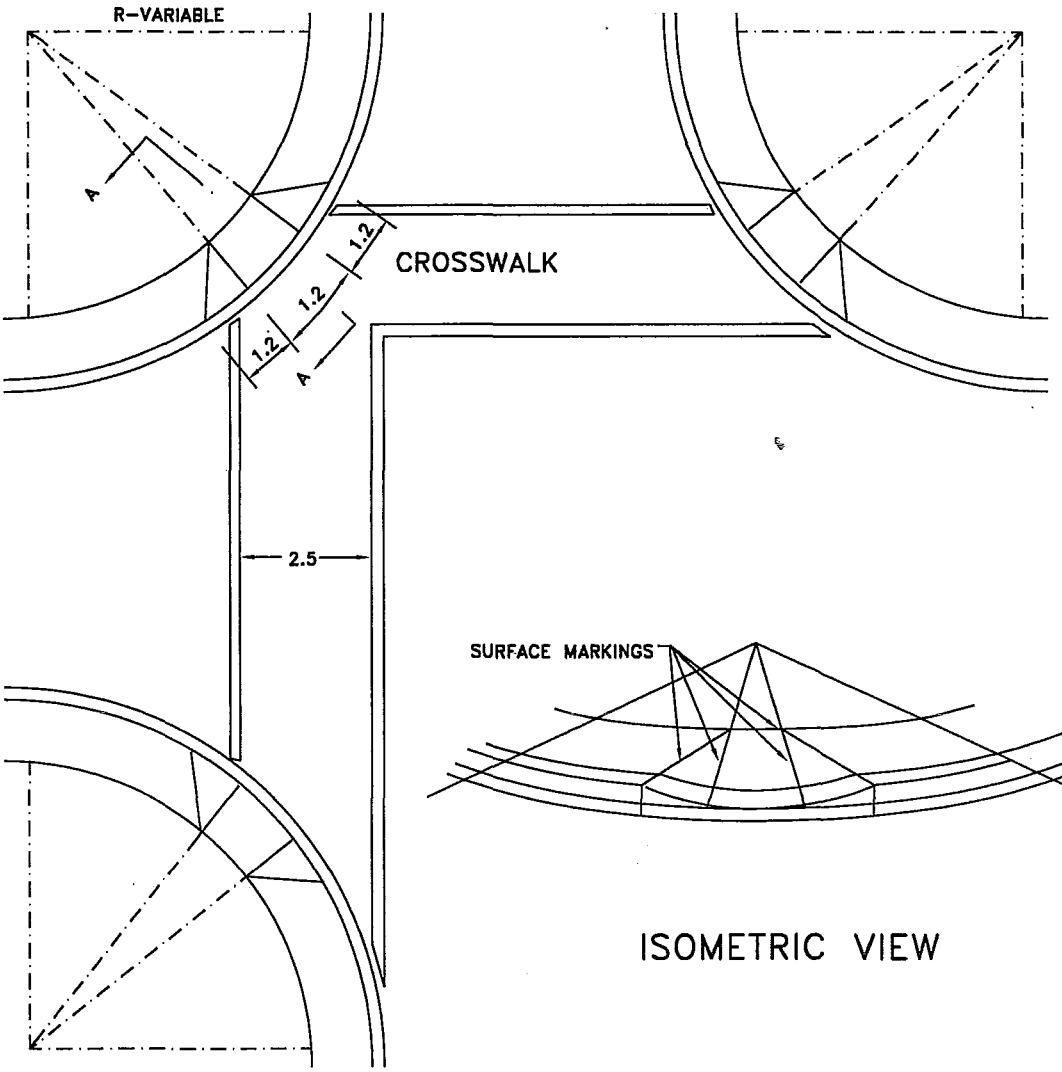
SIDEWALK DRIVEWAY CROSSING

TOWNSHIP OF ESQUIMALT

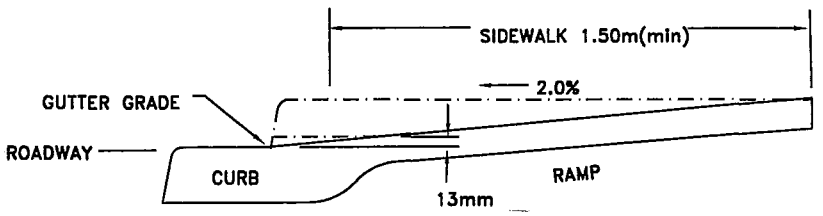
ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R15
APPROVED BY :	FILE NO. : 10.1.2.17	

PLAN



ISOMETRIC VIEW



SECTION A–A

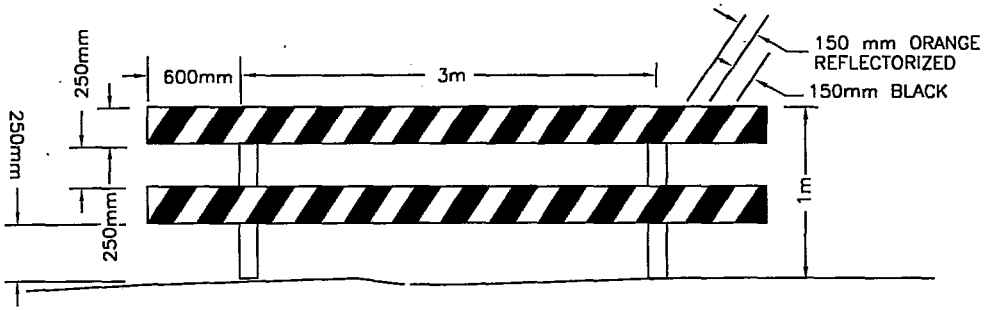
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

SIDEWALK CORNER RAMP

TOWNSHIP OF ESQUIMALT

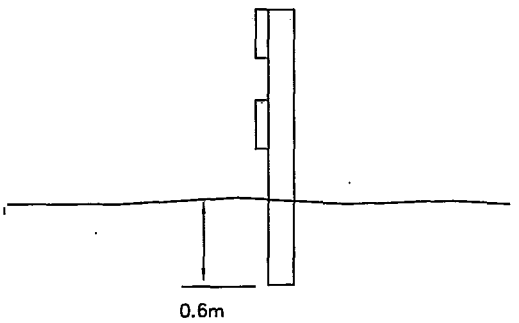
ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R16
APPROVED BY : _____	FILE NO. : 10.1.2.17	



CROSSBAR 50MM X 250MM NOMINAL
SUPPORT 90MM X 90MM NOMINAL

SIDE VIEW



NOTE: BARRICADE LENGTH SHOULD BE EQUAL TO OR GREATER THAN PAVEMENT WIDTH

CHECKER BOARD SIGN TO BE INSTALLED AS REQUIRED

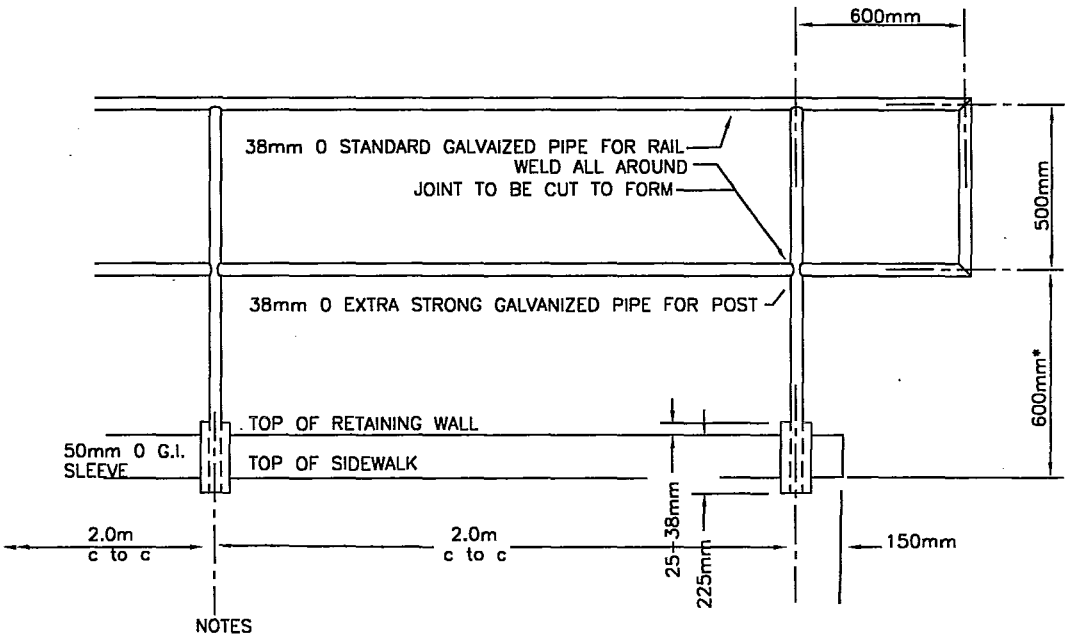
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

BARRICADES

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R17
APPROVED BY : _____	FILE NO. : 10.1.2.17	

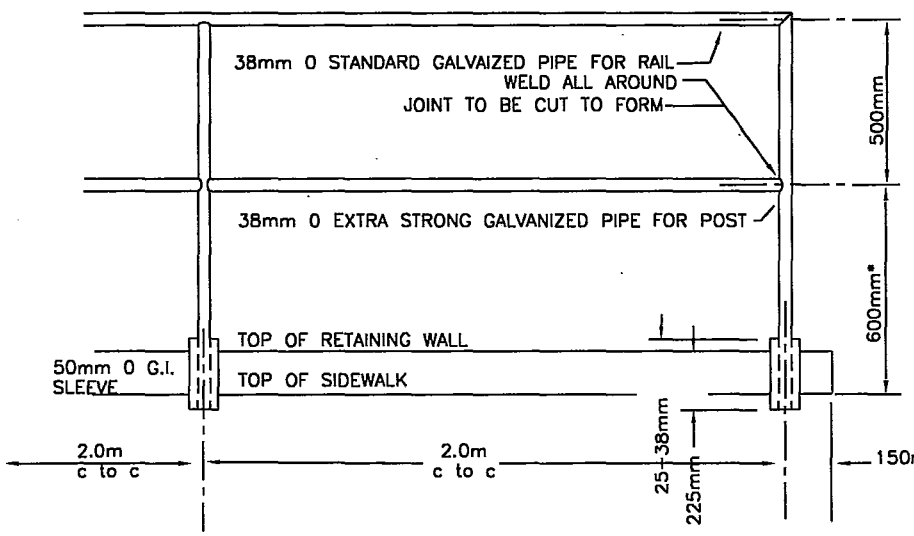


NOTES

PIPE SIZES ARE NOMINAL

* MEASUREMENT FROM TOP OF SIDEWALK OR TOP OF RETAINING WALL WHERE NO SIDEWALK EXISTS

ALL WELDED JOINTS TO BE COATED WITH GALVACON OR EQUIVALENT.



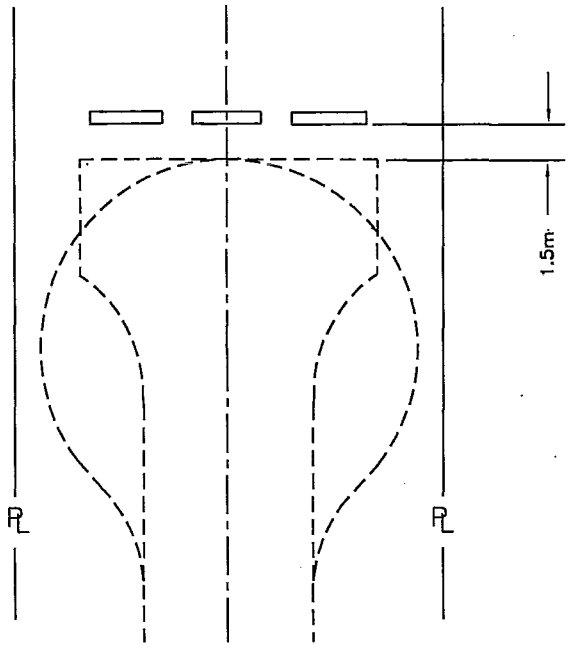
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

SIDEWALK HANDRAILS

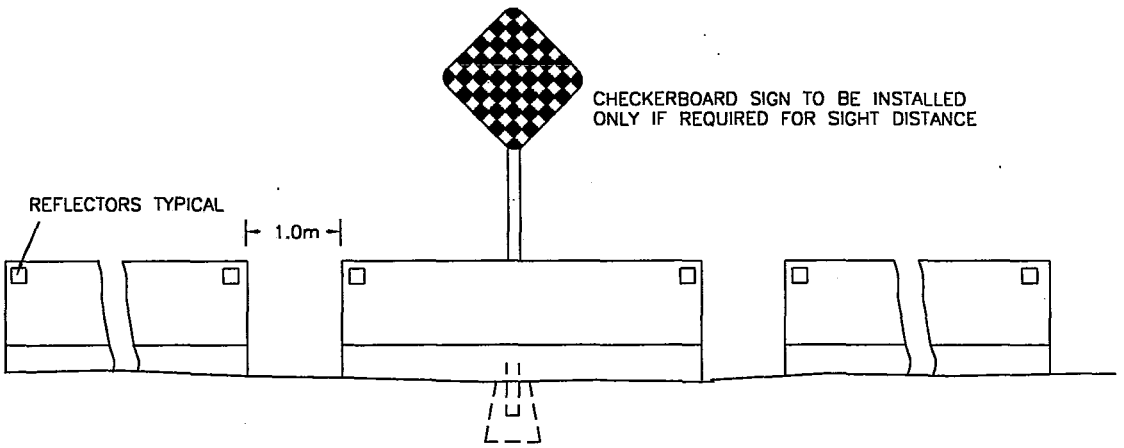
TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R18
APPROVED BY :	FILE NO. : 10.1.2.17	



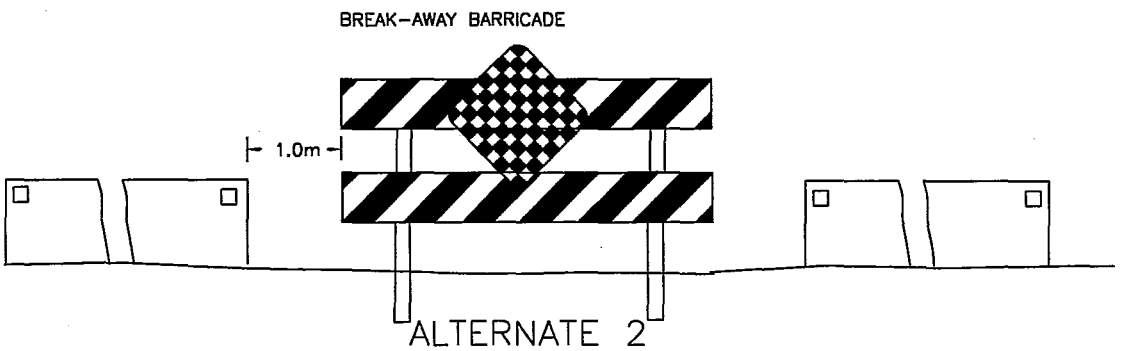
TYPICAL BARRICADE LOCATION N.T.S.



ALTERNATE 1

(MUST BE APPROVED BY FIRE CHIEF)

NOTE: THE ROAD FACE OF ALL CONCRETE BARRIERS TO BE PAINTED WITH REFLECTIVE YELLOW PAINT



ALTERNATE 2

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

STANDARD ROAD CLOSURE

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. R19
APPROVED BY :	FILE NO. : 10.1.2.17	

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'C'

DESIGN AND CONSTRUCTION SPECIFICATIONS

ROADWAYS

APPENDIX

1.0 Preliminary and General

1.01 Scope

a) This Specification describes the requirements for the different types and grades of asphaltic materials and additives to be supplied for highway use.

b) The materials so described are generally classified as follows:

Asphalt Cements; Liquid Asphalts; Emulsified Asphalts and Cationic Emulsified Asphalts.

1.02 Quality Control Requirements

a) Quality Control System

1. The supplier shall develop and maintain an effective quality control system in accordance with the provisions of this Specification. The system shall ensure that adequate inspection coverage coverage is maintained throughout the entire process of manufacture and shipping.

2. Supplies not conforming to contractual requirements shall not be offered for use until the deviations have been authorized by the Consulting Engineer.

b) Quality Control Procedure - The supplier may be required to furnish the Consulting Engineer with an outline of his quality control procedures detailing his method of implementing the requirements of this Specification. This outline shall include the following operations: receiving, blending and processing, sampling and testing, storage and handling, shipping, recording and reporting.

1.03 Sampling and testing - The supplier shall possess adequate sampling equipment, employ satisfactory sampling procedures and maintain a suitable sampling program. Representative samples from filled shipping containers shall be examined by the Consulting Engineer to ensure quality. (Refer to Appendix 7 for Methods of Test.)

1.04 Delivery of Asphaltic Materials

Temperature of Shipment - Where specified, bituminous materials shall be shipped hot. The temperature for shipment shall be subject to arrangement between the Contractor and supplier but generally the supplier should endeavour to ship bituminous materials at such temperatures that on arrival its temperature shall be such that the Kinematic Viscosity of material shall be as below:

Class of Materials	Kinematic Viscosity, Centistokes
Liquid bitumen materials for surface spraying	100 - 200
Liquid bituminous material and asphalt cements for plant mixing purposes	150 - 400

Subject to the above requirements, asphalts shall normally be shipped within the temperature ranges given in the following table. In no case shall asphalt be shipped at a temperature greater than the designated maximum.

Loading Temperatures	Min. °C	Max. °C
Paving Asphalt Cements	145	205
RC-70	50	80
RC-250	65	90
RC-800	80	105
RC-3000	105	135
MC-30	35	80
MC-70	50	80
MC-250	65	90
MC-800	80	105
MC-3000	105	135
SC-70	50	80
SC-250	65	120
SC-800	80	135
SC-3000	105	160
Special Prime	25	65
RS-1	15	55
SS-1	15	55
SS-1h	15	55
CRS-1	15	55
RS-2	45	70
MS-2	45	70
MS-2h	45	70
CRS-2	45	70

2.0 Asphalt Cements

2.01 Asphalt Cements shall:

a) be products prepared by the refining of crude petroleum.

b) be homogeneous, free from water and shall not foam when heated to 175°C.

c) be supplied in such grades as may be ordered.

d) comply with the following detailed requirements and the requirements of A.S.T.M. Specification D-946.

Grade	60-70		85-100		120-150	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Penetration at 25°C 100 g, 5 seconds	60	70	85	100	120	150
Flash point, °C (Cleveland open cup)	232.2		232.2		218.3	
Ductility at 25°C 50 mm per min., mm	1000		1000		1000	
Retained penetration after thin-film oven test, percent	52+		47+		42+	
Solubility in trichloroethylene percent	99.0		99.0		99.0	
Ductility at 25°C 50 mm/min., mm after thin-film oven test	500		750		1000	

3.0 Liquid Asphalts

3.01 General Description

a) Liquid asphalts shall consist essentially of petroleum derivatives and shall be substantially free from water and other impurities.

b) Liquid asphalts shall be of the type and grade described in the following tables, and shall comply with the requirements of A.S.T.M. Specification D-2026 (slow-curing type), A.S.T.M. Specification D-2027 (medium-curing type) and A.S.T.M. Specification D-2028 (rapid-curing type).

1. Slow-Curing Type Liquid Asphalt:

DESIGNATION	SC-70		SC-250		SC-800		SC-3000	
REQUIREMENTS	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Kinematic viscosity at 60°C, cSt.	70	140	250	500	800	1600	3000	6000
Flash point (Cleveland open cup)°C	65.5		79.4		93.3		107.2	
Distillation Test: Total Distillate to 360°C percent by volume	10	30	4	20	2	12		5
Kinematic viscosity on distillation residue at 60°C, stokes	4	70	8	100	20	160	40	350
Asphalt Residue: Residue to 100 penetration, percent	50		60		70		80	
*Ductility of 100 penetration residue at 25°C, mm	1000		1000		1000		1000	
Solubility in trichloroethylene,	99.9		99.0		99.0		99.0	
Water, percent		0.5		0.5		0.5		0.5

*Note: If the ductility at 25°C is less than 1000, the material will be acceptable if its ductility at 15.5°C is more than 1000 mm.

2. Medium-Curing Type Liquid Asphalt:

DESIGNATION	MC-30		MC-70		MC-250		MC-800		MC-3000	
REQUIREMENTS	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Kinematic viscosity at 60°C, cSt.	30	60	70	140	250	500	800	1600	3000	6000
Flash point (Tag open cup), °C	37.8		37.8		65.5		65.5		65.5	
Distillate Test: Distillate, percent by volume of total distillate to 360°C:										
to 225°C		25		20		10				
to 260°C	40	70	20	60	15	55		35		15
to 316°C	75	93	65	90	60	87	45	80	15	75
Residue from distillation to 360°C percent volume by difference	50		55		67		75		80	
Tests on residue from distillation: Penetration at 25°C, 100g, 5 sec.	120	250	120	250	120	250	120	250	120	250
*Ductibility at 25°C, mm	1000		1000		1000		1000		1000	
Solubility in trichloroethylene, percent	99.0		99.0		99.0		99.0		99.0	
Water, percent		0.2		0.2		0.2		0.2		0.2

*Note: If the ductility at 25°C is less than 1000, the material will be acceptable if its ductibility at 15.5°C is more than 1000 mm.

3. Rapid-Curing Type Liquid Asphalt

DESIGNATION	RC-70		RC-250		RC-800		RC-3000	
REQUIREMENTS	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Kinematic viscosity at 60°C, cSt.	70	140	250	500	800	1600	3000	6000
Flash point (Cleveland open cup)°C			26.7+		26.7+		26.7+	
Distillation Test: Distillate, percent by volume of total distillate to 360°C:								
to 190°C	10							
to 225°C	50		35		15			
to 260°C	70		60		45		25	
to 316°C	85		80		75		70	
Residue from distillation to 360°C, percent volume be difference	55		65		75		80	
Tests on residue from distillation: Penetration at 25°C, 100g, 5 sec.	80	120	80	120	80	120	80	120
*Ductility at 25°C, mm	1000		1000		1000		1000	
Solubility in trichloroethylene, percent	99.0		99.0		99.0		99.0	
Water, percent		0.2		0.2		0.2		0.2

*Note: If the ductility at 25°C is less than 1000, the material will be acceptable if its ductility at 15.5°C is more than 1000 mm.

3.02 Special Primer

DESIGNATION	MIN.	MAX.
Kinematic Viscosity at 60°C - Centistokes	20	35
Distillate % by Volume of total distillate to 360°C:		
to 190°C	-	60
to 225°C	40	-
to 260°C	70	-
to 316°C	85	-
Residue from distillation to 360°C, volume % by difference	50	-
Tests on residue from distillation to 360°C		
Penetration at 25°C, 100 g, 5 sec.	80	200
*Ductility at 25°C, mm	1000	-
Solubility in Carbon Tetrachloride	99.5	-
Water, percent	-	0.2

*NOTE: If the ductility at 25°C is less than 1000, the material will be acceptable if its ductility at 15.5°C is more than 1000 mm.

NOTE: Viscosity of residue from distillation to 360°C will be measured at 60°C and reported in stokes on each batch analysis report.

3.03 Preliminary Specification for Rubberized Cutback Asphalt R.R.C.

a) General Description - Rubberized Cutback Asphalt shall consist of a selected vacuum reduced asphalt containing a matched synthetic rubber, dispersed colloidally or in molecular solution at the refinery, and cutback with naptha solvent to produce a range of cutback material having substantially similar properties to R.C. Cutback, except that the rubberized asphalt residue shall have considerable increased tenacity and toughness characteristics.

b) Tests - The rubberized asphalt residue shall, when tested by the Benson Method and compared with the original asphalt base stock, show a minimum toughness of 200 percent and minimum tenacity of 1000 percent.

c) Acceptance - The acceptance of any rubberized asphaltic material shall be at the sole discretion of the Municipal Engineer.

4.0 Emulsified Asphalts

4.01 Types - Liquid bituminous materials in the form of aqueous emulsions shall be of the following:

a) Emulsified Asphalt

1. The emulsified asphalt shall be homogeneous. It shall show no separation of asphalt after thorough mixing within thirty (30) days [crack filler twenty (20) days] after delivery, provided separation has not been caused by freezing.

2. The emulsion shall conform to the detailed requirements of the following table, and the requirements of the A.S.T.M. Specification D-977.

TYPE	RAPID-SETTING				MEDIUM-SETTING						SLOW-SETTING				CRACK FILLER
GRADE	RS-1		RS-2		MS-1		MS-2		MS-2h		SS-1		SS-1h		
REQUIREMENT	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Tests on Emulsions:															
Viscosity, Saybolt Furol at 25°C, s	20	100			20	100	100		100		20	100	20	100	50-200
Viscosity, Saybolt Furol at 50°C, s			75	400											
Settlement, 5 days, percent		5		5		5		5		5		5		5	3-
Storage stability test, 1 day		1		1		1		1		1		1		1	
Demulsibility, 35 ml, 0.02 N CaCl$_2$, percent	60		60												
Coating ability and water resistance:															
Coating, dry aggregate					good		good		good						
Coating after spraying					fair		fair		fair						
Coating, wet aggregate					fair		fair		fair						
Coating, after spraying					fair		fair		fair						
Cement mixing test, percent												2.0		2.0	
Sieve test, percent		0.10		0.10		0.10		0.10		0.10		0.10		0.10	
Residue by distillation, percent	55		63		55		65		65		57		57		
Tests on Residue from Distillation Test:															
Penetration, 25°C, 100 g, 5 s	100	200	100	200	100	200	100	200	40	90	100	200	40	90	60-100
Ductility, 25°C, 50mm/min, mm	400		400		400		400		400		400		400		
Solubility in trichloro-ethelene, percent	97.5		97.5		97.5		97.5		97.5		97.5		97.5		

b) Cationic Emulsified Asphalts - Cationic emulsions shall comply with the requirements given in the following tables when tested according to the methods designated with each requirement, and shall comply with the requirements of A.S.T.M. Specification D-2397.

TYPE	RAPID-SETTING				MEDIUM-SETTING				SLOW-SETTING			
GRADE	CRS-1		CRS-2		CMS-2		CMS-2h		CSS-1		CSS-1h	
REQUIREMENT	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
Tests on Emulsions:												
Viscosity, Saybolt Furol at 25°C, s									20	100	20	100
Viscosity, Saybolt Furol at 50°C, s	20	100	100	400	50	450	50	450				
Settlement, 5 days, percent		5		5		5		5		5		5
Storage stability test, 1 day percent		1		1		1		1		1		1
Classification test	passes		passes									
or												
Demulsibility, 35 ml, 0.8 percent sodium dioctyl sulfosuccinate, percent	40		40									
Coating ability and water resistance:												
Coating, dry aggregate					good		good					
Coating after spraying					fair		fair					
Coating, wet aggregate					fair		fair					
Coating, after spraying					fair		fair					
Particle charge test	positive		positive		positive		positive		positive		positive	
Sieve test, percent		0.10		0.10		0.10		0.10		0.10		0.10
Cement mixing test, percent										2.0		2.0
Distillation:												
Oil distillate, by volume of emulsion, percent		3		3		12		12				
Residue, percent	60		65		65		65		57		57	
Tests on Residue from Distillation Test:												
Penetration, 25°C, 100 g, 5 s	100	250	100	250	100	250	40	90	100	250	40	90
Ductility, 25°C, 50mm/min, mm	400		400		400		400		400		400	
Solubility in trichloro-ethelene, percent	97.5		97.5		97.5		97.5		97.5		97.5	

TABLE #2

Grade:	RS-1K		RS-2K	
Requirement:	Min.	Max.	Min.	Max.
Saybolt Furol Viscosity at 50°C	30	125	174	400
% Residue by Distillation	62	-	68	-
Settlement 1 day, %	-	1.5	-	1.5
Sieve Test, % retained on 1 mm mesh	-	0.1	-	0.1
Oil Portion of Distillate, % of total volume	0	3	0	3
Particle Charge	Positive		Positive	
Tests on Residue:				
Penetration @ 25°C, 100g/5s	100	250	100	150
Solubility in Trichloroethylene, %	97.5	-	97.5	-
Ductility (cm) @ 25°C	60	-	65	-

c) High Float Emulsified Asphalt

Storage stability - High float emulsified asphalt shall show no separation of asphalt within 30 days after delivery and shall be homogeneous after thorough mixing.

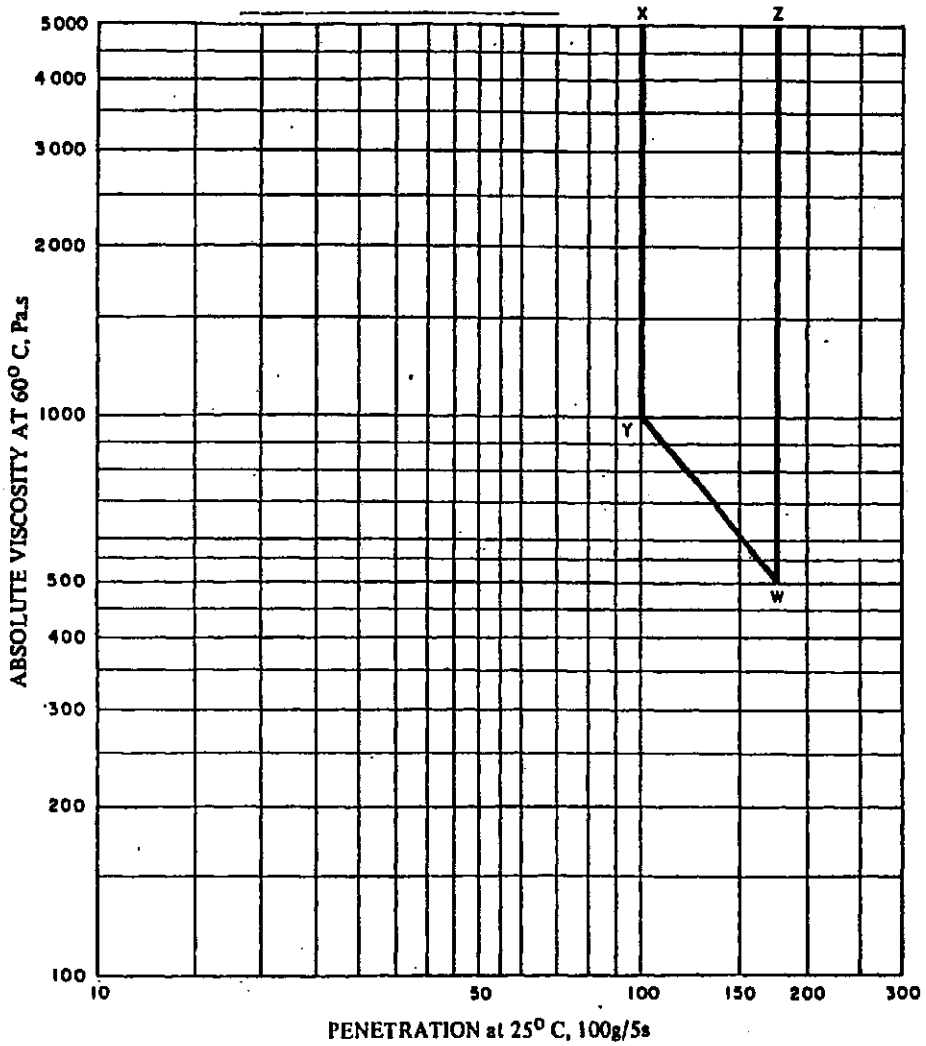
Grade: / Requirements	HF-100S Min.	HF-100S Max.	HF-150S Min.	HF-150S Max.	HF-250S Min.	HF-250S Max.	HF-350S Min.	HF-350S Max.	HF-500M Min.	HF-500M Max.	HF-1000M Min.	HF-1000M Max.
Residue by Distillation, % by Mass	62	-	62	-	62	-	65	-	65	-	65	-
Oil Distillate % By Volume	1	4	0.5	4	1	6	1.5	6	1	6	1	7
Saybolt Viscosity, Furol Seconds at 50°C	35	150	35	150	35	150	75	400	50	-	50	-
Sieve Test, % Retained on 1 mm Sieve	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10	-	0.10
Coating Test %	90	-	90	-	90	-						
Settlement 1 day, % by Mass	-	1.5	-	1.5	-	1.5	-	1.5	-	1.5	-	1.5
Demulsibility: 50 ml 5.55 g/L $CaCl_2$, % by Mass	75	-	75	-	-	-	-	-	-	-	-	-
Workability @ 10°C	-	-	-	-	-	-	-	-	-	-	Pass	-
Test on Residue												
Penetration at 25°C, 100 g/5s	*		**		**		**		-	-	-	-
Viscosity at 60°C, Pa/s	*		**		**		**		8	20	2	8
Float Test at 60°C,s	1200	-	1200	-	1200	-	1200	-	1200	-	1200	-
Solubility in Trichloroethylene, %	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-	97.5	-

* See Figure I - Next Page
** See Figure II - Following

DISTRICT OF SAANICH SPECIFICATION

C) - High Float Emulsified Asphalt (cont'd)

FIGURE I



VISCOSITY REQUIREMENTS FOR DISTILLATION RESIDUES FROM

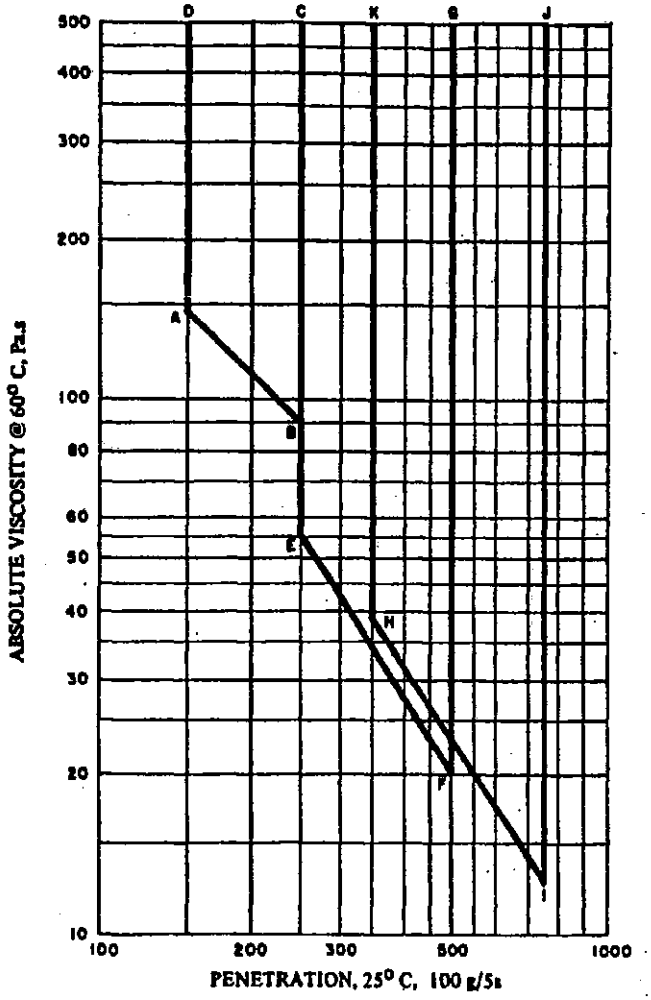
HIGH FLOAT EMULSIFIED ASPHALT, HF-100S

Viscosity shall be within graphic regions described by the letter co-ordinates X, Y, W, Z.

DISTRICT OF SAANICH SPECIFICATION

C) - High Float Emulsified Asphalt (cont'd)

FIGURE II



Gradation of High Float Emulsified Asphalt	HF-150S	HF-250S	HF-350S
Viscosity and Penetration shall be within graphic regions described by the letter co-ordinates	A, B, C, D	E, F, G, C	H, I J, K

1.0 Scope

1.01 General

a) This specification describes the materials, equipment and the workmanship required for construction of granular surfacing, bases and sub-bases, using crushed granular or pit-run aggregates.

b) This specification shall be read and construed with the Special Provisions of the Contract prepared by the Consulting or Municipal Engineer, and the approved Design Drawing.

1.02 Description of Work - The aggregates for granular surfacing, bases and sub-bases shall be supplied by the Contractor. All materials shall be from an approved source and shall be free from lumps of clay, silt, decomposed rock, organic or other deleterious matter. Material that is stock-piled prior to use shall be handled in a manner to avoid segregation. Such care shall be used subsequently in hauling to the area of placement of the material. The material shall be placed, constructed accurately, and thoroughly compacted to the line and grade designated. Surfacing aggregate intended for surface-stabilization to be done in place on the the road, shall be placed on the untreated base only as fast as it can be incorporated in the road mixed stabilizer base. Unless otherwise provided in the Special Provisions, the Contractor shall maintain the prepared surface of the untreated surfacing, until it has been treated or covered with stabilized surface material.

2.01 Materials

2.01 Aggregates shall be composed of inert, durable fragments, free from an excess of flat or elongated particles, and uniform in quality. Soundness testing may be requested by the Consulting Engineer in the absence of satisfactory performance records for the aggregates particular source. Such testing shall be in accordance with A.S.T.M. Specification C88, using Magnesium Sulphate. Aggregates so tested, shall be considered satisfactory, if the loss of five (5) cycles does not exceed twenty (20) percent for coarse aggregate or twenty-five (25) percent for fine aggregate.

2.02 Crushed Surfacing, Crushed Pit-Run and Pit Run

a) Crushed surfacing, crushed pit-run and pit-run and when tested in accordance with A.S.T.M. Specification C136 shall have a gradation falling within the following limits.

MATERIAL DESCRIPTION		PERCENTAGE PASSING - EACH TYPE OF AGGREGATE		
Aggregate size:		20 mm	80 mm	80 mm
Type of aggregate:		crushed	crushed pit-run	pit-run
Aggregate use:		surfacing	base course	sub-base
U.S. Standard Sieve Size	CGSB 8-GP-2M Sieve Size			
3"	80 mm	-	100-	100
1 1/2"	40 mm	-	60-100	-
3/4"	19 mm	100	40- 80	15-100
3/8"	9.5 mm	60-100	30- 60	0-100
No. 4	4.75 mm	40- 80	20- 45	0-100
No. 8	2.36 mm	30- 60	15- 35	-
No. 16	1.18 mm	20- 45	10- 25	-
No. 50	300 um	8- 20	4- 16	0- 15
No. 100	150 um	-	-	-
No. 200	75 um	2- 9	2- 9	0- 5

b) Should the Contractor supply aggregate with a gradation coarser than paragraph 2.02 a), and can satisfy the Consulting Engineer that the compaction and stability requirements can be met, the Engineer may direct, in writing, that such aggregate may be used.

c) In the crushed material, at least fifty (50) percent by numerical count of all coarse particles retained on the 4.75 mm sieve shall have at least one fractured face or shall be naturally angular with sharp edges.

3.0 Construction Method

3.01 Weather and Job Conditions

a) No construction shall be undertaken during heavy rain, snow or freezing conditions.

b) Granular aggregate shall not be placed upon a frozen, wet, muddy or rutted sub-grade, sub-base, or surface, unless directed by the Engineer, in writing.

c) When the sub-grade or base is soft due to excessive moisture conditions, granular materials shall be hauled and placed, such that no rutting or displacement of lower layers occurs.

3.02 Construction Thickness of Granular Courses

a) Crushed granular surface course, and crushed granular or pit-run base course and sub-base courses shall be constructed to the thickness and dimensions as shown in the Design Drawing or described in the Special Provisions, unless otherwise directed by the Consulting Engineer, in writing.

b) Aggregates shall be delivered to the road bed as uniform mixtures and shall be spread in layers or windrows without segragation. Granular aggregate shall not be end-dumped from trucks and piled on the road bed.

c) When the subgrade consists of cohesionless material, the Consulting Engineer may approve in writing, that granular sub-base or base may be dumped in piles and spread in sufficient quantity to stabilize the sub-grade.

d) Fly spreading from the tailgate of trucks may be permitted by the Consulting Engineer, provided that the work is well controlled and that no segregation will occur. Any segregation of materials shall be remixed until uniform.

e) Surfacing materials shall only be laid on a dry base and when weather conditions are suitable, except as directed by the Consulting Engineer.

3.03 Construction of Crushed Granular Base or Pit-Run Sub-Base

a) Where the required thickness is 150 mm or less, the aggregate base or sub-base may be spread and compacted in one (1) layer. Where the required thickness is more than 150 mm, the aggregate shall be spread and compacted in two (2) or more layers of equal thickness: the maximum compacted thickness of any one (1) layer shall not exceed 150 mm. Each layer shall be spread and compacted in a similar manner.

b) Following spreading, the materials shall be compacted to 95% of the labratory density obtained by following A.S.T.M. Specification 698, Method C, or latest revision thereof with exception of the top 300 mm which shall be compacted to 100%.

c) The sub-base or base shall be constructed so that the final surface shall conform to the Design Drawing for line, grade and cross-section, or as staked by the Consulting Engineer to an accuracy of ± 15 mm.

3.04 Construction of 20 mm Crushed Granular Surfacing

a) Crushed granular surfacing shall not be spread until the base has been approved by the Consulting Engineer. If the Consulting Engineer is of the opinion that the finished surface of the base does not meet the requirements of paragraph 3.03 c) but has been thoroughly and densely compacted and should not be disturbed, he may order that the surface of the base be corrected to true cross-section line and grade, within the specified tolerances, by use of a leveling course of 20 mm granular surfacing aggregate.

b) The surfacing aggregate shall be spread in such a manner that the aggregate does not segregate. The thickness of the surfacing shall be uniform and the minimum thickness of the constructed surfacing aggregate shall be not less than the nominal thickness shown in Municipal Standard Drawings R-1, R-2, R-3, and R-4.

c) Following spreading, the material shall be compacted to one-hundred (100) percent of the density obtained in the laboratory in accordance with A.S.T.M. Specification D698 - Method D.

d) The sub-base or base shall be constructed so that the final surface shall conform to Municipal Standard Drawings R-1, R-2, R-3, and R-4 for line, grade, and cross-section, to an accuracy of ± 10 mm.

3.05 Compaction Method and Equipment

a) The compaction and equipment used to obtain the specified density, may be selected by the Contractor, but will be subject to review or alteration by the Consulting Engineer, if the Contractor is unable to attain the desired density.

b) For the purpose of the compaction requirements of paragraphs 3.03 b) and 3.04 c), compaction equipment shall meet the following minimum requirements.

1. Three wheel steel rollers shall have a loaded mass of not less than 10.9 tonnes, with a compression at the rear wheels of not less than 60.0 N/mm of width.

2. Segmented steel wheel rollers shall have two rolls side by side each of a minimum width of 750 mm and minimum diameter of 1500 mm. The minimum loaded rolling mass shall be 13.6 tonnes.

3. Vibratory rollers shall have a minimum steel drum diameter of 1150 mm, a minimum drum width of 1500 mm and shall be capable of being loaded so as to have a load of 17.5 N/mm of drum width.

4. Pneumatic tired rollers shall be equipped with wheels which carry 13.00 x 24 pneumatic tires capable of being inflated to a minimum pressure of 825 kPa, and shall have a loaded mass such that all wheels carry a minimum proportional load of 31.14 kN.

c) Notwithstanding paragraph 3.05 b), the Consulting or Municipal Engineer may give approval for the use of new or alternative compaction equipment, if he is satisfied that such equipment will provide equal or superior compaction performance.

d) Subject to the approval of the Consulting Engineer, base, sub-base and surfacing aggregates may be watered by the Contractor, as required to aid in attaining the specified density.

DISTRICT OF SAANICH SPECIFICATION

APPENDIX 3

SURFACE PREPARATION FOR ASPHALT PAVING

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1.0 General

1.01 All contact surfaces that are to receive asphaltic concrete paving shall be prepared as set out in this Specification. Surface preparation may be generally described as being either priming of non-asphaltic granular bases or tack-coating of existing asphaltic pavement, which are to receive an overlying surfacing course.

2.0 Materials

2.01 Prime or tack-coat asphalts shall be those speficied by the Municipal Engineer. The asphalt specified shall conform to Appendix 1 - Asphaltic Materials.

3.0 Equipment

3.01 Rotary Power Brooms shall be used for all brooming work. The brooms shall be mounted on self-propelled pneumatic-tired tractor units, and shall be capable of vertical adjustment and shall have sufficient power and brushing capacity to completely clean the surface to be paved within three (3) coverages. Hand brooms shall be used to clean all depressions not reached by the rotary broom.

3.02 Pressure Distributors shall be designed and operated to distribute the asphaltic material in a uniform spray without atomization, in the amount and between the limits of temperature specified.

a) It shall be equipped with a bitumeter having a dial registering metres per minute. The dial shall be visible to the truck driver so he can maintain the constant speed required for application at the specified rate.

b) The pump shall be equipped with a tachometer, having a dial registering litres per second passing through the nozzles. The dial shall be readily visible to the operator.

c) Means for indicating accurately the temperature of the asphaltic material at all times shall be provided. The thermometer well shall not be in contact with a heating tube.

d) The normal width of application of the spray bar shall be not less than 3.5 m, with provisions for the application of lesser width when necessary. A hose and spray nozzle attachment shall be provided for applying asphaltic material to patches and areas inaccessible to the spray bar.

e) The distributor shall be provided with heating attachments and the asphaltic material shall be circulated during the entire heating process.

4.0 Cleaning of Surfaces

4.01 All surfaces, both horizontal and vertical, which will be in contact with the new asphalt mix shall be thoroughly cleaned of all dirt and debris. Cleaning will normally be done using rotary brooms and hand brooms, however, washing or flushing may be necessary to remove coatings of clay or dirt on old pavement.

5.0 Preparation of Vertical Surfaces

5.01 Vertical faces of existing pavements, curbs, gutters, drainage gratings, manholes, or other contact surfaces shall be sprayed or painted with a uniform coating of hot asphalt or asphalt emulsion. Sufficient material shall be used to provide closely bonded water-tight joints. This work shall be done in such a way as to not stain exposed curb or gutter surfaces.

6.0 Priming Non-Asphalt Base

6.01 Prior to priming, the granular base, unless constructed by the paving contractor immediately prior to paving, shall be prepared by blading, dragging, spraying with water and compacting with rollers as required, so as to provide a uniform tight compacted surface, correct to line, grade, and crown or superelevation. All surplus loose aggregate shall be bladed clear on the shoulders for use in shouldering. Care shall be exercised in removing loose aggregate, to guard disturbing the bond of the aggregate in the surface of the base.

6.02 Asphaltic priming shall take place when the granular base is dry or slightly damp and the ambient temperatures are over 10°C.

6.03 The selected asphaltic primer shall be uniformly sprayed by an approved distributor at the rate specified by the Consultant Engineer.

6.04 The primer shall be sprayed within a temperature range which will cause the kinematic viscosity to be between fifty (50) and one hundred and fifty (150) centistokes.

6.05 Care shall be exercised, however, to prevent over-priming. Prime that is not absorbed into the base within twenty-four (24) hours after application, or over-priming, shall be corrected by the application of selected cover sand.

6.06 Any spraying faults shall be corrected by hand spraying, brooming or the subsequent removal of cover sand placed on over-primed areas. The asphaltic primer shall be entirely absorbed by the base course.

6.07 All traffic, where possible, shall be kept off the prime base until the primer has been absorbed. Where it is not possible to keep traffic off wet primer, the surface shall be blinded with a cover sand or fine aggregate.

6.08 The Contractor shall maintain the base as may be necesary to keep the surface prime intact.

7.0 Tack Coating of Existing Asphaltic Pavements

7.01 Prior to tack coating, deficiencies in the existing pavement shall be treated as follows:

a) Joints and cracks, 15 mm or more in width, should have the existing filler removed to a depth of at least 25 mm. They shall be refilled with a dense, fine-graded mixture thoroughly tamped into place. Any excess shall be removed level with the pavement surface.

b) Rigid-type pavements that have transverse pre-molded expansion and longitudinal joints shall be cleaned out to a depth of 50 mm and refilled as noted in paragrapgh 7.01 a).

c) Asphalt patches which appear to contain an excess of asphalt or may appear to be unstable shall be removed from the pavement.

d) Surface cracks wider than 5 mm shall be treated as in paragrapgh 7.01 a).

e) Surface cracks less than 5 mm in width shall be treated with the same asphaltic material as used in the tack coat.

7.02 After all repairs have been completed, the surface shall be cleaned as noted in paragraph 4.01 immediately prior to application of the tack coat.

7.03 Tack coating shall take place when the ambient temperature is over 10° C.

7.04 The selected asphaltic tack coat shall be uniformly sprayed by an approved distributor at the rate specified by the Consultant Engineer.

7.05 Extreme care shall be exercised in the application of the tack coat so as to avoid a surplus of asphalt which may flush into the overlying course.

7.06 In places where the distributor bars cannot reach, the tack coat shall be applied with a hand sprayer attached to the distributor by a hose. When hand spray methods are used, care shall be taken to avoid over-coating of the surface.

7.07 No more tack coat than is necessary for the day's operation shall be places on the surface. All traffic not essential to the work shall be kept off the tack coat.

1.0 Scope

1.01 General

a) This Specification describes the materials, plant equipment and workmanship required for the construction of hot mixed, hot laid asphaltic concrete pavement.

b) This Specification shall be read and construed with the Special Provisions of the Contract, (prepared by the Consulting or Municipal Engineer and the approved Design Drawing).

1.02 Description of Work

Under this Specification, asphaltic concrete consisting of mineral aggregate and asphaltic binder, shall be combined and hot mixed in an approved mixing plant, spread on a prepared base and compacted to an approved density, all as shall be described in this Specification.

1.03 Pavement Types and Design Criteria

a) There shall be three (3) types of mixes for pavement construction:

1) Coarse Mix, for base and surface courses where specified.

2) Medium Mix, which shall be the normal mix for pavement construction.

3) Fine Mix, for light surface courses and special levelling purposes.

b) There shall also be three (3) strength classifications for asphaltic concrete pavement, based on design traffic criteria in accordance with The Asphalt Institute Specification Series No. 1 (SS-1) Manual:

Class A - Light Traffic Classification - Residential Road
Class B - Medium Traffic Classification - Collector Road
Class C - Heavy Traffic Classification - Major Road

Mixes for each class of pavement shall meet Marshall Test design criteria as specified in the following table.

c) The type and class of pavement required shall be specified by the Municipal Engineer.

PROPERTY OF LABORATORY COMPACTED PAVING MIXTURE	PAVEMENT CLASS A	B	C
Number of flows each face of test specimen	35	50	75
Stability, all mixtures, N.	2250	2250	3350
Flow index, all mixtures, units of 0.25 mm	8-20	8-18	8-16
Percent Air Voids			
Surface or leveling course	3-5	3-5	3-5
Base course	3-8	3-8	3-8
Minimum Percent Voids in Mineral Aggregate for nominal maximum particle size			
20 mm	14	14	14
15 mm	15	15	15
10 mm	16	16	16
Minimum index of retained stability after immersion in water at 60°C for 24 hours.	80%	80%	80%

d) Mixes shall be designated as to mix type number followed by class strength classification. Thus, coarse mixes will be designated as Mix 1A, Mix 1B, and Mix 1C. Medium mixes will be designated as Mix 2A, Mix 2B, and Mix 2C. Fine mixes will be designated as Mix 3A, Mix 3B, and Mix 3C.

1.04 Final compaction Requirements

a) If required by the Municipal Engineer, cores will be drilled from the road surface after final rolling is completed. The cores shall be used to measure thickness of the pavement and to test the density of the compacted mix, as required under paragraph 1.04 b).

b) The compacted asphalt concrete pavement shall have a density equal to or greater than ninety-seven (97) percent of a laboratory specimen prepared by the Marshall Test Method in accordance with paragraph 1.03 b), from a sample taken from a truck delivering the mixture on the job site. The laboratory density shall be compared with the filed density at the location of the same truckload mixture from which the laboratory specimen was made.

c) The compacted base and surface course shall have average thickness no less than that specified by the approval Design Drawings. Any deficiency in base course thickness shall be made up with surface mixtures when the surface course is placed.

2.0 Materials

2.01 Methods of Test

a) Asphaltic materials shall be tested in accordance with methods of test designated on Appendix 7 - Methods of Test.

b) Mineral aggregates shall be tested in accordance with methods of test designated in Appendix 7 - Methods of Test.

2.02 Asphaltic Material

a) Asphaltic cement to be used in preparation of asphaltic concrete paving mixture shall be penetrating asphalt as described under Appendix 1 - Asphaltic Materials and of the grade specified in the Special Provisions. Such material shall at no time be heated to a temperature in excess of that which will cause the material to have a kinematic viscosity of less than one-hundred (100) centistokes.

b) The bitumous cement content of the mix as determined by the Engineer shall not vary from the selected job mix content by more than ± 0.3 percent by mass of the total mix.

2.03 Coarse Aggregate

a) For purpose of standard A.S.T.M. tests, coarse aggregate shall be all mineral material retained on the 4.75 mm sieve. It shall consists of crushed stone, crushed slag, crushed gravel or combinations thereof, or materials naturally occurring in a fractured condition or of a highly angular natural aggregate with pitted or rough surface texture.

b) The coarse aggregate other than slag or naturally occurring rough textured or pitted surface aggregate shall contain at least sixty (60) percent by mass of crushed pieces having two (2) or more surfaces or faces produced by fracture, when the aggregate is required for incorporation in mixes to be used in construction of pavements, types B or C.

c) Aggregate having known polishing characteristics shall not be used in surface coarse mixes except by express permission of the Municipal Engineer.

d) The maximum absorption of the coarse aggregate when tested in accordance with A.S.T.M. Designation C127 shall be 1.7 percent.

e) All coarse aggregate shall be free from coatings of clay, silt, or other objectionable matter and shall not contain more than 1.5 percent by mass of clay balls or other aggregations of fine material.

f) Coarse aggregate shall be tested for soundness in accordance with A.S.T.M. Specification C88 for which maximum weighted losses for five (5) cycles shall be eighteen (18) percent when magnesium sulphate is used.

g) Crushed slag shall meet the requirements of A.S.T.M. Specification D693.

2.04 Fine Aggregate

a) For purposes of standard A.S.T.M. test, fine aggregate shall be all mineral matter passing the 4.75 mm sieve including mineral fillers. It shall consist of natural and/or manufactured material derived by crushed stone, slag, or gravel.

b) The aggregate particles shall be clean, tough, durable, moderately sharp and free from coating of clay, silt, or other objectionable matter, and shall contain no clay balls or other aggregations of fine material.

c) Fine aggregate shall be tested for soundness by A.S.T.M. Specification C88 for which maximum weighted losses for five (5) cycles shall be twenty (20) percent when magnesium sulphate is used.

2.05 Mineral Filler

a) Mineral filler shall consist of all mineral matter which will pass the No. 200 sieve.

b) Mineral filler may consist of fine particles of the coarse or fine aggregate or of finely ground particles of limestone, hydrated lime, Portland Cement, or other selected mineral matter. It shall be dry, free from organic matter, clay particles or lumps.

c) Mineral filler shall be non-plastic when tested by A.S.T.M. Specification D-423 and D-424.

2.06 Paving Mixes

a) Paving mixes prepared under these Specifications shall be composed of aggregates and paving asphalt meeting the requirements of the following table:

U.S. Standard Sieve Size	CGSB 8-GP-2M Sieve Size	Percentage Passing for Each Mix Type Coarse	Medium	Fine
3/4"	19 mm	100		
1/2"	13.2 mm	80-100	100	
3/8"	9.5 mm	70- 90	80-100	100
No. 4	4.75 mm	50- 70	55- 75	30-100
No. 8	2.36 mm	35- 54	35- 57	64- 39
No. 16	1.18 mm	26- 42	26- 44	48- 76
No. 30	600 µm	18- 32	19- 32	32- 60
No. 50	300 µm	13- 24	13- 23	16- 42
No.100	150 µm	8- 16	8- 16	6- 23
No.200	75 µm	2- 8	4- 10	4- 10

b) However, should the Contractor provide an aggregate which will meet the overall maximum size and design requirements of paragraph 1.03, other than Index of Retained Stability After Immersion in Water, such aggregate may be accepted upon approval of the Engineer, notwithstanding the fact that its grading curve does not fall within the limits prescribed in the above table.

c) If sieve test results indicate that variations in aggregate gradation are exceeding the maximum permissible limits detailed above, the Contractor shall immediately modify his aggregate production procedure to the satisfaction of the Consulting Engineer so as to produce aggregate having a gradation which will consistently fall within the permissible limits specified. Aggregate produced during periods when gradation is out of control may be rejected by the Consulting Engineer and shall be removed or otherwise disposed of as may be directed.

3.0 Plant and Equipment

3.01 Paving Plant Essentials

a) The plant used by the Contractor for the preparation of hot mix asphaltic concrete material shall conform to the requirements for mixing plants for hot mix, hot-laid bituminous paving mixtures, A.S.T.M. Specification D995 and to the recommended procedures of the Asphalt Institute's, "Asphalt Plant Manual" Manual Series No. 3 (MS-3).

b) The plant shall be so designed and co-ordinated as to produce a uniform mixture within the Specifications.

3.02 Control of Mixing Temperatures

a) The mixing temperature for a particular asphaltic concrete mix shall be that which corresponds to a viscosity range of 150 to 300 centistokes (75 to 150 seconds Saybolt Furol) for the asphalt cement penetration grade specified in the Special Provision. Mixing temperatures generally shall conform to the recommended temperatures of the Asphalt Institute. At no time shall the maximum mixing temperature exceed 176°C. The lowest possible temperature consistent with paragraph 3.02 b) should be used.

b) Mixing temperature shall be consistent with paragraph 3.03 to provide uniform coating of asphalt on all aggregate particles.

3.03 Control of Mixing Time

Mixing time shall be the minimum required to obtain a uniform distribution of aggregate sizes and a uniform coating of asphalt on all aggregate particles. The minimum mixing time shall be that which produces a Ross Count of:

1. 90 percent fully coated for base mixes
2. 95 percent fully coated for surface mixes

as determined by the Ross Count Procedure. The least time needed for the pugmill to produce mixes meeting the minimum coating requirements shall be the minimum mixing time.

3.04 Transporting the Mixture

a) Trucks used to haul the asphalt paving mixture from the plant to the job site shall be in good mechanical condition at all times. Truck bodies that come in contact with the asphalt mixture should be clean and smooth and free from cracks, holes, dents, and shall be clean of all foreign material.

b) Surfaces of the truck coming in contact with the asphalt paving mixture may be lubricated with either a mild lime water, a soap, or detergent solution, or an approved commercial solvent in emulsion form suitably diluted as recommended by the manufacturer. After the solution has been painted or sprayed on, the truck beds should be elevated so the excess can drain out. Oil, grease and other similar products shall not be permitted.

c) A canvas or similar covering shall be used to cover the hot mix after loading into the truck regardless of the ambient temperature or haul distance. Hauling trucks in which frame-contact, or bed-bearing with the paver during dumping operation shall not be used.

d) Any load with a paving mix temperature of less than 120° C will be rejected. The lowest acceptable mix temperature may only be varied upon the approval of the Engineer.

e) No load shall be sent out so late in the day as to interfere with spreading and compacting the mixture during daylight unless artificial light, satisfactory to the Engineer, is provided.

4.0 Asphaltic Concrete Paving

4.01 Base Preparation

No asphalt paving mixture shall be placed on a base that has not been either primed or tack-coated in accordance with the Specifications and in accordance with Appendix 3 - Surface Preparation for Asphaltic Paving.

4.02 Paving Equipment

a) Unless otherwise specified, all plant-mixed bituminous mixtures shall be spread by means of mechanical self-powered pavers capable of spreading the mix true to the line, grade and crown indicated on the approved Design Drawing.

b) At the forward end of the machine there shall be hoppers of sufficient capacity to enable the paver to spread the paving mixture continuously and without interruption during the dumping cycle of the haulage trucks. The paving mixture shall be transferred from the hoppers to reversing type distributing screws, designed to distribute the paving mixture evenly and without segregation, across the full laying with of the paver screeds.

c) The paver shall be equipped with an activated screed which shall be adjustable as to level and section. A dampened dial level shall be fitted to the machine so that proper pavement crown or cross fall can be produced throughout the finishing operation.

d) The paver shall be fitted with mechanical devices such as equalizing or straight edge runner, or evener arms or such other compensating devices to prevent minor change in sub-grade elevation from being reflected in the finished surface.

4.03 Placing the Mixture

a) Asphalt paving mixtures shall only be laid upon a base, and under weather conditions, approved by the Consulting Engineer. The surface of the base shall be dry. Prior to delivery of the mixture, the prepared base shall be cleaned of all loose or foreign material.

b) Asphalt paving mixture shall only be laid when the ambient temperature is above 5°C and rising.

c) The mixture shall be spread and tamped to the necessary thickness. The paver feed shall be so adjusted to the rate of delivery of the asphaltic mixture, that the paver shall spread mixture at a constant speed and with a minimum of stoppages.

d) The paving mixture shall be spread at the lowest speed compatible with the rate of supply of the paving mixture. The road speed of the paver shall not exceed ten (10) metres per minute for base course mixtures or eight (8) metres per minute for surface course mixtures without the express permission of the Consulting Engineer.

e) Following screeding and prior to roller compaction, the surface shall be checked and any irregularities such as fatty accumulations or other non-uniform surface texture, shall be adjusted. Crooked edges on the paving mat shall be straightened by either removing and wasting mix which bows outside the edge line or by adding mix from the hopper if the edge of the mat is indented, before the edge is rolled.

f) In places inaccessible to a paving machine, handspreading will be permitted. Placing and spreading by hand shall be done very carefully and the material distributed uniformly so that segregation of the coarse aggregate and asphaltic mortar will be avoided. The asphaltic mix shall be distributed into place using hot shovels and shall be spread with hot rakes in a loose layer of uniform density and correct depth. Asphaltic paving mixture for hand spreading shall not be dumped any faster than can be handled by shovelling and raking.

4.04 Joints

Longitudinal and transverse joints shall be carefully prepared, bonded and sealed.

a) Transverse Joints in both base and surface courses, shall be carefully constructed and thoroughly compacted to provide a smooth riding surface. Joints shall be straight-edged to assure smoothness and true alignment. If a bulkhead was not used to form a transverse joint, the line of the joint shall be located a sufficient distance back of the rounded edge, to provide a true surface and cross section. Where material is trimmed, a neat and vertical face shall be prepared and this face shall be sprayed or painted with a thin uniform coat of hot asphalt cement, or other asphaltic bonding material as may be directed by the Consulting Engineer.

b) Transverse joints made next to an adjoining lane shall be rolled initially by making a pass along the longitudinal joint for a few metres. The surface shall be checked with a straight-edge and corrections made if necessary. The joint shall then be rolled transversely, with the roller on the previously laid material except for a 150 mm projection of the wheels on the freshly laid material. This procedure shall be repeated with successive passes each covering 150 to 200 mm of fresh material until the entire width of a drive roll is on the new mix. Boards of proper thickness should be placed at the edge of the pavement to provide for off-pavement movement of the roller. Where this is impractical, transverse rolling shall stop 150 to 200 mm short of the outside edge of the pavement, and the outside edge shall be rolled out during longitudinal rolling.

c) Longitudinal Joints shall be planned to provide an offset of at least 150 mm from like joints in a previously laid course. The first lane placed shall be true to line and grade and have a near vertical face. Before compaction, the material along unsupported edges shall be butted and slightly elevated with a tamping tool or lute, to set up the edge. Longitudinal edges of a previously laid pavement shall be trimmed to provide a vertical face and this face shall be sprayed or painted with a thin uniform coat of hot asphalt cement, or other asphaltic bonding material as may be directed by the Consulting Engineer.

d) When paving is done against an abutting lane, the paver shall be positioned so that in spreading, the new mix overlaps the compacted lane of pavement by no more than 75 mm. Coarse aggregate in the material overlapping the cold joint shall be carefully removed and wasted. If another course is to be placed over the course being spread, the excess coarse aggregate may be spread over the unrolled lane with a broom or lute. When placing a surface course, excess coarse aggregate shall not be spread over the freshly laid mat.

e) Longitudinal joints shall be rolled directly behind the paving operation. Rolling of joints shall be done with the roller wheels positioned on the previously laid pavement so not more than 150 mm of the rear roller wheel rides on the freshly laid mix. The roller shall continue to roll this line, gradually shifting its position across the joint, until a thoroughly compacted and neat joint is obtained.

5.0 Compaction

5.01 General

Compaction of freshly laid asphaltic concrete shall be such that the final compaction requirements of paragraph 1.04 are satisfied and that the finished pavement shall be smooth and accurate to the established grade and crown.

5.02 Surface

The surface of the finished pavement shall be free from objectionable paver ripple and from lumps or depressions exceeding 5 mm from a 3 m straight edge laid thereon parallel to the centre line or a camber board laid transversely.

5.03 Compaction Method and Equipment

a) The method of compaction to obtain the specified density, may be selected by the Contractor, but shall be subject top approval by the Consulting Engineer. The equipment should meet the following minimum requirements.

1. Three wheel steel rollers shall have a loaded weight of not less than 10.9 tonnes, with a compression at the rear wheels of not less than 60 N/mm of width.

2. Steel wheel or segmented steel wheel rollers shall have two rolls side by side each of a minimum width of 750 mm and minimum diameter of 1500 mm. The minimum loaded rolling mass shall be 13.6 tonnes.

3. Vibratory rollers shall have a minimum steel drum diameter of 1150 mm, a minimum drum width of 1500 mm and shall be capable of being loaded so as to have a loaded mass of 17.5 N/mm of drum width.

4. Pneumatic tired rollers shall be equipped with wheels which carry 13.00 x 24 pneumatic tires capable of being inflated to a minimum pressure of 825 kPa and shall have a loaded mass such that all wheels carry a minimum proportional load of 31 kN.

b) For pneumatic tired rollers, tire contact pressures shall be as high as possible without causing displacement of the mix that cannot be remedied in the final rolling. The use of a small amount of non-foaming detergent or water-soluble oils on the wetting mat of the pneumatic-tired rollers at the beginning of the rolling operation will be most helpful in preventing the asphalt from sticking to the tires until they warm up.

c) During rolling, the roller wheels should be kept moist with only enough water to avoid picking up the material. Rollers should move at a slow but uniform speed with the drive roll or wheels nearest the paver. The speed should not exceed 5 km/h for steel wheeled rollers, or 8 km/h for pneumatic-tired rollers. Rollers should be in good condition, capable of being reversed without backlash. The line of rolling should not be suddenly changed or the direction of rolling suddenly reversed, thereby displacing the mix. Any pronounced change in direction of the roller should be made on stable material, the affected areas should be loosened at once with lutes or rakes and restored to the original grade with loose material before being re-rolled. Heavy equipment, including rollers, should not be permitted to stand on the finished surface before it has thoroughly cooled or set.

5.04 Rolling Procedure

a) When paving in single width, the first lane placed shall be rolled in the following order:

1. Transverse joints
2. Outside edge
3. Initial or breakdown rolling, beginning on the low side and progressing toward the high side
4. Second rolling, same procedure as 3.
6. Finish rolling

b) When paving in echelon, or abutting a previously placed lane, the mix shall be rolled in the following order:

1. Transverse joints
2. Longitudinal joints
3. Outside edge
4. Initial or breakdown rolling, beginning on the low side and progressing toward to high side.
5. Second rolling, same procedure as 4.
6. Finish rolling

c) When paving in echelon, 50 to 75 mm of the edge which the second paver is following shall be left unrolled, and rolled when the joint between the lanes is rolled. Edges shall not be exposed more than fifteen (15) minutes without being rolled. Particular attention shall be given to the construction of transverse and longitudinal joints in both intermediate and surface courses.

5.05 Breakdown Rolling

a) Breakdown rolling shall be accomplished with steel wheel rollers or approved pneumatic rollers. Breakdown rollers shall work as closely as possible behind the paving machine, without cracking the mat or having the mix pick up on the roller wheels.

b) Breakdown rolling shall start on the to low side of the spread, which is normally the outside of the lane being paved, and progress toward the high side. When adjoining lanes are placed, the same rolling procedure shall be followed but only after compaction of the fresh mix at the longitudinal joint with 150 to 200 mm of the roller width.

c) A pattern of rolling that will provide the most uniform coverage of the lane being paved shall be used. Normally, this pattern will involve overlapping on successive trips by at least one half the width of the narrowest wheel of the roller.

d) Breakdown rollers shall generally move onto the freshly laid mat with the drive rolls forward in the direction of paving.

5.06 Intermediate Rolling

a) Intermediate rolling shall follow the breakdown rolling as closely as possible while the asphalt mix is still plastic and at a temperature that will result in maximum density.

b) Normally, pneumatic tired rollers shall be used for the intermediate rollings. Pneumatic tired rollers shall be continuous, consisting of at least three (3) complete coverages.

c) Intermediate rolling shall follow the same rolling pattern as used for the breakdown rolling, and shall be continued until the desired compaction is obtained.

5.07 Finish Rolling

Finish rolling shall be accomplished with two-axle tandems while the material is still warm enough for removal of roller marks.

5.08 Correction of Surface Irregularities

If any irregularities or defects remain after compacting is completed, they shall be corrected in lower courses by removing or adding material. In the surface course the entire affected area of the surface shall be removed promptly and sufficient new material placed to form a true and even surface. All minor surface projections, joints, and minor honey-combed areas shall be rolled to a smooth surface. The final surface shall be of a uniform texture conforming to the line and grade as shown on the Design Drawing.

a) For situations where there is evidence of deficient asphalt pavement, a Certified Materials Testing Laboratory will be engaged by the developer to perform additional tests as required to make recommendations for remedial work which will be approved by the Municipal Engineer. All remedial work will be completed prior to acceptance of the road works.

5.09 Areas Inaccessible to Rollers

When the asphalt mix is spread in areas that are inaccessible to the rollers, compaction shall be obtained by hand tampers, mechanical tampers, or small vibrating-plate compactors.

5.10 Paving to Existing Curb and Gutter

When asphalt paving is being constructed against existing concrete curb and gutter, the finished surface of the asphalt pavement shall not be less than 5 mm above the top of the gutter.

5.11 Traffic Control

No traffic shall be permitted on the finished pavement until it has cooled to such temperature as to ensure that no deformation of the surface will occur.

6.0 Leveling Courses

6.01 Asphalt Mix

Asphaltic concrete mixes to be used in placing leveling course, or the placing of leveling wedges to correct sags and depressions shall be Class C.

6.02 Base Preparation

Leveling courses or leveling wedges shall not be placed on a base that has not been either primed or tack-coated in accordance with the Special Provisions of the Contract, and in accordance with Appendix 3 - Surface Preparation for Asphalt Paving.

6.03 Equipment

a) Self-propelled paving machines may be used. Where construction allows, a long ski riding on an adjacent lane, curb or gutter shall be used. A short ski or shoe grade follower shall be used in instances where a guide-line string is used as a grade reference. A grade reference string line shall be set by the Consulting Engineer to grade references elevation and shall be established parallel to the centre line of the road.

b) Motor grades may be used in laying leveling courses, or leveling wedges using only very skilled and experienced operators. When spreading leveling courses with a motor grader, such spreading shall be done to establish grade reference points as set by the Consulting Engineer.

6.04 Construction

a) In placing the mix in a leveling course with a motor grader it is essential to place the required amount of mix in each station of the work so that there will not be a large excess of material to waste.

b) The asphalt mixture shall be placed in a conventional trapezoidal windrow which shall then be spread by the motor grader in the normal fashion.

c) Ultimately, the asphalt mixture shall be spread from a windrow box to provide a flat spread 100 mm high and from 2 m to 2.5 m wide. The motor grader operator shall then "square blade" the mixture ahead.

d) When an automatic blade control is available on a motor grader, the blade shall be set to the required transverse slope and string line used to maintain longitudinal alignment.

e) Compaction of the asphalt mixture in leveling courses shall be done with a pneumatic tired roller following immediately behind the motor grader or paving machine.

6.05 Leveling Wedges

a) Leveling wedges shall be used to level sags or depressions in an old pavement prior to re-surfacing. Leveling wedges shall be placed in layers of not more than 75 mm in thickness. Where thicker wedges are required, multiple layers shall be used.

b) Where multiple layers are required, the Consulting Engineer shall establish sufficient levels to enable cross-section and profile to be established.

c) In placing multiple layers, the shortest length layer shall be placed first with the successive layer or layers extending over and covering the shortest layer.

6.06 Construction

The method of construction and compaction shall be the same generally as that specified in paragraph 6.04 and following procedural requirements of paragraph 6.05.

1.0 Scope

1.01 General

This Specification covers the materials, plant equipment and workmanship required for surface treatments of existing roads.

1.02 Description of Work

Surface treatments usually described as Seal Coats shall be referred to in this Specification as one of the following:

a) Aggregate Seal - single or multiple treatment
b) Sand Seal
c) Fog Seal
d) Slurry Seal

Additionally, Mixed-in-Place Surface Treatment and Plant-Mixed Surface Treatments shall be described under that particular application.

2.0 Materials

2.01 Methods of Test

a) Asphaltic materials shall be tested in accordance with methods of test designated in Appendix 7 - Methods of Test.

b) Mineral aggregates shall be tested in accordance with methods of test designated in Appendix 7 - Methods of Test.

2.02 Asphalt Primer

The asphalt primer shall be that specified by the Municipal Engineer. The asphalt specified shall conform to Appendix 1 - Asphaltic Materials.

2.03 Asphalt Binder

The asphalt binder shall be that specified by the Municipal Engineer. The asphalt specified shall conform to Appendix 1 - Asphaltic Materials.

2.04 Aggregates

a) For aggregate seals, the aggregate shall consist of clean crushed rock or gravel of uniform quality throughout. The aggregate shall have a percent wear by the Los Angeles Abrasion Machine Test of not more than forty (40), and not less than sixty (60) percent by mass of crushed gravel shall have two or more faces produced by fracture.

b) The aggregate shall meet the following gradation requirements:

Size Number	Nominal Size Square Openings	Amounts finer than each laboratory sieve (square openings), percentage by weight							
		23.75 mm	19.00 mm	13.20 mm	9.50 mm	4.75 mm	2.36 mm	1.18 mm	300 mm
6	19.0 mm to 9.5 mm	100	90 to 100	20 to 55	0 to 15	0 to 5			
7	13.2 mm to 4.75 mm		100	90 to 100	40 to 70	0 to 15	0 to 5		
8	9.5 mm to 2.36 mm			100	85 to 100	10 to 30	0 to 10	0 to 5	
9	4.75mm to 1.18 mm				100	85 to 100	10 to 40	0 to 10	0 to 5

Numbered sieves are those of the United States Standard Sieve Series, converted to metric by Canadian Government Specification Board Standard 8-GP-2M.

Or shall meet the following gradation requirements for one-sized aggregates:

GRADATION REQUIREMENTS FOR ONE-SIZE AGGREGATES

Size Designation	Nominal Size Square Openings	Amounts finer than each laboratory sieve (square openings), percentage by weight						
		23.75 mm	19.00 mm	13.20 mm	9.50 mm	4.75 mm	2.36 mm	75 mm
A	19.0 mm to 13.2 mm	100	85 to 100	2 to 20	0 to 7		0 to 1	0 to 0.5
B	14.25mm to 9.5 mm		100	85 to 100	0 to 30		0 to 1	0 to 0.5
C	9.5 mm to 4.75 mm			100	85 to 100	0 to 10	0 to 1	0 to 0.5

Numbered sieves are those of the United States Standard Sieve Series, converted to metric by Canadian Government Specification Board Standard 8-GP-2M.

c) For sand and seal slurry seals, the aggregate shall consist of clean, sharp sand and mineral filler, combined to meet the following gradation requirements:

CGSB 8-GP-2M Sieve Size	Total Percent Passing
2.36 mm	100
1.18 mm	55 - 85
600 um	35 - 60
300 um	20 - 45
150 um	10 - 30
75 um	5 - 15

d) Notwithstanding paragraphs b) and c), should the Contractor provide aggregates which meet the maximum size requirements, and such aggregates have a proven record of service and durability, the Consulting Engineer may approve the use of such aggregates in writing, although they do not meet the overall grading requirements specified.

3.0 Rates of Application

3.01 Rates of application or spread for asphaltic materials and the grade to be used shall be specified by the Consulting Engineer.

3.02 Rates of application or spread for aggregates and the gradation requirements to be used shall be specified by the Consulting Engineer.

3.03 Surface Preparation of Granular Base - Prior to surface treatment of granular bases, the base shall be prepared in accordance with Appendix 3 - Surface Preparation for Asphalt Paving, paragraph 6.0.

3.04 Surface Preparation of Existing Asphalt Surfaces - Prior to surface treatment of existing asphalt surfaces, defects in the existing pavement shall be repaired in accordance with Appendix 3 - Surface Preparation for Asphalt Paving, paragraph 7.0.

4.0 Construction Methods

4.01 Construction of Aggregate Seals

a) Subsequent to preparation under paragraph 3.0, the surface to be treated shall be swept clean using a rotary broom, and if dusty, the surface shall be dampened with water. Particular care shall be taken to thoroughly clean the outside edges of the area to be treated, and care taken that material removed shall not be mixed with the cover aggregate.

b) Asphaltic primer where specified shall be applied in accordance with Appendix 3 - Surface Preparation for Asphalt Paving, paragraph 6.0.

c) Following absorption and curing of the primer, application of the asphaltic binder shall be made uniformly at the specified rate using a pressure distributor. The binder shall be applied at a temperature such that the asphalt viscosity is within the range of twenty (20) to one hundred and twenty (120) centistokes for asphalt cements and liquid asphalts, or fifty (50) to one hundred (100) centistokes for emulsified asphalts.

d) The distributor shall be cleaned thoroughly before using unless its last use was with the same type of asphaltic binder specified for the work.

e) Applications of liquid asphalts (other than emulsified asphalts) and asphaltic cement shall be made only when the surface is thoroughly dry. Application of emulsified asphalt shall be made when the surface is dry or slightly damp.

f) Asphaltic binder (other than emulsified asphalt RS-2K) shall be applied only when the pavement temperature is twenty-six (26) degrees Celcius or higher. Emulsified asphalt RS-2K shall be applied only when the pavement temperature is ten (10) degrees Celcius or higher.

g) Before beginning application, building paper shall be spread over the surface, from the joint back, for a sufficient distance for the spray bar to begin spraying and be operating at full force when the asphalt surface to be treated is reached. The paper shall be removed after application of the asphalt.

h) The spray bar shall be shut off instantaneously at each construction joint to assure full application of the asphaltic binder up to the joint. Dripping shall be prevented by the insertion of a drip pan under the nozzles.

i) Areas unavoidably missed by the distributor, shall be touched up with a hand sprayer.

4.02 Application of Aggregate

a) Clean, dry aggregate shall be distributed uniformly by a mechanical or a self-propelled spreader and shall follow immediately the asphaltic application.

b) The cover coat shall be applied ahead of the truck or spreader wheels.

c) Immediately after spreading, the aggregate shall be rolled with a self-propelled pneumatic-tired roller having a total compacting width of not less than 1500 mm and minimum contact pressures of 275 kPa.

d) Rolling shall proceed in a longitudinal direction, beginning at the outer edges of the treatment and working towards the centre, with each trip overlapping the previous trip by one half the width of the front wheels, or roller.

e) The first rolling of the aggregate shall be completed within one-half hour after it has been spread, and rolling shall continue only until a smooth, thoroughly compacted surface is obtained.

f) In instances where the surface treatment is done one-half width at a time, 150 mm of the inside edge shall be left uncovered with aggregate to allow for an overlap of asphaltic binder when the remaining half of the surface is treated.

g) All loose aggregate shall be removed from the pavement following completion of the work.

4.03 Traffic Control

a) Traffic shall be kept off of freshly sprayed asphalt and shall be directed through the project with the least interruption of the work.

b) Should it be necessary to route traffic over the new treatment, speed shall be restricted to 8 km/h until completion of rolling and the asphalt has taken its initial set. Speed shall then be restricted to 40 km/h until the Consulting Engineer directs the end of traffic control.

4.04 Double and Multiple Surface Treatments

Where double and multiple surface treatments are specified, preparation and construction of subsequent treatments shall be done in accordance with paragraphs 3.04, 4.01, 4.02, and 4.03.

4.05 Construction of Sand Seals

Preparation, application and construction of sand seal surface treatments shall follow the procedures of paragraphs 3.04, 4.01, 4.02, and 4.03, with types of materials to be used and rates of application of material specified by the Consulting Engineer.

5.0 Fog Seals

5.01 General

This specification covers Fog Seal Surface Treatments to existing asphalt paving.

5.02 Surface Preparation

Prior to surface treatment of existing asphalt surfaces, defects in the existing pavement shall be repaired in accordance with Appendix 3 - Surface Preparation for Asphalt Paving, paragraph 7.01.

5.03 Materials

The emulsified asphalt to be used for this application shall be SS-1 or SS-1h, which shall be diluted with water at the rate of 1:1 parts emulsified asphalt to water.

5.04 Rate of Application

The rate of application shall be specified by the Consulting Engineer.

5.05 Construction Method

a) Subsequent to Surface Preparation under paragraph 5.02, the Fog Seal shall be uniformly applied using a pressure distributor at the rate specified by the Consulting Engineer.

b) The distributor shall be cleaned thoroughly before using unless its last use was with the same type of emulsified asphalt specified for the work.

c) Emulsified asphalt Fog Seal shall only be applied when the ambient temperature is not less than ten (10)° C.

5.06 Traffic Control

a) Traffic shall be kept off of freshly sprayed asphalt and shall be directed through the project with the least interrupion of the work.

b) Traffic shall be kept off of the freshly sprayed asphalt for two (2) hours following application of the seal, or until directed otherwise by the Consulting Engineer.

6.0 Slurry Seals

6.01 General

This Specification covers the application of Slurry Seal Surface Treatments to existing asphalt pavements.

6.02 Surface Preparation

Prior to surface treatment of existing asphalt surfaces, defects in the existing pavement shall be repaired in accordance with Appendix 3 - Surface Preparation for Asphalt Paving, paragraph 7.01.

6.03 Materials

a) Emulsified Asphalt shall be specified in the Special Provisions of the Contract.

b) Aggregate shall meet the requirements of paragraph 2.04c).

6.04 Equipment

a) For slurry sealing of small areas the mixture may be batched in a plaster machine, dumped on the surface to be treated and then spread with long-handled squeegees.

b) For large areas, slurry seals shall be mixed in transit mix type trucks and spread with a squeegee spread box towed behind the truck, or if available the mixture may be spread using a slurry seal machine.

6.05 Slurry Mixture

Unless otherwise specified in the Special Provisions of the Contract, materials shall be combined in the following proportions:

i) Combined aggregate and mineral filler - 50 kg.
ii) Emulsified asphalt - 15 litres.
iii) Water - as required for proper consistency.

In batching the mixture, approximately two-thirds (2/3) of the estimated water requirements shall be placed in the mixer. With the mixer operating, the aggregate is added in the specified proportion followed by the emulsified asphalt. The materials shall be added at a slow and uniform rate so as not to cause any balling or lumping in the mixture. The mixture shall be blended until uniform and shall be tempered with additional water if needed to produce a free-flowing creamy textured mixture.

6.06 Construction Method

a) Immediately prior to applying the slurry, the surface to be treated shall be dampened with a light application of water, except that no pooling of free-standing water shall occur on the surface. Following dampening of the surface, a tack coat of diluted emulsified asphalt shall be applied uniformly to the surface to be treated. The tack coat shall be of emulsified asphalt, the same type and grade specified for the slurry mix, diluted in the ratio of one part emulsified asphalt and three parts of water.

b) The tack coat shall be applied at the rate of 0.5 L/m^2, or as directed by the Consulting Engineer, and shall be thoroughly cured prior to the application of the slurry seal.

c) The slurry seal shall be spread on the area to be treated to provide a slurry thickness of the depth (specified by the Consulting Engineer).

d) The thickness for any one single course shall not exceed 5 mm.

e) Where the slurry seal is being applied over extensively scaled areas, each application shall be thoroughly rolled with a pneumatic tired roller after the slurry has cured.

f) The pneumatic tired roller shall be a total compacting width of not less than 1500 mm and shall have contact pressures of 275 kPa. The operating contact pressure shall be specified by the Consulting Engineer.

6.07 Traffic Control

All traffic control shall be kept off the slurry seal until it has cured to a firm condition that will prevent pick-up of the mixture. Where two applications of the slurry mixture are required, the initial treatment shall be cured thoroughly prior to placing the succeeding application.

1.0 Scope of Specification

1.01 General

This Specification covers the duties and responsibilities of the Consulting Engineer or his authorized representiative as set out in Section A1-3.

1.02 Testing Laboratory

The Consulting Engineer may appoint an independent testing laboratory to provide inspection services as directed, or to conduct testing of materials to ensure compliance with the Specifications.

1.03 Weather

No work shall be undertaken by the Contractor when, in the opinion of the Consulting Engineer, the weather is unsuitable or unfavourable for a particular class of work.

2.0 Inspection

2.01 Plant and Equipment

a) The Contractor shall at all times provide access to, and allow for inspection of the plant and all equipment during the Contract. Any deficiencies in plant or equipment, during either preparation of materials or subsequent construction shall be reported to the Contractor immediately and corrective measures shall be taken by the Contractor.

b) Should the Contractor not take remedial action to any request arising from paragraph 2.01 a), the Consulting Engineer shall order a stoppage of the work in progress until the necessary remedial action has been done by the Contractor.

2.02 Construction

a) During construction, the Contractor shall at all times comply with the methods of construction contained in this specification. Construction methods employed by the Contractor, which are at variance with the methods of construction shall be pointed out by the Consulting Engineer and remedial action, as may be directed, shall be taken by the Contractor.

b) Should the Contractor not take remedial action to any request arising from paragraph 2.02 a), the Consulting Engineer may order a stoppage of the work in progress until the necessary remedial action has been done by the Contractor.

c) At any time during construction, the Consulting Engineer, if of the opinion that the Contractor's construction method is inadequate and unlikely to provide pavement of the required density or surface finish, he may direct the Contractor to change his construction method or to supply alternative equipment, as may be directed.

d) The requirements of paragraph 2.02 c) shall in no way relieve the Contractor of his responsibility for obtaining the required degree of compaction and finish without directions from the Consulting Engineer.

e) Deficiencies in the finished pavement shall be corrected by the Contractor, where such deficiencies are at variance with the Standard Specifications.

f) All such corrctions shall be accomplished as directed by the Consulting Engineer at the expense of the Contractor.

3.0 Testing

3.01 Materials

a) As directed by the Consulting Engineer, the Contractor shall furnish samples, or provide access for sampling of materials.

b) Sampling of materials shall be in accordance with the pertinent specification as outlined in Appendix 7 - Methods of Test.

c) Testing of materials shall be in accordance with the pertinant specification as outlined in Appendix 7 - Methods of Test.

d) As required, for compaction testing purposes, the authorized representative shall obtain samples carefully removed from the completed pavement. Holes made by removal of such samples shall be carefully filled by the Contractor with the appropriate mixtures and thoroughly compacted to conform in every way with the adjoining undisturbed pavement.

4.0 Re-Testing

4.01 Failure to Meet Test Requirements

Should any tests, required by the Consulting Engineer, fail to meet the requirements of the Standard Specification, the Consulting Engineer shall direct re-testing to be done as he may deem necessary.

5.0 Inspection and Testing Costs

5.01 Inspection and Testing of Materials

Should an independent testing laboratory be appointed by the Consulting Engineer, the costs of inspection and testing services provided by the laboratory shall be paid by the applicant.

5.02 Re-Testing of Materials

a) Should re-testing of materials be required under paragraph 4.01, due to failure of materials to meet the Specifications, and such re-testing indicates compliance of the materials with the Specifications, the costs of such re-testing shall be paid by the applicant.

b) Should re-testing of materials be required under paragraph 4.01, due to failure of materials to meet the Specifications, and such re-testing indicates non-compliance of the materials with the Specifications, the costs of such re-testing shall be paid by the Contractor.

1.0 Test Requirements

All A.S.T.M. Specifications shall be read as the latest revision thereof.

1.01 Asphalt Cement

	A.S.T.M. Specification
Viscosity	D2170
Penetration	D5
Flash Point	D92
Thin Film Oven Test	D1754
Rolling Thin Film Oven Test	D2872
Ductibility	D113
Solubility	D2042
Specific Gravity	D70
Softening Point	D2398

1.02 Liquid Asphalt

	A.S.T.M. Specification
Viscosity	D2170
Flash Point	D1310
Distillation	D402
Water in Asphalt	D95
Specific Gravity	D3142
Asphalt Residue of 100 Penetration	D243
Ductibility	D113
Solubility	D4

1.03 Emulsified Asphalt

	A.S.T.M. Specification
Viscosity	D244
Residue from Distillation	D244
Settlement	D244
Demulsibility	D244
Sieve Test	D244
Cement Mixing	D244
Aggregate Coating-Water Resistance Test	D244
Particle Charge Test	D244
Storage Stability	D244
Oil Distillate	D244

1.04 Mineral Aggregates

	A.S.T.M. Specification
Sampling Aggregates for Use as Highway Material	D75
Sieve Analysis:	
- Dry Sieve Analysis, Coarse and Fine Aggregate	C136
- Mineral Filler	D546
Sand Equivalent	D2419
Abrasion (Wear)	C131
Soundness Test	C88
Specific Gravity:	
- Coarse Aggregate	C127
- Fine Aggregate	C128
- Filler	D854 or C188
Unit Density	C29
Moisture	C566

1.04 Asphalt Paving Mixtures	A.S.T.M. Specification
Sampling Bituminous Paving Mixtures	D979
Marshall Test	D1559
Density	D1188 or D2726
Extraction	D2172
Recovery of Asphalt	D1856
Moisture and/or Volatile Distillates	D255
Alternate Methods	D1461
Maximum Specific Gravity	D2041
Sieve Analysis of Extracted Aggregate:	
Coarse and Fine Aggregates	C136
Mineral Filler	D546

1.05 Base Materials	A.S.T.M. Specification
Sieve Analysis - Dry Sieve Analysis:	
Coarse and Fine Aggregates	C136
Sand Equivalent	D2419
Abrasion (Wear)	C131
Soundness Test	C88
Proctor Density - Moisture Density	
Relations of Soils, Method A	D698
Density of Soil in Place:	
Sand-Cone Method	D1556
Rubber-Balloon Method	D2167

1.06 Distributor Spread Rate	State of California Divisions of Highways
Tentative Method of Field Test for the Determination of Distributor Spread Rate	No. Calif. 339-A - Tentative Test Method

1.0 Ready-Mix Concrete

1.01 Reference Standards

Latest revision of all Reference Standards shall apply.

a) C.S.A. Standard A23.1 - Concrete Materials and Methods of Concrete Construction.
b) C.S.A. Standard A23.2 - Methods of Test for Concrete.
c) A.S.T.M. Specification C494 - Chemical Admixture for Concrete.
d) A.S.T.M. Specification C618 - Fly Ash for Use in Portland Cement Concrete.
e) C.S.A. Standard A5 - Porland Cements.
f) C.S.A. Standard A266.1 - Air-Entraining Admixtures for Concrete.
g) A.S.T.M. Specification C309 - Liquid Membrane Forming Compounds for Curing Concrete.

1.02 Inspection and Testing

a) All required sampling, preparation of specimens and testing shall be performed by an independent testing agency appointed by the Consulting Engineer. The testing agency shall report immediately to the Consulting Engineer when any procedure is contrary to the specifications and good practice.

b) Testing costs will be chargeable to the applicant.

c) The testing agency selected by the Consulting Engineer shall approve all mix designs.

d) The testing agency shall perform the following:

1. Supply cylinder moulds, sample the concrete, make and cure test cylinders and perform compressive strength tests in accordance with C.S.A. Standards A23.2.21, A23.2.14, and A23.2.13.

2. Make slump tests and air content tests in accordance with C.S.A. Standards A23.2.20 and A23.2.19 or A23.2.18 for each concrete test.

3. Take three (3) test cylinders for each 100 cubic metres or fraction thereof for each class of concrete placed in any one day, except that in no case shall a class of concrete be represented by less than three (3) tests.

e) The Municipal Engineer may at his discretion reduce or eliminate the test cylinders to be taken for minor pours or pours not of structural significance.

f) A compression strength test of one cylinder of each set shall be performed at the test specimen age of seven (7) days and copies of these test reports shall be forwarded to the Municipal Engineer and concrete supplier within fourteen (14) days of concrete placement.

g) Compression strength tests of the remaining two cylinders of each group shall be performed at the test specimen age of twenty-eight (28) days.

h) The 28-day strength test shall be defined as the average compressive strength of two (2) companion test specimens and copies of this test report shall be forwarded to the Municipal Engineer and concrete supplier within thirty-five (35) days of concrete placement.

1.03 Concrete Materials

a) Cement: Portland Cement shall conform to the requirements of C.S.A. Standard A5.

b) Water: Mixing water for concrete shall be clear and free from injurious amounts of oil, acid, alkali, organic matter, sediment, or any other deleterious substance.

c) Aggregates: Fine and coarse aggregates shall conform to C.S.A. Standard A23.1.5.

d) Admixtures:

1. AIR ENTRAINING ADMIXTURES: shall conform to the requirements of C.S.A. Standard A266.1.

2. WATER REDUCING AGENTS: shall conform to the requirements of A.S.T.M. Specification C494 (Type A). Accelerating or retarding admixtures of Types B, C, D, and E shall only be used with the authority of the Municipal Engineer, or his representative.

3. FLY ASH: shall conform to the requirements of A.S.T.M. Specification C618 - Class F. Fly Ash shall only be used with the authority of the Municipal Engineer or his representiative.

1.04 Concrete Mix Specifications:

Cement	Type 10 or 30
Compressive Strength @ 28 days	30 MPa
Maximum Size Aggregate	20 mm
Class of Exposure	Class A
Slump	80 ± 20 mm
Air content	6 ± 1 percent
Admixtures	*

* Air entraining agents, water reducing agents and Fly Ash shall conform to the requirements of paragraph 1.03.

1.05 Concrete Mix Proportions

Concrete mixes shall be proportioned in accordance with C.S.A. Standard A23.1.9.2.1, Alternative No. 1, and the requirements of paragraph 1.04.

1.06 Concrete Quality

a) Concrete shall conform to the requirements of C.S.A. Standard A23.1.10.

b) Compressive Strength Requirements (C.S.A. Standard A23.1.10.5): The strength of the concrete shall be considered satisfactory if the averages of all sets of three compressive strength tests equal or exceed the specified strength and no individual test is more than 3.45 MPa below the specified strength.

1.07 Failure of Tests to Meet Requirements

If the results of tests indicate that the concrete is not of the specified quality, the Municipal Engineer shall have the right to enforce the provisions of C.S.A. Standard A23.1.10.6. Should additional testing indicate that the concrete is not of the specified quality, the Supplier shall remove the concrete in question at the Municipal Engineer's request.

Note: C.S.A. Standard A23.1.10.6.2. If, after carrying out the appropriate requirement of Clause 10.6.1, the Municipal Engineer is not satisfied that the concrete in the structure is of the specified quality, he may require a strengthening or replacement of those portions which he deems to be unsatisfactory.

1.08 Concrete Control

All concrete shall be "controlled concrete" in accordance with C.S.A. Standards A23.1 and as defined by National Building Code of Canada.

1.09 Measurement and Batching:

a) Materials for concrete shall be measured in accordance with C.S.A. Standard A23.1.11.1 and A23.11.2.

b) Batching of materials for concrete shall be in accordance with C.S.A. Standard A23.1.11.2.

1.10 Mixing and Delivering:

a) The concrete shall be mixed in accordance with C.S.A. Standard A23.1.11.3.

b) Delivery of concrete shall be in accordance with C.S.A. Standard A23.1.11.4.

1.11 Protection

a) COLD WEATHER REQUIREMENTS: Concrete shall be mixed and delivered in accordance with C.S.A. Standard A23.1.16.

b) HOT WEATHER REQUIREMENTS: Concrete shall be mixed and delivered in accordance with C.S.A. Standard A23.1.17.

c) Concrete Curing:

1. The surface of the concrete shall be protected by an approval membrane curing material which shall be applied to the entire exposed surface of the concrete immediately after the concrete has received its finish treatment.

2. The curing compound shall meet the requirements of A.S.T.M. Designation C309.

3. The membrane material shall be applied uniformly by an approved pressure distributor at an average of 5 square metres per litre. The compound when applied to a new concrete surface at the specified rate of application shall present a uniform appearance and shall effectively obscure the original colour of the concrete.

1.0 Scope

The work covered in this appendix of specifications pertains to the construction of portland cement concrete pavements in public rights of way within the Municipality.

2.0 Materials

Cement and other concrete materials, joint filler, curing materials and reinforcing steel, required by these drawings shall conform with the specifications of this Appendix.

2.01 Definitions

The definitions as described in CAN3-A23.1-M shall apply in these specifications.

2.02 Concrete Mix Specifications

Cement	Normal Portland - Type 10
Minimum Compressive Strength @ 28 days	30 MPa
Minimum Flexural Strength @ 28 days	4.2 MPa
Maximum Nominal Size Aggregate	38 mm
Class of Exposure	A
Slump: Placed by Machine Method	40 mm $\pm$ 10 mm
Placed by Hand Methods	70 mm $\pm$ 20 mm
Air Content	6 $\pm$ 1 percent
Admixtures	Air Entraining Agents
	Water Reducing Agents
	Fly Ash

A mix shall be designed to meet the above criteria based on the water/cement ratio necessary to produce concrete of the specified strength, but in any case the water/cement ratio shall not be greater than that required for durability. Except as otherwise provided for on the drawings, the water/cement ratio (by weight) for air-entrained concrete shall not exceed 0.45 for the 30 MPa strength specified.

The weight of water used in determining the water/cement ratio referred to above is the weight of added water plus the weight of aggregate moisture. The added water shall be regulated to take account of the variations of the moisture content of the aggregates during a pour, so that at no time is the water/cement ratio given above exceeded.

The minimum cement content shall be 385 Kg per cubic metre of concrete.

The mix proportions proposed by the Contractor are subject to the approval of the Consulting Engineer, who shall call for such adjustments as he deems necessary. Notwithstanding the approval of the Consulting Engineer, it shall remain the responsibility of the Contractor to ensure the concrete meets all the requirements specified and he shall satisfy himself that in using the mix, these requirements will be met.

2.03 Cement

Cement shall be normal Portland cement (Symbol 10) conforming to CAN3-A5-M, or as approved by the Consulting Engineer.

2.04 Concrete Aggregate

Concrete aggregate shall conform to CAN3-A23.1-M. Concrete aggregate shall be a clean crushed stone or gravel and a natural well-graded sand.

2.05 Water

Water shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. If water is considered unsatisfactory it will be judged on the basis of comparison with distilled water. Change in time of setting of plus-minus 30 minutes or more in a standard cement test for setting time, or loss of 10 percent of strength in a cement mortar strength test when compared to results obtained using distilled water shall be sufficient cause for rejection of the water being tested.

2.06 Admixtures

Admixtures may be used only on the written authority of the Consulting Engineer. The Consulting Engineer will specify the control associated to the use of admixtures.

The use of calcium chloride and other accelerators is prohibited.

Air entraining agents, water reducing agents, and fly ash shall conform to the requirements of Appendix 8, Paragraph 1.03.

2.07 Curing Compound

Curing compound shall be spray applied, liquid type conforming to ASTM C309 (Liquid Membrane - Forming Compounds for Curing Concrete) containing a fugitive dye.

2.08 Joint Sealer

Joint sealer shall conform to ASTM D1190. Joint sealer shall be Para-plastic, hot-poured, rubberized asphalt joint sealing compound, Code 2350, or as approved by the Consulting Engineer.

2.09 Expansion Joints

Expansion joints shall be Flexcell, or as approved by the Consulting Engineer, of the same shape as the concrete cross sections and having a minimum thickness of 13 mm. Joint filler shall conform to ASTM D1751.

2.10 Sub-Base and Base Material

Sub-base and base material shall be as specified in Section R-2 and Appendix 2 of these specifications.

2.11 Reinforcing Steel

Reinforcing steel shall conform with the specifications of Section R-2, Paragraph 6.08.

3.0 Subgrade, Base Course and Sub-Base Preparation

The preliminary subgrade before the setting of forms shall be graded and compacted as required under Appendix 2. The cross sections shall conform to the following Municipal Standard Drawings:

Standard Drawing Number	Road Classification
R-40	Rural
R-41	Residential
R-42	Collector
R-43	Major

After the forms have been securely set to grade and alignment, the subgrade between the forms shall be brought to true cross section by dragging a subgrade template as many times as may be necessary to secure a true subgrade. The finished subgrade shall be brought to an unyielding surface by rolling with compacting units meeting the requirements in Appendix 2.

Where thickened edges for pavements are required, such as shown on the standard plans, the subgrade shall be excavated and shaped to provide for the section shown.

Wherever possible, vehicles shall be kept off the finished subgrade. If vehicles must travel on the subgrade ahead of the paving, a power drag shall be carried immediately ahead of placing concrete. Irregularities in the subgrade caused by trucks during the placement of concrete shall be smoothed out and compacted immediately ahead of placing the concrete.

No concrete shall be placed until the subgrade is approved by the Consulting Engineer. No concrete shall be placed on a frozen base. The subgrade as finally completed and approved shall be maintained by the Contractor at an optimum moisture content by wetting with water until the concrete is actually placed.

4.0 Forms

Forms may be of wood or metal or any other material at the option of the Contractor, provided the forms as constructed result in a pavement of specified thickness and cross section as shown on the following Municipal Standard Drawings:

Standard Drawing Number	Road Classification
R-40	Rural
R-41	Residential
R-42	Collector
R-43	Major

Steel forms may be used for tangents and for curves having a radius of 45 metres or more. Flexible forms shall be used for curves having a radius of less than 45 metres.

Forms shall be adequately supported to prevent deflection or movement and will result in concrete pavement conforming with the drawings and specifications. The top of the forms shall not deviate more than 3 mm in 3 m and the alignment of forms shall be within 6 mm in 3 m. The forms may be removed the day after pouring if the concrete is sufficiently set to withstand removal without danger of chipping or spalling. When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth or sprayed with curing compound. All forms shall be cleaned, oiled, and examined for defects before they are used again.

Steel forms shall be at least 3 metres long and have a depth at least equal to the thickness of the concrete pavement being placed. The metal thickness of the web in flange shall be at least 5 mm, and forms 200 mm or more in height shall be at least 200 mm wide at the base. Forms less than 200 mm in height shall have a base width at least equal to the height of the forms. The base plate and top of forms shall be true and at right angles to the face of the form and flanges securely braced. Each 3 metre form shall have at least 3 stake pockets.

Prior to placing concrete around manholes, catch basins, gate chambers, etc., a temporary cover fitting below the rim of the ring casting shall be provided to prevent the concrete from flowing into them.

5.0 Placing Concrete

The concrete shall be placed upon the prepared subgrade between the forms to the required depth and cross section as shown on the following Municipal Standard Drawings:

Standard Drawing Number	Road Classification
R-40	Rural
R-41	Residential
R-42	Collector
R-43	Major

The concrete shall be placed in a continuous operation between construction and expansion joints. The concrete shall be thoroughly consolidated against and along all forms or adjoining pavements by such means as will prevent gravel pockets along the edges of the finished pavement. Any gravel pockets found after removing the forms shall be repaired.

When integral curb is being constructed with the pavement, fresh concrete for the integral curb shall be placed at such time as will enable the top section of the curb to be consolidated, finished, and bonded to the pavement slab while the concrete is plastic.

Where curb is not being placed integral with the pavement slab, reinforcing steel dowels shall be placed in the base section for the curb. Dowels and keyways shall be placed in the pavement slab as detailed on standard drawings.

5.01 Placing Concrete At Expansion Joints

Concrete placement around expansion joints shall be such that the expansion joint assembly will not be disturbed and that it will remain in a straight line perpendicular to the subgrade, as shown on the standard plan. The concrete shall then be spaded thoroughly or vibrated along the entire length of the joint to consolidate the concrete and leave no rock pockets anywhere at the joint. If any rock pockets are exposed, they shall be repaired.

5.02 Placing Concrete With Reinforcing Steel Bars Or Wire Mesh

Concrete shall be placed in two courses. The first course shall be struck off at the elevation established for reinforcing steel bar or wire mesh, or as designated on the plans. Immediately prior to placing the reinforcement, the concrete shall be brought to a fairly even surface by means of a template conforming to the depth of the reinforcement.

Reinforcing steel bars or wire mesh shall be placed on the bottom course before the concrete attains initial set. No more than 45 minutes shall elapse between mixing of the first course and placement of the second course.

Reinforcement shall be free of dirt, mill scale, oil, grease or other foreign material that may impair bond. Steel, coated with rust, may be used if the oxidations are not deep or loose coated.

Successive mats of steel or wire mesh shall be securely lapped together and tied so that longitudinal bars will lap 40 diameters and wire mesh will lap 150 to 300 mm.

Reinforcing steel or wire mesh shall be laid as a continuous mat. Continuity shall be maintained between expansion joints. Steel shall terminate within 100 mm of the joint.

Concrete may be placed in one lift, provided a method is used to position and secure the reinforcing bars or wire mesh at the designated locations in the slab.

If the concrete is placed in two courses where reinforcement is used, all dirt, sand or dust which collects on the base course shall be removed before the top course is placed.

5.03 Slip Form Construction

At the option of the contractor and with the approval of the Consulting Engineer, concrete pavement may be constructed by the use of slip-form paving equipment.

Slip-form paving equipment shall be provided with traveling side forms of sufficient dimensions, shape, and strength to support the concrete laterally for a sufficient period of time during placement to produce pavement of the required cross section; and the equipment shall spread, consolidate, screed, and float-finish the freshly placed concrete in such a manner as to provide a dense and homogenous pavement.

The concrete shall be distributed uniformly into final position by the slip-form paver and the horizontal deviation in alignment of the edges shall not exceed 13 mm from the alignment established by the Consulting Engineer.

Should the Contractor elect to use a slip-form paving machine that does not form an extruded curb, he will not be required to construct a depressed curb section at driveways. The driveway, when constructed may be poured against the back of the slip formed pavement. No payment will be made for the curb section that is not placed at the driveways.

When concrete is being placed adjacent to an existing pavement, that part of the equipment which is supported on the existing pavement shall be equipped with protective pads on crawler tracks or rubber-tired wheels, and shall be offset to run a sufficient distance from the edge of the pavement to avoid breaking or cracking the pavement edge.

After the concrete has been given a preliminary finish by the finishing devices in the slip-form paving equipment, the surface of the fresh concrete shall be checked with a straight edge to comply with the tolerances and finish specified in Section 8.05 of this Appendix.

Final finishing of slip-form pavement shall be as specified in Section 8.04 of this Appendix.

6.0 Compacting Concrete

Concrete may be compacted by (1) hand methods, (2) machine methods and (3) combined machine and vibrators method at the option of the Contractor. The hand method will be limited to irregular areas, irregular sections and pavements placed in confined work areas.

6.01 Hand Compacting

Concrete shall be spread evenly with shovels and spaded along the forms with a perforated spade after which it shall be struck off with a metal shod tamping rod. The rod shall be cut to exact crown of the roadway and be fitted with handles at each end and be of such depth or trussed to be rigid. The strike-off rod shall be operated with a combined tamping, crosswise and sawing action to produce a smooth surface free from depressions or inequilties. A small amount of mortar must be kept ahead of and extending substantially along the entire length of the rod. Excessive swinging of the rod will not be permitted.

The concrete shall be struck off again with a "second strike rod" operated in the same manner as the first rod and following not closer than 6 m behind the first. The second rod may be eliminated on small pours of pavement of substandard width, unless use of the rod is required by the Consulting Engineer.

6.02 Machine Compacting

The machine used for compacting shall be self-propelled and designed to run on the side forms. Movable parts shall be capable of adjustment and they shall be adjusted so as to produce accurately the roadway sections shown on the plans. The machine shall be equipped with two reciprocating screeds. The tops of the forms shall be kept clean with a suitable device attached to the machine.

The machine shall be put in forward motion as soon as concrete is deposited on the subgrade. A roll of concrete shall be carried ahead of the screed. Screeds and tampers shall be operated so as not to disturb expansion joints and caps.

Machines shall be operated prior to placing longitudinal and transverse dummy joints.

Care must be exercised not to overwork the concrete and bring an excess of mortar to the surface.

6.03 Combined Vibration and Machine Compacting

The combined vibration and compaction equipment shall be demonstrated to the satisfaction of the Consulting Engineer as being capable of consolidating the concrete across the full width of the pavement into a homogeneous mass, free of rock pockets, and without separation of mortar and aggregates.

The equipment shall consist of the machine described in Section 6.02, Machine Compacting, or an approved spreading machine to which is attached a vibrating unit composed of individual internal vibrators spaced not more than 750 mm apart. The vibrators shall be spaced equidistantly, and the distance from the side forms to the nearest vibrator shall not exceed 350 mm. The vibrators shall be carried behind and independent of the strike-off screed of the spreading machine, or ahead of and independent of the strike-off screed of the first compacting machine.

The vibrating unit shall not rest upon the side forms nor impart vibration to the strike-off screeds. The individual vibrators shall be attached to a frame in a manner which will permit adjustment of both the depth of penetration into the concrete and the angle of the vibrator with the horizontal.

The entire vibrating unit shall allow raising the vibrator tips completely clear of the concrete surface.

The vibrators shall be capable of vibrating at rates between 4,800 and 8,000 impulses per minute when inserted in the concrete. All vibrators shall be synchronized to vibrate at a frequency specified by the Consulting Engineer, within the limits established.

On the first trip over the freshly placed concrete the vibration equipment shall be submerged in the concrete to ensure adequate consolidation. Unless otherwise directed by the Consulting Engineer, the vibration equipment shall be operated on the first pass only. The vibration equipment shall not be operated when the machine is not in motion except when vibrating near an expansion joint.

After the first pass with vibration, one or more trips without vibration shall be made as described in Section 6.02 of this Appendix.

6.04 Vibrating Screed Concrete Pavement Construction

The type of vibrating screed which the Contractor proposes to use, whether roller or beam, shall be subject to approval by the Consulting Engineer. Upon request by the Consulting Engineer a test section of pavement shall be placed for the purpose of demonstrating the capabilities of the screed to satisfactorily compact and strike off the concrete to the established grade and section.

Concrete shall be uniformly distributed between the forms and it shall then be compacted and screeded to the level of the top of the forms by means of the vibrating screed. Supplemental compaction by hand spading or mechanical vibration of the concrete adjacent to the forms will be required if the concrete cannot otherwise be adequately compacted.

The vibrating screed shall be operated over the freshly placed concrete in successive passes only a sufficient number of times to obtain maximum compaction. Over-vibration of the concrete, resulting in an excess of mortar at the surface of the pavement, will not be permitted.

After the final passage of the vibrating screed, the surface of the concrete shall be at the established pavement grade and cross section and shall be sufficiently smooth as to require only a very moderate amount of hand finishing for smoothness to meet approval of the Consulting Engineer.

7.0 Joints

7.01 General

A jointing layout design drawing approved by a Consulting Engineer shall be provided to the Contractor. Joints shall be placed as indicated on these drawings, and change from these locations shall only be made with the written approval of the Consulting Engineer. If the Contractor recommends changes in the jointing layout, he shall submit two copies of a drawing to the Consulting Engineer, showing his proposed revisions at least one week prior to the placing of concrete. The Consulting Engineer will return one copy of the drawing to the Contractor indicating either approval or rejection. Jointing shall then be undertaken in accordance with a drawing approved by the Consulting Engineer.

Transverse and longitudinal joints for street pavement may be contraction joints, construction or expansion joints as shown on the plans and as called for in these specifications. When the pavement abuts an existing pavement, the locations of the joints in the new pavement shall coincide with the joints in the existing pavement unless otherwise shown on the plans or specified in the special provisions.

7.02 Formed Transverse Contraction Joints

Standard spacing of transversely formed contraction joints along straight sections of streets between through expansion joints or between intersections or other irregular areas, shall be at intervals of 4.6 m across the full width of the pavement and at right angles to the center line of roadway. Where the spacing between through expansion joints are not in even multiples of 4.6 m for transverse joints, the last several spaces approaching the expansion joint or header shall be varied by shortening the spaces, as directed by the Consulting Engineer. On horizontal curves the spacing of 4.6 m shall be along the outer edge of the pavement.

For intersections and other irregular areas, the arrangement of contraction joints shall be placed in accordance with standard intersection patterns, or as directed by the Consulting Engineer. The area of any one irregular pattern formed by contraction joints in intersections shall not exceed 21 m^2 and the greatest dimension thereof shall not exceed 5 m.

When paving a second lane adjacent to the previously paved lane, the contraction joints shall be matched with the former; except on curves where resultant panel would be less than 3.8 m.

Where uncontrolled cracks are existing in the first lane, they shall be matched as nearly as possible in the second lane. Should the uncontrolled cracks in the existing paved lane be too frequent or in random locations and impossible to match with a uniform spacing in the second lane, then in that event the two lanes shall be completely separated by 5 mm joint material extending from the surface to 25 mm below the bottom of the concrete being placed.

Where full joint material is required to separate two paving lanes, its location shall be noted on the plans or in the special provisions and the cost thereof will be paid for at the unit bid price per linear meter.

Where integral curb or doweled curb is placed along with concrete pavement, premolded joint filler material shall be placed in the full section of the curb in true alignment with the pavement joint and in perpendicular position.

7.03 Construction of Formed Contraction Joints

Formed contraction joints shall be constructed by imbedding a preformed joint material. The filler shall be cut to the exact sections of the joint. The length of the premolded joint filler shall extend to within 6 mm of both edges of any panel. Formed contraction joints shall be formed by means of 'zip strip' as supplied by Demay Inc., or equal.

Transverse contraction joints shall be placed after compaction and finishing of concrete have been completed and before initial set. A groove shall be cut into the surface at the location of joint, using a tool provided with stops (tee iron) to prevent cutting the groove deeper than the planned depth of the joint filler. The joint filler shall then be forced into the groove until the top is flush with the pavement surface, with a deviation of not more than 3 mm below the surface. The joint filler shall be at right angles to the surface and always in a straight line.

After the joint filler has been imbedded in the concrete, the surface of the pavement shall be finished against the filler strip with hand floats to restore the surface finish. While performing this operation, the filler strip must be maintained in a vertical or normal position, true to alignment. After finishing, the entire area of the joint shall be true to grade and smoothness without any irregularities.

No payment will be made for contraction joint material or its placement, and all costs thereof shall be included in the unit contract price per square meter for "Cement Concrete Pavement".

7.04 Sawed Contraction Joints

Sawed contraction joints shall be constructed by sawing a vertical groove in the hardened concrete on an approved schedule after placing and before development of random cracks in the concrete slab. Transverse contraction joints shall be sawed before the longitudinal joints are sawed.

Sawed longitudinal joints in general are not critical as to a specific time schedule after hardening of the concrete and may be delayed under favorable conditions before an incidence of longitudinal random cracking begins. The Consulting Engineer shall direct the time schedule for sawing contraction joints.

Any scheduling for the sawing of joints that results in premature or uncontrolled cracking shall be revised immediately, under direction of the Consulting Engineer, by adjusting the time interval between placing of concrete and the sawing of joints. After the schedule has been approved, the sawing shall proceed as a continuous operation day and night until all joints have been completed.

Two or more sawing units may be required to accomplish the sawing in order to minimize random cracking. Standby equipment shall be on the job to ensure continuous sawing as specified regardless of any breakdown of equipment.

Where curing membrane is used, the area disturbed by sawing of joints shall be resprayed immediately upon completion of the sawing operation and care shall be exercised to prevent the curing compound from getting into the groove. Joint sealing compound will not adhere to concrete if curing compound is present.

The depth of sawed transverse contraction and longitudinal joints shall be either a minimum of 40 mm or not less than 1/4 the depth of the slab, whichever is the greater.

After the curing period the joints shall be cleaned and sealed with joint sealants meeting requirements in Section 2.08. Excess sealing material shall be cleaned off the surface of the pavement before opening to traffic.

7.05 Transverse Construction Joints

Transverse construction joints shall be made at the end of each day's paving, or when placing of concrete is discontinued for more than 60 minutes, by placing a header board transversely across the subgrade. The header board shall be located to conform to the spacing for the transverse contraction joints (or an expansion joint) and shall be left in place until the paving is resumed. If the location of the header board is to be a contraction joint, then the header shall have fastened to the concrete side a wedge-shaped strip of wood to form a key in the concrete. Thickened edge must be constructed at the construction joint header to provide ample depth of concrete above and below the keyway. Where preformed contraction joints are used, the joint made by the construction joint header shall have a 50 mm strip of joint material imbedded against the hardened concrete when paving is resumed.

Where sawed contraction joints are specified, the construction joint made by the header may be sealed or may have a 50 mm strip inserted as specified herein.

No separate payment shall be made for construction joints or for the premolded joint material, extra concrete, or sealing compounds required for the construction joints. All costs therefore shall be included in the unit contract price per square meter for "Cement Concrete Pavement".

7.06 Tranverse Expansion Joints

Transverse expansion joints are placed only where shown on the plans or where directed by the Consulting Engineer.

Transverse expansion joints shall be constructed with premolded material, 13 mm in thickness and conforming to Section 2.10. They shall extend the full width of the pavement and from 25 mm below the subgrade to 25 mm below the top of the pavement. The joint alignment must be at right angles to the pavement center line unless otherwise specified.

The filler material shall be held accurately in place during the placing and finishing of the concrete by a bulkhead, a holder, a metal cap or any other approved method. The joint must be at right angles to the paved surface and the holder must be in place long enough to prevent sagging of the material, especially on streets having steep grades.

In multiple lane construction, the joints shall be matched so as to form a continuous alignment over all lanes.

Expansion joints shall extend continuously through all curbs, special care being exercised to preserve alignment perpendicular to the pavement in the curb section.

A wood filler strip or metal cap shall be placed on the top of the premolded joint filler to form the groove 25 mm deep, and it shall remain in place until after the finishing and the concrete is sufficiently set to resist sloughing into the groove. The joint filler must be stapled together at the ends to preserve continuity.

Immediately after removal of side forms, the edges of the pavement shall be carefully inspected and wherever the joint filler is not fully exposed, the concrete shall be chipped down until the edge of the filler is fully exposed for the entire depth.

No additional payment will be made for expansion joint material or its placement. All cost therefore shall be included in the unit contract price per square meter for "Cement Concrete Pavement".

7.07 Sealing Expansion Joints

After the pavement is cured and before any traffic, the space above the top of expansion joint filler strip shall be thoroughly cleaned of all loose material. The groove 13 mm wide shall be completely free of any projecting concrete from the sides and the groove shall be continuous across the slab to each edge. It shall then be filled level with the pavement surface with joint sealant meeting the requirements of Section 2.08.

The joint sealant material shall be heated and placed in complete accord with the manufacturer's instructions. Burned material will be rejected. The expansion joint groove shall be dry at the time of pouring the sealing compound. No additional payment will be made for the sealing filler or its application and the cost thereof shall be included in the unit contract price per square meter for "Cement Concrete Pavement".

7.08 Longitudinal Contraction Joints

The joints shall be constructed in true alignment with respect to their proper location on center line or parallel thereto as is shown in a succeeding subsection. No payment will be made for contraction joint material and its placement.

7.09 Standard Location for Longitudinal Joints

Longitudinal joint spacing shall not exceed 3.8 m. Standard location for longitudinal joints, whether contraction or construction, shall be as shown below unless otherwise specified in the plans and special provisions:

Road Class.	Std. Dwg. No.	Road Width	Joint Locations
Rural	R-40	5.0 m	Centerline
Residential	R-41	8.5 m	Centerline and 2m each side of center
Collector	R-42	11.0 m	Centerline and 3m each side of center
Major	R-43	14.0 m	Centerline and 3.5m each side of center

In the event the roadway is divided into two lanes, the construction joints shall be located on the center line of the roadway unless otherwise approved by the Consulting Engineer. Construction joints on the center line shall be keyway types as shown on Standard Drawing Number R39.

7.10 Longitudinal Expansion Joints

Longitudinal expansion joints shall be placed where shown on the plans or where required for concrete pavement between or along retaining walls, curbs or other structures. Unless otherwise shown on the plans, longitudinal expansion joints shall be 13 mm thick and of a width equal to the full depth of the pavement.

The furnishing and placing of longitudinal expansion joints, using premolded joint filler material, shall be considered as incidental to the construction of the pavement and the cost thereof shall be included in other bid items of the work unless otherwise covered in the special provisions and proposal.

7.11 Longitudinal Construction Joints

Longitudinal construction joints shall be as shown on the standard drawings. The Contractor may use an approved keyed joint. The Contractor shall submit plans for the keyed joint for approval by the Consulting Engineer prior to construction.

8.0 Finishing Concrete

Hand finishing or machine finishing of the entire pavement surface will be permitted unless otherwise provided in the special provisions.

On all vertical curves and at irregular intersections, modified tools shall be provided as necessary to secure a smooth, uniform contour and surface.

All tools shall be kept in first-class working order and shall be inspected daily. Worn or defective tools will not be permitted. A sufficient number of tools shall be provided for the work to proceed efficiently.

8.01 Hand Finishing

After the concrete has been struck off and consolidated, it shall be smoothed by longitudinal floating. Movement ahead shall be in successive advances of not more than 1/2 the length of the float. Floating shall continue until all irregularities are removed. Longitudinal floating shall follow the compaction of the concrete by not less than 10 m. Free water on the pavement shall be removed with the float or other suitable tool.

After the final passage of the longitudinal float, transverse floating shall be continued with long handled floats operated from outside the pavement slab.

After floating, the surface shall be scraped with a grout rod at least 3 m in length with a long handle for operating at the edge of the pavement. The grout rod shall be operated to correct irregularities in the pavement surface and remove water and laitance. Contraction joints shall be placed after all floating has been completed in accordance with provisions of Section 7.02, Formed Transverse Contraction Joints.

8.02 Machine Finishing

The finishing machine shall be of a type approved by the Consulting Engineer. The machine shall be adjustable to both crown and plane of the finished pavement surface. The screed shall oscillate longitudinally during its travel transversely across the pavement. It shall be operated in the forward direction so that the screed will pass over the same section of pavement at least two times during its transverse travel.

The finishing machine shall be moved over the pavement as many times as is necessary to give the pavement a smooth even texture surface, conforming to the exact crown and cross section specified on the plans.

The floating shall not be considered complete until all free water is removed from the surface.

The finishing operations shall be performed at a time and over such lengths of the pavement surface as existing conditions necessitate. All finishing operations are subject to strict control by the Consulting Engineer, and shall be performed to his satisfaction.

The surface smoothness of the completed pavement shall be tested with a 3 m straightedge and shall meet the surface smoothness requirements specified in Section 8.05.

8.03 Edging

Before the final finishing is completed and before the concrete has taken the final set, the pavement shall be edged as indicated below.

LOCATION	RADIUS
Edge of Pavement	13mm
Formed longitudinal contraction joints	6mm
Longitudinal construction joints	6mm
Transverse construction joints	6mm
Formed transverse contraction joints	6mm
Through joints	13mm
Curbs - back edge	13mm
Curbs - front edge	25mm

Particular attention shall be given to edge at the appropriate time. The concrete shall have attained a partial set and all free water shall have disappeared so that the edged joints will be clearly defined, with no tearing or slump of the edges.

8.04 Final Finish

The pavement surface, after edging, shall be given a uniform, gritty texture true to grade and cross section. The final finish shall be accomplished by one of the methods described hereinafter, or as otherwise directed by the Consulting Engineer to achieve the specified surface texture.

Burlap Finish: A burlap drag at least one meter wide and the length of the pavement section shall be dragged forward over the pavement surface. The burlap drag shall be wet and clean when in use. The burlap shall not be left on the pavement surface between dragging operations.

Brush Finish: After edging, the pavement shall be brushed transversely with a fiber or wire brush of a type approved by the Consulting Engineer.

Before using either the drag or the brush, the concrete shall have set sufficiently that the surface is not grooved or gouged in the finishing operation.

8.05 Surface Smoothness

After all finishing is complete, the surface smoothness shall be checked with a straightedge 3 m long, mounted to a long handle to permit operation from outside the pavement. The straightedge shall be placed on the surface of the pavement parallel to the center line and at intervals of no more than 1.5 m across the full width of the pavement. At conclusion of the finishing operation the surface of the pavement shall not vary from a true surface, when tested with a 3 m testing straightedge, more than 3 mm in 3 m on majors, 3 mm in 3 m on collectors, 6 mm in 3 m on residential streets and rural roads.

In no case shall the grade in the gutter be such that it will allow ponding of water. If the surface smoothness of the pavement after curing is found to exceed the tolerance permitted, the high spots shall be ground until they meet the tolerance. If the surface tolerance cannot be met satisfactorily by grinding, then in that event the pavement shall be removed and be replaced in conformity with the specifications at the expense of the Contractor.

9.0 Curing and Protection

The concrete pavement shall be protected against excess loss of moisture, rapid temperature change, rain, water and mechanical injury during and immediately following the placing and finishing operations.

The concrete pavement shall be cured for the minimum number of days listed below, exclusive of the day the concrete is placed.

Portland cement	5 days
High early-strength cement	3 days*

*The use of High early-strength cement must be approved by the Consulting Engineer.

Moist curing by sprinkling or by saturated mats, liquid membrane or a combination of these may be used for curing medium and shall be applied in a manner and in quantity appropriate to the particular conditions as approved by the Consulting Engineer. Pavement edges which are exposed by the removal of the forms shall be protected by the immediate application of a curing medium or moist earth.

All curing materials shall be free of all substances which are considered to be harmful to portland cement. The curing medium shall be capable of preventing checking, cracking and dry spots regardless of conditions existing at the time of placement. Concrete placement will not be permitted unless curing materials are on the job site and ready for immediate application. Failure to comply with all provisions of the curing procedures hereinafter specified will be sufficient reason to suspend all concrete operations.

9.01 Sprinkler System

The sprinkler system shall keep the entire surface of the concrete pavement continuously wet, 24 hours a day. Care shall be taken to avoid damage to the surface of the pavement during placement of the equipment. The water flowing off the pavement shall be wasted in a manner satisfactory to the Consulting Engineer.

9.02 Saturated Mats

Cotton mats shall be placed over the entire area of the concrete pavement and kept saturated during the full curing period. The mats shall be lapped at all joints, and they shall be securely held in place to prevent displacement. The material which composes the mats shall conform to the standard specifications for AASHTO Designation M73, Cotton Mats for Curing Concrete.

9.03 White Liquid Membrane Curing Compound

White pigmented curing compound shall conform to the requirements in Section 2.07. The entire surface of the pavement shall be sprayed uniformly with sufficient compound to obscure the natural color of the concrete, but not less than one litre for each 4 square meters of area. The curing compound shall be applied immediately after the finishing is completed and all free surface water has disappeared, or after initial curing when other methods are used in combination with the liquid curing compound.

If hair checking occurs before the finishing operations are completed, the Consulting Engineer may require a fog spray as defined in Section 9.04. Any mortar scraped from the pavement surface shall be wasted. When it becomes necessary to fill depressions in the pavement surface, concrete shall be brought from the mixer. Whenever the pavement surface has been disturbed after the initial application of the curing membrane, it shall be restored by respraying.

The curing compound shall be applied with pressure spraying equipment having a feed tank equipped with a mechanically driven agitator and operated with sufficient air to properly atomize the compound.

If forms are removed from the pavement prior to the end of the curing period, curing compound shall be applied to the exposed surfaces within a period of one hour.

Curing compound shall not be applied either immediately before or after a rainfall. If the curing membrane is damaged by rain, it shall be restored to the original condition by respraying.

Provision shall be made for the Consulting Engineer to ascertain the rate at which the curing compound is being applied to the pavement. The compound shall be drawn directly from manufacturer's containers bearing the manufacturer's name, brand and lot number. Before placing the compound in the spray tank, it shall be agitated thoroughly to disperse the pigment. The compound shall not be diluted with solvent or altered in any way from its original condition. If the compound has become chilled, it shall be heated but not above 38 degrees Celsius.

After the compound has been applied, the curing membrane shall be protected against damage from any source, including traffic by foot or other. If any traffic is permitted, a protective cover approved by the Engineer shall be placed over the pavement not less than 24 hours after application of the compound.

The Contractor shall have readily available protective covering such as waterproof paper or plastic membrane sufficient to cover concrete pavement that can be placed in one full day.

The Contractor shall assume all liabilities for and protect the Owner from any damages or claims arising from use of materials or processes described therein.

9.04 Curing In Hot Weather

In periods of low humidity, drying winds, or high temperatures, a fog spray shall be applied to concrete as soon after placement as conditions warrant in order to prevent the formation of shrinkage cracks. The spray shall be continued until conditions permit the application of a liquid curing membrane or other curing media. The Consulting Engineer shall make the decision when the use of a fog spray is necessary.

10.0 Cold Weather Work

Concrete shall not be placed when the temperature is below 4 degrees Celsius, nor shall concrete be placed on a frozen subgrade. If, during a period of concrete placement and curing, the temperature is expected to drop to -1 degree Celsius within 24 hours in the opinion of the Consulting Engineer, all concrete not already cured for at least six days shall be covered with an insulating material in a manner and to a depth which will prevent freezing of the concrete. The insulating material shall be such that it will not stain or injure the concrete. The curing period shall be extended as much time as the Consulting Engineer may determine the conditions justify.

Concrete damaged by frost action shall be replaced at the Contractor's expense.

11.0 Concrete Pavement Construction In Single Lane

Concrete pavement may be placed in single lane full width or multiple lanes between longitudinal joints.

Concrete shall not be placed in a succeeding lane sooner than 48 hours after finishing of the first lane. Trucks shall be operated on the subgrade or on the shoulder adjacent to the lane being paved.

If the Consulting Engineer shall deem conditions to be such as to justify the operation of trucks upon newly paved concrete because of lack of space elsewhere, he may give permission to do so, but only under the following restrictions:

1. The concrete in the new lane shall have attained a compressive strength of 17 M Pa as determined by the Consulting Engineer.

2. The Contractor shall replace at his own expense any panels on the new pavement that are cracked or broken as a result of operating the trucks thereon.

3. A protective ramp shall be constructed at the pavement edge where vehicles may be driven on and off the pavement. The forms shall be left on the outside edge of the first lane at all turnouts until the pavement is opened to traffic.

When tie bars are specified, they shall be placed before the concrete is struck off during the last pass with the strike-off screed whether hand or machine operated. The tie bars shall be protected from traffic by bending down and back against the side form. Prior to placing the adjacent lane, the tie bars shall be straightened.

A metal strip 75 mm wide by 3 mm thick and at least 1.5 m in length shall be placed on the complete pavement lane near to the common joint with the adjacent lane to be paved, and the concrete placed in the adjacent lane shall be struck off from the plate, whether by machine or hand placement.

All roadways, shoulders, and subgrade in use by the Contractor shall be kept adequately dampened to prevent dust upon the freshly placed concrete.

12.0 Opening Pavements To Traffic

The Contractor shall not open newly constructed cement concrete pavement to traffic until the concrete has attained a compressive strength of 17 M Pa, as determined by the Consulting Engineer.

13.0 Cleanup

In addition to the cleanup specified in the construction of roads and sidewalks, Section R-2, Paragraph 9.0, the Contractor shall, before final acceptance of the work, flush the pavement clean and remove the debris. He shall also clean out all open culverts and drains, inlets, catch basins, manholes and water main valve chambers, within the limits of the project, of dirt and debris of any kind which is the result of the Contractor's operations. The cleaning and disposal of such waste material shall be considered as incidental to the construction and all costs thereof shall be included in the unit contract prices of various items of the work.

14.0 Concrete Inspection and Testing

All testing and inspection of concrete shall conform to the specifications of Appendix B, Paragraph 1.02 with the exception that flexural strength tests may also be required at the discretion of the Consulting Engineer.

15.0 Concrete Quality, Mix Proportions, Control, Measurement, Batching, Mixing and Delivery

Concrete quality, mix proportions, control, measurement, batching, mixing and delivery shall conform to the specifications of Appendix B, Paragraph 1.05, 1.06, 1.08, 1.09, and 1.10.

16.0 Failure of Tests to Meet Requirements

Appendix B, Paragraph 1.07 will be applicable in the event that test results indicate that the concrete is not of the specified quality.

17.0 Measurement and Payment

Payment will be made for such of the following bid items as are included in any particular contract:

"Cement Concrete Pavement (class, thickness)," per square meter.
"Extra Concrete for Thickened Edge (cm x cm)," per linear meter.
"Steel Reinforcing Bars," per kilogram.
"Sawing Contraction Control Joints (depth)," per linear meter.
"Extra for Furnishing High-early-strength Cement," per tonne.

17.01 Cement Concrete Pavement

Payment for "Cement Concrete Pavement" shall be at the unit contract price for the specified class and thickness, complete in place.

Measurement for payment shall be by the square meter of concrete in place, including the area underneath curbs. No deduction will be made for castings in pavement.

The unit contract price shall be full compensation for subgrade preparation, furnishing of all labor, tools, equipment, materials excepting reinforcing steel, and for constructing, curing and protecting the cement concrete pavement.

All work, material and equipment not included in a separate unit contract price item shall be considered as incidental to the construction of the pavement and the costs thereof shall be included in the unit contract price per square meter of the cement concrete pavement.

17.02 Steel Reinforcing Bars

Steel required for pavement reinforcement will be paid for at the unit contract price for "Steel Reinforcing Bars" which shall be full compensation for furnishing and placing steel reinforcement as detailed on the construction plans. Measurement for payment will be by the kilogram of steel reinforcement in place.

Reinforcing steel shown on the standard drawings and required for ties of the pavement to driveway, curb, and curb and gutter will not be paid for under the item of "Steel Reinforcing Bars," per kilogram. Such steel shall be considered as incidental to the construction of the pavement and all costs thereof shall be included in the unit contract price per square meter of "Cement Concrete Pavement".

17.03 Sawing Contraction Control Joints

Measurement for payment will be by the linear meter of contraction joint sawed, cleaned and sealed in accordance with the plans and specifications.

The unit contract price per linear meter for sawing joints shall be full compensation for all labor, equipment and materials required to saw joints to the depth specified, and the unit contract price shall include all costs of labor and material for the sealing of the sawed joint as specified.

17.04 Extra for Furnishing High-Early-Strength Cement

If the Consulting Engineer shall direct that high-early-strength cement be used on any part of the work in lieu of standard portland cement, extra compensation will be made the Contractor in an amount per tonne equal to the difference between the price paid by him for standard port an ce ent an the price paid by him for high-early-strength cement.

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'D'

DESIGN AND CONSTRUCTION SPECIFICATIONS

STREET LIGHTING

INDEX **NO. OF PAGES**

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'D'

L-1

STREET LIGHTING DESIGN STANDARDS

1.0 Scope

1.01 A system shall be designed and installed to provide lighting of a type and intensity as hereinafter specified, on all roadways and walkways.

2.0 Basic Design Criteria - Lighting Levels

2.01 All facilities shall be designed and installed in accordance with good current Engineering practice, and complying to the current B.C. Electrical Code. Not limiting the foregoing, the following basic design criteria shall be used:

	Horizontal Average Illuminance	Uniformity Avg./Min.	Average Illum.
a) Roadways			
Provincial Arterial	15	3:1	
Major Road	12	3:1	
Collector	10	3:1	
Local Road	6	6:1	
b) Walkways (bikeways)			
Residential	3.5	10:1	3
c) Cross Walks			
Mid Block			
Provincial Arterial	30	3:1	22
Major Road	24	3:1	22
Collector	20	3:1	22
Local Road	12	3:1	22
Intersection			
Provincial Arterial	60	3:1	11
Major Road	48	3:1	11
Collector	45	3:1	11
Local Road	45	3:1	11

d) Intersections

To have the horizontal average illuminance of the two streets added together.

The average vertical illuminance shall be achieved throughout the approach side of the crosswalk area which includes an off-road area of at least 2.5m depth.

The vertical illuminance criteria is for the approach vehicle side of the pedestrian measured at 1.8m above grade.

2.02 The light levels specified are minimum for normal conditions. The Engineer shall increase levels to suit conditions where visibility is restricted and shall take into account trees and other objects that may reduce the effectiveness of the lighting scheme.

3.0 TYPE OF LIGHTING

3.01 Ornamental Lighting

Ornamental lighting shall be provided on all roadways and walkways not specifically designated by the Township of Esquimalt for overhead power lines. The type of standards, luminaries, lamps, underground wiring, etc., shall be as hereinafter specified.

3.02 Non-Ornamental Lighting

Luminaries may be attached to power poles on roadways designated by the Township of Esquimalt for overhead power lines, provided that davit arms of sufficient length are installed to bring the fixture to the edge of the travelled portion of the roadway. Failing the above, ornamental lighting shall be provided. Special overhead pole lines for street lighting, or additional wood poles to accommodate span wires, are not permitted. The type of luminaries, lamps, etc., shall be as hereinafter specified.

4.0 STREET LIGHTING STANDARDS FOR ORNAMENTAL LIGHTING

4.01 All standards shall be steel, of the type shown in the following table, and of a model approved by the Township of Esquimalt Municipal Engineer.

Application	Type	Minimum Mounting Height	Maximum Height
Provincial Arterial	Davit Arm	10 m	13 m
Major Road	Davit Arm	9 m	13 m
Collector	Davit Arm	5.5 m	6.5 m
Local Road	Post Top	5.5 m	6.5m

NOTE: All standards situated within nine (9) metres of the travelled portion of a roadway shall be designed to shear under high impact.

4.02 All standards shall have heavy dipped galvanized finish.

4.03 All standards must be certified for wind loadings suitable to the exposure of the location, but not less than 160 kmh.

4.04 The general arrangement of standards shall be decided upon by the Township of Esquimalt Municipal Engineer in consultation with the Owner's Consulting Engineer prior to design approval.

5.0 LUMINARIES

5.01 Luminaries shall be specially designed to accept the type and size of lamp proposed, and with a distribution pattern suited to the street width and location of the fixture. They shall be equipped with a closed refractor and be of a design approved by the Township of Esquimalt Municipal Engineer.

5.02 Luminaries and all electrical components must be C.S.A. approved.

5.03 Street luminaries shall be so placed and of distribution type to avoid excessive light pollution to residences. I.E.S. Type V distribution should only be used where no residences would be adversely affected.

5.04 Post top luminaries shall be one piece die cast aluminium with integral pole top adapter, containing the ballast and photocell (where required) within the

luminaire housing. The prismatic refractors shall be polycarbonate. The refractor shall be secured to the luminaire to totally seal the luminaire but allow movement if impacted. The luminaire shall have captive hinged lid and the lid shall be secured to the luminaire by metal rods, and not be supported by the refractor. Pre-approved luminaire is Crouse-Hinds PTA series.

5.05 Davit mounted street luminaries to be smooth cast aluminum housing with prismatic polycarbonate refractor and one piece die formed alzak finished aluminum reflector. Luminaire should be natural aluminum finish and have hinged housing for access to lamp and ballast. The photocell socket shall have adjustable twist lock receptacle and be sealed when not used. The Crouse-Hinds OV series is pre-approved.

6.0 LAMPS

6.01 Unless otherwise approved by the Township of Esquimalt Municipal Engineer, all lamps shall be high pressure sodium, having a minimum rated life of 20,000 hours.

6.02 The lamp sizes shall be 70, 100, 150 or 250 watts and universal mounting.

7.0 BALLASTS

7.01 The ballasts shall be 120 volt supply and have 55V lamp voltage for 70, 100 and 150 watt size, 100V lamp voltage for 250 watt size.

7.02 The ballasts shall be auto regulating type, with Class H insulation. The ballasts shall have push-on connectors to simplify maintenance.

8.0 CONTROLS

8.01 Photocell control may be used to operate luminaries without contactors, but the maximum current carried by the photocell contacts shall not exceed 50% of the rated capacity.

8.02 Controls shall be provided on all street lighting. Use service base for davit type installation per Detail L4. For pole top luminaries, the controls may be contained within the pole, except the main disconnect shall be mounted externally as shown in L3, and to the current Electrical Code.

8.03 Wiring from B.C. Hydro Service to main disconnect shall be run in raceway

internal to the pole. The raceway within the pole to be P.V.C. conduit or liquid tight flexible conduit.

8.04 Luminaries shall be controlled in groups, with H.O.A. control for inspection installed in poles or service bases at each main service point.

8.05 The main disconnects shall be secured to the pole with at least two 6.3 mm self-tapping screws. The main disconnects shall be able to be locked off using a padlock. The main disconnects shall be enclosed in a gasketted weatherproof enclosure (EEMAC4). Any exposed fastening shall be the oval head tamper proof type.

8.06 Where less than three (3) lights are involved in the system, and where possible, the luminaries shall be connected to an existing adjacent luminaire controlled by an exiting controller. If this is not possible then the luminaries shall have individual photo-electric controls.

9.0 UNDERGROUND WIRING

9.01 All duct work and wiring shall be in accordance with the requirements of the B.C. Electrical Code. Not limiting the foregoing, the following are the Township of Esquimalt minimum requirements:

a) All underground wiring to be installed in P.V.C. conduits of a minimum of 25mm in size.

b) All wiring to be copper, and insulation of RWU type.

c) Utility warning tape 300mm over all underground conduit runs.

10.0 CONCRETE BASES

10.01 Concrete bases shall be provided for all ornamental light standards.

10.02 Bases shall not protrude more than 150mm above the finished grade of the adjacent ground, or less than 25mm.

10.03 Bases shall exceed the width of the luminaire base plate by a minimum of 25mm at all points around the base.

10.04 Concrete bases and bolt must be adequate to withstand the earlier noted wind

loads, being installed in the ground to a minimum depth of 1.5m.

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'D'

L-2

INSTALLATION OF STREET LIGHTING

1.0 SCOPE

1.01 This specification shall govern the installation of all street lighting and lighting appurtenances within the Township of Esquimalt.

2.0 PERMITS AND REGULATION

2.01 The equipment, equipment installation, wiring methods and materials shall conform to the rules and regulations contained in the Electrical Energy Inspection Act and rules of overhead and underground electric-line construction as issued by the Ministry of Labour, Province of B.C. and all amending bulletins, any local or provincial bylaws or statutes in effect on the site and the Fire Marshall and Worker's Compensation Acts.

2.02 Wherever the drawings or specifications call for material, workmanship, arrangement or construction of a superior quality than is required, the drawings and specifications will prevail.

3.0 SOIL CONDITIONS

3.01 Where soil conditions and/or foundations are unsuitable, the Contractor shall notify the Owner's Consulting Engineer in order that a special design can be produced to accommodate same.

4. CONDUIT INSTALLATION

4.01 The depth of bury over the top of conduit shall be as follows unless otherwise noted on the drawings or approved by the Township of Esquimalt Municipal Engineer:

a) The minimum depth of bury on conduit below finished grade in areas not subject to vehicular traffic shall be 600mm; and

b) In areas subject to vehicular traffic, depth of bury shall be 1.000mm.

There shall be a 150mm separation between the exterior of conduit and any excavated rock surface. Conduits shall be installed parallel or perpendicular to the roadway, and routed to run in a direct line between adjacent poles. Bends shall be of large radius type unless otherwise approved by the Township of Esquimalt Municipal Engineer.

4.02 During construction conduits shall be capped and covered when electrical work is not actually in progress. A manufactured PVC cap shall be used. Conduit systems shall be cleaned and clear from all moisture and foreign materials prior to pulling the conductors. Empty conduits shall be provided with an acceptable string line and properly capped.

4.03 Buried conduits shall be capped and identified at both ends prior to pouring of concrete or backfilling. Conduits shall extend a minimum of 75mm above the top of the concrete base.

4.04 Conduits laid in the same trench with the communication and power cables shall maintain the required minimum spacing throughout. Conduits laid near underground pipes and the underground portion of overhead structures shall maintain the required minimum clearance. Crossovers shall be kept to a minimum.

5.0 UTILITY WARNING TAPE

5.01 Underground utility warning tape shall be installed 300mm directly above the conduit.

6.0 CONDUCTOR INSTALLATION

6.01 Minimum conductor sizes are subject to voltage drop not exceeding 5% from Hydro source to point of utilizations. No conductor shall be drawn into any raceway until all work of any nature that may cause injury to the conductor or its insulation has been completed. The conductors shall be fed carefully into the raceway to prevent twisting, kinking or looping. Only CSA approved wire lubricants shall be used to assist in the pulling operations. Conductor connections

in the base of the poles shall be made accessible from the handhole.

7.0 SERVICE BASE INSTALLATION

7.01 Service panels shall be mounted in service bases at the locations as per the design prepared by the Owner's Consulting Engineer and acceptable to the Electrical Safety Officer. Service panels and other electrical equipment in the service base shall be properly protected against the entrance of dust, dirt and moisture, and protected against mechanical injury at all times. Unused openings in the sheet steel panels shall be plugged with approved press-in plugs.

8.0 CONCRETE BASE INSTALLATION

8.01 Where possible, the hole for the concrete base shall be dug without disturbing the surrounding soil. The pedestal portion of the base shall be neatly formed to the given dimensions. The top of the base shall be trowelled smooth and level. An accurate template shall be used to locate conduits and pole anchors. Anchor bolts shall be set with a template to suit the poles.

8.02 Before mounting poles, all formwork shall be removed and backfill placed around the base and compacted with a mechanical tamper to 100% of Proctor Density. Bases shall be neatly grouted after pole installation ensuring that drain holes are not plugged. Temporary protective covers shall be provided over any concrete pole base which has exposed wiring prior to the installation of the steel pole.

9.0 POLES, INSTALLATION

9.01 Poles shall be erected plumb, using the shims supplied if required. No more than six (6) shims shall be used for any one pole. Davits and mast arms shall be installed at right angle to the centre-line of the road. Poles shall be cleaned after installation.

10.0 LUMINARIES

10.01 Luminaries shall be cleaned after pole installation and plumbing is complete. Luminaries shall be securely fastened to the poles and oriented to produce the required light distribution.

11.0 TESTING AND CALIBRATION

11.01 The Contractor shall carry out all adjustments and tests necessary to ensure that the entire electrical installation and all its equipment, material and components are in satisfactory condition electrically and perform the intended function and operations. The Contractor is responsible for any adjustment that may be required. At the completion of the job, proper systems operation shall be demonstrated to, and certified by, the Owner's Consulting Engineer.

12.0 CLEAN-UP AND FINAL ACCEPTANCE

12.01 The interior of enclosures, pole handholds and wiring areas shall be cleaned of dust, dirt and loose materials, vacuum-cleaned and all water and moisture removed. All fastening screw holes provided in enclosures shall have a fastening screw installed.

12.02 The Contractor shall submit to the Owner's Consulting Engineer and the Township of Esquimalt Municipal Engineer, prior to requesting final inspection, a copy of the Certificate of Inspection signed by the local electrical authority.

STREET LIGHT STANDARD DRAWINGS

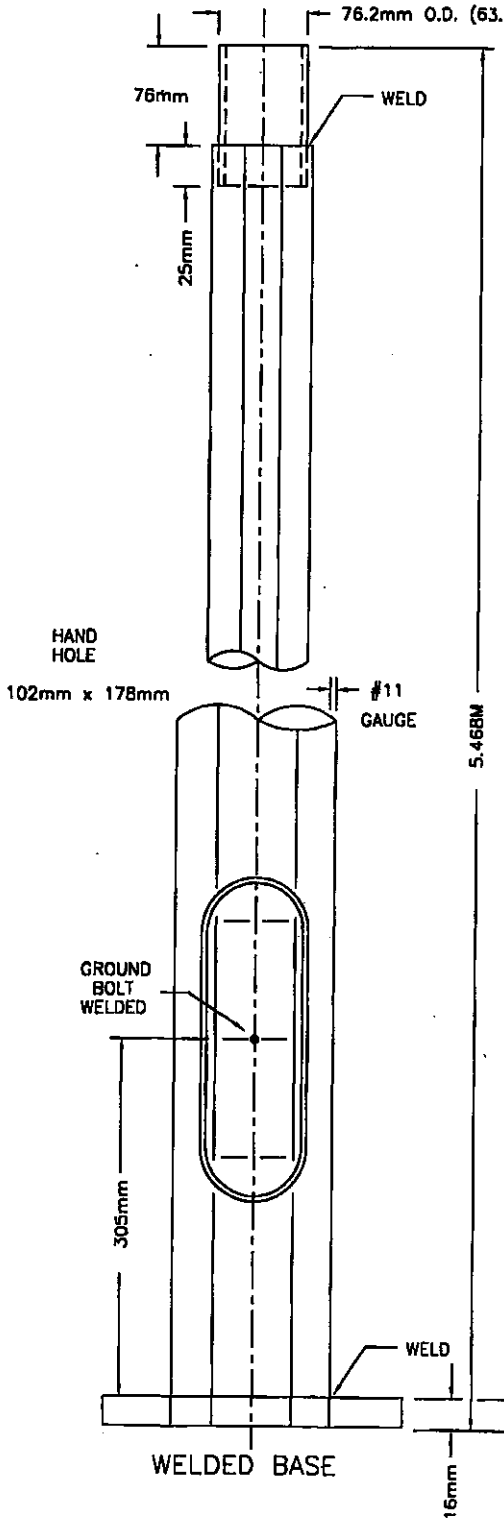
L-1 Street Light Standard — 5.5m Post Top

L-2 Street Light and Traffic Signal Standard Bases

L-3 Service Base

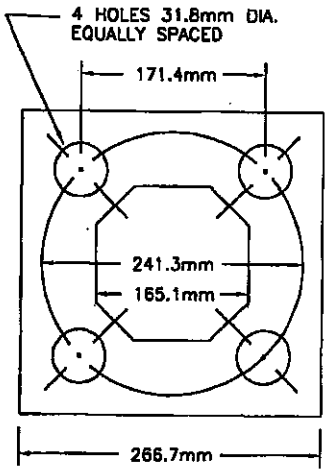
L-4 Control Schematic and Wiring Diagram for Roadway Lighting

L-5 Street Light Standard (Major Roads)

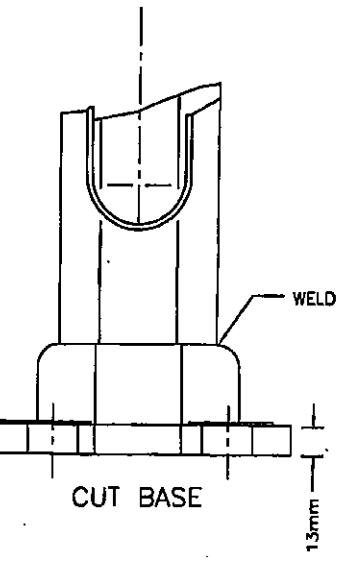


NOTES

1. TO BE SUPPLIED COMPLETE WITH HAND HOLE COVER AND BOLT, NUT, COVERS, SHIMS, AND WASHERS
2. A SWAGED TIP MAY BE SUBSTITUTED FOR THE PIPE INSERT PROVIDED DIMENSIONS AND ALIGNMENT ARE RETAINED
3. BASE PLATE AND PIPE TIP TO BE TRUE AND PLUMB
4. FINISH TO BE GALVANIZED 76.2mm O.D. FOR SLIPFITTER TO INCLUDE GALVANIZING, OTHERWISE OMIT GALVANIZING FROM SLIPFITTER
5. ALL DIMENSION ARE NOMINAL
6. SHALL MEET LATEST REVISION OF MOTH STANDARD DWG SP235 53.1 AND 53.2



COMMON MOUNTING DETAILS



CUT BASE

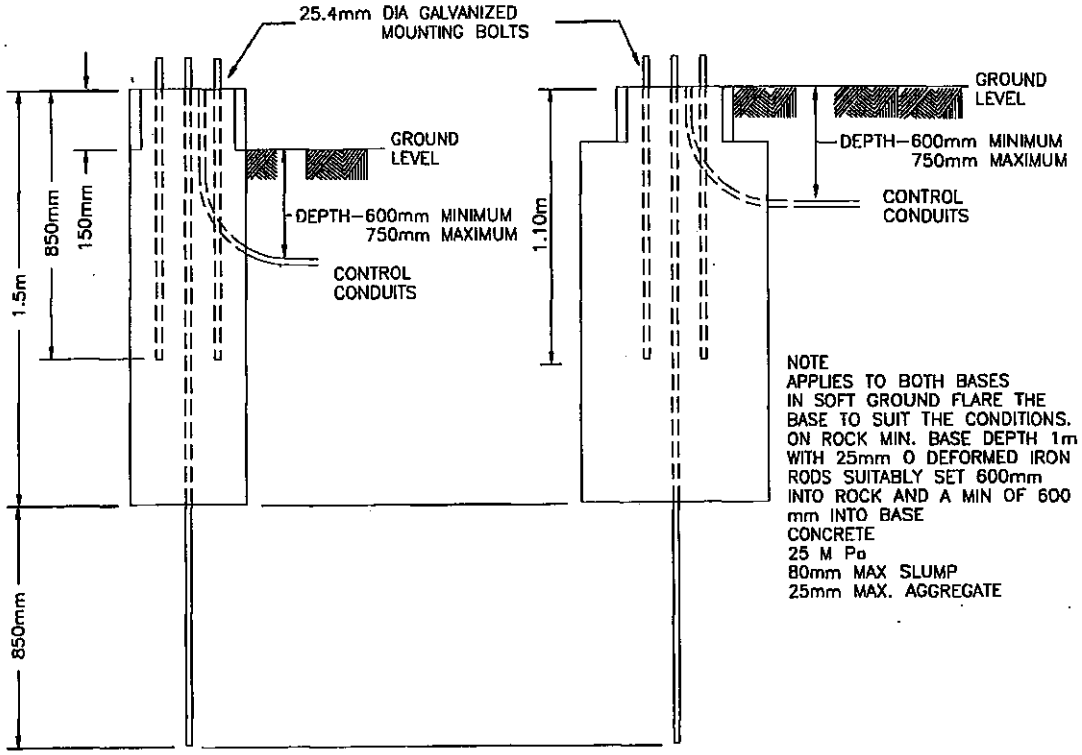
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

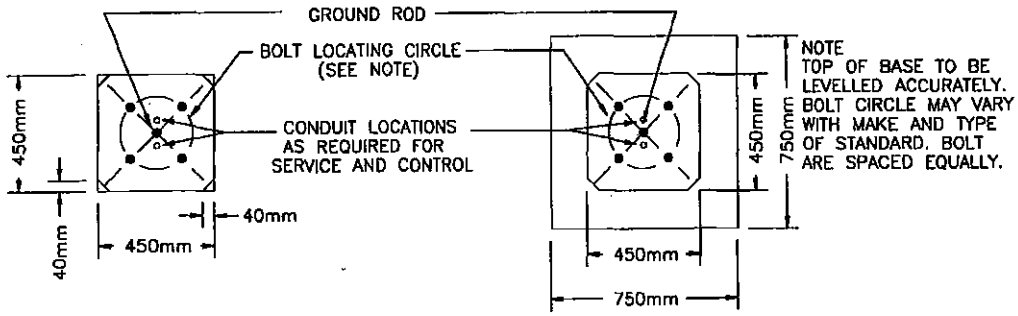
STREET LIGHT STANDARD 5.5m POST TOP

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : JANUARY 14,1993	SCALE : N.T.S.	DWG.NO. L1
APPROVED BY : _____	FILE NO. : 10.1.2.17	





BASE
STREET LIGHTING STANDARD

BASE
TRAFFIC SIGNAL STANDARD

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

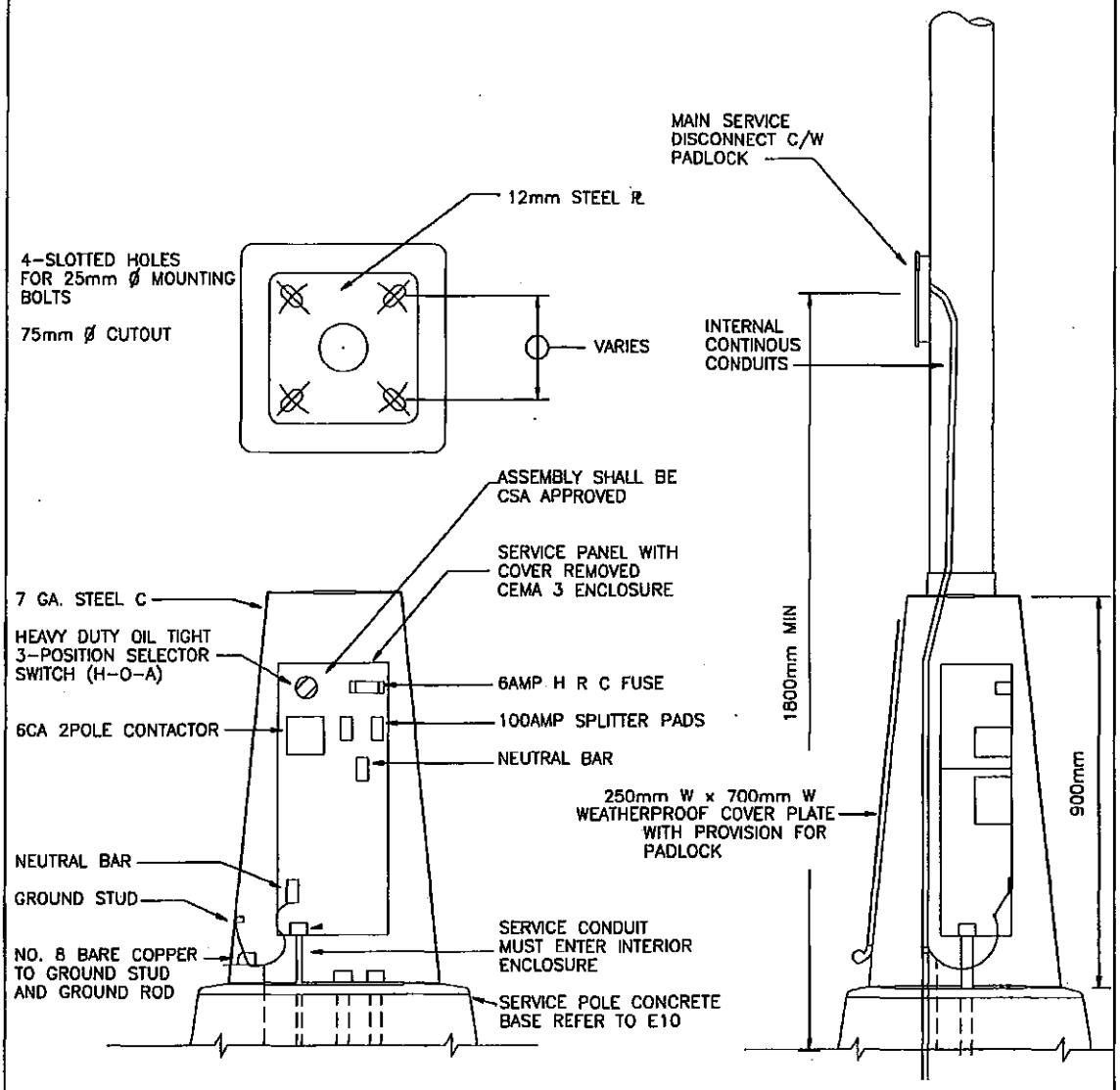
STREET LIGHT & TRAFFIC SIGNAL STANDARD BASES

TOWNSHIP OF ESQUIMALT

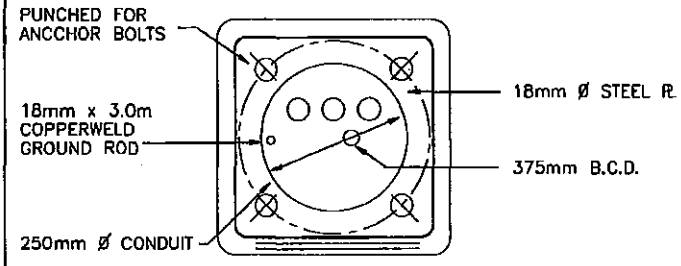
ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. L2
APPROVED BY :	FILE NO. : 10.1.2.17	

POLE TOP PHOTOCELL



SIDE VIEW



NOTE

1. FOR CONDUIT RUNS REFER TO ELECTRICAL DRAWING

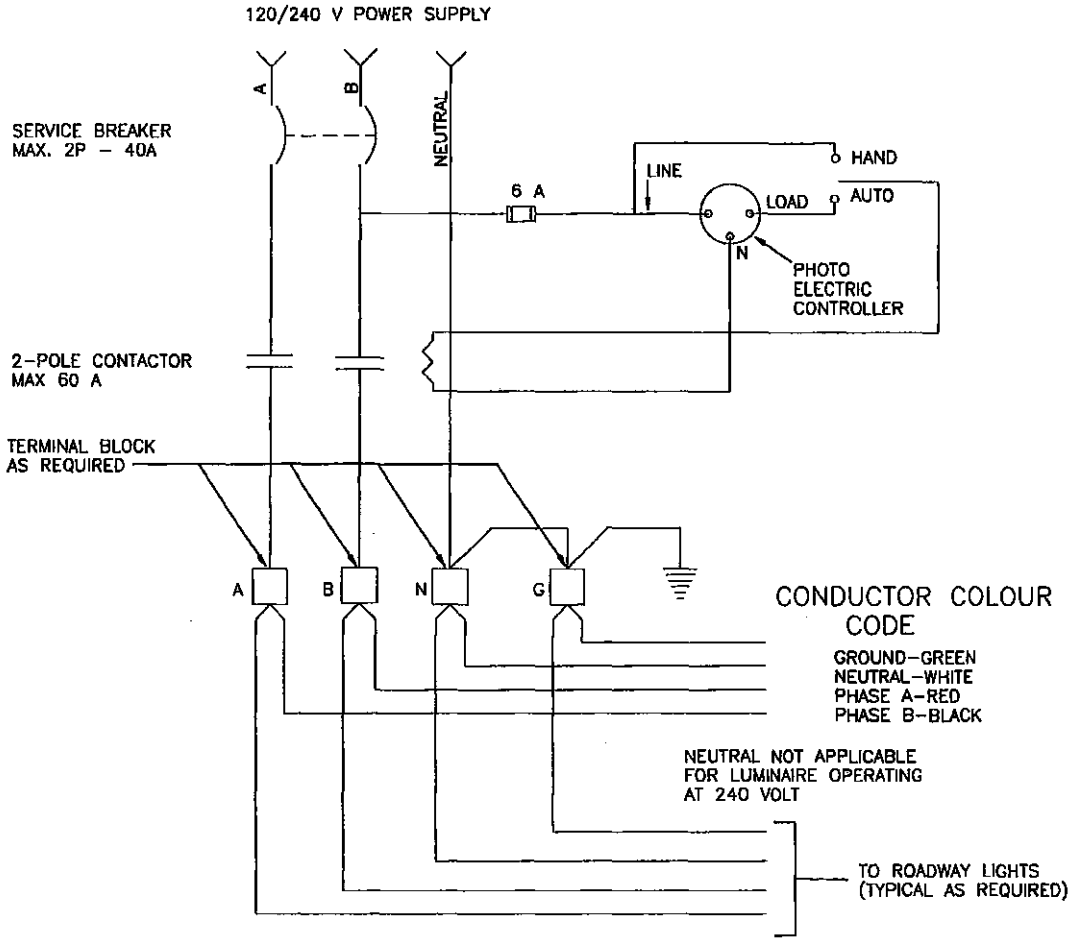
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

SERVICE BASE

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. L3
APPROVED BY :	FILE NO. : 10.1.2.17	



NOTES

1. FOR ACTUAL SERVICE BREAKER AND CONTACTOR RATING REFER TO ELECTRICAL DRAWING
2. FOR USE WITH SERVICE BASE SHOWN ON STANDARD DRAWING L4

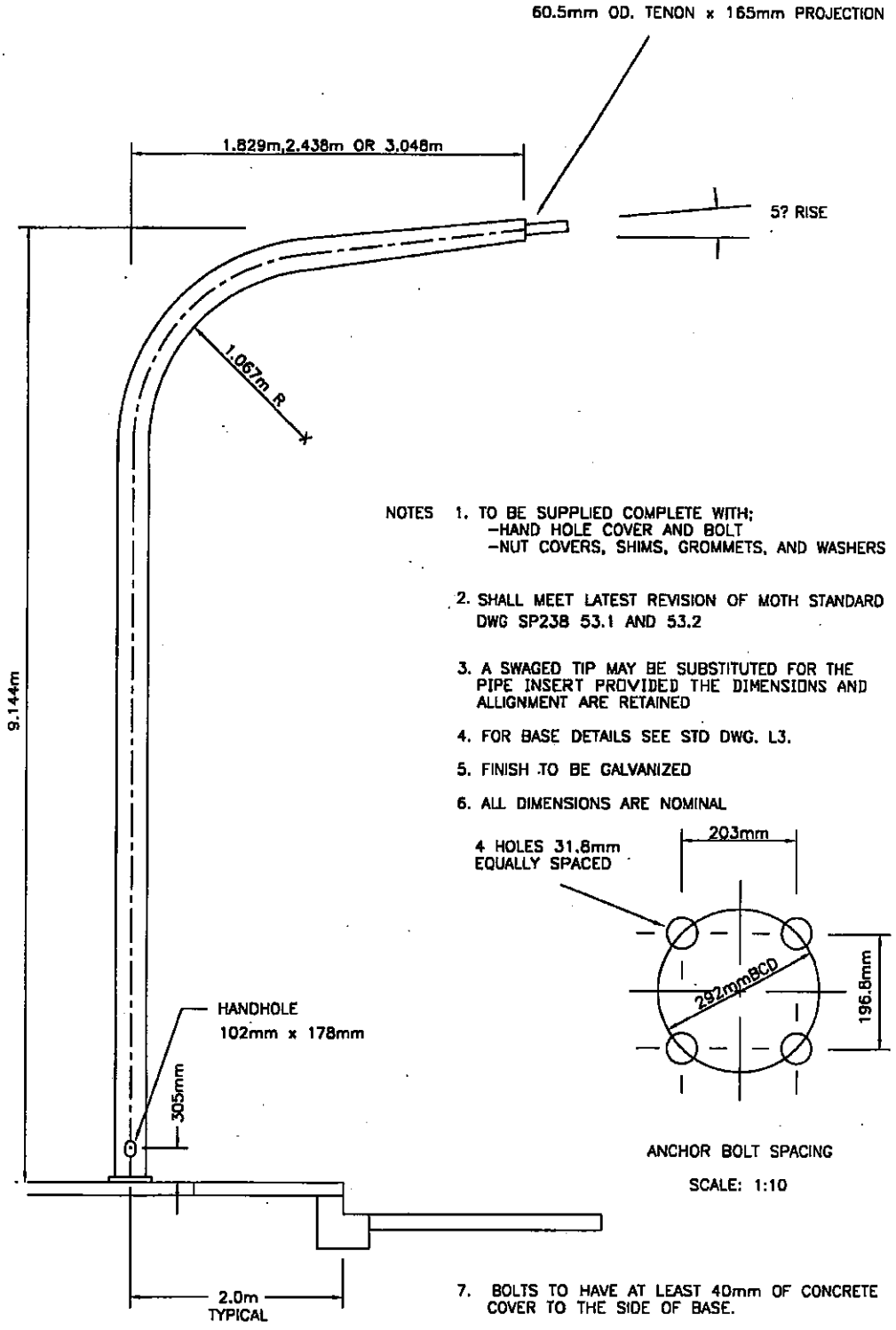
REFER TO SPECIFICATIONS FOR FURTHER DETAILS

CONTROL SCHEMATIC & WIRING DIAGRAM FOR ROADWAY LIGHTING

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : NOV 1992	SCALE : N.T.S.	DWG.NO. L4
APPROVED BY :	FILE NO. : 10.1.2.17	



NOTES
1. TO BE SUPPLIED COMPLETE WITH;
   -HAND HOLE COVER AND BOLT
   -NUT COVERS, SHIMS, GROMMETS, AND WASHERS
2. SHALL MEET LATEST REVISION OF MOTH STANDARD DWG SP238 53.1 AND 53.2
3. A SWAGED TIP MAY BE SUBSTITUTED FOR THE PIPE INSERT PROVIDED THE DIMENSIONS AND ALLIGNMENT ARE RETAINED
4. FOR BASE DETAILS SEE STD DWG. L3.
5. FINISH TO BE GALVANIZED
6. ALL DIMENSIONS ARE NOMINAL

ANCHOR BOLT SPACING

SCALE: 1:10

7. BOLTS TO HAVE AT LEAST 40mm OF CONCRETE COVER TO THE SIDE OF BASE.
8. LUMINAIRES AND SERVICE BASES TO BE APPROVED BY ESQUIMALT

REFER TO SPECIFICATIONS FOR FURTHER DETAILS

STREET LIGHT STANDARD

(MAJOR ROADS)

TOWNSHIP OF ESQUIMALT

ENGINEERING DEPARTMENT

DATE : JANUARY 14,1993	SCALE : N.T.S.	DWG.NO. L5
APPROVED BY :	FILE NO. : 10.1.2.17	

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'E'

SERVICE LEVELS

INDEX

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND DEVELOPMENT CONTROL BYLAW

SCHEDULE 'E'

1.0 HIGHWAYS

1.01 Construction Standards

(a) All Roadways shall be constructed with machine laid asphalt, and concrete curb and gutters;

(b) Roadways in Service Level 1 shall include a 1.5 metre concrete sidewalk on one side; with said sidewalk being extended from any existing concrete sidewalks or in the case where the Highway does not have a sidewalk, on the side specified by the Approving Officer.

(c) Roadways in Service Level 2 shall include 1.5 metre concrete sidewalks on both sides.

1.02 Width of Pavement

(a) The minimum width of paving shall be as indicated in the following table:

ROAD TYPE	SERVICE LEVEL #1	SERVICE LEVEL #2
Cul-de-Sacs less than 100 m long	8.5 m	10.0 m
Local Streets	8.5 m	10.0 m
Collector Streets	12.0 m	12.0 m
Major Streets	14.0 m	14.0 m

1.03 Walkways

(a) Walkways, 3.0 m wide, shall be dedicated where, in the opinion of the Approving Officer, they are essential to provide circulation or access to schools, playgrounds, shopping centres, transportation, beaches, and other community facilities, or for proper circulation of pedestrian traffic and shall be constructed 2.0m wide in

accordance with the specifications.

(b) Service Levels 1 and 2 require a walkway constructed of broom finished concrete, complete with chain link fence on both sides.

2.0 DRAINAGE COLLECTION AND DISPOSAL SYSTEM

2.01 Construction Standards

(a) All storm drainage collection systems for Service Levels 1 and 2 shall be enclosed. No open ditches shall be permitted.

(b) All Parcels shall be connected to the Municipal Drainage System except for waterfront property.

(c) Waterfront properties may drain to below the low water line subject to Provincial and Federal regulations. Installation of silt and oil separation structures shall be located such that proper pump out and maintenance can be achieved.

3.0 SANITARY SEWER SYSTEM

3.01 Construction Standards

(a) All sanitary sewerage collection systems for Service Levels 1 and 2 shall be connected to the Municipal Sanitary System;

4.0 WATER DISTRIBUTION SYSTEM

4.01 Construction Standards

(a) All Parcels must have Frontage on a Municipal Water System and be connected to such System.

5.0 UNDERGROUND WIRING AND STREET LIGHTING

5.01 Construction Standards

(a) In Service Levels 1 and 2, underground wiring shall be installed by the Owner to provide sufficient underground wiring and appurtenances from the existing wiring system to provide each lot in the Subdivision with an adequate supply of electrical

power, telephone, and television communications in accordance with the design, approval, and inspection requirements of B.C. Hydro, B.C. Telephone, and the relevant Cable Company.

(b) In Service Level 1 and 2, street lighting shall be installed by the Owner to meet the minimum allowable visibility criteria established by the Transportation Association of Canada (TAC) "Guide for the Design of Roadway Lighting (1983).

(c) For all parcels, except those Zoned for Single Family use, connections for electrical power, telephone and television communications shall be installed underground, starting at existing overhead or underground systems

CORPORATION OF THE TOWNSHIP OF ESQUIMALT

SUBDIVISION AND CONTROL BYLAW

SCHEDULE 'F'

STANDARD FORMS AND AGREEMENTS

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SCHEDULE F-1

SERVICES AGREEMENT FORM

Date:_____
File:_____

Township of Esquimalt,
1229 Esquimalt Road
Victoria, British Columbia.
V9A 3P1

Attention : Director, Planning and Engineering Services

Re: Proposed Subdivision of_____

This letter is to confirm and stand as proof to the Municipality, that an Engineer - Client Agreement has been executed between:

Consultants)
Name)
Address)
Phone No.)
Fax No.)

and

Owners/)
Developer)

in connection with the above referenced development. The agreement was executed on _____, 19_ and provides for Engineering services as follows:

Circle as applicable

1. Consulting, advisory and predesign services.

2. Schematic and design development services.

3. Preparation of design drawings for approval in accordance with applicable sections of the Township of Esquimalt bylaws.

4. Construction layout.

5. Resident inspection and sampling to ascertain whether the Contractor is carrying out the work in conformity with the approved for construction drawings and the Township of Esquimalt bylaws. Full time resident inspection is required during the installation of storm drains, sanitary sewers. watermains, curb and gutter, asphalt pavement and during the construction of sewage disposal fields.

6. Interpreting specifications when requested by the Client or Contractor.

7. Perform certifications on cost of the work.

8. Attend meetings.

9. Maintaining project documentation.

10. Preparation and submission of certified as-constructed drawings and Auto Cad disk.

11. Final project review to approval.

If for any reason the said agreement is altered, modified or terminated in any manner, it is the duty of the Consultant to inform the Municipal Engineer of such changes 48 hours in advance of their taking effect.

Signed and Sealed

Consultants_____

Owners_____

SCHEDULE F-2

ASSURANCE OF PROFESSIONAL FIELD REVIEW AND COMPLIANCE FORM

Note: This letter must be submitted after completion of the project but before the subdivision plan is signed or a final inspection is made by the Township of Esquimalt.

To: Director, Planning and
Engineering Services
Township of Esquimalt
1229 Esquimalt Road
Victoria, British Columbia.
V9A 3P1

Date _____
File:_____

Dear Sir:

Re: Proposed subdivision of_____

_____
Legal Description of Project (Print)

I hereby give assurance that

(a) I have fulfilled my obligations for field review as required by the Township of Esquimalt bylaws for the subdivision and development of land, and

(b) those components of the project opposite my initials in the previously submitted Schedule F-1 comply in all material respects with
   (i) the applicable requirements of the Township of Esquimalt bylaws and other applicable standards respecting the Works and Services, and
   (ii) the plans and supporting documents submitted in support of the application for subdivision.

(c) I have enclosed the as-constructed plans and supporting documents prepared by me for this project, and

(d) I am a registered Professional Engineer licensed under the provisions of the Engineer and Geoscientists Act of the Province of British Columbia.

(Each registered professional engineer shall complete the following:)

_____
Name (Print)

_____
Signed Date

_____
Address (Print)

_____
Phone
(If the Registered Professional is a member of a firm, complete the following).

I am a member of the firm_____
and I sign this letter on behalf of the firm. (Print name of firm)

NOTE: The above letter must be signed by a registered professional engineer.

SCHEDULE F-3

SUBDIVISION SERVICING AGREEMENT

THIS AGREEMENT made the day of ,199 .

BETWEEN:

THE TOWNSHIP OF ESQUIMALT

(the "Township")

AND:

(the "Developer")

SUBDIVISION SERVICING AGREEMENT

This AGREEMENT made the day of , 199 .

BETWEEN:

THE TOWNSHIP OF ESQUIMALT,
1229 Esquimalt Road
Victoria, BC
V9A 3P1
(the "Township")

OF THE FIRST PART

AND:

(the "Developer")

OF THE SECOND PART

WHEREAS:

A. The Developer is the registered owner of the parcel or parcels described in Schedule "A" to this Agreement (the "Lands");

B. In order to obtain the approval of the Approving Officer of the Township of Esquimalt for the subdivision of the Lands generally in conformity with the preliminary subdivision plan attached as Schedule "B" to this Agreement, the Developer is required to construct and install certain works and services;

C. Section 940 of the Municipal Act provides that:

"940.(1) All works and services required to be constructed and installed at the expense of the owner of the land being subdivided or developed must be constructed and installed to the standards established in the bylaw under section 938 before the approving officer approves of the subdivision or the building inspector issues the building permit.

(2) As an exception, the approval may be given or the permit issued if the owner of the land
(a) deposits, with the municipality or regional district, security

(i) in the form and amount established in the bylaw, or

(ii) if no amount and form is established in the bylaw, in a form and amount satisfactory to the approving officer or building inspector having regard to the cost of installing and paying for all works and services required under the bylaw, and

(b) enters into an agreement with the municipality or regional district to construct and install the required works and services by a specified day or forfeit to the municipality or regional district the amount secured under paragraph (a)."

D. The Developer has requested approval of the subdivision of the Lands by the Approving Officer prior to the construction and installation of the works and services and is agreeable to entering into this Agreement pursuant to the Municipal Act and to depositing the security herein specified;

E. Section 219 of the Land Title Act, R.S.B.C. 1996, C.250 provides, inter alia, that a covenant, whether of a negative or positive nature, in respect of the use of land, or that land is or is not to be built upon in favour of a municipality may be registered as a charge against the title to that land and the Developer has agreed to incorporation of this Agreement into such a covenant.

F. The permitted uses and density of land use within the parcel to be subdivided shall comply with the Esquimalt Zoning Bylaw as amended from time to time.

NOW THEREFORE pursuant to Section 940 of the Municipal Act and pursuant to Section 240 of the Land Title Act, and in consideration of the premises and the agreement by the Township to permit subdivision of the Lands in advance of the construction of the works and services, and of the sum of $1.00 now paid by the Township to the Developer, the receipt and sufficiency of which is acknowledged, the parties covenant and agree as follows:

DEFINITIONS

1.1 In this Agreement:

"Completion" means completion of the Works and Services to the standards and specifications set out in the bylaws of the Township and this Agreement, acknowledged by the issuance of a Certificate of Completion signed by the Municipal Engineer;

"Municipal Engineer" means the Director, Planning and Engineering Services for the Township and duly authorised assistants, or such consulting or other professional engineers as may be appointed to act for the Township in that capacity;

"Security" means cash, a certified cheque or an unconditional, irrevocable letter of credit issued by a Canadian chartered bank or Credit Union in the form of Schedule "C" to this bylaw, or such equivalent form as may be accepted by the Township;

"Subdivision Bylaw" means the Subdivision and Development Control Bylaw of the TOWNSHIP OF ESQUIMALT;

"Works and Services" means all public services, facilities and utilities which are required to be installed pursuant to Section 2.2 of this Agreement and includes all things required under this Agreement or the bylaws of the Township to be done in relation to the construction and installation of those Works and Services.

1.2 Words and terms used in this Agreement and not defined in Section 1.1 of this Agreement have the meaning set out in the Subdivision Bylaw.

COVENANTS OF THE DEVELOPER

2.1 The Developer covenants that the Lands shall not be subdivided until the Developer has provided Security in accordance with Sections 3.1 and 3.2 of this Agreement, as evidenced by the written acceptance of the Security by the Municipal Engineer.

2.2 The Developer shall:

(a) design, construct and install the Works and Services specified in Schedule "D" to this agreement, in accordance with the requirements and standards in the Subdivision Bylaw, as amended from time to time, to the satisfaction of, and in the locations specified by the Municipal Engineer so that the Works and Services function and operate to the satisfaction of the Municipal Engineer;

(b) modify or reconstruct the Works and Services should the Works and Services as constructed prove to be in any way defective or not operate to the reasonable satisfaction of the Municipal Engineer so that the Works and Services are fully operative and function to the reasonable satisfaction of the Municipal Engineer;

(c) complete the design, construction and installation of the Works and Services within nine months of the date of this Agreement;

(d) assign, transfer and convey to the Township all of the Developer's right, title and interest in and to the Works and Services upon issuance of the Certificate of Completion, without further documentation;

(e) grant to the Township all necessary highway dedications, statutory rights-of-way and easements over the Lands to accommodate the Works and Services, in the locations specified by the Approving Officer; and where the Works and Services are located upon or under privately owned lands other than the Lands, obtain at the Developer's expense, all necessary highway dedications, statutory right-of-ways and easements over such lands, in favour of the Township, to accommodate the Works and Services;

(f) submit to the Township final as-built record drawings consisting of one set of prints sealed by a Professional Engineer and on approval by the Municipal Engineer a disk with a digital record, compatible with Auto Cad, of the as-constructed Works and Services, within 30 days of Completion of the Works and Services;

(g) comply with all laws, statutes, regulations and order of any authority having jurisdiction, including the Township, throughout the construction of the Works and Services;

(h) pay within 30 days of receipt of any invoice from the Township the balance of costs of any Works and Services completed by Township forces in excess of the Deposit made and any costs for the removal by the Township of material or debris left on a highway during or after the construction of the Works and Services including 15% administration and supervision costs;

(i) protect all survey markers, pins, posts and similar things during the construction, installation, maintenance and repair of the Works and Services and employ, a British Columbia Land Surveyor to replace any markers, pins, posts or similar things which may be moved, damaged or destroyed during the construction, installation, maintenance or repair of the Works and Services.

SECURITY

3.1 As security for the due and proper performance of all of the terms and conditions of this Agreement, the Developer has upon execution of this Agreement deposited with the Township the Security in the amount of $_____, being 120% of the cost of the Works and Services as reasonably determined by the Municipal Engineer.

3.2 The Security shall be valid for a minimum of one year from the date of this Agreement. Should a check be issued as Security, it shall be cashed and deposited in a Township account with any interest being accumulated in favour of the Township.

3.3 If the Security is in the form of a letter of credit and the Township has notified the Developer of any deficiency in the Works and Services, if the Security has not been renewed at least 10 days before its expiry, the Township may draw down the full amount of the Security and hold the funds so drawn as a deposit in lieu of the Security.

3.4 If the Developer fails to complete the Works and Services in the manner and within the time provided for herein, the Township may, at any time after the expiration of two weeks from the date of the Township malling a registered letter to the Developer advising the Developer that is in default of its obligations under this Agreement, appropriate the Security to meet the costs of remedying the default.

3.5 The Township officers, employees and contractors are authorised to enter on the Lands as may be necessary to complete the Works and Services and to do all things necessarily incidental to completion, in the event the Developer fails to complete the Works and Services as required by this Agreement.

3.6 If the Township completes the Works and Services and the costs of Completion exceeded the amount of the Security, the Developer shall forthwith upon demand by the Township pay all the additional costs incurred by the Township towards completion of the Works and Services.

3.7 The Township shall not be obligated to complete the Works and Services within any specified period, nor shall the Township be required to expend an amount in excess of the Security toward completion of the Works and Services.

3.8 Completion of the Works and Services by the Township shall not relieve the Developer of any of its obligations under this agreement.

3.9 If the Works and Services are completed by the Developer, then the Security shall be returned to the Developer on receipt of the Certificate of Completion.

INSURANCE

4.1 The Developer shall, in respect of the Lands and the Works and Services, take out and maintain, with such insurers and on terms that are acceptable to the Township, at the Developer's expense

(a) at all times while this Agreement is in force, comprehensive general liability insurance in the names of the Developer and the Township which insurance shall cover, without limitation, premises and operations liability, non-owned automobile liability and contractual liability; and

(b) at least until completion of the Works and Services, insurance as specified in subsection 4.1 (a), also covering contractor's contingency liability with respect to the operations of subcontractors.

4.2 The limits of liability for personal injury and property damage combined shall be for not less than $5,000,000 for each occurrence, with a deductible amount of not more than $10,000 per occurrence.

4.3 All insurance policies shall provide that they shall not expire, be cancelled or be materially changed without at least 30 days prior written notice to the Township, by registered mail to the attention of the Municipal Engineer.

4.4 The Developer shall, upon the request of the Township, file with the Township certified copies of each required insurance hereunder, or such other proof satisfactory to the Township that all such policies are in force as may be applicable.

4.5 If the Developer does not obtain and maintain the required insurance or when required does not deliver the policy or policies to the Township, the Township shall have the right, but shall not be obligated, to obtain and maintain the required insurance, and the Developer appoints the Township its lawful attorn do all things necessary for this purpose. All monies expended by the Township for insurance premiums under the provisions of this section shall be charged to the Developer and are payable by the Developer to the Township forthwith upon demand.

CERTIFICATES OF COMPLETION

5.1 Upon satisfactory completion by the Developer of all the Works and Services in accordance with this Agreement, the Township shall provide the Developer with Certificates of Completion for all the Works and Services, and thereafter all Works and Services provided by the Developer under this Agreement shall, subject to the provisions of the Municipal Act, become the property of the Township.

5.2 The Works and Services shall remain at the full and sole risk of the Developer until they are certified as complete by the Township as evidenced by the Certificate of Completion.

INDEMNITY

6.1 The Developer agrees to save harmless and indemnify the Township against all losses expenses, damages and costs of any proceeding, claim or demand related to any work or service done or provided under this Agreement:

(a) which may be incurred by reason of the Township entering this Agreement;

(b) resulting from damage to any property owned in whole or in part by the Township which the Township is obliged in any way to construct, repair or maintain; or

(c) which may be incurred by reason of liens or non-payment for labour or material, Worker's Compensation assessments, unemployment insurance, or Federal or Provincial Tax;

provided that this indemnity does not apply to a cause of action arising after the date of issuance of the Certificate of Acceptance of the Works and Services or to an act or omission of the Township.

INSOLVENCY OF THE DEVELOPER

7.1 Notwithstanding any other provision of this Agreement, the Township shall be entitled to draw on the Security and complete the Works and Services or remedy any defects in the Works and Services in the event that:

(a) the Developer commits an act of bankruptcy or makes a proposal or general assignment for the benefit of its creditors;

(b) an order is made or a resolution passed or petition filed for the liquidation or winding up of the Developer; or

(c) if a receiver receiver-manager of the Developer or the Lands is appointed or any encumbrance-holder takes possession of the Lands or any part thereof.

COVENANTS OF THE TOWNSHIP

8.1 The Township covenants and agrees as follows:

(a) to permit the Developer to construct the Works and Services upon the terms and conditions herein contained and to not unreasonably refuse permission to enter into municipal and public lands in the vicinity of the Works and Services for the purpose of such construction;

(b) to fulfil its duties and obligations hereunder promptly and in a reasonable manner; and

(c) that the Township and the Municipal Engineer shall be reasonable in their requirements where this Agreement confers discretion upon the Township or the Municipal Engineer.

PRIORITY

9.1 The Developer shall, use its best efforts to obtain the necessary consents to priority so that this Agreement may be registered as a Covenant in priority to all other financial charges registered against the Lands, except those specifically agreed to in writing by the Township.

GENERAL

10.1 It is understood and agreed that the Township has made no representations, covenant, warrants, guarantees, promises or agreements, express or implied, with the Developer other than those in the Agreement.

10.2 The Developer shall, on the request of the Township, execute and deliver or use its best efforts to cause to be executed and delivered, all such further transfers, agreements, documents, instruments, easements, statutory rights of way, acts, deeds and assurances, and do and perform or cause or procure to be done, performed, executed and delivered all such acts and things as may in the opinion of the Township be reasonably necessary to give full effect to the intent or meaning of this Agreement.

10.3 Time shall be of the essence in this Agreement. if a delay in performance of the Works and Services is caused by reason of labour disputes, fire, Act of God, unusual delay by common carriers or any other act which in the opinion of the Municipal Engineer is effectively beyond the Developer's control, the Municipal Engineer will extend the time for Completion of the Works and Services by the Developer for the length of time the Municipal Engineer deems to be reasonable in the circumstances.

10.4 The covenants herein are made pursuant to Section 219 of the Land Title Act, to run with and be a charge upon the Lands, provided that this Agreement shall be discharged and released in whole or in part by the Township after the granting of the Certificate of Acceptance by the Township to the Developer. The Lands shall not be subdivided except in accordance with this covenant, provided that the indemnity under Section 6.1 shall survive such release, in relation to any act or omission which occurs prior to the date of release.

10.5 Nothing in this Agreement shall prejudice or affect the rights and powers of the Township in the exercise of its functions under any public and private statutes, bylaws, order and regulations.

10.6 This Agreement shall enure to the benefit and be binding upon the parties hereto and their respective successors and assigns.

10.7 A reference in this Agreement to the Township or the Developer includes their assigns, heirs, successors, officers, employees and agents.

10.8 Whenever it is required or desired that either party deliver or serve a notice on the other delivery or service shall be deemed to be satisfactory and deemed to have occurred when.

(a) served personally, on the date of service; and

(b) mailed by prepaid registered mail to the address listed on the first page of this Agreement or other address of which that party has notified the other, on the earlier of the date received or on the fifth business day following date of mailing at any Canada post office, but in the event of interruption of mail service, notice shall be deemed to be delivered only when actually received by the party to whom it is addressed.

10.9 Should any clause or portion thereof of this Agreement be declared or held invalid for any reason, such invalidity shall not affect the validity of the remainder of that clause or of this

Agreement and this Agreement shall continue to be in force and in effect and be construed as if ft had been executed without the invalid portion.

10.10 No amendment or waiver of any portion of this Agreement shall be valid unless in writing and executed by both of the parties to this Agreement.

10.11 Waiver of any default by either party shall not be deemed to be a waiver of any subsequent default by that party.

10.12 This Agreement shall be construed according to the laws of the Province of British Columbia.

10.13 Whenever the singular or masculine is used in this Agreement, the same shall be deemed to include the plural. the feminine, or the body politic or corporate as the context so requires.

10.14 The following schedules are annexed to and form part of this Agreement:

Schedule "A"": Legal Description of Lands
Schedule "B": Subdivision Plan
Schedule "C": Irrevocable Letter of Credit
Schedule "D": Works and Services to be Constructed

IN WITNESS WHEREOF the parties hereto have set their hands and seals the day and year first above written.

The Corporate Seal of the)
TOWNSHIP OF ESQUIMALT was)
hereunto affixed in the)
presence of:)

C/S

_____)
Mayor

_____)
Clerk

The Corporate Seal of)
_____was)
hereunto affixed in the)
presence of:)

C/S

_____)
AUTHORISED SIGNATORY

_____)
AUTHORISED SIGNATORY

SCHEDULE "A"

Legal Description of Lands:

SCHEDULE "B"

Subdivision Plan

SCHEDULE "C"

Form of Irrevocable Letter of Credit

Date:_____
Bank:_____
_____

TOWNSHIP OF ESQUIMALT
1229 Esquimalt Road
Victoria, BC
V9A 3P1

Dear Sirs:

Re: Irrevocable Letter of Credit No._____.

Upon the instruction of _____(the "Developer) we hereby establish in your favour our irrevocable credit for the sum of _____dollars in Canadian currency. This credit shall be available to you or demand by sight drafts drawn on the Bank of _____when supported by your written demand for payment made upon us.

This Letter of Credit is required in connection with an undertaking by the Developer to perform certain works and services required by you.

We undertake not to refuse to honour any sight draft that you present to use for payment under this Letter of Credit. We shall honour your demand without enquiring whether you have a right as between yourself and the Developer.

You may make partial drawings or full drawings at any time.

This Letter of Credit shall remain in force until 12:00 a.m., _____ 1 9__.

Bank of _____

_____
Authorized Signatory

SCHEDULE "D"

Works and Services To Be Constructed