



# **CITY OF PRINCE GEORGE**

## **SUBDIVISION AND DEVELOPMENT SERVICING**

### **Bylaw No. 8618, 2014**

CONSOLIDATED VERSION

CONSOLIDATED FOR CONVENIENCE

Revised: October 20, 2025

**CONSOLIDATED VERSION****CITY OF PRINCE GEORGE SUBDIVISION AND DEVELOPMENT SERVICING  
BYLAW NO. 8618, 2014**

This is a consolidation of the bylaws listed below and includes amendments up to the date noted on the cover page. This document is for convenience only and is not the legal or official version. Certified copies of the original bylaws should be consulted for all interpretations and applications of the subject bylaw. Copies can be obtained through the Legislative Services Division at City Hall.

| <b><u>AMENDING BYLAW</u></b> | <b><u>EFFECTIVE DATE</u></b> | <b><u>AMENDMENT</u></b>                                                                                                                                                                                                                                             |
|------------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bylaw No. 9530, 2025         | October 20, 2025             | Sections 7.1.2; 7.3.9; and Schedule “D” 1.7.2.                                                                                                                                                                                                                      |
| Bylaw No. 9484, 2024         | September 9, 2024            | Sections 6.2.1.1, 6.3.1, 7.3.2, Schedule “A”, Form A, Form B, Form D, Form G, Form H                                                                                                                                                                                |
| Bylaw No. 9397, 2023         | August 28, 2023              | Sections 7.2.1(a), 7.2.9, 7.3.16; Schedule A: Definitions; Schedule D, Division 1, Section 01561 – 1.1.1 and 1.5.2; Schedule D, Division 2, Section 02225 – 2.1.3; Schedule D, Division 2, Section 02311 – 3.1.2; and Schedule D, Division 2, Section 02315 – 3.1.1 |
| Bylaw No. 8864, 2017         | August 21, 2017              | Schedule B: Land Designations                                                                                                                                                                                                                                       |

**CITY OF PRINCE GEORGE**  
**BYLAW NO. 8618, 2014**

**Amending  
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**A Bylaw of the City of Prince George to regulate the subdivision of land, require the provision of works and services in the subdivision and development of land, and prescribe the standards for infrastructure works and services.**

**WHEREAS** pursuant to the provisions of the *Community Charter* and the *Local Government Act*, City Council may by Bylaw delegate powers to an Approving Officer;

**AND WHEREAS** pursuant to the provisions of the *Local Government Act*, City Council may, by Bylaw, regulate Works and Services, prescribe the standards of Works and Services, require payment of fees and charges and require the provision of extended or excess services.

**NOW THEREFORE**, the Council of the City of Prince George in open meeting assembled, **ENACTS AS FOLLOWS:**

**1.0 Title**

This Bylaw may be cited as the “City of Prince George Subdivision and Development Servicing Bylaw No. 8618, 2014”.

**2.0 Repeal**

“City of Prince George Subdivision and Development Servicing Bylaw No. 7652, 2004” and all amendments are hereby repealed.

**3.0 Definitions**

Definitions for key words and phrases not defined in legislation or other City Bylaws are listed in Schedule A.

**4.0 General**

**4.1** Unless otherwise defined in Schedule A, all words or expressions in this Bylaw shall have the same meaning as the same words or expressions contained in the Land Title Act, the Community Charter, the Local Government Act or the Strata Property Act.

**4.2** Words in this Bylaw directing or empowering any officer or employee of the City to do any act or thing, or otherwise applying to him by name of office, include his successors in such office and his lawful deputy, and any person the Council may from time to time by Bylaw or resolution designate to act in his place.

**4.3** Headings for each section of this Bylaw are intended to organize the content and are to be used for reference purposes only. The provisions

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of this Bylaw shall apply to the whole of the territorial area of the City of Prince George.

- 4.4 A reference in this Bylaw to any enactment of British Columbia is a reference to the enactment as amended, revised, consolidated or replaced from time to time, and a reference to any bylaw of the City is a reference to the bylaw as amended, revised, consolidated or replaced from time to time.

**5.0 Approving Officer**

- 5.1 The Approving Officer appointed by Council pursuant to the provisions of the *Land Title Act* shall be responsible for administration of this Bylaw.

- 5.2 Pursuant to the provisions of the *Community Charter* and the *Local Government Act*, Council delegates to the Approving Officer its authority to exempt a Parcel from the statutory minimum highway frontage of ten percent of the perimeter of the parcel.

- 5.3 Pursuant to the provisions of the *Community Charter* and the *Strata Property Act*, Council delegates to the Approving Officer its authority to approve the conversion of previously occupied residential, commercial and industrial buildings to strata ownership.

- 5.4 When agreements and covenants are required by the Approving Officer at the time of approval of a subdivision, the Approving Officer shall not accept any alterations to the form of agreements and covenants contained in Schedule F unless approved by the Authorized Person.

**6.0 Subdivision and Development Servicing**

- 6.1 An Applicant or Owner who intends to subdivide land within the City is required to seek approval for such subdivision in accordance with Section 6.1 and to provide works and services in accordance with Section 7.

**6.1.1 Subdivision Application**

- 6.1.1.1 An Applicant or Owner who intends to subdivide land under the *Land Title Act* shall seek approval for subdivision from the Approving Officer.

- 6.1.1.2 An Applicant or Owner who intends to subdivide land by the deposit of a bare land strata plan in the land title office under the *Strata Property Act* shall seek approval for subdivision from the Approving Officer.

- 6.1.1.3 An Applicant or Owner who, under the *Strata Property Act*, intends to include in a strata plan a previously occupied building shall make application for strata conversion to the Approving Officer.

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- 6.1.1.4 Application and processing fees in accordance with the Fees and Charges Bylaw are payable to the City at the time of Application submission to the Approving Officer. Review of the Application may only proceed when fees have been paid in full.
- 6.1.1.5 The Owner is required to retain a Consulting Engineer to design the Works and Services required by this Bylaw and certify that they have been installed in accordance with this Bylaw. A Letter of Assurance shall be submitted by the Consulting Engineer confirming that he is responsible for the design and has been engaged by the Owner to provide enough resident supervision to enable him to certify that the works have been constructed in accordance with this Bylaw and with the design, specifications and drawings accepted by the Authorized Person and that he will immediately advise the Authorized Person if his engagement by the Owner is terminated.
- 6.1.1.6 The Consulting Engineer shall prepare designs and construction drawings with such supporting documentation and specialist reports as are necessary to demonstrate that City bylaws, policies, guidelines and all regulatory requirements have been met, including without limitation requirements in relation to tree clearing and disposal, environmental and sediment management, lot grading and stormwater management for both the construction period and the completed condition of the subdivision.
- 6.1.1.7 The Authorized Person may waive part or all of the requirements of Section 6.1.1.5 and 6.1.1.6 for infill subdivisions, subdivisions in relation to which no new roads are being constructed, and subdivisions for which all works and services required by this Bylaw will be constructed by City or utility company forces at the Owners' cost.
- 6.1.2 Subdivision Approval – City Requirements**
- 6.1.2.1 When the extension of works and services is required within the adjacent or perimeter road or City right-of-way, and the Authorized Person requires that the required works and services be performed by the City at the Owner's cost, the Owner shall enter into an agreement with the City to construct the works and services in Form C of Schedule F. The Authorized Person is delegated by Council to make alterations to the agreement as required and to execute the agreement on behalf of the City.
- 6.1.2.2 Design drawings and a construction schedule for the required works and services, required by the Authorized Person for review prior to construction, shall be prepared by a Consulting Engineer in accordance with Schedule G.

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- 6.1.2.3 Examination fees, inspection fees, and sign installation fees in accordance with the Fees and Charges Bylaw are payable to the City prior to Subdivision Approval.
- 6.1.2.4 Development cost charges in accordance with Development Cost Charge Bylaw No. 7825, 2007 may be applicable at the time of Subdivision Approval.
- 6.1.2.5 If the Owner has not completed the required Works and Services at the time of Subdivision Approval, the Owner shall enter into an agreement with the City in Form A of Schedule F and provide security as described in the agreement.
- 6.1.2.6 Unless the installation or construction of the works and services are performed by the City, the Owner shall submit to the Authorized Person at the time of Subdivision Approval the following:
- a) Record drawings and documentation as required by the Authorized Person in accordance with Section 9.1;
  - b) The Engineer's Certificate of Substantial Completion in accordance with Section 9.2 of this Bylaw;
  - c) Security for:
    - i. Any outstanding Works and Services, including record drawings or documentation, in the amount of 120% of the cost of the outstanding works as determined by the Consulting Engineer and accepted by the Authorized Person;
    - ii. The Performance Test Period of works and services provided by the Owner in accordance with Section 9.3;
  - d) Where applicable, approvals from Federal and Provincial government agencies with respect to the acceptance of water systems servicing, the protection of streams and the acceptance of onsite sanitary sewage disposal systems; and
  - e) When required by the Authorized Persons, letters of acceptance of the works and services from utility companies.
- 6.1.3 Strata Conversion Approval**
- 6.1.3.1 Examination fees, and inspection fees in accordance with the Fees and Charges Bylaw are payable to the City at the time of approval of a strata conversion.
- 6.1.3.2 In making his decision, the Approving Officer may require the Owner or Applicant to retain the services of a qualified Professional Engineer or Architect to inspect the premises and prepare and certify a report on the integrity and condition of the building structure, the condition of the heating, ventilation and air conditioning system, the condition

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and integrity of the plumbing system, the condition and R-rating of building insulation, the status of or requirement for firewalls, Building Code deficiencies, estimated costs to improve the building to Building Code standards and any other information that will assist the Approving Officer in making his decision with respect to the proposed conversion.

**6.2 Development Works and Services**

An Applicant or Owner who intends to develop land within the City of Prince George is required to apply for a building permit in accordance with Section 6.2 and provide offsite works and services in accordance with Section 7.

**6.2.1 Development Application****9484, 2024**

**6.2.1.1** An Applicant or Owner who intends to develop land shall make a building permit application to the Building Inspector in accordance with the Development Procedures Bylaw and Building Bylaw.

**6.2.1.2** Application and processing fees in accordance with the Fees and Charges Bylaw are payable to the City at the time of Application submission. Review of the Application may only proceed when fees have been paid in full.

**6.2.1.3** Should the Authorized Persons determine that a Consulting Engineer is to be retained by the Owner to design and certify that the required Works and Services are installed in accordance with this Bylaw, a Letter of Assurance shall be submitted by the Consulting Engineer confirming that he is responsible for the design and has been retained by the Owner to provide enough resident supervision to enable him to certify that the works are constructed in accordance with this Bylaw and with the design, specifications and drawings accepted by the Authorized Person and that he will immediately advise the Authorized Person if he is removed from the project.

**6.2.2 Development Approval – City Requirements**

**6.2.2.1** When the extension of works and services is required within the adjacent or perimeter road or City right-of-way, and the Authorized Person requires that the required works and services be performed by the City at the Owner's cost, the Owner shall enter into an agreement with the City to construct the works and services in Form C of Schedule F.

**6.2.2.2** Design drawings and a construction schedule for the required works and services, required by the Authorized Person for review prior to construction, shall be prepared by a Professional Engineer in accordance with Schedule G.

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- 6.2.2.3 Examination fees, inspection fees, and sign installation fees in accordance with the Fees and Charges Bylaw are payable prior to Development Approval to the Building Inspector.
- 6.2.2.4 Development costs charges in accordance with Development Cost Charge Bylaw No. 7825, 2007 may be applicable prior to Development Approval.
- 6.2.2.5 If the Owner has not completed the required Works and Services at the time of issuance of the building permit, the Owner shall enter into an agreement with the City in Form B of Schedule F and provide Security as described in the agreement. The Authorized Person is delegated by Council to make alterations to the agreement as required and to execute the agreement on behalf of the City
- 6.2.2.6 Unless the installation or construction of the works and services are performed by the City, the Owner shall submit to the Authorized Person prior to Development Approval the following:
- a) Record drawings and documentation as required by the Authorized Person in accordance with Section 9.1;
  - b) The Engineer's Certificate of Substantial Completion in accordance with Section 9.2 of this Bylaw;
  - c) Security for:
    - i. Any outstanding Works and Services, including record drawings or documentation, in the amount of 120% of the cost of the outstanding works as determined by the Consulting Engineer and accepted by the Authorized Person;
    - ii. The Performance Test Period of works and services provided by the Owner in accordance with Section 9.3;
  - d) Where applicable, approvals from Federal and Provincial government agencies with respect to the acceptance of water systems servicing, the protection of streams and the acceptance of onsite sanitary sewage disposal systems
  - e) When required by the Authorized Person, letters of acceptance of the works and services from utility companies.
  - f) The designs, construction drawings, supporting documentation and specialist reports described in Section 6.1.1.6 unless the Authorized Person has waived this requirement for a reason mentioned in Section 6.1.1.7.

**6.3 Latecomer Agreement**

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- 6.3.1 Council delegates to the Authorized Person its authority to determine under Section 508 (1) of the Local Government Act the proportion of the cost of providing works that constitute an excess or extended

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|            |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |            | service, to identify benefiting lands, to determine the amount of latecomer charges payable upon the development of benefiting lands, and to prepare and to execute a Latecomer Agreement.                                                                                                                                                                                                                                                        |
|            | 6.3.2      | If the Owner intends to have the Authorized Person prepare a Latecomer Agreement, the Owner must provide all background information and reports necessary to allow the Authorized Person to determine the excess or extended capacity services that are provided, the Parcels that are benefiting from the excess or extended services, the costs of providing the excess or extended services, and the charge payable for any future connection. |
|            | 6.3.3      | The Owner's Consulting Engineer shall provide certified actual costs for the excess or extended Works and Services being provided, as well as estimates of the costs that are excess to the Owner's requirements, the area and frontage of each Parcel benefiting from the Works and Services and a recommendation on the term of the Agreement.                                                                                                  |
|            | 6.3.4      | For the purposes of a Latecomer Agreement, interest shall be calculated at the Bank of Canada prime rate.                                                                                                                                                                                                                                                                                                                                         |
|            | <b>7.0</b> | <b>Works and Services Requirements</b>                                                                                                                                                                                                                                                                                                                                                                                                            |
|            | <b>7.1</b> | <b>General Provisions</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |
|            | 7.1.1      | The Works and Services to be provided by the Owner within each Designated Area, as shown on Schedule B, are listed in Table 1.                                                                                                                                                                                                                                                                                                                    |
| Bylaw 9530 | 7.1.2      | Notwithstanding Table 1, the Subdivision and Development of Parcels situated in areas designated Highway Commercial, Civic and Institutional, Neighborhood Centres and Corridors on Schedule 12. Future Land Use Plan of the Official Community Plan require Portland Cement Concrete Sidewalk and all other Works and Services shall be provided to the standard indicated under the "Urban" Designated Area, as listed on Table 1.              |
|            | 7.1.3      | Notwithstanding Table 1, the Subdivision and Development of Parcels situated in areas zoned C, with the exception of C9, on Schedule A of the Zoning Bylaw require Portland Cement Concrete Sidewalk and all other Works and Services shall be provided to the standard indicated under the "Urban" Designated Area, as listed on Table 1.                                                                                                        |

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- a) be connected to all Parcels created by Subdivision, unless exempted in this Bylaw;
- b) be fully completed on all Highways within the Subdivision or Development, and to the centerline of the Highway where the Works and Services are required within a Highway adjacent to the Subdivision or Development, to the standards prescribed in Schedule D and Schedule E of this Bylaw;
- c) connected by water, sanitary sewage or drainage mains to the City's systems in accordance with the standards prescribed in Schedule D and Schedule E of this Bylaw; and
- d) where required by the Authorized Person, include excess or extended services to be provided at the cost of the Owner, including without limitation extensions and connections of the works and services to Parcels and systems beyond the proposed Subdivision or Development.

**7.1.5 The Authorized Person is delegated by Council as follows:**

- a) To make alterations to any and all forms of agreement, restrictive covenants, works and services agreements, latecomer agreements, parkland provision agreements or statutory right-of-way agreements contained in Schedule F;
- b) To execute any such agreements on behalf of the City; and,
- c) To execute on behalf of the City any third party easement agreement that contains a covenant in favour of the City with respect to the use of the easement area.

**7.2 Exemptions****7.2.1 The following are exempt from all required Works and Services of this Bylaw:****9397, 2023**

- a) For applications where the subdivision proposes a lot line adjustment, and each parcel affected is serviced by existing water and sewer system connection;
- b) the construction of an Accessory Building on a lot with a single detached dwelling or a two-unit dwelling;
- c) the construction of an Accessory Building without a permanent foundation, connection to City sewerage or waterworks; or on-site private septic systems or private water sources; and,
- d) the construction of an Accessory Building used as a greenhouse and plant nursery or for storage and not exceeding 300 m<sup>2</sup> in floor area.

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- 7.2.2 The following are exempted from all required Highway Works and Services described in Section 7.3 of this Bylaw:
- a) the construction of a single detached dwelling or a two-unit dwelling; and,
  - b) the construction on any lot of an Accessory Building or principal building addition not exceeding 100 m<sup>2</sup> in floor area.
- 7.2.3 For the construction of a single detached dwelling or a two-unit dwelling, including any Accessory Building or principal building additions, the Owner is not required to extend City sewage collection, storm sewer collection and waterworks if the subject Parcel and adjacent area is serviced with a private sewage disposal system, a private potable water system, and open channel drainage.
- 7.2.4 The Owner is not required to provide City sewerage or waterworks systems for the construction of accessory structures except to the extent that another City Bylaw or the British Columbia Building Code requires that the structure be connected to such a system.
- 7.2.5 The Owner is not required to provide works and services under Table 1 of this Bylaw where such works already exist and in the opinion of the Authorized Person are of a sufficient standard such that the replacement of the works with works meeting the minimum standards prescribed in Schedule D and Schedule E is not warranted.
- 7.2.6 At the time of Subdivision Approval, the Authorized Person may waive the requirement to install City sewage collection, storm sewer collection and waterworks service laterals from the service mains to Parcels created by the subdivision, when the zoning regulations for the Parcel permit multi-family residential, commercial, institutional and industrial uses, and the size and extent of future development on the parcel is unknown at the time of Subdivision Approval.
- 7.2.7 Notwithstanding Table 1, on-site potable water sources and private sewage disposal systems are permitted in all M5, M6, M7, U, and W zones designated on Schedule A of the Zoning Bylaw.
- 7.2.8 Notwithstanding an Urban or Semi-Urban designation on Schedule B, parcels with areas greater than 0.4 ha and zoned AR1, AR2, AR3, AR4, AF and AG on Schedule A of the Zoning Bylaw may be provided with a private sewage disposal system, a private potable water system, and open channel drainage.

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- 7.2.9 At the discretion of the Authorized Person, Highway Works and Services described in Section 7.3 of this Bylaw may be waived

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provided a sealed letter of rationale from a relevant Qualified Professional is supplied.

**TABLE 1****WORKS AND SERVICES REQUIRED FOR SUBDIVISION AND DEVELOPMENT**

| SECTION    | SERVICES REQUIRED                                                                   | SCHEDULE B: DESIGNATED AREAS                |       |            |       |
|------------|-------------------------------------------------------------------------------------|---------------------------------------------|-------|------------|-------|
|            |                                                                                     | DOWNTOWN                                    | URBAN | SEMI-URBAN | RURAL |
| <b>7.3</b> | <b>HIGHWAYS</b>                                                                     |                                             |       |            |       |
|            | Asphalt Pavement Surface                                                            | X                                           | X     | X          | X     |
|            | Street information and signage                                                      | X                                           | X     | X          | X     |
|            | Portland Cement Concrete curb and gutter                                            | X                                           | X     |            |       |
|            | City standard street lighting                                                       | X                                           | X     | X          |       |
|            | Boulevard landscaping                                                               | X                                           | X     | X          | X     |
|            | Portland Cement Concrete sidewalk                                                   | See Section 7.1, Section 7.3 and Schedule C |       |            |       |
|            | Transit Bays                                                                        | X                                           | X     | X          | X     |
|            | Electric Power and Telecommunication Services                                       |                                             |       |            |       |
|            | Underground wiring                                                                  |                                             | X     |            |       |
|            | Overhead wiring                                                                     | X                                           |       | X          | X     |
| <b>7.4</b> | <b>SEWAGE COLLECTION &amp; DISPOSAL</b>                                             |                                             |       |            |       |
|            | City sewage collection and disposal system including service laterals               | X                                           | X     | X          |       |
|            | On-site private sewage disposal system                                              |                                             |       |            | X     |
| <b>7.5</b> | <b>DRAINAGE &amp; STORM RUNOFF COLLECTION</b>                                       |                                             |       |            |       |
|            | City storm runoff collection system for the road network including service laterals | X                                           | X     |            |       |
|            | Open channel drainage system for the road network                                   |                                             |       | X          | X     |
| <b>7.6</b> | <b>WATERWORKS</b>                                                                   |                                             |       |            |       |
|            | City water distribution including service laterals and fire hydrant connection      | X                                           | X     | X          |       |

|  |                                 |  |  |  |   |
|--|---------------------------------|--|--|--|---|
|  | Private source of Potable Water |  |  |  | X |
|--|---------------------------------|--|--|--|---|

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#### 7.3 Highways

7.3.1 All Highways Works required by Table 1 shall be provided by the Owner and designed and constructed in accordance with the standards and specifications in Schedules C, D and E of this Bylaw.

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7.3.2 The Owner shall provide without compensation land for Highway purposes, in accordance with section 513 (3) of the Local Government Act. Where the Minimum or Desired Maximum as indicated in section 7.3.3 exceeds 20 metres, the Authorized Person may arrange compensation for the provision of the land in excess of 20 metres in width with the Owner except to the extent that the greater width is required to adequately support, protect or drain a roadway having a width of 8 metres.

7.3.3 All dedicated Highway widths shall be as specified below:

| Highway Classification | Minimum   | Desired Maximum |
|------------------------|-----------|-----------------|
| Arterial               | 25 metres | 40 metres       |
| Collector              | 20 metres | 25 metres       |
| Local                  | 20 metres | 20 metres       |
| Lane                   | 7 metres  | 10 metres       |
| Pathway                | 3 metres  | 6 metres        |

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7.3.4 Maximum and minimum cul-de-sac length, measured from the connecting Highway as indicated in Schedule E of this Bylaw, shall be as specified below:

| Schedule B Designated Area | Minimum Length | Maximum Length |
|----------------------------|----------------|----------------|
| Rural                      | 9.0 metres     | 570.0 metres   |
| Urban and Semi-urban       | 9.0 metres     | 125.0 metres   |

|          |            |             |
|----------|------------|-------------|
| Downtown | 9.0 metres | 125.0metres |
|----------|------------|-------------|

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- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.
- 7.3.6 The minimum median, pavement, shoulder and boulevard widths for the classification of Highway shall be as specified in Schedules D and E of this Bylaw.
- 7.3.7 Sidewalks shall be provided for existing roads in accordance with Schedules C, D, E and F and Table 1 to this Bylaw whether or not the road has been dedicated as a highway. Sidewalks shall be provided for new Roads in accordance with Schedules D, E and F and Table 1 to this Bylaw.
- 7.3.8 Notwithstanding Section 7.3.7, sidewalks are required on both sides of any road of any classification on which an institution or major recreational facility has frontage or when commercial development is situated or proposed for both sides of the road.

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- 7.3.9 Transit bays may be required for existing or proposed transit routes within the Urban Containment Boundary on Schedule 1. Growth Management of the Official Community Plan Bylaw.
- 7.3.10 The Authorized Person may permit a sidewalk with greater width than that required by this Bylaw to be provided on one side of arterial roadways and along the frontage of school, institutional or major recreational facilities in place of a standard sidewalk on both sides, where adjacent land use and pedestrian connectivity warrant this change, underground utilities are not affected, and access to a sidewalk on the other side of the roadway cannot be safely accommodated.

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- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.
- 7.3.11 An existing 1.5 m wide Portland Cement Concrete sidewalk that is in the opinion of the Authorized Person in good condition may be accepted in place of a sidewalk built to the standards of this Bylaw.
- 7.3.12 The Authorized Person may permit a requirement for a Portland Cement Concrete Sidewalk to be met with the provision of a Pathway providing equal or greater accessibility and pedestrian amenity, and may require the provision of a Pathway in addition to a sidewalk.
- 7.3.13 The Authorized Person may require a Pathway to be provided in any Rural or Semi-Urban Area designated in Schedule B.
- 7.3.14 In exercising discretion under Sections 7.3.12 and 7.3.13 to require a Pathway, the Authorized Person shall have regard to the need for pedestrian facilities within the Subdivision or Development being approved and the function of the Pathway in relation to existing pedestrian facilities in adjacent and nearby areas of the City including the need for connectivity between such facilities.
- 7.3.15 For Infill in the Urban areas on Schedule B, the following applies:
- a) Curb and gutter is not required when the subject properties front a Road with open channel drainage.
  - b) Building additions do not require the undergrounding of overhead electric power and telecommunication distribution lines in the Boulevard or the undergrounding of service connections to the property if the addition is to be serviced from an existing connection to the building.
  - c) New electrical service connections may be installed underground from a power pole to the subject property if the subject property abuts an area serviced by overhead electric power and telecommunication distribution lines in the Boulevard.
- 9397, 2023 7.3.16 For Infill, the Authorized Person may waive the requirement for City standard street lighting or permit the use of an alternative type of

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- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.

lighting, when the installation of City standard street lighting conflicts with the minimum clearance distance requirements from overhead electrical distribution lines established by the power authority or any applicable provincial regulation.

- 7.3.17 For Infill in the Rural area on Schedule B, the asphalt pavement surfacing standard may be replaced by a gravel surfacing standard on Schedules D, E and F of this Bylaw.

#### **7.4 Sewage Collection and Disposal**

- 7.4.1 The sewerage system, where required as detailed in Table 1, shall be designed in accordance with Schedules D and E of this Bylaw and all applicable Provincial and Federal regulations.
- 7.4.2 An application, with the payment of an Application Fee in accordance with the Fees and Charges Bylaw, for connection to the City's Sanitary Sewer facilities shall be made by the Owner, or Applicant, in accordance with Sanitary Sewer Bylaw No. 7897, 2006.
- 7.4.3 Connection to the City's sewerage system shall be in accordance with the terms and conditions set out in the Sanitary Sewer Bylaw No. 7897, 2006.
- 7.4.4 Where on-site private sewage disposal systems are required in Table 1, the facilities shall be designed and constructed in accordance with the applicable regulation under the Public Health Act.
- 7.4.5 The Authorized Person may, in accordance with the Sanitary Sewer Bylaw, permit in the Rural and Semi-Urban area on Schedule B, the use of an on-site septic tank and effluent pump (STEP) and the installation of a pressurized sewer main connecting to the City's sewage collection facilities, in lieu of a sewage collection and disposal system complying with Schedules D and E, where neither a gravity sewer connection nor on-site sewage disposal is feasible.

**Amending  
Bylaws**

7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.

**7.5 Drainage and Storm Runoff Collection**

7.5.1 The drainage system, where required as detailed in Table 1, shall be provided in accordance with Schedules D and E of this Bylaw.

7.5.2 An application, with the payment of an Application Fee in accordance with the Fees and Charges Bylaw, for connection to the City's Drainage facilities shall be made by the Owner, or Applicant, to the Authorized Person.

7.5.3 Connection to the City's drainage system shall be in accordance with the terms and conditions set out in the Storm Sewer System Bylaw No. 2656, 1974.

7.5.4 An existing Drainage facility shall not be assumed, in the design of drainage works required by this Bylaw, to have adequate capacity to receive the design flow, nor to be acceptable to the City. Existing undersized or otherwise inadequate drainage facilities shall be upgraded to accommodate the appropriate flow as required for the Subdivision or Development.

7.5.5 The design of drainage management systems for the proposed development or subdivision and lot grading drawings for each lot created by subdivision shall be prepared by a Consulting Engineer and to the satisfaction of the Authorized Person and shall be consistent with any applicable City watershed management plan. Works to incorporate the drainage management system shall be installed by the Applicant, or Owner, to the satisfaction of the Authorized Person prior to Subdivision Approval or Issuance of a Building Permit.

7.5.6 On-site storm water sub-surface recharge systems or detention ponds may be required or provided to reduce or regulate discharge into the City's storm sewer system. Such systems shall be designed by a Consulting Engineer with expertise in hydrology, soils, lot grading, and

**Amending  
Bylaws**

- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.
- 7.5.7 drainage systems. No sub-surface recharge systems shall be installed in locations where potable water well  
To restrict the conveyance of sedimentation from Development Parcels to the City's Drainage system and natural watercourses during construction, a drainage and erosion control plan shall be prepared for approval by the Authorized Person and all facilities provided for in the approved plan shall be installed prior to commencement of construction to ensure all construction site runoff is properly managed.
- 7.5.8 In the Downtown and Urban area on Schedule B, the Authorized Person may permit an alternative to a connection to the City storm runoff collection system if the alternative has been recommended in a report by the Consulting Engineer with expertise in hydrology, lot grading and drainage systems.
- 7.5.9 For Infill in the Urban area on Schedule B, the Authorized Person may waive the requirement to install a connection to the City storm runoff collection system if an open channel system has sufficient capacity and is recommended in a report by a Consulting Engineer with expertise in hydrology, lot grading and drainage systems.
- 7.6 Waterworks**
- 7.6.1 The waterworks system, where required as detailed in Table 1, shall be designed and approved in accordance with Schedules D and E of this Bylaw and the requirements of the Drinking Water Protection Act and the Drinking Water Protection Regulation.
- 7.6.2 An application, with the payment of an Application Fee in accordance with the Fees and Charges Bylaw, for connection to the City's Waterworks facilities shall be made by the Owner, or Applicant, in accordance with Water Regulation and Rates Bylaw No. 7429, 2003.
- 7.6.3 Connections to the City's Waterworks facilities, and use of City water for testing, disinfection and flushing purposes shall be in accordance

**Amending  
Bylaws**

- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.
- with the terms and conditions set out in the Water Regulation and Rates Bylaw and in Schedule D of this Bylaw.
- 7.6.4 When connection to City Waterworks is required, or is requested by the Owner and approved by the Authorized Person, the Development Parcels or the Parcels created by Subdivision shall be provided with a Waterworks system that meets the maximum-day water demand and fire protection requirements established in Schedule D of this Bylaw, the Water Regulation and Rates Bylaw, the British Columbia Building Code and all applicable fire code regulations.
- 7.6.5 Where a private source of potable water is permitted by Table 1, the facilities shall be designed and constructed in accordance with the requirements of the Drinking Water Protection Act for supply of potable water as determined and approved by the local Ministry of Health authority having jurisdiction, and the well shall have a minimum flow rate of 2500 litres per day per dwelling unit and a rate specified by the Authorized Person for non-residential uses based on the number of plumbing fixtures being supplied and the character of the use.
- 7.6.6 In the Semi-Urban area on Schedule B, the Authorized Person may approve a private potable water source for Parcels greater than 0.4 ha in area that front Highways not serviced by City Waterworks, in which case the well shall have a minimum flow rate of 2500 litres per day per dwelling unit for residential uses and a rate specified by the Authorized Person for non-residential uses based on the number of plumbing fixtures being supplied and the character of the use.
- 7.6.7 The Owner's Consulting Engineer shall verify and certify the quality and capacity of any private waterworks system.
- 7.6.8 If a well is intended to provide water to more than one parcel, the Owner must grant in favour of each parcel to which the well is intended to supply water a water supply easement over the parcel on which the

**Amending  
Bylaws**

- 7.3.5** Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.

well is located, and a covenant under section 219 of the Land Title Act in favour of the City prohibiting any use of the easement area, which must include the well location and a reasonable adjacent area, that would interfere with the use of the area for the provision of a supply of groundwater.

**7.7 Other Services**

Other services that are integral parts of Highways, Sewage, Drainage and Waterworks facilities, shall be designed by the Consulting Engineer and provided by the Owner in accordance with the standards and specifications set out in Schedules D and E of this Bylaw.

**7.8 Rights-of-Way, Covenants and Easements**

The Owner shall pay for the cost of legal surveys, legal fees and registration of all Rights-of-Way, Covenants and Easements required by the Authorized Person for subdivision or development.

**8.0 Park Land Acquisition**

**8.1 Servicing Requirements:**

- 8.1.1** A park land parcel or area dedicated as park on a subdivision plan shall be serviced by the Owner or Applicant at no cost to the City with connections to the property line for water, sanitary sewer and storm sewer in the size up to but not exceeding 150 mm for water, 150 mm for sanitary sewer, 200 mm for storm sewer and a single phase electrical service. This requirement does not apply in relation to any type of service, in cases where lots in the subdivision are not required by this Bylaw to be provided with that type of service.

- 8.1.2** Final sizes and locations of services to park land will be determined by the Authorized Person prior to construction and installation by the Owner.

**9.0 Owner's Responsibility**

The Owner and the Consulting Engineer shall complete all reports, designs, specifications and supporting documentation related to the

**Amending  
Bylaws**

- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.

provision of all required Works and Services for any Subdivision or Development.

The Owner and Consulting Engineer shall coordinate their design and construction work with the works and services provided by utility companies including those that provide electric power, telecommunications and natural gas.

**9.1 Record Drawings and Documentation**

- 9.1.1 The Consulting Engineer shall prepare and submit as described in Schedule G sealed infrastructure record drawings of all completed Works and Services, electronic GIS-ready drawings, and History Sheets providing Parcel servicing details. The as-constructed record drawings shall be sealed by the Consulting Engineer certifying that all of the Works and Services have been installed to the standards and specifications prescribed by this Bylaw and approved by the Authorized Person, and that the construction was completed under the Consulting Engineer's direct supervision.
- 9.1.2 The as-constructed record drawings shall be submitted within 30 days following the Consulting Engineer's submission of the Certificate of Substantial Completion. If the drawings are not submitted, the works and services shall be considered deficient and security in the amount required to prepare the record drawings may be held by the Authorized Person until the record drawings are submitted to the satisfaction of the Authorized Person.
- 9.1.3 As required by the Authorized Person, the Consulting Engineer shall submit documentation prepared by him or other specialists, consultants, and testing firms, prior to and during the installation of the Works and Services, including engineering reports, inspection reports, materials testing reports, lot grading reports, environmental monitoring reports, design briefs, shop drawings, operation and maintenance manuals, and other reports, which provide a historical account of the installation and construction activities and support the

**Amending  
Bylaws**

- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.

Consulting Engineer's certification of the Works and Services in accordance with this Bylaw.

**9.2 Certificate of Substantial Completion**

- 9.2.1 The Consulting Engineer shall submit a Certificate of Substantial Completion sealed by a Consulting Engineer in a form acceptable to the Authorized Person, which:

- a) certifies that all of the Works and Services were installed to the standards and specifications prescribed by this Bylaw and approved by the Authorized Person;
- b) certifies that the necessary inspections, testing, cleaning of piping, disinfection of potable water systems, and other procedures as required, including approvals by regulatory Provincial and Federal agencies, have been conducted and that the Works and Services are safe and acceptable for public use;
- c) certifies that the construction was completed under the Consulting Engineer's direct supervision;
- d) provides, to the satisfaction of the Authorized Person, a description of any outstanding and deficient Works and Services; and,
- e) provides, to the satisfaction of the Authorized Person, a cost estimate, sealed by a Professional Engineer, for any deficient or outstanding Works and Services.

- 9.2.2 Following review of the documentation submitted and any field investigations he may deem necessary, the Authorized Person may acknowledge receipt and acceptance of the Consulting Engineer's Certificate of Substantial Completion by issuing a Notice of Construction Completion, the date of which shall mark the beginning of the Performance Test Period.

**9.3 Performance Test Period and Security**

**Amending  
Bylaws**

- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.
- 9.3.1 The Owner shall provide Security, in the amount of 15% of the actual costs certified by the Consulting Engineer for all Works and Services provided and installed by the Owner, for a period of one year from the date of issuance of the Notice of Construction Completion (the "Performance Test Period").
- 9.3.2 The Owner shall maintain and make repairs to any Works and Services that do not continue to meet the minimum standards and specifications during the Performance Test Period.
- 9.3.3 If the Owner fails to make repairs within 30 days for non-emergency Works from the date when requested to do so in writing by the Authorized Person, or, in the case of emergency situations, within two hours of receiving verbal notification of the emergency, then the City, using its own forces or a contractor hired by the City, may make the necessary repairs and recover the costs by drawing down the Security.
- 9.3.4 The Authorized Person shall signify completion of the Subdivision or Development works and services requirements by issuing a Notice of Final Acceptance for all Works and Services, which shall be owned, operated and maintained by the City once the Performance Test Period is over and all Works and Services, in the judgment of the Authorized Person, are performing as originally intended.
- 9.3.5 Provided that the requirements of section 9.3.2 are met, the Performance Security shall be released when the Notice of Final Acceptance is issued.
- 9.3.6 If at the end of the Performance Test Period all or some of the works and services are not performing as originally intended, the Authorized Person at his or her discretion may extend the Performance Test Period for all or some of the works and services. The Security will be held by the City over the extended Performance Test Period, and the Authorized Person may proportionately reduce the amount of Security at his discretion.

**Amending  
Bylaws**

- 7.3.5 Except in cases where a covenant has been granted to the City securing the dedication of an additional means of vehicular access upon the further subdivision of land in the vicinity and the Authorized person considers that such further subdivision will occur within a reasonable time, no subdivision layout may provide a single means of vehicular egress by means of a highway more than 125 m in length providing egress from more than 30 dwelling units regardless of the form of residential development, unless the highway is designed and constructed to a Collector Road standard, in which case a single means of vehicular egress from not more than 80 dwelling units may be permitted.
- 9.3.7 If the works and service are constructed or installed by the Owner between October 1 and April 15, the Consulting Engineer shall provide supporting documentation and testing information acceptable to the Authorized Person in respect of the cold weather construction practices employed by the Owner, and the Authorized Person at his or her discretion may extend the Performance Test Period for all or some of the works and services. The Security will be held by the City over the extended Performance Test Period, and the Authorized Person may proportionately reduce the amount of Security at his discretion.
- 10.0 Severability**  
If any section, subsection, clause, sub-clause or phrase of this Bylaw is for any reason held to be invalid by the decision of any Court of competent jurisdiction, that section, subsection, clause, sub-clause or phrase shall be struck from the Bylaw and any such decision shall not affect the validity of the remaining portions of this Bylaw.
- 11.0 Offence and Penalty**  
Any person contravening or committing any breach of or committing any offence against any provisions of this Bylaw or who suffers or permits any act or thing to be done in contravention or in violation of any of the provisions of this Bylaw or who refuses, omits or neglects to fulfil, observe, carry out or perform any duty, obligation, matter or thing whatsoever by this Bylaw prescribed or imposed or required to be done is liable, on summary conviction, to a fine not exceeding \$10,000.00 or to a term of imprisonment not exceeding three months, or both; and each day during which any violation, contravention or breach shall continue shall be deemed a separate offence.

**Amending  
Bylaws**

READ A FIRST TIME THIS            **15<sup>th</sup>**            DAY OF            **DECEMBER**            , 2014.

READ A SECOND TIME THIS            **15<sup>th</sup>**            DAY OF            **DECEMBER**            , 2014.

READ A THIRD TIME THIS            **15<sup>th</sup>**            DAY OF            **DECEMBER**            , 2014.

All three readings passed by a            **UNANIMOUS**            decision of Members of City Council  
present and eligible to vote.

ADOPTED THIS            **5<sup>th</sup>**            DAY OF            **JANUARY**            , 2015,  
BY A            **UNANIMOUS**            DECISION OF ALL MEMBERS OF CITY COUNCIL PRESENT AND  
ELIGIBLE TO VOTE.

\_\_\_\_\_  
LYN HALL

MAYOR

\_\_\_\_\_  
DEANNA WASNIK

D/CORPORATE OFFICER

Schedule A to Bylaw No. 8618, 2014

Definitions

Amending  
Bylaw

In this Bylaw,

“*Accessory Building*” means an accessory building as defined in the Zoning Bylaw;

“*Applicant*” means a representative of the Owner duly authorized to act on the Owner’s behalf during processing of a Subdivision or Development application;

“*Application*” means a written request by an Owner to Subdivide or otherwise develop land and includes an application for a Building Permit;

“*Architect*” means a registered member of the Architectural Institute of British Columbia under the *Architects Act*;

“*Arterial Highway*” means a Highway, designated as such in the City’s Official Community Plan, which is used to carry high volumes of through or heavy traffic and which has a significant portion of the total traffic volume originating beyond the Subdivision or Development;

“*Authorized Person*” means the Director of Planning and Development of the City of Prince George or his designate;

“*Bicycle Path*” means a portion of a Highway or Statutory Right of Way graded or surfaced for bicycle traffic;

“*Boulevard*” means all portions of a Highway not occupied by a Roadway and includes the median area between separated Roadways;

“*City*” means the City of Prince George;

“*Collector Highway*” means a Highway designated as such in the City’s Official Community Plan that carries traffic originating on Local Highways to Arterial Highways and includes the major entrance Highway into a Subdivision or Development and the major Highway for circulating traffic within a Subdivision or Development;

“*Complete*” or any variation thereof, when used with respect to Works and Services referred to herein, means full completion after Substantial Completion when all deficiencies have been corrected and Works and Services have been certified as complete by the Owner’s Consulting Engineer and accepted by the Authorized Person;

*“Construct”* or any variation thereof, when used with respect to Works and Services referred to herein, means build, erect, install, repair, alter, add, enlarge, move, locate, relocate, rebuild, upgrade, demolish, remove, excavate or shore;

*“Consulting Engineer”* means a Professional Engineer registered in the Province of BC responsible for the design and construction supervision and certification of all Works and Services on behalf of the Owner;

*“Contractor”* means a person or firm having a contract with an Owner or the City to construct Works and Services required by this Bylaw;

*“Council”* mean the elected officials of the City of Prince George;

*“Cul-de-sac”* means a Highway having access to another Highway at one end only and terminating with a vehicle turning area;

*“Development”* means the construction of any structure on a Parcel requiring, under the Building Bylaw of the City, a Building Permit issued by a Building Inspector, and the construction of structures of all types on parcel in respect of which Works and Services were fully provided in accordance with this Bylaw as part of a Subdivision Approval;

*“Development Cost Charge”* means the sum of money payable by an Owner at the time of Subdivision or Development as established in the City’s Development Cost Charge Bylaw in effect from time to time;

*“Director of Planning and Development”* means the official appointed by Council as the head of the Planning and Development Department;

*“Drainage”* means a system of pipes, manholes, catch basins, ditches, retention/detention facilities, outfalls and appurtenances for the collection and disposal of storm water by the City;

*“Excess or Extended Service”* means the extension or over-sizing of Works and Services to provide servicing to Parcel beyond the subdivision or development;

*“Fees and Charges Bylaw”* means Comprehensive Fees and Charges Bylaw No. 7557, 2004;

*“Final Acceptance”* means the approval granted by the Authorized Person signifying the completion of the Subdivision or Development works and services to all relevant requirements of this Bylaw and other relevant Bylaws once the Performance Test Period is over and the works and services are, in the judgment of the Authorized Person are performing as originally intended;

*“Frontage”* means the straight or arced distance along the Front Lot Line of a

parcel where such line abuts a Highway;

*“Infill”* means a subdivision that creates fewer than three additional lots and does not involve an extension of Highway or the construction of a principal or accessory building on a lot with an area equal or less than 4000 m<sup>2</sup> that is on a block face of which not more than 20% of the parcels are vacant;

*“Landscaping”* means any combination of lawns, shrubs, trees, flowers, decorative bricks, boulders and gravel, bark mulch, fences, decorative paving and plantings arranged, by design, to enhance the appearance of a Parcel or Boulevard in a form acceptable to the City;

*“Lane”* means a Highway which has a width less than or equal to ten metres and provides secondary access to a Parcel;

*“Latecomer Agreement”* means an agreement under section 939 of the Local Government Act;

*“Local Highway”* means a Highway which provides primary access to and from Parcels within a subdivision or development;

*“Official Community Plan”* means the official community plan adopted by Bylaw No. 8383 and includes any successor official community plan;

*“Pathway”* means a portion of a Highway or Statutory Right of Way graded or surfaced for pedestrian or bicycle traffic;

*“Performance Test Period”* means the one year period, starting from the date of the issuance of the Notice of Construction Completion, during which the Owner is required to make repairs to any Work or Service that fails to perform as intended;

*“Professional Engineer”* means a registered member of the Association of Professional Engineers and Geoscientists of British Columbia;

*“Provide”* in relation to Works and Services means doing all that is necessary to make a service available and functional in a proper manner and includes design, construction or installation, testing, inspecting and certifying the completion of the Works and Services;

9397, 2023

*“Qualified Professional”* means a professional engineer, geoscientist, architect, biologist, planner or other professional with experience relevant to the applicable matter, as determined by the Director;

*“Road”* means lands dedicated for Highway purposes;

*“Security”* means cash, a certified cheque, or a clean, unconditional and

irrevocable stand-by letter-of-credit that provides for automatic renewals, drawn in favour of the City on a Canadian chartered bank or other institution acceptable to the Authorized Person, and in the form acceptable to the Authorized Person;

“Sewerage” means a system of pipes, manholes, treatment plants, pump stations, valve stations, discharges and appurtenances for the collection and disposal of sewage by the City;

“Sidewalk” means a portion of a Highway surfaced for pedestrian traffic;

“Street Lighting” means an overhead system of lights to illuminate Roadways, Sidewalks, Bicycle Paths and Pathways;

“Subdivision” means the division of land into 2 or more parcels, whether by plan or by metes and bounds description or otherwise;

“Substantial Completion” means the stage of Completion of all Works or Services when the Works and Services are ready to be used for their intended purpose as certified by the Consulting Engineer and accepted by the Authorized Person;

“Underground Wiring” means a system or systems of wires, cables and appurtenances constructed under the surface of a Highway to provide electrical power or telecommunication services to Parcel;

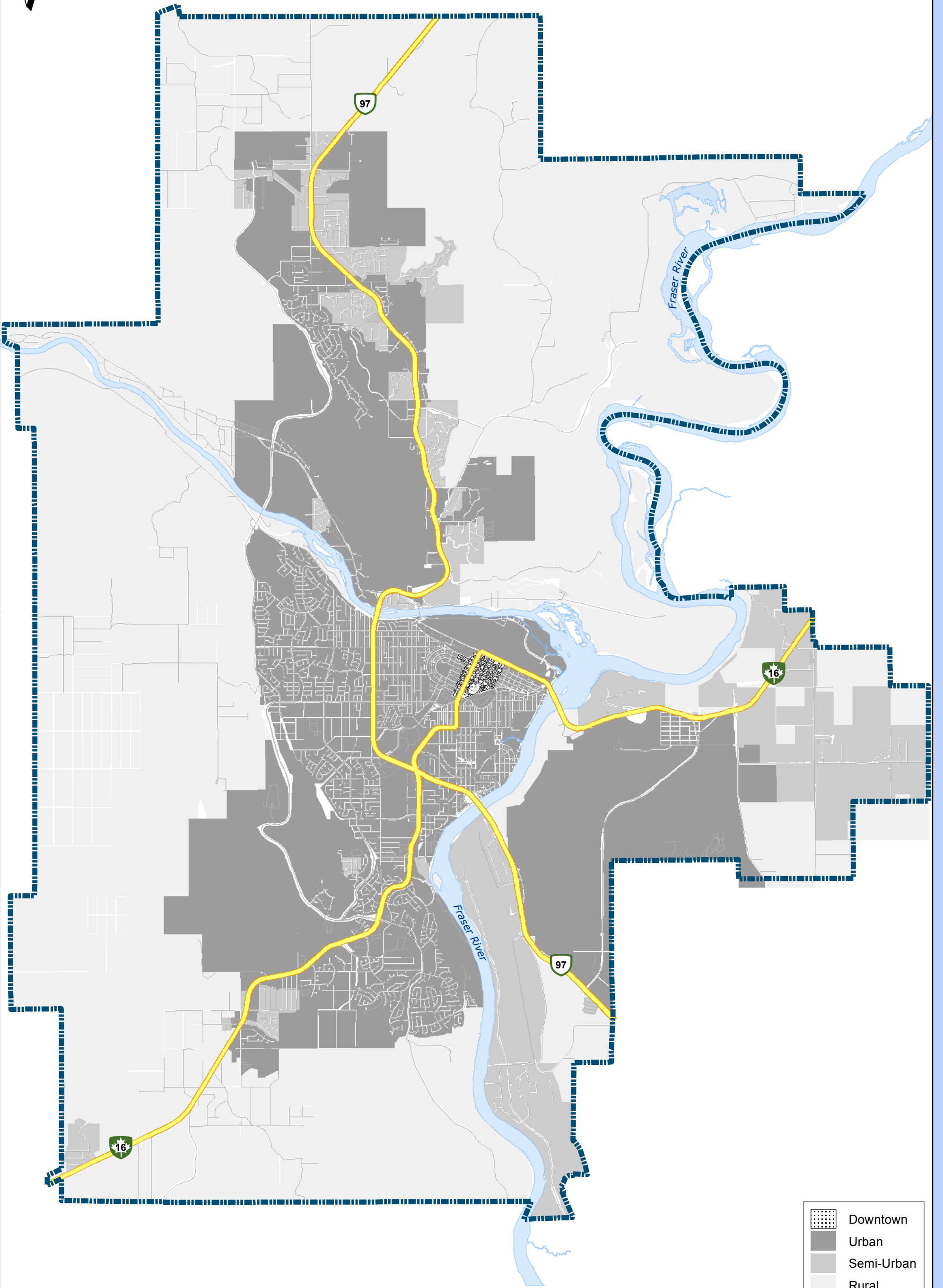
“Waterworks” means a system of pipes, hydrants, pump stations, pressure reducing valve stations, reservoirs and appurtenances for the supply and distribution of water by the City;

“Works and Services” or any variation thereof means Roadways, Sidewalks, Bicycle Paths; Pathways, Waterworks, Sewerage, Drainage, Boulevard Landscaping, Boulevard Crossings, Transit Bays, Street Lighting and Underground Wiring on Highways, Statutory Rights of Way or a Parcel that is being subdivided or developed;

9484, 2024

“Works and Services Agreement” means an agreement between the Owner and the City for the construction and installation of Works and Services pursuant to section 509 of the *Local Government Act*.

“Zoning Bylaw” means City of Prince George Zoning Bylaw No. 7850, 2007.



Downtown

Urban

Semi-Urban

Rural

Amendment Bylaw No 8864: August 21st, 2017

05001,0001,5002,000

Meters

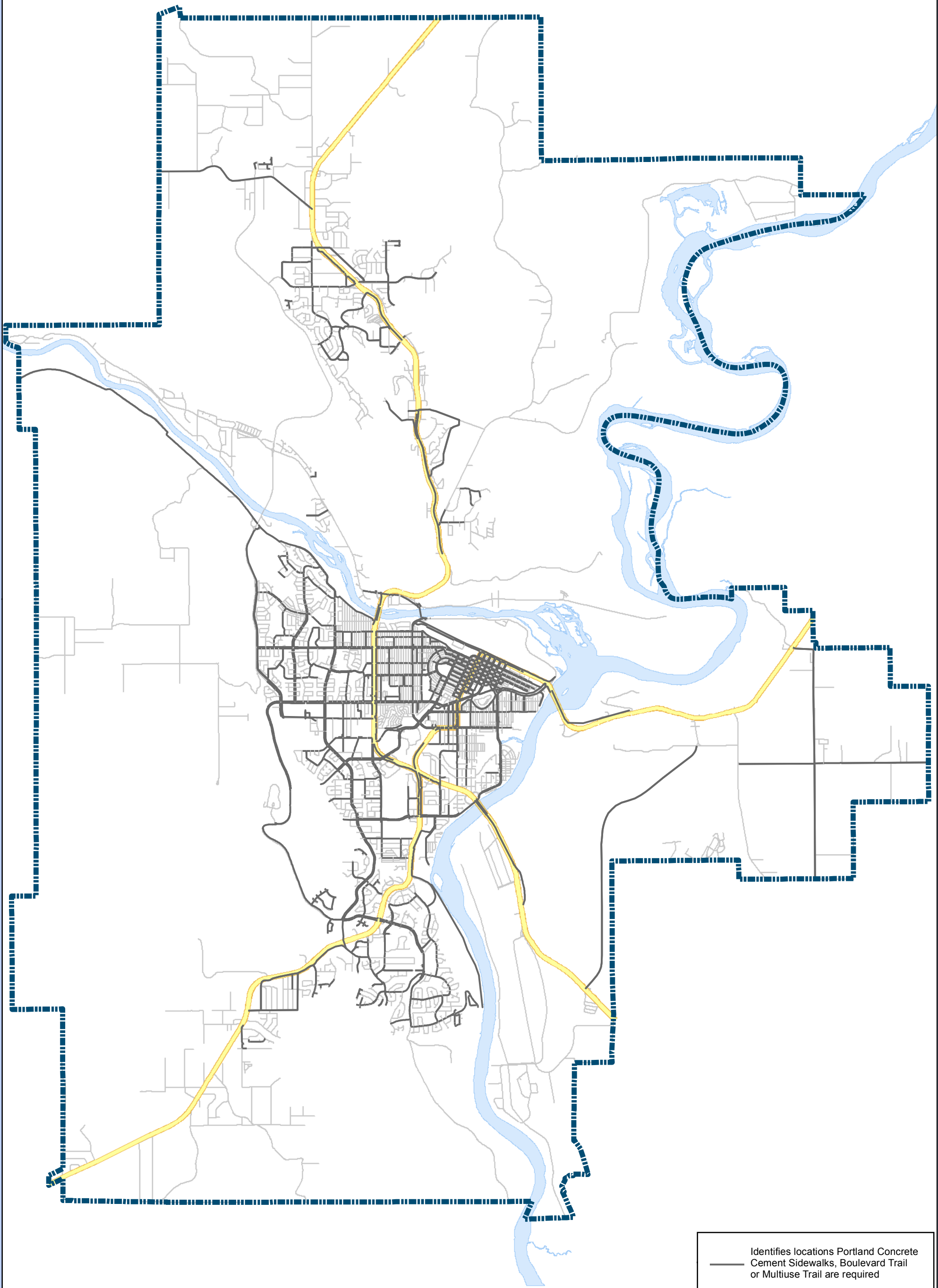
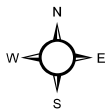
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Subdivision and Development Servicing Bylaw No. 8618, 2014

Schedule B: Land Designations

CITY OF PRINCE GEORGE

Geographic Information Systems Group



Identifies locations Portland Concrete  
Cement Sidewalks, Boulevard Trail  
or Multiuse Trail are required

0 460 920 1,380 1,840 Meters  
Coordinate System: NAD 1983 UTM Zone 10N  
Projection: Transverse Mercator  
Datum: North American 1983  
1:75000

**Subdivision and Development Servicing Bylaw No. 8618, 2014**  
**Schedule C: Pedestrian Network**



## **Schedule D**

### **Infrastructure Specifications**

Infrastructure specifications including a table of contents follow.

# CITY OF PRINCE GEORGE

## INFRASTRUCTURE SPECIFICATIONS

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### **DIVISION 3 - CONCRETE**

|       |                                |   |
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| 03100 | Concrete Forms and Accessories | 3 |
| 03200 | Concrete Reinforcement         | 3 |
| 03300 | Cast-in-Place Concrete         | 6 |

### **DIVISION 16 - ELECTRICAL**

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| 16010 | Electrical: General Requirements                  | 6 |
| 16051 | Installation of Cables in Trenches and in Ducts   | 2 |
| 16061 | Grounding - Primary                               | 4 |
| 16062 | Grounding - Secondary                             | 4 |
| 16122 | Wires and Cables (0-1000V)                        | 3 |
| 16131 | Splitters, Junction, Pull Boxes and Cabinets      | 2 |
| 16133 | Conduits, Conduit Fastenings and Conduit Fittings | 4 |
| 16550 | Street Lighting Poles and Luminaires              | 2 |

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**1 GENERAL****1.1 Section Includes**

1.1.1 Connecting to existing services.

1.1.2 Special scheduling requirements.

**1.2 Related Sections**

1.2.1 Section 01353 – Traffic Control.

1.2.2 Section 01560 – Temporary Barriers and Enclosures.

**1.3 Existing Services**

1.3.1 Notify City and utility companies of intended interruption of services and obtain required permission.

1.3.2 Where Work involves breaking into or connecting to existing services, provide City with a minimum of ten (10) working days of notice to arrange for scheduling of service connections and to arrange for any interruption of service to City customers. Duration of interruptions shall be kept to a minimum. All tie-ins, connections and adjustments to existing active water, sanitary and storm mains are to be performed by the City.

1.3.3 Provide for pedestrian and vehicular traffic.

1.3.4 Construct barriers in accordance with Section 01560 – Temporary Barriers and Enclosures.

**1.4 Special Requirements**

1.4.1 Carry out noise generating work in accordance with the City of Prince George Noise, Nuisance & Disturbances Bylaw No. 3848.

**2 PRODUCTS**

(Not Applicable)

**3 EXECUTION**

(Not Applicable)

END OF SECTION 01140

**1 GENERAL****1.1 Description**

- 1.1.1 Coordinate progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work with progress of Work of other contractors and Work by City.

**1.2 Related Sections**

- 1.2.1 Section 01520 – Construction Facilities.

**1.3 Project Meetings**

- 1.3.1 Schedule and administer project meetings with subcontractors as required throughout progress of Work.
- 1.3.2 Provide physical space and make arrangements for meetings.
- 1.3.3 Attend regular construction progress meetings as determined by Engineer. Arrange for attendance by subcontractors as required. Recording and distributing of minutes will be done by Engineer.

**1.4 Construction Organization**

- 1.4.1 Coordinate allocation of mobilization areas of site; for field offices and sheds, access, traffic, and parking facilities.
- 1.4.2 Coordinate use of site and facilities among subcontractors. Coordinate submittals, reports and records, schedules and drawings. Resolve ambiguities and conflicts among subcontractors.
- 1.4.3 Coordinate Progress Schedules, including dates for submittals and for delivery of products.
- 1.4.4 Comply with instructions of Engineer for use of temporary utilities and construction facilities.
- 1.4.5 Coordinate field engineering and layout work with Engineer.

**1.5 On-Site Documents**

- 1.5.1 Maintain at job site, one copy each of the following:
- Contract drawings.
  - Specifications.
  - Addenda.
  - Reviewed shop drawings.
  - Change orders.

- Other modifications to Contract.
- Field test reports.
- Copy of approved Work schedule.
- Manufacturers' installation and application instructions.
- Labour conditions and wage schedules

#### 1.6 Schedules

- 1.6.1 Submit preliminary construction progress schedule to Engineer for review.
- 1.6.2 After review, revise and resubmit schedule to comply with revised project schedule.
- 1.6.3 During progress of Work revise and resubmit as directed by Engineer.

#### 1.7 Submittals

- 1.7.1 Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination among work of subcontractors then transmit to Engineer for review.
- 1.7.2 Submit requests for payment for review by Engineer.
- 1.7.3 Submit requests for interpretation of Contract Documents, and obtain instructions through Engineer.
- 1.7.4 Process substitutions and change orders through Engineer.
- 1.7.5 Deliver closeout submittals for review and preliminary inspections to Engineer.

#### 1.8 Records During Construction

- 1.8.1 Maintain one complete set of construction drawings on the site for use as Record Documents.
- 1.8.2 Store Record Documents and Samples in Field Office, or other approved location, apart from documents used for construction. Provide files, racks, and secure storage.
- 1.8.3 Maintain Record Documents in a clean, dry and legible condition. Do not use Record Documents for construction purposes.
- 1.8.4 Keep Record Documents and samples available for inspection by Engineer.
- 1.8.5 At the completion of the construction period, turn over the set of Record Documents which have been marked up with changes during the course of the work to the Engineer to permit the Engineer to prepare drawings of record for the work..

#### 1.9 Recording Actual Site Conditions

- 1.9.1 Record information concurrently with construction progress. Do not conceal work until required information is recorded.

1.9.2 Legibly mark each item to record actual construction, including:

- Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements and survey datum, as directed by the Engineer.
- Field changes of dimension and detail.
- Changes made by Addendum, Change Order or Field Order.
- Details not on original Contract Drawings.

1.10 Warranties and Bonds

1.10.1 Provide required Warranties and Bonds to the Authorized Person.

1.10.2 Except for items put into use with Authorized Person's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.

1.10.3 Verify that documents are in proper form and contain full information.

1.11 Closeout Procedures

1.11.1 Notify Engineer when Work is considered ready for Substantial Completion.

1.11.2 Accompany Engineer on preliminary inspection to determine items to be listed for completion or correction.

1.11.3 Comply with Engineer 's instructions for correction of items of Work

2 PRODUCTS

(Not Applicable)

3 EXECUTION

(Not Applicable)

END OF SECTION 01310

**1 GENERAL****1.1 Administrative**

- 1.1.1 Submit to the City submittals listed for review. Submit with reasonable promptness and in orderly sequence to allow opportunity for City review prior to ordering of materials or tendering of works for construction. Failure to submit in ample time is not considered sufficient reason for an extension of development, subdivision or project requirements and may cause delays in the scheduling works to be completed by City forces as part of the development, subdivision or project. No claim for extension by reason of such default will be allowed.
- 1.1.2 Work affected by submittal shall not proceed until review is complete.
- 1.1.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- 1.1.4 Where items or information is not produced in SI Metric units converted values are acceptable.
- 1.1.5 Review submittals for projects prior to submission to City. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- 1.1.6 Notify City in writing at time of submission, identifying deviations from requirements of Contract Documents and stating reasons for deviations.
- 1.1.7 Verify that field measurements and affected adjacent Work are coordinated.
- 1.1.8 The Owner's, Developer's or Contractor's responsibility for errors and omissions in submission is not relieved by the City's review of submittals.
- 1.1.9 The Owner's, Developer's or Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by the City review.
- 1.1.10 Keep one reviewed copy of each submission on site.

**1.2 Shop Drawings and Product Data**

- 1.2.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data, which are to be provided by Contractor to illustrate details of a portion of Work.

- 1.2.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the Section under which adjacent items will be supplied and installed. Indicate cross-references to design drawings and specifications.
- 1.2.3 Allow ten days for City's review of each submission.
- 1.2.4 Make changes in shop drawings as City may require, consistent with Contract Documents. When resubmitting, notify City in writing of any revisions other than those requested.
- 1.2.5 Accompany submissions with transmittal letter containing:
- 1.2.6.1 Date.
- 1.2.6.2 Project title and number.
- 1.2.6.3 Contractor's name and address.
- 1.2.6.4 Identification and quantity of each shop drawing, product data and sample.
- 1.2.6.5 Other pertinent data
- 1.2.6 Submissions shall include:
- 1.2.6.6 Date and revision dates.
- 1.2.6.7 Project title and number.
- 1.2.6.8 Name and address of:
- Contractor or Subcontractor.
  - Supplier.
  - Manufacturer.
- 1.2.6.9 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- 1.2.6.10 Submit 6 prints of shop drawings for each requirement requested in specification Sections and as City may reasonably request. One transparency of each shop drawing may be submitted in lieu of the multiple copies. Electronic copies may be used for submission upon approval by City.

- 1.2.6.11 Submit 6 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by City where shop drawings will not be prepared due to standardized manufacture of product.
- 1.2.6.12 Delete information not applicable to project.
- 1.2.6.13 Supplement standard information to provide details applicable to project.
- 1.2.6.14 If upon review by City, no errors or omissions are discovered or if only minor corrections are made, three copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

## 2 PRODUCTS

(Not Applicable)

## 3 EXECUTION

(Not Applicable)

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**1 GENERAL****1.1 Related Sections**

- 1.1.1 Section 01140 – Work Restrictions.
- 1.1.2 Section 01560 – Temporary Barrier Enclosures
- 1.1.3 Section 02317 - Roadway Excavation Embankment and Compaction.
- 1.1.4 Section 02721 - Granular Base.
- 1.1.5 Section 02723 - Granular Sub-base.
- 1.1.6 Section 02741 - Hot Mix Asphalt Concrete Paving.

**1.2 References**

- 1.2.1 Manual of Uniform Traffic Control Devices for Canada, (MUTCD) published by Transportation Association of Canada.
- 1.2.2 British Columbia Ministry of Transportation Traffic Control Manual for Work on Roadways.
- 1.2.3 City of Prince George Procedure for Notice of Traffic Disruptions.

**1.3 Protection of Public Traffic**

- 1.3.1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of vehicle and pedestrian traffic or use of roadways in areas affected by the work zone.
- 1.3.2 Provide Traffic Management Plan to requirements of Procedure of Notice of Traffic Disruptions. Do not proceed with work until Traffic Management Plan has been approved by City.
- 1.3.3 When working on travelled way:
  - 1.3.3.1 Ensure delimited work zone and equipment placement minimizes interference and hazards to the traveling public.
  - 1.3.3.2 Do not leave equipment on travelled way overnight unless authorized by the City.
- 1.3.4 Do not close any lanes of road or highway without approval of City. Before re-routing traffic, erect suitable traffic controls in accordance with instructions contained in Part D of MUTCD.

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- 1.3.5 Keep travelled way well graded, free of pot holes and of sufficient width for required number of lanes of traffic.
    - 1.3.5.1 Provide minimum 7 metre wide temporary roadway for traffic in two-way sections through Work and on detours
    - 1.3.5.2 Provide minimum 5 metre wide temporary roadway for traffic in one-way sections through Work and on detours
  - 1.3.6 As required, provide gravelled detours or temporary roads to facilitate passage of traffic around restricted construction area.
  - 1.3.7 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, unless other means of road access exist that meet approval of City.
  - 1.4 Traffic Control Devices
    - 1.4.1 Meet with City prior to commencement of Work to prepare list of traffic control devices required for project. If situation on site changes, revise list to approval of City.
    - 1.4.2 Continually maintain traffic control devices in use by:
      - 1.4.2.1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
      - 1.4.2.2 Removing or covering signs which do not apply to conditions existing from day to day.
    - 1.4.3 At the completion of the project, ensure all temporary traffic control devices have been removed.
  - 1.5 Control of Public Traffic
    - 1.5.1 Provide competent flag persons, trained in accordance with, and properly equipped as specified in, MUTCD manual in following situations:
      - 1.5.1.1 When public traffic is required to pass working vehicles or equipment which block the travelled roadway.
      - 1.5.1.2 When it is necessary to institute alternating one-way traffic system through construction area or detour routes.
      - 1.5.1.3 When construction blocks roadways where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
      - 1.5.1.4 When workmen or equipment are employed on travelled way over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
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- 1.5.1.5 Where temporary protection is required while other traffic control devices are being erected or taken down.
  - 1.5.1.6 For emergency protection when other traffic control devices are not readily available.
  - 1.5.1.7 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.
  - 1.5.1.8 At each end of restricted sections where pilot cars are required.
  - 1.5.2 Maximum Traffic Delays
    - 1.5.2.1 Delays to public traffic due to contractor's operations to be maximum 15 minutes.
  - 1.5.3 Equip pilot cars with orange flashing lights and signs clearly designating vehicles as pilot cars.
  - 1.5.4 Provide portable traffic signal system where construction operations may restrict two-way roadways to alternating one lane traffic for 12 hours or more each day. Identify in Traffic Management Plan.
  - 1.6 Operational Requirements
    - 1.6.1 Maintain existing conditions for traffic throughout period of contract except where a traffic management plan has been submitted to and approved by the City to restrict existing conditions for traffic when required for construction under contract.
    - 1.6.2 Maintain existing conditions for traffic crossing right-of-way.
    - 1.6.3 Maintain access and passage for emergency vehicles.
  - 2 PRODUCTS

(Not Applicable)
  - 3 EXECUTION

(Not Applicable)

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1 GENERAL

## 1.1 Standard Specifications

1.1.1 Wherever standard specifications are referred to in these STANDARD CONSTRUCTION SPECIFICATIONS the current edition shall apply.

1.1.2 Where there is a clear conflict between the standard specifications and the STANDARD CONSTRUCTION SPECIFICATIONS, the STANDARD CONSTRUCTION SPECIFICATIONS shall apply.

## 1.2 Associations

1.2.1 AA - Aluminum Association, 900 19th Street N.W., Washington, D.C., U.S.A. 20006 URL <http://www.aluminum.org>

1.2.2 AASHTO - American Association of State Highway and Transportation Officials, 444 N Capitol Street N.W., Suite 249, Washington, D.C., U.S.A. 20001 URL <http://www.aashto.org>

1.2.3 ANSI - American National Standards Institute, 11 West 42nd Street, New York, New York, U.S.A. 10036 URL <http://www.ansi.org>

1.2.4 API - American Petroleum Institute, 1220 L St. Northwest, Washington, D.C., U.S.A. 20005-4070 URL <http://www.api.org>

1.2.5 ASPT Association for Asphalt Paving Technologists, 400 Selby Avenue, Suite 1, St. Paul, MN 55102 U.S.A. URL <http://www.asphalt.org>

1.2.6 ASTM - American Society for Testing and Materials, 100 Barr Harbor Drive West, Conshohocken, Pennsylvania 19428-2959 URL <http://www.astm.org>

1.2.7 AWS - American Welding Society, 550 N.W. LeJeune Road, Miami, Florida U.S.A. 33126 URL <http://www.amweld.org>

1.2.8 AWWA - American Water Works Association, 6666 W. Quincy Avenue, Denver, Colorado, U.S.A. 80235 URL <http://www.awwa.org>

1.2.9 CGSB - Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, Quebec K1A 1G6 URL <http://w3.pwgsc.gc.ca/cgsb>

1.2.10 CNLA - Canadian Nursery Landscape Association, RR #4, Stn. Main, 7856 Fifth Street, Milton, Ontario. L9T 2X8 URL <http://www.canadanursery.com>

1.2.11 CSA - Canadian Standards Association International, 178 Rexdale Blvd., Toronto, Ontario M9W 1R3 URL <http://www.csa-international.org>

1.2.12 CSPI - Corrugated Steel Pipe Institute, 201 Consumers Road, Suite 306, Willowdale, Ontario M2J 4G8

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| 1.2.13 | CUFCA Canadian Urethane Foam Contractor's Association                                                                                                                                                          |
| 1.2.14 | EC - Environment Canada, Conservation and Protection, Ottawa, Ontario K1A 0H3<br>URL <a href="http://www.ec.gc.ca">http://www.ec.gc.ca</a>                                                                     |
| 1.2.15 | EEMAC - Electrical and Electronic Manufacturers' Association of Canada, 5800<br>Explorer Drive, Suite 200, Mississauga, Ontario L4W 5K9 URL<br><a href="http://www.electrofed.ca">http://www.electrofed.ca</a> |
| 1.2.16 | EIMA EIFS Industry Manufacturer's Association, 3000 Corporate Center Drive,<br>Suite 270, Morrow, Georgia U.S.A. 30260 URL <a href="http://www.eifsfacts.com">http://www.eifsfacts.com</a>                     |
| 1.2.17 | FCC - Fire Commissioner of Canada, Place du Portage, Phase II, 165 rue Hotel de<br>Ville, Hull Quebec K1A 0J2 URL <a href="http://www.hrdc-drhc.gc.ca">http://www.hrdc-drhc.gc.ca</a>                          |
| 1.2.18 | IEEE - Institute of Electrical and Electronics Engineers, 345 East 47th Street, New<br>York, New York U.S.A. 10017 URL <a href="http://www.ieee.org">http://www.ieee.org</a>                                   |
| 1.2.19 | MSS - Manufacturers Standardization Society of the Valve and Fittings Industry,<br>127 Park Street, N.E., Vienna, Virginia U.S.A. 22180                                                                        |
| 1.2.20 | NEMA - National Electrical Manufacturers Association, 1300 N. 17th Street, Suite<br>1847, Rosslyn, Virginia 22209 URL <a href="http://www.nema.org">http://www.nema.org</a>                                    |
| 1.2.21 | NFPA - National Fire Protection Association, 1 Batterymarch Park, P.O. Box<br>9101 Quincy, Massachusetts, U.S.A. 02269-9101 URL <a href="http://www.nfpa.org">http://www.nfpa.org</a>                          |
| 1.2.22 | NRC - National Research Council, Montreal Road, Ottawa, Ontario K1A 0S2 URL<br><a href="http://www.nrc.gc.ca">http://www.nrc.gc.ca</a>                                                                         |
| 1.2.23 | SCC - Standards Council of Canada, 200 Albert Street, Suite 2000, Ottawa, Ontario<br>K1P 6N7 URL <a href="http://www.scc.ca">http://www.scc.ca</a>                                                             |
| 1.2.24 | SSPC - The Society for Protective Coatings, 40 24th Street, Pittsburgh,<br>Pennsylvania 15222-4656 URL <a href="http://www.sspc.org">http://www.sspc.org</a>                                                   |
| 1.2.25 | UL - Underwriters' Laboratories, 333 Pfingsten Road, Northbrook, Illinois, U.S.A.<br>60062 URL <a href="http://www.ul.com">http://www.ul.com</a>                                                               |
| 1.2.26 | ULC - Underwriters' Laboratories of Canada, 7 Crouse Road, Toronto, Ontario M1R<br>3A9 URL <a href="http://www.ulc.ca">http://www.ulc.ca</a>                                                                   |

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### 1.3 Reference Standards

1.3.1 Within the text of the specifications, reference may be made to the following standards:

1.3.3.1 ACI:

ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

1.3.3.2 ANSI:

ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

ANSI B18.2.1, Square and Hex Bolts and Screws, Inch Series.

ANSI B18.2.2, Square and Hex Nuts (Inch Series).

ANSI B18.6.4 Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

1.3.3.3 ANSI/ACI:

ANSI/ACI 117, Tolerances for Concrete Construction and Materials.

ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.

ANSI/ACI 347, Concrete Formwork.

1.3.3.4 ANSI/ASTM:

ANSI/ASTM D638M, Test Method for Tensile Properties of Plastic (Metric).

1.3.3.5 ANSI/AWWA:

ANSI/AWWA B300, Hypochlorites.

ANSI/AWWA B301, Water Treatment - Liquid Chlorine.

ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

ANSI/AWWA C105/A21.5, Polyethylene encasement for Ductile-Iron Piping for Water and Other liquids.

ANSI/AWWA C110/A21.10, Ductile-Iron and Gray Iron Fittings, 3 inches through 48 inches for Water and Other Liquids.

ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.

ANSI/AWWA C150 Thickness Design of Ductile-Iron Pipe.

ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids.

ANSI/AWWA C153/A21.53, Ductile-Iron Compact Fittings, 3 inches through 16 inches, for Water and Other Liquids.

ANSI/AWWA C200, Water Pipe 6 inches and Larger, Steel.

ANSI/AWWA C203, Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape-Hot Applied.

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- ANSI/AWWA C205, Cement Mortar Protective Lining and Coating for Steel Water Pipe - 4 inches and larger- Shop Applied.
- ANSI/AWWA C206, Field Welding of Steel Water Pipe.
- ANSI/AWWA C207, Steel Pipe Flanges for Waterworks Service, 4 inches through 144 inches.
- ANSI/AWWA C208, Fabricated Steel Water Pipe Fittings, Dimensions for.
- ANSI/AWWA C210, Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
- ANSI/AWWA C301, Prestressed Concrete Pressure Pipe Steel Cylinder Type for Water and Other Liquids.
- ANSI/AWWA C303, Reinforced Concrete Pressure Pipe Steel Cylinder Type, Pretensioned for Water and Other Liquids.
- ANSI/AWWA C500, Gate Valves for Water and Sewage Systems.
- ANSI/AWWA C502, Dry-Barrel Fire Hydrants.
- ANSI/AWWA C504, Butterfly Valves.
- ANSI/AWWA C509, Resilient-Seated Gate Valves for Water and Sewerage Systems.
- ANSI/AWWA C600, Installation of Ductile-Iron Water Mains, and their Appurtenances.
- ANSI/AWWA C602, Cement Mortar Lining of Water Pipelines - 100 mm and larger - In Place.
- ANSI/AWWA C605, Underground Installation of PolyVinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
- ANSI/AWWA C651, Disinfecting Watermains.
- ANSI/AWWA C800, Underground Service Line Valves and Fittings.
- ANSI/AWWA C900, Pressure Pipe, 4 inches through 12 inches for Water, Polyvinyl Chloride (PVC).
- ANSI/AWWA C901, Polyethylene (PE) Pressure Pipe and Tubing, .5 inch through 3 inches for Water Service.
- ANSI/AWWA C902, Polybutylene (PB) Pressure Pipe and Tubing, .5 inch through 3 inches for Water Service.
- ANSI/AWWA C905, Pressure Pipe, 14 inches through 36 inches for Water, Polyvinyl Chloride (PVC).
- ANSI/AWWA C906, Polyethylene (PE) Pressure Pipe and Fittings, 4 inches through 63 inches, for Water Distribution.
- ANSI/AWWA C907, Standard for Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 inches through 8 inches (100mm through 200mm).
- ANSI/AWWA E101, Vertical Turbine Pumps - Line Shaft and Submersible Types.
- 1.3.3.6 Asphalt Institute MS-2, Mix Design Method for Asphalt Concrete.
- 1.3.3.7 ASTM (A):
- ASTM A36, Standard Specification for Structural Steel.
- ASTM A48, Specification for Gray Iron Castings.
- ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- ASTM A90, Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- ASTM A120, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
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- ASTM A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- ASTM A283/A283M, Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.
- ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- ASTM A313, Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire.
- ASTM A307, Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- ASTM A325, Standard Specification for High-Strength Bolts for Structural Steel Joints.
- ASTM A526M Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
- ASTM A585, Specification for Aluminum-Coated Steel Barbed Wire.
- ASTM A591 Specification for Steel Sheet, Cold-Rolled, Electrolytic Zinc-Coated.
- ASTM A606 Specification for Steel Sheet and Strip, Hot-Rolled and Cold-Rolled, High Strength, Low-Alloy, with Improved Atmospheric Corrosion Resistance.
- ASTM A716, Specification for Ductile - Iron Culvert Pipe.
- ASTM A746, Specification for Ductile - Iron Gravity Sewer Pipe.
- ASTM A764, Specification for Steel Wire, Carbon, Drawn, Galvanized and Galvanized at Size for Mechanical Springs.
- ASTM A775/A775M, Specification for Epoxy-Coated Reinforcing Steel Bars.
- ASTM A792M Specification for Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- 1.3.3.8 ASTM (B):
- ASTM B32 Specification for Solder Metal.
- ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
- ASTM B88M, Specification for Seamless Copper Water Tube.
- ASTM B370 Specification for Copper Sheet and Strip for Building Construction.
- 1.3.3.9 ASTM (C):
- ASTM C14M, Specification for Concrete Sewer, Storm Drain and Culvert Pipe.
- ASTM C76M, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
- ASTM C88, Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
- ASTM C109, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inches or 50 mm Cube Specimens).
- ASTM C117, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
- ASTM C123, Test Method for Lightweight Pieces in Aggregate.
- ASTM C127, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
- ASTM C128, Test Method for Specific Gravity and Absorption of Fine Aggregate.
- ASTM C131, Test Method for Resistance to Degradation of Small Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
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- ASTM C136, Method for Sieve Analysis of Fine and Coarse Aggregates.  
ASTM C139, Specification for Concrete Masonry Units for Construction of Catchbasins and Manholes.  
ASTM C171, Specification for Sheet Materials for Curing Concrete.  
ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.  
ASTM C332, Specification for Lightweight Aggregates for Insulating Concrete.  
ASTM C443M, Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.  
ASTM C478M, Specification for Precast Reinforced Concrete Manhole Sections.  
ASTM C506M, Specification for Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe.  
ASTM C507M, Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.  
ASTM C827, Test Method for Early Volume Change of Cementitious Mixtures.  
ASTM C902, Specification for Pedestrian and Light Traffic Paving Brick.  
ASTM C939, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.

## 1.3.3.10

## ASTM (D):

- ASTM D140, Method for Sampling Bituminous Materials.  
ASTM D412, Test Method for Rubber Properties in Tension.  
ASTM D413, Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate.  
ASTM D523, Test Method for Specular Gloss.  
ASTM D624, Test Method for Rubber Property-Tear Resistance.  
ASTM D638, Standard Test Method for Tensile Properties of Plastics.  
ASTM D698, Test Method for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 2.49 kg Rammer and 304.8 mm Drop.  
ASTM D746, Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.  
ASTM D792, Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.  
ASTM D822, Recommended Practice for Operating Light - and water - Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products.  
ASTM D882, Standard Test Methods for Tensile Properties of Thin Plastic Sheeting.  
ASTM D995, Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.  
ASTM D1004, ASTM D 1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.  
ASTM D1056, Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.  
ASTM D1203, ASTM D 1203, Standard Test Methods for Volatile Loss from Plastics Using Activated Carbon Methods.  
ASTM D1204, Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.  
ASTM D1238, Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

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- ASTM D1248, Specification for Polyethylene Plastics Molding and Extrusion Materials.
- ASTM D1557, Specification for Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10 lb (4.54 kg) Rammer and 18 inch (457 mm) Drop.
- ASTM D1559, Test Method Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.
- ASTM D1593, Standard Specification for Nonrigid Vinyl Chloride Plastic Film Sheeting.
- ASTM D1603, Standard Test Method for Carbon Black in Olefin Plastics.
- ASTM D1693, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
- ASTM D1751, Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- ASTM D1752, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- ASTM D1784, Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.
- ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- ASTM D1790, Standard Test Method for Brittleness Temperature of Plastic Sheeting by Impact.
- ASTM D1883, Test Method for CBR ( California Bearing Ratio) of Laboratory Compacted Soils.
- ASTM D2241, Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR).
- ASTM D2310, Classification for Machine Made Reinforced Thermosetting Resin Pipe.
- ASTM D2412, Standard Test Method for External Loading Properties of Plastic Pipe by Parallel-Plate Loading.
- ASTM D2419, Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
- ASTM D2466, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- ASTM D2467, Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- ASTM D2657, Practices for Heat Joining Polyethylene Pipe and Fittings.
- ASTM D2680, Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Polyvinyl Chloride (PVC) Composite Sewer Piping.
- ASTM D2774, Practices for Underground, Installation of Thermosplastic Pressure Piping.
- ASTM D2837, Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
- ASTM D2855, Recommended Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- ASTM D2992, Method for Obtaining Hydrostatic Design Basis for Reinforced Thermosetting Resin Pipe and Fittings.
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- ASTM D2996, Specification for Filament Wound Reinforced Thermosetting Resin Pipe.
- ASTM D3034, Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- ASTM D3139, Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
- ASTM D3203, Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
- ASTM D3212, Specification for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals.
- ASTM D3405, Specification for Joint Sealants, Hot Poured for Concrete and Asphalt Pavements.
- ASTM D3803, Standard Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal and Reservoir Lining.
- ASTM D4101, Standard Specification for Propylene Plastic Injection and Extrusion Materials.
- ASTM D4218, Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
- ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- ASTM D4595, Test Method for Tensile Properties by the Wide Width Strip Method.
- ASTM D4716, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
- ASTM D4751, Test Method for Determining the Apparent Opening Size of a Geotextile.
- ASTM D4791, Test Method for Flat and Elongated Particles in Coarse Aggregate.
- ASTM D5262, Standard Test Method for Evaluating the Unconfined Tension Creep Behaviour of Geosynthetics.
- 1.3.3.11 ASTM (E):
- ASTM E11, Specification for Wire Cloth Sieves for Testing Purposes.
- ASTM E1155M, Test Method for Determining Floor Flatness and Levelness Using the F-Number System.
- 1.3.3.12 ASTM (F):
- ASTM F477, Specification for Elastomeric Seals (Gaskets) for joining Plastic Pipe.
- ASTM F679, Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-DR) Based on Outside Diameter.
- ASTM F794, Specification for Polyvinyl Chloride (PVC) Ribbed Gravity Sewer Pipe and Fittings based on Controlled Inside Diameter.
- 1.3.3.13 AWWA: (See ANSI/AWWA)
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- 1.3.3.14 BNQ-3624-115, Thermal Plastic Pipe, Flexible Corrugated Tubing and Fittings for Soil Drainage.
- 1.3.3.15 CAN3 = CAN/CSA:
- CAN3-B137.3, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.  
CAN4-S543, Internal Lug, Quick-Connect Couplings for Fire Hose.  
CAN3-B70, Cast Iron Soil Pipe and Fittings, and Means of Joining.  
CAN3-G401, Corrugated Steel Pipe Products.
- 1.3.3.16 CAN4:
- CAN4-S543, Internal Lug, Quick-Connect Couplings for Fire Hose.
- 1.3.3.17 CAN/CGA:
- CAN/CGA-B149.1 Natural Gas Installation Code.
- 1.3.3.18 CAN/CSA = CAN3:
- CAN/CSA-A5, Portland Cement.  
CAN/CSA-A8, Masonry Cement.  
CAN/CSA-A23.1, Concrete Materials and methods for Concrete Construction.  
CAN/CSA-A23.2, Methods of Testing for Concrete.  
CAN/CSA-23.5, Supplementary Cementing Materials.  
CAN/CSA-A231.2, Precast Concrete Pavers.  
CAN/CSA-A257 Series, Standards for Concrete Pipe.  
CAN/CSA-A266.1, Air-Entraining Admixtures for Concrete.  
CAN/CSA-A266.2, Chemical Admixtures for Concrete.  
CAN/CSA-A266.4, Guidelines for the use of Admixtures in Concrete.  
CAN/CSA-A362, Blending Hydraulic Cement.  
CAN/CSA-A363, Cementitious Hydraulic Slag.  
CAN/CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.  
CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.  
CAN/CSA-G40.21, Structural Quality Steels.  
CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.  
CAN/CSA-O80-Series, Wood Preservation.
- 1.3.3.19 CAN/CGSB:
- CAN/CGSB-4.2, Textile Test Methods.  
CAN/CGSB-8.1, Sieves Testing, Woven Wire.  
CAN/CGSB-8.2, Sieves Testing, Woven Wire, Metric.  
CAN/CGSB-16.1, Asphalts, Liquids Petroleum, for Road Purposes.  
CAN/CGSB-16.2, Asphalts, Emulsified, Anionic Type, for Road Purposes.  
CAN/CGSB-16.3, Asphalt Cements for Road Purposes.  
CAN/CGSB-16.5, Asphalt, Emulsified, High Float Type, for Road Purposes.  
CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.  
CAN/CGSB-37.5 Cutback Asphalt Plastic Cement.
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- CAN/CGSB-51.32 Sheathing, Membrane, Breather Type.  
CAN/CGSB-93.1 Sheet, Aluminum Alloy, Prefinished, Residential.  
CAN/CGSB-138.1, Fence, Chain Link, Fabric.  
CAN/CGSB-138.2, Fence, Chain Link, Framework, Zinc-Coated, Steel.  
CAN/CGSB-138.3, Fence, Chain Link - Installation.  
CAN/CGSB-138.4, Fence, Chain Link, Gates.  
CAN/CGSB-148.1, Methods of Testing Geotextiles and Geomembranes.
- 1.3.3.20 CAN/ULC-S520, Standard for Fire Hydrants.
- 1.3.3.21 CGSB:
- CGSB 1-GP-12c, Standard Paint Colours.  
CGSB 1-GP-59M, Enamel, Exterior Gloss Alkyd Type.  
CGSB 1-GP-5M, Thinner, Petroleum Spirits, Low Flash (R/84).  
CGSB 1-GP-71, Method of Testing Paints and Pigments.  
CGSB 1-GP-74M, Paint, Traffic, Alkyd.  
CGSB 1-GP-149M, Paint, Traffic, Reflectorized Alkyd, White and Yellow.  
CGSB 1-GP-181M, Coating, Zinc-Rich, Organic, Ready Mixed.  
CGSB 15-GP-1M, Calcium Chloride.  
CGSB 41-GP-25M, Pipe, Polyethylene, for the Transport of Liquids.  
CGSB 41-GP-29Ma, Tubing, Plastic, Corrugated, Drainage.  
CGSB 51-GP-51M, Polyethylene Sheet for Using in Building Construction.
- 1.3.3.22 CSA:
- CSA A60.1, Vitrified Clay Pipe.  
CSA A60.3, Vitrified Clay Pipe Joints.  
CSA A82.5, Structural Clay Non-Load-Bearing Tile.  
CSA A82.56, Aggregate for Masonry Mortar.  
CSA A257, Standards for Concrete Pipe.  
CSA A257, Standards for Concrete Pipe.  
CSA B111 Wire Nails, spikes and Staples.  
CSA B137.0, Definitions, General Requirements, and Methods of Testing for Thermoplastic Pressure Piping.  
CSA B1337.1, Polyethylene Pipe, Tubing and Fittings for cold Water Pressure Services.  
CSA B137.2, PVC Injection Moulded Gasketed Fittings for Pressure Applications.  
CSA B137.3, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Application.  
CSA B137.6, CPVC Pipe, Tubing and Fittings for Hot and Cold Water Distribution Systems.  
CSA B137.7, Polybutylene (PB) Pipe for Cold Water Distribution Systems.  
CSA B137.8, Polybutylene (PB) Pipe for Pressure Applications.  
CSA B137.9, M91, Polyethylene / Aluminum / Polyethylene Composite Pressure Pipe.  
CSA B137.16, Recommended Practice for the Installation of CPVC Piping for Hot and Cold Water Distribution Systems.  
CSA B181.12, Recommended Practice for the Installation of PVC Drain, Waste and Vent Pipe Fittings.
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- CSA B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.  
CSA B182.11, Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings.  
CSA B182.2, Large Diameter, Type PSM PVC Sewer Pipe and Fittings.  
CSA B182.4, Large Diameter Ribbed PVC Sewer Pipe and Fittings.  
CSA C22.1, Safety Standard for Electrical Installations.  
CSA C22.2, Canadian Electrical Code, General Requirements.  
CSA C22.3, Canadian Electrical Code Outside Wiring.  
CSA G30.3, Cold Drawn Steel Wire for Concrete Reinforcement.  
CSA G30.5, Welded Steel Wire Fabric for Concrete Reinforcement.  
CSA G30.12, Billet-Steel Wire for Concrete Reinforcement.  
CSA G30.14, Deformed Steel Wire for Concrete Reinforcement.  
CSA G30.15, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.  
CSA G30.16, Weldable Low Allow Steel Deformed Bars for Concrete Reinforcement.  
CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.  
CAN3-O188.0, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.  
CSA S157, Strength Design in Aluminum.  
CSA S269.1, Falsework for Construction Purposes.  
CSA S269.3, Formwork.  
CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.  
CSA W59, Welded Steel Construction (Metal Arch Welding).  
CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

2 PRODUCTS

(Not Applicable)

3 EXECUTION

(Not Applicable)

END OF SECTION 01420

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## 1 GENERAL

### 1.1 General

- 1.1.1 During the progress of THE WORK, perform a sufficient number of tests and inspections to determine and demonstrate to the satisfaction of the Authorized Person that MATERIAL, PRODUCT and installation meet the specified requirements.

### 1.2 Inspection

- 1.2.1 Allow Authorized Person access to the Work. If part of the Work is in preparation at locations other than the Place of the Work, provide access to such work whenever it is in progress.
- 1.2.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by the Authorized Person's instructions, or by the law of the Place of the Work.
- 1.2.3 If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have the inspections or tests satisfactorily completed and make good such Work.
- 1.2.4 The Authorized Person may order, at the cost of the Contractor, any part of the Work to be examined if the Work is suspected to be not in accordance with the specifications. If, upon examination such work is found not in accordance with specifications, correct such Work and pay cost of examination and correction.

### 1.3 Independent Inspection Agencies

- 1.3.1 Unless otherwise directed in the project-specific Contract Documents, retain the services of an Independent Inspection/Testing Agency, acceptable to the Authorized Person, for the purpose of inspecting and/or testing portions of Work.
- 1.3.2 Provide equipment required for executing inspection and testing by the appointed agencies, unless directed otherwise in the project-specific Contract Documents.
- 1.3.3 Testing services for quality control include, but are not limited to, the following:
- 1.3.3.1 Sieve analysis of granular material and aggregates to be supplied to the work.
  - 1.3.3.2 Mix designs for asphalt and concrete.
  - 1.3.3.3 Maximum Dry (Standard Proctor) Density curves for backfill and approved borrow materials.
  - 1.3.3.4 Compaction control tests for backfilling and road construction.

- 1.3.3.5 Asphalt and concrete testing as required and specified under other sections of the specifications.
- 1.3.4 The Authorized Person may retain and pay for the services of an independent testing agency for testing for quality assurance, for the City's purposes.
- 1.3.5 Employment of inspection/testing agencies by the Authorized Person does not relax the responsibility to perform Work in accordance with the Contract Documents.
- 1.3.6 If defects are revealed during inspection and/or testing, the independent testing agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by the Engineer or Authorized Person.
- 1.4 Access to Work
  - 1.4.1 Allow inspection/testing agencies access to the Work, off site manufacturing and fabrication plants.
  - 1.4.2 Co-operate to provide reasonable facilities for such access.
- 1.5 Procedures
  - 1.5.1 Notify the appropriate agency and the Authorized Person in advance of the requirement for tests, in order that attendance arrangements can be made.
  - 1.5.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.
  - 1.5.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.
- 1.6 Rejected Work
  - 1.6.1 Remove defective Work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Work or not, which has been rejected by the Authorized Person as failing to conform to the specifications. Replace or re-execute in accordance with the Specifications.
  - 1.6.2 Rectify other Contractor's work damaged by such removals or replacements promptly.
- 1.7 Reports
  - 1.7.1 Submit three copies of inspection and test reports to the Authorized Person.

1.8 Tests and Mix Designs

1.8.1 Furnish test results and mix designs as may be requested.

1.9 Mill Tests

1.9.1 Submit mill test certificates as required in the specification Sections.

2 PRODUCTS

(Not Applicable)

3 EXECUTION

(Not Applicable)

END OF SECTION 01450

**1 GENERAL**

- 1.1 Section 01510 specifies general requirements for temporary and construction facilities not incorporated into the final or permanent work. This section must be referenced to and interpreted in conjunction with other sections pertinent to the works described herein.
- 1.2 Installation and Removal
  - 1.2.1 Provide temporary utilities and construction facilities in order to execute work expeditiously.
  - 1.2.2 Remove from site all such work after use.
- 1.3 Dewatering
  - 1.3.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- 1.4 Water Supply
  - 1.4.1 When specified in the Contract Documents, provide continuous supply of potable water for work force use during construction.
- 1.5 Sanitary Facilities
  - 1.5.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
  - 1.5.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- 1.6 Temporary Power and Light
  - 1.6.1 Provide temporary power during construction for temporary lighting and operating of power tools as required for constructing the Work.
  - 1.6.2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.
  - 1.6.3 Electrical power and lighting systems installed under the Work may be used for construction requirements only with prior approval of the Authorized Person provided that guarantees are not affected.

1.7 Communication Facilities

- 1.7.1 When specified in the Contract Documents, provide and pay for temporary telephone and fax hook up necessary for own use and use of the Authorized Person or Engineer.

1.8 Site Storage/Loading

- 1.8.1 Confine work and operations to limits shown on drawings. Do not unreasonably encumber premises with products.
- 1.8.2 Do not load or permit to load any part of work with a weight or force that will endanger the work.

1.9 Construction Parking

- 1.9.1 Provide parking on site to the extent that it does not disrupt performance of Work.
- 1.9.2 Provide and maintain adequate access to project site.
- 1.9.3 Build and maintain temporary roads where indicated or directed by the Authorized Person and provide snow removal during period of the Work.
- 1.9.4 If authorized to use existing City roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.10 Security

- 1.10.1 Contractor is responsible to provide security personnel as required to guard site and contents of site after working hours and during holidays.

1.11 Site Offices

- 1.11.1 Provide offices for own use and that of the Engineer's representative as required.
- 1.11.2 Provide appropriate first-aid personnel, facilities and supplies in accordance with Workers' Compensation Board requirements.
- 1.11.3 Subcontractors may provide their own offices as necessary. Direct location of these offices.

**1.12 Equipment, Tool and Materials Storage**

1.12.1 Contractor to provide and maintain, in a clean and orderly condition, its own lockable weatherproof sheds for storage of tools, equipment and materials.

1.12.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

**1.13 Public Notice**

1.13.1 Advise residents and other parties within the affected area of planned construction activities and schedule. Coordinate with and obtain the Authorized Person's approval before delivery or mailing of public notices.

**1.14 Fire Protection**

1.14.1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

1.14.2 Comply with requirements of Clean Air Bylaw.

1.14.3 Burning rubbish and construction waste materials is not permitted on site.

**2 PRODUCTS**

(Not Applicable)

**3 EXECUTION**

(Not Applicable)

END OF SECTION 01510

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 01353 – Traffic Control.

1.1.2 Section 01510 – Temporary Construction Facilities.

**1.2 Installation and Removal**

1.2.1 Provide temporary controls in order to execute the Work expeditiously.

1.2.2 Remove from site all such temporary controls after use.

**1.3 Hoarding**

1.3.1 Temporary site enclosures where required to be new 1.2 metre high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 metre on centre. Provide one lockable truck gate. Maintain fence in good repair.

1.3.2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures

**1.4 Guard Rails and Barricades**

1.4.1 When excavating trenches in City Roads, walkways, and other City lands, authorization in writing must be given by the Authorized Person, or his designate, to allow excavations to remain open at the end of a day's operation.

1.4.2 All unattended open excavations must be encircled with bright orange plastic snow fencing and barricades with flashing amber lights. Signage, approved by the Authorized Person or his designate, shall be erected to advise the public traveling within the road, walkway, right-of-way or City lands, of the hazard.

1.4.3 Provide secure, rigid guard rails, concrete barriers or barricades around excavations exceeding 3 metres and open shafts.

**1.5 Access to Site**

1.5.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to the Work.

1.5.2 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform the Work and protect the public as required under Section 01353 Traffic Control.

1.5.3 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.6 Protection for Off-Site and Public Property**

1.6.1 Protect surrounding property from damage during performance of the Work.

1.6.2 Rectify all damage incurred as a result of construction operations.

1.7 Protection of Building Finishes

1.7.1 Provide protection for building finishes and equipment during performance of the Work.

1.7.2 Provide screens, covers, and hoardings as required to protect the buildings.

1.7.3 Rectify damage incurred due to lack of or improper protection.

2 PRODUCTS

(Not Applicable)

3 EXECUTION

(Not Applicable)

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1 GENERAL

## 1.1 Definitions

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1.1.1 Stream is defined as per the Province of British Columbia *Water Sustainability Act* [SBC 2014].

## 1.2 Environmental Impact Studies and Environmental Management Plans

1.2.1 When requested by Authorized Person, prepare an Environmental Impact Study. The Environmental Impact Study shall be carried out by a qualified professional as determined by the Authorized Person. The qualified professional, or professionals, may include a Professional Engineer, a Registered Professional Biologist, a Registered Professional Agrologist, Registered Professional Archeologist, or other professional specialist, licensed to practice in the Province of British Columbia.

1.2.2 An Environmental Impact Study may include, but is not limited to, a:

- (i) fish and wildlife inventory;
- (ii) fish and wildlife habitat inventory;
- (iii) riparian vegetation assessment;
- (iv) benthic study;
- (v) terrestrial habitat study;
- (vi) groundwater quality impact study;
- (vii) leachate or gas migration study; or
- (viii) archeological impact study.

1.2.3 Following review of the Environmental Impact Study, the Authorized Person will determine the requirement or need to prepare an Environmental Management Plan.

1.2.4 Prepare and Environmental Management Plan when work is within 50 metres of a stream.

1.2.5 An Environmental Management Plan:

- (i) shall be prepared by a qualified profession(s) as determined by the Authorized Person;
- (ii) shall be reviewed by all applicable federal and provincial agencies;
- (iii) shall include prescriptive measures to be carried out by the Contractor, Owner or work crews, responsible for the works on-site or within streams.

1.2.6 Complete Works in accordance with the Environmental Work Plan.

## 1.3 Fires

1.3.1 All works performed under this Section must comply with the requirements of the Clean Air Bylaw No. 7232, 2000.

1.3.2 Comply with all regulations as required under provincial and federal government legislation.

1.3.3 Burning of land clearing debris, paper or wood products, noxious wastes, construction and demolition wastes, plastics, tar, oil, tires, garbage, refuse, rubbish on site is not permitted.

#### 1.4 Disposal of Wastes

1.4.1 All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw No. 7022, 1999.

1.4.2 Comply with all regulations as required under provincial and federal government legislation.

1.4.3 Do not bury land clearing debris, concrete or asphalt demolition materials, paper or wood products, hydrocarbons, noxious wastes, construction and demolition waste materials, plastics, tar, tires, garbage, sewage, or refuse.

1.4.4 Do not pump or dispose of organic wastes, hydrocarbons, salts, or volatile materials, such as, mineral spirits, oil or paint thinner into streams, drainage channels, storm or sanitary sewers or ditches. Such wastes shall be completely contained onsite and removed for disposal at facilities licensed to receive such wastes.

#### 1.5 Drainage

1.5.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

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1.5.2 Do not pump water containing silt or clay sediments, deleterious substances, suspended solids materials into streams, sewers or drainage systems. Install the appropriate sediment control systems in accordance with Section 1.7 – Work Adjacent to Streams.

1.5.3 Control disposal or runoff of water containing silt or clay sediments, suspended solid materials or other substances harmful to aquatic life habitat in accordance with all federal, provincial and local government regulations and guidelines.

#### 1.6 Site Clearing and Plant Protection

1.6.1 Clearing and removal of trees is not permitted in areas and zoning districts designated under the Tree Protection Bylaw, City of Prince George Bylaw No. 6343. Perform clearing activity in compliance with the City of Prince George Bylaw No. 6343.

1.6.2 Protect trees and plants, including root structures, on adjacent properties and, where indicated on construction drawings, designated areas onsite.

1.6.3 Protect roots of designated trees to drip line during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

1.6.4 Minimize stripping of topsoil and vegetation.

1.6.5 Restrict tree removal to areas indicated or designated by City's Authorized Person.

#### 1.7 Work Adjacent to Streams

1.7.1 No work within 30 metres of creeks, streams or waterways shall proceed without written authorization from federal and provincial regulatory agencies.

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1.7.2 In accordance with the Official Community Plan, riparian leave strips shall remain to protect fish and wildlife habitat.

1.7.3 Conduct an Environmental Impact Study as required.

1.7.4 Prepare an Environmental Management Plan as required.

1.7.5 Do not operate construction equipment within 30 metres of streams without approval of federal, provincial and local government authorities.

1.7.6 Do not use stream beds for borrow material or excavate need or in waterway beds without approval from Federal and/or Provincial authorities having jurisdiction.

1.7.7 Do not dump excavated fill, waste material or debris in streams.

1.7.8 Design and construct temporary crossings to minimize erosion to streams.

1.7.9 Do not skid logs or construction materials across streams.

1.7.10 Avoid spawning beds when constructing temporary crossings of streams.

1.7.11 Do not blast under water or within 100 m of indicated spawning beds.

#### 1.8 Release of Chlorinated Water to Environment

1.8.1 Related Section: 02511 Water Mains.

1.8.2 Comply with all Federal and Provincial regulations.

1.8.3 Do not release chlorinated water into streams.

1.8.4 Release of chlorinated water into ditches, drainage channels, storm

sewers or sanitary sewers only when approved by Authorized Person and when supervised by representative of Authorized Person or Engineer. Water shall be de-chlorination in accordance with AWWA C651-99 prior to release.

1.9     Pollution Control

1.9.1    Provide and maintain temporary erosion and pollution control features.

1.9.2    Control emissions from equipment and plant to Provincial emission regulations and Provincial authority requirements.

1.9.3    Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

1.9.4    Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

2        PRODUCTS

(Not Applicable)

3        EXECUTION

(Not Applicable)

END OF SECTION 01561

**1 GENERAL****1.1 Section includes:**

- 1.1.1 Field engineering survey services to measure and stake the site.
- 1.1.2 Survey services to establish and confirm invert measurements for the Work.
- 1.1.3 Recording of subsurface conditions found.

**1.2 Qualifications of Construction Layout Surveyor**

- 1.2.1 Qualified Professional Engineer, Engineer in Training, Certified Engineering Technologist or registered Land Surveyor, licensed to practice in British Columbia, unless otherwise approved by the Authorized Person.

**1.3 Survey Reference Points**

- 1.3.1 Locate, confirm and protect existing base horizontal and vertical control points prior to starting site work. Preserve permanent reference points during construction.
- 1.3.2 Make no changes or relocations without prior written notice to Engineer.
- 1.3.3 Report to Engineer when a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- 1.3.4 Replace lost or damaged control points in accordance with original survey control.

**1.4 Integrated Control Survey Monuments and Legal Property Pins**

- 1.4.1 Locate, confirm and protect existing integrated control survey monuments and legal survey property pins prior to starting site work. Preserve such monuments and property pins during construction.
- 1.4.2 Report to Engineer and Authorized Person when an integrated control survey monument or legal survey property pin is lost or destroyed, or requires temporary removal by a registered Land Surveyor licensed to practice in the Province of British Columbia because of necessary changes in grades or locations.
- 1.4.3 Reinstate or replace any and all integrated control survey monuments and legal survey property pins that are destroyed, moved or altered during construction of the Work. Reinstatement or replacement must be performed by a registered land surveyor licensed to practice in British Columbia. Make no changes or relocations without prior written notice to Engineer and Authorized Person.

**1.5 Construction Layout Survey Requirements**

- 1.5.1 Establish bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

- 1.5.2 Establish lines and levels, locate and lay out, by instrumentation.
- 1.5.3 Stake for grading, fill and topsoil placement and landscaping features.
- 1.5.4 Stake slopes and berms.
- 1.5.5 Establish pipe invert elevations.
- 1.5.6 Stake batter boards for foundations.
- 1.5.7 Establish lines and levels for mechanical and electrical work.
- 1.6 Existing Services
  - 1.6.1 Before commencing work, establish location and extent of service lines in area of Work and notify Engineer of findings.
  - 1.6.2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Engineer.
- 1.7 Records
  - 1.7.1 Maintain a complete, accurate log of control and survey work as it progresses.
  - 1.7.2 Record locations of maintained, re-routed and abandoned service lines.
  - 1.7.3 On request of the Authorized Person, submit documentation to verify accuracy of field engineering work.
- 2 PRODUCTS
  - (Not Applicable)
- 3 EXECUTION
  - (Not Applicable)

END OF SECTION 01720

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02315 - Excavating, Trenching and Backfilling.

1.1.2 Section 02317 - Roadway Excavation Embankment and Compaction.

**1.2 Special Requirements**

1.2.1 All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw No. 7022, 1999.

**1.3 References**

1.3.1 GRI GG1, Geogrid Tensile Strength.

1.3.2 GRI GG2, Geogrid Junction Strength

**1.4 Delivery and Storage**

1.4.1 During delivery and storage, protect geogrids from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

**2 PRODUCTS****2.1 Material**

2.1.1 Geogrid: open grid polymer having uniaxial or biaxial orientation as indicated on approved Construction Drawings, free of striations, roughness, pinholes, blisters, undispersed raw materials or any sign of contamination by foreign matter.

2.1.1.1 Polymer: Biaxial geogrid - polypropylene: to ASTM D 4101.

2.1.1.2 Polymer: Uniaxial geogrid - high density polyethylene: to ASTM D 1248.

2.1.1.3 Polymer to have inhibitors added to resist deterioration by ultra-violet and heat exposure.

**2.1.2 Geogrid physical properties:**

2.1.2.1 Peak tensile strength: to GRI GG1. (Geosynthetic Research Institute, Drexel University).

2.1.2.2 Tensile secant modulus at 2% elongation: to GRI GG1.

2.1.2.3 Tensile creep strength: to ASTM D 5262.

2.1.2.4 Rigid geogrid junction strength and efficiency: to GRI GG2 (not applicable to flexible geogrid).

2.1.2.5 Carbon black content: to ASTM D 4218.

### **3 EXECUTION**

#### **3.1 Installation**

3.1.1 Place geogrid material by unrolling onto graded surface in manner and locations indicated and retain in position in accordance with manufacturer's written recommendations.

3.1.2 Place geogrid on sloping surfaces in one continuous length from toe of slope to upper extent of geogrid.

3.1.3 Overlap each successive strip of geogrid 600 mm over previously laid strip.

3.1.4 Join successive strips of geogrid by tying or pinning as recommended by manufacturer.

3.1.5 Protect geogrid from displacement, damage or deterioration before and during placement of overlay soil layers.

3.1.6 After installation, cover with overlay layer within 10 days of placement.

3.1.7 Replace damaged or deteriorated geogrid to approval of Engineer.

#### **3.2 Protection**

3.2.1 No vehicles permitted directly on geogrid.

END OF SECTION 02071

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02315 - Excavating, Trenching and Backfilling.

1.1.2 Section 02317 - Roadway Excavation Embankment and Compaction.

**1.2 Special Requirements**

1.2.1 All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw No. 7022.

**1.3 Delivery and Storage**

1.3.1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

**2 PRODUCTS****2.1 Material**

2.1.1 Geotextile: woven or non-woven synthetic fibre fabric as indicated, supplied in rolls.

2.1.1.1 Composed of: minimum 85% by mass of polypropylene or polyester with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.

**2.1.2 Physical properties:**

2.1.2.1 Thickness: to CAN/CGSB-148.1, No.3.

2.1.2.2 Mass per unit area: to CAN/CGSB-148.1, No.2.

2.1.2.3 Tensile strength and elongation (in any principal direction): to ASTM D 4595.

2.1.2.4 Seam strength: equal to or greater than tensile strength of fabric.

2.1.2.5 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.

2.1.2.6 Ball burst strength: to CAN/CGSB-4.2, method 11.2.

2.1.2.7 Bursting strength: to CAN/CGSB-148.1, No.6.1.

2.1.3 Hydraulic properties:

2.1.3.1 Apparent opening size (AOS): to ASTM D 4751.

2.1.3.2 Transmissivity: to ASTM D 4716.

2.1.3.3 Permittivity: to ASTM D 4491.

2.1.4 Securing pins and washers: to CAN/CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m<sup>2</sup> to CAN/CSA G164.

**3 EXECUTION**

3.1 Installation

3.1.1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position in accordance with manufacturer's written recommendations.

3.1.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

3.1.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

3.1.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

3.1.5 Join successive strips of geotextile by sewing or pinning as indicated.

3.1.6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

3.1.7 After installation, cover with overlying layer within 4 h of placement.

3.1.8 Replace damaged or deteriorated geotextile to approval of Engineer.

3.2 Protection

3.2.1 No vehicles permitted directly on geotextile.

END OF SECTION 02072

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1 GENERAL

1.1 Related Work

1.1.1 Section 02315 - Excavating, Trenching and Backfilling.

1.2 Quality Control testing

1.2.1 Test quality of resin and membrane to ensure consistency of raw material and geomembrane quality in accordance with manufacturer's recommendations.

1.2.2 Test seams in strength and peel at beginning of each seaming period, and at least once every 4 hours if welding operation is interrupted, for each seaming apparatus and seamer used that day. Also test at least two samples from each panel, with samples taken from extra material, such that panel is not damaged and blanket geometry is not altered.

1.2.3 If seam test specimen fails in seam, repeat on new specimen. If new specimen fails in seam, seaming apparatus or seamer shall not be accepted and shall not be used for seaming until deficiencies are corrected and two consecutive successful test seams are achieved.

1.2.4 Test seams by non-destructive methods over their full length, using vacuum test unit or air pressure test as indicated.

1.2.4.1 Vacuum chamber to contain glass viewport and seal for sealing chamber to seam area. With chamber sealed in place and after partly filling chamber with water, apply vacuum of 17.2 kPa. Seam failure is detected by presence of air bubbles through water.

1.2.4.2 Use air lance to apply air at 343 kPa through nozzle directed at edge of overlap seam. Seam failure is indicated by inflation or lifting of any part of geomembrane.

1.2.5 Provide test results to Engineer for each shift's production, including documentation of non-destructive testing and of repairs.

1.3 Shop Drawing

1.3.1 Indicate installation layout, dimensions and details, including fabricated and field seams, anchor trenches and protrusion details.

1.4 Delivery and Storage

1.4.1 During delivery and storage, protect geomembranes from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

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2 PRODUCTS

## 2.1 Materials

## 2.1.1 Geomembrane: extruded synthetic sheet.

2.1.1.1 Supplied in rolls or panels of width and size as indicated.

2.1.1.2 Composed of high density polyethylene or polyvinyl chloride resin with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.

2.1.1.3 Reinforced with 9 x 9 - 1000 denier woven polyester scrim where required.

## 2.1.2 Physical properties:

2.1.2.1 Specific gravity of resin: to ASTM D 792, Method A, minimum 0.93.

2.1.2.2 Melt index of resin: to ASTM D 1238, Condition E, minimum 0.14 g/min.

2.1.2.3 Thickness: to ASTM D 1593, minimum 2 mm.

2.1.2.4 Tensile strength and elongation at yield: to ASTM D 638:

- a) Tensile strength: minimum 35 N/mm.
- b) Elongation: minimum 13 %.

2.1.2.5 Tensile strength and elongation at break: to ASTM D 638:

- c) Tensile strength: minimum 40 N/mm.
- d) Elongation: minimum 700 %.

2.1.2.6 Modulus of elasticity: to ASTM D 638, minimum 550 kPa.

2.1.2.7 Tear resistance: to ASTM D 1004, Die C, minimum 250 N.

2.1.2.8 Puncture resistance: to Federal Tests Methods Standards, USA, 101 B/2065; minimum 300 N.

2.1.2.9 Resistance to soil burial: to ASTM D 3083, as modified by National Sanitation Foundation, Standard Number 54, Appendix A, maximum 10%.

2.1.2.10 Dimensional stability, each direction: to ASTM D 1204, 100°C, 1 h, maximum 1%.

2.1.2.11 Environmental stress crack: to ASTM D 1693, as modified by National Sanitation Foundation, Standard Number 54, Appendix A, minimum 1000 h.

- 2.1.2.12 Low temperature brittleness: to ASTM D 746, Procedure B, minus 40°C.
- 2.1.2.13 Brittleness temperature: to ASTM D 1790.
- 2.1.2.14 Carbon black content: to ASTM D 1603, minimum 2%, maximum 3% by mass.
- 2.1.2.15 Seam strength (at yield point): to ASTM D 3083, as modified by National Sanitation Foundation, Standard Number 54, Appendix A, 280 N and film tear bond.
- 2.1.2.16 Seam peel adhesion: to ASTM D 413 or ASTM D 638, or ASTM D 882, as modified by National Sanitation Standard Number 54, Appendix A; film tear bond.
- 2.1.2.17 Total content of additives, fillers or extenders: maximum 3% by weight.
- 2.1.2.18 Geomembrane: free of striations, roughness, pinholes, bubbles, blisters, undispersed raw materials and any sign of contamination by foreign matter.
- 2.1.2.19 Volatile loss: to ASTM D 1203.
- 2.1.2.20 Other properties as indicated.
- 2.1.3 Seams: welded in accordance with manufacturer's recommendations. Physical properties for resin used for welding to be same as those for resin used in manufacture of membrane.

### 3 EXECUTION

#### 3.1 Installation

- 3.1.1 Maintain area of installation free of water and snow accumulations.
- 3.1.2 Repair excessively soft supporting material as directed by Engineer.
- 3.1.3 Do not proceed with panel placement and seaming when ambient temperatures are below minus 5°C or above 40°C, during any precipitation, in presence of excessive moisture (e.g. fog, dew), nor in presence of high winds.
- 3.1.4 Place and seam panels in accordance with manufacturer's recommendations on graded surface in orientation and locations indicated. Minimize wrinkles, avoid scratches and crimps to geo-membranes and avoid damage to supporting material.
- 3.1.5 Protect installed membrane from displacement, damage or deterioration before, during and after placement of material layers.

- 3.1.6 Replace damaged, torn or permanently twisted panels to approval of Engineer. Remove rejected damaged panels from site.
  - 3.1.7 Keep field seaming to minimum. Locate field seams up and down slopes, with no horizontal field seam less than 1.5 metres beyond toe of slope.
  - 3.1.8 Keep seam area clean and free of moisture, dust, dirt, debris and foreign material.
  - 3.1.9 Make field seam samples in accordance with requirements on fragment pieces of geo-membrane and test to verify that seaming conditions are adequate.
  - 3.1.10 Test field seams as seaming work progresses by non-destructive methods over their full length. Repair seams which do not pass non-destructive test. Reconstruct seam between failed location and any passed test location, until non-destructive testing is successful.
  - 3.1.11 Repair minor tears and pinholes by patching until non-destructive testing is successful. Patches to be round or oval in shape, made of same geo-membrane material, and extend minimum of 75 mm beyond edge of defect.
- 3.2 Protection
- 3.2.1 Do not permit passage of any vehicle directly on membrane at any time.

END OF SECTION 02073

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1 GENERAL

1.1 Related Sections

1.1.1 Section 01561 – Environmental Protection.

1.1.2 Section 02315 - Excavating, Trenching and Backfilling.

1.1.3 Section 01353 – Traffic Control

1.2 References

1.2.1 Canadian Federal Legislation:

1.2.1.1 Canadian Environmental Protection Act (CEPA), 1988.

1.2.1.2 Canadian Environmental Assessment Act (CEAA), 1995.

1.2.1.3 Transportation of Dangerous Goods Act (TDGA), 1992.

1.2.1.4 Motor Vehicle Safety Act (MVSA), 1995

1.2.1.5 Traffic Control for related works.

1.2.2 All works performed under this Section must comply with the requirements of the Clean Air Bylaw No. 7232, 2000.

1.2.3 All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw No. 7022, 2000.

1.2.4 All works performed under this Section must comply with the requirements of the Tree Protection Bylaw No.6343, 1995.

1.3 Storage and Protection

1.3.1 Obtain all required City permits where and when applicable, including soil removal and deposition permits, building demolition permits and permission to construct on City lands.

1.3.2 Obtain all necessary approvals and permits from Provincial and Federal government regulators and agencies.

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- 1.3.3 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Engineer.
  - 1.3.4 In all circumstances ensure that demolition activity does not cause damage to or impacts watercourses, groundwater and wildlife, or contribute to excess air and noise pollution. Comply with Section 01561 Environmental Protection.
  - 1.3.5 Do not dispose of waste of volatile materials such as, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout the project.
  - 1.3.6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
  - 1.3.7 Contain and control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
  - 1.3.8 Protect trees, plants and foliage on site and adjacent properties where indicated.
  - 1.4 Existing Conditions
    - 1.4.1 Prior to the start of any demolition work remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of in safe manner in accordance with all applicable regulatory requirements.
- 2 PRODUCTS
- 2.1 Equipment
    - 2.1.1 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
    - 2.1.2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.
    - 9397, 2023 2.1.3 Ensure construction equipment is thoroughly cleaned and free of leaks.
- 3 EXECUTION
- 3.1 Preparation
    - 3.1.1 Inspect site and verify with Engineer items designated for removal, disposal, salvage and items to remain.
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- 3.1.2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
  - 3.1.3 Notify utility companies before starting demolition.
  - 3.2 Sequence of Operation
    - 3.2.1 Remove items as indicated.
    - 3.2.2 Do not disturb adjacent items designated to remain in place.
    - 3.2.3 In removal of pavements, curbs and gutters:
      - 3.2.3.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Engineer.
      - 3.2.3.2 Protect adjacent joints and load transfer devices.
      - 3.2.3.3 Protect underlying and adjacent granular materials.
    - 3.2.4 When removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving, prevent contamination with base course aggregates.
    - 3.2.5 When removing pipes under existing or future pavement area, excavate at least 300 mm below pipe invert or to native soil below pipe bedding.
    - 3.2.6 Remove only designated trees during demolition. Obtain written approval of Engineer prior to removal of any trees not designated.
    - 3.2.7 Stockpile topsoil for final grading and landscaping. Provide erosion control and seeding if not immediately used.
  - 3.3 Salvage
    - 3.3.1 Carefully dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated.
  - 3.4 Sealing
    - 3.4.1 Seal pipe ends and walls of manholes or catch basins as indicated. Securely plug to form watertight seal.
  - 3.5 Disposal Of Material
    - 3.5.1 Dispose of materials not designated for salvage or re-use in work off-site. Identify location of disposal site to Engineer and to City. If material is suitable for fill or road construction material, obtain all necessary permits to deposit soil on off-site lands.
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3.5.2 Trim disposal areas to approval of Engineer.

3.6 Restoration

3.6.1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

3.7 Site Cleanup

3.7.1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

END OF SECTION 02225

**1      GENERAL**

**1.1      Related Sections**

- 1.1.1      Section 01561 – Environmental Protection.
- 1.1.2      Section 02225 – Sitework Demolition and Removal.
- 1.1.3      Section 02721 – Granular Base.
- 1.1.4      Section 02723 – Granular Sub-base.
- 1.1.5      Section 02741 – Hot-Mix Asphalt Concrete Paving.

**1.2      Special Requirements**

- 1.2.1      All works performed under this Section must comply with the requirements of the Clean Air Bylaw No. 7232, 2000.
- 1.2.2      All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw No. 7022, 1999.
- 1.2.3      Obtain necessary permits as required from Provincial and Federal government regulators and agencies.

**1.3      Protection**

- 1.3.1      Protect existing structures and pavement not designated for removal from damage. In event of damage, immediately replace or make repairs to approval of City.

**2      PRODUCTS**

(Not Applicable)

**3      EXECUTION**

**3.1      Preparation**

- 3.1.1      Prior to commencing removal operation, inspect and verify with City the areas, depths and lines of asphalt pavement to be removed.

**3.2      Equipment**

- 3.2.1      Cold milling, planing or grinding equipment with automatic grade controls to be capable of operating from a stringline, and capable of removing part of pavement surface to depths or grades indicated.
- 3.2.2      Reclaiming equipment to be capable pulverizing and blending of existing pavement and granular material.

3.3      Full Depth Reclamation

- 3.3.1      Pulverize existing asphalt pavement and underlying granular materials and blend to limits and depths indicated on approved Construction Drawings or established by Engineer in field.
- 3.3.2      After material has been processed, shape, grade and compact to lines, grades and depths shown on the drawings.
- 3.3.3      Apply succeeding granular material or asphalt pavement as indicated on the drawings.

3.4      Removal by Milling

- 3.4.1      Remove existing asphalt pavement to lines and grades indicated on approved Construction Drawings or established by Engineer in field.
- 3.4.2      Use equipment and methods of removal and hauling that do not damage or disturb underlying pavement.
- 3.4.3      Prevent contamination of removed asphalt pavement designated for reclamation by topsoil, underlying gravel or other materials.
- 3.4.4      Provide for suppression of dust generated by removal process. Comply with City of Prince George Clean Air Bylaw No. 7232, 2000.

3.5      Sweeping

- 3.5.1      Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

3.6      Finish Tolerances

- 3.6.1      Milled surfaces in areas where asphalt pavement is to be overlaid to be within +/-5 mm of grade specified but not uniformly high or low.

END OF SECTION 02226

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 01561 – Environmental Protection.

1.1.2 Section 02315 - Excavating, Trenching and Backfilling.

**1.2 Special Requirements**

1.2.1 All works performed under this Section must comply with the requirements of the Clean Air Bylaw, City of Prince George Bylaw No 7232, 2000.

1.2.2 All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw, City of Prince George Bylaw No. 7022, 1999.

1.2.3 Clearing and removal of trees is not permitted in area and zoning districts designated under the Tree Protection Bylaw, City of Prince George Bylaw No. 6343. All clearing activity must comply with the Tree Protection Bylaw, City of Prince George Bylaw No. 6343, 1995.

1.2.4 No clearing or removal of trees is permitted in Environmental Development Permit Areas as designated in the Official Community Plan, prior to Development Permit Approval. The Owner, or his/her agent, Contractor, builder, consultant shall comply with the conditions of the Development Permit with respect to clearing or removal of trees, shrubs or vegetation.

1.2.5 Obtain timber mark for merchantable timber to be removed from City properties, dedicated Roads and other publicly owned lands.

**1.3 Definitions**

1.3.1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

1.3.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

1.3.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

1.3.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.

1.3.5 Grubbing consists of excavation and disposal of stumps, roots, boulders and rock fragments of specified size to not less than a specified depth below existing ground surface

**1.4 Storage and Protection**

1.4.1 Prevent damage to fencing, trees, landscaping, natural terrain features, existing buildings, existing pavement, utility lines, site appurtenances, streams and root systems of trees that are to remain.

1.4.1.1 Repair any damaged items to approval of the Engineer.

1.4.1.2 Replace any trees designated to remain, if damaged, as directed by the Engineer.

**2 PRODUCTS**

(Not Applicable)

**3 EXECUTION****3.1 Preparation**

3.1.1 Inspect site and verify with Engineer items designated to remain.

3.1.2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.

3.1.3 Notify utility authorities before starting clearing and grubbing.

3.1.4 Prepare an Environmental Management Plan as specified in Section 01561 Environmental Protection when clearing and grubbing is within 50 metres of a stream.

3.1.5 Obtain all necessary permits.

**3.2 Clearing**

3.2.1 Clear as indicated by cutting at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

3.2.2 Cut off branches and cut down trees overhanging area cleared as directed by Engineer. Remove cuttings and debris and dispose of in accordance with Clause 3.7.

3.2.3 Cut off and removal unsound branches on trees designated to remain as directed by Engineer or professional arborist. Cut off and remove unsound branches on trees designated to remain in public walkways, Parks and Roads as directed by the City.

**3.3 Close Cut Clearing**

3.3.1 Close cut clearing to within 100mm of ground surface.

**3.4 Isolated Trees**

- 3.4.1 Cut off isolated trees as indicated at height of not more than 300 mm above ground surface.
- 3.4.2 Grub out isolated tree stumps.
- 3.5 Underbrush Clearing
  - 3.5.1 Clear underbrush from areas as indicated at ground level.
- 3.6 Grubbing
  - 3.6.1 Grub out stumps and roots to not less than 200 mm below ground surface.
  - 3.6.2 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension.
- 3.7 Removal and Disposal
  - 3.7.1 Remove cleared and grubbed materials to a disposal area in accordance with the Soil Removal and Deposit Bylaw No. 7022, 1999.
  - 3.7.2 Burying of cleared and grubbed materials, including trees, shrubs, brush, stumps and logs is not permitted. All disposal of such organic materials shall comply with the City of Prince George Soil Removal and Deposit Bylaw No. 7022, 1999.
  - 3.7.3 Burning, if permitted, shall comply with City of Prince George Clean Air Bylaw No. 7232, 2000 and the applicable provincial and federal governments legislation.
  - 3.7.4 When burning is permitted, burn only in area designated. Burn under constant care of competent watchmen, at such times and so that surrounding vegetation, adjacent property or anything to remain will not be jeopardized.
  - 3.7.5 Chip or mulch and spread cleared and grubbed vegetative material on site as directed by Engineer.
  - 3.7.6 Remove diseased trees including beetle-infested trees identified by City, or, the Owner's Professional Forester or Arborist and dispose of this material to approval of City.
- 3.8 Finished Surface
  - 3.8.1 Leave ground surface in condition suitable for immediate grading operations and to comply with Soil Removal and Deposit Bylaw, Bylaw No. 7022, 1999.

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02231 – Clearing and Grubbing.

1.1.2 Section 02315 - Excavating, Trenching and Backfilling.

1.1.3 Section 02317 – Roadway Excavation, Embankment and Compaction.

**1.2 Existing Conditions**

1.2.1 Known underground and surface utility lines and buried objects as indicated on construction drawings or site plans are provided for guidance only. Follow procedures in Section 02315, Excavation, Trenching and Backfilling, to determine location of existing utility lines and buried objects prior to commencing work.

1.2.2 All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw.

**1.3 Protection**

1.3.1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by the Engineer. If damaged, restore to original or better condition unless directed otherwise.

1.3.2 Maintain access roads to prevent accumulation of mud, dirt, sand, gravel or debris on City roads, City lands or Provincial Highways.

**2 PRODUCTS****2.1 Materials**

2.1.1 Fill material: In accordance with Section 02315 - Excavating, Trenching and Backfilling.

2.1.2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by the Engineer.

**3 EXECUTION****3.1 Stripping of Topsoil**

3.1.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by the Engineer.

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3.1.2 Commence topsoil stripping of areas as indicated after area has been cleared of vegetation.

3.1.3 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.

3.1.4 Stockpile for reuse as required. Stockpile height not to exceed 2 m unless approved by the Engineer. Separate stockpile from top of excavation in accordance with WCB regulation.

### 3.2 Grading

3.2.1 Rough grade to levels, profiles, and contours allowing for surface treatment as shown in the lot grading plan.

3.2.2 Rough grade to depths below finish grades as indicated on the drawings.

3.2.3 Rough grade to 1V:50H minimum slope away from existing and proposed buildings.

3.2.4 Grade ditches to depth as indicated on the construction drawings.

3.2.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

3.2.6 Unless otherwise indicated on the construction drawings or directed by the Engineer, compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:

3.2.6.1 85% under landscaped areas.

3.2.6.2 95% under paved and walk areas.

3.2.6.3 95% in all areas where fill depth exceeds 500 mm.

3.2.7 Do not disturb soil within branch spread of trees or shrubs to remain.

### 3.3 Testing

3.3.1 Inspection and testing of soil compaction to be carried out by qualified independent testing laboratory.

3.3.2 Submit testing procedure and frequency of tests to City for review.

### 3.4 Surplus Material

3.4.1 Remove surplus material and material unsuitable for fill, grading or landscaping off site in conformance with the Soil Removal and Deposit By-Law.

**1 GENERAL****1.1 Related Sections**

- 1.1.1 Section 02225 – Sitework Demolition and Removal.
- 1.1.2 Section 02231 – Clearing and Grubbing.
- 1.1.3 Section 02311 – Lot and Site Grading.
- 1.1.4 Section 02316 – Rock Removal.
- 1.1.5 Section 02317 – Road Excavation, Trenching and Backfilling
- 1.1.6 Section 02511 – Water Mains.
- 1.1.7 Section 02530 – Sanitary Sewage.
- 1.1.8 Section 02531 – Sewage Force Mains.
- 1.1.9 Section 02630 – Storm Sewer.

**1.2 Definitions**

- 1.2.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation
  - 1.2.1.1 Rock: any solid material in excess of 1.0 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment having a 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
  - 1.2.1.2 Common Excavation: Excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan, partially cemented materials, clay or frozen materials which can be ripped and excavated with heavy construction equipment.
- 1.2.2 Waste material: excavated material unsuitable for use in work
- 1.2.3 Surplus material: excavated material that is suitable for use but surplus to project requirements.
- 1.2.4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- 1.2.5 Subgrade elevation: the elevation immediately below the road pavement structure or the topsoil, or the elevation of the base of an excavation for a building foundation or other structure.
- 1.2.6 Unsuitable Materials:

- 1.2.6.1 Weak and compressible materials including organics, peat, etc. under excavated areas.
    - 1.2.6.2 Frost susceptible materials under excavated areas.
  - 1.2.7 Unshrinkable fill: weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.
- 1.3 Protection of Existing Features
  - 1.3.1 Existing buried utilities and structures.
    - 1.3.1.1 Right of way and easement boundaries, and the size, depth and location of existing utilities and structures as shown on Construction Drawings are for guidance only. Completeness and accuracy not guaranteed.
    - 1.3.1.2 Prior to commencing any excavation work, notify the applicable owner or utility authorities, and establish the location and state of use of buried utility works and structures. Retain utility locator consultant as required to assist in locating buried utility works and structures. Clearly mark such locations to prevent disturbance during work.
    - 1.3.1.3 Confirm locations of buried utilities by careful test excavations.
    - 1.3.1.4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered or shown on Drawings.
    - 1.3.1.5 Where utility lines or structures exist in area of excavation, obtain direction of the applicable utility authority or owner before removing or re-routing.
    - 1.3.1.6 Record location of maintained, re-routed and abandoned underground lines.
  - 1.3.2 Existing buildings and surface features.
    - 1.3.2.1 Prior to beginning the work, conduct, with the Engineer, a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by the work. Notify the Director, or his designate, a minimum of 24 hours in advance to allow the City, at its discretion, to attend the condition survey.
    - 1.3.2.2 Protect existing buildings and surface features which may be affected by work from damage while work is in progress and repair damage resulting from work.
- 1.4 Shoring, Bracing and Underpinning

- 1.4.1 Engage services of a qualified professional engineer who is registered or licensed in Province of British Columbia to design and inspect cofferdams, shoring, bracing and underpinning required for work.
- 1.4.2 Submit design and supporting data at least 2 weeks prior to commencing work.
- 1.4.3 Trench shoring to be designed and installed in accordance with the regulations of the Workers Compensation Act of British Columbia.
- 1.4.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in province of British Columbia.
- 1.4.5 Sides of trenches or other excavations to be adequately supported. Trench stability and safety procedures to meet or exceed minimum requirements of "Accident Prevention Regulations" current issue of the Workers' Compensation Board of British Columbia. All works to be carried out in strict compliance with above mentioned regulations.
- 1.4.6 Professional engineer responsible for design and inspection of temporary structures to submit proof of insurance coverage for professional liability except where engineer is employee of the Contractor, in which case the Contractor shall submit proof that work by the professional engineer is included in the Contractor's insurance coverage.

## **2 PRODUCTS**

- 2.1 Type 1 and Type 2 Fill: properties to Section 02701 - Aggregates: General and the following requirements:
  - 2.1.1 Crushed, pit run or screened stone, gravel or sand.
  - 2.1.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
  - 2.1.3 Type 1 Fill to meet requirements for granular base material described in Section 02701 - Aggregates: General.
  - 2.1.4 Type 2 Fill to meet requirements for granular subbase material described in Section 02701 - Aggregates: General.
- 2.2 Type 3 Fill: selected material from excavation or other sources, approved by City for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- 2.3 Unshrinkable fill: proportioned and mixed to provide:
  - 2.3.1 Maximum compressive strength of 1.0 MPa at 28 days.
  - 2.3.2 Maximum Portland Cement content of 25 kg/ m<sup>3</sup>.

2.3.3 Minimum strength of 0.4 MPa at 24 h.

2.3.4 Concrete aggregates: to CAN/CSA-A23.1.

2.3.5 Portland Cement: Type 10.

2.3.6 Slump: 160 to 200 mm.

### 3 EXECUTION

#### 3.1 Site Preparation

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3.1.1 Remove all vegetation and accumulated debris from site as specified in Section 02231.

3.1.2 Remove obstructions, ice and snow from surfaces to be excavated within limits indicated.

3.1.3 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.1.4 Strip topsoil after area has been cleared and stockpile in locations as shown on Contract Drawings or directed by the Engineer. Stockpile height not to exceed 2 m. Avoid mixing topsoil with subsoil. Dispose of unused topsoil as directed by The Engineer. Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

3.1.5 Comply with requirements of Soil Removal and Deposit Bylaw.

#### 3.2 Stockpiling

3.2.1 Stockpile fill materials in areas designated by the Engineer. Stockpile granular materials in manner to prevent segregation.

3.2.2 Protect fill materials from contamination.

#### 3.3 Cofferdams, Shoring, Bracing And Underpinning

3.3.1 Obtain permits from federal and provincial government authorities having jurisdiction for temporary diversion of water course.

3.3.2 Construct temporary works to depths, heights and locations as approved by the Engineer.

3.3.3 During backfill operation:

3.3.3.1 Unless otherwise indicated or directed by the Director, or his designate, remove sheeting and shoring from excavations.

- 3.3.3.2 Do not remove bracing until backfilling has reached respective levels of such bracing.
    - 3.3.3.3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.
    - 3.3.3.4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
  - 3.3.4 Upon completion of substructure construction:
    - 3.3.4.1 Remove cofferdams, shoring and bracing.
    - 3.3.4.2 Remove excess materials from the site to designated areas in accordance with the Soil Removal and Deposit Bylaw and restore water courses as indicated and as directed by the Engineer.
- 3.4 Dewatering And Heave Prevention
  - 3.4.1 Keep excavations free of water while work is in progress.
  - 3.4.2 Submit for the Engineer's and the City's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.
  - 3.4.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
  - 3.4.4 Protect open excavations against flooding and damage due to surface run-off.
  - 3.4.5 Dispose of water in a manner not detrimental to the environment, fish habitat, public and private property, or any portion of work completed or under construction.
  - 3.4.6 Surface drainage: Provide suitable temporary ditches or other approved means of handling drainage prior to excavation and during construction to protect construction area, adjacent properties and other affected properties. Provide siltation controls to prevent erosion and to protect natural watercourses or existing municipal drainage facilities.
  - 3.4.7 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.
- 3.5 Excavation
  - 3.5.1 Excavation to grade: excavate trenches to allow pipe to be laid to alignment and grades required with allowance for specified pipe bedding.
  - 3.5.2 Excavation must not interfere with normal 45° splay of bearing from bottom of any footing.

- 3.5.3 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
  - 3.5.4 For trench excavation, unless otherwise authorized by the City in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave trench open at the end of a day's operation. Barricade excavated areas in accordance with Section 01560, Temporary Barriers and Enclosures.
  - 3.5.5 Dispose of surplus and unsuitable excavated material in approved location off site in accordance with the Soil Removal and Deposit Bylaw.
  - 3.5.6 Do not obstruct flow of surface drainage or natural watercourses.
  - 3.5.7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
  - 3.5.8 Notify the Engineer when bottom of excavation is reached.
  - 3.5.9 Obtain the Engineer approval of completed excavation.
  - 3.5.10 Remove unsuitable material from trench bottom to extent and depth as directed by the Engineer.
  - 3.5.11 Correct unauthorized over-excavation as follows:
    - 3.5.11.1 Fill under bearing surfaces and footings with fill concrete.
    - 3.5.11.2 Fill under other areas with Type 2 Fill compacted to not less than 95 % of maximum dry density.
  - 3.5.12 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of the Engineer.
- 3.6 Fill Types and Compaction
- 3.6.1 Fill types and minimum compaction requirements for fill, trench backfill and backfill of excavations for works within roads, walkways and rights-of-way are provided below. With the approval of the Director, or his designate, recommended fill types and minimum compaction requirements for specific projects within existing and proposed roads, walkways and rights-of-way, provided by a Professional Engineer registered in the Province of British Columbia with expertise in the field of geotechnical engineering, may supercede the requirements listed below. Compaction densities are percentages of maximum densities obtained from ASTM D698.
    - 3.6.1.1 Boulevards, rights-of-way and easements: Type 3 Fill to a minimum 90% to subgrade level.

- 3.6.1.2 Roads, lanes, driveway restorations, shoulders, re-shaped ditches, sidewalks and walkways : Type 3 Fill or Type 2 Fill to a minimum 95% to subgrade level.
- 3.6.1.3 Use caution in pipe zone to ensure no damage to pipe.
- 3.6.2 Fill types and minimum compaction requirements are specified below for various works and structures in the absence of site specific recommendations provided by a Professional Engineer registered in the Province of British Columbia with expertise in geotechnical engineering. Compaction densities are percentages of maximum densities obtained from ASTM D698:
  - 3.6.2.1 Exterior side of perimeter building walls: unless otherwise indicated on construction drawings, use Type 3 Fill to subgrade level. Compact to 95%.
  - 3.6.2.2 Within chamber or structure area: use Type 2 Fill to underside of base course for floor slabs. Compact to 98%.
  - 3.6.2.3 Under concrete slabs: provide 150 mm compacted thickness of Type 1 Fill. Compact base course to 100%.
  - 3.6.2.4 Retaining walls: unless indicated otherwise, use Type 2 Fill to subgrade level on high side for minimum 500 mm from wall and compact to 95%. For remaining portion, use Type 3 Fill compacted to 95%.
  - 3.6.2.5 Place unshrinkable fill in areas as indicated on construction drawings.
- 3.7 Bedding and Surround of Underground Services
  - 3.7.1 See applicable sections under clause 1.1 for bedding, pipe laying, and granular surround requirements.
  - 3.7.2 Place bedding and surround material in unfrozen condition.
  - 3.7.3 Concrete thrust blocks, encasement or protection: where specified or required by the Engineer, City or utility authority, provide concrete encasement of pipe or slab protection as shown on Contract Drawings. Do not place backfill material until concrete has taken its initial set and in no case less than 1 hour.
  - 3.7.4 Anchor blocks: where specified or required by the Engineer provide anchor blocks as shown on Contract Drawings. All concrete anchor blocks to be installed at least 150 mm into undisturbed ground on bottom and sides of trench.
- 3.8 Backfilling
  - 3.8.1 Do not proceed with backfilling operations until the Engineer has inspected and approved installations.
  - 3.8.2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

- 3.8.3 Do not use backfill material that is frozen or contains ice, snow or debris.
  - 3.8.4 Place backfill material above excavation bottom or pipe surround zone in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
  - 3.8.5 Backfill around manhole, catchbasin and valve chamber installations.
  - 3.8.6 Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.
  - 3.8.7 Do not backfill around or cover cast-in-place concrete within 24 hours after placing of concrete. If concrete is for structural purposes, ensure by means of compressive strength testing, that concrete meets the design strength requirements as specified by the structural engineer responsible for the design of the structure prior to backfilling. If trenching cannot be left open in emergency situations, backfill may be placed under the direction of the Engineer or Authorized Person.
- 3.9 Restoration
- 3.9.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by the Engineer and to the satisfaction of the Director, or his designate.
  - 3.9.2 Provide for sediment and erosion control on surface of backfilling. In non-road surface areas prepare surface to receive vegetation and re-vegetate surface using seeding, hydro-seeding or sod.
  - 3.9.3 Replace topsoil as indicated or as directed by the Engineer and to the satisfaction of the Director or his designate.
  - 3.9.4 Reinstate lawns, boulevards, concrete curbs and gutters, asphalt and concrete pavement surfaces and sidewalks to the elevation, dimensions and material type which existed before excavation.
  - 3.9.5 Clean and reinstate areas affected by work as directed by the Engineer and to the satisfaction of the Director or his designate.
  - 3.9.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
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**1 GENERAL****1.1 Related Sections**

1.1.1 Section 01560 – Temporary Barriers and Enclosures.

1.1.2 Section 02315 – Excavating, Trenching and Backfilling.

**1.2 Definitions**

1.2.1 Rock: any solid material in excess of 1.0 m<sup>3</sup> and which cannot be removed by means of mechanical excavating equipment having a 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material is not classified as rock.

**1.3 Qualifications**

1.3.1 Retain licensed explosives expert to program and supervise blasting work, and to determine precautions, preparation and operations techniques.

1.3.2 Obtain all necessary Federal and Provincial regulatory permits as required for blasting operation. Notify City when blasting is planned.

1.3.3 Comply with requirements of the Explosives Act (Canada) and the Transportation of Dangerous Goods Act, 1992 (Canada).

**1.4 Blasting Operation Proposal**

1.4.1 Submit to City written proposal of operations for removal of rock by blasting, in accordance with Section 01330 - Submittal Procedures.

1.4.2 Indicate proposed method of carrying out work, types and quantities of explosives to be used, loading charts and drill hole patterns, type of caps, blasting techniques, blast protection measures for items such as flying rock, vibration, dust and noise control. Include details on protective measures, traffic control, notification procedures, time of blasting and other pertinent details.

1.4.3 Notify media sources of date and time when blasting is planned.

1.4.4 Hand deliver notices to neighbourhood with 1km radius of date and time when blasting is planned.

**1.5 Protection**

1.5.1 Prevent damage to surroundings and injury to persons. Erect fencing, post guards, sound warnings and display signs when blasting to take place.

**2 PRODUCTS**

(Not Applicable)

**3 EXECUTION**

**3.1 Rock Removal**

- 3.1.1 Remove rock to alignments, profiles, and cross sections as indicated.
- 3.1.2 Use rock removal procedures to produce uniform and stable excavation surfaces, to minimize overbreak, and to avoid damage to adjacent structures.
- 3.1.3 Scale, pressure wash and broom clean rock surfaces which are to bond to concrete.
- 3.1.4 Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated.
- 3.1.5 Cut trenches to widths as indicated.
- 3.1.6 Use pre-shearing, cushion blasting or other smooth wall drilling and blasting techniques unless specified otherwise.
- 3.1.7 Remove boulders and fragments that may slide or roll into excavated areas.
- 3.1.8 Correct unauthorized rock removal at no extra cost, in accordance with backfilling requirements specified in Section 02315 - Excavating, Trenching and Backfilling.

**3.2 Rock Disposal**

- 3.2.1 Incorporate removed rock into the project in areas as designated by the Engineer fill, including lot or site grading, proposed roadworks or fill areas.
  - 3.2.2 Dispose of removed rock not incorporated into the project in offsite areas designated to receive soils under the Soil Removal and Deposit Bylaw.
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1      GENERAL

1.1      Related Sections

- 1.1.1      Section 01353 – Traffic Control.
- 1.1.2      Section 02071 – Geogrid Soil Reinforcement.
- 1.1.3      Section 02072 - Geotextiles.
- 1.1.4      Section 02315 – Excavation, Trenching and Backfilling
- 1.1.5      Section 02316 – Rock Removal.
- 1.1.6      Section 02311 – Lot and Site Grading.
- 1.1.7      Section 02721 – Granular Base.
- 1.1.8      Section 02723 – Granular Sub-base.

1.2      Special Requirements

- 1.2.1      All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw.

1.3      Definitions

- 1.3.1      Common Excavation: excavation of materials that are not Rock Excavation or Stripping.
- 1.3.2      Rock Excavation: rock is any solid material in excess of 1.0 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment having a 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.
- 1.3.3      Stripping: excavation of organic material covering original ground.
- 1.3.4      Embankment: material derived from usable excavation and placed above original ground or stripped surface up to subgrade elevation.
- 1.3.5      Waste Material: material such as organics, peat, etc. unsuitable for use in embankment, and embankment foundation
- 1.3.6      Surplus Material: excess excavated material surplus to project volume requirements.
- 1.3.7      Borrow Material: material obtained from areas outside right-of-way or project site and required for construction of embankments or for other portions of work.
- 1.3.8      Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

1.3.9    Pavement structure: combination of layers of unbound or stabilized granular sub-base, base, and asphalt or concrete surfacing.

1.3.10   Subgrade elevation: elevation immediately below pavement structure.

1.4      Requirements of Regulatory Agencies

1.4.1    Adhere to regulations of authority having jurisdiction if blasting is required.

1.4.2    Adhere to Provincial and National Environmental requirements if potentially toxic materials are involved.

2        PRODUCTS

2.1      Embankment materials require approval by the Engineer.

2.2      Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or any other unsuitable material.

2.3      Borrow material:

2.3.1    Type 3 Fill as specified under Section 02315 - Excavation, Trenching and Backfilling.

2.3.2    All borrow areas to comply with requirements of Soil Removal and Deposit Bylaw.

3        EXECUTION

3.1      Compaction Equipment

3.1.1    Compaction equipment must be capable of obtaining required densities in materials on project. Equipment that does not achieve specified densities must be replaced or supplemented.

3.2      Water Distributors

3.2.1    Apply water with equipment capable of uniform distribution.

3.3      Excavating

3.3.1    General:

3.3.1.1   Notify Engineer whenever waste materials are encountered and remove to depth and extent directed.

3.3.1.2   Subcut 500 mm below subgrade in cut sections unless otherwise directed. Compact top 150 mm below subcut to minimum 95% maximum dry density, ASTM D 698 (AASHTO T99). Replace with approved embankment material and compact.

3.3.1.3    Where subgrade is on transition from excavation to embankment treat ground slopes at grade points as directed by the Engineer.

3.3.2    Drainage:

3.3.2.1    Maintain profiles, crowns and cross slopes to provide good surface drainage.

3.3.2.2    Control sediment and erosion in areas where runoff may enter streams, storm or sanitary sewer systems, ditches or drainage channels.

3.3.2.3    Provide ditches as work progresses to provide drainage.

3.3.2.4    Construct interceptor ditches as shown on plans or as directed before excavating or placing embankment in adjacent area.

3.3.3    Borrow Excavation:

3.3.3.1    Borrow areas shall be identified by the Developer, Owner or the Engineer on the construction drawings. The necessary designations, permits, etc. shall be in place and fees paid as required by the Soil Removal and Deposit Bylaw prior to beginning removal of material from the borrow area.

3.3.3.2    Suitable materials removed from right-of-way excavations shall be completely used in embankments before taking material from borrow areas.

3.3.3.3    Borrow areas shall be managed and maintained to prohibit any release of sediment or deleterious substances into water courses, ditches, groundwater, roads, storm sewers or culverts. The Developer, Owner, or Soil Permittee may be required, at the Director's discretion, to retain a qualified biologist or other qualified environmental consultant to ensure that water runoff from borrow areas is managed to the City's satisfaction and to the satisfaction of provincial and federal government agencies having jurisdiction.

3.3.3.4    Leave borrow pits in safe condition complying with requirements of Soil Removal and Deposit Bylaw.

3.4    Embankments

3.4.1    Where indicated or as directed by Engineer, scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces. Obtain prior approval from Engineer of method to be used.

3.4.2    Break up or scarify existing road surface prior to placing embankment material.

3.4.3    Do not place material which is frozen nor place material on frozen surfaces except in areas authorized.

3.4.4    Maintain a crowned surface during construction to ensure ready run-off of surface water.

3.4.5    Drain low areas before placing materials

- 3.4.5.1    Place and compact to full width in layers not exceeding 200 mm loose thickness. Engineer may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.

3.4.6    Where material consists of rock:

- 3.4.6.1    Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.
- 3.4.6.2    Carefully distribute rock material to fill voids with smaller fragments to form compact mass.
- 3.4.6.3    Fill surface voids at subgrade level with rock spalls or selected material to form an earth-tight surface.
- 3.4.6.4    Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of subgrade elevation.

3.5    Subgrade Compaction

- 3.5.1    Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
- 3.5.2    Compact each layer to minimum 95% maximum dry density, ASTM D 698 (AASHTO T99).
- 3.5.3    Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.6    Finishing

- 3.6.1    Shape and compact entire roadbed to within 30 mm of design elevations but not uniformly high or low.
- 3.6.2    Finish back and side slopes of rock material to a neat and safe condition, true to line and grade. For cut slopes in bedrock steeper than 1:1, scale slope by removing loose fragments.
- 3.6.3    Remove rocks over 150 mm in any dimension from slopes and ditch bottoms.
- 3.6.4    Hand finish slopes that cannot be finished satisfactorily by machine.
- 3.6.5    Round top of backslope 1.5 m both sides of top of slope.
- 3.6.6    Trim and smooth, free of humps, sags and ruts, between constructed slopes and edge of clearing to provide drainage.

3.7      Protection

- 3.7.1      Maintain finished surfaces in condition conforming to this section until acceptance by Authorized Person.

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**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 03300 – Cast-in-Place Concrete.

**1.2 Permits**

1.2.1 Obtain Construction Permit issued by the Northern Health Authority Public Health Engineer prior to beginning construction of any watermain extended from the City's water system. Comply with all conditions of the permit issued by the Public Health Engineer.

1.2.2 Obtain Permit to Construct Works within City Lands from City of Prince George Transportation Division, prior to construction, when waterworks are to be installed in City Roads, Rights-of-Way or City-owned land.

**1.3 Samples**

1.3.1 Inform Engineer at least 2 weeks prior to commencing work, of proposed source of bedding materials and provide access for sampling.

**1.4 Material Certification**

1.4.1 CSA Certification to be marked on pipe.

**1.5 Shop Drawings**

1.5.1 Submit complete any shop drawings required by the City and construction schedule for water mains and appurtenances. Include method for installation of watermain.

1.5.2 Indicate proposed method for installing carrier pipe for highway or roadway undercrossings.

**1.6 Record Drawings**

1.6.1 Provide record drawings, including directions for operating unique specified valves (pressure reducing valves, control valves, etc.), list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions.

**1.7 Scheduling of Work**

1.7.1 Schedule work such that interruptions to existing utilities is minimized.

1.7.2 All tie-in connections to live, existing City utilities to be completed by City forces.

1.7.3 Submit schedule of underground work to Engineer for review by City's Authorized Person. Necessary tie-ins to live, existing utilities will be coordinated by City's Authorized Person to minimize cost and interruption of service to the utility.

- 1.7.4 The City will not be liable to the Contractor, Developer or Owner for any costs due to scheduling delays experienced in performing the tie-in connection.
- 1.7.5 Notify Authorized Person, Engineer and affected parties a minimum of 48 h in advance of construction when excavating near existing City or private utilities.

## 2 PRODUCTS

### 2.1 Pipe, Joints and Fittings

#### 2.1.1 Ductile iron pipe:

2.1.1.1 Pipe: to AWWA C151, to the following pressure classes and cement mortar lined to AWWA C104:

- a) Class 50 for 150mm to 300mm diameter, unless higher pressure class is specified in Contract Documents.
- b) Class 51 for 350mm to 600mm diameter, unless higher pressure class is specified in Contract Documents.
- c) For pipe diameters greater than 600mm diameter, pressure class as specified in Contract Documents.

2.1.1.2 An affidavit of compliance with AWWA specifications and supplementary data shall be provided by the pipe supplier and submitted to the Authorized Person.

2.1.1.3 Joints: Single rubber gasket for push-on bell and spigot type joint or mechanical type joint to AWWA C111 Tyton.

2.1.1.4 Polyethylene Tube Encasement: Minimum 8mm thick, as manufactured by Canada Pipe or approved equal. Material in accordance with AWWA C105 and ANSI A21.5.

2.1.2 Polyvinyl chloride pressure pipe: to AWWA C900 for pipe diameter up to 300 mm only, 1 MPa gasket bell end, cast iron outside diameter. Pressure Class 165.

2.1.2.1 CAN/CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket coupling.

2.1.2.2 Cast iron fittings: to ANSI/AWWA C110/A21.10, and for pipe diameters larger than NPS 4 cement mortar lined to ANSI/AWWA C104/A21.4.

2.1.2.3 PVC fittings: to AWWA C907 and CSA-B137.2 for pipe diameters up to 200 mm.

2.1.3 Polyvinyl chloride pressure pipe: to ANSI/AWWA C905 for pipe diameter up to 900 mm only, 1 MPa gasket bell end, cast iron outside diameter. Pressure class as indicated.

2.1.3.1 CAN/CSA-B137.3, PVC series 160, 1.1 MPa elastomeric gasket coupling.

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- 2.1.3.2 Cast iron fittings: to ANSI/AWWA C110/A21.10, cement mortar lined to ANSI/AWWA C104/A21.4.
  - 2.1.4 Steel water pipe: to ASTM A53, ANSI/AWWA C200 Grade B electrically welded seamless.
    - 2.1.4.1 Exterior finish: to ANSI/AWWA C203, hot applied coal tar enamel
    - 2.1.4.2 Interior finish: to ANSI/AWWA C205, cement mortar lined.
    - 2.1.4.3 Flanges: to ANSI/AWWA C207, class B ring type.
    - 2.1.4.4 Pipe fittings: to ANSI/AWWA C208, cement mortar lined to ANSI/AWWA C205, and exterior protected with hot applied coal tar enamel to ANSI/AWWA C203.
  - 2.2 Valves and Valve Boxes
    - 2.2.1 Valves to open counter clockwise.
    - 2.2.2 Gate valves: to ANSI/AWWA C509, resilient seated, standard iron body, bronze mounted double disc valves with non-rising stems, suitable for 1 MPa with flanged or push-on joints as indicated. Acceptable manufacturer: Clow
    - 2.2.3 Butterfly valves to suit pipe diameter of 350 mm and greater: to ANSI/AWWA C504.
    - 2.2.4 Air and vacuum release valves: heavy duty combination air release valves employing direct acting kinetic principle. Valves to be fabricated of cast iron body and cover, with bronze trim, stainless steel floats with shock-proof synthetic seat suitable for 2 MPa working pressure. Valves to expel air at high rate during filling, at low rate during operation, and to admit air while line is being drained. Valve to be complete with surge check unit. Ends to be flanged to ANSI/AWWA C110/A21.10.
    - 2.2.5 Cast iron valve boxes: Nelson Type, 25 x 25 mm cross section, of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover. Base to be large round type with minimum diameter of 300 mm. Top of box to be marked "WATER". Acceptable manufacturer: Terminal City.
  - 2.3 Valve Chambers
    - 2.3.1 Concrete and reinforcing steel: to Section 03300 - Cast-in-Place Concrete and Section 03200 - Concrete Reinforcement.
    - 2.3.2 Precast concrete sections to ASTM C478M. Ladder rungs to be cast integral with unit; field installation not permitted.
    - 2.3.3 Valve chamber frames and covers: gray iron castings, minimum tensile strength 200 MPa, with two coats, shop applied, approved asphalt coating. Design and dimensions to be as indicated. Cover to be marked "WATER".
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- 2.3.4 Jointing materials:
    - 2.3.4.1 Manufacturer's rubber ring gaskets.
    - 2.3.4.2 Mastic joint filler.
    - 2.3.4.3 Cement mortar.
    - 2.3.4.4 Combination of above types.
  - 2.3.5 Mortar: aggregate to CSA A82.56, masonry cement to CAN/CSA-A8.
  - 2.3.6 Ladder rungs for valve chambers: 20 mm diameter deformed rail steel bars to CAN/CSA-G30.18, hot-dipped galvanized after fabrication to CAN/CSA-G164. Rungs to be safety pattern.
  - 2.4 Fittings
    - 2.4.1 Tees and Reducers: Acceptable Materials: Mueller
  - 2.5 Service Connections
    - 2.5.1 Copper tubing: to ASTM B88M, type K, annealed.
    - 2.5.2 "Kitec" composite pipe: to AWWA C903 when approved by the Authorized Person.
    - 2.5.3 Copper tubing joints: compression type suitable for 1 MPa working pressure.
    - 2.5.4 Brass corporation stops: red brass to ASTM B62, compression type having threads to ANSI/AWWA C800, complete with banding lugs. Acceptable products: Mueller, Ford.
    - 2.5.5 Brass inverted key-type curb stops: red brass to ASTM B62, compression type with drains. Curb stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury. Top of cast iron box marked "WATER". Acceptable products: Mueller, Ford.
    - 2.5.6 Bronze type service clamps: for PVC pipe service connections. Service clamps to be of stainless steel double-strap type, with confined "O" ring seal cemented in place. Clamps to be tapped with threads to ANSI/AWWA C800.
    - 2.5.7 Tee connections: for services above NPS 1. Tee connections to be fabricated of same material and to same standards as specified pipe fittings and to have ends matching pipe to which they are joined.
  - 2.6 Hydrants
    - 2.6.1 Compression type hydrant, Mueller CENTURY Model to CAN/ULC-S250, designed for working pressure of 1.1 MPa with two 65 mm threaded hose outlets, one 100 mm threaded pumper connection, 150 mm riser barrel, 125 mm bottom

valve and 150 mm connection for main. Hydrants to open counter clockwise, threads to local standard. Depth of bury 3 m. Hydrant to have split barrel between boot and ground elevation as indicated on Standard Infrastructure Drawing No. W5.

2.6.1.1 If depth of bury is greater than 3 metres, provide aluminum-type internal hydrant rod.

2.6.1.2 Provide key operated gate valve located as shown on Standard Drawing W5.

2.6.2 Hydrant paint: exterior enamel to CAN/CGSB-1.88. Acceptable product: General Paint urethane enamel Yellow 16-202.

## 2.7 Pipe Bedding and Surround Material

2.7.1 Granular material to Section 02701 – Aggregates: General.

2.7.2 Concrete mixes and materials for cradles and thrust blocks to Section 03300 - Cast-in-Place Concrete.

## 2.8 Backfill Material

2.8.1 As indicated.

## 2.9 Pipe Disinfection

2.9.1 Hypochlorite to ANSI/AWWA B300 to disinfect water mains.

2.9.2 Undertake disinfection of watermains in accordance with ANSI/AWWA C651.

# 3 EXECUTION

## 3.1 Preparation

3.1.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects to approval of City. Remove defective materials from site as directed by City.

## 3.2 Trenching

3.2.1 Do trenching work, in accordance with Section 02315 - Excavating, Trenching and Backfilling.

3.2.2 Trench depth to provide cover over pipe of not less than 3 m from finished grade.

3.2.3 Trench alignment and depth require approval from City prior to placing bedding material or pipe.

## 3.3 Concrete Bedding and Encasement

- 3.3.1 Do concrete work in accordance with Section 03300 - Cast-in-Place Concrete. Place concrete to details as indicated or as directed by City.
- 3.3.2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- 3.3.3 Do not backfill over concrete within 24 h after placing.
- 3.4 Granular Bedding
  - 3.4.1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
  - 3.4.2 Place granular bedding in unfrozen condition.
  - 3.4.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
  - 3.4.4 Shape transverse depressions as required to suit joints.
  - 3.4.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.
  - 3.4.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 02315 - Excavating Trenching and Backfilling with compacted bedding material.
- 3.5 Pipe Installation
  - 3.5.1 Terminate building water service at location indicated. Cap or seal end of pipe and place temporary marker to locate pipe end.
  - 3.5.2 Depending on pipe material type, lay pipes to either ANSI/AWWA C900, ANSI/AWWA C905 or ANSI/AWWA C600, ANSI/AWWA Manual of Practice and manufacturer's standard instructions and specifications.
  - 3.5.3 Depending on pipe material type, join pipes in accordance with either ANSI/AWWA C900, ANSI/AWWA C905 or ANSI/AWWA C600, AWWA Manual of Practice and manufacturer's recommendations.
  - 3.5.4 Bevel or taper ends of PVC pipe to match fittings.
  - 3.5.5 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
  - 3.5.6 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.

- 3.5.7 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- 3.5.8 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- 3.5.9 Position and join pipes with equipment and methods approved by Engineer.
- 3.5.10 Cut pipes in an approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- 3.5.11 Align pipes carefully before jointing.
- 3.5.12 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- 3.5.13 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.
- 3.5.14 Complete each joint before laying next length of pipe.
- 3.5.15 Minimize deflection after joint has been made.
- 3.5.16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- 3.5.17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by City.
- 3.5.18 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- 3.5.19 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- 3.5.20 Do not lay pipe on frozen bedding.
- 3.6 Valve Installation
  - 3.6.1 Install valves to manufacturer's recommendations at locations as indicated.
  - 3.6.2 Support valves by means of either concrete bedding located between valve and solid ground or bedding same as adjacent pipe. Valves are not to be supported by pipe.
  - 3.6.3 Wrap valve with 6 mil polyethylene when supported by concrete.
- 3.7 Valve Chambers

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- 3.7.1 Construct units as indicated, plumb and centered over valve nut, true to alignment and grade, and not resting on pipe.
  - 3.7.2 Place reinforcing steel and miscellaneous metals required to be embedded in concrete to details indicated and in accordance with Section 03300 - Cast-in-Place Concrete.
  - 3.7.3 Cast bottom slabs for precast units directly on undisturbed ground, or, when permitted by City, set precast concrete slab on 150 mm minimum of compacted granular bedding.
  - 3.7.4 Set bottom section of precast unit in bed of cement mortar and bond to bottom slab. Make each successive joint watertight with approved rubber ring gaskets, preformed bituminous gasket (RAM-NEK), mastic joint filler, cement mortar, or combination thereof.
  - 3.7.5 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.
  - 3.7.6 Plug lifting holes with mortar.
  - 3.7.7 Set frame and cover to required elevation on at least one and not more than four courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.
  - 3.7.8 Place frame and cover on top section to elevation indicated. If adjustment is required use concrete ring.
  - 3.7.9 Clean valve chambers of debris and foreign materials; remove fins and sharp projections.
  - 3.8 Undercrossing
    - 3.8.1 Excavate working pit outside facility to be crossed.
    - 3.8.2 Excavate working pit to not less than 0.6 m below lowest invert of pipe.
    - 3.8.3 Dewater excavation.
    - 3.8.4 Dewater area of undercrossing.
    - 3.8.5 Place encasing pipe to exact line and grade indicated.
    - 3.8.6 Install encasing pipe by jacking, boring or tunneling.
    - 3.8.7 Encasing pipe shall not be in tension.
    - 3.8.8 Joints for encasing pipe shall be welded type.
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- 3.8.9 Use casing spacers as required and approved by Engineer. If casing spacers are not used, place concrete grout leveling pad in encasing pipe. Carefully control level of grout during placing.
- 3.8.10 Insert water main into encasing pipe, in end with largest open excavated area, after placement of levelling pad.
- 3.8.11 Use approved blocking method to guide water main in true alignment or use casing spacers as approved by Engineer.
- 3.8.12 Clearance between blocks and encasing pipe shall be maximum 15 mm when water main is in position.
- 3.8.13 Join water main one length at a time outside encasing pipe.
- 3.8.14 Couplings of water main shall not rest on levelling pad when water main is in position.
- 3.8.15 Install rubber boot end seals as directed by Engineer or Authorized Person.
- 3.8.16 When directed by Engineer or Authorized Person, pressure grout remaining void with mixture of one part Portland cement and two parts clean washed sand, with only sufficient water added to allow placing. Do not use additives.
- 3.9 Service Connections
- 3.9.1 When directed by Engineer or Authorized Person, do not install service connections until satisfactory completion of hydrostatic and leakage tests of water main.
- 3.9.2 Construct service connections at right angles to watermain unless otherwise directed. Locate curb stops within Road boulevard as indicated in Schedule D, Standard Infrastructure Drawings.
- 3.9.3 Tappings to be provided with double strap stainless steel service clamps. Tappings to conform to following:

| Pipe<br>Diameter<br>(mm) | Maximum Diameter Tap<br>(mm) |
|--------------------------|------------------------------|
| 150                      | 40                           |
| 200                      | 50                           |
| 250                      | 50                           |
| 300                      | 75                           |

- 3.9.4 Employ only competent workmen equipped with suitable tools to carry out tapping of mains and cutting of pipes.
- 3.9.5 Install single and multiple tap service connections on top half of main, between 45° and 90° measured from apex of pipe.

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- 3.9.6 Install multiple corporation stops, 30 mm apart around circumference of pipe and a minimum of 300 mm apart along pipe.
  - 3.9.7 Leave corporation stop valves fully open.
  - 3.9.8 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
  - 3.9.9 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.
  - 3.9.10 Install curb stop with corporation box on services NPS 2 or less in diameter. Equip larger services with a gate valve and cast iron box. Set box plumb over stop and adjust top flush with final grade elevation. Leave curb stop valves fully closed.
  - 3.9.11 Place temporary location marker at ends of plugged or capped unconnected water lines as shown on Standard Infrastructure Drawing W2. Each marker to consist of 50x100 mm (nominal dimension), 3.0 metre long stake extending from pipe end at pipe level to 600 mm above grade. Paint exposed portion of stake blue with designation "W" and depth to pipe invert indicated in black lettering.
  - 3.9.12 Heat-shrink wrap sanitary and storm sewer service pipe joints if water service pipe is less than 3 metres offset from the sanitary or storm sewer service pipe.
- 3.10 Hydrants
- 3.10.1 Install hydrants at locations as indicated.
  - 3.10.2 Install hydrants in accordance with AWWA Manual of Practice No. M17 and City Standard Infrastructure Drawing No. W5.
  - 3.10.3 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated.
  - 3.10.4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50 mm above final grade.
  - 3.10.5 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.
  - 3.10.6 Where site conditions are suitable for proper drainage for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5 m deep and backfill with coarse gravel or crushed stone to level 150 mm above drain holes.
  - 3.10.7 Drain hole be plugged as directed by City where site conditions are unsuitable and affected hydrant locations to be identified on record drawings.
  - 3.10.8 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.
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**3.11 Thrust Blocks and Restrained Joints**

- 3.11.1 For thrust blocks: do concrete work in accordance with Section 03300 - Cast-in-Place Concrete.
- 3.11.2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated.
- 3.11.3 Keep joints and couplings free of concrete.
- 3.11.4 Do not backfill over concrete within 6 h after placing, unless otherwise accepted by the Engineer.
- 3.11.5 For restrained joints: use restrained joints only when approved by City.

**3.12 Hydrostatic and Leakage**

- 3.12.1 Do tests in accordance with ANSI/AWWA C600 for ductile iron pipe or ANSI/AWWA C605 for PVC pipe.
- 3.12.2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- 3.12.3 Notify Engineer at least 24 h in advance of all proposed tests. Perform tests in presence of the Engineer. Forward test results to the Authorized Person.
- 3.12.4 Where any section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- 3.12.5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by the Authorized Person.
- 3.12.6 Under direction of the Engineer when inadequate thrust restraint is not provided by thrust blocks, strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- 3.12.7 Open valves within test section.
- 3.12.8 Expel air from main by slowly filling main with potable water. Install corporation stops at high points in main to release air during filling of main where no air-vacuum release valves are installed. Remove stops after satisfactory completion of test and seal watertight.
- 3.12.9 Apply a leakage test pressure of 1.5 times design working pressure or 1035 kPa, whichever is greater, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 h.
- 3.12.10 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 h.

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- 3.12.11 Allowable leakage to be in accordance with ANSI/AWWA C600, C605 or pipe manufacturer recommendation.
- 3.12.12 Locate and repair defects if leakage is greater than amount specified.
- 3.12.13 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- 3.12.14 Repeat test until leakage is within specified allowance for full length of watermain.
- 3.13 Pipe Surround and Backfilling
- 3.13.1 Upon completion of pipe laying and after City has inspected work in place, surround and cover pipes as indicated.
- 3.13.2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 3 m of pipe.
- 3.13.3 Place layers uniformly and simultaneously on each side of pipe.
- 3.13.4 Do not place material in frozen condition.
- 3.13.5 Compact up to underside of backfill each layer of bedding sand and pipe surround material, as specified in Section 02701 Aggregates: General, to manufacturers recommendation or at least 95% maximum density to ASTM D 698.
- 3.13.6 Backfill above pipe zone to requirements of Section 02315 – Excavating, Trenching and Backfilling.
- 3.14 Flushing and Disinfecting
- 3.14.1 Perform flushing and disinfecting operations to AWWA C651-99. Flushing and disinfecting operations to be witnessed by the Engineer. Notify City at least 4 days in advance of proposed date and time when disinfecting operations will commence.
- 3.14.2 Flush water mains through available outlets with a sufficient flow of potable water to produce a velocity of 1.5 m/s, within pipe for 10 min, or until foreign materials have been removed and flushed water is clear.
- 3.14.3 Flushing flows to be as follows:
- | <u>Pipe Size (mm)</u> | <u>Flow (L/s) Minimum</u> |
|-----------------------|---------------------------|
| 150 and below         | 38                        |
| 200                   | 75                        |
| 250                   | 115                       |
| 300                   | 150                       |
- 3.14.4 Provide connections and pumps for flushing as required.
- 3.14.5 Open and close valves, hydrants and service connections to ensure thorough flushing.
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- 3.14.6 When flushing has been completed to satisfaction of City, introduce a strong solution of chlorine to AWWA C651-99 into watermain and ensure that it is distributed throughout entire system.
- 3.14.7 Rate of chlorine application to be proportional to rate of water entering pipe.
- 3.14.8 Chlorine application to be close to point of filling water main and to occur at same time.
- 3.14.9 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- 3.14.10 After adequate chlorine residual not less than 50 ppm, has been obtained leave system charged with chlorine solution for 24 h. After 24 h, further samples shall be taken to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.
- 3.14.11 Flush line to remove chlorine solution after 24 hours. Chlorine shall be neutralized to the satisfaction of the Engineer before discharging into the environment. Obtain approval of City prior to discharging neutralized chlorine solution into City sanitary sewers. Discharging chlorine solution, either neutralized or non-neutralized, into City storm sewers is not be permitted.
- 3.14.12 Take water samples at hydrants and service connections, in suitable sequence, at extreme end of pipeline being tested to test for chlorine residual.
- 3.14.13 Perform bacteriological tests on water main, after chlorine solution has been flushed out. Take samples daily for minimum of two days. Should contamination remain or recur during this period, repeat disinfecting procedure. Bacteriological tests shall be performed by an accredited laboratory approved by the Northern Health Authority.

END OF SECTION 02511

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 02631 – Manholes and Catch Basins.

1.1.3 Section 02701 – Aggregates: General

1.1.4 Section 03300 – Cast-in-Place Concrete.

**1.2 Shop Drawings**

1.2.1 Indicate proposed method for installing carrier pipe for undercrossings.

**1.3 Material Certification**

1.3.1 CSA Certification to be marked on pipe.

**1.4 Scheduling Of Work**

1.4.1 Submit schedule of expected interruptions to Engineer for approval and adhere to interruption schedule as approved by Engineer.

1.4.2 Notify City and other affected parties minimum of 24 h in advance of any interruption in service.

**2 PRODUCTS****2.1 Concrete Pipe**

2.1.1 Non-reinforced circular concrete pipe and fittings: to CAN/CSA-A257, ASTM C14M, Class as indicated, designed for flexible rubber gasket joints to ASTM C443M.

2.1.2 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257, ASTM C76M, strength classification as indicated, designed for flexible rubber gasket joints to ASTM C443M.

**2.1.3 Lifting holes:**

2.1.3.1 Pipe 900 mm and less diameter: no lift holes.

2.1.3.2 Pipe greater than 900 mm diameter: lift holes not to exceed two in piece of pipe.

2.1.3.3 Provide pre-fabricated plugs to effectively seal lift holes watertight after installation of pipe.

**2.2 Plastic Pipe**

2.2.1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D3034, CAN/CSA-B182.2.

2.2.1.1 Standard Dimensional Ratio (SDR): 35 unless noted otherwise.

2.2.1.2 Locked-in gasket and integral bell system.

2.2.1.3 Nominal lengths: 4 m.

2.2.2 Acrylonitrile - Butadiene - Styrene (ABS): to ASTM D2680, CAN/CSA-B182.2.

2.2.3 Plastic pipe with UV damage from improper storage is not acceptable.

**2.3 Service Connections**

2.3.1 Type PSM Poly (Vinyl) Chloride: to CAN/CSA-B182.2, SDR28.

2.3.2 Plastic pipe: to CAN/CSA B182.1, with push-on joints.

2.3.3 Insert-a-Tee fittings shall not be used unless approved by the Authorized Person.

2.3.4 Cast Iron Service Clean-Out Cap: Acceptable Product: Crowl – C30

**2.4 Cement Mortar**

2.4.1 Portland cement: to CAN/CSA-A5, type 10.

2.4.2 Mix mortar one part by volume of cement to two parts of clean, sharp sand mixed dry. Add only sufficient water after mixing to give optimum consistency for placement. Do not use additives.

**2.5 Pipe Bedding and Surround Material**

2.5.1 Granular material to Section 02701 – Aggregates: General.

2.5.2 Concrete mixes and materials for bedding, cradles, encasement, supports: to Section 03300 - Cast-in-Place Concrete.

**2.6 Backfill Material**

2.6.1 As specified in Section 02315 – Excavating, Trenching and Backfilling.

**3 EXECUTION****3.1 Preparation**

3.1.1 Clean and dry pipes and fittings before installation.

3.1.2 Obtain Engineer's approval of pipes and fittings prior to installation.

**3.2 Trenching**

- 3.2.1 Do trenching work in accordance with Section 02315 - Excavating, Trenching and Backfilling.
- 3.2.2 Excavate trenching to provide a minimum cover pipe crown of 2.25 metres unless otherwise approved by the Authorized Person.
- 3.2.3 Do not allow contents of any sewer or sewer connection to flow into trench.
- 3.2.4 Trench alignment and depth to approval of Engineer prior to placing bedding material and pipe.

**3.3 Concrete Bedding and Encasement**

- 3.3.1 Do concrete work in accordance with Section 03300 - Cast-in-Place Concrete. Place concrete to details as indicated or directed by Engineer.
- 3.3.2 Position pipe on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- 3.3.3 Do not backfill over concrete within 24 h after placing.

**3.4 Granular Bedding**

- 3.4.1 Place bedding in unfrozen condition.
- 3.4.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- 3.4.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.
- 3.4.4 Shape transverse depressions as required to suit joints.
- 3.4.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.
- 3.4.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

**3.5 Installation**

- 3.5.1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Engineer.
- 3.5.2 Handle pipe using methods approved by Engineer. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

- 3.5.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- 3.5.4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- 3.5.5 Do not exceed one half of the maximum joint deflection recommended by pipe manufacturer, unless otherwise approved by the Authorized Person.
- 3.5.6 Do not allow water to flow through pipes during construction except as may be permitted by City.
- 3.5.7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- 3.5.8 Install plastic pipe and fittings in accordance with CSA B182.11.
- 3.5.9 Pipe Jointing:
  - 3.5.9.1 Install gaskets in accordance with the manufacturer's recommendations.
  - 3.5.9.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
  - 3.5.9.3 Align pipes before joining.
  - 3.5.9.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
  - 3.5.9.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
  - 3.5.9.6 Complete each joint before laying next length of pipe.
  - 3.5.9.7 Minimize joint deflection after joint has been made to avoid joint damage.
  - 3.5.9.8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
  - 3.5.9.9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
  - 3.5.9.10 Heat-shrink wrap joints that have less than 3 metre horizontal separation from existing or proposed watermain.
- 3.5.10 When any stoppage of work occurs, block pipes as directed by Engineer to prevent "creep" during down time.

- 3.5.11 Plug lifting holes with prefabricated plugs approved by the Engineer, set in shrinkage compensating grout.
- 3.5.12 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- 3.5.13 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available.
- 3.5.14 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes. Joint to be structurally sound and watertight.
- 3.6 Pipe Surround and Backfill
  - 3.6.1 Place surround material in unfrozen condition.
  - 3.6.2 Upon completion of pipe laying, and after Engineer has inspected pipe joints, surround and cover pipes as indicated.
  - 3.6.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness to manufacturer's specifications. Do not dump material within 1 m of pipe.
  - 3.6.4 Place and compact bedding and surround layers uniformly and simultaneously on each side of pipe to manufacturer's specifications.
  - 3.6.5 Backfill and compact above pipe zone to requirements of Section 02315 – Excavating, Trenching and Backfilling.
- 3.7 Undercrossing
  - 3.7.1 Excavate working pit outside right-of-way to be crossed.
  - 3.7.2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pipe.
  - 3.7.3 Dewater excavation.
  - 3.7.4 Dewater area of undercrossing.
  - 3.7.5 Place encasing pipe to exact line and grade as indicated.
  - 3.7.6 Install encasing pipe by jacking, boring or tunneling as indicated.
  - 3.7.7 Ensure encasing pipe is not in tension.
  - 3.7.8 Provide shop drawings showing proposed method of installation for sanitary sewer in undercrossing.
  - 3.7.9 Insert sanitary sewer pipe into encasement pipe, in end with largest excavation opening after placement of leveling pad.

- 3.7.10 Use approved blocking method to guide sanitary sewer pipe in true alignment.
- 3.7.11 Join sanitary sewer pipe one length at time outside encasement pipe.
- 3.7.12 Couplings of sanitary sewer pipe: not to rest on levelling pad when carrier pipe is in position.
- 3.7.13 Install casing spacers and rubber end seals as indicated on construction drawings or directed by Engineer.
- 3.7.14 When directed by Engineer, place 20 MPa concrete cradle around sanitary sewer pipe after it is positioned. Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.
- 3.7.15 When directed by Engineer, pressure grout remaining void with grout consisting of one part Portland cement and two parts clean washed sand with only sufficient amount of water added to allow placement. Do not install pressure grout until sanitary sewer pipe is secure against flotation. Do not use additives.
- 3.7.16 Do field testing before placing concrete cradle and grouting.
- 3.8 Service Connections
  - 3.8.1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.
  - 3.8.2 Maintain minimum grade or 2% for 100 diameter sewers and 1% for 150 mm diameter sewers unless directed otherwise by the Authorized Person.
  - 3.8.3 Service connections to main sewer: standard Tee or Wye fittings or approved saddles. Do not use break-in and mortar patch-type joints.
  - 3.8.4 Service connection pipe: not to extend into interior of main sewer.
  - 3.8.5 Make up required horizontal and vertical bends from 45° bends or less, separated by straight section of pipe with minimum length of four pipe diameters. Use long sweep bends where applicable.
  - 3.8.6 Provide cleanout on service line as indicated on Standard Infrastructure Drawing S10.
  - 3.8.7 Plug service laterals with water tight caps or plugs as approved by Engineer.
  - 3.8.8 Place location marker at capped ends of unconnected sewer lines as shown on Standard Drawing S10. Each marker shall consist of 38 x 89 mm stake extending from pipe end at pipe level to 0.6 m above grade. Paint exposed portion of stake white with designation "S" in black.

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### 3.9 Field Testing

- 3.9.1 Repair or replace pipe, pipe joint or bedding found defective.
- 3.9.2 When directed by Engineer, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- 3.9.3 Remove foreign material from sewers and related appurtenances by flushing with water.
- 3.9.4 Perform air testing in accordance with manufacturer's specifications. Perform tests in presence of Engineer. Notify City 24 h in advance of proposed tests.
- 3.9.5 When requested by Engineer or Authorized Person, perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- 3.9.6 Do infiltration and exfiltration testing as specified herein and as directed by Engineer. Perform tests in presence of Engineer. Notify City 24 h in advance of proposed tests.
- 3.9.7 Carry out tests on each section of sewer between successive manholes including service connections.
- 3.9.8 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- 3.9.9 Exfiltration test, when specified by Engineer or Authorized Person:
  - 3.9.9.1 Fill test section with water in such a manner as to allow displacement of air in line. Maintain under nominal head for 24 h to ensure absorption in pipe wall is complete before test measurements are commenced.
  - 3.9.9.2 Immediately prior to test period add water to pipeline until there is a head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.
  - 3.9.9.3 Duration of exfiltration test: 2 h.
  - 3.9.9.4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
- 3.9.10 Infiltration test, when specified by Engineer or Authorized Person:
  - 3.9.10.1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
  - 3.9.10.2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.

- 3.9.10.3 Install watertight plug at upstream end of pipeline test section.
- 3.9.10.4 Discontinue pumping operations for at least 3 days before test measurements are to commence and during this time, keep thoroughly wet at least one third of pipe invert perimeter.
- 3.9.10.5 Prevent damage to pipe and bedding material due to flotation and erosion.
- 3.9.10.6 Place 90° V-notch weir, or other measuring device approved by Engineer in invert of sewer at each manhole.
- 3.9.10.7 Measure rate of flow over minimum of 1 h, with recorded flows for each 5 min interval.
- 3.9.11 Leakage: not to exceed following limits in litres per hour per mm of diameter per 100 m of sewer including service connections:
  - 3.9.11.1 Exfiltration, based on 600 mm head: 0.175 L.
  - 3.9.11.2 Infiltration: 0.150 L.
- 3.9.12 Repair and retest sewer line as required, until test results are within limits specified.
- 3.9.13 Repair visible leaks regardless of test results.
- 3.10 Closed Circuit Television Inspections (CCTV)
  - 3.10.1 Flush and clean debris from sanitary sewer gravity mains prior to CCTV inspections.
  - 3.10.2 Perform inspection of installed sewers by CCTV camera and recording devices.
  - 3.10.3 All units provided in records shall be in SI (metric) units.
  - 3.10.4 Prepare CCTV recordings in DVD-R format using Water Resources Centre (WRc) inspection standards. CCTV technician to be WRc certified.
  - 3.10.5 Recording shall be continuous for full length on section between manholes. Date of recording and stationing to be shown on the video image.
  - 3.10.6 Repair all deficiencies in sewer and repeat television inspection.
  - 3.10.7 Provide copy of sewer main testing video, in DVD-R format, to City after all deficiencies are corrected.
  - 3.10.8 Provide CCTV report to City.
  - 3.10.9 Provide means of access to permit Engineer to do inspections.

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## 1 GENERAL

### 1.1 Related Sections

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 03300 – Cast-in-Place Concrete.

### 1.2 Samples

1.2.1 Inform City at least 2 weeks prior to commencing work, of proposed source of bedding materials and provide access for sampling.

### 1.3 Record Drawings

1.3.1 Provide record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions.

### 1.4 Scheduling of Work

1.4.1 Schedule work to minimize interruptions to existing services.

1.4.2 Submit schedule of expected interruptions to City for approval and adhere to interruption schedule as approved by City.

1.4.3 Notify City and other affected parties minimum of 24 h in advance of any interruption in service.

## 2 PRODUCTS

### 2.1 Pipe, Joints and Fittings

2.1.1 Polyvinyl chloride pressure pipe: to ANSI/AWWA C900, pressure class 150, 1 MPa gasket bell end, cast iron outside diameter.

2.1.1.1 Cast iron fittings: to ANSI/AWWA C110/A21.10, and for pipe diameters larger than NPS 4 cement mortar lined to ANSI/AWWA C104/A21.4.

2.1.2 Polyethylene pressure pipe: to CAN/CSA B137.1 type PE 3406, series 160 or ASTM F714, type PE 3408, series DR 11.

2.1.2.1 Joints: to ANSI/AWWA C207 thermal butt fusion or flanged with steel backing flanges.

2.1.2.2 Polyethylene fittings: to CAN/CSA B137.1, for pipe sizes NPS 4 and less.

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## 2.2 Pipe Bedding and Surround Material

2.2.1 Granular material to Section 02701 – Aggregates: General.

2.2.2 Concrete mixes and materials for cradles and thrust blocks to Section 03300 - Cast-in-Place Concrete.

## 2.3 Backfill Material

2.3.1 As specified in Section 02315- Excavation, Trenching and Backfilling.

# 3 EXECUTION

## 3.1 Preparation

3.1.1 Pipe and fittings to be clean and dry.

3.1.2 Prior to installation, obtain City's approval of pipes and fittings.

## 3.2 Trenching

3.2.1 Do trenching work, in accordance with Section 02315 - Excavating, Trenching and Backfilling.

3.2.2 Trench alignment and depth require approval from City prior to placing bedding material or pipe.

## 3.3 Granular Bedding

3.3.1 Place granular bedding in unfrozen condition.

3.3.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.

3.3.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

3.3.4 Shape transverse depressions as required to suit joints.

3.3.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.

3.3.6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding with compacted bedding material.

## 3.4 Installation

3.4.1 Lay pipes to ANSI/AWWA C605, ANSI/AWWA Manual of Practice and manufacturer's standard instructions and specifications.

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- 3.4.2 Join pipes in accordance with ANSI/AWWA C600, AWWA Manual of Practice and manufacturer's recommendations.
  - 3.4.3 Avoid damage to machined ends of pipes in handling and moving pipe.
  - 3.4.4 Maintain grade and alignment of pipes.
  - 3.4.5 Align pipes carefully before jointing.
  - 3.4.6 Do not exceed maximum joint deflection recommended by pipe manufacturer.
  - 3.4.7 Support pipe firmly over entire length, except for clearance necessary at couplings. Do not use blocks to support pipe.
  - 3.4.8 Keep pipe and pipe joints free from foreign material.
  - 3.4.9 Avoid bumping gasket and knocking it out of position, or contaminating with dirt or other foreign material. Gaskets so disturbed to be removed, cleaned, lubricated and replaced before jointing is attempted.
  - 3.4.10 Support pipes by means of hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
  - 3.4.11 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
  - 3.4.12 Apply restraint to pipe to ensure that joints when completed are held in place, by tamping fill material under and alongside pipe, or otherwise as approved by City.
  - 3.4.13 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- 3.5 Thrust Blocks
- 3.5.1 Restrain bends, tees and fittings by concrete thrust blocks. Supply concrete to Section 03300.
  - 3.5.2 Keep pipe couplings free of concrete.
  - 3.5.3 Bearing area of thrust blocks to be as indicated on the drawings.
  - 3.5.4 Install mechanical thrust restraints under the direction of the Engineer and only when use of thrust restraints are approved by the Authorized Person.
- 3.6 Pipe Surround and Backfill
- 3.6.1 Do not place material in frozen condition.
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- 3.6.2 Upon completion of pipe laying and after Engineer has inspected work in place, surround and cover pipes as indicated.
  - 3.6.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness to manufacturer's specifications. Do not dump material within 1 m of pipe.
  - 3.6.4 Place and compact bedding and surround layers uniformly and simultaneously on each side of pipe to manufacturer's specifications.
  - 3.6.5 Backfill and compact above pipe zone to requirements of Section 02315 – Excavating, Trenching and Backfilling.
- 3.7 Undercrossing
- 3.7.1 Excavate working pit outside facility to be crossed.
  - 3.7.2 Excavate working pit to not less than 0.6 m below lowest invert of pipe.
  - 3.7.3 Dewater excavation.
  - 3.7.4 Dewater area of undercrossing.
  - 3.7.5 Place encasing pipe to exact line and grade indicated.
  - 3.7.6 Install encasing pipe by jacking, boring or tunneling.
  - 3.7.7 Encasing pipe shall not be in tension.
  - 3.7.8 Joints for encasing pipe shall be welded type.
  - 3.7.9 When required by Engineer, place concrete grout leveling pad in encasing pipe. Carefully control level of grout during placing.
  - 3.7.10 Provide shop drawings showing proposed method of installation for sewage force main in undercrossing.
  - 3.7.11 Insert sewage force main into encasing pipe, in end with largest excavated open area, after placement of levelling pad.
  - 3.7.12 Install casing spacers and rubber end seals as indicated on construction drawings or directed by Engineer.
  - 3.7.13 Use approved blocking method to guide sewage force main in true alignment.
  - 3.7.14 Clearance between blocks and encasing pipe shall be maximum 15 mm when sewage force main is in position.
  - 3.7.15 Join sewage force main one length at a time outside encasing pipe.
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- 3.7.16 Couplings of sewage force main shall not rest on levelling pad when sewage force main is in position.
  - 3.7.17 When required by the Engineer, place concrete cradle around sewage force main after it is positioned. Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.
  - 3.7.18 When required by the Engineer, pressure grout remaining void with mixture of one part Portland cement and two parts clean washed sand, with only sufficient water added to allow placing. Do not install pressure grout until sewage force main is secure against flotation. Do not use additives.
  - 3.7.19 Do field testing before placing concrete cradle and grouting.
- 3.8 Field Testing of Force Main
- 3.8.1 Testing of force main to be carried out in presence of Engineer.
  - 3.8.2 Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.
  - 3.8.3 Expel air from force main, by slowly filling main with water. High points to be drilled and tapped and suitable cocks installed to vent air and to be shut when pressure is applied. Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.
  - 3.8.4 Apply test pressure of 1035 kPa based on elevation of lowest point in line and corrected to elevation of test gauge for a period of 2 h.
  - 3.8.5 Remove defective joints, pipe and fittings and replace with new sound material.
  - 3.8.6 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2h.
  - 3.8.7 Do not exceed allowable leakage as defined in ANSI/AWWA C605. Locate and repair defects if leakage greater than amount allowable.
  - 3.8.8 Remove defective joints, pipe and fittings and replace with new sound material.
  - 3.8.9 Repeat test until leakage is within specified allowance for full length of force main.

END OF SECTION 02531

**1 GENERAL****1.1 Related Work**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 03300 – Cast-in-Place Concrete.

**1.2 Record Drawings**

1.2.1 Provide record drawings including location of duct banks, manholes and markers.

**2 PRODUCTS****2.1 PVC Ducts**

2.1.1 PVC ducts, type EB1, encased in concrete.

**2.2 PVC Duct Fittings**

2.2.1 Rigid PVC opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation.

2.2.2 Expansion joints.

2.2.3 Rigid PVC 5° angle couplings

**2.3 Precast Concrete Manholes**

2.3.1 Precast concrete manholes and auxiliary sections fabricated in steel forms.

2.3.2 Aggregates: to CSA-A23.1.

2.3.3 Cement: to CAN/CSA-A5, type10.

2.3.4 Pulling inserts and bolts for racks integrally cast in concrete.

2.3.5 Neoprene gasket seals between manhole sections: to ASTM D 1056.

2.3.6 Concrete reinforcement: to Section 03200 - Concrete Reinforcement.

**2.4 Drainage**

2.4.1 Floor drain fittings in each manhole consisting of floor drain, back water valve, trap and pipe connection to drainage system or Dry sump as indicated.

**2.5 Manhole Necks**

2.5.1 Concrete brick and mortar.

2.6 Manhole Frames and Covers

2.6.1 Cast iron manhole frames and covers.

2.7 Grounding

2.7.1 Ground rods for cable rack grounding.

2.8 Cable Racks

2.8.1 Hot dipped galvanized cable racks and supports.

2.8.2 12 x 100 mm preset inserts for rack mounting.

2.9 Cable Pulling Equipment

2.9.1 Pulling iron: galvanized steel rods, size and shape as indicated.

2.9.2 Pull rope: 6 mm stranded polypropylene, tensile strength 5 kN, continuous throughout each duct run with 3 m spare rope at each end.

2.10 Markers

2.10.1 Concrete type cable markers: 600 x 600 x 100 mm, with words: "cable", "joint" or "duct" impressed in top surface, with arrows to indicate change in direction of duct runs.

3 EXECUTION

3.1 Installation General

3.1.1 Build duct bank and manholes on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.

3.1.2 Open trench completely between manholes to be connected before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.

3.1.3 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.

3.1.4 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of ducts.

3.1.5 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 40 mm horizontally and vertically. Stagger joints in adjacent layers at least 150 mm and make joints watertight. Encase duct bank with 75 mm thick concrete cover.

- 3.1.6 Make transpositions, offsets and changes in direction using 5° bend sections, do not exceed a total of 20° with duct offset.
  - 3.1.7 Use bell ends at duct terminations in manholes or buildings.
  - 3.1.8 Use conduit to duct adapters when connecting to conduits.
  - 3.1.9 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.
  - 3.1.10 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.
  - 3.1.11 Allow concrete to attain 50% of its specified strength before backfilling.
  - 3.1.12 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.
  - 3.1.13 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
  - 3.1.14 Immediately after placing of concrete, pull through each duct a steel mandrel not less than 300 mm long and of a diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Avoid disturbing or damaging ducts where concrete has not set completely. Pull stiff bristle brush through each duct immediately before pulling-in cables.
  - 3.1.15 Install reinforcing rods in duct bank as detailed when connecting duct to manholes or buildings. Protect existing cables and equipment when breaking into existing manholes. Place concrete down sides of duct bank filling space under and around ducts. Rod concrete with flat bar between vertical rows filling voids.
  - 3.1.16 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end
- 3.2 Manholes
- 3.2.1 Install cast-in-place or precast manholes as indicated.
  - 3.2.2 Place concrete in two lifts with slab and sump in first, walls, roof and neck in second lift. Provide key in walls to slab. Place 100 x 6 mm PVC water bar vertically in key. Install ground rod before placing slab and place reinforcing steel, inserts for cable rack, pulling irons, drain, duct outlets, duct run dowels before casting walls. Make manhole to duct connection as indicated.

- 3.2.3 Provide 115 mm deep window to facilitate cable bends in wall at each duct connection. Terminate ducts in bell-end fitting flush with window face. Provide four 10M steel dowels at each duct run connection to anchor duct run. On runs of 16 ducts and over, support concrete duct encasement on a 700 mm wide by 75 mm thick concrete pier poured against manhole wall between slab and bottom of duct run, provide dowels for anchoring.
- 3.2.4 Alternately connect large duct runs by leaving square opening in wall, later pouring duct run and wall opening in one pour, and install 10M x 3m reinforcing rods in duct run at manhole connection.
- 3.2.5 Build up concrete manhole neck to bring cover flush with finished grade in paved areas and 40 mm above grade in unpaved areas.
- 3.2.6 Install manhole frames and covers for each manhole. Set frames in concrete grout onto manhole neck.
- 3.2.7 Drain floor towards sump with 1 to 48 slope minimum and install drainage fittings as indicated.
- 3.2.8 Install cable racks, anchor bolts and pulling irons as indicated.
- 3.2.9 Grout frames of manholes. Cement grout to consist of two parts sand and one part cement and sufficient water to form a plastic slurry.
- 3.2.10 Ensure filling of voids in joint being sealed. Plaster with cement grout, walls, ceiling and neck.
- 3.2.11 Spray paint an "X" on ceiling of manhole above floor drain or sump pit.
- 3.3 Markers
  - 3.3.1 Mark location of duct runs under hard surfaced areas not terminating in manhole with railway spike driven flush in edge of pavement, directly over run. Place concrete duct marker at ends of such duct runs. Construct markers and install flush with grade.
  - 3.3.2 Mark ducts every 150 m along straight runs and changes in direction.
  - 3.3.3 Where markers are removed to permit installation of additional duct, reinstall existing markers.
  - 3.3.4 Lay concrete markers flat and centered over duct with top 25mm above earth surface.
- 3.4 Inspection
  - 3.4.1 Inspection of duct will be carried out by Engineer prior to placing concrete. Placement of concrete and duct cleanout to be done when Engineer present.

1      GENERAL

1.1      Related Sections

- 1.1.1      Section 02315 - Excavating, Trenching and Backfilling.
- 1.1.2      Section 02581 – Concrete Encased Duct Banks and Manholes.

2      PRODUCTS

2.1      PVC Ducts and Fittings

- 2.1.1      Rigid PVC duct: to CSA C22.2 No. 211.1, Type DB2/ES2, with moulded fittings, for direct burial, expanded flange ends. Nominal length: 6 m plus or minus 12 mm.
- 2.1.2      Rigid PVC split ducts
- 2.1.3      Rigid PVC bends, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.
- 2.1.4      Rigid PVC 90° and 45° bends.
- 2.1.5      Rigid PVC 5° angle couplings.
- 2.1.6      Expansion joints as required.

2.2      Solvent Weld Compound

- 2.2.1      Solvent cement for PVC duct joints.

2.3      Fibreglass Ducts

- 2.3.1      Fibreglass reinforced thermoset duct: to CSA C22.2, No. 211.3, type AG, watertight, underwater type.
- 2.3.2      Couplings, reducers, plugs, caps, adaptors, and supports to make a complete installation.
- 2.3.3      Expansion joints as required.

2.4      Plastic Polyethylene Pipe

- 2.4.1      Rigid plastic polyethylene pipe with approved couplings and fittings required to make a complete installation.

2.5      Cable Pulling Equipment

2.5.1      6 mm stranded nylon pull rope, tensile strength 5 kN.

2.6      Markers

2.6.1      Concrete type cable markers: with words: "cable", "joint" or "conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

3      EXECUTION

3.1      Installation

3.1.1      Install duct in accordance with manufacturer's instructions.

3.1.2      Clean inside of ducts before laying.

3.1.3      Ensure full, even support every 1.5 m throughout duct length.

3.1.4      Slope ducts with 1 to 400 minimum slope.

3.1.5      During construction, cap ends of ducts to prevent entrance of foreign materials.

3.1.6      Pull through each duct steel mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling-in cables.

3.1.7      In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.

3.1.8      Install markers as required.

END OF SECTION 02582

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 02631 – Manholes and Catch Basins.

**1.2 Material Certification**

1.2.1 Certification to be marked on pipe.

**1.3 Scheduling Of Work**

1.3.1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

1.3.2 Submit schedule of expected interruptions to City for approval and adhere to interruption schedule as approved by City.

**2 PRODUCTS****2.1 Concrete Pipe**

2.1.1 Non-reinforced circular concrete pipe and fittings: to CAN/CSA-A257, ASTM C14M, Class as indicated, designed for flexible rubber gasket joints to ASTM C443M.

2.1.2 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257, ASTM C76M, strength classification as indicated, designed for flexible rubber gasket joints to ASTM C443M.

**2.1.3 Lifting holes:**

2.1.3.1 Pipe 900 mm and less diameter: no lift holes.

2.1.3.2 Pipe greater than 900 mm diameter: lift holes not to exceed two in piece of pipe.

2.1.3.3 Provide pre-fabricated plugs to effectively seal lift holes watertight after installation of pipe.

**2.2 Corrugated Steel Pipe**

2.2.1 Asphalt-coated corrugated steel pipe and couplers: to CAN3-G401.

- 2.3 Spiral Rib Steel Pipe
  - 2.3.1 Acceptable product: Armttec Ultra Flo.
- 2.4 Plastic Pipe
  - 2.4.1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D3034, CAN/CSA-B182.2.
    - 2.4.1.1 Standard Dimensional Ratio (SDR): 35 unless noted otherwise.
    - 2.4.1.2 Locked-in gasket and integral bell system.
    - 2.4.1.3 Nominal lengths: 4 m.
  - 2.4.2 Large diameter, ribbed PVC sewer pipe and fittings: to CAN/CSA B182.4, ASTM F794.
- 2.5 Service Connections and Catch Basin Leads
  - 2.5.1 Catch Basin Leads: Asphalt-coated corrugated steel pipe and couplers to CAN3-G401.
  - 2.5.2 Service Connections: (Allowed only when used with corrugated steel pipe mains) asphalt-coated corrugated steel pipe and couplers to CAN3-G401.
  - 2.5.3 Service Connections: Type PSM Poly Vinyl Chloride: to CAN/CSA-B182.2.
    - 2.5.3.1 Standard Dimensional Ratio (SDR): 35 for pipe 150 mm diameter and smaller.
    - 2.5.3.2 Pipe larger than 150mm diameter to conform to requirements for mainline pipe.
- 2.6 Pipe Bedding and Surround Material
  - 2.6.1 Granular material to Section 02701 – Aggregates: General.
  - 2.6.2 Concrete mixes and materials for bedding, cradles, encasement, supports: to Section 03300 - Cast-in-Place Concrete.
- 2.7 Backfill Material
  - 2.7.1 As specified in Section 02315 – Excavation, Trenching and Backfilling.
- 2.8 Joint Mortar
  - 2.8.1 Portland cement: to CAN/CSA-A5, type 10.
  - 2.8.2 Mortar: one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

**3 EXECUTION****3.1 Preparation**

- 3.1.1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of City.

**3.2 Trenching**

- 3.2.1 Do trenching work in accordance with Section 02223 - Excavating, Trenching and Backfilling.
- 3.2.2 Do not allow contents of any sewer or sewer connection to flow into trench.
- 3.2.3 Trench alignment and depth to approval of City prior to placing bedding material and pipe.
- 3.2.4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by City.

**3.3 Concrete Bedding and Encasement**

- 3.3.1 Do concrete work in accordance with Section 03300 - Cast-in-Place Concrete. Place concrete to details as indicated or directed by City.
- 3.3.2 Position pipe on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- 3.3.3 Do not backfill over concrete within 24 h after placing.

**3.4 Granular Bedding**

- 3.4.1 Place bedding in unfrozen condition.
- 3.4.2 Place granular bedding material in uniform layer[s] not exceeding 150 mm compacted thickness to depth as indicated.
- 3.4.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.
- 3.4.4 Shape transverse depressions as required to suit joints.
- 3.4.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.
- 3.4.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

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### 3.5 Installation

- 3.5.1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of City.
- 3.5.2 Handle pipe using methods approved by City. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- 3.5.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- 3.5.4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- 3.5.5 Do not exceed one half maximum joint deflection recommended by pipe manufacturer, unless otherwise approved by the Authorized Person.
- 3.5.6 Do not allow water to flow through pipes during construction except as may be permitted by City.
- 3.5.7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- 3.5.8 Install plastic pipe and fittings in accordance with CSA B182.11.
- 3.5.9 Joints:
  - 3.5.9.1 Corrugated steel pipe:
    - i) Install gaskets on both sides of joints.
    - ii) Match corrugations or indentations of coupler band with pipe sections before tightening.
    - iii) Tap coupler firmly while tightening, to take up slack and ensure snug fit.
    - iv) Ensure bolts are inserted and tightened.
  - 3.5.9.2 Concrete Pipe:
    - i) Install gaskets as recommended by manufacturer.
    - ii) Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
    - iii) Align pipes before joining.
    - iv) Maintain pipe joints free from mud, silt, gravel and other foreign material.
    - v) Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
    - vi) Complete each joint before laying next length of pipe.

- vii) Minimize joint deflection after joint has been made to avoid joint damage.
- viii) Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- ix) Mortared joints:
  - a) Pipe interior: circular pipes 700 mm diameter and larger, and arch or elliptical pipe equivalent to 900 mm diameter or larger shall have interior gap between ends of adjacent pipes filled with mortar. Apply mortar minimum 7 days after backfilling has been completed to allow pipe settlement to occur. Finish interior surface of joints smooth.
  - b) Pipe exterior: for bell and spigot pipe, use mortar to seal outside of joints. Press and bed mortar into place. Allow mortar to set minimum of 1 h before backfilling.

3.5.9.3 Shrink wrap joints that have less than 3 m separation from existing or proposed water mains.

3.5.10 When any stoppage of work occurs, restrain pipes as directed by Engineer to prevent "creep" during down time.

3.5.11 Plug lifting holes with prefabricated plugs approved by Engineer, set in shrinkage compensating grout.

3.5.12 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

3.5.13 Make watertight connections to manholes and catch basins. Use shrinkage compensating grout when suitable gaskets are not available.

3.5.14 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes. Joint to be structurally sound and watertight.

3.5.15 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

### 3.6 Pipe Surround and Backfill

3.6.1 Place surround material in unfrozen condition.

3.6.2 Upon completion of pipe laying, and after Engineer has inspected pipe joints, surround and cover pipes as indicated.

3.6.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1 m of pipe.

3.6.4 Place layers uniformly and simultaneously on each side of pipe.

3.6.5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D698.

- 3.6.6 Compact each layer from mid height of pipe to underside of backfill to at least 90% maximum density to ASTM D698.
- 3.6.7 Backfill above pipe zone to requirements of Section 02315 – Excavating, Trenching and Backfilling.
- 3.7 Undercrossing
  - 3.7.1 Excavate working pit outside right-of-way to be crossed.
  - 3.7.2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pipe.
  - 3.7.3 Dewater excavation.
  - 3.7.4 Dewater area of undercrossing.
  - 3.7.5 Place encasing pipe to exact line and grade as indicated.
  - 3.7.6 Install encasing pipe by jacking, boring or tunneling as indicated.
  - 3.7.7 Ensure encasing pipe is not in tension.
  - 3.7.8 Provide shop drawings showing proposed method of installation for sanitary sewer in undercrossing.
  - 3.7.9 Insert sanitary sewer pipe into encasement pipe, in end with largest excavation opening after placement of leveling pad.
  - 3.7.10 Use approved blocking method to guide sanitary sewer pipe in true alignment.
  - 3.7.11 Join sanitary sewer pipe one length at time outside encasement pipe.
  - 3.7.12 Couplings of sanitary sewer pipe: not to rest on levelling pad when carrier pipe is in position.
  - 3.7.13 Install casing spacers and rubber end seals as indicated on construction drawings or directed by Engineer.
  - 3.7.14 When directed by Engineer, place 20 MPa concrete cradle around sanitary sewer pipe after it is positioned. Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.
  - 3.7.15 When directed by Engineer, pressure grout remaining void with grout consisting of one part Portland cement and two parts clean washed sand with only sufficient amount of water added to allow placement. Do not install pressure grout until sanitary sewer pipe is secure against flotation. Do not use additives.
  - 3.7.16 Do field testing before placing concrete cradle and grouting.
- 3.8 Service Connections and Catch Basin Leads

- 3.8.1 Service connections to main sewer: standard Tee or Wye fittings or approved saddles. Do not use break-in and mortar patch-type joints. Connection pipe not to extend into interior of main sewer.
- 3.8.2 Catch basin leads to be connected directly to manholes. Cement-mortar grout on interior and exterior of manhole and catchbasins to Section 02631.
- 3.8.3 Provide cleanout on service line at location indicated.
- 3.8.4 Plug service laterals with water tight caps or plugs as approved by City.
- 3.8.5 Place location marker at capped ends of unconnected service lines as shown on Standard Drawing S10. Each marker shall consist of 50 x 100 (nominal) mm stake, 3.0 metres long, extending from pipe end at pipe level to 0.6 m above grade. Paint exposed portion of stake green with designation "D" in black.
- 3.9 Field Testing
  - 3.9.1 Repair or replace pipe, pipe joint or bedding found defective.
  - 3.9.2 When directed by City, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
  - 3.9.3 Remove foreign material from sewers and related appurtenances by flushing with water.
- 3.10 Closed Circuit Television Inspections (CCTV)
  - 3.10.1 Flush and clean debris from sanitary sewer gravity mains prior to CCTV inspections.
  - 3.10.2 Perform inspection of installed sewers by CCTV camera and recording devices.
  - 3.10.3 All units provided in records shall be in SI (metric) units.
  - 3.10.4 Prepare CCTV recordings in DVD-R format using Water Resources Centre (WRc) inspection standards. CCTV technician to be WRc certified.
  - 3.10.5 Recording shall be continuous for full length on section between manholes. Date of recording and stationing to be shown on the video image.
  - 3.10.6 Repair all deficiencies in sewer and repeat television inspection.
  - 3.10.7 Provide copy of sewer main testing video, in DVD-R format, to City after all deficiencies are corrected.
  - 3.10.8 Provide CCTV report to City.

**END OF SECTION 02630**

**1 GENERAL****1.1 Related Work**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 02530 – Sanitary Sewage.

1.1.3 Section 02630 – Storm Sewer.

1.1.4 Section 03200 – Concrete Reinforcement

1.1.5 Section 03300 – Cast-in-Place Concrete.

**1.2 Scheduling of Work**

1.2.1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

1.2.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

**2 PRODUCTS****2.1 Materials**

2.1.1 Cement: to CAN/CSA-A5, type10.

2.1.2 Concrete to be minimum 21 MPa or as specified otherwise on Contract Drawings.

2.1.3 Concrete reinforcement: to Section 03200 - Concrete Reinforcement.

2.1.4 Precast manhole units: to ASTM C 478M, circular, complete with ladder rungs. Top sections flat slab top type with opening offset for vertical ladder installation.

2.1.5 Precast catch basin sections: to ASTM C 139.

2.1.6 Asphalt-coated corrugated steel pipe and couplers: to CAN3-G401

2.1.7 Joints: to be made watertight using rubber rings or bituminous compound.

2.1.8 Mortar:

2.1.8.1 Aggregate: to CSA A82.56.

2.1.8.2 Cement: to CAN/CSA-A8.

2.1.9 Ladder rungs: to CAN/CSA-G30.18, No. 25M billet steel deformed bars, hot dipped galvanized to CAN/CSA G164. Rungs to be safety pattern (drop step type).

2.1.10 Adjusting rings: to ASTM C478.

- 2.1.11 Concrete Brick: to CAN3-A165 Series.
- 2.1.12 Drop manhole pipe: to be same as sewer pipe.
- 2.1.13 Manhole lids: to be precast reinforced concrete designed to withstand H20 loading.
- 2.1.14 Frames, gratings, covers to details and dimensions as indicated on Detail Drawing.

### **3 EXECUTION**

#### **3.1 Excavation and Backfill**

- 3.1.1 Excavate and backfill in accordance with Section 02315 - Excavating, Trenching and Backfilling.
- 3.1.2 Obtain approval of Engineer before installing manholes, catchbasins or other specified structures.

#### **3.2 Concrete Work**

- 3.2.1 Place concrete reinforcement in accordance with Section 03200 - Concrete Reinforcement.
- 3.2.2 Do concrete work in accordance with Section 03300 - Cast-in-Place Concrete.
- 3.2.3 Position metal inserts in accordance with dimensions and details as indicated.

#### **3.3 Installation**

- 3.3.1 Install units in accordance with details indicated, plumb and true to alignment and grade, concurrently with pipe laying.
- 3.3.2 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.
- 3.3.3 Dewater excavation to approval of Engineer and remove soft and foreign material before placing concrete base.
- 3.3.4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% maximum density to ASTM D 698,

**3.3.5 Precast Units:**

- 3.3.5.1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with City approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof.
- 3.3.5.2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
- 3.3.5.3 Plug lifting holes with concrete plugs set in cement mortar or mastic compound

**3.3.6 For sewers:**

- 3.3.6.1 Place stub outlets and bulkheads at elevations and in positions indicated.
- 3.3.6.2 Provide for a 25 mm smooth drop for piping through manhole barrels and a 50 mm smooth drop for piping entering and leaving manhole between 45 and 90 degrees.
- 3.3.6.3 When pipe changes diameter size, match pipe crowns to same elevation, unless otherwise approved by Authorized Person.
- 3.3.6.4 Bench to provide a smooth U-shaped channel. Side height of channel to be 0.75 times diameter of sewer. Slope adjacent floor at 1 in 20. Curve channels smoothly. Slope invert to establish sewer grade. For pipes smaller than 250 mm use standard fittings, breaking out upper half of fitting upon completion of manhole.

**3.3.7 Compact granular backfill to 95% maximum density to ASTM D 698.****3.3.8 Place unshrinkable backfill in accordance with Section 02315 - Excavating, Trenching and Backfill.****3.3.9 Installing units in existing systems:**

- 3.3.9.1 Where new unit is to be installed in existing run of pipe, ensure full support of existing pipe during installation and carefully remove that portion of existing pipe to dimensions required. Install new unit as specified.
- 3.3.9.2 Make joints watertight between new unit and existing pipe.
- 3.3.9.3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.

- 3.3.10 Set frame and cover to required elevation on no more than 4 courses of brick. Make brick joints and join brick to frame with cement mortar. Parge and make smooth and watertight.
- 3.3.11 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.
- 3.3.12 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.
- 3.4 Adjusting Tops of Existing Units
  - 3.4.1 Remove existing gratings and frames and store for re-use at locations designated by City.
  - 3.4.2 Sectional units:
    - 3.4.2.1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
    - 3.4.2.2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation. Do not replace cone section. Replace with flat slab top type lid. When amount of raise is less than 600 mm use standard manhole brick to adjust elevation.
  - 3.4.3 Monolithic units:
    - 3.4.3.1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.
    - 3.4.3.2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.
    - 3.4.3.3 When monolithic units with tapered upper section are to be lowered more than 150 mm, remove concrete for entire depth of taper plus as much straight wall as necessary, then rebuild upper section to required elevation with cast-in-place concrete.
    - 3.4.3.4 Install additional manhole ladder rungs in adjusted portion of units as required.
    - 3.4.3.5 Re-use existing gratings, frames etc.
  - 3.4.4 Re-set gratings and frames to required elevation on not more than 4 courses of brick. Make brick joints and joint brick to frame with cement mortar, parge and trowel smooth. Place cement mortar between bricks and around bricks.

3.5 Sealing over Existing Units

3.5.1 Cut galvanized iron sheet to extend 50 mm beyond opening of existing manhole or catch basin grating. Center iron sheet over existing grating and spot or stitchweld to grating.

3.5.2 Fill with cast-in-place concrete.

3.6 Leakage Test

3.6.1 When required by Engineer or Authorized Person, install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole.

3.6.2 If permissible leakage is exceeded, correct defects. Repeat until acceptable to Engineer.

3.6.3 Engineer will issue Test Certificate for each manhole passing test.

END OF SECTION 02631

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 02317 – Roadway Excavation, Embankment and Compaction.

**1.2 Material Certification**

1.2.1 Certification to be marked on pipe.

**2 PRODUCTS****2.1 Corrugated Steel Pipe and Structural Plate**

2.1.1 Corrugated steel pipe: to CAN3-G401.

2.1.2 Water-tight cut-off collars: as indicated on Construction Drawings.

2.1.3 Prefabricated end sections and wing walls: as indicated on Construction Drawings.

**2.2 Granular Bedding and Backfill**

2.2.1 Granular material to Section 02701 – Aggregates: General.

2.2.2 Concrete mixes and materials for bedding, cradles, encasement, supports: to Section 03300 - Cast-in-Place Concrete.

2.2.3 Backfill Material as indicated on Construction Drawings.

**3 EXECUTION****3.1 Trenching**

3.1.1 Do trenching work in accordance with Section 02223 - Excavating, Trenching and Backfilling.

3.1.2 Obtain Engineer's approval of trench line and depth prior to placing bedding material or pipe.

**3.2 Bedding**

3.2.1 Dewater excavation, as necessary, to allow placement of culvert bedding in the dry.

3.2.2 Place minimum thickness of 200 mm of approved granular material on bottom of excavation and compact to minimum 95% of maximum density to ASTM D 698.

- 3.2.3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated on Construction Drawings or as directed by Engineer, free from sags or high points.
- 3.2.4 Place bedding in unfrozen condition.
- 3.3 Laying Corrugated Steel Pipe Culverts
  - 3.3.1 Commence pipe laying at downstream end.
  - 3.3.2 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.
  - 3.3.3 Do not allow water to flow through pipes during construction except as may be permitted by Engineer.
- 3.4 Joints: Corrugated Steel Culverts
  - 3.4.1 Corrugated steel pipe:
    - 3.4.1.1 Match corrugations or indentations of coupler band with pipe sections before tightening.
    - 3.4.1.2 Tap coupler firmly while tightening, to take up slack and ensure snug fit.
    - 3.4.1.3 Insert and tighten bolts.
    - 3.4.1.4 Repair spots where damage has occurred to spelter coating by applying two coats of zinc rich paint.
  - 3.4.2 Structural Plate:
    - 3.4.2.1 Erect in final position by connecting plates with bolts at longitudinal and circumferential seams.
    - 3.4.2.2 Drift pins may be used to facilitate matching of holes.
    - 3.4.2.3 Place plates in sequence recommended by manufacturer with joints staggered wherever possible so that not more than three plates come together at any one point.
    - 3.4.2.4 Draw bolts up tight, without overstress, before beginning backfill.
    - 3.4.2.5 Repair spots where damage has occurred to spelter coating by applying two coats of zinc-rich paint.
- 3.5 Backfilling

- 3.5.1 Backfill around and over culverts as indicated on Construction Drawings or as directed by Engineer.
- 3.5.2 Place backfill material, approved by Engineer, in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
- 3.5.3 Compact each layer to 95% maximum density to ASTM D 698 taking special care to obtain required density under haunches.
- 3.5.4 Protect installed culvert with minimum 600 mm cover of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 1 Vertical : 2 Horizontal (1V:2H).
- 3.5.5 Place backfill in unfrozen condition.

END OF SECTION 02641

**1 GENERAL****1.1 Related Sections**

- 1.1.1 Section 02721 – Granular Base.
- 1.1.2 Section 02723 – Granular Sub-base.
- 1.1.3 Section 02741 – Hot Mix Asphalt Concrete Paving

**1.2 Samples**

- 1.2.1 Inform City of proposed source and provide samples or access for sampling at least 2 weeks prior to commencing production.
- 1.2.2 Install sampling facilities at discharge end of production conveyor, to allow City to obtain representative samples of items being produced. Stop conveyor belt when requested by the City to permit full cross section sampling.
- 1.2.3 If, in opinion of the City, materials from proposed source do not meet, or cannot reasonably be processed to meet specified requirements, locate alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- 1.2.4 Acceptance of material does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unsatisfactory.

**1.3 Special Requirements**

- 1.3.1 All works performed under this Section must comply with the requirements of the Soil Removal and Deposit Bylaw.

**2 PRODUCTS****2.1 Materials General**

- 2.1.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- 2.1.2 In absence of satisfactory performance records over a five year period for a particular source of material, soundness to be tested according to ASTM C88.
- 2.1.3 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
  - 2.1.3.1 Greatest dimension to exceed five times least dimension.

2.1.4 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

2.1.4.1 Natural sand.

2.1.4.2 Manufactured sand.

2.1.4.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

2.1.5 Coarse aggregates satisfying requirements of applicable section to be one, or blend of following:

2.1.5.1 Crushed rock.

2.1.5.2 Gravel and crushed gravel composed of naturally formed particles of stone.

2.1.5.3 Light weight aggregate, including slag and expanded shale.

2.1.6 Native Material or Type 3 Fill:

2.1.6.1 To be any workable soil free of organic or foreign matter. Any native material obtained within limits of Contract may be deemed granular material for purposes of payment if it meets specifications of granular material. Native material not acceptable if it is impracticable to control its water content or to compact to specified density.

2.2 Granular Sub-base

2.2.1 To be well-graded granular material, substantially free from clay lumps, organic matter and other extraneous material, screened to remove all stones in excess of maximum diameter specified in material description. Conform to following gradations:

| Sieve Designation |    | Percent Passing |
|-------------------|----|-----------------|
| 75                | mm | 100             |
| 25                | mm | 50 - 90         |
| 0.300             | mm | 0 - 15          |
| 0.075             | mm | 0 - 6           |

## 2.3 Drain Rock

2.3.1 To consist of clean round stone or crushed rock conforming to following gradations:

| Sieve Designation |    | Coarse<br>%Passing | Fine<br>(Torpedo Gravel)<br>% Passing |
|-------------------|----|--------------------|---------------------------------------|
| 25.0              | mm | 100                |                                       |
| 19.0              | mm | 0 - 100            |                                       |
| 9.5               | mm | 0 - 5              | 100                                   |
| 4.75              | mm | 0                  | 50 - 100                              |
| 2.36              | mm |                    | 10 - 35                               |
| 1.18              | mm |                    | 5 - 15                                |
| 0.60              | mm |                    | 0 - 8                                 |
| 0.30              | mm |                    | 0 - 5                                 |
| 0.15              | mm |                    | 0 - 2                                 |
| 0.075             | mm |                    | 0                                     |

2.3.2 Drain rock to be used only where specified. Use of drain rock other than as specified requires approval of City after examination of soils against which drain rock will be placed.

## 2.4 Granular Pipe Bedding and Surround Material

2.4.1 Crushed or graded gravels: to conform to following gradations:

| Sieve Designation |    | Type 1<br>% Passing | Type 2<br>% Passing |
|-------------------|----|---------------------|---------------------|
| 25.0              | mm | 100                 | 100                 |
| 19.0              | mm | 90 - 100            | 90 - 100            |
| 12.5              | mm | 65 - 85             | 70 - 100            |
| 9.5               | mm | 50 - 75             |                     |
| 4.75              | mm | 25 - 50             | 40 - 70             |
| 2.36              | mm | 10 - 35             |                     |
| 0.85              | mm | 5 - 20              | 8 - 30              |
| 0.425             | mm | 0 - 15              |                     |
| 0.300             | mm |                     | 3 - 20              |
| 0.180             | mm | 0 - 8               |                     |
| 0.075             | mm | 0 - 5               | 0 - 8               |

Type 1: standard gradation

Type 2: to be used only in dry trench conditions and with the City's prior approval

2.4.2 Other permissible materials: where shown on Contract Drawings or directed by City, drain rock, pit run sand or approved native material may be used for bedding and pipe surround.

## 2.5 Granular Base

2.5.1 Use crushed and screened material, conforming to following gradation.

| Sieve Designation |    | Percent Passing |
|-------------------|----|-----------------|
| 19                | mm | 100             |
| 4.75              | mm | 40 - 80         |
| 2.36              | mm | 27 - 65         |
| 1.18              | mm | 18 - 50         |
| 0.600             | mm | 12 - 35         |
| 0.300             | mm | 8 - 25          |
| 0.150             | mm | 4 - 17          |
| 0.075             | mm | 2 - 8           |

2.5.2 Not less than 10% is to be retained between each pair of successive sieves.

2.5.3 Crushed particles: at least 60% of particles by mass within each of the following designation ranges to have at least one freshly fractured face. Material to be divided into ranges using methods of ASTM C 136:

| Passing |    | Retained on |  |
|---------|----|-------------|--|
| 50 mm   | to | 25 mm       |  |
| 25 mm   | to | 19 mm       |  |
| 19 mm   | to | 4.75 mm     |  |

## 3 EXECUTION

## 3.1 Aggregate Source Preparation

3.1.1 Comply with requirements of Soil Removal and Deposit Bylaw.

3.1.2 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials..

3.1.3 Where clearing is required, leave screen of trees between cleared area and roadways as directed.

3.1.4 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.

3.1.5 When excavation is completed dress sides of excavation to nominal 1.5H:1V slope, and provide drains or ditches as required to prevent surface standing water.

3.1.6 Trim off and dress slopes of waste material piles and leave site in neat condition.

**3.2 Processing**

- 3.2.1 Process aggregate uniformly, using methods that prevent contamination, segregation and degradation.
- 3.2.2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by City.
- 3.2.3 Wash aggregates, if required to meet specifications. Use only equipment approved by City. Dispose of wash water in accordance with all Federal and Provincial regulations.
- 3.2.4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

**3.3 Handling**

- 3.3.1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- 3.3.2 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by City within 48 h of rejection.

**3.4 Stockpiling**

- 3.4.1 Stockpile aggregates on site in locations as approved by City. Do not stockpile on completed pavement surfaces.
- 3.4.2 Stockpile aggregates in sufficient quantities to meet project schedules.
- 3.4.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- 3.4.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.
- 3.4.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- 3.4.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by the City within 48 hours of rejection.
- 3.4.7 Stockpile materials in uniform layers of thickness as follows:
  - 3.4.7.1 Max 1.5m for coarse aggregate and base course materials.
  - 3.4.7.2 Max 1.5m for fine aggregate and sub-base materials.

3.4.7.3 Max 1.5m for other materials.

3.4.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

3.4.9 Do not cone piles or spill material over edges of piles.

3.4.10 Do not use conveying stackers.

3.4.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.5 Cleaning

3.5.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

3.5.2 Leave any unused aggregates in neat compact stockpiles as directed by City.

3.5.3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of Soil Removal and Deposit Bylaw.

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**1 GENERAL****1.1 Summary**

- 1.1.1 This method covers measurement of loss of Marshall Stability resulting from action of water on compacted asphalt paving mixtures containing penetration grade asphalt cement.
- 1.1.2 Numerical index of retained stability is obtained by comparing stability of specimens determined in accordance with usual Marshall procedures with stability of specimens that have been immersed in water for prescribed period.

**1.2 References**

- 1.2.1 ASTM D1559, Test Method for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.

**2 PRODUCTS****2.1 Equipment**

- 2.1.1 One or more water baths with automatic controls for immersing specimens. Baths normally used for Marshall test are suitable for test.
- 2.1.2 Scale and water bath with suitable accessory equipment for weighing test specimens in air and in water to determine their densities.
- 2.1.3 Flat transfer plates of glass or metal. Keep one plate under each specimen during immersion period and during subsequent handling, except when weighing and testing, to prevent breakage or distortion of specimens.
- 2.1.4 Apparatus required to conduct Marshall test.

**3 EXECUTION****3.1 Preparation of Test Specimens**

- 3.1.1 Prepare at least 8 specimens for each test in accordance with ASTM D1559, except where specified otherwise.

**3.2 Test Procedure**

- 3.2.1 Do Marshall testing in accordance with ASTM D1559, except where specified otherwise.
- 3.2.2 Weigh each specimen in air and in water. Weigh in water as rapidly as possible to minimize absorption.

- 3.2.3 Calculate specific gravity of each specimen as follows:

$$\text{Specific Gravity} = \frac{A}{A - B}$$

Where A = weight of specimen in air in grams

B = weight of specimen in water in grams.

- 3.2.4 Sort each set of 8 specimens into 2 groups of 4 specimens each so that average specific gravity of specimens in group 1 is essentially same as that of group 2.
- 3.2.5 Test group 1 specimens for Marshall stability. Calculate S1 = Marshall stability of group 1 (average).
- 3.2.6 Immerse group 2 specimens in water for 24 h at 60 °C, then test immediately for Marshall stability. Calculate S2 = Marshall stability of group 2 (average).

### 3.3 Test Report

- 3.3.1 Report all test results to City.
- 3.3.2 Report numerical index of retained stability as resistance of asphaltic paving mixtures to detrimental effect of water, expressed as percentage of original stability retained after immersion period.
- 3.3.3 Calculate index as follows: Index of Retained Stability =  $\frac{S2 \times 100}{S1}$

END OF SECTION 02703

**1 GENERAL****1.1 Related Sections**

- 1.1.1 Section 02701 – Aggregates: General.
- 1.1.2 Section 02723 – Granular Sub-base.
- 1.1.3 Section 02741 – Hot-Mix Asphalt Concrete Paving.
- 1.1.4 Section 02770 – Concrete Walks, Curbs and Gutters.

**1.2 Delivery, Storage and Handling**

- 1.2.1 Deliver and stockpile aggregates in accordance with Section 02701 - Aggregates General. Stockpile minimum 50% of total aggregate required prior to commencing operation.

**2 PRODUCTS****2.1 Materials**

- 2.1.1 Refer to Section 02701 - Aggregates General for material specifications.

**3 EXECUTION****3.1 Sequence of Operation**

- 3.1.1 Underlying granular sub-base surface to be true to cross-section and grade, and of the specified material compacted to 98% Maximum Dry Density (Standard Proctor Density) in compliance with ASTM D698. Do not place granular base until finished sub-base surface is inspected and approved by Engineer.
- 3.1.2 Placing
  - 3.1.2.1 Construct granular base to depth and grade in areas indicated.
  - 3.1.2.2 Ensure no frozen material is placed.
  - 3.1.2.3 Place material only on clean unfrozen surface, free from snow and ice.
  - 3.1.2.4 Place base material using methods that do not lead to segregation or degradation of aggregate.
  - 3.1.2.5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Engineer may authorize thicker layers if specified compaction can be achieved.

- 3.1.2.6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
    - 3.1.2.7 Remove and replace portion of any layer in which material has become segregated during spreading.
  - 3.1.3 Compaction Equipment
    - 3.1.3.1 Compaction equipment to be capable of obtaining required material densities on project.
  - 3.1.4 Compacting
    - 3.1.4.1 Compact to density not less than 100% Maximum Dry Density (Standard Proctor Density) to ASTM D698.
    - 3.1.4.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
    - 3.1.4.3 Apply water as necessary during compacting to obtain specified density.
    - 3.1.4.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.
    - 3.1.4.5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.2 Site Placement Tolerances
  - 3.2.1 Granular Base surfaces intended to receive Hot Mix Asphalt pavement or Portland Cement Concrete pavement on roads where curbs are installed, shall not be finished more than one millimetre (1mm) above the specified grade and cross section as governed by the constructed curb elevation. Minimum thickness of Hot Mix Asphalt Concrete and Granular Base materials, placed above the Granular Subbase finished surface, shall be in accordance with the City of Prince George Standard Drawings contained within this Bylaw.
  - 3.2.2 Granular Base surfaces of open shouldered roads intended to receive Hot Mix Asphalt Concrete Paving are not to be finished greater than 6 mm above the specified grade.
  - 3.2.3 Finished granular road surfaces to be within plus or minus 10 mm of specified grade and cross-section but not uniformly high or low.
- 3.3 Protection
  - 3.3.1 Maintain finished granular base in condition conforming to this section until succeeding material is applied or until granular base is accepted by the Engineer

when application of hot mix asphalt concrete paving is the responsibility of another Contractor under separate Contract.

END OF SECTION 02721

**1 GENERAL****1.1 Related Work**

1.1.1 Section 02741 – Hot Mix Asphalt Concrete Paving.

1.2 Conduct pavement surface cleaning in accordance with City of Prince George Clean Air Bylaw No. 7232, 2000 and all applicable Provincial and Federal legislation.

1.3 All works performed under this section must comply with the City of Prince George Highways Bylaw No. 6114.

**2 PRODUCTS****2.1 Materials**

2.1.1 Abrasives and solvents used for removal of paint, oil, grease, rubber deposits: proprietary products specially designed for pavement cleaning, subject to approval by City.

**3 EXECUTION****3.1 Pavement Surface Cleaning**

3.1.1 Where directed by City, remove sealing compound which has protruded excessively. Dispose of removed material as directed by City.

3.1.2 Remove dust, contaminants, loose and foreign materials, oil and grease, in areas designated and by method approved by City.

3.1.3 Use rotary power brooms or vacuum sweepers supplemented by hand brooming.

END OF SECTION 02722

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02317 – Roadway Excavation, Embankment and Compaction.

1.1.2 Section 02701 – Aggregates: General.

1.1.3 Section 02721 – Granular Base.

**2 PRODUCTS****2.1 Materials**

2.1.1 Refer to Section 02701 – Aggregates: General for material specifications.

**3 EXECUTION****3.1 Placing**

3.1.1 Underlying subgrade surface to be true to cross-section and grade. Where constructed of imported material, subgrade to be compacted to 95% Maximum Dry Density in compliance with ASTM D698. Engineer may accept satisfactory proof rolling as evidence of acceptable compaction of undisturbed native subgrade. Do not place granular sub-base until subgrade is inspected and approved by Engineer.

3.1.2 Construct granular sub-base to depth and grade in areas indicated.

3.1.3 Ensure no frozen material is placed.

3.1.4 Place material only on clean unfrozen surface, free from snow and ice.

3.1.5 Place sub-base material using methods that do not lead to segregation or degradation of aggregate.

3.1.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Engineer may authorize thicker layers if specified compaction can be achieved.

3.1.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

3.1.8 Remove and replace portion of any layer in which material has become segregated during spreading.

**3.2 Compaction**

3.2.1 Compaction equipment to be capable of obtaining required densities in materials on project.

- 
- 3.2.2 Compact to density not less than 98% Maximum Dry Density (Standard Proctor Density) in accordance with ASTM D698.
  - 3.2.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
  - 3.2.4 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is suitable for compaction.
  - 3.2.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Engineer.
  - 3.2.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
  - 3.3 Proof Rolling
    - 3.3.1 For proof rolling use fully loaded single or dual axle dump truck. Weigh scale ticket indicating Gross Vehicle Weight to be submitted to Engineer at time of proof rolling.
    - 3.3.2 Engineer may authorize use of other acceptable proof rolling equipment.
    - 3.3.3 Proof roll at level in sub-base as required. If alternative proof rolling equipment is authorized, Engineer to determine level of proof rolling.
    - 3.3.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
    - 3.3.5 Where proof rolling reveals areas of defective subgrade:
      - 3.3.5.1 Remove sub-base and subgrade material to depth and extent directed by Engineer.
      - 3.3.5.2 Backfill excavated subgrade with approved embankment material and compact in accordance with this Section.
      - 3.3.5.3 Replace sub-base material and compact.
    - 3.3.6 Where proof rolling reveals areas of defective sub-base, remove defective materials to depth and extent directed by Engineer and replace with new materials in accordance with this section at no extra cost.
  - 3.4 Finished Tolerances
    - 3.4.1 Sub-base surfaces intended to receive granular base material and hot mix asphalt pavement or Portland cement concrete pavement on roads where curbs are installed, shall not be finished more than one millimetre (1mm) above the specified grade and cross section as governed by the constructed curb elevation. Minimum thickness of
-

Hot Mix Asphalt Concrete and Granular Base materials, placed above the Granular Subbase finished surface, shall be provided in accordance with the City of Prince George Standard Drawings contained within this Bylaw.

- 3.4.2 Finished sub-base surface of asphalt –surfaced open shoulder roads and granular-surface roads shall be within plus or minus 15 millimetres (15mm) of specified grade and cross-section but not uniformly high or low.
- 3.4.3 Ensure finished subbase surface has no irregularities exceeding 15 mm when checked with a 3 m straight edge placed in any direction.
- 3.4.4 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 Protection

- 3.5.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by the Engineer when granular base and hot mix asphalt concrete paving is the responsibility of another Contractor under separate Contract.

END OF SECTION 02723

**1 GENERAL****1.1 Related Sections**

- 1.1.1 Section 02226 – Removal of Existing Asphalt Pavement
- 1.1.2 Section 02701 – Aggregates: General.
- 1.1.3 Section 02703 – Marshall Immersion Test.
- 1.1.4 Section 02721 – Granular Base.
- 1.1.5 Section 02722 – Pavement Surface Cleaning.
- 1.1.6 Section 02745 – Asphalt Prime
- 1.1.7 Section 02746 – Asphalt Tack
- 1.1.8 Section 02761 – Painted Traffic Lines and Markings.

**1.2 Product Data**

- 1.2.1 Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175°Celsius at least 2 weeks prior to commencing work
- 1.2.2 Submit asphalt concrete mix design and trial mix test results to Engineer for review at least 2 weeks prior to commencing work.

**2 PRODUCTS****2.1 Asphalt Materials**

- 2.1.1 Asphalt cement: to CGSB-16.3-M90, Grade 150-200.
- 2.1.2 Reclaimed asphalt pavement: Crush and screen so that 100% of reclaimed asphalt pavement (RAP) material passes 19.5 mm screen before mixing.
- 2.1.3 Aggregates: to Section 02701 – Aggregates: General and following requirements:
  - .1 Crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117.

| Sieve Designation | Percent Passing         |                  |                            |
|-------------------|-------------------------|------------------|----------------------------|
|                   | Mix A<br>Base<br>Course | Mix B<br>Overlay | Mix C<br>Surface<br>Course |
| 20.0 mm           | 90-100                  | --               | --                         |
| 16.0 mm           | --                      | 100              | 100                        |
| 12.5 mm           | 55-75                   | 80-95            | --                         |
| 9.5 mm            | --                      | 70-85            | 73-90                      |
| 4.75 mm           | 30-50                   | 55-67            | 50-75                      |
| 2.36 mm           | 25-40                   | 43-53            | 35-57                      |
| 1.18 mm           | --                      | 31-43            | 26-45                      |
| 0.600 mm          | 12-27                   | 22-35            | 18-34                      |
| 0.300 mm          | --                      | 12-15            | 10-26                      |
| 0.150 mm          | 3-13                    | 5-15             | 6-17                       |
| 0.075 mm          | 2-7                     | 3-7              | 3-7                        |

- .3 Coarse aggregate is aggregate retained on 4.75 mm sieve and fine aggregate is aggregate passing 4.75 mm sieve when tested to ASTM C136.
- .4 When dryer drum plant or plant without hot screening is used, process fine aggregate through 4.75 mm sieve and stockpile separately from course aggregate.
- .5 Do not use aggregates having known polishing characteristics in mixes for surface courses.
- .6 Sand equivalent: to ASTM D2419 Min: 40
- .7 Magnesium Sulphate soundness: to ASTM C88. Max % loss by mass:  
i) Coarse aggregate: 15  
ii) Fine aggregate: 18
- .8 Los Angeles abrasion: Grading B, to ASTM C131. Max % loss by mass:  
i) Coarse aggregate, surface course: 25  
ii) Coarse aggregate, base course: 35
- .9 Absorption: to ASTM C127. Max % by mass:  
i) Coarse aggregate, surface course: 1.75  
ii) Coarse aggregate, base course: 2.00
- .10 Loss by washing: to ASTM C117. Max % passing 0.075 mm sieve:  
i) Coarse aggregate, surface course: 1.5  
ii) Coarse aggregate, lower course: 2.0

- .11 Flat and elongated particles: (with length to thickness ratio greater than 3): Max % by mass:
- i) Coarse aggregate, surface course: 10
  - ii) Coarse aggregate, lower course: 10

- .12 Crushed fragments: at least 80% of particles by mass within each of following sieve designation ranges, to have at least 2 freshly fractured faces. Material to be divided into ranges, using methods of ASTM C136.

| Passing |    | Retained On |
|---------|----|-------------|
| 25 mm   | to | 12.5 mm     |
| 12.5 mm | to | 4.75 mm     |

- .13 Regardless of compliance with specified physical requirements, fine aggregates may be accepted or rejected on basis of past field performance.

#### 2.1.4 Mineral filler:

- .1 Finely ground particles of limestone, hydrated lime, Portland cement or other approved non-plastic mineral matter, thoroughly dry and free from lumps.
- .2 Add mineral filler when necessary to meet job mix aggregate gradation or as directed to improve mix properties.
- .3 Mineral filler to be dry and free flowing when added to aggregate.

- 2.1.5 Anti-stripping agent: hydrated lime to ASTM C 207 type N. Add lime at rate of approximately 2-3% of dry weight of aggregate.

- 2.1.6 Water: to approval of Engineer.

## 2.2 Asphalt Mix Design

- 2.2.1 Mix design to be developed by testing laboratory approved by City.

- 2.2.2 Mix may contain up to a maximum 15% by mass of reclaimed asphalt pavement (RAP) without a special mix design. City may approve higher proportion of RAP if Contractor demonstrates ability to produce mix meeting the requirements of specification.

- 2.2.3 Design of mix: by Marshall method to requirements below.

- .1 Compaction blows on each face of test specimens:
  - i) Mix A – 75
  - ii) Mix B – 50
  - iii) Mix C – 75

- .2 Mix physical requirements:

Properties of Laboratory  
Compacted Paving Mixtures

| Property                                           | Mix A<br>Base<br>Course | Mix B<br>Surface<br>Course | Mix C |
|----------------------------------------------------|-------------------------|----------------------------|-------|
| Marshall Stability at 60 <sup>0</sup> C kN minimum | 6.0                     | 4.5                        | 6.0   |
| *Air Voids in compacted mixture, %                 | 3-5                     | 3-5                        | 3-5   |
| Flow index in 0.25 mm                              | 6-12                    | 8-16                       | 8-14  |
| **Voids in Mineral Aggregate, % min.               | 13                      | 14.5                       | 14.5  |
| Index of Retained Stability, % minimum             | 75                      | 75                         | 85    |

\*Portion of asphalt cement absorbed into aggregates to be allowed for when calculating percentage air voids.

\*\*Percentage voids in mineral aggregate to be calculated on the basis of ASTM bulk specific gravity for the aggregates.

.3 Measure physical requirements as follows:

- i) Marshall load and flow value: to ASTM D1559.
- ii) Air voids: to ASTM D3203.
- iii) Index of Retained Stability: measure in accordance with Marshall Immersion Test (ASTM D1559).
- iv) Do not change job-mix without prior approval of City. Should change in material source be proposed, new job-mix formula shall be submitted to City for review and approval.

2.3 Granular Surface Shouldering

2.3.1 Aggregates: to Section 02701

2.4 Asphalt Tack Coat

2.4.1 Materials: to Section 02746

2.5 Asphalt Prime Coat

2.5.1 Materials: to Section 02745

### 3 EXECUTION

3.1 Plant and Mixing Requirements

3.1.1 Batch and continuous mixing plants:

.1 To ASTM D995.

.2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.

- 
- .3 Feed cold aggregates to plant in proportions that will ensure continuous operations.
  - .4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
  - .5 Before mixing, dry aggregates to a moisture content not greater than 0.5% by mass or to a lesser moisture content if required to meet mix design requirements. Heat to temperature required to meet mixing temperature as directed by the City after combining with RAP.
  - .6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.
  - .7 Store hot screened aggregates in manner to minimize segregation and temperature loss.
  - .8 Heat asphalt cement and aggregate to mixing temperature directed by City. Do not heat asphalt cement above 160 degrees Celsius.
  - .9 Make available current asphalt cement viscosity data at plant. With information relative to viscosity of asphalt being used, City to approve temperature of completed mix at plant and at paver after considering hauling and placing conditions.
  - .10 Maintain temperature of materials within plus or minus 5 degrees Celsius of specified mix temperature during mixing.
  - .11 Mixing time:
    - i) In batch plants, dry mix for not less than 10 seconds. Continue wet mixing as long as necessary to obtain a thoroughly blended mix but not less than 30 seconds or more than 75 seconds.
    - ii) In continuous mixing plants, mixing time as directed by City but not less than 45 seconds.
    - iii) Do not alter mixing time unless directed by City.
  - .12 Where RAP is to be incorporated into mix:
    - i) Feed from separate cold feed bin specially designed to minimize consolidation of material. Provide 37.5 mm scalping screen on cold feed to remove oversized pieces of RAP.
    - ii) Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti-rollback device to prevent material from sliding backward on feed belt.
    - iii) Combine RAP and new aggregates in proportions as specified. Dry mix thoroughly, until uniform temperature within plus or minus 5 degrees Celsius of mix temperature, as directed by City, is achieved prior to adding new asphalt cement. Do not add new asphalt cement where temperature of dry mix material is above 160 degrees Celsius.

### 3.1.2 Dryer drum mixing plants:

- .1 To ASTM D 995.
- .2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.
- .3 Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.
- .4 Where RAP to be incorporated into mix, dryer drum mixer to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180 degrees Celsius.
- .5 Feed RAP from separate cold feed bin designed to minimize reconsolidation of material.
- .6 Meter total flow of aggregate and RAP by electronic weigh belt system with an indicator that can be monitored by plant operator and which is interlocked with asphalt pump so that proportions of aggregate, RAP and asphalt entering mixer remain constant.
- .7 Provide for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.
- .8 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved. Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time. Difference between this value and amount shown by plant computer system to differ by not more than plus or minus 2 %.
- .9 Make provision for conveniently sampling full flow of materials from the cold feed.
- .10 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.
- .11 Provide a system interlock that will stop all feed components if either asphalt or aggregate from any bin stops flowing.
- .12 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream. Control heating to prevent fracture of aggregate or excessive oxidation of asphalt. Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator. Submit printed record of mix temperatures at end of each week.

- .13 Mixing period and temperature to produce a uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer to be less than 0.5%.

3.1.3 Temporary storage of hot mix:

- .1 Provide mix storage of sufficient capacity to permit continuous operation, maintained at specified temperatures and designed to prevent segregation.
- .2 Do not store asphalt mix in storage bins in excess of 3 hours.

3.1.4 Mixing tolerances:

- .1 Permissible variation in aggregate gradation from job mix (percent of total mass):
- |      |                          |     |
|------|--------------------------|-----|
| i)   | 4.75 mm sieve and larger | 5.5 |
| ii)  | 2.36 mm sieve            | 4.5 |
| iii) | 0.600 mm sieve           | 3.5 |
| iv)  | 0.150 mm sieve           | 2.5 |
| v)   | 0.075 mm sieve           | 1.5 |
- .2 Permissible variation of asphalt cement from job mix: 0.25%.
- .3 Permissible variation of mix temperature at discharge from plant: 5 degrees Celsius.

3.1.5 Addition of anti-stripping agent:

- .1 Plant to be equipped with pugmill to thoroughly mix aggregates and lime prior to entering the plant.
- .2 Plant to be equipped with suitable conveyor systems capable of supplying aggregates and lime at constant rate.
- .3 Plant and equipment used for addition of lime to be equipped with covers to control loss of lime.
- .4 Plant to be equipped to control rate of lime incorporation to within 0.25%.
- .5 Add water to aggregate prior to entering pugmill.
- .6 Add water to lime sufficiently in advance to permit time to slake prior to entering pugmill.

3.2 Equipment

- 3.2.1 Pavers: either crawler or pneumatic tire mounted, mechanical grade-controlled self-powered asphalt surface finishers capable of spreading mix within specified

tolerances, true to line, grade and crown indicated. Pavers to be operated by competent personnel and maintained in good working order, such that the mat is laid of uniform consistency true to line and grade, free from segregation or leaving tamper marks. Pavers shall be adjustable to lay a mat in one pass between 2.5metres wide and 3.5 metres or more wide in increments of 300 millimetres (mm) and to a depth of between 25mm to 75mm. The screed shall be adjustable such that transitions in elevation are gradual and free of ripples and humps. Paving speed should not exceed 13 metres per minute.

3.2.2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.

3.2.3 Vibratory rollers:

- .1 Minimum drum diameter: 1200 mm.
- .2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.

3.2.4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:

- .1 Boxes with tight metal bottoms.
- .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
- .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
- .4 Use only trucks that can be weighed in a single operation on scales supplied.

3.2.5 Hand tools:

- .1 Lutes or rakes with covered teeth for spreading and finishing operations.
- .2 Tamping irons having mass not less than 12 kg and a bearing area not exceeding 310 cm<sup>2</sup> for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by City, may be used instead of tamping irons.
- .3 Straight edges, 4.5 m in length, to test finished surface.

### 3.3 Preparation

- 3.3.1 Reshape granular roadbed or asphalt pavement if required. Perform work in accordance with Sections 02226, 02317, 02721, 02722 and 02723 as required.
- 3.3.2 When paving over existing asphalt surface, clean pavement surface and remove old markings. Perform surface cleaning in accordance with Section 02722 – Pavement Surface Cleaning. When leveling course is not required, patch and correct depressions and other irregularities to approval of City before beginning paving operations. Apply asphalt tack coat in accordance with Section 02746 – Asphalt Tack Coat.
- 3.3.3 Vertical faces of existing pavement, curbs, gutters, drainage gratings, manholes, valve boxes and other contact surfaces shall be painted with a uniform coating of asphalt emulsion Type RS-1 or RS-2, or asphalt cutback Type RC-2 or RC-3, to provide closely bonded watertight joints. Castings having asphalt surfaces need not be further coated.
- 3.3.4 When placing Hot Mix Asphalt Concrete over granular base, the requirement for the application of asphalt prime over the granular base will be at the discretion of the Engineer. When asphalt prime is required, application to be made in accordance to Section 02745 – Asphalt Prime.
- 3.3.5 Prior to laying asphalt concrete, clean surfaces of loose and foreign material.
- 3.4 Transportation of Mix
  - 3.4.1 Transport mix to job site in vehicles cleaned of foreign material.
  - 3.4.2 Paint or spray truck beds with limewater, soap or detergent solution, or non-petroleum based commercial product at least daily or as required. Elevate truck bed and thoroughly drain. No excess solution will be permitted.
  - 3.4.3 Schedule delivery of material for placing in daylight, unless City approves artificial light.
  - 3.4.4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation. Do not dribble mix into trucks.

3.4.5 Deliver material to paver at a uniform rate and in an amount within capacity of paving and compacting equipment.

3.4.6 Deliver loads continuously in covered vehicles and immediately spread and compact. Deliver and place mixes at temperature within range as directed by City but not less than 135 degrees Celsius.

3.5 Placing

3.5.1 Obtain Engineer's approval of base or existing surface prior to placing asphalt.

3.5.2 Place asphalt concrete to the applicable thickness, grades and dimensions as specified on City of Prince George Standard Drawings and directed by the Engineer, or, as indicated on Contract Drawings approved by the City of Prince George.

3.5.3 Placing conditions:

.1 Place asphalt mixtures only when air temperature is above 5 degrees Celsius.

.2 When temperature of surface on which material is to be placed falls below 10 degrees Celsius, provide extra rollers as necessary to obtain required compaction before cooling.

.3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.

3.5.4 Place asphalt concrete in compacted lifts of thickness as follows:

.1 Leveling course(s) to thickness required but not exceeding 50 mm each.

.2 No single lift of asphaltic concrete shall be placed at a depth of 75mm or greater. In the event that any area is to receive 75mm or more of any one type of asphaltic concrete, such areas shall be laid in two or more lifts of approximately equal depths. Under no circumstances shall a surface course be placed to a compacted thickness less than 30mm.

3.5.5 Where possible, do the necessary tapering and leveling when paving the lower lifts. Overlap joints as specified under Clause 3.7 Joints of this Section.

3.5.6 No course shall be placed upon a previously laid course less than twelve hours after final compaction of the latter.

3.5.7 Commence spreading at high side of pavement or at crown and span crowned centerlines with initial strip.

3.5.8 Spread and strike off mixture with self-propelled mechanical asphalt finisher (paver).

.1 Construct longitudinal joints and edges true to line markings. Position and operate paver to follow established line closely.

- .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver. Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
- .3 Maintain constant head of mix in auger chamber of paver during placing.
- .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
- .5 Correct irregularities in alignment left by paver by trimming directly behind machine.
- .6 Correct irregularities in surface of pavement course directly behind paver. Remove by shovel or lute excess material forming high spots. Fill and smooth indented areas with hot mix. Do not broadcast material over such areas.
- .7 Do not throw surplus material on freshly screened surfaces.

3.5.9 When hand spreading is used:

- .1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section. Use measuring blocks and intermediate strips to aid in obtaining required cross-sections.
- .2 Distribute material uniformly. Do not broadcast material.
- .3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes. Reject material that has formed into lumps and does not break down readily.
- .4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.
- .5 Provide heating equipment to keep hand tools free from asphalt. Control temperatures to avoid burning material. Do not use tools at a higher temperature than temperature of mix being placed.

3.6 Compacting

- 3.6.1 Do not change rolling pattern unless mix changes or lift thickness changes. Change rolling pattern only as directed by Engineer.
- 3.6.2 Roll asphalt continuously to average density not less than 98% of 75-blow Marshall density in accordance with ASTM D1559.
- 3.6.3 General:

- .1 Provide at least two rollers and as many additional rollers as necessary to achieve specified pavement density. When more than two rollers are required, one roller to be pneumatic tired type.
- .2 Start rolling operations as soon as placed mix can bear weight of roller without undue displacement of material or cracking of surface.
- .3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.
- .4 Use static compaction for leveling coarse less than 25mm thick.
- .5 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 20 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing should not exceed compacted lift thickness.
- .6 Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.
- .7 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
- .8 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
- .9 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
- .10 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.
- .11 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.
- .12 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.

3.6.4 Breakdown rolling:

- .1 Commence breakdown rolling immediately following rolling of transverse and longitudinal joint and edges.
- .2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.

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- .3 Operate breakdown roller with drive roll or wheel nearest finishing machine. When working on steep slopes or super-elevated sections use operation approved by City.
  - .4 Use only experienced roller operators for this work.
- 3.6.5 Intermediate rolling:
- .1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.
  - .2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.
- 3.6.6 Finish rolling:
- .1 Accomplish finish rolling with two-axle or three-axle steel wheel rollers while material is still warm enough for removal of roller marks. If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by City.
  - .2 Conduct rolling operations in close sequence.
- 3.6.7 Dust entire area of sheet asphalt pavements with hydrated lime immediately after rolling to eliminate tendency to pick-up under traffic.
- 3.7 Joints
- 3.7.1 General:
- .1 Remove surplus material from surface of previously laid strip. Do not dispose on surface of freshly laid strip.
  - .2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as specified.
  - .3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement as specified under Clause 3.3 of this Section.
- 3.7.2 Transverse joints:
- .1 Offset transverse joint in succeeding lifts by at least 600 mm.
  - .2 Transverse joints shall be made by the matching of two straight and vertical surfaces. Asphalt placement shall begin from a properly prepared vertical face either by cutting back the previously placed mat to a full depth face or by 50mm thick boards placed at the end previously laid mat.
  - .3 Tack face with thin coat of hot asphalt prior to continuing paving.
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- .4 Compact transverse joints to provide a smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

### 3.7.3 Longitudinal joints:

- .1 Offset longitudinal joints in succeeding lifts by at least 300 mm.
- .2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees Celsius prior to paving of adjacent lane. If cold joint can not be avoided, cut back by saw cutting previously laid lane, by at least 150mm, to full depth vertical face and tack coat face of the cold joint prior to placement of the adjoining asphalt mat.
- .3 Overlap previously laid strip with spreader by 100 mm. The joint on the surface course shall, where possible, be situated under the lane lines.
- .4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with a lute or rake.
- .5 Roll longitudinal joints directly behind paving operation.
- .6 When rolling with static roller, shift roller over onto previously placed lane in order that 100 to 150 mm of drum width rides on newly laid lane, then operate roller to pinch and press fines gradually across joint. Continue rolling until thoroughly compacted neat joint is obtained.
- .7 When rolling with vibratory roller, have most of drum width ride on newly placed lane with remaining 100 to 150 mm extending onto previously placed and compacted lane.

- 3.7.4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out course aggregate in mix. Place and compact joint so that joint is smooth and without visible breaks in grade. Locate feather joint as specified.

- 3.7.5 Construct butt joints and saw cut joints at locations and to details as shown on Contract Drawings.

### 3.8 Finish Tolerances

- 3.8.1 The asphalt thickness indicated on City of Prince George Standard Drawings in all cases is the minimum thickness. Where coring or other procedures determines that pavement thickness does not meet the minimum required, such pavement will be considered defective.
- 3.8.2 On roads where curbs are installed, the finished asphalt surface adjacent to the curb shall not be less than the minimum dimension of 10mm above the curb face indicated on City of Prince George Standard Drawing Nos. C1 and C2, and shall not exceed 16 mm.

3.8.3 Finished asphalt surface to be within 6 mm of design elevation but not uniformly high or low.

3.8.4 Finished asphalt surface not to have irregularities exceeding 6 mm when checked with a 4.5 m straight edge placed in any direction.

3.9 Defective Work

3.9.1 Correct irregularities that develop before completion of rolling by loosening surface mix and removing or adding material as required.

3.9.2 If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form a true and even surface and compact immediately to the specified density.

3.9.3 Repair areas showing checking, rippling, or segregation.

3.9.4 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.10 Rejection of Asphalt Materials

3.10.1 Notwithstanding reasons for rejection specified elsewhere, any load of asphalt concrete may be rejected, if in the opinion of the Engineer, the asphalt concrete is:

- .1 Above the specified mix temperature;
- .2 Below 135 degrees Celsius;
- .3 Outside plus or minus 0.3% of the design asphalt concrete content;
- .4 Containing excessive coarse or fine aggregate;
- .5 Containing excessive moisture in the aggregate.

or, in any other way does not comply with these specifications.

3.11 Intersection Ramps

3.11.1 At intersecting streets not having curbs and gutters, asphaltic concrete pavement shall be ramped to the existing traveled area over a distance of approximately ten (10) metres radius.

3.12 Granular Surface Shouldering for Open Shoulder Roads

3.12.1 Where directed by the Engineer or as indicated on the Contract Drawings, a surface of 19 mm crushed granular material shall be placed on the shoulder to the dimensions shown on the City of Prince George Standard Drawings.

- 3.12.2 Provide granular surface shouldering material as specified under Section 2.3, above.
- 3.12.3 The area to receive the granular surface shouldering shall first be graded, leveled and compacted. The material shall then be placed on the shoulder and compacted by vibratory compactor to 98% Standard Proctor Density.
- 3.12.4 To spread shouldering material, a shouldering machine shall be used rather than a grader. The machine shall have an adjustable strike-off and cut-off plate to regulate the depth, width and cross-slope of the deposited shoulder aggregate.
- 3.12.5 The Contractor shall minimize the amount of granular shouldering material that is deposited into adjacent ditches during the shouldering operation. Payment will not be made for shoulder material deposited into the ditches. The Contractor during the operation shall remove shouldering material deposited into ditches at its expense.
- 3.12.6 Costs for damage to adjacent asphalt pavement or curbs caused by the Contractor during the shouldering operation shall be borne by the Contractor.

END OF SECTION 02741

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02721 – Granular Base.

1.1.2 Section 02741 – Hot Mix Asphalt Concrete Paving.

**1.2 Samples**

1.2.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

1.2.2 Submit two - 4 L samples of asphalt prime proposed for use in clean, air tight sealed, wide mouth containers to Engineer at least 2 weeks prior to commencing work.

1.2.3 Submit sample asphalt prime coat materials in accordance with ASTM D 140.

1.2.4 Provide access on tank truck for Engineer to sample asphalt material to be incorporated into work, in accordance with ASTM D 140.

**1.3 Quality Assurance**

1.3.1 Upon request from Engineer, submit manufacturer's test data and certification that asphalt prime material meets requirements of this section.

**2 PRODUCTS****2.1 Material**

2.1.1 Asphalt material: to CAN/CGSB-16.1 grade RM-20.

2.1.2 Sand blotter: clean granular material passing 4.75 mm sieve and free from organic matter or other deleterious materials.

2.1.3 Water: clean, potable, free from foreign matter.

**3 EXECUTION****3.1 Equipment**

3.1.1 Pressure distributor to be:

3.1.1.1 Designed, equipped, maintained and operated so that asphalt material can be:

- i) Maintained at even temperature.
- ii) Applied uniformly on variable widths of surface up to 5 m.
- iii) Applied at controlled rates from 0.2 to 5.4 L/m<sup>2</sup> with uniform pressure, and allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>.

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- iv) Distributed in uniform spray without atomization at temperature required.
  - 3.1.1.2 Equipped with meter registering metres of travel per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
  - 3.1.1.3 Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
  - 3.1.1.4 Equipped with easily read, accurate and sensitive device which registers temperature of liquid in reservoir.
  - 3.1.1.5 Equipped with accurate volume measuring device or calibrated tank.
  - 3.1.1.6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
  - 3.1.1.7 Equipped with nozzle spray bar, with operational height adjustment.
  - 3.1.1.8 Cleaned if previously used with incompatible asphalt material.
  - 3.2 Application
    - 3.2.1 Obtain Engineer's approval of granular base surface before applying asphalt prime.
    - 3.2.2 Cutback asphalt:
      - 3.2.2.1 Heat asphalt prime to temperature range recommended by CAN/CGSB-16.1 for pumping and spraying.
      - 3.2.2.2 Apply asphalt prime to granular base at rate not to exceed 2 L/m<sup>2</sup>.
      - 3.2.2.3 Apply on dry surface unless otherwise directed by Engineer.

- 3.2.2.4 Apply only on unfrozen surface
- 3.2.3 Do not apply prime when air temperature is less than 10°C or when rain is forecast within 2 hours.
- 3.2.4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt prime material.
- 3.2.5 Where traffic is to be maintained, treat no more than one-half width of surface in one application.
- 3.2.6 Prevent overlap at junction of applications.
- 3.2.7 Do not prime surfaces that will be visible when paving is complete.
- 3.2.8 Apply additional material to areas not sufficiently covered as directed by Engineer.
- 3.2.9 Keep traffic off primed areas until asphalt prime has cured.
- 3.2.10 Permit prime to cure before placing asphalt paving.
- 3.3 Use of Sand Blotter
  - 3.3.1 If asphalt prime fails to penetrate within 24 hours, spread sand blotter material in amounts required to absorb excess material.
  - 3.3.2 Allow sufficient time for excess prime to be absorbed as directed by Engineer.
  - 3.3.3 Apply second application of sand blotter as required.
  - 3.3.4 Sweep and remove excess blotter material.

END OF SECTION 02745

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02722 –Pavement Surface Cleaning.

1.1.2 Section 02741 – Hot Mix Asphalt Concrete Paving.

**1.2 Samples**

1.2.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

1.2.2 Submit two - 4 L samples of asphalt prime proposed for use in clean, air tight sealed, wide mouth containers to Engineer at least 2 weeks prior to commencing work.

1.2.3 Submit samples to: ASTM D 140.

1.2.4 Provide access on tank truck for Engineer to sample asphalt material to be incorporated into work, in accordance with ASTM D 140.

**1.3 Quality Assurance**

1.3.1 Upon request from Engineer, submit manufacturer's test data and certification that asphalt tack coat meets requirements of this section.

**2 PRODUCTS****2.1 Material**

2.1.1 Anionic emulsified asphalt: to CAN/CGSB-16.2 grade SS-1.

2.1.2 Water: clean, potable, free from foreign matter.

**3 EXECUTION****3.1 Equipment**

3.1.1 Pressure distributor to be:

3.1.1.1 Designed, equipped, maintained and operated so that asphalt material can be:

- i) Maintained at even temperature.
- ii) Applied uniformly on variable widths of surface up to 5 m.
- iii) Applied at controlled rates from 0.2 to 0.5 L/m<sup>2</sup> with uniform pressure, and allowable variation from any specified rate not exceeding 0.1 L/m<sup>2</sup>.
- iv) Distributed in uniform spray without atomization at temperature required.

- 3.1.1.2 Equipped with meter registering metres of travel per minute, visibly located to enable truck driver to maintain constant speed required for application at specified rate.
- 3.1.1.3 Equipped with pump having flow meter graduated in units of 5 L or less per minute passing through nozzles and readily visible to operator. Pump power unit to be independent of truck power unit.
- 3.1.1.4 Equipped with easily read, accurate and sensitive device that registers temperature of liquid in reservoir.
- 3.1.1.5 Equipped with accurate volume measuring device or calibrated tank.
- 3.1.1.6 Equipped with nozzles of same make and dimensions, adjustable for fan width and orientation.
- 3.1.1.7 Equipped with nozzle spray bar, with operational height adjustment.
- 3.1.1.8 Cleaned if previously used with incompatible asphalt material.

## 3.2 Application

- 3.2.1 Apply asphalt tack coat only on clean and dry surface. Obtain Engineer's approval of surface before applying asphalt tack coat.
- 3.2.2 Dilute asphalt emulsion with water at 1:1 ratio for application. Mix thoroughly by pumping or other method approved by Engineer.
- 3.2.3 Apply asphalt tack coat evenly to pavement surface at rate but do not exceed 0.7 litres/m<sup>2</sup>.
- 3.2.4 Paint contact surfaces of curbs, gutters, headers, manholes and like structures with thin, uniform coat of asphalt tack coat material.
- 3.2.5 Do not apply asphalt tack coat when air temperature is less than 10°C or when rain is forecast within 2 hours of application.
- 3.2.6 Apply asphalt tack coat only to surfaces that are expected to be overlaid on same day.
- 3.2.7 Evenly distribute localized excessive deposits of tack coat by brooming as directed by Engineer.
- 3.2.8 Where traffic is to be maintained, treat no more than one half of width of surface in one application.
- 3.2.9 Keep traffic off tacked areas until asphalt tack coat has set.
- 3.2.10 Re-tack contaminated or disturbed areas as directed by Engineer.

3.2.11 Permit asphalt tack coat to set before placing asphalt pavement.

END OF SECTION 02746

**1 GENERAL****1.1 Related Sections**

- 1.1.1 Section 02723 – Granular Sub-base.
- 1.1.2 Section 03100 – Concrete Forms and Accessories.
- 1.1.3 Section 03200 – Concrete Reinforcement.
- 1.1.4 Section 03300 – Cast-in-Place Concrete.

**1.2 Samples**

- 1.2.1 Submit samples in accordance with Section 01330 – Submittal Procedures.
- 1.2.2 Inform City of proposed source of aggregates and provide access for sampling at least 5 weeks prior to commencing work.

**1.3 Certificates**

- 1.3.1 Submit to City manufacturer's test data and certification that following material meets requirements of this section prior to starting concrete work:
  - i) Portland cement.
  - ii) Blended Hydraulic Cement.
  - iii) Supplementary Cementing Material.
  - iv) Admixtures.
  - v) Joint sealants.
  - vi) Curing materials.
  - vii) Joint filler.
- 1.3.2 Submit certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1, and that mix design is adjusted to prevent alkali aggregate reactivity problems.

**1.4 Delivery and Storage**

- 1.4.1 Unload cement and store in weathertight bins or silos that protect cement from dampness and contamination and provide easy access for inspection and identification of each shipment.
- 1.4.2 Store admixtures, curing compounds and miscellaneous materials as recommended by manufacturer.

**2 PRODUCTS****2.1 Materials**

2.1.1 Portland cement: to CAN/CSA-A5.

2.1.2 Aggregates: to CAN/CSA-A23.1 and following requirements:

2.1.2.1 Coarse aggregate:

- i) Produce coarse aggregate in at least two separate sizes which, when combined, yields gradation specified. Each component size to form approximately equal percentage of total coarse aggregate.
- ii) Gradation: to CAN/CSA-A23.1, table 2, nominal size 28-5 or 40-5.
- iii) Flat and elongated particles: to CAN/CSA-A23.2(13A) (length to thickness ratio greater than 5) not to exceed 15% by mass.
- iv) Crushed particles: minimum 50% by mass on each sieve size.

2.1.2.2 Fine aggregate:

- i) Gradation: to CAN/CSA-A23.1, Table I. Material passing 0.160 mm sieve: maximum 5%.
- ii) Not to include more than 25% by mass of crusher screenings.

2.1.3 Supplementary cementing materials: to CAN/CSA-A23.5.

2.1.4 Air entraining admixture: to ASTM C 260.

2.1.5 Chemical admixtures: to ASTM C 494. City to approve accelerating or set retarding admixtures during cold and hot weather placing.

2.1.6 Burlap mats for curing: to ASTM C 171.

2.1.7 Joint sealant, hot poured: to ASTM D 3405. Bond breaker to City's approval.

2.1.8 Joint seal, preformed polychloroprene elastomeric: to ASTM D 2628.

2.1.9 Preformed expansion joint filler: to ASTM D 1752.

2.1.10 Dowels and tie-bars: to CSA G30.18.

2.1.10.1 Dowels: clean, straight and free from flattened or burred ends.

2.1.10.2 Tie-Bars: deformed steel bars.

2.1.11 Metal preformed keyway for use when slip form paving is employed to be 0.8 mm thick wiped zinc coated steel, galvanized, copper clad, or similar rust resistant material of sufficient stiffness to support upper keyway.

2.1.12 Protective covers and insulation for cold weather curing: to CAN/CSA-A23.1.

**2.2 Mixes**

2.2.1 Job mix formula to be approved by City in accordance with Alternative 1.

2.2.2 For concrete proportioned in accordance with Alternative 1:

2.2.2.1 Use type 10 cement.

2.2.2.2 Flexural strength when tested in accordance with CAN/CSA-A23.2, (8C): average 28 day modulus of rupture to be minimum 4 MPa.

2.2.2.3 Compressive strength when tested in accordance with CAN/CSA-A23.2, (9C): average 28 day compressive strength to be minimum 35 MPa.

2.2.2.4 Cement content: 290 to 335 kg/m<sup>3</sup> of concrete mix.

2.2.2.5 Slump at point of discharge when tested in accordance with CAN/CSA-A23.2, (5C): 10 to 50 mm.

2.2.2.6 Air content when tested in accordance with CAN/CSA-A23.2, (4C), immediately after discharge: 4-6%.

2.2.2.7 Class of exposure: Class C2.

2.2.2.8 Use of chemical admixture will be approved only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.

2.2.3 Proposed changes in material source to be approved by City. New mix design to be approved by City.

2.2.4 If average strength at 7 days is less than 70% of specified minimum 28 day strength, check mix at once and adjust to ensure required strength is obtained.

**3 EXECUTION****3.1 Equipment**

3.1.1 Concrete plant: in accordance with CAN/CSA-A23.1.

3.1.2 Where fixed form paving is used provide equipment with following features:

3.1.2.1 Scratch template for checking contours of base to operate from side forms and be provided with adjustable rods projecting down to base course at maximum 300 mm intervals.

3.1.2.2 Mechanical self-propelled spreader capable of moving concrete forward and laterally and of correcting segregated areas.

- 3.1.2.3 Vibrators mounted at rear of spreader or independent self-propelled unit at front of finisher.
- 3.1.2.4 Surface vibrators: vibrating screed or pan type with "bull nose" edge; use at least one vibratory unit for each 2.5 m length of vibratory screed or each 2.0 m length of vibratory pan.
- 3.1.2.5 Internal vibrators (for pavement 200 mm or more thickness): frame-mounted 50 mm size vibratory units with vibrating tubes extending into slab at intervals slightly less than twice manufacturers "radius of action".
- 3.1.2.6 Mechanical, self-propelled finisher with two independently operated transverse screeds.
- 3.1.2.7 Float to be wood or metal, straight, smooth, sufficiently light to avoid sinking into concrete surface, operated mechanically or manually from edge to edge while advancing longitudinally.
- 3.1.3 Where slip form paving is used provide equipment with following features:
  - 3.1.3.1 Self-propelled slip form paver with crawler type tracks, designed to spread, consolidate, screed and float finish fresh concrete to required cross section, lines and grades. Paver to be approved by City.
  - 3.1.3.2 Pavement line and surface elevation to be automatically controlled from taut string or wire or by laser equipment.
  - 3.1.3.3 Internal type vibrators: frame-mounted 50 mm size vibratory units with vibrating tubes extending into slab at intervals slightly less than twice manufacturers "radius of action".
- 3.1.4 Use following equipment on approval of City:
  - 3.1.4.1 Hand operated transverse screeds spanning side forms.
  - 3.1.4.2 Mechanically powered vibrating beam spanning side forms.
  - 3.1.4.3 Hand operated floats and fluting tools used by skilled workers.
- 3.1.5 Use following miscellaneous equipment where required:
  - 3.1.5.1 Edging tool.
  - 3.1.5.2 Water truck equipped with pump, hose line and fine spray nozzle.

- 3.1.5.3 Self-propelled automatic spray machine spanning fresh concrete, equipped with fine spray nozzles suitable for application of membrane curing compound uniformly over surface and exposed edges, and with wind skirt to permit proper application during windy conditions.
- 3.1.5.4 Self-propelled concrete saws equipped with rubber-tired wheels, readily adjustable blade depth controls, and sawing line guide pointers both front and rear. Provide adequate number of units to complete sawing at rate required and have ample supply of suitable saw blades and at least one standby sawing unit available on job site before concrete placement is started.
- 3.1.5.5 Heating kettle or tank for heating sealing compound:
  - i) Double boiler with space between inner and outer shells filled with oil, asphalt or other material for heat transfer.
  - ii) Equip for positive temperature control of sealing compound.
  - iii) Equip with readily calibrated device which accurately registers temperature of sealing compound.

## 3.2 Formwork

### 3.2.1 For fixed form paving:

- 3.2.1.1 Provide steel forms of sufficient strength to support and keep alignment under weight of spreading and finishing machines.
- 3.2.1.2 Use of wood forms for fillet areas to be approved by City.
- 3.2.1.3 Set forms true to line and grade, join neatly and tightly and stake securely to resist concrete pressure and impact from tampers without springing.
- 3.2.1.4 Install keyways as indicated.
- 3.2.1.5 Clean and oil forms before each use.
- 3.2.1.6 Obtain City's approval of forms before placing concrete.

### 3.2.2 For slip form paving:

- 3.2.2.1 Provide sufficient length of slip form trailing behind paver to prevent slumping at slab edge. Ensure rigid lateral support.
- 3.2.2.2 Form key in formed longitudinal joints by means of metal preformed keyway permanently inserted in location as indicated.

**3.3 Base Preparation**

- 3.3.1 Check base between forms with scratch template in presence of City. Trim and recompact as necessary.
- 3.3.2 Repair damage to base resulting from hauling or equipment operations.
- 3.3.3 Wet base sufficiently in advance of concrete placing to ensure surface is moist without ponding.
- 3.3.4 Surface condition of base to be approved by City before placing concrete.

**3.4 Reinforcing Steel and Dowels**

- 3.4.1 Place reinforcing steel and dowels as indicated and to Section 03200 - Concrete Reinforcement.
- 3.4.2 Paint portion of dowel intended to move within hardened concrete with one coat of liquid asphalt material or corrosion inhibitor paint. When paint is dry, apply bondbreaker material.
- 3.4.3 Place sufficient number of joint dowel assemblies in advance of paver to avoid delay in concrete placement.
- 3.4.4 Remove oil, grease, dirt and deleterious material from reinforcing bars before placing concrete.
- 3.4.5 Steel placement to be approved by City before placing concrete.

**3.5 Plant and Mixing Requirements**

- 3.5.1 If crusher screenings are approved as mixture component, proportion separately from sand.
- 3.5.2 If washing of aggregate required, allow aggregate to drain for 24 h or longer as required to stabilize moisture content.
- 3.5.3 For truck mixers, mixing to be in accordance with CAN/CSA-A23.1.
- 3.5.4 Mix produced to be within following tolerances from mix design:
  - 3.5.4.1 Slump: 20 mm.
  - 3.5.4.2 Air content: 1%.

**3.6 Transport and Delivery of Mix**

- 3.6.1 Time from initial mixing to final placing to be not more than 90 min if mix is transported by agitating equipment (eg truck mixer).
- 3.6.2 Transport mix by non-agitating equipment only if;
  - 3.6.2.1 Time from addition of cement to time of placing not to exceed 45 min.
  - 3.6.2.2 Haul units to be of sufficient capacity to transport at least one regular size batch from mixer.
  - 3.6.2.3 Haul routes to be well maintained to prevent undue disturbance of concrete mix during transport.

**3.7 Placing**

- 3.7.1 Place concrete to lines, grades and depths as indicated.
- 3.7.2 Discharge concrete into forms as soon as practical after mixing.
- 3.7.3 Construct pavement lanes in sequence approved by City.
- 3.7.4 Use hand placing where machine spreading is not feasible.
- 3.7.5 Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing. Do not apply external tractive force to paver.
- 3.7.6 Operate with continuous forward momentum. Schedule concrete supply to minimize interruptions.
- 3.7.7 Insert tie bars as indicated.
- 3.7.8 When completing concrete placement for day, carry placement through to scheduled control joint location.
- 3.7.9 Where concrete placement is stopped for more than 30 min due to breakdowns, weather or any other reasons, construct extra bulkhead and construction joint as directed by City.
- 3.7.10 Do not place concrete on frozen surface.
- 3.7.11 Stop paving operations if rain is sufficiently intense to separate cement from surface of mixture or to hinder finishing operations.
- 3.7.12 Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with CAN/CSA A23.1. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.

**3.8 Consolidation****3.8.1 When internal vibrators are used:**

3.8.1.1 For slab depths up to 200 mm, mount vibrators parallel to base at mid depth. For slab depths greater than 200 mm, mount vibrators with tips minimum 50 mm above base and tips minimum 50 mm beneath pavement surface.

3.8.1.2 Operate at between 9000 and 12000 vibrations per minute at minimum amplitude of 1 mm

**3.8.2 When surface vibrators are used:**

3.8.2.1 Synchronize units on each individual screed or pan.

3.8.2.2 Operate at minimum of 3,500 vibrations per minute and minimum amplitude of 0.4 mm.

3.8.2.3 Treat each pavement section to at least two passes of vibratory equipment unless otherwise directed by City.

**3.8.3 Stop vibrators when paver stops.**

3.8.4 Use hand operated vibrator on odd shaped slabs inaccessible to frame mounted units. Do not operate vibrator in one location longer than 5 s.

3.8.5 Ensure concrete adjacent to edge forms or previously constructed slabs is thoroughly vibrated.

**3.9 Finishing**

3.9.1 After consolidation by vibration, finish with equipment approved by City.

3.9.2 When striking off concrete surface, maintain uniform roll of concrete ahead of first screed for its full length when finishing machine is on first pass.

3.9.3 Make two passes with transverse finishing machine.

3.9.4 Where joints are formed rather than sawn, form longitudinal and transverse joints after final pass of finishing machine.

3.9.5 Hand finish areas inaccessible to finishing machines to same quality and surface characteristics as machine finished surfaces.

3.9.6 Finish concrete surface with approved float at proper time. Operate from edge to edge with wiping motion while advancing, with each succeeding pass overlapping previous one.

- 3.9.7 Check surface with approved 4.5 m long straightedge. Correct irregularities exceeding 5 mm before concrete takes initial set.
- 3.9.8 Finish edges of slabs with edging tool to form smooth squared surface. Do not patch with cement paste.
- 3.10 Surface Texturing
  - 3.10.1 Commence texturing immediately after float finishing.
  - 3.10.2 Use moistened burlap drag or stiff bristled broom as indicated to produce nonslip concrete surface finish approved by City, with fine granular texture free from disfigurements.
  - 3.10.3 Where indicated, provide surface texture by transverse wire comb leaving grooves in surface of plastic concrete 5 mm wide and 5 mm deep on 20 mm centers.
  - 3.10.4 Where indicated, provide transverse surface texture by self-propelled machine specifically designed for purpose, automatically controlled from stringline reference used by paver, to produce an average textured depth of not less than 1 mm when measured by Sand-Patch Method described in Canadian Portland Cement Assoc. Technical Bulletin No. 6.
  - 3.10.5 Texturing to be straight, precise and not damaging to pavement edges.
- 3.11 Curing
  - 3.11.1 Cure for minimum 4 days by one of following methods:
    - i) Curing compound.
    - ii) Burlap or cotton mats.
    - iii) Sheet material.
  - 3.11.2 Curing compound:
    - 3.11.2.1 Apply in two coats with approved spray equipment to form complete and unbroken film on surface of concrete. Mechanically agitate compound before and during use.
    - 3.11.2.2 Apply first spray as soon as excess water has evaporated from surface.
    - 3.11.2.3 Apply second spray within 24 h of first and in accordance with manufacturer's instructions.
    - 3.11.2.4 Apply each spray at application rate recommended by manufacturer.
    - 3.11.2.5 Spray slab edges within 1 h of removal of forms.

3.11.2.6 Protect formed or sawed joints from evaporation during curing period.

3.11.2.7 Respray areas where membrane is damaged during curing period.

3.11.3 Burlap or cotton mats:

3.11.3.1 As soon as concrete surface has been finished and can bear weight without marking, carefully cover with burlap or cotton mats.

3.11.3.2 Place mats to overlap each other by 150 mm or more and to overlap concrete slab by 300 mm or more at each side.

3.11.3.3 Cover sides and ends of slab with mats as soon as forms are removed.

3.11.3.4 Thoroughly wet mats before placing them on concrete and keep saturated during curing period with water spray sufficiently fine to avoid damaging concrete surface.

3.11.4 Sheet material:

3.11.4.1 Cover slab with waterproof sheet material as soon as concrete has set sufficiently to bear weight without marking.

3.11.4.2 On leading slabs place sheet material at least 1 m wider than slab and after removal of side form fold down edges of sheet and bank with soil, sand or gravel to prevent air circulation.

3.11.4.3 Batten down sheet to prevent free access of air.

3.11.4.4 Keep sheet in place during curing period and promptly repair tears and pinholes.

3.12 Protection

3.12.1 Do not open concrete pavement to traffic or construction equipment until concrete reaches 70% of specified strength unless approved by City.

3.12.2 When placing concrete in lanes adjacent to existing concrete, operate placing equipment on rubber wheels or pads to prevent damage to existing surface.

3.13 Tolerances

3.13.1 Finished concrete surface to be within 5 mm of design grade but not uniformly high or low.

3.13.2 Finished concrete surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.

3.13.3 Horizontal deviations of slab edge from alignment of pavement not to exceed 10 mm.

3.13.4 Keyway formed on slab edge to be within 5 mm of dimensions and location indicated.

3.14 Joints

3.14.1 General:

3.14.1.1 Construct joints plumb, straight and square to details indicated.

3.14.1.2 Transverse joints to coincide with those in adjacent pavement unless indicated or directed otherwise.

3.14.1.3 Install preformed joint filler at locations and to details indicated.

3.14.1.4 Install isolation joints around structures and features that project through, into or against pavement.

3.14.2 For sawn joints:

3.14.2.1 Ensure joints are sawn straight. Install end stakes to ensure straight joint alignment across paved area. Mark joint alignment with chalk line or other suitable guide to approval of City.

3.14.2.2 Saw joints using approved equipment and methods to produce joint dimensions indicated.

3.14.2.3 Restrict speed of saw cutting to ensure proper joint alignment and to avoid damage to concrete.

3.14.2.4 Supply sufficient workers and equipment including standby equipment, to maintain satisfactory sawing schedule.

3.14.2.5 Schedule sawing operations on 24 h basis and consistent with concrete placing.

3.14.2.6 Make initial saw cuts in progressive manner and as soon as concrete surface has hardened sufficiently to resist ravelling as cut is made and before shrinkage cracks occurs.

3.14.2.7 If cracking occurs ahead of saw cut, stop sawing immediately. Move ahead several joints and cut one or more joints before returning to saw intermediate joints. Where cracking persists, make 1 m saw cut from one edge and complete sawing from opposite edge. Adjust sawing schedule accordingly.

3.14.2.8 If uncontrolled cracking or other surface damage results from inadequate or improper sawing techniques suspend further concrete operations until situation is corrected and immediately remove and replace damaged slabs.

3.14.2.9 Immediately on completion of sawing, flush joints with water to remove laitance.

3.14.3 Sealing:

3.14.3.1 Seal joints before allowing vehicular traffic on new pavement.

3.14.3.2 Provide City with copy of sealant manufacturer's instructions for application.

3.14.3.3 Just prior to sealing joint, clean with compressed air or flush with high pressure water to remove laitance, curing compound and protrusions of hardened concrete. Clean and dry by compressed air and vacuum to remove loose and foreign material.

3.14.3.4 Do not apply joint sealant in rainy weather or when ambient temperature is less than 5 °C.

3.14.3.5 Insert approved filler and bond breaking material in joint prior to applying sealant, then fill joint from bottom up with sealant to avoid trapping air.

3.14.3.6 Prepare sealant for application using equipment and methods approved by City.

3.14.3.7 Apply sealant strictly in accordance with manufacturer's recommendations with special attention to temperature ranges for safe heating and for application of hot poured sealants and cleanliness of concrete to be bonded.

3.14.3.8 On completion of first application of sealant, return and top up any underfilled areas.

3.14.3.9 Replace sealant which fails to bond to concrete or fails to cure properly, as directed by City.

3.15 Defective Concrete

3.15.1 Concrete is defective when:

3.15.1.1 It contains: honeycombing, embedded debris, uncontrolled shrinkage cracking, or other surface defects.

3.15.1.2 It is damaged by freezing.

3.15.1.3 It is placed at too high temperature.

3.15.1.4 Average 28 day strength of any three consecutive strength tests is less than specified minimum 28 day strength.

**3.16 Repair/Restoration**

**3.16.1 Repair of defective concrete work:**

3.16.1.1 Where defective concrete is identified by City during plastic condition, repair using methods approved by City.

3.16.1.2 Grind off high surface variations where directed by City

**3.16.2 Remove and replace defective concrete where directed by City.**

3.16.2.1 Remove minimum 3 m of pavement by sawing through concrete across full lane width.

3.16.2.2 Replace with new concrete to this specification.

3.16.2.3 Construct contraction joint at boundary between sawn face of existing concrete and new concrete.

**3.17 Protection**

3.17.1 Keep vehicular traffic off newly paved areas until paving has properly cured and joints have been sealed.

END OF SECTION 02752

**1 GENERAL****1.1 Related Work**

1.1.1 Section 02722 –Pavement Surface Cleaning.

1.1.2 Section 02741 – Hot-Mix Asphalt Concrete Paving.

**2 PRODUCTS****2.1 Materials****2.1.1 Paint:**

2.1.1.1 To CGSB 1-GP-74M, alkyd traffic paint.

2.1.1.2 Colour: to CGSB 1-GP-12C, yellow 505-308, black 512-301, white 513-301.

2.1.1.3 Upon request, City will supply a qualified product list of paints applicable to work. Qualified paints may be used but City reserves right to perform further tests.

2.1.2 Thinner: to CAN/CGSB-1.5.

**2.1.3 Glass beads:**

2.1.3.1 Overlay type: to CGSB 1-GP-74M.

**3 EXECUTION****3.1 Equipment Requirements**

3.1.1 Paint applicator to be an approved pressure type mobile distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified, and to dimensions as indicated, and to have positive shut-off.

3.1.2 Distributor to be capable of applying reflective glass beads, if required, as an overlay on freshly applied paint.

**3.2 Condition of Surfaces**

3.2.1 Pavement surface to be dry, free from ponded water, frost, ice, dust, oil, grease and other foreign materials.

**3.3 Application**

3.3.1 Lay out pavement markings.

3.3.2 Unless otherwise approved by City, apply paint only when air temperature is above 10°C, wind speed is less than 60km/h and no rain is forecast within next 4 h.

3.3.3 Apply traffic paint evenly at rate of 3 m<sup>2</sup>/L.

3.3.4 Do not thin paint unless approved by City.

3.3.5 Symbols and letters to conform to dimensions indicated.

3.3.6 Paint lines to be of uniform colour and density with sharp edges.

3.3.7 Thoroughly clean distributor tank before refilling with paint of different colour.

3.3.8 Apply glass beads at rate of 200g/m<sup>2</sup> of painted area on road centerlines, cross walks and other areas designated immediately after application of paint.

**3.4 Tolerance**

3.4.1 Paint markings to be within plus or minus 12 mm of dimensions indicated.

3.4.2 Remove incorrect markings in accordance with Section 02722 - Pavement Surface Cleaning.

**3.5 Protection of Completed Work**

3.5.1 Protect pavement markings until dry.

END OF SECTION 02761

**1 GENERAL****1.1 Related Work**

- 1.1.1 Section 02315 – Excavating, Trenching and Backfilling.
- 1.1.2 Section 02701 – Aggregates: General.
- 1.1.3 Section 03100 – Concrete Forms and Accessories
- 1.1.4 Section 03200 –Concrete Reinforcement.
- 1.1.5 Section 03300 – Cast-in-Place Concrete.

**2 PRODUCTS****2.1 Materials**

- 2.1.1 Reinforcing steel: to Section 03200 - Concrete Reinforcement.
- 2.1.2 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.
- 2.1.3 Fill material: to Section 02315 - Excavating, Trenching and Backfilling.
- 2.1.4 Boiled linseed oil: to CAN/CGSB-1.2.
- 2.1.5 Kerosene: to CAN/CGSB-3.3.

**2.2 Concrete**

- 2.2.1 Concrete mixes and materials: to Section 03300 - Cast-in-Place Concrete.
- 2.2.2 Hand formed and hand placed concrete to meet the following criteria.
  - i) Slump: 50 mm – 90 mm.
  - ii) Air Entrainment: 5% - 8%.
  - iii) Maximum aggregate size: 20 mm.
  - iv) Minimum 28 day compressive strength: 32 MPa.
- 2.2.3 Extruded concrete to meet the following criteria.
  - v) Slump: 30 mm – 40 mm.
  - vi) Air Entrainment: 5% - 8%.
  - vii) Maximum aggregate size: 20 mm.
  - viii) Minimum 28 day compressive strength: 32 MPa.

M

**3 EXECUTION****3.1 Grade Preparation**

- 3.1.1 Do grade preparation work in accordance with Section 02315 - Excavating, Trenching and Backfilling.
- 3.1.2 Construct embankments using excavated material free from organic matter or other objectionable materials. Dispose of surplus and unsuitable excavated material off site.
- 3.1.3 When constructing embankment provide for minimum 0.5 m shoulders, where applicable, outside of neat lines of concrete.
- 3.1.4 Place fill in maximum 150 mm layers and compact in accordance with Section 02315 - Excavating, Trenching and Backfilling.

**3.2 Granular Subbase**

- 3.2.1 Obtain Engineer's approval of subgrade before placing granular subbase.
- 3.2.2 Place granular subbase material to lines, widths, and depths as indicated on Standard Drawings or approved Construction Drawings.
- 3.2.3 Compact granular subbase to specifications outlined in Section 02723.

**3.3 Granular Base**

- 3.3.1 Obtain Engineer's approval of subbase before placing granular base.
- 3.3.2 Place granular base material to lines, widths, and depths as indicated on Standard Drawings or approved Construction Drawings.
- 3.3.3 Compact granular base to specifications outlined in Section 02721.

**3.4 Concrete**

- 3.4.1 Obtain City's approval of granular base and reinforcing steel prior to placing concrete.
- 3.4.2 Do concrete work in accordance with Section 03300 - Cast-in-Place Concrete.
- 3.4.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to center line.
- 3.4.4 Provide edging as indicated with radius edging tool. as shown on Standard Drawings C1 and C5.

3.4.5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Engineer can be demonstrated. Hand finish surfaces when directed by Engineer.

3.4.6 Prepare one set of three test cylinders for each 100 m length of curb and gutter placed.

3.4.7 Prepare one set of three test cylinders for each 100 m<sup>2</sup> area of concrete sidewalk.

3.4.8 Refer to Section 03300 - Cast-in-Place Concrete for field quality control requirements.

3.5 Tolerances

3.5.1 Finish surfaces to within 3 mm in 3 m as measured with a 3 m straight edge placed on surface.

3.6 Control Joints

3.6.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals as shown on Standard Drawings C1 and C5.

3.6.2 Install expansion joints as indicated on Standard Drawings C1 and C5.

3.6.3 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

3.6.4 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.6.5 Install joint filler in expansion joints as indicated.

3.6.6 Seal expansion joints with sealant approved by Engineer.

3.7 Curing

3.7.1 Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least 7 days after placing, or by sealing moisture in with curing compound approved by Engineer.

3.7.2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

3.7.3 Apply curing compound evenly to form continuous film in accordance with manufacturer's requirements.

- 3.7.4 When outside air temperature is expected to be below 4° C during placement or during curing period, cover concrete and provide heating as required in accordance with CAN/CSA-A23.1 to maintain concrete at a minimum temperature of 10° C for a minimum of 72 hours after placement. Protect concrete from freezing for an additional 72 hours thereafter or such time as to ensure proper curing of concrete.

3.8 Backfill

- 3.8.1 Allow concrete to cure for 7 days or when concrete has achieved 75% of specified design strength, prior to backfilling.
- 3.8.2 Backfill to designated elevations with material approved by the Engineer. Compact and shape to required contours as indicated or as directed by the Engineer.

END OF SECTION 02770

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 02701 – Aggregates: General.

1.1.3 Section 02721 – Granular Base.

**1.2 Product Data**

1.2.1 Submit following test data:

1.2.1.1 Sieve analysis for gradation of bedding and joint material.

1.2.1.2 Unit paver test data

**1.3 Samples**

1.3.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

1.3.2 Submit full size sample of each type of paving unit.

**1.4 Protection**

1.4.1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property. Make good any damage.

**2 PRODUCTS****2.1 Materials**

2.1.1 Unit pavers: uniform in material, colour, size and from one manufacturer.

2.1.2 Precast concrete paving slabs: to CSA-A231.1.

2.1.3 Granular Sub-Base: to requirements of Section 02701- Aggregates: General.

- 2.1.4 Manufactured sand for bedding: hard, durable, crushed stone particles, conforming to the gradation of concrete sand as specified in CAN/CSA A23.1, Section 5.3.2. Sand shall be free from clay lumps, cementation, organic material, frozen material and other deleterious materials. Do not use limestone screenings or stone dust. Conform to following gradations:

| Sieve Designation |    | Percent Passing |
|-------------------|----|-----------------|
| 10                | mm | 100             |
| 5                 | mm | 95 - 100        |
| 2.5               | mm | 80 - 100        |
| 1.25              | mm | 50 - 90         |
| 0.63              | mm | 25 - 60         |
| 0.315             | mm | 10 - 35         |
| 0.16              | mm | 2 - 10          |

- 2.1.5 Joint sand: to CSA A179, hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

### 3 EXECUTION

#### 3.1 Subgrade

- 3.1.1 Ensure that subgrade preparation conforms to levels and compaction required to allow for installation of granular sub-base.

#### 3.2 Geotextile

- 3.2.1 Install geotextile filter as indicated on approved Construction Drawings.

#### 3.3 Granular Sub-Base

- 3.3.1 Spread and compact crushed stone or gravel base in uniform layers not exceeding 100 mm compacted thickness.
- 3.3.2 Compact base to a density of not less than 100 % Standard Density in accordance with ASTM D698.
- 3.3.3 Shape and roll alternately to obtain a smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.
- 3.3.4 Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist, remove it and install more granular material to rid it of sponginess.
- 3.3.5 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.

- 3.3.6 Ensure top of granular sub-base does not exceed plus or minus 10 mm over a 3 m straightedge.
- 3.4 Edging
  - 3.4.1 Install edging true to grade, in location, layout and pattern as indicated.
- 3.5 Bedding Sand
  - 3.5.1 Place and spread bedding sand to compacted thickness as indicated on Standard Drawing R14.
  - 3.5.2 Do not use joint sand for bedding sand.
- 3.6 Surface Course
  - 3.6.1 Ensure bedding sand and granular base are not saturated prior to placement of unit pavers.
  - 3.6.2 Install unit paving true to grade on the bedding sand, in location, layout and pattern as indicated on approved Construction Drawings.
  - 3.6.3 Where required, cut units accurately without damaging edges.
  - 3.6.4 Do not pre-compact bedding sand where pavers are 300 x 300 mm or smaller.
  - 3.6.5 Precast concrete paving slabs:
    - 3.6.5.1 For vehicular areas, use cut pieces no smaller than one-third of a whole paver.
    - 3.6.5.2 Compact and level slabs with min. 22 kN force mechanical plate vibrator until units are true to grade and free of movement.
    - 3.6.5.3 Do not compact unit paving within 1 m of unrestrained edges.
    - 3.6.5.4 Fill spaces between pavers by sweeping in sand.
    - 3.6.5.5 Pass mechanical plate vibrator over unit paving to achieve compaction of sand in joints. Ensure joints are full at completion of compaction.
    - 3.6.5.6 At the completion of each work day, ensure all work within 1 m of laying face is left fully compacted with sand filled joints.
    - 3.6.5.7 Surface of finished pavement: free from depressions exceeding 3 mm as measured with 3 m straight edge.
    - 3.6.5.8 Sweep surface clean and check final elevations for conformance to drawings.

END OF SECTION 02785

**1 GENERAL****1.1 Related Work**

1.1.1 Section 03300 – Cast-in-Place Concrete.

**2 PRODUCTS****2.1 Materials**

2.1.1 Lockable Access Gates: Gates shall be painted yellow to the following code specification: General Paint, urethane enamel 16-202 or equivalent approved by Authorized Person.

2.1.2 Concrete mixes and materials: to Section 03300 - Cast-in-Place Concrete.

2.1.2.1 Nominal coarse aggregate size: 20-50 mm.

2.1.2.2 Compressive strength: 20MPa minimum at 28days.

2.1.3 Chain-link fence fabric: to CAN/CGSB-138.1.

2.1.3.1 Type 1, Class A, medium style unless indicated otherwise on approved Construction Drawings.

2.1.3.2 Height of fabric: 1.8m unless indicated otherwise on approved Construction Drawings.

2.1.4 Posts, braces and rails: to CAN/CGSB-138.2, Schedule 40 galvanized steel pipe. Dimensions as indicated.

2.1.5 Bottom tension wire: to CAN/CGSB-138.1, Table 2, single strand, galvanized or vinyl coated as indicated, steel wire, 5mm diameter.

2.1.6 Tie wire fasteners: to CAN/CGSB-138.1, Table 2 steel wire single strand, vinyl coated where indicated.

2.1.7 Tension bar: to ASTM A 525M, 5x20mm minimum galvanized steel.

2.1.8 Gates: to CAN/CGSB-138.4.

2.1.9 Fittings and hardware: to CAN/CGSB-138.2, cast aluminum alloy, galvanized steel or malleable or ductile cast iron. Tension bar bands: 3x20mm minimum galvanized steel or 5x20mm minimum aluminum. Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail. Overhang tops to provide waterproof fit, to hold top rails and a projection as indicated to hold barbed wire overhang. Provide projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart. Projection of approximately 300 mm long to project from fence at 45° above horizontal. Turnbuckles to be drop forged.

2.1.10 Organic zinc rich coating: to CAN/CGSB-1.181.

2.1.11 Barbed wire: 2mm diameter galvanized steel wire to ASTM A 121 or aluminum coated steel wire to ASTM A 585, 4 point barbs 125 mm spacing.

2.1.12 Grounding rod where indicated: 16 mm diameter copperwell rod, 3 m long.

## 2.2 Finishes

### 2.2.1 Galvanizing:

2.2.1.1 For chain link fabric: to CAN/CGSB-138.1 Grade 2.

2.2.1.2 For pipe: 550 g/m<sup>2</sup> minimum to ASTM A 90.

2.2.1.3 For barbed wire: to ASTM A 121, Class 2 CAN/CGSB-138.2.

2.2.1.4 For other fittings: to CAN/CSA-G164.

### 2.2.2 Aluminum coating:

2.2.2.1 For barbed wire: to ASTM A 585, Class 2.

### 2.2.3 Vinyl coating:

2.2.3.1 0.045 mm dry film thickness minimum.

## 3 EXECUTION

### 3.1 Grading

3.1.1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts. Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

### 3.2 Erection on Fence

3.2.1 Erect fence along lines as indicated and in accordance with CAN/CGSB-138.3.

3.2.2 Excavate post holes to dimensions indicated by methods approved by Engineer.

3.2.3 Space line posts 3 m apart, measured parallel to ground surface.

3.2.4 Space straining posts at equal intervals not exceeding 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade is greater than 150 m.

3.2.5 Install additional straining posts at sharp changes in grade and where directed by Engineer.

- 
- 3.2.6 Install corner post where change in alignment exceeds 10°.
  - 3.2.7 Install end posts at end of fence and at buildings. Install gate posts on both sides of gate openings.
  - 3.2.8 Place concrete in post holes then embed posts into concrete to depths indicated. Extend concrete 50 mm above ground level and slope to drain away from posts. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.
  - 3.2.9 Do not install fence fabric until concrete has cured a minimum of 5 days.
  - 3.2.10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface. Install braces on both sides of corner and straining posts in similar manner.
  - 3.2.11 Install overhang tops and caps.
  - 3.2.12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.
  - 3.2.13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
  - 3.2.14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals. Knuckled selvedge at bottom. Twisted selvedge at top.
  - 3.2.15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals. Give tie wires minimum two twists.
  - 3.2.16 Install barbed wire strands and clip securely to lugs of each projection.
  - 3.2.17 Install grounding rods as indicated
  - 3.3 Installation of Gates
    - 3.3.1 Install gates in locations as indicated.
    - 3.3.2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.
    - 3.3.3 Determine position of centre gate rest for double gate where required. Cast gate rest in concrete as directed. Dome concrete above ground level to shed water.
    - 3.3.4 Install gate stops where indicated
  - 3.4 Touch up
-

3.4.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.5 Cleaning

3.5.1 Clean and trim areas disturbed by operations. Dispose of surplus material and replace damaged turf with sod as directed by Engineer.

END OF SECTION 02821

**1 GENERAL****1.1 Related Work**

1.1.1 Section 02231 – Clearing and Grubbing.

1.1.2 Section 02311 – Site Grading.

**1.2 Standards**

1.2.1 Unless otherwise approved or directed by the Authorized Person, supply materials and install works to BC Landscape Standard, 6<sup>th</sup> Edition – British Columbia Society of Landscape Architects and BC Landscape and Nursery Association.

**1.3 Definitions**

1.3.1 **COMPOST:** A mixture of soil and decomposing organic matter used as a fertilizer, mulch, or soil conditioner. Compost is processed organic matter containing 40% or more organic matter as determined by the Walkley-Black or LOI test. Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 50, and contain no toxic or growth inhibiting contaminants. Composed bio-solids must meet the requirements of the Guidelines for Compost Quality, Category A produced by the Canadian Council of the Ministers of the Environment (CCME), January 1996.

**2 PRODUCTS****2.1 Topsoil**

2.1.1 Topsoil for seeded areas: mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth.

2.1.2 Soil texture based on The Canadian System of Soil Classification, to consist of 20 to 70 % sand, minimum 7 % clay, and contain 2 to 10 % organic matter by weight.

2.1.3 Contain no toxic elements or growth inhibiting materials.

2.1.4 Finished surface free from:

2.1.4.1 Debris and stones over 50 mm diameter.

2.1.4.2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

2.1.4.3 Consistence: friable when moist.

**2.2 Soil Amendments**

- 2.2.1 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and any other micro-nutrients suitable to the specific plant species or application or defined by the soil test.
  - 2.2.1.1 Fertility: major soil nutrients present in following amounts:
    - i) Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
    - ii) Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
    - iii) Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
    - iv) Calcium, magnesium, sulfur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
    - v) Ph value: 6.5 to 8.
- 2.2.2 Peat Moss:
  - 2.2.2.1 Derived from partially decomposed species of Sphagnum Mosses.
  - 2.2.2.2 Elastic and homogeneous, brown in colour.
  - 2.2.2.3 Free of wood and deleterious material which could prohibit growth.
  - 2.2.2.4 Shredded particle minimum size: 5 mm.
- 2.2.3 Sand: washed coarse silica sand, medium to coarse textured.
- 2.2.4 Organic matter: compost Category A, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- 2.2.5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.
- 2.2.6 Limestone:
  - 2.2.6.1 Ground agricultural limestone.
  - 2.2.6.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- 2.3 Source Quality Control
  - 2.3.1 Advise Engineer of sources of topsoil to be utilized with sufficient lead time for testing.
  - 2.3.2 Contractor is responsible for amendments to supply topsoil as specified.
  - 2.3.3 Soil testing by recognized testing facility for PH, P and K, and organic matter.

- 2.3.4 Soil sampling, testing and analysis to be in accordance with Provincial standards.

### **3 EXECUTION**

#### **3.1 Preparation of Existing Grade**

- 3.1.1 Verify that grades are correct. If discrepancies occur, notify Engineer and do not commence work until instructed by Engineer.
- 3.1.2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- 3.1.3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site.
- 3.1.4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

#### **3.2 Placing and Spreading of Topsoil**

- 3.2.1 Place topsoil after Engineer has accepted subgrade.
- 3.2.2 Spread topsoil in uniform layers not exceeding 150 mm.
- 3.2.3 For sodded areas keep topsoil 15 mm below finished grade.
- 3.2.4 Spread topsoil to the minimum depths (after settlement) indicated.
- 3.2.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

#### **3.3 Soil Amendments**

- 3.3.1 Where required, apply and thoroughly mix soil amendments to the depths and concentrations indicated.

#### **3.4 Finish Grading**

- 3.4.1 Grade to eliminate rough spots and low areas and ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- 3.4.2 Consolidate topsoil to required bulk density using equipment approved by Engineer. Leave surfaces smooth, uniform and firm against deep footprinting.

#### **3.5 Acceptance**

- 3.5.1 Test topsoil for Nitrogen-Phosphorous-Potassium (NPK) fertility to verify fertilizer requirements and application rates.

3.5.2 Apply fertilizer as required per test results.

END OF SECTION 02911

**1 GENERAL****1.1 Related Sections**

- 1.1.1 Section 03200 – Concrete Reinforcement.
- 1.1.2 Section 02770 – Concrete Walks, Curbs and Gutters
- 1.1.3 Section 03300 – Cast-In-Place Concrete.

**1.2 Shop Drawings**

- 1.2.1 Submit shop drawings for formwork and falsework in accordance with Section 01330 - Submittal Procedures.
- 1.2.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawing.
- 1.2.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- 1.2.4 Each shop drawing submission shall bear stamp and signature of qualified Professional Engineer registered or licensed in Province of British Columbia.

**2 PRODUCTS****2.1 Materials****2.1.1 Formwork materials:**

- 2.1.1.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86.1, CSA O437 Series and CSA-O153 as applicable.
- 2.1.1.2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.

**2.1.2 Tubular column forms: round, spirally wound laminated fiber forms, internally treated with release material.****2.1.3 Form ties:**

- 2.1.3.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia in concrete surface.
- 2.1.3.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- 2.1.4 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, non-toxic, biodegradable.
- 2.1.5 Falsework materials: to CSA S269.1.

### 3 EXECUTION

#### 3.1 Fabrication and Erection

- 3.1.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- 3.1.2 Obtain Engineer's approval for use of earth forms.
- 3.1.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- 3.1.4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- 3.1.5 Do not place shores and mud sills on frozen ground.
- 3.1.6 Provide site drainage to prevent washout of soil supporting mud sills and shores
- 3.1.7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.
- 3.1.8 Obtain Engineer's permission before framing openings not indicated.
- 3.1.9 Align form joints and make watertight. Keep form joints to minimum.
- 3.1.10 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.
- 3.1.11 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners of concrete members, unless specified otherwise.
- 3.1.12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

- 3.1.13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- 3.1.14 Line forms for following surfaces:
  - 3.1.14.1 Outer face of outside girders, beams and vertical edge of bridge sidewalk slab.
  - 3.1.14.2 Soffit of girders and underside of bridge decks if exposed.
  - 3.1.14.3 Exposed faces of abutments, wingwalls, piers and pylons. Do not stagger joints of form lining material. Align joints to obtain uniform pattern.
- 3.1.15 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.
- 3.1.16 If slip forming and flying forms are used, submit details of equipment and procedures for Engineer's approval.
- 3.2 Removal and Reshoring
  - 3.2.1 Leave formwork in place for following minimum periods of time after placing concrete.
    - 3.2.1.1 7 days for walls and sides of beams.
    - 3.2.1.2 7 days for columns.
    - 3.2.1.3 14 days for beam soffits, slabs, decks and other structural members, or 3 days when replaced immediately with adequate shoring to standard specified for falsework.
    - 3.2.1.4 3 days for footings and abutments.
  - 3.2.2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
  - 3.2.3 Space re-shoring in each principal direction at not more than 3000 mm apart.
  - 3.2.4 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION 03100

## 1 GENERAL

### 1.1 Related Sections

1.1.1 Section 03100 – Concrete Forms and Accessories.

1.1.2 Section 03300 – Cast-in-Place Concrete.

### 1.2 Shop Drawings

1.2.1 Submit shop drawings including placing of reinforcement in accordance with Section 01330 - Submittal Procedures.

1.2.2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Engineer, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada. ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

1.2.3 Detail lap lengths and bar development lengths to CAN3-A23.3.

## 2 PRODUCTS

### 2.1 Materials

2.1.1 Substitute different size bars only if permitted in writing by Engineer.

2.1.2 Reinforcing steel: billet steel, grade 300 deformed bars to CSA G30.18, unless indicated otherwise.

2.1.3 Reinforcing steel: weldable low alloy steel deformed bars to CSA G30.18.

2.1.4 Cold-drawn annealed steel wire ties: to CSA G30.3.

2.1.5 Deformed steel wire for concrete reinforcement: to CSA G30.14.

2.1.6 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets if wire heavier than 21 mm<sup>2</sup>.

2.1.7 Epoxy coating of non-prestressed reinforcement: to ASTM A775/A775M.

2.1.8 Galvanizing of non-prestressed reinforcement: to CSA G164, minimum zinc coating 610 g/m<sup>2</sup>.

2.1.9 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

2.1.10 Mechanical splices: subject to approval of Engineer.

2.1.11 Plain round bars: to CAN/CSA-G40.21.

## 2.2 Fabrication

2.2.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada unless indicated otherwise.

2.2.2 Obtain Engineer's approval for locations of reinforcement splices other than those shown on placing drawings.

2.2.3 Upon approval of Engineer, weld reinforcement in accordance with CSA W186.

2.2.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

## 3 EXECUTION

### 3.1 Field Bending

3.1.1 Do not field bend or field weld reinforcement except where indicated or authorized by Engineer.

3.1.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

3.1.3 Replace bars which develop cracks or splits.

### 3.2 Placing Reinforcement

3.2.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.

3.2.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

3.2.3 Prior to placing concrete, obtain Engineer's approval of reinforcing material and placement.

3.2.4 Ensure cover to reinforcement is maintained during concrete pour.

3.2.5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.3 Field Touch-up

- 3.3.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION 03200

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 03100 – Concrete Forms and Accessories.

1.1.2 Section 03200 – Concrete Reinforcement.

1.1.3 Section 02770 – Concrete Walks, Curbs and Gutters

**1.2 Standard**

1.2.1 Concrete materials and methods of construction: to CAN/CSA-A23.1 unless otherwise specified.

**1.3 Inspection**

1.3.1 Concrete testing: to CAN/CSA-A23.2 by testing laboratory approved by City.

1.3.2 Give Engineer minimum 24 h notice before each concrete pour.

**1.4 Certificates**

1.4.1 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

**2 PRODUCTS****2.1 Materials**

2.1.1 Portland cement: to CAN/CSA-A5, Type 10.

2.1.2 Supplementary cementing materials: to CAN/CSA-A23.5.

2.1.3 Water: to CAN/CSA-A23.1.

2.1.4 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.

2.1.5 Air entraining admixture: to ASTM C 260.

2.1.6 Chemical admixtures: to ASTM C 494. City to approve accelerating or set retarding admixtures during cold and hot weather placing.

2.1.7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.

2.1.7.1 Compressive strength: 50 Mpa at 28 days.

- 2.1.8 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compression strength of 30 MPa at 28 days.
- 2.1.9 Waterstops: extruded ribbed PVC strips, 12 MPa tensile strength, minimum 350% elongation, minus 45 C to plus 80 C working temperature.
- 2.1.10 Premoulded joint fillers: Bituminous impregnated fiber board: to ASTM D1751.
- 2.1.11 Joint sealer/filler: grey, to CAN/CGSB-19.24, Type1, Class B; black, cold applied, to CAN/CGSB-19.20, Type 1.
- 2.1.12 Floor hardener: non-metallic, pre-mixed.
- 2.1.13 Sealer: boiled linseed oil, mixed with mineral spirits 1:1, proprietary poly-siloxane resin blend.
- 2.1.14 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel, insulation filled.
- 2.1.15 Dampproofing: Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2.
- 2.1.16 Polyethylene film 0.15 mm: to CGSB 51-34.
- 2.1.17 All other concrete materials: to CAN/CSA-A23.1.
- 2.2 Concrete Mixes
  - 2.2.1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1.
  - 2.2.2 Cement: Type 10 Portland cement.
  - 2.2.3 Minimum 28 day compressive strengths and exposure classifications:
    - 2.2.3.1 Suspended parking floors and ramps: 35 MPa.
    - 2.2.3.2 Pavements, walks, curbs and exposed site concrete: 32 MPa.
    - 2.2.3.3 Retaining structures, bridge decking, and other structures: as specified by the Professional Engineer responsible for the design.
    - 2.2.3.4 All other concrete: 25 MPa.
  - 2.2.4 Nominal size of coarse aggregate: Clause14 of CAN/CSA-A23.1.
  - 2.2.5 Slump: to Table 6 of CAN/CSA-A23.1.
  - 2.2.6 Air content: all concrete to contain purposely entrained air in accordance with Table10 of CAN/CSA-A23.1.

2.2.7 Admixtures: to Clause 6 of CAN/CSA-A23.1.

2.2.8 Polypropylene fibres (where indicated): add 1 kg/m<sup>3</sup>, at plant, with minimum 7 minutes mixing time.

### **3 EXECUTION**

#### **3.1 Preparation**

3.1.1 Obtain Engineer's approval before placing concrete. Provide 24 h notice prior to placing of concrete.

3.1.2 Pumping of concrete is permitted only after approval of equipment and mix.

3.1.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

3.1.4 Prior to placing of concrete obtain Engineer's approval of proposed method for protection of concrete during placing and curing in adverse weather.

3.1.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

3.1.6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

3.1.7 Do not place load upon new concrete until authorized by Engineer.

#### **3.2 Construction**

3.2.1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.

##### **3.2.2 Sleeves and Inserts**

3.2.2.1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Engineer.

3.2.2.2 Where approved by Engineer, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated on the drawings, must be approved by Engineer.

3.2.2.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Engineer before placing of concrete.

##### **3.2.3 Anchor bolts:**

3.2.3.1 Place anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

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### 3.2.4 Finishing

- 3.2.4.1 Formed surfaces exposed to view: sack rubbed finish in accordance with CAN/CSA-A23.
- 3.2.4.2 Interior floor slabs to be left exposed or to receive epoxy, carpet, sheet vinyl or other covering requiring a smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CAN/CSA-A23.1 to produce hard, smooth, dense trowelled surface free from blemishes; finishing tolerance classification: Flat.
- 3.2.4.3 Hardened floor finish: as specified above in conjunction with application of hardener applied  $2.44 \text{ kg/m}^2$ .
- 3.2.4.4 Floor slabs to receive mortar bed for ceramic or quarry tile: screed to correct grade to provide broomed texture; finishing tolerance classification: Conventional.
- 3.2.4.5 Equipment pads: smooth trowelled surface; finishing tolerance classification: Very Flat.
- 3.2.4.6 Pavements, walks, curbs and exposed site concrete: screed to plane surfaces and float using aluminum, magnesium, or wood floats. Round edges and provide joint spacings using standard tools. Trowel smooth followed by lightly brushed non-slip finish.

### 3.2.5 Waterstops

- 3.2.5.1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
- 3.2.5.2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections.

### 3.2.6 Control Joints and Expansion Joints

- 3.2.6.1 Cut and form control joints to induce shrinkage cracking during concrete curing in slabs on grade at locations indicated, in accordance with CAN/CSA-A23.1 and as indicated on Standard Drawing C5. Fill with specified joint sealer/filler when specified by Engineer.
- 3.2.6.2 Install expansion joints as specified in Section 02770 and as indicated on Standard Drawings C1 and C5.

### 3.2.7 Joint Fillers

3.2.7.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Engineer. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

3.2.7.2 Locate and form isolation joints as indicated. Install joint filler.

3.2.7.3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to finished slab surface unless indicated otherwise.

### 3.2.8 Cold Weather Requirements

3.2.8.1 When air temperature is at or below 5° C during placement or within the 24 hours following, protect concrete in accordance with CAN/CSA-A23.1.

3.2.8.2 Provide enclosures for heating such that air circulation is maintained. Protect concrete from alternating freeze-thaw cycles for a minimum of 14 days.

3.2.8.3 Withdraw protection and heating gradually such that air temperature around concrete does not drop by more than 15° C per day.

### 3.2.9 Hot Weather Requirements

3.2.9.1 When air temperature is at or above 23° C place concrete in accordance with CAN/CSA-A23.1. If concrete temperature exceeds limits specified in CAN/CSA-A23.1 suspend operations until constituent materials of concrete are cooled.

3.2.9.2 Retarding admixtures to be used only upon written approval of the City.

### 3.2.10 Curing

3.2.10.1 Cure and protect concrete in accordance with CAN/CSA-A23.1, except that curing compounds shall not be used where bond is required by subsequent topping or coating.

### 3.2.11 Sealing

3.2.11.1 Following curing, apply linseed oil or poly-siloxane resin blend sealer treatment as indicated.

3.2.11.2 Apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m<sup>2</sup> /L. Allow first coat to dry before applying second coat.

3.2.11.3 Apply poly-siloxane resin blend sealer at 4 m<sup>2</sup> /L.

## 3.3 Field Quality Control

- 3.3.1 Inspection and testing of concrete and concrete materials to be carried out by a Testing Laboratory approved by Owner in accordance with CAN/CSA-A23.1.
- 3.3.2 Prepare one set of three test cylinders for every 10 m<sup>3</sup> of concrete placed. A minimum of one set of test cylinders is required for every day during which concrete is placed. Cure cylinders on job site under same conditions as concrete which they represent.
- 3.3.3 Conduct slump and air content tests with each set of cylinders.
- 3.3.4 Engineer may take additional test cylinders.
- 3.3.5 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- 3.3.6 Inspection or testing by Engineer will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION 03300

**1 GENERAL****1.1 Codes and Standards**

- 1.1.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- 1.1.2 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1987 except where specified otherwise.

**1.2 Care, Operation and Start-up**

- 1.2.1 Instruct City and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- 1.2.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- 1.2.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

**1.3 Voltage Ratings**

- 1.3.1 Operating voltages: to CAN3-C235-83.
- 1.3.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

**1.4 Permits, Fees and Inspection**

- 1.4.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- 1.4.2 Pay associated fees.
- 1.4.3 City will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- 1.4.4 Advise City of changes required by Electrical Inspection Department prior to making changes.
- 1.4.5 Furnish Certificates of Acceptance from authorities having jurisdiction on completion of work to City.

**1.5 Materials and Equipment**

1.5.1 Equipment and material to be CSA certified.

1.5.2 Factory assemble control panels and component assemblies.

**1.6 Finishes**

1.6.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

1.6.1.1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.

1.6.1.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

1.6.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

1.6.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

**1.7 Equipment Identification**

1.7.1 Identify electrical equipment with nameplates and labels.

1.7.2 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

1.7.3 Labels: Embossed plastic labels with 6 mm high letters unless specified otherwise.

1.7.4 Wording on nameplates and labels to be approved by City prior to manufacture.

1.7.5 Allow for average of twenty-five (25) letters per nameplate and label.

1.7.6 Identification to be English.

1.7.7 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

1.7.8 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

1.7.9 Terminal cabinets and pull boxes: indicate system and voltage.

1.7.10 Transformers: indicate capacity, primary and secondary voltages.

**1.8 Wiring Identification**

- 1.8.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- 1.8.2 Maintain phase sequence and colour coding throughout.
- 1.8.3 Colour code: to CSA C22.1.
- 1.8.4 Use colour coded wires in communication cables, matched throughout system.

**1.9 Conduit and Cable Identification**

- 1.9.1 Colour code conduits, boxes and metallic sheathed cables.
- 1.9.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- 1.9.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

**1.10 Wiring Terminations**

- 1.10.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

**1.11 Warning Signs**

- 1.11.1 As specified and to meet requirements of Electrical Inspection Department.
- 1.11.2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

**1.12 Single Line Electrical Diagrams**

- 1.12.1 Provide single line electrical diagrams under plexiglass: locate in main electrical room.
- 1.12.2 Provide fire alarm riser diagram, plan and zoning of building under plexiglass at fire alarm control panel and annunciator.
- 1.12.3 Drawings: 600 x 600 mm minimum size.

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1.13 Location of Outlets

- 1.13.1 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- 1.13.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- 1.13.3 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

## 1.14 Mounting Heights

- 1.14.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- 1.14.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- 1.14.3 Install electrical equipment at following heights unless indicated otherwise:
  - i) Local switches: 1400 mm.
  - ii) Wall receptacles (General): 300 mm.
  - iii) Wall receptacles above top of continuous baseboard heater: 200 mm.
  - iv) Wall receptacles above top of counters or counter splash backs: 175 mm.
  - v) Wall receptacles in mechanical rooms: 1400 mm.
  - vi) Panelboards: as required by Code or as indicated.
  - vii) Telephone and interphone outlets: 300 mm.
  - viii) Wall mounted telephone and interphone outlets: 1500 mm.
  - ix) Fire alarm stations: 1500 mm.
  - x) Fire alarm bells: 2100 mm.
  - xi) Television outlets: 300 mm.
  - xii) Wall mounted speakers: 2100 mm.
  - xiii) Clocks: 2100 mm.
  - xiv) Door bell pushbuttons: 1500 mm.

## 1.15 Load Balance

- 1.15.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- 1.15.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- 1.15.3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

**1.16 Conduit and Cable Installation**

- 1.16.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- 1.16.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- 1.16.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

**1.17 Field Quality Control**

- 1.17.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- 1.17.2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province that the work is being constructed.
- 1.17.3 Conduct and pay for following tests:
  - i) Power generation and distribution system including phasing, voltage, grounding and load balancing.
  - ii) Circuits originating from branch distribution panels.
  - iii) Lighting and its control.
  - iv) Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - v) Systems: fire alarm system, communications and automation systems (programmable logic controllers - PLCs)
- 1.17.4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- 1.17.5 Insulation resistance testing.
  - 1.17.5.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - 1.17.5.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
  - 1.17.5.3 Check resistance to ground before energizing.

1.17.6 Carry out tests in presence of City.

1.17.7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

1.17.8 Submit test results for City's review.

1.18 Co-ordination of Protective Devices

1.18.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

2 PRODUCTS

(Not Applicable)

3 EXECUTION

(Not Applicable)

END OF SECTION 16010

**1 GENERAL****1.1 Related sections**

1.1.1 Section 02315 – Excavating, Trenching and Backfilling.

1.1.2 Section 16010 – Electrical General Requirements.

**2 PRODUCTS****2.1 Cable Protection**

2.1.1 Warning Tape – yellow with black lettering, labeled: “CAUTION – ELECTRICAL LINE BURIED CABLE”

**3 EXECUTION****3.1 Cable Installation in Conduit**

3.1.1 Install cables as indicated in ducts.

3.1.2 Do not pull spliced cables inside ducts.

3.1.3 Install multiple cables in duct simultaneously.

3.1.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

3.1.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

3.1.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

3.1.7 After installation of cables, seal duct ends with duct sealing compound.

**3.2 Field Quality Control**

3.2.1 Perform tests in accordance with Section 16010 - Electrical General Requirements.

3.2.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

3.2.3 Check phase rotation and identify each phase conductor of each feeder.

- 3.2.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- 3.2.5 Pre-acceptance tests:
  - 3.2.5.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
  - 3.2.5.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- 3.2.6 Acceptance tests:
  - 3.2.6.1 Ensure that terminations and accessory equipment are disconnected.
  - 3.2.6.2 Ground shields, ground wires, metallic armour and conductors not under test.
  - 3.2.6.3 High Potential (Hipot) Testing: Conduct hipot testing in accordance with manufacturer's and IPCEA recommendations.
  - 3.2.6.4 Conduct Leakage Current Testing if indicated:
    - i) Raise voltage in steps from zero to maximum values as specified by IPCEA for type of cable being tested.
    - ii) Hold maximum voltage for time period specified by IPCEA or manufacturer.
    - iii) Record leakage current at each step.
- 3.2.7 Provide City with list of test results showing location at which each test was made, circuit tested and result of each test.
- 3.2.8 Remove and replace entire length of cable if cable fails to meet any of test criteria

END OF SECTION 16051

**1 GENERAL****1.1 Related sections**

1.1.1 Section 16010 – Electrical General Requirements.

1.2 Perform all work in accordance with the Canadian Electrical Code.

**2 PRODUCTS****2.2 Materials**

2.2.1 Rod electrodes: copper clad steel, 19 mm dia by 3 m long.

2.2.2 Conductors: bare, stranded, soft annealed copper wire, size No 4/0 AWG for ground bus, electrode interconnections, metal structures, gradient control mats, transformers, switchgear, motors, ground connections.

2.2.3 Conductors: stranded soft annealed copper wire, size No. 4 AWG for grounding cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers.

2.2.4 Conductors: pvc insulated coloured green, stranded soft annealed copper wire No. 10 AWG for grounding meter and relay cases.

2.2.5 Conductors: No. 3/0 AWG extra flexible (425 strands) copper conductor for connection of switch mechanism operating rod to gradient control mat, fence gates, vault doors.

2.2.6 Accessories: non-corroding, necessary for complete grounding system, type, size material as indicated, including:

- 1 Grounding and bonding bushings,
- 2 Protective type clamps,
- 3 Bolted type conductor connectors,
- 4 Thermit welded type conductor connectors,
- 5 Bonding jumpers, straps,
- 6 Pressure wire connectors.

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### 3 EXECUTION

#### 3.2 Grounding Installation

3.2.1 Install continuous grounding system including, electrodes, conductors, connectors and accessories in accordance with CSA C22.2 No.0.4 and requirements of local authority having jurisdiction.

3.2.2 Ground fences to grounding system independent of station ground.

3.2.3 Install connectors in accordance with manufacturer's instructions.

3.2.4 Protect exposed grounding conductors from mechanical injury.

3.2.5 Make buried connections, and connections to electrodes, structural steel work, using copper welding by thermit process or permanent mechanical connectors to ANSI/IEEE 837.

3.2.6 Use mechanical connectors for grounding connections to equipment provided with lugs.

3.2.7 Use No. 4/0 AWG bare copper cable for main ground bus of substation and No. 2/0 AWG mhd bare copper cable for taps on risers from main ground bus to equipment.

3.2.8 Use tinned copper conductors for aluminum structures.

3.2.9 Do not use bare copper conductors near un-jacketed lead sheath cables.

3.2.10 Install grounding resistor bank.

3.2.11 Install zig-zag grounding transformer.

#### 3.3 Electrode Installation

3.3.1 Install ground rod electrodes. Make grounding connections to station equipment.

3.3.2 Install ground rod electrodes at transformer and switchgear locations.

3.3.3 Install gradient control mats. Connect mats to station ground electrode and switch mechanism operating rods.

3.3.4 Make special provision for installing electrodes that will give acceptable resistance to ground value, where rock or sand terrain prevails.

### 3.4 Equipment Grounding

3.4.1 Install grounding connections as indicated to typical station equipment including: metallic water main, line sky wire, neutral, gradient control mats. Non current carrying parts of: transformers, generators, motors, circuit breakers, reclosers, current transformers, frames of gang-operated switches and fuse cutout bases. Cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers. Meter and relay cases. Any exposed building metal, within or forming part of station enclosure. Sub-station fences, pothead bodies. Outdoor lighting.

3.4.2 Ground hinged doors to main frame of electrical equipment enclosure with flexible jumper.

3.4.3 Connect metallic piping (water, oil, air, etc.) inside station to main ground bus at several locations, including each service location within station. Make connections to metallic water pipes outside station to assist in reduction of station ground resistance value.

### 3.5 Neutral Grounding

3.5.1 Connect transformer neutral and distribution neutral together using 1000 V insulated conductor to one side of ground test link, the other side of the test link being connected directly to main station ground. Ensure distribution neutral and neutrals of potential transformers and service banks are bonded directly to transformer neutral and not to main station ground.

3.5.2 Interconnect electrodes and neutrals at each grounding installation.

3.5.3 Connect neutral of station service transformer to main neutral bus with tap of same size as secondary neutral.

3.5.4 Ground transformer tank with continuous conductor from tank ground lug through connector on ground bus to primary neutral. Connect neutral bushing at transformer to primary neutral in same manner.

### 3.6 Pole Mounted Switching Device Grounding

3.6.1 Drive four ground rods 3 m long at base of each pole on which group-operated line switching devices are mounted.

3.6.2 Arrange rods in square formation with 3 m sides, located so that operator must stand within square to operate switch.

3.6.3 Interconnect ground rods with No. 2/0 AWG stranded annealed copper conductor and join to switch operating handle ground wires.

3.6.4 Connect operating handle of switch to handle base with No. 3/0 AWG extra flexible copper conductor.

3.7 Pole Mounted Transformer Grounding

3.7.1 Drive ground rods at base of each pole on which transformers are mounted and interconnect transformer, system neutral, lightning arresters and ground rods.

3.8 Grounding in Manholes

3.8.1 Install conveniently located grounding stud, electrode, stranded copper conductor in each manhole.

3.8.2 Install ground rod with lug for grounding connection in each manhole so that top projects through bottom of manhole.

3.9 Cable Sheath Grounding

3.9.1 Bond single conductor, metallic sheathed cables together at one end only. Break sheath continuity by inserting insulating sleeves in cables or using special isolating transformer.

3.9.2 Use No. 6 AWG flexible copper wire soldered, not clamped, to cable sheath.

3.9.3 Connect bonded cables to ground with No. 2/0 AWG copper conductor.

3.10 Field Quality Control

3.10.1 Perform tests in accordance with Section 16010 - Electrical General Requirements.

3.10.2 Perform earth loop test and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction.

3.10.3 Perform test before energizing electrical system.

END OF SECTION 16061

**1 GENERAL****1.1 Related sections**

1.1.1 Section 16010 – Electrical General Requirements.

**2 PRODUCTS****2.1 Equipment**

2.1.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

2.1.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed, size as indicated.

2.1.3 Rod electrodes: copper clad steel 19 mm dia by 3 m long.

2.1.4 Plate electrodes: galvanized steel, surface area 0.2 m<sup>2</sup>, 1.6 mm thick.

2.1.5 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

2.1.6 Insulated grounding conductors: green, as indicated.

2.1.7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

2.1.8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

2.1.8.1 Grounding and bonding bushings.

2.1.8.2 Protective type clamps.

2.1.8.3 Bolted type conductor connectors.

2.1.8.4 Thermit welded type conductor connectors.

2.1.8.5 Bonding jumpers, straps.

2.1.8.6 Pressure wire connectors.

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3 EXECUTION

## 3.1 Installation General

- 3.1.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- 3.1.2 Install connectors in accordance with manufacturer's instructions.
- 3.1.3 Protect exposed grounding conductors from mechanical injury.
- 3.1.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process or permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- 3.1.5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- 3.1.6 Soldered joints not permitted.
- 3.1.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- 3.1.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- 3.1.9 Install separate ground conductor to outdoor lighting standards.
- 3.1.10 Install grounding resistance bank.
- 3.1.11 Install zig-zag grounding transformer on line side of main interrupter.
- 3.1.12 Connect building structural steel and metal siding to ground by welding copper to steel.
- 3.1.13 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- 3.1.14 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- 3.1.15 Ground secondary service pedestals.

**3.2 Manholes**

- 3.2.1 Install conveniently located grounding stud, electrode, stranded copper conductor in each manhole.
- 3.2.2 Install ground rod with lug for grounding connection in each manhole so that top projects through bottom of manhole. Provide with lug to which grounding connection can be made.

**3.3 Electrodes**

- 3.3.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- 3.3.2 Install water meter shunt.
- 3.3.3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
- 3.3.4 Install rod or plate electrodes as indicated and make grounding connections.
- 3.3.5 Bond separate, multiple electrodes together.
- 3.3.6 Use size 2/0, 3/0 or 4/0 AWG copper conductors as required for connections to electrodes.
- 3.3.7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

**3.4 Equipment Grounding**

- 3.4.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

**3.5 Grounding Bus**

- 3.5.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- 3.5.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0 AWG.

3.6 Communication Systems

3.6.1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:

3.6.1.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

3.6.1.2 Sound, fire alarm, intercommunication systems as indicated.

3.7 Field Quality Control

3.7.1 Perform tests in accordance with Section 16010 - Electrical General Requirements.

3.7.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of City and local authority having jurisdiction over installation.

3.7.3 Perform test before energizing electrical system.

3.7.4 Disconnect ground fault indicator during tests.

END OF SECTION 16062

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 16010 – Electrical General Requirements.

**2 PRODUCTS****2.1 Building Wires**

2.1.1 Conductors: stranded for 14 AWG and larger. Minimum size: 14 AWG.

2.1.2 Copper conductors: size as indicated, with 600 or 1000 V insulation as indicated of chemically cross-linked thermosetting polyethylene material rated RW90 or RWU90 for the use intended.

2.1.3 Neutral supported cable: insulated conductors of aluminum and one neutral conductor of aluminum steel reinforced, size as indicated. Insulation: Type NS-1 rated 300 V and Type NSF-2 flame retardant rated 600 V where required.

**2.2 TECK Cable**

2.2.1 Only use TECK Cable when approved by the Authorized Person.

2.2.2 Cable: to CAN/CSA-C22.2 No. 131.

2.2.3 Grounding and Circuit conductors where indicated to be copper.

2.2.4 Insulation:

2.2.4.1 Type: ethylene propylene rubber.

2.2.4.2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 or 1000 V as indicated.

2.2.5 Inner jacket: polyvinyl chloride material.

2.2.6 Armour: interlocking galvanized steel or aluminum.

2.2.7 Overall covering for wet or corrosive conditions: thermoplastic polyvinyl chloride material.

2.2.8 Connectors: Watertight, explosion-proof approved for TECK cable.

**2.3 Streetlighting Wire**

2.3.1 Conductors: 10AWG, stranded. Acceptable Product: RW90 X-Link

**2.4 Armoured Cables**

- 2.4.1 Conductors: insulated copper, size as indicated on drawings.
- 2.4.2 Type: AC90 or ACL90 - lead sheath over cable assembly and under armour.
- 2.4.3 Armour: interlocking type fabricated from galvanized steel or aluminum strip.
- 2.4.4 Type: ACWU90 - PVC flame retardant jacket over thermoplastic armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2 m.

## 2.5 Instrumentation and PLC Control Cables

- 2.5.1 Type LVT: soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of cotton braid, thermoplastic jacket, and armour of closely wound aluminum wire as indicated.
- 2.5.2 Instrumentation cables: 18 AWG, stranded, individually twisted and shielded pairs.  
Acceptable product: Beldem

## 2.6 Non-Metallic Sheathed Cable

- 2.6.1 Non-metallic sheathed copper cable type: NMD-7, NMD-7 nylon, NMW-9 or NMW-10, size as indicated.

# 3 EXECUTION

## 3.1 Installation General

- 3.1.1 Install wires and cables as indicated.
- 3.1.2 Group cables wherever possible.

## 3.2 Installation of Mineral-Insulated cables

- 3.2.1 Run cable securely supported by staples, straps or hangers.
- 3.2.2 Support 2 h fire rated cables at 1m intervals.
- 3.2.3 Make cable terminations by using factory-made kits.
- 3.2.4 At cable terminations use thermoplastic sleeving over bare conductors.
- 3.2.5 Where cables are buried in cast concrete or masonry, sleeve for entry or exit of cables.
- 3.2.6 Do not splice cables.

3.3 Installation of Instrumentation and PLC Control Cables

3.3.1 Instrumentation cables shall be installed in a separate metal conduit or contained in a TECK cable.

3.3.2 Ground control cable shield.

END OF SECTION 16122

**1 GENERAL****1.1 Related Sections**

1.1.1 Section 16010 – Electrical General Requirements.

**2 PRODUCTS****2.1 Splitters**

2.1.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

2.1.2 Main and branch lugs and connection bars to match required size and number of incoming and outgoing conductors as indicated.

2.1.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

**2.2 Junction and Pull Boxes**

2.2.1 Aluminum construction with screw-on flat covers for surface mounting.

2.2.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

**2.3 Cabinets**

2.3.1 Vancouver Electrical Box (VBE), hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

**3 EXECUTION****3.1 Splitter Installation**

3.1.1 Install splitters and mount plumb, true and square to the building lines.

3.1.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

- 3.2 Junction, Pull Boxes and Cabinets Installation
  - 3.2.1 Install pull boxes in inconspicuous but accessible locations.
  - 3.2.2 Mount cabinets with top not higher than 2 m above finished floor.
  - 3.2.3 Install terminal block as indicated in Type T cabinets.
  - 3.2.4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.
- 3.3 Identification
  - 3.3.1 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION 16131

1      GENERAL

1.1      Related Sections

1.1.1      Section 16010 – Electrical General Requirements.

2      PRODUCTS

2.1      Conduits

2.1.1      Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel or aluminum threaded.

2.1.2      Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

2.1.3      Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings or expanded ends as indicated.

2.1.4      Rigid pvc conduit: to CSA C22.2 No. 211.2.

2.1.5      Flexible metal conduit: to CSA C22.2 No. 56.

2.1.6      Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.2      Conduit Fastenings

2.2.1      One hole malleable iron or steel straps to secure surface conduits NPS 2 and smaller. Two hole steel straps for conduits larger than NPS 2 (50 mm).

2.2.2      Beam clamps to secure conduits to exposed steel work.

2.2.3      Channel type supports for two or more conduits at spacing indicated.

2.2.4      Threaded rods, 6 mm dia., to support suspended channels.

2.3      Conduit Fittings

2.3.1      Fittings: manufactured for use with conduit specified. Coating: same as conduit.

2.3.2      Factory "ells" where 90° bends are required for NPS 1 (25 mm) and larger conduits.

2.3.3      Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4      Expansion Fittings for Rigid Conduit

2.4.1      Weatherproof expansion fittings with internal bonding assembly suitable for linear expansion.

2.4.2      Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

2.4.3      Weatherproof expansion fittings for linear expansion at entry to pane.

2.5      Fish Cord: Polypropylene.

3      EXECUTION

3.1      Installation

3.1.1      Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

3.1.2      Use EMT (Electrical Mechanical Tubing) conduit except where specified otherwise.

3.1.3      Use epoxy coated or rigid pvc conduit underground or in corrosive areas.

3.1.4      Use electrical metallic tubing (EMT) above 2.4 m not subject to mechanical injury.

3.1.5      Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without a prewired outlet box, connection to surface or recessed fluorescent fixtures and work in movable metal partitions.

3.1.6      Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

3.1.7      Use explosion proof flexible connection for connection to explosion proof motors.

3.1.8      Install conduit sealing fittings in hazardous areas. Fill with compound.

3.1.9      Minimum conduit size for lighting and power circuits: NPS 3/4 (19 mm).

3.1.10      Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

3.1.11      Mechanically bend steel conduit over 19 mm dia.

3.1.12      Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

- 3.1.13 Install fish cord in empty conduits.
- 3.1.14 Run 2-NPS 1 spare conduits up to ceiling space and 2-NPS 1 spare conduits down to ceiling space from each flush panel. Terminate these conduits in [152 x 152 x 102 mm] junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete or surface type box.
- 3.1.15 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- 3.1.16 Dry conduits out before installing wire
- 3.2 Surface Conduits
  - 3.2.1 Run parallel or perpendicular to building lines.
  - 3.2.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
  - 3.2.3 Run conduits in flanged portion of structural steel.
  - 3.2.4 Group conduits wherever possible on suspended or surface channels.
  - 3.2.5 Do not pass conduits through structural members except as indicated.
  - 3.2.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.
- 3.3 Concealed Conduits
  - 3.3.1 Run parallel or perpendicular to building lines.
  - 3.3.2 Do not install horizontal runs in masonry walls.
  - 3.3.3 Do not install conduits in terrazzo or concrete toppings.
- 3.4 Conduits in Cast-in-place Concrete
  - 3.4.1 Locate to suit reinforcing steel. Install in centre one third of slab.
  - 3.4.2 Protect conduits from damage where they stub out of concrete.
  - 3.4.3 Install sleeves where conduits pass through slab or wall.
  - 3.4.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

- 3.4.5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- 3.4.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- 3.4.7 Organize conduits in slab to minimize cross-overs.
- 3.5 Conduits in Cast-in-place Slabs on Grade
  - 3.5.1 Run conduits NPS 1 and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.
- 3.6 Conduits Underground
  - 3.6.1 Slope conduits to provide drainage.
  - 3.6.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

END OF SECTION 16133

## 1 GENERAL

## 1.1 Related sections

1.1.1 Section 16010 – Electrical General Requirements.

## 2 PRODUCTS

## 2.1 Steel Poles

2.1.1 Steel poles: davit-style as indicated on Standard Infrastructure Drawings, to NEMASH5 designed for underground wiring and:

2.1.1.1 Hot-dipped galvanized finish.

2.1.1.2 Mounting on concrete anchor base with transformer base where indicated.

2.1.1.3 Style: monotube, minimum 3.0 mm thick, tapered, round, octagonal, or octaflute as indicated.

2.1.1.4 Straight for luminaire mounting brackets.

2.1.1.5 Access handhole above pole base for wiring connections, with welded-on reinforcing frame and bolted-on cover.

2.1.1.6 Grounding lug

2.1.1.7 NOTE: Post-top style poles are no longer accepted.

## 2.2 Luminaire Mounting Brackets

2.2.1 Mounting brackets steel or aluminum for specified luminaires:

2.2.1.1 Single and twin brackets as indicated.

## 2.3 Luminaires

2.3.1 Luminaire with cast aluminum weatherproof housing and:

2.3.1.1 Lamp type: non-cycling bulb. Acceptable product: Powerlite

2.3.1.2 Lamp wattage:

(i) Local Roads: 100W

(ii) Collector Roads: 150W

(iii) Arterial Roads: 250W

2.3.1.3 Ballast: high power factor to match lamp wattage, one lamp, 120V, unless specified otherwise by Engineer.

2.3.1.4 Optical assembly:

- i) High pressure sodium lamps.
- ii) Reflector: sheet aluminum with Alzak finish.
- iii) Refractor: one piece prismatic glass, flat glass type
- iv) Gasket: neoprene seal between refractor and housing.

2.3.1.5 Light Distribution: IES distribution Type III, unless otherwise specified by Engineer, by adjusting position of lamp socket.

2.3.1.6 Self-locking latches of stainless steel and aluminum.

2.3.1.7 Factory wired including integral ballast.

**3 EXECUTION**

- 3.1 Install poles true and plumb, complete with brackets in accordance with manufacturer's instructions.
- 3.2 Install luminaires on pole davits and install lamps.
- 3.3 Check luminaire orientation, level and tilt.
- 3.4 Connect luminaire to lighting circuit.

END OF SECTION 16550

## **Schedule E**

### **Standard Infrastructure Drawings**

Infrastructure specifications including a table of contents follow.



# STANDARD INFRASTRUCTURE DRAWINGS INDEX

| DWG | GENERAL                                             | REV |
|-----|-----------------------------------------------------|-----|
| G1  | Utility Location Local (20m road)                   | 0   |
| G2  | Utility Location Collector (25m road - 13m surface) | 0   |
| G3  | Utility Location Arterial (37m road - divided)      | 0   |
| G4  | Lot Servicing (Water, Sanitary & Storm)             | 0   |
| G5  | Pipe Trench                                         | 0   |
| G6  | Control Monument Set Below Road Surface             | 0   |
| G7  | Control Monument Set in Concrete                    | 0   |
| G8  | Removable Bollard                                   | 0   |
| G9  | Lockable Access Gate                                | 0   |
| G10 | Sign Placement                                      | 0   |

| DWG | CONSTRUCTION DETAIL - SURFACE WORKS                      | REV |
|-----|----------------------------------------------------------|-----|
| C1  | Erect Curb and Gutter                                    | 0   |
| C2  | Roll Curb and Gutter                                     | 0   |
| C3  | Cutting Down and Filling Curb Drops                      | 0   |
| C4  | Gutter Transition at Catch Basin for Roll and Erect Curb | 0   |
| C5  | Sidewalk Concrete Construction                           | 0   |
| C6  | Sidewalk Base Construction                               | 0   |
| C7  | Sidewalk Crossing                                        | 0   |
| C8  | Crosswalk and Ramp Layout (sheet 1)                      | 0   |
| C9  | Crosswalk and Ramp Layout (sheet 2)                      | 0   |
| C10 | Unit Pavers                                              | 0   |
| C11 | Urban Walkway                                            | 0   |
| C12 | Median Bullnose                                          | 0   |
| C13 | Island Bullnose Ramp                                     | 0   |
| C14 | Asphalt Drainage Curb                                    | 0   |
| C15 | Tree Grate                                               | 0   |

| DWG | ELECTRICAL                                                   | REV |
|-----|--------------------------------------------------------------|-----|
| E1a | Standard Concrete Base<br>Conduit Configurations             | 0   |
| E1b | Standard Concrete Base<br>For all Type 2 & 4 poles           | 0   |
| E1c | Standard Concrete Base<br>For all Type 1 & 3 poles           | 0   |
| E1d | Standard Concrete Base<br>For All Type L Poles               | 0   |
| E1e | Standard Concrete Base<br>For Service Poles                  | 0   |
| E2a | Lighting Pole Elevations - Single Davit Pole                 | 0   |
| E2b | Lighting Pole Elevations - Double Davit Pole                 | 0   |
| E2c | Lighting Pole Elevations - Davit Service Pole                | 0   |
| E3a | Signal/Sign Pole Elevation - Type 4 Signal Pole              | 0   |
| E3b | Signal/Sign Pole Elevation - Type 1 Signal Pole              | 0   |
| E3c | Signal/Sign Pole Elevation - Type 3 Signal Pole              | 0   |
| E3d | Signal/Sign Pole Elevation - Type L Signal Pole              | 0   |
| E3e | Signal/Sign Pole Elevation<br>Controlled Pedestrian Crossing | 0   |
| E3f | Signal/Sign Pole Elevation - Crosswalk Sign                  | 0   |
| E4a | Underground Electrical<br>Utility Corridor                   | 0   |
| E4b | Underground Electrical<br>Road Crossing                      | 0   |
| E4c | Underground Electrical<br>Lot Servicing (Hydro TFMR)         | 0   |
| E4d | Underground Electrical<br>Lot Servicing (Hydro SB)           | 0   |

| DWG | ELECTRICAL CONTINUED                                              | REV |
|-----|-------------------------------------------------------------------|-----|
| E5a | Overhead Electrical - Pole Layouts                                | 0   |
| E6a | Power and Distribution<br>Wiring Diagram (Single Phase)           | 0   |
| E6b | Power and Distribution<br>Wiring Diagram (Three Phase)            | 0   |
| E6c | Power and Distribution<br>Underground Service For Street Lighting | 0   |
| E6d | Power and Distribution<br>Overhead Service Parking Lots           | 0   |
| E6e | Power and Distribution<br>Underground Service For Parking Lots    | 0   |
| E6f | Power and Distribution<br>Distribution Base Layout                | 0   |
| E7a | Junction Box - Type 10                                            | 0   |
| E7b | Junction Box - Type 14                                            | 0   |
| E8a | Utility Marker                                                    | 0   |

| DWG | PARKS           | REV |
|-----|-----------------|-----|
| P1  | Trail Standards | 0   |

| DWG | ROADS                                     | REV |
|-----|-------------------------------------------|-----|
| R1  | Local - (20m road) - Paved                | 0   |
| R2  | Local - (20m road) - Gravel Surface       | 0   |
| R3  | Collector - (20m road - 13m surface)      | 0   |
| R4  | Collector - (25m road - 13m surface)      | 0   |
| R5  | Collector - (25m road - 15m surface)      | 0   |
| R6  | Arterial Un-divided - (30m road)          | 0   |
| R7  | Arterial Divided - (37m road)             | 0   |
| R8  | 90° Expanded Elbow                        | 0   |
| R9  | Temporary Turnaround (20m road)           | 0   |
| R10 | Urban Offset Cul-de-sac                   | 0   |
| R11 | Urban Cul-de-sac                          | 0   |
| R12 | Rural Cul-de-sac                          | 0   |
| R13 | Driveway Culvert                          | 0   |
| R14 | Recommended Planting Offset - Residential | 0   |
| R15 | Recommended Planting Offset - Downtown    | 0   |

| DWG | SEWER                                       | REV |
|-----|---------------------------------------------|-----|
| S1  | Manhole for 200mm - 450mm Pipes             | 0   |
| S2  | Manhole for 525mm - 1050mm Pipes            | 0   |
| S3  | Precast Riser Manhole                       | 0   |
| S4  | Manhole Construction                        | 0   |
| S5  | Manhole Connection - Drop & Ramp Type       | 0   |
| S6  | Inside Drop Manhole                         | 0   |
| S7  | Top Inlet Catchbasin - Concrete             | 0   |
| S8  | Circular Corrugated Catch Basin             | 0   |
| S9  | Circular Twin Catch Basins                  | 0   |
| S10 | Sanitary and Storm Sewer Service Connection | 0   |
| S11 | Recharge Chamber                            | 0   |
| S12 | Lawn Drains                                 | 0   |
| S13 | Storm Sewer Inlet With Safety Grill         | 0   |

| DWG | WATER                                                               | REV |
|-----|---------------------------------------------------------------------|-----|
| W1  | Thrust Block Arrangement                                            | 0   |
| W2  | Water Service Connection                                            | 0   |
| W3  | Gate Valve Installation<br>(for watermains 300mm or less)           | 0   |
| W4  | Butterfly Valve Installation<br>(for watermains greater than 300mm) | 0   |
| W5  | Fire Hydrant Installation                                           | 0   |
| W6  | Test Point Installation                                             | 0   |
| W7  | Air-Release Valve                                                   | 0   |
| W8  | Blow-Off for Watermain to 250mm                                     | 0   |
| W9  | Watermain Relocation                                                | 0   |
| W10 | Temporary Water Supply Connection                                   | 0   |

Power and Distribution

Concrete Bases

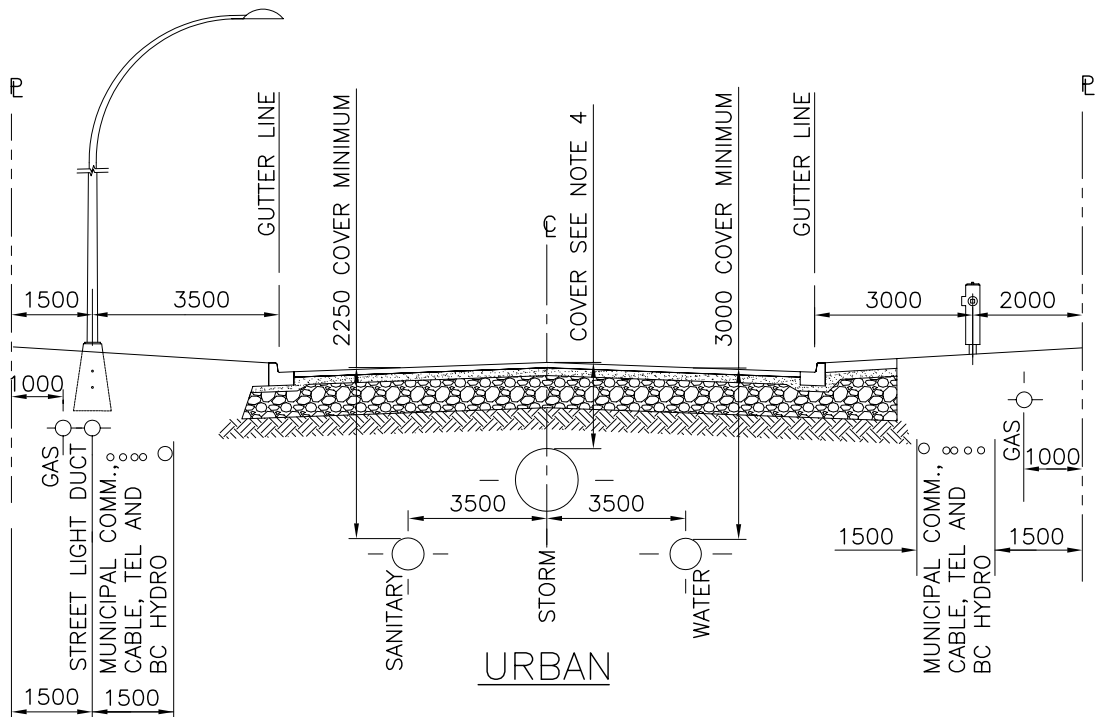
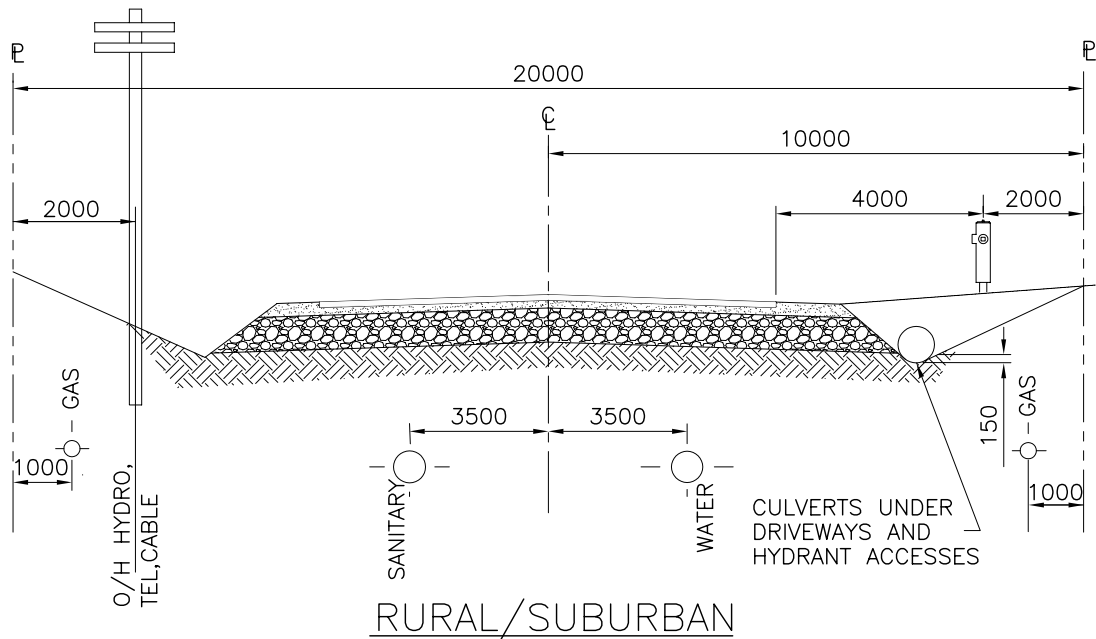
Light Pole Elevation

Signal/Sign Pole Elevation

Underground Electrical

# UTILITY LOCATION LOCAL (20m ROAD)

G1



- NOTES:**
1. IF CLEAR SPACING BETWEEN SANITARY SEWER AND WATER PIPES OR STORM SEWER AND WATER PIPES IS LESS THAN 3m THEN ALL JOINTS MUST BE HEAT SHRINK WRAPPED, UNLESS OTHERWISE APPROVED BY DIRECTOR.
  2. FOR PARALLEL CONDUITS MAINTAIN 300mm MINIMUM CLEAR SPACING BETWEEN POWER AND COMMUNICATION CONDUITS. REFER TO CODE OR UTILITY COMPANY STANDARDS FOR MINIMUM SPACING AT CONDUIT CROSSINGS.
  3. SEE DWG. R1 FOR ROAD DETAILS.
  4. MINIMUM STORM SEWER COVER DEPTH SHALL BE 2250, UNLESS OTHERWISE APPROVED BY THE DIRECTOR.

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SCALE

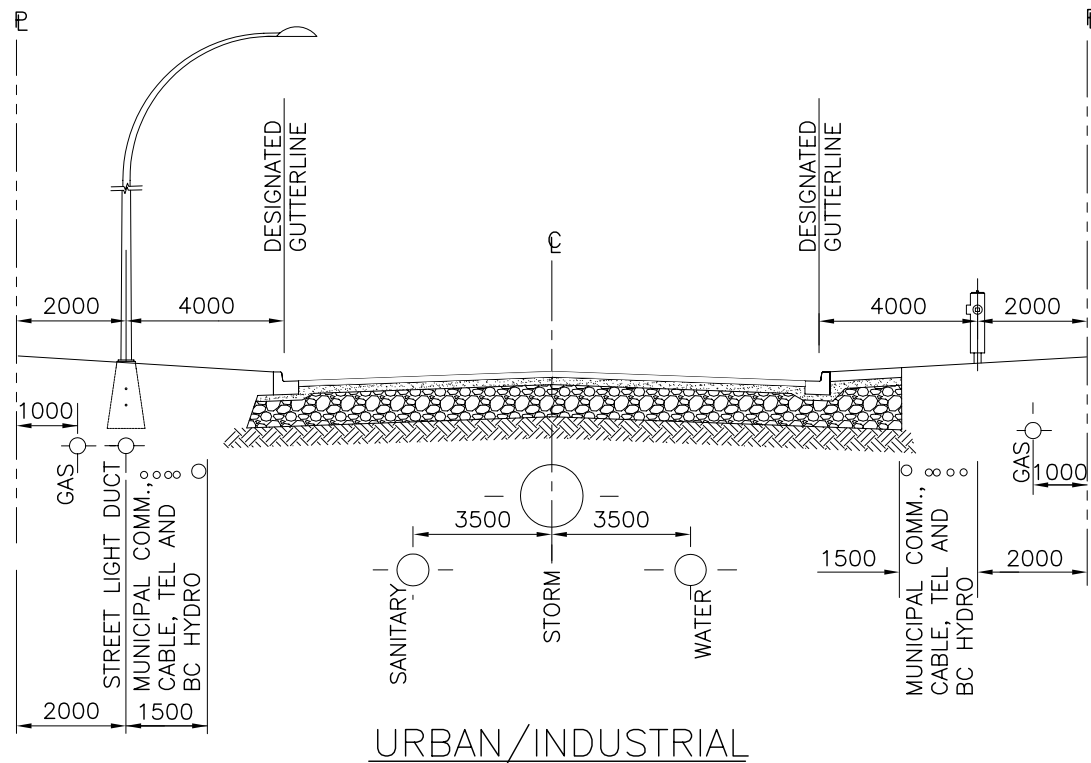
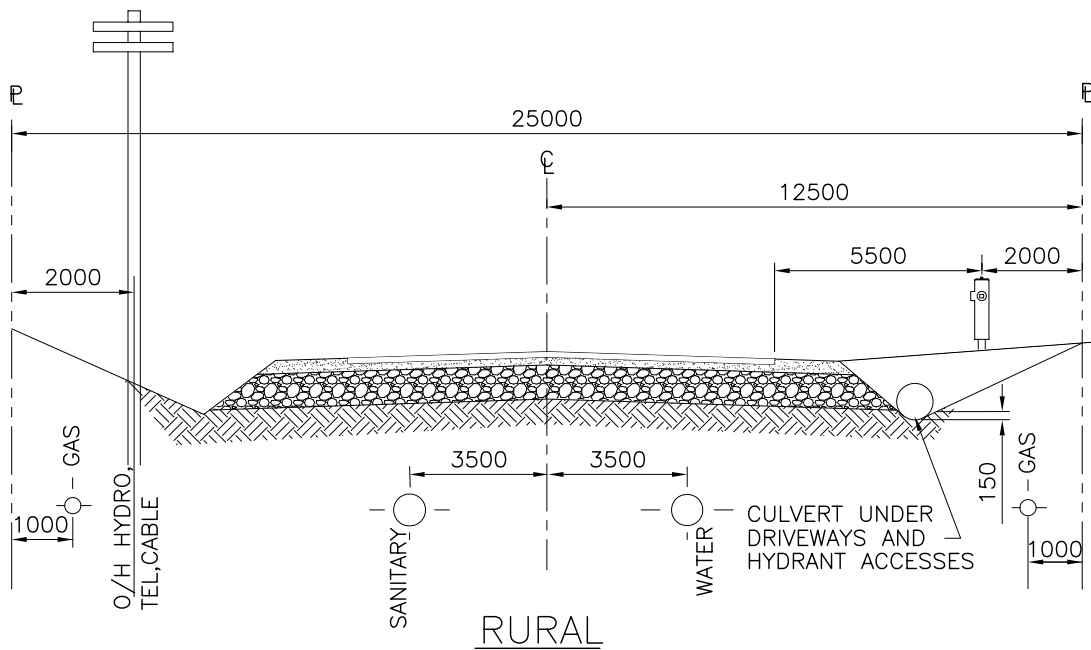
N.T.S.

DRAWING NUMBER

G1

# UTILITY LOCATION COLLECTOR (25m ROAD – 13m SURFACE)

G2



- NOTES:**
1. IF CLEAR SPACING BETWEEN SANITARY SEWER AND WATER PIPES OR STORM SEWER AND WATER PIPES IS LESS THAN 3m THEN ALL JOINTS MUST BE HEAT SHRINK WRAPPED, UNLESS OTHERWISE APPROVED BY DIRECTOR.
  2. FOR PARALLEL CONDUITS MAINTAIN 300mm MINIMUM CLEAR SPACING BETWEEN POWER AND COMMUNICATION CONDUITS. REFER TO CODE OR UTILITY COMPANY STANDARDS FOR MINIMUM SPACING AT CONDUIT CROSSINGS.
  3. SEE DWG. R4 FOR ROAD DETAILS
  4. SEE DWG. G1 FOR MAIN COVER DEPTHS.

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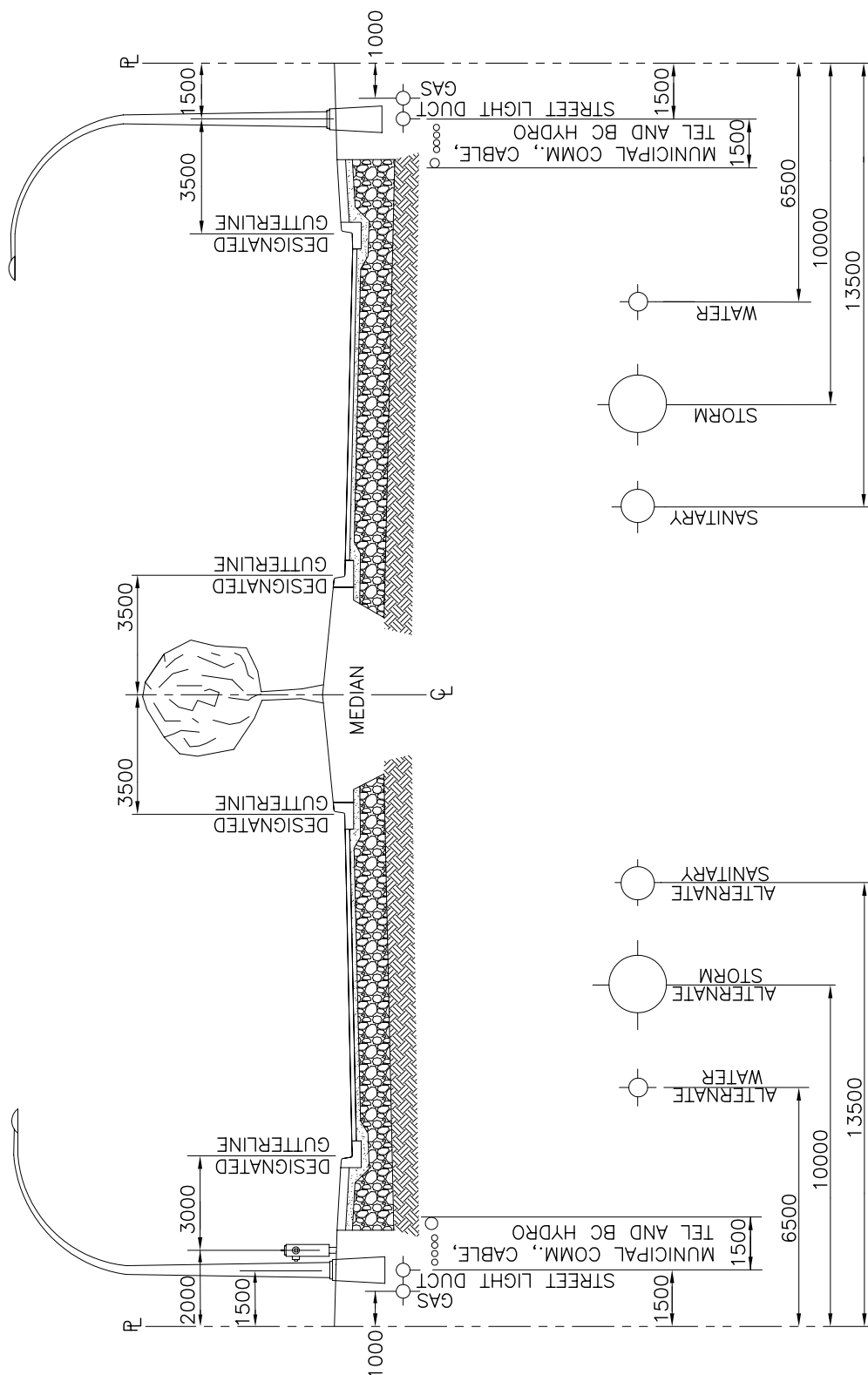
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**G2**

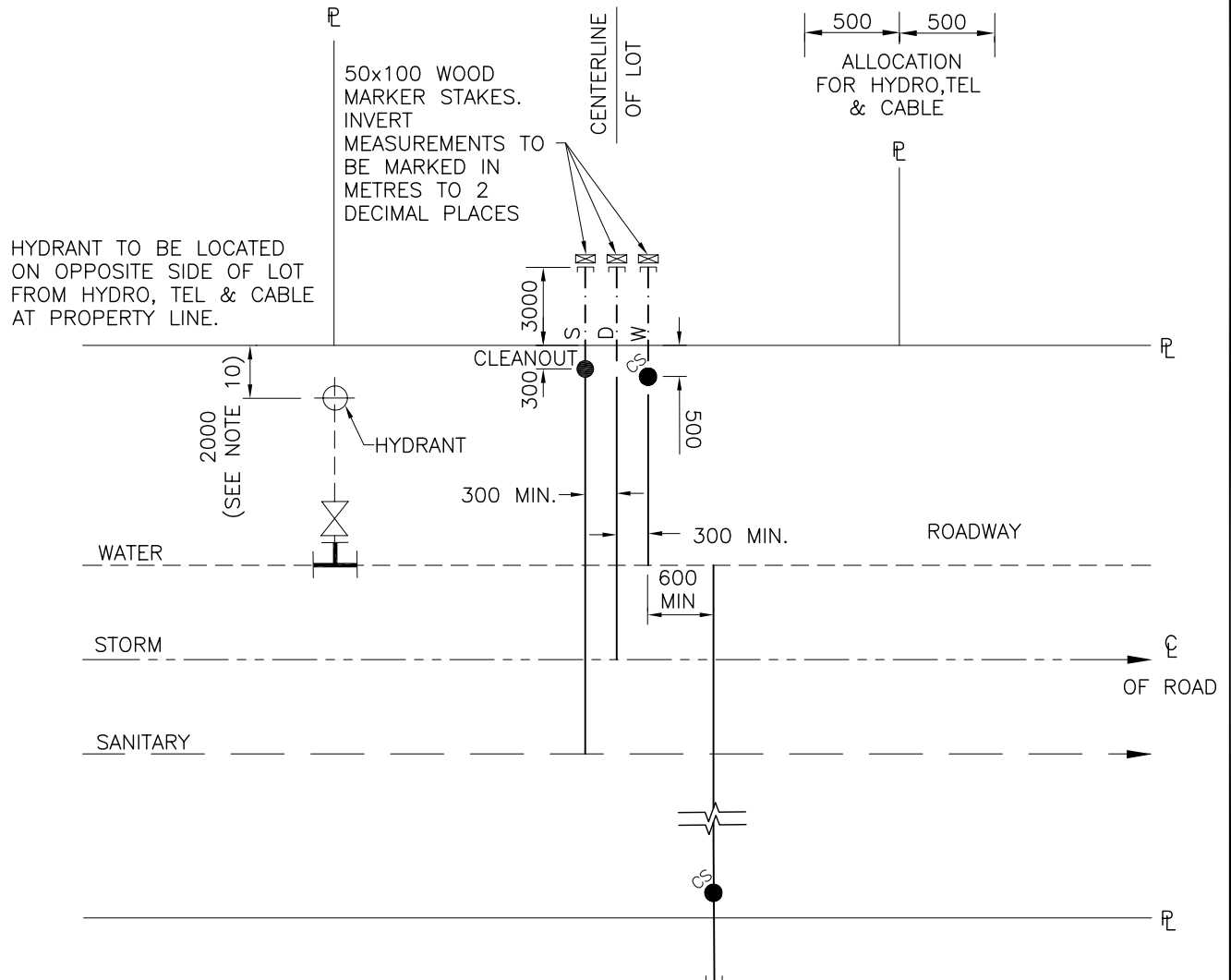
UTILITY LOCATION  
ARTERIAL (37m ROAD – DIVIDED)



- NOTES:
1. IF CLEAR SPACING BETWEEN SANITARY SEWER AND WATER PIPES OR STORM SEWER AND WATER PIPES IS LESS THAN 3m THEN ALL JOINTS MUST BE HEAT SHRINK WRAPPED, UNLESS OTHERWISE APPROVED BY DIRECTOR.
  2. FOR PARALLEL CONDUITS MAINTAIN 300mm MINIMUM CLEAR SPACING BETWEEN POWER AND COMMUNICATION CONDUITS. REFER TO CODE OR UTILITY COMPANY STANDARDS FOR MINIMUM SPACING AT CONDUIT CROSSINGS.
  3. SEE DWG. R7 FOR ROAD DETAILS
  4. SEE DWG. G1 FOR MIN. DEPTHS OF MAINS

# LOT SERVICING (WATER, SANITARY & STORM)

G4



**NOTES:**

- FOR DETAILS OF SERVICES SEE DWG. S10 AND W2.
- HYDRO, TEL AND CABLE DETAILS SEE DWG. E4c.
- WHERE POSSIBLE LAY AT MAXIMUM SEPARATIONS ALLOWED BY TRENCHING EQUIPMENT.
- SANITARY CONNECTIONS TO BE LOCATED FARTHEST FROM THE WATER CONNECTION ON DOWNHILL SIDE OF LOT.
- ALL JOINTS ON SANITARY SERVICE PIPING MUST HAVE HEAT SHRINK WRAP OR OTHER WRAPPING AS APPROVED BY DIRECTOR UNLESS WATER SERVICE PIPE IS INSTALLED IN SEPARATE TRENCH AT 3000 CLEAR SPACING.
- WATER SERVICE PIPE TO BE CONTINUOUS WITH NO BREAKS FROM WATERMAIN TO CURB STOP AT PROPERTY LINE.
- SANITARY SERVICE PIPE TO BE WHITE. STORM SERVICE PIPE ANY COLOUR OTHER THAN WHITE.
- STAKE SHALL BE PLACED AT THE END OF THE CONNECTION AND COLOURED AS FOLLOWS:  
WATER - BLUE  
SANITARY- WHITE  
STORM - GREEN.
- WATER SERVICE SADDLES TO BE MIN. 600 APART OR FROM FITTINGS AND END OF PIPE.
- HYDRANT OFFSET FROM PROPERTY LINE MAY BE ADJUSTED IN RETROFIT SITUATIONS UPON APPROVAL OF THE DIRECTOR.

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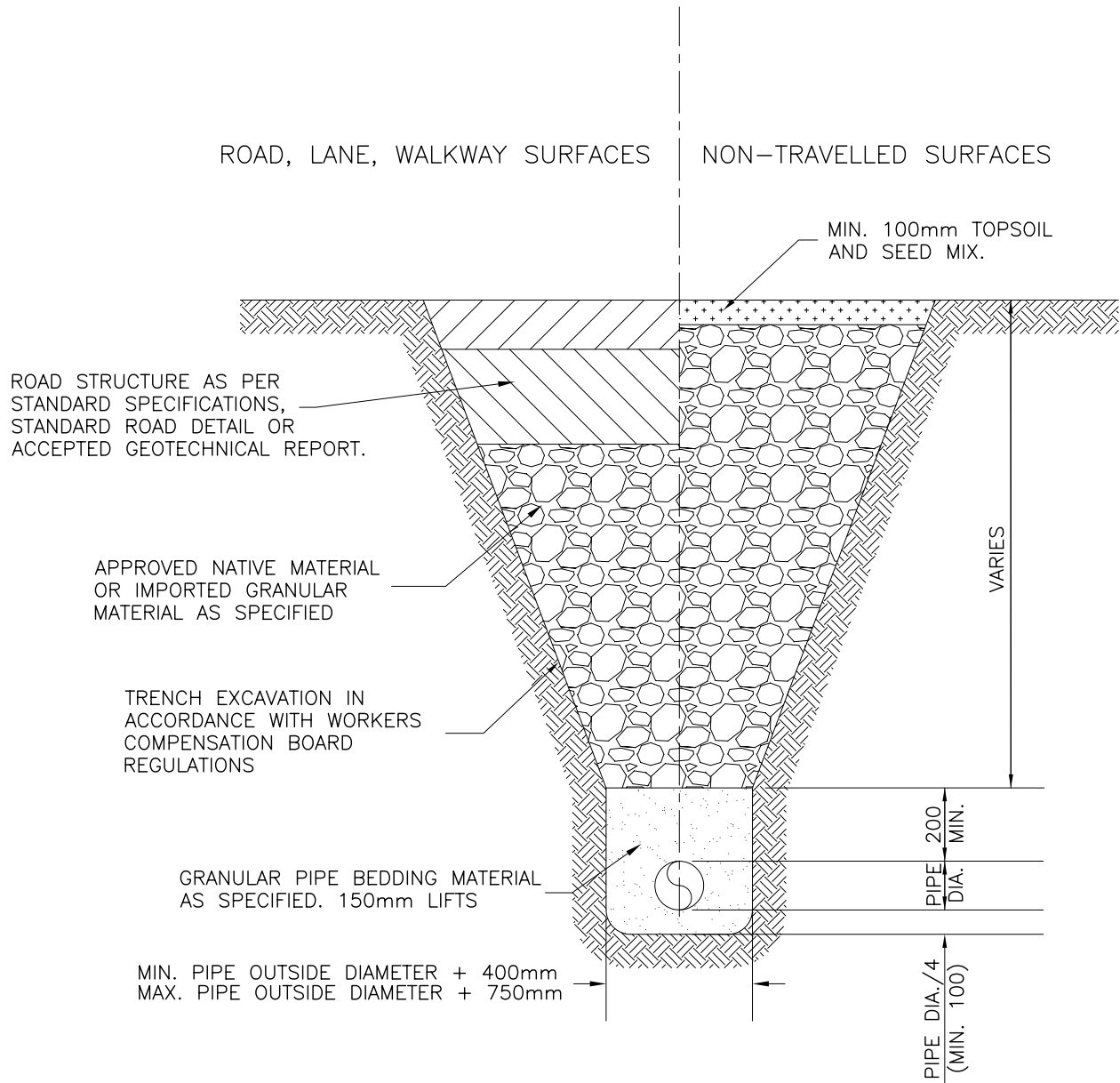
**G4**



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# PIPE TRENCH

G5



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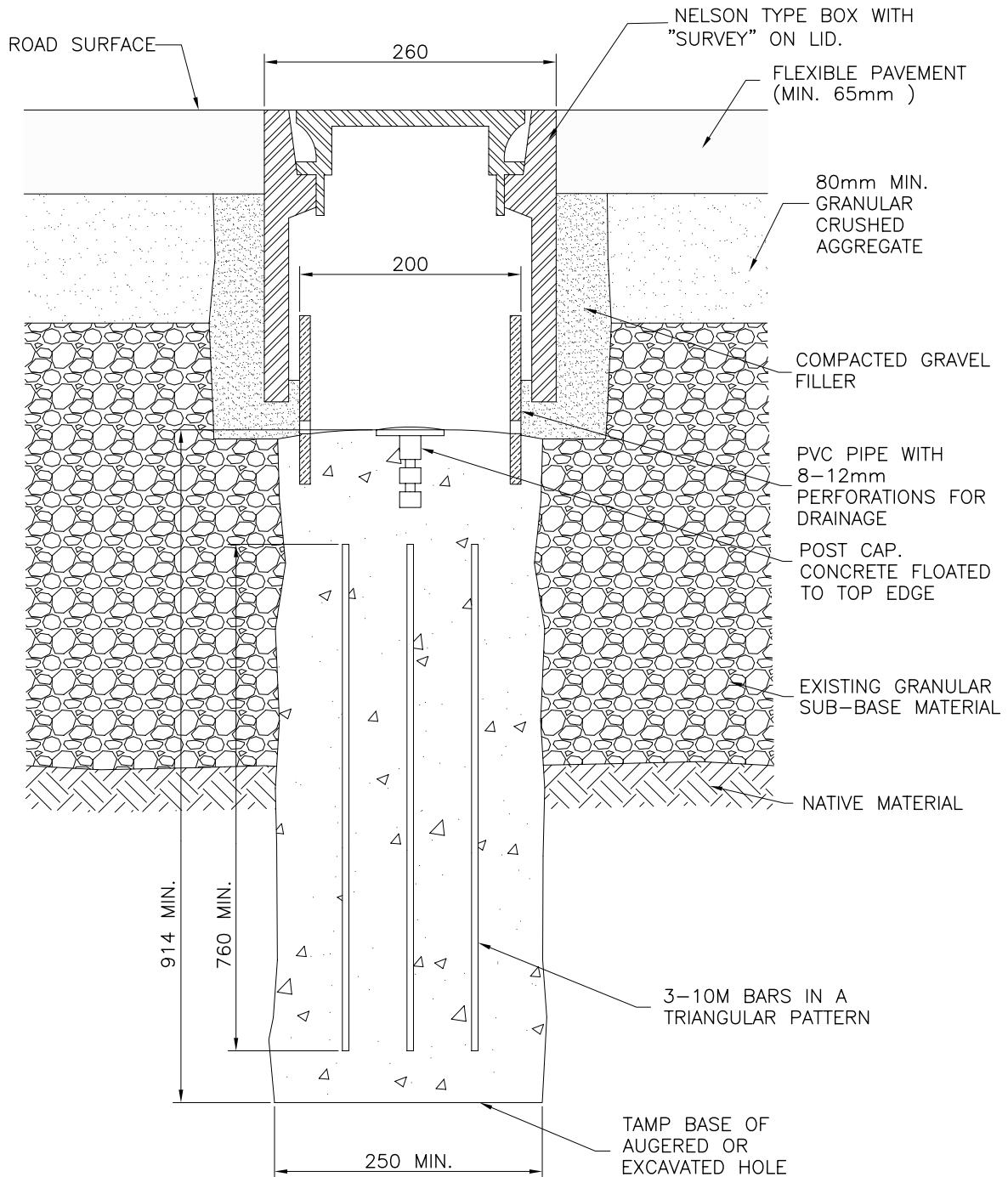
**G5**



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# CONTROL MONUMENT SET BELOW ROAD SURFACE

G6



NOTE: CONCRETE BASE MUST BE INSTALLED AS A SINGLE POUR

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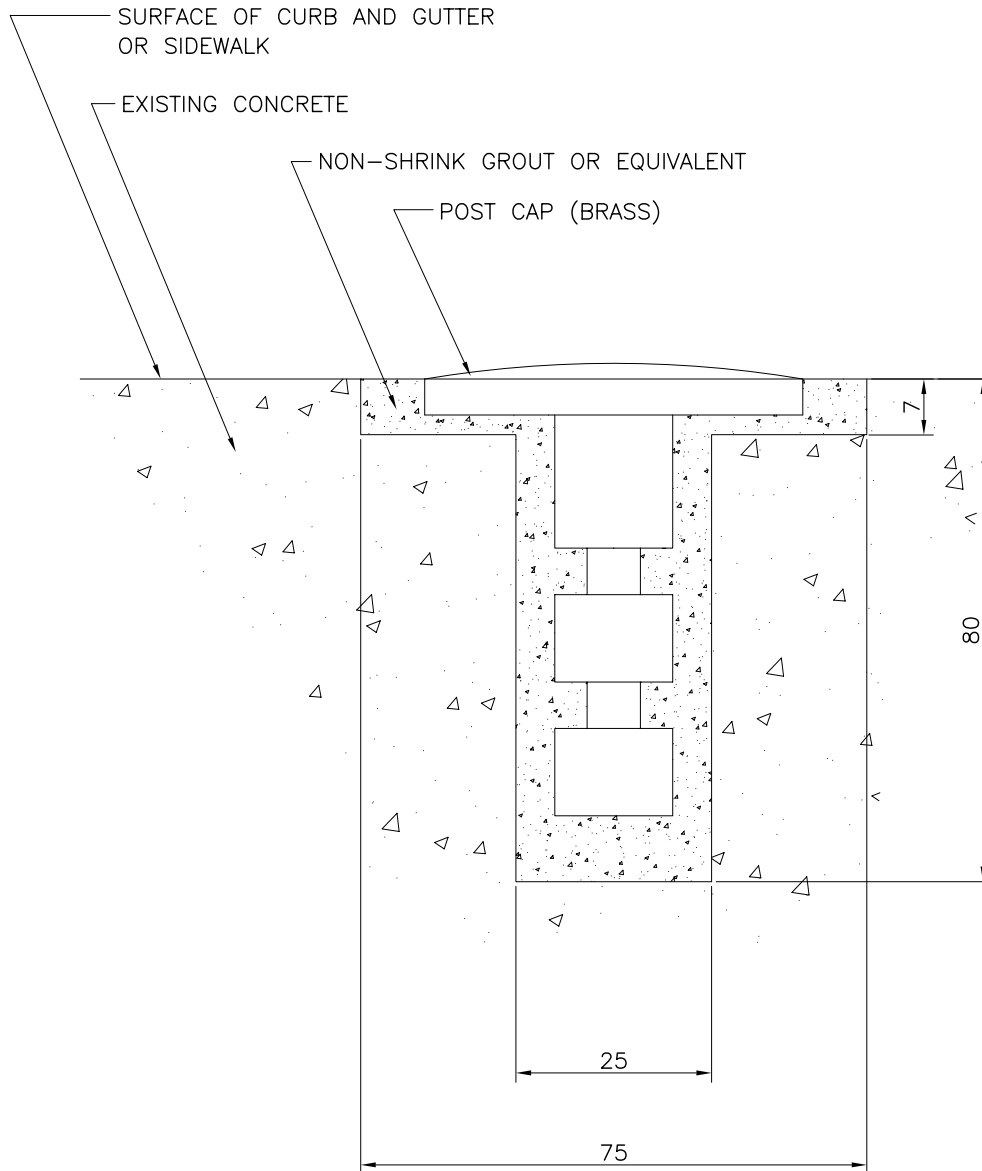
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**G6**

# CONTROL MONUMENT SET IN CONCRETE

G7



**NOTES:** HOLE TO BE DRILLED WITH A 25mm ROCK DRILL WITH A 75mm CORE BIT ON A ROTARY HAMMER.

SHANK OF CAP SHOULD BE SET ROUGHLY VERTICAL.

PRIOR TO PLACING CAP IN DRILL HOLE, PACK GROUT AROUND UPPER PART OF SHANK TO ELIMINATE POTENTIAL AIR POCKETS.

FLOAT GROUT FLUSH WITH UPPER EDGE OF CAP.

ENSURE THAT THE CONCRETE AROUND CAP IS SMOOTH AND WILL NOT INTERFERE WITH THE LEVEL ROD BEING PLACED ON CAP.

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**G7**

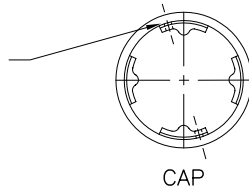


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# REMOVABLE BOLLARD

G8

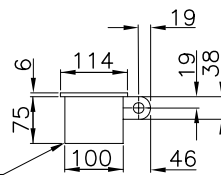
HALF SPHERE CAST ALUMINUM  
CAP WITH 2-6mm DIA. HOLES  
FOR POP RIVETS



HALF SPHERE CAST ALUMINUM CAP  
2-25mm DIA. #2 SHOULDERED  
EYE RINGS WELDED TO PIPE

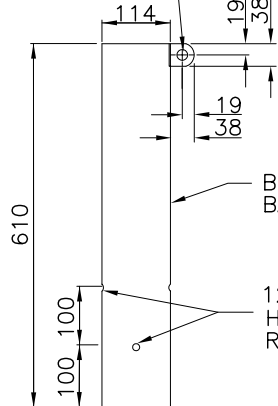
114mm O.D. STEEL PIPE

BASE COVER



ALUMINIUM COLLAR

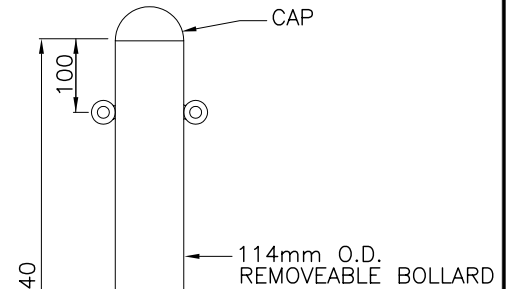
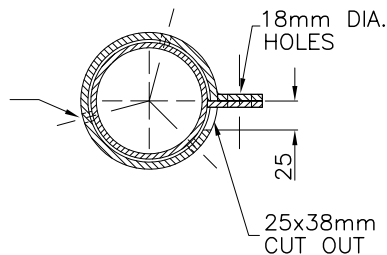
18mm DIA. HOLES



BOLLARD  
BASE

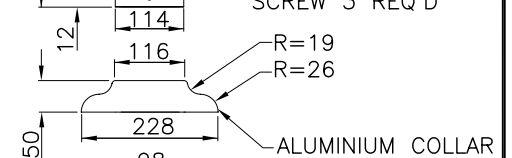
12mm DIA.  
HOLES FOR  
REBAR

3-8mm DIA. SET SCREW  
AT BOTTOM OF BOLLARD.



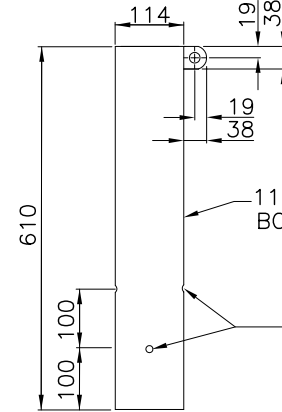
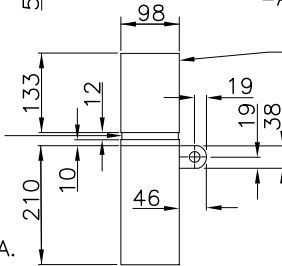
114mm O.D.  
REMOVEABLE BOLLARD

8mm DIA. SET  
SCREW 3 REQ'D



98mm O.D.  
INSERT SLEEVE

2mm  
DEEP



114mm O.D.  
BOLLARD BASE

12mm DIA. HOLES  
FOR REBAR

**NOTE:** 1. FOR PAINT REFER TO SECTION 01420 OF STANDARD SPECIFICATIONS.  
2. OTHER BOLLARD STYLE DESIGNS SHALL BE APPROVED BY DIRECTOR.

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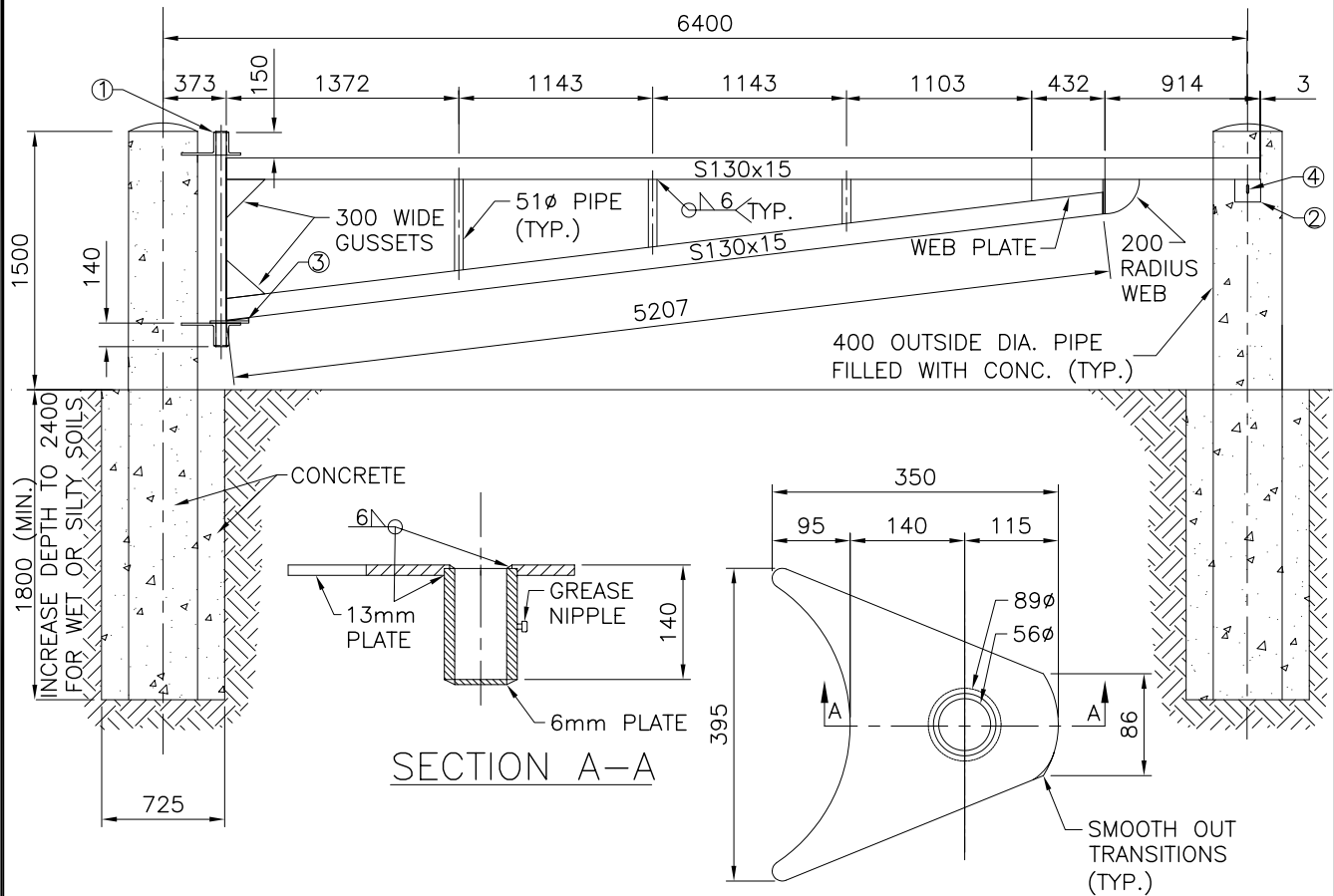
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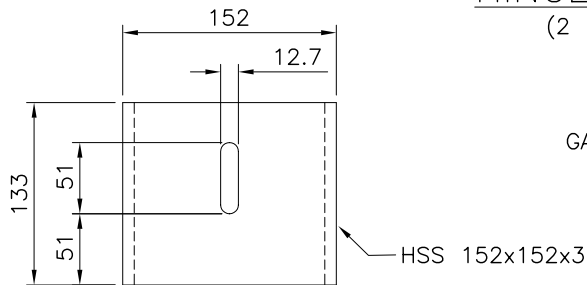
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# LOCKABLE ACCESS GATE

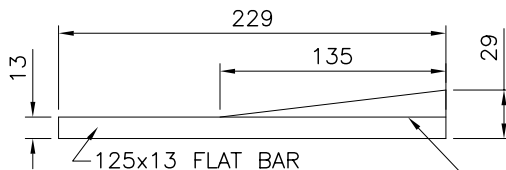
G9



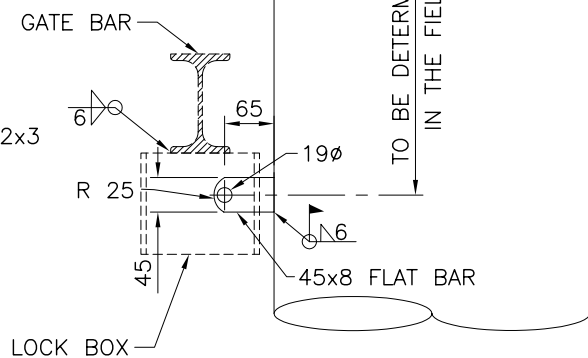
HINGE DETAIL ①  
(2 REQ'D)



LOCK BOX DETAIL ②



SOLE PLATE DETAIL ③  
FILL AREA WITH STEEL TO FIT ANGLE AND WELD



GATE LATCH DETAIL ④

## NOTES:

1. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS.
2. WELDS ON GATE ARE ALL AROUND.
3. PRIME AND PAINT WITH 2 COATS OF YELLOW EPOXY PAINT.

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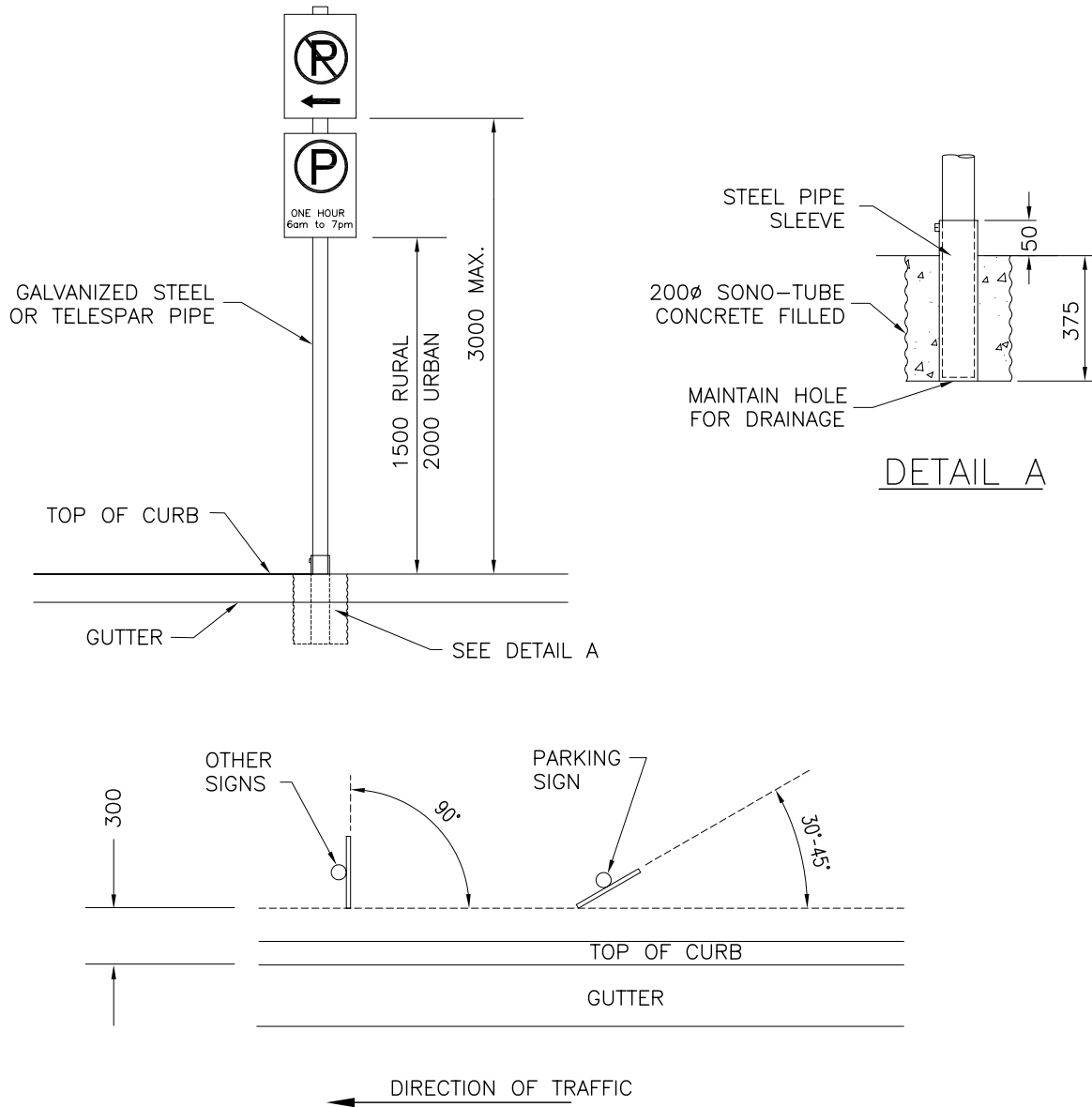
G9



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# SIGN PLACEMENT

G10



## NOTES:

1. WHEN TWO SIGNS ARE ON THE SAME POST, ALWAYS PLACE RED SIGN (PROHIBITION) ABOVE AND GREEN SIGN (PERMITTED) BELOW.
2. SIGNAGE TO COMPLY WITH THE BRITISH COLUMBIA MINISTRY OF TRANSPORTATION (MOT) MANUAL OF STANDARD TRAFFIC SIGNS AND PAVEMENT MARKINGS. IN ABSENCE OF MINISTRY STANDARDS, TRANSPORTATION ASSOCIATION OF CANADA (TAC) MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA SHALL APPLY.

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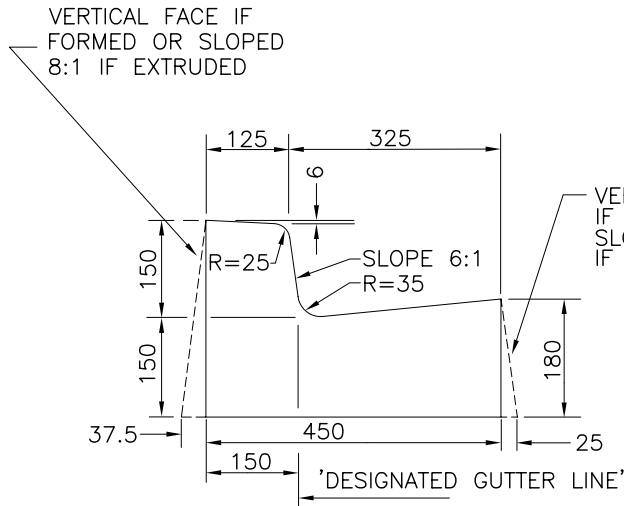
**G10**



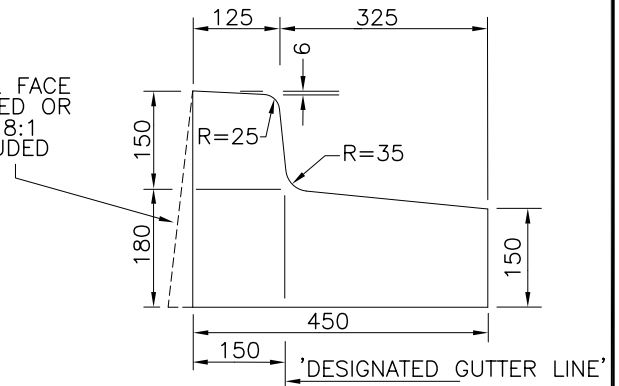
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# ERECT CURB AND GUTTER

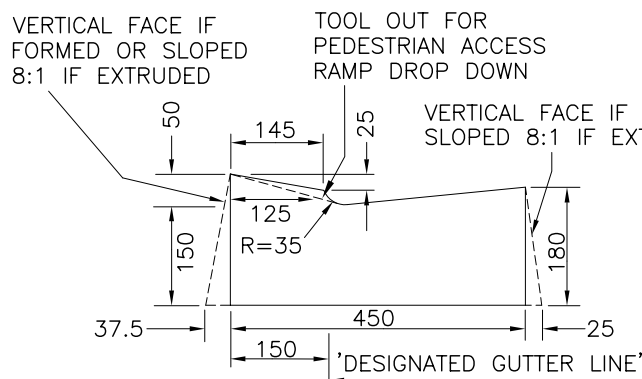
C1



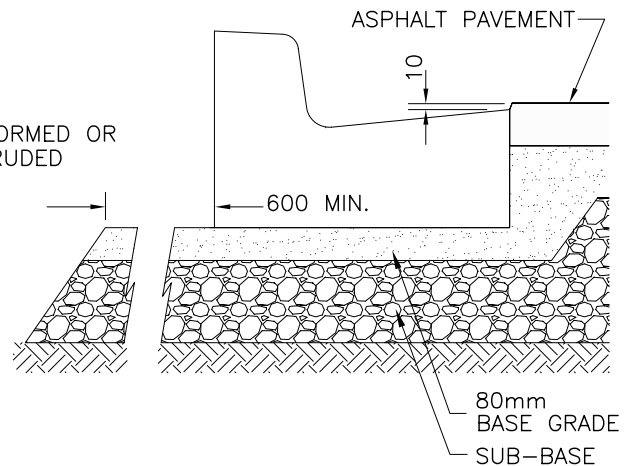
ERECT CURB  
WITH INTEGRAL GUTTER  
(TYPICAL)



ERECT CURB  
WITH REVERSE CROSS FALL



ERECT CURB  
WITH INTEGRAL GUTTER  
(AT CROSSING)



TYPICAL CURB DROP  
(FOR ACCESS)

NOTES:

1. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS
2. MAXIMUM CROSS FALL FOR GUTTER IS 1:12.
3. ALL EXPOSED CORNERS TO BE SLIGHTLY ROUNDED.
4. PROVIDE CONTROL JOINTS AT 3m INTERVALS ALONG CURB.

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SCALE

N.T.S.

DRAWING NUMBER

**C1**

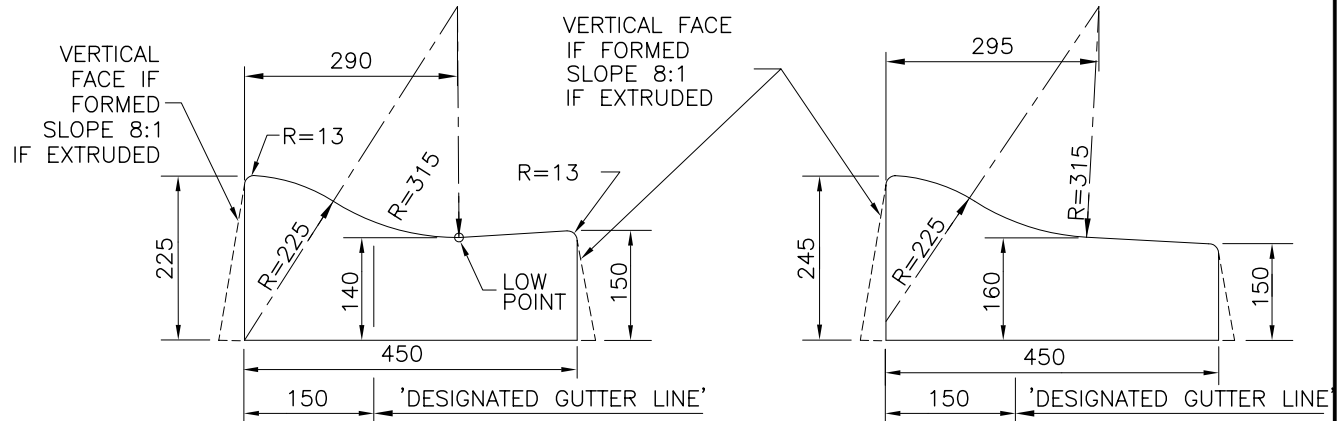
2004



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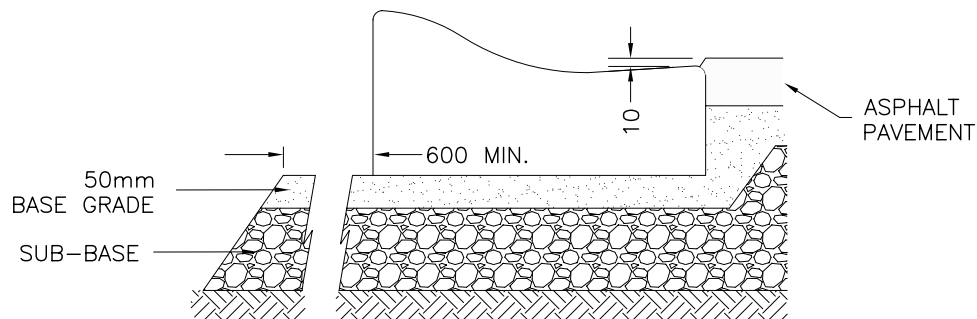
# ROLL CURB AND GUTTER

C2

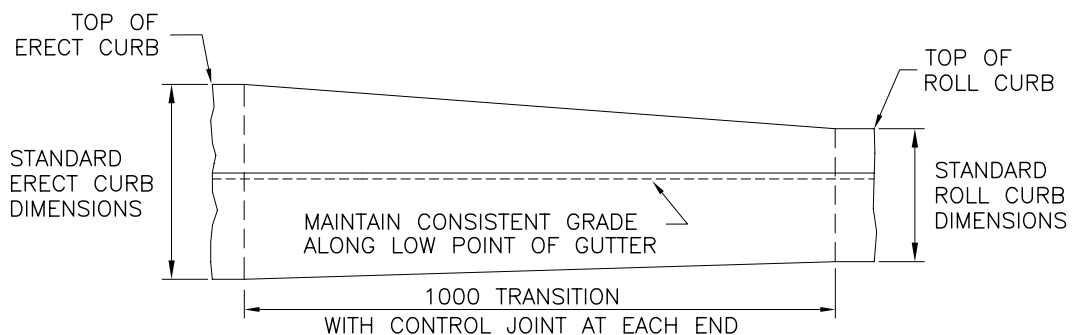


ROLL CURB WITH INTEGRAL  
GUTTER - DIMENSIONS  
(TYPICAL)

ROLL CURB WITH REVERSE  
CROSS FALL - DIMENSION  
(TYPICAL)



ROLL CURB INSTALLATION



FRONT VIEW

TRANSITION FROM 150 HIGH ERECT CURB TO ROLL CURB.

- NOTES:
1. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS
  2. MAXIMUM CROSS FALL FOR GUTTER IS 1:12.
  3. ALL EXPOSED CORNERS TO BE SLIGHTLY ROUNDED.
  4. PROVIDE CONTROL JOINTS AT 3m INTERVALS ALONG CURB.

2004

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REVISION NUMBER

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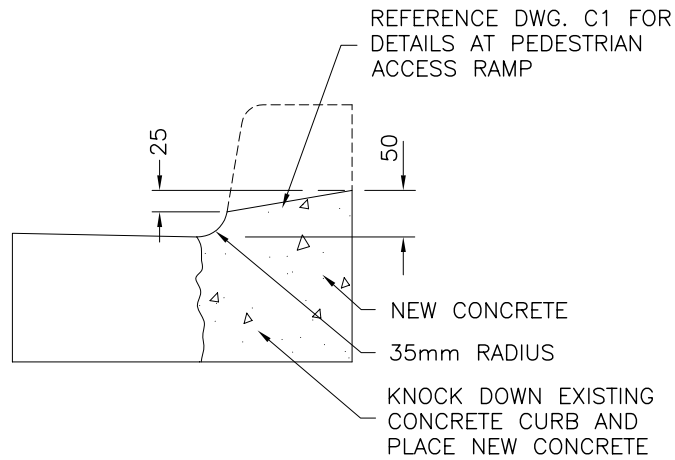
SCALE

N.T.S.

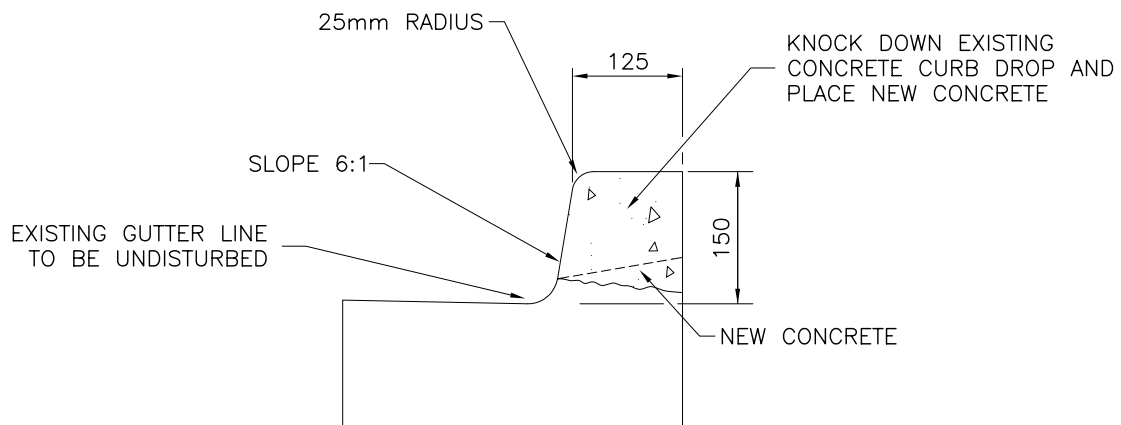
DRAWING NUMBER

**C2**

# CUTTING DOWN AND FILLING CURB DROPS



## CUTTING DOWN CURB DROP



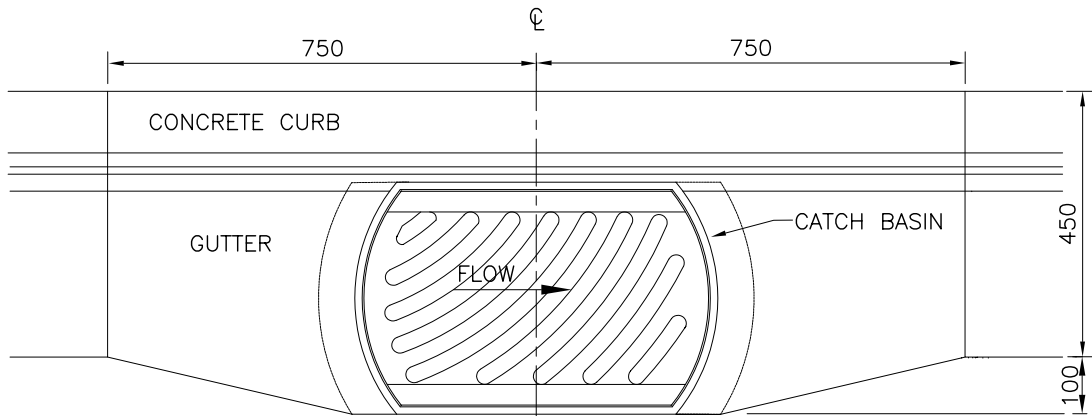
## FILLING CURB DROP

### NOTES:

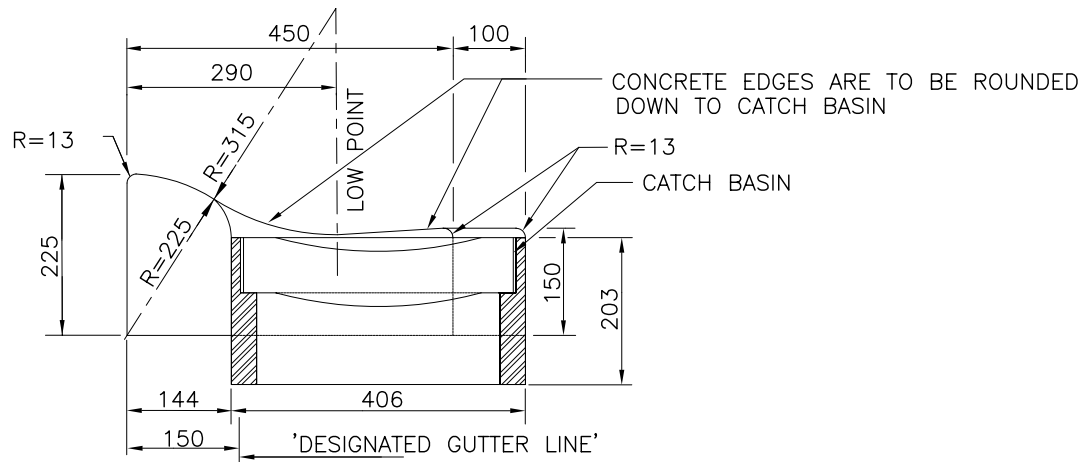
1. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS
2. MAXIMUM CROSS FALL FOR GUTTER IS 1:12.
3. ALL EXPOSED CORNERS TO BE SLIGHTLY ROUNDED.
4. MEDIAN CURBS TO HAVE 200mm FACE.
5. PROVIDE CONTROL JOINTS AT 3m INTERVALS ALONG CURB.

# GUTTER TRANSITION AT CATCH BASIN FOR ROLL AND ERECT CURB

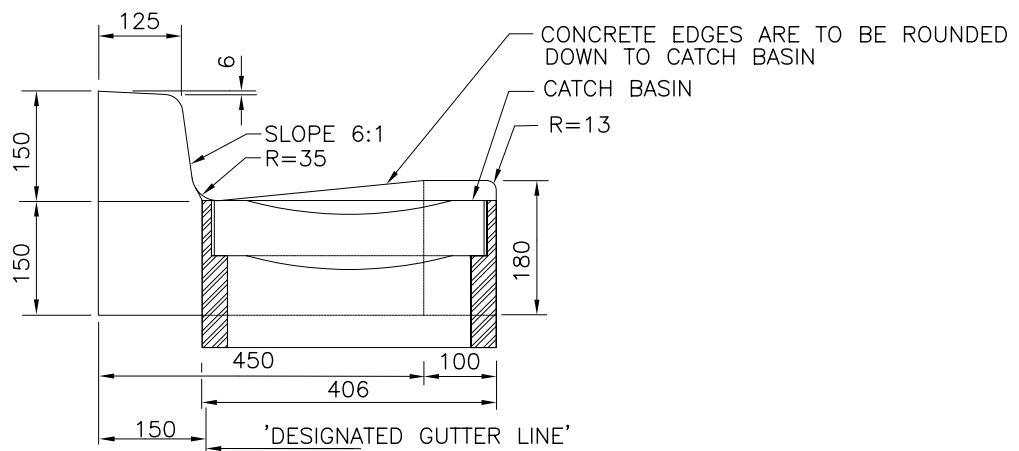
C4



ERECT AND ROLL CURB WITH CATCH BASIN  
PLAN VIEW



ROLL CURB SECTION WITH CATCH BASIN (TYPICAL)



ERECT CURB SECTION WITH CATCH BASIN (TYPICAL)

2004

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JUN 2004

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SCALE

N.T.S.

DRAWING NUMBER

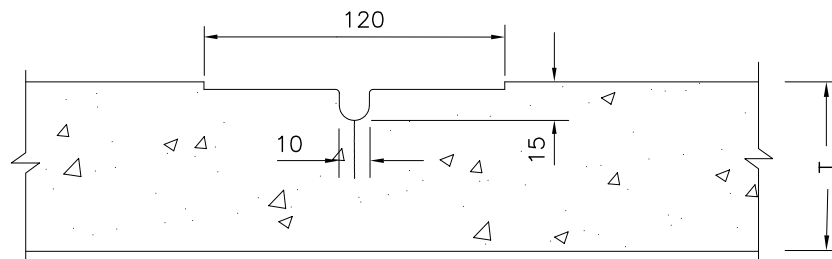
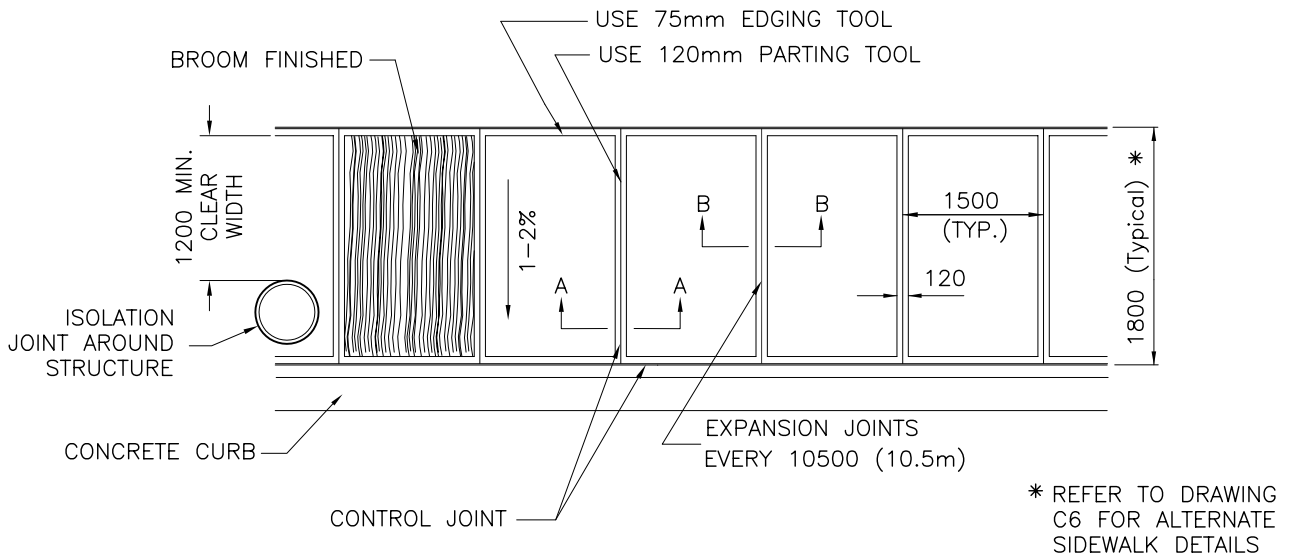
**C4**



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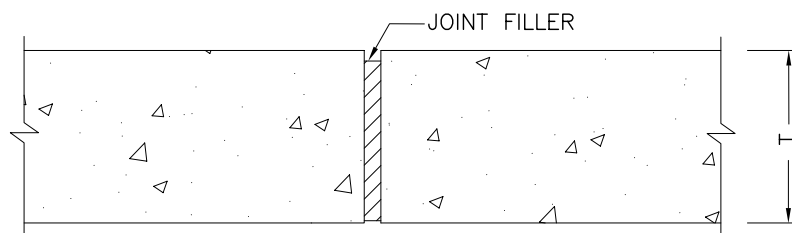
# SIDEWALK CONCRETE CONSTRUCTION

C5



SECTION 'A-A'  
CONTROL JOINT

T = 100 MINIMUM WITH ERECT CURBS  
(125 MINIMUM WITH ROLL CURBS)



SECTION 'B-B'  
EXPANSION JOINT

NOTE:

1. PLACE ISOLATION JOINT FILLER EXPANSION MATERIAL BETWEEN THE SIDEWALK AND ADJOINING STRUCTURES SUCH AS BUILDINGS OR UTILITY POLE BASES.
2. FOR SIDEWALK BASE AND SUBGRADE DETAILS SEE STANDARD DWG. C6
3. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS
4. IN SPECIAL RETRO FIT CIRCUMSTANCES, WHEN APPROVED BY THE DIRECTOR, THE WIDTH MAY BE REDUCED TO 1500mm.

2004

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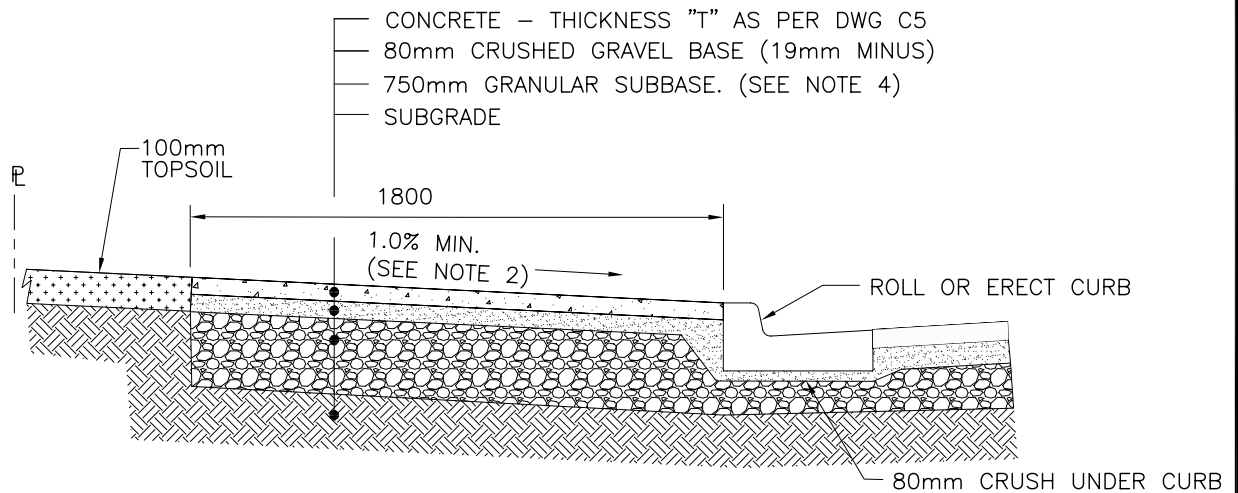
**C5**



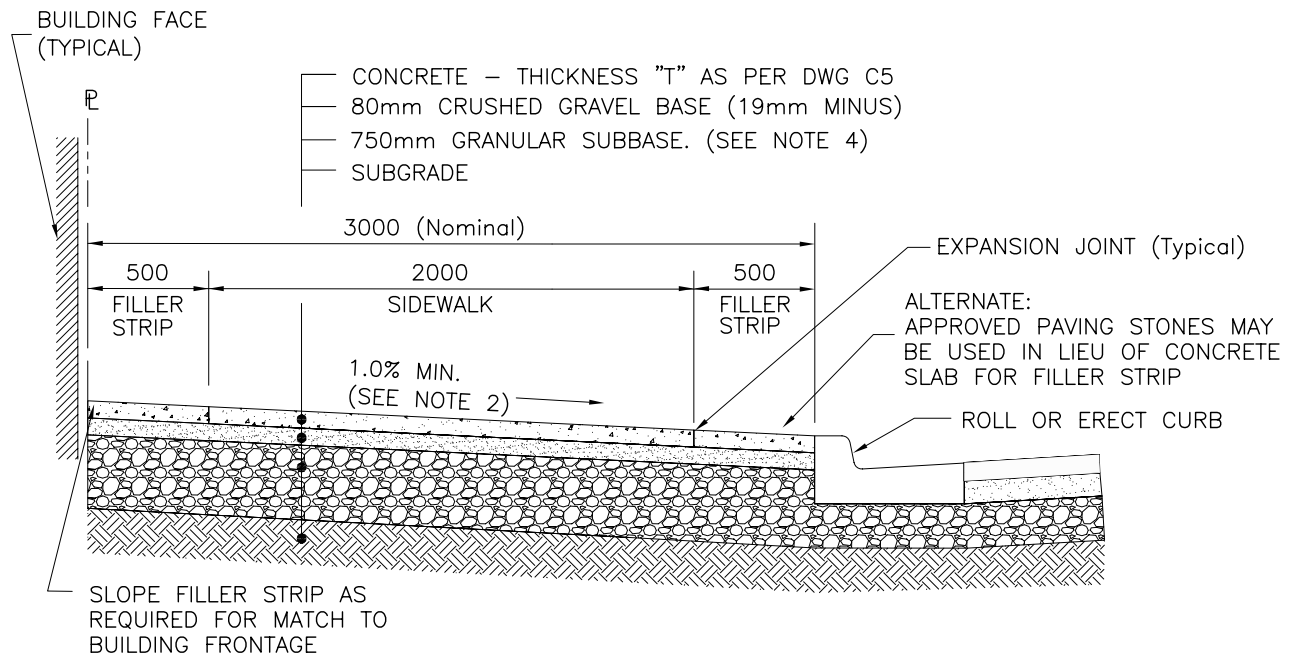
CITY OF  
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# SIDEWALK BASE CONSTRUCTION

C6



TYPICAL SIDEWALK CROSS-SECTION



"DOWNTOWN" SIDEWALK CROSS-SECTION

NOTES:

1. WHERE NATIVE SUBGRADE IS GRANULAR THE 300mm SUBBASE IS NOT REQUIRED.
2. SIDEWALK CROSSFALL TO BE 1.0% MINIMUM(RECOMMENDED), 2.0% MAXIMUM.
3. REFER TO DRAWINGS C7 AND C8 FOR SIDEWALK WIDTHS AT CROSSWALKS AND PEDESTRIAN RAMPS. REFER TO DRAWING C5 FOR ADDITIONAL SIDEWALK DETAILS.
4. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR OF DEVELOPMENT SERVICES.

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DRAWING NUMBER

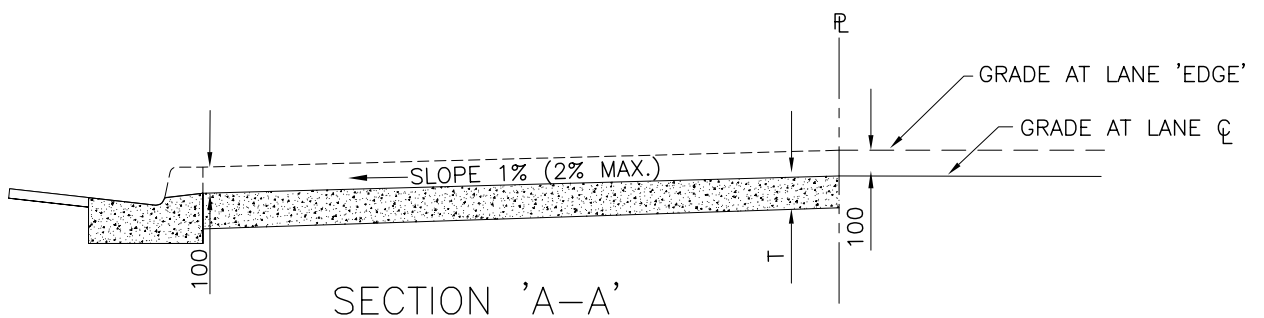
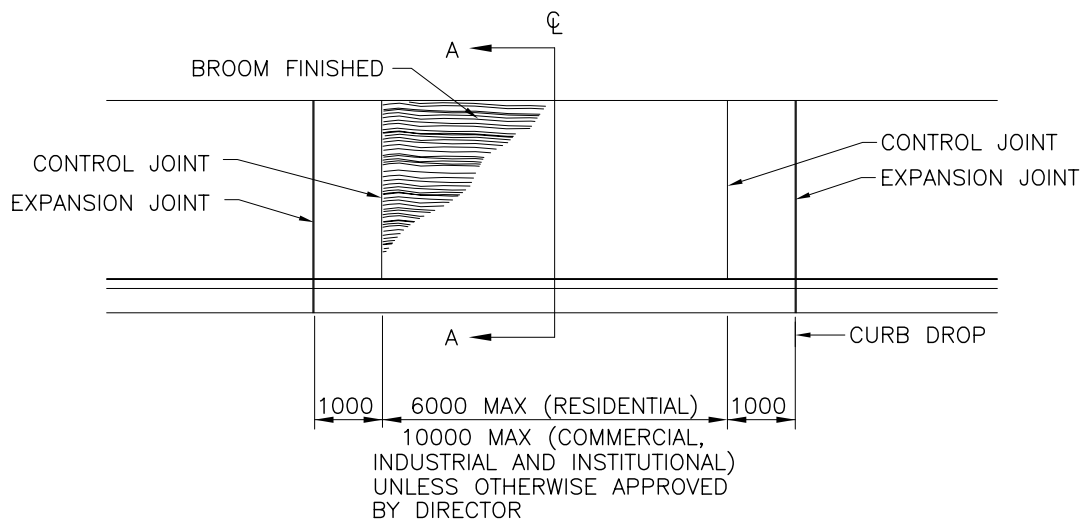
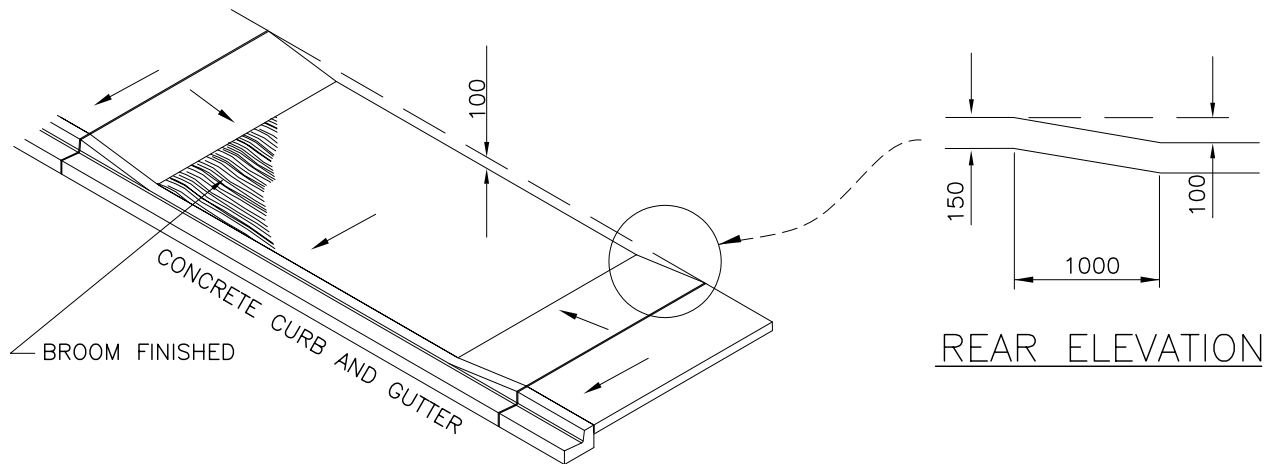
**C6**



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# SIDEWALK CROSSING

C7



T = 150 - IN RESIDENTIAL AREAS  
T = 200 - IN COMMERCIAL, INDUSTRIAL  
AND INSTITUTIONAL AREAS

- NOTE:**
1. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS
  2. FOR SUBGRADE DETAILS SEE DWG. C6
  3. WIDTH OF CROSSING TO SUIT DEVELOPMENT IN ACCORDANCE WITH ZONING BYLAW

2004

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REVISION NUMBER

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SCALE

N.T.S.

DRAWING NUMBER

**C7**

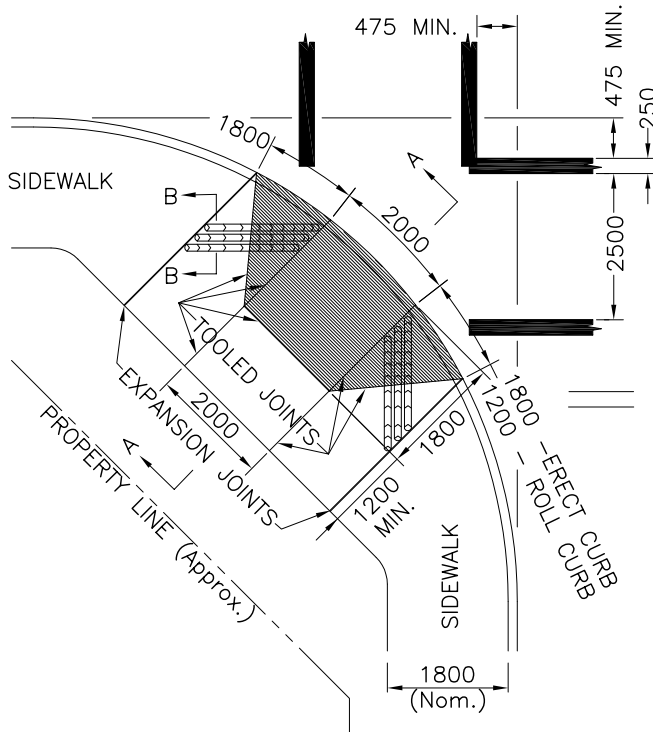


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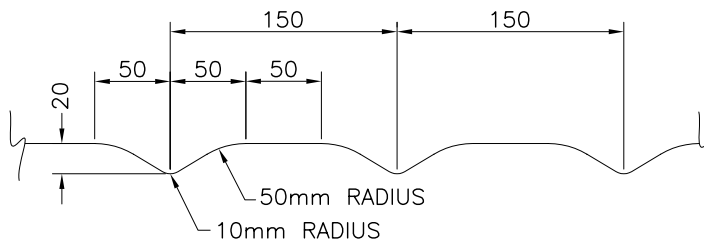
# CROSSWALK AND RAMP LAYOUT (SHEET 1)

C8

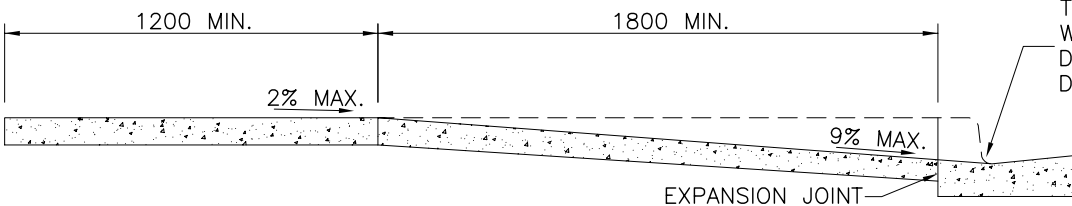
- NOTE:** 1. GROOVES MUST BE CARVED PARALLEL TO THE CROSSWALK AND BE LOCATED IN LINE WITH THE MIDDLE THIRD OF DELINEATED CROSS WALK AREA.  
2. CROSSWALK MUST BE PAINTED TO ENSURE RAMPS DROP INTO CROSSWALK AREA



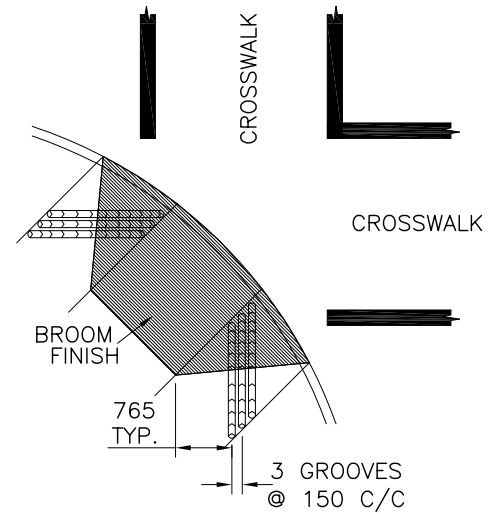
MEDIUM RADIUS CURB RETURN  
6m TO 9m



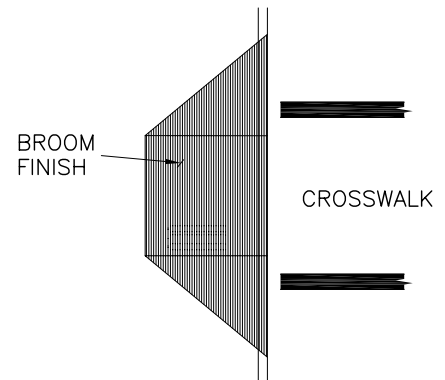
SECTION B-B GROOVE DETAIL



SECTION A-A



RAMP ON ANGLE  
GROOVE LAYOUT



RAMP IN LINE WITH CROSSWALK  
(NO GROOVES REQUIRED)

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SCALE

N.T.S.

DRAWING NUMBER

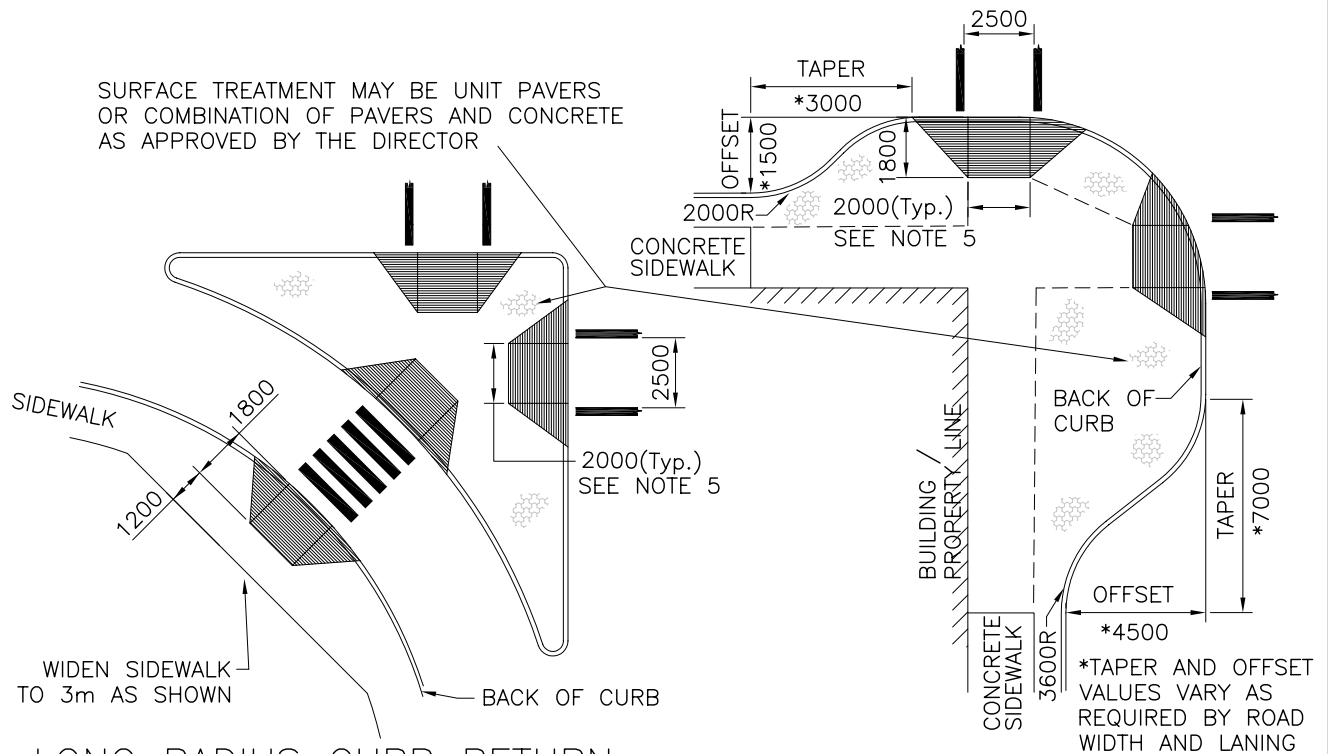
**C8**



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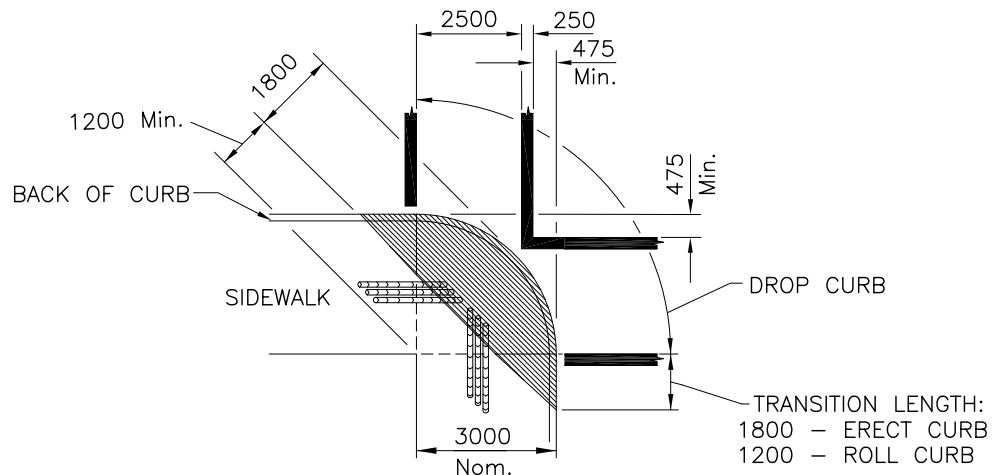
# CROSSWALK AND RAMP LAYOUT (SHEET 2)

C9



LONG RADIUS CURB RETURN  
GREATER THAN 9m

BULB OUT



SHORT RADIUS CURB RETURN  
3m TO 6m

NOTE:

1. SIDEWALKS TO BE 100mm THICK CONCRETE. SEE DWG. C6 FOR CONSTRUCTION DETAILS.
2. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS
3. REFER TO SECTION 02761 OF STANDARD SPECIFICATIONS FOR LINE PAINTING DETAILS
4. NO VISUAL AID GROOVES REQUIRED ON CROSSWALKS WHEN RAMP EDGES ALIGN WITH CROSSWALK
5. RAMP WIDTHS LESS THAN 2000mm MAY BE NECESSARY FOR GEOMETRIC PURPOSES AND MAY BE REDUCED ONLY WHEN APPROVED BY DIRECTOR. RAMPS SHALL NEVER BE LESS THAN 1200mm WIDE.

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SCALE

N.T.S.

DRAWING NUMBER

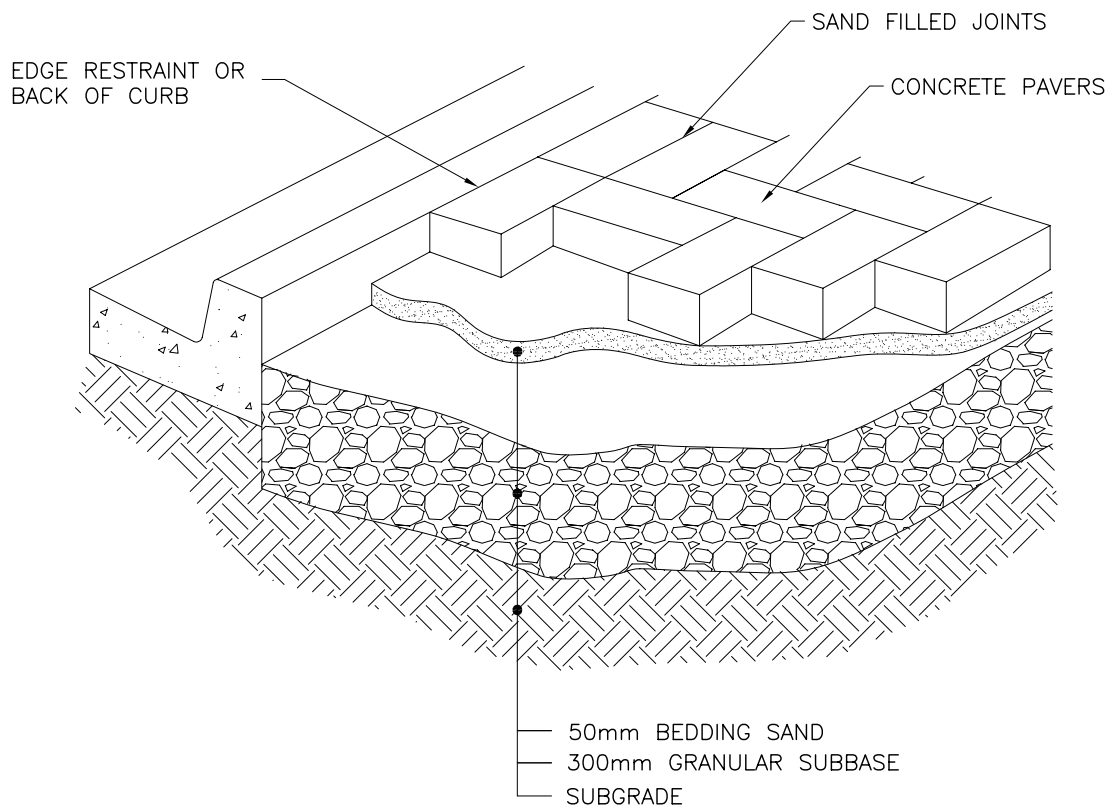
**C9**



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# UNIT PAVERS

C10



NOTE: REFER TO STANDARD SPECIFICATIONS FOR DETAILS.

2004

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SCALE

N.T.S.

DRAWING NUMBER

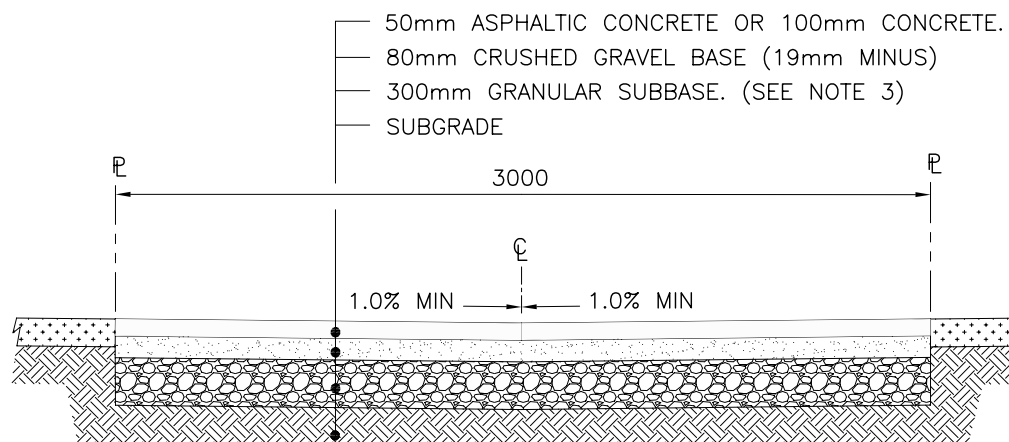
**C10**



CITY OF  
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# URBAN WALKWAY

C11



## 3 METER WALKWAY CROSS-SECTION

### NOTES:

1. WHERE SUBGRADE IS GRANULAR THE 300mm SUBBASE IS NOT REQUIRED.
2. WALKWAY CROSSFALL TO BE 1.5% DESIRABLE, 1.0% MINIMUM, 2.0% MAXIMUM.
3. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR OF DEVELOPEMENT SERVICES.
4. LONGITUDINAL GRADIENTS = 0.5% MINIMUM, 8.0% MAXIMUM.

2004

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SCALE

N.T.S.

DRAWING NUMBER

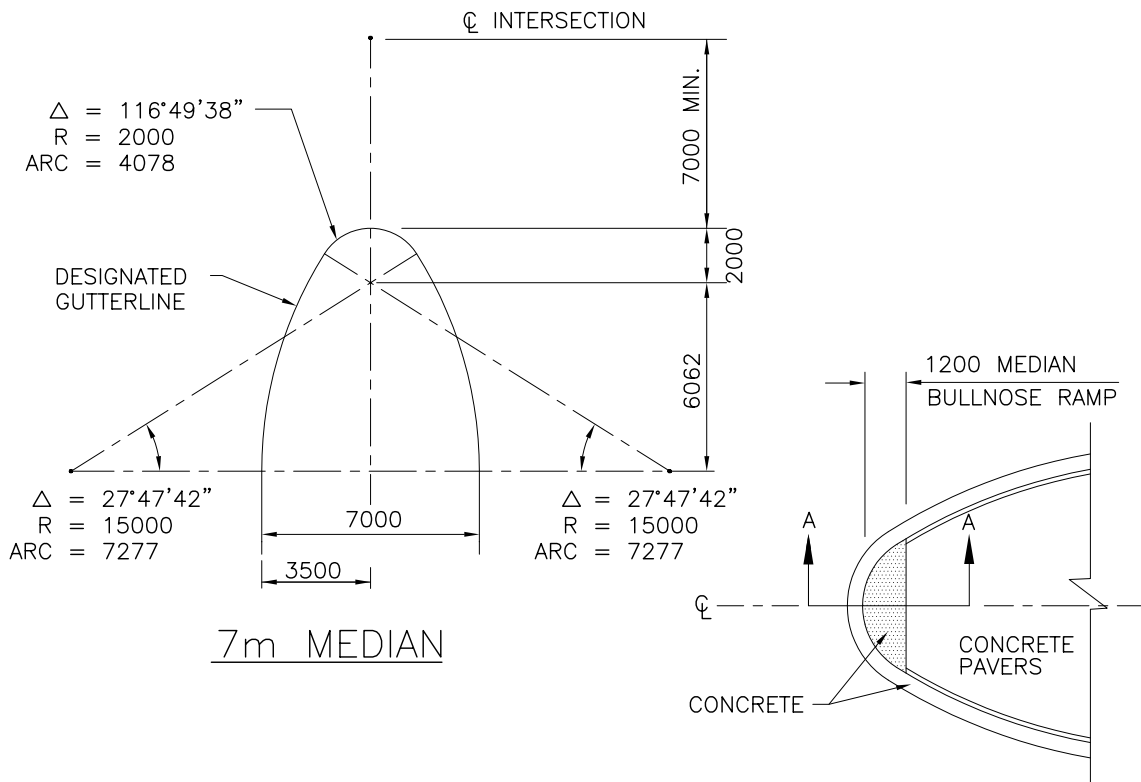
**C11**



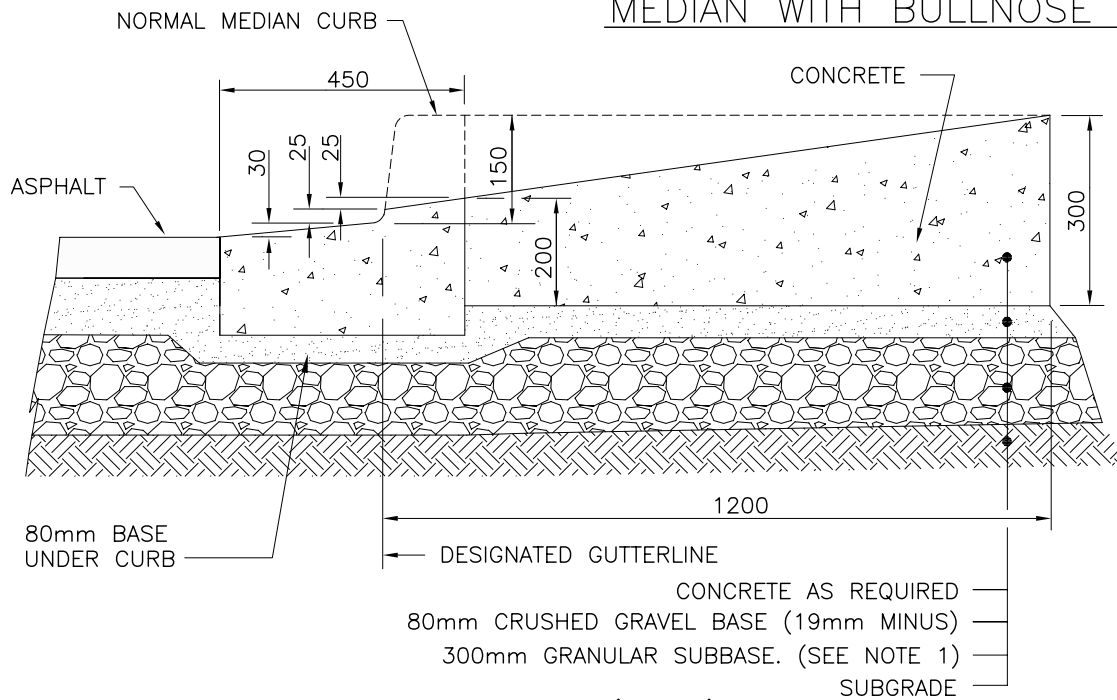
CITY OF  
PRINCE GEORGE

# MEDIAN BULLNOSE

C12



## MEDIAN WITH BULLNOSE RAMP



## SECTION 'A-A'

NOTE:

1. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR OF DEVELOPMENT SERVICES.

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DATE OF REVISION

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REVISION NUMBER

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SCALE

N.T.S.

DRAWING NUMBER

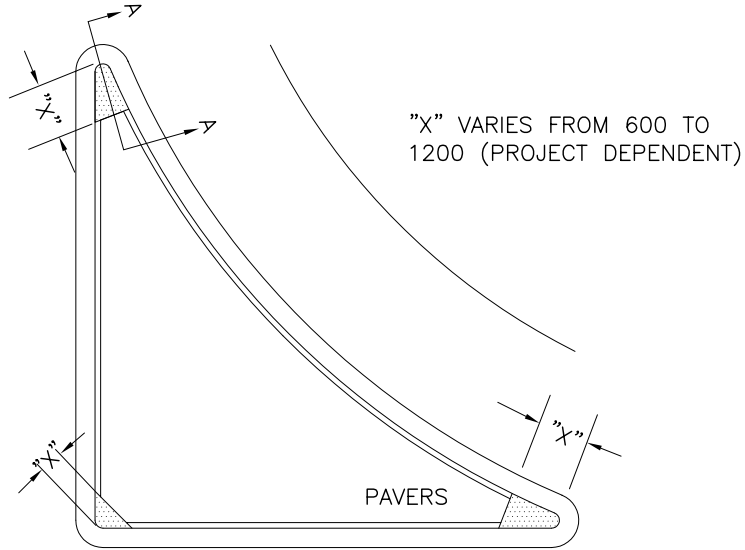
C12



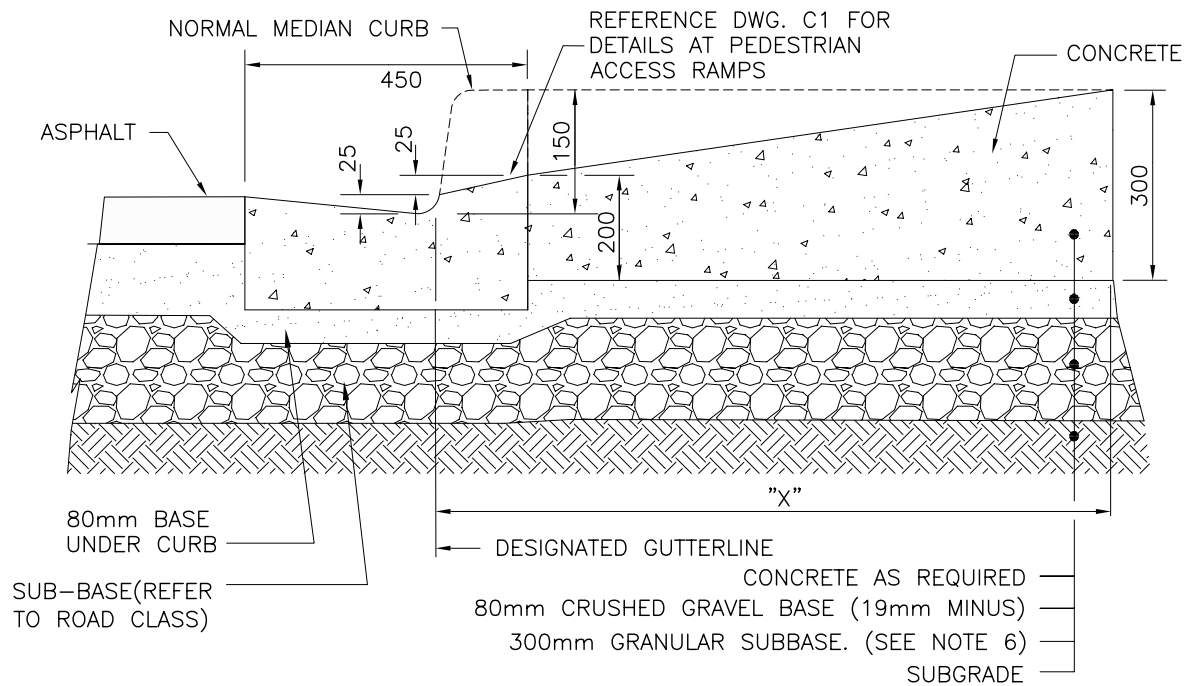
CITY OF  
PRINCE GEORGE

# ISLAND BULLNOSE RAMP

C13



## ISLAND WITH BULLNOSE RAMPS



### SECTION 'A-A'

**NOTE:**

1. REFER TO SECTION 03300 OF STANDARD SPECIFICATIONS FOR CONCRETE DETAILS
2. BASE CONSTRUCTION UNDER RAMPS PER CONCRETE SIDEWALK DETAILS.
3. SEE DWG. C7 FOR TYPICAL SECTION OF ACCESS RAMP.
4. MINIMUM DEPTH OF CONCRETE FOR INTERIOR OF ISLAND TO BE 200mm.
5. STANDARD AND REVERSE GUTTERS USED AROUND ISLANDS.
6. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR OF DEVELOPMENT SERVICES.

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SCALE

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DRAWING NUMBER

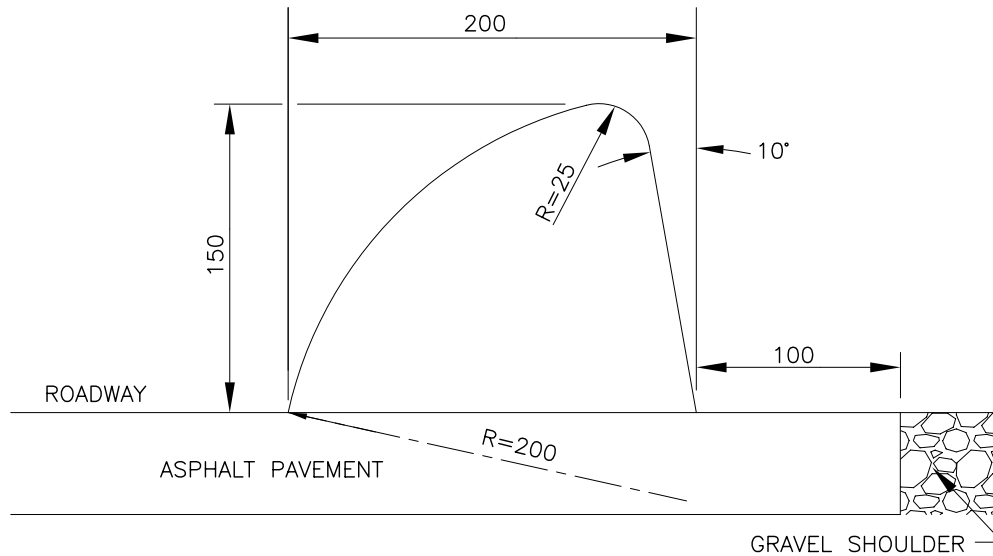
**C13**



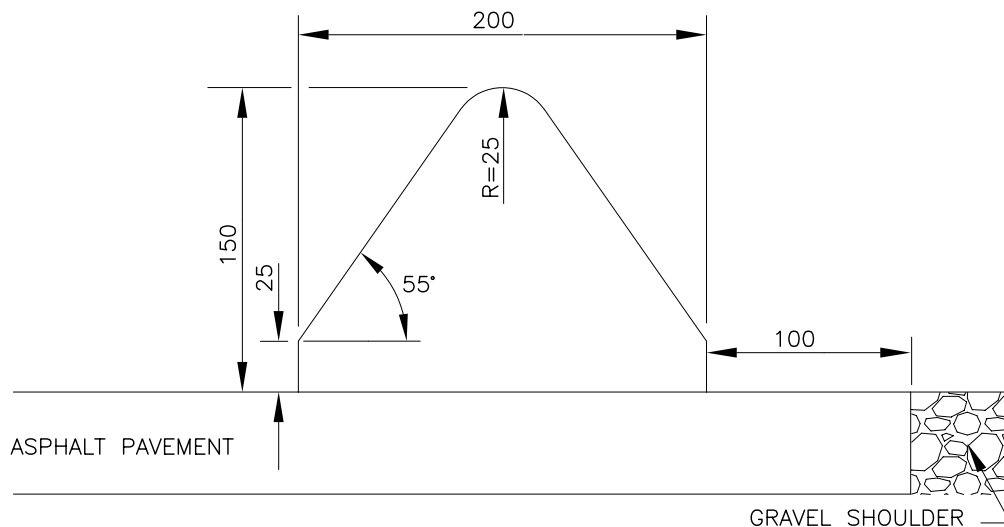
CITY OF  
PRINCE GEORGE

# ASPHALT DRAINAGE CURB

C14



TYPE-A



TYPE-B

NOTE: USE ONLY WHERE APPROVED BY DIRECTOR OF DEVELOPEMENT SERVICES

2004

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JUN 2004

REVISION NUMBER

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SCALE

N.T.S.

DRAWING NUMBER

**C14**

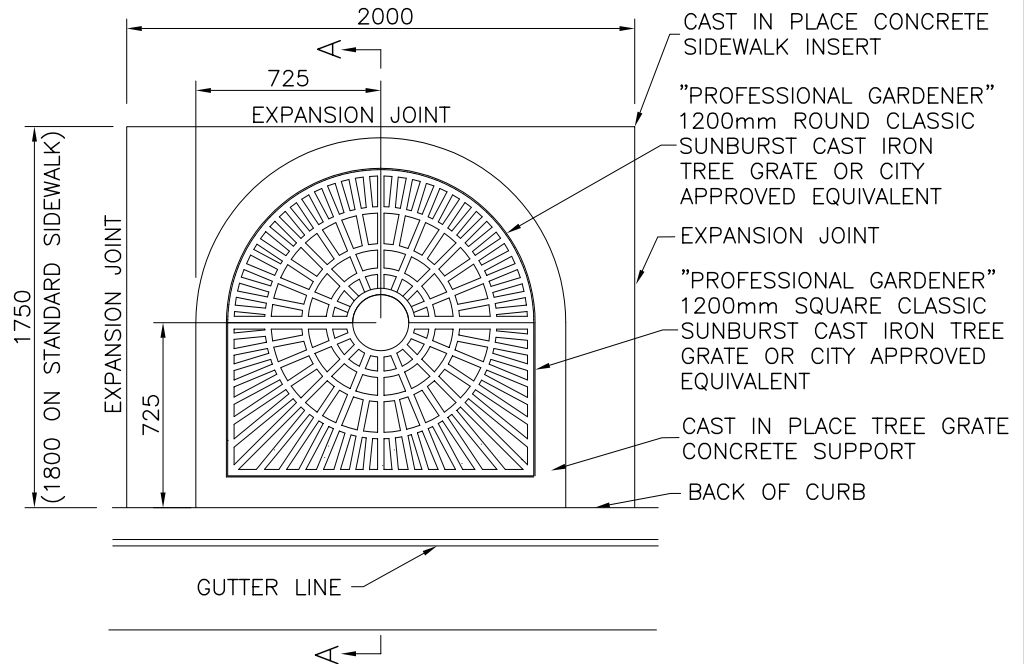


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PRINCE GEORGE

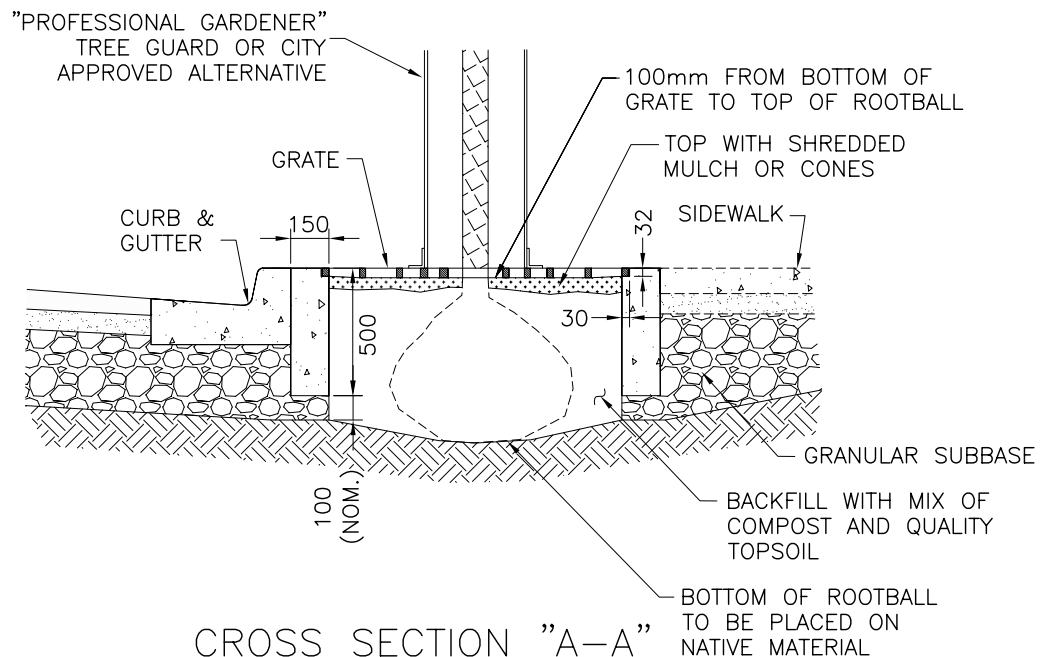
# TREE GRATE

C15

TREE AND UPRIGHT  
TREE GUARD NOT  
SHOWN FOR CLARITY



PLAN VIEW



CROSS SECTION "A-A"

**NOTE:**

TREE GRATE CONCRETE SUPPORT IS TO BE PLACED BETWEEN EXPANSION JOINTS ON SIDEWALK.

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SCALE

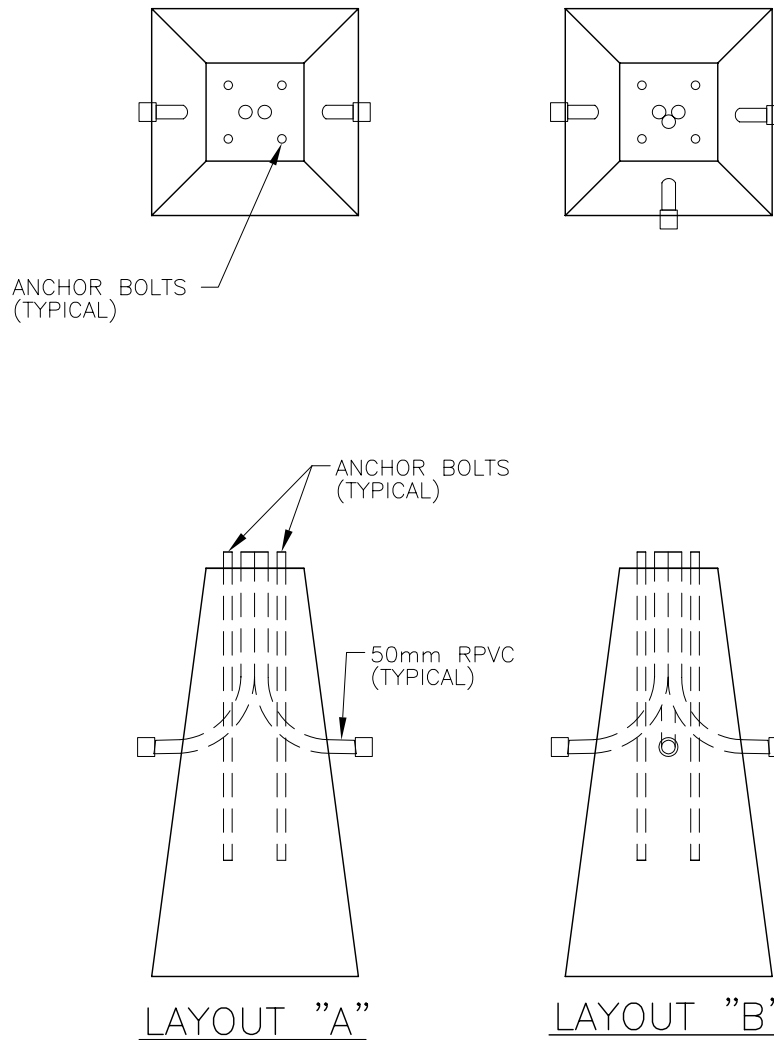
N.T.S.

DRAWING NUMBER

**C15**

# STANDARD CONCRETE BASE CONDUIT CONFIGURATIONS

**E1a**



**NOTE:**

CONDUIT LAYOUTS AND QUANTITIES OF CONDUITS TO COORDINATE WITH STREET LIGHT DESIGN

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SCALE

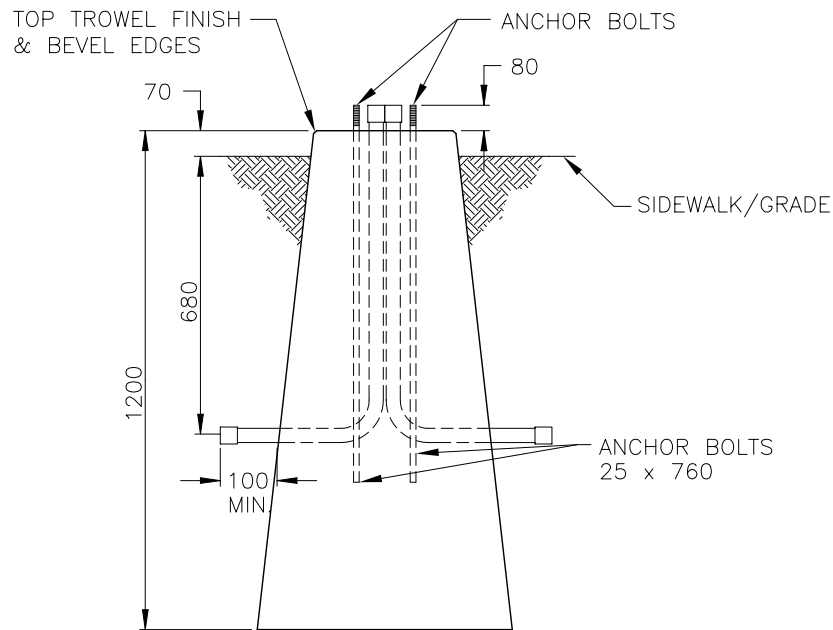
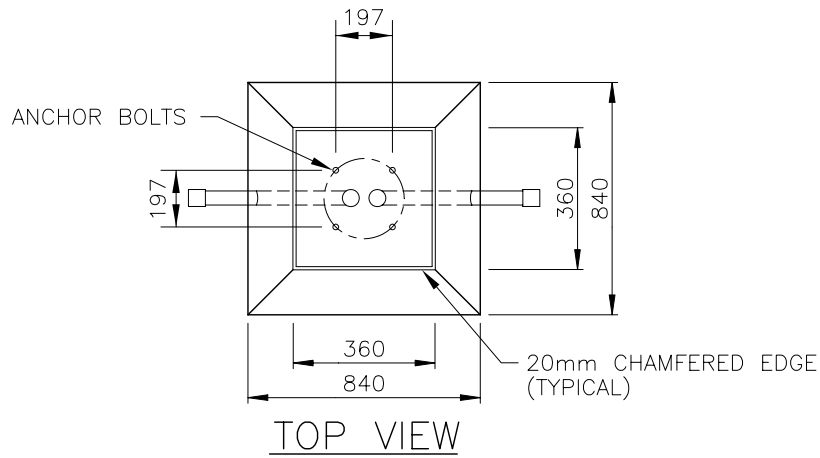
N.T.S.

DRAWING NUMBER

**E1a**

# STANDARD CONCRETE BASE FOR ALL TYPE 2 AND 4 POLES

**E1b**



## NOTES:

1. ANCHOR BOLTS TO BE GALVANIZED ANSI/SAE 4140
2. ANCHOR BOLTS TO BE EMBEDDED 760mm MINIMUM AND 900mm MAXIMUM
3. CHAMFER ALL EXPOSED EDGES OF CONCRETE 20mm
4. ALL DUCTS TO BE 50mm R.P.V.C. EXCEPT AS NOTED
5. SEE APPLICABLE SCHEDULES FOR MATERIAL SPECIFICATIONS

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SCALE

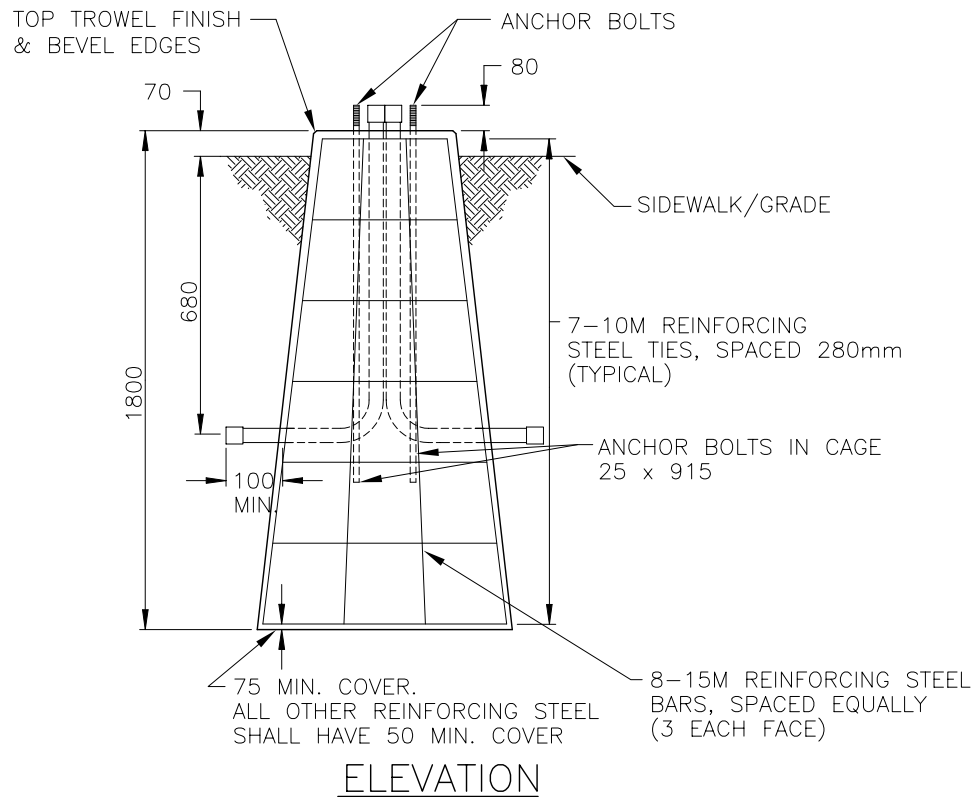
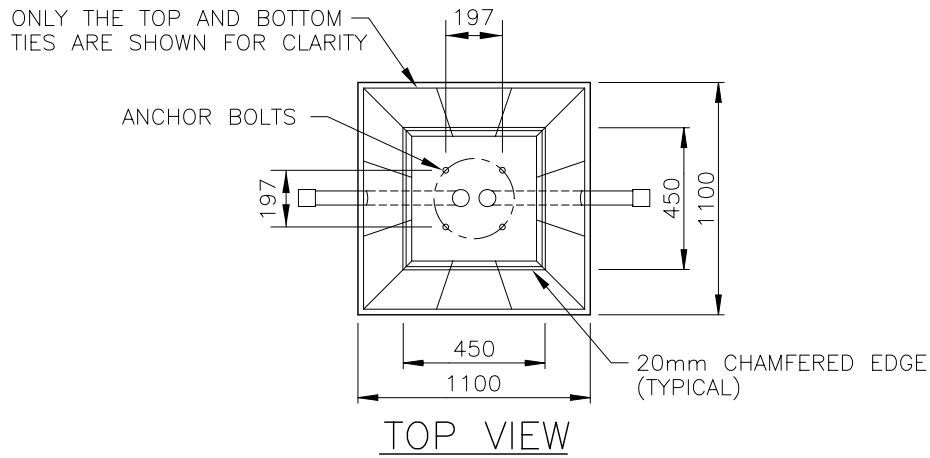
N.T.S.

DRAWING NUMBER

**E1b**

# STANDARD CONCRETE BASE FOR TYPE 1 AND 3 POLES

**E1c**



## NOTES:

1. ANCHOR BOLTS TO BE GALVANIZED ANSI/SAE 4140
2. ANCHOR BOLTS TO BE EMBEDDED 800mm MINIMUM AND 850mm MAXIMUM
3. CHAMFER ALL EXPOSED EDGES OF CONCRETE 20mm
4. ALL DUCTS TO BE 50mm R.P.V.C. EXCEPT AS NOTED
5. SEE APPLICABLE SCHEDULES FOR MATERIAL SPECIFICATIONS

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REVISION NUMBER

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SCALE

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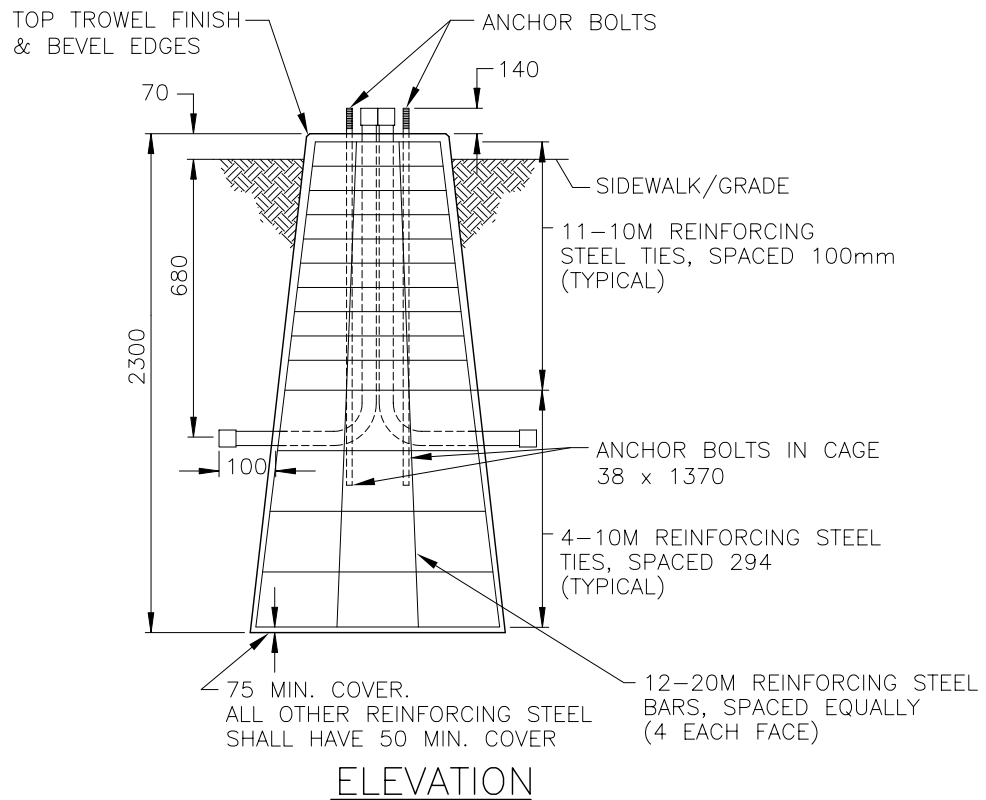
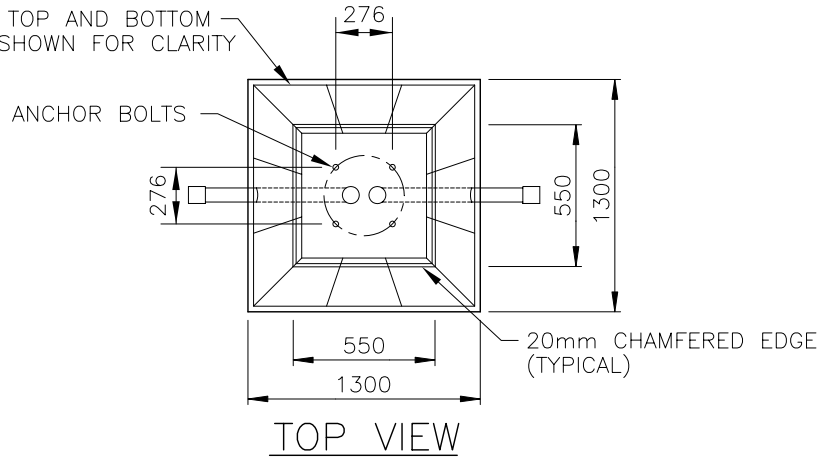
DRAWING NUMBER

**E1c**

# STANDARD CONCRETE BASE FOR ALL TYPE L POLES

E1d

ONLY THE TOP AND BOTTOM  
TIES ARE SHOWN FOR CLARITY



## NOTES:

1. ANCHOR BOLTS TO BE GALVANIZED ANSI/SAE 4140
2. ANCHOR BOLTS TO BE EMBEDDED 1100mm MINIMUM AND 1200mm MAXIMUM
3. CHAMFER ALL EXPOSED EDGES OF CONCRETE 20mm
4. ALL DUCTS TO BE 50mm R.P.V.C. EXCEPT AS NOTED
5. SEE APPLICABLE SCHEDULES FOR MATERIAL SPECIFICATIONS

2004

DATE OF REVISION

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REVISION NUMBER

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SCALE

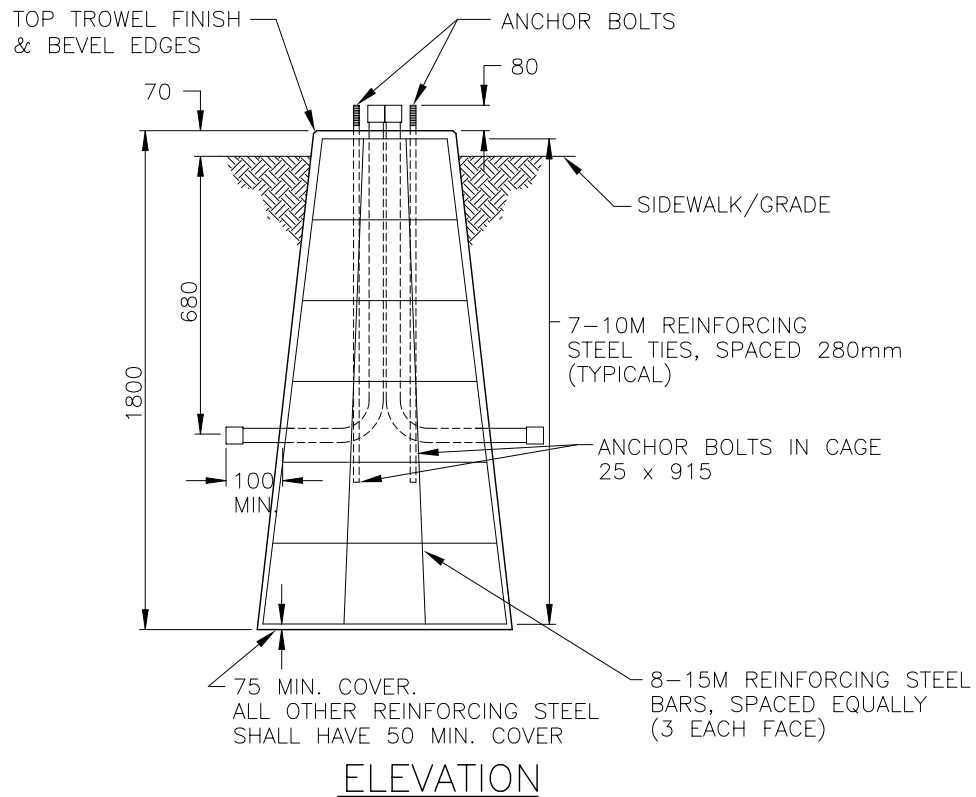
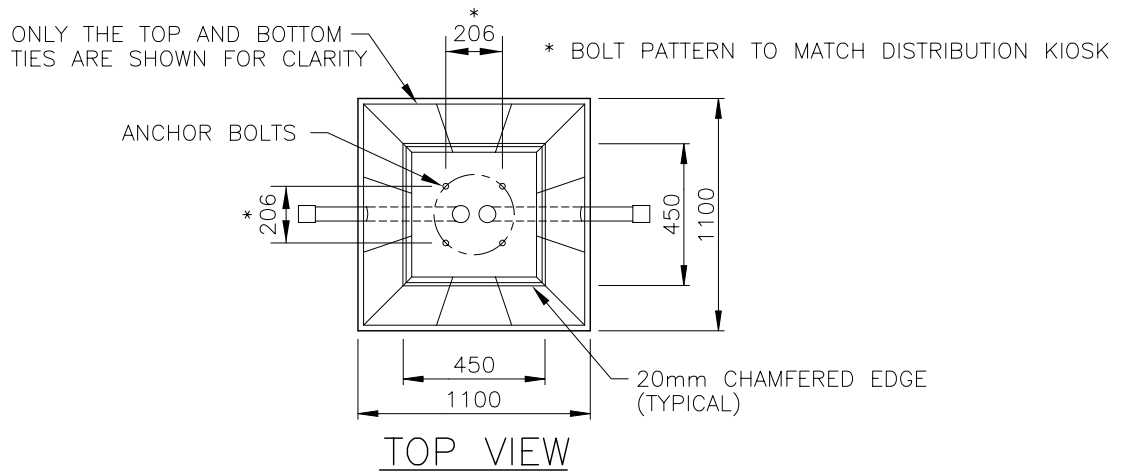
N.T.S.

DRAWING NUMBER

**E1d**

# STANDARD CONCRETE BASE FOR SERVICE POLES

**E1e**



## NOTES:

1. ANCHOR BOLTS TO BE GALVANIZED ANSI/SAE 4140
2. ANCHOR BOLTS TO BE EMBEDDED 800mm MINIMUM AND 850mm MAXIMUM
3. CHAMFER ALL EXPOSED EDGES OF CONCRETE 20mm
4. ALL DUCTS TO BE 50mm R.P.V.C. EXCEPT AS NOTED
5. SEE APPLICABLE SCHEDULES FOR MATERIAL SPECIFICATIONS

2004

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SCALE

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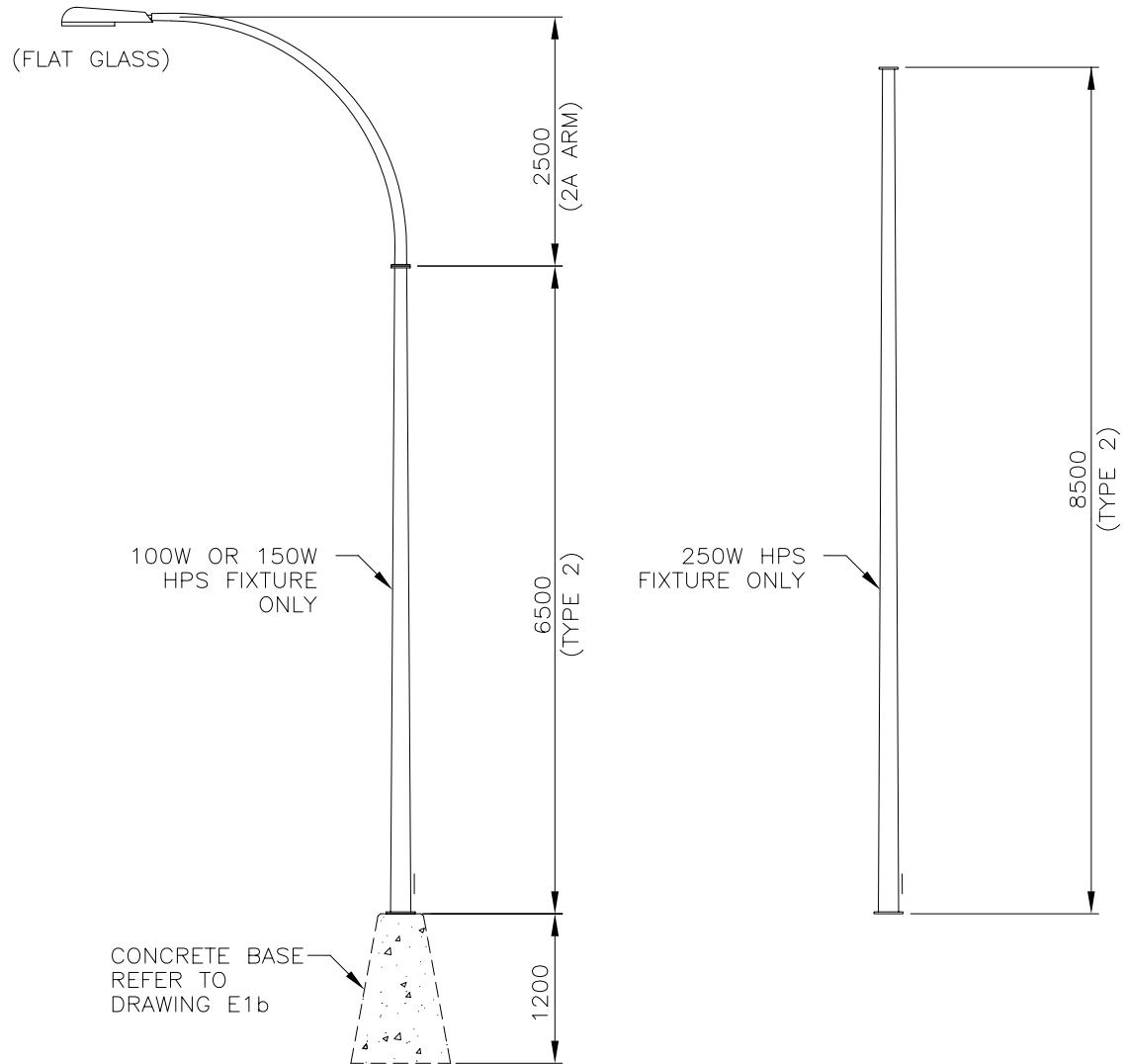
**E1e**



CITY OF  
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# LIGHTING POLE ELEVATIONS SINGLE DAVIT POLE

E2a



## NOTES:

1. LOCAL ROADS TO USE 100W HPS
2. COLLECTOR ROADS TO USE 150W HPS
3. ARTERIAL ROADS TO USE 250W HPS

2004

DATE OF REVISION

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SCALE

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DRAWING NUMBER

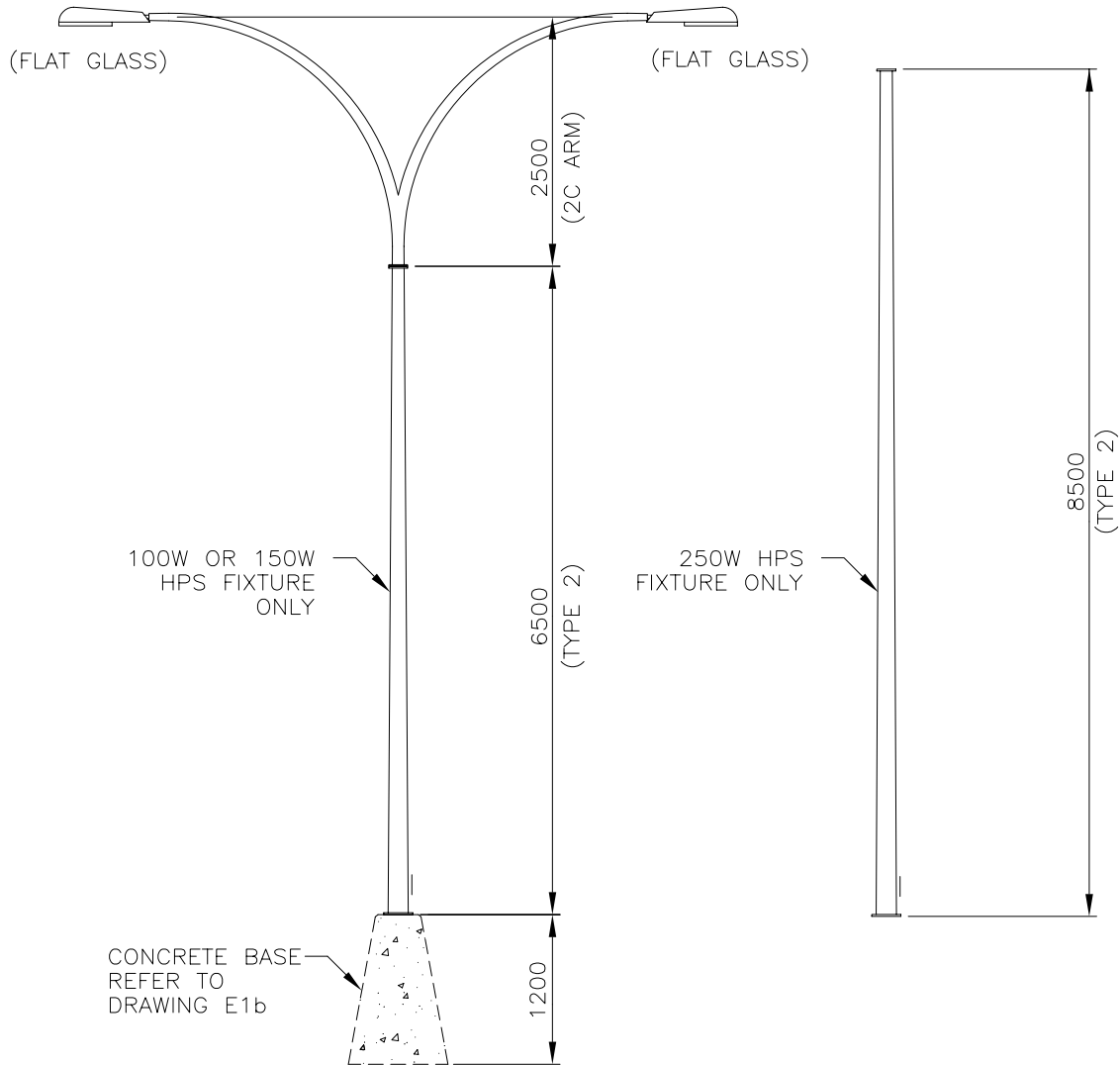
**E2a**



CITY OF  
PRINCE GEORGE

# LIGHTING POLE ELEVATIONS DOUBLE DAVIT POLE

E2b



## NOTES:

1. LOCAL ROADS TO USE 100W HPS
2. COLLECTOR ROADS TO USE 150W HPS
3. ARTERIAL ROADS TO USE 250W HPS

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

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SCALE

N.T.S.

DRAWING NUMBER

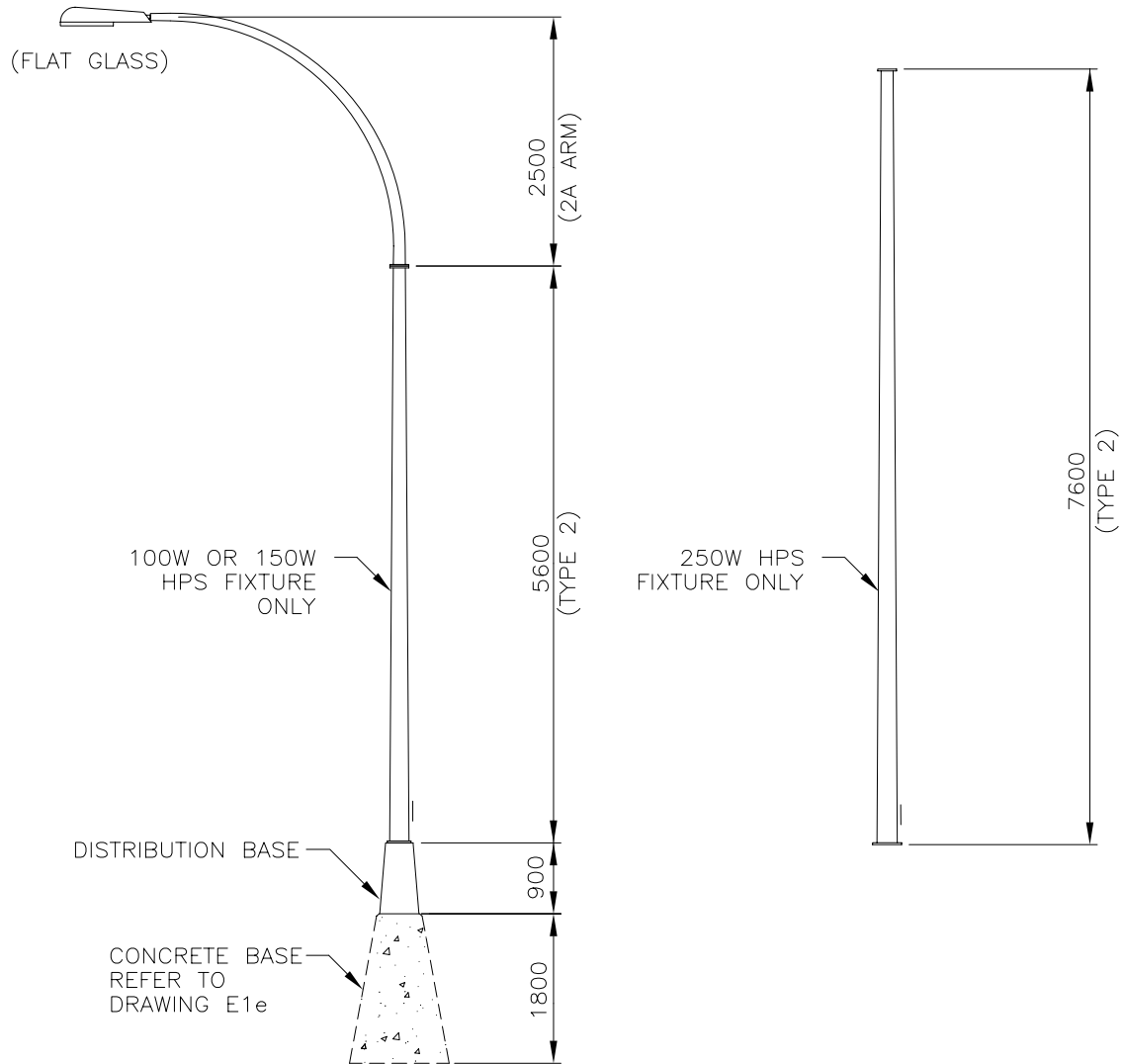
**E2b**



CITY OF  
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# LIGHTING POLE ELEVATIONS DAVIT SERVICE POLE

E2c



## NOTES:

1. LOCAL ROADS TO USE 100W HPS
2. COLLECTOR ROADS TO USE 150W HPS
3. ARTERIAL ROADS TO USE 250W HPS

2004

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REVISION NUMBER

0

SCALE

N.T.S.

DRAWING NUMBER

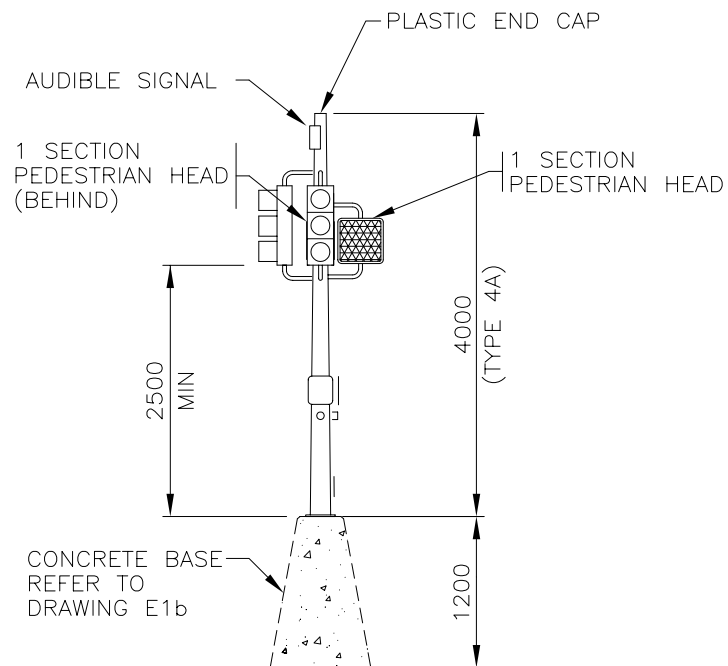
**E2c**



CITY OF  
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# SIGNAL/SIGN POLE ELEVATIONS TYPE 4 SIGNAL POLE

E3a



## NOTE:

REFER TO TRANSPORTATION ASSOCIATION OF CANADA STANDARD DRAWINGS FOR LAYOUT DESIGN AND SIGNAGE

DATE OF REVISION

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REVISION NUMBER

0

SCALE

N.T.S.

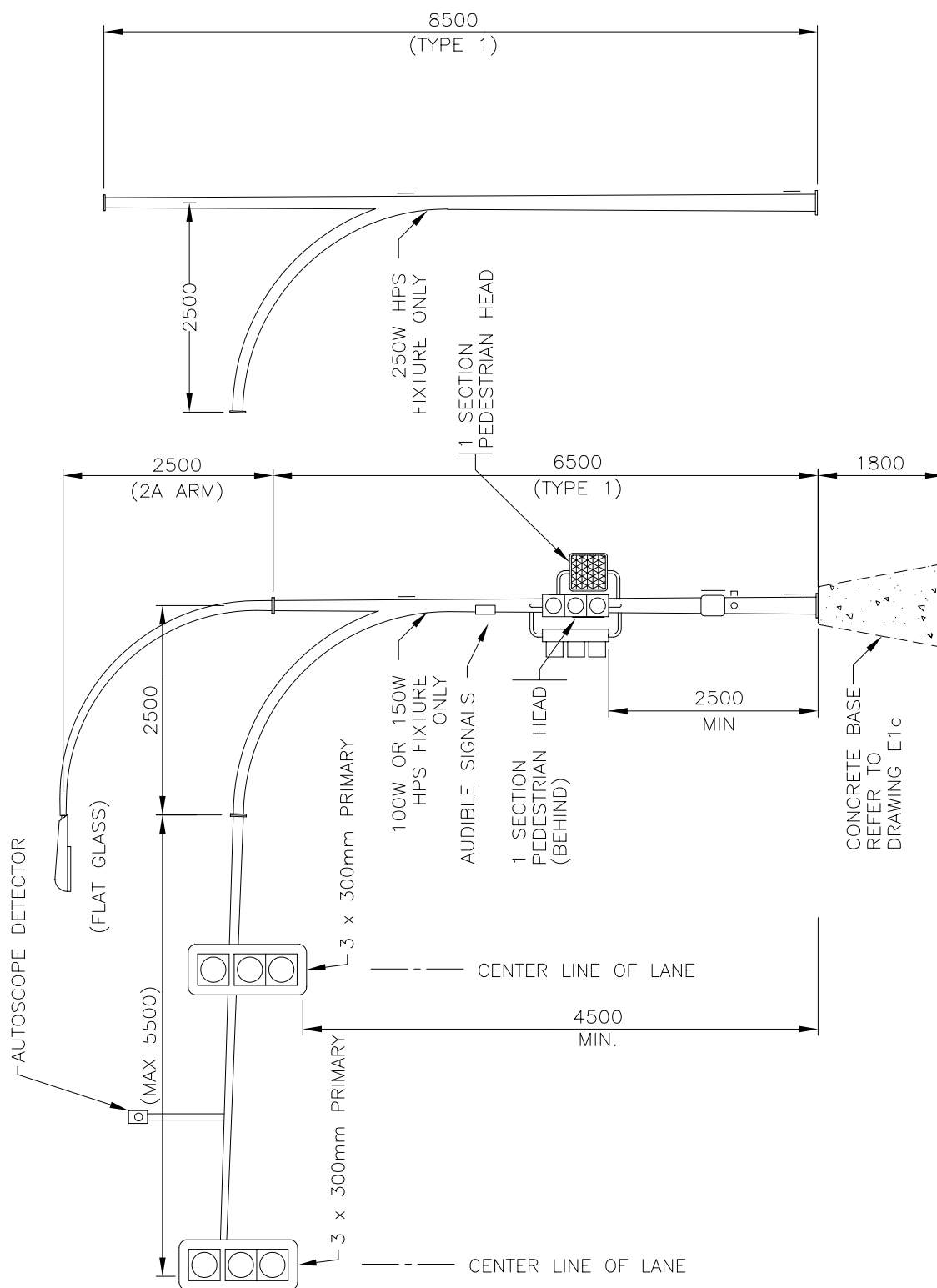
DRAWING NUMBER

**E3a**

2004



SIGNAL/SIGN POLE ELEVATIONS  
TYPE 1 SIGNAL POLE

**E3b**

NOTES:

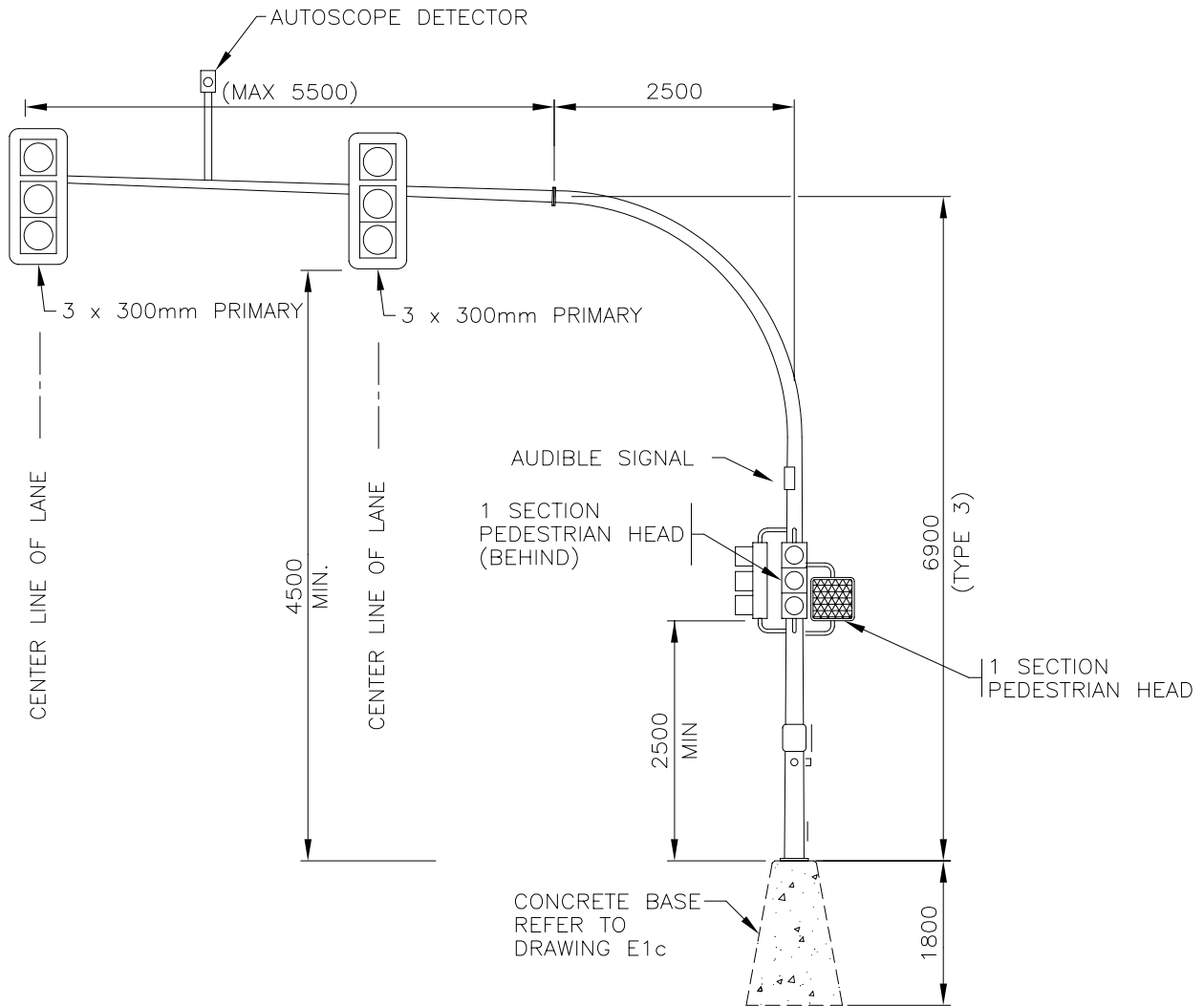
1. LOCAL ROADS TO USE 100W HPS
2. COLLECTOR ROADS TO USE 150W HPS
3. ARTERIAL ROADS TO USE 250W HPS
4. REFER TO TRANSPORTATION ASSOCIATION

2004

|                  |                 |        |                |
|------------------|-----------------|--------|----------------|
| DATE OF REVISION | REVISION NUMBER | SCALE  | DRAWING NUMBER |
| JUN 2004         | 0               | N.T.S. | <b>E3b</b>     |

# SIGNAL/SIGN POLE ELEVATIONS TYPE 3 SIGNAL POLE

E3c



## NOTE:

REFER TO TRANSPORTATION ASSOCIATION OF CANADA STANDARD DRAWINGS FOR LAYOUT DESIGN AND SIGNAGE

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

0

SCALE

N.T.S.

DRAWING NUMBER

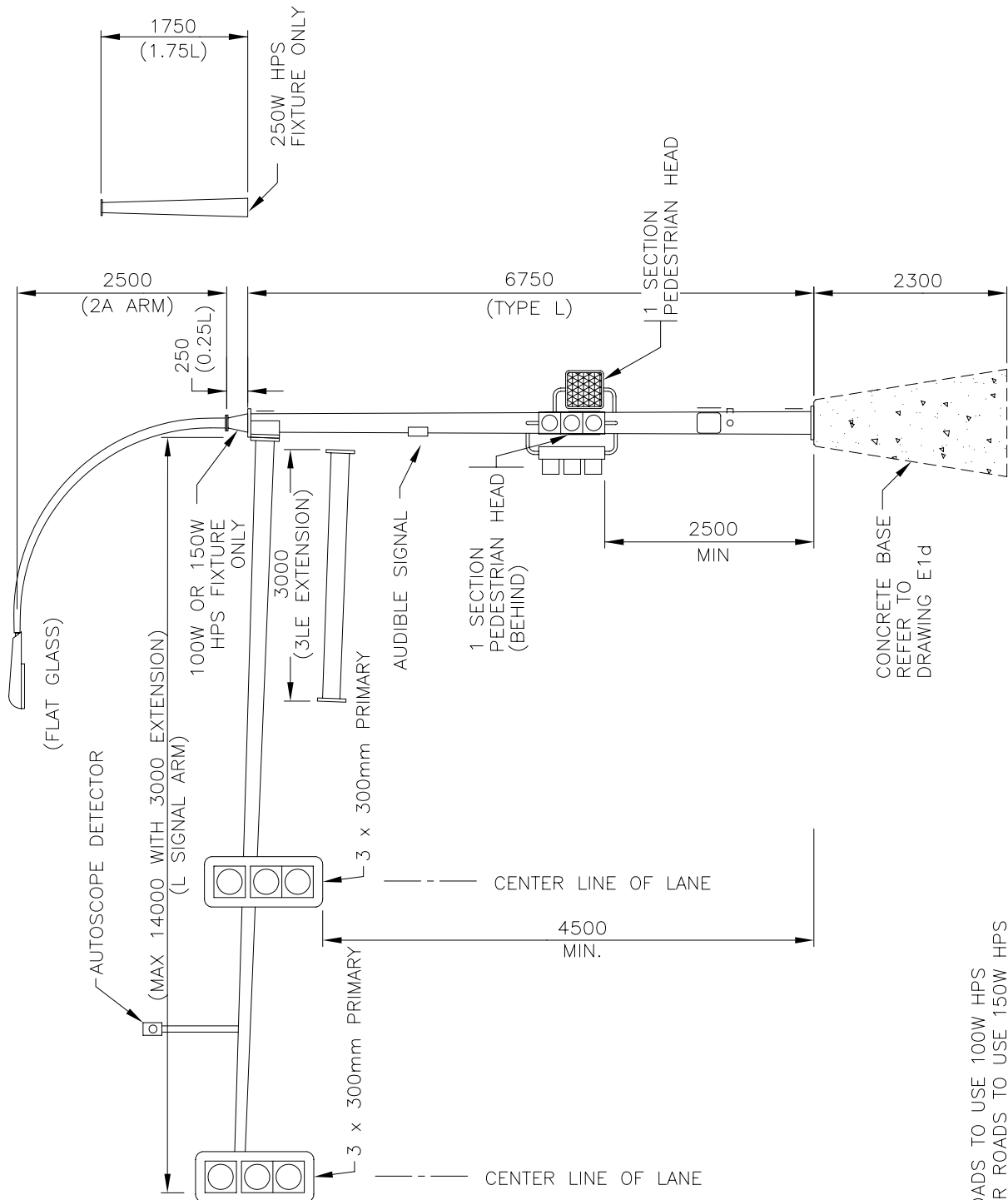
**E3c**



CITY OF  
PRINCE GEORGE

# SIGNAL/SIGN POLE ELEVATIONS TYPE L SIGNAL POLE

**E3d**



## NOTES:

1. LOCAL ROADS TO USE 100W HPS
2. COLLECTOR ROADS TO USE 150W HPS
3. ARTERIAL ROADS TO USE 250W HPS
4. REFER TO TRANSPORTATION ASSOCIATION OF CANADA STANDARD DRAWINGS FOR LAYOUT DESIGN AND SIGNAGE

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

0

SCALE

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DRAWING NUMBER

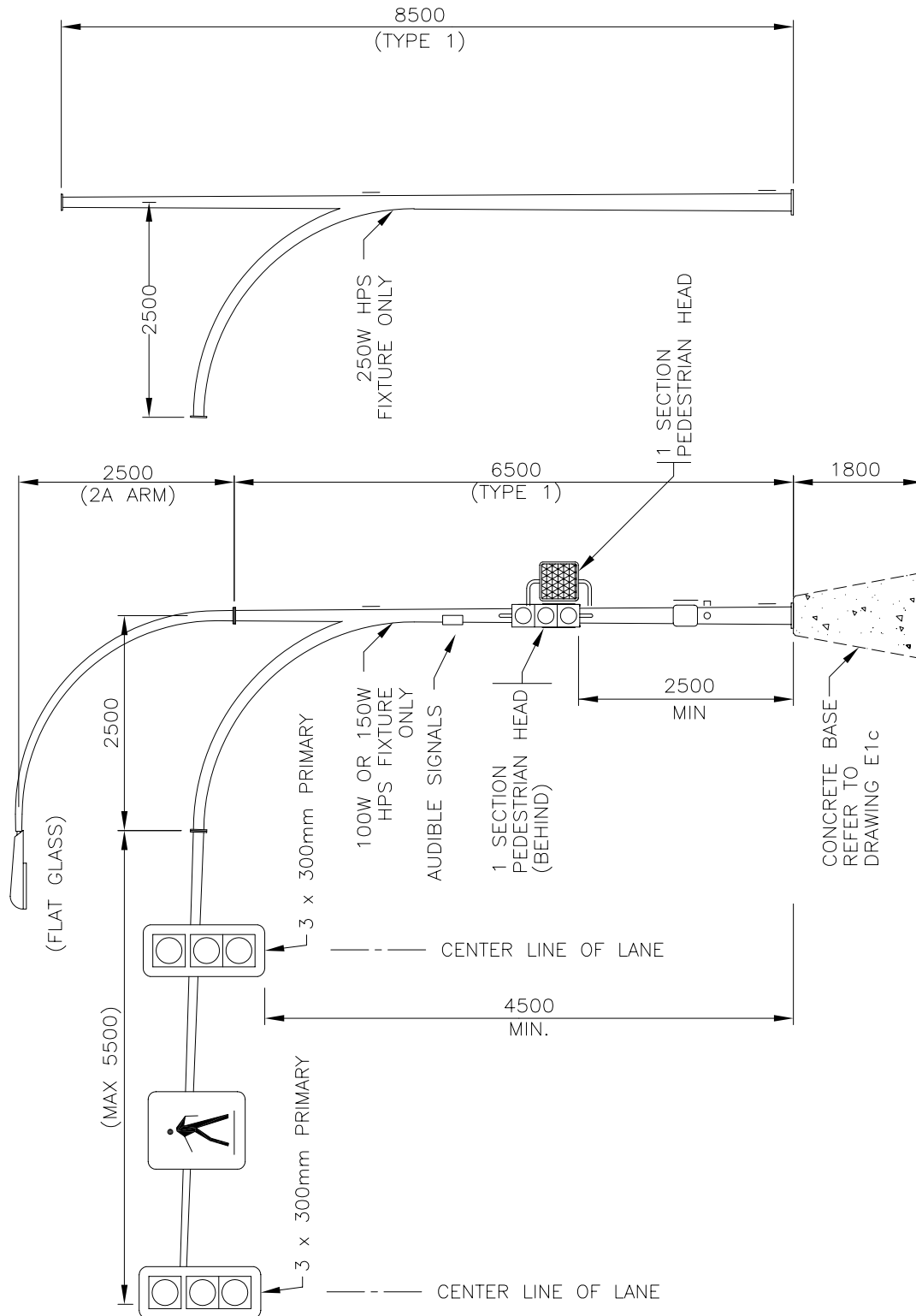
**E3d**



CITY OF  
PRINCE GEORGE

# SIGNAL/SIGN POLE ELEVATIONS CONTROLLED PEDESTRIAN CROSSING

E3e



## NOTES:

1. LOCAL ROADS TO USE 100W HPS
2. COLLECTOR ROADS TO USE 150W HPS
3. ARTERIAL ROADS TO USE 250W HPS
4. REFER TO TRANSPORTATION ASSOCIATION OF CANADA STANDARD DRAWINGS FOR LAYOUT DESIGN AND SIGNAGE

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

0

SCALE

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DRAWING NUMBER

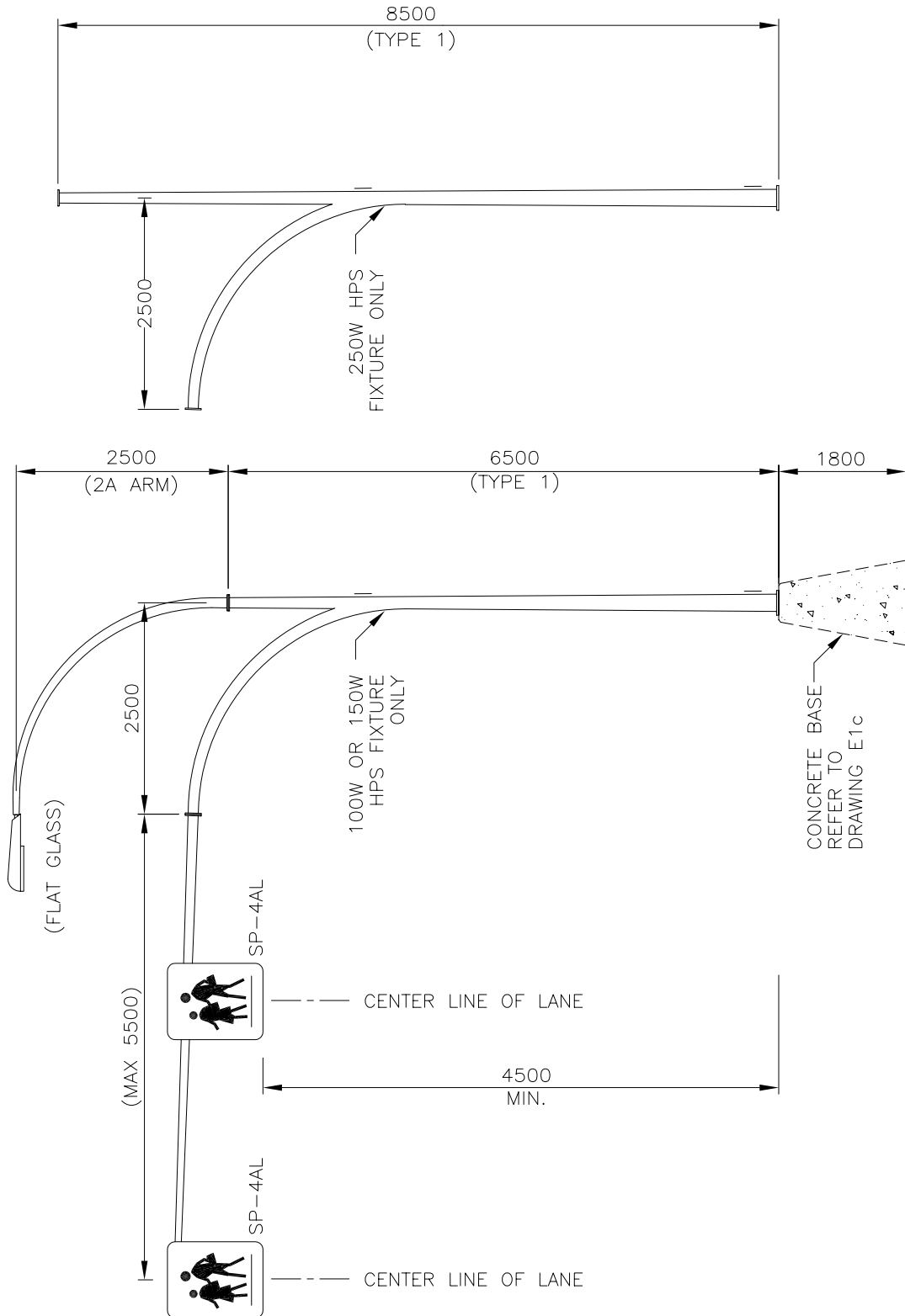
E3e



CITY OF  
PRINCE GEORGE

# SIGNAL/SIGN POLE ELEVATIONS SCHOOL CROSSWALK SIGN

**E3f**



## NOTES:

1. LOCAL ROADS TO USE 100W HPS
2. COLLECTOR ROADS TO USE 150W HPS
3. ARTERIAL ROADS TO USE 250W HPS
4. REFER TO TRANSPORTATION ASSOCIATION OF CANADA STANDARD DRAWINGS FOR LAYOUT DESIGN AND SIGNAGE

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

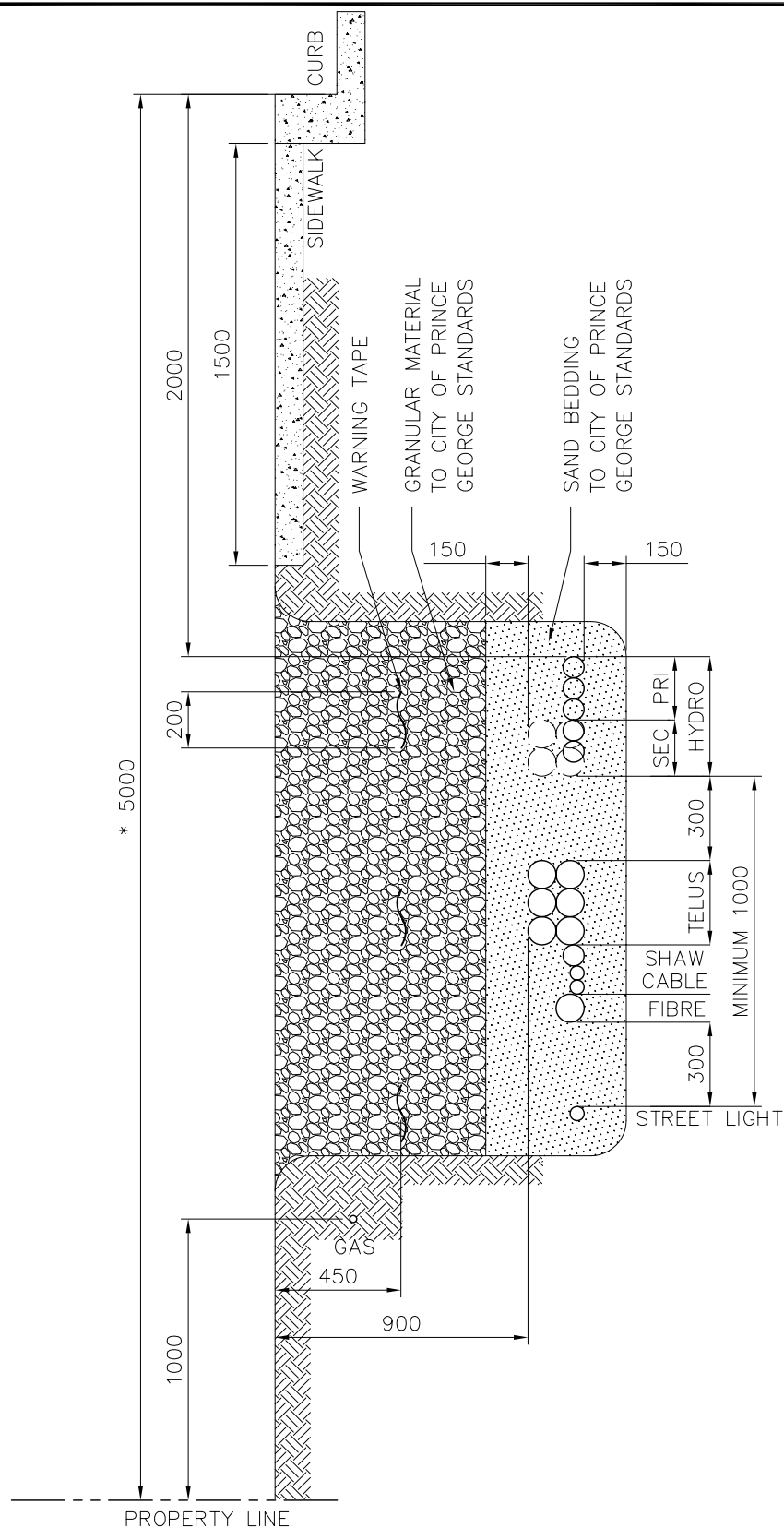
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SCALE

N.T.S.

DRAWING NUMBER

**E3f**



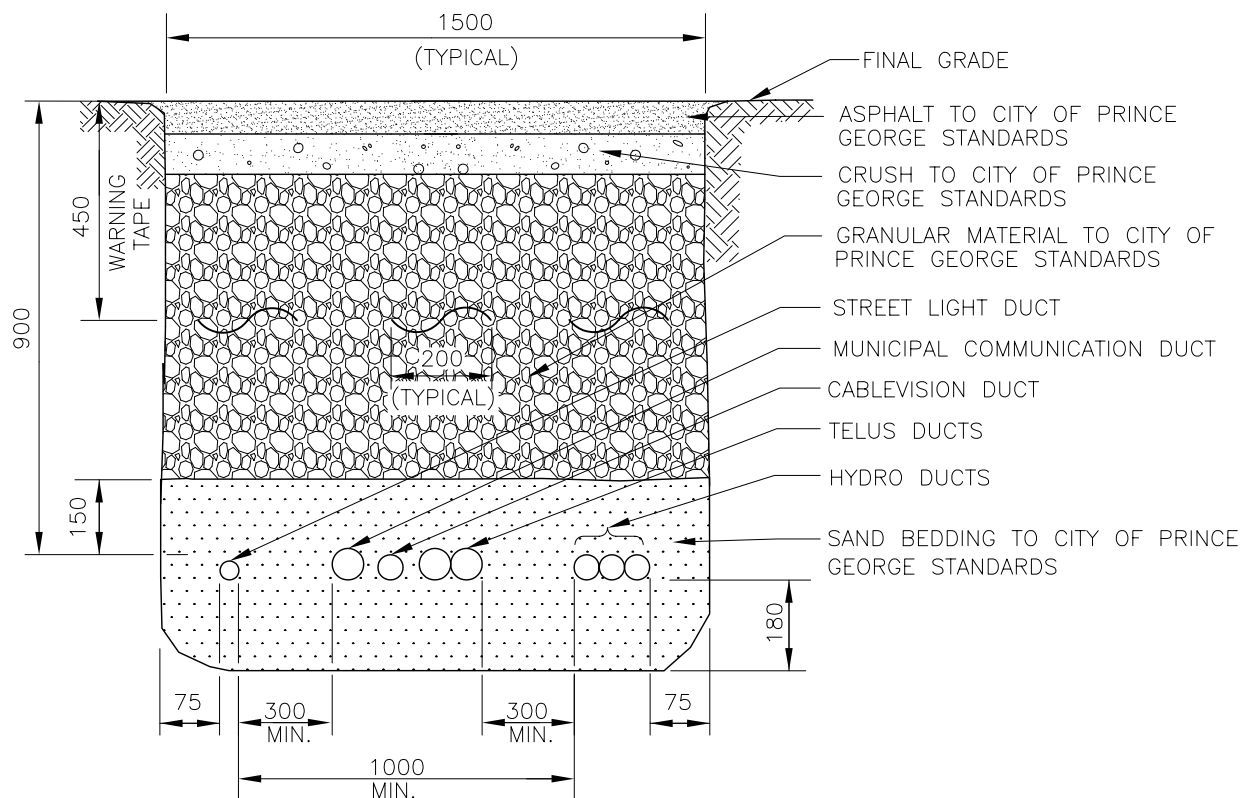
\* 6000 FOR 25m COLLECTOR ROADS

## NOTES:

1. NUMBER OF SERVICE DUCTS WILL VARY THROUGHOUT LENGTH OF TRENCH
2. CONTRACTOR SHALL MAINTAIN 2000mm OFFSET FROM CURB TO NEAREST HYDRO DUCT, AS SHOWN
3. CONTRACTOR SHALL MAINTAIN 300mm CLEARANCE BETWEEN HYDRO AND TELEPHONE DUCTS AND 1000mm BETWEEN HYDRO AND STREETLIGHTING DUCTS

# UNDERGROUND ELECTRICAL ROAD CROSSING

**E4b**



## NOTES:

1. SIZE AND QUANTITY OF CONDUIT FOR EACH UTILITY WILL VARY IN ACCORDANCE WITH DETAILED DESIGN
2. CONTRACTOR SHALL MAINTAIN 300mm CLEARANCE BETWEEN HYDRO AND TELEPHONE DUCTS AND 1000mm BETWEEN HYDRO AND STREETLIGHTING DUCTS

2004

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REVISION NUMBER

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SCALE

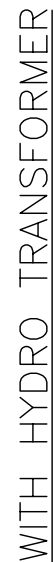
N.T.S.

DRAWING NUMBER

**E4b**



# E4C



1. FOR DETAIL OF SERVICE TRENCH SEE DRAWING E4a
2. HYDRO, TELEPHONE AND CABLE VISION TO BE INSTALLED AS PER RESPECTIVE UTILITIES SPECIFICATIONS
3. STREET LIGHT DUCT CAN GO EITHER FRONT OR BACK OF SERVICE BOX AS CONDITIONS DICTATE

DATE OF REVISION

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SCALE

N.T.S.

DRAWING NUMBER

## E4c

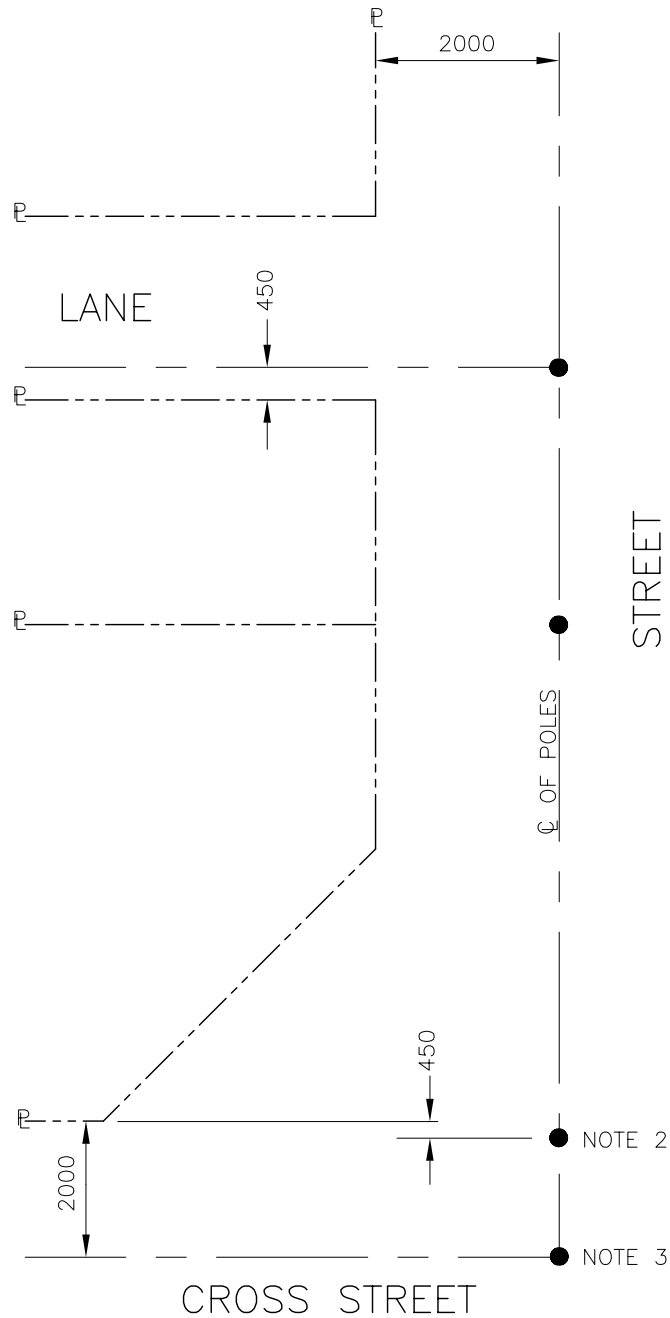


1. FOR DETAIL OF SERVICE TRENCH SEE DRAWING E4a
2. HYDRO, TELEPHONE AND CABLE VISION TO BE INSTALLED AS PER RESPECTIVE UTILITIES SPECIFICATIONS

WITH HYDRO SERVICE BOX

# OVERHEAD ELECTRICAL POLE LAYOUTS

E5a



## NOTES:

1. WHERE A CHOICE EXISTS, POLE LINES SHALL BE INSTALLED ON THE SOUTH AND/OR THE WEST SIDE OF CITY ROADS, AND MID BLOCK POLES SHALL BE LOCATED ON THE EXTENSION OF LOT LINES
2. WHERE NO POLE LINE EXISTS ON THE CROSS STREET, POLES SHALL ONLY PROTRUDE 450mm INTO THE CROSS STREET RIGHT OF WAY
3. WHERE POLE LINE EXIST ON BOTH STREET, THE INTERSECTION POLE SHALL BE LOCATED SO AS NOT TO INTERFERE WITH FUTURE CURB AND GUTTER INSTALLATIONS

2004

DATE OF REVISION

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REVISION NUMBER

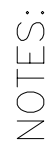
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SCALE

N.T.S.

DRAWING NUMBER

**E5a**



1. 120V FIXTURES ARE TO BE USED, WITH 120V FIXTURES ALTERNATELY WIRED ADJACENT FIXTURES SHALL NOT BE CONNECTED TO THE SAME PHASE WIRE
2. UNDERGROUND SERVICES TO BE BONDED TO HYDRO POWER SOURCE, AND TO APPROVED GROUND ELECTRODES. SEE GROUNDING DETAIL
3. DRAWING ILLUSTRATES PHOTO CELL CONTROLLED CONTACTOR . PROVIDE IN-LINE FUSE HOLDER FOR HOT LEG OF PHOTOCELL WITH 5 AMP. 120 VOLT FUSE
4. 120V FIXTURE SHOWN. 120V IS TO BE PROVIDED IN POLE UP TO FIXTURE. 120/240V MUST BE AVAILABLE AT BASE OF POLE, UNLESS POLE IS LAST IN CIRCUIT OR IN A CUL-DE-SAC
5. MIN. CONDUCTOR SIZE AND TYPE #10 AWG, RW90, STRANDED, CODED: L1/L3-BLACK, L2/L4-RED GROUND-GREEN, NEUTRAL-WHITE. SYSTEM GROUND BARE WIRE, MIN. No. 6 AWG STRANDED
6. EACH STREET LIGHT TO BE FUSED AT 15 AMPS 1 POLE FOR 120V, 2 POLES FOR 240V AT BASE OF POLE FUSE HOLDER TO BE BUSSMAN CAMASTER, 30A



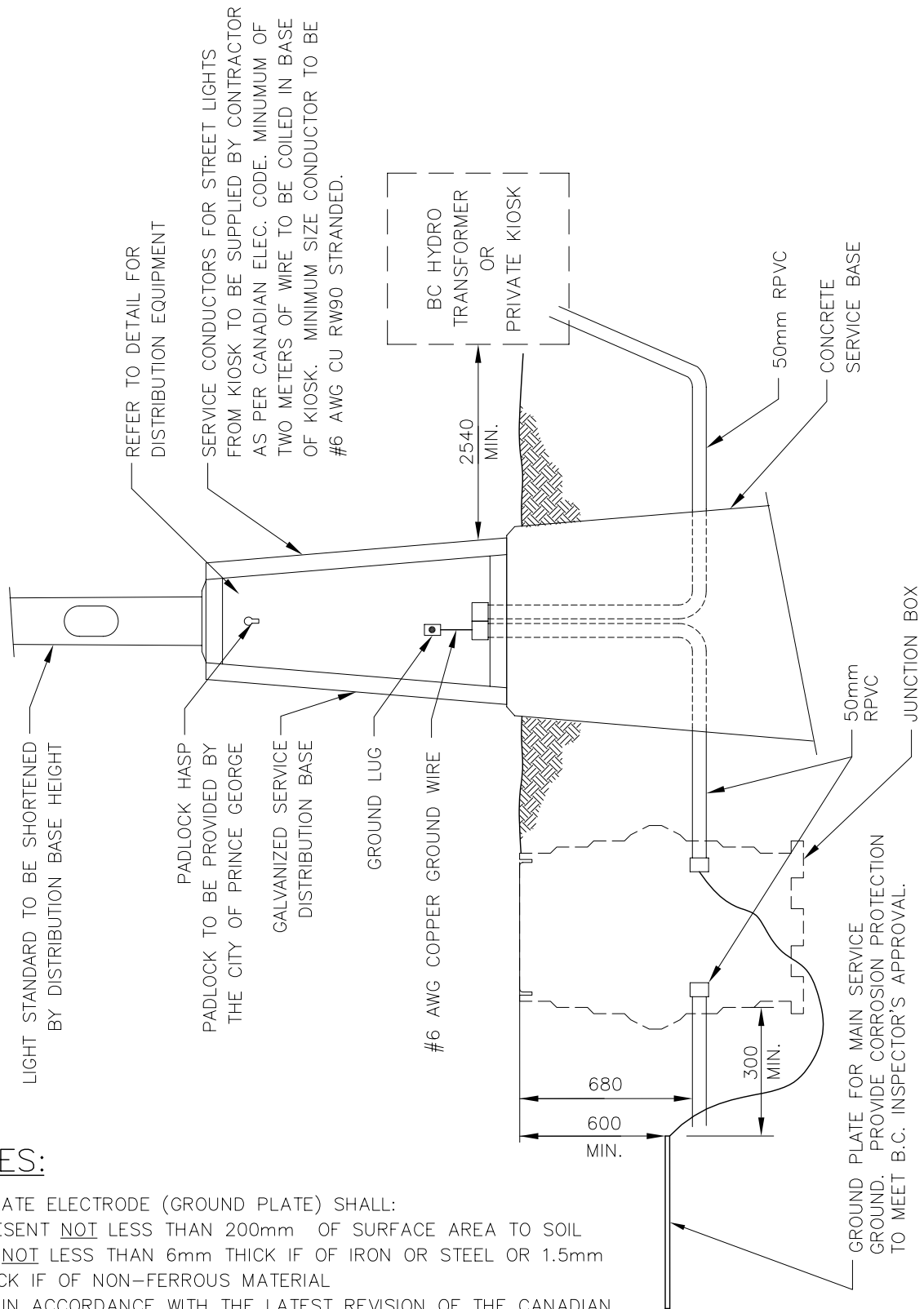
1. 120V FIXTURES ARE TO BE USED, WITH 120V FIXTURES ALTERNATELY WIRED ADJACENT FIXTURES SHALL NOT BE CONNECTED TO THE SAME PHASE WIRE
2. UNDERGROUND SERVICES TO BE BONDED TO HYDRO POWER SOURCE, AND TO APPROVED GROUND ELECTRODES. SEE GROUNDING DETAIL
3. DRAWING ILLUSTRATES PHOTOCELL CONTROLLED CONTACTOR . PROVIDE IN-LINE FUSE HOLDER FOR HOT LEG OF PHOTOCELL WITH 5 AMP. 120 VOLT FUSE
4. 120V FIXTURE SHOWN. 120V IS TO BE PROVIDED IN POLE UP TO FIXTURE. 120/208V MUST BE AVAILABLE AT BASE OF POLE, UNLESS POLE IS LAST IN CIRCUIT OR IN A CUL-DE-SAC
5. MIN. CONDUCTOR SIZE AND TYPE #10 AWG, RW90, STRANDED, CODED: L1/L4-BLACK, L2/L5-RED, L3/L6-BLUE GROUND-GREEN, NEUTRAL-WHITE. SYSTEM GROUND BARE WIRE, MIN. No. 6 AWG STRANDED
6. EACH STREET LIGHT TO BE FUSED AT 15 AMPS 1 POLE FOR 120V, 2 POLES FOR 208V AT BASE OF POLE FUSE HOLDER TO BE BUSSMAN CAMASTER, 30A



CITY OF  
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# POWER AND DISTRIBUTION UNDERGROUND SERVICE FOR STREET LIGHTING

**E6c**



## NOTES:

THE PLATE ELECTRODE (GROUND PLATE) SHALL:

1. PRESENT NOT LESS THAN 200mm OF SURFACE AREA TO SOIL
2. BE NOT LESS THAN 6mm THICK IF OF IRON OR STEEL OR 1.5mm THICK IF OF NON-FERROUS MATERIAL
3. BE IN ACCORDANCE WITH THE LATEST REVISION OF THE CANADIAN ELECTRICAL CODE

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

0

SCALE

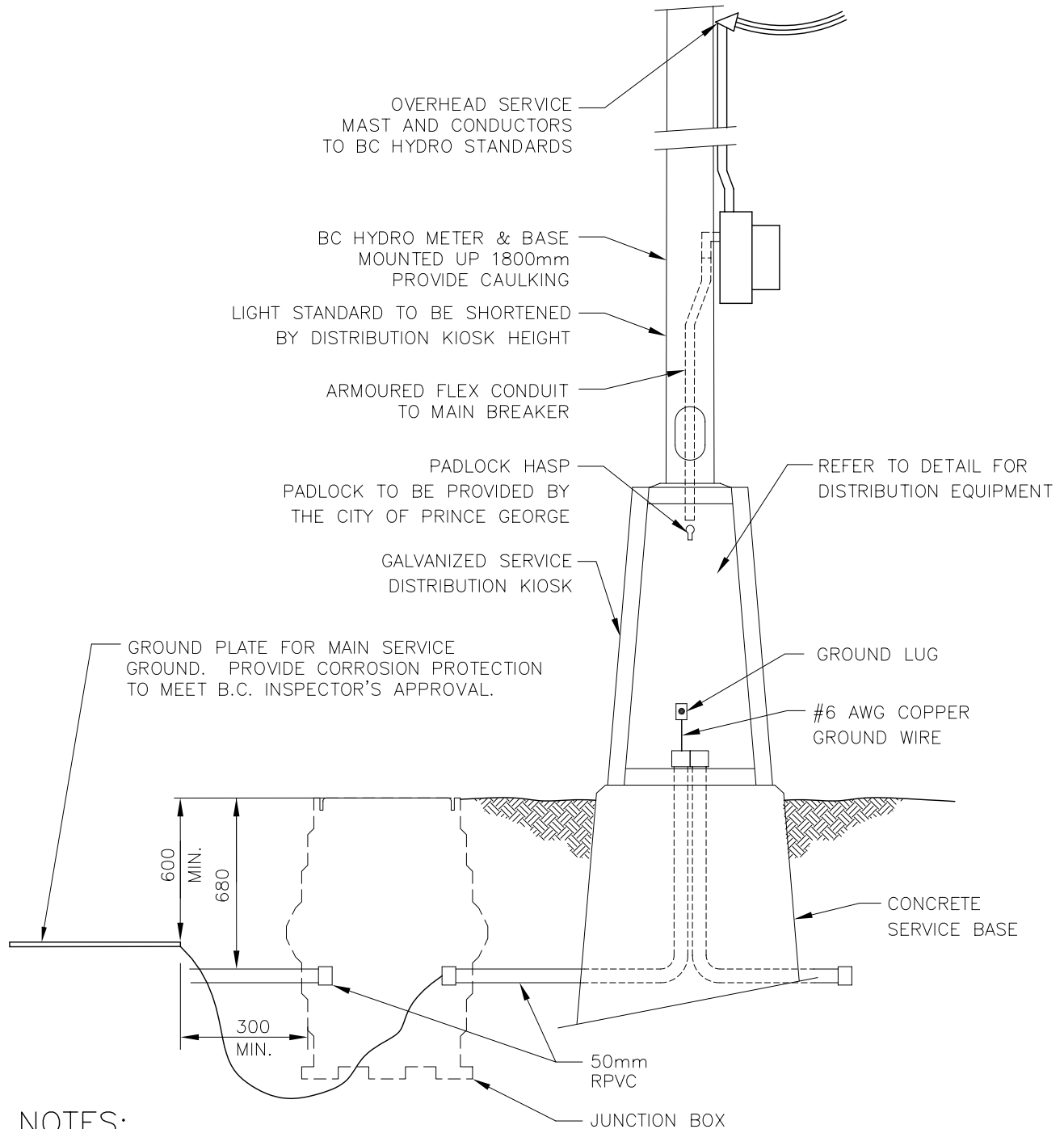
N.T.S.

DRAWING NUMBER

**E6c**

# POWER AND DISTRIBUTION OVERHEAD SERVICE FOR PARKING LOTS

E6d



## NOTES:

THE PLATE ELECTRODE (GROUND PLATE) SHALL:

1. PRESENT NOT LESS THAN 200mm OF SURFACE AREA TO SOIL
2. BE NOT LESS THAN 6mm THICK IF OF IRON OR STEEL OR 1.5mm THICK IF OF NON-FERROUS MATERIAL
3. BE IN ACCORDANCE WITH THE LATEST REVISION OF THE CANADIAN ELECTRICAL CODE

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

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SCALE

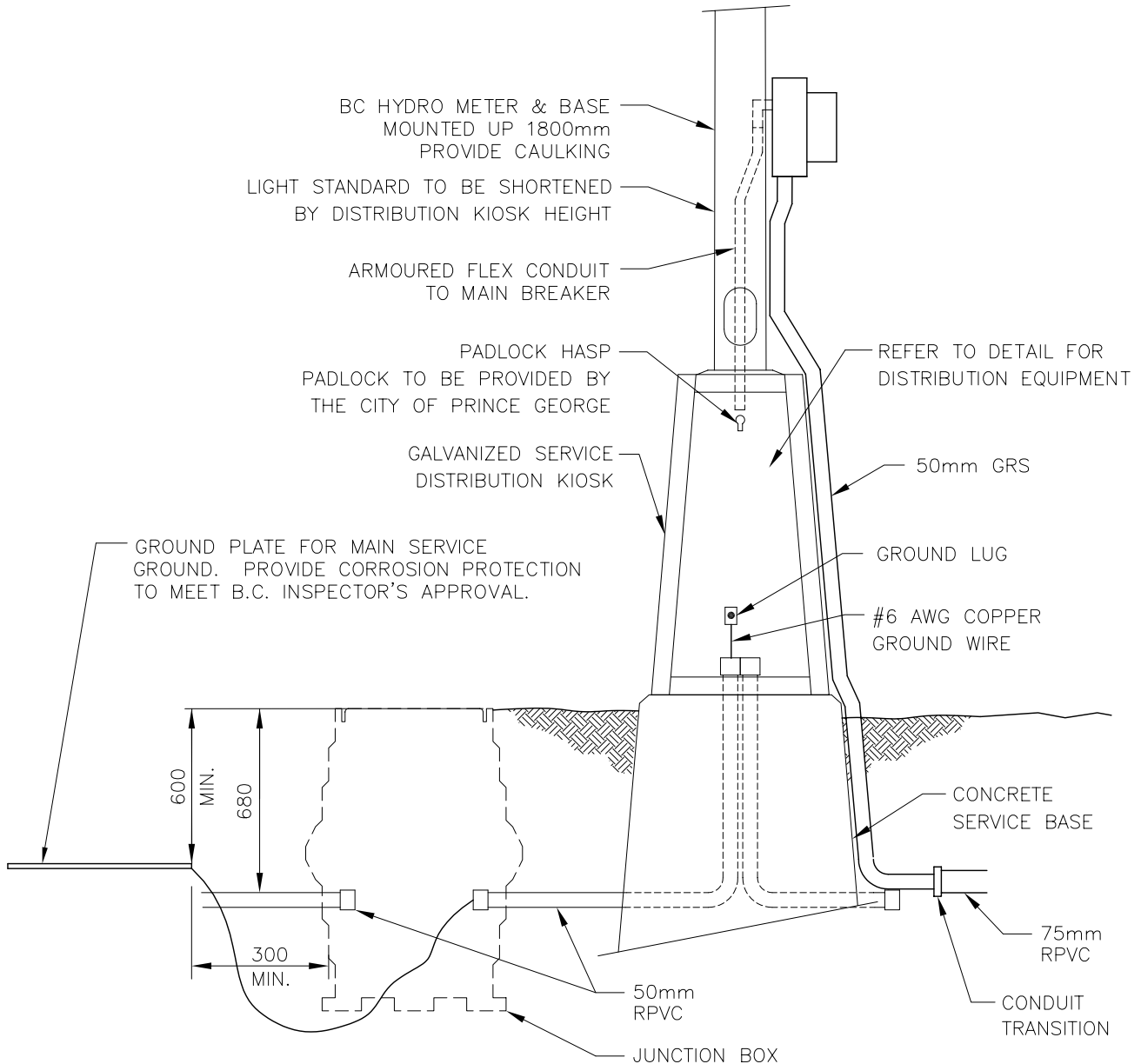
N.T.S.

DRAWING NUMBER

**E6d**

# POWER AND DISTRIBUTION UNDERGROUND SERVICE FOR PARKING LOTS

**E6e**



## NOTES:

THE PLATE ELECTRODE (GROUND PLATE) SHALL:

1. PRESENT NOT LESS THAN 200mm OF SURFACE AREA TO SOIL
2. BE NOT LESS THAN 6mm THICK IF OF IRON OR STEEL OR 1.5mm THICK IF OF NON-FERROUS MATERIAL
3. BE IN ACCORDANCE WITH THE LATEST REVISION OF THE CANADIAN ELECTRICAL CODE.

2004

DATE OF REVISION

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REVISION NUMBER

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SCALE

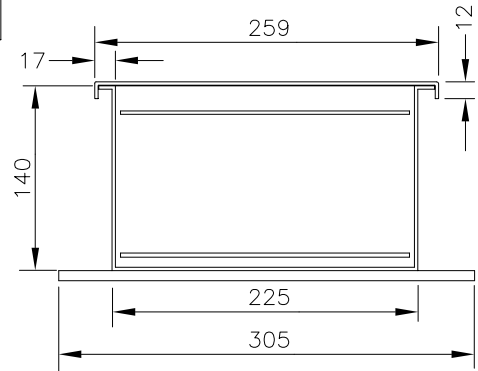
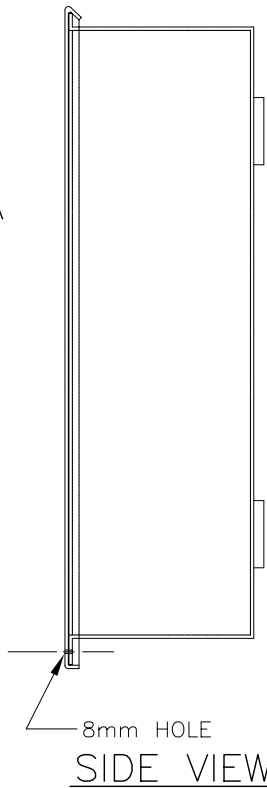
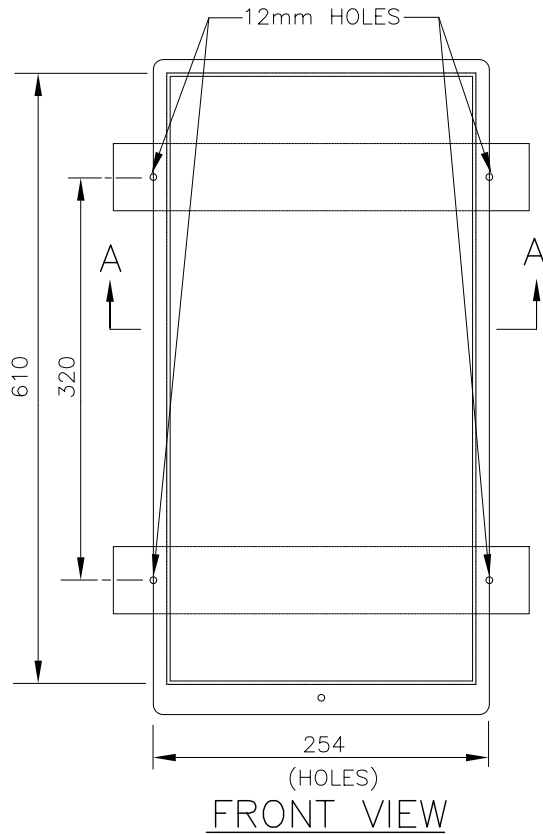
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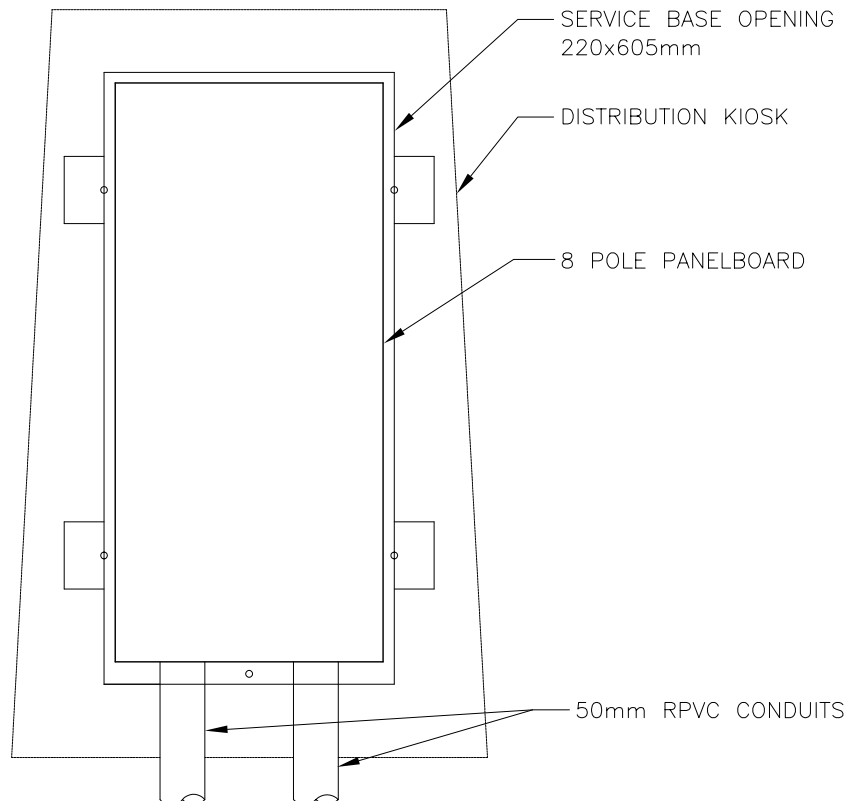
**E6e**

# POWER AND DISTRIBUTION DISTRIBUTION KIOSK LAYOUT

**E6f**



**SECTION A-A**



## NOTE:

BYPASS/TEST SWITCH AND CONTACTOR ARE NOT CONNECTED BY THE MANUFACTURER. THE CONTRACTOR IS TO PROVIDE ALL MATERIAL AND LABOUR TO CONNECT THE SWITCH AND CONTACTOR AS DESCRIBED IN DETAILS AND NOTES

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SCALE

N.T.S.

DRAWING NUMBER

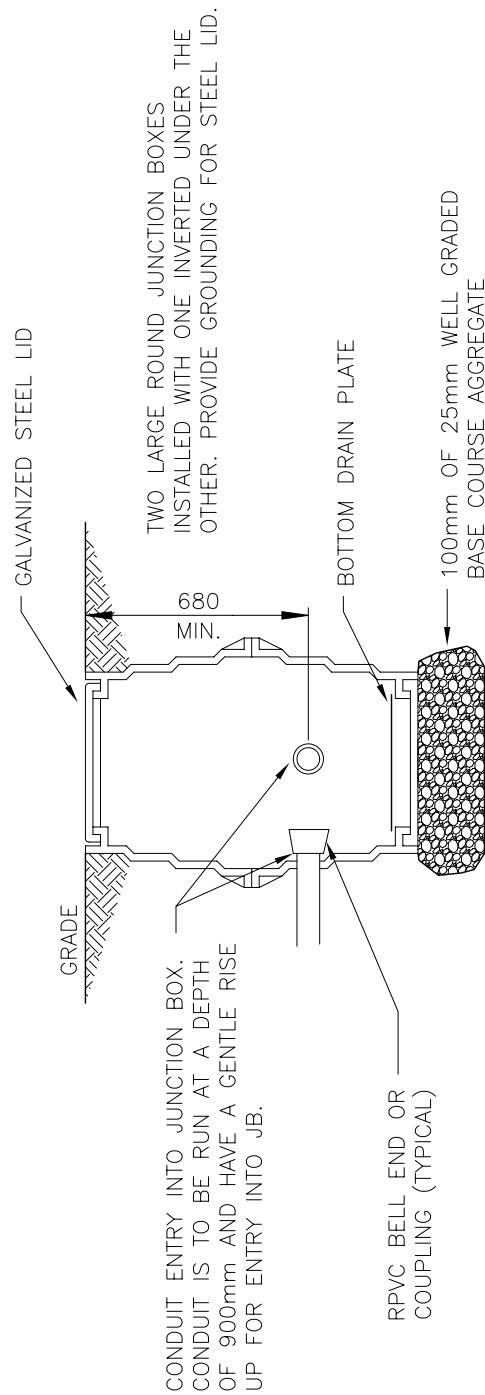
**E6f**



CITY OF  
PRINCE GEORGE

# JUNCTION BOX TYPE 10

E7a



2004

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SCALE

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DRAWING NUMBER

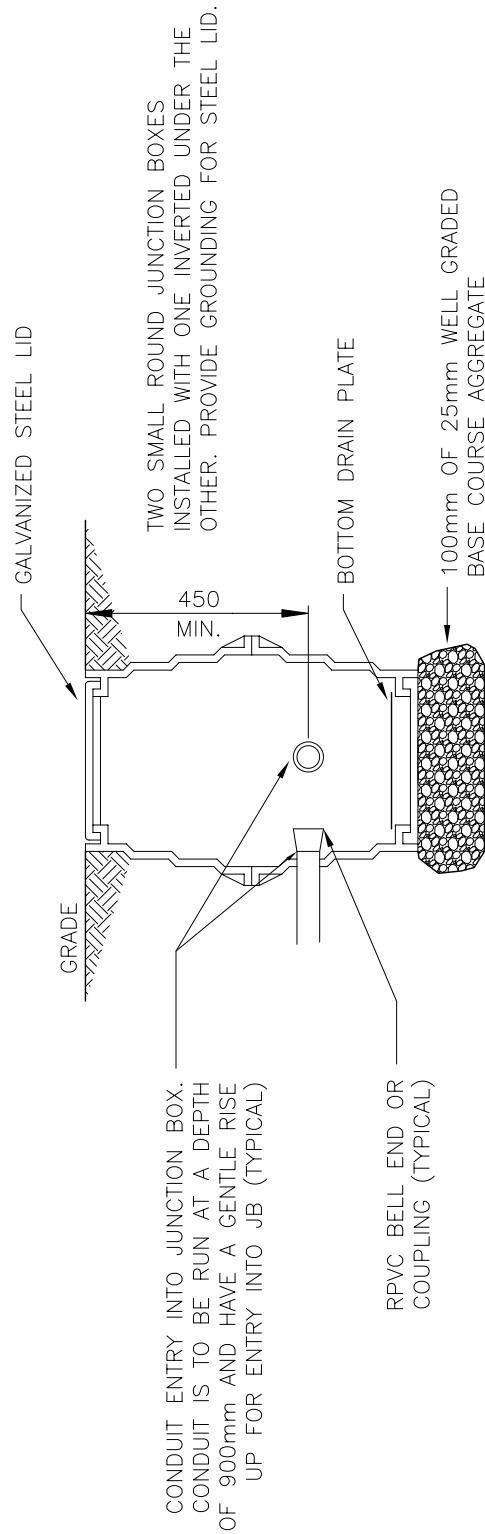
**E7a**



CITY OF  
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# JUNCTION BOX TYPE 14

E7b



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REVISION NUMBER

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SCALE

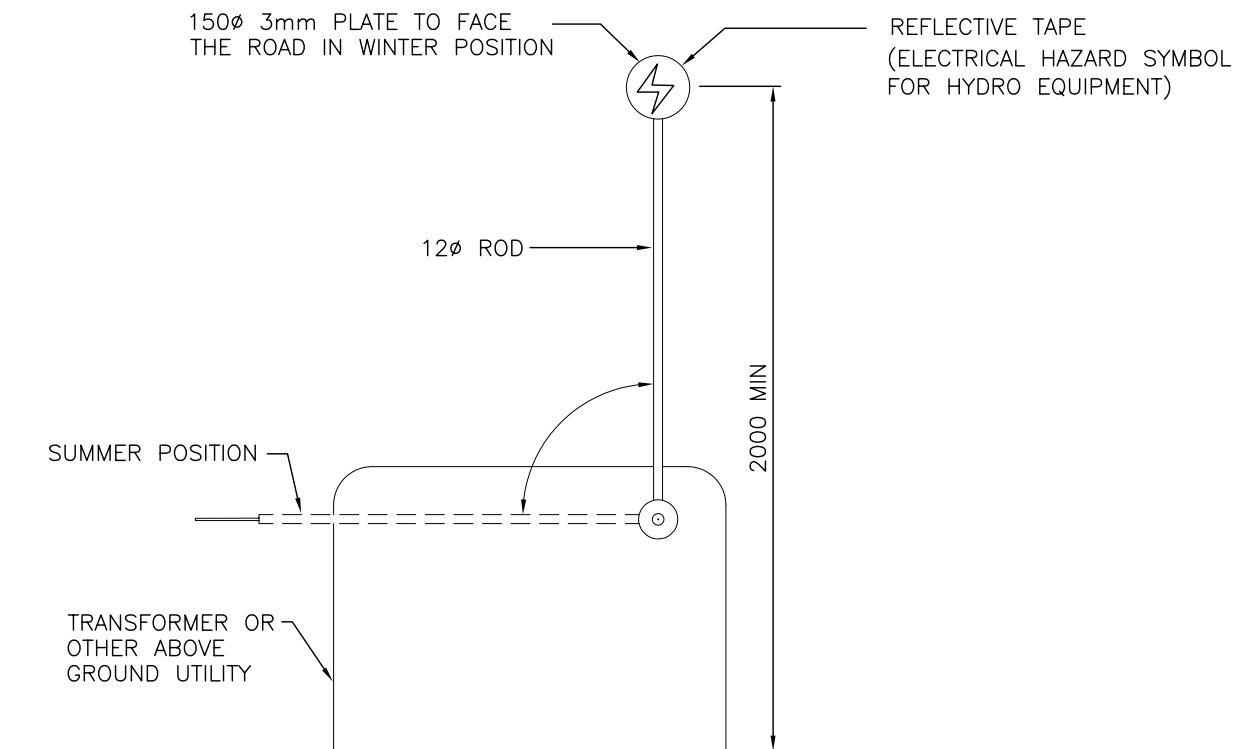
N.T.S.

DRAWING NUMBER

**E7b**

# UTILITY MARKER

E8a



## NOTES:

1. UTILITY COMPANIES SHALL INSTALL AND MAINTAIN MARKERS FOR THEIR ABOVE GROUND INFRASTRUCTURE

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SCALE

N.T.S.

DRAWING NUMBER

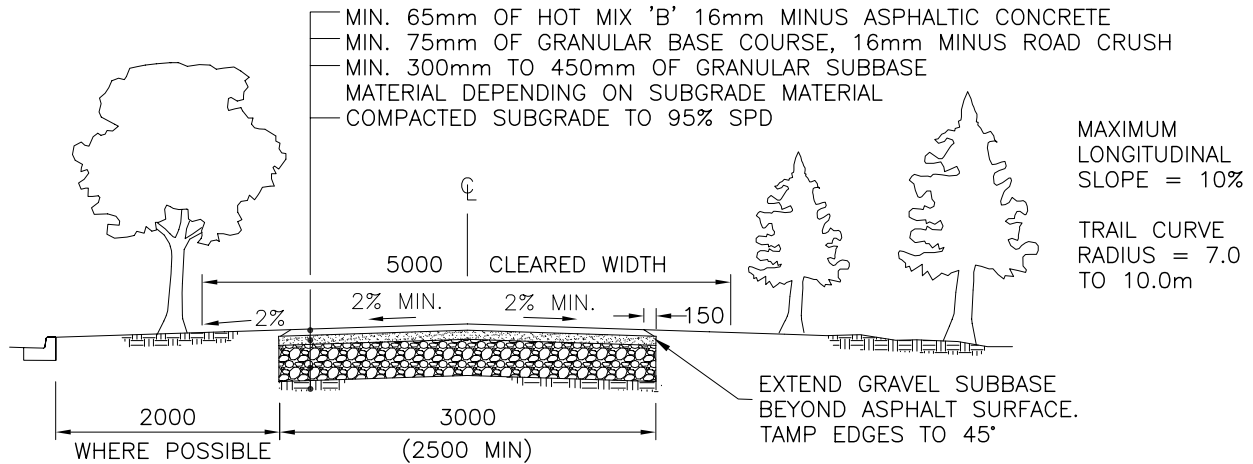
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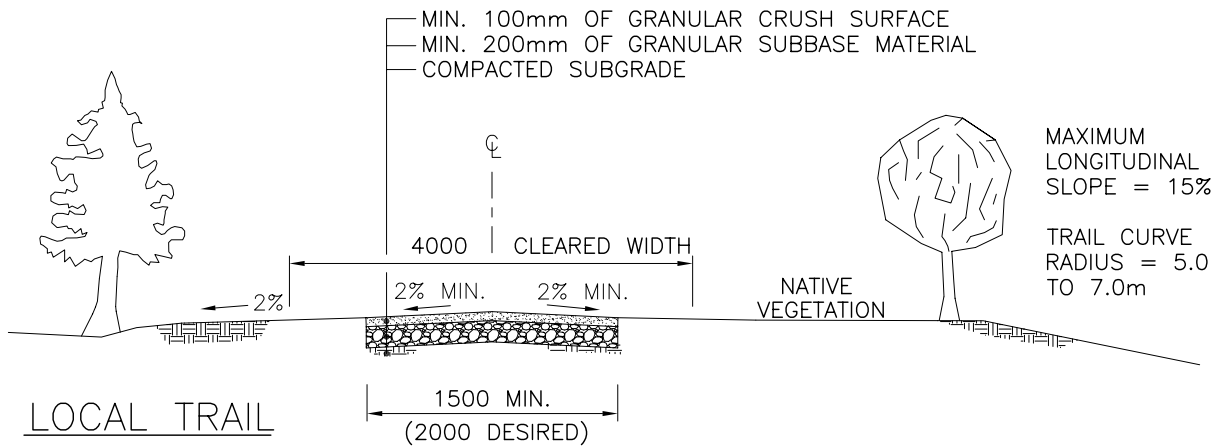
CITY OF  
PRINCE GEORGE

# TRAIL STANDARDS

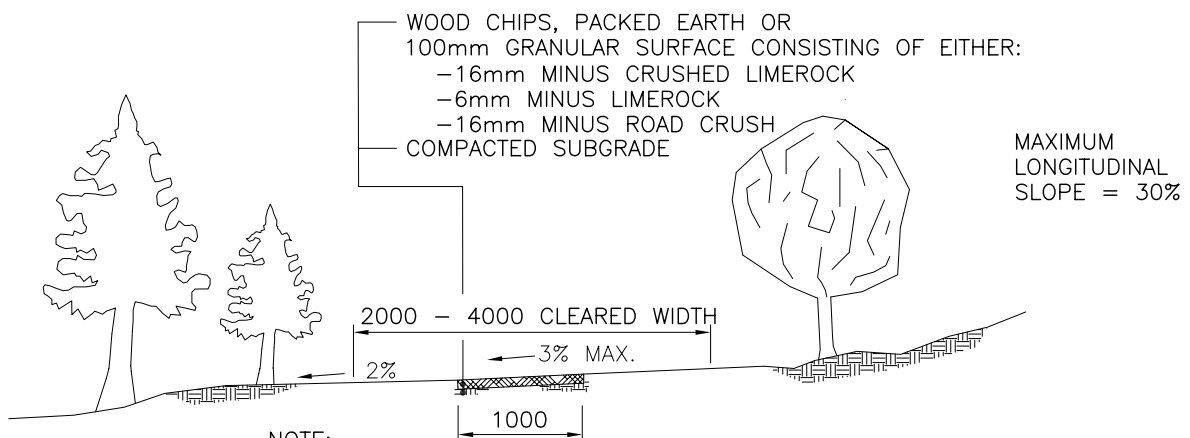
P1



## MULTI-USE TRAIL



## LOCAL TRAIL



## RUSTIC TRAIL

### NOTE:

1. TRAILS TO BE CONSTRUCTED IN AREAS AS DESIGNATED IN THE CITY OF PRINCE GEORGE "CITYWIDE TRAIL SYSTEM MASTER PLAN" OR OTHER OPEN SPACE AREAS.
2. DEPTH OF GRANULAR SUB BASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL REPORT APPROVED BY THE DIRECTOR.

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SCALE

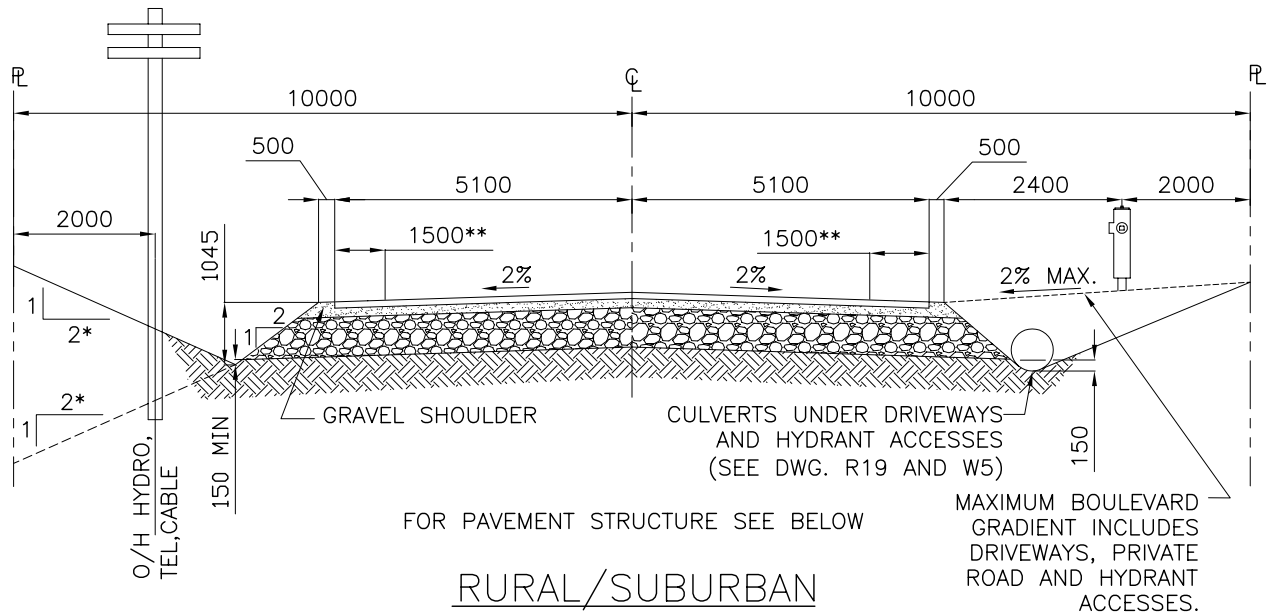
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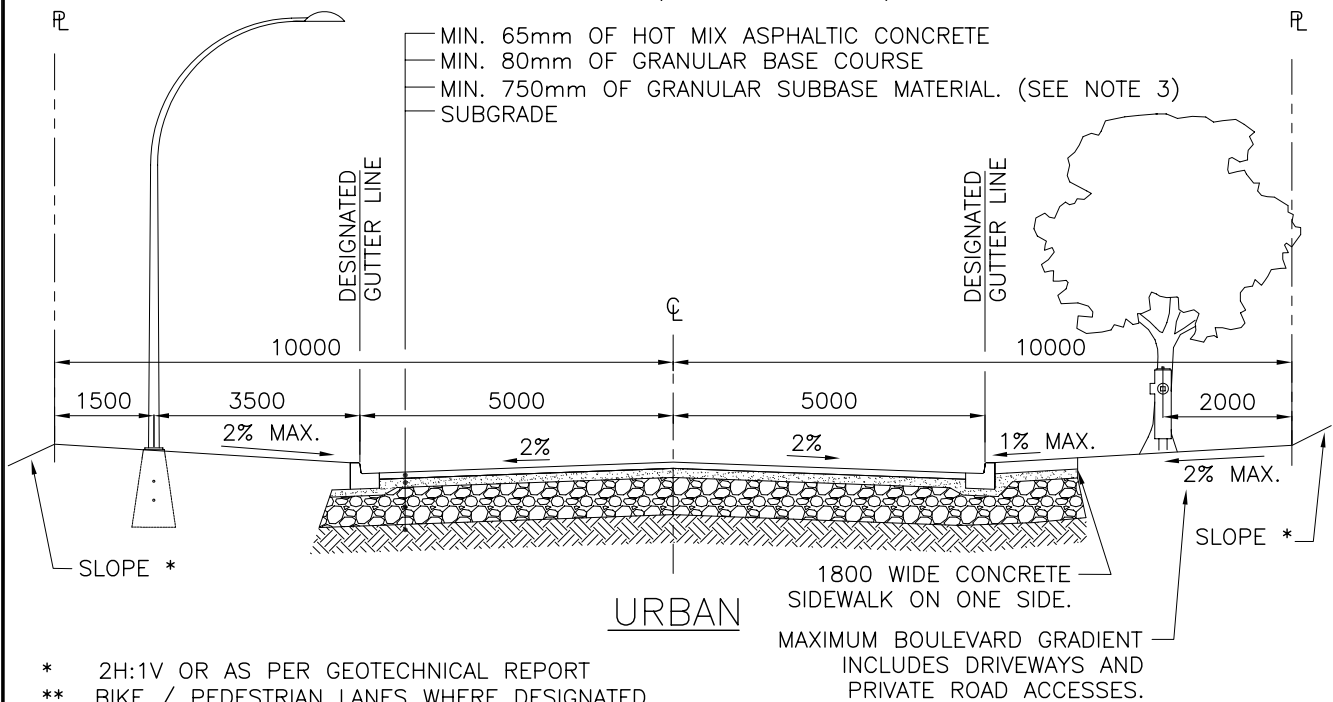
P1

# LOCAL (20m ROAD) – PAVED

**R1**



## PAVEMENT STRUCTURE (RURAL AND URBAN)



- \* 2H:1V OR AS PER GEOTECHNICAL REPORT  
\*\* BIKE / PEDESTRIAN LANES WHERE DESIGNATED

- NOTE:**
1. ROLL CURB AND GUTTER TO BE USED IN RESIDENTIAL (SINGLE FAMILY LOTS) AREAS.
  2. SEE DWG. G1 FOR UTILITY LOCATIONS
  3. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR.
  4. FOR SIDEWALK REQUIREMENTS IN URBAN CUL-DE-SACS, SEE DRAWING R11

2004

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SCALE

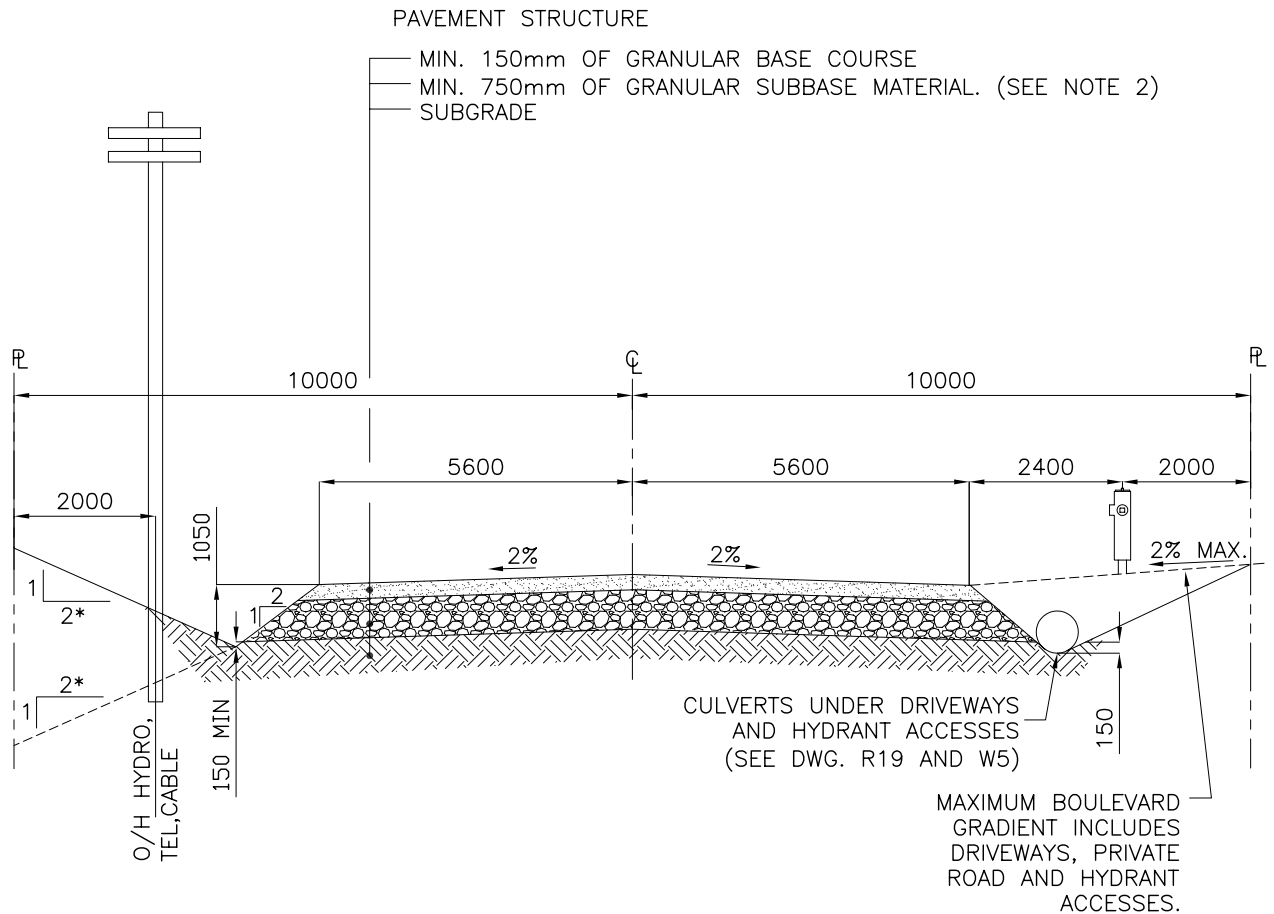
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DRAWING NUMBER

**R1**

# LOCAL (20m ROAD) – GRAVEL SURFACE

R2



NOTE:

1. SEE DWG G1 FOR UTILITY LOCATIONS.
2. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR.

2004

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0

SCALE

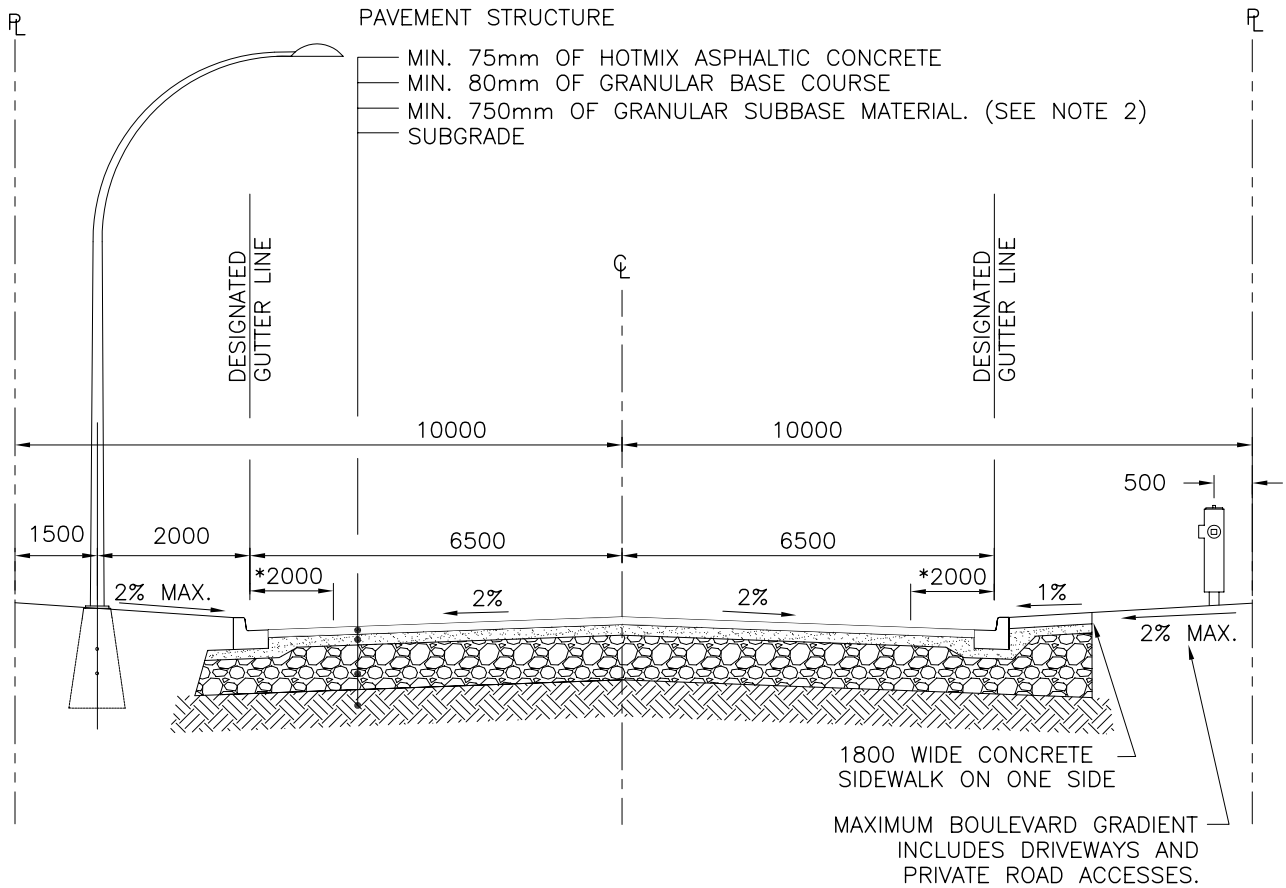
N.T.S.

DRAWING NUMBER

**R2**

# COLLECTOR (20m ROAD – 13m SURFACE)

R3



\* BIKE LANES WHERE DESIGNATED

- NOTE:**
1. SEE DWG. G2 FOR UTILITY LOCATIONS
  2. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR.
  3. TRANSIT PULLOUTS TO BE PROVIDED AS PER TRANSPORTATION ASSOC. GUIDELINES.

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SCALE

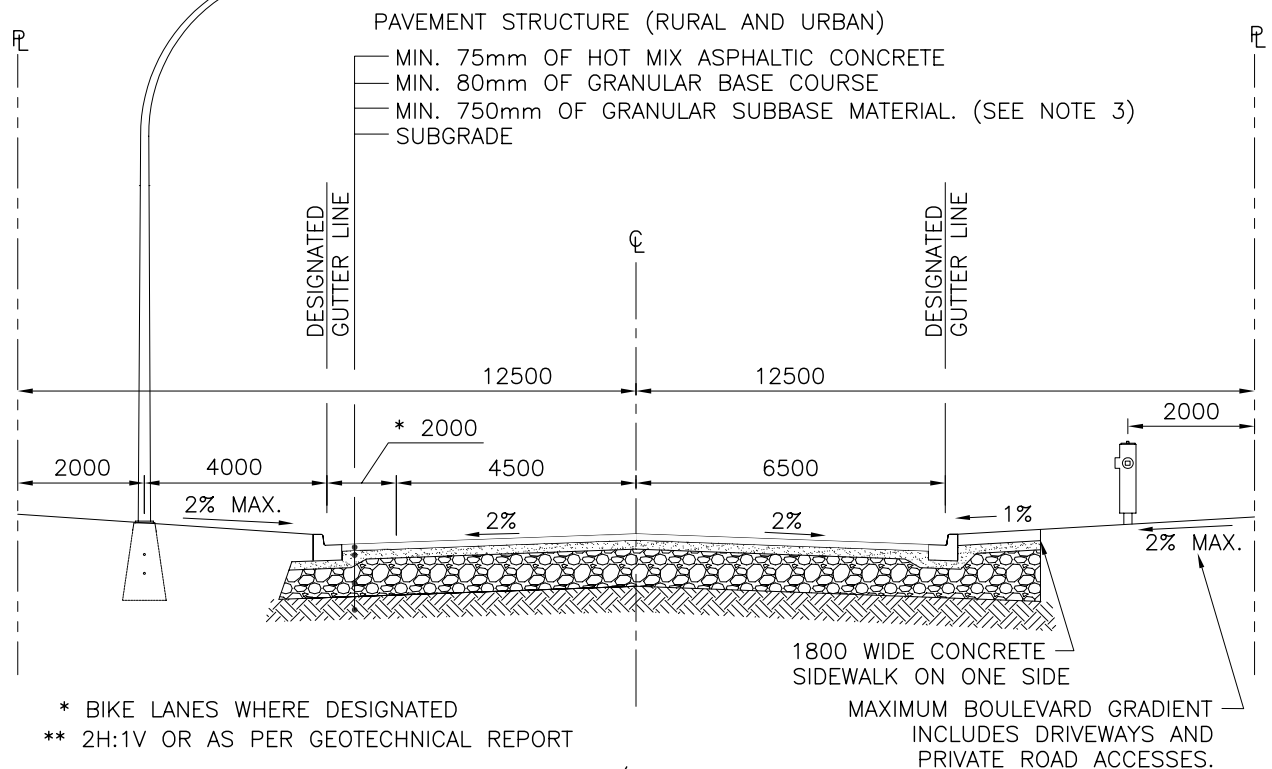
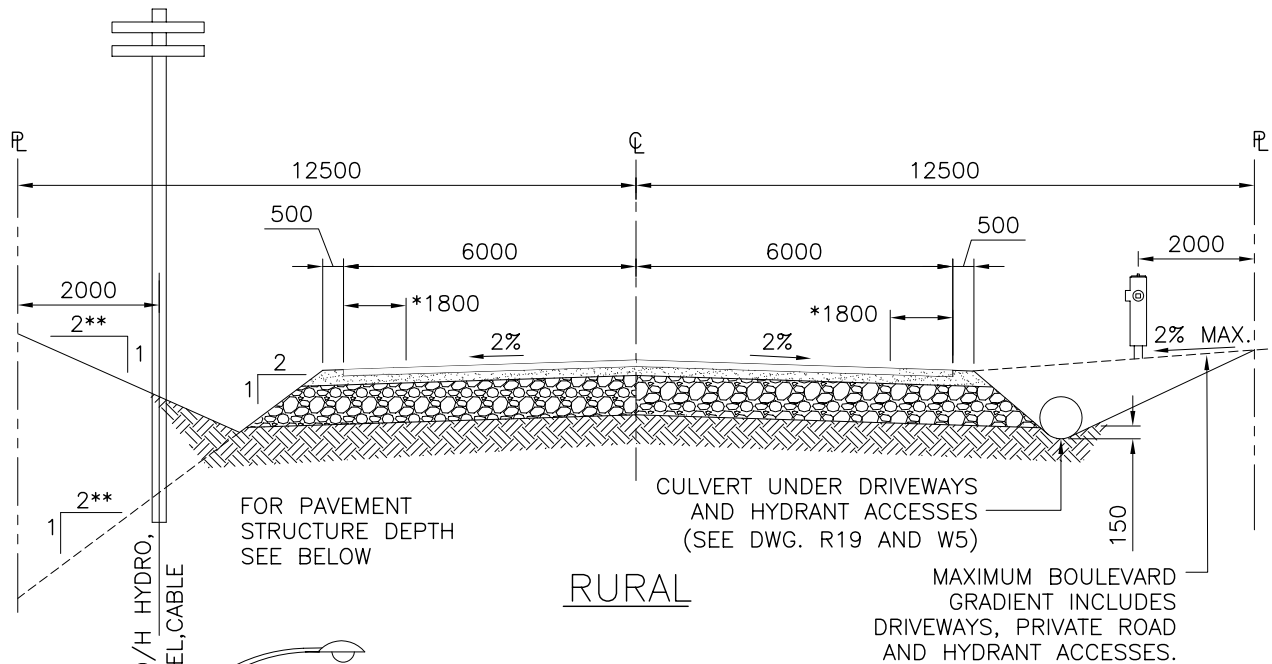
N.T.S.

DRAWING NUMBER

**R3**

# COLLECTOR (25m ROAD – 13m SURFACE)

R4



- NOTES:**
1. ROLL CURB TO BE USED IN RESIDENTIAL (SINGLE FAMILY LOTS) AREAS.
  2. SEE DWG. G2 FOR UTILITY LOCATIONS
  3. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR.

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SCALE

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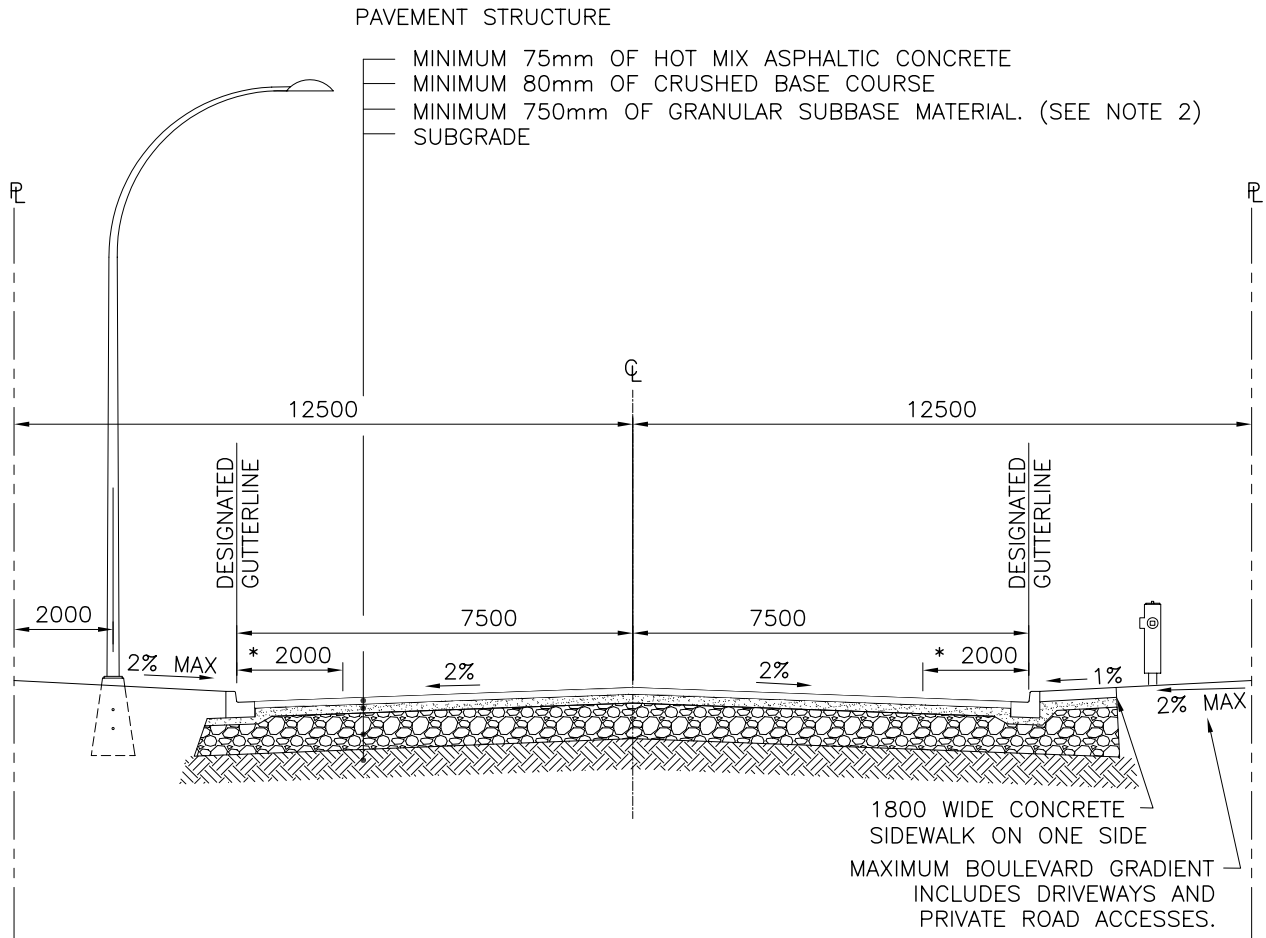
DRAWING NUMBER

**R4**

# COLLECTOR (25m ROAD – 15m SURFACE)

R5

THIS STANDARD IS PROVIDED FOR SITUATIONS WHERE AN AUXILIARY LANE IS REQUIRED (ie. LEFT TURN SLOT OR RIGHT TURN LANES)



\* BIKE LANES WHERE DESIGNATED

- NOTE:
1. SEE DWG. G2 FOR UTILITY LOCATIONS
  2. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR.
  3. AUXILIARY LANING TO BE APPROVED BY THE DIRECTOR

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SCALE

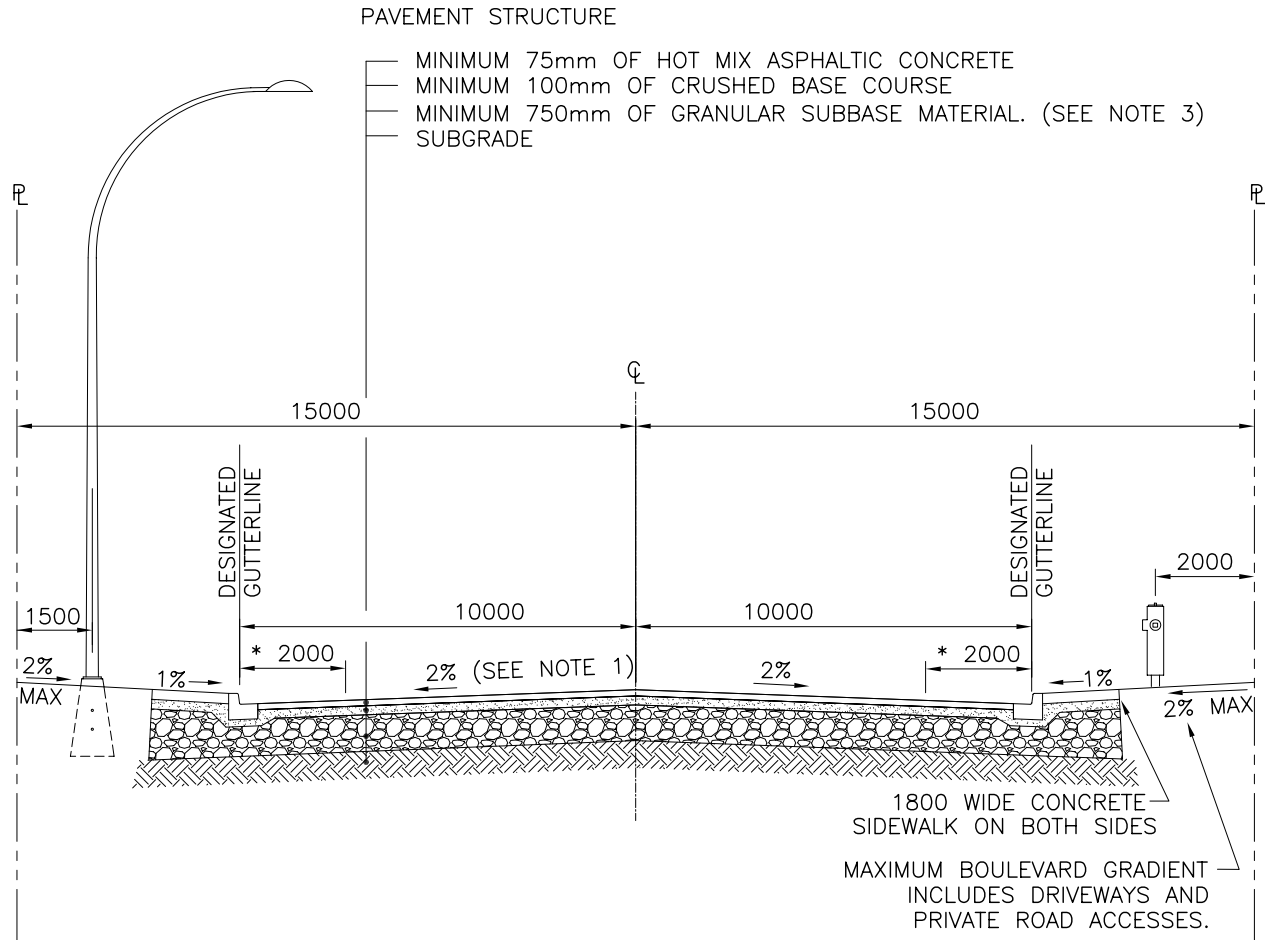
N.T.S.

DRAWING NUMBER

**R5**

# ARTERIAL UN-DIVIDED (30m ROAD)

R6



\* BIKE LANES WHERE DESIGNATED

- NOTE:
1. CROSSFALL MAY VARY WHERE SUPERELEVATION IS NEEDED.
  2. SEE DWG. G2 FOR UTILITY LOCATIONS.
  3. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR.
  4. AUXILIARY LANING TO BE APPROVED BY THE DIRECTOR

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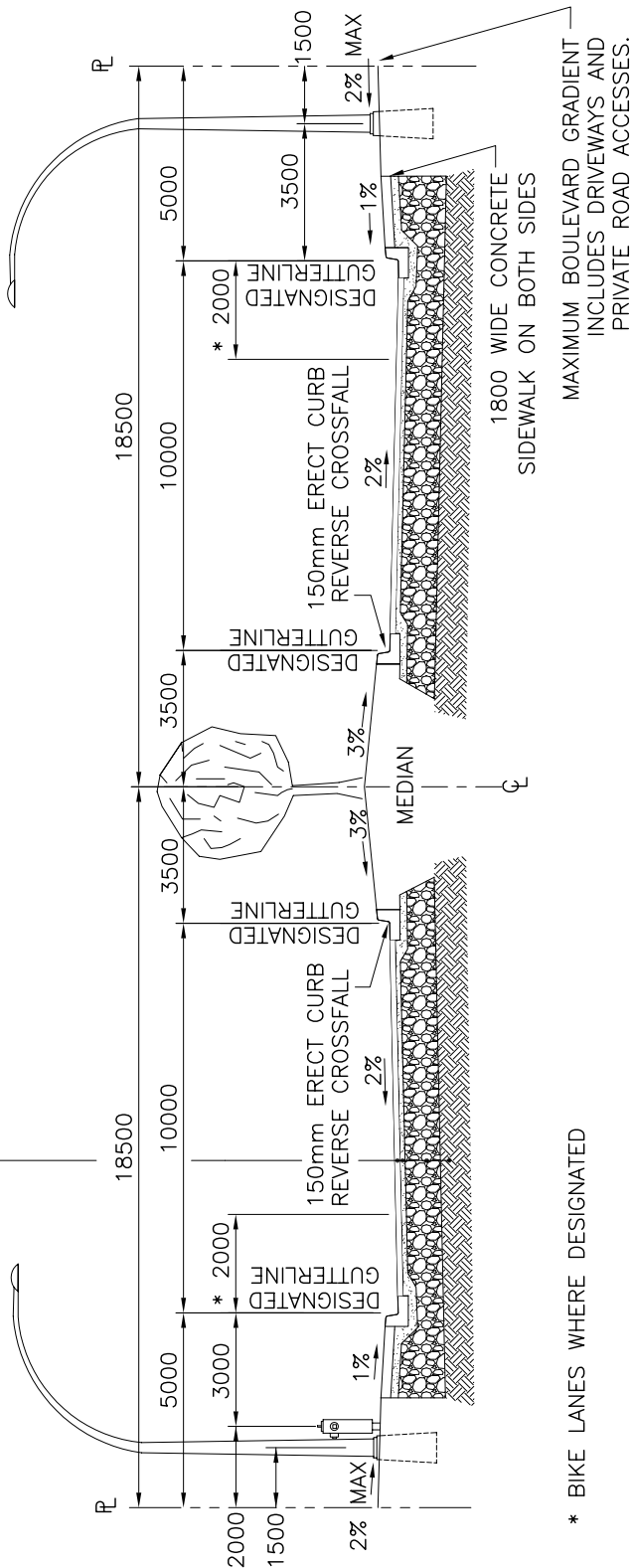
**R6**

# ARTERIAL DIVIDED (37m ROAD )

R7

## PAVEMENT STRUCTURE

- MINIMUM 75mm OF HOT MIX ASPHALTIC CONCRETE
- MINIMUM 100mm OF CRUSHED BASE COURSE
- MINIMUM 750mm OF GRANULAR SUBBASE MATERIAL. (SEE NOTE 4)
- SUBGRADE



\* BIKE LANES WHERE DESIGNATED

## NOTES:

1. ERECT 150mm CURB AND GUTTER TO BE USED.
2. WIDER SIDEWALKS MAY BE REQUIRED.
3. SEE DWG. G3 FOR UTILITY LOCATION.
4. DEPTH OF GRANULAR SUBBASE MAY BE ADJUSTED TO RECOMMENDATION OF GEOTECHNICAL ENGINEERING REPORT APPROVED BY DIRECTOR.

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SCALE

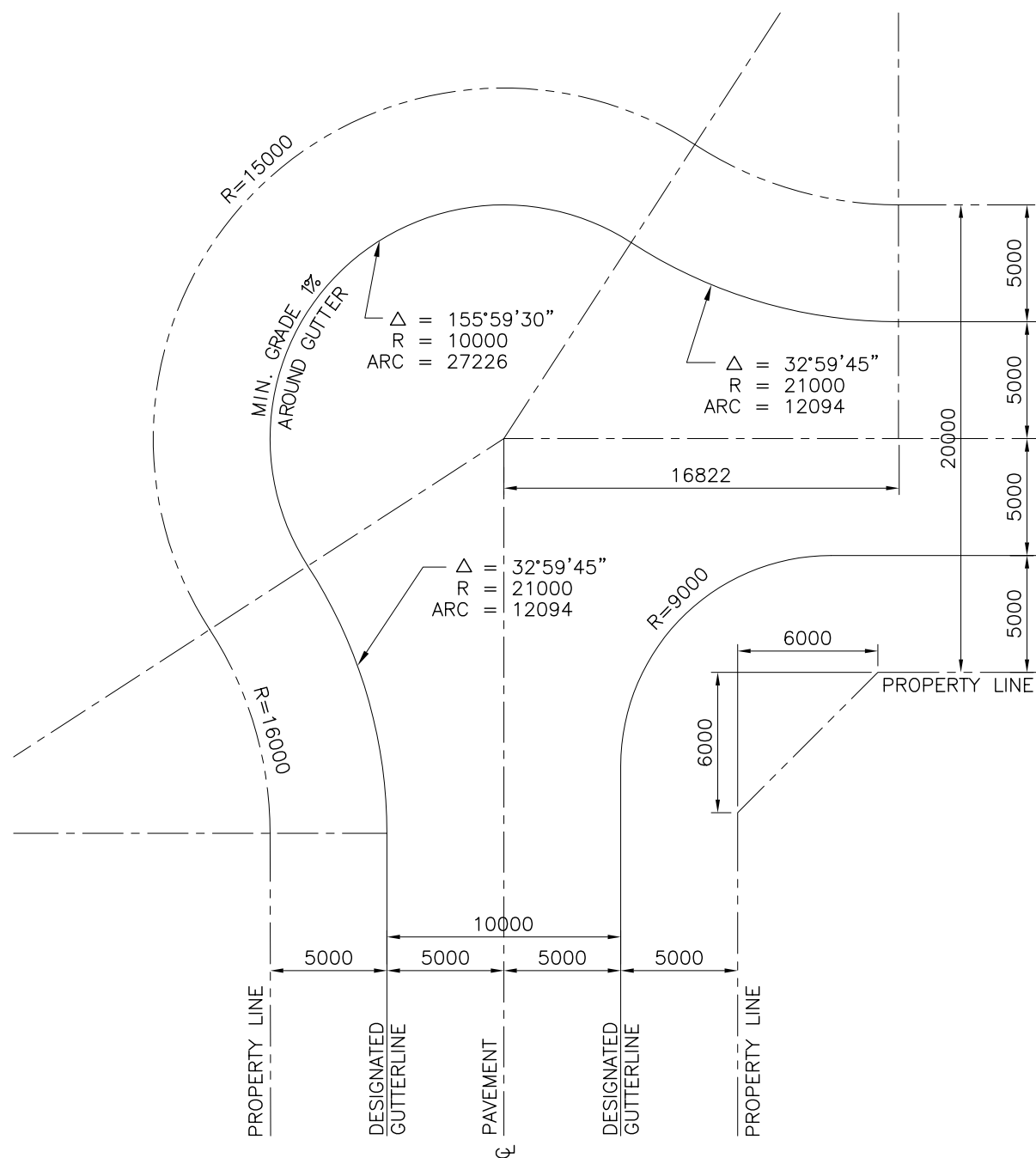
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R7



## 82



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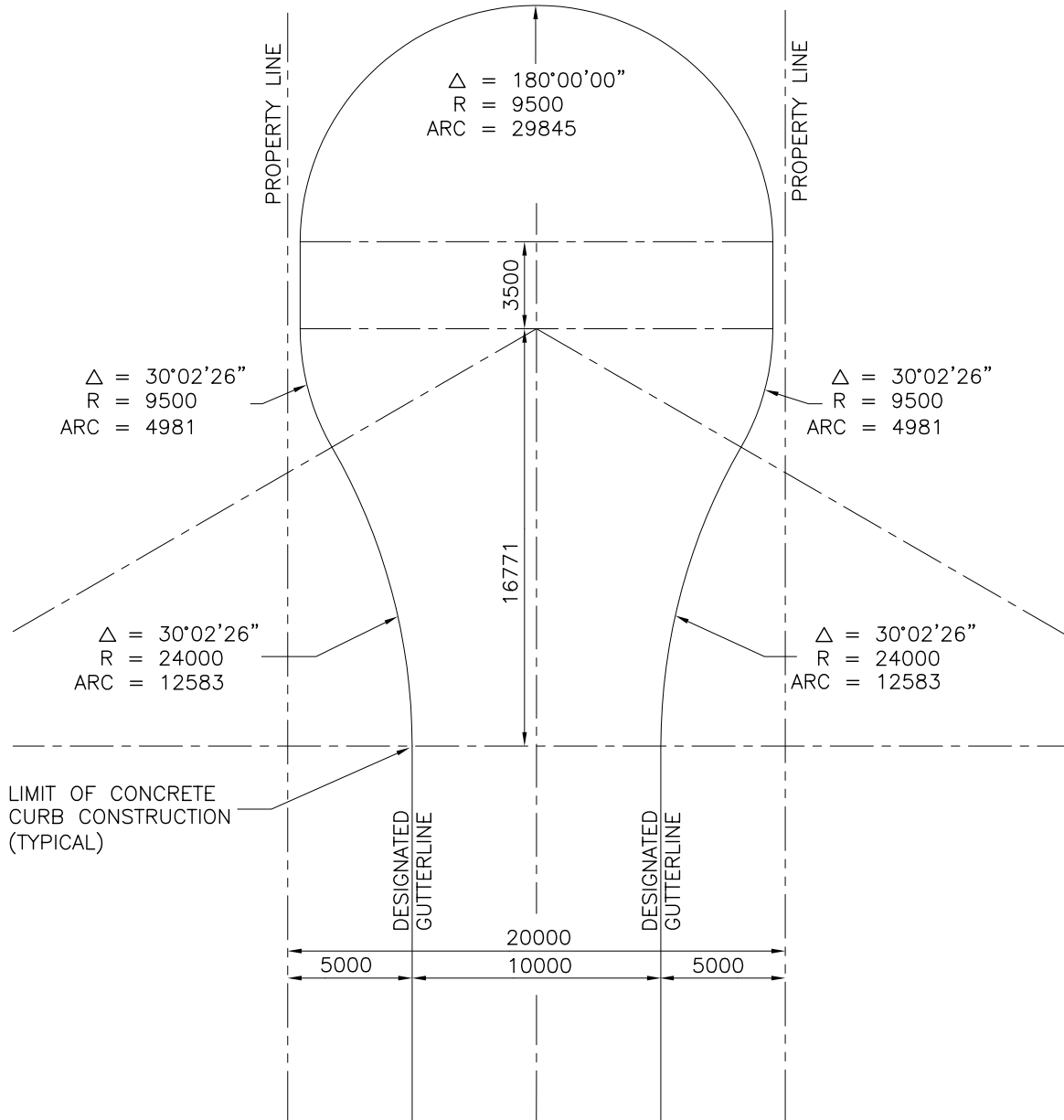
# R8



CITY OF  
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# TEMPORARY TURNAROUND (20m ROAD)

R9



NOTE: TO BE USED WHERE A ROAD WILL  
BE EXTENDED IN THE FUTURE

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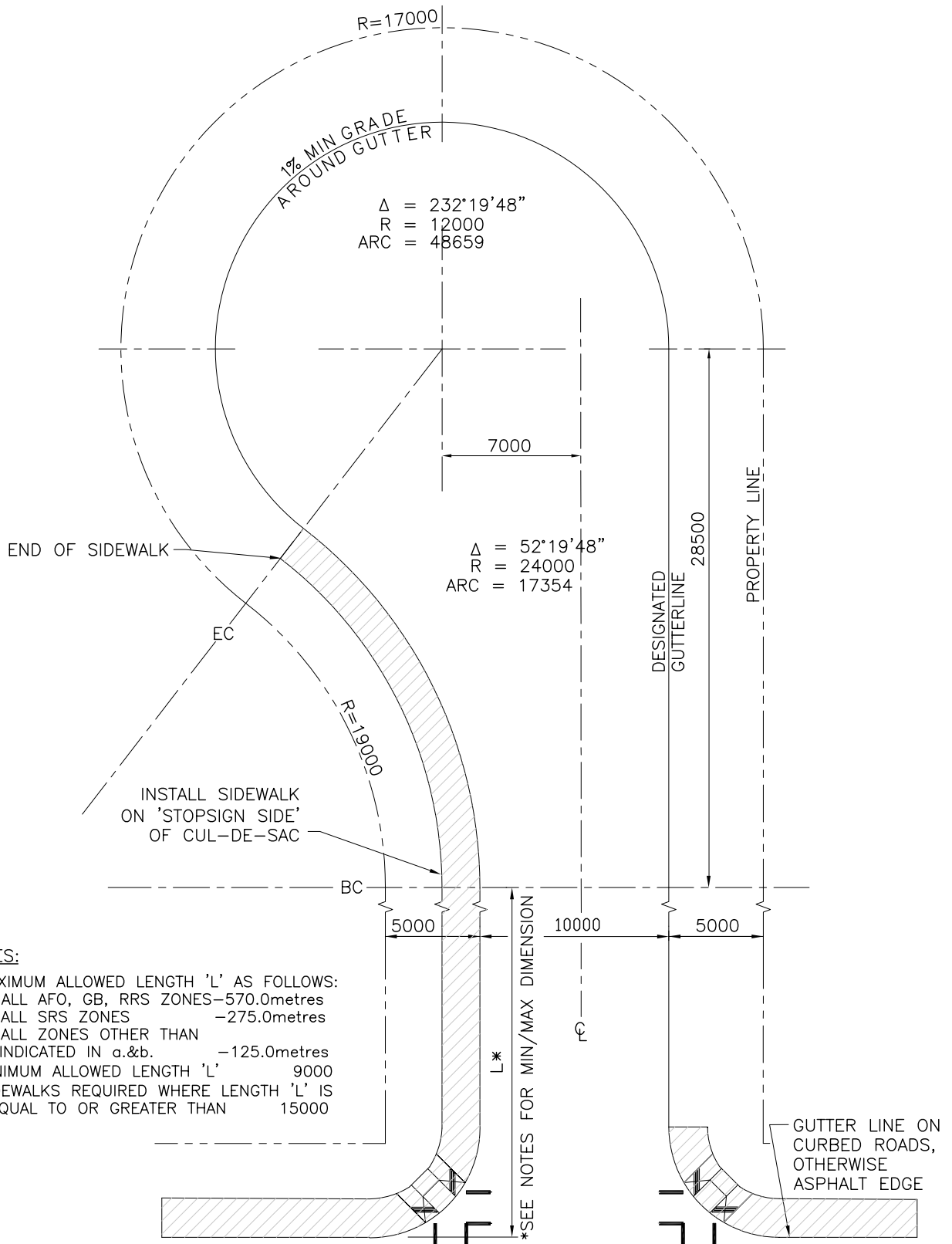
**R9**



CITY OF  
PRINCE GEORGE

# URBAN OFFSET CUL-DE-SAC

R10



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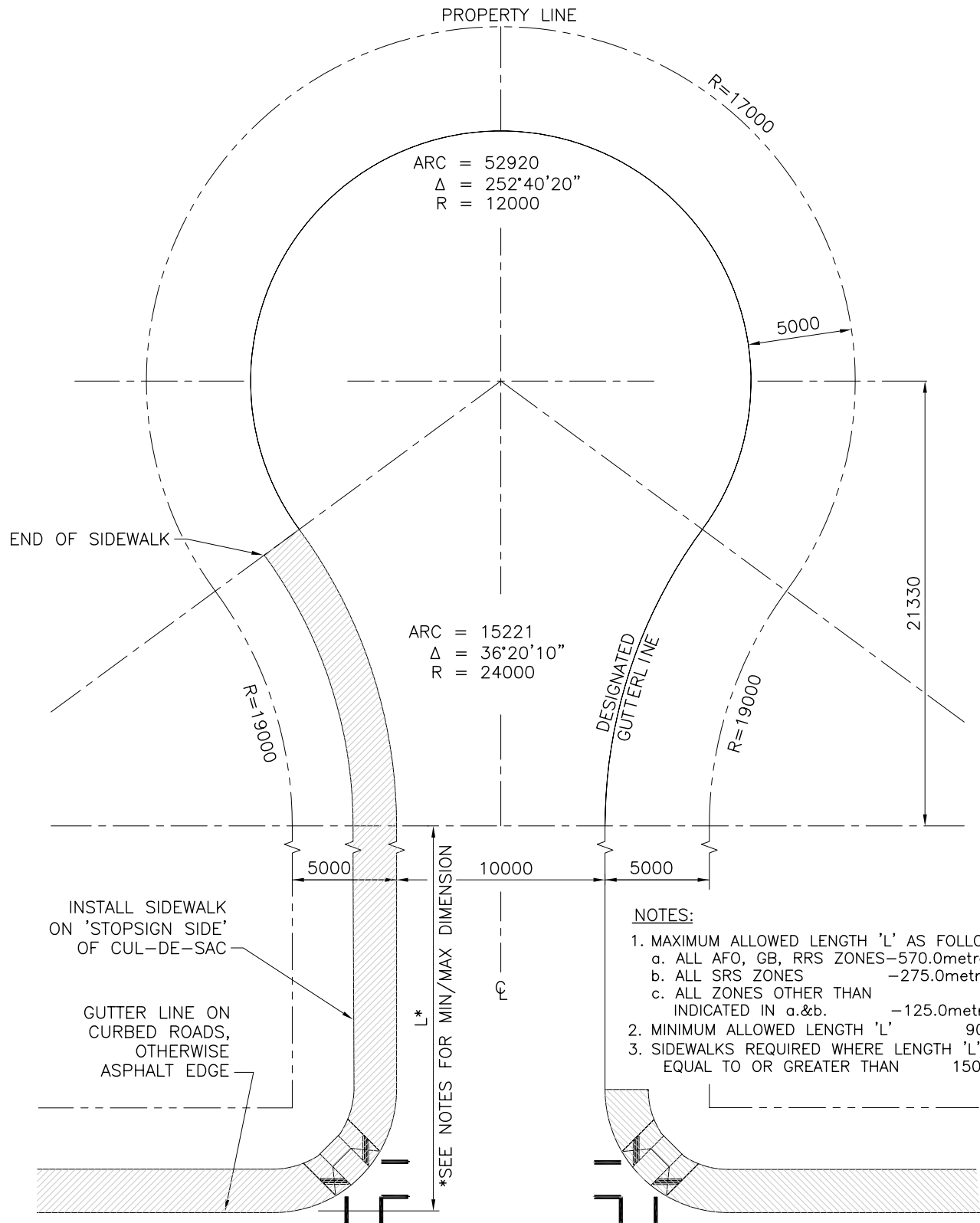
**R10**



CITY OF  
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# URBAN CUL-DE-SAC

R11



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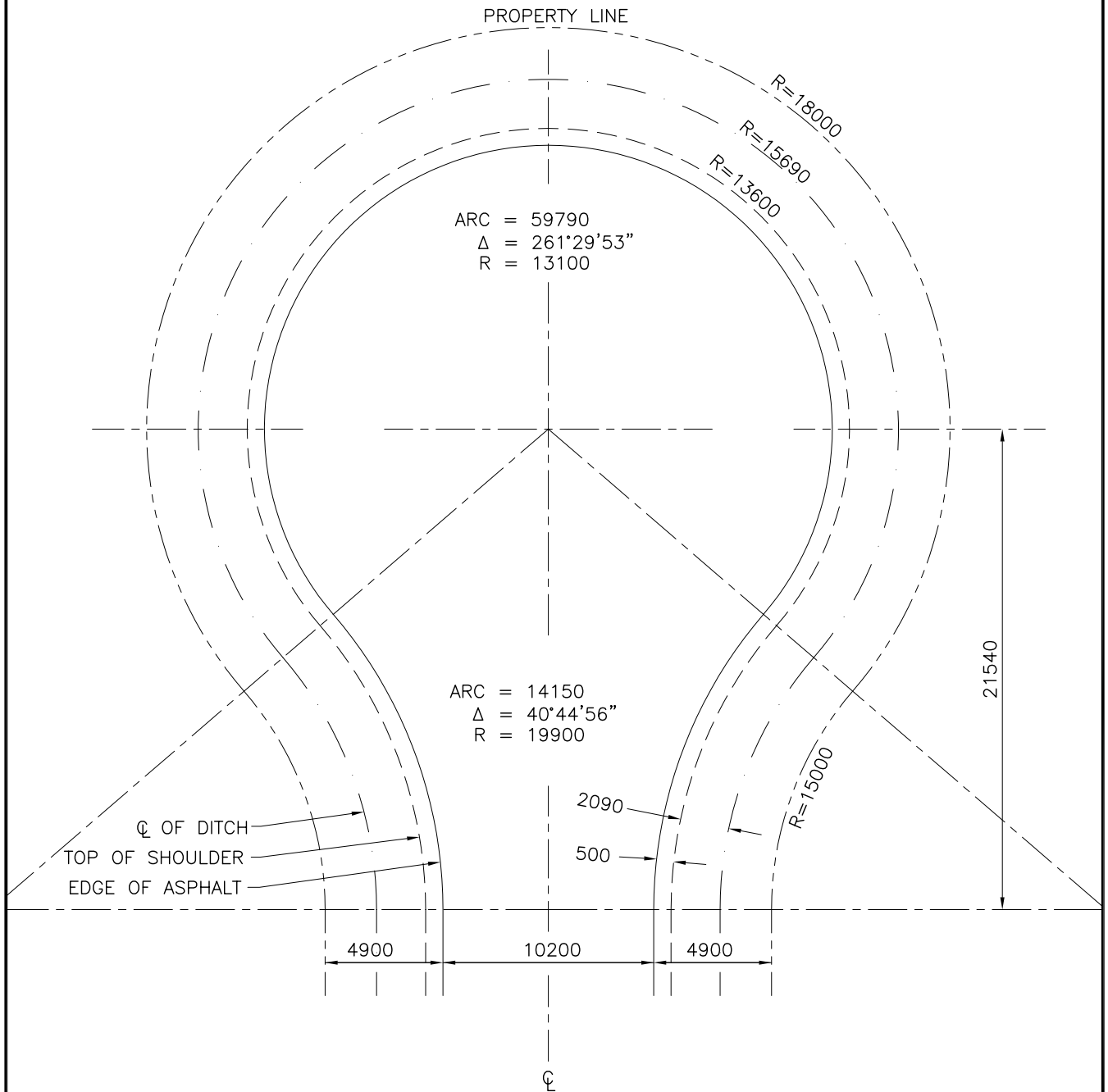
**R11**



CITY OF  
PRINCE GEORGE

# RURAL CUL-DE-SAC

R12



**NOTE:**

THIS STANDARD APPLIES ONLY TO SUBDIVISION  
DEVELOPMENT WHERE CURB AND GUTTER IS NOT  
REQUIRED

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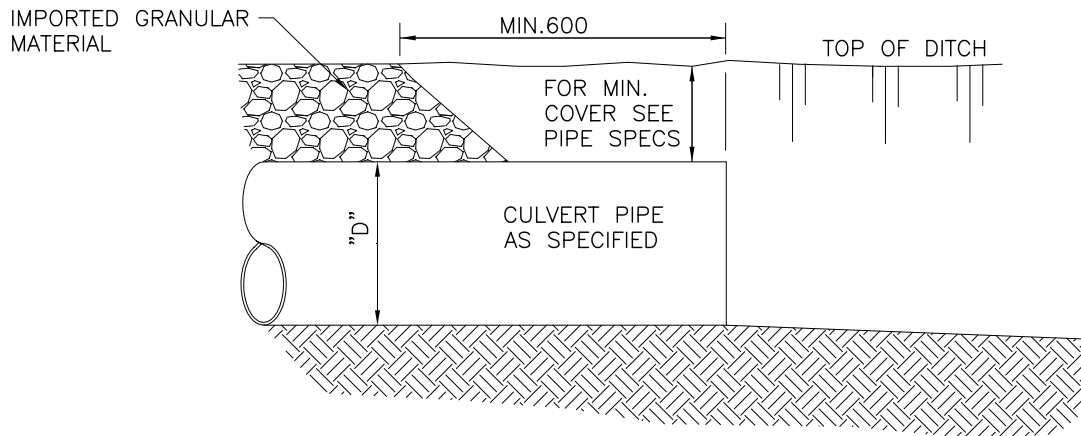
**R12**



CITY OF  
PRINCE GEORGE

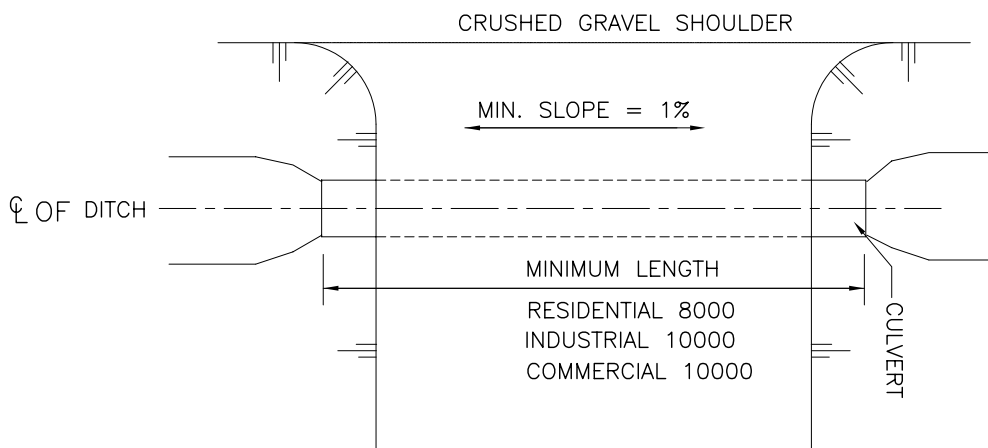
# DRIVEWAY CULVERT

R13



## SECTION

EDGE OF PAVEMENT



## PLAN VIEW

- NOTE:
1. AT THE DISCRETION OF THE CITY RIP-RAP MAY BE REQUIRED AROUND CULVERT ENDS
  2. MINIMUM PIPE DIAMETER ("D") IS 400mm

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SCALE

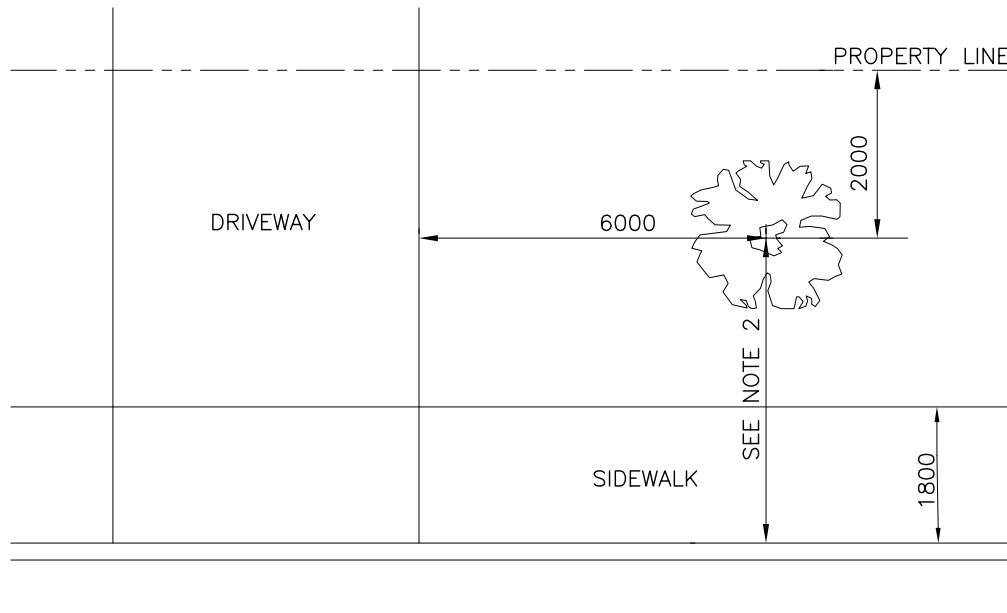
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DRAWING NUMBER

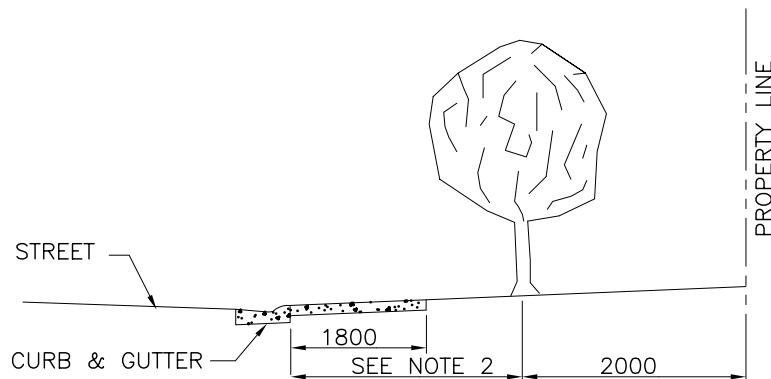
**R13**

# RECOMMENDED PLANTING OFFSET RESIDENTIAL

R14



PLAN VIEW  
(FOR ROADS HAVING BOULEVARD  
5000 OR WIDER.)



SECTION VIEW

## GUIDELINES FOR PLANTING WITHIN BLVD.

- 3.00m OFF A TRANSFORMER, KIOSK  
OR SERVICE BOX.
- 3.00m OFF NEAR EDGE OF DRIVEWAY.
- 2.50m OFF STREET LAMPS.
- 3.00m OFF HYDRANTS.
- 1.50m OFF WATER AND SEWER SERVICE
- 1.25m OFF GAS SERVICE.
- 1.25m OFF BURIED CABLES.

NOTE:

1. CONTACT THE CITY OF PRINCE GEORGE  
FOR A CURRENT LIST OF SPECIES.
2. 3000 FOR 5000 WIDE BOULEVARD  
4000 FOR 6000 WIDE BOULEVARD

## CHOICE OF TREE TYPES:

MAY BE SUBJECT TO DESIRABILITY OF  
CONTINUITY OF TYPES ON ANY ONE STREET

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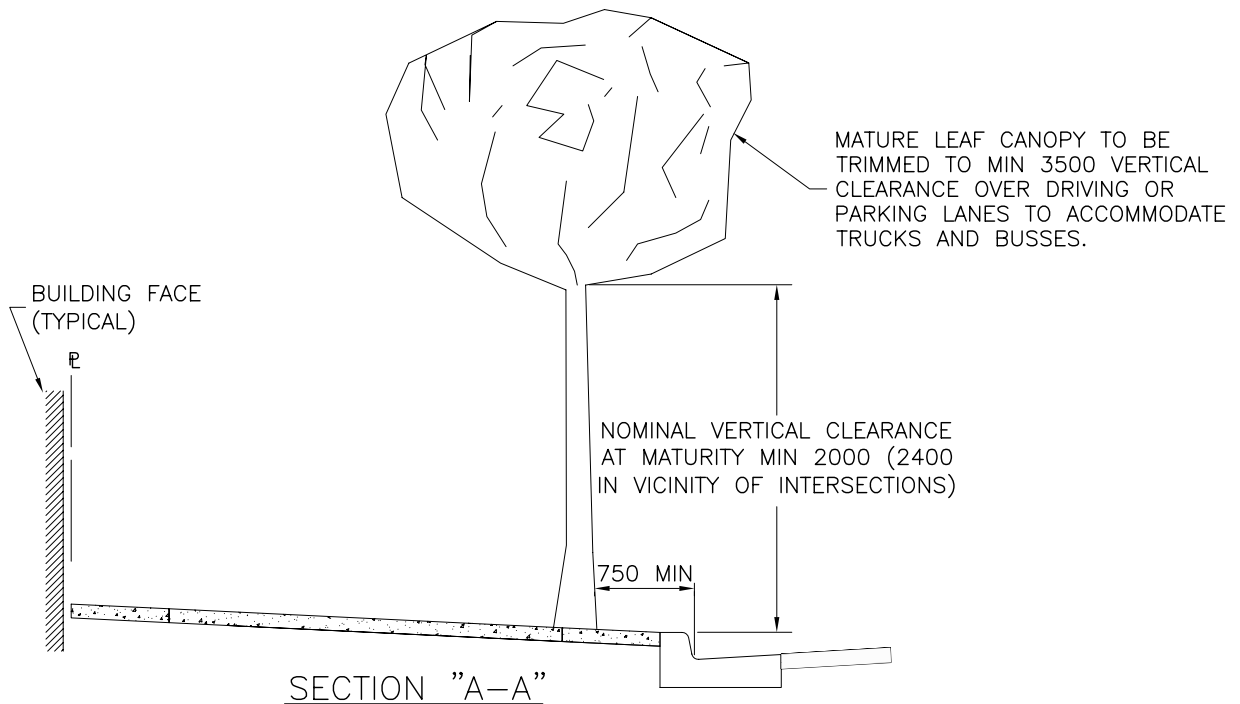
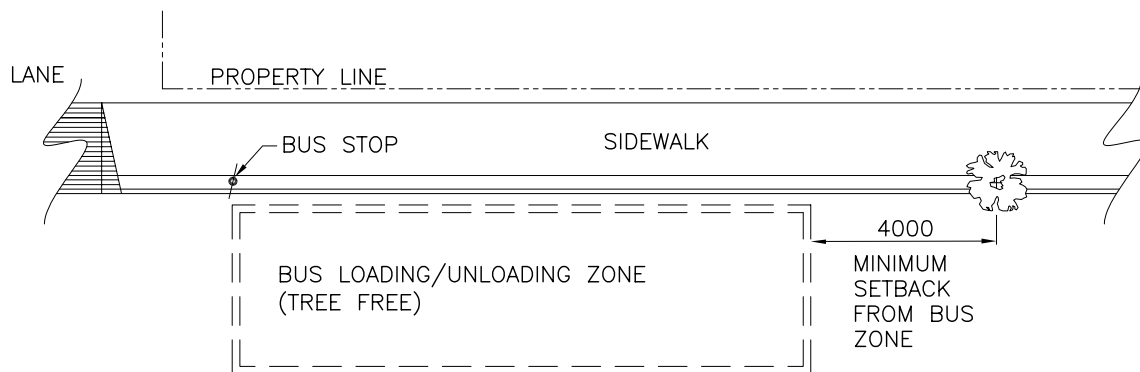
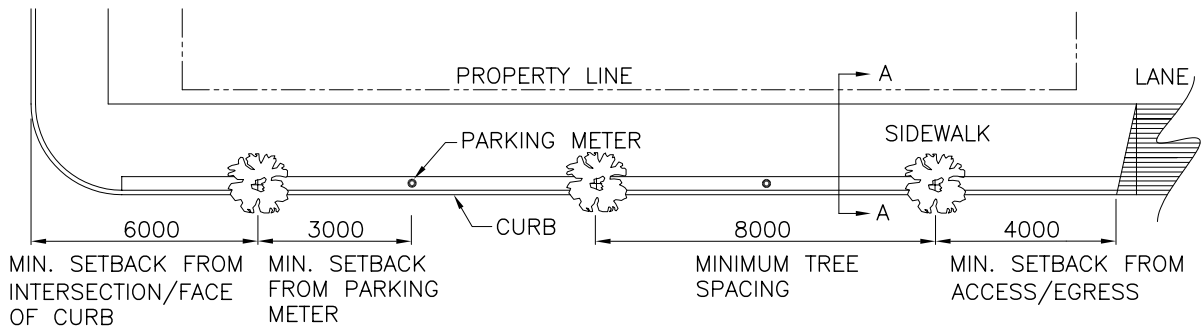
**R14**



CITY OF  
PRINCE GEORGE

# RECOMMENDED PLANTING OFFSET DOWNTOWN

R15



**NOTE:**

1. REFER TO DRAWING C15 FOR TREE GRATE DETAILS.
2. REFER TO CITY OF PRINCE GEORGE FOR CURRENT LIST OF SPECIES AND SPECIFICATIONS.

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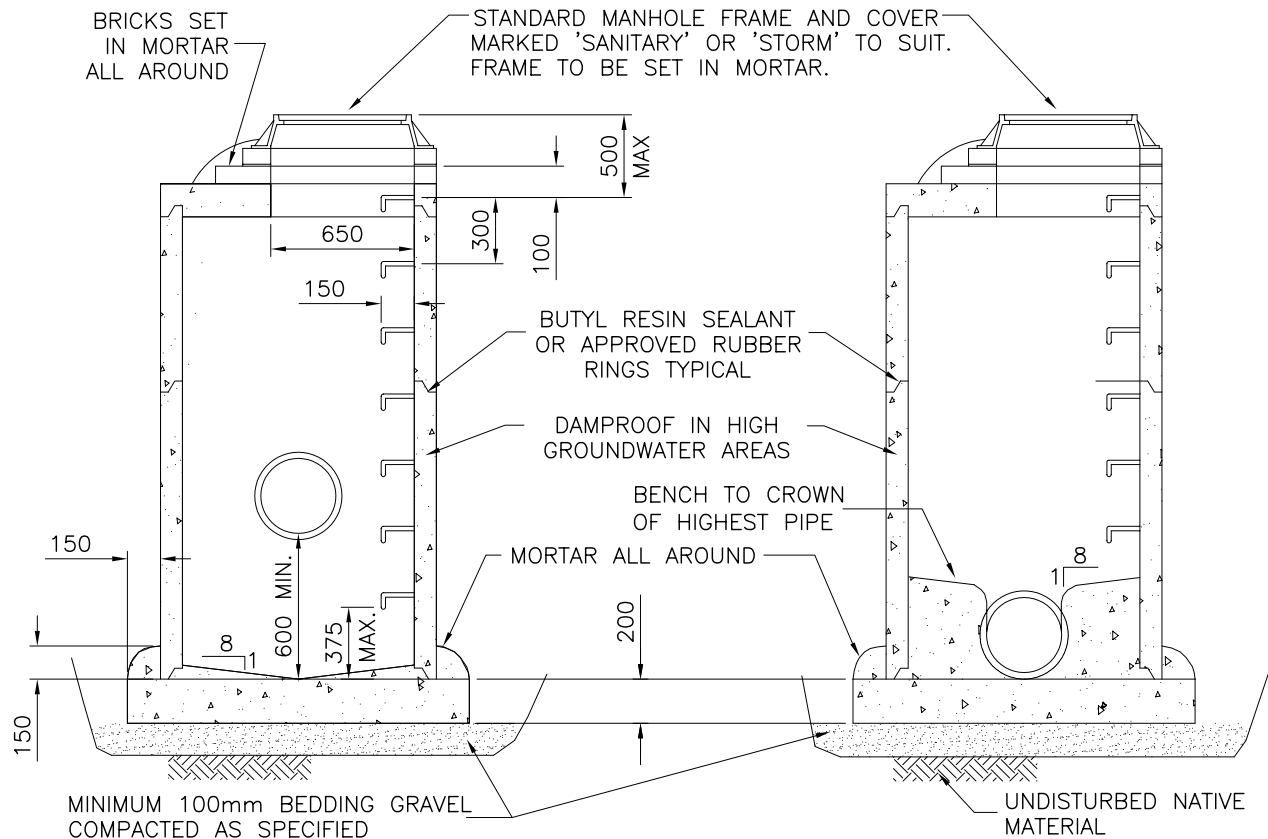
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**R15**

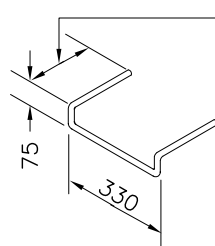
# MANHOLE FOR 200mm – 450mm PIPES

S1

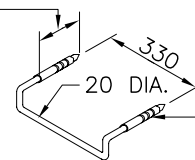


MANHOLE WITH SUMP

STANDARD 1050mm  
DIAMETER MANHOLE



TO SUIT LOAD AND  
MANUFACTURING  
REQUIREMENTS



INSERT TO BE  
CAST WITH PIPE

GALVANIZED LADDER RUNG  
TO BE CAST WITH PIPE

GALVANIZED OR ALUMINUM  
LADDER RUNG

NOTES:

1. DETAILS ARE DRAWN FOR PRECAST RISERS ON CAST-IN-PLACE BASE. PRECAST BASES APPROVED BY DIRECTOR ARE ACCEPTABLE.
2. MAXIMUM DEPTH TO FIRST RUNG IS 500mm. WHEN HANDHOLD IS INSTALLED BETWEEN TOP AND FIRST RUNG, MAXIMUM DEPTH MAY BE INCREASED TO 660mm.
3. REFER TO DWG. S4 FOR CONNECTION DETAILS.
4. REFER TO SECTION 02631 OF STANDARD SPECIFICATIONS.
5. FIELD INSTALLATION OF LADDER RUNGS NOT ALLOWED UNLESS APPROVED BY DIRECTOR.

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**S1**

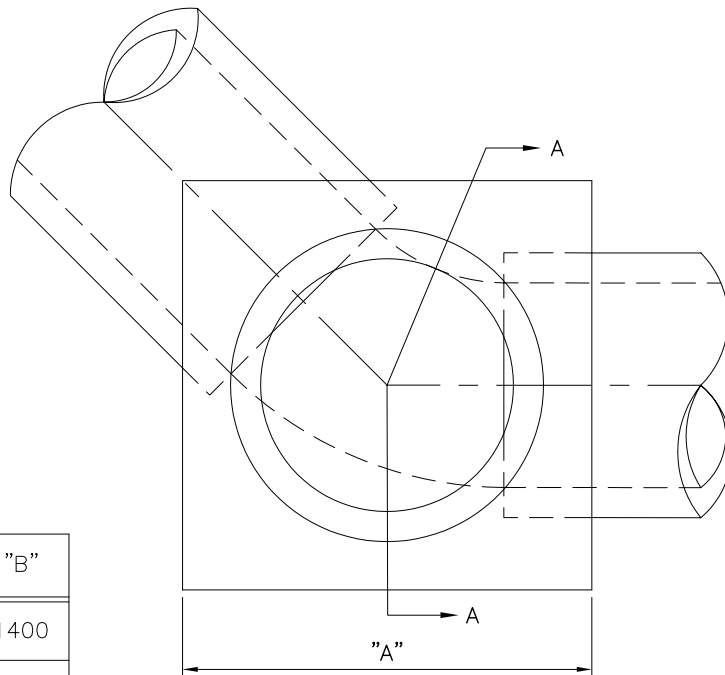


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# MANHOLE FOR 525mm – 1050mm PIPES

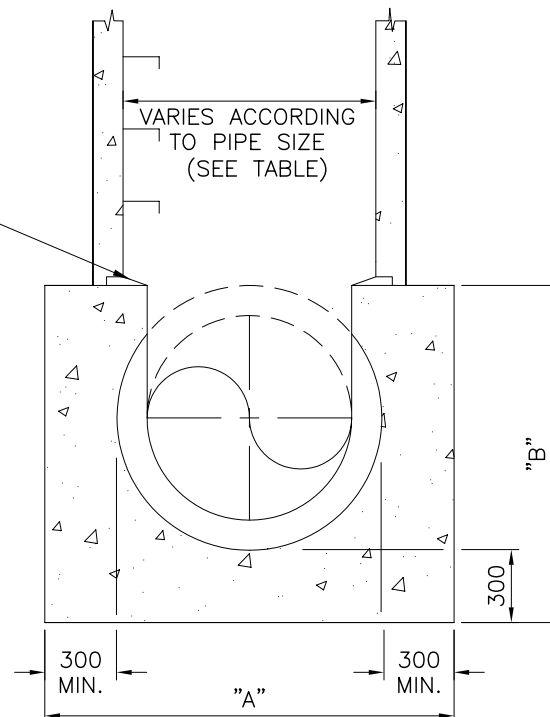
S2

| PIPE<br>DIAMETER | MANHOLE<br>SIZE | "A"  | "B"  |
|------------------|-----------------|------|------|
| 525–600          | 1200            | 1700 | 1400 |
| 675–750          | 1350            | 1700 | 1400 |
| 900–1050         | 1500            | 1900 | 1600 |



PLAN

SAND AND CEMENT  
MORTAR BENCHING  
1:10 SLOPE



SECTION A-A

**NOTE:**

1. REFER TO SECTION 02631 OF STANDARD SPECIFICATIONS.
2. CORRUGATED STEEL RISERS MAY BE USED IN PLACE OF CONCRETE BARRELS WHEN APPROVED BY DIRECTOR.

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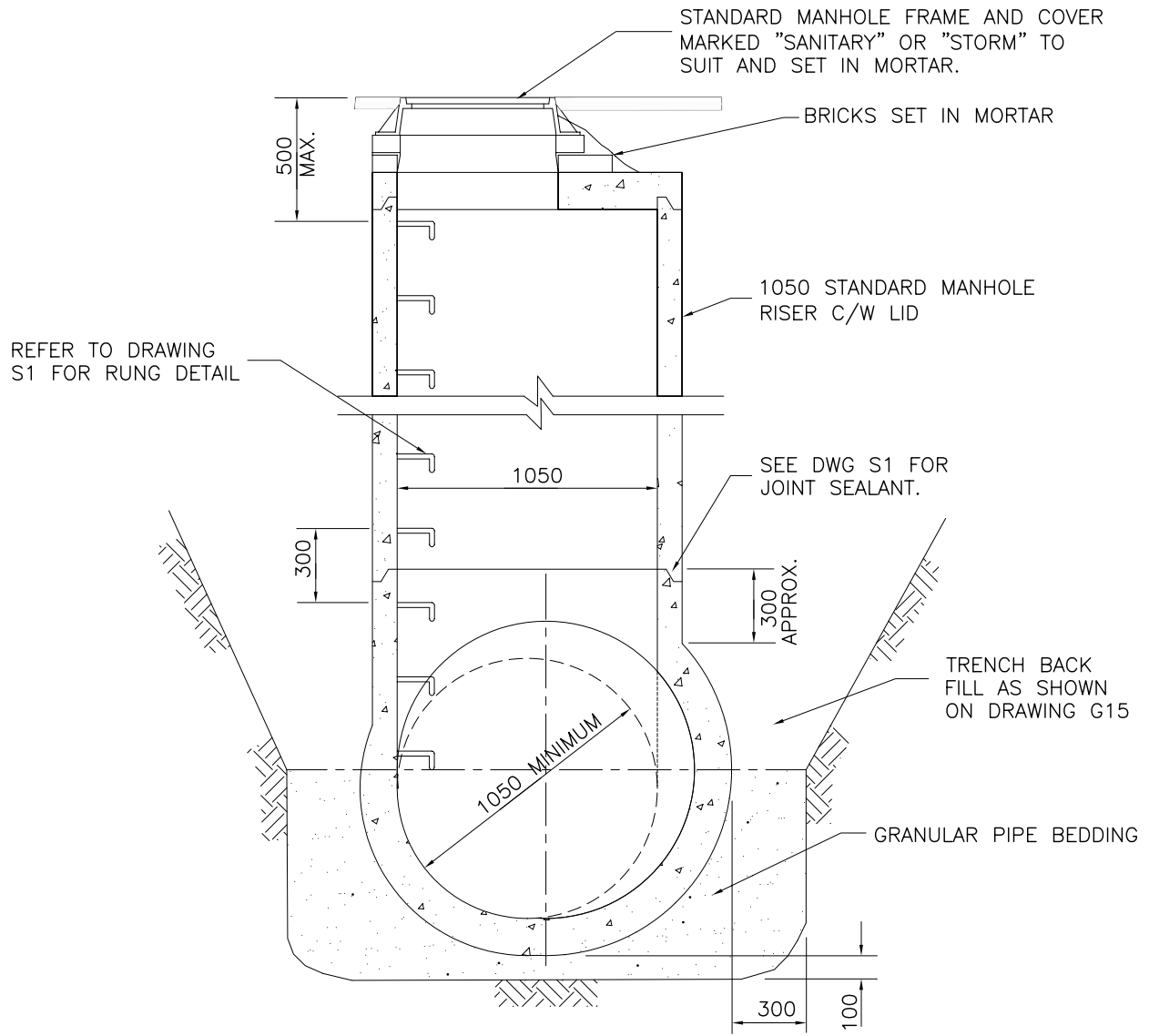
**S2**



CITY OF  
PRINCE GEORGE

# PRECAST RISER MANHOLE 1200mm AND GREATER PIPES

S3



ELEVATION

- NOTE:
1. PRECAST RISER MANHOLE SUBJECT TO DIRECTORS APPROVAL.
  2. MAXIMUM DEPTH TO FIRST RUNG IS 500mm. WHEN HANDHOLD IS INSTALLED BETWEEN TOP AND FIRST RUNG, MAXIMUM DEPTH MAY BE INCREASED TO 660mm.
  3. REFER TO SECTION 02631 OF STANDARD SPECIFICATIONS.

2004

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SCALE

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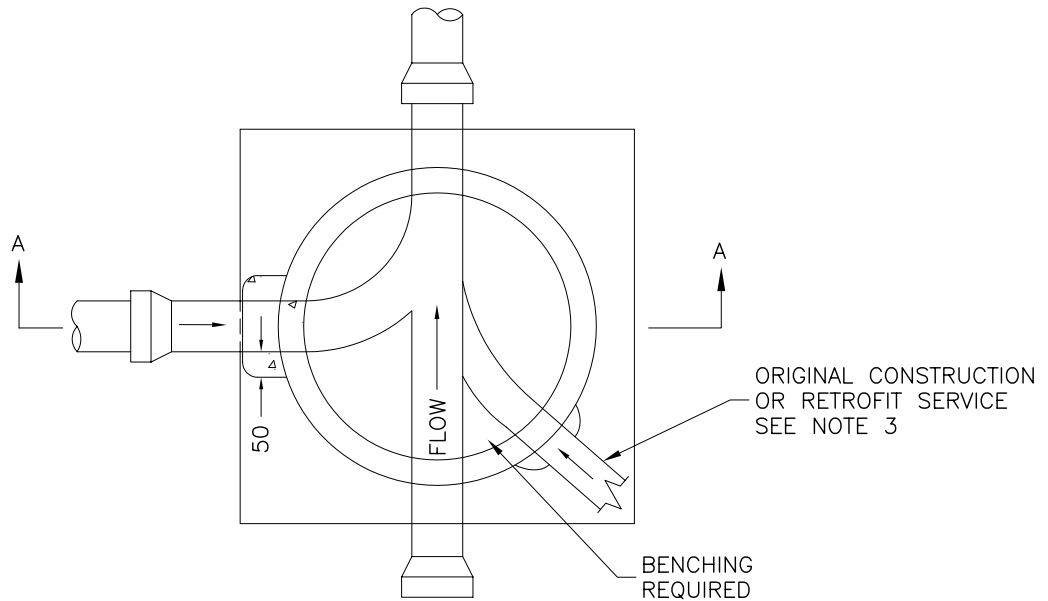
**S3**



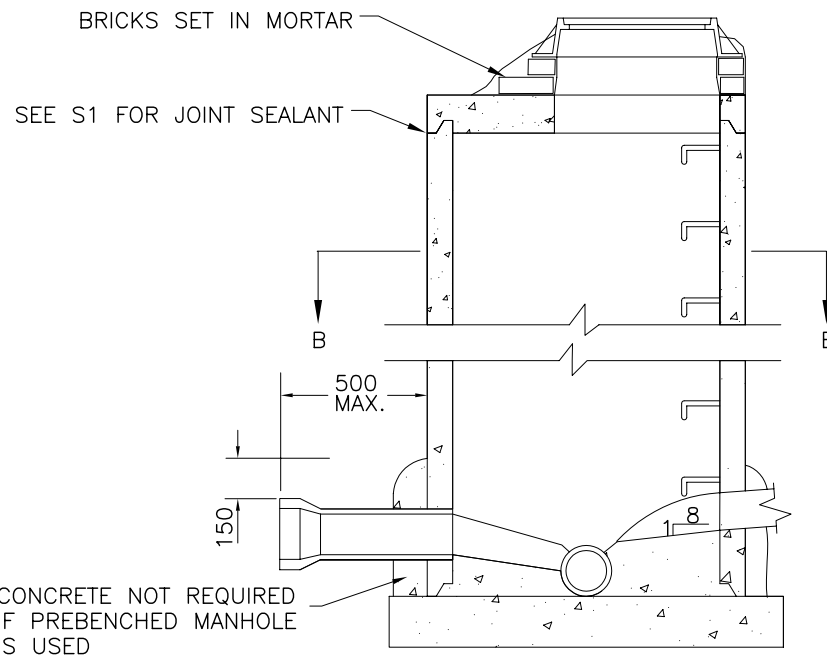
CITY OF  
PRINCE GEORGE

# MANHOLE CONSTRUCTION

S4



SECTION B-B



SECTION A-A

- NOTE:
1. THIS DRAWING SHOWS CONNECTION DETAILS ONLY. REFER TO DRAWINGS S1 TO S3 FOR ADDITIONAL DETAILS PERTAINING TO MANHOLE REQUIREMENTS AND INSTALLATION.
  2. REFER TO CONTRACT DRAWINGS AND SECTION 02631 FOR DETAILED SPECIFICATIONS.
  3. MULTIPLE SERVICES ARE PERMITTED TO BE PUT IN UNDER THE FOLLOWING CONDITIONS:  
-BENCHING IS PUT IN, FLOW IS DIRECTED TO THE STREAM FLOW.

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SCALE

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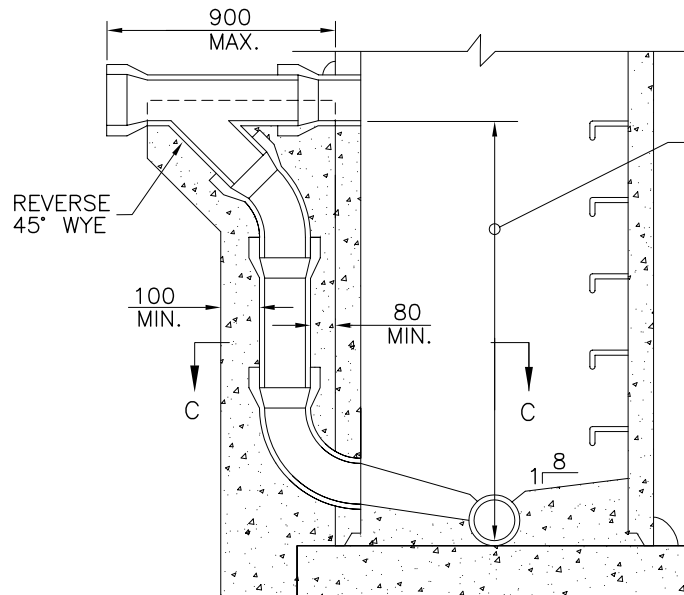
**S4**



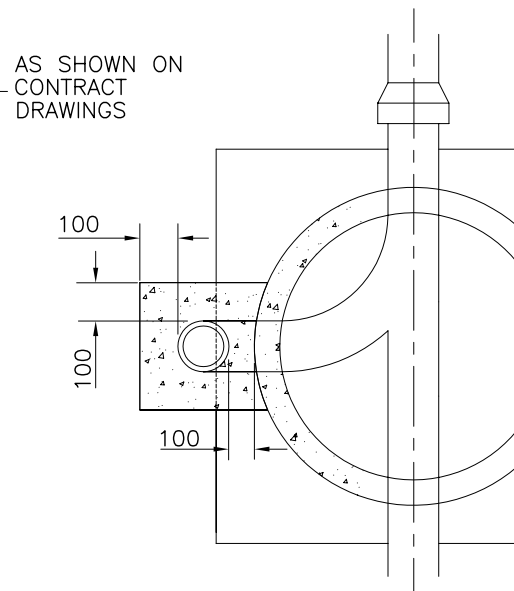
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# MANHOLE CONNECTION -DROP & RAMP TYPE

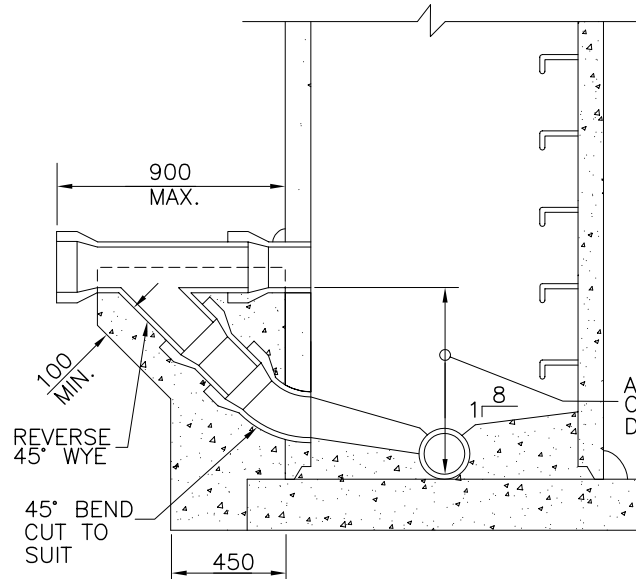
S5



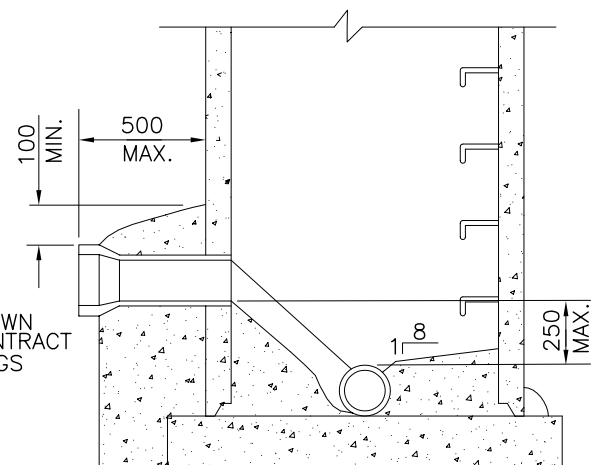
OUTSIDE DROP TYPE



SECTION C-C



OUTSIDE RAMP TYPE



INSIDE RAMP TYPE

## NOTES:

1. THIS DRAWING SHOWS CONNECTION DETAILS ONLY, REFER TO DRAWINGS S1 TO S4 FOR ADDITIONAL DETAILS PERTAINING TO MANHOLE REQUIREMENTS AND INSTALLATION.
2. REFER TO SECTION 02631 OF STANDARD SPECIFICATIONS.

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SCALE

N.T.S.

DRAWING NUMBER

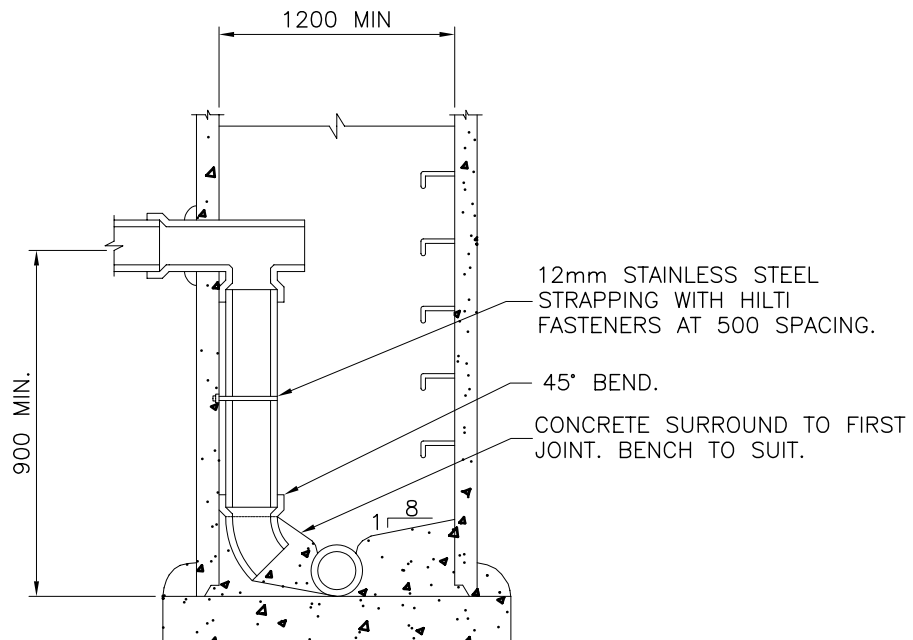
**S5**



CITY OF  
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# INSIDE DROP MANHOLE

S6



## INSIDE DROP TYPE

- NOTES:
1. INSIDE DROP TO BE USED ONLY WHERE SPECIFIED OR APPROVED BY DIRECTOR.
  2. ALL INSIDE PIPE AND FITTINGS PVC DR 28/35.
  3. THIS MANHOLE SHOWS INSIDE DROP ONLY. SEE DRAWING S1 FOR ADDITIONAL DETAILS PERTAINING TO MANHOLE REQUIREMENTS.
  4. REFER TO SECTION 02631 OF STANDARD SPECIFICATIONS.

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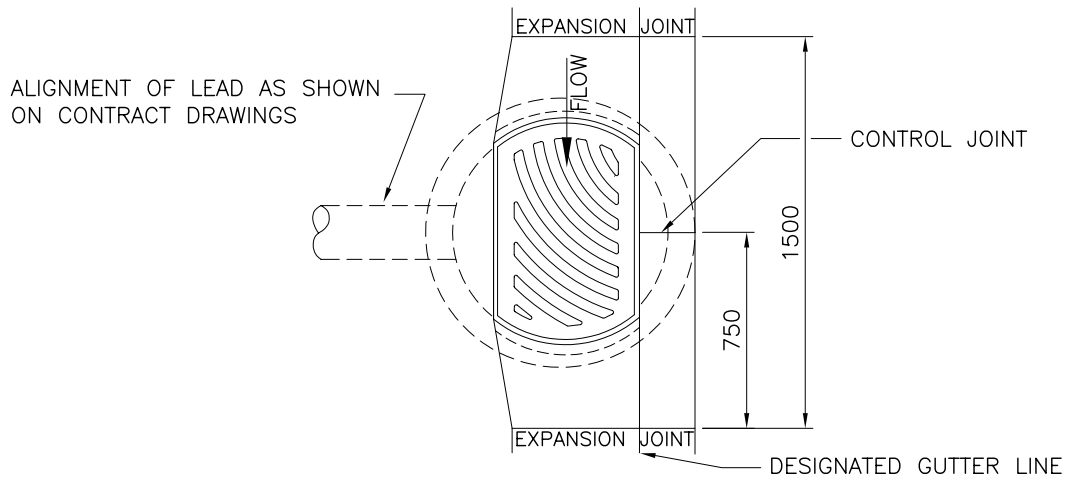
**S6**



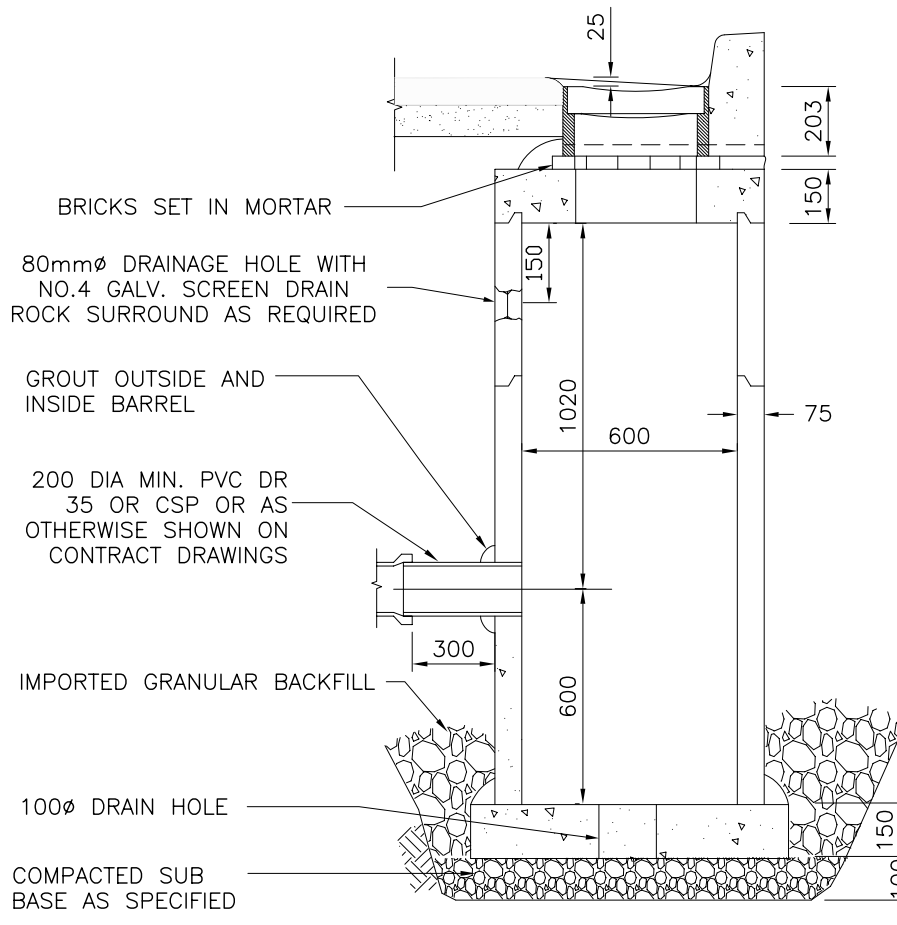
CITY OF  
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# TOP INLET CATCHBASIN – CONCRETE

S7



## FRAME AND COVER DETAILS



## STANDARD CATCHBASIN

- NOTE:**
1. REFER TO CONTRACT DRAWINGS AND SECTION 02631 FOR DETAILED SPECIFICATIONS.
  2. SEE DWG C4 FOR GUTTER DETAILS.
  3. PRECAST CONCRETE BASE UNIT IS ACCEPTABLE.

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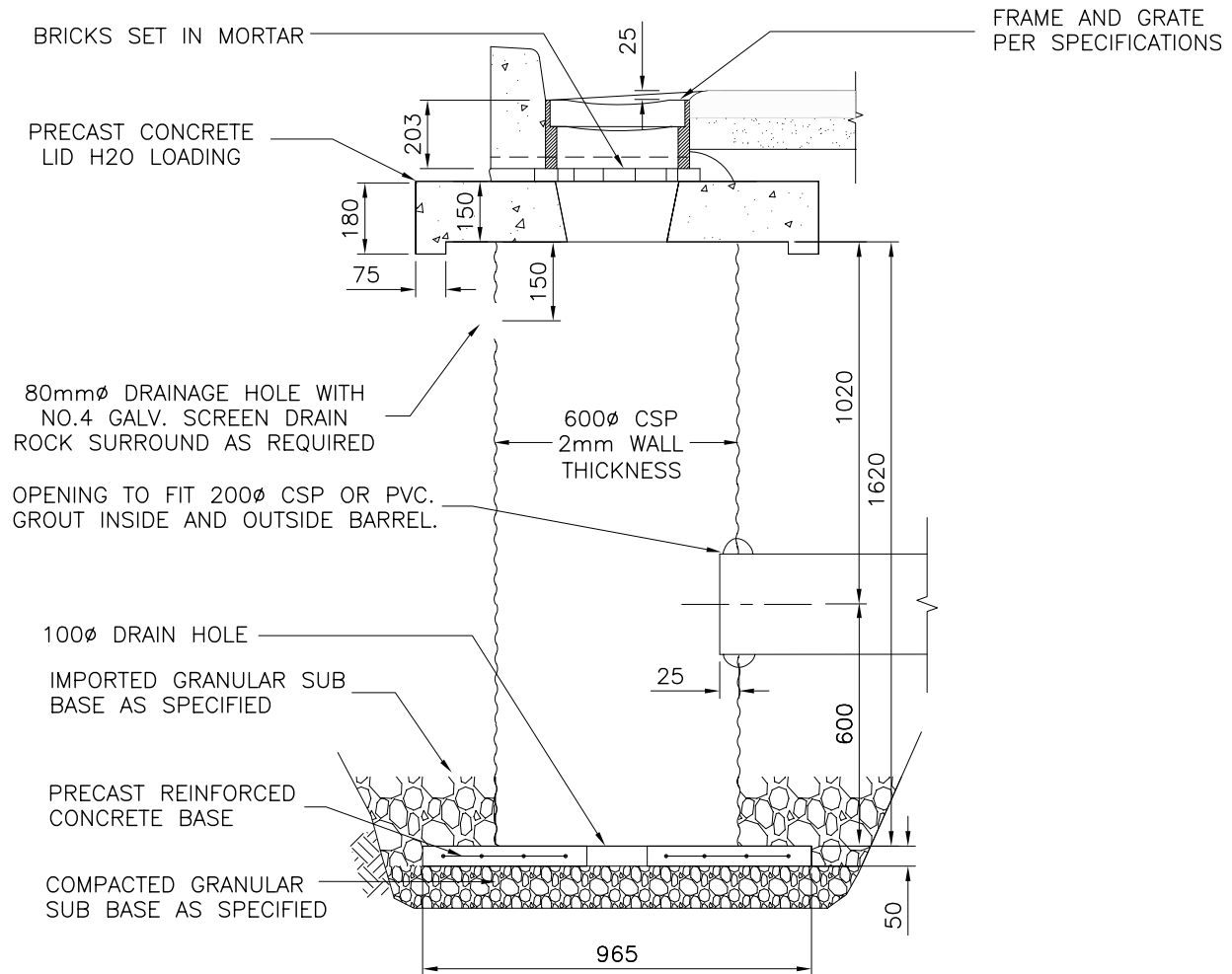
**S7**



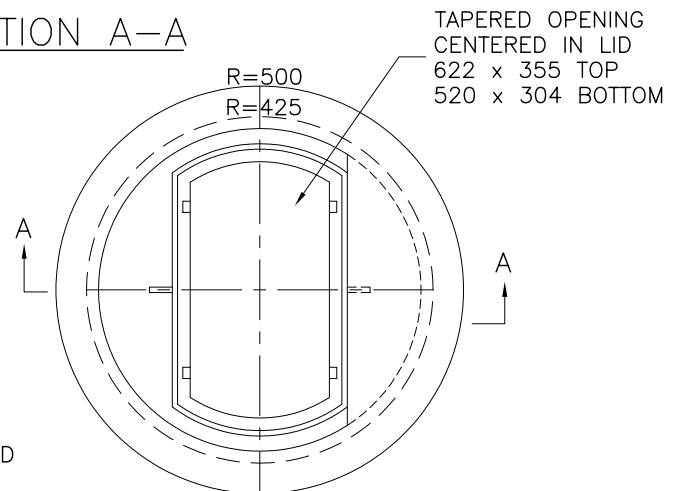
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# CIRCULAR CORRUGATED CATCH BASIN

S8



SECTION A-A



TOP VIEW

## NOTES:

1. CORRUGATED STEEL PIPE TO BE GALVANIZED AND ASPHALT DIPPED AFTER HOLES CUT.
2. CATCH BASIN LEADS TO BE GROUTED INTO BARREL.
3. CATCH BASIN BARREL MAY BE INVERTED (FLIPPED) WHERE NOTED TO OBTAIN MAXIMUM POSSIBLE GRADE ON THE LEAD.
4. SEE DWG C4 FOR GUTTER AND FRAME DETAILS.

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DRAWING NUMBER

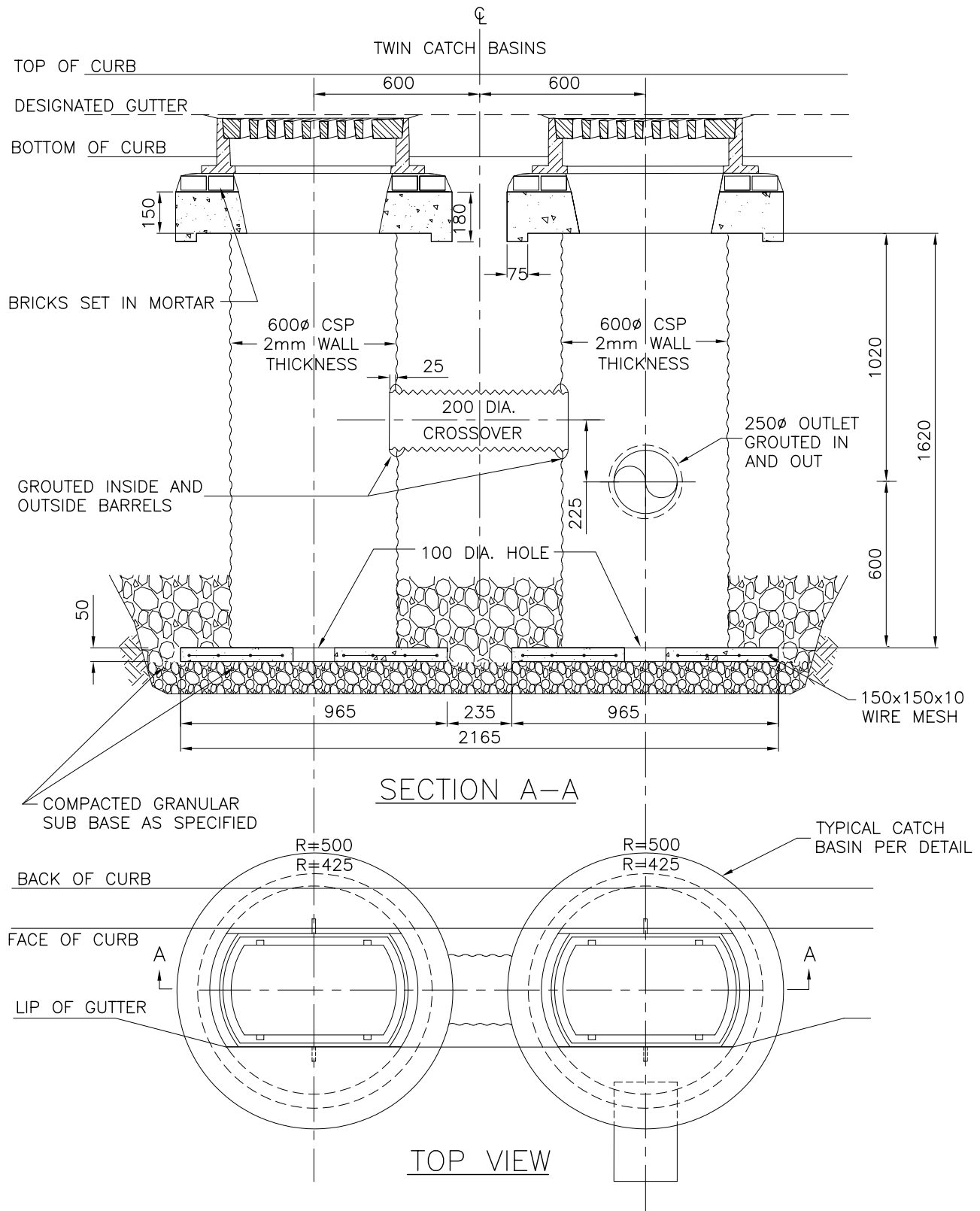
S8



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# CIRCULAR TWIN CATCH BASINS

S9



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SCALE

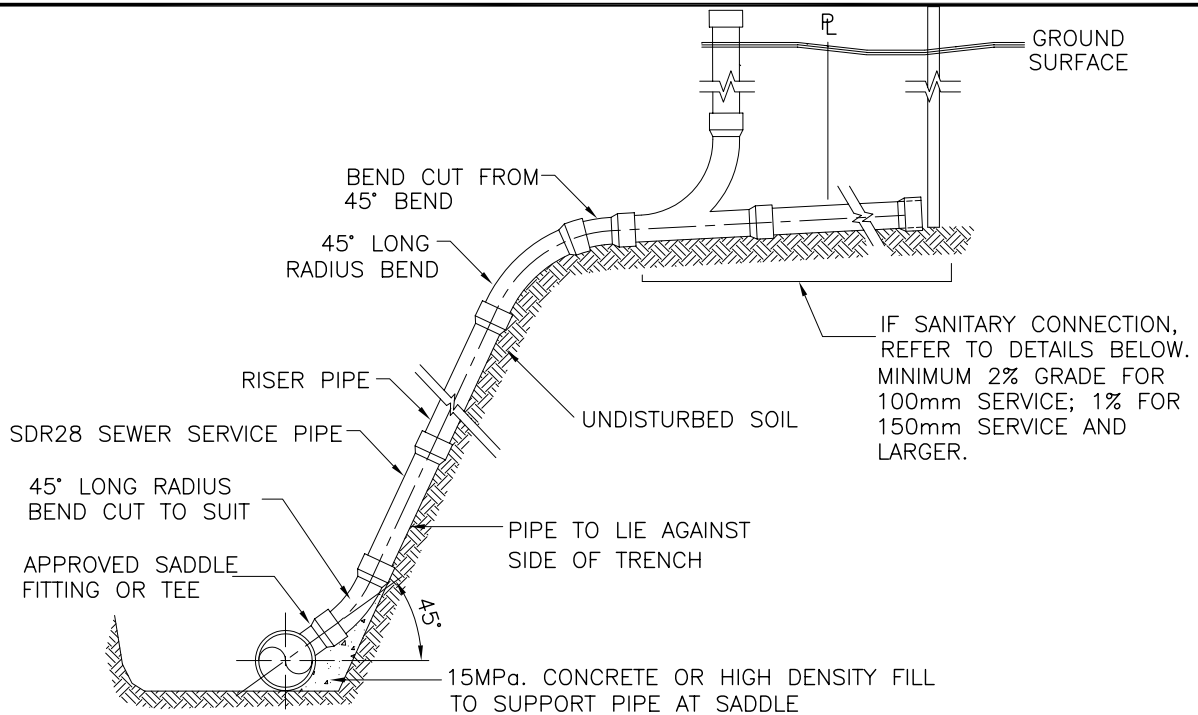
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DRAWING NUMBER

S9

# SANITARY AND STORM SEWER SERVICE CONNECTION

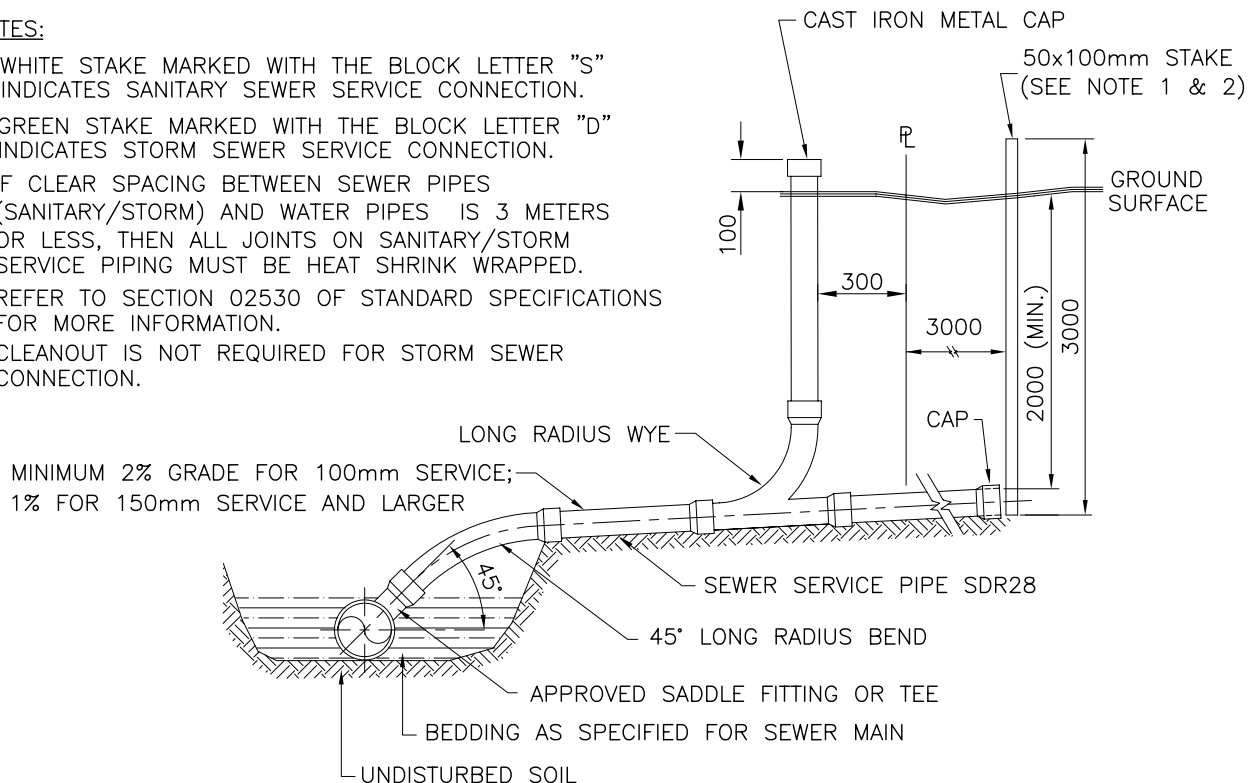
**S10**



## DEEP RISER TYPE SERVICE

### NOTES:

1. WHITE STAKE MARKED WITH THE BLOCK LETTER "S" INDICATES SANITARY SEWER SERVICE CONNECTION.
2. GREEN STAKE MARKED WITH THE BLOCK LETTER "D" INDICATES STORM SEWER SERVICE CONNECTION.
3. IF CLEAR SPACING BETWEEN SEWER PIPES (SANITARY/STORM) AND WATER PIPES IS 3 METERS OR LESS, THEN ALL JOINTS ON SANITARY/STORM SERVICE PIPING MUST BE HEAT SHRINK WRAPPED.
4. REFER TO SECTION 02530 OF STANDARD SPECIFICATIONS FOR MORE INFORMATION.
5. CLEANOUT IS NOT REQUIRED FOR STORM SEWER CONNECTION.



## SHALLOW RISER TYPE SERVICE

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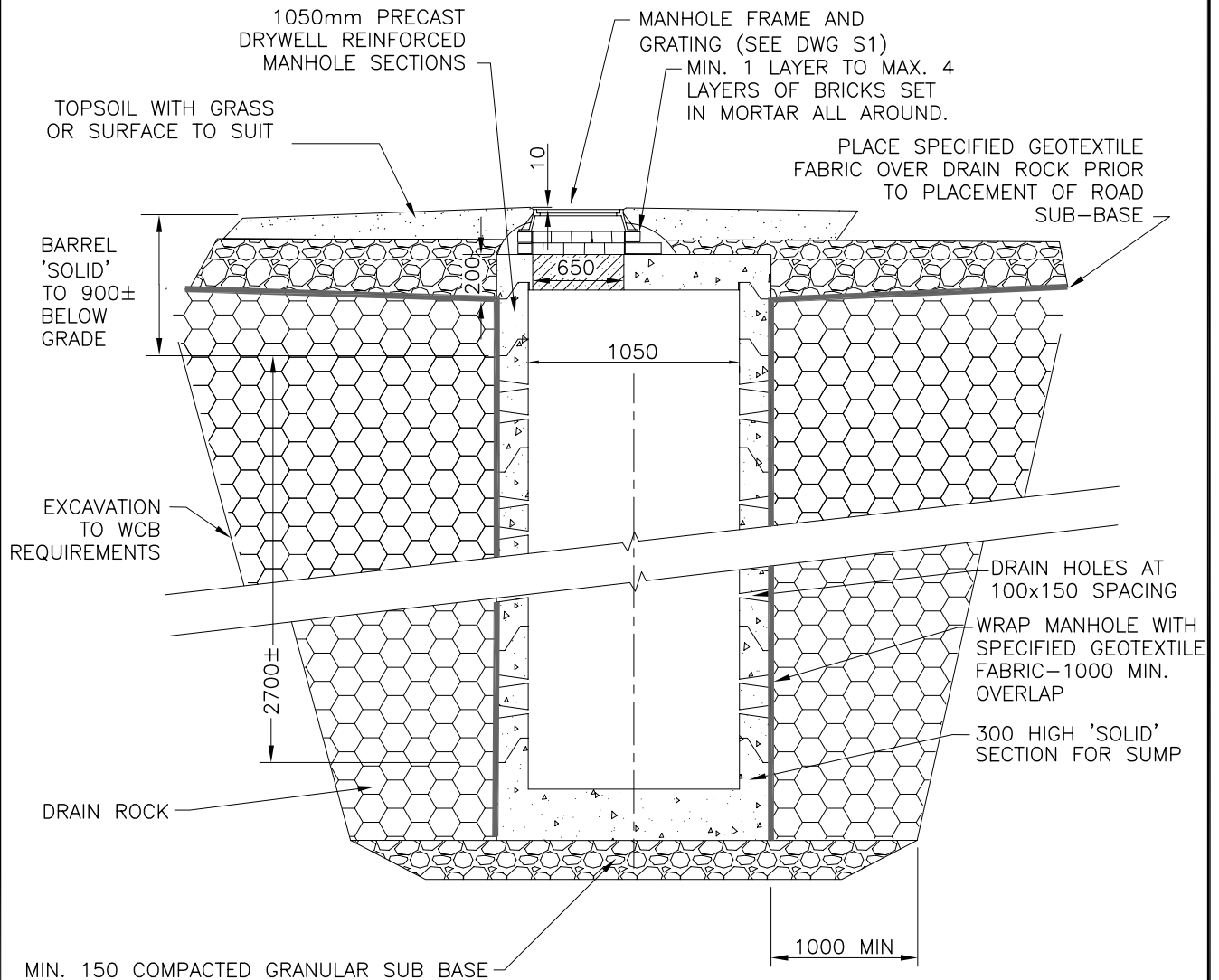
N.T.S.

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**S10**

## RECHARGE CHAMBER

115



NOTE:

1. CHAMBER BARREL SIZE MAY BE INCREASED IN DIAMETER TO SUIT SITE CONDITIONS.
2. ALTERNATIVE RECHARGE CHAMBERS DESIGNED BY PROFESSIONAL ENGINEER MAY BE SUBSTITUTED WHEN APPROVED BY DIRECTOR.

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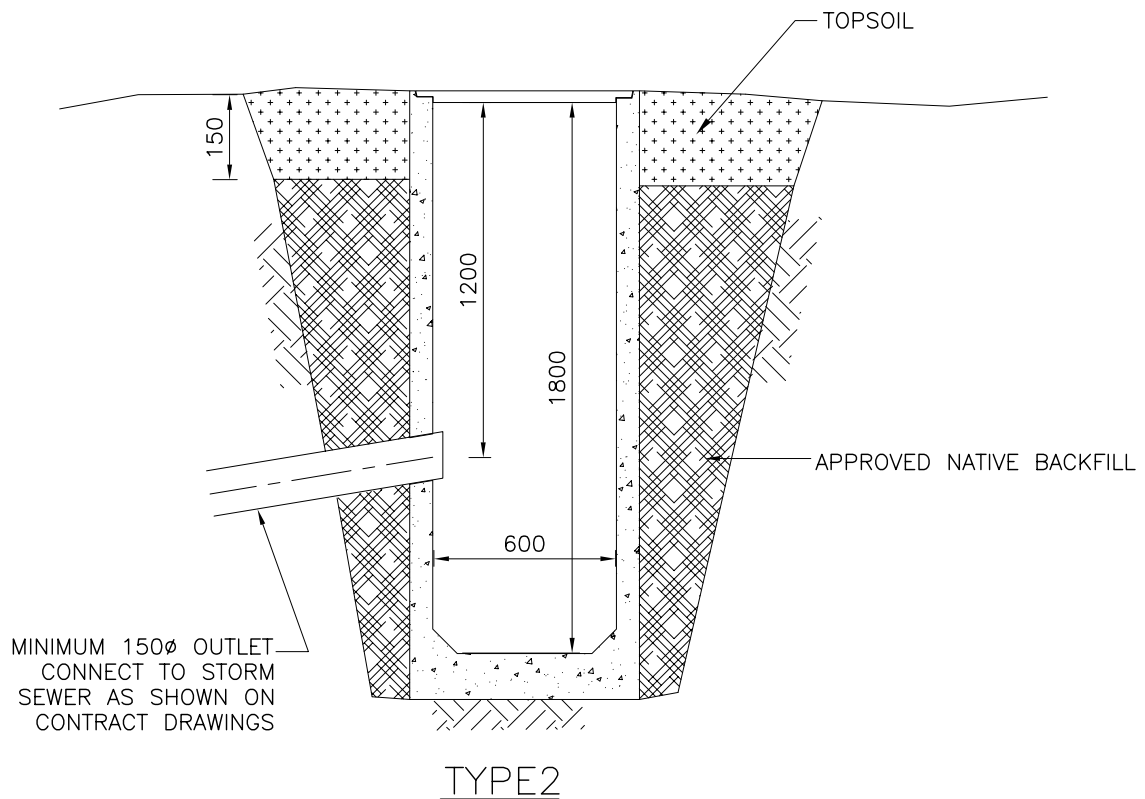
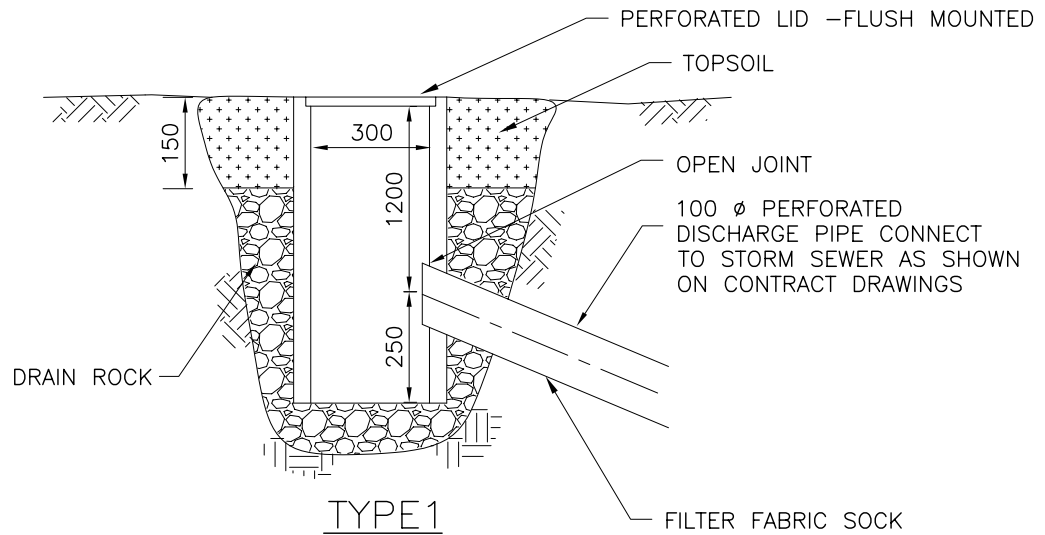
**S11**



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# LAWN DRAINS

S12



**NOTE:**

1. REFER TO CONTRACT DRAWINGS AND SECTION 02630 FOR DETAILED SPECIFICATIONS.
2. ALTERNATIVE RECHARGE CHAMBERS DESIGNED BY PROFESSIONAL ENGINEER MAY BE SUBSTITUTED WHEN APPROVED BY DIRECTOR.

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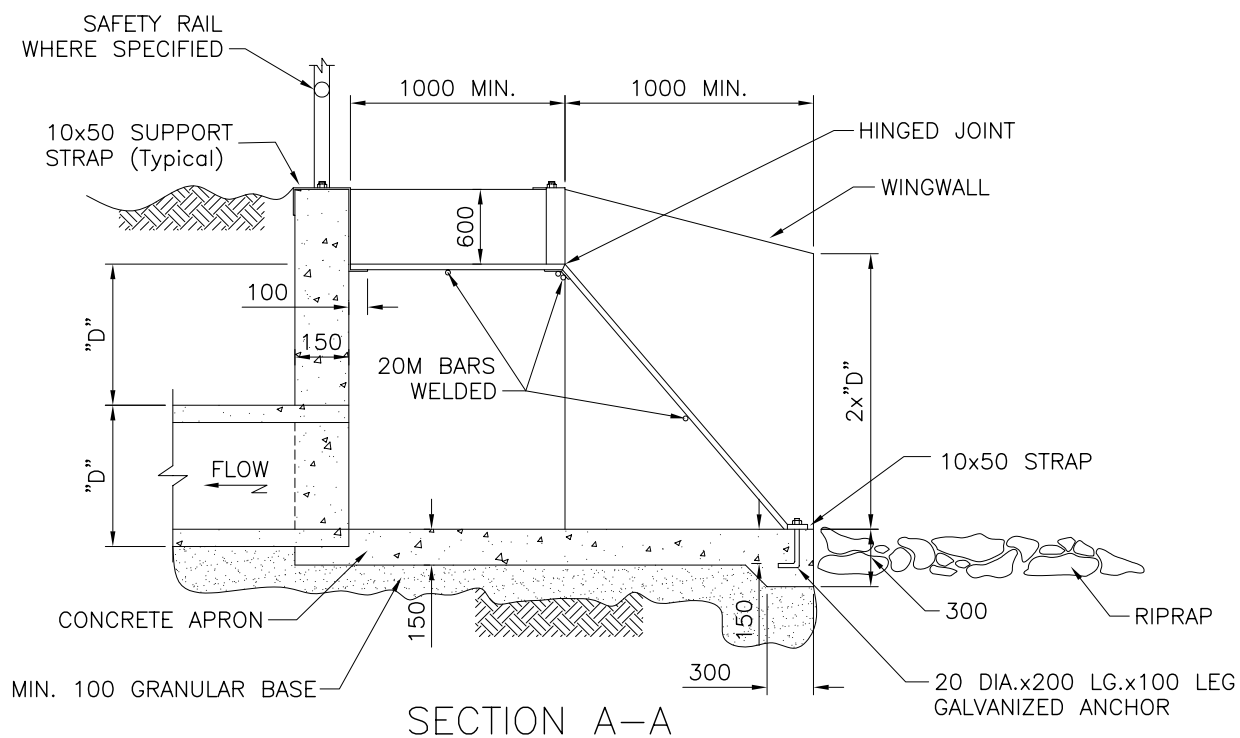
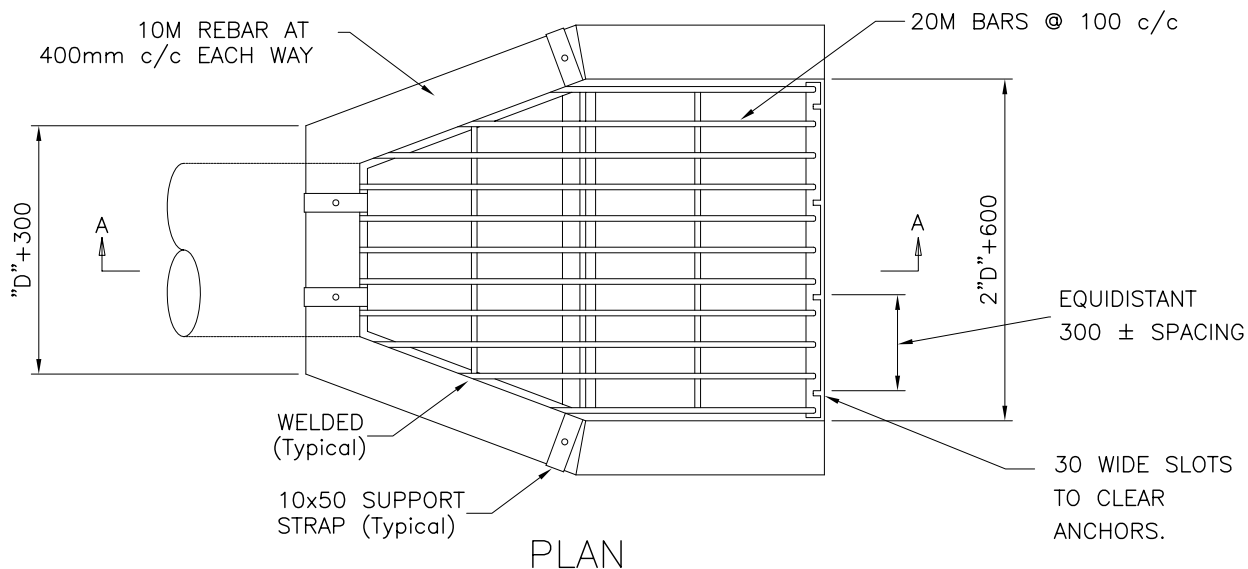
DRAWING NUMBER

**S12**



# STORM SEWER INLET WITH SAFETY GRILL

**\$13**



NOTES:

1. INSTALL SAFETY HANDRAIL IF SPECIFIED ON CONTRACT DRAWINGS.
2. PRECAST UNIT MAY BE PROVIDED AS ALTERNATIVE WITH CONTRACT ADMINISTRATOR'S PRIOR APPROVAL
3. ALL STEEL COMPONENTS TO BE HOT DIPPED GALVANIZED AFTER FABRICATION.
4. SAFETY GRILLAGE TO BE WELDED AT ALL JOINTS AND CONNECTIONS EXCEPT AT ANCHOR BOLTS.
5. REFER TO CONTRACT DRAWINGS FOR LOCATIONS AND SITE SPECIFIC DIMENSIONS. REFER TO SECTIONS 3100, 3200 & 3300 OF STANDARD SPECIFICATIONS.

2004

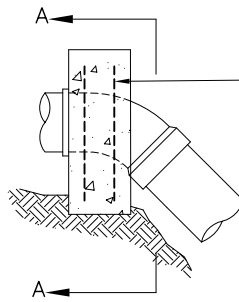
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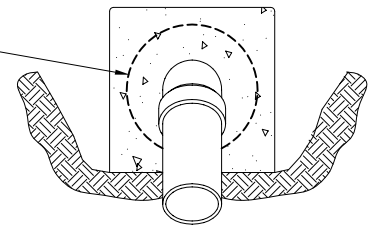
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# THRUST BLOCK ARRANGEMENT

W1

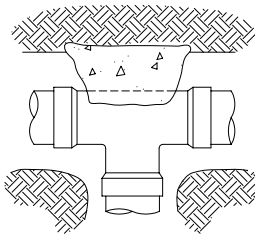


10mm TIE BARS



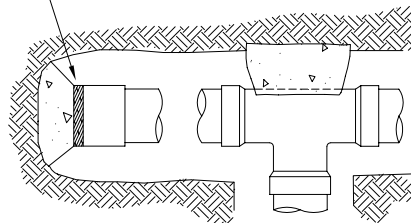
SECTION A-A

## VERTICAL BENDS GENERAL ARRANGEMENTS — ELEVATIONS

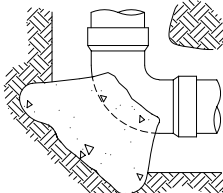


TEES

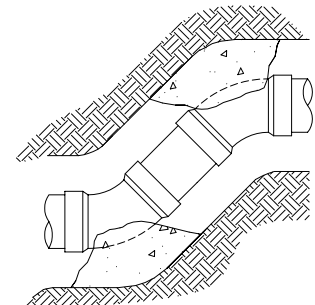
PRESSURE TREATED  
PLYWOOD — FOR  
TEMPORARY DEAD END



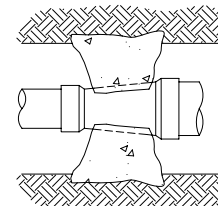
TEES



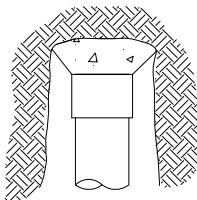
90° BEND



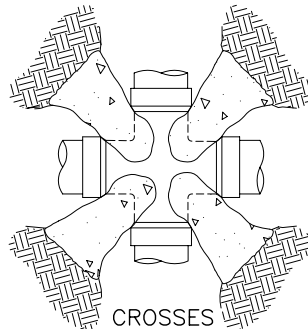
11½°, 22½°, 45° BENDS



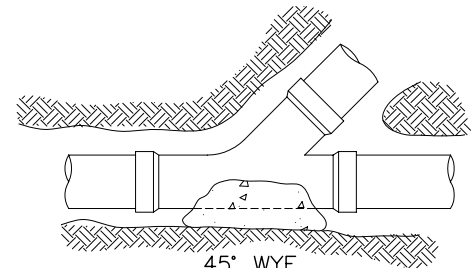
REDUCER



CAPS



CROSSES



45° WYE

## GENERAL ARRANGEMENTS — PLAN VIEW

### NOTES:

1. REFER TO CONTRACT DRAWINGS FOR SPECIFIED BEARING AREA OF THRUST BLOCKS AND/OR SPECIFIC REQUIREMENTS NOT SHOWN ON THE DRAWING.
2. PLACE 6mm POLYETHYLENE ON INTERFACE BETWEEN CONCRETE AND FITTING.
3. PLACE 20 MPa CONCRETE AGAINST UNDISTURBED GROUND. KEEP CONCRETE CLEAR OF FITTING JOINTS.
4. REFER TO SECTION 02511 OF STANDARD SPECIFICATIONS.

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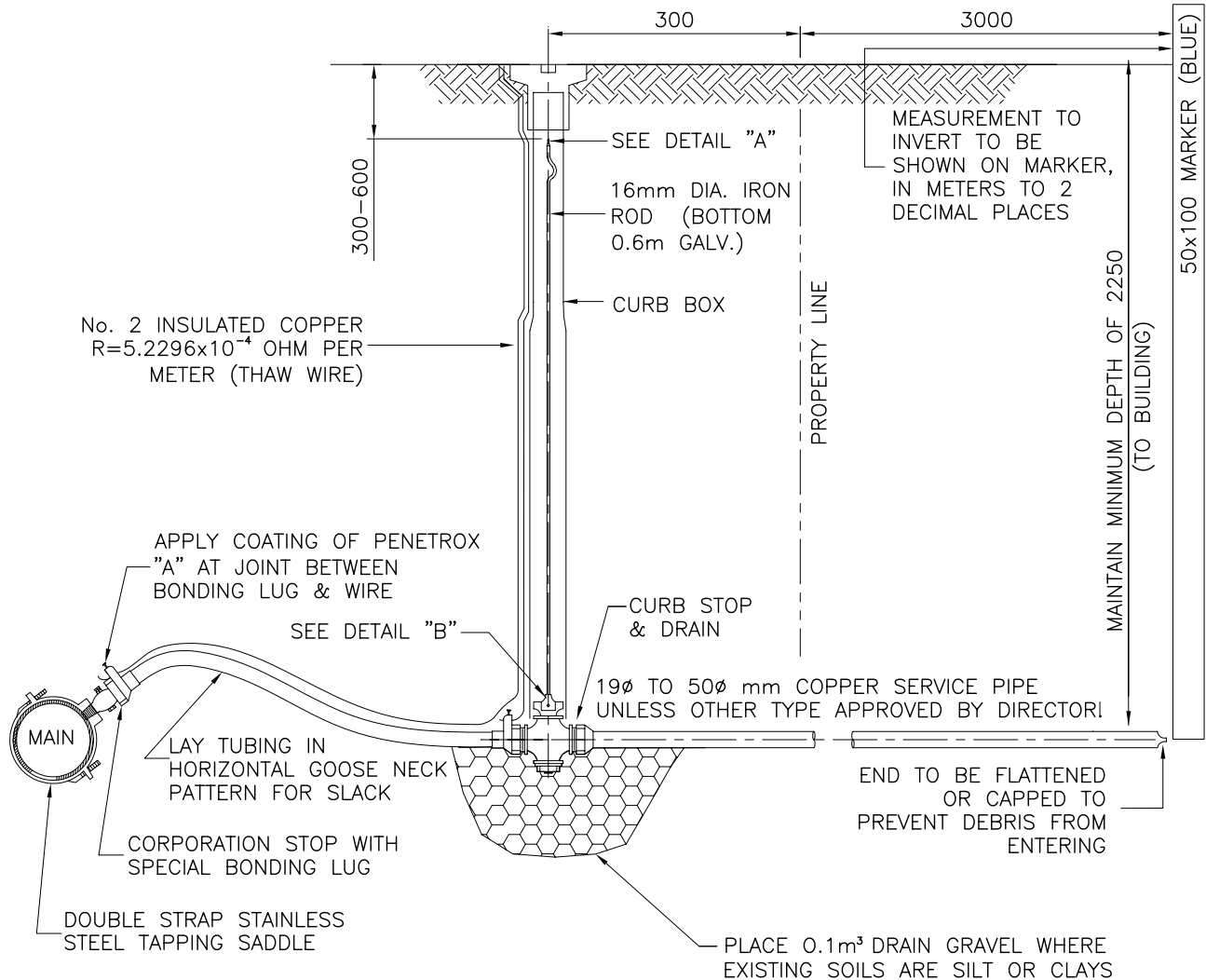
**W1**



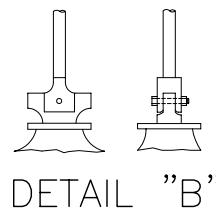
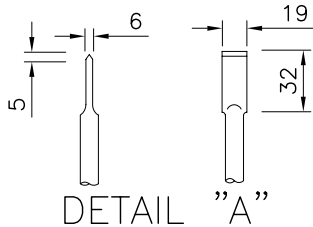
CITY OF  
PRINCE GEORGE

# WATER SERVICE CONNECTION

W2



NOTE : ALSO AVAILABLE WITH  
SQUARE HEAD



HOLES TO MATCH FOR  
FITTING 6mm BOLT (GALV.)  
GROUND TO FIT VALVE TEE

## NOTES:

1. THIS DETAIL FOR SERVICES 19 TO 50mm ONLY.
2. WHEN CURB STOP INSTALLED IN DRIVEWAY, PLACE COVER IN NELSON TYPE VALVE BOX MARKED "WATER".
3. REFER TO SECTION 02511 OF STANDARD SPECIFICATIONS.
4. SEE DWG G14 FOR HORIZONTAL LAYOUT.
5. INSTALL SERVICE CONNECTION WITH HORIZONTAL GOOSE NECK.

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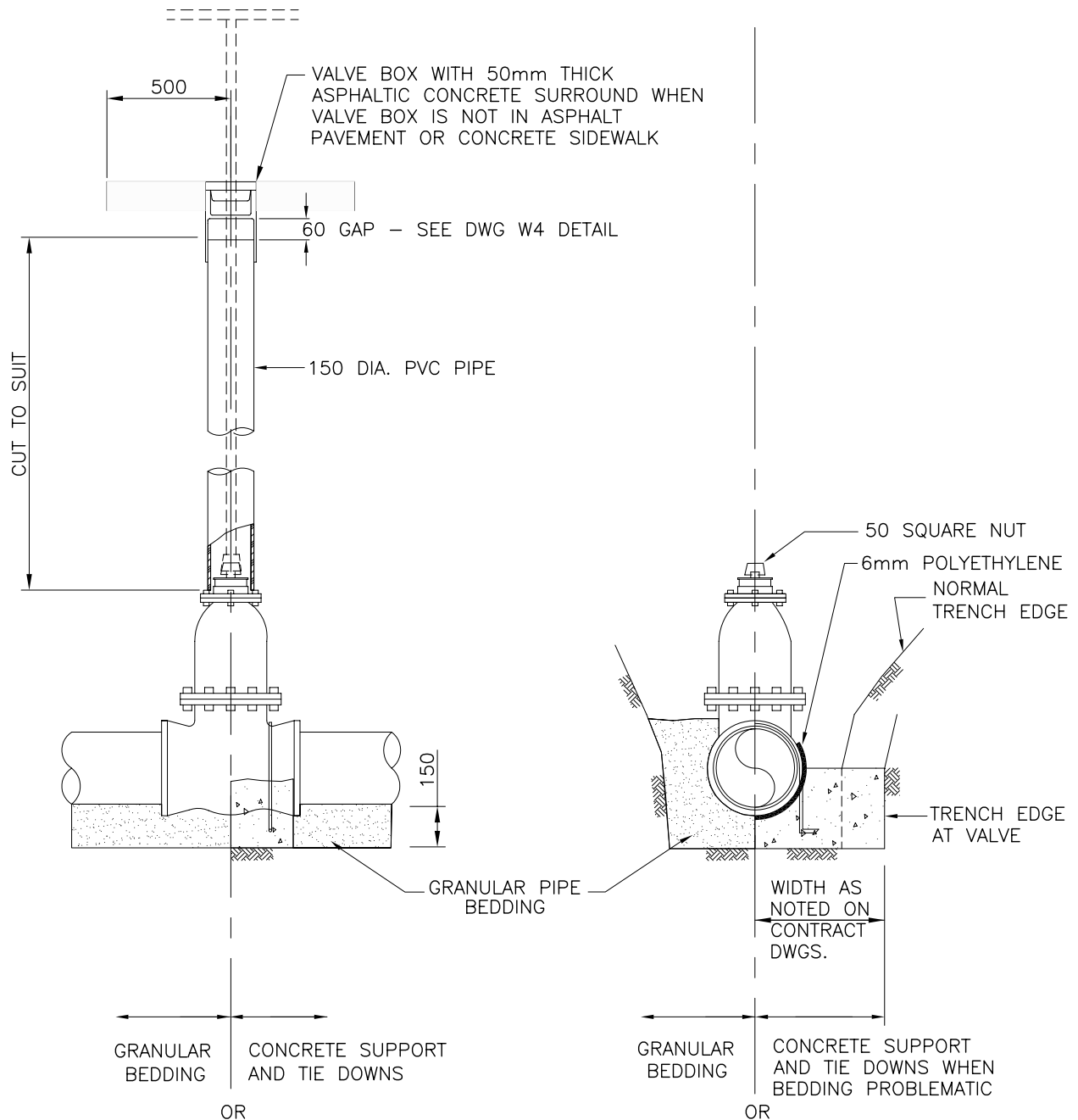
N.T.S.

DRAWING NUMBER

W2

# GATE VALVE INSTALLATION (FOR WATERMAINS 300mm OR LESS)

W3



**NOTE:**

1. REFER TO CONTRACT DRAWINGS FOR VALVE INSTALLATION DETAILS IN AREAS OF UNSTABLE GROUND (WHERE APPLICABLE).
2. REFER TO SECTION 02511 OF STANDARD SPECIFICATIONS.

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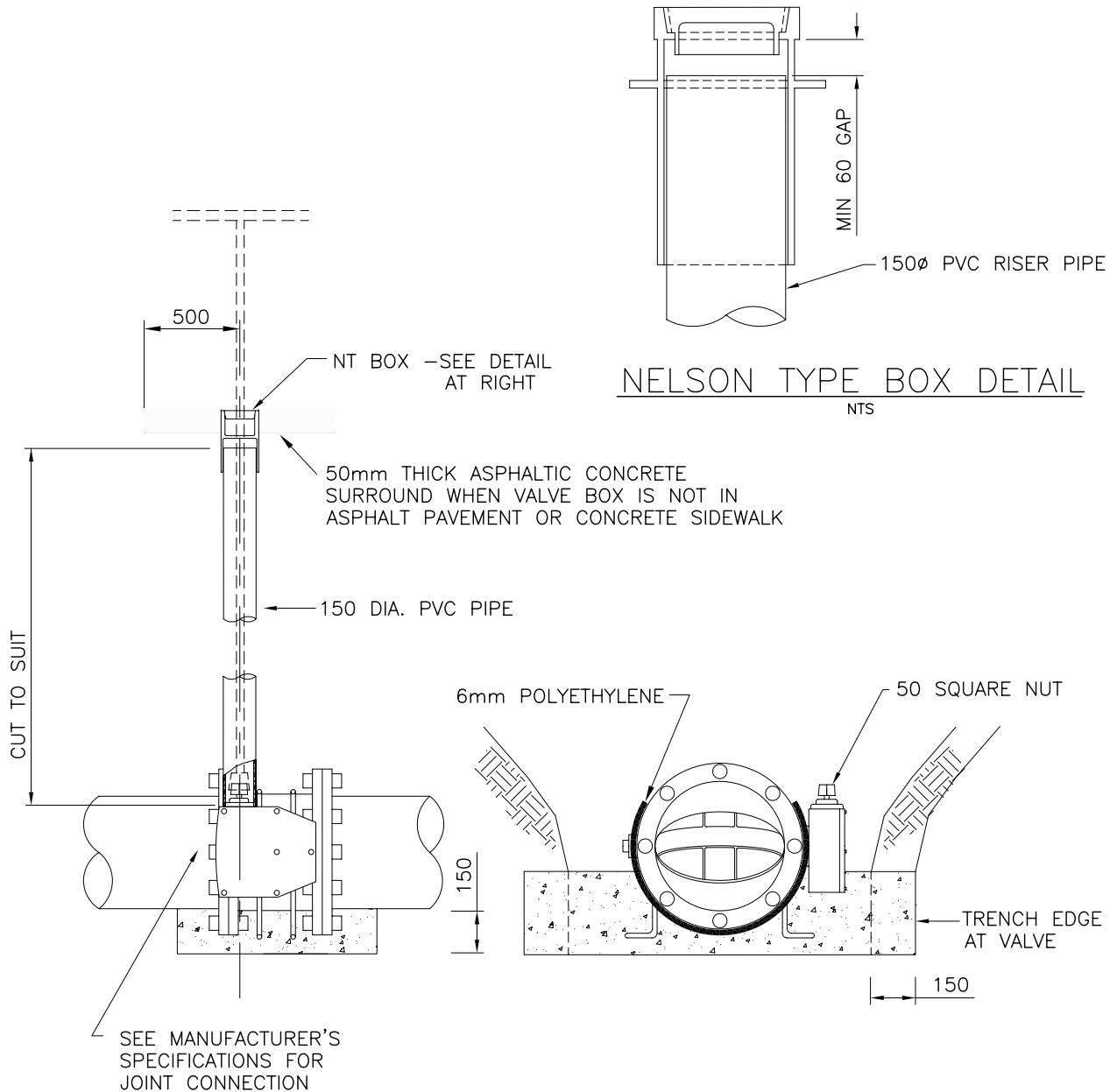
N.T.S.

DRAWING NUMBER

**W3**

# BUTTERFLY VALVE INSTALLATION (FOR WATERMAINS GREATER THAN 300mm)

W4



- NOTE:**
1. REFER TO CONTRACT DRAWINGS FOR VALVE INSTALLATION DETAILS IN AREAS OF UNSTABLE GROUND (WHERE APPLICABLE).
  2. REFER TO SECTION 02511 OF STANDARD SPECIFICATIONS.

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N.T.S.

DRAWING NUMBER

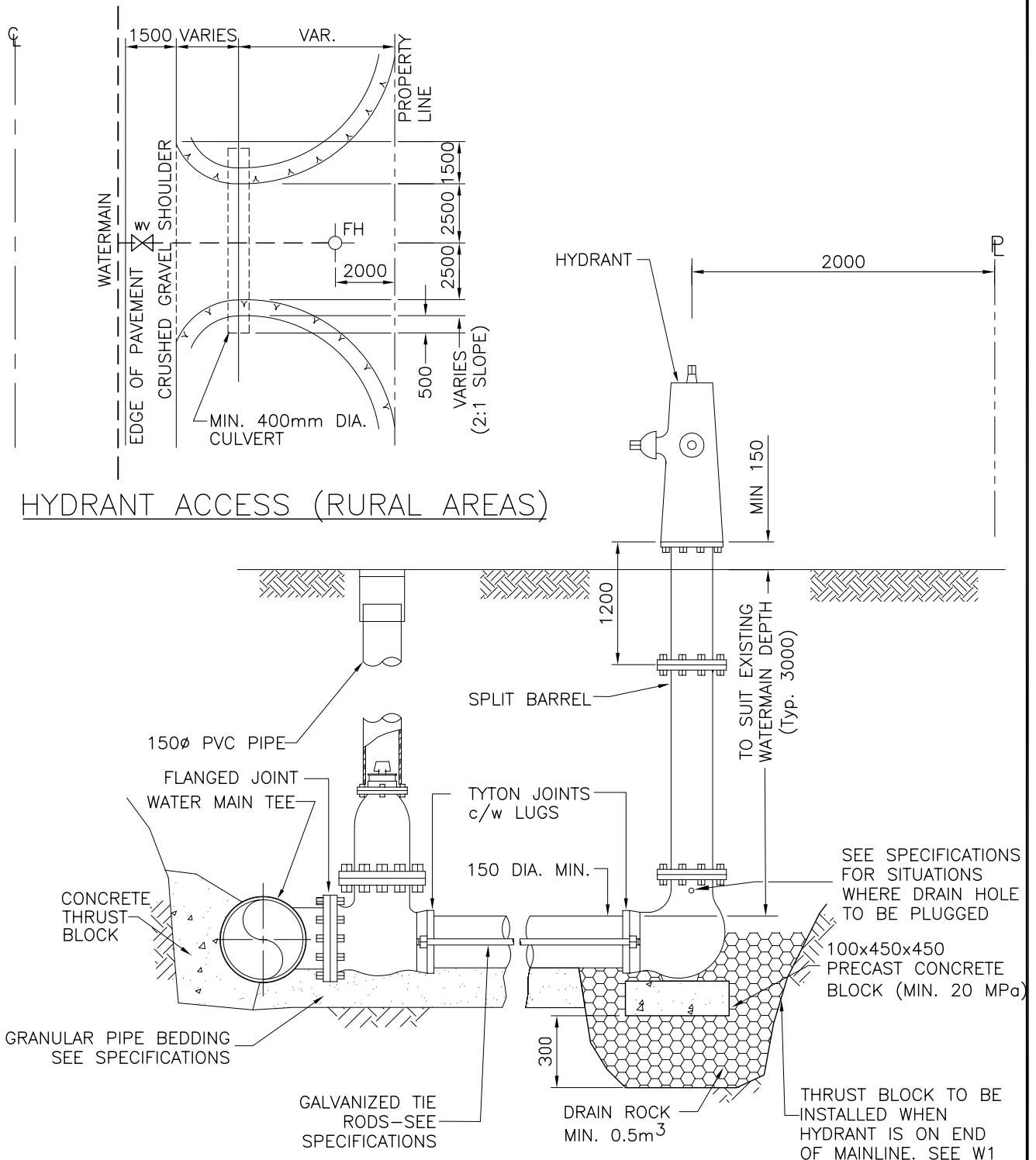
**W4**



CITY OF  
PRINCE GEORGE

# FIRE HYDRANT INSTALLATION

W5



## NOTES:

1. REFER TO SECTION 02511 OF SPECIFICATIONS.
2. FOR VALVE INSTALLATION SEE DWG W3

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

0

SCALE

N.T.S.

DRAWING NUMBER

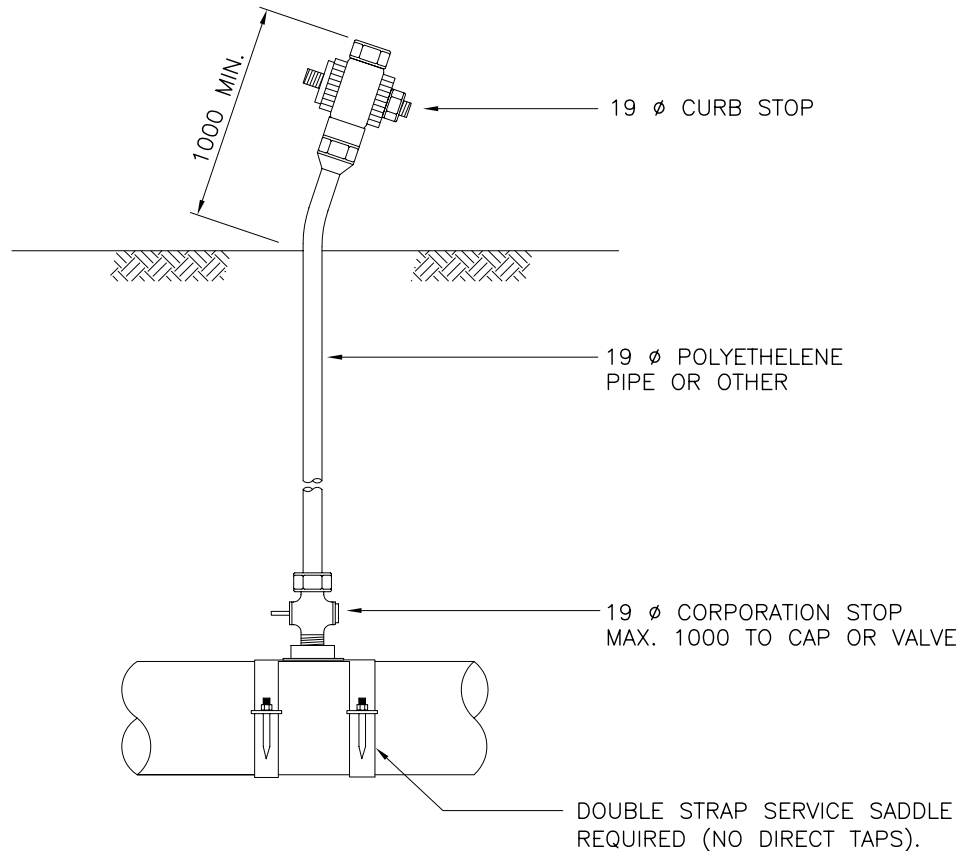
**W5**



CITY OF  
PRINCE GEORGE

# TEST POINT INSTALLATION

W6



ELEVATION

## TEST POINT INSTALLATION DURING CONSTRUCTION

- NOTES:
1. THIS DETAIL TO BE USED ONLY FOR TESTING DURING CONSTRUCTION.  
NOT TO BE USED FOR FLUSHING.
  2. REFER TO CONTRACT DRAWINGS AND SECTION 02511 FOR DETAILED SPECIFICATIONS
  3. REMOVE CORPORATION STOP AFTER TESTING IS COMPLETED AND PLUG SADDLE.

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

0

SCALE

N.T.S.

DRAWING NUMBER

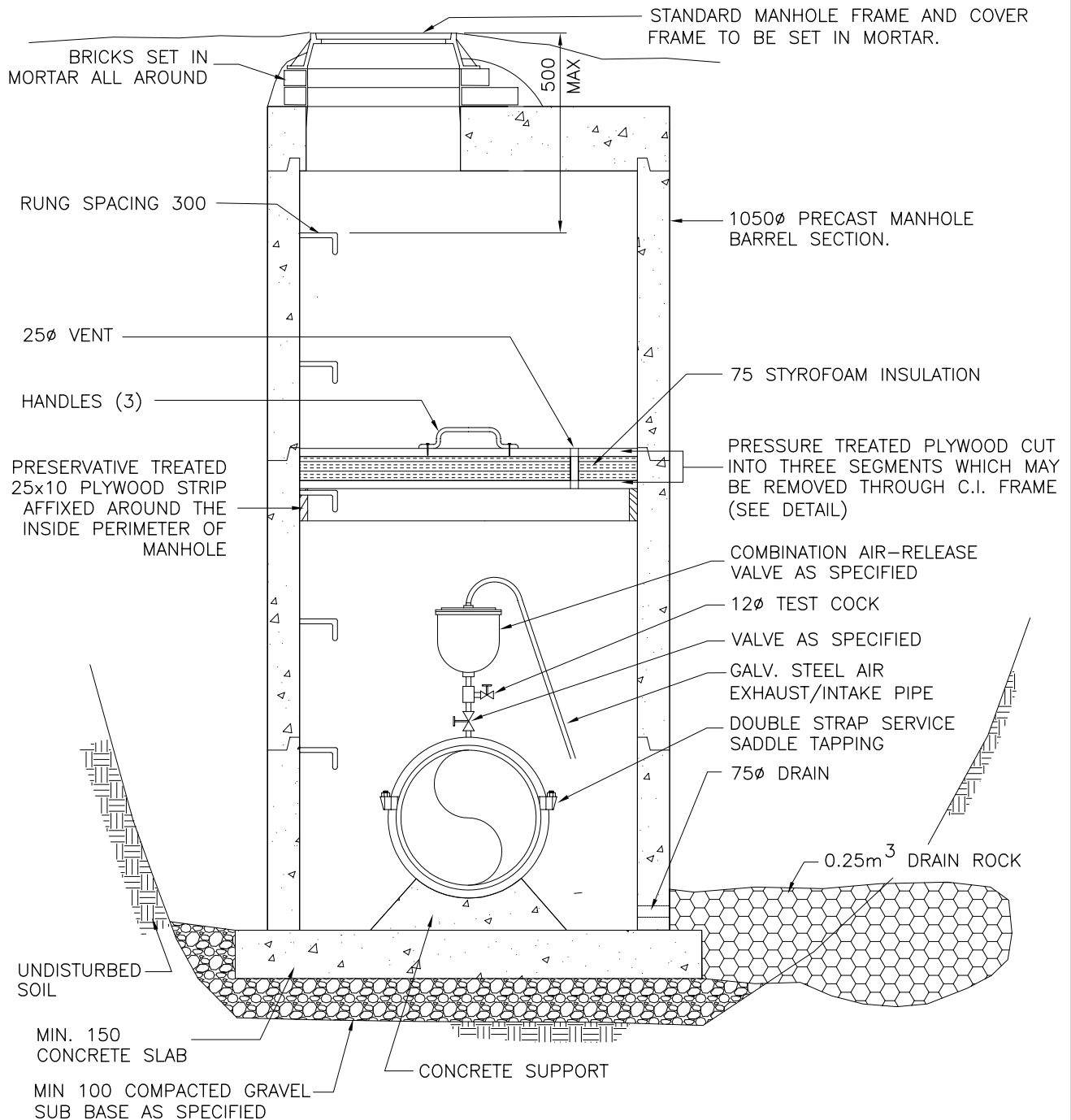
**W6**



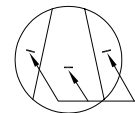
CITY OF  
PRINCE GEORGE

# AIR-RELEASE VALVE

W7



- NOTES:**
1. SEE DETAILS FOR MANHOLE ON  
STANDARD DWG. NO. S1
  2. SPECIAL DESIGN IS REQUIRED ON MAIN  
LINES GREATER THAN 300mm.



GALVANIZED  
LIFTING HANDLES

NOTE: SIZE TO FIT THROUGH OPENING  
PLYWOOD CUTTING DETAIL

2004

DATE OF REVISION

JUN 2004

REVISION NUMBER

0

SCALE

N.T.S.

DRAWING NUMBER

**W7**



## W8



- 2004

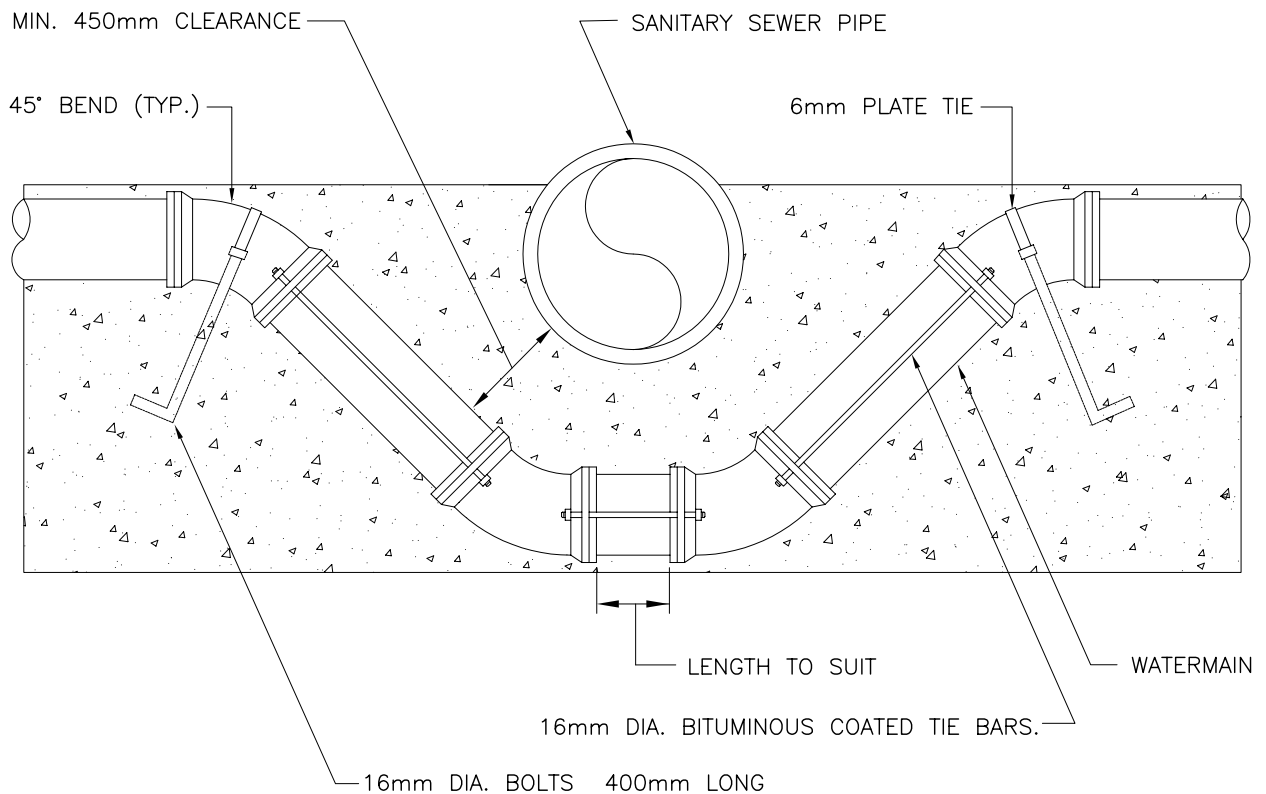
|                              |                      |                 |                             |
|------------------------------|----------------------|-----------------|-----------------------------|
| DATE OF REVISION<br>JUN 2004 | REVISION NUMBER<br>0 | SCALE<br>N.T.S. | DRAWING NUMBER<br><b>W8</b> |
|------------------------------|----------------------|-----------------|-----------------------------|



CITY OF  
PRINCE GEORGE

# WATERMAIN RELOCATION

W9



- NOTES:
1. SANITARY SEWER COLLAR TO BE MINIMUM 1.5m FROM WATERMAIN CROSSING.
  2. WATERMAIN TO BE ENCASED IN CONCRETE TO 500mm ON EITHER SIDE OF SEWER TRENCH.
  3. IF CLEAR SPACING BETWEEN SEWER PIPES (SANITARY/STORM) AND WATER PIPES IS 3 METERS OR LESS, THEN ALL JOINTS ON SANITARY/STORM PIPING MUST BE HEAT SHRINK WRAPPED, UNLESS OTHERWISE APPROVED BY DIRECTOR.
  4. JOINT RESTRAINT IS PERMITTED IF APPROVED BY THE DIRECTOR.

2004

DATE OF REVISION

SEPT 2004

REVISION NUMBER

0

SCALE

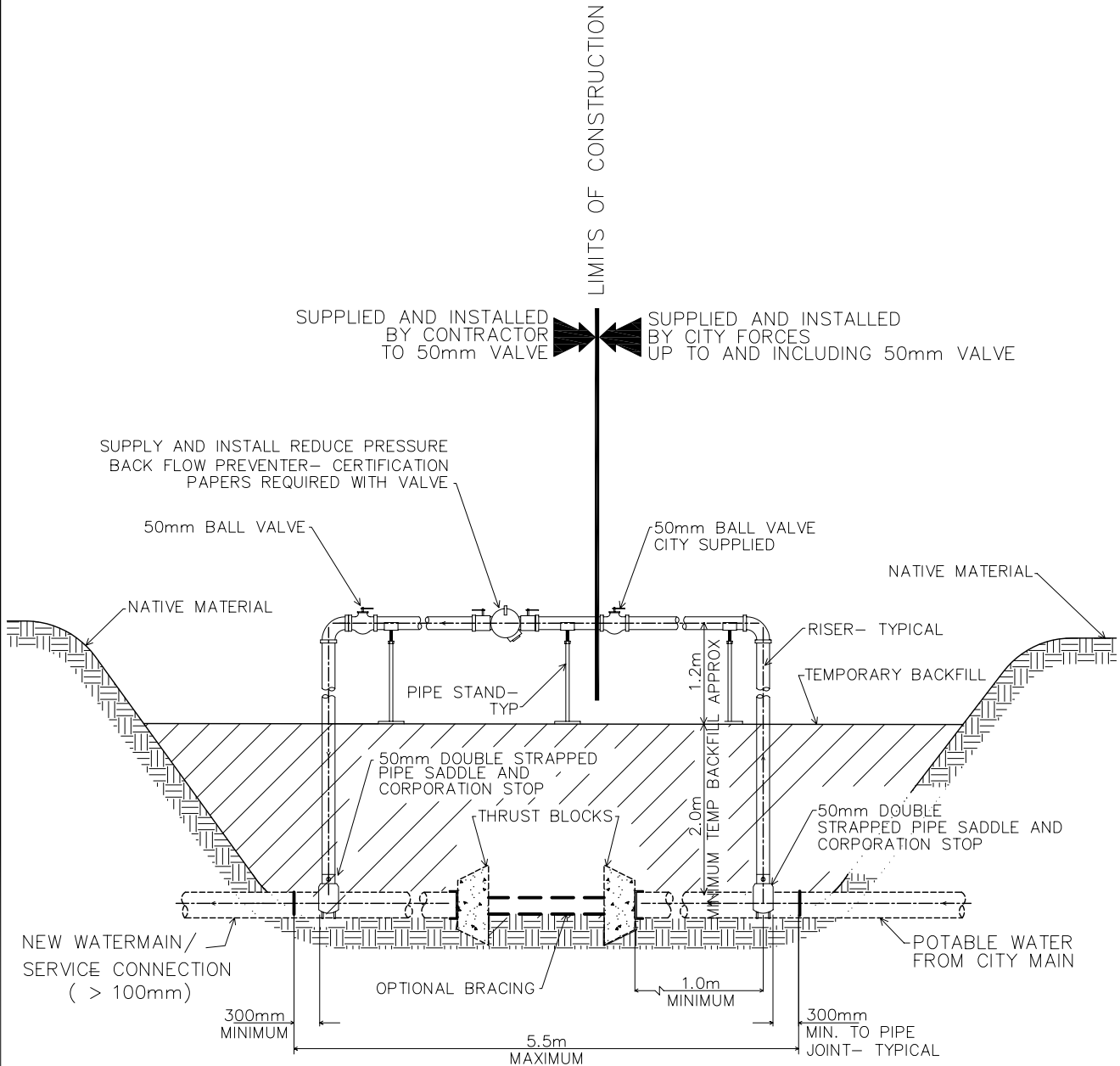
N.T.S.

DRAWING NUMBER

**W9**

# TEMPORARY WATER SUPPLY CONNECTION

W10



**NOTE:**  
USE FOR WATERMAIN EXTENSIONS AND WATER SERVICE  
EXTENSIONS 100mm DIAMETER AND GREATER

2004

DATE OF REVISION  
JUN 2004

REVISION NUMBER  
0

SCALE  
N.T.S.

DRAWING NUMBER  
**W 10**

**City of Prince George**  
**Subdivision and Development Servicing Bylaw No. 8618, 2014**

**Schedule F**

**Forms of Agreement**

Forms of agreement that follow, include:

- Form A – Works and Servicing Agreement – Subdivision
- Form B – Works and Servicing Agreement – Development Servicing
- Form C – Agreement With Owner for Works and Services Performed by City
- Form D – Section 943 – Waiver Agreement
- Form E – Sample Section 219 Restrictive Covenant
- Form F – Latecomer Charge Waiver Agreement
- Form G – Latecomer Agreement
- Form H – Parkland Provision Agreement
- Form I – Notice of Park Land Agreement
- Form J – Blanket Statutory Right of Way
- Form K – Sample – Statutory Right of Way Agreement
- Form M – Flood Plain Section 219 Covenant and Priority Agreement

*FORM A – Works and Services Agreement - Subdivision*

THIS AGREEMENT made on \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_.

BETWEEN:

**CITY OF PRINCE GEORGE**

(the "City")

AND:

*[name of owner]*

(the "Owner")

WHEREAS:

- A. The Owner is the registered-owner of those lands in the City of Prince George legally described as:

Parcel Identifier: *[no.]*  
*[legal description]*

(the "Lands");

And more precisely, described legally as the lands within the bold outline shown on Plan No. EPP \_\_\_\_\_,

*[The plan number shall be inserted following registration of the plan of subdivision deposited in the Land Title Office in New Westminster. (See Schedule C)]*

(the "Lands");

- B. City of Prince George Subdivision and Development Servicing Bylaw No. 7652, 2004 (the "Subdivision Bylaw") requires the provision of various works and services upon the subdivision of land and regulates the standards to which such works and services must be constructed and installed;
- C. The Owner has applied to subdivide the Lands and has under section 509 of the Local Government Act requested the City to enter into this Agreement in order to enable the approving officer to approve the subdivision before the construction and installation of all works and services required by the Subdivision Bylaw;
- D. The Owner has agreed to grant and transfer to the City all its right, title and interest in and to the works and services required to be constructed and installed by the

Subdivision Bylaw to the City and the City has agreed to accept such transfer of the works and services on the terms of this Agreement.

NOW THEREFORE in consideration of the mutual promises contained in this Agreement and in consideration of the City entering into this Agreement to allow the construction and installation of the works and services after the approval of the subdivision of the Lands, the Owner covenants and agrees with the City as follows:

1. In this Agreement:

"Complete" or "Completion" with respect to the Works means completion to the satisfaction of the Authorized Person of the City evidenced by the certificate issued by the Authorized Person under section 10 b);

"Authorized Person" means the City's Director of Planning and Development and his or her duly authorized assistants and such consulting or professional engineers as may be appointed to act for the City;

"Works" means all those works and services required to be provided under the Subdivision Bylaw and without limitation, those works and services described in Schedules A and B to this Agreement.

2. The Owner covenants and agrees:

- (a) to install, construct and complete the Works;
- (b) to pay to the City in advance upon execution of this Agreement all applicable fees and charges including the inspection fee in accordance with the City's Comprehensive Fees and Charges Bylaw No. 7557, 2004;
- (c) as security for the due and proper performance by the Owner of all of the covenants, agreements and obligations, of the Owner in this Agreement, the Owner has deposited with the City security, in accordance with the Subdivision Bylaw, in the sum of \$ ***[amount]*** (the "Deposit");
- (d) that the Deposit, less the amount required by section 6 to be maintained, will only be returned to the Owner upon completion of the Works in strict conformance with this Agreement; and
- (e) that no interest on the Deposit shall be paid to the Owner.

3. In carrying out the Works the Owner covenants and agrees:

- (a) not to commence the construction or installation of the Works without first advising the Authorized Person in writing at least five days before commencement;
- (b) to construct, install and complete the Works as designed and to the specifications and as shown in Schedule B (the "Approved Design and Specifications") and in conformance with the Subdivision Bylaw;
- (c) to obtain the prior written approval of the Authorized Person for any changes to the Approved Design and Specifications;
- (d) to comply with any changes to the Approved Design and Specifications required by the Authorized Person as necessary to satisfy the Authorized Person that the Works will function and operate in a manner satisfactory to the City;
- (e) to pay the cost of all necessary connections by the City of the Works to municipal water distribution, storm drainage and sanitary sewage systems as the case may be;
- (f) not to damage any City works, services or property, or remove, alter or destroy any survey pins, posts or monuments, and if in default to replace, repair and restore any damage of whatever nature to the reasonable satisfaction of the Authorized Person;
- (g) to comply with all statutes, laws, regulations and orders of any authority having jurisdiction and without limiting the generality of the foregoing all bylaws of the City;
- (h) to not deposit or permit the deposit of any material or debris upon any highways or City lands;
- (i) to retain at all times a professional engineer to provide competent survey, layout and onsite supervision to ensure that the Works strictly conform to the Approved Design and Specifications, and to record the details of any field design or construction changes to the Approved Design and Specifications and to record all of the geometric information for preparation as "as-constructed" drawings;
- (j) to advise the Authorized Person of the name and address of the professional engineer retained by the Owner and to ensure that such professional engineer maintains during the term of his or her engagement:
  - i. professional liability and errors and omissions insurance of not

- less than \$1,000,000 per occurrence, and
- ii. comprehensive general liability insurance in an amount not less than \$2,000,000 inclusive per occurrence insuring against bodily injury, personal injury and property damage and including liability assumed under Contract with insurers licensed in the City of Prince George and in the forms and amounts acceptable to the City.

The owner's engineer shall provide proof of such insurance before the Owner commences the construction and installation of the Works;

- (k) not to employ any person or contractor in the construction of the Works who, in the reasonable opinion of the Authorized Person is unfit, incapable or unskilled, and at all times, in connection with the execution of the Works, to employ and keep on site a competent general works superintendent capable of speaking, reading and writing the English language. Any explanations, directions and requests given by the Authorized Person to the superintendent shall be conclusively deemed to have been given to the Owner; and
  - (1) not to engage any contractor in respect of the Works unless that contractor holds a valid business license issued by the City.
4. The Owner shall prosecute the Works diligently without interruptions and shall complete the construction and installation of the Works by the [day] day of [month], 2 [year].
5. Upon completion of the Works, the Owner covenants and agrees:
- (a) to assign to the City, all of its right, title and interest in and to the Works free and clear of all encumbrances;
  - (b) to grant or cause to be granted to the City in registerable form all statutory rights-of-way reasonably required by the Authorized Person for the operation, maintenance, repair and replacement of the Works, on such terms as are satisfactory to the Authorized Person;
  - (c) to execute and deliver or cause to be executed and delivered at the request of the City all such further transfers, instruments, agreements, documents and plans and to perform all such acts as may be necessary to give full effect to this Agreement; and
  - (d) to deliver to the City final as-constructed drawings of the Works which drawings shall be prepared by the Owner's engineer in accordance with the Subdivision Bylaw and in a form satisfactory to the Authorized Person.

6. The Owner covenants and agrees to:
  - (a) maintain the Works in complete repair for a period of one year from completion of the Works;
  - (b) remedy any defects appearing within a period of one year from the date of completion and pay for any damage to other work or property resulting there from, save and except for defects caused by reasonable wear and tear, negligence of the City, its servants or agents, or acts of God; and
  - (c) keep deposited with the City for a period of one year from completion of the Works, the sum of 15% of the Deposit by cash or letter of credit.
7. The Owner shall release, and does hereby indemnify and save the City harmless from and against:
  - (a) all costs, expenses, damages, claims, demands, actions, suits and liability by whomever brought or made and however arising whether directly or indirectly, from the construction or installation of the Works and any injury or damage thereby caused to person or property (including death) except that arising from the negligence or other fault of the City;
  - (b) all costs and expenses incurred by the City directly or indirectly arising from any engineering operation, construction, repair, replacement or maintenance by the City to or on any real or personal property which is affected by the Works and which the City either owns or is by duty or custom obliged, directly or indirectly, to construct, repair, replace or maintain; and
  - (c) all expenses and costs incurred by reason of liens for nonpayment of labour or material, workers' compensation assessments, unemployment insurance, federal or provincial tax check off in relation to Works and for unlawful encroachments by the Works.
8. The Owner shall take out and maintain at all times from commencement of construction and installation of the Works until the Authorized Person issues a certificate of acceptance, insurance at its sole expense. Such insurance shall include comprehensive general liability insurance against claims for bodily injury including death and property damage or loss arising from its operations in or about the Lands, highways or other lands in carrying out the construction and installation of the Works and in performing its obligations under this Agreement. Such insurance shall name the City as a co-insured and shall contain a cross-liability or severability of interest clause so that the City and

the Owner are insured in the same manner and to the same extent as if individual policies had been issued to each. Such insurance shall be for the amount of not less than \$5,000,000 combined single limit or such other amount as the Authorized Person may reasonably require. The Owner shall provide to the Authorized Person proof in writing of such insurance before commencing the Works and again before the issuance of any certificate of Completion. The policy of insurance shall contain a provision requiring the insurer to give to the City 30 days' prior written notice before any alteration of or cancellation of the policy shall be effective.

9. The Owner acknowledges and agrees that the Owner relies exclusively on its own engineer and contractor and that the City does not, by its approvals, inspections or acceptance of the Works, warrant or represent that the Works are without fault or defect, and that all approvals and inspection of the Works given or made by the City are for the sole benefit of the City and shall in no way relieve or excuse the Owner from constructing and installing the Works in strict compliance with the provisions of this Agreement.
10. The City covenants and agrees that:
  - (a) it will permit the Owner to perform the Works on the terms and conditions contained in this Agreement and to occupy and use municipal highways and City lands as necessary for the Works subject to such terms and conditions in any case and from time to time as the Authorized Person may impose;
  - (b) it will issue a Certificate of Completion signed by the Authorized Person upon the owner satisfactorily completing the Works and performing all other requirements of this Agreement except the requirements of section 6; and
  - (c) upon the satisfactory completion by the Owner of all the covenants and conditions in this Agreement, and without limiting the generality of the foregoing, including the maintenance of the Works constructed under this Agreement in complete repair for a period of one year, it shall provide to the Owner a certificate of acceptance of the Works, signed by the Authorized Person, together with the balance of the Deposit and a release and discharge of any restrictive covenant granted under section 12.
11. Nothing in this Agreement shall exempt the Owner or the Lands from the ordinary jurisdiction of the council of the City, its bylaws and regulations, and without limitation the construction of the Works shall not confer directly or indirectly any exemption or right of set-off from development cost charges, connection charges, application fees, user fees or other fee or charges, except as

statutorily required.

***Note: Depending on the scope and complexity of the Works remaining at the time of subdivision, the Authorized Person may choose either A), B) or C) as the appropriate Section 12. In some circumstances, the Authorized Person may determine that Section 12 is not required.***

12.

- A) Pursuant to section 219 of the Land Title Act, the Owner covenants that no buildings or structures, except the Works, shall be placed, built or constructed upon the Lands until the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement. All amounts of money due and owing to the City from the Owner as provided for in this Agreement and without limiting the generality of the foregoing due and owing under section 15 of this Agreement shall constitute a rent charge charging the Lands.
- B) Pursuant to section 219 of the Land Title Act, the Owner covenants to not occupy the lands until the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement. Buildings or structures may be placed, built or constructed upon the Lands pursuant to the building permit issued for the building or structure. The Authorized Person may instruct the Building Inspector to withhold the Occupancy Permit until the Owner has satisfactorily completed the Works and the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement.
- C) The Owner agrees not to occupy the lands until the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement. Buildings or structures may be placed, built or constructed upon the Lands pursuant to the building permit issued for the building or structure. The Authorized Person may instruct the Building Inspector to withhold the Occupancy Permit until the Owner has satisfactorily completed the Works and the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement.

13. Any letter of credit provided by the Owner to the City shall be a clean unconditional and irrevocable letter of credit, that provides for automatic renewals, in favor of the City drawn on a Canadian chartered bank or such other financial institution satisfactory to the Authorized Person. Such letter of credit shall be maintained as good and valid security by the Owner at all times as required by this Agreement, and if the Owner fails or omits to renew any letter of credit and deliver such renewal to the City at least 14 days before the expiry

of any letter of credit then held by the City, the City may draw down on the then current letter of credit without notice or restriction, and hold the monies in lieu thereof.

14. If the Owner shall fail to observe, perform or keep any of the provisions of this Agreement to be observed, performed or kept by the Owner, the City may at its sole discretion and without prejudice to any other remedy rectify the default of the Owner, at the Owner's expense and without limiting the generality of the foregoing may:

- (a) enter onto the lands and do or cause to be done through its servants, contractors and others, all such things as may be required to fulfill the obligations of the Owner including without limitation, the completion of the Works; and
- (b) make any payments required to be made for and on behalf of the Owner; and for such purposes may without notice or limitation deduct from the Deposit all costs, and expenses incurred, payment and expenditures made, and monies due and owing to the City.

15. If the City incurs any costs and expenses or makes payments as either provided in section 14 of this Agreement or otherwise in this Agreement, or if the Owner is otherwise indebted to the City under this Agreement, and the Deposit is not sufficient to fully recompense the City, the Owner shall forthwith upon notice from the City pay to the City the amount of such deficiency together with interest thereon at *[percentage]* % per annum calculated and compounded monthly from the date such cost or expense was incurred or payment or expenditure was made by the City. Such amounts required to be paid by the Owner shall constitute a debt due and owing to the City *[add if section 12A is used]* and shall charge the Lands under section 12.

16. Wherever in this Agreement the approval of the Authorized Person is required or some act or thing is to be done to the satisfaction of the Authorized Person:

- (a) such provisions shall not be deemed to have been fulfilled or waived unless the approval or expression of satisfaction is in writing signed by the Authorized Person and no prior approval or expression of satisfaction and no condoning, excusing or overlooking by the City or the Authorized Person on previous occasions when such approval or satisfaction was required shall be taken to operate as a waiver of the necessity for such approval or satisfaction wherever required by this Agreement; and
- (b) such approval or satisfaction shall be at the discretion of the Authorized Person acting reasonably in conformance with sound and accepted public municipal engineering practice.

17. Unless otherwise expressly provided in this Agreement, wherever the Owner is obliged or required to do or cause to be done any act, matter or thing, such act, matter or thing shall be done by the Owner at its sole expense.
18. Any notice to be given under this Agreement shall be in writing, and any letter may be delivered personally or sent by prepaid mail. The addresses of the parties for the purpose of notice are as follows:

To the City:

1100 Patricia Boulevard  
Prince George, BC V2L 3V9

Attention: Director of Planning and

Development Fax No. (250) 561-7721

To the Owner:

[owner's address]  
[owner's contact name]  
[owner's fax no.]

Any party may at any time give notice in writing to another of any change of address and from and after the third day after the giving of such notice the address specified shall be deemed to be the address of such party for the giving of notice. In the event of any disruption of mail services, all notices shall be delivered or sent by facsimile rather than mailed.

19. The City has made no representations, warranties, guarantees, promises, covenants or agreements to or with the Owner regarding the installation and construction of the Works other than those in this Agreement.
20. Subject only to section 3(d) of this Agreement, no amendment to this Agreement is valid unless in writing and executed by the parties.
21. Wherever the singular or masculine is used in this Agreement, the same shall be construed as meaning the plural or the feminine or the body corporate or politic where the context or the parties so require.
22. If any section or lesser portion of this Agreement is held invalid by a court of competent jurisdiction, the invalid portion shall be severed and the invalidity of such section or portion shall not affect the validity of the remainder.

23. Time is of the essence of this Agreement.

24. This Agreement shall ensure to the benefit of and be binding upon the parties, their respective heirs, executors, administrators, successors and assigns.

IN WITNESS WHEREOF the Owner has caused his hand and seal to be affixed in the presence of his proper officers, first duly authorized in that behalf, on the date hereinafter appearing.

SIGNED, SEALED AND DELIVERED BY:  
OWNER:

Execution Date

|   |   |   |
|---|---|---|
| Y | M | D |
|   |   |   |

\_\_\_\_\_  
Owner's Signature or Authorized Agent

\_\_\_\_\_  
Owner's Name (PRINT) or Authorized Agent

CITY OF PRINCE GEORGE:

Execution Date

|   |   |   |
|---|---|---|
| Y | M | D |
|   |   |   |

\_\_\_\_\_  
Authorized Signatory Signature

\_\_\_\_\_  
Authorized Signatory (STAMP)

Schedule A - [works and services checklist]  
Schedule B - [design and specifications]  
Schedule C -[legal plan]

*FORM B – Works and Services Agreement – Development Servicing*

THIS AGREEMENT made on \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_\_.

BETWEEN:

**CITY OF PRINCE GEORGE**

(the "City")

AND:

*[name of owner]*

(the "Owner")

WHEREAS:

- A. The Owner is the registered owner of those lands in the City of Prince George legally described as:

Parcel Identifier:

*[no.] [legal  
description]*

(the "Lands");

- B. City of Prince George Subdivision and Development Servicing Bylaw (the "Development Servicing Bylaw") requires the provision of various works and services upon the issuance of a building permit and regulates the standards to which such works and services must be constructed and installed;
- C. The Owner has applied for a building permit on the Lands and has under section 509 of the Local Government Act, requested the City to enter into this Agreement in order to enable the building inspector to issue a building permit before the construction and installation of all works and services required by the Development Servicing Bylaw;
- D. The Owner has agreed to grant and transfer to the City all its right, title and interest in and to the works and services required to be constructed and installed by the Development Servicing Bylaw to the City and the City has agreed to accept such transfer of the works and services on the terms of this Agreement.

NOW THEREFORE in consideration of the mutual promises contained in this Agreement and in consideration of the City entering into this Agreement to allow the construction and installation of the works and services after the issuance of a building permit for development on the Lands, the Owner covenants and agrees with the City as follows:

1. In this Agreement:

"Complete" or "Completion" with respect to the Works means completion to the satisfaction of the Authorized Person of the City evidenced by the certificate issued by the Authorized Person under section 10 b);

"Authorized Person" means the City's Director of Planning and Development and his or her duly authorized assistants and such consulting or professional engineers as may be appointed to act for the City;

"Works" means all those works and services required to be provided under the Development Servicing Bylaw and without limitation, those works and services described in Schedules A and B to this Agreement.

2. The Owner covenants and agrees:

- (a) to install, construct and complete the Works;
- (b) to pay to the City in advance upon execution of this Agreement all applicable fees and charges including the inspection fee in accordance with the City's Comprehensive Fees and Charges Bylaw;
- (c) as security for the due and proper performance by the Owner of all of the covenants, agreements and obligations of the Owner in this Agreement, the Owner has deposited with the City security, in accordance with the Development Servicing Bylaw, in the sum of \$ ***[amount]*** (the "Deposit");
- (d) that the Deposit, less the amount required by section 6 to be maintained, will only be returned to the Owner upon completion of the Works in strict conformance with this Agreement; and
- (e) that no interest on the Deposit shall be paid to the Owner.

3. In carrying out the Works the Owner covenants and agrees:

- (a) not to commence the construction or installation of the Works without first advising the Authorized Person in writing at least five days before commencement;
- (b) to construct, install and complete the Works as designed and to the specifications and as shown in Schedule B (the "Approved Design and Specifications") and in conformance with the Development Servicing Bylaw;

- (c) to obtain the prior written approval of the Authorized Person for any changes to the Approved Design and Specifications;
- (d) to comply with any changes to the Approved Design and Specifications required by the Authorized Person as necessary to satisfy the Authorized Person that the Works will function and operate in a manner satisfactory to the City;
- (e) to pay the cost of all necessary connections by the City of the Works to municipal water distribution, storm drainage and sanitary sewage systems as the case may be;
- (f) not to damage any City works, services or property, or remove, alter or destroy any survey pins, posts or monuments, and if in default to replace, repair and restore any damage of whatever nature to the reasonable satisfaction of the Authorized Person;
- (g) to comply with all statutes, laws, regulations and orders of any authority having jurisdiction and without limiting the generality of the foregoing all bylaws of the City;
- (h) to not deposit or permit the deposit of any material or debris upon any highways or City lands;
- (i) to retain at all times a professional engineer to provide competent survey, layout and onsite supervision to ensure that the Works strictly conform to the Approved Design and Specifications, and to record the details of any field design or construction changes to the Approved Design and Specifications and to record all of the geometric information for preparation as “as- constructed” drawings;
- (j) to advise the Authorized Person of the name and address of the professional engineer retained by the Owner and to ensure that such professional engineer maintains during the term of his or her engagement:
  - i. professional liability and errors and omissions insurance of not less than \$1,000,000 per occurrence, and
  - ii. comprehensive general liability insurance in an amount not less than \$2,000,000 inclusive per occurrence insuring against bodily injury, personal injury and property damage and including liability assumed under Contract with insurers licensed in the City of Prince George and in the forms and amounts acceptable to the City.

The owner's engineer shall provide proof of such insurance before the Owner commences the construction and installation of the Works;

- (k) not to employ any person or contractor in the construction of the Works who, in the reasonable opinion of the Authorized Person is unfit, incapable or unskilled, and at all times, in connection with the execution of the Works, to employ and keep on site a competent general works superintendent capable of speaking, reading and writing the English language. Any explanations, directions and requests given by the Authorized Person to the superintendent shall be conclusively deemed to have been given to the Owner; and
  - (1) not to engage any contractor in respect of the Works unless that contractor holds a valid business license issued by the City.
4. The Owner shall prosecute the Works diligently without interruptions and shall complete the construction and installation of the Works by the [day] day of [month], 2 [year].
5. Upon completion of the Works, the Owner covenants and agrees:
- (a) to assign to the City, all of its right, title and interest in and to the Works free and clear of all encumbrances;
  - (b) to grant or cause to be granted to the City in registrable form all statutory rights-of-way reasonably required by the Authorized Person for the operation, maintenance, repair and replacement of the Works, on such terms as are satisfactory to the Authorized Person;
  - (c) to execute and deliver or cause to be executed and delivered at the request of the City all such further transfers, instruments, agreements, documents and plans and to perform all such acts as may be necessary to give full effect to this Agreement; and
  - (d) to deliver to the City final as-constructed drawings of the Works which drawings shall be prepared by the Owner's engineer in accordance with the Development Servicing Bylaw and in a form satisfactory to the Authorized Person.
6. The Owner covenants and agrees to:
- (a) maintain the Works in complete repair for a period of one year from completion of the Works;

- (b) remedy any defects appearing within a period of one year from the date of completion and pay for any damage to other work or property resulting therefrom, save and except for defects caused by reasonable wear and tear, negligence of the City, its servants or agents, or acts of God; and
  - (c) keep deposited with the City for a period of one year from completion of the Works, the sum of 15% of the Deposit by cash or letter of credit.
- 7. The Owner shall release, and does hereby indemnify and save the City harmless from and against:
  - (a) all costs, expenses, damages, claims, demands, actions, suits and liability by whomever brought or made and however arising whether directly or indirectly, from the construction or installation of the Works and any injury or damage thereby caused to person or property (including death) except that arising from the negligence or other fault of the City;
  - (b) all costs and expenses arising incurred by the City directly or indirectly from any engineering operation, construction, repair, replacement or maintenance by the City to or on any real or personal property which is affected by the Works and which the City either owns or is by duty or custom obliged, directly or indirectly, to construct, repair, replace or maintain; and
  - (c) all expenses and costs incurred by reason of liens for nonpayment of labour or material, workers' compensation assessments, unemployment insurance, federal or provincial tax check off in relation to Works and for unlawful encroachments by the Works.
- 8. The Owner shall take out and maintain at all times from commencement of construction and installation of the Works until the Authorized Person issues a certificate of acceptance, insurance at its sole expense. Such insurance shall include comprehensive general liability insurance against claims for bodily injury including death and property damage or loss arising from its operations in or about the Lands, highways or other lands in carrying out the construction and installation of the Works and in performing its obligations under this Agreement. Such insurance shall name the City as a co-insured and shall contain a cross-liability or severability of interest clause so that the City and the Owner are insured in the same manner and to the same extent as if individual policies had been issued to each. Such insurance shall be for the amount of not less than \$5,000,000 combined single limit or such other amount as the Authorized Person may reasonably require. The Owner shall provide to the Authorized Person proof in writing of such insurance before commencing the Works and again before the issuance of any certificate of Completion. The

policy of insurance shall contain a provision requiring the insurer to give to the City 30 days' prior written notice before any alteration of or cancellation of the policy shall be effective.

9. The Owner acknowledges and agrees that the Owner relies exclusively on its own engineer and contractor and that the City does not, by its approvals, inspections or acceptance of the Works, warrant or represent that the Works are without fault or defect and that all approvals and inspection of the Works given or made by the City are for the sole benefit of the City and shall in no way relieve or excuse the Owner from constructing and installing the Works in strict compliance with the provisions of this Agreement.
10. The City covenants and agrees that:
  - (a) it will permit the Owner to perform the Works on the terms and conditions contained in this Agreement and to occupy and use municipal highways and City lands as necessary for the Works subject to such terms and conditions in any case and from time to time as the Authorized Person may impose;
  - (b) it will issue a Certificate of Completion signed by the Authorized Person upon the owner satisfactorily completing the Works and performing all other requirements of this Agreement except the requirements of section 6; and
  - (c) upon the satisfactory completion by the Owner of all the covenants and conditions in this Agreement, and without limiting the generality of the foregoing, including the maintenance of the Works constructed under this Agreement in complete repair for a period of one year, it shall provide to the Owner a certificate of acceptance of the Works, signed by the Authorized Person, together with the balance of the Deposit and a release and discharge of any restrictive covenant granted under section 12.
11. Nothing in this Agreement shall exempt the Owner or the Lands from the ordinary jurisdiction of the council of the City, its bylaws and regulations, and without limitation the construction of the Works shall not confer directly or indirectly any exemption or right of set-off from development cost charges, connection charges, application fees, user fees or other fee or charges, except as statutorily required.

***Note: Depending on the scope and complexity of the Works remaining at the time of subdivision, the Authorized Person may choose either A), B) or C) as the appropriate Section 12. In some circumstances, the Authorized Person may determine that Section 12 is not required.***

- 12.
- A) Pursuant to section 219 of the Land Title Act, the Owner covenants that no buildings or structures, except the Works, shall be placed, built or constructed upon the Lands until the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement. All amounts of money due and owing to the City from the Owner as provided for in this Agreement and without limiting the generality of the foregoing due and owing under section 15 of this Agreement shall constitute a rent charge charging the Lands.
  - B) Pursuant to section 219 of the Land Title Act, the Owner covenants to not occupy the lands until the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement. Buildings or structures may be placed, built or constructed upon the Lands pursuant to the building permit issued for the building or structure. The Authorized Person may instruct the Building Inspector to withhold the Occupancy Permit until the Owner has satisfactorily completed the Works and the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement.
  - C) The Owner agrees not to occupy the lands until the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement. Buildings or structures may be placed, built or constructed upon the Lands pursuant to the building permit issued for the building or structure. The Authorized Person may instruct the Building Inspector to withhold the Occupancy Permit until the Owner has satisfactorily completed the Works and the Authorized Person has issued to the Owner the certificate of Completion provided for in section 10 (b) of this Agreement.
13. Any letter of credit provided by the Owner to the City shall be a clean unconditional and irrevocable letter of credit, that provides for automatic renewals, in favour of the City drawn on a Canadian chartered bank or such other financial institution satisfactory to the Authorized Person. Such letter of credit shall be maintained as good and valid security by the Owner at all times as required by this Agreement, and if the Owner fails or omits to renew any letter of credit and deliver such renewal to the City at least 14 days before the expiry of any letter of credit then held by the City, the City may draw down on the then current letter of credit without notice or restriction, and hold the monies in lieu thereof.
14. If the Owner shall fail to observe, perform or keep any of the provisions of this Agreement to be observed, performed or kept by the Owner, the City may at its sole discretion and without prejudice to any other remedy rectify the default of the Owner, at the Owner's expense and without limiting the generality of the

foregoing may:

- (a) enter onto the lands and do or cause to be done through its servants, contractors and others, all such things as may be required to fulfill the obligations of the Owner including without limitation, the completion of the Works; and
  - (b) make any payments required to be made for and on behalf of the Owner; and for such purposes may without notice or limitation deduct from the Deposit all costs, and expenses incurred, payment and expenditures made, and monies due and owing to the City.
- 15. If the City incurs any costs and expenses or makes payments as either provided in section 14 of this Agreement or otherwise in this Agreement, or if the Owner is otherwise indebted to the City under this Agreement, and the Deposit is not sufficient to fully recompense the City, the Owner shall forthwith upon notice from the City pay to the City the amount of such deficiency together with interest thereon at *[percentage]* % per annum calculated and compounded monthly from the date such cost or expense was incurred or payment or expenditure was made by the City. Such amounts required to be paid by the Owner shall constitute a debt due and owing to the City ***[and if section 12A is used]*** and shall charge the Lands under section 12.
- 16. Wherever in this Agreement the approval of the Authorized Person is required or some act or thing is to be done to the satisfaction of the Authorized Person:
  - (a) such provisions shall not be deemed to have been fulfilled or waived unless the approval or expression of satisfaction is in writing signed by the Authorized Person and no prior approval or expression of satisfaction and no condoning, excusing or overlooking by the City or the Authorized Person on previous occasions when such approval or satisfaction was required shall be taken to operate as a waiver of the necessity for such approval or satisfaction wherever required by this Agreement; and
  - (b) such approval or satisfaction shall be at the discretion of the Authorized Person acting reasonably in conformance with sound and accepted public municipal engineering practice.
- 17. Unless otherwise expressly provided in this Agreement, wherever the Owner is obliged or required to do or cause to be done any act, matter or thing, such act, matter or thing shall be done by the Owner at its sole expense.
- 18. Any notice to be given under this Agreement shall be in writing, and any letter may be delivered personally or sent by prepaid mail. The addresses of the parties for the purpose of notice are as follows:

To the City:

1100 Patricia Boulevard  
Prince George, BC V2L 3V9

Attention: Director of Planning and

Development Fax No. (250) 561-7721

To the Owner:

*[Owner's address]*  
*[Owner's contact name]*  
*[Owner's fax no.]*

Any party may at any time give notice in writing to another of any change of address and from and after the third day after the giving of such notice the address specified shall be deemed to be the address of such party for the giving of notice. In the event of any disruption of mail services, all notices will be delivered or sent by facsimile rather than mailed.

19. The City has made no representations, warranties, guarantees, promises, covenants or agreements to or with the Owner regarding the installation and construction of the Works other than those in this Agreement.
20. Subject only to section 3(d) of this Agreement, no amendment to this Agreement is valid unless in writing and executed by the parties.
21. Wherever the singular or masculine is used in this Agreement, the same shall be construed as meaning the plural or the feminine or the body corporate or politic where the context or the parties so require.
22. If any section or lesser portion of this Agreement is held invalid by a court of competent jurisdiction, the invalid portion shall be severed and the invalidity of such section or portion shall not affect the validity of the remainder.
23. Time is of the essence of this Agreement.
24. This Agreement shall ensure to the benefit of and be binding upon the parties, their respective heirs, executors, administrators, successors and assigns.

\_\_\_\_\_  
**IN WITNESS WHEREOF** the parties have executed this Agreement  
with effect as of the date and year first above written.

**CITY OF PRINCE GEORGE**

Execution Date

|   |   |   |
|---|---|---|
| Y | M | D |
|   |   |   |

\_\_\_\_\_  
Authorized Signatory Signature

\_\_\_\_\_  
Authorized Signatory (STAMP)

**OWNER:**

Execution Date

|   |   |   |
|---|---|---|
| Y | M | D |
|   |   |   |

\_\_\_\_\_  
Owner's Signature or Authorized Agent

\_\_\_\_\_  
Owner's Name (PRINT) or Authorized Agent

**Schedule A - *[works and services checklist]***  
**Schedule B - *[design and specifications]***

*Form C - Agreement with Owner for Works and Services Performed by City*

THIS AGREEMENT dated for reference the \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_.

BETWEEN:

CITY OF PRINCE GEORGE, 1100 Patricia Boulevard,  
Prince George, in the Province of British Columbia

(the "City")

**OF THE FIRST PART**

AND:

(the "Owner")

**OF THE SECOND PART**

WHEREAS:

- A. The Owner is the registered owner of those lands in the City of Prince George legally described as:

Parcel Identifier: *[no.]*  
*[legal description]*

(the "Lands");

- B. City of Prince George Subdivision and Development Servicing Bylaw (the "Subdivision Bylaw") requires the provision of various works and services upon the subdivision or development of land and regulates the standards to which such works and services must be constructed and installed;
- C. Pursuant to the Subdivision Bylaw, the City has agreed to perform certain works and services upon or adjacent to the said Lands at the request of the Owner and the Owner has agreed to pay for such works and services in the manner hereinafter appearing.

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the mutual covenants hereinafter appearing and in consideration of the premises and other valuable consideration the parties each covenant and agree with the other as follows:

**1.0 THIRD PARTY WORKS**

1.1 City agrees to supply all work, services and materials referred to in Paragraph 1.3 (the "Third Party Works") required by the Subdivision Bylaw to be installed in areas shown on Schedule "A".

1.2 All works and services shall be performed to the standards set forth in the Subdivision Bylaw.

1.3 While no representation, promise, covenant, or agreement is made or intended, the City will use its best efforts to complete the installation of the following items by the following dates:

1.3.1 *[description of works and services]*

1.3.2 *[description of works and services]*

**2.0 COST**

2.1 The parties acknowledge, declare and agree that the price of the Third Party Works, has been estimated to be the sum of \_\_\_\_\_ (\$\_\_\_\_\_) DOLLARS (the "Third Party Works Cost").

2.2 Owner covenants to pay the Third Party Works Cost to the City in the manner set forth in Paragraph 2.3 below.

2.3 Owner covenants to provide to the City cash, a certified cheque or irrevocable stand-by letter of credit to secure payment to the City of the Third Party Works Cost (the "Security"). Any stand-by letter of credit shall be clean, unconditional and irrevocable, provide for automatic renewals, be drawn in favour of the City on a Canadian chartered bank, and be in a form acceptable to the Authorized Person as defined in the Subdivision Bylaw. The City may deposit the Security in a City account that bears no interest.

2.4 On the date that the Authorized Person certifies that the installation of the Third Party Works has been completed, the City shall be at liberty to apply or draw upon the Security to reimburse the City for the Third Party Works Cost.

2.5 Where the actual Third Party Works Cost is less than the amount provided in Paragraph 2.3, the City will return to the Owner within 30 days of the date set forth in

Paragraph 2.4 any unused portion of the Security.

- 2.6 Where the actual Third Party Works Cost is greater than the amount provided in Paragraph 2.3, the City may forward an invoice for the cost of such works to Owner.
  - 2.6.1 Within 30 days of the date of such invoice, the Owner shall pay the amount of such invoice to the City.
  - 2.6.2 In the event such invoice is not paid on its due date as aforesaid, the City may add interest at a rate of 1.5 percent per month.
  - 2.6.3 In the event such invoice is not paid on or before December 31st in the year in which the Third Party Works are completed, the Collector may add the amount of such invoice plus accumulated interest to the taxes, as taxes in arrears, in respect of the Lands.
  - 2.6.4 Any notice, demand of payment, invoice, or other communication to be issued by the City pursuant to this Agreement shall be deemed to be sufficiently given if mailed by registered mail and addressed to the Owner at his address on the application for subdivision or building permit or to the owner at his address as shown on the last revised assessment roll. Any such communication so mailed shall be deemed to have been received by the Owner 72 hours following the posting of such communication as set out above.

### **3.0 GENERAL**

- 3.1 Time shall be deemed to be the essence of this Agreement.
- 3.2 There are no guarantees, warranties or representations, whether oral or written, other than herein set forth and this Agreement shall be deemed to constitute the entire agreement between the parties.
- 3.3 The Owner shall do all things and sign all such documents as may be required from time to time in order to carry out this Agreement according to its true intent.
- 3.4 This Agreement shall enure to the benefit of and be binding upon the parties and their respective heirs, executors, successors and assigns.
- 3.5 Wherever the singular and neuter are used throughout this Agreement, the same shall be construed as the masculine, feminine or plural wherever the parties or the context so require.

**IN WITNESS WHEREOF** the Owner has caused his hand and seal to be affixed in the presence of his proper officers, first duly authorized in that behalf, on the date hereinafter appearing.

**SIGNED, SEALED AND DELIVERED BY**

**OWNER:**

Execution Date

\_\_\_\_\_  
Owner's Signature or Authorized Agent

|   |   |   |
|---|---|---|
| Y | M | D |
|   |   |   |

\_\_\_\_\_  
Owner's Name (PRINT) or Authorized Agent

**CITY OF PRINCE GEORGE:**

Execution Date

\_\_\_\_\_  
Authorized Signatory Signature

|   |   |   |
|---|---|---|
| Y | M | D |
|   |   |   |

\_\_\_\_\_  
Authorized Signatory's Name (PRINT)

SECTION 943 WAIVER AGREEMENT

As authorized by section 943 of the Local Government Act, I agree with the City of Prince George that section 943 of the Local Government Act shall not apply with regard to the proposed subdivision, (insert legal description of the land to be subdivided) (the “Land”), and that all bylaws enacted under Part 26 of the Local Government Act during the consideration of my application to subdivide the Land shall take effect immediately in relation to the Land, with the following exceptions:

- (a) (Insert description of exceptions as appropriate);
- (b)
- (c)

Signed, Sealed and Delivered this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_.

\_\_\_\_\_  
Witness

\_\_\_\_\_  
Applicant for Subdivision

\_\_\_\_\_  
Witness

\_\_\_\_\_  
CITY OF PRINCE GEORGE  
by its authorized signatories

## SAMPLE SECTION 219 RESTRICTIVE COVENANT

THIS AGREEMENT made this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_

BETWEEN:

[name of owner], occupation  
[name of spouse], occupation  
[street address]  
[location], British Columbia, [postal code]  
as Joint Tenants  
(the "Grantor")

OF THE FIRST PART

AND:

CITY OF PRINCE GEORGE, having an office  
at 1100 Patricia Boulevard in Prince George,  
British Columbia, V2L 3V9  
(the "Grantee")

OF THE SECOND PART

WHEREAS the Grantor is the registered owner in fee simple of the following lands in the Province of British Columbia, more particularly known and described as:

Lot \_\_\_\_  
District Lot \_\_\_\_  
[name of] District  
Plan \_\_\_\_  
(the "Lands");

AND WHEREAS the Grantor proposes to subdivide the Lands, according to a plan of subdivision completed and certified correct on the \_\_\_\_th day of \_\_\_\_\_, \_\_\_\_\_, by [name of surveyor], British Columbia Land Surveyor, a copy of which is attached hereto as Schedule "A", into the following lots:

Lot \_\_\_\_ and Lot \_\_\_\_;

AND WHEREAS a covenant under section 219 of the Land Title Act is required as a condition of the consent to approval of the subdivision of the Lands by the Approving Officer under section 86(1)(d)(ii) of the Land Title Act;

AND WHEREAS section 219 of the Land Title Act provides that there may be registered as a charge against the title to any land, a covenant in favour of a municipality, that land is to be used in a particular manner, or that land is not to be subdivided except in accordance with the covenant;

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the sum of ONE (\$1.00) DOLLAR of lawful money of Canada and other good and valuable consideration paid by the Grantee to the Grantor, the receipt of which is hereby acknowledged, the Grantor does hereby covenant and agree with the Grantee under section 219 of the Land Title Act of the Province of British Columbia as follows:

1. The Grantor is aware of and, on behalf of himself and his heirs, executors, administrators, successors and assigns, hereby acknowledges that there is a potential flood danger to Lot "\_\_\_".
2. The Grantor, on behalf of himself and his heirs, executors, administrators, successors and assigns, hereby covenants and agrees with the Grantee, as a covenant in favour of the Grantee pursuant to section 219 of the Land Title Act, it being the intention and agreement of the Grantor that the provisions hereof be annexed to and run with and be a charge upon Lot "\_\_\_", that from and after the date hereof:
  - (a) No building, manufactured home or unit, modular manufactured home or structure shall be constructed, reconstructed, moved, extended or located within \_\_\_\_\_ (\_\_\_\_) metres of the natural boundary of [name of] River.
  - (b) No area used for habitation, business or storage of goods damageable by floodwaters and no furnace or other fixed equipment damageable by floodwaters shall be located within any building, modular manufactured home or structure at an elevation such that the underside of the floor system is less than elevation \_\_\_\_ metres, Geodetic Survey of Canada datum. In the case of a manufactured home or unit, modular manufactured home or structure, the ground level or top of concrete or asphalt pad on which it is located shall be no lower than the above-described elevation.
  - (c) There be no removal of the natural vegetation within the horizontal setback established in 2(a) above without the written approval of the Regional Water Manager.
3. Where landfill is used to raise the natural ground elevation, the toe of the landfill slope shall be no closer to the natural boundary than the setback requirement given in paragraph 2, above. The face of the landfill slope shall be adequately protected against erosion from flood flows (wave action, ice, or other debris). The required

elevation may be achieved by structural elevation of the said habitable, business, or storage area or by adequately compacted landfill on which any building, modular manufactured home or structure is to be constructed or manufactured home or unit located, or by a combination of both structural elevation and landfill; provided, that no area below the required elevation shall be used for the installation of furnaces or other fixed equipment damageable by floodwaters.

4. The Grantor, on behalf of himself and his heirs, executors, administrators, successors and assigns, acknowledges that the Grantee does not represent to the Grantor, nor to any other person that any building, modular manufactured home, manufactured home or unit, improvement, chattel or other structure, including the contents of any of them, built, constructed or placed on Lot "\_\_\_" will not be damaged by flooding or erosion and the Grantor, on behalf of himself and his heirs, executors, administrators, successors and assigns, with full knowledge of the potential flood or erosion danger and in consideration of the approvals given by the Grantee hereby:
  - (a) agrees to indemnify and to save harmless the Grantee.
  - (b) does remise, release and forever discharge the Grantee and its employees, servants or agents from all manner of actions, cause of actions, suits, debts, accounts, covenants, contracts, claims and demands which the Grantor or any of his heirs, executors, administrators, successors and assigns may have against the Grantee and its employees, servants or agents for and by reason of any personal injury, death or loss or damage to Lot "\_\_\_", or to any building, modular manufactured home, manufactured home or unit, improvement, chattel or other structure, including the contents of any of them, built, constructed or placed on Lot "\_\_\_", including existing non-conforming buildings, caused by flooding, erosion or some such similar cause.
5. Subject to the provisions of section 219 of the Land Title Act, the Grantor's covenants contained in this Agreement shall burden and run with Lot "\_\_\_" and shall enure to the benefit and be binding upon the Grantor, his heirs, executors, administrators, successors and assigns and the Grantee and its assigns.
6. Nothing in this Agreement shall prejudice or affect the rights, powers and remedies of the Grantee in relation to the Grantor, including his heirs, executors, administrators, successors and assigns, or Lot "\_\_\_" under any law, bylaw, order or regulation or in equity all of which rights, powers and remedies may be fully and effectively exercised by the Grantee as if this Agreement had not been made by the parties.
7. The Grantor will do or cause to be done at his expense all acts reasonably necessary for the Grantee to gain priority for this Agreement over all liens, charges and encumbrances which are or may be registered against Lot "\_\_\_" save and except those in favour of the Grantee and those specifically approved in writing by the Grantee.
8. The parties agree that this Agreement shall not be modified or discharged except in accordance with the provisions of section 219 of the Land Title Act.

9. The Grantor shall do or cause to be done all things and execute or cause to be executed all documents and give such further and other assurance which may be reasonably necessary to give proper effect to the intent of this Agreement.
10. (a) The Grantor or any of his heirs, executors, administrators and assigns, as the case may be, shall give written notice of this Agreement to any person to whom he proposes to dispose of Lot "\_\_\_", which notice shall be received by that person prior to such disposition.  
  
(c) For the purposes of this paragraph the word "dispose" shall have the same meaning given to it under section 29 of the Interpretation Act, R.S.B.C. 1979, c. 206.
11. Wherever the singular or masculine or neuter is used herein, the same shall be construed as including the plural, feminine, body corporate or politic unless the context requires otherwise.
12. If any section or any part of this Agreement is found to be illegal or unenforceable, then such sections or parts shall be considered to be separate and severable from this Agreement and the remaining sections or parts of this Agreement, as the case may be, shall be unaffected thereby and shall remain and be enforceable to the fullest extent permitted by law as though the illegal or unenforceable parts or sections had never been included in this Agreement.
13. This Agreement shall be interpreted according to the laws of the Province of British Columbia.
14. Where there is a reference to an enactment of the Province of British Columbia in this Agreement, that reference shall include a reference to any subsequent enactment of the Province of British Columbia of like effect, and unless the context otherwise requires, all statutes referred to herein are enactments of the Province of British Columbia.

IN WITNESS WHEREOF the parties hereto have executed this Agreement on the day and year first above written.

|                                      |   |         |
|--------------------------------------|---|---------|
| Signed by [name of owner] and        | ) |         |
| [name of spouse] in the presence of: | ) |         |
|                                      | ) |         |
|                                      | ) |         |
| _____                                | ) | _____   |
| Witness                              | ) | Grantor |
|                                      | ) |         |
|                                      | ) |         |
| _____                                | ) | _____   |
| Address                              | ) | Grantor |
|                                      | ) |         |
|                                      | ) |         |
| _____                                | ) |         |
| Title or Occupation                  | ) |         |

This is the instrument creating the condition or covenant pursuant to section 219 of the Land Title Act by the Grantor referred to herein and shown on the Print and Plan annexed hereto as Schedule "A" and initialed by me.

\_\_\_\_\_  
Approving Officer, City of Prince George

# LATECOMER CHARGE WAIVER AGREEMENT

THIS AGREEMENT made the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_

BETWEEN:

[name of owner]

(the "Owner")

OF THE FIRST PART

AND:

CITY OF PRINCE GEORGE  
Province of British Columbia

(the "Municipality")

OF THE SECOND PART

WHEREAS:

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

Parcel Identifier:

Lot \_\_, Block \_\_, District Lot \_\_\_\_, \_\_\_\_\_ District, Plan \_\_\_\_\_  
(the "Lands")

for [describe use] use:

- B. Such development is in accordance with the future plans of the Municipality but is presently premature as a portion of the municipal works and services required to be installed by the Owner to serve the proposed development may provide access to or serve land other than the Lands and thus may be eligible for a contribution towards the cost of such works and services from the Municipality or from the owners of other land who may connect to or use those works and services; however, the Municipality does not have sufficient funds, either on hand or anticipated from development cost charges, to make a contribution towards the cost of the works and services, nor does the Municipality at this time have a system in place to levy

latecomer charges against the owners of other lands who may connect or use the said works and services; and

- C. The Owner has voluntarily agreed to waive any right the Owner may have to a contribution toward the cost of such works and services which are necessary to serve the proposed development of the Lands and has requested that the Municipality enter into this Agreement with the Owner.

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

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

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

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

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

\_\_\_\_\_  
Authorized Signatory

\_\_\_\_\_  
Authorized Signatory

)  
)  
)  
)  
)  
)  
)  
)  
)  
)

c/s

The corporate seal of the City of Prince George  
was hereunto affixed in the presence of:

\_\_\_\_\_  
Mayor

\_\_\_\_\_  
Clerk

)  
)  
)  
)  
)  
)  
)  
)  
)  
)

c/s

## LATECOMER AGREEMENT

THIS AGREEMENT dated for reference the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

BETWEEN:

**CITY OF PRINCE GEORGE**

(the Municipality) **OF THE FIRST PART**  
AND:

**(insert name(s) of owner-developers)**

(the Owner) **OF THE SECOND PART**

GIVEN THAT:

- A. The Owner has applied to the Municipality to provide works on or about \_\_\_\_\_ Road and \_\_\_\_\_ Avenue to \_\_\_\_\_ Avenue in accordance with the Municipalities subdivision and development bylaw providing sewage facilities that will serve the Lands defined in this Agreement;
- B. A portion of the sewage facilities (herein defined as Excess or Extended Services) will also serve the Benefiting Lands herein defined;
- C. The Municipality considers that its costs to provide the Excess or Extended Services in whole or in part are excessive, and requires the Owner, as owner of the Lands, and the owners of the benefiting lands to pay the cost of the Excess or Extended Services;
- D. The Municipality is authorized to enter into this agreement under section 508 of the Local Government Act;
- E. The Council of the Municipality Has by way of Bylaw No. 8618, 2014 as amended or replaced from time to time, set the rate of interest referred to under section 508(4) of the Local Government Act and in paragraph 3 of this Agreement;

NOW THEREFORE THIS AGREEMENT WITNESSES THAT in consideration of the mutual covenants and agreements made by each of the parties to the other as set out in this Agreement, and for other valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Municipality and the Owner covenant and agree as follows:

## **Interpretation**

### **1. In this Agreement**

- a. "Benefiting Lands" means each of the lands shown shaded on Schedule A which lands may be connected to the Excess or Extended Services after Completion of the Excess or Extended Services;
- b. "Completion" means the date of the issuance of a Certificate of Completion signed by the Municipality's Director of Planning and Development certifying that the Excess or Extended Services have been completed to the standards and specifications set out in the bylaws of the Municipality, such that the Excess or Extended Services have been fully tested, are functional, and can be used for their intended purpose when the system becomes operational, all to the satisfaction of the Municipality's Director of Planning and Development;
- c. "Excess or Extended Services" means that portion of the sewer main and related appurtenances installed by the Owner in \_\_\_\_ Road and \_\_\_\_ Avenue, shown generally on Schedule B, that serves the Benefiting Lands;
- d. "Lands" means those certain lands shown shaded on Schedule C.

## **Charges for Latecomer Connections or Use**

- 2. The Municipality must pay to the Owner charges imposed by the Municipality under section 508(1)(c) of the Local Government Act, in respect of the Excess or Extended Services only if and to the extent the charges are paid by the owners of Benefiting Lands and collected by the Municipality during the period commencing on Completion, up to and including \_\_\_\_ years subsequent to Completion.

## **Interest**

- 3. There shall be included in the charge payable by the owner of Benefiting Lands under section 508(1)(c) of the Local Government Act, interest calculated annually at a rate prescribed by Bylaw No. 8618, 2014, payable for the period commencing on Completion, up to the date that the connection is made, and if paid by the owners of Benefiting Lands and collected by the Municipality during the period referred to in paragraph 2, the interest shall be paid to the Owner.

## **Assignment or Transfer of Owner's Rights**

- 4. In the event of the assignment or transfer of the rights of the Owner voluntarily, or by operation of law, the Municipality's Financial Officer may pay any benefits accruing under this Agreement, after notice, to such successor of the Owner as the Municipality's Financial Officer, in his judgment, deems entitled to such benefits.  
In

the event of conflicting demands being made on the Municipality for benefits accruing under this Agreement, then the Municipality may at its option commence an action in interpleader joining any party claiming rights under this Agreement, or other parties which the Municipality believes to be necessary or proper, and the Municipality shall be discharged from further liability on paying the person or persons whom the court having jurisdiction over such interpleader action shall determine, and in such action the Municipality shall be entitled to recover its reasonable legal fees and costs, which fees and costs shall constitute a lien upon all funds accrued or accruing pursuant to this Agreement.

### **Indemnity**

5. The Owner covenants not to sue the Municipality, its administrators, successors, assigns, directors, officers, agents, employees, servants, tenants, solicitors, consultants, and anyone else for whom the Municipality is in law liable, by reason of or arising out of or in any way connected with any error, omission, or conduct of the Municipality in relation to the Excess or Extended Services, including, without limiting the generality of the foregoing, a failure of the Municipality to pass a resolution, enact a bylaw, enter into an agreement, impose a charge, calculate a charge correctly, or collect a charge under Section 508 of the Local Government Act.

### **Termination**

6. This Agreement shall expire and shall be of no further force and effect for any purpose on the earlier of:
  - (a) the payment of the latecomer charge or charges by the Municipality to the Owner for all the Benefiting Lands under paragraphs 2 and 3 of this Agreement; or
  - (b) \_\_\_\_ years subsequent to Completion.

and thereafter the Municipality shall be forever fully released and wholly discharged from any and all liability and obligations hereunder this Agreement, or howsoever arising pertaining to the Excess or Extended Services, and whether arising before or after the expiry of this Agreement.

7. Paragraphs 5 to 16 shall survive the termination of this Agreement.

### **Owner Representation and Warranty**

8. The Owner represents and warrants to the Municipality that the Owner has not received, claimed, demanded, or collected money or any other consideration from the owners of the Benefiting Lands for the provision, or expectation of the provision of the Excess or Extended Services, other than as contemplated and as provided for under this Agreement; and further represents and warrants that the Owner has not entered into any agreement with the owners of the Benefiting Lands for consideration

in any way related to or connected directly or indirectly with the provision of the Excess or Extended Services.

### **Miscellaneous**

9. Time is of the essence.
10. Any notice required by this Agreement will be sufficiently given if delivered by courier or registered mail to the parties at the addresses first above written.
11. This Agreement will enure to the benefit of and be binding on the parties hereto and their respective successors and assigns.
12. The laws of the Province of British Columbia shall govern this Agreement.
13. This Agreement constitutes the entire agreement between the Municipality and the Owner with regard to the subject matter hereof and supersedes all prior agreements, understandings, negotiations, and discussions, whether oral or written of the Municipality with the Owner.
14. No amendment or waiver of any portion of this Agreement shall be valid unless in writing and executed by the parties to this Agreement. Waiver of any default by a party shall not be deemed to be a waiver of any subsequent default by that party.
15. A reference in this Agreement to the Municipality or the Owner includes their permitted assigns, heirs, successors, officers, employees and agents.
16. The Owner represents and warrants to the Municipality that:
  - (a) all necessary corporate actions and proceedings have been taken by the Owner to authorize its entry into and performance of this Agreement;
  - (b) upon execution and delivery on behalf of the Owner, this Agreement constitutes a valid and binding contractual obligation of the Owner;
  - (c) neither the execution and delivery, nor the performance, of this Agreement shall breach any other agreement or obligation, or cause the Owner to be in default of any other agreement or obligation, respecting the Lands; and
  - (d) the Owner has the corporate capacity and authority to enter into and perform this Agreement.

IN WITNESS WHEREOF the parties hereto have executed this agreement as of the year and date first above written.

SIGNED, SEALED AND DELIVERED )

By \_\_\_\_\_ )

\_\_\_\_\_ in the presence of )

)

)

)

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\_\_\_\_\_  
Name: (Authorized Signatory)

)

)

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\_\_\_\_\_  
Name: (Authorized Signatory)

)

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)

SIGNED, SEALED AND DELIVERED )

By the CITY OF PRINCE GEORGE by its )

authorized signatories: )

)

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\_\_\_\_\_

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\_\_\_\_\_

)

PARKLAND PROVISION  
AGREEMENT

THIS AGREEMENT made the \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_.

BETWEEN:

CITY OF PRINCE GEORGE  
1100 Patricia Boulevard  
Prince George, British Columbia  
V2L 3V9

(the "Municipality")

OF THE FIRST PART

AND:

[name of land owner] (Inc. #\_\_\_\_\_)  
[street address]  
[location], British Columbia  
[postal code]

(the "Owner")

OF THE SECOND PART

WHEREAS the Owner desires to subdivide land within the [name of municipality], more particularly known and described as:

Parcel Identifier -----  
District Lot\_\_\_\_\_, etc.  
(the "Lands")

AND WHEREAS the Owner, as a condition of subdivision approval, is required to provide, without compensation, park land of an amount and in the location acceptable to the Council of the Municipality to the extent provided in section 510 of the Local Government Act.

AND WHEREAS the Owner wishes to enter into an agreement pursuant to section 510(9) of the Local Government Act whereby the park land shall be provided after approval of the subdivision;

NOW THEREFORE in consideration of the premises and in consideration of the agreement by the Municipality to permit the approval of the subdivision plan prior to the provision of park land, the Municipality and the Owner covenant and agree as follows:

1. The Owner shall provide park land having a total area equal to or greater than xx,xxx square metres within the Lands, in locations acceptable to the Council of the Municipality, on or before the 1st day of July, 2000 (the "Dedication Date").

Without limiting the generality of subsection (1), the park land shall be dedicated as follows and as shown on the map attached as Schedule "A" to this Agreement:

- (a) a parcel having a minimum area of xx,xxx m<sup>2</sup> and located more or less within the heavily outlined boundaries noted as "Area 1"; and
  - (b) a parcel having a minimum area of xx,xxx m<sup>2</sup> and located more or less within the heavily outlined boundaries noted as "Area 2".
2. Not later than 60 days before the Dedication Date, the Municipality shall provide the Owner with a plan identifying the final location of the park land within Area 1 and Area 2, and the Owner shall at its expense prepare such surveyed plans and documents as are required to complete the dedication of the park land.
3. Notwithstanding section 1, if any of the Lands included in the areas outlined on Schedule "A" are subdivided prior to the Dedication Date, the park land dedications required by this Agreement shall be made on or before the date of such subdivision.
4. The Owner shall execute all plans and documents and do all things necessary for the dedication of the parkland to be provided under this Agreement.
5. As security for the Owner's performance all of the covenants, terms and conditions in this Agreement, the Owner has deposited with the Municipality cash or a certified cheque in the amount of \$xx,xxx (the "Security").
6. The Municipality shall hold the Security in an interest-bearing account at a financial institution, which the Owner acknowledges and agrees will be chosen at the sole discretion of the Municipality, and shall pay the Security together with accrued interest to the Owner when the Owner has performed all of its obligations under this Agreement.
7. The Owner agrees that if all of the park land required under this Agreement is not dedicated from within the Lands on or before the Dedication Date, the full amount of the Security together with accrued interest shall be forfeited to the Municipality.
8. Notwithstanding any forfeiture of the Security, the Municipality may bring proceedings for specific performance of this Agreement and may hold the Security together with accrued interest towards its court-awarded costs in such proceedings until the conclusion of the proceedings, including any appeals.
9. The area of land taken into account for the purpose of this Agreement and the purpose of section 510(8) of the Local Government Act is the entire area of the Lands.

10. Nothing in this Agreement commits the Municipality or its approving officer to approve any proposed subdivision of the Lands

11. This Agreement runs with the Lands.

12. The Owner acknowledges that the Municipality shall pursuant to section 510(10) of the Local Government Act file a notice of this Agreement with the Registrar at the Land Title Office in [location], British Columbia.

IN WITNESS WHEREOF the parties have executed this Agreement with the effect of the date and year first written above.

**CITY OF PRINCE GEORGE**

by its authorized signatories:

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**OWNER:**

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(use letterhead)

**NOTICE OF PARK LAND AGREEMENT**

TO: Registrar of Titles  
Land Title Office  
[street address]  
[location], British Columbia, [postal code]

TAKE NOTICE that the land described below is subject to a park land agreement entered into between:

CITY OF PRINCE GEORGE

and

[NAME OF OWNER]  
(Incorporation # \_\_\_\_\_)  
[mailing address]  
[location], British Columbia, [postal code]

**PARTICULARS OF AGREEMENT**

Legal Description of Land Affected:

Parcel Identifier: \_\_\_\_ - \_\_\_\_ - \_\_\_\_

District Lot \_\_\_\_, [name of] District, etc.

Expiry Date: \_\_\_\_, \_\_\_\_

FURTHER PARTICULARS OF THE AGREEMENT MAY BE OBTAINED FROM  
THE CITY OF PRINCE GEORGE

Dated: \_\_\_\_\_ th, \_\_\_\_

CITY OF PRINCE GEORGE

c/s

by \_\_\_\_\_  
Clerk

# SAMPLE

## STATUTORY RIGHT OF WAY

*(Land Title Act – Section 218)*

### **1. INTERPRETATION**

#### 1.1 “**Build and Service**” means to:

- (a) enter, go, pass and repass, over, across and through, at all times by day and by night, with or without motor vehicles; and
- (b) establish, construct, operate, maintain, repair, extend, alter, protect, improve or remove;

#### 1.2 “**City**” means the CITY OF PRINCE GEORGE named as the Transferee in Form C;

#### 1.3 “**City’s Undertaking**” means:

- (a) sewerage works for the collection, conveyance and disposal of sewage;
- (b) drainage works for the impounding, conveying and discharging of surface and other waters; and
- (c) water works for the collection, storage and distribution of water
- (d) a driveway or roadway, for use by the City and its employees, agents, invitees, licensees and permittees, at all times hereafter by day and night and at their will and pleasure, to enter, go, pass and repass with or without motor vehicles;

#### 1.4 “**Form C**” means Form C under the *Land Title (Transfer Forms) Regulation* to which these Express Charge Terms are attached as Part 2, and includes any schedules or addenda to Form C;

#### 1.5 “**Lands of the Owner**” means the land described in paragraph 2 of Form C and includes the Right of Way Lands;

#### 1.6 “**Owner**” means the person or persons named as the Transferor in Form C; and

#### 1.7 “**Right of Way Area**” has the meaning ascribed to such term in section 3.5.

### **2. RECITALS**

#### 2.1 The Owner is the registered owner of the Lands of the Owner.

- 2.2 The Owner has entered into this Statutory Right of Way to allow the City to Build and Service the City's Undertaking in, on or over the Lands of the Owner.
- 2.3 This Statutory Right of Way is necessary for the operation and maintenance of the City's Undertaking.

### **3. WHAT THIS STATUTORY RIGHT OF WAY DOES**

- 3.1 This Statutory Right of Way is evidence that in return for the City having paid to the Owner the sum of ONE (\$1.00) DOLLAR, and in return for the Owner allowing the City to Build and Service the City's Undertaking on the Lands of the Owner, the City and the Owner agree with each other as set out in this Statutory Right of Way.
- 3.2 The Owner grants to the City this Statutory Right of Way to Build and Service the City's Undertaking in, on or over the Lands of the Owner.
- 3.3 The Owner agrees that the City, and persons, equipment and materials authorized by the City, may from time to time enter in, on or over the Lands of the Owner to Build and Service the City's Undertaking as reasonably required by the City.
- 3.4 The Owner agrees that the City may dig and carry away soil or other surface or subsurface materials, and clear off any trees or obstructions, from the Lands of the Owner as reasonably required by the City for the purpose of the City's Undertaking.
- 3.5 Notwithstanding the foregoing, after the City has constructed the City's Undertaking on the Lands of the Owner, the statutory right of way granted hereunder will be confined and restricted to the portion of the Lands of the Owner where the City's Undertaking are situated (the "Right of Way Area"), which will be precisely determined by a survey to be made by a British Columbia Land Surveyor at the expense of the Owner.

### **4. PROMISES OF THE OWNER**

- 4.1 The Owner shall by way of an unregistered licence, permit the City, and persons, equipment and materials authorized by the City, from time to time as reasonably required by the City to enter upon and pass over such of the Lands of the Owner as may be reasonably required for access to the City's Undertaking.
- 4.2 The Owner will not permit anything to be built or done in, on or over such portions of the Lands of the Owner that is likely to cause harm to, or prevent access to, any of the City's Undertaking.
- 4.3 The Owner will not reduce the soil cover over any of the City's Undertaking and will not construct open drains or ditches along or across the Lands of the Owner.
- 4.4 The Owner will sign any other documents reasonably required by the City to complete the grant of this Statutory Right of Way to the City.

- 4.5 The Owner will do everything reasonably necessary, at the Covenantor's expense, to ensure that this Statutory Right of Way is registered against title to the Lands of the Owner with priority over all financial charges, liens and encumbrances registered, or the registration of which is pending, at the time of application for registration of this Statutory Right of Way.

**5. PROMISES OF THE CITY**

- 5.1 The City will not bury any debris or rubbish in the Lands of the Owner, and the City will remove any shoring or other similar temporary structures as backfilling proceeds.
- 5.2 The City will remove from the Lands of the Owner any construction debris created or placed there by the City.
- 5.3 Each time the City disturbs the surface soil on any of the Lands of the Owner, the City will return the natural drainage to the Lands of the Owner by restoring the surface soil as soon as reasonably possible. The City will not restore any trees or other surface growth to the Lands of the Owner, but will leave the surface soil in a condition, which will not inhibit natural regeneration of such growth.
- 5.4 The City will carry out all work in a proper and workmanlike manner so as to do as little injury as possible to the Lands of the Owner.

**6. AGREEMENTS BETWEEN THE OWNER AND THE CITY**

- 6.1 After the City has completed construction of the City's Undertaking, the Owner will cause the Right of Way Area to be surveyed and, subject to approval by the City of the accuracy of the survey plan, the Owner will deposit the survey plan in the appropriate Land Title Office. The Owner will prepare and apply to register a partial discharge of the statutory right of way in the Land Title Office concurrently with the deposit of the survey plan at its own expense. Upon receipt of the discharge, and provided the City has approved of the survey plan, the City will execute and return the executed discharge to the Owner forthwith. After the survey plan and partial discharge have been accepted for deposit in the Land Title Office, the statutory right of way granted under this Agreement will be discharged from all portions of the Lands of the Owner except the Right of Way Area.
- 6.2 All material, equipment, machinery or attachments used in connection with the City's Undertaking (the "Works") shall remain the property of the City, and all or any part of the Works may be removed from time to time by the City even though such Works have been attached to the Right of Way Area.
- 6.3 If the City abandons all or part of the Works, the City may remove all or any part of the Works from the Right of Way Area or the City may leave all or any part of the Works in, on or over the Right of Way Area.

- 6.4 The Owner may continue to fully use and enjoy all of the Lands of the Owner, including the Right of Way Area, subject only to the rights and restrictions set out in this Statutory Right of Way.
- 6.5 The covenants herein contained shall be covenants running with the land. In other words, the promises made in this Statutory Right of Way by the Owner not to do certain things will be binding on all future owners of the Lands of the Owner. The Lands of the Owner at all times remain charged with the promises made in this Statutory Right of Way, however such promises are only binding on an owner during the time and to the extent that such owner has a registered interest in all or part of the Lands of the Owner.
- 6.6 If there is more than one owner of the Lands of the Owner, all of the promises made by the Owner in this Statutory Right of Way shall be binding on each Owner individually and shall be binding on each Owner on behalf of all of the Owners.
- 6.7 The Owner and the City, and their respective personal representatives and successors and assigns, shall each be bound by this Agreement and shall each be entitled to the benefit of this Agreement.
- 6.8 Their Agreement is a Statutory Right of Way as referred to in Section 218 of the *Land Title Act* of British Columbia.

**- END OF DOCUMENT -**

# **SAMPLE**

## **STATUTORY RIGHT OF WAY AGREEMENT**

**BETWEEN:**

(the "Owner")

**OF THE FIRST PART**

**AND:**

**CITY OF PRINCE GEORGE**  
1100 Patricia Boulevard,  
Prince George, British Columbia V2L 3V9

(the "City")

**OF THE SECOND PART**

### **W H E R E A S:**

A. The Owner is the registered owner in fee simple of the lands and premises described as:

**PID:**

(the "Lands");

- B. Section 218 of the Land Title Act, R.S.B.C. 1996, c. 250 enables the Owner to grant in favour of the City an easement without a dominant tenement to be known as a statutory right of way;
- C. The City requires and the Owner wishes to grant to the City a statutory right of way for water utility, storm water drainage utility, and sanitary sewer utility purposes over portions of the Lands; and
- D. This statutory right of way is necessary for the operation and maintenance of the City's undertaking.

*Form K – Statutory Right of Way Agreement with Reference Plan*

NOW THEREFORE in consideration of the premises contained in this Agreement, \$1.00 paid by the City to the Owner, and other good and valuable consideration, the receipt and sufficiency of which are acknowledged by the parties, the parties agree as follows:

1. The Owner hereby grants and conveys in perpetuity and at all times to the City, and to persons authorized by the City, the full, free and uninterrupted right, licence, liberty, privilege, easement and right of way in common with the Owner over that portion of the Lands (the “Right of Way Area”) shown outlined in heavy black on Statutory Right of Way Plan No. \_\_\_\_\_ filed concurrently with this Agreement, a reduced copy of which plan is attached to this Agreement as Schedule “A”:
  - (a) to enter over, on, in, and under the Right of Way Area to:
    - (i) conduct surveys and examinations;
    - (ii) dig up, remove and replace soil;
    - (iii) construct, install, operate, maintain, repair, protect, improve, clean, cover with soil, alter, extend, relocate, renew, inspect, replace, abandon and remove pipes, culverts, retaining walls, wing walls, manholes, meters, pumps, valves, waterworks connections, sanitary sewer and storm drainage service connections, storm drainage catch basins, storm drainage system inlets and outlets and similar equipment, or any of them, together with all ancillary attachments and fittings (all of which are collectively called the “Works”);  
  
all for the purposes of the collection, storage and distribution of water, the collection, conveyance and disposal of sewage and liquid waste, and the impounding, conveying and discharging of surface and other waters;
  - (b) to bring on to the Right of Way Area all materials and equipment the City requires or desires for the Works;
  - (c) to clear the Right of Way Area and keep it clear of anything which in the opinion of the City constitutes or may constitute an obstruction to the use of the Right of Way Area or to the Works; and
  - (d) to do all acts which in the opinion of the City are incidental to the foregoing.
2. The Owner shall:
  - (a) not do or permit to be done any act or thing which in the opinion of the City might interfere with, injure, impair the operating efficiency of, or obstruct access to or the use of the Right of Way Area or the Works, provided always that the Owner may pave the Right of Way Area;

*Form K – Statutory Right of Way Agreement with Reference Plan*

- (b) not reduce the soil cover over any of the Works and shall not construct open drains or ditches along or across the Right of Way Area;
  - (c) trim or, if necessary, cut down any tree or other growth on the Lands which in the opinion of the City constitutes or may constitute a danger or obstruction to those using the Right of Way Area or to the Works;
  - (d) execute all further documents and things for the better assuring unto the City of the Statutory Right of Way granted by this Agreement;
  - (e) permit the City to peaceably hold and enjoy the rights granted by this Agreement; and
  - (f) maintain, care for and clean the surface of the Statutory Right of Way Area and do all other things deemed by the City to be reasonably necessary for the safe use and preservation of the Statutory Right of Way granted by this Agreement.
3. The City shall:
- (a) use the Statutory Right of Way Area and carry out the construction and maintenance of the Works in a good and workmanlike manner, in order to cause no unnecessary damage to the Lands;
  - (b) not bury, without the prior written consent of the Owner, debris or rubbish in excavations or backfill;
  - (c) remove shoring and like temporary structures as backfilling proceeds;
  - (d) rake up all rubbish and construction debris it creates in order to leave the Statutory Right of Way Area in a reasonably neat and clean condition;
  - (e) exercise care not to damage the Lands, and each time the City disturbs the surface soil of the Lands, the City will return the natural drainage to the Lands by restoring the surface soil as soon as reasonably possible. The City will not restore any trees or other surface growth to the Lands, but will leave the surface soil in a condition that will not inhibit natural regeneration of such growth.
4. No right granted to or reserved by the City in this Agreement shall require the City to clean, repair, or maintain the Works or the Statutory Right of Way Area unless the City is expressly required in this Agreement to perform such cleaning, repairing or maintenance.
5. If the City deems it necessary or convenient to alter the location of the Statutory Right of Way Area or the Works, the Owner agrees to execute a new statutory right of way agreement in substantially the same form as this Agreement to authorize and protect the Statutory Right of Way Area in its new location and the Works in their new location and,

*Form K – Statutory Right of Way Agreement with Reference Plan*

on execution and registration of the new agreement, this Agreement shall be deemed to be null and void and if the alteration is at the request of the Owner, the cost of the physical relocation of the Works and preparation, execution and registration of the amending statutory right of way agreement and plan shall be borne by the Owner.

6. All chattels, equipment, supplies, fixtures or other materials comprising the Works or otherwise installed by the City over, on, in or under the Statutory Right of Way Area are and shall remain the property of the City, any rule of law or equity to the contrary notwithstanding, and may be removed from time to time by the City.
7. If the City no longer requires the Works, then the City will have an option to abandon the Works or any part thereof, at no cost to the City, and upon registration of a release of this Agreement at the appropriate Land Title Office, any abandoned part of the Works will become the property of the Owner, with no liability incurred by the City to the Owner.
8. Should the Owner omit, fail or neglect to carry out one of its obligations contained in this Agreement or do some act contrary to its obligations contained in this Agreement, the City may give the Owner 14 days' written notice in the manner provided in this Agreement requiring the default to be cured; if the Owner fails to cure such default to the satisfaction of the City within the time specified, the City may enter onto the Lands and rectify such default to the extent considered necessary by it and the cost of doing so shall be a debt due and owing to the City.
9. The Owner shall, after execution of this Agreement by it, at the expense of the Owner, do or cause to be done all acts reasonably necessary to grant priority to this Agreement over all financial charges and encumbrances which may have been registered against the title to the Lands in the Land Title Office save and except those as have been specifically approved in writing by the City or have been granted in favour of the City.
10. The Owner shall at all times and does hereby indemnify, save harmless, release and forever discharge the City, and its elected and appointed officials, from and against all manner of actions, causes of action, claims, debts, suits, damages, demands and promises, at law or in equity, whether known or unknown, including without limitation for injury to persons or property including death, of any person directly or indirectly arising or resulting from, or attributable to, any act, omission, negligence or default of the Owner in connection with or in consequence of this Agreement.
11. Notwithstanding anything contained in this Agreement the City reserves all rights and powers of expropriation otherwise enjoyed by the City.
12. Waiver of any default by either party shall not be deemed to be a waiver of any subsequent default by that party.
13. This Agreement runs with the Lands.

*Form K – Statutory Right of Way Agreement with Reference Plan*

14. Whenever it is required or desired that either party shall deliver or serve a notice on the other, delivery or service shall be deemed to be satisfactory if and deemed to have occurred when:
  - (a) the Clerk of the City or a director of the Owner has been served personally, on the date of service; or
  - (b) mailed by prepaid registered mail, on the date received or on the sixth day after receipt of mailing by any Canada Post office, whichever is the earlier, so long as the notice is mailed to the party at the address provided in this Agreement or to whatever address the party may from time to time provide to the other party.
15. Wherever the singular or masculine is used in this Agreement, the same is deemed to include the plural or the feminine or the body politic or corporate as the context so requires.
16. Every reference to each party is deemed to include the heirs, executors, administrators, successors, assigns, employees, agents, officers, and invitees of such party wherever the context so requires or allows.
17. Any opinion which the City is entitled by virtue of this Agreement to form may be formed on behalf of the City by the City Manager in which event the opinion of the City Manager shall be deemed to be the opinion of the City for the purposes of this Agreement.
18. If any section, subsection, sentence, clause or phrase in this Agreement is for any reason held to be invalid by the decision of a court of competent jurisdiction, the invalid portion shall be severed and the decision that it is invalid shall not affect the validity of the remainder of the Agreement.
19. This Agreement shall enure to the benefit of and be binding on the parties notwithstanding any rule of law or equity to the contrary.
20. This Agreement may be assigned by the City without the consent of the Owner.
21. This Agreement shall be governed and construed in accordance with the laws of the Province of British Columbia.
22. Notwithstanding anything contained in this Agreement, neither the Owner named herein nor any future owner of the Lands or any portion of the Lands shall be liable under any of the covenants and agreements contained herein where such liability arises by reason of an act or omission occurring after the Owner named herein or any future owner ceases to have a further interest in the Lands.
23. Wherever this Agreement creates a power or obligation of the City to make a decision or to exercise any contractual right or remedy, the City may do so in accordance with the

*Form K – Statutory Right of Way Agreement with Reference Plan*

provisions of this Agreement and no public law duty, whether arising from the principles of procedural fairness or the rules of natural justice, shall have any application.

24. This Agreement is a Statutory Right of Way as referred to in section 218 of the *Land Title Act* of British Columbia.

IN WITNESS WHEREOF the parties acknowledge that this Agreement has been duly executed and delivered by the parties executing Part 1 of the *Land Title Act* Form C and Form D attached to and forming part of this Agreement.

Schedule A

END OF DOCUMENT

THIS AGREEMENT made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

BETWEEN:

\_\_\_\_\_  
\_\_\_\_\_

(hereinafter called the "Grantor")

OF THE FIRST PART

AND:

**CITY OF PRINCE GEORGE**

having an office at

1100 Patricia Boulevard  
Prince George, British Columbia  
(hereinafter called the "Grantee")

OF THE SECOND PART

WHEREAS the Grantor is the registered owner in fee simple of the following lands in the Province of British Columbia, more particularly known and described as:

(parcel identifier) \_\_\_\_\_

(legal description) \_\_\_\_\_

(hereinafter called the "Lands");

AND WHEREAS section 219 of the *Land Title Act* provides that there may be registered as a charge against the title to any land a covenant in favour of the Grantee and a municipality that land is to be used in a particular manner or that land is not to be subdivided except in accordance with the covenant;

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the sum of ONE (\$1.00) DOLLAR of lawful money of Canada and other good valuable consideration paid by the Grantee to the Grantor, the receipt of which is hereby acknowledged, the Grantor does hereby covenant and agree with the Grantee under section 219 of the *Land Title Act* of the Province of British Columbia as follows

1. The Grantor is aware of and, on behalf of himself or herself and his or her heirs, executors, administrators, successors and assigns, hereby acknowledges that there is a potential flood danger to the Lands.
2. The Grantor, on behalf of himself or herself and his or her heirs, executors, administrators, successors and assigns, hereby covenants and agrees with the Grantee, as a covenant in favour of the Grantee pursuant to section 219 of the *Land Title Act*, it being the intention and agreement of the Grantor that the provisions hereof be annexed to and run with and be a charge upon the Lands, that from and after the date hereof:

- a. No building, manufactured home or unit, modular home or structure shall be constructed, reconstructed, moved, extended or located within \_\_\_\_\_ metres of the natural boundary of (name of watercourse).
- b. No area used for habitation, business or storage of goods damageable by floodwaters and no furnace or other fixed equipment damageable by floodwaters shall be located within any building, modular home or structure at an elevation such that the underside of the floor system is less than \_\_\_\_\_ metre(s) above the natural boundary of \_\_\_\_\_ or elevation \_\_\_\_\_ metres Geodetic Survey of Canada datum or \_\_\_\_\_ metre(s) above the natural ground elevation taken at the perimeter of the building.

In the case of a manufactured home or unit, the ground level or top of concrete or asphalt pad on which it is located shall be no lower than the above described elevation.

3. Where landfill is used to raise the natural ground elevation, the toe of the landfill slope shall be no closer to the natural boundary than the setback requirement given in paragraph (2) above. The face of the landfill slope shall be adequately protected

against erosion from flood flows (wave action, ice, or other debris). The required elevation may be achieved by structural elevation of the said habitable, business, or storage area or by adequately compacted landfill on which any building, modular home or structure is to be constructed or manufactured home or unit located, or by a combination of both structural elevation and landfill, provided, that no area below the required elevation shall be used for the installation of furnaces or other fixed equipment damageable by floodwaters.

4. The Grantor, on behalf of himself or herself and his or her heirs, executors, administrators, successors and assigns, acknowledges that the Grantee does not represent to the Grantor, nor to any other person that any building, modular home, manufactured home or unit, improvement, chattel or other structure, including the contents of any of them, built, constructed or placed on the Lands will not be damaged by flooding or erosion and the Grantor, on behalf of himself or herself and his or her heirs, executors, administrators, successors and assigns, with full knowledge of the potential flood or erosion danger and in consideration of the approvals given by the Grantee hereby:
  - a. agrees to indemnify and to save harmless the Grantee and the Grantee's employees, servants or agents from all loss, damage, costs, actions, suits, debts, accounts, claims and demands which the Grantee or any of the Grantee's employees, servants or agents, may suffer or incur or be put to arising out of or in connection with any breach of any covenant or agreement on the part of the Grantor or his or her heirs, executors, administrators, successors and assigns contained in this Agreement or arising out of or in connection with any personal injury, death or loss or damage to the Lands, or to any building, modular home, manufactured home or unit, improvement, chattel or other structure, including the contents of any of them, built, constructed or placed on the Lands, including any existing non-conforming buildings, caused by flooding, erosion or some such similar cause; and

- b. does remise, release and forever discharge the Grantee and the Grantee's employees, servants or agents from all manner of actions, causes of action, suits, debts, accounts, covenants, contracts, claims and demands which the Grantor or any of his or her heirs, executors, administrators, successors and assigns may have against the Grantee and the Grantee's employees, servants or agents for and by reason of any personal injury, death or loss or damage to the Lands, or to any building, modular home, manufactured home or unit, improvement, chattel or other structure, including the contents of any of them, built, constructed or placed on the Lands, caused by flooding, erosion or some such similar cause.
- 5. Subject to the provisions of section 219 of the *Land Title Act*, the Grantor's covenants contained in this Agreement shall burden and run with the Lands and shall enure to the benefit and be binding upon the Grantor, his or her heirs, executors, administrators, successors and assigns and the Grantee and its assigns.
- 6. Nothing in this Agreement shall prejudice or affect the rights, powers and remedies of the Grantee in relation to the Grantor, including his or her heirs, executors, administrators, successors and assigns, or the Lands under any law, bylaw, order or regulation or in equity, all of which rights, powers and remedies may be fully and effectively exercised by the First Grantee as if this Agreement had not been made by the parties.
- 7. The Grantor will do or cause to be done at his or her expense all acts reasonably necessary for the First Grantee to gain priority for this Agreement over all liens, charges and encumbrances which are or may be registered against the Lands save and except those in favour of the First Grantee and those specifically approved in writing by the First Grantee.
- 8. The parties agree that this Agreement shall not be modified or discharged except in accordance with the provisions of section 219(9) of the *Land Title Act*.

9. The Grantor shall do or cause to be done all things and execute or cause to be executed all documents and give such further and other assurance which may be reasonably necessary to give proper effect to the intent of this Agreement.
10.
  - a. The Grantor or any of his or her heirs, executors, administrators and assigns, as the case may be, shall give written notice of this Agreement to any person to whom he or she proposes to dispose of the Lands, which notice shall be received by that person prior to such disposition.
  - b. For the purposes of this paragraph the word “dispose” shall have the meaning given to it under section 29 of the *Interpretation Act*, R.S.B.C. 1996, c.238
11. Wherever the singular or masculine or neuter is used herein, the same shall be construed as including the plural, feminine, body corporate or politic unless the context requires otherwise.
12. If any section or any part of this Agreement is found to be illegal or unenforceable, then such sections or parts shall be considered to be separate and severable from this Agreement and the remaining sections or parts of this Agreement, as the case may be, shall be unaffected thereby and shall remain and be enforceable to the fullest extent permitted by law as though the illegal or unenforceable parts or sections had never been included in this Agreement.
13. This agreement shall be interpreted according to the laws of the Province of British Columbia.
14. Where there is a reference to an enactment of the Province of British Columbia in this agreement, that reference shall include a reference to any subsequent enactment of the Province of British Columbia of like effect, and unless the context otherwise requires, all statutes referred to herein are enactments of the Province of British Columbia.

IN WITNESS WHEREOF the parties hereto have executed this Agreement on  
the day and year first above written.

Signed by )  
in the presence of: )

\_\_\_\_\_)  
Witness )

\_\_\_\_\_)  
Address )

\_\_\_\_\_)  
Title or Occupation )

\_\_\_\_\_) Grantor

CITY OF PRINCE GEORGE

\_\_\_\_\_)  
Authorized Signatory

\_\_\_\_\_)  
was hereunto affixed in the presence of: )

\_\_\_\_\_)  
\_\_\_\_\_)

\_\_\_\_\_)

(A Consent and Priority Agreement may be required to gain priority for the Section 219 Covenant over financial charges. See below.)

**CONSENT AND PRIORITY AGREEMENT**

(liens, charges and encumbrances)

WHEREAS \_\_\_\_\_ (the “Chargeholder”) is the holder of a \_\_\_\_\_ registered in the \_\_\_\_\_ Land Title Office under No. \_\_\_\_\_ (the “Charge”) encumbering the lands described in the attached Section 219 Covenant (the “Covenant”).

Therefore this Consent and Priority Agreement witnesses that the Chargeholder hereby:

1. approves of, joins in and consents to the registration of the Covenant;
2. covenants and agrees that the Covenant is binding upon and takes priority over the Charge; and
3. postpones the Charge and all of its right, title and interest thereunder to the Covenant in the same manner and to the same effect as if the Covenant had been dated, executed and registered prior to the Charge.

IN WITNESS WHEREOF the Chargeholder has executed this Consent and Priority Agreement on the attached Form C.

## **Schedule G**

### **INFRASTRUCTURE SERVICING DRAWING SUBMISSION REQUIREMENTS**

#### **Drawing, GIS and Record Documentation Requirements**

#### **1.0 Design Submissions Requirements**

1. All documentation, including drawings, reports, cost estimates, technical letters and other documentation, submitted to the Authorized Person for the purposes of reviewing proposed infrastructure to service and develop lands, shall be prepared and sealed by a Professional Engineer registered in the Province of British Columbia. A minimum number of four (4) originally sealed sets of documents shall be submitted. For reports, letters or other documentation in support of developing lands which require specialized professional expertise as determined by the Authorized Person, Approving Officer or provincial or federal government agency, four (4) originally signed or sealed copies of the documents prepared by the qualified professional shall be submitted to the Authorized Person. Alternatively, the Authorized Person may accept fewer originally sealed sets (hardcopy) if the documents are sealed and submitted in electronic (digital) format acceptable to the Authorized Person.
2. The Engineer shall submit to the Authorized Person for review, four (4) complete sets of paper prints of the design drawings, bearing the Engineer's seal, and the technical specifications including special provisions for the construction. The layout, format and content of the design drawings shall be provided in the form as shown on the sample drawings contained within this Schedule. Infrastructure symbols, standard line types and hatching patterns shall be presented in accordance with Table G-1 of this Schedule. The design submission shall include four (4) copies of all the detailed design calculations used to complete the drawings in the form of a design brief. Four (4) copies of soils reports or geotechnical engineering reports, as required by the Authorized Person or Approving Officer, shall accompany submissions for all new road construction, drainage systems, water distribution, sanitary and storm sewer collection systems, lot grading and structural designs. Street lighting plans shall be accompanied by photometric lighting calculations. Alternatively, the Authorized Person may accept fewer originally sealed sets (hardcopy) if the drawings and geotechnical engineering reports are sealed and submitted in electronic (digital) format acceptable to the Authorized Person.

3. The Engineer's seal on the drawings(s), submitted for review and acceptance, shall certify that the design has been completed in compliance with this Bylaw, with the minimum criteria as defined by the Authorized Person in the City of Prince George Design Guidelines, and in accordance with accepted engineering practice. Drawings shall not be submitted without the Engineer first having the design checked and reviewed for compliance prior to sealing each drawing. Should the design drawings or construction documents contain proposed specifications, procedures, dimensions or other instructions that conflict or do not comply with this Bylaw, any other City Bylaw, provincial or government agency requirements, the Engineer or Applicant shall provide written explanation to the Authorized Person as to why the proposed conflict or non-compliance is necessary or required, otherwise, the design drawings and construction documents submitted shall be deemed to be out of compliance even if drawings sealed "Accepted for Construction Purposes" have been issued by the Authorized Person. Works and Services required by this Bylaw or any other City Bylaw, may be waived only on the approval of a Development Variance Permit by City Council.
4. The Authorized Person will review the design drawings and calculations to verify general compliance with the City's requirements but will not necessarily check the adequacy or accuracy of the Professional Engineer's design. Any errors or omissions will be the sole responsibility of the Professional Engineer whose seal appears on the drawings.
5. If the design drawings and calculations, as submitted, are not acceptable, one "Red Line" marked up set of drawings will be returned to the Engineer for review and revisions, as necessary. Items "red-lined" for attention must be addressed by the Engineer. Failure to do so will result in submissions being returned. All submissions subsequent to the first submission shall have "high-lighted", with yellow, any changes made by the Engineer which are in addition to those marked up by the Authorized Person. The Engineer shall return the marked up set of the prior submission drawings to the Authorized Person.
6. Design submissions are to be accompanied by a complete construction cost estimate sealed by a Professional Engineer.
7. Upon notification that the design drawings are acceptable to the Authorized Person, the Engineer will be asked to submit four (4) complete sets of paper prints, duly sealed by a Professional Engineer registered in the Province of British Columbia. One set will be stamped "Accepted for Construction Purposes" by the City and returned to the Consulting Engineer. Alternatively, the Authorized Person may accept fewer originally sealed sets (hardcopy) if the drawings and geotechnical engineering reports are sealed and submitted in electronic (digital) format acceptable to the Authorized Person.

8. Where there is a conflict between the Standard Drawings and the “Accepted for Construction Purposes” drawings, the “Accepted for Construction Purposes” drawings shall govern. In the absence of “Accepted for Construction Purposes” drawings, the Schedule D Infrastructure Specifications and Schedule E Standard Infrastructure Drawings and all other requirements of this Bylaw shall apply.
9. The Engineer shall prepare and submit, on behalf of the City or otherwise, the necessary forms, plans and documents to the appropriate government agency as required for the proposed works. Government agencies will include federal and provincial agencies with approval or permitting responsibilities under, but not limited to, the following legislation: Federal Fisheries Act, Federal Navigable Waters Act, Health Act, Local Government Act, Land Titles Act, Highway Act, Motor Vehicle Act, and Water Act.

## **2.0 INFRASTRUCTURE RECORD DRAWING SUBMISSIONS**

1. Infrastructure record drawings or “as-constructed drawings” must be submitted to the City of Prince George Development Services Department in the form acceptable to the Authorized Person. Infrastructure record drawings should include construction and design information relevant to the drawing. Notes shall be modified to reflect actual construction. The layout, format and content of the infrastructure record drawings shall be provided in the form as shown on the sample drawings contained within this Schedule. Infrastructure symbols, standard line types and hatching patterns shall be presented in accordance with Table G-1 of this Schedule.
2. The Engineer will be required to prepare and submit infrastructure record drawings of all completed Works and Services, certifying that all of the installed Works and Services have been installed in accordance with the infrastructure standards and specifications and the design drawings as originally accepted. The infrastructure record drawings shall be sealed by the Engineer, which certifies that the construction was completed under the Engineer’s supervision.
3. The following procedures are to be followed in the submission of infrastructure record drawings for acceptance by the Authorized Person:
  - .1 The Engineer shall submit two (2) complete sets of paper prints, excluding the road cross-section sheet(s).
  - .2 One marked-up set of the “As-Constructed” paper prints will be returned to the Engineer for revision. If there are numerous amendments, it is likely that the Engineer will be requested to re-submit two sets of revised paper prints for a second review.

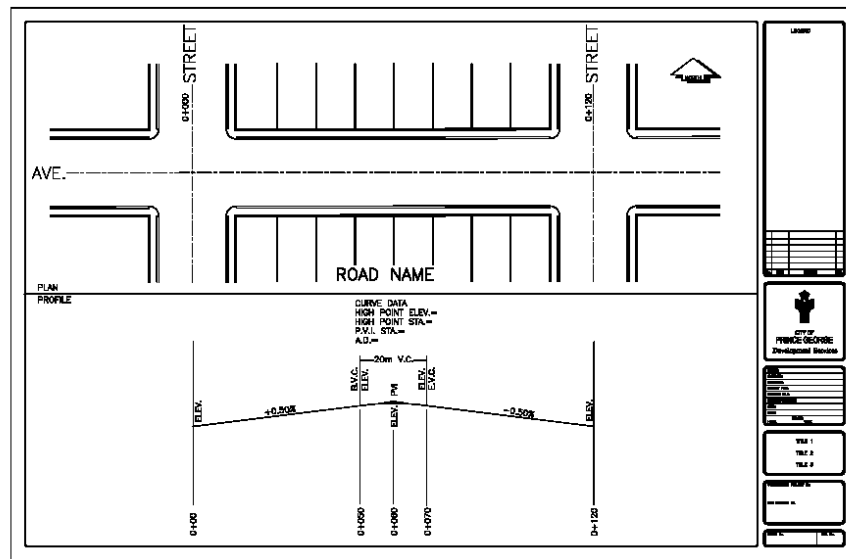
- .3 When the Authorized Person is satisfied with the “As-Constructed” submission, the Engineer will be requested to submit the following, unless otherwise approved by the Authorized Person:
  - i. One complete set of mylar drawings, accompanied with a statement, duly signed and sealed by the Engineer, in accordance with the requirements of the current issue of the City of Prince George Design Guidelines.
  - ii. Digital (electronic) drawing files submitted in standard portable document file (pdf) or AutoCAD format, on acceptable medium (i.e. compact disc, floppy disk, or other).

### **3.0 “GIS-READY” DRAWING SUBMISSIONS**

- .1 Unless the requirements are reduced or waived by the Authorized Person depending on his/her consideration of the extent, complexity and nature of the new infrastructure servicing provided for the subdivision or development, the Engineer shall submit “GIS-ready” digital plans in accordance with the requirements herein.
- .2 A “GIS-ready” digital plan drawing (AutoCAD) depicting new infrastructure construction shall conform to drawing symbol, block and layering requirements as shown in Table G-2 of this Schedule.
- .3 The digital data requirements for the “GIS-ready” Site Plan are as follows:
  - a) Format: spatial data shall be stored in ARC/INFO coverage format;
  - b) Metadata: coverages shall have metadata attached including author, date of creation and accuracy;
  - c) Projection and datum: coverages shall be in UTM NAD 83. The coordinate units shall be in metres and stored without offsets;
  - d) Precision: coverages shall be created in double precisions coordinates;
  - e) Topology:
    - i. All coverages shall be topologically clean and correct;
    - ii. All polygon boundaries shall meet exactly;
    - iii. All polygons shall contain one label point;
    - iv. Arcs shall not contain pseudo-nodes;
    - v. Line and polygon features shall be contiguous across coverage boundaries;
    - vi. Every feature shall have one attribute record (zone\_cd).

- f) Data registration: new data shall be registered to existing features.  
 Existing features should be copied, rather than digitized, to form features where applicable.

**Table G-1**  
**Infrastructure Drawing Standards**



## ROAD RECORD PLANS

BASIC SCALE : 1:500 HORIZONTAL, 1:50 VERTICAL

LABEL ALL LINES ON DRAWINGS, NAME ALL ROADS, PROVIDE LEGAL AND CIVIC ADDRESSES.

### PAVEMENT:

PLOT CENTER LINE ON PLAN AND PROFILE SECTIONS. SHOW WIDTH AND HORIZONTAL CURVE DATA (DELTA ANGLE, TANGENT LENGTH, CENTERLINE RADIUS, CENTERLINE ARC LENGTH, STATION), AND DISTANCES ON PLAN.

SHOW ELEVATIONS AT GRADE CHANGES, BEGINNING OF VERTICAL CURVE, POINT OF VERTICAL INTERSECTION, AND END OF VERTICAL CURVE ON PROFILE.

PLOT VERTICAL CURVES. (BEGINNING OF VERTICAL CURVE, HIGH AND LOW POINTS, POINT OF VERTICAL INTERSECTION AND END OF VERTICAL CURVE) SHOW GRADE PERCENT (%).

### CURB AND GUTTER:

SHOW CURB RETURNS HIGH AND LOW POINTS. MARK ELEVATIONS ON ENDS AND 1/4 POINTS OF CURB RETURNS. SHOW CATCH BASINS INCLUDING ELEVATION AT GRATE.

### SIDEWALKS :

SHOW ON PLAN. SHOW WIDTH AND DISTANCES. SHOW WHEELCHAIR RAMPS.

**Table G-1 (continued)**  
**Infrastructure Drawing Standards**

STANDARD LINE TYPES

| <u>EXISTING FEATURES</u>                                                                                  |                                                                        |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| EXISTING GASLINE _____ G _____                                                                            | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE – "GASLINE" (CUSTOM)  |
| EXISTING UNDERGROUND CABLE (LABEL HYDRO/TEL/ETC.) _____                                                   | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "HIDDEN"              |
| EXISTING WATERMAIN (LABEL SIZE) _____                                                                     | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "HIDDEN"              |
| EXISTING WATER SERVICE _____ W                                                                            | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "DASH-DOT"            |
| EXISTING SANITARY MAIN (LABEL SIZE) _____                                                                 | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "DASHEDX2"            |
| EXISTING SANITARY SEWER SERVICE _____ S                                                                   | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "DASHDOT"             |
| EXISTING STORM MAIN (LABEL SIZE) _____                                                                    | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "PHANTOM"             |
| EXISTING STORM SEWER SERVICE _____ D                                                                      | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "DASHDOT"             |
| EXISTING TOE OF SLOPE / TOP OF BANK _____                                                                 | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "DASHED2"             |
| EXISTING FENCE _____ x _____ x _____ x _____ x _____ x _____                                              | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "FENCELINE3" (CUSTOM) |
| PROPERTY LINES _____                                                                                      | LINEWEIGHT 0.13m<br>LINETYPE "CONTINUOUS"                              |
| EXISTING EDGE OF PAVEMENT / GUTTER LINE _____                                                             | LINEWEIGHT 0.13m<br>LINETYPE "CONTINUOUS"                              |
| DISTRICT LOT BOUNDARY _____                                                                               | LINEWEIGHT 0.13mm; TEXT HEIGHT 5.0mm<br>LINETYPE "CENTER"              |
| EXISTING RAILWAY _____                                                                                    | LINEWEIGHT 0.13mm; TEXT HEIGHT 2.0mm<br>LINETYPE "TRACKS"              |
| <b>NOTE:</b><br>MAY USE 0.15mm IN PLACE OF 0.13mm<br>REFER TO SAMPLE DRAWINGS FOR APPLICATION OF LINETYPE |                                                                        |

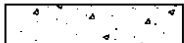
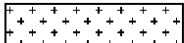
**Table G-1 (continued)**  
**Infrastructure Drawing Standards**

STANDARD LINE TYPES

| PROPOSED FEATURES                                                                                         |                                                                     |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <u>GASLINE</u> — G — — — — G — — — —                                                                      | LINEWEIGHT 0.35mm; TEXT HEIGHT 2.5mm<br>LINETYPE "GASLINE" (CUSTOM) |
| <u>UNDERGROUND CABLE (LABEL HYDRO/TEL/ETC.)</u> — — — — —                                                 | LINEWEIGHT 0.35mm; TEXT HEIGHT 2.5mm<br>LINETYPE "HIDDEN"           |
| <u>WATERMAIN (LABEL SIZE)</u> — — — — —                                                                   | LINEWEIGHT 0.70mm; TEXT HEIGHT 2.5mm<br>LINETYPE "HIDDEN"           |
| <u>WATER SERVICE</u> ————— W                                                                              | LINEWEIGHT 0.35mm<br>LINETYPE "DASHDOT"                             |
| <u>SANITARY MAIN (LABEL SIZE)</u> — — — — —                                                               | LINEWEIGHT 0.70mm; TEXT HEIGHT 2.5mm<br>LINETYPE "DASHEDX2"         |
| <u>SANITARY SEWER SERVICE</u> ————— S                                                                     | LINEWEIGHT 0.35mm<br>LINETYPE "DASHDOT"                             |
| <u>STORM MAIN (LABEL SIZE)</u> — — — — —                                                                  | LINEWEIGHT 0.70mm; TEXT HEIGHT 2.5mm<br>LINETYPE "PHANTOM"          |
| <u>STORM SEWER SERVICE</u> ————— D                                                                        | LINEWEIGHT 0.35mm<br>LINETYPE "DASHDOT"                             |
| <u>FIBER OPTIC / MISC. UNDERGROUND (LABEL)</u> — — — — —                                                  | LINEWEIGHT 0.50mm; TEXT HEIGHT 2.5mm<br>LINETYPE "CENTER2"          |
| <u>PROPOSED CENTRELINE (PLAN)</u> — — — — —                                                               | LINEWEIGHT 0.50mm<br>LINETYPE "CENTER"                              |
| <u>PROPOSED DESIGN PROFILE</u> —————                                                                      | LINEWEIGHT 0.50mm<br>LINETYPE "CONTINUOUS"                          |
| <u>CUT/FILL</u> — — — — —                                                                                 | LINEWEIGHT 0.13mm<br>LINETYPE "DASHED2"                             |
| <u>EDGE OF SHOULDER</u> — — — — —                                                                         | LINEWEIGHT 0.35mm<br>LINETYPE "HIDDEN"                              |
| <u>EDGE OF PAVEMENT / GUTTER LINE</u> —————                                                               | LINEWEIGHT 0.70mm<br>LINETYPE "CONTINUOUS"                          |
| <u>PAINTED BICYCLE LANE</u> —————                                                                         | LINEWEIGHT 0.35mm<br>LINETYPE "CONTINUOUS"                          |
| <u>PAINT LINE — TRAFFIC LANE SEPARATION</u> — — — — —<br>8m Sp. 5m                                        | LINEWEIGHT 0.35mm<br>LINETYPE (CUSTOM)                              |
| <u>PAINT LINE — CENTRELINE / SOLID</u> —————                                                              | LINEWEIGHT 0.35mm<br>LINETYPE "CONTINUOUS"                          |
| <u>FENCE</u> — x — — — — x — — — — x — — — — x — — — — x — — — — x — — — —                                | LINEWEIGHT 0.35mm<br>LINETYPE "FENCELINE3" (CUSTOM)                 |
| <u>RIGHT-OF-WAY / EASEMENT</u> — — — — —                                                                  | LINEWEIGHT 0.70mm<br>LINETYPE "PHANTOM2"                            |
| <b>NOTE:</b><br>MAY USE 0.15mm IN PLACE OF 0.13mm<br>REFER TO SAMPLE DRAWINGS FOR APPLICATION OF LINETYPE |                                                                     |

**Table G-1 (continued)**  
**Infrastructure Drawing Standards**

HATCHING PATTERNS

| HATCH PATTERN<br>(ON CROSS SECTIONS ONLY<br>—UNLESS NOTED OTHERWISE)                                                                                                       | DESCRIPTION                                | ACAD HATCH PATTERN               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------|
|                                                                                           | PROPOSED PAVEMENT                          | (SOLID)                          |
|  }<br> } | GRANULAR BASE<br><br>OR<br>BEDDING         | (AR-SAND)<br><br>(AR-SAND) DENSE |
|  }<br> } | GRANULAR BACKFILL<br><br>OR<br>SUB-BASE    | (ANSI31)<br><br>(GRAVEL)         |
|                                                                                           | APPROVED NATIVE MATERIAL                   | (HOUND)                          |
|                                                                                           | CONCRETE                                   | (AR-CONC)                        |
|                                                                                         | TOP SOIL                                   | (CROSS)                          |
|                                                                                         | UNDISTURBED EXISTING MATERIAL              | (EARTH) @45°                     |
|                                                                                         | DRAIN ROCK                                 | (HONEY)                          |
|                                                                                         | PIT RUN SAND                               | (LINE)                           |
|                                                                                         | PAVEMENT – EXISTING/REMOVAL<br>(PLAN VIEW) | (ANSI31) DENSE; COLOR 254        |
|                                                                                         | PAVEMENT MILLING (PLAN VIEW)               | (ANSI31)                         |
| <b>NOTE:</b><br>THIS LEGEND APPLIES TO ALL STANDARD DRAWINGS. THE MATERIALS<br>THAT ARE DENOTED BY THIS LEGEND MAY NOT BE LABELLED                                         |                                            |                                  |

**Table G-1 (continued)**  
**Infrastructure Drawing Standards**

WATER AND SEWER SYMBOLS

| EXISTING | PROPOSED | DESCRIPTION                                                                | BLOCK       |
|----------|----------|----------------------------------------------------------------------------|-------------|
|          |          | SANITARY MANHOLE – (Reference I.D. on As-built)                            | SANMH-*     |
|          |          | STORM MANHOLE – (Reference I.D. on As-built)                               | STRMMH-*    |
|          |          | CATCH BASIN – TOP INLET                                                    | CB-*        |
|          |          | CATCH BASIN – SIDE INLET                                                   | CS-*        |
|          |          | DOUBLE CATCH BASIN                                                         | CB-DBL-*    |
|          |          | CATCH BASIN MANHOLE                                                        | CBMH-*      |
|          |          | LAWN BASIN                                                                 | LB-*        |
|          |          | SANITARY BLOW-OFF                                                          | SANBO-*     |
|          |          | CLEANOUT                                                                   | CLEANOUT-*  |
|          |          | AIR VALVE                                                                  | AIRVALVE-*  |
|          |          | WATER METER                                                                | WAT-METER-* |
|          |          | BLOW-OFF                                                                   | BLOWOFF-*   |
|          |          | TEMPORARY BLOW-OFF                                                         | TBO-*       |
|          |          | CAPPED END                                                                 | CAP-*       |
|          |          | REDUCER                                                                    | REDUCER-*   |
|          |          | WATER VALVE                                                                | VALVE-*     |
|          |          | CURB STOP (Water Shutoff)                                                  | CSTP-*      |
|          |          | WELL                                                                       | WELL-*      |
|          |          | HYDRANT AND VALVE ASSEMBLY                                                 | HYDRANT-*   |
|          |          | CULVERT                                                                    | CULV-*      |
|          |          | FLOW DIRECTION ARROW (Sanitary & Storm Sewer)                              | FLOW-*      |
|          |          | SANITARY SEWER SERVICE (c/w INSP. CHAMBER)                                 | SANS-*      |
|          |          | SANITARY SEWER SERVICE                                                     |             |
|          |          | STORM SEWER SERVICE (c/w INSP. CHAMBER)                                    | STRMS-*     |
|          |          | STORM SEWER SERVICE                                                        |             |
|          |          | WATER SERVICE                                                              |             |
|          |          | DITCH OR SWALE ("LABEL" ACCORDINGLY)                                       | DITCH-*     |
|          |          | SIDEWALK (LABEL "TYPE" – CONCRETE, ASPHALT, PAVER ETC. AND INDICATE WIDTH) |             |

\* –BLOCK NAME SUFFIX "E" FOR EXISTING, "P" FOR PROPOSED AND "F" FOR FUTURE

**Table G-1 (continued)**  
**Infrastructure Drawing Standards**

STREET LIGHT / ELECTRICAL SYMBOLS

| EXISTING | PROPOSED             | DESCRIPTION                                                          | BLOCK       |
|----------|----------------------|----------------------------------------------------------------------|-------------|
|          |                      | POWER POLE                                                           | PP-*        |
|          |                      | TELEPHONE POLE                                                       | TEL-*       |
|          |                      | POWER/TELEPHONE POLE                                                 | PT-*        |
|          |                      | GUY POLE                                                             | GP-*        |
|          |                      | ANCHOR/GUY WIRE                                                      | ANC         |
|          |                      | JUNCTION BOX (Type 10 etc.)                                          | JB-*        |
|          |                      | CONCRETE JUNCTION BOX OR VAULT                                       | CJB-*       |
|          | (NO LONGER ACCEPTED) | POST TOP LUMINAIRE POLE (STEEL)                                      | LUMINT-*    |
|          |                      | LUMINAIRE POLE                                                       | LUMIND-*    |
|          |                      | SIGNAL POLE WITH SIGNAL HEAD<br>(DIMENSION TO SUIT ARM REACH)        | TSP-*       |
|          |                      | COMBINATION SIGNAL POLE / LUMINAIRE<br>(DIMENSION TO SUIT ARM REACH) | LUMIN-TSP-* |
|          |                      | ARROW TO INDICATE A TURN PHASE<br>—ON SIGNAL HEAD(S)                 | TPH         |
|          |                      | SIGNAL POST                                                          | SP-*        |
|          |                      | UTILITY POLE (WOOD) WITH LUMINAIRE                                   | LUMINU-*    |
|          |                      | MANHOLE — UNDERGROUND SERVICE<br>(HYDRO / TEL / ETC.)                | MH-*        |

\* —BLOCK NAME SUFFIX "E" FOR EXISTING, "P" FOR PROPOSED AND "F" FOR FUTURE

**Table G-1 (continued)**  
**Infrastructure Drawing Standards**

MISCELLANEOUS DETAIL SYMBOLS

| SYMBOL | DESCRIPTION                           | BLOCK  |
|--------|---------------------------------------|--------|
|        | IRON PIN                              | IP     |
|        | BENCHMARK                             | BM     |
|        | INTEGRATED SURVEY MONUMENT            | ISM    |
|        | SURVEY HUB / NAIL                     | STA    |
|        | STANDARD BRASS CAP                    | SBC    |
|        | LEAD PLUG                             | LP     |
|        | TEST PIT                              | TP     |
|        | TEST HOLE (DRILLHOLE)                 | DH     |
|        | STANDPIPE                             | STP    |
|        | PIEZOMETER TUBE                       | PZ     |
|        | LEFT TURN ARROW – PAINT MARKING       | LEFT   |
|        | RIGHT TURN ARROW – PAINT MARKING      | RIGHT  |
|        | THRU ARROW – PAINT MARKING            | THRU   |
|        | TREE – CONIFEROUS (Size To Suit)      | CTREE  |
|        | TREE – DECIDUOUS (Size To Suit)       | DTREE  |
|        | MARSH                                 | MARSH  |
|        | BOLLARD                               | BOLL   |
|        | GAS VALVE                             | GV     |
|        | SIGN – SINGLE POST (NOM. 600mm WIDE)  | SIGN1  |
|        | SIGN – DOUBLE POST (NOM. 1060mm WIDE) | SIGN2  |
|        | SIDEWALK RAMP                         | SWRAMP |
|        | DRIVEWAY RAMP                         | DWRAMP |
|        | CONCRETE ROADSIDE/MEDIAN BARRIER      | CRB    |
|        | DIRECTION OF TRAFFIC FLOW             | TF     |
|        | BICYCLE LANE                          | BIKE   |
|        | HANDICAPPED PARKING / ACCESS          | HANDI  |
|        | NORTH ARROW (Size To Suit)            | NORTH  |

**Table G-2**  
**GIS-Ready Drawing Standards**

GIS DIGITAL DRAWING SYMBOLS

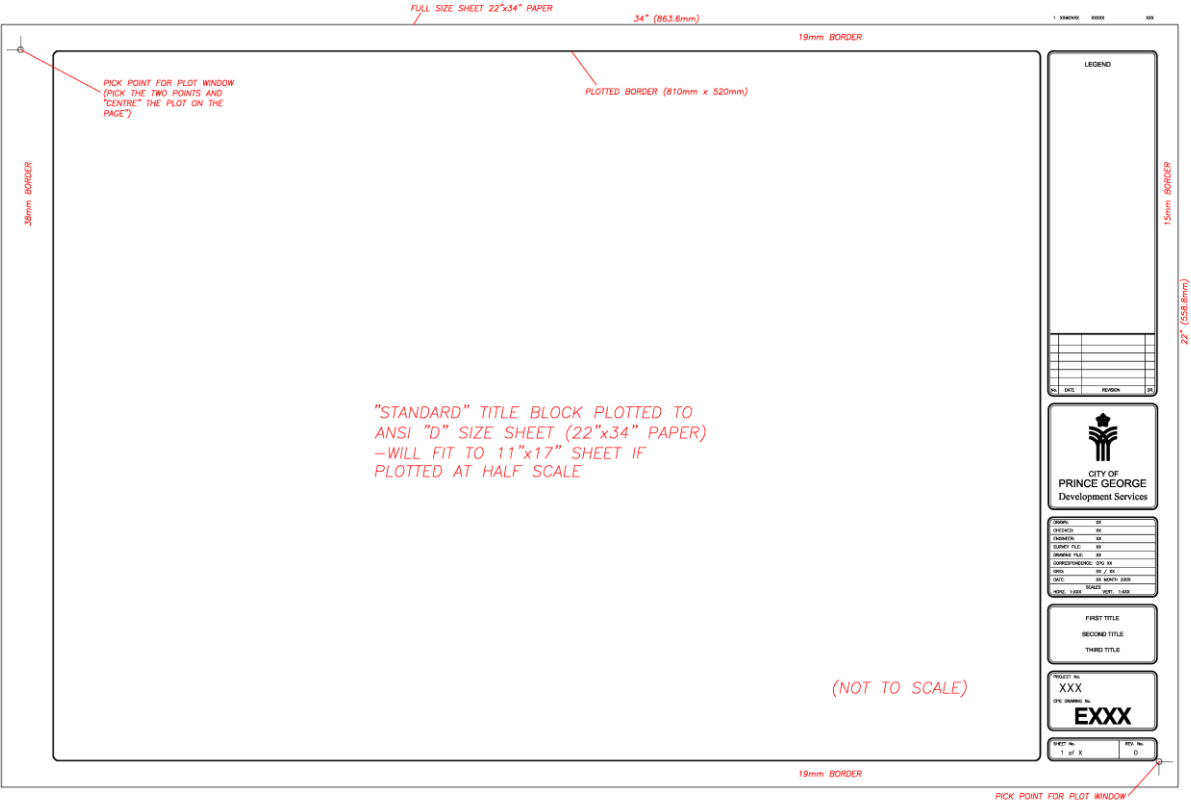
| SYMBOL                                                                                                                                                                                                                                                                                         | DESCRIPTION                                 | BLOCK          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------|
|  PW____                                                                                                                                                                                                       | PRESSURE REDUCING VALVE                     | PRV            |
|  PW____                                                                                                                                                                                                       | BOOSTER PUMP                                | BOOSTER        |
|  PW____                                                                                                                                                                                                       | PUMP                                        | PUMP           |
|  PW____                                                                                                                                                                                                       | RESERVOIR                                   | RESERVOIR      |
|  (Feature ID)                                                                                                                                                                                                 | WATER VALVE CHAMBER (Feature ID Number)     | WAT-VALVE-CHAM |
|  (Feature ID)                                                                                                                                                                                                 | INLET (Feature Identification Number)       | INLET          |
|  (Feature ID)                                                                                                                                                                                                | OUTFALL (Feature Identification Number)     | OUTFALL        |
|  (Feature ID)                                                                                                                                                                                               | RETENTION POND (Feature Identification No.) | RETENTION_POND |
|  PW____                                                                                                                                                                                                     | LIFT STATION                                | LIFTSTATION    |
| <p><b>NOTE:</b><br/> THE SYMBOLS DEPICTED ON THIS PAGE WILL NOT GENERALLY BE SHOWN ON ENGINEERING DRAWINGS. THEY ARE TO BE USED, WHERE APPROPRIATE, ON THE PROJECT DIGITAL INFORMATION DRAWING FILE, TO BE SUBMITTED FOR INCORPORATION INTO THE CITY'S GEOGRAPHIC INFORMATION SYSTEM (GIS)</p> |                                             |                |

**Table G-2 (continued)**  
**GIS-Ready Drawing Standards**

GIS DIGITAL DRAWING SYMBOLS

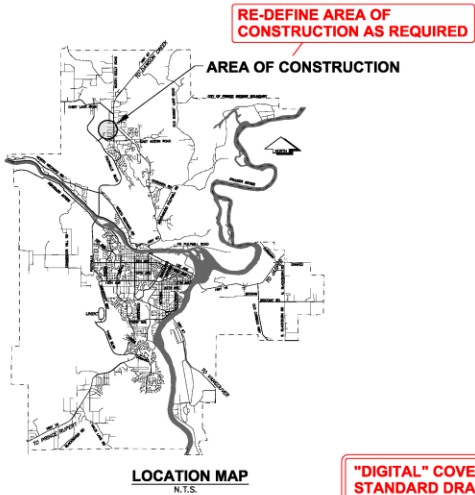
| SYMBOL                                                                                                                                                                                                                                                                                                                                                                        | DESCRIPTION                                   | BLOCK     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------|
|  (Feature ID)                                                                                                                                                                                                                                                                                | AIR VALVE (Feature Identification Number)     | AIRVALVE  |
|  (Feature ID)                                                                                                                                                                                                                                                                                | WATER METER (Feature Identification Number)   | WAT-METER |
|  (Feature ID)                                                                                                                                                                                                                                                                                | BLOW-OFF (Feature Identification Number)      | BLOWOFF   |
|  (Feature ID)                                                                                                                                                                                                                                                                                | CAPPED END (Feature Identification Number)    | CAP       |
|  (Feature ID)                                                                                                                                                                                                                                                                                | REDUCER (Feature Identification Number)       | REDUCER   |
|  (Feature ID)                                                                                                                                                                                                                                                                                | WATER VALVE (Feature Identification Number)   | VALVE     |
|  (Feature ID)                                                                                                                                                                                                                                                                                | HYDRANT (Feature Identification Number)       | HYDRANT   |
|  (Feature ID)                                                                                                                                                                                                                                                                               | STORM MANHOLE (Feature Identification Number) | STRMMH    |
|  (Feature ID)                                                                                                                                                                                                                                                                              | CATCH BASIN (Feature Identification Number)   | CB        |
|  (Feature ID)                                                                                                                                                                                                                                                                              | DOUBLE CATCH BASIN (Grid Reference Location)  | CB-DBL    |
|  (Feature ID)                                                                                                                                                                                                                                                                              | CATCH BASIN MANHOLE (Feature I.D. Number)     | CBMH      |
|  (Feature ID)                                                                                                                                                                                                                                                                              | SANITARY MANHOLE (Feature Identification No.) | SANMH     |
|  (Feature ID)                                                                                                                                                                                                                                                                              | SANITARY B/O (Feature Identification Number)  | SANBO     |
|  (Feature ID)                                                                                                                                                                                                                                                                              | CLEANOUT                                      | CLEANOUT  |
|                                                                                                                                                                                                                                                                                            | FLOW DIRECTION ARROW                          | FLOW      |
|  (Feature ID)                                                                                                                                                                                                                                                                              | POST TOP LUMINAIRE (City of PG)               | LUMINT    |
|  (Feature ID)                                                                                                                                                                                                                                                                              | UTILITY POLE WITH LUMINAIRE (BC Hydro)        | LUMINU    |
| <b>NOTE:</b><br>THE SYMBOLS DEPICTED ON THIS PAGE ARE SIMILIAR TO THOSE USED ON THE PROJECT ENGINEERING DRAWINGS, WITH THE FOLLOWING EXCEPTIONS. CITY ASSIGNED FEATURE IDENTIFICATION NUMBERS ARE ASSIGNED TO THE TEXT ATTRIBUTE. THE ATTRIBUTE TEXT HEIGHT IS DOUBLED, AND THE ENTIRE BLOCK IS SCALED (4X) ON INSERTION TO MAKE THE SYMBOLS AND TEXT LEGIBLE ON G.I.S. PLOTS |                                               |           |

Sample Drawings





IMPROVEMENT PROJECT DESCRIPTION (YEAR)  
ROAD / WATER / SEWER ETC. - LOCATION / STREET NAME(S)



CITY TO PROVIDE DRAWING NUMBERING SERIES.  
CONTACT THE DEVELOPMENT SERVICES DEPARTMENT,  
INFRASTRUCTURE PLANNING DIVISION, RECORDS SECTION

Drawing Index

| Dwg No. | Rev. | Description                                          | Dwg No. | Rev. | Description                                          |
|---------|------|------------------------------------------------------|---------|------|------------------------------------------------------|
| EXXX    | 0    | Drawing Title / Description<br>(Two Line Capability) | EXXX    | 0    | Drawing Title / Description<br>(Two Line Capability) |
|         |      |                                                      |         |      |                                                      |
|         |      |                                                      |         |      |                                                      |
|         |      |                                                      |         |      |                                                      |
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|         |      |                                                      |         |      |                                                      |
|         |      |                                                      |         |      |                                                      |
|         |      |                                                      |         |      |                                                      |

ADD/DELETE LINES FROM DRAWING  
INDEX AS REQUIRED - KEEP BALANCED

"DIGITAL" COVER PAGE, TITLE BLOCK,  
STANDARD DRAWING SHEET, Etc. ARE  
AVAILABLE FOR CONSULTANTS USE

COMPLETE AS APPROPRIATE

CONSULTANT TO COMPLETE

ADD CONTRACTOR'S NAME AND CONTACT  
INFORMATION TO ALL "AS-BUILT" DRAWINGS  
TEXT HEIGHT 2.5mm



CONSULTANT'S NAME  
STREET / MAILING ADDRESS  
CITY / PROVINCE / POSTAL CODE  
TELEPHONE  
FAX / E-MAIL ETC.

|                                                                                                                        |   |
|------------------------------------------------------------------------------------------------------------------------|---|
| CITY OF PRINCE GEORGE<br>1100 PATRICIA BOULEVARD<br>PRINCE GEORGE BC V2L 3V9<br>Tel. (250) 561-7800 Fax (250) 561-7721 |   |
| PROJECT No.:                                                                                                           | X |
| CITY CORRESPONDENCE FILE No.'s:                                                                                        | X |
| PROJECT MANAGER:                                                                                                       | X |
| DESIGNER:                                                                                                              | X |
| DRAFTSPERSON(S):                                                                                                       | X |