

**Bylaw 345
Ordano Booster Pump Station Works Agreement Bylaw**

Cowichan Bay Waterworks District

Ordano Booster Pump Station Works Agreement Bylaw No 345

A bylaw to establish the Ordano Booster Pump Station Works Agreement between Cowichan Bay Waterworks District and Cowichan Bay Estates Ltd.

The trustees of the Cowichan Bay Waterworks District enact as follows:

1. Cowichan Bay Estates Ltd. has constructed and installed a Booster Pump Station at the Ordano Reservoir Site.
2. Cowichan Bay Estates Ltd. has agreed to transfer the Booster Pump Station to the Cowichan Bay Waterworks District.
3. A Works Agreement has been developed and agreed to between Cowichan Bay Waterworks District and Cowichan Bay Estates Ltd. for representations and warranties as to the construction, installation and completion of the Booster Pump Station and the maintenance of the Booster Station for one year from the date of Construction Acceptance by Cowichan Bay Waterworks District as per the terms and conditions set out in Schedule A of the Bylaw.
4. The Works Agreement between Cowichan Bay Waterworks District and Cowichan Bay Estates Ltd. is hereby attached as Schedule 1.
5. This bylaw may be cited as the "Ordano Booster Pump Station Works Agreement Bylaw No. 345".

Introduced and given first reading by the Trustees on the 25th day of April, 2022.

Reconsidered and finally passed by the Trustees on the 2nd day of May, 2022.


Lew Penney, Chairperson

I hereby certify that this is a true copy of Bylaw No. 345.


Cheryl Wirsz, District Administrator

Schedule 1 – Works Agreement

WORKS AGREEMENT

THIS AGREEMENT made the 2 day of MAY, 2022.

BETWEEN:

COWICHAN BAY WATERWORKS DISTRICT
an improvement district under
the Local Government Act of British Columbia
c/o 1760 Pavenham Road
Cowichan Bay, BC, V0R 1N1

(the "District")

AND:

COWICHAN BAY ESTATES LTD. (Inc. #BC0938908)
921 H Canada Avenue
Duncan, BC
V9L 1V2

(the "Developer")

WHEREAS:

- A. The Developer is the registered owner in fee simple of those certain lands situated within the boundaries of the District, and legally described as:

PID: 005-167-841

Lot 1, Section 5, Range 4, Cowichan District, Plan 10957, Except That Part of Said Lot Shown Outlined in Red on Plan 1659-R and Except Parts in Plans 15342, 16358, 18893, VIP81664 and EPP16402;

(collectively, the "Lands").

- B. The Developer will be applying for approval to subdivide the Lands into forty-nine (49) lots (the "Subdivision").
- C. The Subdivision of the Lands is governed by, inter alia, Bylaw 323 (the "Subdivision Water Regulation Bylaw") and Bylaw 226 (the "Comprehensive Capital Expenditure Charge (Water) Bylaw").
- D. Pursuant to a Memorandum of Understanding (the "MOU") dated May 2, 2019 between the Developer and the District, the Subdivision Water Regulation Bylaw, and the Comprehensive Capital Expenditure (Water) Bylaw, the Developer constructed and installed certain infrastructure for the delivery of water to the Lands (the "Works").

- E. Pursuant to Section 10 of the Subdivision Water Regulation Bylaw, the Developer has agreed to transfer the Works to the District.
- F. A portion of the Works required to be installed by the Developer to serve the proposed development will serve land other than the Lands, but the District does not have sufficient funds on hand to make a contribution toward the cost of the works and services, and the District will implement a system to levy latecomer charges against the owners of other lands who may connect to, benefit from, or use the works and services. The Developer has voluntarily agreed to install such works and services as are necessary to serve the proposed development of the Lands based on the right of the Developer to a late-comer contribution toward the cost of those works.

NOW THEREFORE in consideration of the premises, the sum of TEN (\$10.00) DOLLARS now paid by each party to the other (the receipt and sufficiency of which are acknowledged by each party) and other good and valuable consideration, the parties covenant and agree as follows:

1. Definitions:

“District Engineer” means the engineer appointed by the District;

“Construction Acceptance” means the District Engineer’s approval of, and the District’s acceptance of the construction of the Works provided by the Developer, subject to the obligation of the Developer to remedy defects and deficiencies becoming apparent during the Warranty Period;

“Final Acceptance” means the District’s acceptance of the Works provided at the end of the Warranty Period with all defects and deficiencies remedied to the satisfaction of the District;

“Maintenance Security” has the meaning set out in section 4.3;

“Professional Engineer” means a professional engineer who is registered with Engineers and Geoscientists BC;

“Specifications” means the specifications set out on Schedule “A” hereto;

“Warranty Period” has the meaning set out in section 4.2;

“Works” means all the works and services to be provided, performed and constructed by the Developer as required by the District for the system of water pipes, pumps, tanks, and appurtenances necessary for the storage or conveyance of water and connection to the District’s water distribution system, and includes the construction of a booster pump station located at the Ordano Road Reservoir in Cowichan Bay, British Columbia, as shown or referred to in the engineering drawings, utilities and connections attached hereto as Schedule “B”, as approved by the District Engineer

2. The Works

- 2.1 The Developer covenants and agrees with the District to complete the construction and installation, at its sole cost, of all the Works as set out in this Agreement.

3. Representations and Warranties

- 3.1 In carrying out the Works, the Developer represents and warrants it:
- (a) constructed, installed, and fully completed the Works to the satisfaction of the District Engineer in accordance with the plans attached as Schedule "B".
 - (b) obtained prior written approval of the District or the District Engineer for any changes to the design and specifications of the Works;
 - (c) retained a Professional Engineer during the construction period to:
 - (i) inspect the Works to ensure compliance with the approved engineering plans;
 - (ii) review and provide 'as-built' or record drawings of the Works;
 - (iii) record the details of any field design or construction changes and all relevant information for preparation of the as-built drawings of the Works to be provided to the District pursuant to this Agreement;
 - (d) submitted to the District Engineer certification from the Professional Engineer that the Works have been constructed to the specifications and standards required by this Agreement, as well as relevant operations and maintenance manuals and test results
 - (e) complied with all statutes, laws, regulations, and orders of any authority having jurisdiction;
 - (f) did not engage any employee or contractor in the construction of the Works who, in the reasonable opinion of the District Engineer, would be unfit, incapable or unskilled;
 - (g) ensured that a competent superintendent was on site at all times during the construction and installation of the Works;
 - (h) did not deposit or permit the deposit of any material or debris on any lands of the District, except for landscaping gravel;
 - (i) did not damage any of the District's infrastructure, services, or property, or remove, alter or destroy any survey pins, post or monuments, and in default shall replace, repair and restore any damage of whatsoever nature to the reasonable satisfaction of the District;

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- (j) provided and maintained during construction of the Works, at its own expense, all required vehicular or pedestrian traffic warning controls or barrier devices and traffic control personnel in order to ensure safety to the public as well as those engaged about the Lands or the Works;
 - (k) took such precautions and actions during the construction of the Works as required by the District Engineer to clean up or otherwise abate nuisance caused by mud, dirt, dust, or noise, and to ensure safe access to driveways, buildings and property for vehicles and pedestrians, whenever necessary including constructing and maintaining in good order and serviceable condition, suitable temporary platforms, approaches, bridges, crossings or other works as required by the District Engineer;
 - (l) replaced trenched boulevards with sod, and restored boulevards to an equal or better condition than existed prior to construction of the Works;
 - (m) ensured no discharge of chlorinated water, silt, debris or dirt into any existing drainage facility or watercourse; and
 - (n) repaired any damage to any roads, sidewalks or other District property caused by traffic relating to the construction of the Works or improvements on the Lands to the satisfaction of the District Engineer within two weeks of the completion of the Works and the improvements on the Lands.
- 3.2 Should the Developer have breached any representations or warranties contained in this section 3, the District may do whatever is necessary to satisfy the requirements of this section at the expense of the Developer and invoice the Developer for the costs thereof. If the District still holds the Maintenance Security as defined in Section 4, the District may recover the amount of such invoice by drawing upon the Maintenance Security.
- 4. Maintenance / Warranty Period**
- 4.1 Despite section 4.2, the Developer covenants and agrees to maintain the Works in complete repair until such time as Construction Acceptance has been issued by the District.
- 4.2 The Developer covenants and agrees to maintain the Works in complete repair for a period of one (1) year from the date of Construction Acceptance certified by the District Engineer (the "Warranty Period"), including remedying any defects appearing within the Warranty Period, and to pay for any resulting damage to other work or property save and except for defects caused by reasonable wear and tear, negligence of the District, its employees or agents, or acts of God.
- 4.3 The Developer covenants and agrees to deposit with the District for the Warranty Period, security in the form of cash or a clean, irrevocable, and unconditional letter of credit in an amount equal to \$85,500.00 on terms acceptable to the District (the "Maintenance Security").

- 4.4 In the event the Developer fails to maintain the Works or remedy any defect or pay for any damages resulting therefrom, the District may draw upon the Maintenance Security and may, in whole or in part, maintain the Works, remedy the defect or pay the damages at the cost of the Developer and may deduct the cost of maintaining the Works, remedying the defect or paying the damages from the Maintenance Security and the balance of the Maintenance Security shall be returned to the Developer upon the Developer's written request for same and upon issuance of a certificate of Final Acceptance of the Works by the District Engineer, certifying that the District accepts ongoing responsibility for the maintenance and repair of the Works.
- 4.5 If the Maintenance Security is insufficient to cover the actual costs incurred by the District, the shortfall is a debt owing by the Developer to the District and is recoverable as a contract debt.

5. Transfer of the Works

- 5.1 The District covenants and agrees that so long as the Developer is not in default of its obligations under this Agreement, the District will provide the following:
- a) **Upon the execution of this Agreement, all necessary consents, approvals and permits** or assurances required by any authority having jurisdiction for the approval and registration of the subdivision of the Lands;
 - b) **certificate of Construction Acceptance** – to be issued upon the District Engineer's approval of, and the District's acceptance of the construction of Works, subject to the obligation of the Developer to remedy defects and deficiencies becoming apparent during the Warranty Period;
 - c) **certificate of Final Acceptance** – to be issued upon completion of the Warranty Period provided that all outstanding deficiencies with respect to the Works have been remedied.
- 5.2 The Developer shall submit to the District within 30 days of receiving the Certificate of Construction Acceptance the final 'as-built' or record drawings which accurately and completely depict the Works, as well as relevant operations and maintenance manuals and test results.
- 5.3 Upon Final Acceptance of the Works, the Developer covenants and agrees with the District to:
- (a) assign, transfer and convey to the District all of its right, title, and interest in and to the Works free and clear of all encumbrances;
 - (b) grant or cause to be granted to the District or as the District may direct, in registerable form, all statutory rights of way, easements, and other interests reasonably required by the District for the operation, maintenance, repair, and replacement of the Works,

including but not limited to District roads and services, on terms satisfactory to the District; and

- (c) execute and deliver or cause to be executed and delivered, at the request of the District, all such further transfers, instruments, agreements, documents, and plans and perform all such acts as may be necessary to give full effect to this Agreement.

5.4 The District covenants and agrees with the Developer to permit the Developer to perform all of the Works upon the terms and conditions contained in this Agreement.

6. Indemnity

6.1 During construction of the Works, the Warranty Period and a period of one (1) year thereafter, the Developer covenants to save harmless and effectually indemnify the District, and its elected officials, officers and employees against:

- (a) all actions and proceedings, costs, damages (including economic loss), expenses, claims, demands penalties and fines (the "Claims") whatsoever and by whomsoever brought, arising, whether directly or indirectly, by reason of the construction, installation, maintenance or repair of any of the Works and any injury or damage thereby caused to person or property (including death), including, without limitation, any Claims relating to environmental damage or pollution or the breach of any federal or provincial statute, regulation or order;
- (b) all Claims recoverable from the District which may be incurred by reason of the construction, installation, maintenance or repair of the Works and the development of the Lands resulting in damage to any property owned in whole or in part by the District or which the District by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, install, maintain or repair;
- (c) all actions and proceedings, costs, damages, expenses, claims and demands whatsoever and by whomsoever brought, relating to or arising from the District's approval of the subdivision plan of the Lands, including without limitation, any claims for personal injury, death, economic loss or property damage;
- (d) all expenses and costs which may be incurred by reason of liens for non-payment of labour or materials, workers' compensation assessments, unemployment insurance, federal or provincial taxes, check-off or encroachments owing to mistakes in survey;
- (e) all Claims by whomsoever brought, imposed or incurred relating to or arising from any failure of the Developer, or any person or company hired by or on behalf of the Developer, to comply with any provisions of the *Workers Compensation Act*, R.S.B.C. 1996, c. 492 ("Workers Compensation Act"), and any regulations adopted pursuant thereto, that the Developer has agreed herein to accept and satisfy in relation to the construction, installation and maintenance of the Works, including but not limited to

any penalties or assessments imposed on the District pursuant to the Workers Compensation Act or any regulations adopted pursuant thereto; and

(f) all expenses and costs which may be incurred by the District as a result of faulty workmanship and defective material in any of the works installed by the Developer.

6.2 The claims in sections 6.1 (a)-(f) above include, legal costs on a solicitor and own client basis, which the Developer shall pay, provided that the Developer shall have the right to carry the defence of any such claims.

7. Insurance

7.1 The Developer will obtain and maintain until the date of issuance of Final Acceptance of the Works, at the Developer's expense, with such company or companies and on such forms as are acceptable to the District, in the name of the Developer, Comprehensive General Liability insurance coverage covering premises and operations liability, contingency liability with respect to the operations of contractors and subcontractors, completed operations liability, contractual liability and automobile liability for owned, non-owned and hired units. The limits of liability shall be not less than \$3,000,000.00 for each occurrence for bodily injury and property damage. Each policy shall provide that it cannot be cancelled, materially altered or allowed to lapse until at least 30 days' notice in writing has been given to the District by express post mail, shall name the District as an additional insured, shall contain a cross-liability clause and shall not be on a claims made basis. The Developer shall prior to the commencement of any construction, installation, maintenance or repair of the Works, deliver a certificate of insurance in a form acceptable to the District, signed by an insurance broker or insurance company certifying that the Developer has obtained the insurance referred to above.

8. Condition Precedent

8.1 This Agreement is subject to its approval as a Bylaw by the District in accordance with the *Local Government Act* of British Columbia.

9. Dispute Resolution

9.1 Any dispute arising out of this Agreement shall be resolved initially by consultation between the parties, failing that, by mediation, and failing agreement by mediator or consultation, by arbitration pursuant to the *Arbitration Act* of British Columbia by a single arbitrator with such arbitration to take place in Duncan, British Columbia.

10. General Terms

10.1 It is understood and agreed that the District has made no representations, covenants, warranties, guarantees, promises or other (verbal or otherwise) with the developer other than those contained or referenced within this Agreement and the associated Latecomers Agreement.

- 10.2 The Developer covenants and agrees that nothing contained or implied herein shall prejudice or affect the rights and powers of the District in the exercise of its functions under any public and private statutes, bylaws, orders and regulations all of which may be fully and effectively exercised in relation to the said lands as if the Agreement had not been executed and delivered by the Developer.
- 10.3 Time shall be of the essence of this Agreement.
- 10.4 If any section or portion of this Agreement is declared or held invalid for any reason, such invalidation shall not affect the validity of the remainder of that section or of this Agreement and this Agreement shall continue to be in force and effect and be construed as if it had been executed without the invalid portion.
- 10.5 All obligations of the parties will be suspended so long as the performance of such obligations is prevented or hindered in whole or in part, by reason of labour dispute, fire, act of God, unusual delay by common carriers, earthquake, act of the elements, riot or civil commotion.
- 10.6 The Developer and the District covenant and agree from time to time and at all times, upon the reasonable request of the other, to make, do and execute, or cause to be made, done or executed, all such further acts, deeds, rights of way, easements, and assurances necessary for the more effectual carrying out of this Agreement.
- 10.7 This Agreement shall be governed by and construed in accordance with the laws of the Province of British Columbia.
- 10.8 This Agreement shall enure to the benefit of and be binding on the parties and their respective successors and permitted assigns, notwithstanding any rule of law or equity to the contrary.
- 10.9 No provision of this Agreement shall be deemed to have been waived by either party unless written waiver signed by the party waiving a provision has first been obtained by the party asserting a waiver and, without limiting the generality of the foregoing, no condoning, excusing, or overlooking by a party of a breach of the provisions of this Agreement nor any earlier written waiver shall be taken to operate as a waiver or constitute acquiescence to subsequent default or breach of this Agreement by either party.
- 10.10 This Agreement may not be modified or amended except by an instrument in writing signed by the parties or by their successors or permitted assigns.
- 10.11 All rights and remedies of either party under this Agreement are cumulative and are in addition to, and shall not be deemed to exclude, any other right or remedy allowed by law. All rights and remedies may be exercised concurrently.

- 10.12 Any notice or other communication required or contemplated to be given or made by any provision of this Agreement shall be given or made in writing and either delivered personally (and if so shall be deemed to be received when delivered) or mailed by prepaid registered mail in any Canada Post Office in the Province of British Columbia (and if so shall be deemed to be delivered on the fourth business day following such mailing, except that, in the event of interruption of mail service notice shall be deemed to be delivered only when actually received by the party to whom it is addressed), so long as the notice is addressed as follows:

To the Developer at:

Cowichan Bay Estates Ltd.,
921 H Canada Avenue
Duncan, BC
V9L 1V2

and:

To the District at:


Cowichan Bay Waterworks District
c/o 1760 Pavenham Road
Cowichan Bay, BC, V0R 1N1

or to such other address of which a party from time to time notifies in writing the other party.

- 10.13 Wherever the singular or the masculine is used in this Agreement it shall be deemed to include the plural or the feminine or the body politic or corporate wherever the context or the parties so require.
- 10.14 This Agreement shall not prejudice or affect the rights of the District to exercise all of its rights and powers.
- 10.15 Any reference to the Lands shall be deemed to be a reference to each and every parcel comprising the Lands and any reference to the Developer shall be deemed to be a reference to the owner or owners of each of the parcels comprising the Lands, all unless the context or the parties otherwise require, although any security will be returned to the person who provided the security to the District.
- 10.16 Whenever in this Agreement the District is required or entitled to exercise any discretion in the granting of consent or approval, or is entitled to make any determination, take any action or exercise any contractual right or remedy, including without limitation to termination of this Agreement, the District may do so in accordance with the contractual provisions of this Agreement and no public law duty whether arising from the principles of procedural fairness or the rules of natural justice shall have any application.

IN WITNESS WHEREOF the parties have signed this Agreement as of the date written above.

Cowichan Bay Waterworks District)
the "District")



Authorized Signatory)
Trustee)



Authorized Signatory)
Trustee / District Administrator)


Cowichan Bay Estates Ltd.)
the "Developer")

Per:)


Per:)

IN WITNESS WHEREOF the parties have signed this Agreement as of the date written above.

Cowichan Bay Waterworks District
the "District"



Authorized Signatory
Trustee



Authorized Signatory
Trustee / District Administrator

Cowichan Bay Estates Ltd.
the "Developer"



Per: **James Leonard
Goodman**

Per:

SCHEDULE "A"

The Specifications

(attached hereto)

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.

Subdivision Water Regulation Bylaw No. 323 - 2020

- (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.

Subdivision Water Regulation Bylaw No. 323 - 2020

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.

Subdivision Water Regulation Bylaw No. 323 - 2020

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 proposed 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

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SECTION 1

GENERAL INFORMATION

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SECTION 1: GENERAL INFORMATION

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.

SECTION 1: GENERAL INFORMATION

- 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.

SECTION 1: GENERAL INFORMATION

- 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

- 1.0 Introduction
- 2.0 General Information and Policy
 - 2.01 Extension Costs
 - 2.02 Topographical Surveys
 - 2.03 General Provisions
 - 2.04 Responsibility for Material – Applicant/Owner
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 - 2.06 Responsibility for Safe Storage
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 - 4.05 Design Changes
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- 5.0 Circulation and Approval of Design Drawings
 - 5.01 Design Drawing
 - 5.02 Pump Station Design
 - 5.03 Drawing Plot Resolution
 - 5.04 Review Comments
 - 5.05 Final Approval
 - 5.06 Letter of Confirmation
 - 5.07 Approval & Permits
 - 5.08 VIHA Approval
- 6.0 Water Main and Service Installation Policies
 - 6.01 Pre-Construction Requirements
 - 6.02 Site Drawings
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SECTION 2

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

- 7.0 Acceptance of Works and Services
 - 7.01 Required Documentation
 - 7.02 Return of Deposits
 - 7.03 Warranty Security
 - 7.04 Statutory Declaration
 - 7.05 As Constructed Drawings / Warranty Period

- 8.0 Warranty of Works and Services
 - 8.01 Warranty Period
 - 8.02 Interruption of Service
 - 8.03 Execution of Warranty
 - 8.04 Final Acceptance

- 9.0 Testing and Disinfection
 - 9.01 Disinfection
 - 9.02 Compaction Testing

- 10.0 Payment to CBWD
 - 10.01 Prepayment
 - 10.02 Materials Prepayment

SECTION 2: WATERWORKS CONNECTION/EXTENSIONS POLICIES AND PROCEDURES

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.

SECTION 2: WATERWORKS CONNECTION/EXTENSIONS POLICIES AND PROCEDURES

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.

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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.

SECTION 2: WATERWORKS CONNECTION/EXTENSIONS POLICIES AND PROCEDURES

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.

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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.

SECTION 2: WATERWORKS CONNECTION/EXTENSIONS POLICIES AND PROCEDURES

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.

SECTION 2: WATERWORKS CONNECTION/EXTENSIONS POLICIES AND PROCEDURES

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

- 1.0 Scope
 - 1.01 Drawings
- 2.0 Design Drawings
 - 2.01 Applicant Responsibility
 - 2.02 Right of Ways and Easements
 - 2.03 Identification
 - 2.04 Street Names
 - 2.05 Services
 - 2.06 Plan and Profile
 - 2.07 Other Utilities
 - 2.08 Drawing Size
 - 2.09 Profile Information
 - 2.10 Plan Information
 - 2.11 Approvals
 - 2.12 Further Details
 - 2.13 Elevations
 - 2.14 Mechanical Room Drawings
 - 2.15 Requirements for Other Utilities
- 3.0 Completing 'As Constructed' Drawing
 - 3.01 Requirements
 - 3.02 Digital DWG File
 - 3.03 Locations
 - 3.04 Certification Stamp
 - 3.05 Additional Details
 - 3.06 Operational and Maintenance Manuals
 - 3.07 Warranty Period

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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.

SECTION 3: DESIGN AND 'As Constructed' DRAWINGS

- .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
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SECTION 4

WATER SYSTEM DESIGN (con't)

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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).

SECTION 4: WATER SYSTEM DESIGN

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 purposes, 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.

SECTION 4: WATER SYSTEM DESIGN

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.

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- .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 following 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:

$$\text{Total Storage Volume} = A + B + C$$

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
- 2.0 General
- 3.0 Piping
- 4.0 Gate Valves
- 5.0 Hydrants
- 6.0 Air Valves
- 7.0 End of Lines
- 8.0 Reaction Blocking
- 9.0 Water Services
- 10.0 General Procedures Flushing and Testing
 - 10.01 General, Cleaning and Preliminary Flushing
 - 10.02 Testing Procedure
- 11.0 Disinfection
 - 11.01 General
 - 11.02 Disinfection and Flushing Procedures

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 0.2m³ 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 from 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**

SECTION 6

WATER UTILITY EXCAVATION, BACKFILL, RESTORATION AND CLEANUP

- 1.0 Scope
- 2.0 Excavation
- 3.0 Backfill
- 4.0 Restoration
- 5.0 Compaction Testing

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.

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- .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 m³. 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 recompact 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 GWPR¹* 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 test³ 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.

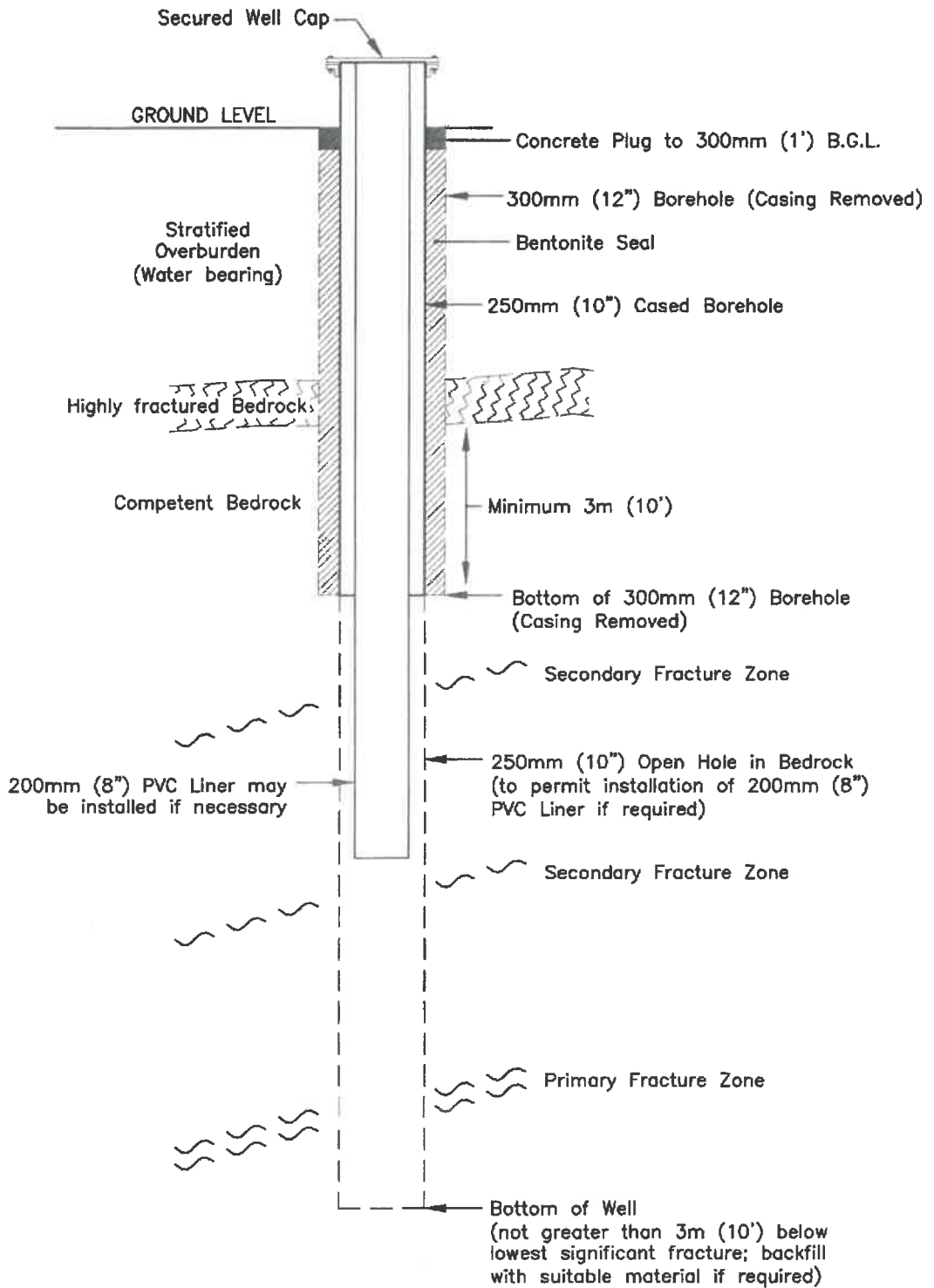
**COWICHAN BAY WATERWORKS DISTRICT
PROCEDURE "D"**

**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 than 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.



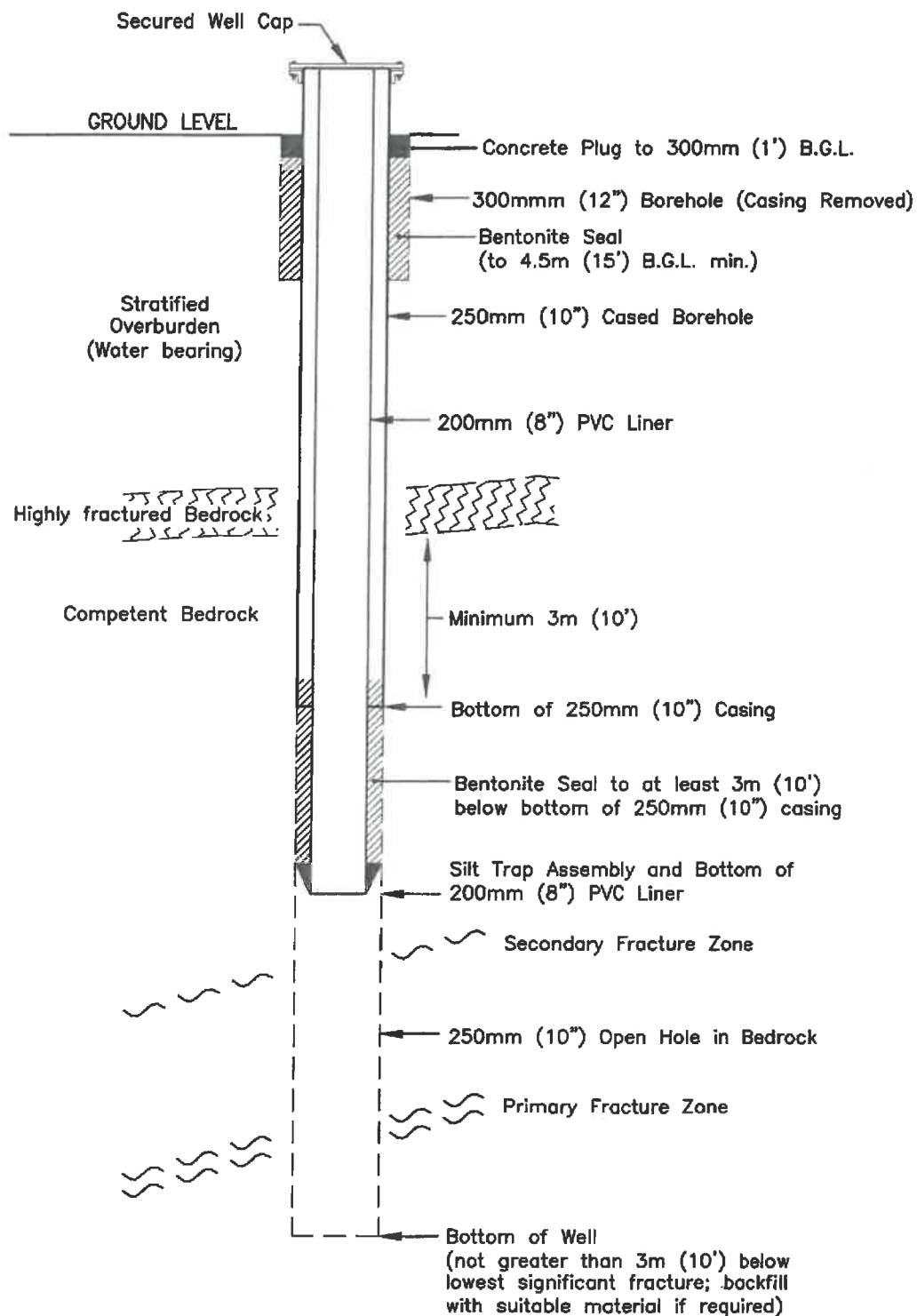
TYPICAL COMPLETED WELL SECTION FOR PVC LINED BEDROCK WELLS WHERE DEPTH TO BEDROCK IS LESS THAN 15 metres (50 ft.)

NOT TO SCALE

COWICHAN BAY WATERWORKS DISTRICT
FUTURE WELL REQUIREMENTS

FIGURE D-1





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



APPENDIX C
STANDARD DRAWINGS

SCHEDULE "B"

**The Works Engineering Drawings, Utilities and Connections
(attached hereto)**



Associated Engineering (B.C.) Ltd.
#206 1016 McCallum Road
Victoria, B.C., Canada, V9B 4C6

August 10, 2021
File: 2012-2147.01.E.03.04

TEL: 250.478.8383
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www.ae.ca

Caroline Stillinger
Administrator
Cowichan Bay Waterworks District
1760 Pavenham Road
Cowichan Bay, BC V0R 1N1

Re: ORDANO BOOSTER PUMP STATION DESIGN REVIEW

Dear Caroline:

1 DESIGN SUBMISSION REVIEW

Associated Engineering (B.C.) Ltd., on behalf of the Cowichan Bay Waterworks District (CBWD), has reviewed a design submission for the Proposed Ordano Road Booster Pump Station. The design was submitted by Cowichan Engineering Services on June 22, 2021. The submission consists of a covering letter dated August 4, 2021 along with updates to design package components that were reviewed previously in January and August 2020, and January, March, and July 2021. The covering letter includes responses to our July 2021 review comments.

The design includes responses to the two items identified as critical in the previous review. Several deficiencies in the design are still observed, foremost among them a lack of interdisciplinary coordination. It is likely that construction completed using these drawings will result in some changes being required in the field. However, since the most significant issues have now been addressed; we feel that this design package could now be utilized for construction of the pump station, with the developer bearing all risk for rework as a result of discrepancies between portions of the design documents. In short, we recommend that CBWD approves the design but reserves the right to reject work which does not conform to the most onerous requirement within the 78-page design appended to the letter of August 4, 2021.

2 REVIEW COMMENTS

- A. These review comments add to previous comments and must be read together with the earlier review letters. The Developer remains responsible for addressing all comments, including those not repeated below.
- B. The building envelope details have been amended to include insulation. The Contractor is to ensure that all self-adhered membranes and flashings are positively lapped to provide adequate drainage to the exterior.
- C. The cover letter clarifies that primary ventilation openings will be on NW and SE walls of the structure.

A Carbon
Neutral
Company

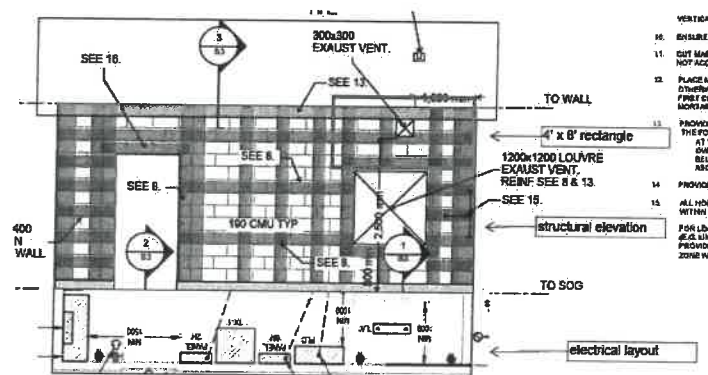
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Platinum
member

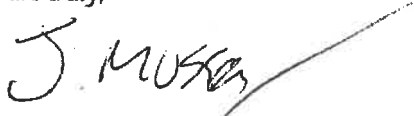
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- D. Structural elevations still show gable ends on the adjacent NE and SE walls. For a typical gable roof, these must be on opposite ends. The Developer is to provide written confirmation from the Structural Engineer of the correct roof orientation or to indicate desired roof type if gables are to be provided on adjacent walls. The District Engineer will require this information before they are able to provide confirmation that the Developer has substantially completed the building construction.
- E. The newly added architectural drawings call out moisture resistant drywall. As discussed previously and noted in Section 3.5 of the design report, Type X (fire rated) drywall is required. Demonstration that Type X drywall is installed will be required, to the satisfaction of the District Engineer. The District Engineer will require this information before they are able to provide confirmation that the Developer has substantially completed the building construction.
- F. Roof truss shop drawings, clearly indicating all required loading, must be prepared by a BC P.Eng. and provided to CBWD for our records. Required loading includes but is not limited to: ceiling assembly, lifting provisions, seismic, snow, and wind. The District Engineer will require these shop drawings before they are able to provide confirmation that the Developer has substantially completed the building construction.
- G. The covering letter indicates that a 4' x 8' (lengthwise) communications backboard is to be installed above the penetration on the NW wall. As shown on the following sketch, the wall does not have adequate space for this, and a suitable location for communications backboard will have to be determined in the field. The Contractor is to obtain CBWD's written approval for location of communications backboard. Backboard installed without CBWD's written approval may be rejected, in which case the Developer will be required to coordinate relocation of all items mounted upon the backboard.



We are available to discuss any of our comments noted above, should they be unclear.

Yours truly,



Jonathan Musser, P.Eng., M.A.Sc.
District Engineer

JM/sh



Cowichan Engineering Services LTD.

6468 Norcross Road
Duncan BC
V9L 6C5
Phone 250-737-1440
Fax 250-737-1551
cowichanengineering@shaw.ca

August 4, 2021

Our File: 1371-C

Cowichan Bay Waterworks District
1760 Pavenham Rd
Duncan, BC
V0R 1N1

Attn: Caroline Stillinger, District Administrator

RE: Design Submission for Booster Pump Station

Enclosed herewith is our design submission for approval for construction of the Booster Pump Station at the Ordano Reservoir site.

Enclosed is;

1. This Letter
2. Signed & Sealed Civil Design Brief
3. Signed & Sealed Civil Design Drawings
4. Signed & Sealed Structural Design Drawings of proposed building
5. Building Permit
6. Signed & Sealed Electrical Drawings
 - i. Electrical Design Brief
7. Actuator Valve – Detail Sketch
8. Ventilation Details
9. Building Envelope Confirmation

In addition we provide the following comments below with reference to Associated Engineering's (AE) design review;

1. General Notes:

- A. Enclosed are requirements set out by Praxis Architects to assure NECB compliance.
- B. Ventilation penetrations were and are shown on opposite walls (NW & SE)



Cowichan Engineering Services LTD.

6468 Norcross Road
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2. Structural: GC Engineering (GCE)

A. Penetrations on the NW and SE walls

3. Electrical

A. NW penetration to be below communications backboard. Backboard is 4'x8' plywood length wise above ventilation.

Please contact us at the above contacts with any questions or concerns.

Yours Very Truly,

Cowichan Engineering Services Ltd.

A handwritten signature in black ink, appearing to read "Cameron Williams", is written over a light blue horizontal line.

Cameron Williams, ASc.T.

cc Len Goodman– Cowichan Bay Estates

DESIGN BRIEF

COWICHAN BAY WATER DISTRICT BOOSTER STATION

Prepared For: Cowichan Engineering Services Ltd.
6468 Norcross Road
Duncan, BC V9L 6C5
Attention: Cam Williams

Prepared By: Islander Engineering Ltd.
623 Discovery Street
Victoria, BC V8T 5G4

Date: December 20 2019
Rev. No. 1 June 26 2020
Rev. No. 2 January 4 2021
Rev. No. 3 February 11 2021
Rev. No. 4 June 18 2021

Project: 2266 - Cowichan Bay Water



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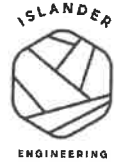
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FIGURES

- 1 Booster Station - Hydraulic Schematic
- 2 Booster Station - Schematic

APPENDIX

- A Grundfos Hydro MPC-EC 2CR95 95-2-2 3X575V Basis
- B Peerless AEF - Horizontal Split Case Single Stage Fire Pump
- C Hazen-Williams & Darcy-Weisbach Minor Losses



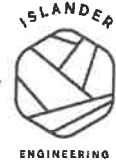
1 INTRODUCTION

This design brief has been prepared for the Cowichan Bay Waterworks District (CBWD) to provide information regarding the design and construction of a proposed booster pump station located at the Ordano Reservoir site. The proposed booster station is required to support the development of Phase 3A of the Cowichan Bay Estates by providing additional domestic water supply and fire protection to the existing network. The booster station will also improve domestic water supply and quality to the entire District and will increase the availability of stored emergency water for fire protection to residences located at higher elevations within the CBWD. The station design shall be in general accordance with the CBWD Engineering Specifications and Standard Drawings (February 2016), Section 4 - 9.0 Booster Pump Stations, as well as the National Fire Protection Association (NFPA) 20 - Standard for the Installation of Stationary Pumps for Fire Protection unless otherwise approved by CBWD. This report has also been prepared based on design criteria provided in a Technical Memorandum prepared by Associated Engineering (AE), *Booster Station Design Requirements* dated December 20th, 2018, and a subsequent Technical Memorandum, *Booster Pump Station Control Philosophy* dated October 2nd, 2019.

An initial submission including a preliminary Design Brief was made to CBWD in December 2019 and review comments were provided in a memorandum dated January 13th, 2020. Subsequent submissions were made to CBWD in July 2020 and February 2021 with review comments returned in memorandums dated August 10th, 2020, and March 30th, 2021. Islander understands that the selected pumps (both domestic and fire) will be input into the overall CBWD network model by their selected engineering consultant to confirm hydraulic performance. This report accompanies design drawings that have been prepared for the Site which detail critical specifications and the proposed layout of the booster pump station.

2 SYSTEM DESIGN REQUIREMENTS

The proposed system will consist of two domestic booster pumps (duty and standby), a diesel fire booster pump, electrical and controls equipment stationed within a non-



combustible, post-disaster structure. The booster station will be situated directly north of the existing reservoir with an approximate slab elevation of 87.75m geodetic (location to be confirmed and approved by CBWD). The existing site access will be maintained through the gated entrance along the south side of the Ordano Road and McGill Road intersection directly east of the proposed building. A summary for the existing Ordano Reservoir has been included in the table below,

Table 1 - Ordano Reservoir

Top Water Elevation (TWL)	100.9 m
Service Bottom Elevation (70% total storage volume)	97.0 m
Bottom Elevation	88.6 m
Total Storage Volume	1,568 m ³

Future domestic demand requirements within the CBWD are anticipated to increase which shall be supplied in part by the Ordano Reservoir system and the proposed booster station. A summary of the existing and future domestic requirements has been included in the table below,

Table 2 - Domestic Demand, CBWD

Existing Average Daily Demand (ADD)	1,140 m ³ /day (13.2 L/s)
Future Average Daily Demand	1,557 m ³ /day (18.0 L/s)
Peaking Factor	2.2
Existing Maximum Daily Demand (MDD)	2,508 m ³ /day (29.0 L/s)
Future MDD	3,425 m ³ /day (39.6 L/s)
Future MDD Pressure Zone 2	2,333 m ³ /day (27.0 L/s)

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2.1 Domestic Water Supply Pumps Design Criteria

To meet the increasing demand, the proposed domestic pumps will be required to supply approximately 450 cu.m. of water per day into the existing network. The pumps shall not draw Ordano Reservoir below 85% of its total storage capacity which represents a maximum pumped volume of approximately 225 cu.m. per pump cycle when the reservoir is full. Maintaining 85% of the total storage capacity within the reservoir will ensure adequate fire flows are available to service existing dwellings within Pressure Zones 1 & 2 in the CBWD system. The domestic booster pumps will provide a maximum of 27 L/s to the system which is equivalent to the forecasted future MDD flow rate for Pressure Zone 2. Accordingly, the system will be designed to match the operating pressure of Pressure Zone 2 which corresponds to the TWL of the Telegraph Reservoir (127m H₂O). A summary of the proposed domestic design requirements has been included in the table below,

Table 3 - Domestic Pump Requirements

Domestic Flow Demand	27 L/s (Future MDD of Pressure Zone 2)
Design Head	127 m H ₂ O

- Pump Design Elevation - ±88.20m
 - a. Pump station situated north of the existing reservoir
- Inlet Hydraulic Grade Line (HGL) = 8.80m (12.5 psi)- 12.70m (18.1 psi)
 - a. Minor losses from reservoir to pump inlet = ±0.61m
 - i. Calculated using Hazen-Williams and Darcy Weisbach Equations for pipe and minor losses in fittings (attached in Appendix "C")
 - b. Minor losses in overall system to be confirmed based on hydraulic operating conditions within CBWD model
 - c. Represents Ordano Reservoir TWL to Service Bottom Elevation (70% total storage volume)
- Outlet HGL = 38.80 (55.2 psi)
 - d. Minor losses within CBWD distribution network during forecasted MDD to be confirmed by others
- Net Positive Suction Head (NPSH) Available; assumed water temperature of 10°C
 - a. At TWL (100.9m) = 22.30m (31.70 psi)
 - b. At Service Bottom Elevation (97.0m) = 18.40m (26.20 psi)

- Net Positive Suction Head (NPSH) Required = 3.63m (5.16 psi)
- 150mm discharge piping
- Limiting Velocities:
 - Pump Discharge Piping = 3.0 to 5.0 m/s
 - Pump Suction Piping = 24 to 39 L/s
 - Flow Meter Velocity range = 24 to 39 L/s

Furthermore, as per the Technical Memorandums completed by AE, the following items shall be incorporated into the final detailed design package:

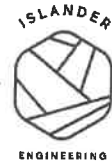
- A Variable Frequency Drive(s) will be required to reduce pressure surges during pump start up and to maintain the required head for varying flow rates
- A timer is to be included to turn on the booster pump at a pre-set time
- The pumps are to be turned off at a pre-set discharge volume
- The booster pumps will also turn on during low pressure during high demand when Telegraph reservoir cannot keep up. This would be the pressure when the Telegraph reservoir drops to approximately 85% (122m hydraulic grade)

In order to prevent a pumped loop at the Ordano Reservoir, an existing altitude valve located adjacent to the reservoir shall be modified to include an actuating device that can close the valve while the pumps are in operation. Upon completion of each pump cycle, the actuator will open the valve permitting the reservoir to be replenished from the distribution network. The configuration as proposed will replenish Ordano Reservoir once approximately every three days. Additional operating information has been included in the Schematic Design Report completed by AES Engineering which is summarized in *Section 3.3* of this report.

2.2 Fire Pump Design Criteria

A fire pump shall supply the required fire flow in addition to the forecasted MDD while maintaining the minimum residual pressure (140 kPa or 20 psi at the highest operating point of the system) during fire flow scenarios and shall provide more effective access to stored water within the Ordano Reservoir for fire fighting. The fire pump shall also be equipped with a pressure sensor that turns the systems on when the network pressure



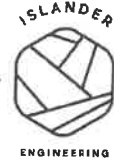


drops to 117m HGL which corresponds to the minimum residual pressure (14m pressure head or 20psi) at the highest service connections within the CBWD network (Mindy Road and Sears Road area at 103m). The working range of the proposed system will be from the bottom of the Ordano Reservoir at 88.6m to 117 m geodetic (slightly below the low-level alarm level of the Telegraph Reservoir set at approximately 118 m). A summary of the proposed fire pump design requirements has been included in the table below:

Table 4 - Fire Pump Requirements

Fire Flow Demand	133 L/s
Design Head	117m H ₂ O

- Pump Design Elevation - $\pm 88.45\text{m}$
 - a. Pump station situated north of the existing reservoir
- Inlet HGL = 0.15m (0.2 psi) – 8.55m (12.2 psi)
 - a. Minor losses from reservoir to pump inlet = $\pm 4.44\text{m}$
 - i. Calculated using Hazen-Williams and Darcy-Weisbach Equations for pipe and minor losses in fittings (attached in Appendix "C")
 - b. Minor losses in overall system to be confirmed based on hydraulic operating conditions within CBWD model
 - c. Represents reservoir Service Bottom Elevation (70% total storage volume) to Reservoir Bottom Elevation
- Outlet HGL = 28.55m (40.6 psi)
 - e. Minor losses within CBWD distribution network during forecasted MDD to be confirmed by others
- Net Positive Suction Head (NPSH) Available; assumed water temperature of 10°C
 - a. At Service Bottom Elevation (97.0m) = 14.32m (20.36 psi)
 - b. At Reservoir Empty (88.6m) = 5.92m (8.42 psi)
- As per communication with Peerless, "NPSH_R is not provided for fire pumps as all fire pumps must perform to an NPSH test per UL/FM/ULC testing procedures and therefore NPSH_R is not a factor when sizing a fire pump that is designed for a system per NFPA-20". Provided the suction line is submerged, NPSH_R is not a concern.
- Assumes a minimum 250mm discharge
- Limiting Velocities:
 - Pump Discharge Piping = 2.0 to 5.0 m/s
 - Pump Suction Piping = 98 to 245 L/s
 - Flow Meter Velocity range = 98 to 245 L/s



Furthermore, as per the Technical Memorandums completed by AE, the following items shall be incorporated into the final detailed design package:

- The fire pump will have a manual shutoff that can be operated by the CBWD operator or Fire Department
- The fire pump will have a communication system that can be used to notify several individuals (by phone or text message) that it has been switched on
- The altitude valve at Ordano Reservoir should be closed using an actuator when the fire pump engages
- A control valve or other suitable method should be used to reduce pressure surges at the pump start up
- The design should be in accordance with the National Fire Protection Association (NFPA) 20 – Standard for the Installation of Stationary Pumps for Fire Protection

2.3 CBWD Engineering Specifications & Standard Drawings 2016)

The design of all booster station requirements shall be in accordance with the CBWD Engineering Specifications and Standard Drawings, Section 4 - 9.0 Booster Pump Stations.

Table 5 - General Design Criteria

Friction Coefficient (Hazen Williams)	130
Standby Power	N/A
Station Piping	316L Schedule 10S; stainless steel pipe shall conform to the latest AWWA C220
Electric Actuators	AWWA Standard C540-02
Butterfly Valves	AWWA Standard C504-06
Check Valves	Silent Check Valve
Pressure Relief, Control and Air Valves	Singer or Clayton
Gate Valves	AWWA C509, Fusion bonded Epoxy to AWWA

Flow Meter	Magmeter, with 4-30mA signal. Piping to be clear minimum three pipe diameters upstream and five pipe diameters downstream
Flow Control Valves	AWWA

2.4 Pressure Requirements

The proposed booster station design shall ensure sufficient pressure within the distribution system is maintained as per CBWD Engineering Specifications and Standard Drawings, Section 2.03:

- Minimum operating pressure, MDD = 275 kPa (40psi)
- Minimum operating pressure, PHD = 240 kPa (35psi)
- Minimum residual pressure during Fire, Fire Flow plus MDD = 20 psi (140 kPa)
- Maximum desirable working pressure = 700 kPa (100 psi)

3 *PUMP STATION DESIGN*

The preliminary booster pump station design including the domestic and fire pumps have been included in the following sections. Schematic figures detailing the proposed system have been attached to the end of the report.

3.1 Piping:

Main Pipe Diameter and Velocities:

- Domestic Pump Discharge pipe - 150mm – 1.5 m/s (@ 27 L/s)
- Fire Pump Discharge pipe - 250mm – 2.7 m/s (@ 133 L/s)

All station piping shall be supported using flange connected pipe stands. The fire pump shall be located on a steel skid (see below). The Contractor shall provide shop drawings and product data sheets for the steel skid and all pumps, piping, valves, fittings, electrical and control equipment.

3.2 Domestic Pumps

To meet the domestic water supply pump design criteria specified in Section 2.1, a Grundfos pressure booster system (Hydro MPC E 2CR95-2-2 3x575V Basis) has been selected for approval by CBWD. The accompanying specifications have been included in Appendix "A" and have been summarized below:

- Delivers approximately 27 L/s (430 USGPM) @ 39.8m (56.6psi) TDH
- Contains 2 vertical, multistage centrifugal pumps, type CR95-2-2
- Pump rotating parts in contact with pumped liquid are made of ANSI 304 stainless steel
- All pumps are speed controlled
- Each pump is equipped with an external variable frequency drive in panel
 - a. Hydro MPC-EC maintains constant pressure through continuous adjustment of the speed of the pumps
 - b. The system performance is adapted to the demand through cutting in/out the required number of pumps and through parallel control of the pumps in operation
 - c. Pump changeover is automatic and depends on load, operating hours and fault
- Dry-running protection is standard with use of pressure transducer on suction manifold
 - d. Control MPC in a UL 12 steel control panel enclosure including main disconnect switch, all required fuses, motor protection, switching equipment and microprocessor-controlled CU 352.

3.3 Fire Pump

To meet the fire flow demand requirements specified in Section 2.2, a Peerless, AEF horizontal split case single stage diesel fire pump (Peerless - 8AEF20G) on a steel skid complete with a diesel engine to provide backup power. Preliminary fire pump system configuration has been coordinated with Chamco Industries Ltd. The pump specifications have been included in Appendix "B" and have been summarized below:

- Delivers approximately 133 L/s (2,100 USGPM) @ 32.3m (46psi) TDH

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- 291mm impeller (11.46 inches)
- 75hp, pump speed of 1780 RPM, Diesel

All equipment will be mounted on 8' wide x 12' long structural steel skid with following components:

- C6 x 8.2 main structure members
- Checker-plate decking
- Four (4) lifting lugs c/w 100% MPI testing
- Sand blasted to SSPC-6, primed, and painted grey enamel

All skid piping shall be carbon steel as per the following:

- One (1) 10" fire pump suction piping with one 150# flange connection at skid edge
- One (1) 10" fire pump discharge piping with 150# flange connection at skid edge
- One (1) 8" test flow meter line with one 150# flange connection at skid edge
- For above, the piping is A106B, Sch. 40 or standard, with A234WPB weld fittings, and A105N ANSI flanges. All welding is done to ANSI B31.3 and hydro tested to code. 10% radiography is included
- All piping and welded fittings to be sand blasted to SSPC-6, primed, and painted red enamel
- All piping 2" and smaller is 304 stainless steel
- All sensing lines are stainless steel tubing c/w stainless steel fittings

A final detailed skid design package shall be procured from Chamco (or an approved equal) upon approval of the system design by CBWD.

3.4 Electrical and Controls

Electrical controls and communication will be in accordance with CBWD Engineering Specifications and Drawings Section 9.03. Communication between the Ordano Reservoir and the proposed booster station will be accomplished using the existing hard wired Telus or Shaw network and will be compatible with the existing CBWD communication system. A Schematic Design Report completed by AES Engineering dated March 3rd, 2021 summarizes the available electrical services adjacent to the site and details the on-site power and



communication requirements for the proposed booster station. Detailed design drawings completed by AES have been included with this submission. As per the AES drawings, three phase power is available from a nearby BC Hydro transformer bank (transformers are 10kVA each) located approximately 100m from the Site on McGill Road.

The existing transformer bank presently provides power to the site via overhead cables which terminate on a site service pole before dipping underground through a pilaster to service the existing buildings. AES is proposing to demolish the existing dip service and install new power and communications pilasters to service the proposed booster station and existing building. A communication connection to the local telephone and internet networks was confirmed on the existing overhead system which connects to the service pole on-site before proceeding overhead to a communication pilaster along the corner of the existing site.

3.5 Pump Building

The domestic and fire pumps, piping, valves, electrical and communications equipment are to be housed in a structure and shall consist of the following general components:

- Building footprint of 42.25 sq.m. (455 sq. ft.)
- Reinforced concrete blocks to CSA S304.1-14 'Masonry Design for Buildings' and CSA A371 'Masonry Construction for Buildings'
- Reinforced concrete slab
- Timbre roof truss complete with membrane and metal roof
- Roof trusses to be designed with suitable lifting rungs to accommodate maintenance requirements
- Double layer of 5/8" fire wall drywall on the ceiling
- Roof water leaders and footing drains connecting to Site drainage system
- Wall mounted electric heat
- Gable ends to be finished with hardy plank
- Wall mounted vents will be utilized for diesel fire pump exhaust
- Wall mounted louvers will be installed to create adequate cross ventilation as per Avalon Mechanical Specifications



- Access hatch to attic will be installed at time of construction

All design and construction shall be completed to the latest version of the British Columbia Building Code. Detailed design drawings completed by GC have been included with this submission.

4 CLOSURE

The design brief for the proposed booster pump station located at the Ordano Reservoir site within the Cowichan Bay Water District has been prepared by,

ISLANDER ENGINEERING LTD.

Please contact the undersigned if you have any questions or concerns.

Yours Truly,

A handwritten signature in black ink, appearing to be "C. Brown".

Corey Brown, M.Eng., EIT, ASCT
Project Design Engineer



A handwritten signature in black ink, appearing to be "Mike Achtem".

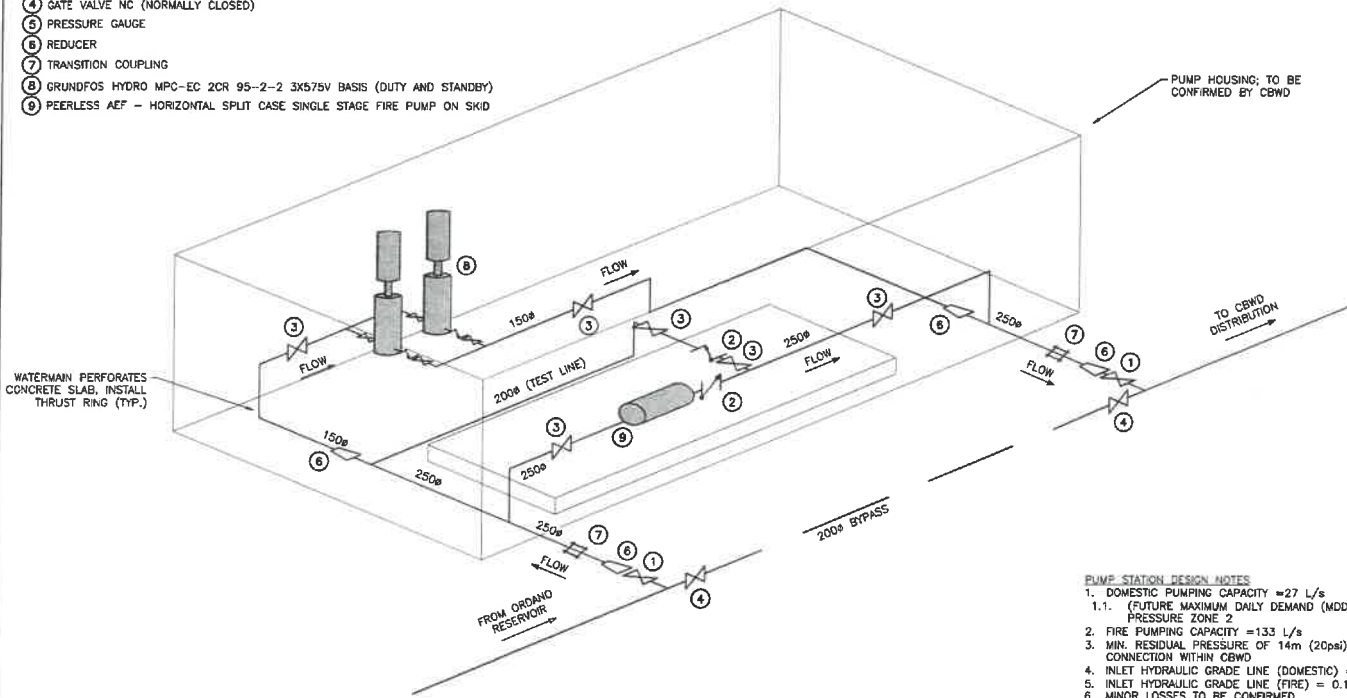
Mike Achtem, P.Eng., CCA, PMP
Principal, Review Engineer

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FIGURES

- ① GATE VALVE ISOLATES SYSTEM
- ② CHECK VALVE
- ③ GATE VALVE NO (NORMALLY OPEN)
- ④ GATE VALVE NC (NORMALLY CLOSED)
- ⑤ PRESSURE GAUGE
- ⑥ REDUCER
- ⑦ TRANSITION COUPLING
- ⑧ GRUNDFOS HYDRO MPC-EC 2CR 95-2-2 3X575V BASIS (DUTY AND STANDBY)
- ⑨ PEERLESS AEF - HORIZONTAL SPLIT CASE SINGLE STAGE FIRE PUMP ON SKID



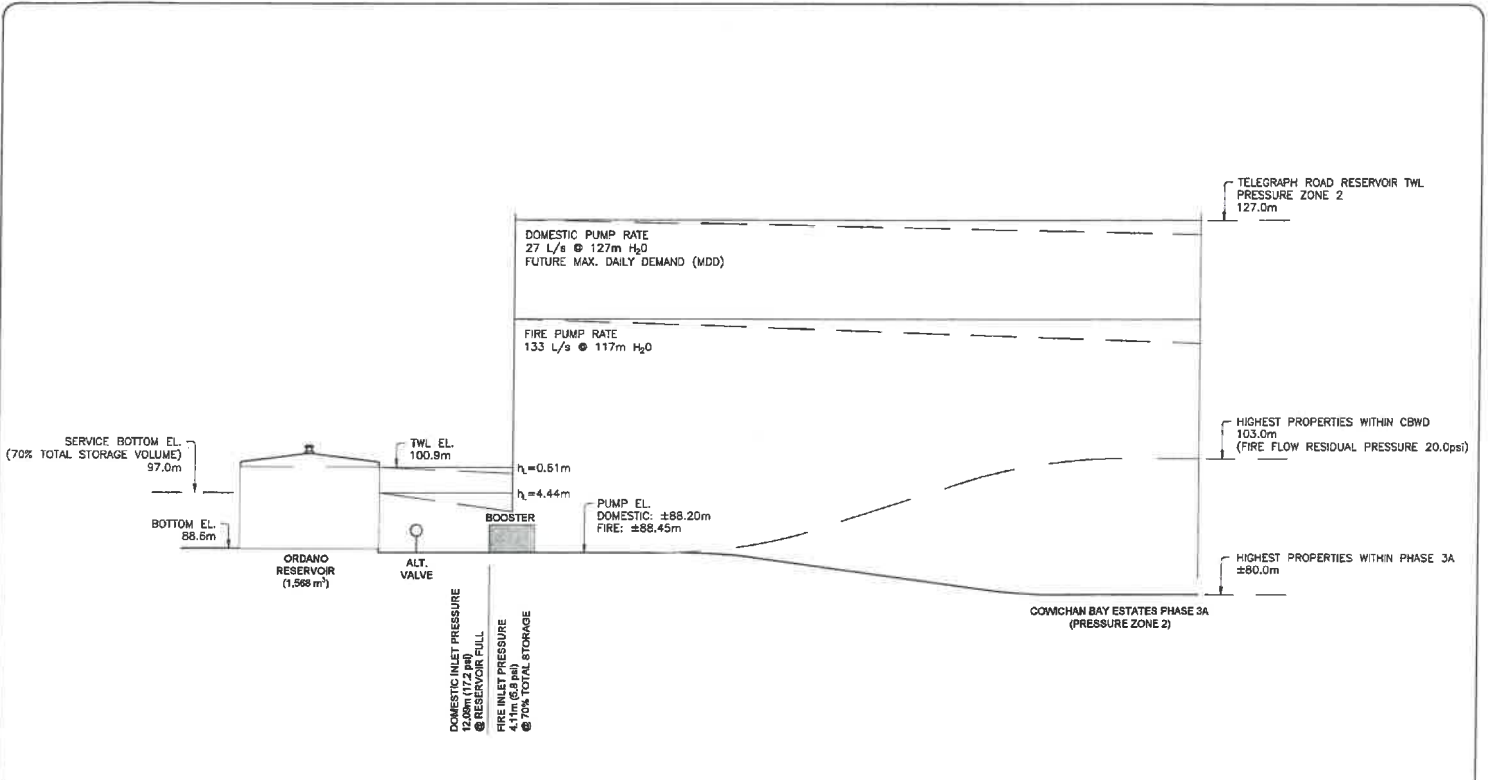
- PUMP STATION DESIGN NOTES**
1. DOMESTIC PUMPING CAPACITY = 27 L/s
 - 1.1. (FUTURE MAXIMUM DAILY DEMAND (MDD) WITHIN CWD PRESSURE ZONE 2)
 2. FIRE PUMPING CAPACITY = 133 L/s
 3. MIN. RESIDUAL PRESSURE OF 14m (20pa) AT HIGHEST SERVICE CONNECTION WITHIN CWD
 4. INLET HYDRAULIC GRADE LINE (DOMESTIC) = 8.80m TO 12.70m
 5. INLET HYDRAULIC GRADE LINE (FIRE) = 0.15m TO 8.55m
 6. MINOR LOSSES TO BE CONFIRMED
 7. PUMP PIPING TO BE 316L SCHEDULE 10 STAINLESS STEEL

FEBRUARY 4, 2021
**FINAL REPORT
 DRAWING**

BOOSTER PUMP STATION - SCHEMATIC
 NTS

ORDANO RESERVOIR SITE BOOSTER STATION - SCHEMATIC	
COWICHAN BAY WATER DISTRICT	
I&L PROJECT - 2266	
ISSUED: FEB 4, 2021	
DRAWN BY: CEB	CHECKED BY: M7A

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BOOSTER STATION - HYDRAULIC SCHEMATIC
NTS

DECEMBER 21, 2020

FINAL REPORT
DRAWING

ORDANO RESERVOIR SITE BOOSTER STATION - HYDRAULIC SCHEMATIC	
COWICHAN BAY WATER DISTRICT	
ZEL PROJECT - 2266	
ISSUED: DEC 21, 2020	
DRAWN BY: CBB	CHECKED BY: MJA



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APPENDIX A

**Grundfos Hydro MPC-EC 2CR 95 2CR95-2-2 3X575V
Basis**

Pump Performance Datasheet

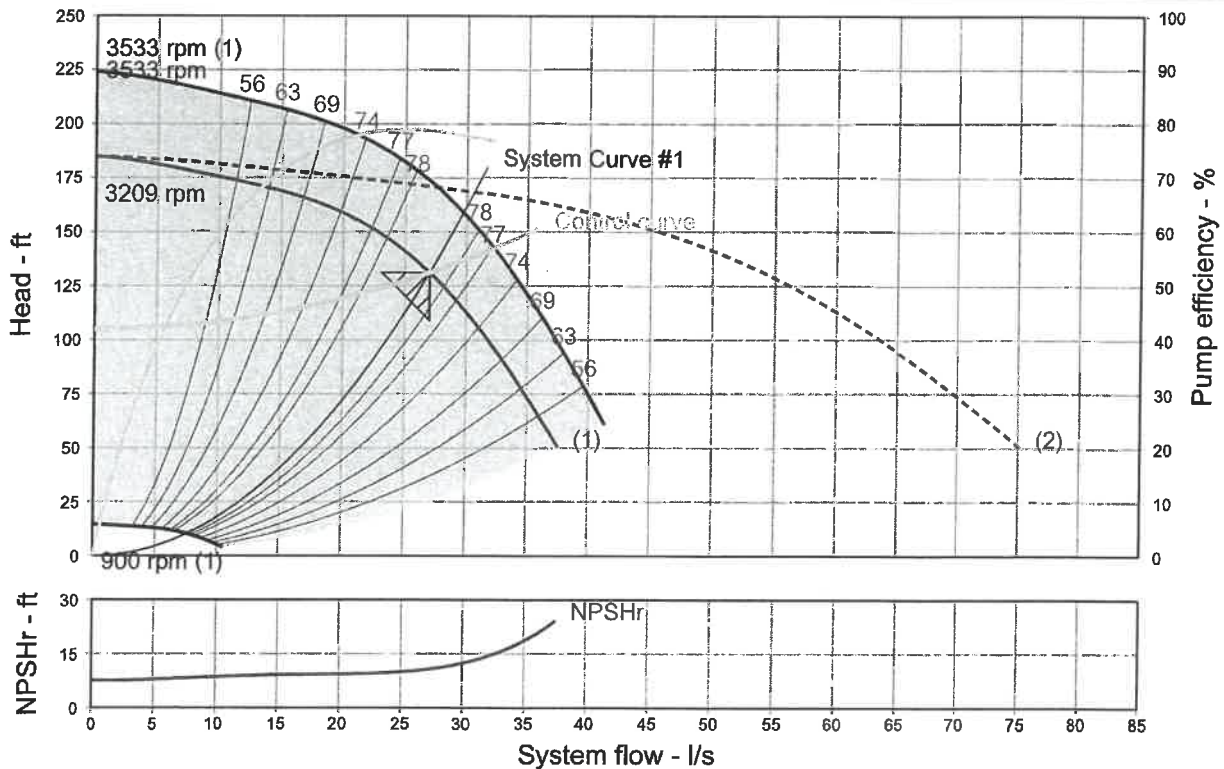
Customer :	Quote Number / ID : 843320
Customer ref. / PO :	Model : Hydro MPC-EC (CUE) 2CR 95-2-2
Tag Number : 001	Part Number : Custom system
Service :	Stages : 2
Quantity : 1	Based on curve number : 95-2-2_SB
Quantity of pumps : 1 active + 1 standby	Date last saved : December 18, 2020 10:21 AM

Operating Conditions		Liquid	
System flowrate : 27.00 l/s	Liquid type : Cold Water	Additional liquid description :	
Flowrate per pump : 27.00 l/s	Temperature, max : 68.00 deg F	Fluid density, rated / max : 1.000 / 1.000 SG	
Differential head / pressure, rated (requested) : 131.2 ft	Viscosity, rated : 1.00 cP	Vapor pressure, rated : 0.34 psi.a	
Differential head / pressure, rated (actual) : 131.3 ft			
Suction pressure, min / max : 0.00 / 0.00 psi.g			
NPSH available, rated : Ample			
Site Supply Frequency : 60 Hz			
Power Supply : 3ph 575V			

Performance		Material	
Speed, rated : 3209 rpm	Material selected : Standard - Cast Iron / 304 Stainless Steel		
Speed, maximum : 3533 rpm			
Speed, minimum : 900 rpm			
Pump efficiency : 78.64 %			
NPSH required / margin required : 10.64 / 0.00 ft			
nq (imp. eye flow) / S (imp. eye flow) : 53 / 220 Metric units			
Head maximum, rated speed : 184.9 ft			
Head rise to shutoff : 40.84 %			
Flow, best eff. point : 25.94 l/s			
Flow ratio, rated / BEP : 104.09 %			
Speed ratio (rated / max) : 90.83 %			
Head ratio (rated speed / max speed) : 75.57 %			
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010] : 1.00 / 1.00 / 1.00 / 1.00			
Selection status : Acceptable			

Pressure Data		Driver & Power Data (@Max density)	
Pump shut off pressure : 184.5 ft H2O.g	Motor sizing specification : Max power (non-overloading)	Margin over specification : 0.00 %	Service factor : 1.00
Maximum allowable suction pressure : 145.0 psi.g	Rated power (based on duty point) : 18.03 hp	Max power (non-overloading) : 18.03 hp	Nameplate motor rating : 25.00 hp / 18.64 kW (Fixed)
	Panel Max FLA * : 70 A		
	* addition of pilot pump, up-sizing HP, or 3x575V will affect System FLA		

Energy Indexes	
PEI (VL) : 0.45	
ER (VL) : 55	



Hydro MPC E (CUE) with CR pumps

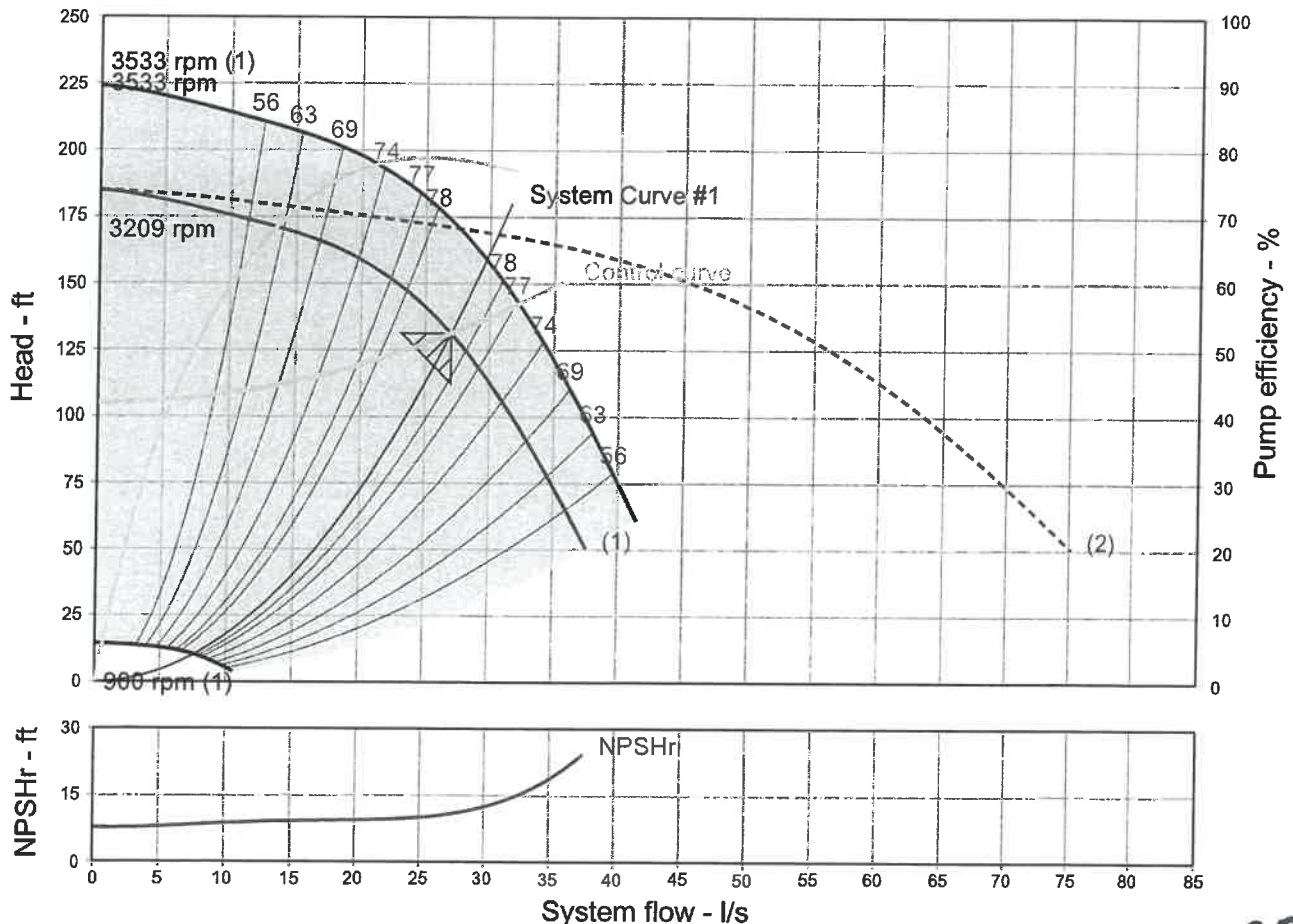
QUOTE NUMBER / ID 843320	UNIT TAG 001	QUANTITY 1
REPRESENTATIVE ENGINEER	SERVICE SUBMITTED BY	DATE
CONTRACTOR	APPROVED BY	DATE
	ORDER #	DATE



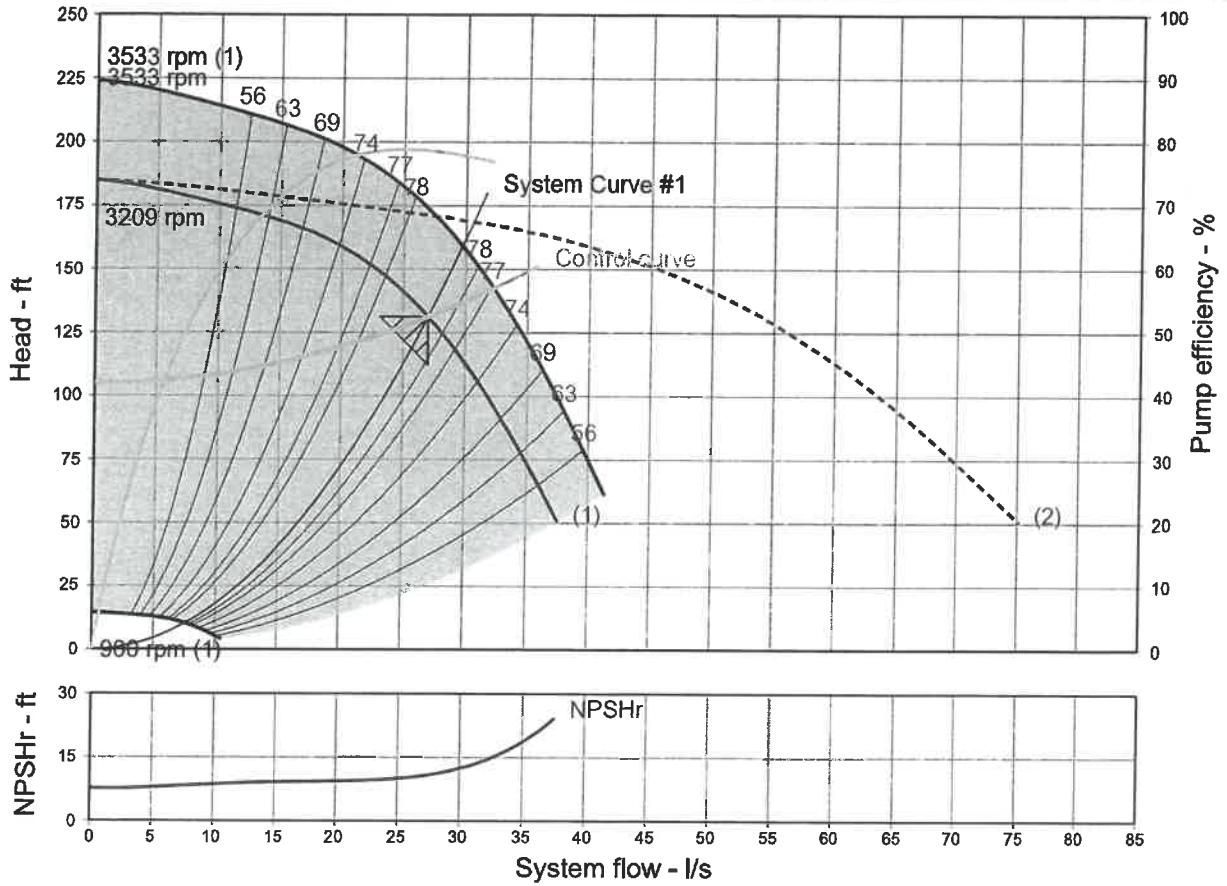
**Hydro MPC-EC (CUE)
2CR 95-2-2 3x575V 60Hz
3533 rpm**

Part Number N/A

Conditions of Service		Pump Data		Motor Data	
Flow Per Pump	27.00 l/s	Material	Standard - Cast Iron / 304 Stainless Steel	Nameplate HP	25 HP
Head	131.2 ft	Pump shut off pressure	184.5 ft H2O.g	Rated Power	18.03
Liquid	Cold Water	Max Allowable Suction Pressure	334.5 ft H2O.g	Enclosure	TEFC
Temperature	68.00 deg F	Pump Efficiency	78.64 %	Voltage	575 V
NPSHr	10.64 ft	PEI (VL)	0.45	Phase	3 Phase
Viscosity	1.00 cP	ER (VL)	55		
Specific Gravity	1.000 SG				



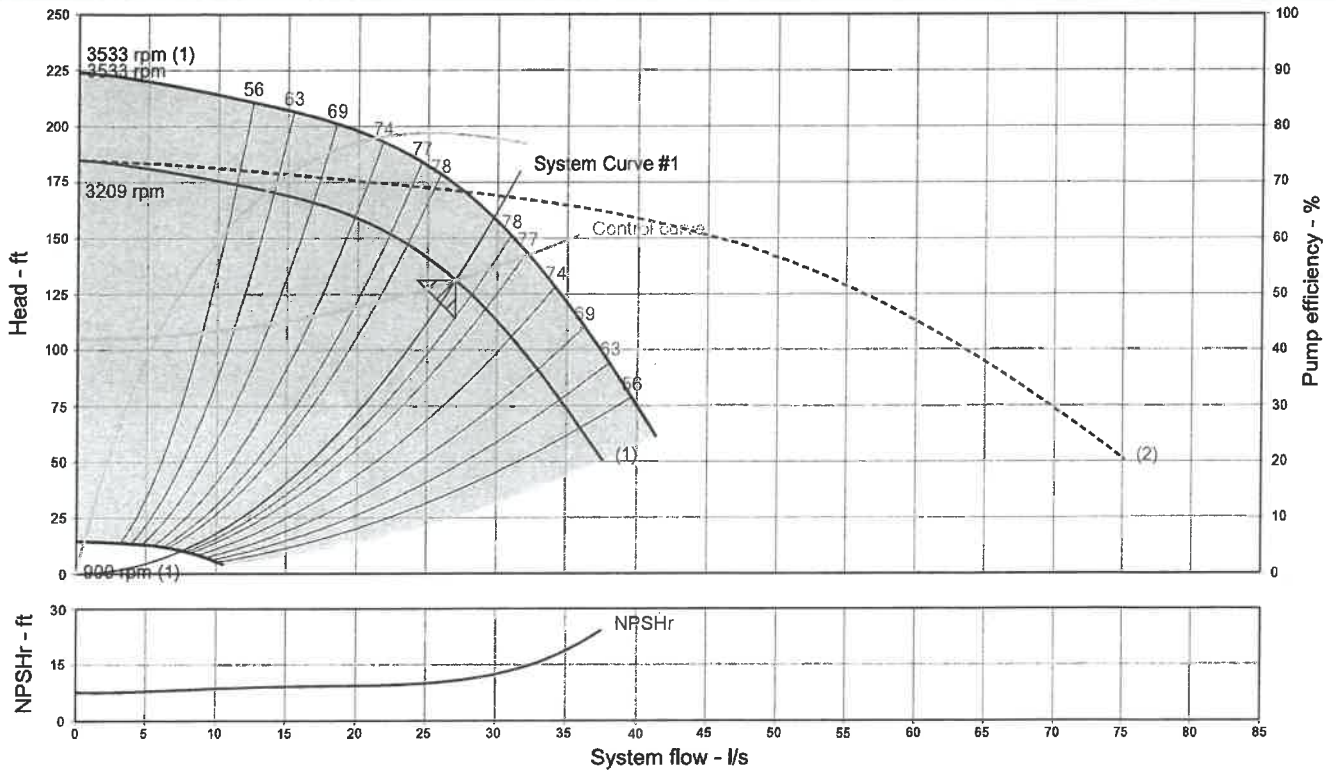
Pump Performance Curve



Customer :	Model :	Hydro MPC-EC (CUE) 2CR
Customer ref. / PO :	Stages :	95-2-2 3x575V 60Hz
Tag Number : 001	Speed, rated :	3209 rpm
Service :	Based on curve number :	95-2-2_SB
Quantity : 1	Pump efficiency :	78.64 %
Quote Number / ID : 843320	Rated power (based on duty point) :	18.03 hp
Date last saved : December 18, 2020 10:21 AM	NPSH required :	10.64 ft
System flowrate : 27.00 l/s	Fluid density, rated / max :	1.000 / 1.000 SG
Flowrate per pump : 27.00 l/s	Viscosity :	1.00 cP
Differential head / pressure, rated : 131.2 ft		
Pressure control curve : Quadratic control curve		

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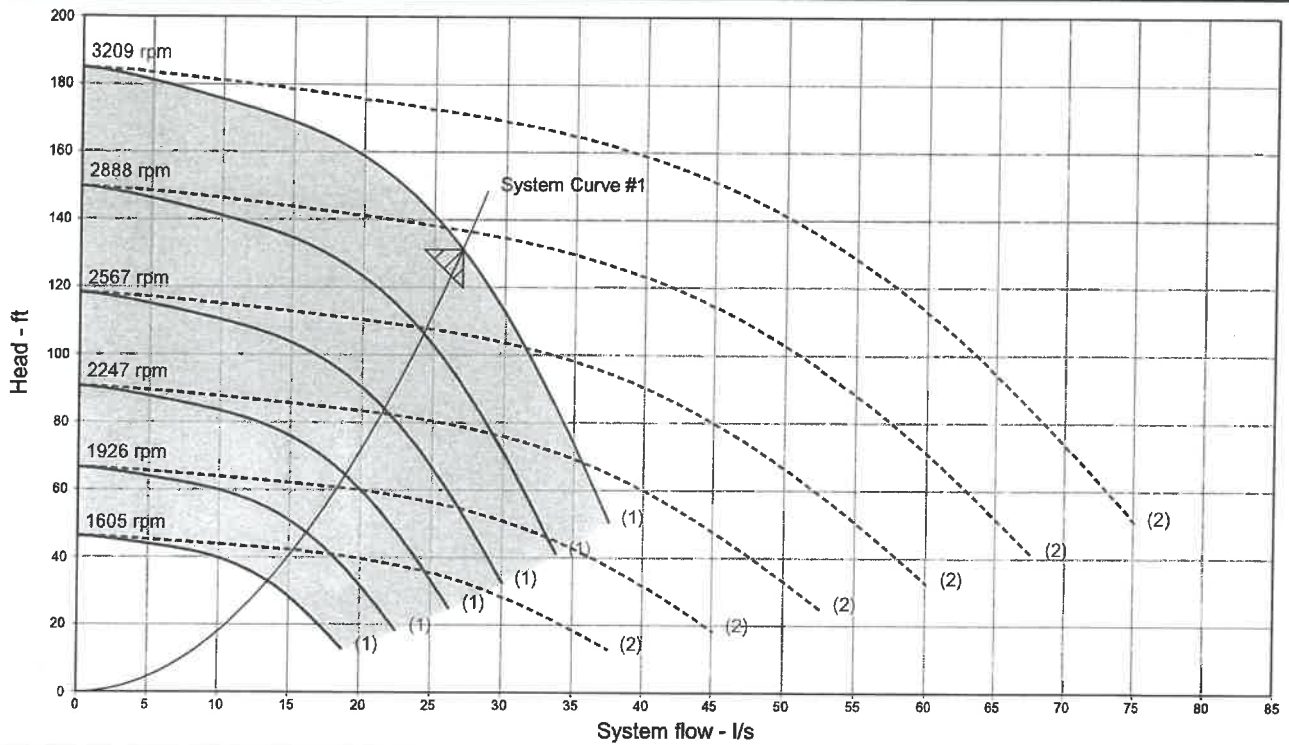
Pump Performance Curve



Project name	: Default	Tag Number	: 001	Speed, rated	: 3209 rpm
Consulting engineer	:	Service	:	System flowrate	: 27.00 l/s
Customer	:	Model	: Hydro MPC-EC (CUE) 2CR	Flowrate per pump	: 27.00 l/s
Customer ref. / PO	:		: 95-2-2 3x575V	Differential head / pressure, rated	: 131.2 ft
Quote Number / ID	: 843320	Quantity	: 60Hz : 1	Rated power (based on duty point)	: 18.03 hp
Date last saved	: December 18, 2020 10:21 AM	Quoted By (Sales Office)	: Grundfos Canada Inc. (GCA)	Max power (non-overloading)	: 18.03 hp
Pressure control curve	: Quadratic control curve	Quoted By (Sales Engineer)	: Chris Check	Pump efficiency	: 78.64 %
				Based on curve number	: 95-2-2_SB

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Multi-Speed Performance Curve



Project name	: Default	Tag Number	: 001	Speed, rated	: 3209 rpm
Consulting engineer	:	Service	:	System flowrate	: 27.00 l/s
Customer	:	Model	: Hydro MPC-EC (CUE) 2CR	Flowrate per pump	: 27.00 l/s
Customer ref. / PO	:		: 95-2-2 3x575V	Differential head / pressure, rated	: 131.2 ft
Quote Number / ID	: 843320	Quantity	: 60Hz : 1	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: December 18, 2020 10:21 AM	Quoted By (Sales Office)	: Grundfos Canada Inc. (GCA)	Viscosity	: 1.00 cP
Pressure control curve	: Quadratic control curve	Quoted By (Sales Engineer)	: Chris Check	Based on curve number	: 95-2-2_SB



Pump Performance - Additional Data

Project name	: Default	Tag Number	: 001			
Consulting engineer	:	Service	:			
Customer	:	Model	: Hydro MPC-EC (CUE) 2CR 95-2-2 3x575V 60Hz			
Customer ref. / PO	:	Quantity	: 1			
Quote Number / ID	: 843320	Quoted By (Sales Office)	: Grundfos Canada Inc. (GCA)			
Date last saved	: December 18, 2020 10:21 AM	Quoted By (Sales Engineer)	: Chris Check			
Stages	: 2	Speed, rated	: 3209 rpm			
Performance Data		Stage, Speed and Solids Limits				
Head, maximum speed, rated flow	: 173.7 ft	Stages, maximum	: 2			
Head, minimum speed, rated flow	: 407.0 ft	Stages, minimum	: 2			
Head maximum, rated speed	: 184.9 ft	Pump speed limit, maximum	: 3533 rpm			
Efficiency adjustment factor, total	: 1.00	Pump speed limit, minimum	: 900 rpm			
Power adjustment, total	: 0.00 hp	Curve speed limit, maximum	: 3533 rpm			
Head adjustment factor, total	: 1.00	Curve speed limit, minimum	: 900 rpm			
Flow adjustment factor, total	: 1.00	Variable speed limit, minimum	: 900 rpm			
NPSHR adjustment factor, total	: 1.00	Solids diameter limit	: 0.01 in			
NPSH margin dictated by pump supplier	: 0.00 ft	Energy Indexes				
NPSH margin dictated by user	: 0.00 ft	ER (VL)	: 55			
NPSH margin used (added to 'required' values)	: 0.00 ft	PEI (VL)	: 0.45			
Mechanical Limits		Typical Driver Data				
Torque, rated power, rated speed	: 0.56 hp/100 rpm	Driver speed, full load	: 3525 rpm			
Torque, maximum power, rated speed	: 0.56 hp/100 rpm	Driver speed, rated load	: 3546 rpm			
Torque, driver power, full load speed	: 0.71 hp/100 rpm	Driver efficiency, 100% load	: N/A			
Torque, driver power, rated speed	: 0.71 hp/100 rpm	Driver efficiency, 75% load	: N/A			
Torque, pump shaft limit	: -	Driver efficiency, 50% load	: N/A			
Radial load, worst case	: -					
Radial load limit	: -					
Impeller peripheral speed, rated	: -					
Impeller peripheral speed limit	: -					
Various Performance Data		System flow (l/s)	Head (ft)	Pump efficiency (%)	NPSHr (ft)	Power (hp)
Shutoff, rated diameter		0.00	184.9	-	-	9.36
Shutoff, maximum diameter		0.00	224.1	-	-	12.50
MCSF		-	-	-	-	-
Rated flow, minimum diameter		27.00	407.0	-	-	-
Rated flow, maximum diameter		27.00	173.7	78.52	-	23.90
BEP flow, rated diameter		26.94	136.7	78.82	10.26	18.01
120% rated flow, rated diameter		32.40	95.26	70.59	14.76	17.49
End of curve, rated diameter		37.59	50.26	46.09	24.31	16.40
End of curve, minimum diameter		10.54	3.95	46.09	1.91	0.36
End of curve, maximum diameter		41.39	60.93	46.09	29.47	21.89
Maximum value, rated diameter		-	184.9	78.82	-	18.03
Maximum value, maximum diameter		-	-	78.82	-	24.07
System differential pressure		@ Density, rated		@ Density, max		
Differential pressure, rated flow, rated diameter (psi)		56.80		56.80		
Differential pressure, shutoff, rated diameter (psi)		80.00		80.00		
Differential pressure, shutoff, maximum diameter (psi)		96.99		96.99		
Discharge pressure		@ Suction pressure, rated	@ Suction pressure, max	@ Suction pressure, rated	@ Suction pressure, max	
Discharge pressure, rated flow, rated diameter (ft H2O.g)		131.0	131.0	131.0	131.0	
Discharge pressure, shutoff, rated diameter (ft H2O.g)		184.5	184.5	184.5	184.5	
Discharge pressure, shutoff, maximum diameter (ft H2O.g)		223.7	223.7	223.7	223.7	
Ratios						
Maximum flow / rated flow, rated diameter	: 139.22 %	Head rated diameter / head minimum diameter, rated flow		: 32.25 %		

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Panel Part Number:
99554710

Description
Control MPC EC
2 X 25HP
3 X 575V

Selected Options: System Fault Light, Audible Alarm, Surge Protection, Pump Run Light, Normal/Emergency Switch, Service Disconnect Switch

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1	9/3/2019			EDW-CD-GPC-1237				
ECM/Rev	Date							

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Feeder Circuit Protection:

Feeder circuit protection to be provided by others.
Type and size to be based on local, state and national electrical codes

SCCR Rating: 100 kA RMS Symmetric, 480V

UL Type Rating: 12

Largest Motor FLA and Panel Maximum FLA:

Motor Horsepower	25HP
Motor FLA	34FLA
Panel Max. FLA	70FLA

Wire Type	Color	Abbr.
+12/24VDC Power/PLC Input(s)	Blue	BU
-12/24VDC Power/PLC Input(s)	Blue w/White Stripe	BUWH
115VAC Primary Line Power	Black	BK
115VAC Neutral	White	WH
Ground/PE	Green/Yellow Stripe	GNYE
Analog Inputs	Orange	OG
Analog Outputs	Orange	OG
Digital Inputs (CU Components)	Violet	VT
Ground for Digital Inputs (CU Components)	Violet w/White Stripe	VTWH
Digital Outputs	Yellow	YE
Power L1	Black	BK
Power L2	Orange	OG
Power L3	Red	RD
Power Neutral	White	WH
All Other Wiring	Brown	BN

Safety / Application Notes:

**** Please Reference the "BOOSTERPAQ - HYDRO MPC"**

Installation and Operation Instructions

"BEFORE" Applying power to Panel.



** Power supply wires in front of main disconnect switch have dangerous voltage even though the main disconnect switch is off.


** Control panel must be connected professionally to the earth / ground.

** GRUNDFOS MLE motors have an integrated variable frequency drive (VFD) which provides motor overload protection. If a system utilizes MLE motors, the motor overload protection is provided by the VFD and does not require any additional motor overload protection.

Cross Reference Definition
(##-##)
Sheet-Row

Wire Types

Internal Panel Wire 
External Wire 


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1	9/3/2019			EDW-CD-GPC-1237	
ECM/Rev	Date				SHEET: 2/10

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1 1-Table of Contents

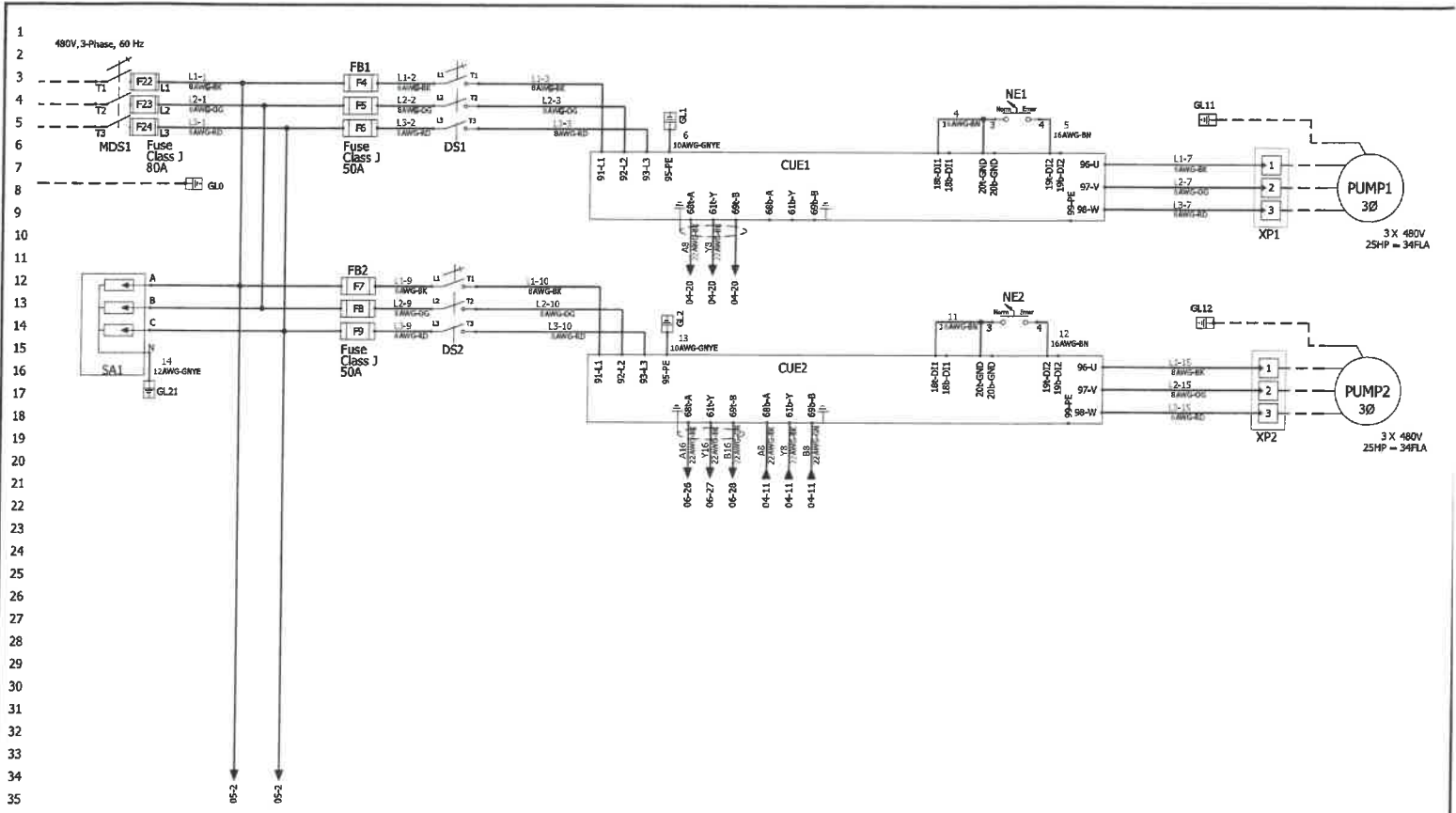
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02	0	6/18/2019	cabel	Cover Page 02
03	0	6/18/2019	cabel	Drawings list
04	0	6/18/2019	cabel	Power 01
05	0	6/18/2019	cabel	Control 01
06	0	6/18/2019	cabel	Control 02
07	0	6/18/2019	cabel	Panel Layout
08	0	6/18/2019	cabel	Panel Views
09	0	6/18/2019	cabel	Bill Of Materials grouped by manufacturer Rev1.0 (Components)
10	0	6/18/2019	cabel	Bill Of Materials grouped by manufacturer Rev1.0 (Components)
11	0	6/18/2019	cabel	Main electrical closet


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1	9/3/2019			EDW-CD-GPC-1237	Panel Part Number: 99554710	
ECM/Rev	Date					

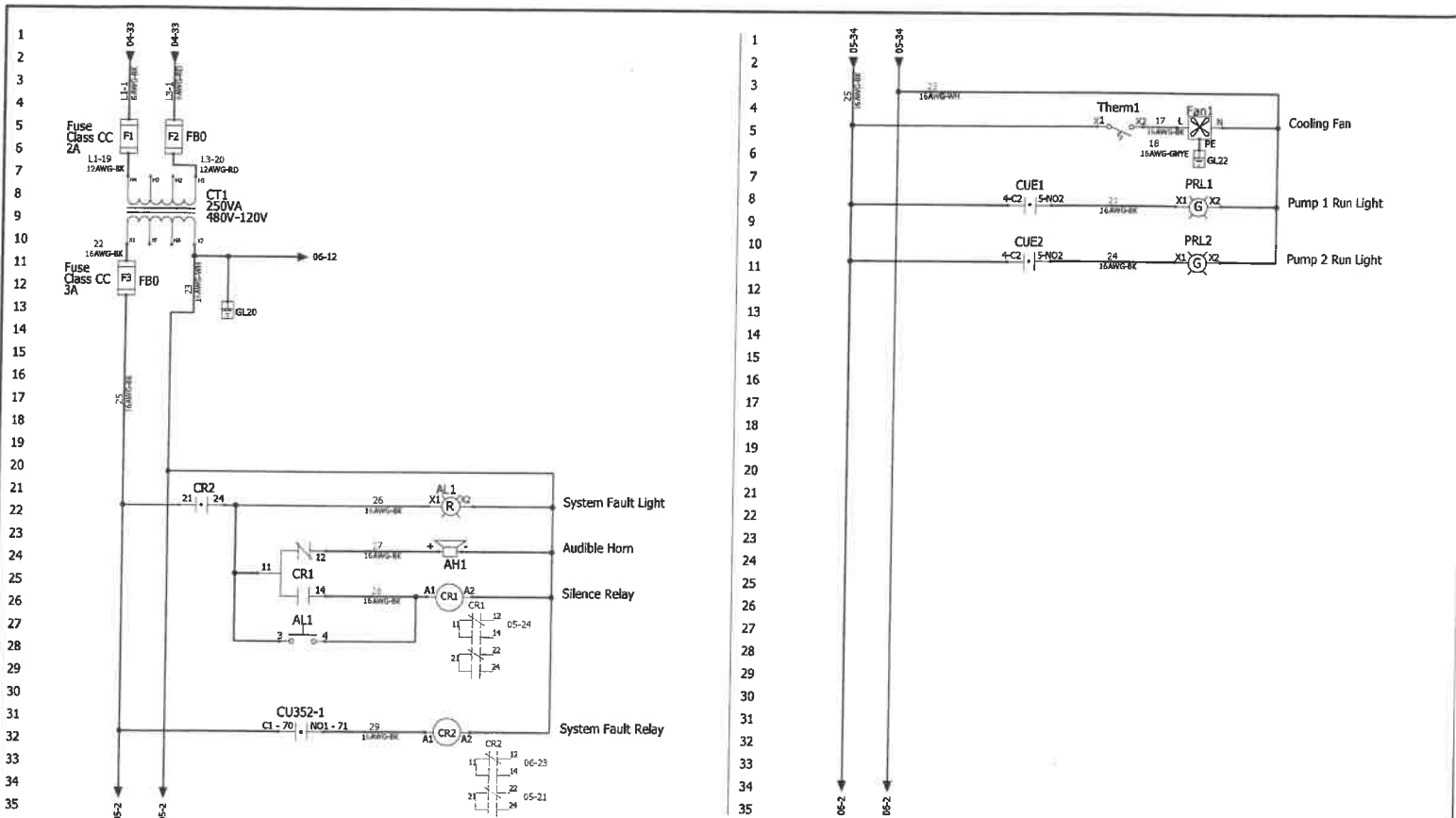
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1	9/3/2019				EDW-CD-GPC-1237			
ECM/Rev	Date							

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0	6/18/2019	Control MPC EC
1	9/3/2019	2 X 25HP 3 X 575V
ECM/Rev	Date	

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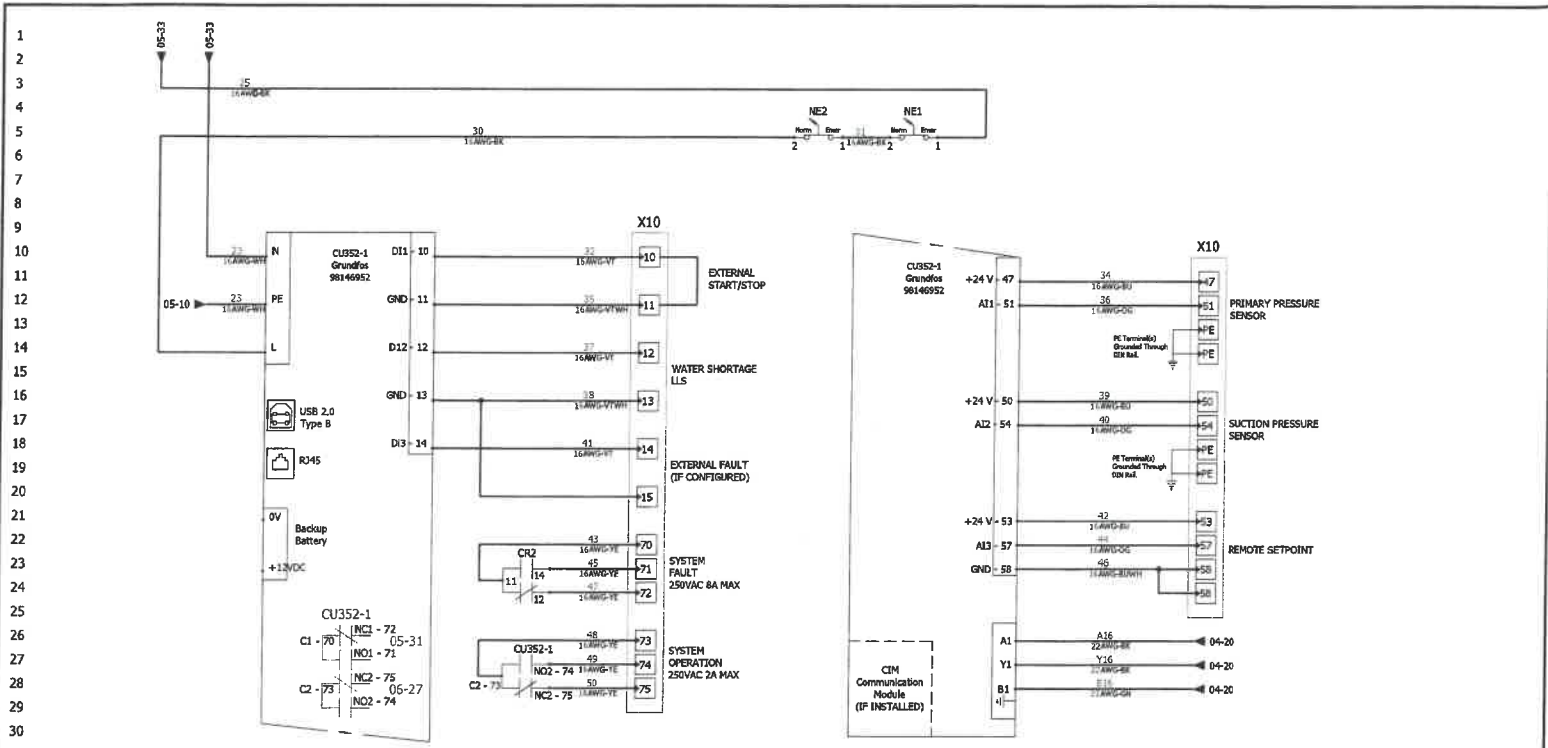
PROJECT: 99554710
EDW-CD-GPC-1237

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Panel Part Number: 99554710 SHEET: 5/10

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CIM COMMUNICATION MODULE TERMINATIONS

CIM	Terminal 1	Terminal 2	Terminal 3	Terminal 4
CIM 110 LON	LON terminal A	LON terminal B	LON terminal for cable screen	N/A
CIM 150 PROFIBUS DP	PROFIBUS terminal B	PROFIBUS terminal A	PROFIBUS terminal DGND	+5VDC
CIM 200 Modbus RTU	Modbus terminal D1	Modbus terminal D0	Modbus terminal common GND	N/A
CIM 300 BACnet MS/TP	BACnet Plus terminal	BACnet Minus terminal	BACnet Ground terminal	N/A
CIM 500 BACnet IP, Modbus TCP, PROFINET IO, RJ45	RJ45			

0	6/18/2019
1	9/3/2019
ECM/Rev	Date

Control MPC EC
2 X 25HP
3 X 575V

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PROJECT: 99554710
EDW-CD-GPC-1237

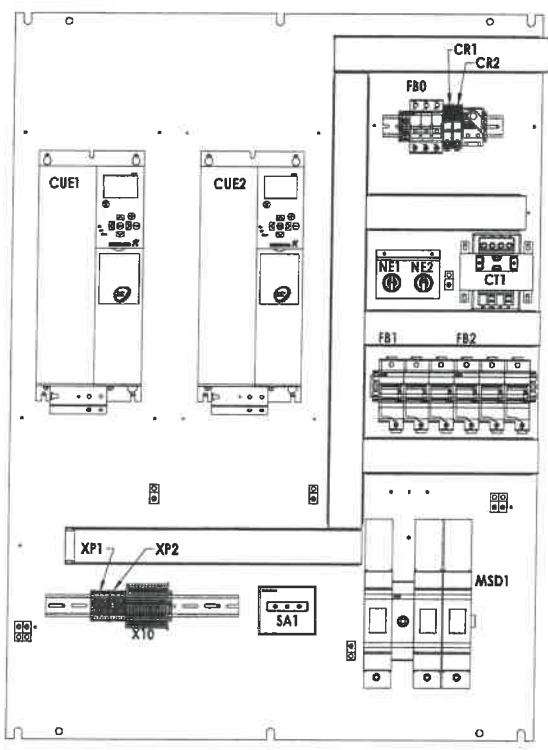
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Panel Part Number: 99554710

SHEET: 6/10

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0	6/18/2019
1	9/3/2019
ECM/Rev	Date

Control MPC EC
2 X 25HP
3 X 575V

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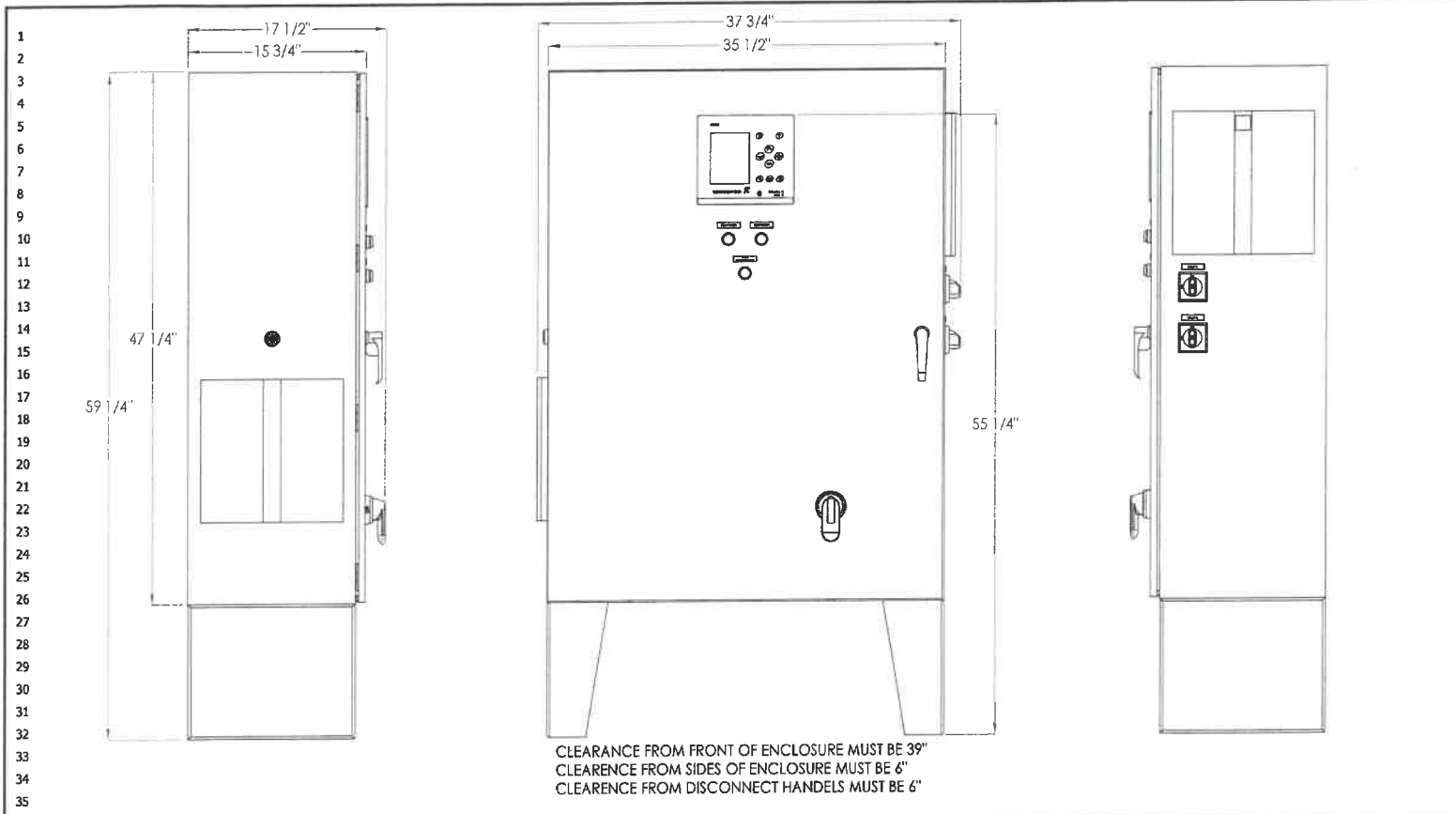
PROJECT: 99554710
EDW-CD-GPC-1237

GRUNDFOS 


Panel Part Number: 99554710 SHEET: 7/10

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CLEARANCE FROM FRONT OF ENCLOSURE MUST BE 39"
 CLEARANCE FROM SIDES OF ENCLOSURE MUST BE 6"
 CLEARANCE FROM DISCONNECT HANDLES MUST BE 6"

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1	9/3/2019				EDW-CD-GPC-1237	
EOM/Rev				Date		

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Article Number	Mark	Manufacturer	Reference	Description	Quantity	Component Type
13-16-26-1241	FB0	ABB	E9330CCS	Fuse Block; 3P, 30 A, Class CC, Indicator, Padlockable	1	Fuse Block 3-pole
13-16-26-1226	FB1 , FB2	ABB	E9360JS	Fuse Block; 3P, 60 A, Class J, Indicator, Padlockable in Open Position	2	Fuse Block 3-Pole
13-16-66-1615	MDS1	ABB	OHY90L6	Disconnect Handle; Red/Yellow, 30/60/100/250A, Type 4, 4X, 3R, 12	1	Main Disconnect Switch
13-16-66-1348	DS1 , DS2	ABB	OHYS2RJ (Old# OHY2RJ)	Disconnect Handle; Red/Yellow, for Side Mount, Type 3R	2	Service Disconnect
13-16-66-1506	MDS1	ABB	OHZK10	Alignment Ring; Use on all Pistol Grip Handles	1	Main Disconnect Switch
13-16-66-1433	MDS1	ABB	OS100GJ12	Disconnect Switch; 100A, Fuseable, 600V, 3-Pole, Class J, Center Shaft	1	Main Disconnect Switch
13-16-66-1437	MDS1 , MDS1	ABB	OSS160G1L3	Touch Safe Cover for Disconnect switch; 100A, 600V, 3-Pole, UL98	2	Main Disconnect Switch
13-16-66-1383	DS1 , DS2	ABB	OT63FT3 (Old# OT45ET3)	Disconnect Switch; 60A, 600V, 3-Pole, Front Mount	2	Service Disconnect
13-16-66-1610	MDS1	ABB	OXP6X500	Disconnect Shaft; 19.7", 6x500	1	Main Disconnect Switch
13-16-86-1024	MDS1	ABB	OZXA-24	Terminal Lug Kit; Line Side, 100/200A Disconnects, 14-2/0AWG wire, 6 Pack	1	Main Disconnect Switch
13-16-86-1021	MDS1	ABB	OZXA-175	Terminal Lug Kit; Load Side, 100/200A Disconnects, (6) 6-14AWG, 3 Pack	1	Main Disconnect Switch
13-16-81-1453	CT1	Acme	TB250B005C	Transformer; 250 VA, P/208/230/460V, S/115V	1	Controls Transformer
13-16-26-1263	F4 , F5 , F6 , F7 , F8 , F9	F.Shaw	A4J50	Fuse; 50A, 600V, Class J	6	Fuse
13-16-26-1244	F22 , F23 , F24	F.Shaw	A4J80	Fuse; 80A, 600V, Class J	3	Fuse
13-16-26-1061	F1 , F2	F.Shaw	ATQR2	Fuse; 2A, 600V, 13/32" x 1 1/2", Class CC	2	Fuse
13-16-26-1063	F3	F.Shaw	ATQR3	Fuse; 3A, 600V, 13/32" x 1 1/2", Class CC	1	Fuse
13-16-56-1029	AH1	Floyd Bell	SP-1081	Alarm; 120V, 95db, Reduced Sensitivity, Extra Fast Warble, Panel Mount	1	Audible Horn
XX-XX-XX-6030	CUE1 , CUE2	Grundfos	96754696	CUE; 25HP, 380-500VAC 3PH in, 37.5A	2	VFD
13-16-39-1093	CU352-1	Grundfos	98146952	(CM) Logic Module; Grundfos MPC Controller (CU352)	1	CU352
13-16-46-1073	CR1 , CR2	Idec	RJ2S-CL-A120	Relay; 120V, DPDT, 8A, Indicator	2	Silence Relay , System Fault Relay
13-16-46-1283	CR1 , CR2	Idec	SJ2S-07LW	Socket; 8 Pin, DIN/Pnl Mt, for RJ Relays	2	Silence Relay , System Fault Relay
65-BP-4836-02	L1	orenco	65-BP-4836-02	Backplate; 48x36, Steel, Pre-Drilled, Layout 02	1	Main electrical closet
13-66-11-1130	SAB1	OSI	13-66-11-1130	Bracket; Surge Arrestor	1	SA Bracket

0	6/18/2019	Control MPC EC 2 X 25HP 3 X 575V	This drawing and its content is the property of GRUNDFOS. It may not be copied for third parties or competitors. Changes are only to be made by GRUNDFOS.	PROJECT: 99554710	
1	9/3/2019			EDW-CD-GPC-1237	
ECH/Rev	Date				

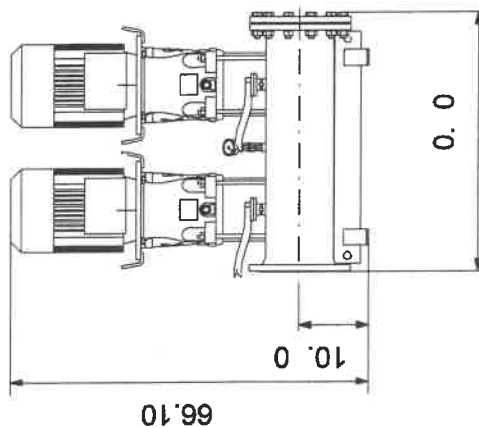
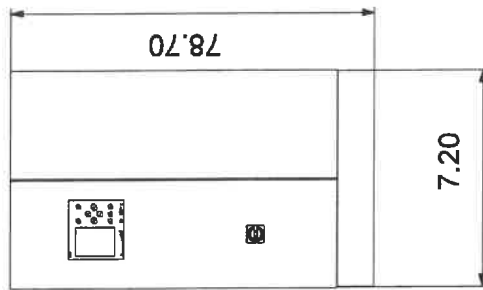
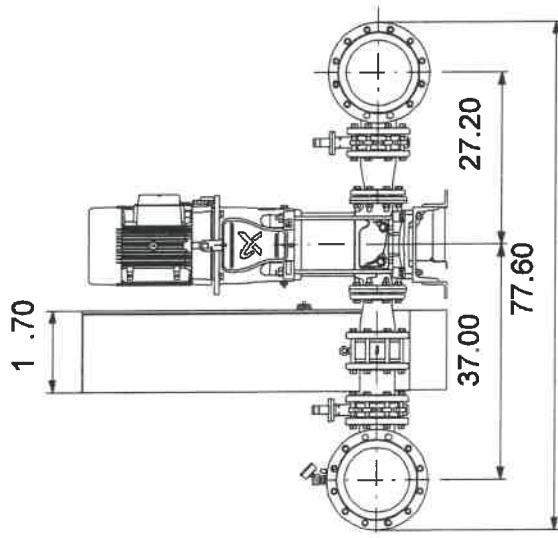
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Article Number	Mark	Manufacturer	Reference	Description	Quantity	Component Type
65-ELEC-BRKT-2HOA	SWB1	OSI	65-ELEC-BRKT-2HOA	Bracket; HOA or N/E Switch, x2	1	NE Bracket
65-LIGHT-1R-032	AL1	OSI	65-light-1R-032	Push Button Light; Fault, Push to Silence	1	System Fault Light
65-SWITCH-2-12	NE1, NE2	OSI	65-SWITCH-2-12	Switch; Two Position, 1-NO, 1-NC	2	Normal/Emergency Switch
65-TB-CU352-DB	X10 1	OSI	65-TB-CU352-DB	Terminal Blocks; Double Stack, X10 CU352 Terminals	1	CU352 Terminal Blocks
65-TB-PT-50A	XP1 1, XP2 1	OSI	65-TB-PT-50A	Terminal Blocks; Single Pump Pass Through, 50A	2	Pump Power Terminal Blocks
13-16-86-1680	GL0, GL1, GL2, GL11, GL12, GL20, GL21, GL22	Raco	TA2-Bulk	Ground Lug; 2AWG, Burndy	8	Ground Lug
13-21-11-1315	Fan1	Rittal	3243.110 (Old# 3326.117)	Axial Fan; 323/353 cfm, 120V, 50/60 Hz, NEMA 12	1	Cooling Fan
13-21-11-1325	Fan1	Rittal	3243.200 (Old# 3326.207)	Exhaust Grille; for 323/353 cfm	1	Cooling Fan
13-21-11-1272	L1	Rittal	FSK1216C	Floor Stand Kit; 12"x16", Carbon steel, 12 ga, RAL 7035, for AE & WM	1	Main electrical closet
13-21-11-1042	L1	Rittal	WM483616NC	Enclosure; 48x36x16, Steel, Single Door, Backplate Included	1	Main electrical closet
13-16-61-1010	SA1	Schneider Electric	SDSA 3650	Surge Arrestor; 3 Phase, 600V, WYE	1	Surge Arrestor
13-16-36-1421	PRL1, PRL2	Siemens	3SU11036AA401AA0	Pilot Light; Green, 110 VAC Complete	2	Pump 1 Run Light, Pump 2 Run Light
13-16-31-1095	Therm1	Stego	VESNO-01141.9-00	Thermostat; 32-140 Deg. F	1	Thermostat

0	6/18/2019	Control MPC EC 2 X 25HP 3 X 575V	This drawing and its content is the property of GRUNDFOS. It may not be copied for third parties or competitors. Changes are only to be made by GRUNDFOS.	PROJECT: 99554710	GRUNDFOS 
1	9/3/2019			EDW-CD-GPC-1237	
ECM/Rev	Date				

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99441163 HYDRO MPC-E 2 CR95-2-2



Note: All units are in inches unless otherwise stated.
 Disclaimer: This is a simplified dimensional drawing and does not show all details.

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APPENDIX B

Peerless AEF - Horizontal Split Case Single Stage Fire Pump



Pump Performance Datasheet

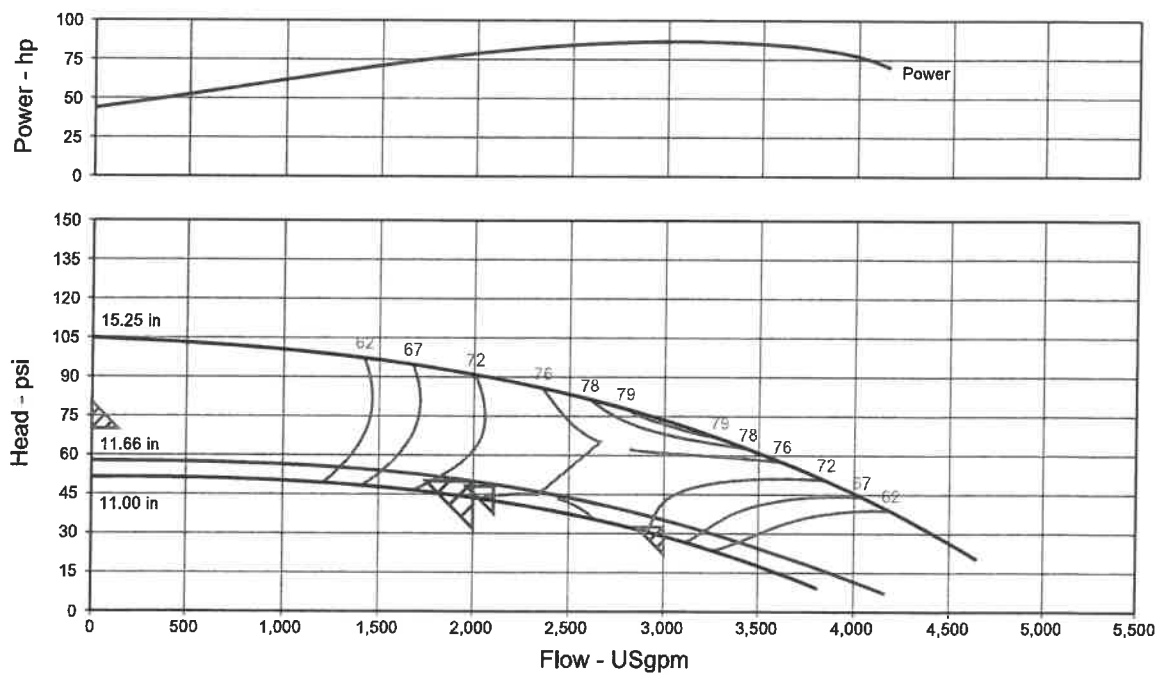
Customer :	Quote Number / ID :
Customer ref. / PO :	Peerless Model : 8AEF15G
Tag Number :	Stages : 1
Service :	Based on curve number : 8AEF15G-1780Fix Rev May 2019
Quantity : 1	Date last saved :

Operating Conditions		Liquid	
Flow, rated	: 2,000 USgpm	Liquid type	: Cold Water
Differential head / pressure, rated (requested)	: 50.00 psi	Additional liquid description	:
Differential head / pressure, rated (actual)	: 50.02 psi	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.20 / 12.10 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Site Supply Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
		Viscosity, rated	: 1.00 cP
		Vapor pressure, rated	: 0.34 psi.a

Performance		Material	
Speed, rated	: 1780 rpm	Material selected	: Cast Iron
Impeller diameter, rated	: 11.66 in		
Impeller diameter, maximum	: 15.25 in		
Impeller diameter, minimum	: 11.00 in		
Efficiency	: 73.96 %		
NPSH required / margin required	: - / 0.0 ft		
Ns (imp. eye flow) / Nss (imp. eye flow)	: 1,498 / - US Units		
MCSF	: -		
Head, maximum, rated diameter	: 57.75 psi		
Head rise to shutoff	: 15.50 %		
Flow, best eff. point	: 2,402 USgpm		
Flow ratio, rated / BEP	: 83.26 %		
Diameter ratio (rated / max)	: 76.46 %		
Head ratio (rated dia / max dia)	: 54.98 %		
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00		
Selection status	: Acceptable		

Pressure Data	
Maximum working pressure	: 69.85 psi.g
Maximum allowable working pressure	: 175.0 psi.g
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Performance based on test acceptance - Hyd Inst 14.6 Unilateral (1U)
 The rated point is the only guaranteed point (within the specified HI grade) on the performance curve.
 The published closed valve head has a +6% tolerance.
 Other specified duty points, including their tolerances, shall be per separate agreement between Peerless Pump Co. and buyer.



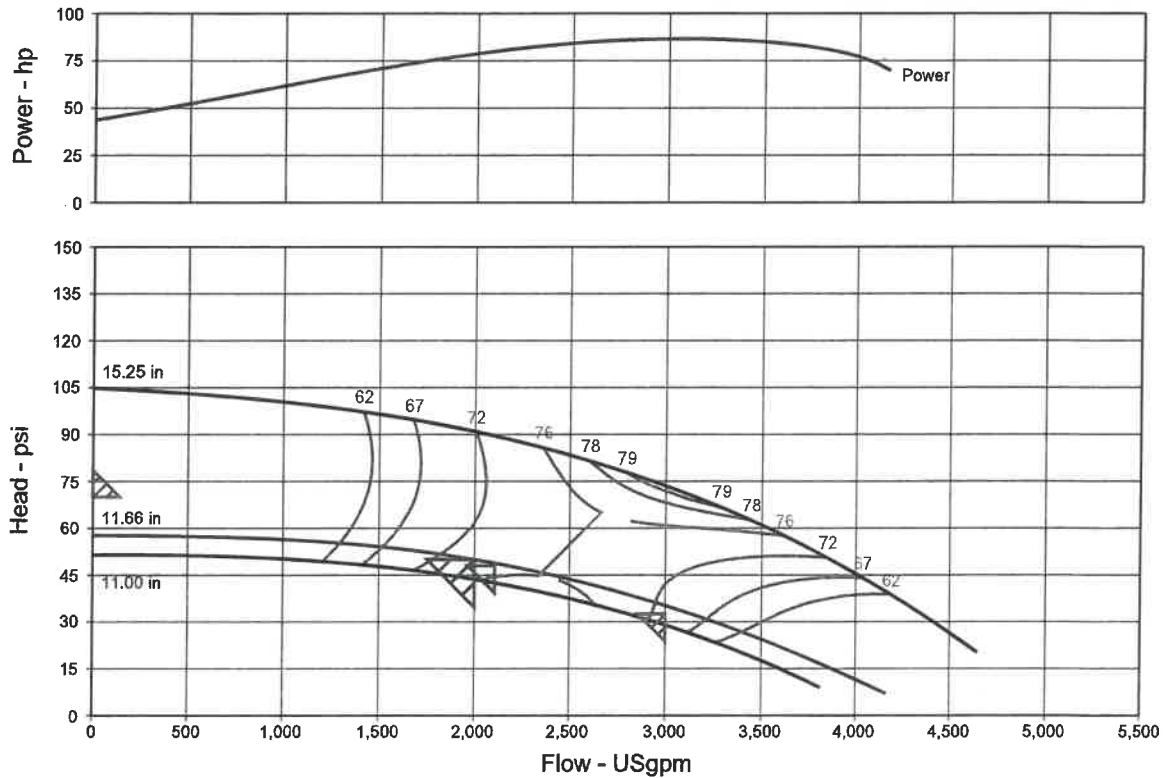
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Pump Performance Curve

Performance based on test acceptance - Hyd Inst 14.6 Unilateral (1U)
 The rated point is the only guaranteed point (within the specified HI grade) on the performance curve.
 The published closed valve head has a +6% tolerance.
 Other specified duty points, including their tolerances, shall be per separate agreement between Peerless Pump Co. and buyer.



Customer	Peerless Model	: 8AEF15G
Customer ref. / PO	Stages	: 1
Tag Number	Speed, rated	: 1780 rpm
Service	Based on curve number	: 8AEF15G-1780Fix Rev May 2019
Quantity	Efficiency	: 73.96 %
Quote Number / ID	Rated power (based on duty point)	: 78.9 hp
Date last saved	NPSH required	: -
Flow, rated	Viscosity	: 1.00 cP
Differential head / pressure, rated	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Fluid density, rated / max		: 1.000 / 1.000 SG

Flow (USgpm)	Head (psi)	Efficiency (%)	Power (hp)	NPSHr (ft)	Thrust, total (lbf)
0	57.75	0.00	43.7	-	-
463	57.45	29.97	51.7	-	-
925	56.64	50.58	60.4	-	-
1,388	54.78	64.20	69.1	-	-
1,851	51.44	72.36	76.7	-	-
2,313	46.35	75.72	82.6	-	-
2,776	39.33	74.08	86.0	-	-
3,238	30.35	66.39	86.4	-	-
3,701	19.51	50.76	83.0	-	-
4,164	7.01	24.42	69.8	-	-

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Construction Datasheet

Customer :	Quote Number / ID
Customer ref. / PO :	Service
Tag Number	Date last saved
Pump Model : 8AEF15G	Quantity
Construction	Listings and Approvals
Direction of Rotation (viewed from drive end) : Clockwise (RH)	UL : No
Suction Flange Diameter : 10.00 in	FM : Yes
Suction Flange Rating : 125lb ANSI Flat faced	ULC : Yes
Discharge Flange Diameter : 8.00 in	CE : No
Discharge Flange Rating : 125lb ANSI Flat faced	NSF61 : No
Impeller Diameter : 11.66 in	NSF372 : No
Bearing Type : Single Row	
Bearing Lubrication : Grease	Engine Information
Maximum Working Pressure : 69.85 psi.g	Manufacturer : -
Pump Seal : Packing seal	Model : -
Rotor Group : N/A	Cooling type : N/A
	Rated speed : N/A
	Rated power : N/A
	Derated power : N/A
	Installation elevation : 1,200 in
	Installation temperature (max) : 68.00 deg F
	Engine voltage : N/A
	Preheater voltage : N/A
	Fuel supply : None
	Tier : N/A
	Silencer type : None
	Silencer size : N/A
	Silencer configuration : N/A
	Flexible exhaust connection : N/A
	Drive shaft type : N/A
	Tank : None
	Torsional coupling : No
	Batteries : No
	Rack and cables : No
	Cooling loop size : N/A
	Cooling loop material : N/A
	ULC fuel lines : No
	Fuel system : No
	Ventilation : N/A
	Base mounted controller adapter : No
Materials	
Pump Casing : Cast Iron	
Impeller : Silicon Brass	
Pump Shaft : Carbon steel	
Shaft Sleeve : 304SS with O-ring	
Case Ring : Bismuth tin bronze	
Impeller wear ring : Integral	
Paint : Peerless Fire Red	
Additional information	
Pump Base : N/A	
Mounting : Bare pump	
Max suction pressure** : 12.10 psi.g	
Testing	
Hydraulic performance test : Non-witnessed per HI 14.6 1U	
Hydrostatic test : Non-witnessed	
Curve approval : No	
NPSH test : N/A	
String test : N/A	
Test w/ motor : No	
Approximate Weights	
Bare Pump : 885 lb	
Driver : N/A	
Base : N/A	





Pump Performance - Additional Data

Project name	Tag Number	:	
Commissioned	Service	:	
Representative	Model	:	8AEF15G
Customer	Quantity	:	1
Customer ref. / PO	Quoted By (Sales Office)	:	Chamco Industries Ltd. - Calgary
Quote Number / ID	Quoted By (Sales Engineer)	:	Song Deng
Date last saved	Speed, rated	:	1780 rpm
Stages			

Performance Data		Stage, Speed and Solids Limits	
Head, maximum diameter, rated flow	: 90.94 psi	Stages, maximum	: 1
Head, minimum diameter, rated flow	: 43.68 psi	Stages, minimum	: 1
Head, maximum, rated diameter	: 57.75 psi	Pump speed limit, maximum	: 1780 rpm
Efficiency adjustment factor, total	: 1.00	Pump speed limit, minimum	: 1780 rpm
Power adjustment, total	: 0.0 hp	Curve speed limit, maximum	: 1780 rpm
Head adjustment factor, total	: 1.00	Curve speed limit, minimum	: 1779 rpm
Flow adjustment factor, total	: 1.00	Variable speed limit, minimum	: 700 rpm
NPSHR adjustment factor, total	: 1.00	Solids diameter limit	: 0.74 in

Mechanical Limits		Typical Driver Data	
NPSH margin dictated by pump supplier	: 0.0 ft	Driver speed, full load	: 1780 rpm
NPSH margin dictated by user	: 0.0 ft	Driver speed, rated load	: 1784 rpm
NPSH margin used (added to 'required' values)	: 0.0 ft	Driver efficiency, 100% load	: N/A
		Driver efficiency, 75% load	: N/A
		Driver efficiency, 50% load	: N/A

Torque, rated power, rated speed	: 4.43 hp/100 rpm
Torque, maximum power, rated speed	: 4.86 hp/100 rpm
Torque, driver power, full load speed	: 5.62 hp/100 rpm
Torque, driver power, rated speed	: 5.62 hp/100 rpm
Torque, pump shaft limit	: -
Radial load, worst case	: -
Radial load limit	: -
Impeller peripheral speed, rated	: -
Impeller peripheral speed limit	: -

Various Performance Data	Flow (USgpm)	Head (psi)	Efficiency (%)	NPSHr (ft)	Power (hp)
Shutoff, rated diameter	0	57.75	-	-	43.7
Shutoff, maximum diameter	0	104.8	-	-	79.0
MCSF	-	-	-	-	-
Rated flow, minimum diameter	2,000	43.68	75.83	-	67.2
Rated flow, maximum diameter	2,000	90.94	71.93	-	147.5
BEP flow, rated diameter	2,402	45.15	75.81	-	83.5
120% rated flow, rated diameter	2,400	45.18	75.81	-	83.4
End of curve, rated diameter	4,164	7.01	24.42	-	69.8
End of curve, minimum diameter	3,814	8.96	29.81	-	66.9
End of curve, maximum diameter	4,648	20.18	38.14	-	143.5
Maximum value, rated diameter	-	57.75	75.81	-	86.6
Maximum value, maximum diameter	-	-	79.55	-	162.0

System differential pressure	@ Density, rated	@ Density, max
Differential pressure, rated flow, rated diameter (psi)	50.00	50.00
Differential pressure, shutoff, rated diameter (psi)	57.75	57.75
Differential pressure, shutoff, maximum diameter (psi)	104.8	104.8

Discharge pressure	@ Suction pressure, rated	@ Suction pressure, max	@ Suction pressure, rated	@ Suction pressure, max
Discharge pressure, rated flow, rated diameter (psi.g)	50.20	62.10	50.20	62.10
Discharge pressure, shutoff, rated diameter (psi.g)	57.95	69.85	57.95	69.85
Discharge pressure, shutoff, maximum diameter (psi.g)	105.0	116.9	105.0	116.9

Ratios	
Maximum flow / rated flow, rated diameter	: 208.18 %
Head rated diameter / head minimum diameter, rated flow	: 114.47 %

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Pump Performance - Additional Data

NFPA 20 Data

Maximum allowed head at shutoff	: 70.00 psi (140.00 %)	Minimum allowed runout flow	: 3,000 USgpm (150.00 %)
Actual shutoff head	: 57.75 psi		
Minimum allowed head at 150 % flow	: 32.50 psi (65.00 %)	Actual runout flow	: 4,164 USgpm
Actual head at 150 % flow	: 35.22 psi	Rated power (based on duty point)	: 78.9 hp
		Max power (non-overloading)	: 86.6 hp

Product Line Options

Driver Type	: Diesel engine	Tolerance Type	: Hyd Inst 14.6 Unilateral (1U)
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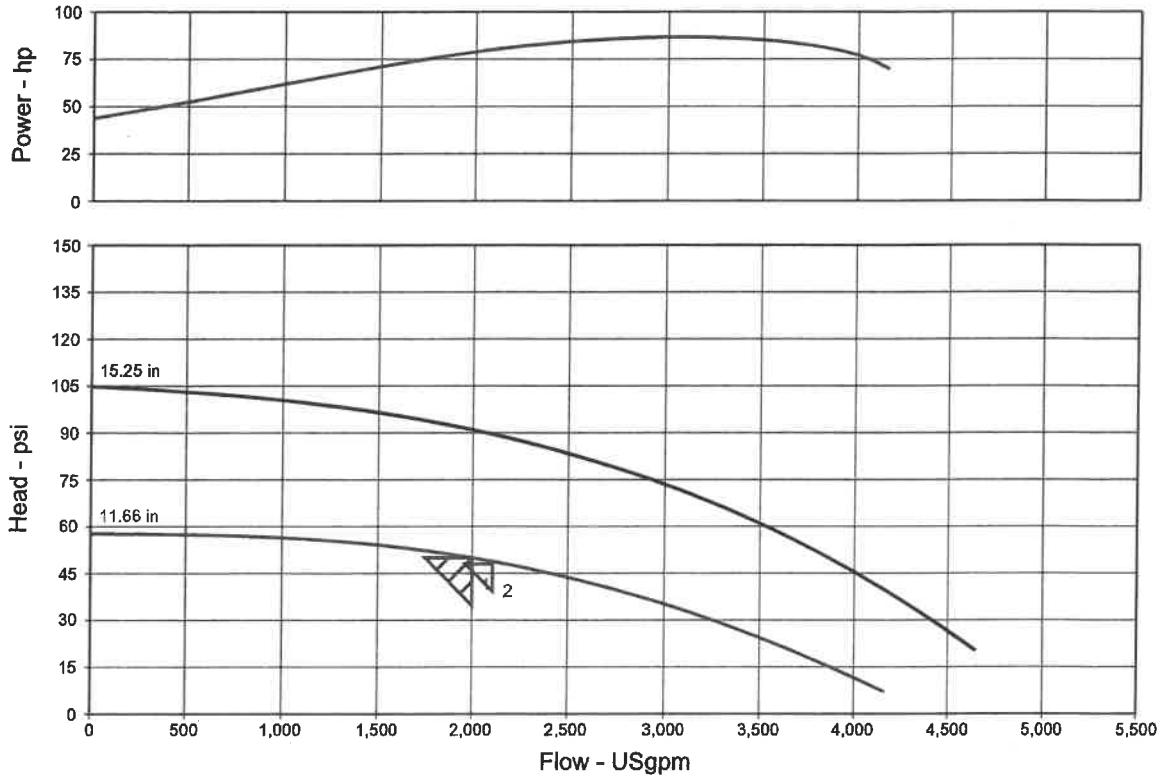
Condition #		1	2	3	4	5	6	7	8
Description		-	-						
Temperature, max	deg F	68.00	68.00						
Fluid density, rated / max	SG	1.000 / 1.000	1.000 / 1.000						
Viscosity, rated	cP	1.00	1.00						
Primary condition		⊙	○	○	○	○	○	○	○
Model		8AEF15G							
Stages		1							
Impeller diameter, rated	in	11.66							
Flow, rated	USgpm	2,000	2,108						
Head, rated (requested)	psi	50.00	48.00						
Head, rated (actual)	psi	50.00	48.84						
Suction pressure, rated / max	psi.g	0.20 / 12.10	2.00 / 3.00						
NPSH available, rated	ft	Ample	Ample						
Speed, rated	rpm	1780	1780						
Selection status		Acceptable	Acceptable						
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]		1.00 / 1.00 / 1.00 / 1.00	1.00 / 1.00 / 1.00 / 1.00						
Efficiency	%	73.96	74.82						
NPSH required	ft	-	-						
Submergence	ft	-	-	-	-	-	-	-	-
Rated power (based on duty point)	hp	78.9	80.3						

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Multiple Conditions Curve

Performance based on test acceptance - Hyd Inst 14.6 Unilateral (1U)
 The rated point is the only guaranteed point (within the specified HI grade) on the performance curve.
 The published closed valve head has a +6% tolerance.
 Other specified duty points, including their tolerances, shall be per separate agreement between Peerless Pump Co. and buyer.

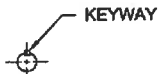
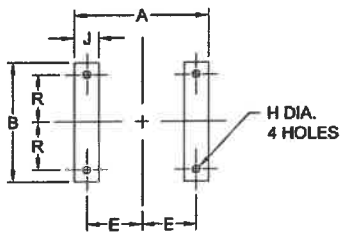


Customer :	Model :	8AEF15G
Customer ref. / PO :	Stages :	1
Tag Number :	Speed, rated :	1780 rpm
Service :	Based on curve number :	8AEF15G-1780Fix Rev
Quantity : 1		May 2019
Quote Number / ID :	Efficiency :	73.96 %
Date last saved :	Rated power (based on duty point) :	78.9 hp
Flow, rated : 2,000 USgpm	NPSH required :	-
Differential head / pressure, rated : 50.00 psi	Viscosity :	1.00 cP
Fluid density, rated / max : 1.000 / 1.000 SG	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010] :	1.00 / 1.00 / 1.00 / 1.00
	Submergence :	

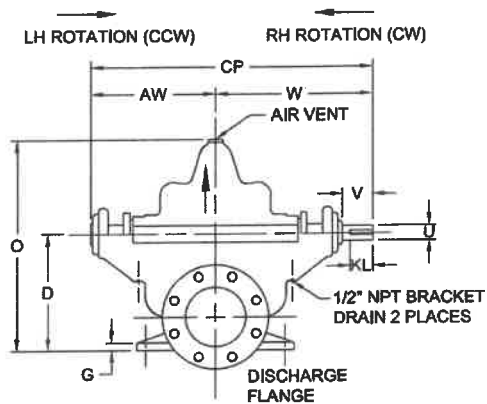
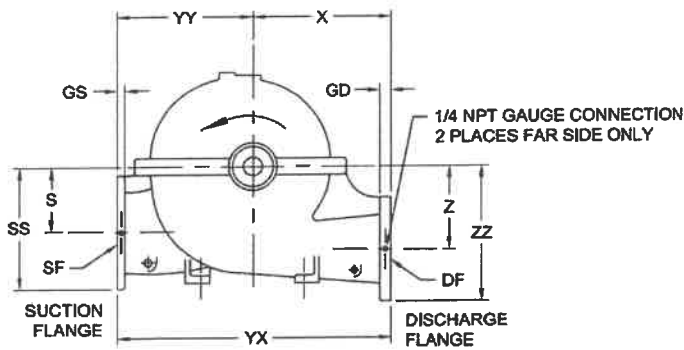


General Arrangement

PLAN VIEW OF FEET



DETAIL SHAFT END



GENERAL	
Pump Model	8AEF15G
Listing / Approval	FM/ULC Listed
Rated Flow	2,000 USgpm
Liquid	Cold Water
Rated Pressure	50.00 psi
Specific Gravity	0.99824
Rated Speed	1780 rpm

Customer	
Quote No.	
Item No.	
Project	
Date	



A	18.00 in	S	9.00 in	GS	1.88 in	ZZ	17.75 in	AW	14.75 in
B	19.00 in	SS	18.00 in	GD	1.62 in	O	28.00 in	W	19.00 in
R	8.25 in	SF	10.00 in	YX	33.69 in	D	16.00 in	V	4.00 in
J	3.38 in	YY	17.69 in	Z	10.00 in	G	1.12 in	KL	3.00 in
E	7.50 in	X	16.00 in	DF	8.00 in	CP	33.75 in	U	1.88 in



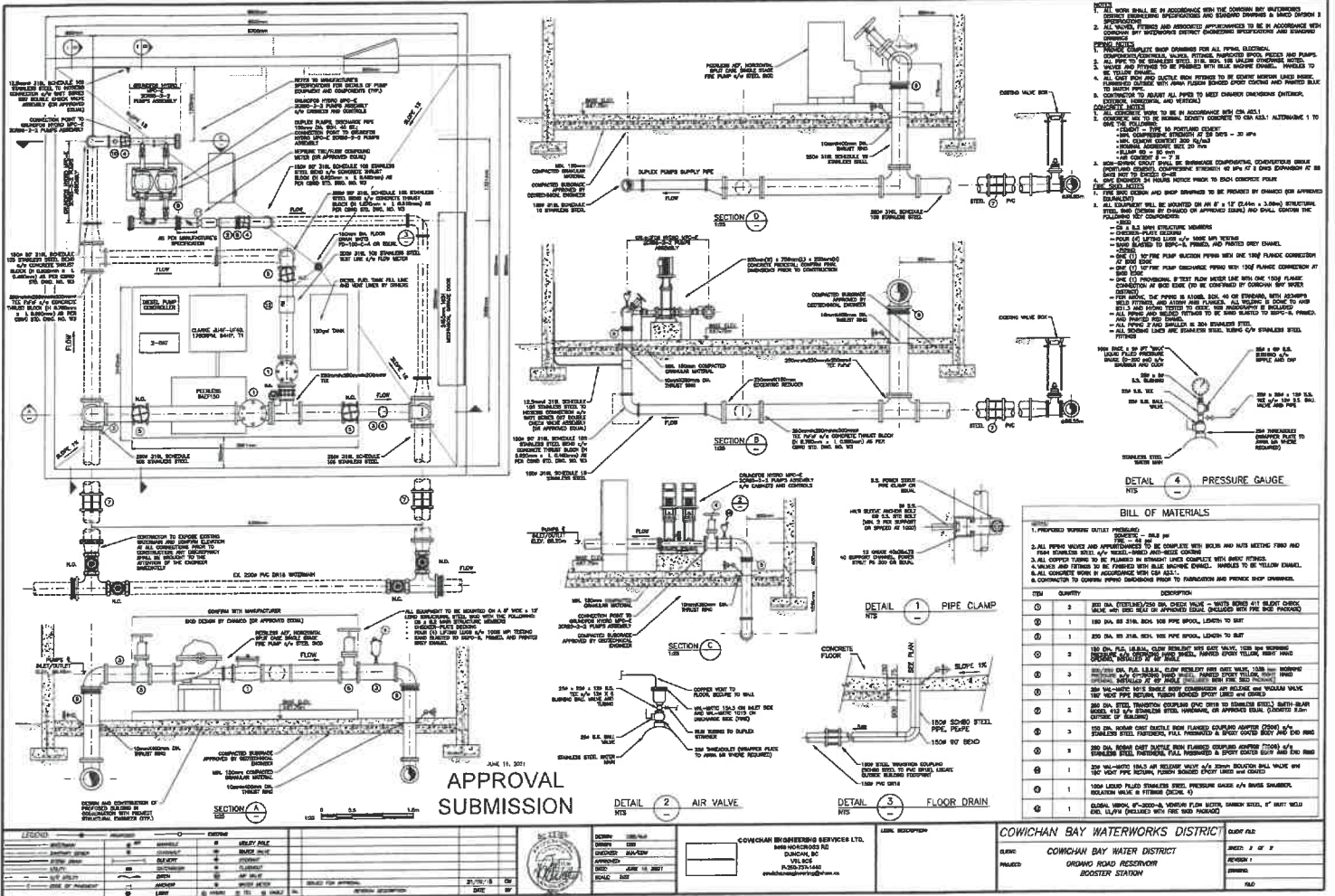
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APPENDIX C

Hazen-Williams & Darcy-Weisbach Minor Losses

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- NOTES**
1. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AUTHORITY.
 2. ALL VALVES, FITTINGS AND APPURTENANCES TO BE IN ACCORDANCE WITH CONDITIONS BY REFERENCED DISTRICT SPECIFICATIONS AND STANDARDS.
 3. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.
 4. ALL VALVES, FITTINGS AND APPURTENANCES TO BE IN ACCORDANCE WITH CONDITIONS BY REFERENCED DISTRICT SPECIFICATIONS AND STANDARDS.
 5. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.
 6. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.
 7. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.
 8. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.
 9. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.
 10. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

BILL OF MATERIALS

1. PREPARED WORKING OUTLINE PROVIDED BY CONTRACTOR - SEE B.1.

2. ALL PIPEWORK SHALL BE APPROVED BY THE LOCAL AUTHORITY AND THE DISTRICT ENGINEER. ALL PIPEWORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

3. ALL VALVES AND FITTINGS TO BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

4. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

5. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

6. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

7. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

8. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

9. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

10. ALL WORK SHALL BE IN ACCORDANCE WITH THE DRAWING AND INSTRUMENTS.

ITEM	QUANTITY	DESCRIPTION
1	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
2	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
3	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
4	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
5	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
6	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
7	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
8	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
9	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING
10	1	100 S.A. STEEL/STAINLESS STEEL CHECK VALVE WITH 100 S.A. BALL BEARING HOUSING AND 100 S.A. BALL BEARING HOUSING WITH 100 S.A. BALL BEARING HOUSING

APPROVAL
SUBMISSION

NO.	REVISION	DATE	BY	CHKD.
1	ISSUED FOR APPROVAL	21/06/18
2

LEGEND

SYMBOL	DESCRIPTION
...	...
...	...
...	...

DATE: 21/06/18

SCALE: AS SHOWN

PROJECT: COWICHAN BAY WATERWORKS DISTRICT

CLIENT: COWICHAN BAY WATER DISTRICT

DESIGNER: COWICHAN ENGINEERING SERVICES LTD.

PROJECT: COWICHAN BAY WATER DISTRICT ROOSTER STATION

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ABBREVIATIONS

A.F.B. ASPHALT IMPREGNATED
 FIBRE BOARD
 ALT. ALTERNATE
 ARCH. ARCHITECTURAL
 B.C.E. BOTTOM CHORD
 EXTENSION
 B.L. BOTTOM LOWER LAYER
 B.U. BOTTOM UPPER LAYER
 S.M. BEAM
 BOT. BOTTOM
 B.P.O. BAR PLACING ORDER
 B.T.W. BETWEEN
 BRG. BEARING
 CANT. CANTILEVER
 C.J. CONTROL JOINT
 CL. CENTER LINE
 CLR. CLEAR
 COL. COLUMN
 CONC. CONCRETE
 CONT. CONTINUOUS
 C.P. COMPLETE
 PENETRATION
 C.W. COMPLETE WITH DET. DETAIL
 D.L. DEAD LOAD
 D.O. DO OVER (DITTO)
 D.P. DEEP
 DWG. DRAWING
 DWLS. DOWELS
 E.E. EACH END
 E.F. EACH FACE
 ELEC. ELECTRICAL
 EL. ELEVATION
 ELEV. ELEVATION
 E.S. EACH SIDE
 EXT. EXISTING
 EX. EXTRA
 EXT. EXTERIOR
 F.D. FLOOR DRAIN
 F.S. FAR SIDE
 FTG. FOOTING
 GALV. GALVANIZED
 G.L. GRID LINE
 H.E. HOOK ONE END
 H2E HOOK 2 ENDS
 H.D. & HOT DIPPED GALVANIZED
 HOR. HORIZONTAL
 HORIZ. HORIZONTAL
 I.F. INSIDE FACE
 INT. INTERIOR

JT. JOINT
 L.L. LONG
 LLH LONG LEG HORIZONTAL
 LLV LONG LEG VERTICAL
 LSH LONG SIDE HORIZONTAL
 LSV LONG SIDE VERTICAL
 L.W. LONG WAY
 MAX. MAXIMUM
 MECH. MECHANICAL
 MIN. MINIMUM
 N.I.C. NOT IN CONTRACT
 N.S. NEAR SIDE
 N.T.S. NOT TO SCALE
 O.C. ON CENTRE
 O.F. OUTSIDE FACE
 OPP. OPPOSITE
 P.L.A. POINT LOAD ABOVE
 P.F. PRESSURE TREATED
 R.D. ROOF DRAIN
 REINF. REINFORCING
 R.W. REINFORCED WITH
 S.D.L. SUPERIMPOSED DEAD LOAD
 S.M. SIMILAR
 S.I.P. STRUCTURAL INSULATED PANEL
 S.O.G. SLAB ON GRADE
 STAG. STAGGERED
 STR. STRIP
 S.W. SHORT WAY
 TEMP. TEMPERATURE
 REINFORCING
 THK. THICK
 THRU THROUGH
 T.J. T.E. JOINT
 T.L. TOP LOWER LAYER
 T.O. TOP OF
 T.O.C. TOP OF CONCRETE
 T.O.S. TOP OF STEEL/SLAB
 T.U. TOP UPPER LAYER
 TYP. TYPICAL
 T & B TOP AND BOTTOM
 T & G TONGUE AND GROOVE
 U.N.O. UNLESS NOTED OTHERWISE
 UND. UNDERSIDE
 VERT. VERTICAL
 VERT. WALL THICKNESS
 W.P. WORK POINT

DESIGN DATA - CONTINUED

DESIGN DEFLECTION LIMITS:
 DEFLECTION LIMITS (SERVICEABILITY) LESSER OF U.N.O.:
 ROOFS & FLOORS, TOTAL LOAD = SPAN / 180
 FLOORS, LIVE LOAD = SPAN / 360
 WALLS, WIND LOAD = SPAN / 360
 ROOFS, SNOW & LIVE LOADS:
 FINISHES SUSCEPTIBLE TO CRACKING = SPAN / 360
 FINISHES NOT SUSCEPTIBLE TO CRACKING = SPAN / 240
 MAXIMUM LIVE / SNOW DEFLECTION FOR ANY SPAN = 1" (25mm)
 LATERAL STOREY DRIFT = HEIGHT / 500

MATERIAL SPECIFICATIONS

WOOD
 TO CONFORM WITH CSA/CAN 088-14 ENGINEERING DESIGN IN WOOD (LIMIT STATES DESIGN)
MINIMUM DESIGN PROPERTIES
 LAMINATED VENEER LUMBER (L.V.L.)
 E = 1900 ksi
 Fb = 2600 psi
 Fv = 285 psi
 Pc = 750 psi (PERPENDICULAR)
 Fc = 2510 psi (PARALLEL)

FRAMING
 1. GRADES AND TYPES TO BE AS FOLLOWS U.N.O.:
 * BEAMS & MULTIPLE BEAMS & PLYWOOD WEB JOISTS: T.J. MICROSLAM AND/OR PARALLAM BY WEVERHAELUSER, OR APPROVED EQUAL
 * WOOD BASED SHEATHING: ORIENTED STRANDBOARD TO CSA-0473.0-03(R, 2011) GRADE O-2, PLYWOOD TO CSA 0265-16
 * STRUCTURAL JOISTS & PLANKS: SPF #2 OR BETTER
 * STRUCTURAL LIGHT FRAMING: SPF #2 OR BETTER
 * WOOD POSTS & BUILT UP COLUMNS: SPF #2 OR BETTER
 * RIM BOARD: 1 1/4" LSL 1.3E

HARDWARE
 1. TO CONFORM TO THE FOLLOWING U.N.O.:
 * BOLTS: ASTM A307, A325, A525M, A490, A490M
 * NUTS: ASTM A563M
 * THREADED ROD: ASTM A307
 * SCREWS: GRK R55, SIMPSON SDS
 * WASHERS: ASTM F436M
 * STEEL ROD: ASTM A449 OR ASTM A307

CONCRETE
 1. CONCRETE SHALL BE MIXED, PLACED AND CURED IN ACCORDANCE WITH CSA A23.1 OR CSA A23.2 WITH PERFORMANCE REQUIREMENTS OF: 35 MPa COMPRESSIVE STRENGTH AT 28 DAYS AND MEETING EXPOSURE CLASS C-1

CONCRETE REINFORCEMENT
 1. CONFORM TO CSA 630 SERIES Fy=400MPa FOR ALL REINFORCEMENT.

GENERAL

1. THE CONTRACTOR SHALL EXAMINE ALL CONTRACT DOCUMENTS, CHECK DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO COMMENCING CONSTRUCTION. DISCREPANCIES NOT REPORTED ARE THE RESPONSIBILITY OF THE CONTRACTOR. CHECK AND VERIFY ALL DIMENSIONS WITH ANY WORK. NOTIFY THE ARCHITECT OF ANY ERRORS OR OMISSIONS.
2. READ STRUCTURAL DRAWINGS IN CONJUNCTION WITH PLANS FROM OTHER DISCIPLINES
3. DO NOT CONSTRUCT FROM THESE DRAWINGS UNLESS MARKED "ISSUED FOR CONSTRUCTION".
4. ALL DESIGN TO CONFORM TO THE CBC 2016 AND ALL OTHER APPLICABLE CODES AND PRACTICES AND BEST PRACTICES.
5. FIELD REVIEWS: NOTIFY THE ENGINEER 48 HOURS IN ADVANCE FOR FIELD REVIEWS AND APPROVAL OF THE FOLLOWING:
 A. CONCRETE REINFORCEMENT BEFORE EACH CONCRETE POUR
 B. WOOD FRAMING BEFORE COVERING UP
6. THE DESIGN HAS BEEN PREPARED BASED ON THE ASSUMPTION THAT THE OWNER AND/OR OPERATOR HAS A SITE SAFETY PLAN IN PLACE TO ADDRESS AND MITIGATE SAFETY HAZARDS, BOTH COMMON AND SPECIFIC TO THIS PROJECT.
7. TYPICAL DETAILS AND GENERAL NOTES APPLY UNLESS NOTED OTHERWISE ON PLANS.
8. GENERAL CONTRACTOR TO ADVISE AND COORDINATE WITH CONSULTANTS IF CONFLICTS ARISE BETWEEN SPECIFICATIONS AND DRAWINGS PRIOR TO PROCEEDING WITH SHOP DRAWINGS, FABRICATION, AND/OR CONSTRUCTION.

DESIGN DATA

DESIGN CODE: CBC 2016 PART 4.
 IMPORTANCE FACTOR: POST-DISASTER
ROOF
 DEAD LOADS:
 FRAMING, ASPHALT SHINGLE, GYPSUM CEILING,
 NOMINAL MECHANICAL & ELECTRICAL: 0.72 kPa
ENVIRONMENTAL LOADS: BASED ON DUNCAN, BC
 DESIGN SNOW LOAD (Sg) 1.80 kPa
 RAIN LOAD (Ri) 0.40 kPa
FLOOR
 DEAD LOADS
 CONCRETE SELF WEIGHT 24 kN/m²
LIVE LOADS:
 TYPICAL FLOOR SPACE 4.80 kPa
 WIND LOADS: HOURLY WIND PRESSURE (1/50) 0.38 kPa
SEISMIC DATA: Sd(0.2) = 1.17 Sd(0.5) = 1.09
 Sd(1.0) = 0.831 Sd(2.0) = 0.375
 Sd(3.0) = 0.116 Sd(10.0) = 0.042
 PGA = 0.513 PGV = 0.796
 SITE CLASS: D
SOIL CONDITIONS:
 THE FOUNDATION HAS BEEN DESIGNED BASED ON THE FOLLOWING ASSUMED VALUES:
 SERVICE BEARING CAPACITY 100 kPa
 ULTIMATE BEARING CAPACITY 140 kPa
 HEATED FROST DEPTH 1'-6"
 UNHEATED FROST DEPTH 2'-0"
 GENERAL CONTRACTOR TO ENGAGE A GEOTECHNICAL ENGINEER TO VERIFY ASSUMED VALUES.



Victoria Office 778-833-8922
 1807 Peninsula Terrace, Victoria, BC V8M 3K6

Notes
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When this drawing shall have been reviewed and approved by the Engineer, the Engineer shall be responsible for the dimensions and quantities shown on the plan and the Engineer shall be informed of any variations from the dimensions and quantities shown on the plan. When approved, these dimensions shall be the dimensions to be used for the construction of the work.



NO.	REVISIONS	DATE
3	ISSUED FOR APPROVAL	G.C. 2021.05.16
2	ISSUED FOR REVISED BP	G.C. 2020.12.29
1	ISSUED FOR BILLING PURPOSES	G.C. 2020.01.05

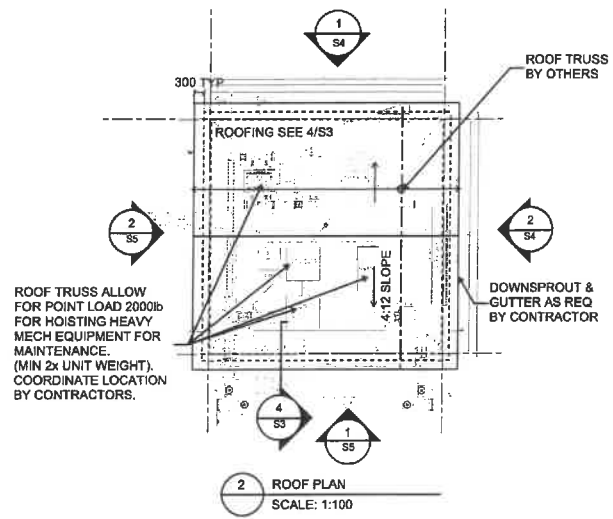
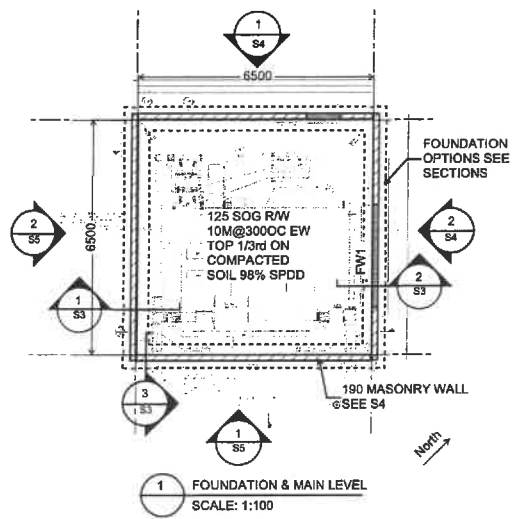
COWICHAN BOOSTER PUMP STATION BUILDING

GENERAL NOTES

Scale	As Indicated	Revision No.
Project No.	20203	1
Drawn	HY	Drawing No.
Checked	KY	Date
Design Checked	GC	
Reviewed	GC	Date

1/10

Notes:
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ROOF TRUSS ALLOW FOR POINT LOAD 2000lb FOR HOISTING HEAVY MECH EQUIPMENT FOR MAINTENANCE. (MIN 2x UNIT WEIGHT). COORDINATE LOCATION BY CONTRACTORS.

CONCRETE

1. CONCRETE IS TO BE TESTED IN ACCORDANCE WITH CSA A23.1-14/A23.2-14 AND BY A QUALIFIED TESTING AGENCY AS REQUESTED BY THE ENGINEER. THREE TEST CYLINDERS SHOULD BE TAKEN FOR EVERY 75 CU METERS OR LESS OF CONCRETE PLACED. A MINIMUM OF ONE TEST OF THREE CYLINDERS IS REQUIRED PER POUR.
2. SAWCUT CONTROL JOINTS FOR SLABS ON GRADE AS SOON AS POSSIBLE SPACED AT 25 TIMES THE SLAB THICKNESS, NOT EXCEEDING 4.5m SPACING OR AT LOCATIONS SHOWN ON DRAWINGS, AS PER CSA A23.
3. ENSURE SLEEVES, TIES, ANCHOR RODS, PIPE HANGERS AND ANY OTHER INSERTS OR OPENINGS REQUIRED IN THE CONCRETE BY OTHER TRADES ARE COMPLETED.

CONCRETE REINFORCING

1. TIE ALL BARS SECURELY IN PLACE TO PREVENT DISPLACEMENT. SUPPORT SLAB REINFORCEMENT ON SUITABLE CHAIRS OR SUPPORTS AT MAXIMUM 1.2 METER CENTRES. PROVIDE CORNER BARS TO MATCH HORIZONTAL WALL REINFORCEMENT.
2. CLEAR COVER TO REINFORCEMENT (PRINCIPAL REINFORCEMENT) IS: CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 75mm EXPOSED TO EARTH OR WEATHER 40mm NOT EXPOSED TO EARTH OR WEATHER OR NOT IN CONTACT WITH THE GROUND: SLABS AND WALLS 25mm.
3. UNLESS OTHERWISE NOTED, USE CLASS B TENSION SPLICE FOR ALL REINFORCING STEEL.

ROUGH CARPENTRY

1. WOOD FRAMING TO CONFORM TO NLCA STANDARD GRADING RULES FOR CANADIAN LUMBER AND CSA 086-14 ENGINEERING DESIGN IN WOOD (LIMIT STATES DESIGN).
2. THE ROOF SHEATHING AND SUPPORTING ROOF MEMBERS HAVE BEEN DESIGNED AS A DIAPHRAGM. DIAPHRAGM CONNECTION REQUIREMENTS FOR THE ROOF SHEATHING ARE: 84 (2 1/2") LONG COMMON NAILS @ 75 (3") O/C AT SUPPORTED PANEL EDGE AND AT 300 (12") O/C ALONG INTERMEDIATE FRAMING MEMBERS.
3. WIRE NAILS, SPIKES AND STAPLES TO CSA B111-1974(R2000).



P. Eng. Permit

No.	DESCRIPTION	BY	DATE
1	REQUIRED FOR BUILDING PERMIT	G.C.	01/27/2020

COWICHAN BOOSTER PUMP STATION BUILDING

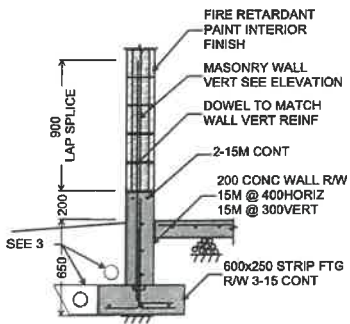
PLANS

Scale	As Indicated	Revision No.
Project No.	202003	1
Client	HY	Drawing No.
Designed	HY	Date 2020.06.02
Design Checked	GC	
Check/Revised	GC	Date 2020.06.02

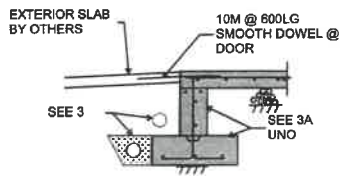


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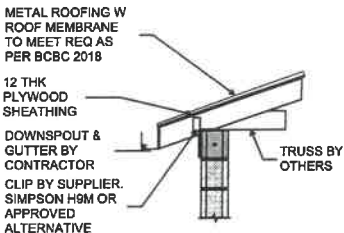
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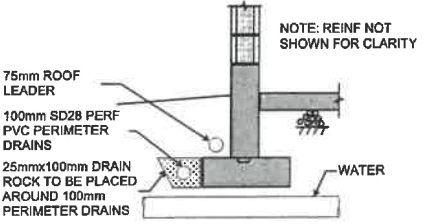
1 FDN @ TYP WALL
 SCALE: 1:25



2 FND @ DOOR
 SCALE: 1:25



4 ROOF TRUSS ON WALL
 SCALE: 1:25



3 FDN @ WATERMAIN
 SCALE: 1:25



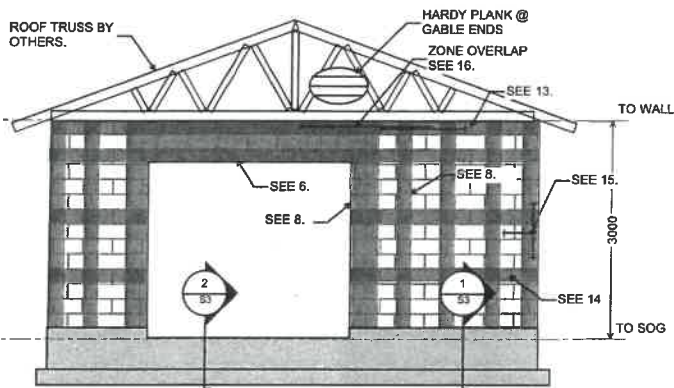
No.	DESCRIPTION	BY	DATE
3	ISSUED FOR APPROVAL	G.C.	2021/06/16
2	ISSUED FOR REVISION	G.C.	2021/03/25
1	ISSUED FOR BUILDING PERMIT	G.C.	2021/07/28

COWICHAN BOOSTER PUMP STATION BUILDING

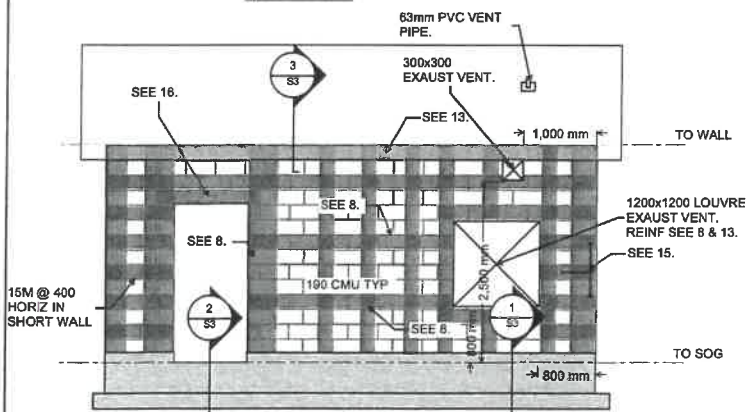
SECTION & DETAILS

Scale	As Indicated	Revision No.	1
Project No.	271001	Drawing No.	S3
Checked	BY	Date	2021/06/30
Design Checked	GC	Date	2021/06/30
Client/Reviewer	GC	Date	2021/06/30

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2. NE ELEVATION 1:50



1. NW ELEVATION 1:50

MASONRY NOTES

1. PROVIDE PLAIN AND REINFORCED CONCRETE BLOCK TO CSA S364.1-14 MASONRY DESIGN FOR BUILDINGS AND CSA A371 MASONRY CONSTRUCTION FOR BUILDINGS.
2. PROVIDE HOLLOW LOAD BEARING UNITS TO CSA A165 SERIES-14, NORMAL WEIGHT, 28MPa UNITS (91/150N), BASED ON NET AREA. PROVIDE HOLLOW CLAY UNITS TO CSA A62.14. PROVIDE MORTAR TO CSA A174-14, TYPE S ONLY.
3. MASONRY GROUT; DESIGN STRENGTH 20MPa (3000PSI) (12.5 MPa BASED ON CYLINDER STRENGTH), WEIGHT 24kN/m³ (150 PCF), CEMENT TYPE 10, AIR 14%, SLUMP 290-295, 10mm AGGREGATE.
4. PROVIDE NEW DEFORMED BARS TO CSA G30.18, GRADE 400. LAP SPLICE 48mm FOR 15M TYP UNO.
5. PROVIDE LADDER TYPE JOINT REINFORCEMENT TO CSA G30.5, 0.9% GALVANIZED, CONTACT WELDED, MINIMUM LAP 150mm. INSTALL HORIZONTAL WALL REINFORCEMENT AT EVERY SECOND COURSE.
6. UNLESS NOTED OTHERWISE, PROVIDE LINTELS AS PER THE FOLLOWING:

SPAN	LINTEL
UP TO 1200	200 DP, RW 1-15M T&B
1200 TO 2400	400 DP, RW 2-15M T&B, 10M STR, @ 200
2400 TO 3000	600 DP, RW 2-25M T&B, 10M STR, @ 200

 EXTEND LINTELS A MINIMUM OF 400 FAST OPENINGS.
7. PROVIDE KNOCKOUT TYPE BOND BEAMS 2 COURSES DEEP AT ALL FLOOR AND ROOF LINES AND PARAPETS, AND AT MAX. OF 2.44 METRES O.C. REINFORCE WITH 2-15M CONTINUOUS BOT, INCLUDING AROUND CORNERS.
8. EXCEPT AS NOTED, PROVIDE VERTICAL FULL HEIGHT REINFORCING AT THE FOLLOWING LOCATIONS:
 - 1-15M AT 600 OVC MAX.
 - 2-15M AT ENDS OF ALL WALLS
 - 4-15M OVER 2 CELLS AT CORNERS & INTERSECTIONS
 - 2-15M AT EACH SIDE OF DOORS AND WINDOWS OVER 2 CELLS.
9. BUILD MASONRY TRUE-TO-LINE, PLUMB, SQUARE AND LEVEL WITH VERTICAL JOINTS IN PROPER ALIGNMENT, CONFORM TO CSA A371-14.
10. ENSURE A MAXIMUM JOINT WIDTH 6 ROUND BAR TOOL.
11. CUT MASONRY UNITS WITH A MASONRY SAW. BROKEN UNITS ARE NOT ACCEPTABLE.
12. PLACE MASONRY UNITS IN RUNNING BOND UNLESS EXCEPT OTHERWISE ON THE DRAWINGS. USE FACE BEDDING ON TOP OF FIRST COURSES AND CELLS TO BE GROUTED WHERE FULL BED MORTARING IS TO BE USED.
13. PROVIDE 200DP BOND BEAM REINFORCED WITH 2-15M, CONT. AT THE FOLLOWING LOCATIONS:
 - AT THE TOP OF WALLS
 - COVER WINDOW OPENINGS
 - BELOW WINDOW OPENINGS
 - ABOVE AND BELOW MECHANICAL OPENINGS
14. PROVIDE 200DP BOND BEAM REINFORCED WITH 1-15M, @ 800 MAX
15. ALL HORIZ BAR TO HAVE 180 DEGREE HOOK AT ENDS. DO NOT SPLICE WITHIN 600mm FROM WALL ENDS
16. FOR LOCATION OVERLAP BETWEEN 2 ZONES IN SAME DIRECTION (E.G. LINTEL BEAM & BOND BEAM OVERLAP), USE LARGER REINF. PROVIDE TENSION LAP SPLICE OF SMALLER BAR DIAMETER BEYOND ZONE WHERE LARGER BAR IS REQUIRED.



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888 Providence Terrace, Victoria, BC V8M 0K6

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NO.	DESCRIPTION	BY	DATE
3	ISSUED FOR APPROVAL	G.C.	19/07/2018
2	ISSUED FOR REVISION	G.C.	18/08/2018
1	ISSUED FOR BUILDING PERMIT	G.C.	06/09/2018

COWICHAN BOOSTER PUMP STATION BUILDING

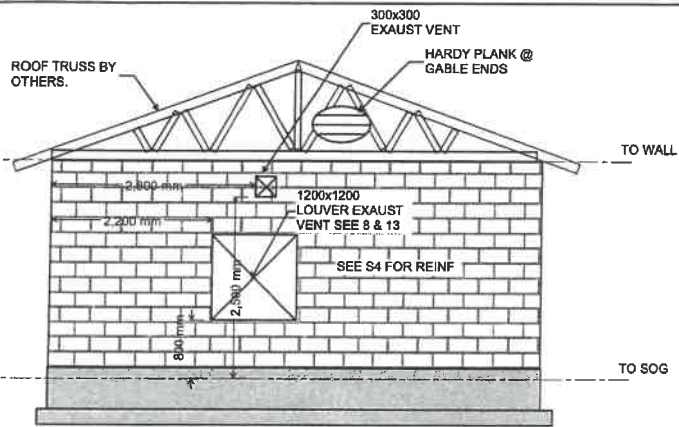
MASONRY WALL ELEVATIONS

Project No.	Revision No.
2018-001	1

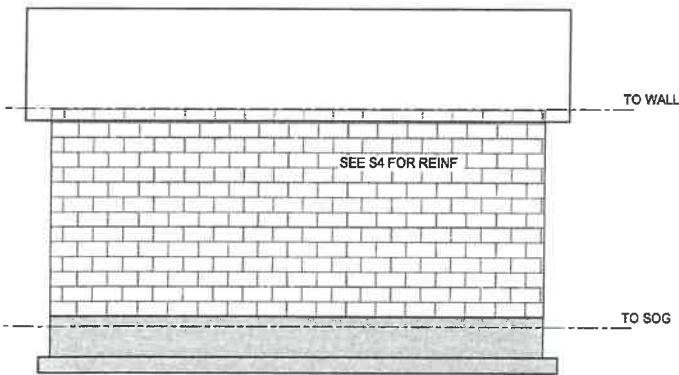
Client: HW Date: 07/20/18
Design: G.C. Date: 07/20/18
Discipline Review: G.C. Date: 07/20/18

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2. SE ELEVATION 1:50



1. SW ELEVATION 1:50

GC
Engineering

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1887 Frederick Terrace, Uxbridge, ON L9R 4M6

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P. Eng. Print

No.	DESCRIPTION	BY	DATE
3	ISSUED FOR APPROVAL	G.C.	2021.08.18
2	ISSUED FOR REVISED BP	G.C.	2020.12.23
1	ISSUED FOR BUILDING PERMIT	G.C.	2020.07.28

Project: **COWICHAN BOOSTER PUMP STATION BUILDING**

Title: **MASONRY WALL ELEVATIONS**

Scale	As Indicated	Revision No.
Project No.	20200	1
Drawn	HY	Designing
Design	HY	Date 2020.06.30
Design	Checked: GC	
Drawn	Reviewed: GC	Date 2020.06.30

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COWICHAN VALLEY REGIONAL DISTRICT
LAND USE SERVICES DEPARTMENT
 175 Ingram Street, DUNCAN, BC V9L 1N8
 Tel: 250.746.2610; Email: inspections@cvrd.bc.ca

SITE COPY

BUILDING PERMIT APPLICATION

Project Info

Address 1700 Ordano, Cowichan Bay, BC					
Lot 1	District Cowichan	Plan 101600	Elec. Area D	PID 005-069-831	Zoning
Description of Work: Ordano Reservoir Booster Pump Station					

Owner

Name(s) /Company Cowichan Bay Estates Ltd			Contact George Schmidt		
Address PO Box 126, Duncan, BC V9L 3X1			City		Postal Code
Phone 250-715-8199		E-mail george_karin@shaw.ca			

Applicant or Contractor (circle one)

Name		Company Superior Excavating Ltd			
Address 6149 Scott Rd		City Duncan		Postal Code BC V9L 6Y8	
Phone 250-715-0454		E-mail brent@superiorexavating.ca			

I, the owner of the above property, hereby authorize and appoint Cowichan Engineering Services Ltd as my agent for this application. The undersigned owner/authorized agent of the owner makes application for the permit specified herein, and declares that the information submitted in support of the application is true and correct in all respects.

Owner's Signature	Date March 9, 2021	Authorized Agent Signature 	Date March 9, 2021
-------------------	-----------------------	--------------------------------	-----------------------

Personal Information Declaration: This information is collected for the administrative and/or operational functions of the CVRD as authorized by the 'Local Government Act' and CVRD Building Bylaw No. 3422. This information has been collected, and may be used, and/or listed in a Building Permit Listing, or forwarded to authorized agencies in accordance with the 'Freedom of Information and Protection of Privacy Act'.

OFFICE USE ONLY

Building Classification	<input type="checkbox"/> SFD	<input type="checkbox"/> Residential	<input type="checkbox"/> Institutional	<input type="checkbox"/> Commercial	<input checked="" type="checkbox"/> Industrial	<input type="checkbox"/> _____
Construction	<input checked="" type="checkbox"/> New	<input type="checkbox"/> Addition	<input type="checkbox"/> Renovation	<input type="checkbox"/> Decommission	<input type="checkbox"/> Replacement	<input type="checkbox"/> _____
Building	Fee	Engineering	Fee	Value of Improvement (including labour)		
Building Permit	312	Water Connection	/	\$ 31,200		
Plumbing Permit	18	(Service Area)		Building Inspector: SB		
Building Services	-	Sewer Connection		Engineering Department: /		
Land Titles	25	(Service Area)		Planning: FL		
Other		Other		Date Issued: MAR 10 2021		
Subtotal	\$ 355	Subtotal	\$	Total Permit Fee: \$ 355		

Building Permit Issuance (Office Use)

Permission is hereby granted to CONSTRUCT BOOSTER PUMP STATION Complying with all CVRD Bylaws, BC Building Code and Approved Plans marked 'Site Copy'	DP <input type="checkbox"/> or DVP <input type="checkbox"/> # EXEMPT
Conditions RELYING ON PROFESSIONALS FOR POST DISASTER IMPROVANCE	This Building Permit is issued subject to conditions of the above DP or DVP. CVRD GIS Assigned Address /
Permit No. 21-D-062	Date
Owner/Agent Signature at time of pick up X	Receipt No. 116





COWICHAN VALLEY REGIONAL DISTRICT BUILDING INSPECTION DIVISION

175 Ingram Street, Duncan, BC V9L 1N8 Tel: 250.746.2610 FAX: 250.746.2621
inspections@cvrld.bc.ca

- **ONLY FRONT OFFICE STAFF BOOK INSPECTIONS**
- **24 HOURS NOTICE IS REQUIRED PRIOR TO INSPECTION**
- **BUILDING PERMIT NO. 21-D-062 MUST BE GIVEN**

LIST OF POTENTIAL INSPECTIONS

- Footing forms (PRIOR to pouring concrete)
- Perimeter tile and drain rock cover
- Water/sewer hook-up
- Underslab & roughed in plumbing
- Framing
- Braced wall panels
- Site built showerbase membrane (24 hr. test-install test ball in drain)
- Insulation
- Fire separations (at each layer prior to taping)
- Masonry fireplace (smoke chamber)
- Manufactured chimneys and solid fuel appliances
- Substantial completion

A SIGN MUST BE POSTED AT ALL TIMES DISPLAYING THE HOUSE NUMBER AND THE PROVIDED PERMIT NUMBER IN A CONSPICUOUS LOCATION THAT IS VISIBLE FROM THE FRONTING STREET

The **HOUSE NUMBER (civic address)** * is a requirement for Emergency Services

- Ambulance, Police, Fire Department, Hydro, Telephone, etc.

**As per CVRD House Numbering Bylaw Nos. 373 and 430*

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Building Permit No.

21-D-062

1700 Ordano Road

Post in Visible Location



CVRD

Inspections & Enforcement Division

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Designing A Better Tomorrow

Schematic Design Report
**COWICHAN BAY WATER
DISTRICT ORDANO
BOOSTER STATION**

PREPARED FOR:

**George Schmidt
Cowichan Bay Estates Ltd.**

PO Box 126
Duncan BC
V9L 3X1

AUTHORED BY

Jacob Bieling, P. Eng

PEER REVIEWED BY

Iain Barnes, P. Eng

SUBMITTED BY:

AES Engineering Ltd.
500 - 3795 Carey Road
Victoria, BC Canada V8Z 6T8
P 250.381.6121 F 250.381.6811
www.AESEngr.com

PROJECT NO. 1-20-054

March 3, 2021

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1.0 INTRODUCTION

AES Engineering Ltd were retained by Cowichan Bay Estates and George Schmidt to review and develop a schematic design report for the electrical power and control requirements for the new booster station located at the Ordano Reservoir to support the phase 3A development of Cowichan Bay Estates. This report is based on the submission of various other consultants reports and design documents provided to AES by the client.

2.0 EXISTING LOCATION

2.1 ORDANO RESERVOIR

This existing site is located on the corner of Ordano and McGill road and consists of a pump station and water storage and pressure tower. The design reports provided do not indicate any electrical modifications to existing structures or systems, so AES will assume all existing conditions will remain unless an electrical requirement mandates action.

There is three phase power high voltage currently available on a nearby BC Hydro pole located about 100m from the site on McGill road. BC Hydro will extend this three-phase power further down the road to the site service pole. BC Hydro will provide a new, dedicated transformer bank to supply a 400A, 120/208V three phase service to the site. Power will be via pilaster dip off this BC Hydro pole, and then run underground to the BC Hydro approved service entrance and metering cabinet in the new building.

Communications connection to the local telephone and internet networks is via an overhead system running below the electrical cables, which connects to the same service pole and then a further overhead run to a communication pilaster located in the trees at the corner of the existing site.

3.0 NEW BUILDING REQUIREMENTS

The following requirements are based on the provided design reports from other disciplines, and a review of the site from the street.

The design reports from the other disciplines has decided on the installation of a diesel driven fire pump, with electrical supply and monitoring as required.

1. A New building is required for housing all the new equipment. This will require base building electrical services such as lights, receptacles, heat, ventilation, data connections and distribution and control equipment. Locations for these services will be coordinated with equipment positions in the building. The building is designed as a post-disaster building but this generally no bearing on electrical components selected.

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2. A New BC Hydro transformer bank and overhead/underground service at 120/208V, three phase will be required to meet the new pump requirements. This service will route to the new building location and will be sized to pick up the entire site load. New metering will be installed at the new building, and transformation and reconnection to existing building will be performed. BC Hydro has provided their working documents supporting the revisions to the utility equipment located off site. Short circuit calculations to ensure new equipment is suitably rated for the Utility Fault current will be performed.
3. The design will include provisions for temporary generator power to maintain existing building operation during service switch over. Design will attempt to minimize this outage time to reduce the shutdown time.
4. A Standby or Emergency generator is not considered necessary, AES was directed to remove the generator from project scope by Cowichan Engineering Services on 2021/01/26. Battery supplied for lights, exit signs and control systems has been provided.
5. The booster station building arrangement will be such to minimize the impact of a water leak or spray from a pipe or pump. This will be accomplished by ensuring that all electrical equipment is mounted off the floor to allow for drainage via a floor drain; mounting panels and controls away from piping or potential leakage points; specifying electrical enclosures suitable for wet or damp locations with gasketed enclosures and corrosion resistant materials.

Lighting for the booster station will include linear LED, vapour proof fixtures within the building connected to an occupancy sensor to turn them off when nobody is in the space. Exterior lighting will be provided to support safe access to the building after hours and will be controlled via photocell. These LED fixtures will be selected to be Dark Sky compliant and to not impact neighbouring properties or roadways with glare or lighting trespass. Lighting levels of between 35–45-foot candles has been used for lighting selection and spacing.

6. A new 120/208V main distribution panel, BC Hydro metering, and 600V step up transformer to supply the pumps working voltage will be provided. The new distribution will include breakers and circuiting for the 600V domestic pumps and associated VFD's (variable Frequency Drive). Short circuit levels for the main distribution and all sub panels will be calculated.
 - a. Design will include remote shut off switch for the diesel fire pump for CBWD and Fire Department. Location to be confirmed by users.
 - b. The diseltec fire pump will tie into an annunciation autodialled to call individuals when it is operating. Design intent will be to share this system with the control annunciator system, if used.
7. AES will coordinate the process & instrumentation diagram for connection of pressure and discharge of all pumps to manage pressure spikes and maintain controlled discharge volumes. These will be routed

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back to a centralized programmable logic controller (PLC) and shared with the appropriate VFD and pump control systems.

- a. VFDs will be reviewed to ensure THD injection into the load side of the distribution is less than the IEEE 519 limits.
 - b. The pumps will have timing controls to turn on the normal booster pumps at pre-set times.
 - c. The pumps will be started/stopped via timer along with input from the pressure zone, reservoir level and fire pump operation. The domestic pumps will be shut down if the fire pump is operating or if the reservoir level is drawn below the prescribed level.
8. The existing booster pump control MPC load cycling and protection system that comes integrated with VFDs will be interconnected with the PLC system for control, annunciation, and monitoring.
 9. AES will coordinate with CBWD and the equipment suppliers to allow for provision for remote control of pump MPC and PLC system. Current scope does not include design of the remote interconnection, but the PLC specifications will require this to be possible without additional expansion cards. Space will also be set aside in the control panel for this equipment.
 10. AES will design the new communication system to branch off from the existing Ordano booster station I/T system. The new communication system will interconnect the existing facility with the new booster station. AES will coordinate with the other disciplines to determine control methodology between the new and existing systems. Client has not clarified if off site I/O will be via, radio, cellular or land line. AES will ensure PLC can output to radio and cellular transmitters or switches and has provided communication conduit and pilaster for connection to Telus/Shaw if required.
 11. AES will provide PLC and HMI system requirements, including I/O lists, performance requirements, device types to meet CBWD sole source components where required, and preliminary dimensional drawings. These will be for pricing and final design by the contractor's control trade. This system will be designed to manage all new sensors, input and control functions, and will leave sufficient space to allow for future growth.
 12. Proposed instrumentation for the booster station would include:
 - a. Inlet pressure transducer – used to represent reservoir water level and for comparison to outlet pressure. Shutdown of domestic operation could be triggered from this signal if reservoir level drops to 85%.

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- b. Outlet pressure transducer – used to represent pressure zone water pressure and for determining domestic pump startup and variable speed level, if used.
- c. Outlet pressure switch – differential pressure switch with band used to represent a call for the fire pump to start and run.
- d. Leak sensor – to monitor for build up of water within the space. This could report or signal an alert to the District.
- e. Room temperature sensor – monitor for overheating in the room to prevent damage to VFDs and similar equipment within the space. This effectively monitors for failure of any ventilation system installed.

End of Report

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From: Colin Robins <LRobins@summitvalve.com>
Sent: Thursday, June 17, 2021 11:23 AM
To: Cameron Williams
Cc: 'Holland Baker'; Dustin Ewanowich
Subject: RE: Ordano - 25943
Attachments: 210-19-X.pdf

Hi Cam / Holland,

Thank you for taking the time to meet with me this morning. I've discovered that the Cla-Val 210-19 pilot system is not noted in our standard pricelist. I've sent an RFQ to the factory detailing the requirements, we expect to have pricing back tomorrow.

Attached is the referenced 210-19 schematic. I've highlighted the altitude pilot, and pressure sustaining pilot in RED. These pilots are existing on the customers valves, and will be re-used in the new pilot system to cut down on cost. I have also highlighted the solenoid and auxiliary Hytrol valve in GREEN. These are the components being added for the solenoid control function.

I will include a copy of the schematic with installation details in our quotation. Please let me know if you need anything else.

Thank you,



Colin Robins
Account Manager

📞 778-879-9889

📠 778-285-7590

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CATALOG NO. 210-19/610-19

DRAWING NO. 85021

REV H

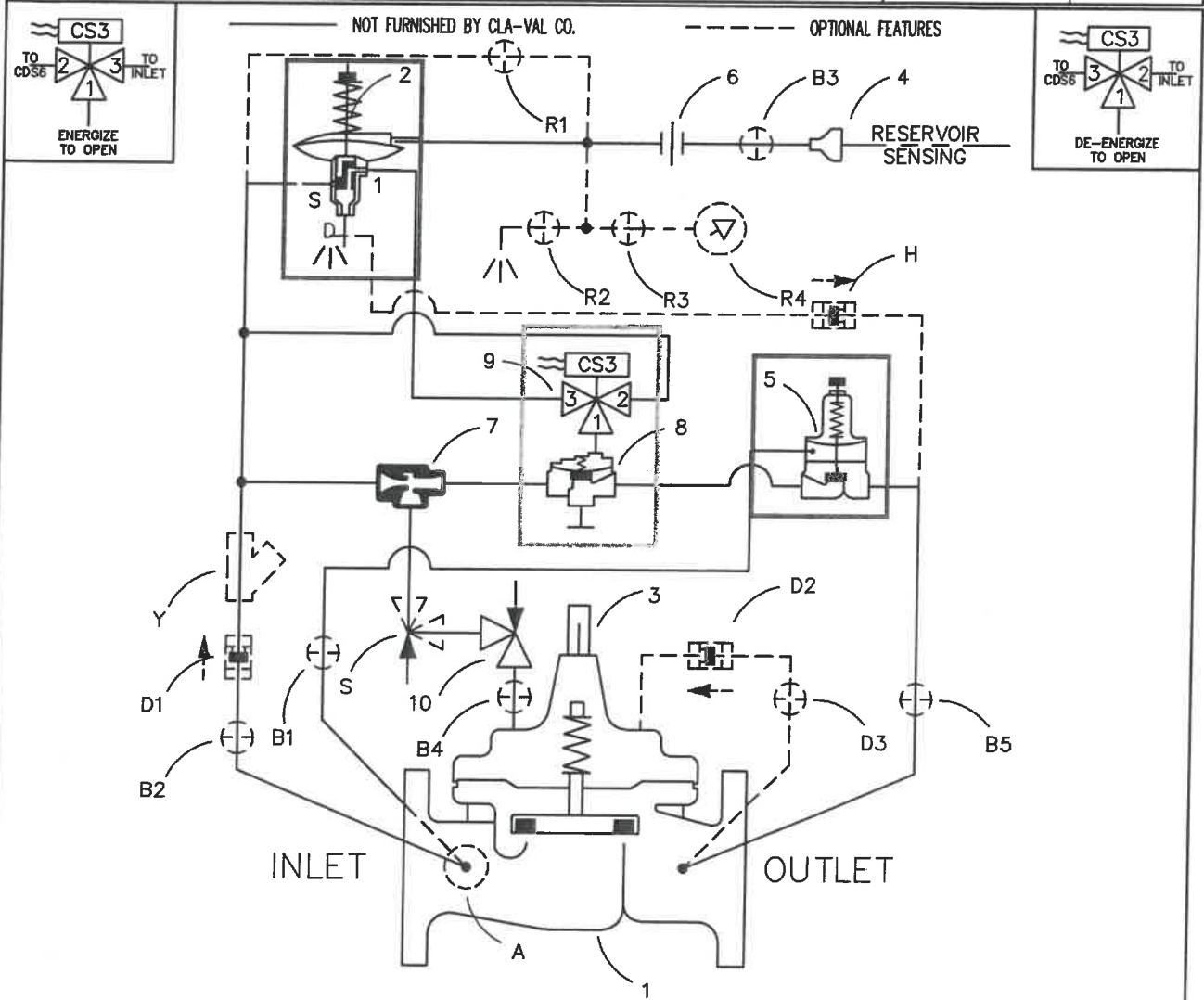
TYPE OF VALVE AND MAIN FEATURES

COMBINATION ALTITUDE, PRESSURE SUSTAINING AND SOLENOID SHUTOFF VALVE

DESIGN		
DRAWN	CH	11-19-73
CHK'D	RB	11-20-73
APVD	RB	11-20-73

F ADDED 600 SERIES (NED 47537)
 G ADDED "D" OPTIONAL FEATURE (21541)
 H ADDED CRL60 TO COMPONENT LIST; ADDED FEATURE "R" (ECO 23596)

CAD REVISION RECORD - DO NOT REVISE MANUALLY
 DESCRIPTION
 BY DATE
 A-D SEE REVISION FILE
 E REDRAWN ON CAD; CHANGED CDS5 TO CDS6 (ECO 17665) AK 7-30-99




ITEM NO.	BASIC COMPONENTS		QTY
1	100-01 HYTROL (210-19) MAIN VALVE		1
	100-20 HYTROL (610-19) MAIN VALVE		1
2	CDS6A ALTITUDE PILOT CONTROL		1
3	X101 VALVE POSITION INDICATOR		1
4	BELL REDUCER		1
5	CRL/CRL60 PRESSURE RELIEF CONTROL		1
6	UNION		1
7	X47A EJECTOR		1
8	100-01 AUXILIARY HYTROL (REV. FLOW)		1
9	CS3S SOLENOID CONTROL		1
10	CV FLOW CONTROL (CLOSING)		1

OPTIONAL FEATURE SUFFIX		ADDED TO CATALOG NUMBER	
A	X46A FLOW CLEAN STRAINER	1	
B	CK2 COCK (ISOLATION VALVE)	5	
D	CHECK VALVES WITH COCK	1	
H	PILOT DRAIN TO OUTLET	1	
R	RESERVOIR GAUGE WITH TESTER	1	
S	CV FLOW CONTROL (OPENING)	1	
Y	X43 "Y" STRAINER		1

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 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO.	DRAWING NO.	REV
	210-19/610-19	85021	H
TYPE OF VALVE AND MAIN FEATURES		DESIGN	
COMBINATION ALTITUDE, PRESSURE SUSTAINING AND SOLENOID SHUTOFF VALVE		DRAWN	CH 11-19-73
		CHK'D	RB 11-20-73
		APVD	RB 11-20-73

OPERATING DATA

I. ALTITUDE VALVE FEATURE:

ALTITUDE CONTROL (2) IS A SPRING-LOADED, 3-WAY, DIAPHRAGM-ACTUATED CONTROL THAT SENSES PRESSURE IN THE RESERVOIR. WHEN RESERVOIR PRESSURE (LIQUID LEVEL) IS LOWER THAN THE SET POINT OF CONTROL (2), PORTS 1 AND D ARE INTERCONNECTED. THIS RELIEVES PRESSURE IN THE COVER CHAMBER OF AUXILIARY HYTROL (8), OPENING AUXILIARY HYTROL (8) AND THE MAIN VALVE OPENS UNDER THE COMMAND OF PRESSURE RELIEF CONTROL (5) TO FILL THE RESERVOIR. RESERVOIR SENSING PRESSURE INCREASES AS THE LIQUID LEVEL RISES IN THE RESERVOIR. WHEN RESERVOIR PRESSURE INCREASES TO THE SET POINT OF CONTROL (2), CONTROL (2) SHIFTS, INTERCONNECTING PORTS S AND 1. THIS PRESSURIZES THE COVER CHAMBER OF AUXILIARY HYTROL (8), CLOSING AUXILIARY HYTROL (8) AND THE MAIN VALVE CLOSES. ALTITUDE CONTROL (2) ADJUSTMENT: TURN THE SPRING ADJUSTING NUT CLOCKWISE TO INCREASE THE LIQUID LEVEL SHUTOFF POINT AND COUNTERCLOCKWISE TO DECREASE THE LIQUID LEVEL SHUTOFF POINT.

II. PRESSURE RELIEF FEATURE:

PRESSURE RELIEF CONTROL (5) IS A NORMALLY CLOSED CONTROL THAT RESPONDS TO MAIN VALVE INLET PRESSURE CHANGES. AN INCREASE IN INLET PRESSURE TENDS TO OPEN CONTROL (5) AND A DECREASE IN INLET PRESSURE TENDS TO CLOSE CONTROL (5). THIS CAUSES MAIN VALVE COVER PRESSURE TO VARY AND THE MAIN VALVE MODULATES (OPENS AND CLOSES), MAINTAINING A RELATIVELY CONSTANT PRESSURE AT THE MAIN VALVE INLET. WHEN INLET PRESSURE IS LOWER THAN THE SET POINT OF CONTROL (5), CONTROL (5) CLOSES. THIS PRESSURIZES THE MAIN VALVE COVER CHAMBER AND THE MAIN VALVE CLOSES. PRESSURE RELIEF CONTROL (5) ADJUSTMENT: TURN THE ADJUSTING SCREW CLOCKWISE TO INCREASE THE SETTING.

CAD REVISION RECORD -- DO NOT REVISE MANUALLY	DATE	
	BY	
DESCRIPTION	SEE SHEET 1	
LTR		

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NEWPORT BEACH, CALIFORNIA

CATALOG NO.
210-19/610-19

DRAWING NO.
85021

REV
H

TYPE OF VALVE AND MAIN FEATURES

COMBINATION ALTITUDE, PRESSURE SUSTAINING
AND SOLENOID SHUTOFF VALVE

DESIGN		
DRAWN	CH	11-19-73
CHK'D	RB	11-20-73
APVD	RB	11-20-73

OPERATING DATA-CONTINUED

III. SOLENOID CONTROL FEATURE:

SOLENOID CONTROL (9) IS A DIRECT-ACTING, 3-WAY SOLENOID CONTROL THAT CHANGES POSITION WHEN THE COIL IS DE-ENERGIZED OR ENERGIZED. THIS APPLIES OR RELIEVES PRESSURE IN THE COVER CHAMBER OF AUXILIARY HYTROL (8), PROVIDING THE OPERATION SHOWN IN THE FOLLOWING TABLE:

SOLENOID CONTROL (9)		210E-19/610E-19 SERIES		210D-19/210D-19 SERIES	
POSITION	PORTS CONNECTED	AUXILIARY HYTROL (8) POSITION	MAIN VALVE (1) POSITION	AUXILIARY HYTROL (8) POSITION	MAIN VALVE (1) POSITION
ENERGIZED	1 & 2	OPEN	OPEN UNDER COMMAND OF CONTROLS (2) & (5)	CLOSED	CLOSED
DE-ENERGIZED	1 & 3	CLOSED	CLOSED	OPEN	OPEN UNDER COMMAND OF CONTROLS (2) & (5)

IV. CLOSING SPEED CONTROL:

CV FLOW CONTROL (10) CONTROLS THE CLOSING SPEED OF THE MAIN VALVE. TURN THE ADJUSTING STEM CLOCKWISE TO MAKE THE MAIN VALVE CLOSE SLOWER.

V. OPTIONAL FEATURE OPERATING DATA:

SUFFIX A (FLOW CLEAN STRAINER):

A SELF-CLEANING STRAINER IS INSTALLED IN THE MAIN VALVE INLET BODY BOSS WHICH PROTECTS THE PILOT SYSTEM FROM FOREIGN PARTICLES.

SUFFIX B (ISOLATION VALVES):

CK2 COCKS (B1), (B2), (B3), (B4), AND (B5) ARE USED TO ISOLATE THE PILOT SYSTEM FROM MAIN LINE PRESSURE. THESE VALVES MUST BE OPEN DURING NORMAL OPERATION.

SUFFIX D (CHECK VALVES WITH COCK):

WHEN OUTLET PRESSURE IS HIGHER THAN INLET PRESSURE, CHECK VALVE (D2) OPENS AND (D1) CLOSSES. THIS DIRECTS THE HIGHER OUTLET PRESSURE INTO THE MAIN VALVE COVER AND THE MAIN VALVE CLOSSES.

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CAD REVISION RECORD - DO NOT REVERSE MANUALLY

DATE

BY

DESCRIPTION

SEE SHEET 1

LTR


CLA-VAL CO.

NEWPORT BEACH, CALIFORNIA

CATALOG NO.

210-19/610-19

DRAWING NO.

85021

REV

H

TYPE OF VALVE AND MAIN FEATURES

COMBINATION ALTITUDE, PRESSURE SUSTAINING
AND SOLENOID SHUTOFF VALVE

DESIGN

DRAWN CH 11-19-73

CHK'D RB 11-20-73

APVD RB 11-20-73

OPERATING DATA-CONTINUED

SUFFIX H (PILOT DRAIN TO OUTLET):

CDC CHECK VALVE (H) IS USED WHEN PILOT DRAIN TO ATMOSPHERE IS NOT DESIRED. WHEN OUTLET PRESSURE IS HIGHER THAN INLET PRESSURE, CHECK VALVE (H) CLOSSES.

SUFFIX R (RESERVOIR GAUGE WITH TESTER):

TO SET THE RESERVOIR PRESSURE FOR ALTITUDE CONTROL (2), ISOLATE RESERVOIR SENSING LINE. CLOSE CK2 COCK (R2) AND OPEN CK2 COCKS (R1) AND (R3). THIS APPLIES PRESSURE TO ALTITUDE CONTROL (2) SENSING CHAMBER. WHEN THE DESIRED PRESSURE HAS BEEN REACHED BY READING PRESSURE GAUGE (R4), ADJUST ALTITUDE CONTROL (2). CLOSE CK2 COCK (R1) AND OPEN CK2 COCK (R2). THIS RELIEVES EXCESS PRESSURE TO ATMOSPHERE, SETTING THE DESIRED RESERVOIR PRESSURE FOR ALTITUDE CONTROL (2). DURING NORMAL OPERATIONS CK2 COCKS (R1) AND (R2) MUST BE CLOSED.

SUFFIX S (OPENING SPEED CONTROL):

FLOW CONTROL (S) CONTROLS THE OPENING SPEED OF THE MAIN VALVE. TURN THE ADJUSTING STEM CLOCKWISE TO MAKE THE MAIN VALVE OPEN SLOWER.

SUFFIX Y (Y-STRAINER):

A Y-PATTERN STRAINER IS INSTALLED IN THE PILOT SUPPLY LINE TO PROTECT THE PILOT SYSTEM FROM FOREIGN PARTICLES. THE STRAINER SCREEN MUST BE CLEANED PERIODICALLY.

V. CHECK LIST FOR PROPER OPERATION:

- () SYSTEM VALVES OPEN UPSTREAM AND DOWNSTREAM.
- () AIR REMOVED FROM THE MAIN VALVE COVER AND PILOT SYSTEM AT ALL HIGH POINTS.
- () PERIODIC CLEANING OF STRAINER (Y) IS RECOMMENDED (OPTIONAL FEATURE).
- () RESERVOIR SENSING LINE PROPERLY CONNECTED.
- () CV FLOW CONTROL (10) OPEN AT LEAST 4 TURNS.
- () CV FLOW CONTROL (S) OPEN AT LEAST 4 TURNS (OPTIONAL FEATURE).
- () CORRECT VOLTAGE TO SOLENOID CONTROL (9).
- () CK2 COCKS (B1), (B2), (B3), (B4), (B5), AND (D3) OPEN (OPTIONAL FEATURE).
- () CK2 COCKS (R1) AND (R2) CLOSED (OPTIONAL FEATURE).

CAD REVISION RECORD - DO NOT REVISE MANUALLY

DESCRIPTION

DATE

BY

SEE SHEET 1

LTR

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June 18, 2021
P: 221219

COWICHAN ENGINEERING SERVICES
6468 Norcross Rd
Duncan, BC V9L 6C5

Attention: Cam Williams, AScT

Reference: Ordano Booster Pump Station Ventilation
Cowichan Bay, BC

The attached sealed equipment specifications were selected by Avalon Mechanical Consultants to facilitate proper cooling and ventilation for the booster pump station and the diesel engine driven fire pump it houses.

In their Design Review Report dated March 30, 2021, Associated Engineering correctly identified the fact that there was inadequate ventilation provided. Based on the performance data given for the diesel booster pump, the required fan and associated intake and exhaust louvers were calculated and sized. This system will provide adequate airflow to prevent overheating of the diesel pump, as well as combustion air requirements.

Sincerely,

AVALON MECHANICAL CONSULTANTS LTD.

A handwritten signature in black ink, appearing to read 'Jon Edgell', is written over a light blue horizontal line.

Jon Edgell, P.Eng.
Principal

Written: Jon Edgell
File: 221219 Ordano Station Letter

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GRILLE / DIFFUSER / LOUVER SCHEDULE						
TAG	MAKE	MODEL	FINISH	MOUNTING	NOTES	COMMENTS
IL-1	GREENHECK	EAC-601 TFB24	MILL	WALL	1,2	FOR 8" WALL. IF 4" WALL, REPLACE WITH MODEL EAC-401
EL-1	PRICE	DE639	MILL	WALL	2,3	FOR 8" WALL. IF 4" WALL, REPLACE WITH MODEL DE439

NOTES:
1. MOTORIZED DAMPER - INTERLOCKED WITH FAN OPERATION
2. BIRD SCREEN
3. GRAVITY BACKDRAFT DAMPER

FAN SCHEDULE										
TAG	SERVICE	TYPE	SIZE	MAKE	MODEL	POWER/LOAD	SOUND	WEIGHT	CONTROL	NOTES
EF-1	PUMP ROOM	CABINET	2500 CFM @ 25"	GREENHECK	SQ-160-VG	115/1 3/4HP	6.3 SONES	145 LBS	COOLING T-STAT	1,2,3

NOTES:
1. SPRING ISOLATION
2. GRAVITY BACKDRAFT DAMPER
3. COOLING THERMOSTAT CONTROL (SET TO 30°C - ADJUSTABLE)

FAN/INTAKE LOUVER AND EXHAUST LOUVER TO BE INSTALLED ON OPPOSING SIDES OF THE BUILDING IN ORDER TO CREATE ADEQUATE CROSS-VENTILATION. INSTALLATION HEIGHT TO BE A MINIMUM 2' ABOVE SLAB, BUT PREFERABLY HIGH UP THE WALL.

AVALON HAS BEEN ASKED TO SIZE AND SPECIFY COMPONENTS ONLY. NO DRAWINGS HAVE BEEN PREPARED. IF NECESSARY, PROVIDE DRAWINGS AND/OR PICTURES TO AVALON FOR COORDINATION OF LOCATIONS.



2021-06-18

AM AVALON MECHANICAL
300-1245 Esquimalt Road
Victoria, BC V9A 3P2
250-584-4128
info@avalonmechanical.com

103-5220 Dublin Way
Nanaimo, BC V9T 2K6
250-585-2180

DRAWINGS ARE NOT TO BE USED FOR COSTING, PRICING, TENDER, OR CONSTRUCTION UNLESS THEY HAVE BEEN ISSUED AS SUCH.

AVALON MECHANICAL WILL NOT BE RESPONSIBLE FOR ANY ADDITIONAL WORK, COSTS, OR COORDINATION REQUIRED FOR DRAWINGS USED FOR OTHER PURPOSES THAN INDICATED.

ORANDO BOOSTER PUMP STATION

VENTILATION SYSTEM COMPONENTS

COWICHAN BAY, BC

PROJECT NORTH

DESIGNED
CJP
AVALON PROJECT NO.
221219

SHEET NUMBER

M-1.01

APPROVED
JE
SCALE
AS NOTED

133



July 21, 2021

Cameron Williams
Cowichan Engineering Services Ltd.
6468 Norcross Road
Duncan, BC

V9L 6C5

RE. Building Envelope Services
Booster Pump Station
Ordano Reservoir Site

Dear Cameron,
I have reviewed the documents provided and offer the following re. meeting NECB 2017 Performance requirements:

Zone 4	<3000	Thermal Transmittance	RSI	R
				Overall Thermal Resistance
	Walls	0.315		3.175
	Roofs	0.193		5.181
	Floors	0.227		4.405
	All doors	2.1		25.0
Assemblies in contact with ground				
	Walls	0.568		
3.2.3.1.(5)	Floors	.757 for 1.2 m		
Air Leakage				
	OH Doors	5.0L/(s.m2)	ASTM E283	
	Other Doors	.5L/(s.m2)		

Refer to the attached drawings for detail information.

Walls Above Ground:

The proposed construction is 190 mm concrete masonry units with structural reinforcing as called for. RSI of 3.175 (R18.0) required. I suggest the simplest means to achieve this is with an EIFS (Exterior Insulation and Finish System). I recommend the following: StoTherm ci with Sto IMPACT, using 100 mm GPS insulation (R4.7). Regular EPS will not provide the required RSI. (R value per inch 3.7, x 4 = R14.4).

Recommend interior be painted with washable acrylic paint (semi gloss) per Master Painter's spec., walls and ceiling.

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Roof (with attic):

The required overall thermal resistance is RSI 5.181 (R29.4). To achieve this the space between the bottom chords of trusses should be filled with R12 (for 2x4 bottom chord) with R-20 continuous over. Ensure minimum ventilation clearance at exterior walls over insulation. Provide soffit ventilation and gable vents (total minimum open area 1/300 building floor area). Refer to elevations attached for gable vents.

Ceiling finish 6 mil polyethylene vapour retarder, 2 layers 16 mm moisture resistant GWB, painted.

Below Ground:

Inside perimeter to have horizontally RSI 1.32 (R 7.5) = 50 mm XPS insulation 1.2 m wide continuously (see building section). Ensure 10 mil polyethylene vapour retarder membrane under slab on grade.


Doors:

Refer to the table above for information re. required door thermal and air leakage performance.

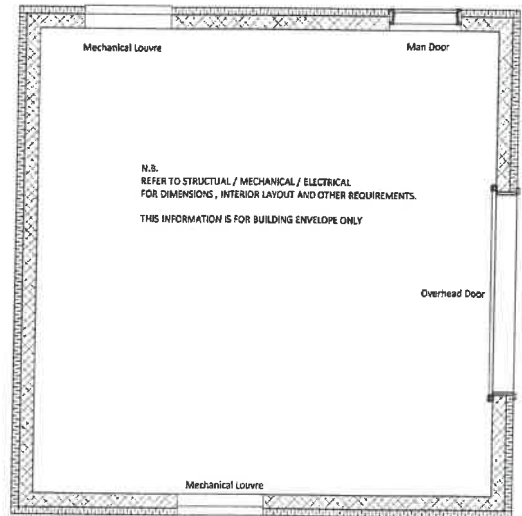
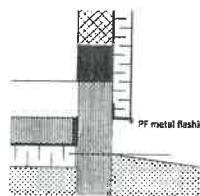
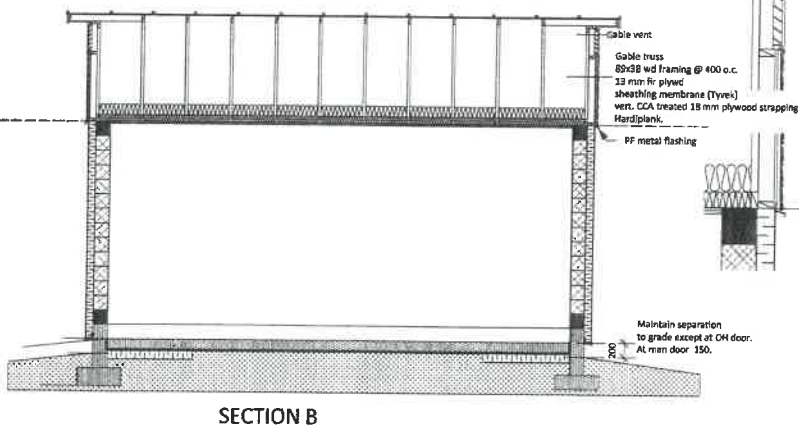
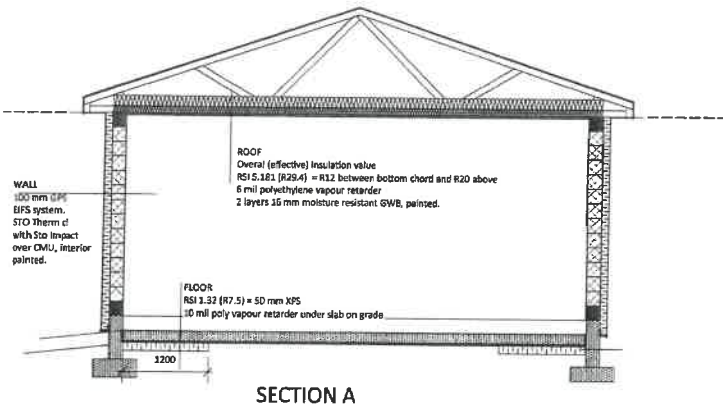
Trust this addresses the building envelope component of this project.

PRAXIS ARCHITECTS INC

per:


Robert Rocheleau, Architect AIBC
Director





PLAN AND SECTIONS

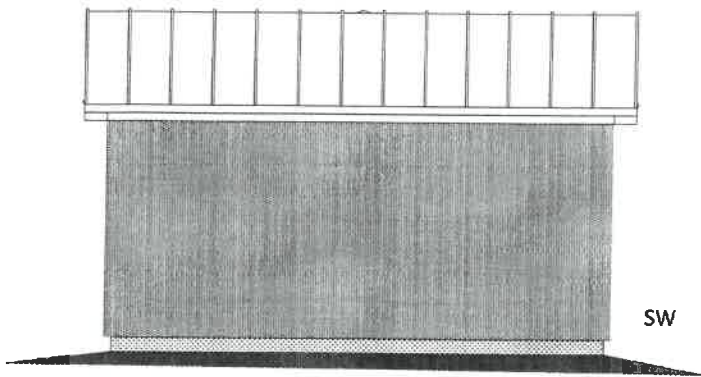
**BUILDING ENVELOPE
BOOSTER PUMP STATION
ORDANO RESERVOIR SITE**

**PRAXIS ARCHITECTS INC.
401 - 1245 Esquimalt Rd.
Victoria, BC
V9A 3P2**

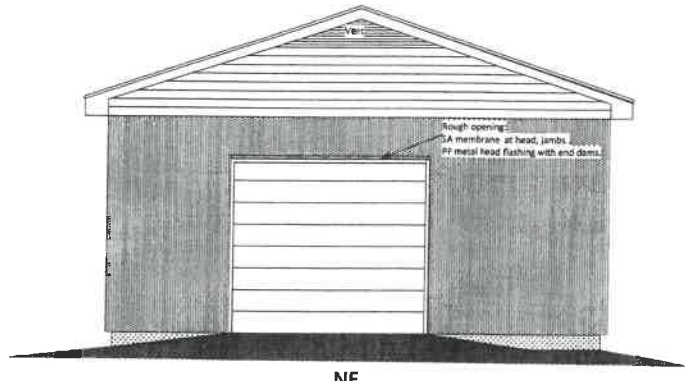
July 22, 2021



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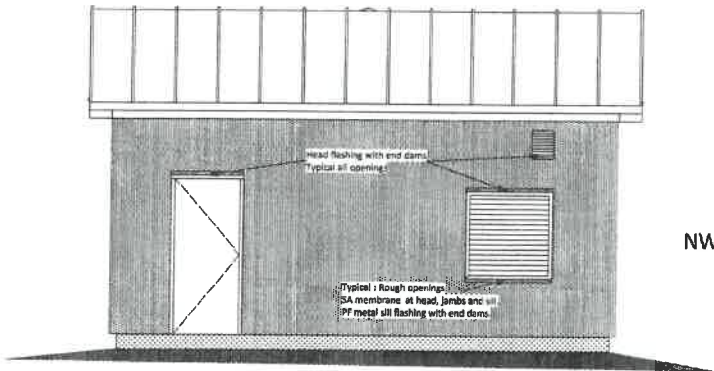


SW

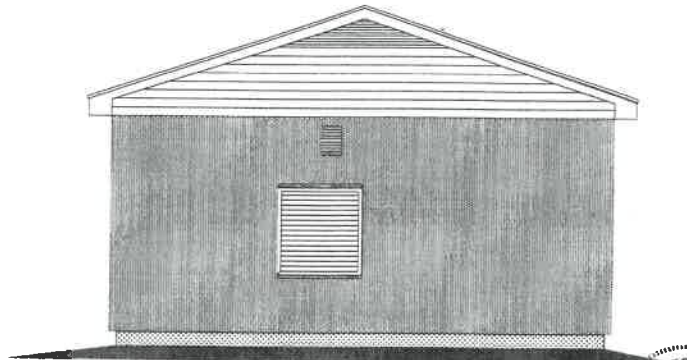


NE

N.A.
REFER TO MECHANICAL AND ELECTRICAL FOR ADDITIONAL ITEMS TO BE INTEGRATED INTO BUILDING ENVELOPE NOT INDICATED HERE. ALL PENETRATIONS OF ROOF AND WALL ASSEMBLIES TO BE SEALED TO ENSURE CONTINUOUS VAPOUR / AIR RETARDER IS PROVIDED.



NW



SE

July 22, 2021

ELEVATIONS
BUILDING ENVELOPE
BOOSTER PUMP STATION
ORDANO RESERVOIR SITE

PRAXIS ARCHITECTS INC.
401 - 1245 Esquimalt Rd.
Victoria, BC
V9A 3P2



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END.

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