COWICHAN BAY WATERWORKS DISTRICT

BYLAW NO. 323

A bylaw regulating the subdivision of land that is being proposed for connection to the Improvement District's water system.

The Trustees of Cowichan Bay Waterworks District ENACT AS FOLLOWS:

INTERPRETATION

1. In this bylaw:

   (1) "Applicant" means the owner of the property, or the authorized agent of the owner, who has submitted a completed application for the subdivision of land to which water may be supplied by the District.

   (2) "District" means the Cowichan Bay Waterworks District.

   (3) "Subdivision" means a subdivision as defined in the *Land Title Act* or the *Strata Property Act.*

   (4) "Standards" means the District's water system construction and design standards attached as Schedule B to this bylaw.

   (5) "District's System" means the water distribution system including all works owned and operated by the District.

   (6) "Trustees" mean the trustees for the District.

   (7) "Works" means any structures, including pipes, and all attachments, fittings, and facilities for the storage, supply, conveyance, treatment and distribution of water.

OTHER ENACTMENTS

2. Nothing contained in this bylaw will relieve any person from responsibility for seeking out and complying with other enactments applicable to their undertaking.

GENERAL PROHIBITION

3. Land that is connected to the District's System, or is proposed for connection to the District's system, will not be subdivided contrary to this bylaw.

APPLICATION

4. (1) An owner of land who proposes to subdivide land and wishes to connect one or more parcels to be created by the subdivision to the District's System must apply to the District by delivering to the District:

   (a) the form prescribed as Schedule A to this bylaw.
   (b) the plans and other information specified in Schedule A.
   (c) a subdivision application fee of $250.00 plus $25.00 per lot.

(2) Every application for subdivision of land that will create a parcel to be connected to the District's System must include a calculation of the peak hourly water demand and pressure requirement for the ultimate development of the parcels and sufficient information, plans and drawings for the District to determine whether the proposed works comply with this bylaw.

GENERAL PROVISION

5. (1) The trustees may refuse to approve the proposed subdivision where:

(a) the proposed subdivision does not comply with the provision of this and other applicable bylaws of the District;

(b) one or more parcels to be created by the subdivision are to be connected to the District's System and the District has insufficient water supply to provide such parcels with a supply of water.

(2) For the purpose of (1)(b), the demand that would be placed on the District's System as a result of the proposed subdivision will be calculated having reference to the peak hourly water demand and pressure requirement for the ultimate development of the parcels or provided under section 4(2).

(3) Despite subsection (1), an application may be approved where the owner of the land provides to the District with a reasonable proposal to increase the supply capacity of the District's System so that it is capable of providing the parcels to be created by the subdivision with a sufficient supply of water and a supply that is of overall benefit to the District.

CONSTRUCTION OF WORKS WITHIN SUBDIVISION

6. (1) Subject to section 747.1(3) of the *Local Government Act*, an owner of land who proposes to subdivide the land must:

(a) provide, locate and construct a water distribution system within the subdivision; and

(b) connect the water distribution system to the District's System in accordance with the Standards.

(2) The costs of providing, locating and constructing the water distribution system and connecting the water distribution system to the District's System must be paid completely by the owner of the land providing the Works.

(3) The costs referred to in paragraph (2) include the cost of all permits, inspections, engineering costs and other costs related to the proposed subdivision.

CONSTRUCTION OF WORKS IN ADJACENT HIGHWAYS

7. In addition to the requirements of section 6, the Board of Trustees of the District may also, by resolution, require that an owner of land provide works and services in accordance with the Standards, on that portion of a highway immediately adjacent to the site being subdivided or developed up to the centre line of the highway, in accordance with section 747.1(4) of the *Local Government Act.*

CONSTRUCTION OF EXTENDED SERVICES

8. Where the Board of Trustees requires that an owner of land provide excess or extended services under section 747.2 of the *Local Government Act*, the District will determine the proportion of the cost of the extended or excess service which will be borne by the applicant in accordance with the *Local Government Act* and any policy regarding latecomer charges by the Board of Trustees.

EXTENSION OF WORKS AND SERVICES

9. (1) All works required to be installed under section 6 must be installed along the full frontage of the land being subdivided or developed unless the lands beyond the land being subdivided or developed are incapable of further subdivision or development, as determined by the District.

(2) For the purpose of subsection (1) lands are not incapable of further subdivision or development by reason only that an amendment to an enactment of a local government or the District would be necessary to permit further subdivision or development.

TRANSFER OF WORKS TO DISTRICT

10. (1) An owner of land who has installed works under this agreement must:

(a) transfer the works to the District, and

(b) where any part of the works transferred to the District are located on lands owned by any person other than the District or within a highway, provide a statutory right of way agreement for the works in a form acceptable to the District, naming the District as transferee with priority over any financial encumbrances registered against the title to the land.

(2) An owner who transfers works to the District must:

(a) remedy all defects in the Works for one year following the date of the transfer; and

(b) deposit with the District an irrevocable standby letter of credit valid for at least one year from the date of the transfer in an amount not less than 20% of the cost of the Works as security for the performance of the owner's obligations under (a).

COPIES OF PERMITS

11. The owner required to install works under this bylaw must provide to the District a copy of the construction permit for the Works, issued by the Ministry of Health or Vancouver Island Health Authority, and the Ministry of Transportation.

CONNECTION CHARGES

12. No person may connect any parcel to the District's System without paying all applicable charges in accordance with the District's bylaws.

APPROVAL PERIOD

13. (1) Subject to the changes in an enactment which may affect a subdivision, approval of a subdivision under this bylaw will be valid for a period of six months. Extensions may be applied for at the discretion of the District.

(2) An approval under this bylaw must not be interpreted as limiting the function or authority of the Approving Officer under section 87 of the *Land Title Act*.

VIOLATION

14. A person who does not act or suffers or permits any act to be done in contravention of this bylaw or who neglects to do or refrains from doing any act or thing, which is required to be done by this bylaw, commits an offence.

PENALTY

15. A person who commits an offence under this bylaw is liable on summary conviction to a penalty in accordance with the *Offence Act*.

SEVERABILITY

16. If any section, subsection, sentence, clause, or phrase of this bylaw is for any reason held to be invalid by the decision of any court, such section, subsection, sentence, clause or phrase may be severed from the remaining portion of this bylaw with the remaining portions of the bylaw remaining valid and of full force and effect.

INSPECTION AND RIGHT OF ACCESS

17. (1) The trustees, or an officer or employee of the District may enter at all reasonable times upon land subject to this bylaw, to ascertain whether the provisions of the bylaw are being obeyed, provided that:

    (a) consent to inspect the land is obtained from the owner or occupier of the land, or;

    (b) where such consent has been refused, written notice of the intent to inspect is given to the owner or occupier no less than 24 hours prior to the time of inspection.

    (2) No person will obstruct or prevent a person referred to in paragraph (1) from carrying out any of the provisions of this bylaw.

REPEAL

18. Subdivision Water Regulation Bylaw No. 246 is repealed.

CITATION

19. This bylaw may be cited as the "Subdivision Water Regulation Bylaw No. 323 - 2020.

INTRODUCED and given first reading by the Trustees on the 17th day of September 2020.

RECONSIDERED and finally passed by the Trustees on the 17th day of September 2020.

_____
Chairman, Board of Trustees

I hereby certify under the SEAL OF THE DISTRICT that this is a true copy of Bylaw No. 323 - 2020 of the COWICHAN BAY WATERWORKS DISTRICT passed on the 17th day of September 2020.

_____
District Administrator

COWICHAN BAY WATERWORKS DISTRICT
SUBDIVISION WATER REGULATION BYLAW NO. 323
SCHEDULE "A"

APPLICATION FOR WATER SERVICES TO PROPOSED SUBDIVISION

Property Address(es): _____

Legal Description of Property(ies): _____

Legal Description of Property(ies): _____

Registered Owner(s): _____

Registered Owner(s): _____

Address (Correspondence/calls) to be directed to: _____

Phone: _____ Fax: _____ Email: _____

THE FOLLOWING MUST ACCOMPANY THIS APPLICATION:

1. Copy of Indefeasible Title(s), dated within thirty days of the date of application.

2. A letter of authorization if the applicant is not the owner.

3. Plan of proposed subdivision with dimensions clearly illustrating lot layout, roads, etc, to a scale of not less than 1:2000. Four copies are required.

4. The layout sketch plan, in metric, shall be prepared by a consulting engineer, planner, or land surveyor and show the following:
    - The full legal description of the parcel(s) to be subdivided;
    - The dimensions and area of all proposed lots;
    - The arrangement of parcels and streets which will be created by the subdivision, including the widths of the opposed streets and alteration of lot lines or subdivision of any existing parcels;
    - The location of all existing buildings and structures on the property;
    - Existing property lines and highways to be eliminated by the proposed subdivision;
    - The location of all natural features and watercourses;
    - The relationship of the development to the neighbouring parcels and highways;
    - Intended use of each parcel to be created by the subdivision;
    - Topographic information where land affected by the application is steep, irregular, or otherwise difficult to appraise in respect of the proposed development;
    - A plan of the water system to service the subdivision designed in accordance with the District's Standards.

5. An application fee of $250 plus $25 per lot.

6. Evidence of approval or authorization from other agencies involved in the subdivision process.

COWICHAN BAY WATERWORKS DISTRICT
SUBDIVISION WATER REGULATION BYLAW NO. 323
SCHEDULE "A"

APPLICATION FOR WATER SERVICES TO PROPOSED SUBDIVISION

PLEASE NOTE THE FOLLOWING:

Personal information collected on this form is collected for the purpose of processing this application and for administration and enforcement of District bylaws related to subdivision. Proposed information or business information submitted on this form is not considered to be supplied in confidence.

The District, or their duly appointed representatives, are authorized to enter the property for inspection purposes.

Property owner(s) signature(s): _____ _____

_____ _____

OR

Authorized agent's signature: _____ _____

Date of Application: (D) (M) 20___

Approved this_____day of _____, 20___

_____
Authorized Signature

COWICHAN BAY WATERWORKS DISTRICT
SUBDIVISION WATER REGULATION BYLAW NO. 323
SCHEDULE "B"

CBWD Engineering Specifications and Standard Drawings

COWICHAN BAY WATERWORKS DISTRICT (CBWD)

ENGINEERING SPECIFICATIONS

&

STANDARD DRAWINGS

COWICHAN BAY WATERWORKS DISTRICT
1760 Pavenham Road
Cowichan Bay, BC V0R 1N1
Tel: (250) 748-1687
Fax: (250) 748-1627
Email: cbwater@telus.net

Date Issued: February 2016

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1.0 Scope

1.01 These engineering specifications and standard drawings shall apply to the design and installation of Waterworks within the MBWD service boundaries. They apply to the design and installation of water mains, together with their respective connections and appurtenances and any other associated works such as pump houses, reservoirs, vaults, wells, etc., which are required to be designed and/or installed.

1.02 It is the responsibility of the person or persons using these specifications to ensure that all these specifications are the most current issue.

1.03 The CBWD Standard Drawings shall form an integral part of these specifications and shall apply throughout.

2.0 Documents

2.01 The following specifications and conditions shall apply to all or any of the respective services:

Section 1	General Information
Section 2	Water Connections/Extension Policies and Procedures
Section 3	Design and 'As Constructed' Drawings
Section 4	Water System Design
Section 5	Water System Installation
Section 6	Water Utility Excavation, Backfill, Restoration and Cleanup
Appendix A	New Well Guidance Checklist
Appendix B	General Use Procedures A, A-11, B, C and D
Appendix C	Standard Drawings

2.02 All the services shall be designed and installed as detailed in the specifications, according to the procedures set out in the specifications and any Bylaws approved by the CBWD.

2.03 Where strict compliance with these specifications is impractical or unreasonable the CBWD may permit a minor variance to the specifications provided prior approval in writing is obtained.

3.0 Definitions

In these specifications the following words shall have the meaning hereby assigned to them –

3.01 **'The Agreement'** means an understanding between two or more parties required to carry out works as specified in these specifications or to CBWD standards.

3.02 **'As Constructed Drawing'** means those Design Drawings that have been revised to reflect any changes in the design that were incorporated into the actual construction of the works.

3.03 **'Applicant/Owner'** means the person, firm or corporation identified as the registered Owner or their designated agent or representative as designated to CBWD in writing but not including the Consulting Engineer or Contractor.

3.04 **'Authority Having Jurisdiction'**, means that public body with powers to enforce statutes, regulations, codes and Bylaws, and to issue consent, approvals, licenses and permits, in a given area, all as applicable and necessary to the design and construction of the works.

3.05 **'Bylaws and Resolutions'** are passed by the Trustees and would contain letters of understanding, procedures and policies, engineering specifications, standard drawings, warranties and other documents required for approvals by the Applicable Ministry.

3.06 **'Consulting Engineer or Engineer'** means the person; firm or corporation identified by the Applicant in writing and is a professional engineer licensed to practice in the Province of British Columbia.

3.07 **'Contractor'** means the person; firm or corporation or their authorized representative designated by either the Owner or the Improvement District in writing, which shall undertake the installation of the Waterworks on behalf of either the Owner or the Improvement District.

3.08 **'Cost of Works and Services'** means all costs associated with installing the works including construction costs, CBWD costs, inspection costs, and engineering costs.

3.09 **'Design Drawings'** means those detailed drawings, which are prepared to illustrate the description of the work to be constructed.

3.10 **'Design Approval'** means those Design Drawings, which have been given final approval and marked "Reviewed" by the Improvement District.

3.11 **'District/Improvement District/CBWD'** means the Trustees of the Cowichan Bay Waterworks District or their authorized agent.

3.12 **'Engineer-Client Agreement'** means the Agreement entered into by the Owner and the Consulting Engineer wherein the Owner engages the professional services of a Consulting Engineer to provide the level of engineering services required by these specifications, the design and construction supervision of the Waterworks.

3.13 **'Engineer of Record'** means the Engineer/Consulting Engineer, who is acting on behalf of the Applicant; is the person, firm, or corporation identified as such in the Agreement Documents; is licensed by the Association of Professional Engineers and Geoscientists of BC (APEGBC); has sealed the Design Drawings; supervised/inspected the construction; sealed daily inspection reports and As-Constructed drawings.

3.14 **'Documents'** means Bylaws, letters of understanding between the Improvement District and the Owner, Improvement District definitions, procedures and policies, engineering specifications, easements, standard drawings, warranty Agreements and such other documents including amendments as agreed upon between the parties.

3.15 **'Memorandum of Understanding'** means the undertaking by the parties to perform their respective duties, responsibilities and obligations as prescribed in the memorandum, and represents the entire Agreement between the parties. This memorandum supersedes all prior written, oral, or representations either written or oral. This memorandum may be amended only as agreed upon between the parties.

3.16 **'Preliminary Design Drawings'** means those Design Drawings, which show the location and layout of the works and contain sufficient detail to enable the project to be reviewed by the CBWD and other authorities having jurisdiction.

3.17 **'Waterworks'** means the total construction and related services required by CBWD.

3.18 **'Waterworks Inspector'** means a person either employed or engaged by the Improvement District or representative, or Consulting Engineer, who shall make such inspections and tests, as he considers necessary and shall coordinate works being carried out within the area served by the CBWD.

3.19 **'Works'** means the total construction and related services required by these engineering specifications.

NOTE:

Where specifications for works are not covered by the Cowichan Bay Waterworks District Engineering Specifications and Standard Drawings document, the current edition of the Master Municipal Construction Document shall apply.

SECTION 2

WATERWORKS CONNECTION/EXTENSION POLICIES & PROCEDURES

SECTION 2

WATERWORKS CONNECTION/EXTENSION POLICIES & PROCEDURES (con't)

1.0 Introduction

1.01 This section contains Waterworks Connection/Extensions Policies and Procedures that apply to the CBWD.

2.0 General Information and Policies

2.01 The extension and upgrading of the water distribution system owned and operated by the CBWD to serve customers or developments is the responsibility of the Improvement District, but the entire cost of the works and services is at the Applicant's expense.

2.02 Topographical survey, design and preparation of drawings for Waterworks shall be carried out by a Consulting Engineer, engaged by the Applicant, and in accordance with these specifications.

2.03 General Provisions

.1 The estimated cost of Waterworks extension shall be based upon compliance with these specifications, and the requirements of other regulatory authorities having jurisdiction.

.2 The Improvement District may charge the Owners located beyond serviced areas the full cost, in advance, for extensions and servicing of the un-serviced area, plus a reasonable portion of charges for replacing or enlarging any existing works (including watermains, pump stations, reservoirs and control systems) to serve the area with the required water supply and fire flow while maintaining water quality. If there are no watermains to the subdivision, the Owner shall pay for one large enough to supply the subdivision. The size and number of the watermains shall be determined as part of the development of an approved water distribution network.

.3 The Improvement District will only assume ownership and responsibility to operate and maintain water distribution works that comply with these specifications, and are located along publicly gazetted roads, through right of ways held in CBWD name, or property owned outright by the Improvement District.

.4 All works shall conform to WorkSafe BC safety standards.

2.04 Responsibility for Material Furnished by the Applicant/Contractor

.1 The Contractor shall be responsible for all material furnished by him, and shall replace at his own expense all such material found defective in manufacture or damaged in handling. This shall include the furnishings of all materials and labour required for the replacement of installed materials. The Improvement District shall approve all materials furnished by the Contractor, before being incorporated into the works.

2.05 Responsibility for Material Furnished by Cowichan Bay Waterworks District

.1 The Contractor's responsibility for material furnished by the Waterworks District shall begin at the point of delivery to said Contractor. Material already on the site shall become the Contractor's responsibility on the day work commences.

2.06 Responsibility for Safe Storage

.1 The Contractor shall be responsible for the safe storage of all material intended for the works until it has been incorporated in the completed project. The interior of all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

3.0 Right of Way

3.01 The Applicant shall be responsible for preparation of all Right of Way documents prepared for the Waterworks where the Improvement District will assume responsibility for maintenance and/or ownership, including all costs. The minimum acceptable width of a single Right of Way is 6.0 metres. The watermain shall be located a minimum of 1.5 metres from the edge of the Right of Way. Right of Way shall be registered using language acceptable to the Improvement District or as provided by CBWD's lawyer.

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

3.03 Any Right of Way outside of the proposed subdivision plan must be obtained and registered by the Applicant prior to the Design Approval.

4.0 Engineering Supervision

4.01 The Consulting Engineer shall be responsible for the layout, inspections and approval of all services, which are the responsibility of the Applicant in order to certify that the Work was constructed in accordance with the approved Design Drawings and the CBWD Engineering Specifications & Standard Drawings. Engineering supervision on works carried out by the Contractor require a minimum of one visit per day to full time inspection for major works. The Consulting Engineer shall provide certified reports and submit copies of his inspection reports to the Improvement District on a weekly basis.

4.02 Connection of new waterworks to the existing CBWD system shall not be made until the inspection reports described in 4.01 are provided and reviewed by CBWD.

4.03 If copies of the inspection reports are not provided, CBWD shall require the Applicant to excavate and expose the water main/appurtenances to determine geodetic elevation and NAD83 UTM coordinates and 50 m intervals along the water main, at all critical crossings and at all bends, prior to acceptance by CBWD and Applicant shall bear all costs of such work.

4.04 In addition to the Consulting Engineer carrying out supervision, the Improvement District inspector may be on site daily, at the Owner's expense, and shall immediately notify, in writing, the Contractor and the Consulting Engineer of any unacceptable materials or practices. If remedial action is not taken to the satisfaction of the Improvement District, the Waterworks will not be accepted.

4.05 If the Consulting Engineer wishes to make any changes in approved design either before or during the execution of the work, he shall first submit a marked print of the Design Drawings showing proposed revisions to the Improvement District office and all other authorities having jurisdiction. The District Engineer shall be involved in the decision process. If approval is granted, for revision, the original drawing shall be immediately revised, signed by the District and replaced with new prints.

4.06 The attention of the Consulting Engineer is directed to the safety regulations of the Worker's Compensation Act of BC as administered by WorkSafe BC. No approval will be given to installation, which cannot be inspected because of unsafe working conditions.

5.0 Circulation and Approval of Design Drawings

5.01 The Consulting Engineer shall prepare Design Drawings and submit these to the Improvement District for review and comment.

5.02 Where the design involves a pump station (well, booster, etc.) PRV station or reservoir, submit one hard copy and digital copy in PDF of a design brief.

5.03 CBWD requires one paper copy and an AutoCAD DWF (Drawings Web Format) file containing the complete set of drawings. The DWF file shall be created with a minimum plot resolution of 1200 dpi. Ensure that all layers are turned on when creating the DWF.

5.04 After review, comments will be returned on the DWF file by email to the Consulting Engineer for revisions.

5.05 When all comments have been addressed, the Consulting Engineer shall submit two paper copies and an AutoCAD DWF of the revised Design Drawings, signed and sealed by the Professional Engineer to the Improvement District for final approval.

5.06 The Improvement District, prior to Design Approval, must receive a letter of confirmation that an Engineer Client Agreement is in force. The Engineer Client Agreement must provide for the level of engineering service required in these specifications.

5.07 Where authorization, approval and permits are required from senior governments and other authorities having jurisdiction, it is the Applicant's responsibility to obtain these. The following agencies will require plans to be submitted:

- Ministry of Transportation
- Cowichan Bay Fire Improvement District
- Vancouver Island Health Authority (VIHA) – Public Health Engineer
- B.C. Hydro, Telus, Shaw, Terasen Gas

5.08 The above approvals are additional to the submission to the Improvement District and are required prior to the Design Approval with the exception of VIHA. VIHA approval (Construction Certificate) is required prior to commencing construction.

6.0 Water Main and Service Installation

6.01 The following shall be carried out prior to the start of construction of works:

.1 Design Drawings must have approval of the Improvement District.

.2 All necessary permits and approvals must be obtained from the Authority having jurisdiction before works proceed.

.3 The Consulting Engineer shall make arrangements to inspect the site of works in the company of the Improvement District representative 24 hours prior to the start of construction. If works proceeds without proper inspection, the Improvement District will require work to be exposed for an inspection prior to acceptance.

.4 A copy of the Design Drawings shall be maintained by the Contractor at the construction site during the installation of all waterworks and these drawings shall be used to document any changes during construction.

6.02 The Contractor at the construction site shall maintain a clean copy of the approved Design Drawing and CBWD Engineering Specifications and Standard Drawings during the installation of the works. These drawings shall be kept for marking all 'As Constructed' details and shall be submitted to the Improvement District upon completion of the works.

6.03 New Waterworks and services shall not be connected to the existing Improvement District's distribution system until the Waterworks and services have been inspected, pressure tested, disinfected, and approved in writing by the Improvement District.

7.0 Acceptance of Works and Services

7.01 The following required documentation shall be completed and approved by CBWD prior to acceptance of works and services:

REQUIRED DOCUMENTATION	
1.	As-Constructed Drawings
2.	Field Inspection Reports
3.	Statement of Actual Construction Costs (see below)
4.	Statutory Declaration (see below)
5.	Warranty Security (see below)

7.02 Upon the authorization of the Improvement District and after the receipt of satisfactory 'As Constructed' drawings, warranty security and acceptance of required works, any relevant deposits guaranteeing the satisfactory installation of the works shall be returned to the Applicants.

7.03 The Improvement District shall hold warranty security of 20% of the cost of construction as certified by the Consulting Engineer in the form of an Irrevocable Letter of Credit or cash deposit for a one (1) year period, the period of warranty for all services. The security shall be in a form and for an amount satisfactory to the Improvement District.

7.04 The Improvement District will not accept the works until the Applicant provides a Statutory Declaration stating that all employees, contractors, subcontractors, and suppliers used in connection with the work have been fully paid and satisfied, that there are no claims outstanding or pending, and there is no lien filed against the work. The Statutory Declaration shall be provided by an independent third party.

7.05 The Improvement District will not accept the works until 'As Constructed' drawings for the work, signed and sealed by the Consulting Engineer, including Daily Inspection Reports have been provided and approved. **The Period of Warranty will begin on the date the 'As Constructed' drawings are approved and certificates as per section 7.03 above are issued to the Improvement District.** The Improvement District will retain the security until the Warranty ends.

8.0 Warranty of Works and Services

8.01 The Owner/Applicant shall be responsible at his own expense for the execution of all works, repair, alteration, reconstruction or replacement required to remedy any defect, fault or deficiency in, or developing in the completed works not only up to the receipt and approval of the Consulting Engineer's 'As Constructed' drawings, but also during the period of Warranty of twelve (12) months after the date of approval by the Improvement District.

8.02 In the event repairs are required which necessitate the interruption of service to any customer and/or the draining of any main, the Improvement District reserves the right to perform the work and charge the cost to the Owner/Applicant.

8.03 All such works of rectification, repair and warranty shall be executed upon the written request of the Improvement District. Should the Applicant neglect or fail to commence the execution of such works within the time period given by the Improvement District, the Improvement District shall complete the remedial work at the cost of the Applicant.

8.04 Final Acceptance by the Improvement District

.1 The Improvement District shall inspect the works prior to the expiration of the Warranty period. Any deficiencies shall be corrected as noted above prior to release of the Warranty deposit.

.2 If no deficiencies have developed during the warranty period, the Warranty deposit shall be released.

9.0 Testing and Disinfection

9.01 The Contractor shall flush and disinfect all water mains in accordance with AWWA Standards (per VIHA Construction Certificate) after a satisfactory leakage test has been carried out. The CBWD inspector will direct the testing of all water mains for leakage and health compliance. All work shall be completed in accordance with Section 5, Items 10.0 and 11.0.

9.02 The Consulting Engineer shall, at his discretion arrange for periodic compaction testing within the trench. Test results shall be submitted to the Improvement District.

10.0 Payment to CBWD

10.01 Work that is carried out by CBWD is subject to prepayment of 120% of the estimated costs. Where the actual cost of the work exceeds the estimated cost, the Applicant shall be responsible to pay any additional cost. Where the costs are less than estimated, a refund will be issued.

10.02 Where work is carried out by the Applicant with materials supplied by CBWD, prepayment for the estimated costs of materials shall be made to CBWD.

SECTION 3

DESIGN AND 'AS CONSTRUCTED' DRAWINGS

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- 3.06 Operational and Maintenance Manuals
- 3.07 Warranty Period

1.0 Scope

1.01 This specification shall govern engineering Design Drawings and As-Constructed Drawings of services within the CBWD.

2.0 Design Drawings

2.01 Any information received from the Improvement District on existing services shall be used as a guide only. Verification of locations and elevations must be checked by actual survey. The Improvement District takes no responsibility for the accuracy of service information obtained from drawings. Confirmation of the location of underground utilities shall be the sole responsibility of the Applicant.

2.02 All existing statutory rights of way and their permitted uses must be checked through the Land Titles Office. Registration numbers must be shown.

2.03 All rights of way must be clearly identified. These shall be tied to the iron pins at each lot, together with their width, permitted use, and noted as 'existing', 'acquired' or 'proposed'. Right of way documents shall be prepared as detailed in these specifications.

2.04 A north arrow, existing and proposed street names shall be shown on the Design Drawings.

2.05 All services shall be clearly designated on one plan using standard symbols.

2.06 Existing and proposed water mains, sanitary sewer mains, storm drains, including all appurtenances, ditches, pavement, curbs, sidewalks, underground wiring, gas, poles, trees, service connections and other underground utilities must be indicated in the plan and profile where applicable and dimensioned from existing or proposed iron pins or lot lines.

2.07 Complete details of all other utilities shall be obtained from appropriate utility companies.

2.08 The Plan and Profile shall be on one standard sheet A1 metric size 594 mm x 841mm of transparent paper.

.1 Plan view shall be on the lower half of the page.

.2 All drawings and dimensions shall use metric units.

Plan View:	Horizontal 1:500 or 1:250	Vertical 1:100 or 1:50
Cross Sections:	Horizontal 1:100	Vertical 1:100
Structural Details:	1:20 (typically)	

2.09 The following information shall be shown in the Profile:

.1 The size, type and class of pipe and class of bedding;

.2 For mains 100mm and larger, profile grades to 2 decimal places.

2.10 The following information shall be shown on the Plan:

.1 The offset of the main centerline from the property line;

.2 Extent of works required to make the connections to the existing water main.

2.11 Design Drawings prepared for pump stations, meter stations and PRV stations must be reviewed and approved by the CBWD and shall include the following information as a minimum:

.1 Plan view of the station detailing all pipe work, meters, valves, etc., within the station, architectural, mechanical and structural details, details, ventilation controls, lighting, electrical disconnects, SCADA, drainage, etc. Schematic drawings of pipe work will not be accepted;

.2 Section view of the station and well sites showing finished ground, station and pipe work **elevations related to geodetic datum**, drainage, hatches, etc.;

.3 Location plan showing legal (street/intersection) location of station;

.4 Site plan showing topographic details and all utility information for approximately a thirty (30) meter radius around the station;

.5 Material list of each item detailing manufacturer, pressure class, size, dimensions (if applicable), ordering information, etc.;

2.12 CBWD reserves the right to require further detail prior to Approval.

2.13 **All Elevations are to be to metric geodetic datum.**

2.14 Requirements for mechanical room drawings shall include:

.1 Overall Plan View showing overall site plan with location of water service from the connection to water main in the public right-of-way to location of water entry to building, location of water pipe through building, and remote readout and wiring.

.2 Mechanical Room Details will include backflow prevention assemblies, wiring for remote readout, strainers are required for all compound meters and fire line meters 100mm and larger, and bypass with valves and hose bib. Strainers are not required for ultrasonic or magnetic flow meters.

2.15 Requirements for Other Utilities

.1 Complete details of all other utilities shall be obtained from the appropriate utility company and shown, including the following:

.1 Existing utilities;

.2 Utility offset from property line and/or iron pin;

.3 Lot service connections and other appurtenances;

.4 Existing and proposed poles shall be dimensioned from the pole centre to property line and/or pin.

3.0 Completing 'As Constructed' Drawings

3.01 Submit 'As Constructed' Drawings as follows:

SUBMISSION PROCEDURE		Other Requirements
Step 1	Submit one (1) paper copy of As-Constructed Drawings and a DWF file of the drawings.	Sealed by Consulting Engineer.
Step 2	Revise according to CBWD comments.	
Step 3	Submit two (2) sets of paper drawings and a DWF and DWG file.	Sealed by Consulting Engineer.

3.02 The digital DWG file shall be complete with plotter configuration file of the approved Design Drawing, revised as required to show services 'As Constructed'.

3.03 The 'As Constructed' Drawings shall clearly show the location of all services and bends as installed, using offsets from survey pins. The locations will be shown either by check marking any correct original dimension on the drawing or by showing the revised dimensions beside the original dimension. Show location of any fittings by using two offsets and geodetic elevation. The extent of the constructed service shall be shown in dark blue. In addition, the location to the end of the underground pipe shall be shown in detail.

3.04 Within two weeks of completion of the waterworks being installed by the Applicant, the Consulting Engineer shall deliver 'As Constructed' Drawings to the Improvement District. These drawings shall include the following statement signed, sealed and dated by the Consulting Engineer:

> I CERTIFY THAT THE FOLLOWING SERVICES:
>
> **WATER**
>
> WERE INSPECTED DURING CONSTRUCTION AND WERE INSTALLED IN ACCORDANCE WITH THE IMPROVEMENT DISTRICT'S SPECIFICATIONS AND STANDARD DRAWINGS AND AS SHOWN ON THIS DRAWING.

3.05 Additional Required Detail

.1 Show domestic water service and reference to the corner iron pin to the nearest 30mm.

.2 Location of corporation stops.

.3 Location of rock cuts and maximum depth of rock excavation.

.4 Profile of main indicating the invert at 15 m stations.

.5 Reference locations of fire hydrants to main valve and iron pins.

.6 Location of all valves and reference to iron pins.

.7 Location of end of curbs, sidewalks and pavement.

.8 Location of bridge structures, etc. and geodetic elevation of deck.

3.06 Provide Operational and Maintenance Manuals for **pressure control station, well pump stations, booster pump stations, kiosks and reservoirs**, using format as approved by CBWD, one hard copy and one PDF format file.

3.07 In accordance with Section 2, Item 8.0, the Warranty Period will not start until 'As-Constructed' Drawings and Operations and Maintenance manuals for pressure reducing stations, pump stations, kiosks and reservoirs are received and accepted by CBWD.

SECTION 4

WATER SYSTEM DESIGN

1.0 Scope

2.0 Water Demands
- 2.01 Source
- 2.02 Distribution
- 2.03 Water Pressure
- 2.04 Design Population
- 2.05 Hydraulic Design

3.0 Distribution System
- 3.01 Piping
- 3.02 Valves
- 3.03 Hydrants
- 3.04 Flush Outs
- 3.05 Health Certificate
- 3.06 Backflow Prevention

4.0 Materials
- 4.01 Specifications
- 4.02 Water Mains
- 4.03 Fittings
- 4.04 Valves
- 4.05 Valve Boxes
- 4.06 Hydrants
- 4.07 Air Valves
- 4.08 End of Lines
- 4.09 Small Diameter Valves
- 4.10 Water Services
- 4.11 Meters

5.0 Community Wells
- 5.01 Minimum Well Yield
- 5.02 General Requirements and Acceptance of Community Wells
- 5.03 Site Requirements

6.0 Well Pumps

7.0 Pressure Reducing Valve (PRV) Stations

SECTION 4

WATER SYSTEM DESIGN (con't)

8.0 Reservoirs
- 8.01 Preliminary Design
- 8.02 Capacity
- 8.03 Communications
- 8.04 Site Requirements

9.0 Booster Pump Stations
- 9.01 Preliminary Design
- 9.02 General Requirements
- 9.03 Communications
- 9.04 Site Requirements

1.0 Scope

This section shall govern the design standards and material specifications for waterworks within or connected to the Cowichan Bay Water Works District supply and distribution system.

2.0 Water Demands

2.01 The Water supply source for ground water wells shall be capable of providing Maximum Day Demand rate for the population to be served.

2.02 The water distribution system shall be designed according to the minimum demands:

.1 Residential

Per Capita Average Day Demand (ADD):	500 L/c/d	(110 Ig/c/d)
Per Capita Maximum Day Demand (MDD):	1,100 L/c/d	(242 Ig/c/d)
Per Capita Peak Hour Demand (PHD):	2,000 L/c/d	(450 Ig/c/d)

Peaking Factors:

Maximum Day Demand (MDD):	2.2 x ADD
Peak Hour Demand (PHD):	4 x ADD

.2 Commercial and Industrial

.1 Commercial and industrial demands shall be determined on an individual basis. Maximum day demand shall be calculated as above. It is generally assumed that there is no peak hour for commercial or industrial demands.

.3 Fire

.1 Required fire flows shall be in accordance with the latest release of "Water Supply for Public Fire Protection" as published by the Fire Underwriter's Survey (FUS).

.2 During a fire situation, the system shall be designed to supply the required fire flow in addition to the maximum daily demand delivered with a minimum residual pressure of 140 kPa (20 psi).

.3 Fire flows are also subject to the following **minimum** requirements:

Developments (without sprinklers)	Flow (L/s)	Duration (Hours)
Single Family Housing	60	1.50
Churches, Apartments, Townhouses	90	2.00
Commercial (> 1,500 m^2)	150	2.00
Institutional (> 1,500 m^2)	150	2.00
Light Industrial (> 4,500 m^2)	225	3.00

.4 Prior to commencing a design, consultants should review the existing master water distribution plan(s) available at CBWD

2.03 Water Pressure

.1 Maximum and minimum design pressures are:

- Maximum desirable	700 kPa	(100 psi)
- Minimum, MDD	275 kPa	(40 psi)
- Minimum, PHD	240 kPa	(35 psi)
- Minimum, MDD + Fire at Hydrant	140 kPa	(20 psi)
- Minimum, static at building site	275 kPa	(40 psi)

.2 Where distribution pressures will exceed 840 kPa (120 psi) due to a drop in elevation, a pressure reducing station shall be installed as part of the distribution system. Individual pressure reducing valves shall be installed on private property by the Property Owner on all service connections where the pressure exceeds 550 kPa (80 psi).

2.04 Design Population

.1 Design population shall be computed according to the following figures:

Land Use	Description	Average Occupancy
Low Density	Any residential with a gross density of less than 20 Units/hectare	2.6 persons/unit
Medium Density	Any residential with a gross density of greater than 20 Units/hectare and less than 50 Units/hectare	2.0 persons/unit
High Density	Any residential with a gross density of greater than 50 Units/hectare	1.4 persons/unit

2.05 Hydraulic Design

.1 Depending upon the complexity and extent of the proposed distribution system the District may require a hydraulic network analysis diagram showing design flows and pressures. The hydraulic network shall be designed to distribute the design flows at the pressure specified.

.2 A standard grid main network is required throughout a residential subdivision. Water mains must be looped whenever possible. Where dead ends are unavoidable and approved by the District, flush outs shall be provided.

.3 The maximum allowable design velocity under fire flow conditions should be 3.5 m/s.

3.0 Distribution System

3.01 Piping

.1 Location

.1 Unless otherwise approved by the Engineer, water mains shall be located in the road right of way in accordance with Standard Drawings and as approved by the authority having jurisdiction. Design with a minimum distance of 1.5 metres from edge of road allowance or statutory right-of-way.

.2 Water mains shall not be located under sidewalks or where sidewalks may be constructed in the future.

.3 The water service shall be located in the road allowance fronting the lot to be serviced. Where a water service is required for irrigation purposed, provide a 19 mm water service, complete with water meter and double check valve backflow preventer, to traffic islands with planting areas. The Applicant shall apply for a water meter, installed by CBWD and supply and install an approved, testable backflow preventer.

.4 Where the Applicant requesting service does not have a water main fronting the property, the Applicant shall be responsible for all costs to supply and install the water main along the full frontage of the property to be developed and any extension required to the most convenient existing water main that will provide an adequate supply of water, all of which shall be to the approval of CBWD.

.5 Where the final road pattern prevents the looping of the water main network within the roadway, a water main may be required through a minimum 6 m statutory right-of-way registered in favour of the CBWD. The water main shall be a minimum of 150 mm diameter. No services shall be connected to the water main within the right-of-way.

.6 At all dead ends, provision shall be made for flushing the completed main prior to filling and pressure testing. Provision shall also be made for expelling air during filling by the installation of double acting air valves or main cocks where necessary.

.2 Separation

.1 Water mains and services shall be above sewers and services. In accordance with Vancouver Island Health Authority (VIHA) requirements, water mains should have at least 3.0 m horizontal separation from sewers and services and a minimum 0.45 m clear vertical separation. Where not possible, variance may be requested and will require approval from both CBWD and VIHA. The following mitigative measures are acceptable where a watermain crosses over a sewer or sewer connection with less than 0.45 m but greater than 0.15 m clear separation between the water main and the sewer:

.1 Provide Ductile Iron AWWA C151 Pressure Class 350 pipe for the watermain and wrap joints with Denso tape, 3m either side of crossing

.2 Sleeve the sewer main or sewer service in ductile iron pipe at the crossing for a distance of 3 m both sides of the crossing and wrap water main joints with Denso tape 3 m either side of crossing.

.2 The water main shall not be located within 1.0 m of any utility pole or 1.5 metres of any gas main and electrical conduit.

.3 Depth

.1 All water mains shall have at least 1.0m of cover to finished grade. Where 1.0m cover cannot be provided installation at a shallower depth may be approved by the Engineer, subject to there being adequate cover to support live loads and provide frost protection. Use of ductile iron pipe or a protective sleeve should be considered. Concrete encasement of water mains will not be permitted.

.4 Size

1. Water mains shall be sized as determined by the network analysis to provide design flows and pressures. In general, water mains shall be a minimum of 150 mm diameter.

2. For a dead end road or cul-de-sac with approval by the District, distribution main minimum diameter may be reduced to 100mm after the last fire hydrant.

.5 Curvature

1. On a curve for ductile iron pipe the minimum permissible pipeline radius with 5.5 m length of ductile pipe shall be 60m. A shorter radius shall be allowed with shorter pipe lengths provided the radius is not less than the manufacturer's minimum.
2. For PVC pipe approved Manufacturers and Joint Deflections allowed as follows:

   - IPEX – deflection allowed as per manufacturers instructions
   - Royal Plastics – deflection allowed as per manufacturers instructions
   - Rehau Pipe (Aqua loc) – no deflection allowed
   - Northern Pipe – no deflection allowed

   Where no deflection of the joints is permitted, small degree (5°) bends shall be used to lay PVC pipe on a curve if required.
3. PVC pipe shall not be bent to achieve required curvature.
4. For other manufacturers, approval for deflection of pipe must be obtained from the CBWD.
5. All water mains are to be installed to within a minimum of 3 meters of the farthest extremity of the property being serviced.

.6 Trench Dams

.1 For slopes of 10% to 30%, construct trench dams using standard sandbags filled with 5:1 ratio of sand to cement and in accordance with Standard Drawing W20.

.2 For slopes greater than 30%, construct trench dam using 20 MPa concrete and in accordance with Standard Drawing W21.

3.02 Valves

.1 In general, valves shall be located on all sides of the tee and cross at intersections and at spacing not exceeding 300m. Valves shall be positioned so that generally no more than one hydrant or 25 homes are isolated. Main valves should be placed at hydrant tees on the hydrant lead and on the downstream side of the tee.

3.03 Hydrants

.1 Hydrant distribution shall be in general conformance with the "Water Supply for Public Fire Protection" as published by Fire Underwriters Survey and in accordance with the following table:

Zoning	Maximum Hydrant Spacing
Single family residential areas with more than 3 m separation between houses.	150 m
Single family residential areas with less than 3 m separation between houses.	90 m
Townhouses or multi-family and other medium density areas.	90 m
Institutional, commercial, industrial, apartments and other high density areas.	90 m

3.04 Flush Outs

.1 Where a water main ends in a dead end, a flush out shall be provided for flushing purposes. If there is a possibility the line could be extended in the future the valve shall be the full size of the water main with the appropriate reducing cap to accommodate the flush out. If there is no possibility of future extension, a permanent flush out shall be used as shown in the detailed drawings. Flush outs shall be of sufficient size to ensure scouring velocity and to adequately flush the main.

3.05 Health Certificate

.1 The design drawings for the distribution system shall be forwarded to the Vancouver Island Health Authority (VIHA), Public Health Engineer, for approval in accordance with Section 21 of the Health Act. Construction shall not commence until a construction Certificate has been received.

3.06 Backflow Prevention

.1 General requirements for cross connection control and backflow prevention shall follow the latest version of the "AWWA Canadian Cross Connection Control Manual" as published by the Western Canada Section

of American Water Works Association (AWWA) and in accordance with the latest version of the BC Building Code and CSA B64.10.

.2 As a minimum, a dual check valve shall be installed in all residential services (a back flow device consisting of two force loaded, independently acting check valves. This device is designed for use under continuous pressure.).

.3 Connections to sewage treatment facilities and/or sewage lift station will require Reduced Pressure Backflow Prevention Assemblies as outlined in the "AWWA Canadian Cross Connection Control Manual" as published by the Western Canada Section of American Water Works Association (AWWA).

.4 An approved back flow assembly shall be installed in all commercial services, (subject to risk assessment), by a certified cross connection control tester.

.5 The CBWD engineering representative and/or operations manager shall have access to and afforded inspection of the backflow prevention assembly. Certification requirements for the assembly shall be provided to the District prior to any water service being activated.

4.0 Materials

4.01 All materials in the water main installation shall conform to the following specifications, and shall be subject to inspection and testing at the discretion of the Improvement District.

4.02 Water Mains

.1 Ductile Iron Pipe

Ductile Iron Pipe shall conform to the latest AWWA designation C151. Pipe manufactured to these specifications shall be at least Class 350. The ductile iron pipe shall be cement mortar lined in accordance with the latest AWWA C104. Where corrosive soil conditions exist, the Engineer may require special protection for the pipe. Joints shall be rubber gasket in accordance with the latest AWWA C111.

.2 Polyvinyl Chloride (PVC) Pressure Pipe

PVC pressure pipe shall conform to the latest AWWA designation C900 and CSA B137.3. Unless otherwise specified on the drawings all pipe shall be Class 150, DR 18, minimum. All PVC pipe shall have cast iron pipe equivalent outside diameter. It is mandatory that joints shall be integrally thickened bell and spigot type conform to ASTM D3139 clause 6.2 with single elastomeric gasket to ASTM F477.

.3 Stainless Steel Pipe

Stainless Steel pipe shall conform to the latest AWWA C220. All stainless steel pipe shall be type 316L. All piping in chambers shall be minimum Schedule 10S.

.4 HDPE Pipe

Where the installation of High Density Polyethylene (HDPE) pipe is approved for pipe diameters 100 mm through 1575 mm, HDPE pipe shall conform to the latest edition of AWWA Standard C906 Polyethylene (PE) Pressure Pipe and Fittings. Generally, HDPE shall be DR11, unless otherwise approved. As well, fittings such as tees, bends, reducers and crosses, for HDPE pipe installations shall be HDPE and fused to the pipe.

.5 All water mains shall be marked with a detectable marker tape.

4.03 Fittings

.1 All fittings for ductile iron and PVC pipe shall be:

.1 Cast iron fittings manufactured to AWWA C110 designated for a working pressure of 1035 kPa. (150 psi), cement mortar lined and externally seal coated, both to AWWA C104.

.2 Asphalt coated ductile iron compact fittings manufactured to ANSI/AWWA C153/A21.53-94, suitable for pressure rating of 2415 kPa, cement mortar lined to AWWA C104.

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

.4 Flanged joints on fittings shall be flat faced conforming in dimension and drilling to ANSI B16.1 (125lb).

.5 Ends shall be flanged or belled to suit the pipe ends.

.6 Thrust blocks shall be provided as shown in the standard drawings.

4.04 Valves

.1 All valves used on pipe 50 mm to 300 mm diameter shall be gate valves of the same size as the pipe unless otherwise approved by CBWD, valves shall be AVK.

.2 Gate valves shall be in accordance with AWWA C509 and the following supplementary data:

1. Unless otherwise specified, gate valves shall be suitable for a minimum working pressure of 1034 kPa (150 psi).
2. Gate valves shall have a ductile iron body, c/w stainless steel stem.
3. Gate valves shall be resilient seat, with a non-rising stem.
4. Valve ends shall be provided to fit the pipe.
5. The position of the valve in line shall be vertical.
6. Stem seals shall be o-ring.
7. Valves shall open to the left (counter-clockwise).
8. Extension pieces shall be used where valve operator nut bury is deeper than 1.0 m.
9. Valves shall be flanged to fittings.
10. Valves shall have a 50 mm square operating nut.
11. Valves shall have a stainless steel stem and stainless steel fasteners.

4.05 Valve Boxes

.1 Valve boxes shall be Robar Type, cast iron complete with direction indicator and telescoping so that surface loads are not transmitted to the valve body or pipeline. A minimum of 300 mm of adjustment shall be available on all valve boxes. In cases where the valve box extension will not fit over the valve stuffing box a valve hood shall be used.

.2 All valve boxes located outside of the paved areas shall have a minimum of 450 square meters of 100 mm thick concrete apron surrounding the valve boxes per Standard Drawing W-1.

4.06 Hydrants

.1 Installed fire hydrants shall meet the following specifications:

.1 Hydrants shall be ULFM, ULC approved compression type complying fully with AWWA standard C502. Hydrants shall be AVK Model 2780 to meet CBWD standards.

.2 Hydrants shall be counter clockwise opening and have a standard pentagonal operating nut.

.3 The hydrant lead shall be minimum 150 mm diameter and made of the same material as the mainline piping.

.4 Hydrants shall have two nominal 65 mm (2.5") diameter hose outlets without independent cut-off. The 65 mm diameter hose outlets shall conform to the BC Fire Hose Thread Standards. There shall also be one nominal 100 mm diameter (120 mm OD) pumper outlet. The 100 mm diameter pumper outlet shall conform to the BC Fire Hose thread Standards nominal 100 mm IP, 117.5 OD (4.625") male, 6 threads per 25 mm (6 TP1).

.5 Hydrants shall be epoxy coated red above the ground line to an average dry thickness of 2.5 mils. Hydrant ports and bonnets shall be painted to CBWD colour code for pressure rating.

.6 Drain outlets shall be provided as per the standard drawing.

.7 A gate valve shall be provided between the hydrant and the main line, flanged to a flanged tee in the main. Installation shall be in general accordance with AWWA M17. Hydrants shall not be flanged to the main or gate valve.

.8 Hydrants shall be set with a minimum clearance from the property line equal to 1.5 times the depth of the hydrant.

4.07 Air Valves

.1 All air valves shall be combination air release valves per Standard Drawing W7. Bushings, reducers and unions to be used in the valve connection shall be brass manufactured to CSA specification a 40.2 using ASTM B-62 Bronze Nipples shall be standard brass and threaded at both ends.

.2 Service valves for use in air valve assemblies shall have screw ends and shall be brass or bronze.

.3 Air valves for watermain greater than 300mm diameter shall be as approved by Engineer.

4.08 End of the Lines

.1 End of the line assemblies (flush outs) shall be constructed from minimum 50 mm diameter Stainless Steel Schedule 40.

.2 All valves shall be ductile iron body gate valves conforming to AWWA C509, as detailed in Section 4.04. Valves shall be same size as main per Standard Drawing W1.

.3 Caps and fire hose adapters shall be connected to the flush outs to provide for a 65 mm fire hose connection to permit easy removal and connection of a fire hose per Standard Drawing W8.

.4 All tie rods and steel piping that are below ground to be stainless steel per Standard Drawing W8.

.5 All flush outs shall be sized to achieve the minimum scouring velocity for the size of pipe they are servicing (minimum velocity to be 0.8 m/s and/or in accordance to AWWA C651).

.6 Adequate drainage shall be provided at all flush outs.

4.09 Small Diameter Valves

.1 All valves between the sizes of 19mm and 40mm diameter shall be brass body, solid wedge, gate valves with inside screw, non-rising stem and screw-in bonnet. Valves shall be rated for minimum 125 lbs. Saturated steam and 200lbs. non-shock cold water, oil or gas. Valve shall be Jenkin Bros., Crane or approved equal.

4.10 Water Services

.1 Size

.1 Service connections shall be 19 mm diameter unless otherwise designated by the Engineer. All components, e.g., corporation stop, meter setter, shall be the same size as the service pipe to which they are connected.

.2 Pipe

.1 Pipe for underground service 50 mm diameter and smaller shall be Polyethylene pipe conforming to CSA B137.1. Poly pipe to be identified as Series 200, Municipal Potable Water tubing.

.2 Pipe for underground service greater than 50 mm and less than 100 mm diameter shall be polyethylene conforming to Canadian Standards Association under CSA Standard B137.1. Pipe for services 100 mm and greater diameter shall be as specified for the distribution piping.

.3 Corporation Stops

.1 Corporation stops shall conform to AWWA C800. Sizes 19 mm and 25 mm diameter shall have AWWA Standard threaded inlet and compression type outlet. Sizes 40 mm and 50 mm shall have iron pipe thread inlet and compression outlet.

.2 Shut off head shall be solid tee head type.

.3 Corporation stops shall be "Cambridge Brass" unless otherwise approved by the Water District.

.4 Meter setters

.1 Meter setters shall be supplied with compression connection inlets and outlets, as required.

.2 Meter setters shall only be "Cambridge Brass" Model No. 6031- 215-H3H3 UQP, unless otherwise approved by the Improvement District.

.3 Meter setters shall be 19mm, set to accept a 17x19mm water meter.

.4 Meter setters shall have "Cambridge Brass" meter idlers installed, Model # 450-2.

.5 Shutoff head shall be solid tee head type.

.6 Meter setters shall have a built in, testable, dual check valve.

.5 Couplings and Joints

.1 Couplings for jointing copper shall be compression type. Sweated joints shall not be permitted.

.2 Couplings for jointing polyethylene shall be compression type. Compression type couplings shall be "Cambridge Brass" unless

otherwise approved by the Improvement District. Stainless steel inserts shall be used in all polyethylene compression joints

.6 Pipe Saddles

.1 Pipe saddles shall be broadband, strap type with brass body and stainless steel straps designed and approved for the size and type of pipe on which they are installed. All saddles shall be double strap. Unless otherwise approved, saddles shall be Robar #2706.

.7 Location

.1 All water services to be located at the center of the lot.

4.11 Meters

.1 Upon application, all water meters shall be supplied and installed by the Water District at the Owners expense, unless otherwise approved by the Water District. All meters are to be installed on public property. The following are three options for providing domestic and fire connections:

.1 Domestic Only

.1 Meters used with services ranging in size from 19 mm to 25 mm diameter shall be positive displacement meters. Sizes 19 mm through 40 mm shall be supplied with a brass bonnet and cast bottom

.2 For applications requiring meters ranging in size from 40 mm to 300 mm diameter shall be Master Meter Octave Ultrasonic. Meter selection shall suit high and low flow requirements.

.3 Bypasses shall be provided on all meters 50mm diameter and larger.

.2 Combined Domestic and Fire

.1 For applications where domestic and fire demands are supplied from the same internal system, a Master Meter Octave Ultrasonic flow meter and piping arrangement complete with bypass piping per Standard Drawing W15 shall be used.

.2 Meter chamber per Standard Drawing W17.

.3 Separate Domestic and Fire

.1 For applications where fire demands are to be supplied from a designated fire system separate from the domestic system, a

Double Check Valve Assembly complete with bypass metering for fire demand and separate meter for domestic demand per Standard Drawing W16 shall be used.

.2 Approved backflow prevention shall be installed at Owner's expense. The backflow preventer is to be tested and certified as per the requirements of the AWWA Canadian Cross Connection Control Manual with copies of the testing and certification sent to the Owner.

.3 Meter chamber to be as shown on Standard Drawing W-17.

.4 Meter Boxes and Chambers

.1 In un-traveled areas as determined by the Engineer, meter service boxes for water services 40mm diameter and smaller shall be "Ametek" or "Brooks" 300mm standard meter boxes complete with standard lids and 150mm box extensions as required, or approved equal.

.2 In traveled areas (driveways and sidewalks), service boxes for water services 25 mm diameter and smaller shall be "A.E. Concrete Pre-cast Products", 300 mm x 500 mm concrete meter boxes complete with flush cast iron traffic cover marked "water" and extension sections as required, or approved equal.

.3 Meter boxes and chambers for water services larger than 40mm diameter shall be as approved by the Engineer.

5.0 Community Wells

5.01 Minimum Well Yield

.1 The minimum yield for well acceptance by CBWD shall be 3 L/s (40 Imp gpm or 48 US gpm). Wells with less than the minimum yield requirement may be accepted at the discretion of the board of Trustees.

5.02 General Requirements and Acceptance of Community Wells

.1 All wells shall follow the CBWD "New Well Check List" found in Appendix A.

.2 Specific procedures for acceptance of Community Wells and rehabilitation are found in Appendix B, under applicable Procedure A, A1, B, C and D (with Figure D-1 and D-2).

.3 **The well water quality or treatment requirements must be acceptable to the CBWD before the well can be taken over by the District.**

5.04 Site Requirements

.1 General

.1 Locate the well pump station with adequate working space on land transferred by the developer on a fee simple lot to CBWD with access to a public road right-of-way. If access to a public road right-of-way is not available and provided the station does not front on a public road right-of-way, provide a statutory right-of-way registered in favour of CBWD as per the CBWD requirements.

.2 The applicant shall apply for and obtain a civic address for the property from the municipality / Regional District.

.3 Power supply to the station shall be underground. All overhead power/telephone/cable lines must be located clear of equipment operating and delivery areas.

.2 Site Access

.1 Provide an access road to all pump stations, minimum right-of-way width of 6 metres with a maximum grade of 12% and an entrance with a minimum 6 metre radius suitable for trucks and boom hoists. Provision must be made at the site for a turning area for delivery trucks and cars. The access road, parking and turning areas shall be paved. A parking area is required for additional vehicles during maintenance or repair operations.

.2 Provide a minimum 4.5 m paved access road to the pump station with a minimum lift of 50 mm asphalt or pavement structure as recommended by the Geotechnical Engineer registered to practice in the Province of BC. Provide sub base must be approved by Geotechnical Engineer.

.3 Landscaping, Grading and Drainage

.1 Provide aesthetically pleasing landscaping design, which blends in with the local surroundings and is preferably of low maintenance design and low water consumption to the approval of CBWD and the local municipality.

.2 Site grading should allow for positive drainage away from the building. Provide berms in sensitive areas to reduce noise and visual impact.

.4 Security Fence

.1 Where required by CBWD and/or VIHA, the area should be fenced with a chain link security fence at least 2.4 m high with 3 strands of barbed wire on top. Preferably the fencing should be designed to allow service vehicles to be clear of the roadway/sidewalk prior to opening the gate, i.e. off the road. A 4.5 m gate for vehicular access and a separate man gate should also be provided. Local zoning by-laws may dictate type and height of fence. Specifications for fencing material are subject to approval by CBWD.

6.0 Well Pumps

.1 Well pump facility design must include a preliminary design and accompanied by a design brief for well pump and PLC/SCADA equipment, which is to be approved by the CBWD before detailed design proceeds. Preliminary design should include the following:

.1 Well pumps shall be designed for maximum overall plant efficiency

.2 The standard electrical power is 575 volt, 3 phase

.3 Well head protection shall conform to the latest Ministry of Health standards.

.4 All piping within the well is to meet AWWA standards for potable water piping. Schedule 80 PVC pipe with a threaded schedule 120 PVC coupling is permissible to a maximum of 2 hp. All piping within the well which is used to transport water, from ground water well pumps in excess of the 2 hp, shall be Schedule 40 Stainless Steel, threaded and coupled design only.

.5 Pump motors shall be reviewed and approved by Electrical Engineer for load and service factor. The preferred equipment to be used is Franklin.

.2 The method used for well pump control shall be SCADA and compatible with existing systems. Equipment to be housed in an approved kiosk complete with manual transfer switch and portable generator receptacle.

.3 The communications methods for data transfer for each site will be evaluated on its own merits and in the order of preferences are:

.1 Hardwire link and the nature of that link to be reviewed and approved by CBWD.

.2 Broadband (Ethernet)

.3 Radio

7.0 Pressure Reducing Valve (PRV) Stations

.1 PRV station design parameters shall be reviewed and approved by CBWD before detailed design proceeds. PRV stations shall be housed in concrete chambers complete with parallel pressure reducing valves sized for peak hour and maximum day demand plus fire flow. An external bypass with closed valve is to be included.

.2 Provide a plan view and section drawings for the PRV. Design Drawings shall be accompanied by a design brief and shall be approved by CBWD prior to installation.

.3 All pressure reducing valves shall have speed controls and valve stem position indicator.

.4 Provide a minimum 50 mm flush valve on pressure reducing valves 150 mm diameter or larger.

.5 Provide a flow test port and gauge between downstream isolation valve and control valve.

.1 For a 50 mm pressure reducing valve (minimum 19 mm port) with gauge.

.2 For a 150 – 200 mm pressure reducing valve (minimum 50 mm port) with gauge.

.3 Any connections for isolating valves or drain ports shall be at either the 3 o'clock or 9 o'clock positions.

8.0 Reservoirs

8.01 Preliminary Design

.1 Reservoir design should include a preliminary design and be accompanied by a Design Brief, which is to be approved by the CBWD before detailed design begins and prior to installation. Preliminary designs should cover the flowing issues:

- Selection of materials (concrete or glass fused to steel)

- Design standards
- Design philosophy for drain, fill and cleaning
- Dedicated main between the relevant pump station and reservoir, separate from outlet/distribution water main
- Volume
- Shape
- Monitoring systems, controls and communications
- Number of cells
- Geotechnical report on foundation conditions
- Appearance
- Isolation valves for maintenance, multiple reservoir separation, etc.

8.02 Capacity

.1 Reservoirs should be designed to suit the particular circumstances. Reservoir capacity should be calculated by the following formula:

Total Storage Volume = A + B + C

Where: A = Fire Storage (from Fire Underwriters Survey guide)

B = Equalization Storage (25% of Maximum Day Demand)

C = Emergency Storage (25% of A + B)

8.03 Communications

.1 The communications methods for data transfer for each site will be evaluated on its own merits and the order of preferences are:

.1 Hardwire link and the nature of that link to be reviewed and approved by CBWD.

.2 Broadband (Ethernet)

.3 Radio

8.04 Site Requirements

.1 General

.1 Locate reservoir with adequate working space on land transferred by the developer on a fee simple lot to CBWD with access to a public road right-of-way. If access to a public road right-of-way is not available and provided the reservoir does not front on a public road right-of-way, provide a statutory right-of-way registered in favour of CBWD as per the CBWD requirements.

.2 The applicant shall apply for and obtain a civic address for the property from the municipality / Regional District.

.3 Power supply to the reservoir shall be underground. All overhead power/telephone/cable lines must be located clear of equipment operating and delivery areas.

.2 Site Access

.1 Provide an access road to all reservoirs, minimum right-of-way width of 6 metres with a maximum grade of 12% and an entrance with a minimum 6 metre radius suitable for trucks and boom hoists. Provision must be made at the site for a turning area for delivery trucks and cars. The access road, parking and turning areas shall be paved. A parking area is required for additional vehicles during maintenance or repair operations.

.2 Provide a minimum 4.5 m paved access road to the reservoir with a minimum lift of 50 mm asphalt or pavement structure as recommended by the Geotechnical Engineer registered to practice in the Province of BC. Provide sub base must be approved by Geotechnical Engineer.

.3 Landscaping, Grading and Drainage Site Access

.1 Provide aesthetically pleasing landscaping design, which blends in with the local surroundings and is preferably of low maintenance design and low water consumption to the approval of CBWD and the local municipality.

.2 Site grading should allow for positive drainage away from the building. Provide berms in sensitive areas to reduce noise and visual impact.

.4 Security Fence Site Access

.1 Where required by CBWD and/or VIHA, the area should be fenced with a chain link security fence at least 2.4 m high with 3 strands of barbed wire on top. Preferably the fencing should be designed to allow service vehicles to be clear of the roadway/sidewalk prior to opening the gate, i.e. off the road. A 4.5 m gate for vehicular access and a separate man gate should also be provided. Local zoning by-laws may dictate type and height of fence. Specifications for fencing material are subject to approval by CBWD.

9.0 Booster Pump Stations

9.01 Preliminary Design

.1 Booster Pump Station design should include a preliminary design and be accompanied by a Design Brief, which is to be approved by the CBWD before detailed design begins and prior to installation.

9.02 General Requirements

.1 General requirements for booster pump stations shall be as follows:

.1 A valved bypass shall be provided.

.2 There shall be sufficient capacity so that, with the most important pump out of service, the station will be capable of supplying the maximum design flow.

.3 Provisions may be required for the maximum design flow during a power failure by an emergency standby generator or connection for a portable generator.

.4 Where design flows are such that starting and stopping surges will cause water hammer in the inlet or discharge lines, pump control valves or other pressure control devices shall be provided. Relief valves will also be required to protect against surges caused by power failure.

.5 Pump system to be PLC-controlled and connected to SCADA system. Soft starts, or Variable frequency drives may be considered for specific applications. Flow and pressure measurement shall be provided. Flow recording will be required.

.6 Pumps shall normally be housed in above ground buildings, designed to provide adequate insulation, heating, lighting and ventilation.

.7 Each pump shall have a combination motor starter with a motor circuit protector, a "hand-off-auto" selector switch, a green "pump run" pilot light, a red "pump failed" pilot light and an elapsed time meter.

.8 The pumps shall be shut down and stay locked in the event of motor high temperature or motor overload. The pumps shall also shut down on low suction pressure; re-start shall be automatic when the suction pressure recovers; a red alarm light shall stay on until manually reset.

9.03 Communications

.1 The communications methods for data transfer for each site will be evaluated on its own merits and the order of preferences are:

.1 Hardwire link and the nature of that link to be reviewed and approved by CBWD.

.2 Broadband (Ethernet)

.3 Radio

9.04 Site Requirements

.2 General

.1 Locate booster reservoir with adequate working space on land transferred by the developer on a fee simple lot to CBWD with access to a public road right-of-way. If access to a public road right-of-way is not available and provided the pump station reservoir does not front on a public road right-of-way, provide a statutory right-of-way registered in favour of CBWD as per the CBWD requirements.

.2 The applicant shall apply for and obtain a civic address for the property from the municipality / Regional District.

.3 Power supply to the pump station reservoir shall be underground. All overhead power/telephone/cable lines must be located clear of equipment operating and delivery areas.

.3 Site Access

.1 Provide an access road to all pump stations, minimum right-of-way width of 6 metres with a maximum grade of 12% and an entrance with a minimum 6 metre radius suitable for trucks and boom hoists. Provision must be made at the site for a turning area for delivery trucks and cars. The access road, parking and turning areas shall be

paved. A parking area is required for additional vehicles during maintenance or repair operations.

.2 Provide a minimum 4.5 m paved access road to the pump station with a minimum lift of 50 mm asphalt or pavement structure as recommended by the Geotechnical Engineer registered to practice in the Province of BC. Provide sub base must be approved by Geotechnical Engineer.

.1 Landscaping, Grading and Drainage

.1 Provide aesthetically pleasing landscaping design, which blends in with the local surroundings and is preferably of low maintenance design and low water consumption to the approval of CBWD and the local municipality.

.2 Site grading should allow for positive drainage away from the building. Provide berms in sensitive areas to reduce noise and visual impact.

.2 Security Fence

.1 Where required by CBWD and/or VIHA, the area should be fenced with a chain link security fence at least 2.4 m high with 3 strands of barbed wire on top. Preferably the fencing should be designed to allow service vehicles to be clear of the roadway/sidewalk prior to opening the gate, i.e. off the road. A 4.5 m gate for vehicular access and a separate man gate should also be provided. Local zoning by-laws may dictate type and height of fence. Specifications for fencing material are subject to approval by CBWD.

SECTION 5

WATER SYSTEM INSTALLATION

1.0 Scope

This section shall govern the installation of waterworks within the CBWD water system.

2.0 General

.1 Any installation, not covered by this section, shall be in accordance with current AWWA Standards and manufacturer's recommendations.

.2 In general, water services originate at the main and terminate at the meter box and shall include the saddle, corporation stop, service line, meter setter and meter box, but exclude the meter. All water meters shall be supplied and installed by CBWD at the Applicant's expense.

.3 CBWD prefers water meter installations at property line. However, subject to approval by CBWD, the applicant may, for commercial, industrial and institutional buildings, have the water meter located in the mechanical room of a building. The water service shall originate at the main and terminate at the property line. The Applicant shall retain ownership of the water service line from the property line to the meter and shall be responsible for all maintenance costs.

.4 Subject to approval by CBWD, the applicant may, for a strata property, where the water main is to be owned by CBWD, the water service shall originate at the main terminating at the edge of a statutory right-of-way and shall include the saddle, corporation stop, service line and meter box. The Applicant shall retain ownership of the water service line from the edge of the statutory right-of-way to his unit and shall be responsible for all maintenance costs.

.5 Any connection to the existing system shall be carried out by District personnel at the Owner's expense. Prior to making connection to an existing system, testing and disinfection to be done as per this specification. Operation of the existing valves or hydrants shall be by District personnel only.

.6 Where installations of other services cross under Asbestos Cement water mains, the Engineer may require that a section of the A.C. main be replaced with Ductile Iron or PVC pipe such that the full trench width is bridged. This work shall be done by District personnel, at the Owner's expense.

.7 Ductile iron pipe shall be installed without joint conductance unless specifically required for corrosion protection.

3.0 Piping

.1 Standards for excavation, bedding, backfilling and restoration shall be in accordance with the permit issued by the Ministry of Highways, the design drawing and the direction of the Engineer.

.2 Pipe shall be handled, stored and laid in accordance with the recommendations of the pipe manufacturer. Particular care shall be taken to ensure that before each joint is made, the pipe is cleaned and all dirt and other debris removed.

.3 During construction, water and debris shall be prevented from entering the new system by keeping the excavation sufficiently dewatered and also by capping or plugging any openings with watertight fittings. Pipe and fittings shall be protected from contamination during construction.

.4 Pipe shall not be backfilled until the bedding, grade and alignment has been approved by the Consulting Engineer and District personnel.

.5 All pipe shall be laid to the designed alignment and grade with the following tolerance:

- .1 Horizontal tolerance shall not be greater than 100mm from designated location;
- .2 Vertical tolerances shall not be greater than 19mm from designated grades on 200mm and larger water mains.
- .3 Vertical tolerances from designated grades shall be as approved by the Engineer on water mains smaller than 200mm.

.6 Do not exceed maximum joint deflection specified in AWWA C600 or maximum joint deflection recommended by pipe manufacturer and as outlined in SECTION– 4 Water System Design, paragraph 3.01 Piping, Article .5 Curvature.

.7 Keep jointing materials and installed pipe free of dirt, 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 water and foreign materials.

4.0 Gate Valves

.1 Gate valves shall be installed at the locations shown on the design drawings in accordance with Standard Drawing W1.

.2 Each valve shall be provided with a valve box as specified on the Standard Drawing. The valve box shall be centered and plumb over the wrench nut of the valve, shall be set evenly on the valve bonnet, shall be supported so it does not transmit shock or stress to the valve and shall be braced against lateral movement of the sides of the trench. The top of the valve box shall be adjusted to the elevation required by the Engineer. Valve boxes, which are not plumb nor centered over the valve nut shall be dug up and reset properly.

.3 A stem extension shall be installed where the valve operation nut bury is deeper than 1.0 m.

5.0 Hydrants

.1 Hydrants shall be installed at the locations shown on the design drawings in accordance with Standard Drawing W2.

.2 All hydrants shall be plumb and shall have their nozzles parallel with or at right angles to the street, with pumper nozzles facing the street.

.3 Hydrants shall be connected to the water main by a hydrant lead conforming to the pipe material used for the mains. A 150 mm valve shall be connected to the water main by a tee.

.4 A precast concrete block shall be installed below the hydrant and a sump pit shall be provided containing not less than $0.2m^3$ of coarse drain rock placed up to a level of 300 mm above the drain port.

.5 Hydrant access shall be culverted across ditches with headwalls. Culvert sizing and surfacing shall be in accordance to MoTI Construction Specifications.

6.0 Air Valves

.1 Air valves shall be installed at the locations shown on the design drawings and in accordance with Standard Drawing W7. Care shall be taken to ensure that the air valve is properly located in the chamber to permit maintenance and removal. The air valve chamber must also be free draining; installation of a connection to the storm drain system may be required to ensure this. Chamber drain system to be approved by District.

7.0 End of the Line

.1 Permanent or temporary end of line assemblies shall be installed as applicable at the locations shown on the design drawings in accordance with Standard Drawing W8 for above or W9 for below ground installations.

8.0 Reaction Blocking

.1 All plugs, caps, tees, crosses, reducers, valves, and bends deflecting 11.25 degrees or more, and all points where there is unrestrained thrust, shall be anchored to prevent movement by providing suitable reaction blocking, metal harness, or tie-back rods. Reaction blocking details are shown on Standard Drawing W3.

.2 Reaction blocks shall be concrete having a compressive strength of not less than 20.7 MPA at 28 days. Alternately, engineered mechanical restraint may be used as shown on Standard Drawing W5.

.3 Blocking shall be placed between undisturbed ground and the fitting to be anchored. The arrangement of the blocking shall be as shown on the standard drawing and all blocks shall be sized in accordance with good engineering practices for the prevailing soil conditions. The reaction blocking shall be so placed that the pipe and fittings will be accessible for repair. Where reaction blocking comes in contact with piping, burlap sacking shall be placed between the pipe and concrete.

.4 Metal harness made of steel tie rods and concrete blocking shall be used for valves and vertical leads. All tie rods to be coated with paraffin tape, or an approved corrosion protection.

9.0 Water Services

.1 Water services shall be installed at the locations shown on the design drawings in accordance with Standard Drawing W11.

.2 A minimum of 100 mm of bedding shall be placed under the pipe and 300 mm of bedding shall be placed over the pipe. Trenching, bedding and backfilling required shall be in accordance with MOT and Standard Drawing W10.

.3 Meter boxes and meter setters shall be installed by the contractor. Plastic meter boxes shall be used in untraveled areas. Concrete meter boxes, complete with cast iron lid both capable of H20 loading, shall be used if the meter box is located under a traveled area such as a driveway. Care shall be taken to ensure that all boxes are installed as close as possible to finished grade.

.4 Water meters shall be applied for to the Improvement District by the Owner, with installation by the Improvement District personnel at the time of building permit.

.5 All water services shall be connected to the main by means of an approved service saddle with double strap. Nuts on service saddle straps to be tightened to torque range specified by manufacturer and in no case in excess of that torque. Use core-out type bit, provide coupons to CBWD Inspector. The water service pipe shall be connected to the upper half of the water main inclined at an angle of 30 degrees with the horizontal leaving a suitable gooseneck. A corporation main stop shall be installed at the main in accordance with the manufacturer's specifications or instructions. Water services shall be installed from the water main to the property line using the shortest and straightest route, however sufficient slack shall be provided to allow for settlement during backfilling and compaction. Services to property shall be at the center of the lot. All services shall be marked with a detectable marking tape.

.6 Wooden markers shall be installed at the termination of building water services. The marker shall be 50 mm x 100 mm (2" x 4") wood and shall extend from the invert of the service to 600 mm above ground level. The top 600 mm shall be painted blue. In addition, the water service tube from the meter setter shall be attached to the wooden marker as shown on Standard Drawing W11.

.7 Cross connection control shall be used to prevent the backflow of contaminated water from entering the public water supply in the CBWD. Typically, premise isolation is provided by a backflow preventer installed just downstream of the water meter (often referred to as "at the meter") since this location provides the best assurance that all subsequent connections will be downstream of the backflow preventer. However, where space limitation precludes an at-the-meter location an alternative location may be proposed (e.g. just inside the point of service entry to the building).

.8 In accordance with CSA B64.10, the following general requirements for the installation of backflow preventers shall apply when alternative location for premises isolation are proposed:

.1 No water connection shall be made between the water meter and the backflow preventer (e.g. for fire hydrants, irrigation systems, hose connections, etc.) unless protected by a backflow preventer.

.2 All backflow preventers shall be installed in readily accessible areas to facilitate safe inspection, field-testing and maintenance.

.3 Manufacturer's recommendations shall govern the clearances provided for backflow preventers.

.4 All by-pass around backflow preventers shall be prohibited except where an equivalent preventer is installed on the by-pass.

.5 Reduced pressure backflow preventers shall not be installed below grade in a pit or vault unless located a minimum of 300 mm above a non-restrictive, bore-sighted, daylight drain, which cannot be submerged during floods.

.6 Backflow preventers shall be located so that they do not hinder the operation of other safety system devices such as fire sprinklers.

.7 All backflow preventers shall be protected from freezing.

.9 In addition to the above, the home owner will be required to provide compliance testing at time of installation and an annual test per the CBWD forms.

10.0 General Procedure Flushing and Testing

10.01 General, Cleaning and Preliminary Flushing

.1 Before flushing and pressure testing, ensure waterworks system is completely finished except tie-ins to existing watermains. The CBWD inspector will direct the testing of all watermains for leakage and health compliance. The Contractor shall be responsible for the testing of the system. All necessary labour, materials and equipment shall be provided by the Contractor including a suitable pump and measuring tank, pressure hoses, connection plugs, caps, gauges, and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure leakage losses.

.2 The Improvement District Inspector shall be notified 24 hours in advance of any proposed testing.

.3 Operation of the existing Improvement District system during testing shall be by Improvement District personnel only. The Consultant shall provide 48 hours notice when requesting operation of the Improvement District system.

.4 Remove foreign material from pipe and related appurtenances by flushing with water. Main to be flushed at water velocities as high as can be obtained from available water sources. Minimum velocity to be 0.8 m/s and/or in accordance with AWWA C651. Continue flushing at least until

flow form the furthest most distant point has reached discharge point and until water discharged is clean and clear.

10.02 Testing Procedure

.1 Upon Completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, make section ready for testing. Carry out testing in accordance with 10.02.2 following.

.2 Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests.

.3 Submit pipeline to a test of 1.5 x working pressure applied at lowest elevation in each section, with a minimum of 1380 kPa (200psi) applied at lowest point of test section. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 liters per millimeter diameter of pipe per kilometer per 24-hour period. Minimum duration of test period to be 2 hours. Maximum test pressures should not exceed those specified in CSA B137.3 0 Table 9.

.4 Perform pressure and leakage testing of ductile iron piping to AWWA C600 and AWWA M41.

.5 Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23 and AWWA C605.

.6 Perform testing of welded steel piping to AWWA C206; no leakage allowed.

.7 Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirement is achieved.

11.0 Disinfection

11.01 General

.1 After Contract Administrator has certified that pipes and appurtenances have passed all specified tests, flush and disinfect pipes and appurtenances.

.2 Disinfect and flush in accordance with 11.02 following.

11.02 Disinfection and Flushing Procedures

.1 Retain water containing not less than 25mg/L free chlorine in water system for a period of at least 24 h, in accordance with AWWA C651, Continuous Feed Method. Submit outline of proposed disinfection procedure accompanied by marked up schematic drawing to CBWD Inspector or Engineer for approval 48h in advance of commencement of disinfection.

.2 Allow water from existing distribution system, isolated by reduced pressure principle backflow prevention device or other approved source of supply, to flow at constant measured rate into newly laid watermain. In absence of a meter, rate may be approximated by methods such as placing Pitot gauge in discharge, measuring time to fill container of known volume, or measuring trajectory of discharge and using formula presented in AWWA C 651.

.3 At a point not more than 3 m downstream from beginning of new main, ensure water entering new main receives dose of chlorine fed at constant rate such that water will have not less than 25 mg/L free chlorine. To assure that this concentration is provided, measure chlorine concentration at regular intervals as specified in AWWA C651.

.4 Amount of chlorine required to produce 25 mg/L concentration in 30 m of pipe of various sizes as given in the following table:

Pipe Size (mm)	**100 Percent Chlorine** (kg)	**1 Percent Chlorine Solution** (Litres)
100	0.006	0.61
150	0.014	1.36
200	0.024	2.46
250	0.039	3.86
300	0.054	5.45
400	0.098	9.85

.5 Allow flow of water containing chlorine to continue until entire main, all service connections, extremities and hydrants to be treated are filled with 25-mg/L chlorine solution. To ensure that this concentration has been attained throughout, measure free chlorine residual at a number of points and extremities along main. Retain chlorinated water in main for at least 24 h. During this time operate all valves, curb stops and hydrants in section treated in order to disinfect them thoroughly. At end of this 24 h

period, treated water to contain no less than 10 mg/L free chlorine throughout main. If chlorine content is less than 10 mg/L repeat chlorination procedure until specifications are met.

.6 After Chlorination is completed the mains shall be thoroughly flushed. Chlorinated disinfection water shall not be discharged to the sanitary sewer, drainage system or a natural watercourse. Where necessary the disinfection water shall be de-chlorinated in order to ensure the discharge meets Ministry of Environment and Federal Fisheries requirements.

.7 After final flushing, and before connecting, 2 consecutive sets of acceptable samples, taken at least 24 hours apart shall be collected from the new main. The District Supervisor or the Improvement District's personnel shall carry out bacteriological sampling and testing. The system shall not be put into operation until test results have been reviewed and the Engineer has granted approval.

.8 After the Engineer has approved the system, the system shall only be operated by the Improvement District.

SECTION 6

WATER UTILITY EXCAVATION, BACKFILL, RESTORATION AND CLEANUP

1.0 Scope

.1 This specification shall govern the excavation, backfilling and clean up within the Cowichan Bay Waterworks District Distribution System.

.2 All work shall be in accordance with WorkSafe BC safety regulations.

2.0 Excavation

.1 The excavation shall be to the required alignment, width, depth and grade as shown on the CBWD Standard Drawings or the approved design drawings.

.2 For work on existing roadways, excavated material shall not be stockpiled on the roadway.

.3 If the material at the bottom of the excavation is organic or other unsuitable material, it shall be over-excavated to firm ground and backfilled with suitable compacted material, unless otherwise specified by the Professional Engineer.

.4 Excavations shall be dewatered where necessary. Provide sedimentation and erosion control as required.

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

.6 Where an existing structure or underground installation may be affected by the works, appropriate mitigating measures shall be implemented.

3.0 Backfill

.1 All backfill shall be completed in accordance with Standard Drawing W10, or District requirements.

.2 Where a pipe or conduit is installed beneath an existing or foreseeable future pavement, sidewalk, driveway or gravel shoulder the trench shall be backfilled in accordance with the latest edition of edition of MoTI Standard Specifications for Highway Construction.

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

.4 Controlled density fill (CDF), where required, shall be used in lieu of compacted gravel backfill. CDF shall be manufactured and placed in accordance with CAN/CSA A23.1 & 2. CDF shall be excavatable in the future and have a maximum unconfined compressive strength of 0.5 MPa at 28 days and maximum cement content of 25 kg per m^3. Where CDF is used to fill annular voids, 28 day compressive strength shall be 1 MPa.

.5 A copy of concrete test results shall be provided to CBWD. As-Constructed drawing shall show location and extent of CDF.

4.0 Restoration

.1 Upon completion of the work, remove waste materials and debris, trim slopes and correct defects. Dispose of excess materials at an approved disposal site.

.2 Reinstate pavement, sidewalks and lawns to the elevation which existed before the excavation or as shown on the drawings.

.3 Where seeding is required, use a good quality grass seed at the rate of 50 grams of seed per square metre.

.4 Where replacement of topsoil is required, provide a minimum of 200 mm approved topsoil, mounded on top to allow for settlement and sown with a good quality grass seed. If the installation is under a developed lawn, the soil shall be rolled, fine raked during the appropriate season and sown with a good quality grass seed at a rate of 50 grams seed per square metre.

.5 If final paving cannot be completed immediately, gravel filled trenches shall be maintained to within 25 mm of the original surface prior to final paving, or cold mix asphalt applied if required by the municipality.

.6 Patching cuts in existing pavement.

.1 As a minimum, pavement restoration shall meet the local municipality requirements.

.2 Cuts shall be hot mix paved within 3 days of backfilling and to the same thickness as the adjacent pavement to a minimum of 50 mm, weather permitting.

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

.4 Where the excavation is on the shoulder or under the traveled portion of the street, the surface material shall be cut in neat straight lines at the

edges of the trench by means of an asphalt cutting wheel, milling machine or pneumatic pavement breaker. Where the edges of any area requiring repaving extend outside the straight lines cut, further cuts shall be made so that the final patch will have a neat appearance.

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

.7 For pavement cuts, which have settled, remove asphalt, excavate and re-compact the trench, then repave.

5.0 Compaction Testing

.1 The Engineer of Record shall arrange for periodic compaction testing of the backfill and asphaltic concrete. As a minimum, test the backfill and asphaltic concrete once every 100m of pipe installed. A copy of test reports shall be included with Daily Inspection Reports.

APPENDIX A

NEW WELL GUIDANCE CHECK LIST

COWICHAN BAY WATERWORKS DISTRICT
(CBWD)
NEW WELL GUIDANCE CHECK LIST

Pre- Drilling:

- The consultant must contact the VIHA Public Health Engineer (PHE) or Environmental Health Officer (EHO) to determine their requirements for Source Approval prior to drilling the well;
- A site visit with the EHO should be requested to discuss the location(s) of the proposed well(s).

Well Drilling;

- Confirm the chosen well location is satisfactory with the CBWD and VIHA;
- Minimum well casing (or pvc liner if required in bedrock wells) must be 200 mm (8") diameter;
- Minimum casing wall thickness must be 6.4 mm (0.250") for 200 & 250 mm (8" & 10") diameter production wells or 4.8 mm (0.188") for 150 mm (6") observation wells;
- Driller must ensure that well casing is properly sealed to bedrock to prevent cross-contamination of aquifers.
- Bedrock wells that require lining must use 200 mm (8"), Schedule 40 PVC, CSA (potable) Approved. Slotted sections must be machine cut by supplier to design criteria provided by the consultant;
- Drilling of the well must be done by, or under the direct supervision of, a British Columbia Ministry of Environment (BCMOE) Certified Well Driller;
- Well construction must adhere to the current MOE Ground Water Protection Regulations.

Well Test Pumping:

- Test pumping of the well must be done by, or under the direct supervision of, a BCMOE Certified Pump Installer;
- Test pumping duration must be at least 72 hours for a bedrock well with 24 hours of recovery monitoring or 90% recovery whichever comes first;
- The test pumping duration must be at least 48 hours for an overburden well with 24 hours of recovery monitoring or 90% recovery whichever comes first;
- As many existing or new observation wells as is practical (including existing CBWD wells), should be monitored during test pumping and recovery of a new production well. We recommend the use of correctly calibrated and installed data loggers;

Groundwater Sampling:

- Collect at least one set of water samples for the VIHA parameters as outlined in the current "*Guidelines for the Approval of Water Supply Systems – Shallow Wells, Deep Wells and Springs*";

- Bottles to be supplied and analysis to be undertaken by Maxxam Analytics or another certified water quality laboratory approved by CBWD;
- Iron Related Bacteria (IRB) to be assessed using the BART method or another method approved by CBWD.

GWUDI Well Investigation

- The well location and construction must be examined to see if the Province of British Columbia DRAFT 5: *Guidance Document for Determining Ground Water At Risk of Containing Pathogens and Ground Water Under the Direct Influence of Surface Water*, Stage 1 Screening Tool applies.

Hydrogeologic Assessment – Determine and Present:

- Hydraulic characteristics of the well and aquifer;
- Inferred bedrock lineament mapping for bedrock well location;
- Inferred aquifer boundaries (if any) for an overburden or bedrock aquifer;
- Well Protection Plan including capture zone mapping for each well, use of the MOE Well Protection Tool Kit is recommended where applicable;
- Wellhead Protection Plan (15m radius around well)
- Well interference conditions on other wells and interference from other wells on the subject well.

> Note: New wells must avoid adverse impact on the established yield of existing CBWD wells. If interference is present, the new well yield must be adjusted to maintain the established yield of the impacted CBWD well(s).

- If IRB is determined to exist in the new well this issue must be addressed.

The reader is referred to CBWD Procedures "A, A-1, B, C, D (Figures D-1 & D-2)" for further detailed information.

APPENDIX B

GENERAL USE PROCEDURES A, A-1, B, C and D

COWICHAN BAY WATERWORKS DISTRICT

PROCEDURE "A"

[For General Acceptance of an existing well for community use]

IRON BACTERIA REMOVAL REHABILITATION PROCEDURE

1.0 Retain a *B.C. Qualified Well Driller, listed under the GWPR*[1] with extensive well rehabilitation experience to undertake the following procedure;

2.0 Confirm through measurement the depth of the well;

3.0 Mechanically scour the entire well using a suitable brushing technique to loosen and remove (air lift) iron bacteria growth until the water is relatively clear;

4.0 Install a suitable tremmie pipe to the bottom of each well;

5.0 At the surface prepare one or more well volumes of fresh water treated with a disinfectant solution (250 mg/l chlorine concentration of Sodium Hypochlorite (or equivalent) in accordance with the CGWA *Fact Sheet #4., Sect.4.0.*)[2] Specific requirements to be determined later;

6.0 Introduce the disinfectant solution through the tremmie pipe displacing the untreated well water out of the surface of the casing. Once the disinfectant has been placed into the well and the well water displaced (as shown by a significant concentration of disinfected water returning to the surface), using the drilling tools, enhance mixing and distribution of the treated water by mechanical means (surging, jetting etc.).

7.0 Allow the disinfectant solution to sit in each well for not less than 24 hrs;

8.0 Install a steam cleaned pump and riser pipe in the targeted well accordingly. The pump intake should be set as close as possible to the primary fracture(s) identified from the well log;

9.0 Flush the wells by pumping at the consultant's designated test rate until field testing indicates the water is continuous at <1 mg/l chlorine. During this process, the chlorinated water must be handled in an appropriate manner, to not endanger fish or other sensitive habitat. Permits or permission may be required from various government authorities;

10.0 Once the residual chlorine is removed (<1 mg/L) let the well sit for not less than 24 hours, then (flush) pump the well for 2 hours to take a sample of the water and test[3] the quality for the following parameters; pH, turbidity, iron bacteria, heterotrophic plate count, iron and manganese (total and dissolved metals), total coliform and E.coli;

11.0 Leave the pump in the well for two weeks. During this period purge/pump for 24 hours at the end of the first and second weeks to re-sample the water and analyze as noted above in 10;

12.0 Have the water quality results reviewed by the CBWD, their consultants and other stakeholders;

13.0 Meet to discuss findings and proceed as results indicate.

[1] BC Ministry of Environment *Ground Water Protection Regulation*;

[2] Canadian Ground Water Association; *Guidelines for Sanitizing a Water Well*;

[3] Recommended laboratory is CanTest Ltd, Victoria, B.C., using the *BART* method for IRB determination.

COWICHAN BAY WATERWORKS DISTRICT

PROCEDURE "A-1"

WATER QUALITY (IRON BACTERIA) MONITORING PROGRAM FOR AN OPERATIONAL WELL

Treatment Procedure

1. Pump the well continually for 24 hours, for 2 to 3 days, then shut the pump off.
2. Insert through a tremie pipe a specified volume of a 12% chlorine solution, as the non-pumping well water level rises. Flush this concentration by adding a specified volume of raw water. This should provide an approximate level of 5 mg/L of free chlorine in the well.
3. Let the well sit idle (no pumping) for a period of 24 hours contact time.
4. After 24 hours turn the pump on and allow the well to operate on-line as it normally would.

Frequency and Check Sampling/Lab Testing

1.0 The above described procedure should be done on a bi-weekly basis for two months.

2.0 Sample the water just before the next scheduled treatment for specified parameters* to be tested by CanTest Labs.

3.0 Review water quality results at two month intervals up to 6 months.

4.0 At the 6 month time line decide to proceed with the program, cease the program or address other options such as well rehabilitation or abandonment.

* pH, Iron Related Bacteria, Heterotropic Plate Count

COWICHAN BAY WATERWORKS DISTRICT

PROCEDURE "B"

GENERAL ACCEPTANCE OF A FUTURE (UNDRILLED) COMMUNITY WELL

[WATER QUALITY PROCEDURE]

1. The well should be drilled at a time that minimizes the period between well completion and use by the CBWD;
2. The well must be drilled and constructed by registered *B.C. Qualified Well Driller* with local well drilling and construction experience;
3. Permanent pump installation must be done by a *B.C. Qualified Pump Installer*.
4. All drilling equipment and materials (drilling bit, drill rods etc.) that are to be used initially in drilling the hole must be steam cleaned to reduce the risk of contaminants entering the well;
5. During the drilling procedure the water injected into the well must be chlorinated;
6. All the above mentioned material and equipment must be handled on-site in a manner that minimizes the risk of introducing bacteria into the well water;
7. Upon completion of the well drilling/construction, the well must be disinfected by the driller;
8. Subsequently the well must be test pumped using a pump and drop pipe that has been steam cleaned before it is placed in the well;
9. During the final stages of the test pumping water samples must be collected for the "Minimum Untreated Water Source Quality Parameters", listed in the Shallow Wells, Deep Wells and Springs section of the current Vancouver Island Health Authority (VIHA) "Guidelines for the Approval of Waterworks";
10. Upon completion of the test pumping operation, the well must be disinfected by the contractor;
11. If the water quality results indicate parameters are out of compliance with the current Guidelines for Canadian Drinking Water Quality, these parameters must be addressed;
12. If bacterial parameters such as coliform and iron, (IRB) etc. are present, the well water must be disinfected and/or rehabilitated (in accordance with Procedure "A" or approved alternate method), followed by re-sampling and laboratory analysis;
13. The well water quality or treatment requirements must be acceptable to the CBWD before the well can be taken over by the CBWD.

COWICHAN BAY WATERWORKS DISTRICT

PROCEDURE "C"

GENERAL ACCEPTANCE FOR A FUTURE (EXISTING DRILLED) COMMUNITY WELL

[WATER QUALITY PROCEDURE]

1. The well should be assessed at a time that minimizes the period between well completion and use by the CBWD. This will vary depending upon the circumstances (contractor availability, Vancouver Island Health Authority (VIHA) approval process etc.);
2. All wells drilled after November 1, 2005, must have been drilled and constructed by a registered *B.C. Qualified Well Driller,* preferably with local well drilling and construction experience;
3. The well must have been initially approved for water quantity and quality in accordance with the Vancouver Island Health Authority (VIHA) "Guidelines for the Approval of Waterworks";
4. A well that has remained dormant (unused) for more than six months, must be purged for at least two (2) hours, then the water sampled and tested for total coliform (E-Coli), iron bacteria (IRB), iron & manganese (total & dissolved) and any other parameters flagged as being out of compliance from the VIHA parameter results;
5. If the above test results indicate the presence of any bacteria, the well should be shock chlorinated in accordance with Canadian Ground Water Association; *Fact Sheet #4., Sect.5.0;*
6. Following shock chlorination the well water should be tested in accordance with the VIHA recommended parameters for community water supplies;
7. If water quality results differ significantly from the original VIHA test results, (beyond the Maximum Acceptable Concentration (MAC) or Aesthetic Objective (AO) of the current Guidelines for Canadian Drinking Water Quality), these results must be addressed and acted upon as required by the approving authorities (disinfection, treatment etc.);
8. If the water quality results indicated the presence of IRB or a sulphate reducing bacteria is now present, the well must be remediated in accordance to CBWD Guideline "A" (Well Remediation) as provided by CBWD.

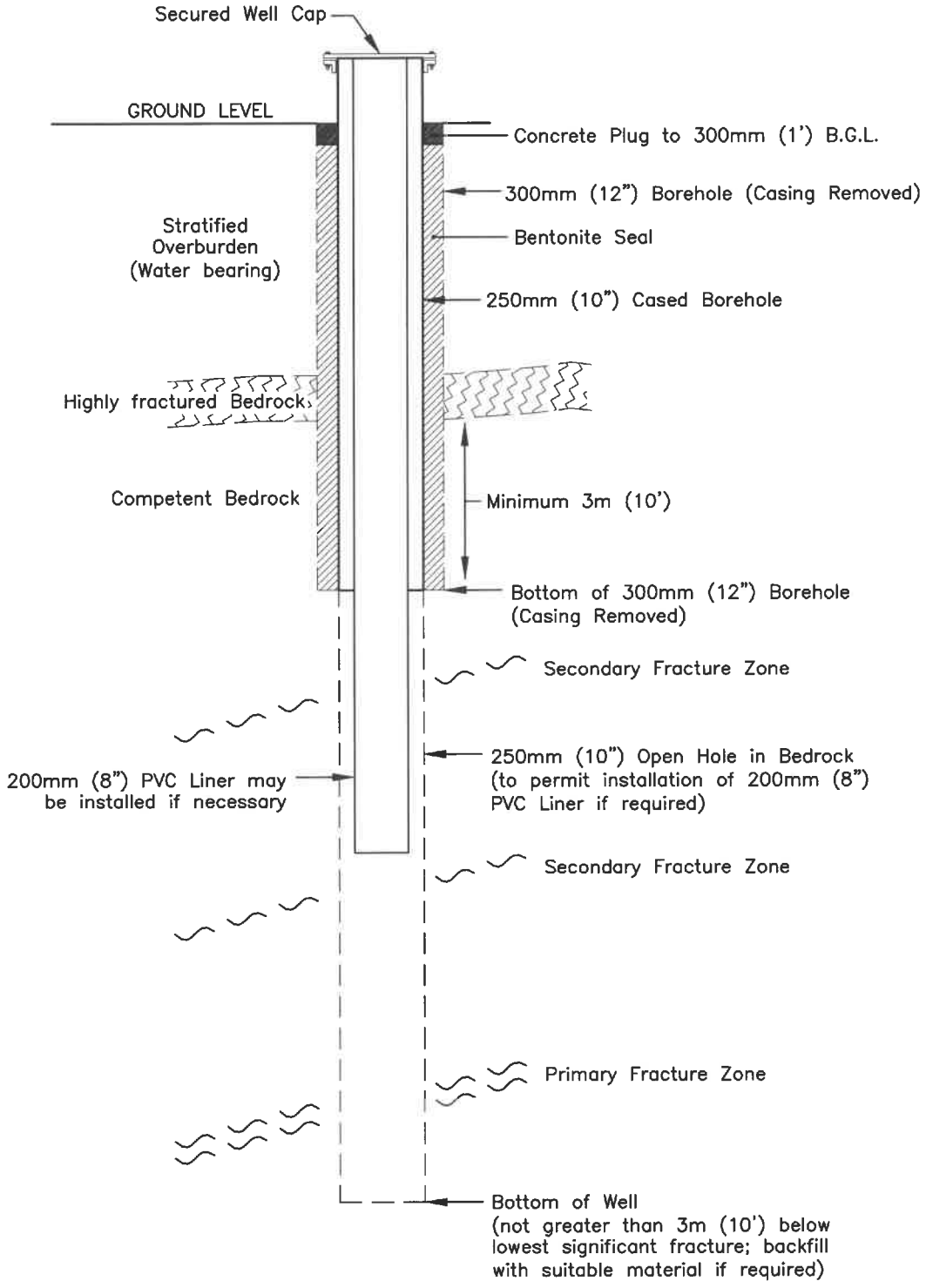
COWICHAN BAY WATERWORKS DISTRICT
PROCEDURE "D"

REQUIRED WATER WELL CONSTRUCTION DETAIL OPTIONS FOR A FUTURE BEDROCK WELL TO BE DRILLED IN AREAS OF KNOWN BACTERIAL CONTAMINATION RISK FROM THE SOURCE OR CONNECTED AQUIFER(S)

The objective is to create a water tight seal between the overburden, bedrock wall and the well casing, and allow for the installation of an 8" PVC well liner (if required). This Procedure should be read in conjunction with attached Figures D-1 & D-2.

1. In all future well exploration programs in risk areas, an 8"x6" **pilot hole** should be drilled to a required depth to explore for suitable bedrock fractures.
2. Upon completion, the drilled test hole should be inspected using a down-hole camera to determine the bedrock conditions at the bottom of the casing and confirm primary and secondary fractures. Results of the inspection will provide the consultant with information for the design of a production well if sufficient fractures have been encountered. [Consideration should be given to test pumping the well to determine specific capacity and other hydraulic and water quality information.] The pilot hole would become a permanent monitoring well.
3. If the test drilling and pumping results justify the installation of a production well at the test well location (less then 10 m away), the well drilling program should proceed using either well design recommendations* shown in Figures D-1 or D-2, appended to this procedure sheet.
4. All drilling equipment (drilling bit, drill rods etc.) that are to be used in drilling the hole must be steam cleaned and are not to be placed in contact with the ground. Drilling procedures must be undertaken to reduce the risk of contaminants entering the well.

Note: All borehole geological conditions are unique and thus the design and construction of the well is also. Should drilling conditions be encountered that do not lend themselves to the conceptual designs shown in Figures D-1 and D-2, the consultant can recommend changes to be considered by the CBWD.



TYPICAL COMPLETED WELL SECTION FOR PVC LINED BEDROCK WELLS WHERE DEPTH TO BEDROCK IS LESS THAN 15 metres (50 ft.)

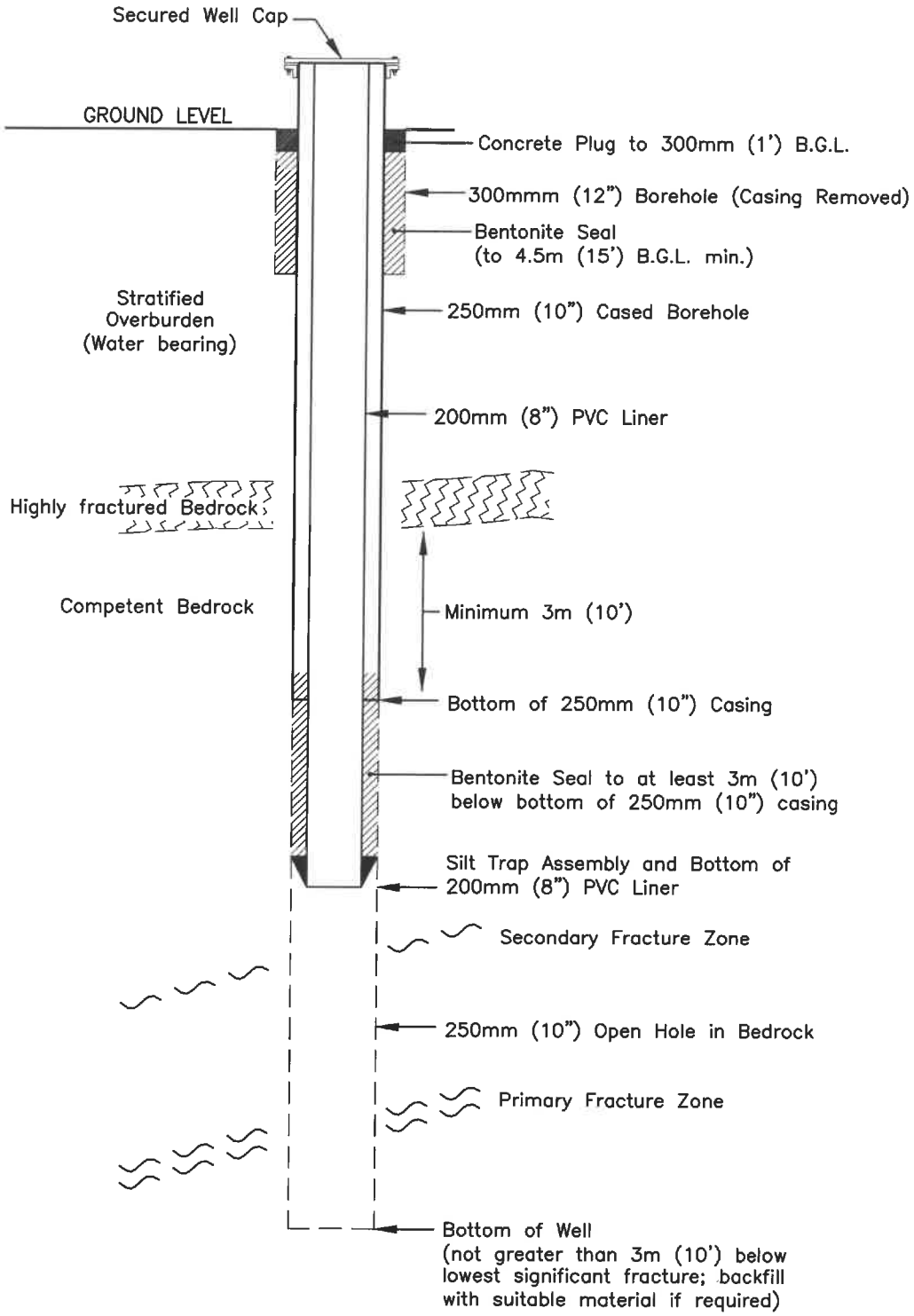
NOT TO SCALE

COWICHAN BAY WATERWORKS DISTRICT

FUTURE WELL REQUIREMENTS

FIGURE D-1

THURBER



TYPICAL COMPLETED WELL SECTION FOR PVC LINED BEDROCK WELLS WHERE DEPTH TO BEDROCK IS GREATER THAN 15 metres (50 ft.)

NOT TO SCALE

COWICHAN BAY WATERWORKS DISTRICT

FUTURE WELL REQUIREMENTS

FIGURE D-2

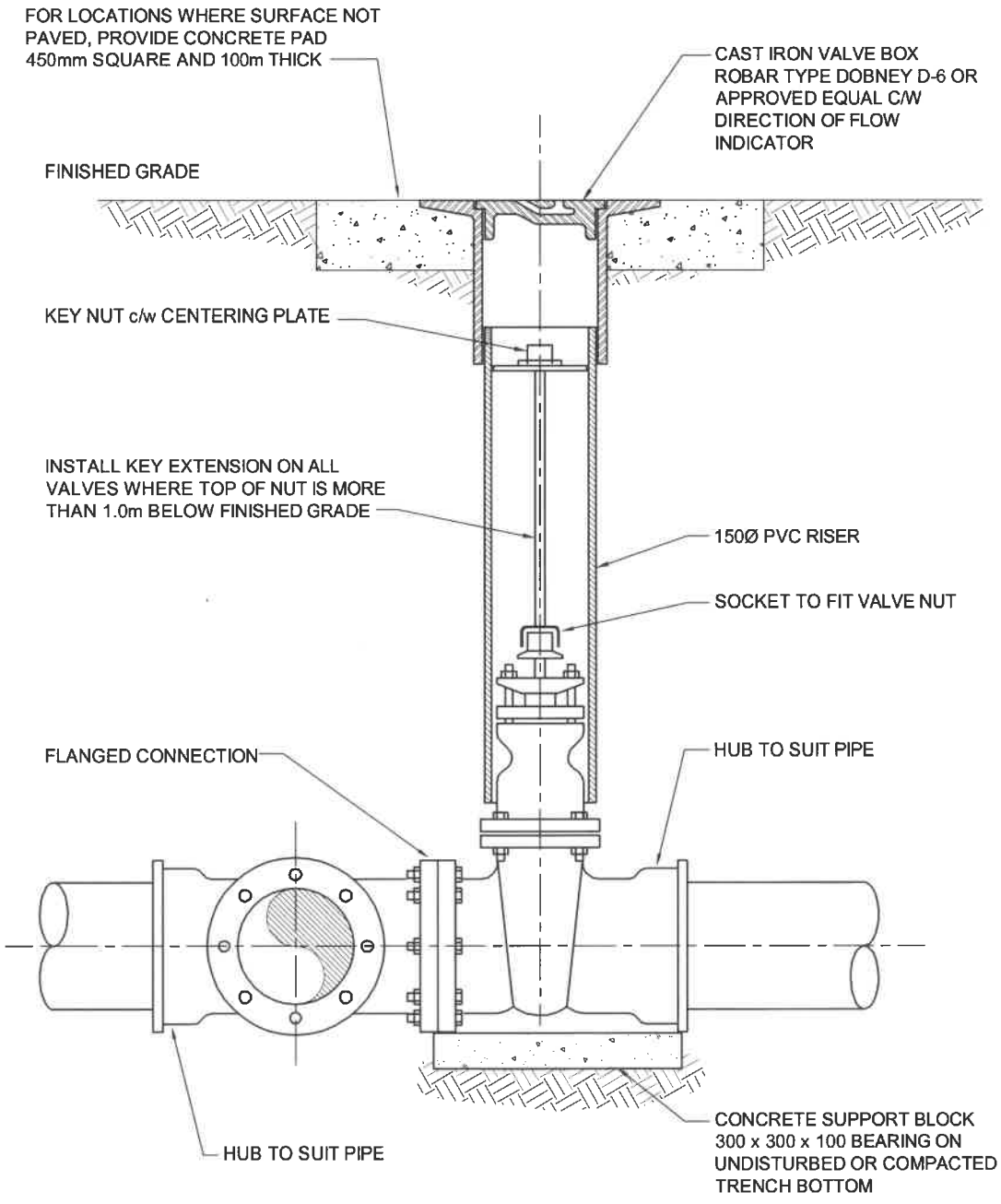
THURBER

APPENDIX C

STANDARD DRAWINGS

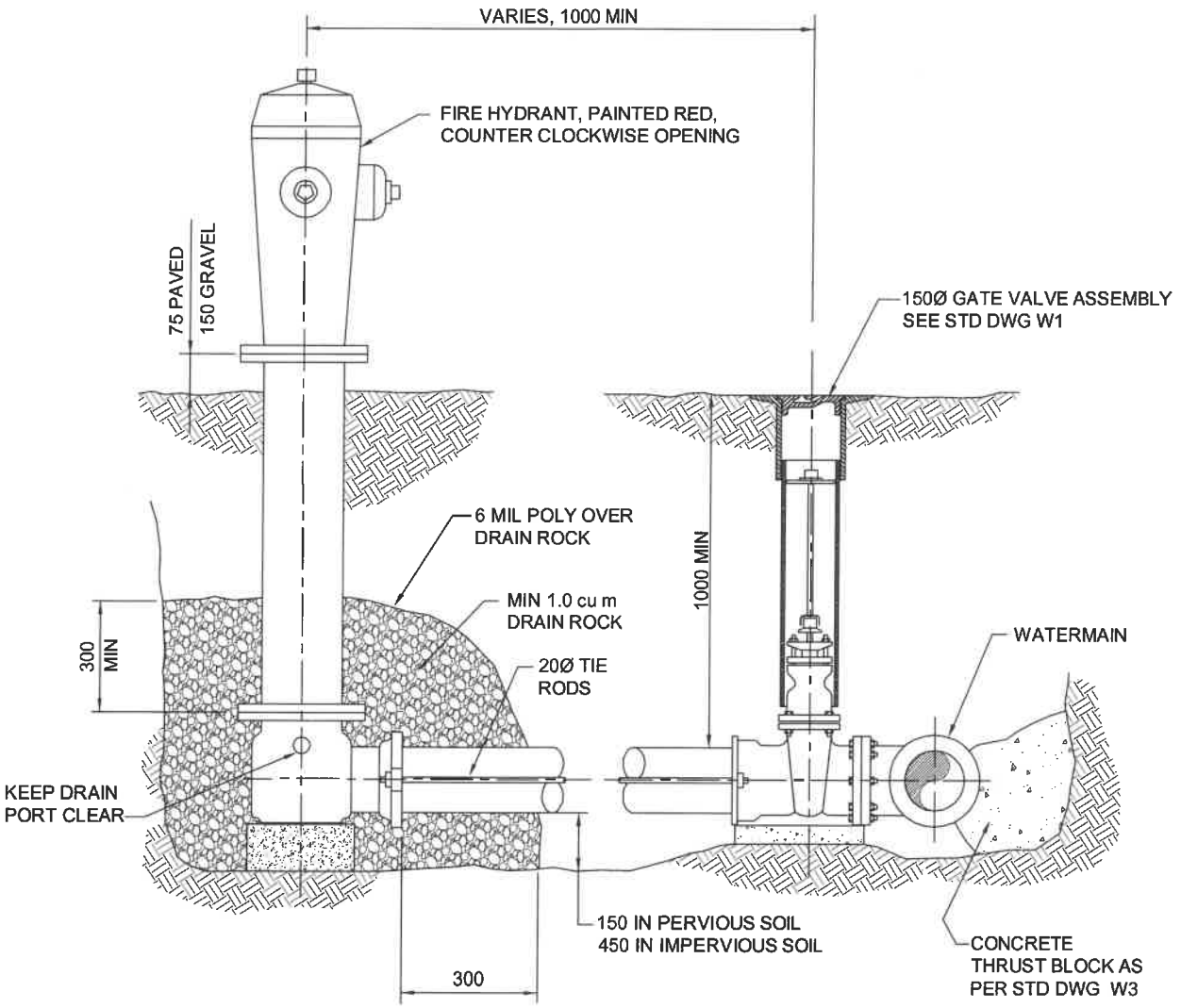
STANDARD DRAWINGS

Standard Drawing No.	Description
W1	Gate Valve
W2	Fire Hydrant Assembly
W3	Thrust Block Details
W4	Thrust Block Details
W5	Mechanical Thrust Restraint Applications
W6	Thrust Restraint Length
W7	Air Valve – Typical Installation 100 to 300mm Pipe
W8A	End of Line Flush Valve
W8B	Temporary End of Line Flush Valve – Below Ground
W9	Permanent End of Line Flush Assembly Below Ground
W10	Trench Details
W11	19ø Metered Water Service
W12	50ø Metered Water Service
W13	Municipal Service Locations
W14	Fire/Domestic Water Meter Layout (150ø – 250ø)
W15	Separate Fire & Domestic Piping Layout
W16	Rectangular Precast Water Meter/Device Chamber
W17	19mm Reduced Pressure Backflow Prevention Assembly Above Ground
W18	150mm PRV Station Details
W19	Water Meter Detail Mechanical Room
W20	Trench Dams for Slopes to 30%
W21	Trench Dams for Slopes Greater than 30%



SCALE: NTS	GATE VALVE	DRAWING No. W1
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT

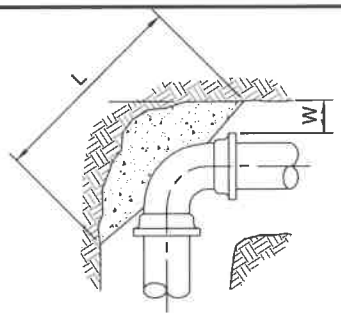


NOTES:

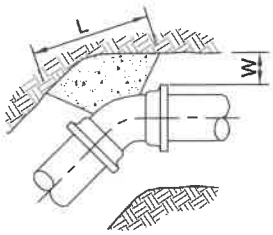
1. DRAIN ROCK TO BE 20 TO 50 CLEAN CRUSHED ROCK, MINIMUM VOLUME 1.0 cu m
2. TIE RODS TO BE 20Ø STAINLESS STEEL WITH STAINLESS STEEL NUTS.
3. SHEET POLYETHYLENE (6 MIL) INTERFACE REQUIRED BETWEEN CONCRETE & FITTINGS
4. CONCRETE THRUST BLOCK AS SPECIFIED FOR A 150Ø CAP FITTING TO BE INSTALLED AT BASE OF HYDRANT WHEN DISTANCE BETWEEN HYDRANT AND VALVE EXCEEDS 2.4m

SCALE: NTS	FIRE HYDRANT ASSEMBLY	DRAWING No. W2
DATE LAST REVISION: NOV 2015		

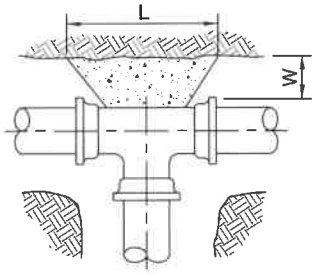
COWICHAN BAY WATERWORKS DISTRICT



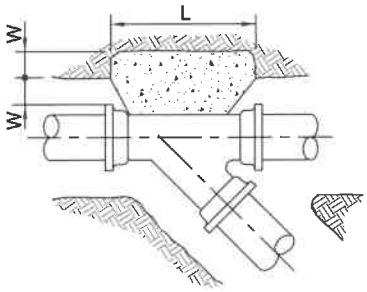
90° BEND



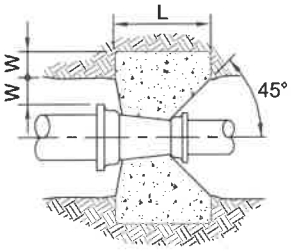
45° BEND



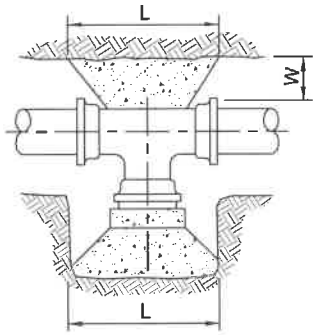
TEE



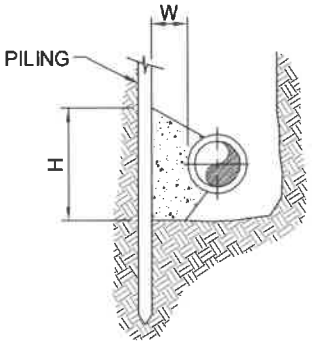
WYE



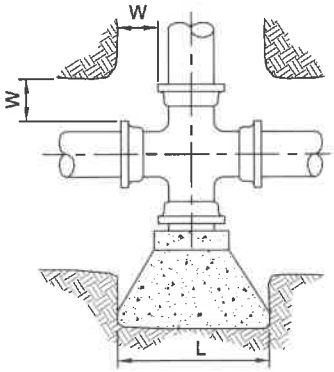
REDUCER



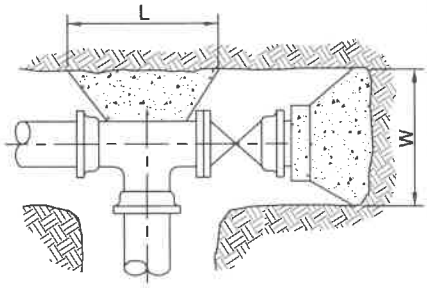
TEE WITH PLUG



THRUST PILING



CROSS WITH PLUG



TEE WITH VALVE

NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. PILING TO BE CREOSOTED PLANKS, DRIVEN PRIOR TO EXCAVATION
3. PILING TO BE USED ONLY BELOW THE PERMANENT WATER TABLE WHERE GROUND CANNOT BE EXCAVATED TO FREE STANDING UNDISTURBED SOIL

SEE STANDARD DRAWING W4 FOR TABLE OF THRUST AND SOIL LOAD BEARING SPECIFICATIONS

SCALE: NTS	THRUST BLOCK DETAILS	DRAWING No. W3
DATE LAST REVISION: MAR 2011		

COWICHAN BAY WATERWORKS DISTRICT

MINIMUM THRUST AREAS

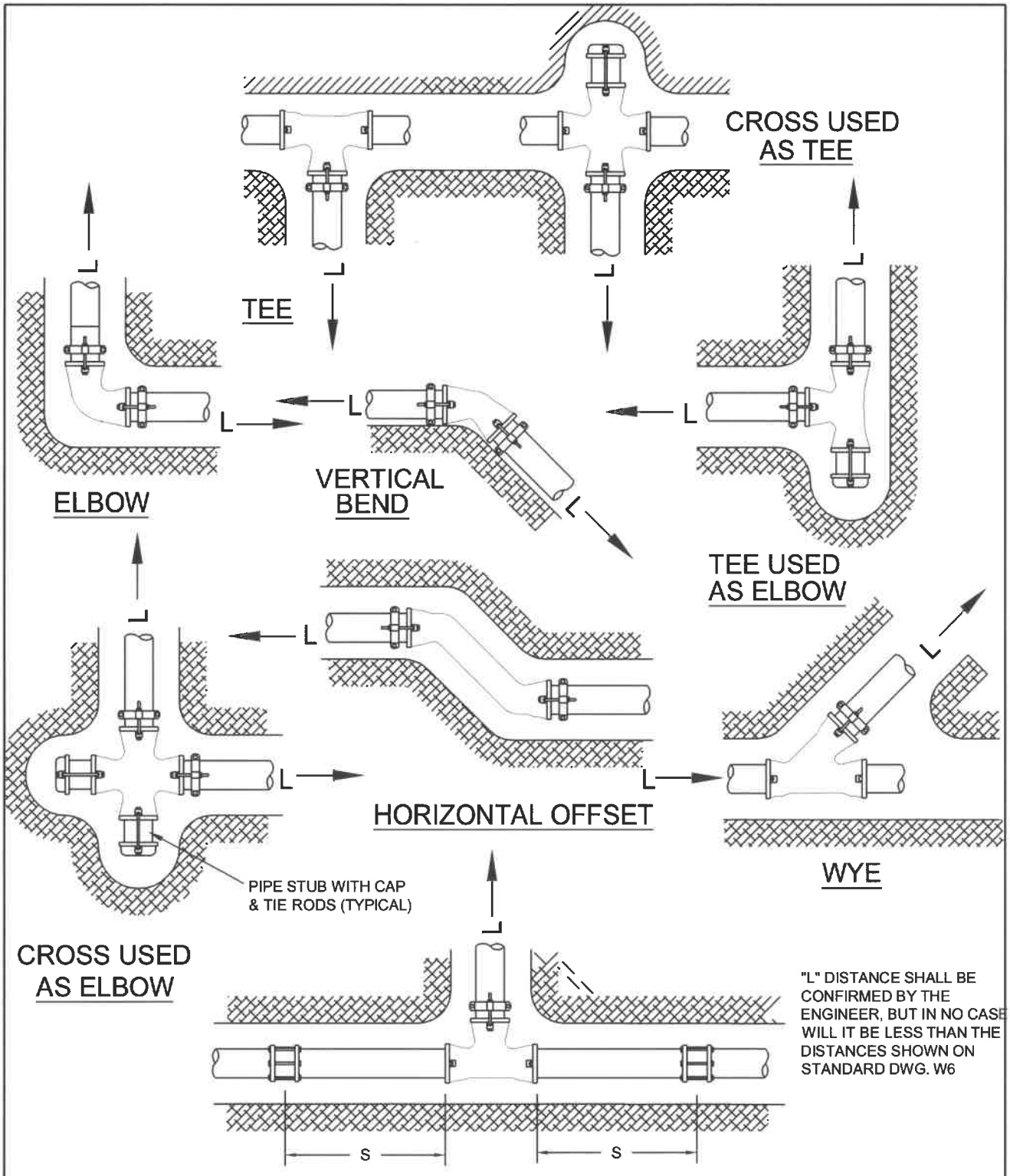
TYPE OF FITTING	FITTING SIZE	OUTSIDE FITTING BEARING FACE	RECESS TRENCH WALL	LENGTH	HEIGHT
	D	W	W	L	H
90° BEND	150	300		920	460
	200	350		1070	610
	250	380		1450	760
	300	400		1650	920
45° BEND	150	300		400	460
	200	350		610	610
	250	380		760	760
	300	400		920	920
22 1/2° BEND	150	300		460	230
	200	350		610	300
	250	380		840	460
	300	400		920	460
TEE	150	300		610	460
	200	350		760	610
	250	380		990	760
	300	400		1220	920
CROSS	150	300		610	460
	200	350		760	610
	250	380		990	760
	300	400		1220	920
45° WYE	150	300	300	460	460
	200	350	400	610	610
	250	380	500	760	760
	300	400	600	920	920
REDUCER	150	300	350	460	460
	200	350	200	610	610
	250	380	250	760	760
	300	400	300	920	920
CAPS & PLUGS (IF NOT BELTED)	150	300		460	460
	200	350		610	610
	250	380		760	760
	300	400		920	920

NOTES:

1. AREAS APPLY TO FITTINGS AT 1030 KPa PRESSURE AND SOILS WITH MINIMUM BEARING CAPACITY OF 96 KPa (NOT TO BE USED FOR SOFT CLAY, MUCK, PEAT etc)
2. DIMENSIONS APPLY TO THE LARGER END OF REDUCING FITTINGS
3. ALL DIMENSIONS ARE IN MILLIMETRES

SCALE: NTS	THRUST BLOCK DETAILS	DRAWING No. W4
DATE LAST REVISION: MAR 2011		

COWICHAN BAY WATERWORKS DISTRICT



"L" DISTANCE SHALL BE CONFIRMED BY THE ENGINEER, BUT IN NO CASE WILL IT BE LESS THAN THE DISTANCES SHOWN ON STANDARD DWG. W6

DROP IN TEE

SEE STANDARD DWG W6 FOR "S" DISTANCE

SCALE: NTS			DRAWING No.
DATE LAST REVISION: SEPT 2014		MECHANICAL THRUST RESTRAINT APPLICATIONS	W5

COWICHAN BAY WATERWORKS DISTRICT

RECOMMENDED RESTRAINED LENGTHS OF PIPE

PIPE: _____ PVC, AWWA C900, DR 18
DEPTH OF BURY: _____ ONE METRE
MAXIMUM PRESSURE: _____ 1035kPa (150 psi, includes surge allowance)
SAFETY FACTOR: _____ 2:1

L = LENGTH OF RESTRAINED PIPE (in metres)

NOMINAL PIPE SIZE (mm)	SILT/SAND					WET CLAY					HARD PAN				
	ELBOWS				VALVE TEE END	ELBOWS				VALVE TEE END	ELBOWS				VALVE TEE END
	11°	22°	45°	90°		11°	22°	45°	90°		11°	22°	45°	90°	
100	0.3	0.3	1.8	4.3	12.8	0.3	0.9	1.8	4.6	12.5	0.3	0.6	1.5	3.4	10.4
150	0.6	1.2	2.4	5.8	17.7	0.6	1.2	2.7	6.4	18.9	0.6	0.9	1.8	4.6	14.6
200	0.6	1.5	3.0	7.6	23.5	0.9	1.8	3.7	8.5	24.7	0.6	1.2	2.4	6.1	19.2
250	0.9	1.8	3.7	9.1	28.0	0.9	2.1	4.3	10.4	29.6	0.9	1.5	3.1	7.0	22.9
300	0.9	2.1	4.3	10.7	32.9	1.2	2.4	4.9	12.2	34.7	0.9	1.5	3.7	8.2	26.8

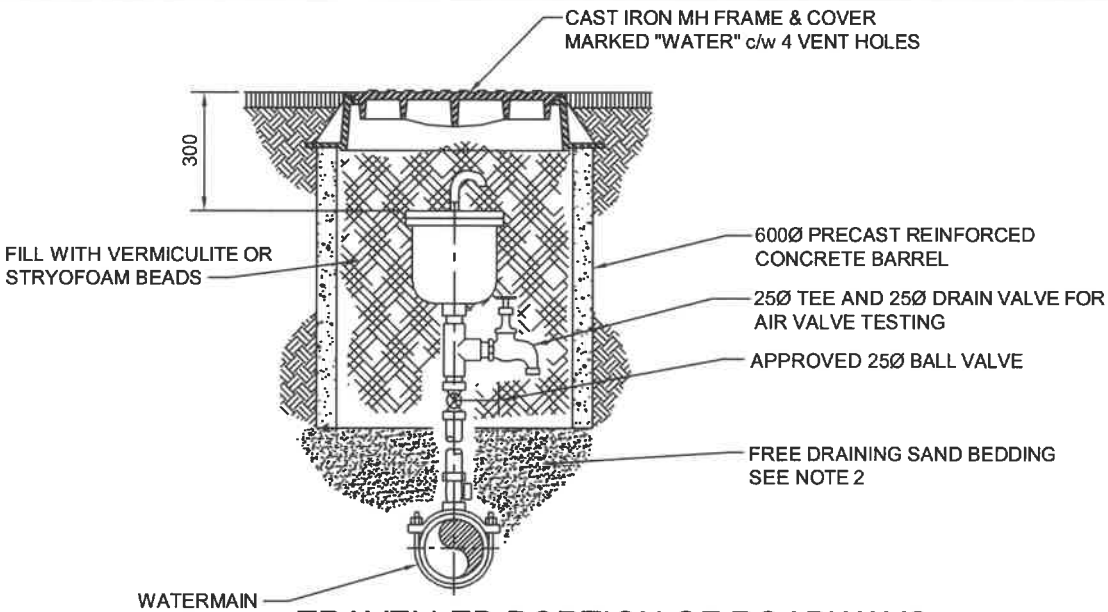
L = RESTRAINED LENGTH FOR BRANCH OUTLET OF DROP IN TEES (in metres)

SOIL (SILT/SAND)	S = LENGTH OF PIPE ON EACH SIDE OF TEE (in metres)			
NOMINAL TEE SIZE	S = 6.1	S = 3.0	S=1.5	S=0.3
100x100	FIRST JOINT	FIRST JOINT	0.3	6.4
150x150	FIRST JOINT	FIRST JOINT	3.4	9.8
200x200	FIRST JOINT	FIRST JOINT	7.0	13.4
250x250	FIRST JOINT	1.5	9.8	16.2
300x300	FIRST JOINT	4.6	12.8	19.5

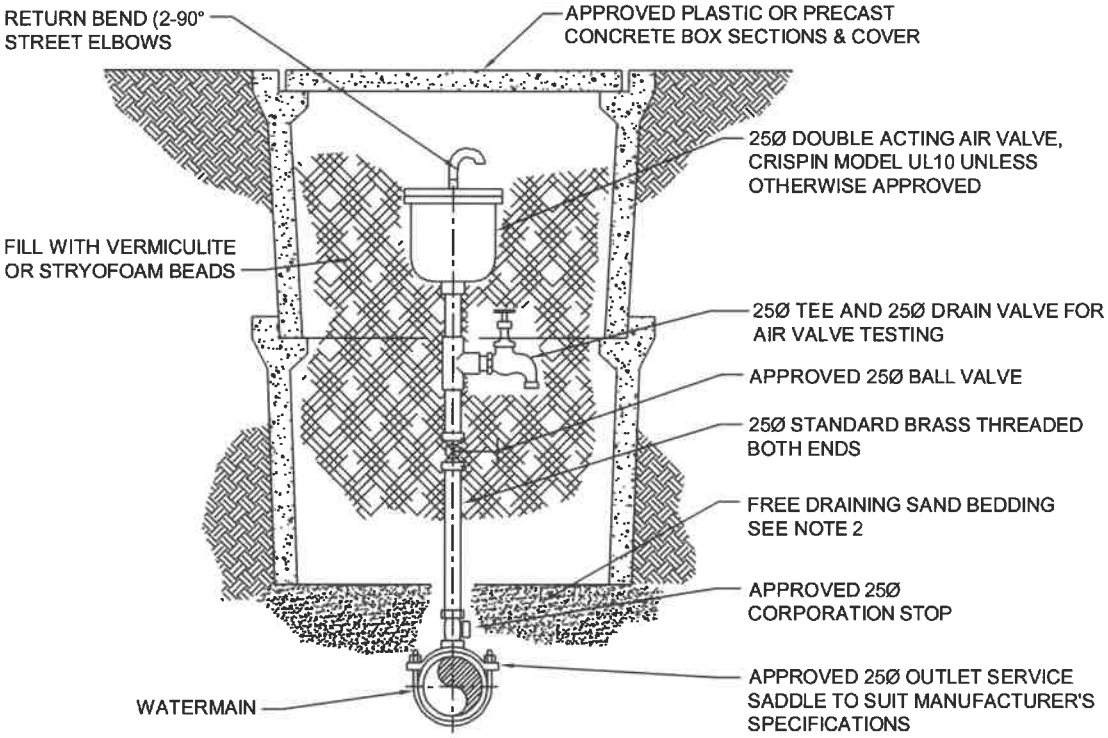
1. THIS STANDARD TO BE USED IN CONJUNCTION WITH STANDARD DRAWING W5
2. WHEN DEPTH OF SOIL COVER IS LESS THAN 0.6M VALUES FOR "L" MUST BE INCREASED BY 30%.
3. WHEN DEPTH OF SOIL COVER IS LESS THAN HALF PIPE O.D. VALUES FOR "L" MUST BE INCREASED BY 100%.
4. WHEN PIPE IS PARTIALLY OR FULLY EXPOSED, ALL JOINTS MUST BE RESTRAINED.
5. WHEN IN DOUBT AS TO SOIL TYPE, DEPTH OR CONFIGURATION USE NEXT LONGEST VALUE OF L.

SCALE: NTS	THRUST RESTRAINT LENGTH	DRAWING No. W6
DATE LAST REVISION: SEPT 2014		

COWICHAN BAY WATERWORKS DISTRICT



TRAVELLED PORTION OF ROADWAYS



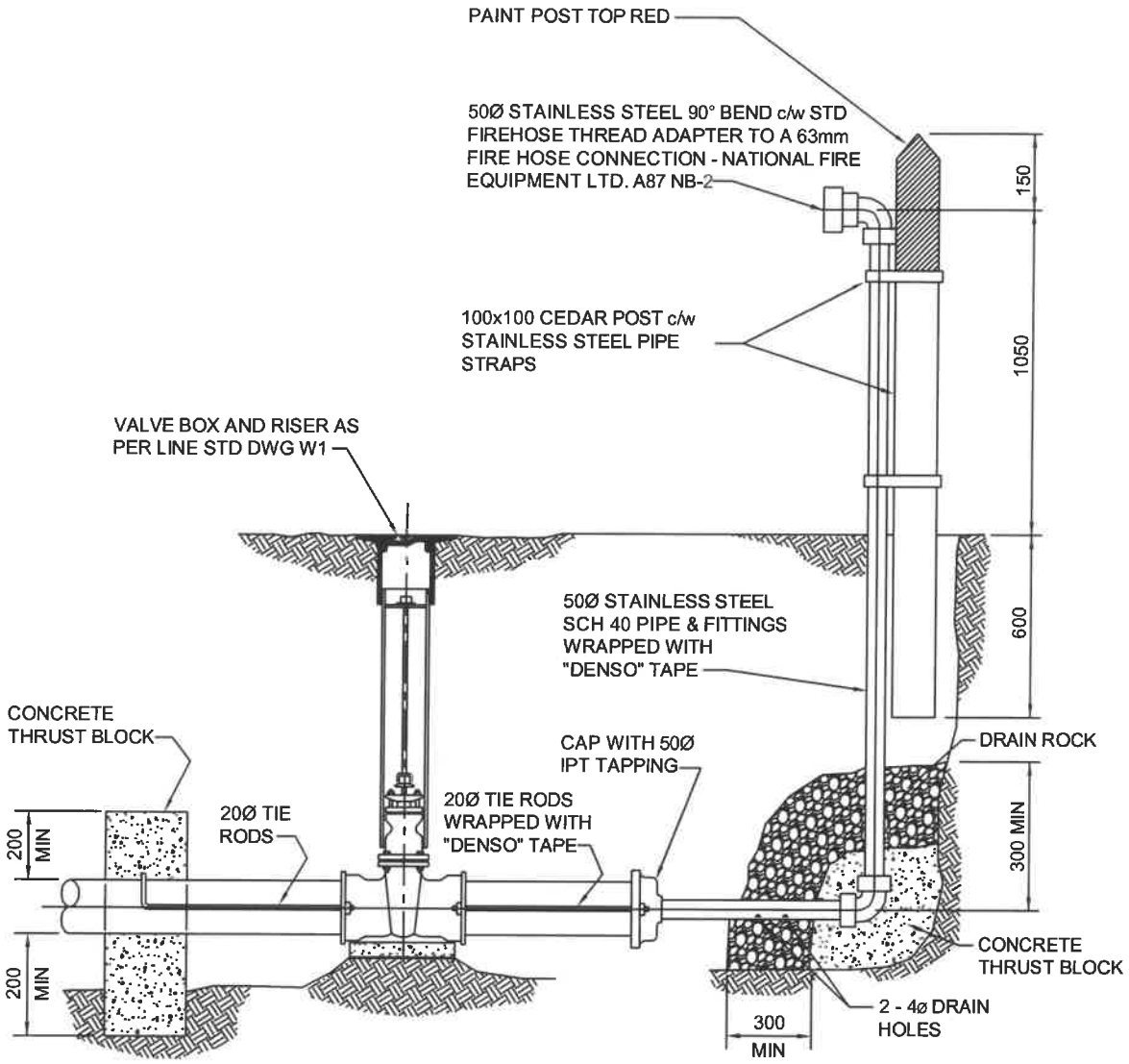
UNTRAVELLED PORTION OF ROADWAYS

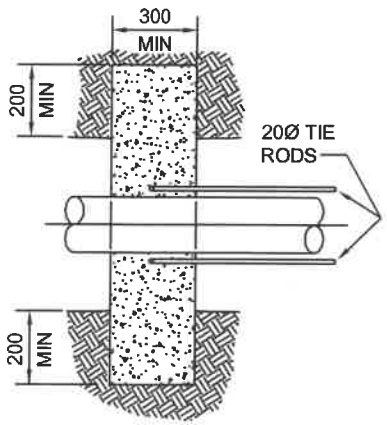
NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. DRAIN TO STORM SYSTEM AS REQUIRED

SCALE: NTS	AIR VALVE	DRAWING No.
DATE LAST REVISION: NOV 2015	TYPICAL INSTALLATION 100mm - 300mm PIPE	W7

COWICHAN BAY WATERWORKS DISTRICT



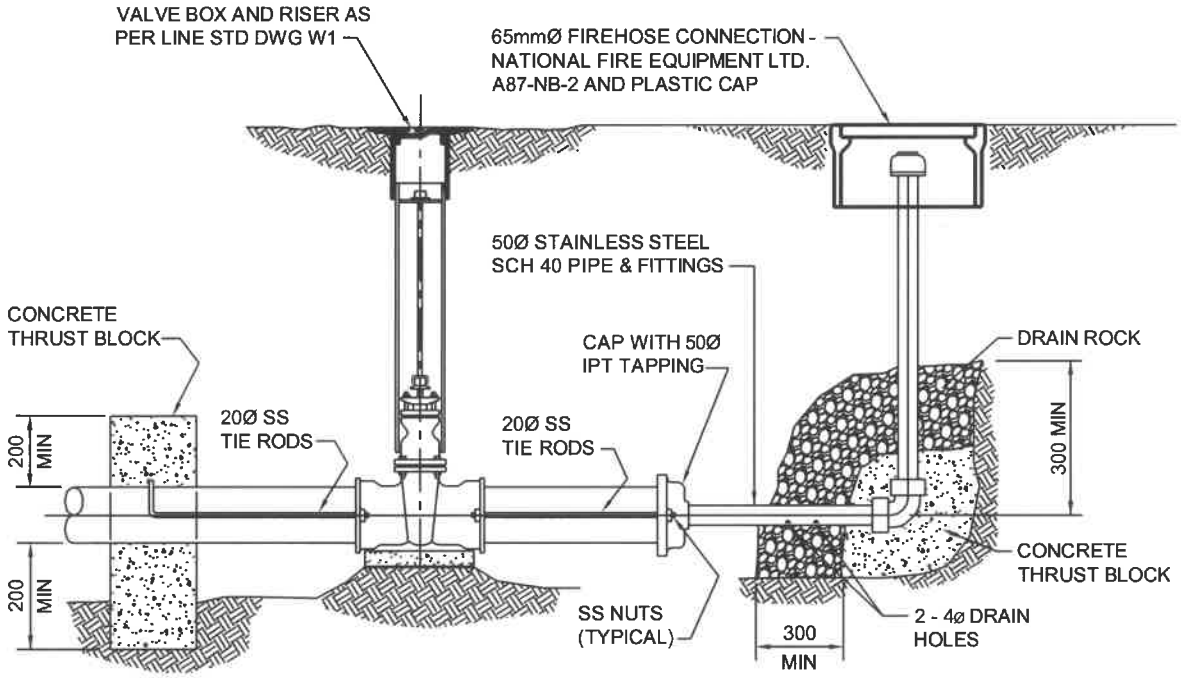


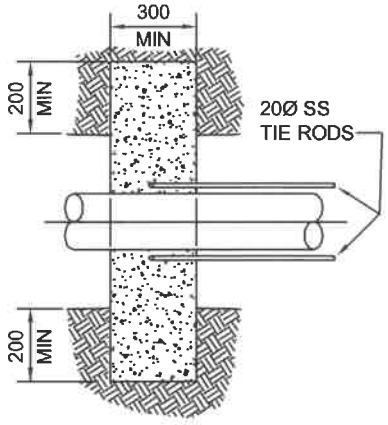
NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. CONCRETE THRUST BLOCKS TO BE MIN 20 MPa AT 28 DAYS
3. PERMANENT END OF LINE FLUSH VALVES TO HAVE 50Ø VALVE AFTER REDUCER IN PLACE OF MAIN LINE VALVE.
4. VALVE TO BE INSTALLED AS PER STD DWG W1

SCALE: NTS	END OF LINE FLUSH VALVE	DRAWING No. W8A
DATE LAST REVISION: SEPT 2014		

COWICHAN BAY WATERWORKS DISTRICT



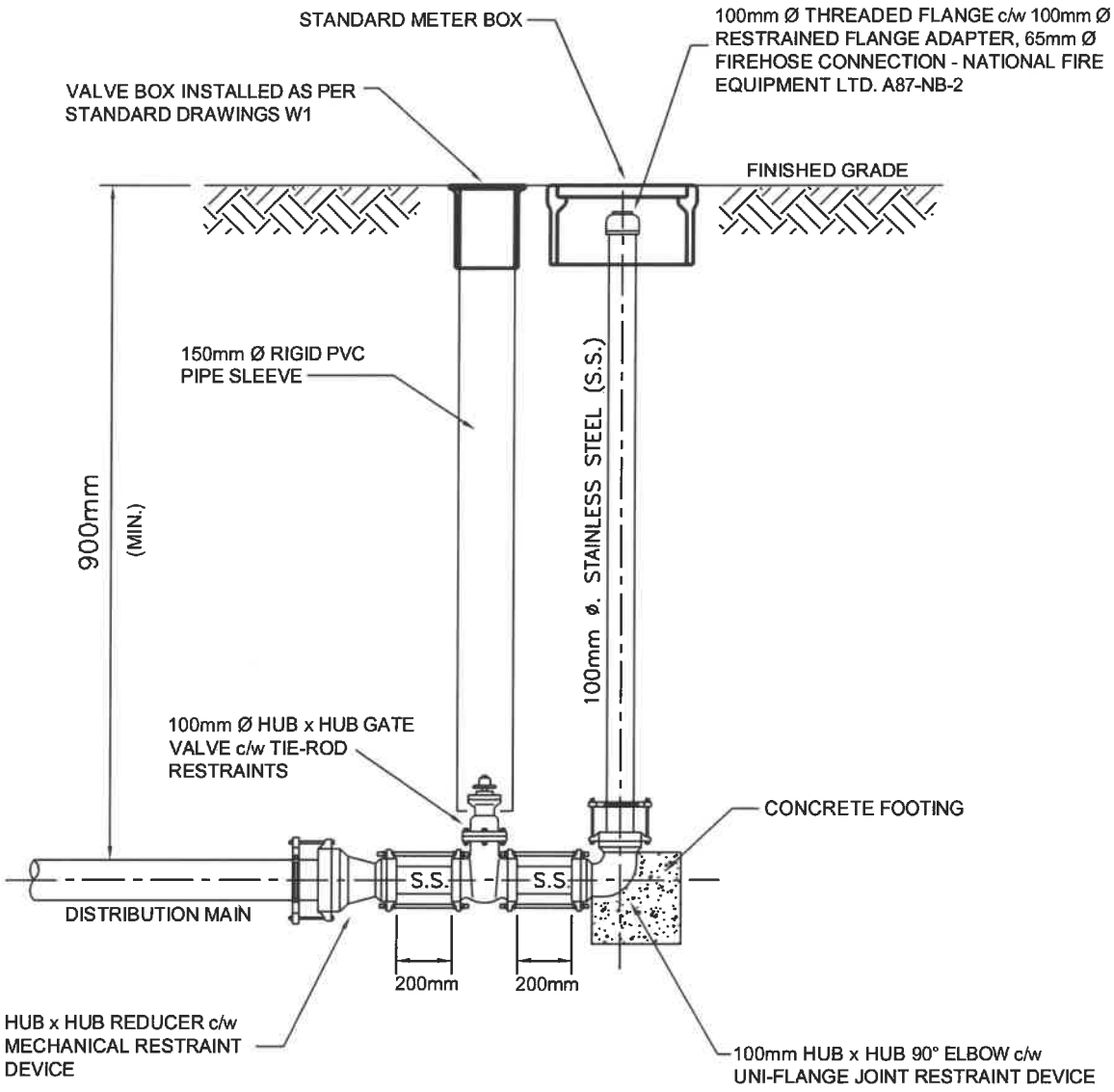


NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. CONCRETE THRUST BLOCKS TO BE MIN 20 MPa AT 28 DAYS
3. PERMANENT END OF LINE FLUSH VALVES TO HAVE 50Ø VALVE AFTER REDUCER IN PLACE OF MAIN LINE VALVE.
4. VALVE TO BE INSTALLED AS PER STD DWG W1

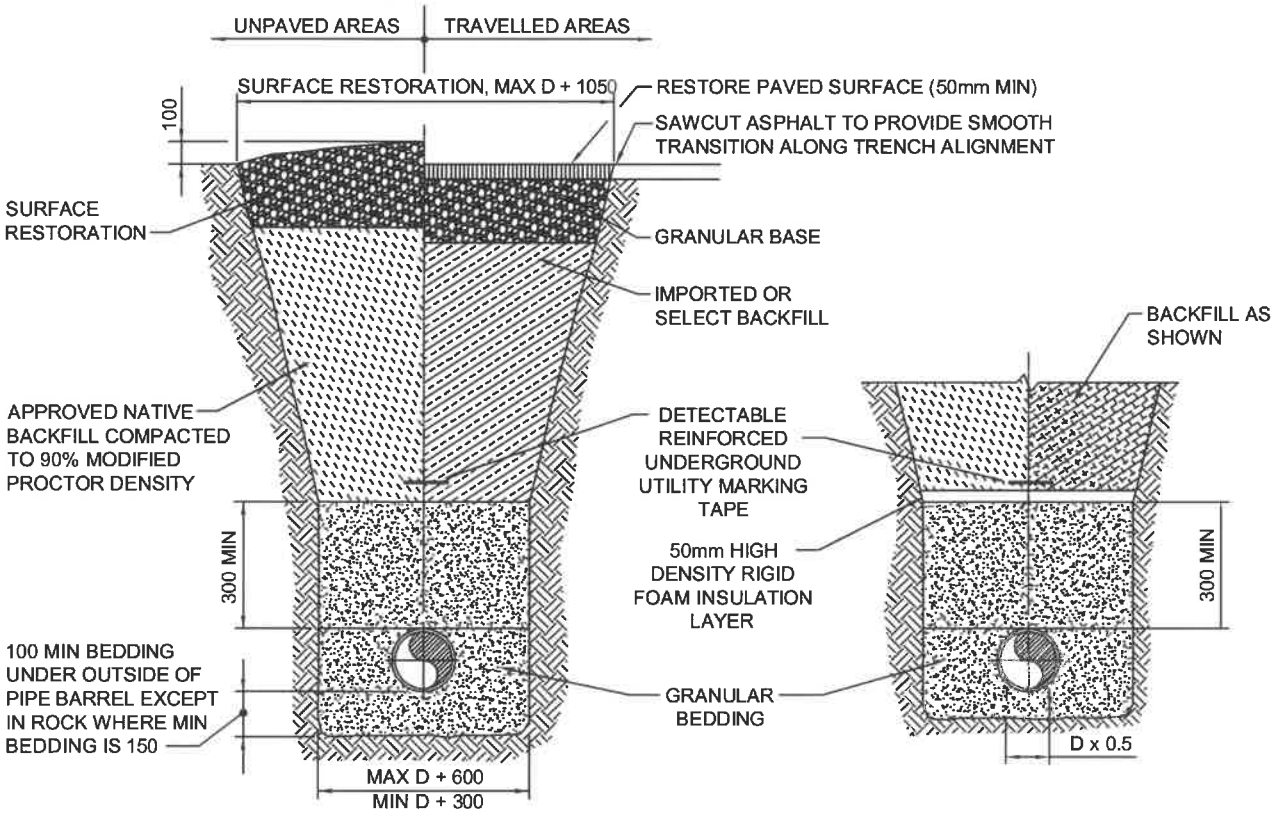
SCALE: NTS	TEMPORARY END OF LINE FLUSH VALVE - BELOW GROUND	DRAWING No. W8B
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT



SCALE: NTS	PERMANENT END OF LINE FLUSH ASSEMBLY BELOW GROUND	DRAWING No.	W9
DATE LAST REVISION: NOV 2015			

COWICHAN BAY WATERWORKS DISTRICT



PVC PIPE

DUCTILE IRON PIPE

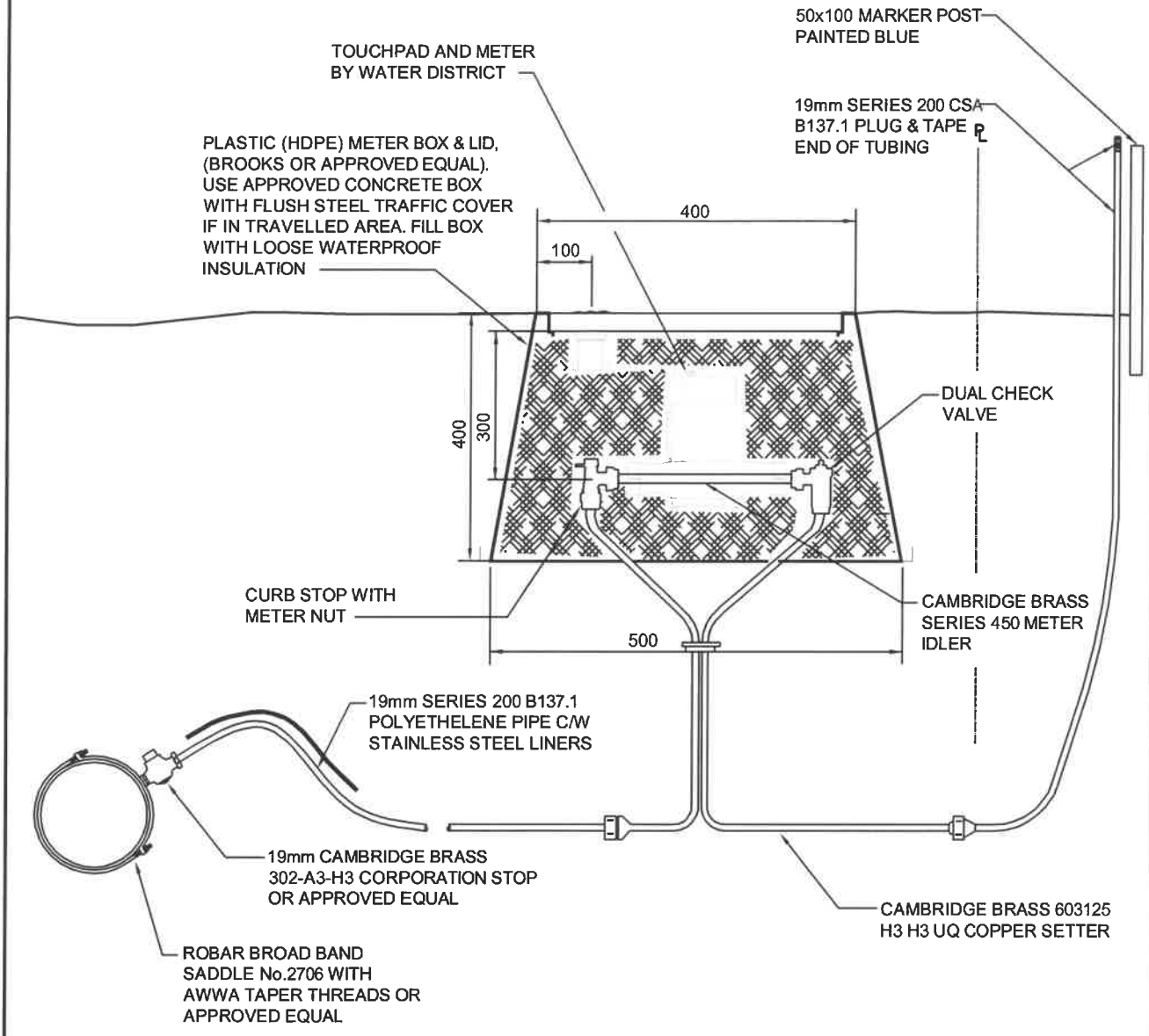
BEDDING		25mm MINUS CRUSHED ROAD BASE MATERIAL PLACED IN LAYERS NOT EXCEEDING 150mm.COMPACT BY SLICING WITH A SHOVEL OR BY USING A TAMPING BAR BEDDING TO BE COMPACTED TO MIN 95% MODIFIED PROCTOR DENSITY
IMPORTED OR SELECT BACKFILL		EXCAVATED STABLE GRANULAR MATERIAL CONTAINING NO CLAY, NO STONES OR FRAGMENTS LARGER THAN 75mm, NO ROOTS, STUMPS OR OTHER ORGANIC MATERIAL, COMPACTED TO MIN 95% MODIFIED PROCTOR DENSITY
APPROVED NATIVE BACKFILL		EXCAVATED MATERIAL APPROVED BY ENGINEER FREE OF STONES LARGER THAN 300mm & FREE OF ROOTS OR OTHER ORGANIC MATERIAL COMPACTED TO MIN 90% MODIFIED PROCTOR DENSITY
GRANULAR BASE		CRUSHED GRAVEL 25mm MINUS OR APPROVED EQUAL AS PER DESIGN DRAWINGS COMPACTED TO MIN 95% MODIFIED PROCTOR DENSITY

NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. SURFACE RESTORATION TO BE AS PER DESIGN DRAWINGS
3. WORKS TO BE COMPLETED AS PER HIGHWAY'S CURRENT STANDARD
4. D = OUTSIDE PIPE DIAMETER

SCALE: NTS	TRENCH DETAILS	DRAWING No. W10
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT

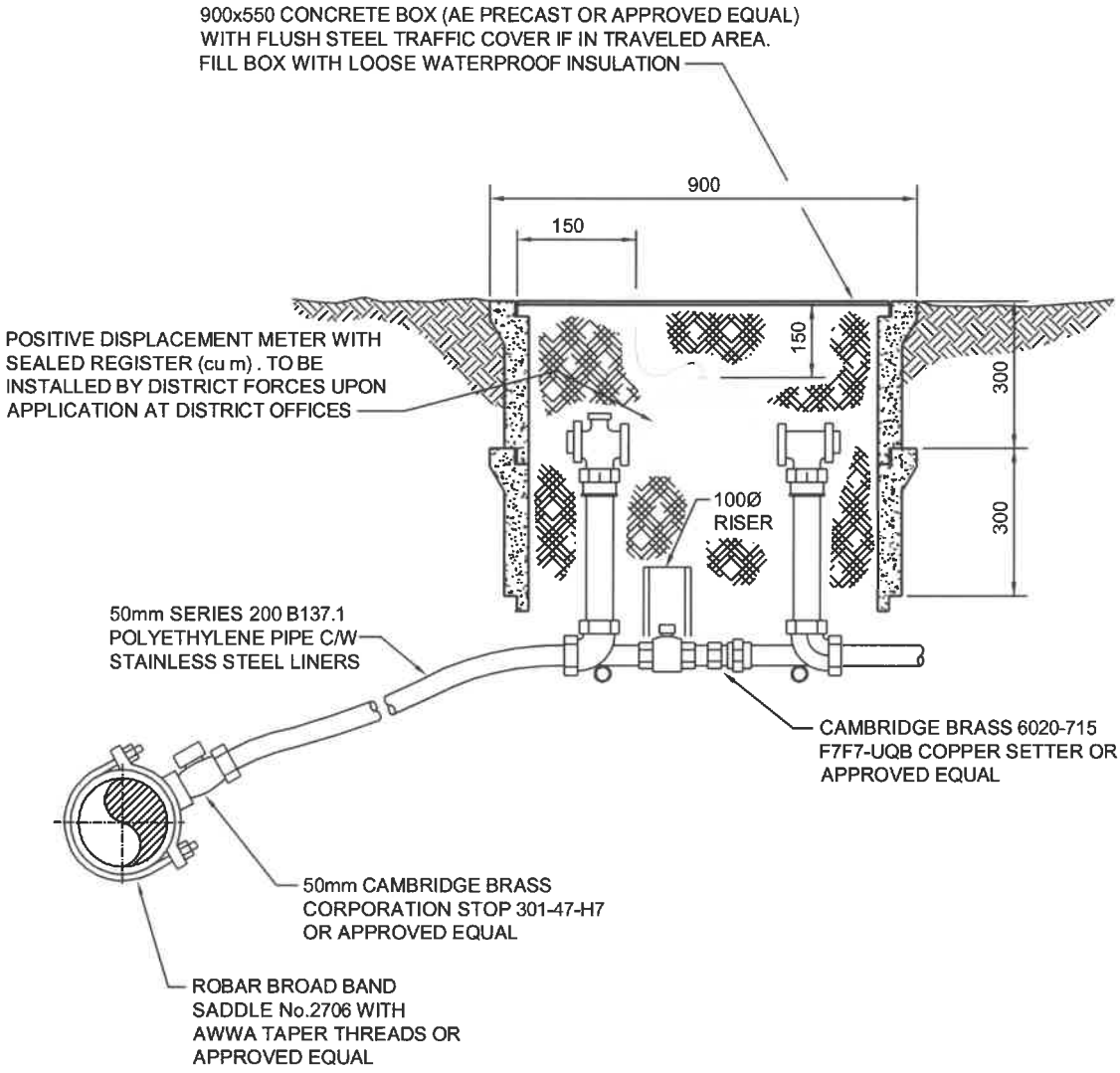


NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. PROVIDE MIN 900mm COVER OVER SERVICE PIPE IN RIGHT OF WAY
3. CONTRACTOR TO INSTALL SERVICE LOCATION MARKER AS PER STD DWG W10
4. BACKFILL AND BEDDING AS PER STD DWG W10
5. SHOULD ROCK BE ENCOUNTERED AT PROPERTY LINE, AN ADDITIONAL 2.0m OF TRENCH MUST BE EXCAVATED AND BACKFILLED
6. SERVICE METER BOX TO BE LOCATED 600 FROM PROPERTY LINE UNLESS OTHERWISE APPROVED
7. USE COMPRESSION TYPE FITTINGS UNLESS OTHERWISE NOTED

SCALE: NTS	19ø METERED WATER SERVICE	DRAWING No. W11
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT

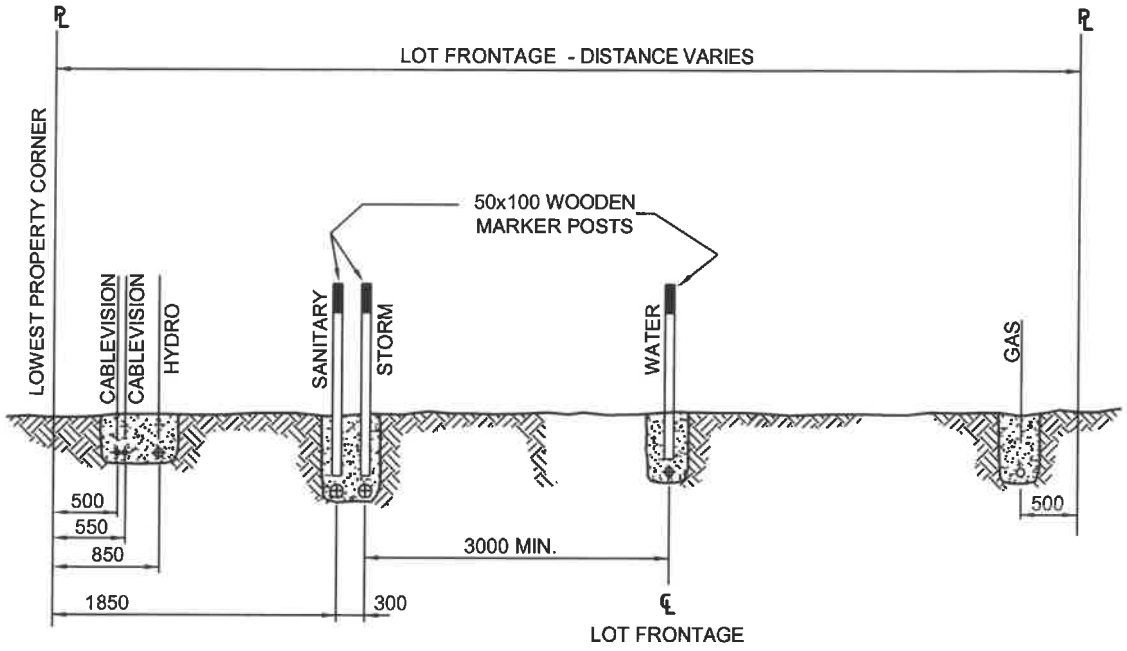


NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. PROVIDE MIN 900mm COVER OVER SERVICE PIPE IN RIGHT OF WAY
3. CONTRACTOR TO INSTALL SERVICE LOCATION MARKER AS PER STD DWG W10
4. BACKFILL AND BEDDING AS PER STD DWG W10
5. SHOULD ROCK BE ENCOUNTERED AT PROPERTY LINE, AN ADDITIONAL 2.0m OF TRENCH MUST BE EXCAVATED AND BACKFILLED
6. SERVICE METER BOX TO BE LOCATED 600 FROM PROPERTY LINE UNLESS OTHERWISE APPROVED
7. USE COMPRESSION TYPE FITTINGS UNLESS OTHERWISE NOTED

SCALE: NTS	50ø METERED WATER SERVICE	DRAWING No. W12
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT



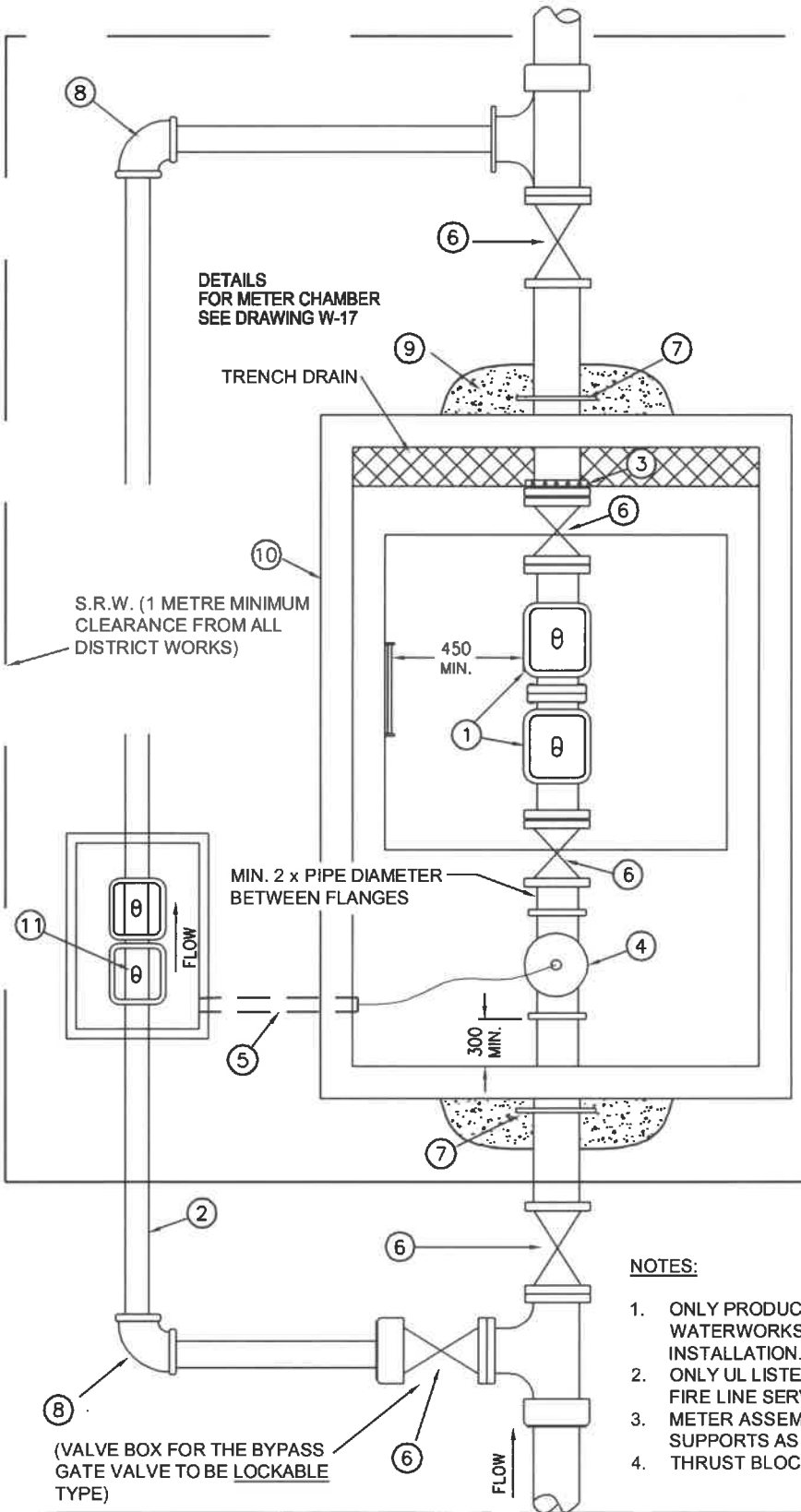
NOTES:

1. ALL UNITS INDICATED ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
2. SANITARY & STORM SERVICES TO BE LOCATED ON LOW SIDE OF LOT FRONTAGE
3. GAS SERVICE TO BE LOCATED ON OPPOSITE SIDE OF LOT FRONTAGE FROM HYDRO, TELEPHONE & CABLEVISION
4. 50x100 MARKER POSTS TO BE MARKED AND THE TOP 600mm PAINTED AS FOLLOWS

SANITARY	RED,	MARKED Xm TO INVERT
STORM	GREEN,	MARKED Xm TO INVERT
BLUE	BLUE,	NO MARKING

SCALE: NTS	MUNICIPAL SERVICE LOCATIONS	DRAWING No. W13
DATE LAST REVISION: SEPT 2014		

COWICHAN BAY WATERWORKS DISTRICT



MATERIAL LIST

1. TESTABLE DOUBLE CHECK VALVE ASSEMBLY (UL/FM APPROVED).
2. 50mm SS SCHEDULE 40 PIPE AND FITTINGS
3. FLANGED COUPLING ADAPTOR
4. MASTER METER OCTAVE ULTRASONIC METER
5. 50mm PVC DUCT
6. GATE VALVE
7. THRUST RINGS
8. 90° ELBOW
9. CONCRETE THRUST BLOCK
10. METER CHAMBER DRAINAGE AND ACCESS - SEE STD DWG. W17
11. 50mm DUAL CHECK BACKFLOW ASSEMBLY FOR BACK FLOW PREVENTION - TO PROVIDE SAME LEVEL OF PROTECTION AS DOWNSTREAM SYSTEM. SEE W12 FOR ENCLOSURE C/W TOUCH READ COVER

CLEARANCE

ALL BYPASS PIPING, INLET & OUTLET FLANGES AND ASSOCIATED WORKS SHALL HAVE A MINIMUM HORIZONTAL CLEARANCE OF 300mm FROM THE CHAMBER WALLS, AND 450mm FROM THE LADDER.

NOTES:

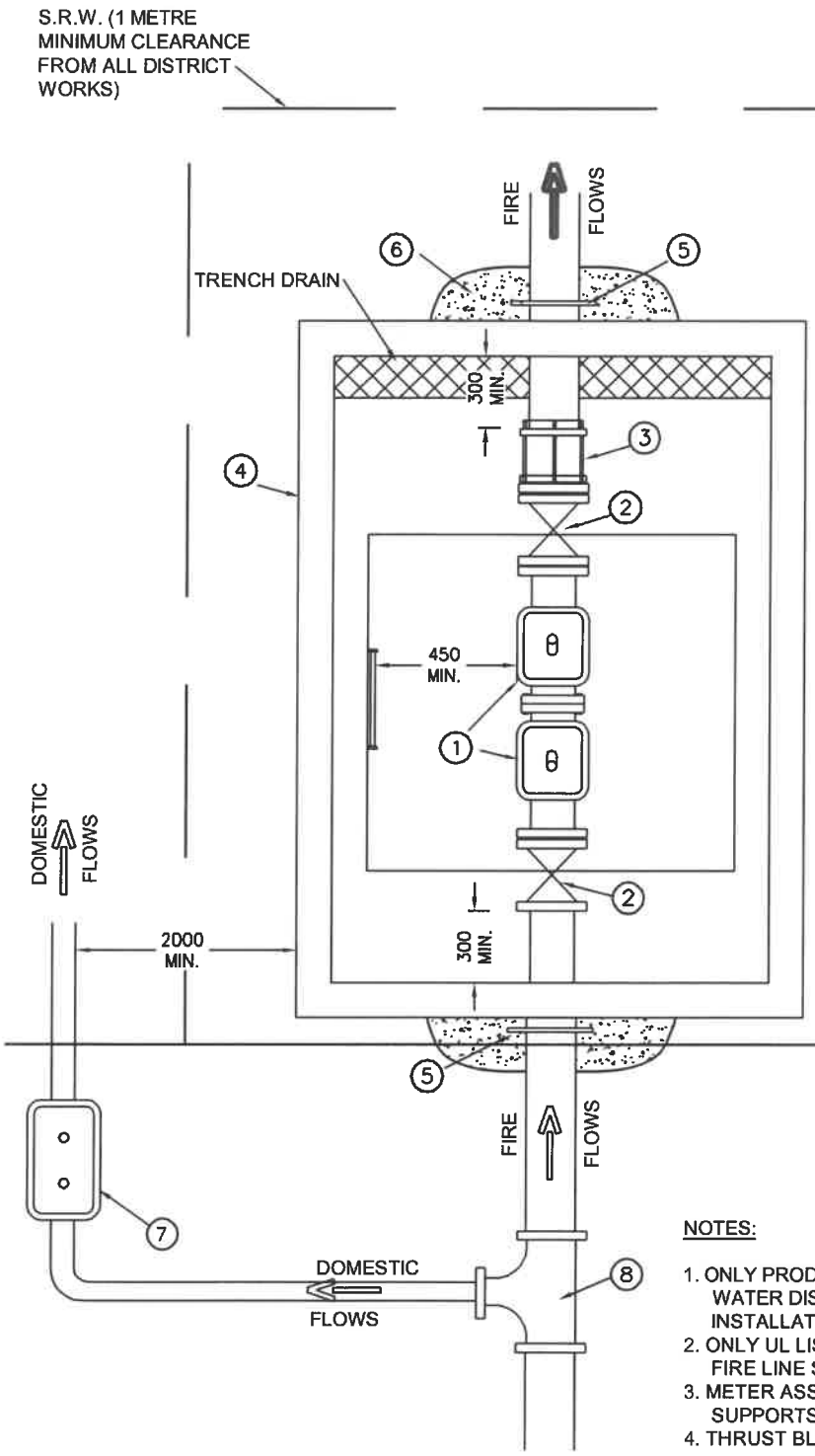
1. ONLY PRODUCTS APPROVED BY COWICHAN BAY WATERWORKS DISTRICT WILL BE ACCEPTED FOR INSTALLATION.
2. ONLY UL LISTED PRODUCTS SHALL BE APPROVED FOR FIRE LINE SERVICE.
3. METER ASSEMBLY TO BE SUPPORTED BY STEEL PIPE SUPPORTS AS REQUIRED (2 MIN.)
4. THRUST BLOCKING TO BE INSTALLED AS REQUIRED.

SCALE: NTS	FIRE/DOMESTIC WATER METER LAYOUT (150Ø - 250Ø)	DRAWING No. W14
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT

MATERIAL LIST

1. TESTABLE DOUBLE DETECTOR CHECK VALVE ASSEMBLY (UL/FM APPROVED).
2. GATE VALVE.
3. FLANGED COUPLING ADAPTOR OR UNIFLANGE
4. METER CHAMBER DRAINAGE AND ACCESS - SEE STD DWG W14.
5. THRUST RINGS.
6. CONCRETE THRUST BLOCK.
7. DOMESTIC METER AND SETTER AS PER STD DWGS W8 OR W9.
8. TEE OR SADDLE



CLEARANCE

ALL BYPASS PIPING, INLET & OUTLET FLANGES AND ASSOCIATED WORKS SHALL HAVE A MINIMUM HORIZONTAL CLEARANCE OF 300mm FROM THE CHAMBER WALLS, AND 450mm FROM THE LADDER.

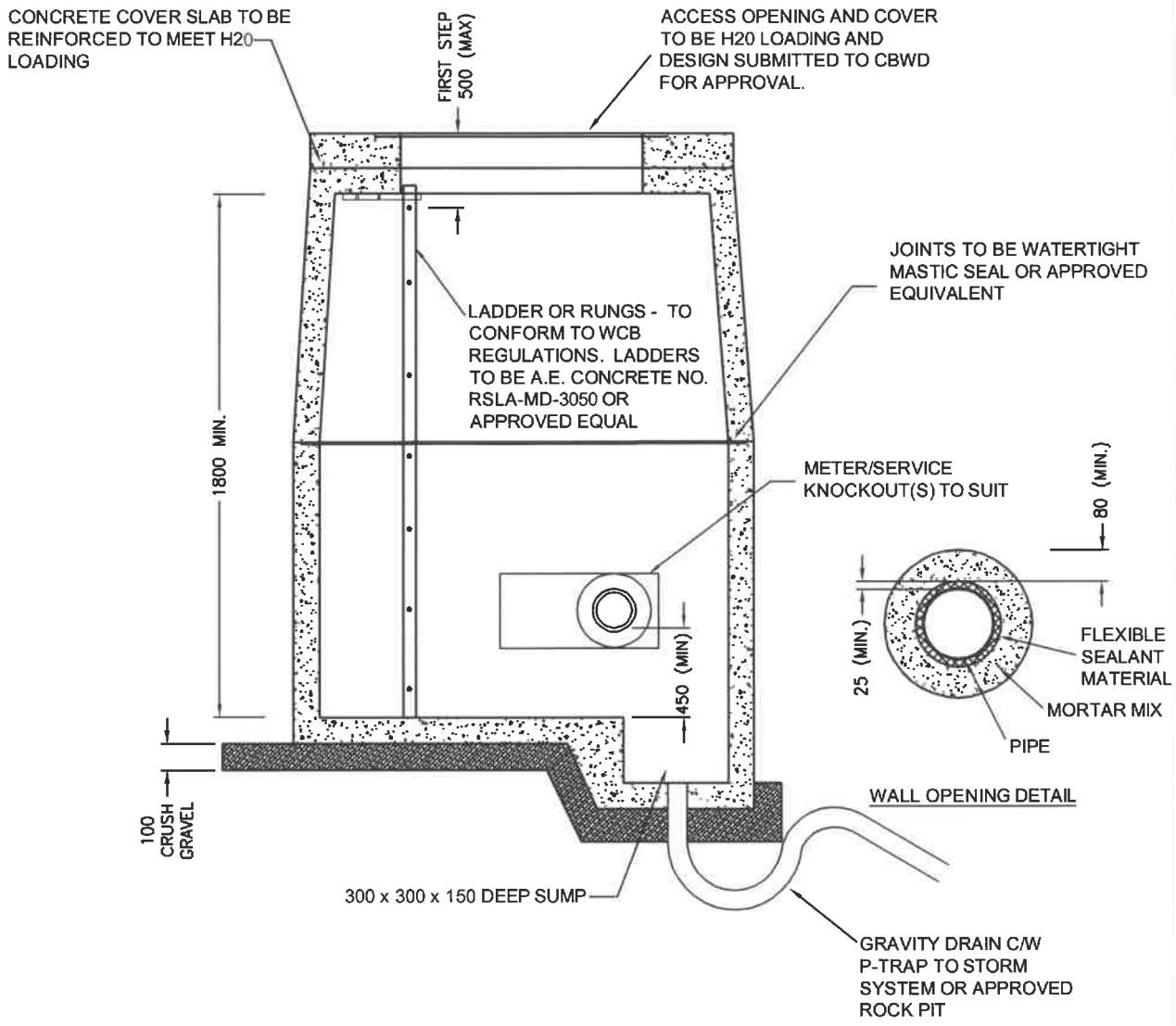
PROPERTY LINE
DEDICATED ROAD

NOTES:

1. ONLY PRODUCTS APPROVED BY COWICHAN BAY WATER DISTRICT WILL BE ACCEPTED FOR INSTALLATION.
2. ONLY UL LISTED PRODUCTS SHALL BE APPROVED FOR FIRE LINE SERVICE.
3. METER ASSEMBLY TO BE SUPPORTED BY STEEL PIPE SUPPORTS AS REQUIRED (2 MIN.)
4. THRUST BLOCKING TO BE INSTALLED AS REQUIRED.

SCALE: NTS	SEPARATE FIRE & DOMESTIC PIPING LAYOUT	DRAWING No. W15
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT

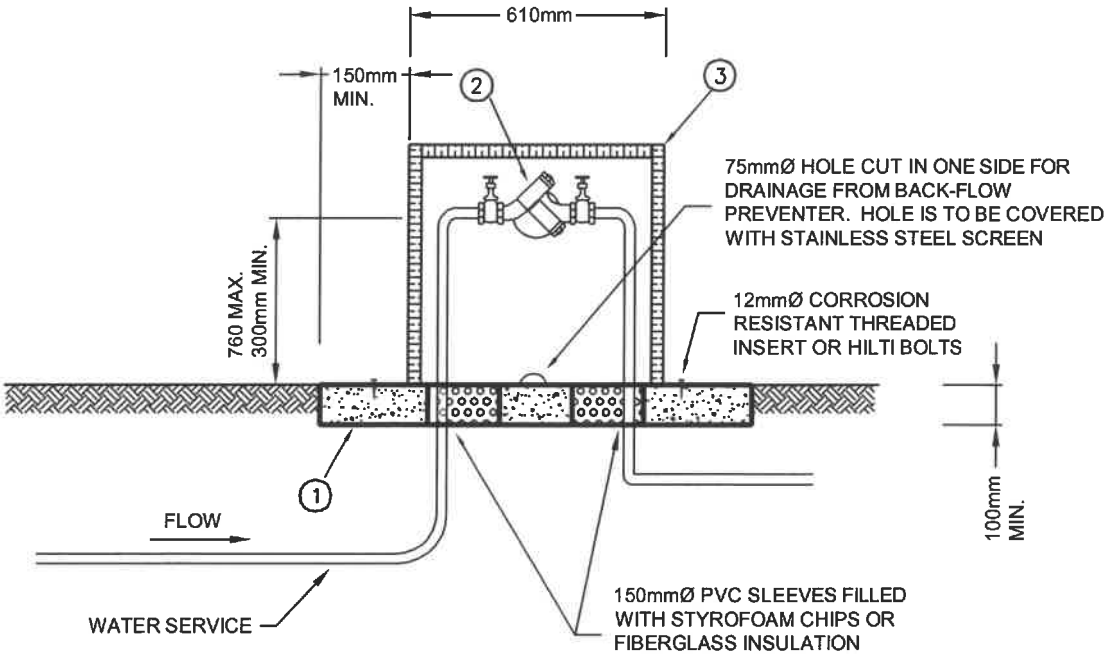


NOTES:

1. ALL WATER METER CHAMBERS TO BE IN CONFORMANCE WITH WCB REGULATIONS.
2. CHAMBERS MUST BE SIZED TO PROVIDE 300mm MINIMUM CLEARANCES, BASED ON ARRANGEMENT OF PIPING.
3. EXTERIOR WALLS OF CHAMBER TO BE WATER TIGHT AND TAR COATED TO PREVENT LEAKAGE. INSIDE WALLS TO BE PAINTED WITH A WHITE WATER SOLUBLE CEMENT PAINT.
4. FOR CONCRETE COVER CHAMBERS ACCESSES MUST BE SIZED AND SITUATED TO PERMIT VERTICAL REMOVAL OF ENTIRE ASSEMBLY WITH NO HORIZONTAL MOVEMENT.
5. FITTINGS TO BE SUPPORTED WITH ADJUSTABLE PIPE STANDS AS REQUIRED (2 MIN.)
6. VERTICAL CLEARANCE (I.E. HEAD SPACE) BETWEEN HIGHEST POINT OF WATER METER AND UNDER SIDE OF VAULT MUST PERMIT SERVICE OF STRAINER, AND MUST NOT BE LESS THAN 600mm.
7. CHAMBER FLOOR SHALL BE SLOPED (2% MIN.) AND FITTED WITH A 300mm x 300mm x 150mm DEEP SUMP CONNECTED TO STORM SYSTEM OR APPROVED ROCKPIT VIA A GRAVITY DRAIN PIPE C/W P-TRAP.

SCALE: NTS	RECTANGULAR PRECAST WATER METER/DEVICE CHAMBER	DRAWING No. W16
DATE LAST REVISION: SEPT 2014		

COWICHAN BAY WATERWORKS DISTRICT



LIST OF MATERIALS

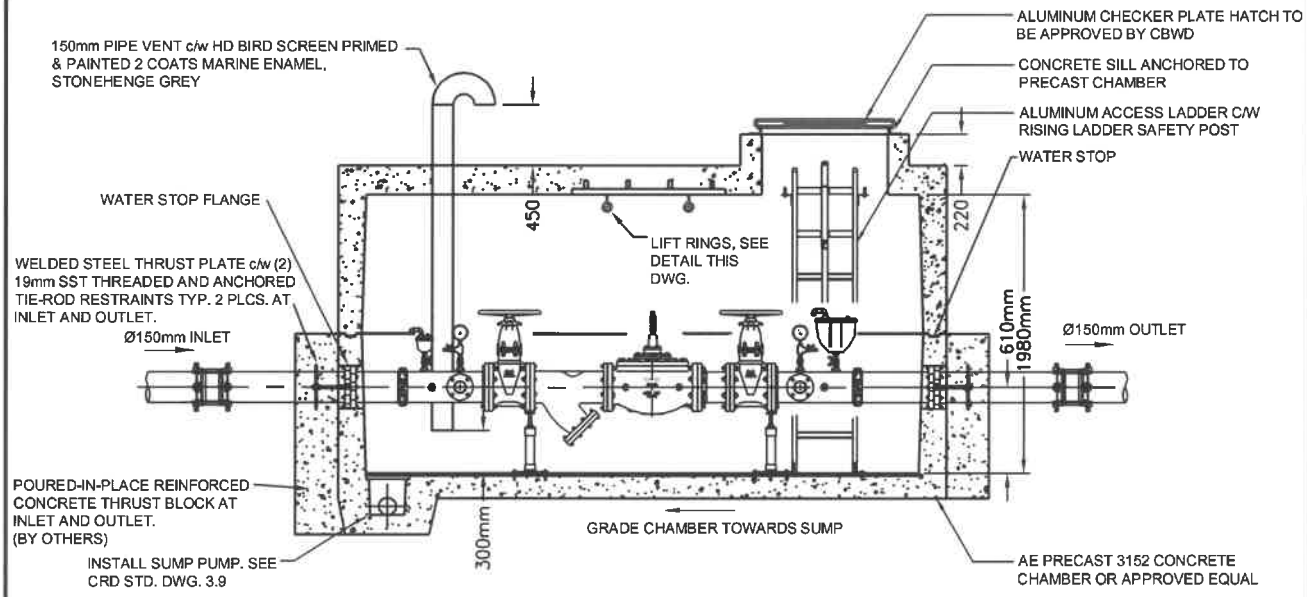
1. 910mm x 710mm x 100mm MIN. CONCRETE SLAB.
2. REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY (SEE NOTE 1). PROVIDE SUPPORT FOR VALVES AS NECESSARY, ELEVATE VALVES (SEE NOTE 2).
3. 610mm MIN. x 610mm x 406mm x 3mm THICK CHECKER PLATE ALUMINUM ENCLOSURE WITH 50mm RIGID INSULATION INSIDE OR OTHER MEASURES TO ENSURE ASSEMBLY DOES NOT FREEZE.

NOTES:

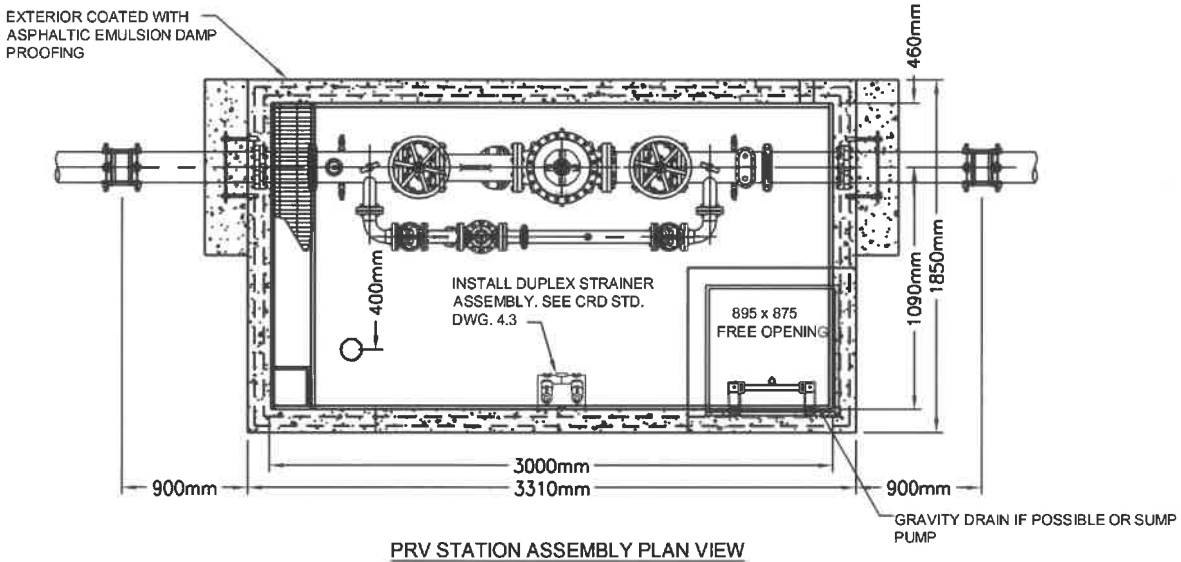
1. INSTALLATION IS FOR A 19mm FEBCO MODEL 825Y REDUCED PRESSURE BACKFLOW PREVENTER. DIMENSIONS & CLEARANCES MAY VARY WITH DIFFERENT MANUFACTURERS. INSTALLATION CLEARANCES MUST BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
2. INSTALLATION MUST BE APPROVED BY LOCAL PLUMBING INSPECTOR.
3. ALL MATERIALS TO BE IN ACCORDANCE WITH CURRENT B.C. PLUMBING CODES.

SCALE: NTS	19mm REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY ABOVE GROUND	DRAWING No. W17
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT



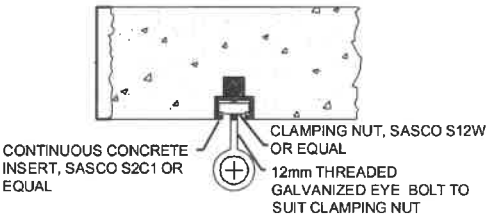
MAINLINE PIPE AND CHAMBER SECTION VIEW



PRV STATION ASSEMBLY PLAN VIEW

NOTES:

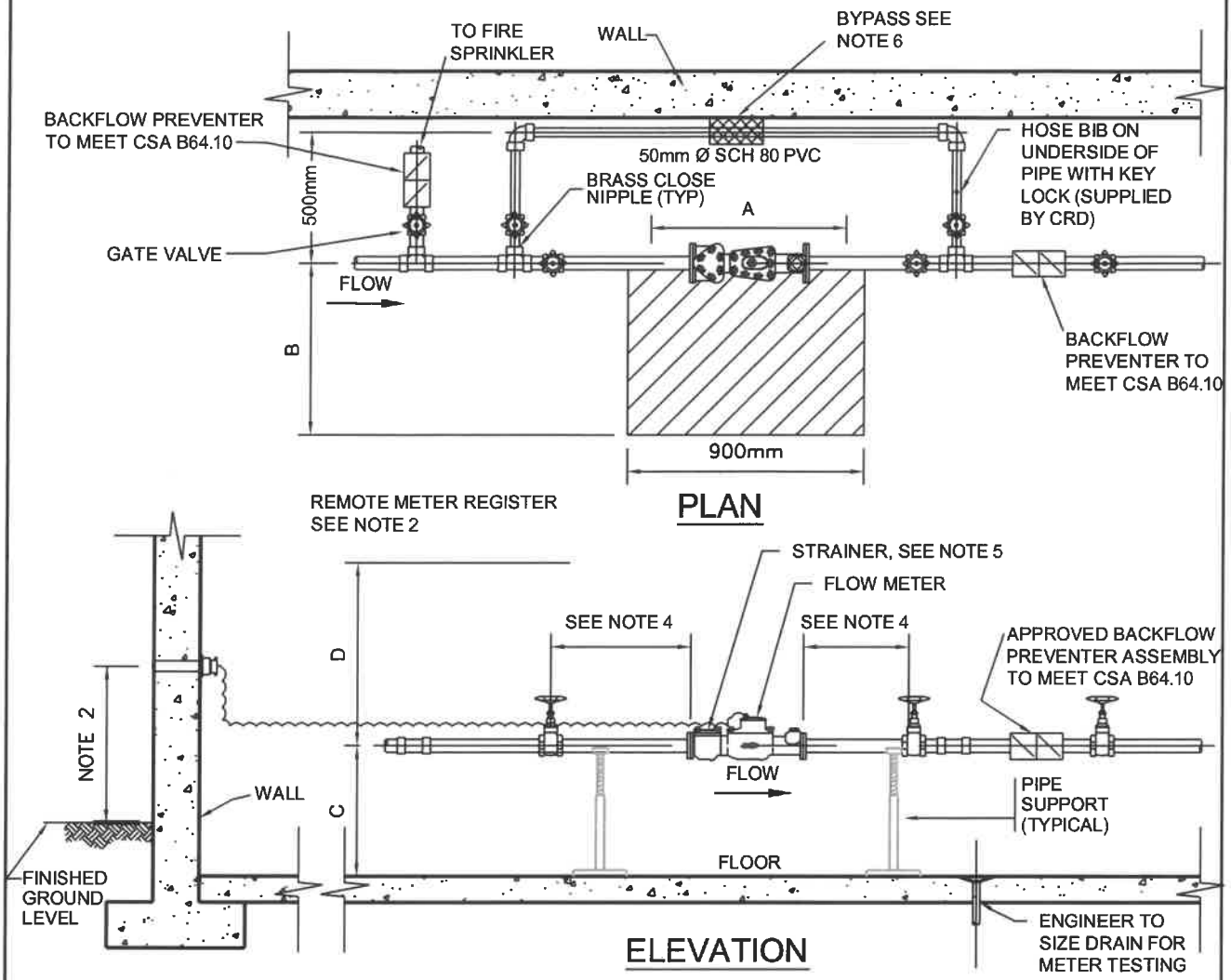
1. ALL VALVES TO BE LEFT HAND (COUNTER-CLOCKWISE OPENING).
2. PRV SIZE TO BE CONFIRMED BY CONSULTANT.
3. PIPE SHALL BE STAINLESS STEEL TO AWWA/ANSI C220-92



LIFT RING DETAIL

SCALE: NTS	150mm PRV STATION DETAILS	DRAWING No. W18
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT



NOTES:

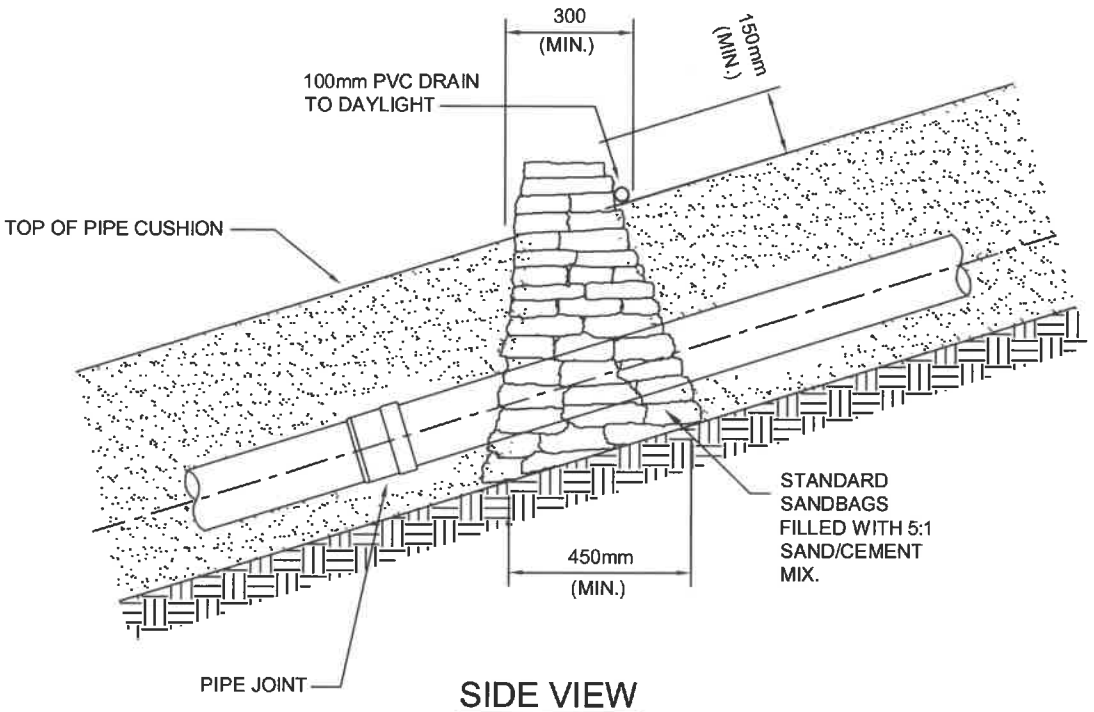
1. HARD COPPER AND BRASS FITTINGS ONLY.
2. SHOW REMOTE METER READOUT LOCATION IN ELEVATION VIEW (EXTERIOR OF BUILDING). METER READOUT MUST BE EASILY ACCESSIBLE FOR METER READING.
3. CONTRACTOR TO INSTALL WALL CONDUIT FOR METER CABLE.
4. MINIMUM 10 PIPE DIAMETERS OF STRAIGHT PIPE BEFORE AND 5 PIPE DIAMETERS AFTER FLOW METER.
5. METER INSTALLATIONS 75mm Ø AND LARGER REQUIRE A STRAINER.
6. BYPASS PIPE SIZE SHALL BE 1 PIPE SIZE SMALLER THAN THE PIPE TO THE METER. MAXIMUM BYPASS SIZE 50mm. SECURE AND STABILIZE.

MINIMUM WORKING AREA WITH MINIMUM HEIGHT OF 2.0m

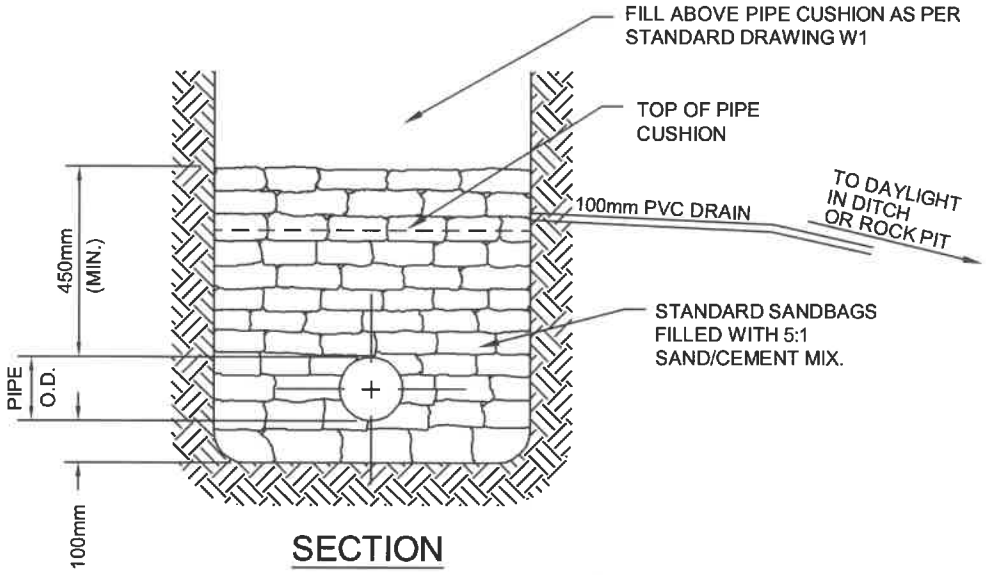
A. SPECIFY SPACE FOR METER INSTALLATION.
B. MINIMUM DISTANCE IN FRONT OF METER TO NEAREST PERMANENT OBSTRUCTION IS 920mm.
C. SPECIFY HEIGHT. (MIN. 750mm, MAX 1500mm)
D. SPECIFY VERTICAL DISTANCE FROM METER TO NEAREST PERMANENT OVERHEAD OBSTRUCTION. (MIN. 1220mm)

SCALE: NTS	WATER METER DETAIL MECHANICAL ROOM	DRAWING No. W19
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT



SIDE VIEW



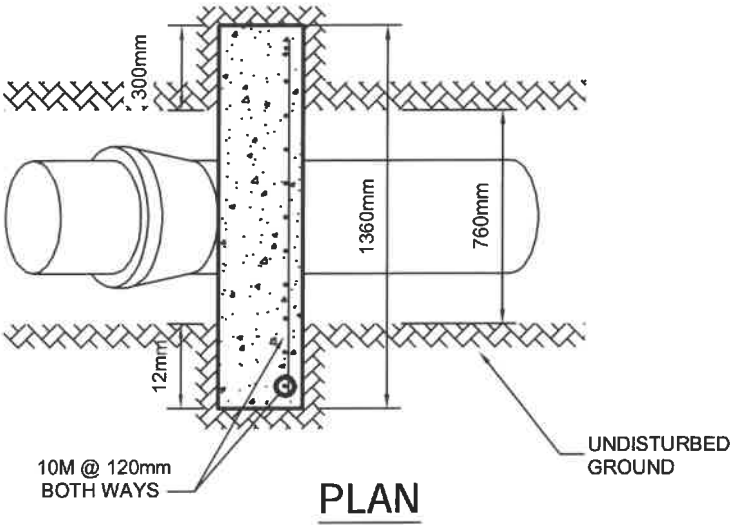
SECTION

NOTES:

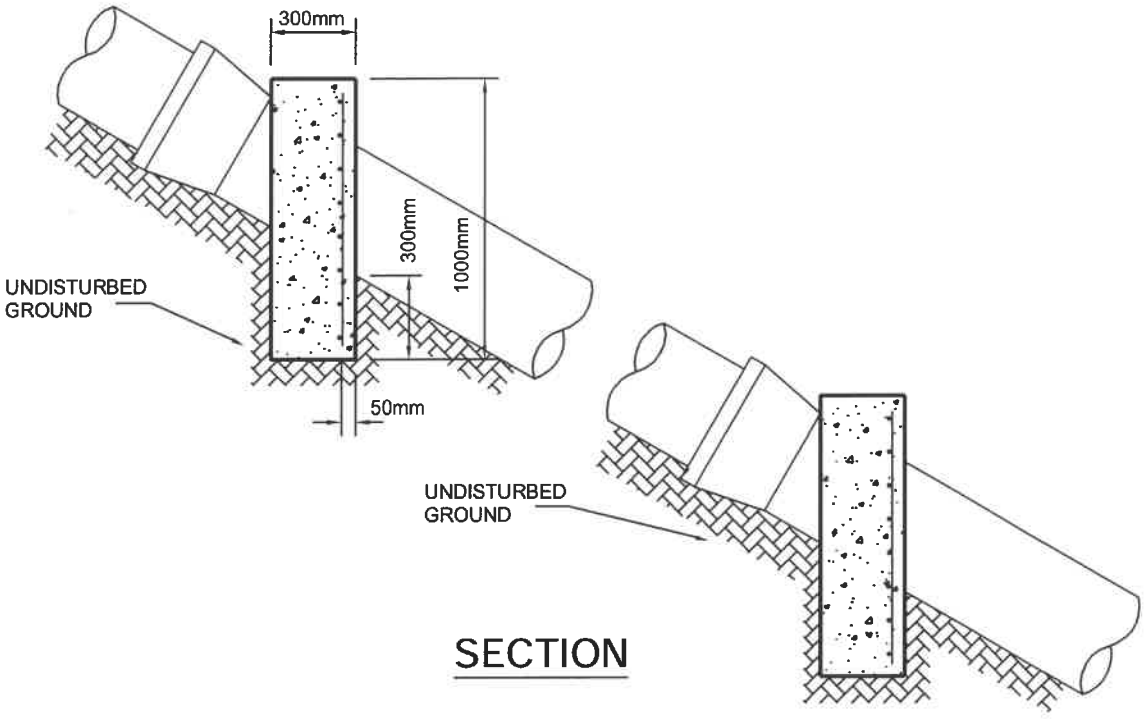
1. TRENCH DAMS TO BE CONSTRUCTED:
   - ON PIPE INSTALLATIONS WITH 10% to 15% SLOPE, NOT MORE THAN 30 METRES APART
   - ON PIPE INSTALLATIONS WITH 15% to 30% SLOPE, NOT MORE THAN 15 METRES APART
   - AS DIRECTED BY THE ENGINEER ON SITE
   - WHERE PIPE INSTALLATION EXCEEDS 30% REFER TO STANDARD DRAWING W4

SCALE: NTS	TRENCH DAMS FOR SLOPES TO 30%	DRAWING No. W20
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT



PLAN



SECTION

NOTES:

1. PLACE ANCHORS AT EVERY SECOND PIPE JOINT EXCEPT IN UNSTABLE GROUND WHERE ANCHORS SHALL BE PLACED AT EACH JOINT.
2. PLACE TWO PLIES OF 6mil POLYETHYLENE BETWEEN PIPE AND CONCRETE.
3. CONCRETE TO HAVE A MINIMUM 28 DAY STRENGTH OF 20 MPa AND A MAXIMUM SLUMP OF 75mm.
4. THIS TRENCH DAM IS FOR USE ON SLOPES GREATER THAN 30% AND PIPE SIZE NOT TO EXCEED 400mm Ø.
5. FOR SLOPES LESS THAN 30% SEE STANDARD DWG. W3
6. FOR PIPES LARGER THAN 400mm Ø CONSULT THE ENGINEER.

SCALE: NTS	TRENCH DAMS FOR SLOPES GREATER THAN 30%	DRAWING No. W21
DATE LAST REVISION: NOV 2015		

COWICHAN BAY WATERWORKS DISTRICT