a division of Englobe

Saddle Hills County

Bonanza Distribution Pumps Upgrading

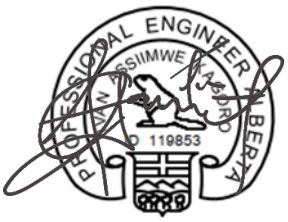
5201-008-00

January 2025

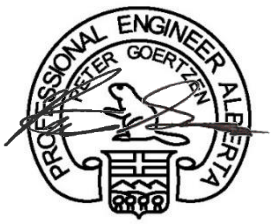
Proud of Our Past... Building the Future

Saddle Hills County

Bonanza Distribution Pumps Upgrading



January 28, 2025
Process/Civil



January 28, 2025
Electrical/Controls

PERMIT TO PRACTICE
MPE, a division of Englobe Corp.
Signature
APEGA ID 51203
Date January 28, 2025
PERMIT NUMBER: P 7841
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Prepared by MPE a division of Englobe

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PREAMBLE

The format of these Specifications is based on "MasterFormat" published jointly by Construction Specifications Canada and The Construction Specifications Institute. This Table of Contents generally reflects the "MasterFormat" division and section arrangement.

Where it is indicated that a division of "MasterFormat" is "Not Used", or where a division heading is omitted entirely, this means only that the division has not been included in the Specification. It does not necessarily mean that the work normally specified in that division is not required.

DIVISION 9 – FINISHES

DIVISION 15 – MECHANICAL

DIVISION 16 – ELECTRICAL

CONTRACT DRAWINGS – ISSUED SEPARATELY

END OF TABLE OF CONTENTS

1. BID SUBMISSION

.1 Bidders must submit bids through the Online Bidding System https://mpe.bidsandtenders.ca/.

.2 Bidders may submit bids only before the time and date set by for receiving bids on the Online Bidding System.

.3 The time as indicated by the declining time clock on the Online Bidding System shall be the official time for closing. Bids submitted after the Online Bidding System closing time will not be allowed by the Online Bidding System.

.4 Hard copy, oral, telephone, telegram, fax, or e-mail bids will not be accepted nor acknowledged.

.5 The foregoing states the date and time before which bids will be received hereinafter called the "bid closing time".

.6 Bids shall be prepared and submitted and the bidding process will be administered in accordance with these bidding requirements.

2. SUMMARY

.1 The intent of this bid call is to solicit and receive formal offers for:

Saddle Hills County
Bonanza Distribution Pumps Upgrading

.2 Refer to Section 01110 - Summary of Work for a summary of the Project, including requirements pertaining to Contract Time.

3. BASIS OF BID – UNIT PRICE

.1 Bids shall be on a unit price basis.

.2 The unit prices, lump sums and allowances stated in the Bid Form and Schedule of Prices shall form the basis of the bid price.

.3 Make entries in the Bid Form and Schedule of Prices in figures only. Ensure that figures are legible.

.4 Where, in the Owner's opinion, there is a question as to the legibility of figures entered by the Bidder, the Owner will make a determination as to legibility. The Owner may, at the Owner's sole discretion, declare as invalid and reject any bid that contains figures which, in the Owner's opinion, are illegible or open to dispute.

.5 Extensions of unit prices and addition of extended unit prices, lump sums and allowances entered in the Schedule of Prices will be checked by the Owner. If arithmetical errors are discovered, the unit prices shall be considered as representing the Bidder's intentions and the unit price extensions and the total amount entered in the Bid Form and Schedule of Prices will be corrected by the Owner. The Bidder shall be bound to such corrected amounts.

.6 If no unit price is stated for an item, but an extended amount is stated, a unit price determined by dividing the extended amount by the estimated quantity shall be considered as representing the Bidder's intentions.

.7 If a unit price and amount have both been omitted (or the amount only in the case of a lump sum item), unless the Bidder has specifically stated otherwise in his bid, the Owner shall assume that the Bidder has allowed elsewhere in his Bid Form the cost of carrying out the said item. The unit price (or lump sum amount) will be assumed to be zero.

.8 The total amount of the bid shall be the arithmetically correct sum of the arithmetically correct unit price extensions, lump sums and allowances in the Bid Form and Schedule of Prices.

.9 Each unit price stated in the Bid Form and Schedule of Prices shall be a reasonable price for that item of work.

.10 Unless otherwise indicated, quantities specified in the Bid Form and Schedule of Prices are estimated quantities and shall not be considered as actual quantities of work to be performed. Subject to Contract terms, unit prices stated in the Bid Form and Schedule of Prices shall be applied to actual quantities of work performed as measured in accordance with the Contract.

.11 Unless separate measurement and payment is specifically identified for any material or activity necessary to complete the project as specified, any labour, equipment, or material necessary for completion will be considered to be incidental to the price paid for the Work.

.12 The prices tendered shall include the supply of all materials except those specified to be supplied by others, all supervision, labour, and equipment, and a provision for overhead and profit, and shall represent the entire cost to the Owner for the completed works as specified and shown on the drawings.

.13 Taxes will be automatically applied to the Total Contract Amount in the Summary Table of the Schedule of Prices on the Online Bidding System. Each unit price stated in the Bid Form and Schedule of Prices should not include taxes. The Bidder is responsible for verifying the Total Contract Amount stated in the Summary Table prior to submission.

4. SUFFICIENCY OF BID

.1 The submission of a bid shall constitute an incontrovertible representation by the Bidder that:

.1 The Bidder has complied with all bidding requirements,

.2 The Bidder is qualified and experienced to perform the Work in accordance with the Bid Documents,

.3 The bid is based upon performing the Work in accordance with the Bid Documents, without exception, and

.4 The price or prices stated in the bid cover all the Bidder's obligations under the Contract and all matters and things necessary for the performance of the Work in accordance with the Bid Documents.

5. BID DOCUMENTS

.1 The Bid Documents are the documents issued or made available to Bidders by the Owner for the purpose of preparing a bid. The Bid Documents consist of the following:

.1 Instructions to Bidders.

.2 Bid Security.

.3 Pre-Bid Meeting.

.4 Bid Form Supplements.

.5 Agreement Form.

.6 Definitions.

.7 Payment Conditions.

.8 Contract Performance Security.

.9 Security for Payment of Claims.

.10 Insurance Conditions.

.11 General Conditions of Contract.

.12 Supplementary Conditions.

.13 Specifications, Divisions 1 to 16 inclusive.

.14 Drawings.

.15 Addenda issued during the bid period.

.16 Contract Information Documents.

6. BID FORM SUPPLEMENTS

.1 Prepare and submit the Bid Form and Schedule of Prices on the Online Bidding System.

.2 The Owner may, after bid closing time and before contract award, require any Bidder to submit, in a form prescribed by or acceptable to the Owner, supplementary information about any aspect of the Bidder's bid which, in the Owner's opinion, is necessary for bid evaluation purposes.

7. BID WITHDRAWAL AND ACCEPTANCE

.1 A bid may be withdrawn through the Online Bidding System at any time before the bid closing time.

.2 Withdrawn bids may be resubmitted in accordance with these bidding requirements providing the resubmitted bid is received through the Online Bidding System as indicated in 1.1, before the bid closing time.

.3 A bid may not be withdrawn at or after bid closing time and shall be open to acceptance by the Owner until:

.1 Some other Bidder has entered into a contract with the Owner for the Work, or

.2 60 days after the bid closing time,

whichever occurs first.

.4 The 60 day period referred to above shall commence at midnight of the date of the bid closing and shall terminate at midnight of the 60th day thereafter. If the 60th day falls on a statutory holiday, such day, and any subsequent contiguous holidays, shall be omitted from the computation.

.5 The 60 day acceptance period referred to above may be extended at the Owner's request and subject to the Bidder's written agreement to the extension.

.6 The Contract shall be established upon the Owner issuing to the successful Bidder, a letter accepting the bid without qualification or, if the letter accepting the bid contains one or more qualifications, upon the Bidder’s written acceptance of all such qualifications.

.7 The lowest or any bid will not necessarily be accepted and the Owner may reject any and all bids.

.8 The Owner may negotiate contract terms with the Bidder submitting the lowest valid bid, provided that the negotiated changes to the Bid Documents result in either no change to the bid price or a reduced bid price. Such changes may be formalized in the form of a Post-Bid Addendum that, upon written acceptance by the Bidder, shall form part of the Contract Documents.

8. BID OPENING

.1 Bids will be opened on the Online Bidding System immediately after the bid closing time.

.2 The name of each Bidder and the bid price will be displayed. The displaying of a bid price shall not be considered a representation or warranty that the price is correct or that the bid is valid.

9. IRREGULARITIES

.1 A bid that is informal, incomplete, qualified, non-compliant with the requirements of the Bid Documents, or otherwise irregular in any way, may be declared invalid and rejected.

.2 The Owner may accept or waive a minor and inconsequential irregularity, or where practicable to do so, the Owner may, as a condition of bid acceptance, request a Bidder to correct a minor and inconsequential irregularity with no change in the bid price.

.3 The determination of what is, or is not, a minor and inconsequential irregularity, the determination of whether to accept, waive or require correction of an irregularity, and the final determination of the validity of a bid, shall be at the Owner's sole discretion.

.4 Discrepancies between words and figures will be resolved in favour of words.

10. SAFETY PREQUALIFICATION

.1 Prime contract Bidders should possess a valid Certificate of Recognition (COR) or Temporary Letter of Certification (TLC) as issued by the Alberta Construction Safety Association (ACSA) or another certifying organization authorized to issue CORs.

.2 Prospective Bidders who do not possess a COR, and wish to obtain information about obtaining a COR or TLC, are advised to contact:

The Alberta Construction Safety Association online at http://www.youracsa.ca/.

11. AVAILABILITY OF BID DOCUMENTS

.1 Bid Documents are available on the Online Bidding System at https://mpe.bidsandtenders.ca/.

.2 A Bid Document deposit is not required.

.3 The Owner will assume no responsibility or liability for the completeness of any Bid Documents obtained from a source other than the Online Bidding System.

12. EXAMINATION OF BID DOCUMENTS AND THE SITE

.1 Bidders shall, before submitting a bid:

.1 Examine and read the Bid Documents thoroughly,

.2 Visit the site and its surroundings and other locations to become familiar with local and other conditions affecting the Work,

.3 Consider the effect of regulatory requirements applicable to the Work,

.4 Study and correlate Bidder's Site observations with the Bid Documents,

.5 Immediately notify the Owner of all perceived omissions and discovered conflicts, errors and discrepancies in the Bid Documents, and

.6 Understand the Bid Documents and be competent to undertake and complete the Work.

.2 Refer to Section 00300 – Information Documents which identifies available information pertaining to the Project and specifies the status of and the extent, if any, to which the Bidder may rely upon such Information Documents.

.3 Before submitting a bid, each Bidder shall, at the Bidder's expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the conditions at, under, or contiguous with the site, which may affect performance of the Work and which the Bidder deems necessary to determine its bid for performing the Work in accordance with the Bid Documents. Bidders shall obtain the Owner's prior approval for access to the site for the purpose of carrying out any such activities. Bidders shall restore the site to a condition acceptable to the Owner upon completion of such activities.

.4 Lands upon which Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by the Contractor in performing the Work are identified in the Bid Documents. Additional lands and access thereto required for performance of the Work shall be provided by Contractor.

.5 When Section 00250 - Pre-Bid Meeting, is included in the Bid Documents, a pre-bid meeting is arranged by the Owner to take place during the bid period. The date and time of the meeting will be indicated on the Online Bidding System.

13. BID SECURITY

.1 Provide and submit the bid security specified in Section 00210 - Bid Security.

14. CONSENT OF SURETY

.1 Provide and submit a Consent of Surety Form in the amount equal to fifty (50%) percent of the Contract sum.

15. CONTRACT PERFORMANCE SECURITY

.1 Provide and include in the bid price for the security specified in Section 00612 - Contract Performance Security.

16. SECURITY FOR PAYMENT OF CLAIMS

.1 Provide and include in the bid price for the security specified in Section 00616 - Security for Payment of Claims.

17. EVIDENCE OF ABILITY TO PROVIDE SECURITY

.1 The Owner may, after the bid submission and before the contract award, require a Bidder to submit evidence of the Bidder's ability to provide the security specified in the Bid Documents.

18. ALLOWANCES

.1 Include in the bid price all allowances specified in Section 01280.

19. PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Product options: Comply with the requirements of Section 01621.

.2 Substitutions:

.1 Comply with the requirements of Section 01621.

.2 Where products are specified by a proprietary specification, and substitutions are permitted, Bidders may base their bids on a named product or manufacturer or on unnamed substitutions, subject to the requirements specified for substitutions in Section 01621.

.3 During the bid period, it is the sole responsibility of each Bidder to determine whether a substitution meets the requirements specified in Section 01621.

.4 The Owner will not consider requests for approval of substitutions from Bidders during the bid period.

.5 Substitutions will be evaluated and approved or rejected by the Owner after the contract award.

.3 Product Acceptability:

.1 The Owner may, after the bid submission and before the contract award, require any Bidder to submit proof that a product proposed for use complies with the requirements of the Bid Documents. Such proof shall be in the form of product data as specified in Section 01621.

.2 Should the Owner determine that a proposed product does not meet the requirements of the Bid Documents, the Bidder shall propose a product which, in the Owner's opinion, does meet requirements of Bid Documents, otherwise such Bidder's bid may be declared invalid and rejected.

20. AGREEMENT

.1 The successful Bidder will be required to enter into a formal Agreement with the Owner for the performance of the Work.

21. DIVISION OF WORK

.1 Work specified in the Specifications is divided into Divisions and Sections for reference purposes only. Except as may be otherwise specified in the Bid Documents, the division of the Work among the Contractor, Subcontractors, Sub-subcontractors and suppliers is the Bidders' responsibility.

22. INTERPRETATION AND MODIFICATION OF BID DOCUMENTS

.1 Submit questions about the meaning and intent of the Bid Documents to the Owner at the office identified under "Inquiries". Interpretations and modifications considered necessary by the Owner in response to such questions will be issued by the Owner in writing in the form of an Addendum.

.2 Addenda may also be issued by the Owner to modify the Bid Documents as deemed necessary by the Owner.

.3 Submit questions as early as possible in the bid period. The Owner may not respond to questions received too close to the bid closing time to permit issuance of an Addendum.

.4 Submit inquiries as early as possible in the bid period. If an inquiry requires an interpretation or modification of the Bid Documents, but is received too close to the bid closing time to permit issuance of an Addendum, the Owner may be unable to respond to that inquiry.

.5 Any replies to inquiries or interpretations or modifications of the Bid Documents made verbally, by e-mail, or by any manner other than in the form of a written Addendum, shall not be binding.

23. ADDENDA

.1 Addenda, when issued, will become part of the Bid and Contract Documents.

.2 Each Bidder shall ascertain before bid submission, that it has received all Addenda issued by the Owner, and shall indicate in the Bid Form, the Addendum number(s) of all Addenda received.

.3 During the Bid period, all Addenda issued by the Owner will be published on the Online Bidding System.

.4 Bidders who have obtained Bid Documents from any another source may not automatically receive addenda.

24. CONTRACT TIME (SCHEDULING AND COMPLETION DATE)

.1 Bidders are required to indicate on page 1 of the Bid Form their required duration of construction in calendar days to attain each of Substantial Performance and Total Performance of the work.

.2 The length of construction period submitted on the Bid Form may have a bearing on the selection of the successful Bidder.

25. BID FORM SUPPLEMENT – SCHEDULE OF RATES FOR UNCLASSIFIED WORK

.1 Submit rate schedule in Section 00493 identifying the project personnel rates to carry out unclassified work for project change orders and force account work in accordance with the General Conditions.

.2 The submitted rates should include all overhead and profit for the Contractor and/or subcontractor to provide a complete all-inclusive rate for each personnel. Identify overtime rate separately.

26. BID FORM SUPPLEMENT – SCHEDULE OF SUBCONTRACTORS

.1 Submit in Section 00495 names of all subcontractors that will be employed on the work.

.2 Changes in subcontractors will not be permitted without the written consent of the Owner's Representative. If requested by the Owner, the Bidder may be required to confirm the qualifications of a subcontractor prior to their acceptance.

.3 The Owner reserves the right to reject a named subcontractor for reasonable cause. The Bidder shall then be required to name an alternate subcontractor.

27. INQUIRIES

.1 Direct inquiries during bid period to:

Ivan Kagoro, P.Eng.

MPE a division of Englobe
Suite 101, 10630 – 172 Street
Edmonton, AB T5S 1H8

Tel: (780) 486-2000
Email: ikagoro@mpe.ca

END OF SECTION

1. TYPE AND AMOUNT OF BID SECURITY

.1 Provide bid security in the form of a digital bid bond (e-bond) in an amount not less than 10% of the bid price.

.2 Submit bid security with bid on the Online Bidding System. Bids not accompanied by bid security will be rejected.

2. BID BONDS

.1 Bid bonds shall be in accordance with the Canadian Construction Documents Committee (CCDC) Standard Form of Bid Bond, CCDC Document No. 220.

.2 Bid bonds shall be issued by a duly incorporated surety company authorized to transact business of suretyship in the Province of Alberta.

.3 Bid bonds shall be properly electronically executed by both the Bidder and the surety.

3. DEFAULT BY BIDDER

.1 If a Bidder whose bid is accepted by the Owner in writing, without qualification, and within the acceptance period specified in the Bid Documents, refuses or fails within 21 days after the date of issuance of the written acceptance of the bid:

.1 To sign a formal Agreement with the Owner for the performance of the Work, and

.2 To provide contract performance security, or security for payment of claims, or both, if and as required by the Bid Documents,

the Bidder shall be liable to the Owner for the difference between the amount of its bid and the greater amount for which a contract for the Work is entered into with some other Bidder, up to the maximum amount of the bid security provided.

END OF SECTION

1. PRE-BID MEETING AND SITE INSPECTION

.1 A pre-bid meeting and site inspection will be held at the time and place specified on the Online Bidding System.

.2 Purpose is to provide bidders an opportunity to familiarize themselves with the Work and with existing conditions. Owner's representative(s) will be present.

.3 This meeting will be Bidders' only opportunity to inspect the site in the presence of the Owner's Representative.

.4 Site access is not restricted.

.5 All prime contract and major subcontract Bidders are strongly advised to attend. Others are invited to attend.

.6 No information provided by the Owner or any of his representatives at the pre-bid meeting and site inspection shall be binding, unless such information is included in an Addendum.

END OF SECTION

1. CONTRACT INFORMATION DOCUMENTS

.1 Contract Information Documents listed in 3.1 are incorporated into the Contract.

.2 The Bidder is entitled to rely upon the factual information or factual data contained in Contract Information Documents, or parts thereof, which have been obtained principally for the purposes of study and design and believed to be correct, within normal limits inherent in gathering such information and data, but the Bidder shall draw its own conclusions from such factual information or factual data and shall not rely on opinions or interpretations contained therein.

.3 Contract Information Documents shall not be considered a representation or warranty that information contained therein is complete or appropriate for construction.

.4 Information contained in Contract Information Documents may be time sensitive and dates and times shall be considered when interpreting such information.

.5 The Bidder is encouraged to obtain specialist advice with respect to Contract Information Documents. The Owner assumes no responsibility for such interpretations and conclusions.

2. OTHER INFORMATION DOCUMENTS

.1 Other Information Documents means information documents not listed in 3.1 herein, and are not part of the Contract Documents.

.2 The Bidder is not entitled to rely upon the factual information or factual data in any Other Information Documents, nor any opinions or interpretations contained therein. Other Information Document shall not be considered accurate, complete, or appropriate.

.3 Other Information Documents are made available to the Bidder for the purpose of providing the Bidder with access to the information available to the Owner.

3. LIST OF CONTRACT INFORMATION DOCUMENTS

.1 Contract Information Documents comprise the following: N/A

4. ACCESS TO INFORMATION DOCUMENTS

.1 Contract Information Documents and Other Information Documents not issued to Bidders with the Bid Documents are available for examination at:

MPE a division of Englobe
Suite 101, 10630-172 Street
Edmonton, AB T5S 1H8

.2 Bidders may examine the above documents during normal business hours, 8:00 a.m. to 12:00 p.m. and 1:00 p.m. to 5:00 p.m. daily.

.3 For an appointment to examine the documents contact:

Ivan Kagoro, P.Eng.
780-486-2000

.4 Direct enquiries during the bid period to the person identified in Instructions to Bidders to receive enquiries.

END OF SECTION

.1 The Schedule of Prices must be completed on the Online Bidding System.

END OF SECTION

AGREEMENT BETWEEN (Saddle Hills County) AND (Contractor)

This Agreement made in triplicate on the ..... day of ..... 20.....

between

Saddle Hills County, hereinafter called the "Owner"

and

.....
(Name of Contractor)

.....
(address)

.....

.....
(city, prov, postal code)

hereinafter called the "Contractor"

witnesses: that the parties agree as follows:

ARTICLE 1: THE WORK

The Contractor shall perform the Work required by the Contract Documents for:

Saddle Hills County
Bonanza Distribution Pumps Upgrading

and do and fulfill everything required by this Agreement.

ARTICLE 2: CONTRACT DOCUMENTS

The Contract Documents referred to in Article 1 of this Agreement shall be as defined in the Contract Documents. Terms used in the Contract Documents which are defined in the Definitions and Interpretation Section shall have the meanings designated therein.

ARTICLE 3: CONTRACT TIME

The Contractor shall attain Substantial Performance of the Work by the following date:

30th day of September, 2025.

The Contractor shall attain Total Performance of the Work by the following date:

15th day of October, 2025.

ARTICLE 4: CONTRACT PRICE

The Contract Price is ..... dollars

and ..... cents.

($.....) in Canadian funds **(GST in).**

ARTICLE 5: TAXES AND DUTIES

Unless otherwise stated in the Contract Documents, the Contractor shall pay all government sales taxes, customs duties and excise taxes with respect to the Contract.

Any increase or decrease in costs to the Contractor due to changes in such taxes and duties, after the closing date of the Tender submissions, shall increase or decrease the Contract Price accordingly.

Where an exemption from or recovery of government sales taxes, duties or excise taxes is applicable to the Contract, the procedure shall be as established in the Payment conditions and other applicable provisions in the Contract Documents.

ARTICLE 6: PAYMENT

The Owner shall make payment in Canadian funds to the Contractor on account of the Contract Price in accordance with the Payment Conditions and other applicable provisions in the Contract Documents.

The Owner shall hold back an amount equal to 10% from each progress payment as provided for in the Payment Conditions of the Contract Documents.

ARTICLE 7: RIGHTS AND REMEDIES

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by the Owner or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

ARTICLE 8: LANGUAGE AND LAW OF THE CONTRACT

The language of the Contract is English and the Contract shall be construed and interpreted accordingly. The law prevailing in the Province of Alberta, Canada shall govern the interpretation of the Contract.

ARTICLE 9: SUCCESSION

The Contract Documents are to be read into and form part of this Agreement and the whole shall constitute the Contract between the parties and subject to law and the provisions of the Contract Documents shall ensure to the benefit of and be binding upon the parties hereto, their respective heirs, legal representatives, successors and permitted assigns.

ARTICLE 10: NOTICES

Notices to be given under the Contract shall be addressed to the parties as follows:

The Owner at:

Saddle Hills County
RR#1, Junction of Highway 49 & Highway 725
Spirit River, Alberta
T0H 3G0

Telephone: 780-864-3760

The Owner's Representative at:

MPE a division of Englobe
Suite 101, 10630 – 172 Street
Edmonton, AB
T5S 1H8

Telephone: 780-486-2000

The Contractor at:

Contractor's Name
Address
City, Prov
Postal Code

Telephone: xxx-xxx-xxxx

In witness whereof the parties hereto have executed this Agreement under their respective seals and by the hands of their proper officers thereunto duly authorized.

SIGNED, SEALED AND DELIVERED in the presence of:

CONTRACTOR

.....
Company Name

.....
Signature of Authorized Signing Officer

.....
Name of Officer Title of Officer

Corporate Seal

OWNER

Saddle Hills County .....
Name

.....
Signature of Authorized Signing Officer

.....
Name of Officer Title of Officer

Corporate Seal

END OF SECTION

1. DEFINITIONS

In the Contract, the following terms shall have the meanings assigned to them:

.1 "Additional Instruction" means a written instruction, issued by the Owner to the Contractor, clarifying or finalizing requirements of the Contract Documents and not involving a change in the Contract Price or the Contract Time.

.2 "Agreement Form" means the document which, when executed by the Owner and the Contractor, formalizes the Contract.

.3 "Bid" means the Contractor's priced offer to the Owner for the performance of the Work in accordance with the provisions of the Contract, as accepted by the Letter of Acceptance.

.4 “Certificate of Total Performance” means the certificate issued by the Owner’s Representative, when to the best of his knowledge, information and belief, the entire Work has been performed to the requirements of the Contract Documents, except for defects in the Work not discovered by the Owner’s Representative and the making good of faulty workmanship or materials during the maintenance period.

.5 “Certificate of Warranty Performance” means the certificate issued by the Owner’s Representative following a period of twelve (12) months from the date of the Certificate of Substantial Performance, or, if a Certificate of Substantial Performance is not issued, following a period of twelve (12) months from the date of the Certificate of Total Performance, which twelve (12) month period is hereafter referred to as the "maintenance period", certifying that to the best of his knowledge, information and belief the performance of the Work (except for defects in the Work not discovered by the Owner’s Representative) has been completed.

.6 "Change Order" means a written instruction, issued by the Owner to the Contractor on or after the date of execution of the Agreement Form, authorizing or ordering a Change in the Work or a change in the Contract Price or the Contract Time or any combination thereof.

.7 "Change in the Work" means an addition to, deletion from or other modification of the Work consistent with the scope and intent of the Contract.

.8 "Construction Equipment" means equipment, appliances and things required for the performance of the Work, but does not include Permanent Work or Temporary Work.

.9 "Contemplated Change" means a written communication, issued by the Owner to the Contractor on or after the date of execution of the Agreement Form, containing a contemplated Change in the Work and requiring the Contractor to submit a quotation for executing such contemplated change, including the Contractor's proposed changes to either or both the Contract Price or the Contract Time.

.10 "Contract" means the undertaking by the Owner and the Contractor to perform their respective duties, responsibilities and obligations as prescribed in the Contract Documents and represents the entire agreement between the Owner and the Contractor. The Contract Documents form the Contract.

.11 "Contract Deficiency" means a deficiency in the Work, or part thereof, for which the Contractor is responsible under the Contract and includes a deficiency in any design for which the Contractor is responsible.

.12 "Contract Documents" means: - the Letter of Acceptance; - the executed Agreement Form; - Instructions to Bidders, completed Bid Form, Schedule of Prices, and Supplements to Bid Form; - Information Documents specifically incorporated into the Contract Documents; - Definitions and Interpretation, Payment Conditions, Security Conditions, Insurance Conditions, General Conditions, Supplementary Conditions; - the Specifications; - the Drawings; - Addenda; - and such other documents as may be identified as Contract Documents, and shall include amendments thereto made pursuant to the provisions of the Contract.

.13 "Contract Price" means the total amount payable by the Owner to the Contractor under the Contract as stated in the Agreement Form, including authorized adjustments thereto.

.14 "Contract Time" means the period of time specified in the Contract for attainment of substantial Performance of the Work, including authorized adjustments thereto.

.15 "Contractor" means the person, firm or corporation contracting directly with the Owner to perform the Work.

.16 "Cost Plus Work" means a contractual arrangement that prescribes the cost of the work plus an allowance for overhead and profit, as expressly defined in the Contract, as payment for performance of the item of work to which it relates.

.17 "Day" means a calendar day.

.18 "Drawings" means the graphic and pictorial portions of the Contract Documents showing the design, location or dimensions of the Work, generally including plans, elevations, sections, details and diagrams.

.19 “Engineer” means the person or persons named in these Contract Documents as the Owner’s representative. Words importing persons shall include firms, corporations and joint ventures.

.20 "Information Documents" means information of any type and in any form related to the Project and identified in the Contract Documents as such, but which does not form part of the Contract unless specifically incorporated therein.

.21 "Invention" means any new and useful practice, process, machine, device, manufacture or composition of matter, or any new and useful improvement thereof.

.22 "Letter of Acceptance" means the formal acceptance by the Owner of the Contractor's Bid, including any modifications to the Bid agreed to by the Owner and the Contractor and incorporated therein.

.23 "Lump Sum Work" means a contractual arrangement that prescribes a lump sum as payment for performance of the item of work to which it relates.

.24 "Online Bidding System" means the Bids&Tenders Online Bidding System available at https://mpe.bidsandtenders.ca/.

.25 "Other Contractor" means any person, firm or corporation employed by or having a separate contract with the Owner for work related to the project other than that required by the Contract Documents.

.26 "Owner" means the Owner as named elsewhere in these Contract Documents and includes a person acting for, or in place of, the Owner.

.27 "Owner's Representative" means the employee or Engineer identified in writing by a duly authorized officer to represent the Owner under the Contract.

.28 "Permanent Work" means any structure, Product or thing constructed, manufactured or installed in the performance of the Work, but does not include Temporary Work.

.29 "Products" means material, components, elements, machinery, equipment, fixtures, systems and other items forming the Work or part thereof but does not include Construction Equipment. "Products" is synonymous with "Materials".

.30 "Project" means the total construction of which the Work to be provided under the Contract may be the whole or a part.

.31 “Prompt Payment and Construction Lien Act” means the Prompt Payment and Construction Lien Act (Alberta), R.S.A. 2000, c. B-7 and is referred to as the Prompt Payment Act.

.32 “Proper Invoice” means an application for payment containing the information that is required for the application for payment to constitute a “Proper Invoice” under the Prompt Payment Act and this Contract.

.33 "Regulatory Requirements" means laws, ordinances, rules, regulations, orders, codes, and other legally enforceable requirements in effect and applicable to the performance of the Work.

.34 "Schedule of Prices" means the completed Schedule of Prices submitted by the Contractor with his Bid, as accepted by the Letter of Acceptance.

.35 "Site" means the designated Site or location of the Work and any other places as may be specifically designated in the Contract as forming part of the Site.

.36 "Specifications" means that portion of the Contract Documents comprising Divisions 1 to 16 of the specification format including the General Requirements and technical specifications.

.37 "Subcontractor" means a person, firm or corporation having a contract with the Contractor for the performance of a part of the Work at the Site.

.38 "Sub-subcontractor" means a person, firm or corporation having a contract with a Subcontractor for the performance of a part of the Work at the Site.

.39 “Substantial Performance of the Work" means the time when the prerequisites to Substantial Performance of the Work required by the Contract are fulfilled and the Work is ready for use or is being used for the purpose intended and the state of the work is so declared, in writing, by the Owner.

.40 "Supplier" means a person, firm or corporation having a contract with the Contractor, a Subcontractor or a Sub-subcontractor for the supply of goods or services to be incorporated into or utilized in the performance of the Work.

.41 "Temporary Work" means site offices, temporary structures, facilities and controls and other temporary things required for the performance of the Work, but does not include Construction Equipment.

.42 "Total Performance of the Work" means the time when the prerequisites to Total Performance of the Work required by the Contract are fulfilled and the entire Work, except those items arising from the warranty provisions of the Contract, has been performed to the requirements of the Contract Documents and is so declared, in writing, by the Owner.

.43 "Unit Price" means the amount payable by the Owner to the Contractor under the Contract for a single unit of each separately identified item of work for which a unit price is prescribed as the basis of payment, as stated in the Schedule of Prices.

.44 "Unit Price Work" means a contractual arrangement that prescribes the product of a Unit Price multiplied by a number of units of measurement of a class as payment for performance of the item of work to which it relates.

.45 "Warranty Performance of the Work" means the time when the prerequisites to Warranty Performance of the Work required by the Contract are fulfilled and all items arising from the warranty period or periods required by the Contract have been corrected by the Contractor and the state of the Work is so declared, in writing, by the Owner.

.46 "Work" means the total construction and related services required by the Contract Documents.

2. INTERPRETATION

The Contract shall be interpreted as follows:

.1 The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all.

.2 Words importing the singular also include the plural and the masculine includes the feminine and vice-versa where the context requires.

.3 "Herein", "hereby", "hereof", "hereunder" and similar expressions refer to the Contract as a whole and not to a particular part thereof, unless the context indicates otherwise.

.4 Words and abbreviations which have well known technical meanings are used in the Contract in accordance with such recognized meanings.

.5 Words importing persons or parties shall include firms and corporations and any organization having legal capacity.

.6 In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an", but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

.7 The imperative mood is used extensively in the Contract Documents, particularly the Specifications. Such language is always directed to the Contractor, and it is the Contractor's responsibility to perform the Work specified in the imperative mood, unless specifically stated otherwise.

.8 Unless the context indicates otherwise, where a term is defined in the Contract Documents, other parts of speech or grammatical forms of the same word or expression have corresponding meanings.

.9 Unless the context indicates otherwise, all monetary amounts shall be interpreted as amounts in the lawful currency of Canada.

.10 When provision is made for the giving or issue of any notice, consent, approval, certificate or determination by any person, unless otherwise specified, such notice, consent, approval, certificate or determination shall be in writing and the words "notify", "certify" or "determine" shall be construed accordingly. Any such consent, approval, certificate or determination shall not unreasonably be withheld or delayed.

.11 When provision is made for a communication to be "written" or "in writing" this means any handwritten, typewritten or printed communication, including facsimile transmissions.

.12 Except in relation to a change in the Contract Time, any period of time in the Contract within which the Owner or the Contractor is to take action or decide anything may be extended by agreement, notwithstanding that the period of time has expired.

.13 The term "including" or "includes" shall be construed as inclusive and not exclusive, and shall be interpreted to mean including but not necessarily limited to the items referred to.

.14 In the event of ambiguities, discrepancies and conflicts between the several documents forming the Contract Documents the following order of precedence shall apply:

.1 Executed Agreement Form.

.2 Letter of Acceptance.

.3 Addenda.

.4 Supplementary Conditions.

.5 Conditions of Contract, including General, Payment, Security and Insurance Conditions.

.6 Specifications.

.7 Drawings.

.8 Drawings of larger scale shall govern over those of smaller scale of the same date.

.9 Figured dimensions shown on a Drawing shall govern even though they may differ from dimensions scaled on the same Drawing.

Notwithstanding the foregoing, documents of later date shall always govern over the documents amended.

END OF SECTION

1. TYPE AND AMOUNT OF SECURITY

.1 Contractor shall provide security for performance of the Contract in the form of one of the following:

.1 Bank Draft or equivalent in the amount of 10% of the Contract Price.

.2 Performance Bond for 50% of the Contract Price.

.2 Security in the form of a bank letter of credit is not acceptable.

.3 Submit security to the Owner within 21 days after date of issuance of Letter of Acceptance.

2. BANK DRAFT

.1 Bank Drafts shall be drawn on a financial institution authorized to conduct business in the Province of Alberta and shall be made payable to the Owner.

.2 After receipt Owner will present Bank Drafts to the bank for payment. Contractor shall not be entitled to accrued interest on a Bank Draft provided as security.

3. SURETY BOND

.1 Performance bond shall be in accordance with the Canadian Construction Documents Committee (CCDC) Standard Form of Performance Bond, CCDC Document No. 221. Consign performance bond to the Owner.

4. RELEASE OF SECURITY

.1 When security is in the form of a Bank Draft, such security shall be released progressively as follows:

.1 Four months after Substantial Performance of the Work, not more than one third of the amount of the security shall be released to the Contractor.

.2 Eight months after Substantial Performance of the Work, a further amount not exceeding one third of the amount of the security shall be released.

.3 After the warranty period has expired, the balance of the security shall be released, subject to deficiencies in materials and workmanship arising during the warranty period having been corrected to the Owner's satisfaction.

.2 Progressive releases of security shall be made upon written request by Contractor.

END OF SECTION

1. TYPE AND AMOUNT OF SECURITY

.1 Contractor shall provide security for payment to claimants for labour and material used or reasonably required for use in the performance of the Contract. Such security shall be in the form of one of the following:

.1 Bank Draft or equivalent in the amount of 10% of the Contract Price.

.2 Labour and Material Payment Bond for 50% of the Contract Price.

.2 Security in the form of a bank letter of credit is not acceptable.

.3 Submit security to Owner within 21 days after date of issuance of Letter of Acceptance.

2. BANK DRAFT

.1 Bank Drafts shall be drawn on a financial institution authorized to conduct business in the Province of Alberta and shall be made payable to the Owner.

.2 After receipt Owner will present Bank Drafts to the bank for payment. Contractor shall not be entitled to accrued interest on a Bank Draft provided as security.

3. SURETY BOND

.1 Labour and Material bond shall be in accordance with the Canadian Construction Documents Committee (CCDC) Standard Form of Labour and Material, CCDC Document No. 222. Consign Labour and Material Bond to the Owner.

4. RELEASE OF SECURITY

.1 When security is provided in the form of a Bank Draft, such security shall be released to Contractor provided:

.1 Owner has issued a Certificate of Substantial Performance,

.2 Prompt Payment Act claims period of 60 days from date of Substantial Performance of the Work has expired,

.3 Third party claims received by Owner have been resolved, or addressed and course of action agreed to between Owner and Contractor,

.4 Contractor has submitted to Owner, completed Statutory Declaration.

END OF SECTION

1. RELATED REQUIREMENTS

.1 Hold Harmless Agreement: General Conditions.

2. GENERAL REQUIREMENTS FOR INSURANCE

.1 Without restricting the generality of the hold harmless provisions of the General Conditions of Contract and without limiting the obligations or liabilities under the Contract, Contractor shall, provide, maintain, and pay for the insurance coverages specified in this Section.

.2 Form: Insurance policies shall be placed with Insurers, licensed to conduct business in the Province of Alberta, who comply with the Insurance Act (Alberta) and be in forms acceptable to the Owner.

.3 Duration: Unless otherwise specified, required insurance coverages shall be maintained continuously from date of commencement of the Work until date of Total Performance of the Work.

.4 Waiver of Recourse and Subrogation: Contractor waives all rights of recourse and subrogation against Owner for damages to Contractor's property.

.5 Notice of Change to Policy: Each required policy shall be endorsed to provide the Owner with not less than 30 days’ advance written notice of cancellation or material change restricting coverage.

.6 Proof of Insurance: Prior to commencement of any activities on site, Contractor shall provide Owner with proof that insurance coverages are in effect and meet specified conditions. In addition, Contractor shall at any time upon request, promptly file certified true copy of any insurance policy and shall otherwise provide proof of any required insurance, in a form acceptable to the Owner.

.7 Subcontractors' Insurance: Contractor shall ensure that Subcontractors provide their own General Liability Insurance, Automobile Liability Insurance, where such risks exist, Aircraft and Watercraft Liability Insurance, and Other Insurance equivalent to that specified herein. With respect to General Liability Insurance, Contractor may alternatively provide such insurance on a wrap-up basis insuring himself, his Subcontractors, and anyone employed directly or indirectly by himself or his Subcontractors to perform a part of the Work.

3. GENERAL LIABILITY INSURANCE

.1 General Liability Insurance shall be in the name of the Contractor. The policy shall include the Owner and the Owner's Representative as Additional Insured with respect to liability arising from the Contractor's operations with regard to the work. The limits shall not be less than five million dollars inclusive per occurrence. The insurance coverage shall include at least the following extensions: Premises, Property and Operations; Occurrence basis, Owners/Contractors' protective, Products and Completed Operations; Blanket Contractual; Employees as Additional Insureds: Broad Form Property Damage; Broad Form Loss of Use; Personal Injury; Incidental Malpractice; Contingent Employers' Liability; Cross Liability/Severability of Interests; Non-Owned Automobile Liability including Endorsement Form 96; Intentional Injury to protect persons or property, X-plate/unlicensed/specially licensed vehicles; Attached Machinery; Voluntary Medical Payments. To achieve the desired limit, umbrella or excess liability insurance may be used. The Policy shall be endorsed to provide the Owner with not less than 30 days' notice in writing in advance of any cancellation or change or amendment restricting coverage.

4. AUTOMOBILE LIABILITY INSURANCE

.1 Automobile Liability Insurance in respect of licensed vehicles shall have limits of not less than five million dollars inclusive per occurrence for bodily injury, death, and damage to property, in the following forms endorsed to provide the Owner with not less than fifteen (15) days' written notice in advance of any cancellation or change or amendment restricting coverage:

.1 Standard Owner's Form SPF #1 Automobile Policy providing Third Party Liability and Accident Benefits Insurance and covering licensed vehicles owned or operated by or on behalf of the Contractor.

5. AIRCRAFT AND WATERCRAFT LIABILITY INSURANCE

.1 Aircraft and Watercraft Liability Insurance with respect to owned or non-owned aircraft or watercraft if used directly or indirectly in the performance of the Work, including use of additional premises, shall be subject to limits of not less than two million dollars inclusive per occurrence for bodily injury, death and damage to property including loss of use thereof and limits of not less than one million dollars for Aircraft Passenger Hazard. Such insurance shall be in the form acceptable to the Owner. The policies shall be endorsed to provide the Owner with not less than thirty (30) days' written notice in advance of cancellation, change or amendment restricting coverage.

6. COURSE OF CONSTRUCTION AND BOILER INSURANCE

.1 All Risk Property Insurance shall be in the joint names of the Contractor and the Owner, insuring not less than the sum of the Contract Price and the full value, as stated in the General Requirements, of products that are specified to be provided by the Owner for incorporation into the Work. The insurance coverage shall be maintained continuously until ten (10) days after the date of the Certificate of Total Performance.

.2 Boiler Insurance insuring the interests of the Contractor, the Owner and the Owner's Representative for not less than the replacement value of boilers and pressure vessels forming part of the Work. The insurance coverage shall be maintained continuously from the commencement of use or operation of the property insured and until ten (10) days after the date of the Certificate of Total Performance.

.3 Should the Owner wish to use or occupy part or all of the Work, he shall give thirty (30) days' written notice to the Contractor of the intended purpose and extent for such use or occupancy. Prior to such use or occupancy the Contractor shall notify the Owner in writing of the additional premium cost, if any, to maintain such insurance which shall be at the Owner's expense. If because of such use or occupancy the Contractor is unable to provide coverage, the Owner, upon written notice from the Contractor and prior to such use or occupancy, shall assume the responsibility to provide, maintain and pay for Property and Boiler Insurance insuring the full value of the Work, as in (a) and (b) above, including coverage for such use or occupancy and the Contractor shall refund to the Owner the unearned premiums applicable to the Contractor's Policies upon termination of coverage.

.4 The Policies shall provide that, in the event of a loss or damage, payment shall be made to the Owner and the Contractor as their respective interests may appear. The Contractor shall act on behalf of the Owner and himself for the purpose of adjusting the amount of such loss or damage payment with the Insurers. When the extent of the loss or damage is determined, the Contractor shall proceed to restore the Work. Loss or damage shall not affect the rights and obligations of either party under the Contract except that the Contractor will be entitled to such reasonable extension of time for completion of the Work as the Owner's Representative may decide.

.5 Payment for Loss or Damage:

.1 When the property insurance has been obtained by the Contractor in accordance with the requirements of this Section: The Contractor shall be entitled to receive from the payments made by the Insurer the amount of his interest in the restoration of the work. In addition, the Contractor shall be entitled to receive from the Owner (in addition to the amount due under the Contract) the amount in which the Owner's interest in the restoration of the Work has been appraised, such amount to be paid upon receipt of payment or payments from the Insurer in accordance with the Owner's Representative's certificates for payment.

.2 When the property insurance has been obtained by the Owner pursuant to the terms of the Contract Documents: The Contractor shall be entitled to receive from the payments made by the Insurer the amount of the Contractor's interest in the restoration of the Work. In addition, the Contractor shall be entitled to receive from the Owner (in addition to the amount due under the Contract) the amount in which the owner's interests in the restoration of the Work has been appraised, such amount to be paid as the restoration of the Work proceeds and in accordance with the requirements of Contract Documents.

.6 The Contractor shall be responsible for deductible amounts under the policies.

7. CONTRACTORS' EQUIPMENT INSURANCE

.1 All Risks Contractors' Equipment Insurance covering construction machinery and equipment owned or rented and used by the Contractor and/or Subcontractors for the performance of the Work, including Boiler Insurance on temporary boilers and pressure vessels, shall be in the form acceptable to the Owner.

8. OTHER INSURANCE

.1 Contractor shall provide, maintain and pay for any additional insurance required to be provided by law, or which he considers necessary to cover risks not otherwise covered by insurance specified in the Contract Documents.

END OF SECTION

1. FEDERAL GOODS AND SERVICES TAX

.1 Monies payable by the Owner to the Contractor shall be inclusive of the Federal Goods and Services Tax (GST).

2. BASIS OF PAYMENT

.1 Payment for Lump Sum Work shall be based on the prices in the Contract and, when required by the Contract, the approved schedule of values for such work.

.2 Payment for Unit Price Work shall be based on the Unit Prices in the Contract.

.3 Payment for Cost Plus Work shall be based on the cost of such work, as specified herein, plus a fee in the amount of 10% of the cost of such work for the Contractor's overhead and profit except that no fee shall be applied to the cost of Construction Equipment when such cost is based on rates which already include the Contractor's overhead and profit.

.4 The cost of Cost Plus Work shall be computed as the sum of the following cost elements as applicable to such work:

.1 Cost of labour (other than labour costs included in other cost elements) comprised of payroll costs for employees in the direct employ of the Contractor. Such employees shall include the superintendent and foremen at the Site. Payroll costs shall include salary, fringe benefits and statutory charges paid by Contractor. Fringe benefits shall include health care, vacations with pay, sick time allowance, and pension plan, life and disability insurance, dental and medication plan contributions. Statutory charges shall include contributions for Canada Pension Plan, Workers' Compensation, statutory holidays and Unemployment Insurance. Labour rates shall be consistent with rates actually paid for equivalent job classifications in the normal performance of Lump Sum Work or Unit Price Work or, if there are no such equivalencies, under a schedule of job classifications and labour rates agreed upon by the Owner and the Contractor, if possible before labour costs are incurred.

.2 Cost of Products supplied and incorporated into Permanent Work, including cost of transportation and storage thereof and Supplier's site services required in connection therewith. Cash discounts shall accrue to the Contractor. Trade discounts, rebates and refunds and returns from sale of surplus Products shall accrue to the Owner.

.3 Cost of Construction Equipment:

Cost of Construction Equipment shall be paid at the rates specified in the current edition of the Equipment Rental Rates Guide published by the Alberta Roadbuilders and Heavy Construction Association, hereinafter called the "Rates Guide", subject to the following:

.1 Rates specified in the Rates Guide shall be deemed to include all overhead and profit, regardless of whether Construction Equipment is provided by the Contractor, Subcontractors or Sub-subcontractors.

.2 Rates specified in the Rates Guide shall be deemed to include cost of owning, operating, loading, unloading, assembling, erecting, and dismantling.

.3 When applicable rates are not included in the Rates Guide, costs shall be paid at the rates agreed upon by the Owner and the Contractor, if possible before such costs are incurred.

.4 Cost of moving Construction Equipment to and from the Site shall not be payable, unless such cost is solely attributable to the Work and is approved as such by the Owner.

.5 Except for Construction Equipment traveling under its own power, travel time for Construction Equipment shall not be payable. Unless otherwise approved by the Owner, Construction Equipment shall be moved by the most economical method.

.5 Cost of Temporary Work, including cost of transportation and maintenance thereof, used and consumed in the performance of the Work and the cost less fair market value of such work used but not consumed which shall remain the property of the Contractor.

.6 Cost of special services, including the cost of architects, engineers, specifiers, surveyors, testing laboratories and inspection agencies.

.7 Supplemental costs, including:

.1 Travel and subsistence costs of Contractor's employees;

.2 Statutory charges, including fees, cost of permits and licenses and custom duties;

.3 Cost of rights-of-way and other land related costs;

.4 Royalty payments and patent license fees;

.5 Deposits lost for causes other than the Contractor's fault or negligence.

.8 Subcontract and Sub-subcontract costs, including payments made by the Contractor to Subcontractors and by Subcontractors to Sub-subcontractors in accordance with the requirements of such contracts. Subcontractors' and Sub-subcontractors' costs and fee for overhead and profit for Cost Plus Work to be performed under such contracts shall be determined in the same manner as the Contractor's cost and fee.

.9 With respect to Cost Plus Work:

.1 Costs payable by Owner shall be directly related to or shall have been necessarily and properly incurred in the performance of such work.

.2 Overhead shall include the Contractor's costs related to the operation and maintenance of his head office and branch offices, administration at head office and branch offices, general management, legal, audit and accounting services, buying organization, corporate tax, financing and other bank charges, company directors, salaries and other compensation of personnel stationed off-site, design of Construction Equipment and Temporary Work, supervision, planning and scheduling of work, expendable and unexpendable small tools, including maintenance thereof, clean up and recruitment and training of site staff.

.3 Contractor shall obtain the Owner's prior approval to subcontract or enter into other agreements for Cost Plus Work.

.4 Costs claimed for delay or extension of the contract will be considered only if the Contractor has clearly demonstrated the work delayed or extended the critical path of the project.

.5 The Owner may refuse to pay all or part of the cost of any Work item under any cost element, where the item in question was, in the Owner's opinion, unsuitable for the Work performed.

3. MEASUREMENT FOR PAYMENT

.1 Unless otherwise specified in the Contract, the Owner shall measure the Work for the purpose of determining payment to the Contractor in accordance with the measurement provisions of the Contract.

4. PROGRESS PAYMENTS

.1 Prior to Substantial Performance of the Work, the Owner shall make monthly payments to the Contractor.

.2 Within 5 days prior to the end of each monthly payment period, the Contractor shall submit to the Owner a draft of the Contractor’s proposed application for payment for all of the Work performed by the Contractor in that month, in order to facilitate and expedite payments, including an estimate of the Work to be performed and Products to be delivered at the date of such application for payment but before the end of that month, and including any reports or certificates confirming the satisfactory completion of any commissioning and testing required by the Contract Documents for any completed part of the Work that the Contractor will include in its application for payment

.1 The Contractor shall review with the Owners Representative, the draft application for payment and the percentage of the Work completed for each item indicated in the schedule of values. This procedure shall be complied with for each draft application for payment.

.2 Nothing in this paragraph is intended to be a condition, pre-condition, prevent or delay the Contractor’s right to submit its applications for payment and the Prompt Payment Act.

.3 Within 5 days after the end of each monthly payment period, the Contractor shall submit to the Owner:

.1 Proper Invoice containing the information required for the application for payment to constitute a “Proper Invoice” under the Prompt Payment and Construction Lien Act (Alberta), R.S.A. 2000, c. B-7 including:

.1 Contractor’s name and business address;

.2 Date of the invoice and the period during which the work was done or materials were furnished;

.3 The applicable contract number;

.4 A clear description, including quantity if appropriate, of the Work or Materials furnished;

.5 The amount requested for payment and the corresponding payment terms broken down for the work done or materials furnished;

.6 The name, title, telephone number, email address and mailing address of the person to whom payment is to be sent;

.7 A statement indicating that the invoice provided is intended to constitute a Proper Invoice;

.8 Completed Statutory Declaration Form, at and after the second monthly payment period,

.9 Workers' Compensation Board verification that the Contractor's account is in good standing,

.2 Any data requested by the Owner to assist the Owner to determine the amount due and payable to the Contractor, and

.3 For Products stored by the Contractor on the Site for incorporation in Permanent Work but not incorporated in such Work, proof of purchase price and delivery to the Site, along with a statement of the quantity of such Products and the Schedule of Prices item to which the Products relate.

.4 The Owner shall, within 28 days after the receipt of a Proper Invoice and subject to having received within the time specified any required information referred to in clause 4.2, pay to the Contractor the undisputed amount due and payable, up to the end of the monthly payment period in respect of:

.1 The value of Work executed;

.2 The value of Work executed pursuant to authorized Changes in the Work;

.3 The value of Products stored by the Contractor on the Site for incorporation in Permanent Work but not incorporated in such Work;

.4 Adjustments due to changes in Regulatory Requirements or price fluctuation provisions of the Contract, if applicable;

.5 Any other amount determined by the Owner; and

.6 Subject to:

.1 any deductions under clause 10;

.2 any withholdings under clause 11; and

.3 retention of the holdback amount calculated by applying the holdback percentage referred to in clause 5 to the amount payable to the Contractor under clause 4.3 after any deductions and withholdings.

.5 If the amount of any invoice is disputed by the Owner, the Owner shall give notice of dispute (Form 1 "Owners' Notice of Dispute" attached) within specifying the amount of the Proper Invoice that is not being paid and detailing all the reasons for non-payment.

.6 For Unit Price Work, Owner may, at his discretion, make partial payment based on partial completion of the scope of a single unit of an item of Work. Partial payment (payment of the undisputed amount by the owner) can only occur if a notice of dispute (Form 1 "Owners' Notice of Dispute") was issued within 14 days after the Owner received a Proper Invoice.

.7 If, after receipt of a progress payment from the Owner, the Contractor disagrees with the amount of such payment, such amount shall nevertheless be considered to be correct unless the Contractor, within 7 days after such receipt, notifies the Owner of the respects in which such payment is claimed by him to be incorrect. On receipt of such notice, the Owner shall review the amount of the payment and either confirm or vary it. If the Owner varies the payment, such variance shall be added to the next progress payment.

.8 Notwithstanding the terms of this clause or any other clause of the Contract, no amount shall be paid by the Owner until the contract security and proof of insurance, if required under the Contract, have been provided by the Contractor.

5. HOLDBACK

.1 The Owner shall hold back the percentage specified in the Agreement Form from each progress payment referred to in clause 4.

.2 Sixty (60) days after the date of a Certificate of Substantial Performance, if issued, the Owner will pay to the Contractor, the unpaid balance of holdback moneys then due, provided:

.1 Third party claims, received by the Owner pursuant to the Prompt Payment Act or applicable requirements of the Contract have been resolved, or addressed and a course of action agreed to by the Owner and the Contractor,

.2 The Contractor has submitted to the Owner, within 7 days after the date of Substantial Performance, a letter of clearance from the Workers' Compensation Board and a completed Statutory Declaration Form,

.3 The Contractor has submitted to the Owner, a letter from the Contractor's Surety (if any) approving the release of the holdback,

.4 The Contractor has submitted to the Owner, all Record Documents, showing changes as constructed, Operating and Maintenance Manuals, guarantees, warranties, certificates, reports, spare parts and spare material required by the Contract Documents,

.5 The Contractor has submitted to the Owner, a statement verifying that "all payment quantities on the completed portion of the Contract have been accepted; and all claims, all demands for Extra Work, or otherwise, under or in connection with the completed portion of the Contract have been presented to the Owner's Representative".

.3 Sixty (60) days after the date of Total Performance, the Owner will pay to the Contractor, the unpaid balance of holdback moneys then due, provided:

.1 Third party claims, received by the Owner pursuant to the Prompt Payment Act or applicable requirements of the Contract have been resolved, or addressed and a course of action agreed to by the Owner and the Contractor,

.2 The Contractor has submitted to the Owner, within 7 days after the date of Substantial Performance, a letter of clearance from the Workers' Compensation Board and a completed Statutory Declaration Form,

.3 The Contractor has submitted to the Owner, a letter from the Contractor's Surety (if any) approving the release of the holdback,

.4 The Contractor has submitted to the Owner, all Record Documents, showing changes as constructed, Operating and Maintenance Manuals, guarantees, warranties, certificates, reports, spare parts and spare material required by the Contract Documents,

.5 The Contractor has submitted to the Owner, a statement verifying that "all payment quantities on the completed portion of the Contract have been accepted; and all claims, all demands for Extra Work, or otherwise, under or in connection with the completed portion of the Contract have been presented to the Owner's Representative".

6. FINAL PAYMENT

.1 Upon the accepted date of Total Performance, the Contractor shall submit an application for final payment in the form of a Proper Invoice containing all of the documents and information required under this Agreement, including all final reports and certificates confirming satisfactory completion of all required commissioning and testing, to the extent applicable.

.2 Upon receipt of the final invoice the Owner will pay to the Contractor the unpaid balance of any monies then due under the Contract, PROVIDED THAT the Owner's Representative may dispute, and withhold, or on account of subsequently discovered evidence, nullify the whole or any part of any certificate to such an extent as may be necessary to protect the Owner from loss on account of:

.1 The Contractor's unsatisfactory prosecution of the Work.

.2 Defective or damaged Work requiring correction or replacement.

.3 Claims or liens filed or reasonable evidence indicating the probable filing of claims or liens.

.4 Failure of the Contractor to make payments promptly to subcontractors or for materials or labour.

.5 A reasonable doubt that the Contract can be completed for balance unpaid.

.6 Damage to an Other Contractor's Work which has not been settled which may result in the Other Contractor whose Work has been damaged bringing action against the Owner. In case of action, the Contractor will bear the expense of same.

.7 When the above conditions are resolved to the satisfaction of the Owner, payment shall be made for the amounts withheld because of them.

.3 The final payment shall represent full and final settlement of all monies due to the Contractor pursuant to the Contract except with respect to unresolved claims, if any.

7. OWNER'S LIABILITY

.1 After the final payment issued has been made, the Owner shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contract, except as may be provided elsewhere in the Contract, unless the Contractor shall have made a claim in respect therefore prior to or within the time specified in the Prompt Payment Act.

8. DELAY IN MAKING PAYMENT

.1 In respect of progress payments, payment after Substantial Performance of the Work, payment of holdback, and final payment, the Owner shall pay the Contractor an amount that the Owner considers to be due to the Contractor, pursuant to the Contract, within the time specified.

9. RIGHT OF SET-OFF

.1 Without limiting any right of set-off, deduction or recovery given or implied by law or elsewhere in the Contract, the Owner may set off any amount payable to the Owner by the Contractor, or recoverable from the Contractor by the Owner, under the Contract or under any other current contract against any amount payable to the Contractor under this Contract.

.2 For the purposes of these Payment Conditions, "other current contract" means a contract between the Owner and the Contractor under which the Contractor has an undischarged obligation to perform or supply work, labour, or material, or in respect of which the Owner has, since the date of execution of the contract agreement, exercised any right to take the work that is the subject of the contract out of the Contractor's hands.

10. DEDUCTIONS FROM PAYMENTS

.1 Owner may dispute and deduct any amount claimed by or payable to Contractor in conjunction with General Conditions 15 including but not limited to:

.1 An amount at least equal to the value, as determined by Owner, of Work not in accordance with Contract Documents,

.2 The amount of any unresolved third party claim submitted pursuant to the Prompt Payment Act or applicable requirements of the Contract,

.3 The amount of any unpaid and overdue statutory account related to the Contract and of which the Owner has received notice and which is enforceable against the Owner,

.4 The amount of any overpayment made by the Owner to the Contractor, and

.5 Any other amount recoverable by the Owner from the Contractor under the Contract.

11. WITHHOLDING OF PAYMENT

.1 Owner may issue a Notice of Dispute in accordance with the Prompt Payment Act and withhold all or part of any amount payable to Contractor in order to protect the Owner or third parties from loss due to Contractor's:

.1 Failure to make payments properly to Subcontractors or for labour, materials or equipment,

.2 Failure to ensure that Subcontractors make payments properly to Sub-subcontractors or for labour, materials or equipment,

.3 Inability to complete the Work within the Contract Time,

.4 Inability to complete the Work for the unpaid balance of the Contract Price,

.5 Persistent failure to perform the Work in accordance with the Contract Documents.

.2 When the causes for withholding payment pursuant to 11.1 are removed to the Owner's satisfaction, the Owner shall pay the Contractor the amount previously due and payable with the next progress payment.

12. TITLE TO AND ACCEPTANCE OF WORK

.1 Contractor warrants that title to work and Products covered by any payment made by the Owner to the Contractor will pass to the Owner, at the time of payment, free and clear of all claims, interests and encumbrances.

.2 Contractor further warrants that Products stored at the Site and for which payment has been received, shall not be removed from the Site and shall be kept secure and protected.

.3 Payments made by Owner shall not be construed as an acceptance that the Work, Products, or any part thereof is complete, is satisfactory or is in accordance with the Contract Documents.

END OF SECTION

Form 1

Owner's Notice of Dispute
(Section 32.2(2) of the Act)

Name of Owner:
_____

Owner address:
_____

Work site legal land description: _____

_____

Name of Contractor:
_____

Contractor address:
_____

Contractor address for service, if known:
_____

The Owner disputes the proper invoice dated _____, submitted to the Owner by the Contractor in respect to the work done or material furnished. The Owner will not pay the indicated amount payable under the invoice:

(Please check the appropriate box)

☐ The full amount of the proper invoice, being $_____

☐ A portion of the amount of the proper invoice, being $_____

Reason(s) for non-payment:

_____

_____

_____ _____
Date Signature (Owner)

5201-008-00

Statutory Declaration
of Payment Distribution

Identification of Contract

Contract Name (location and description of the Work as it appears in the Contract Documents)

Date of This Application for Payment
Month Day Year
Date of Last (Immediate Preceding) Application for Payment
Month Day Year

Identification of Declarant (person making the declaration)

Full Name of Declarant	Position or Title (of office held with Contractor)	
Business Name (Name of Contractor)		
Business Address		
City or Town	Province	Postal Code

Declaration

I, the undersigned, solemnly declare that as of the date of this application for payment:

.1 all the Contractor's lawful obligations to subcontractors and suppliers, in respect of work contracted for and performed before the date of the last (immediate preceding) application for payment, are fully discharged, except for (i) hold back monies properly retained, and (ii) payments deferred by agreement;

.2 all the Contractor's lawful obligations to workers, in respect to work contracted for, are fully discharged;

.3 all assessments and payments required to be made by the Contractor under law have been made in full; and that

.4 I am an authorized signing officer of the Contractor and have personal knowledge of the contract identified and the facts stated in this statutory declaration.

I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath.

Making a false or fraudulent declaration is a contravention of the Criminal Code of Canada, and could carry, upon conviction, penalties including fines, imprisonment, or both.

_____
Signature of declarant

Attestation (to be completed by a person empowered to receive declarations, e.g. Commissioner of Oaths, Notary Public, etc.)

DECLARED before me at _____ this _____ day of _____ 20 ____
City/Town and Province

_____ _____ _____
Signature of person before whom declaration is made | Authority to receive solemn declarations | Expiry date

_____
Name (please print)

Any changes or corrections on this Statutory Declaration must be initialed by the person before whom the declaration is made.

15. SETTLEMENT OF DISPUTES

15.1 Disputes
15.2 Notice of Dispute
15.3 Negotiated Settlement
15.4 Mediation
15.5 Arbitration

1. OWNER AND OWNER'S REPRESENTATIVE

1.1 OWNER'S DUTIES AND AUTHORITY

.1 The Owner shall carry out the duties and exercise the authority specified in the Contract.

1.2 OWNER'S REPRESENTATIVE

.1 The Owner shall appoint a representative, who shall, unless the Contractor is expressly advised otherwise by the Owner, have full authority to act on behalf of and bind the Owner under the Contract.

1.3 APPOINTMENT OF ASSISTANTS

.1 The Owner's Representative may appoint any number of persons to assist him in carrying out his duties. He shall notify the Contractor of the names, duties and scope of authority of such persons.

.2 The failure of any assistants appointed pursuant to clause 1.3.1 to disapprove any work shall not prejudice the authority of the Owner to disapprove such work and to give instructions for the rectification thereof.

1.4 INSTRUCTIONS IN WRITING

.1 The Contractor shall take instructions only from the Owner or any assistants appointed pursuant to clause 1.3. Instructions given by the Owner shall be in writing, provided that if the Owner considers it necessary to give any instruction orally, the Contractor shall comply with such instruction. Confirmation in writing of such oral instruction given by the Owner, whether before or after the carrying out of the instruction, shall be deemed to be an instruction within the meaning of this clause. Provided that if the Contractor, within 7 days, confirms in writing to the Owner any oral instruction of the Owner and such confirmation is not contradicted in writing within 7 days by the Owner, it shall be deemed to be an instruction of the Owner.

1.5 OWNER INTERPRETER OF CONTRACT

.1 The Owner in the first instance shall be the interpreter of the Contract and the judge of the Contractor's performance.

1.6 OWNER'S DETERMINATIONS

.1 When the Owner is required to exercise his discretion by giving his decision, opinion or consent, or expressing his satisfaction or approval, or determining value, or otherwise taking action which may affect the rights and obligations of the Contractor he shall exercise such discretion within the terms of the Contract after due consultation with the Contractor and shall promptly notify the Contractor of such decision, opinion, consent, approval or determination.

1.7 OWNER'S REVIEW

.1 Any review, comment, consent, acceptance or approval, or lack thereof, by the Owner, shall not relieve the Contractor of any of its responsibilities or liabilities under the Contract.

2. ASSIGNMENT, SUBCONTRACTING AND NOMINATION

2.1 ASSIGNMENT

.1 The Contractor shall not assign the Contract, either in whole or in part, without the previous written consent of the Owner, which consent, notwithstanding other provisions of the Contract, shall be at the Owner's sole discretion.

.2 The Owner shall not be bound by any assignment by the Contractor of any monies payable or to become payable to the Contractor under the Contract, without the written consent of the Owner, which consent:

.1 Will not be given for a general assignment of book debts, but

.2 May, at the Owner's sole discretion, be given for a specific assignment of all or part of monies payable to the Contractor under the Contract, subject however, in all cases, to the provisions of the Financial Administration Act (Alberta).

2.2 SUBCONTRACTING

.1 The Contractor:

.1 Shall not sublet the Contract as a whole,

.2 Shall not subcontract any part of the Work without the Owner's prior consent, which shall not be unreasonably withheld,

.3 Shall provide such details of any Subcontractor he wishes to engage as the Owner may require,

.4 Shall contract with those Subcontractors proposed by him and accepted by the Owner and such Subcontractors shall not be changed without the Owner's prior consent.

.2 The Owner may, for reasonable cause, object to the use of a proposed Subcontractor and require the Contractor to contract with another Subcontractor.

.3 If the Owner requires a change from a proposed Subcontractor, the Contract Price shall be adjusted by any difference in cost and markup occasioned by such required change, except where such change is required due to the Contractor's default or negligence, in which case there shall be no change in the Contract Price.

.4 The Owner may, upon reasonable request and at his discretion, provide to a Subcontractor information as to the percentage or quantity of the Subcontractor's work for which payment has been approved.

.5 Nothing contained in the Contract shall create a contractual relationship between a Subcontractor and the Owner and subcontracting part of the Work shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any Subcontractor, his agents, servants or workers as fully as if they were his own.

.6 The Contractor shall enter into contracts or written agreements with his Subcontractors to require them to perform their work in accordance with the Contract, and the Contractor shall incorporate the terms and conditions of the Contract Documents, to the extent that they apply, into all subcontracts.

2.3 NOMINATED SUBCONTRACTORS AND SUPPLIERS

.1 A nominated Subcontractor or nominated Supplier means a person, firm or corporation with whom the Contract requires the Contractor to enter into a contract for the performance of a subcontract or the supply of things related to the Work.

.2 Nothing contained in the Contract shall create a contractual relationship between the Owner and a nominated Subcontractor or nominated Supplier and such nomination shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any nominated Subcontractor or nominated Supplier, his agents, servants or workers as fully as if they were his own.

3. DOCUMENTS

3.1 PROPERTY AND USE OF CONTRACT DOCUMENTS

.1 The Contract Documents are the sole property of the Owner and unless it is necessary for the purposes of the Contract, the Contract Documents shall not, without the consent of the Owner, be used by or communicated to a third party by the Contractor.

3.2 REPORTING OF CONFLICTS, ERRORS AND DISCREPANCIES

.1 If the Contractor finds a conflict, error or discrepancy in the Contract Documents, the Contractor shall so report to the Owner in writing at once and, before proceeding or continuing with the Work affected thereby, shall obtain a written interpretation or clarification from the Owner; however, the Contractor shall not be liable to the Owner for failure to report any conflict, error or discrepancy in the Contract Documents unless the Contractor had actual knowledge thereof or should reasonably have known thereof.

.2 The Contractor shall obtain from the Owner any dimensions required but not indicated in figures in the Contract Documents nor calculable from figures in the Contract Documents. Scaling of Drawings, for any purpose, shall be at the Contractor's risk.

3.3 DISRUPTION OF PROGRESS

.1 The Contractor shall notify the Owner when planning or execution of the Work is likely to be delayed or disrupted unless any further document or instruction required of the Owner under the Contract is issued by the Owner within a reasonable time. The notice shall include details of the document or instruction required and of why and by when it is required and of any delay or disruption likely to be suffered if it is late.

.2 If, by reason of any failure or inability of the Owner to issue, within a reasonable time, any document or instruction for which notice has been given by the Contractor in accordance with clause 3.3.1, the Contractor suffers delay or incurs costs then the Owner shall determine:

.1 Any extension of time to which the Contractor is entitled under clause 6.4, and

.2 The amount of such costs, which shall be added to the Contract Price.

.3 If the failure or inability of the Owner to issue any documents or instruction is caused in whole or in part by the failure of the Contractor to submit documents, which he is required to submit under the Contract, the Owner shall take such failure by the Contractor into account when making his determination pursuant to clause 3.3.2.

3.4 ADDITIONAL INSTRUCTIONS

.1 The Owner shall have authority to issue to the Contractor, from time to time, such Additional Instructions as may be necessary for the proper performance of the Work. The Contractor shall carry out and be bound by such Additional Instructions.

3.5 FORMS

.1 Forms to be used pursuant to the Contract or as otherwise may be required for the administration of the Contract shall be as prescribed or approved by the Owner.

4. GENERAL OBLIGATIONS

4.1 CONTRACTOR'S RESPONSIBILITIES

.1 The Contractor shall, with due care and diligence, design, to the extent provided for by the Contract, execute and complete the Work and remedy any defects therein in accordance with the provisions of the Contract. This shall include the provision of superintendence, labour, Products, Construction Equipment, Temporary Work and all other things, whether of a temporary or permanent nature, required in and for such design, execution, completion and remedying of any defects. The Contractor shall comply with and adhere strictly to the Owner's instructions on any matter, whether mentioned in the Contract or not, concerning the Work.

4.2 CONTRACT SECURITY

.1 The Contractor shall, if required by the Bid Documents, provide either or both contract performance security or security for payment of claims for labour and material.

.2 Surety bonds shall be issued by a duly incorporated surety company authorized to transact business of suretyship in the Province of Alberta.

.3 The Owner may, for reasonable cause, object to use of the surety company proposed by the Contractor, and may require the Contractor to provide a surety bond issued by another surety company acceptable to the Owner, with no change in Contract Price.

4.3 SITE OPERATIONS AND METHODS OF CONSTRUCTION

.1 The Contractor shall be fully responsible for the adequacy, stability and safety of all Site operations and methods of construction.

.2 The Contractor shall submit at such times and in such detail as the Owner may require such information pertaining to the methods of construction (including Temporary Work and the use of Construction Equipment) which the Contractor proposes to use and such calculations of stresses, strains and deflections that will arise, in the Permanent Work or any part thereof, from the use of such methods during execution of the Work.

.3 The Owner shall, on request from the Contractor, provide to the Contractor such design criteria relevant to the Permanent Work or any Temporary Work designed by the Owner as may be necessary to enable the Contractor to comply with clause 4.3.2.

.4 For the purposes of this clause, "method of construction" means a method, means, technique, sequence or procedure of construction.

4.4 DIFFERING PHYSICAL CONDITIONS OR OBSTRUCTIONS

.1 If, during the execution of the Work, the Contractor encounters physical obstructions or physical conditions, including sub-surface obstructions or conditions, other than weather conditions or conditions due to weather conditions, on the Site, which, in his opinion, differ substantially from those indicated in the Contract and which were not reasonably foreseeable, the Contractor shall as soon as possible give notice thereof to the Owner. On receipt of such notice, the Owner shall, if in his opinion such obstructions or conditions differ substantially from those indicated in the Contract Documents and could not have been reasonably foreseen, determine:

.1 Any extension of time to which the Contractor is entitled under clause 6.4, and

.2 The amount of any costs, valued in accordance with clause 8.3, which may have been incurred by the Contractor by reason of such obstructions or conditions having been encountered, which shall be added to the Contract Price.

.2 A determination by the Owner pursuant to clause 4.4.1 shall take account of:

.1 The time of the Contractor's notice to the Owner of a differing physical condition or obstruction,

.2 Any instruction which the Owner may have issued to the Contractor in connection therewith, and

.3 Any proper and reasonable measures acceptable to the Owner, which the Contractor may have taken in the absence of specific instructions from the Owner.

4.5 CLIMATIC AND WEATHER CONDITIONS

.1 The relevant climatological records and related information published by the Canadian Climate Centre of Environment Canada, for one or more locations in the vicinity of the Site, shall be used as a basis for any evaluations and determinations concerning climate and weather.

4.6 CONTRACTOR'S SUPERINTENDENCE

.1 The Contractor shall provide all necessary superintendence during the execution of the Work and as long thereafter as the Owner may consider necessary for the proper fulfilling of the Contractor's obligations. The Contractor, or a competent and authorized representative approved of by the Owner, which approval may at any time be withdrawn, shall give his whole time to the superintendence of the Work. Such authorized representative shall receive, on behalf of the Contractor, instructions from the Owner.

.2 If approval of the Contractor's representative is withdrawn by the Owner, the Contractor shall, as soon as is practicable, after receiving notice of such withdrawal, remove the representative from the Work and shall not employ him again on the Work in any capacity and shall replace him by another representative approved by the Owner.

4.7 CONTRACTOR'S EMPLOYEES

.1 The Contractor shall provide on the Site in connection with the execution and completion of the Work and the remedying of any defects therein:

.1 Technical assistants who are skilled and experienced in their respective trades and such foremen and others as are competent to give proper superintendence of the Work, and

.2 Labour as is necessary for the proper and timely fulfilling of the Contractor's obligations.

4.8 OWNER MAY OBJECT

.1 The Owner may object to and require the Contractor to remove forthwith from the Site any person who, in the opinion of the Owner, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose presence is otherwise considered by the Owner to be undesirable, and such person shall not be allowed on the Site without the consent of the Owner.

4.9 SAFETY, SECURITY AND PROTECTION OF THE ENVIRONMENT

.1 The Contractor shall, throughout the execution of the Work and the remedying of any defects therein:

.1 Have full regard for the health and safety of all persons upon the Site and keep the Site and the Work, to the extent that they are under his control, in an orderly state appropriate to the avoidance of danger to such persons, and

.2 Provide and maintain at his own cost all temporary facilities and controls when and where necessary or required by the Owner or by any duly constituted authority, for the protection of the Work or for the safety and convenience of the public or others, and

.3 Take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or any other causes arising as a consequence of his methods of operation.

.2 The Contractor shall appoint a person at the Site who shall manage an accident prevention program. This person shall be Contractor's superintendent unless another person is appointed and approved by the Owner.

4.10 OWNER'S RESPONSIBILITIES FOR SAFETY

.1 If under clause 4.18 the Owner carries out work on the Site with his own workers he shall, in respect of such work and subject to clause 4.9:

.1 Have full regard to the safety of all persons upon the Site, and

.2 Keep the Site in an orderly state appropriate to the avoidance of danger to such persons.

.2 If under clause 4.18 the Owner contracts with Other Contractors on the Site he shall require them to have the same regard for safety and avoidance of danger.

4.11 CARE OF WORK

.1 The Contractor shall take full responsibility for the care of the Work from the date of commencement of Work at the Site until the date of issue of the Certificate of Substantial Performance of the Work, when the responsibility for such care shall pass to the Owner, provided that:

.1 Except where otherwise specified in the Contract, if the Owner accepts a Certificate of Substantial Performance for part of the Permanent Work the Contractor shall cease to be liable for the care of that part from the date of issue of such certificate, then the responsibility for the care of that part shall pass to the Owner, and

.2 The Contractor shall take full responsibility for the care of any outstanding Work which he undertakes to finish during the warranty period until such outstanding Work has been completed.

4.12 RESPONSIBILITY TO RECTIFY LOSS OR DAMAGE

.1 If there is any loss or damage to the Work, or any part thereof, or to Products for incorporation therein, during the period for which the Contractor is responsible for the care thereof, from any cause whatsoever, the Contractor shall, at his own cost, rectify such loss or damage so that the Work conforms with the provisions of the Contract to the satisfaction of the Owner. The Contractor shall also be liable for any loss or damage to the Work occasioned by him in the course of any operations carried out by him for the purpose of complying with his obligations under the warranty provisions of the Contract.

4.13 HOLD HARMLESS AGREEMENT

.1 The Contractor shall hold harmless the Owner from any and all third party claims, demands, or actions for which the Contractor is legally responsible, including those arising out of negligence, willful harm, or crimes by the Contractor or the Contractor's employees or agents. This hold harmless shall survive the Contract.

4.14 REGULATORY REQUIREMENTS

.1 The Contractor shall conform in all respects, including by the giving of all notices and the paying of all fees, with the provisions of:

.1 Any Regulatory Requirements, and

.2 The rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Work, and the Contractor shall keep the Owner indemnified against all penalties and liability of every kind for breach of any such provisions.

.2 The Owner shall be responsible for obtaining any planning, zoning or other similar permission required for the Project to proceed.

.3 Without limiting the Contractor's obligations under clause 4.14.1, the Contractor shall:

.1 Comply with all requirements of and pay all fees in connection with the Workers' Compensation Act (Alberta),

.2 Comply with the Occupational Health and Safety Act (Alberta) and all safety requirements as contained in the regulations thereto,

.3 Ensure that wages, hours of work and other conditions of employment of all persons employed by the Contractor in the performance of any work required by the Contract are in compliance with the requirements of the Employment Standards Code (Alberta), the Labour Relations Code (Alberta) and any other applicable law, rule, regulation or order, and

.4 Pay all fees and charges levied by a municipal authority in respect of applicable permits and licences.

4.15 ARTIFACTS AND FOSSILS

.1 Coins, fossils, artifacts, structures and other remains or things of geological or archaeological interest discovered on the Site shall, as between the Owner and the Contractor, be deemed to be the property of the Owner. The Contractor shall take reasonable precautions to prevent his workers or any other persons from removing or damaging any such article or thing and shall, immediately upon discovery thereof and before removal, inform the Owner of such discovery and carry out the Owner's instructions for dealing with same. If, by reason of such instructions, the Contractor suffers delay or incurs costs then the Owner shall determine:

.1 Any extension of time to which the Contractor is entitled under clause 6.4, and

.2 The amount of such costs, which shall be added to the Contract Price.

4.16 PATENT RIGHTS

.1 The Contractor shall indemnify the Owner from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any Product, Construction Equipment, Temporary Work or other thing used for or in connection with or for incorporation in the Work and from and against all damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto, except where such infringement results from compliance with the design or specification provided by the Owner.

4.17 ROYALTIES

.1 Except as otherwise provided in the Contract, the Contractor shall be liable for all tonnage and other royalties, rent and other payments or compensation, if any, for obtaining stone, sand, gravel, clay or other materials required for the Work.

.2 The Contractor shall be liable for all payments or other compensation, if any, levied in relation to the dumping of all or part of any waste materials.

4.18 OTHER CONTRACTORS

.1 The Contractor shall, in accordance with the requirements of the Owner, afford all reasonable opportunities for carrying out their work to:

.1 Any Other Contractors of the Owner and their workers,

.2 The workers of the Owner, and

.3 The workers of any duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any contract which the Owner may enter into in connection with or ancillary to the Work.

.2 Pursuant to clause 4.18.1 and except as may be provided in the Contract, the Contractor shall, on the request of the Owner:

.1 Make available to any person referred to in clause 4.18.1, any roads or ways for the maintenance of which the Contractor is responsible, or

.2 Permit the use, by any such persons, of Temporary Work or Construction Equipment on the Site, or

.3 Provide any other service for any such person, the Owner shall determine an addition to the Contract Price in accordance with clause 8.3.

4.19 PERMANENT WORK DESIGNED BY CONTRACTOR

.1 Where the Contract provides that part of the Permanent Work shall be designed by the Contractor, he shall submit to the Owner, for review:

.1 Such drawings, specifications, calculations and other information as is necessary for the Owner's review, and

.2 Operation and maintenance manuals, as applicable, together with drawings of the Permanent Work as completed, in sufficient detail to enable the Owner to operate, maintain, dismantle, reassemble and adjust the Permanent Work incorporating that design, and such design and any alterations thereto shall be performed by a qualified design professional licensed to practice in Alberta.

.2 The Contractor shall not commence any work to which the information referred to in clause 4.19.1 relates unless such information has been reviewed by the Owner, and the Contractor shall not thereafter alter such design without the Owner's review.

4.20 RECORDS AND AUDIT

.1 With respect to Cost Plus Work, the Contractor shall:

.1 Keep accurate records of estimated and actual costs, payments made and time spent;

.2 Keep record copies of bids, quotations, contracts, correspondence, invoices, receipts and vouchers related thereto;

.3 Make such records available for inspection and audit by the Owner for a period of at least 2 years after the date of Total Performance of the Work;

.4 Provide the Owner with copies and extracts therefrom when requested by the Owner; and

.5 Afford facilities for audit and inspection by the Owner at mutually agreeable times and places.

.2 The Contractor shall cause Subcontractors and other persons directly or indirectly controlled by or affiliated with the Contractor and persons directly or indirectly having control of the Contractor to comply with clause 4.20.1 as if they were the Contractor.

4.21 RECORD OF LABOUR AND CONSTRUCTION EQUIPMENT

.1 The Contractor shall, if required by the Owner, deliver to the Owner a record in detail, in such form and at such intervals as the Owner may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such information respecting Construction Equipment as the Owner may require.

4.22 CUSTOMS

.1 With respect to the importation and re-export of Construction Equipment, Temporary Work, Products and other things required for the Work, the Contractor shall:

.1 Be liable for all applicable customs, import duties, taxes and brokerage fees, and

.2 Be responsible for obtaining clearance through Customs. If requested by the Contractor, the Owner may assist in obtaining such clearance.

4.23 URGENT REMEDIAL WORK

.1 If, due to any accident, or failure, or other event occurring to, in, or in connection with the Work, or any part thereof, either during the execution of the Work, or during the warranty period, any remedial or other work is, in the opinion of the Owner, urgently necessary for the safety of the Work, persons or property and the Contractor is unable or unwilling at once to do such work, the Owner may employ other persons or contract with other firms or corporations to carry out such work as the Owner may consider necessary.

.2 If the work or repair done by the Owner pursuant to clause 4.23.1 is work which, in the opinion of the Owner, the Contractor was liable to do at his own cost under the Contract, then all costs consequent thereon or incidental thereto shall be determined by the Owner and shall be recoverable from the Contractor by the Owner.

5. QUALITY OF PRODUCTS AND WORK

5.1 PRODUCTS AND WORKMANSHIP

.1 Products and workmanship shall be:

.1 Of the respective kinds described in the Contract, and

.2 Subjected from time to time to such tests as the Owner may require at the place of manufacture, fabrication or preparation, or on the Site or at such other place or places as may be specified in the Contract, or at all or any of such places.

.2 The Contractor shall:

.1 At his cost provide all things necessary for examining, measuring, and testing Products including labour, electricity, fuels, stores, apparatus and instruments, and

.2 Supply samples of materials, before incorporation in the Work, for testing as may be selected and required by the Owner.

5.2 COST OF SAMPLES

.1 All samples shall be supplied by the Contractor at his own cost if the supply thereof is provided for in the Contract.

5.3 COST OF TESTS PROVIDED FOR

.1 The cost of making any test shall be borne by the Contractor if such test is:

.1 Specified in the Contract to be performed by the Contractor, or

.2 In cases of a test under load or of a test to ascertain whether the design of any finished or partially finished work is appropriate for the purposes which it was intended to fulfill, specified in the Contract in sufficient detail to enable the Contractor to price or allow for the same in his Bid.

5.4 COST OF TESTS NOT PROVIDED FOR

.1 If the Owner requires any test which is not provided for in the Contract and such test shows the Products or workmanship not to be in accordance with the Contract, then the cost of such test shall be borne by the Contractor, but in any other case clause 5.4.2 shall apply.

.2 Where, pursuant to clause 5.4.1, this clause applies, the Owner shall determine:

.1 Any extension of time to which the Contractor is entitled under clause 6.4, and

.2 The amount of any costs incurred by the Contractor, which shall be added to the Contract Price.

5.5 INSPECTION AND TESTING

.1 The Owner shall at reasonable times have access to the Site and to all workshops and places where Products are being manufactured, fabricated or prepared for the Work and the Contractor shall afford every facility for, and every assistance in, obtaining the right to such access.

.2 The Owner shall be entitled, during manufacture, fabrication or preparation to inspect and test the Products to be supplied under the Contract. If Products are being manufactured, fabricated or prepared in workshops or places other than those of the Contractor, the Contractor shall obtain permission for the Owner to carry out such inspection and testing in those workshops or places. Such inspection or testing shall not release the Contractor from any obligation under the Contract.

5.6 DATES FOR INSPECTION AND TESTING

.1 The Contractor shall agree with the Owner on the time and place for the inspection or testing of any Products as provided in the Contract. The Owner shall give the Contractor not less than 48 hours notice of his intention to carry out the inspection or to attend the tests. If the Owner does not attend on the date agreed, the Contractor may, unless otherwise instructed by the Owner, proceed with the tests. The Contractor shall forthwith forward to the Owner certified copies of the test results.

5.7 REJECTION

.1 If, at the time and place agreed in accordance with clause 5.6, Products are not ready for inspection or testing or if, as a result of the inspection or testing referred to in clause 5.5, the Owner determines that the Products are defective or otherwise not in accordance with the Contract, he may reject the Products and shall notify the Contractor thereof immediately. The notice shall state the Owner's objections with reasons. The Contractor shall then promptly make good the defect or ensure that rejected Products comply with the Contract. If the Owner so requests, inspection and testing of rejected Products shall be made or repeated under the same terms and conditions.

5.8 COST FOR INSPECTION AND TESTING

.1 All costs incurred by the Owner because of rescheduling, or undue delay of inspection and testing, and for which the Contractor is responsible, shall be determined by the Owner and shall be recoverable from the Contractor by the Owner.

5.9 INDEPENDENT INSPECTION

.1 Inspection and testing of Products to be carried out by the Owner may be delegated to an independent agency. Any such delegation shall be effected in accordance with clause 1.3 and for this purpose such independent agency shall be considered as an assistant of the Owner.

5.10 EXAMINATION OF WORK BEFORE COVERING UP

.1 The Contractor shall afford full opportunity for the Owner to examine and measure any part of the Work which is about to be covered up or put out of view and to examine exposed or excavated surfaces before any part of the Work is placed thereon. The Contractor shall give notice to the Owner whenever any such part of the Work or exposed or excavated surface is or are ready or about to be ready for examination and the Owner shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such part of the Work or of examining such surfaces.

5.11 UNCOVERING AND MAKING OPENINGS

.1 The Contractor shall uncover any part of the Work or make openings in or through the same as the Owner may from time to time instruct and shall reinstate and make good such part. If any such part has been covered up or put out of view after compliance with the requirement of clause 5.9 and is found to be executed in accordance with the Contract, the Owner shall determine the amount of the Contractor's costs in respect of such uncovering, making openings in or through, reinstating and making good, which shall be added to the Contract Price. In any other case all costs shall be borne by the Contractor.

5.12 REMOVAL OF IMPROPER WORK OR PRODUCTS

.1 The Owner shall have authority to issue instructions for:

.1 The removal from the Site, within such time or times as may be specified in the instruction, of any Products which, in the opinion of the Owner, are not in accordance with the Contract,

.2 The substitution of proper and suitable Products, and

.3 The removal and proper re-execution, notwithstanding any previous test thereof or progress payment therefore, of any work which is not in accordance with the Contract.

.2 In case of default by the Contractor in carrying out instructions pursuant to clause 5.12.1 within the time specified therein or, if none, within a reasonable time, the Owner may employ other persons or contract with other firms or corporations to carry out the same, and all costs consequent thereon or incidental thereto shall be determined by the Owner and shall be recoverable from the Contractor by the Owner.

6. COMMENCEMENT, COMPLETION, CONTRACT TIME AND DELAYS

6.1 COMMENCEMENT OF WORK

.1 The Contractor shall commence the Work as soon as is reasonably possible in accordance with the instructions contained in the Letter of Acceptance and other provisions of the Contract. Thereafter, the Contractor shall proceed with the Work without delay.

6.2 POSSESSION OF SITE AND ACCESS TO SITE

.1 If the Contractor suffers delay or incurs costs from failure of the Owner to give possession of the Site or part thereof in accordance with the provisions of the Contract, the Owner shall determine:

.1 Any extension of time to which the Contractor is entitled under clause 6.4, and

.2 The amount of such costs, which shall be added to the Contract Price.

.2 The Contractor shall bear all costs and charges for special or temporary rights-of-way required by him in connection with the Work. The Contractor shall also provide at his own cost any additional facilities outside the Site required by him for the purposes of the Work.

6.3 CONTRACT TIME

.1 The Contractor shall achieve Substantial Performance of the Work as a whole within the Contract Time.

.2 When the Contractor is required to achieve Substantial Performance of part or parts of the Work prior to achieving Substantial Performance of the Work as a whole, the Contractor shall achieve Substantial Performance of such part or parts of the Work within the time or times specified and such time or times shall be considered to be the Contract Time or Times for such part or parts.

6.4 EXTENSION OF CONTRACT TIME

.1 In the event of:

.1 A change in the Work made under clause 8.1, or

.2 Any cause of delay referred to in the Contract, or

.3 Abnormally adverse weather conditions, abnormal weather being defined as temperature, precipitation, humidity or wind that is outside of plus or minus one standard deviation from the mean, for the time period in question, determined pursuant to clause 4.5, or

.4 Any delay, impediment or prevention by the Owner, or

.5 Other special circumstances which may occur, other than through a default of or breach of Contract by the Contractor or for which he is responsible, being such as to affect an activity on the critical path of the Contractor's schedule, the Owner shall determine the extension of the Contract Time for the whole or part of the Work, to which the Contractor may be entitled.

6.5 CONTRACTOR TO PROVIDE NOTIFICATION AND DETAILS

.1 The Owner shall not be bound to make any determination pursuant to clause 6.4 unless the Contractor has:

.1 Within 7 days after such event has first arisen notified the Owner, and

.2 Within 14 days, or such other reasonable time as may be agreed by the Owner after such notification, submitted to the Owner details of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time.

6.6 INTERIM DETERMINATION OF EXTENSION OF TIME

.1 Where an event has a continuing effect such that it is not practicable for the Contractor to submit details within the period of 14 days referred to in clause 6.5.1.2, he may claim for an extension of time provided that he has submitted to the Owner interim details at intervals of not more than 14 days and final details within 14 days of the end of the effects resulting from the event. On receipt of such interim details, the Owner may make an interim determination of extension of time and, on receipt of the final details, the Owner shall review all the circumstances and may determine an overall extension of time in regard to the event. No final review shall result in a decrease of any extension of time already determined by the Owner. The Owner may determine an extension of the Contract Time notwithstanding that the Contract Time may have passed without being extended.

6.7 RATE OF PROGRESS

.1 If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the Work or any part is at any time, in the opinion of the Owner, too slow to comply with the Contract Time, the Owner may notify the Contractor who shall immediately take such steps as are necessary, subject to the consent of the Owner, to expedite progress so as to comply with the Contract Time. The Contractor shall not be entitled to any additional payment for taking such steps. If any steps, taken by the Contractor in meeting his obligations under this clause, involve the Owner in additional costs, such costs shall be determined by the Owner and shall be recoverable from the Contractor by the Owner.

6.8 SUBSTANTIAL PERFORMANCE OF THE WORK

.1 When the whole of the Work has been substantially performed and any pre-requisites to Substantial Performance of the Work prescribed by the Contract have been met, the Contractor may so submit to the Owner a Certificate of Substantial Performance, accompanied by a written undertaking to finish without delay any outstanding work during the warranty period. Such notice and undertaking shall be deemed to be a request by the Contractor for the Owner to accept or reject the Certificate of Substantial Performance.

.2 The Owner shall, within 21 days after the date of receipt of the certificate referred to in clause 6.8.1, either issue to the Contractor, a letter, stating the date on which, in his opinion, the Work was substantially performed in accordance with the Contract, or give instructions in writing to the Contractor specifying all the work which, in the Owner's opinion, is required to be done by the Contractor before the acceptance of such

certificate. The Owner shall also notify the Contractor of any defects in the Work affecting substantial performance that may appear after such instructions and before completion of the Work specified therein. The Contractor shall be entitled to receive such notification within 21 days after completion, to the satisfaction of the Owner, of the Work so specified and remedying all defects so notified. The Owner may specify the date for Total Performance of the Work in such notice.

6.9 SUBSTANTIAL PERFORMANCE OF PART OR PARTS OF WORK

.1 In accordance with the procedure set out in clause 6.8, the Contractor may submit a Certificate of Substantial Performance to the Owner in respect of any substantial part of the Permanent Work which has been substantially completed and which has been or will be occupied or used by the Owner or an Other Contractor prior to Substantial Performance of the Work as a whole, whether or not such prior occupation or use is provided for in the Contract.

6.10 TOTAL PERFORMANCE OF THE WORK

.1 When the whole of the Work has been totally performed and any pre-requisites to Total Performance of the Work prescribed by the Contract have been met, the Contractor may so submit written notice to the Owner. Such notice shall be deemed to be a request by the Contractor for the Owner to issue a Certificate of Total Performance of the Work.

.2 The Owner shall, in accordance with the procedure set out in clause 6.8.2, either issue a Certificate of Total Performance of the Work or give instructions.

6.11 WARRANTY PERFORMANCE OF THE WORK

.1 The Work of the Contract shall only be considered as completed when a Certificate of Warranty Performance of the Work has been signed by the Owner and delivered to the Contractor, stating the date on which the Contractor has completed his obligations to execute and complete the Work and remedy any defects therein to the Owner's satisfaction. The Certificate of Warranty Performance of the Work shall be given by the Owner within 28 days after the expiration of the warranty period, or, if different warranty periods are applicable to different parts of the Permanent Work, the expiration of the latest such period, or as soon thereafter as any Work instructed, pursuant to clause 7, has been completed to the satisfaction of the Owner.

6.12 ACCELERATION

.1 If the Owner wishes to reduce the Contract Time for the Work or any part thereof, he shall issue to the Contractor a notice thereof and an instruction requiring the Contractor to submit to him within the period specified in the instruction:

.1 The Contractor's priced proposals for reducing the Contract Time, together with any consequential modifications to the construction schedule, or

.2 The Contractor's explanation why he is unable to reduce the Contract Time.

.2 If the Owner accepts the Contractor's proposals submitted pursuant to clause 6.12.1.1, including amendments thereto agreed by both parties, the Owner shall issue instructions to the Contractor modifying the Contract accordingly. Such instructions shall include:

.1 The revised Contract Time or Times,

.2 The modifications to the construction schedule,

.3 The revised Contract Price, and

.4 Any other relevant modifications to the Contract.

.3 The Contractor may at any time submit to the Owner proposals to reduce the Contract Time for the Work or part thereof. The Owner shall consider such proposals and if he accepts them he shall take action as in clause 6.12.2.

6.13 DAMAGES FOR DELAY

.1 Without prejudice to any other right the Owner may have with respect to damages, if the Contractor fails to achieve Substantial Performance of the Work or, if applicable, of part of the Work, within the Contract Time or Times, the Contractor shall pay to the Owner an amount equal to the sum of:

.1 **Two Thousand Dollars ($2,000)** as liquidated damages and not as a penalty for each calendar day the Work is not substantially complete after the Date of Substantial Performance. The said sum being a fair estimate of the actual damages the Owner will incur if the Work is not completed by the said Substantial Performance Date.

.2 **Two Thousand Dollars ($2,000)** as liquidated damages and not as a penalty for each calendar day the Work remains uncompleted after the date of Total Performance. The said sum being a fair estimate of the actual damages the Owner will incur if the Work is not completed by the said Total Performance Date.

.3 All other costs and damages incurred or sustained by the Owner as a result of the Contractor's failure to achieve Substantial Performance of the Work or part thereof within the Contract Time or Times.

.2 The Owner may, without prejudice to any other method of recovery, deduct the amount referred to in clause 6.13.1 from any monies due or to become due to the Contractor under the Contract. The payment or deduction of such amount shall not relieve the Contractor from his obligation to complete the Work or from any other of his contractual obligations.

.3 For the purposes of this clause, "period of delay" means the period commencing on the date specified in the Contract for Substantial Performance of the Work or part thereof and ending on the day immediately preceding the date on which Substantial Performance of the Work or part thereof is actually achieved.

7. WARRANTY

7.1 WARRANTY PERIOD

.1 In the Contract the term "warranty period" shall mean a period of one (1) year, or such longer period as may be provided elsewhere in the Contract, calculated from:

.1 The date of Substantial Performance of the Work, certified by the Owner in accordance with clause 6.8, or

.2 In the event of more than one certificate having been issued by the Owner under clause 6.9, the respective dates so certified, or

.3 In the case of outstanding work to be completed after the date or dates of Substantial Performance referred to in clauses 7.1.1.1 and 7.1.1.2, the date upon which such work is certified as complete by the Owner, and in relation to the warranty period the term "the Work" shall be construed accordingly.

7.2 COMPLETION OF OUTSTANDING WORK

.1 The Contractor shall complete work outstanding at the date of Substantial Performance of the Work within the time specified by the Owner in the Certificate of Substantial Performance of the Work.

7.3 REMEDYING DEFECTS

.1 The Contractor shall, during or as soon as practicable after the expiration of the warranty period, remedy any defects in the Work and execute any work of modification or reconstruction related thereto, as the Owner may, during the warranty period or within 14 days after its expiration instruct the Contractor to do.

.2 Work referred to in clause 7.3.1 shall be executed by the Contractor at his own cost if the necessity thereof is, in the opinion of the Owner, due to:

.1 Defects in Products or workmanship, or defects in design for which the Contractor is responsible,

.2 The neglect or failure on the part of the Contractor to comply with any obligation, expressed or implied, on the Contractor's part under the Contract. If, in the opinion of the Owner, such necessity is due to any other cause, he may determine an addition to the Contract Price in accordance with clause 8.

7.4 CONTRACTOR'S FAILURE TO CARRY OUT INSTRUCTIONS

.1 If the Contractor defaults in carrying out instructions issued pursuant to clause 7.2 or 7.3, the Owner may employ other persons or contract with other firms or corporations to carry out the same. If such work is work, which, in the opinion of the Owner, the Contractor was liable to do at his own cost, then all costs consequent thereon or incidental thereto shall be determined by the Owner and shall be recoverable from the Contractor by the Owner.

7.5 CONTRACTOR TO SEARCH

.1 If any defect in the Work appears at any time prior to the end of the warranty period, the Owner may instruct the Contractor to search for the cause thereof. If such defect is one for which the Contractor is liable, the cost of the work carried out in searching shall be borne by the Contractor and he shall in such case remedy such defect at his own cost in accordance with the provisions of clauses 7.3 and 7.4. If such defect is one for which the Contractor is not liable under the Contract, the Owner shall determine the amount of the costs of such search incurred by the Contractor, which shall be added to the Contract Price.

8. CHANGES AND VARIATIONS

8.1 CHANGES IN THE WORK

.1 Consistent with the Work, the Owner may make changes in the Work or any part thereof, and he shall have the right to instruct the Contractor to make such changes and the Contractor shall make such changes, which may include:

.1 Increasing or decreasing the quantity of any work included in the Contract,

.2 Omitting any work, but not if the omitted work is to be carried out by the Owner or by an Other Contractor except by reason of the Contractor's default or negligence,

.3 Changing the character or quality or kind of any work,

.4 Changing the levels, lines, position and dimensions of any part of the Work,

.5 Executing additional work of any kind necessary for the completion of the Work,

.6 Changing any specified sequence or timing of construction of any part of the Work.

.2 No such change shall invalidate the Contract, but the effect, if any, of such changes on the Contract Price shall be valued in accordance with clause 8.3 and any extension of the Contract Time shall be determined in accordance with clause 6.4. Where an instruction to change the Work is necessitated by default or negligence of the Contractor or for which he is responsible, any cost and time attributable to such default or negligence shall be borne by the Contractor.

8.2 INSTRUCTIONS FOR CHANGES IN THE WORK

.1 The Contractor shall not make any changes in the Work without a written instruction from the Owner.

.2 No instruction shall be required for:

.1 An increase or decrease in the quantity of any work where such increase or decrease is not the result of an instruction given under this clause, but is the result of quantities exceeding or being less than those stated in the Schedule of Prices, and

.2 A change or adjustment in lines, levels, grades or elevations when such change or adjustment is already provided for in the Contract.

8.3 VALUATION OF CHANGES IN THE WORK

.1 Changes referred to in clause 8.1 and any changes to the Contract Price which are required to be determined in accordance with this clause (for the purposes of this clause referred to as "changed work"), shall be valued, at the Owner's option:

.1 At the rates and prices set out in the Contract if, in the opinion of the Owner, these are applicable, or

.2 If the rates and prices set out in the Contract are not applicable to the changed work, at rates and prices deduced or extrapolated from such rates and prices, or

.3 By acceptance by the Owner of rates and prices submitted by the Contractor or other rates and prices as may be agreed by negotiation, or

.4 By acceptance by the Owner of a lump sum quotation submitted by the Contractor or other lump sum as may be agreed by negotiation, or

.5 As Cost Plus Work in accordance with the provisions of Section 00630 – Payment Conditions.

.2 If there is disagreement on the value of changed work, the Owner shall fix such rates or prices as are, in his opinion, appropriate and shall notify the Contractor accordingly. Until such time as rates or prices are agreed or fixed, the Owner shall determine provisional rates or prices to enable on-account payments to be made in accordance with the payment conditions of the Contract.

8.4 IMPACT OF CHANGES IN THE WORK

.1 If in the opinion of the Owner or the Contractor the nature or amount of any changed work relative to the nature or amount of the whole of the Work or to any part thereof, is such that the rate or price contained in the Contract for any item of the Work is, by reason of such changed work, rendered inappropriate or inapplicable, then, after due consultation by the Owner with the Contractor, a suitable rate or price may be agreed upon between the Owner and the Contractor.

.2 If there is disagreement on the rates or prices referred to in clause 8.4.1, the Owner shall fix such rate or price as is, in his opinion, appropriate and shall notify the Contractor. Until such time as rates or prices are agreed or fixed, the Owner shall determine provisional rates or prices to enable on-account payments to be made in accordance with the payment conditions of the Contract.

8.5 QUANTITY VARIATIONS

.1 The quantities set out in the Schedule of Prices are approximate only and no claim shall be made by the Contractor against the Owner on account of any excess or deficiencies absolute or relative, in the same.

.2 The price or prices provided in the Contract whether stipulated sum or unit price or both shall be accepted by the Contractor, as full compensation for everything furnished and done by the Contractor under the Contract, including all Work required but not included in the items herein mentioned, and also for all loss or damages arising out of the nature of the Work or the action of the weather, elements, or any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all risks of every description connected with the Work, and for all expenses incurred by or in the consequence of any delay or suspension or discontinuance of the work as herein specified, and for well and faithfully completing the Work as provided in the Contract.

9. CHANGES IN COST AND REGULATORY REQUIREMENTS

9.1 INCREASE OR DECREASE IN COST

.1 Subject to clause 9.2, the Contract Price shall not be subject to any adjustment in respect of rise or fall in the cost of labour, Products or any other matters affecting the cost of execution of the Contract.

9.2 CHANGES IN REGULATORY REQUIREMENTS

.1 If, after the latest date for submission of Bids for the Contract, there is a change to any Regulatory Requirement, or a new Regulatory Requirement is introduced, which causes additional or reduced cost to the Contractor in the execution of the Contract, such additional or reduced cost shall be determined by the Owner and shall be added to or deducted from the Contract Price.

.2 When a Regulatory Requirement is changed or introduced during the period of time referred to in clause 9.2.1 but public notice thereof has been given by the applicable authority before the commencement of such period of time, the change or introduction shall be deemed to have occurred before the commencement of such period of time.

10. CLAIMS

10.1 NOTICE OF CLAIMS

.1 If the Contractor intends to claim any additional payment, he shall give notice of his intention to the Owner within 7 days after the event giving rise to the claim has first arisen.

.2 Upon the occurrence of the event referred to in clause 10.1.1, the Contractor shall take all reasonable measures required to mitigate any loss or damage, which may be incurred as a result of such event.

10.2 CONTEMPORARY RECORDS

.1 Upon the occurrence of the event referred to in clause 10.1, the Contractor shall keep such contemporary records as may reasonably be necessary to support any claim he may subsequently wish to make, including records of time and cost relating to labour, products, construction equipment and other resources used in the work. The Contractor shall permit the Owner to inspect all records kept pursuant to this clause and shall supply him with copies thereof as and when the Owner so instructs.

10.3 SUBSTANTIATION OF CLAIMS

.1 Within 14 days, or such other reasonable time as may be agreed by the Owner, of giving notice under clause 10.1, the Contractor shall send to the Owner an account giving detailed particulars of the amount claimed and the grounds upon which the claim is based. Where the event giving rise to the claim has a continuing effect, such account shall be considered to be an interim account and the Contractor shall, at such intervals as the Owner may reasonably require, send further interim accounts giving the accumulated amount of the claim and any further grounds upon which it is based. In cases where interim accounts are sent to the Owner, the Contractor shall send a final account within 14 days after the end of the effects resulting from the event.

10.4 PAYMENT OF CLAIMS

.1 The Contractor shall be entitled to have included in any progress payment such amount in respect of any claims as the Owner may consider due to the Contractor. If information is insufficient to substantiate the whole of the claim, the Contractor shall be entitled to payment in respect of such part of the claim as such information may substantiate to the satisfaction of the Owner.

10.5 OBLIGATIONS TO AND CLAIMS OF THIRD PARTIES

.1 The Contractor shall, with respect to lawful obligations of and lawful claims against the Contractor or any Subcontractor arising from the Contract:

.1 Discharge such obligations of and satisfy such claims against the Contractor, and

.2 Ensure the discharge of such obligations of and the satisfaction of such claims against Subcontractors.

.2 The Contractor shall, when requested by the Owner, make a statutory declaration deposing to the existence and condition of any obligations and claims referred to in clause 10.5.1.

.3 If a third party sends written notice to the Owner of an undischarged obligation or unsatisfied claim referred to in clause 10.5.1, the Owner may, 30 days after giving written notice to the Contractor, and surety where applicable:

.1 Pay any amount that is due and payable to the Contractor pursuant to the Contract directly to the obligees of and the claimants against the Contractor or the Subcontractor, and

.2 Where security for payment of claims has been provided in the form of a security deposit, the Owner may deduct such amount from the security deposit, or

.3 Where a security deposit has not been provided or insufficient monies are available in the security deposit, the Owner may deduct such amount, or portion thereof, from the amount payable to the Contractor under the Contract.

.4 Clause 10.5.3 shall apply only when written notice of the obligation or claim is sent to Owner as set out in the Prompt Payment Act.

10.6 CLAIMS AGAINST OWNER ONLY

.1 Any claims, demands or actions by the Contractor, arising out of alleged errors, omissions or misrepresentations in the Contract Documents or arising out of acts or omissions of the Owner's Representative or his assistants during the execution of the Work, shall be made only to or against the Owner. The Contractor waives any right to commence or carry on such claims, demands or actions against any person or party other than the Owner.

11. RELEASE FROM PERFORMANCE

11.1 FRUSTRATION

.1 If any circumstance outside the control of both the Owner and the Contractor arises after the award of the Contract which renders it impossible or unlawful for either party to fulfill his contractual obligations, then the Owner or the Contractor may terminate the Contract by giving notice to the other party and, upon such notice, the Contract shall, except as to the rights of the parties under this clause and to the operation of clause 15, terminate, but without prejudice to the rights of either party in respect of any antecedent breach thereof.

11.2 REMOVAL OF CONSTRUCTION EQUIPMENT ON TERMINATION

.1 If the Contract is terminated pursuant to clause 11.1, the Contractor shall remove from the Site all Construction Equipment.

11.3 PAYMENT IF CONTRACT TERMINATED

.1 If the Contract is terminated pursuant to clause 11.1, the Contractor shall be paid by the Owner, insofar as such amounts or items have not already been covered by payments on account made to the Contractor, for all Work executed prior to the date of termination at the rates and prices provided in the Contract and in addition:

.1 The cost of Products reasonably ordered for the Work which have been delivered in acceptable condition to the Contractor or of which the Contractor is liable to accept delivery, such Products becoming the property of the Owner upon such payments being made by him,

.2 The amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the Work insofar as such expenditure has not been covered by any other payments referred to in this clause,

.3 Such proportion of the cost as may be reasonable, taking into account payments made or to be made for work executed, for removal of Construction Equipment under clause 11.2 provided that against any payment due from the Owner under this clause, the Owner shall be credited with any amounts which, at the date of termination, were recoverable by the Owner from the Contractor.

.2 Any amount payable under this clause shall be determined by the Owner.

12. SUSPENSION AND TERMINATION BY OWNER

12.1 SUSPENSION OF WORK

.1 The Contractor shall, on the instructions of the Owner, suspend the progress of the Work or any part thereof for such time and in such manner as the Owner may consider necessary and shall, during such suspension, properly protect and secure the Work or such part thereof so far as is necessary in the opinion of the Owner. Clause 12.2 shall apply unless such suspension is:

.1 Otherwise provided for in the Contract, or

.2 Necessary by reason of some default of or breach of contract by the Contractor or for which he is responsible, or

.3 Necessary by reason of normal weather conditions on the Site, or

.4 Necessary for the proper execution of the Work or for the safety of the Work or any part thereof, except to the extent that such necessity arises from any act or default by the Owner, in which case such suspension shall be at the Contractor's expense.

12.2 OWNER'S DETERMINATION FOLLOWING SUSPENSION

.1 Where, pursuant to clause 12.1, this clause applies the Owner shall determine:

.1 Any extension of time to which the Contractor is entitled under clause 6.4, and

.2 The amount, which shall be added to the Contract Price, in respect of the cost incurred by the Contractor by reason of such suspension.

12.3 SUSPENSION LASTING MORE THAN 91 DAYS

.1 If the progress of the Work or any part thereof is suspended on the written instructions of the Owner and if permission to resume work is not given by the Owner within a period of 91 days after the date of suspension then, unless such suspension is the Contractor's responsibility pursuant to clauses 12.1.1.1 to 12.1.1.4, the Contractor may give notice to the Owner requesting permission, within 28 days from the receipt thereof, to proceed with the Work or that part thereof in regard to which progress is suspended. If, within such time, such permission is not granted, the Contractor may elect to treat the suspension, where it affects only part of the Work, as an omission of such part under clause 8.1 by giving a further notice to the Owner to that effect, or, where it affects the whole of the Work, treat the suspension as an event of default by the Owner and terminate the Contract in accordance with the provisions of clause 14, in which case the provisions of clauses 14.2 and 14.3 shall apply.

12.4 TERMINATION OF CONTRACT

.1 The Owner may terminate the Contract at any time by giving a notice of termination to the Contractor. When such a notice is received by the Contractor he shall, subject to the provisions of such notice, forthwith cease all operations in performance of the Contract.

.2 If the Owner terminates the Contract pursuant to clause 12.4.1, the Owner shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions of clause 14.

13. DEFAULT OF CONTRACTOR

13.1 DEFAULT

.1 If the Contractor:

.1 Is deemed by law unable to pay his debts as they fall due, or becomes insolvent, or

.2 Enters into voluntary or involuntary bankruptcy, liquidation or dissolution (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or

.3 If any act is done or event occurs with respect to the Contractor or his assets which, under any applicable law, has a similar effect to any of the foregoing, or if he

.4 Has contravened clause 2.1, or

.5 Has repudiated the Contract, then the Owner may, upon written notice, enter upon the Site and the Work and immediately terminate the Contractor's right to continue with the Work.

.2 If the Owner determines, that, in his opinion, the Contractor without reasonable excuse:

.1 Has failed to commence and proceed with the Work or any part thereof in accordance the provisions of the Contract, or

.2 Has failed to comply with a notice issued pursuant to clause 6.7 or an instruction issued pursuant to clause 6.12 within 14 days after receiving it, or

.3 Despite previous warning from the Owner, in writing, is otherwise persistently or flagrantly neglecting to comply with any of his obligations under the Contract, or

.4 Has contravened clause 2.2, or

.5 Has failed to attain Substantial Performance of the Work or part or parts of the Work within the Contract Time or Times pursuant to clause 6.3, then the Owner may, after giving 14 days notice to the Contractor, and unless the Contractor has within such period remedied the default, enter upon the Site and the Work and terminate the Contractor's right to continue with the Work in whole or in part.

.3 If the Owner terminates the Contractor's right to continue with the Work, in whole or in part, pursuant to clause 13.1.1 or clause 13.1.2, such termination shall not release the Contractor from any of his obligations or liabilities under the Contract, and shall not affect the rights and authorities conferred on the Owner by the Contract, and the Owner may complete the Work or part thereof, or may contract with any Other Contractor to complete the Work or part thereof. The Owner or such Other Contractor may use for such completion so much of the Construction Equipment, Temporary Work and Products as he or they may think proper.

13.2 VALUATION AT DATE OF TERMINATION

.1 The Owner shall, as soon as practicable after any entry and termination by the Owner pursuant to clause 13.1, determine:

.1 What amount (if any) had, at the time of such entry and termination, been reasonably earned by or would reasonably accrue to the Contractor in respect of work then actually done by him under the Contract, and

.2 The value of any unused or partially used Products, any Construction Equipment and any Temporary Work.

13.3 PAYMENT AFTER TERMINATION

.1 If the Owner terminates the Contractor's right to continue with the Work in whole or in part under clause 13.1, he shall not be liable to pay to the Contractor any further amount in respect of the Contract until the expiration of the warranty period and thereafter until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any) and all other expenses incurred by the Owner have been determined. The Contractor shall then be entitled to receive only such sum (if any) as the Owner may determine would have been payable to him upon due completion by him after deducting the said amount. If such amount exceeds the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon demand, pay to the Owner the amount of such excess and it shall be deemed a debt due by the Contractor to the Owner and shall be recoverable accordingly.

13.4 ASSIGNMENT OF BENEFIT OF AGREEMENT

.1 The Contractor shall, if so instructed by the Owner within 14 days of the entry and termination referred to in clause 13.1, assign to the Owner the benefit of any agreement for the supply of any goods or materials or services and/or for the execution of any work for the purposes of the Contract, which the Contractor may have entered into.

14. DEFAULT OF OWNER

14.1 FAILURE OF OWNER TO PAY

.1 If the Owner fails to pay to the Contractor any amount due under the Contract within 28 days after the expiry of the time stated in the Payment Conditions within which payment is to be made, the Contractor may terminate the Contract by giving notice to the Owner. Such termination shall take effect 14 days after the giving of such notice unless payment is received within such period.

14.2 REMOVAL OF CONSTRUCTION EQUIPMENT

.1 Upon the termination of the Contract referred to in clause 14.1, the Contractor shall remove promptly from the Site all Construction Equipment.

14.3 PAYMENT ON TERMINATION

.1 In the event of termination pursuant to clause 14.1 the Owner shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions of clause 11, but, in addition to the payments specified in clause 11.3, the Owner shall pay to the Contractor the amount of any loss or damage, including reasonable profit, to the Contractor directly arising out of or in connection with or by consequence of such termination.

14.4 CONTRACTOR MAY SUSPEND WORK

.1 As an alternative to termination under clause 14.1 but without prejudice to the Contractor's entitlement to terminate under clause 14.1, the Contractor may, after giving 14 days' prior notice to the Owner, suspend work or reduce the rate of work.

.2 If the Contractor suspends or reduces the rate of work pursuant to clause 14.4.1 and thereby suffers delay or incurs cost the Owner shall determine:

.1 Any extension of time to which the Contractor is entitled under clause 6.4, and

.2 The amount of such costs, which shall be added to the Contract Price.

14.5 RESUMPTION OF WORK

.1 When the Contractor suspends work or reduces the rate of work pursuant to clause 14.4.1 and the Owner subsequently pays the amount due, the Contractor's entitlement under clause 14.1 shall, if notice of termination has not been given, lapse and the Contractor shall resume normal working as soon as is reasonably possible.

15. SETTLEMENT OF DISPUTES

15.1 DISPUTES

.1 If a dispute of any kind arises between the Owner and the Contractor in connection with, or arising out of, the Contract or the execution of the Work, whether during the execution of the Work or after its completion and whether before or after repudiation or other termination of the Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Owner, the matter in dispute shall be settled in accordance with the provisions of this clause 15.

.2 Unless the Contract has already been repudiated or terminated, the Contractor shall, during the course of any dispute settlement, and without prejudice to any claim the Contractor may have:

.1 Proceed with the Work without delay, and

.2 Comply with any instructions issued by the Owner with respect thereto, unless and until such instructions are revised, as hereinafter provided, in a negotiated settlement or an arbitral or judicial award.

15.2 NOTICE OF DISPUTE

.1 A dispute shall be deemed to arise when the Owner or the Contractor serves on the other party a written notice of dispute stating the nature of the dispute. No notice of dispute shall be served by either party unless all other applicable provisions of the Contract have been invoked.

15.3 NEGOTIATED SETTLEMENT

.1 The Owner and the Contractor shall make bona fide efforts to settle any dispute arising between them by negotiations, in accordance with this clause 15.3, and provide timely disclosure of all relevant facts, information and documents to such negotiations.

.2 Within 14 days after the serving of a notice of dispute by one party on the other pursuant to clause 15.2, the parties shall commence negotiations for the purposes of settling the dispute. Such settlement process may include, if both parties agree, the use of mediation.

.3 If, after 28 days, or such longer period as the parties and the mediator, if any, may agree, after the commencement of negotiations pursuant to clause 15.3.2, the parties have not settled the dispute, it shall be referred to arbitration, unless the parties mutually agree otherwise.

15.4 MEDIATION

.1 If, in their efforts to reach a negotiated settlement, the parties agree to use mediation pursuant to clause 15.3.2, such mediation shall be conducted by a single mediator acceptable to both parties and under terms-of-reference established by both parties and the mediator. The parties shall share equally the cost of mediation.

15.5 ARBITRATION

.1 A reference to arbitration pursuant to clause 15.3.3 shall be effected by either party serving on the other party a notice to refer the dispute to arbitration and such dispute shall be referred to a single arbitrator agreed for that purpose or, in default of agreement within a reasonable time, appointed at the request of the Owner or the Contractor by the Alberta Arbitration and Mediation Society.

.2 A reference to arbitration under this clause shall be a reference to which the Arbitration Act (Alberta) applies and any award pursuant thereto shall bind the parties, except as otherwise provided by the Act.

END OF SECTION

1. SUPPLEMENTARY CONDITIONS

.1 These Supplementary Conditions provide information relative to specific items not covered in other sections.

2. ALBERTA ENVIRONMENT NAME CHANGE

.1 Any reference to "Alberta Environment" refers to the Provincial Regulatory Agency that is responsible for the 'Water Act', 'Environmental Protection and Enhancement Act', and 'Public Lands Act'.

.2 The Owner has made application for the proposed work under the Alberta Environmental Protection and Enhancement Act. Do not commence work on the project until approval has been obtained by the Owner.

3. PROJECT FUNDING

.1 The Owner has made funding applications for the project work. Do not commence work until funding approval has been obtained by the Owner.

4. WARRANTY PERIOD

.1 The Warranty Period for all work is Two (2) Years, except for ground settlement, roads, lanes, sidewalks, valve and manhole adjustments, for which the Warranty Period is Three (3) Years.

.2 Thirty to sixty days prior to the end of the Warranty Period the Contractor shall apply to the Owner for acceptance of the Warranty Performance of the Work. The Owner will review the work and advise the Contractor of any defects that require remedy under the Contract. The Owner will issue a certificate of Warranty Performance of the Work, after all defects have been remedied.

.3 No extra payment will be made for these required maintenance items.

5. INCIDENTAL ITEMS

.1 The following items are incidental to the contract and no separate payment will be made for this work:

.1 All submittals.

.2 All Road Restoration beyond the Limits of Work, which have been damaged or disturbed by the Work.

.3 All Site Restoration beyond the Limits of Work, which have been damaged or disturbed by the Work.

.4 Locating, protecting, and reconnecting where necessary all existing utilities (underground and overhead) and service connections, existing trees, fences, buildings, etc.

.5 Working in proximity to and crossing of utilities including Alberta One-Call notification, third party locations and hydrovacing / hand exposure as required.

.6 Public notification program.

.7 Road/lane closure and traffic control, providing access to existing residences, businesses or facilities as required or to provide nearby alternate parking.

.8 Cleaning and delivery of salvaged material removed during construction to the Owner's Public Works yard.

.9 Care of Water.

.10 Removal and replacement of guardrail, fencing, signs, etc., necessary to complete the work.

.11 Sequencing of Construction.

6. DISPOSAL OF WASTE MATERIAL

.1 Unless otherwise indicated in these documents, salvaged materials which are re-useable will be the property of the Owner. The Contractor shall obtain authorization prior to removing any materials from the project site and shall obtain written verification from the Owner as to what removed materials are to be salvaged and what removed materials are to be disposed as waste. The Contractor will be responsible for transporting salvaged materials to the Owner's Public Works Yard. There will be no separate payment for salvaging or transferring to storage of these items.

.2 Unless indicated otherwise, non-salvageable materials will be excavated, transported and disposed of at the nearest sanitary landfill site. Burying of non-salvageable materials will not be allowed under any circumstances.

.3 There will be no separate payment for Disposal of Waste Materials. The cost of Disposal of Waste Materials including the cost of materials, labour, equipment supply, excavation, handling, hauling, and disposal, shall be included in the prices bid in the Tender Form.

.4 The Contractor is to use the services of a waste management company approved by the Owner for the disposal of non-salvageable materials.

.5 When practical, minimize the amount of waste generated from construction operations and demolitions by salvaging materials for recycling. Salvage and segregate metal, plastic, paper, cardboard, and glass and transfer them to the nearest appropriate collection facility identified by the Owner.

7. DAILY PROGRESS REPORTS

.1 The Contractor shall complete and submit Daily Progress Reports to the Owner's Representative. Progress Reports shall include daily completed work, weekly work forecasts, and any daily work related issues or setbacks.

8. DAMAGES

.1 In the event that the County becomes entitled to any damages, reimbursement or other claims as against the Contractor, whether in relation to this Agreement or otherwise, the Contractor agrees that the County shall be entitled to set off and deduct the full value of any such claims or amounts owing from any monies payable by the County to the Contractor

9. GUARANTEE FUND

.1 In addition to the Contract Performance Security outlined in Section 00612, a Guarantee Fund shall be retained from the 10% holdback payment in the amount of $15,000.00.

.2 The Owner shall retain the Guarantee Fund for the duration of the Warranty Period.

.3 In lieu of providing a cash Guarantee Fund, the Contractor may provide an irrevocable letter of credit issued by a chartered bank payable to Saddle Hills County.

.4 The irrevocable letter of credit shall be in a form acceptable to the Owner's Representative and the Owner, Saddle Hills County.

.5 The letter of credit shall be in effect for the Warranty Period.

.6 Should the Contractor fail to correct all deficiencies and defects occurring in the Work during the Warranty Period, the Owner shall be entitled to make withdrawls from the Guarantee Fund sufficient to correct all such deficiencies and defects.

.7 In the event the Contractor proceeds to correct all deficiencies and defects in the Work, occurring during the Warranty Period, the Owner shall pay the Contractor all monies remaining in the Guarantee Fund upon expiration of the Guarantee Period.

.8 No interest will be paid in the Guarantee Period.

10. PRIME COST ALLOWANCE

.1 Commissioning Prime Cost Allowance:

.1 This allowance is for Commissioning. This work will be performed and administered by MPE Engineering Ltd. Invoices for the work will be issued to the Contractor for payment. Contractor will not mark-up invoices.

.2 Programming Prime Cost Allowance:

.1 This allowance is for programming and PLC, HMI and SCADA. This work will be performed and administered by Oneshot Automation and controls Ltd. Invoices for the work will be issued to the Contractor for payment. Contractor will not mark-up invoices.

11. MAINTAINING EXISTING SYSTEM OPERATION

.1 The Contractor shall ensure the operation of existing potable water supply system is safeguarded and is not interfered with for the duration of construction of the Bonanza Distribution Pumps Upgrading.

.2 Scheduling to result in no disruption of existing water supply system at all times.

.3 Provide schedule of activities which will disrupt any portion of the existing system at least fourteen (14) days prior to activities occurring.

.4 The scheduling of all disruptive activities must be approved by the Owner, together with the existing customers of the Bonanza water supply system.

.5 Maintain any existing water supply systems in operation until the new system is capable of being operated on a full-time basis.

.6 The existing distribution water supply to the County customers must be maintained in service at all times.

.7 Any activities that will result in an interruption of the capability to deliver treated water to distribution will not be allowed.

.8 Obtain approval from Owner prior to proceeding with any activity that will result in an interruption of the capability to fill the existing or new water reservoir.

.9 The Contactor shall provide construction work plans outlining specific procedures and techniques that will be implemented for each stage of construction to the Owner or Engineer for approval a minimum of fifteen (15) business days prior to beginning work.

.10 Provide temporary piping connections are required to ensure un-interrupted water supply to the Bonanza's distribution system.

.11 No separate payment shall be made for this work.

12. PIPE, FITTING, AND EQUIPMENT SUPPORTS

.1 Pipe, duct, conduit, and equipment supports may not all be necessarily shown on the Contract Drawings. The Contractor is responsible to ensure sufficient supports are supplied, fabricated, and installed to properly secure all pipe, fittings, and equipment to satisfy piping and equipment manufacturer's recommendations. No separate payment will be made for this work.

13. VARIATION OF INFORMATION

.1 Information shown on the drawings or described in the specifications, including topographic lines, locations of existing facilities, ground surveys and soil conditions is approximate only.

.2 The Owner assumes no responsibility for the accuracy of the information described above, nor does the Owner represent that materials or conditions other than those indicated will not be encountered.

.3 The Contractor shall understand that and borings or other investigations made by the Engineer and which may be shown on the Drawings or as Appendices to the Specifications are for the Engineer's own information.

.4 If any information as to the character of the materials likely to be encountered in performing the Work, or any other information as to the condition of the site is taken from this information, it shall be distinctly understood that the Engineer shall not be responsible if the information does not correctly set forth the facts or if the boring sheets or other written documents provided by the Engineer do not correctly set forth the results of borings or other investigations made.

.5 Each Bidder or Contractor must make himself personally acquainted with the location, extent and purpose of the proposed Work.

.6 Each Bidder or Contractor shall inform himself by borings, test pits, or by such other means as he may prefer as to the actual conditions of the subsurface and the Work prior to submitting his tender.

.7 The Contractor shall assume all risk arising from, or out of, the nature of the materials to be excavated or used.

14. MATERIALS FURNISHED BY THE CONTRACTOR

.1 The Contractor will be required to furnish all materials and supplies necessary for the satisfactory completion of the Contract except such items as are specifically identified as being supplied by the Owner.

.2 The cost of hauling, storing, processing, fabricating, handling and caring for all materials furnished by the Owner and by the Contractor shall be paid for as stipulated in the agreement.

15. SCHEDULING OF WORK

.1 Contractor to provide Engineer with schedule of work for review. Provide updates to schedule of work as required.

.2 Contractor shall coordinate work with the Owner.

.3 No separate payment will be made for this work.

16. SYSTEMS START-UP

.1 The Contractor will be responsible to start up any new and/or retrofitted systems and to demonstrate that the systems are capable of being operated to the modes of operations specified.

.2 When a sufficient portion, or portions, of the work have been completed and warrant testing, notify the Engineer of intention to start testing and outline plans for testing procedure and timing.

.3 Provide all necessary labour and direction to start up the system.

.4 A technical representative of the pumps supplier shall be on site for operations instructions for at least one day after the water system is capable of being placed (back) into permanent operations. All pumps supplied under the project must be commissioned by the representative of the pump supplier.

.5 Ensure that an authorized and skilled representative of the supplier for any specialized equipment and component is on site for operations instructions for at least one day after the specialized component is placed into operation for its intended purpose.

.6 Provide instructions to operating staff to Section 15013 and Section 15015.

.7 Instruction to operating staff shall occur after the system is capable of being operated on a permanent basis.

.8 Submit schedule of operating instruction to Owner's Representative for approval.

.9 Operating instruction shall include providing instruction on operation and function of system controls, and electrical installations.

17. TECHNICAL REPRESENTATION FOR SYSTEM START-UPS

.1 Further to Item 18. in addition to a representative of the pump supplier Technical representatives and start up services are required for the following systems:

.1 Vertical turbine pumps
.2 Electrical system
.3 Control system

END OF SECTION

1. GENERAL

1.1 WORK OF THE PROJECT

.1 Work of the Project, comprises of the following contract:

.1 Saddle Hills County – Bonanza Distribution Pumps Upgrading

.2 The Owner may subdivide, consolidate, add to, or otherwise modify the above contract package.

.3 Co-ordinate and connect the work of this Contract to accommodate the work of Other Contractors.

1.2 WORK OF THIS CONTRACT

.1 The main items of Work of this Contract include the following:

.1 Supply and Install Two Distribution Pumps, which includes the following:

1) Removal of existing pumps and associated mechanical connections
2) Supply and install new pumps
3) Interior piping, valves, mechanical systems, and necessary modifications
4) Electrical and controls removal and modifications
5) Miscellaneous concrete
6) Leakage testing, flushing, and disinfection of pipes
7) Painting and identification of pipes conduits and equipment
8) System start-up and miscellaneous tasks

.2 The Site of the Work of this Contract is located in **Bonanza Water Treatment Plant** which is located at the southeast intersection of Range Road 123 and Township 802.

1.3 CONTRACT TIME

.1 The Contract will commence on the date on which the Letter of Acceptance is issued.

.2 Upon receipt of the Letter of Acceptance, promptly, and without undue delay, commence work at the Site.

.3 Attain Substantial Performance of the Work by September 30, 2025.

.4 Attain Total Performance of the Work by October 15, 2025.

1.4 USE OF THE SITE

.1 The Site Limits are specified in the Contract Documents.

.2 Approximate locations of existing utility lines within the Site that are known to the Owner are specified in the Contract Documents.

.3 Site Limits to allow for construction access are specified in the Contract Documents.

.4 Use of the areas within the Site described below are subject to the following conditions:

.1 Maintain public access as specified in Section 01552 – Existing and Temporary Roads.

.5 Assume responsibility for the care and protection of the existing work.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 MEASUREMENT SYSTEM

.1 This section specifies the measurement rules that will generally be used for payment purposes unless otherwise specified in the Contract Documents. In case of conflict between the method of measurement specified in this section and the requirements specified in Section 01280 – Measurement Schedule, the latter will govern.

.2 Work will be measured in the International System of Units (SI) in accordance with CAN/CSA–Z234.1–89 Canadian Metric Practice Guide.

.3 When used in the Contract, the following abbreviations and symbols have the meaning assigned to them.

Abbreviation/Symbol	Meaning
µm	micrometre or micron
mm	millimetre
m	metre
mm^2 or mm2	square millimetre
m^2 or m2	square metre
ha	hectare
kPa	kilopascal
MPa	megapascal
m^3 or m3	cubic metre
L	litre
L.S.	lump sum
g	gram
kg	kilogram
N	newton
kN	kilonewton
t	tonne
no.	number (quantity)
min	minute (time)
h	hour
d	day
wk	week
%	percent
>	greater than
≥	greater than or equal to
<	less than
≤	less than or equal to
$	Canadian dollars
°	degree (angle)
°C	degree Celsius
vm	vertical metre
rpm	revolutions per minute
US gpm	US gallon per minute
gal	gallon
Btu	British thermal unit
VDC	volts of direct current
VAC	volts of alternating current
Ah	amp hour

1.2 METHOD OF MEASUREMENT

.1 Unless otherwise indicated in the Contract Documents:

.1 Earthwork materials will be measured net in place after compaction, with no allowance for bulking, shrinkage, compression, foundation settlement, or waste;

.2 Products will be measured net, with no allowance for waste;

.3 Dimensions used in calculating quantities will be rounded to the nearest unit of dimension as follows:

Quantity	Dimension
Volume of earth	centimetre
Volume of concrete	millimetre
Length of pipe	metre
Area of land	decimetre

.4 The survey station grid system adopted will be at 10 linear metres spacing on curves and 20 linear metres spacing on tangent sections for measuring earthwork quantities, respectively;

.5 Contours may be based on aerial photograph interpretation and are approximate only. Actual ground elevations and location co–ordinates will be determined in the field during the course of the Work for measurement purposes; and

.6 Measurement and payment will not be made for work carried out beyond measurement and payment lines and limits specified in the Contract Documents.

.2 When boundaries between different items of Work are not specified in the Contract Documents, such boundaries will be established by the Owner.

.3 Mass:

.1 Mass will be measured by weigh scale or by estimated or theoretical mass taken from reference documents, as specified.

.2 Mass will be measured to 3 decimal places.

.4 Length:

.1 Length will be measured at the item centreline or mean chord.

.2 Items to be measured by linear dimension will be measured parallel to the base or foundation upon which such items are placed.

.3 Items to be measured by station will be measured horizontal to the base or foundation upon which such items are placed.

.4 Centre line for pipes, ducts, culverts, and similar items will be the line equidistant between inside faces of pipe walls.

.5 Area:

.1 For rectangular and regular shaped objects, area will be measured using mean length and width or radius.

.2 For irregular objects, area will be measured by the sum of squares, triangles, and circles, etc., as selected by the Owner.

.6 Volume:

.1 Unless otherwise indicated, volume will be measured using mean length, width, and height or thickness.

.2 Excavation and fill volumes will be computed using a digital terrain modelling computer software program.

.7 Time:

.1 Construction Equipment to be paid for on a time basis will be measured in hours of actual working time, and necessary travelling time, when under its own power to the nearest tenth thereof.

.2 Hauling equipment to be paid for on a time basis will be measured in hours of actual working time to the nearest tenth thereof.

.8 Number of items will be measured on a per item basis.

.9 Lump Sum items will not be measured for payment.

.10 When standard manufactured items are identified by their physical characteristics, such characteristics will be considered as nominal. Unless more stringently controlled by specified tolerances, manufacturing tolerances established by the industry involved will be accepted.

1.3 MEASUREMENT COMPUTATION

.1 Formulae and computer programs used for measurement computation will be as specified or, when not specified, as selected by the Owner.

1.4 MEASUREMENT OF WORK

.1 Unless otherwise specified, the Owner will measure the Work for the purpose of determining payment to the Contractor.

.2 The Owner will request the Contractor to attend with the Owner in making measurements.

.3 If the Contractor does not attend pursuant to Paragraph 1.4.2, measurements made or approved by the Owner will be considered to be the correct measurement for such part of the Work.

.4 The Owner will prepare survey records and drawings for payment purposes as the Work progresses. The Owner will request the Contractor to attend, within 14 days, to examine and verify such records and drawings. If the Contractor does not attend to examine and verify such records and drawings, they will be considered to be correct.

.5 If, after attending pursuant to Paragraph 1.4.2 or 1.4.4, the Contractor disagrees with such measurements or records or drawings, they will nevertheless be considered correct until the Contractor notifies the Owner of the aspects in which they are considered incorrect. On receipt of such notice, the Owner will review the measurements or records or drawings and either confirm or vary them.

1.5 QUANTITIES

.1 Unless otherwise indicated, quantities specified in the Schedule of Prices for Unit Price Work are estimated quantities and will not be considered as actual quantities of Work to be performed. Subject to the Contract terms, unit prices stated in the Schedule of Prices will be applied to actual quantities of Work performed as measured in accordance with the Contract Documents.

.2 When it is stated that the Contractor will be paid only for the quantity specified for an item of Work, such quantity will be considered as a fixed quantity and the Contractor will be paid for the quantity specified, regardless of the actual quantity performed. If a change in the Work directed by the Owner results in a change in a fixed quantity, the quantity will be adjusted in accordance with the Contract Documents and payment will be made for the adjusted quantity.

1.6 SCALES

.1 Unless otherwise indicated, provide weigh scales, certified by Industry Canada, for measurement purposes.

.2 Provide scales that are accurate to within 0.5% of correct mass throughout the range of use. Spring balances will not be permitted.

.3 Prior to use and at any time requested by the Owner, provide the services of a qualified independent person, acceptable to the Owner, for the testing and servicing of weigh scales. Perform baseline tests and record results. Service and adjust weigh scales to meet requirements of Industry Canada and the Contract Documents. Submit a final report of weigh scale tests, services, and adjustments.

.4 Scales indicating more than true mass will not be permitted to operate and material measured subsequent to the last previous correct accuracy test will be reduced by the percentage of error in excess of 0.5%.

.5 Scales indicating less than true mass will be adjusted and no additional payment will be made for materials previously scaled and recorded.

1.7 SCHEDULE OF PRICES

.1 The Schedule of Prices is divided into items for purposes of measurement and payment of Work. Price each item in accordance with the methods of measurement specified in the Contract.

.2 Item names in the Schedule of Prices identify the work covered by the respective item, but do not define the size or nature of the unit.

.3 Read item names in the Schedule of Prices as part of the item scope, measurement, and payment requirements to which they apply in the Measurement Schedule.

.4 For each price specified in the Schedule of Prices include all costs and charges required to perform the Work including overhead charges and profit, and all costs of all related Work for which payment is not specified elsewhere.

.5 Subject to the provisions of the Contract Documents, the total amount of the Schedule of Prices shall cover all of the Contractor's obligations under the Contract and all matters and things necessary for performance of the Work in accordance with the Contract Documents.

.6 Payment will be made only for items specified in the Schedule of Prices. Costs and charges not directly provided for in the Schedule of Prices will be deemed to be included therein.

.7 Work or material included in any one item will not also be measured for payment under another item. No item will be paid for more than once.

.8 Omissions or errors in any item including quantities in the Schedule of Prices will not invalidate the Contract nor release the Contractor from any of his obligations or liabilities under the Contract.

1.8 LUMP SUM ITEMS

.1 Breakdown of Lump Sum Items:

.1 If requested, submit to the Owner a breakdown of each Lump Sum item included in the Schedule of Prices, within 21 days after the commencement date of the Contract.

.2 Provide sufficient details as required by the Owner to identify the principal components of the Work and to permit ready valuation of Work performed.

.2 Lump Sum Items Paid in Accordance with a Schedule:

.1 For Mobilization and Demobilization, Existing and Temporary Roads, and Care of Water, where payment of the respective Lump Sum amount will be made in accordance with a schedule as specified in Section 01280 – Measurement Schedule, the measurement of the completed Work by the Owner will include the amount of any work completed for Mobilization and Demobilization, Existing and Temporary Roads, and Care of Water.

1.9 SCHEDULE OF PRICES – DIVIDED BID ITEMS

.1 Where Divided Bid items are included in the Schedule of Prices or the Measurement Schedule, such items shall be excluded from the provisions for variations specified in the General Conditions.

.2 Include in the Unit Price for the first quantity of the divided item:

.1 Costs and profit for each unit of first quantity, and

.2 Contractor's fixed costs for the total quantity of the divided item specified in the Schedule of Prices plus additional quantities as specified in 1.9.4 Contractor's fixed costs shall include fixed costs for labour, Products, Construction Equipment, Temporary Work and overhead.

.3 Include in the Unit Price for the quantity of Work over the first quantity, hereinafter called the 'second quantity', cost and profit for each unit of Work, excluding fixed costs included in 1.9.2.2.

.4 Where the actual total quantity of the Divided Bid item is less than 120% of the estimated total quantity specified in the Schedule of Prices, the Unit Prices bid for the second quantity shall apply to all quantities in excess of the first quantity.

.5 Where the actual total quantity of the Divided Bid item is more than 120% of the estimated total quantity of the Divided Bid Item, the Contractor's fixed costs per unit of Work shall be calculated by the Owner as follows:

Fixed costs per Unit of work = ((FQUP – SQUP) x FQ)/ TQ

Where: FQUP – First Quantity Unit Price bid
SQUP – Second Quantity Unit Price bid
FQ – First Quantity in the Schedule of Prices
TQ – Total Quantity in the Schedule of Prices

Payment for the actual quantity which exceeds 120% of the total quantity in the Schedule of Prices shall be based on the Unit Price bid for the second quantity plus the fixed costs calculated by the Owner.

.6 The Unit Price for the second quantity of Work shall not exceed the Unit Price for the first quantity. Where a Unit Price for the second quantity of Work is greater in amount than the Unit Price for the first quantity, the Unit price and its extension will be corrected by the Owner to the Unit Price of the first quantity. Accordingly, the Bid will be evaluated and the Work will be paid for at the Unit Price of the first quantity. Contractor shall be bound to such corrected amounts.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

.1 Requirements specified in this Section apply to the scope and measurement of work for purposes of determining payment under the Contract.

2. MEASUREMENT SCHEDULE

2.1 EXTRA WORK ALLOWANCES

.1 Unforeseen Work

.1 Scope: Includes unforeseen work for which payment is not included elsewhere. Unforeseen work shall be approved by Owner.

.2 Measurement: Shall be made by the Owner after assessment of the nature of the unforeseen work. Method of measurement, extent of work and the limit of work shall be agreed to prior to commencing the unforeseen work.

.3 Payment: Shall be made by an approved change order describing the unforeseen work and setting out the method of payment (ie. lump sum, unit price and/or force account). Payment amount shall be taken from the Extra Work Allowance provided for in the Contract.

.2 Prime Cost Allowance

.1 Scope: Includes programming and control integration of PLC's and SCADA, man machine interfaces, and Commissioning.

.2 Measurement: Not applicable.

.3 Payment: Allowance based on the price included in the Contract.

.3 Provisional Cost Sum Items

.1 Scope: Includes where any provisional cost sum is provided on the Bid Form. The Contractor will be required to coordinate all tasks associated with any provisional cost sum item. Provisional cost sum work shall be approved by Owner.

.2 Measurement: The Owner will determine by whom and for what amount(s) the items included in each provisional cost sum will be performed. Method of measurement, extent of work and the limit of work shall be agreed to prior to commencing the provisional cost sum work.

.3 Payment: The Contractor will be reimbursed from the provisional cost sum at the cost of these items plus a 10% markup. The Contractor is not entitled to any extra payment on account of a specified provisional cost sum, except as specified above, and is not entitled to any unexpended provisional cost sum amounts.

2.2 SCHEDULE 'A' – Water Treatment Plant Upgrades

.1 Existing Mechanical Removals – Item A.1

.1 Scope: Includes but is not limited to all labour, material and equipment to remove existing mechanicals as required to install new pumps.

.2 Measurement: Shall not be measured separately for payment.

.3 Payment: Lump Sum payment.

.2 Miscellaneous Concrete– Item A.2

.1 Scope: Includes, but is not limited to, all labour, materials, and equipment necessary to perform concrete work as required for the project. This encompasses coring, demolition and removal of existing concrete structures, preparation of surfaces, and placement of new concrete for miscellaneous project components such as equipment pads, bases, curbs, or any other structural elements specified in the drawings or as directed by the engineer. All removed concrete is to be disposed of at an approved disposal site. Payment is to include all related work for which payment is not included elsewhere.

.2 Measurement: Shall not be measured for payment.

.3 Payment: Lump Sum payment.

.3 Supply of Pumps - Item A.3

.1 Scope: Includes all labour, material and equipment to supply two water distribution pumps identified in the drawings and specifications free of board to site in Bonanza water treatment plant.

.2 Measurement: Shall not be measured for payment.

.3 Payment: Lump Sum payment.

.4 Installation of Pumps – Item A.4

.1 Scope: Includes all labour, material, equipment, and incidental items required to install the two water distribution pumps at the water treatment plant as indicated in the drawings and specifications.

.2 Measurement: Shall not be measured for payment.

.3 Payment: Lump Sum payment.

.5 Interior Piping Valving Mechanical and Modifications – Item A.5

.1 Scope: Includes all labour, material and equipment to install interior process and mechanical piping, valves, appurtenances, connection to existing systems and all related work for which payment is not included elsewhere

.2 Measurement: Shall not be measured for payment.

.3 Payment: Lump Sum payment.

.6 Electrical and Controls c/w Removals and Modifications – Item A.6

.1 Scope: Includes all labour, material and equipment to provide electrical and controls as outlined in the drawings and specifications. Payment is to include connection to power service and includes work for removal of existing components and modifications as indicated.

.2 Measurement: Shall not be measured for payment.

.3 Payment: Lump Sum payment.

.7 Painting and Identification of Pipes Conduits and Equipment – Item A.7

.1 Scope: Includes, but is not limited to, all labour, materials, and equipment necessary to clean, prepare, and apply protective coatings and paint to all specified pipes, conduits, and equipment. This also encompasses the proper labeling and identification of these elements per project specifications, including color coding, stenciling, and signage as required by standards and project documents. Surface preparation shall follow industry standards, and paint application must ensure durability and adherence to environmental conditions. Payment for this item includes all related work not specifically covered elsewhere, such as touch-ups, final inspections, and addressing deficiencies.

.2 Measurement: Shall not be measured for payment

.3 Payment: Lump Sum payment.

.8 Start-Up – Item A.8

.1 Scope: Includes, but is not limited to, all labour, materials, equipment, and services required to ensure the operational readiness and commissioning of all installed systems and equipment. This includes initial system checks, calibration, adjustments, functional testing, and performance verification to confirm compliance with project specifications and design requirements. The contractor is responsible for coordinating with relevant stakeholders, including the owner and engineer, to conduct start-up activities and resolve any deficiencies identified during this phase. Payment for this item includes all associated work not covered under other specified items, such as preparing documentation, training personnel, and ensuring successful handover of a fully operational system.

.2 Measurement: Shall not be measured for payment

.3 Payment: Lump Sum payment.

2.3 SCHEDULE 'B' – General Items

.1 Mobilization/Demobilization/Bonding & Insurance/Profit – Item B.1

Scope: Mobilization and demobilization shall include the Contractor's costs of mobilization at the beginning of the project; and the costs of demobilization at the end of the project. Included in mobilization are such items as bonding, insurance, permits, moving personnel, materials and equipment to the site, setting up temporary facilities and all preparation for performing the work. Included in demobilization are preparation and submission of operation and maintenance manuals, removal of all personnel, materials and equipment; and cleanup of the site and the work. The lump sum price bid for this work shall be relative to the costs involved but shall not exceed five percent of the Bid Price.

Location: Bonanza Water Treatment Plant.

Measurement: Mobilization/Demobilization will not be measured for payment.

Payment: Payment for Mobilization/Demobilization will be as follows:

(a) When 5% of the original contract amount is earned, 25% of the lump sum bid for "Mobilization/Demobilization" will be paid.

(b) When 10% of the original contract amount is earned, 50% of the lump sum bid for "Mobilization/Demobilization" will be paid.

(c) When 25% of the original contract amount is earned, 60% of the lump sum bid for "Mobilization/Demobilization" will be paid.

(d) When 50% of the original contract amount is earned, 70% of the lump sum bid for "Mobilization/Demobilization" will be paid.

(e) Upon completion of all work on the Project, 100% of the lump sum bid for "Mobilization/Demobilization" will be paid.

With respect to Division 1 General Requirements, payment will be made as specified for demobilization and mobilization. The costs of other items specified under General Requirements shall be considered as incidental to the work; and separate payment will not be made for any other items of General Requirements.

The total payments for this item shall not exceed the original amount bid for this item regardless of the fact that the Contractor may have for any reason shut down his work on the project or moved equipment away from the project and then back again.

.2 Leakage Testing Flushing and Disinfection of Pipes – Item B.2

.1 Scope: Includes all works and labor required to fill, flush, chlorinate, and leakage test the installed piping as per 15190 of the Contract Documents. Also includes any pumping, temporary facilities, or temporary fittings required to complete the test.

.2 Measurement: Shall not be measured for Payment.

.3 Payment: Lump Sum payment.

2.4 SCHEDULE 'C' – Cost Allowances

.1 Commissioning Management – Item C.1

.1 Scope: Includes an allowance for engineering services to support commissioning procedures at the project site as outlined in Section 01810.

.2 Measurement: Shall not be measured for Payment.

.3 Payment: Prime Cost Allowance.

.2 Programming– Item C.2

.1 Scope: Includes an allowance for automation services to program control systems, develop and update associated software required for the upgrades to the Bonanza and Kstituan Water Treatment Plants.

.2 Measurement: Shall not be measured for Payment.

.3 Payment: Prime Cost Allowance.

END OF SECTION

1. GENERAL

1.1 CO–ORDINATION

.1 Co-ordinate all construction activities to provide efficient and orderly construction of each and every part of the Work.

.2 Where construction of one part of the Work is dependent on construction of other parts, schedule and co–ordinate construction activities in the sequence needed to obtain the best results.

.3 Where availability of space is limited, co–ordinate construction of different parts of the Work to provide maximum accessibility for maintenance, service, and repair.

.4 Make adequate provisions to accommodate Work scheduled for later construction by Other Contractors or by the Owner's own forces.

1.2 COMMUNICATION EQUIPMENT

.1 Provide suitable computer equipment and software at the Contractor's office specified in this section for exchange of electronic data by e-mail of the following types of documents:

.1	Letters and Memos	Microsoft® Word
.2	Document Readers	Adobe Acrobat®Reader
.3	Schedules	Microsoft® Project
.4	Drawings	AutoCAD®
.5	Communication	Microsoft® Outlook

1.3 COMMUNICATION METHODS

.1 Communications will be sufficiently given by any one of the following methods:

.1 Delivered personally to the Contractor, the Contractor's representative, or left at the Contractor's address as specified in this section.

.2 Mailed at any post office to the Contractor's address as specified in this section.

.3 Couriered to the Contractor's address as specified in this section.

.4 Transmitted by facsimile to the Contractor's facsimile number as specified in this section.

.5 Transmitted by Internet to the Contractor's e-mail address as specified in this section.

1.4 CONTRACT ADMINISTRATION

.1 Co–ordinate scheduling and timing of administrative procedures with other construction activities to avoid delays and provide orderly progress of the Work. Administrative procedures include the following:

.1 Preparation and monitoring of schedules.

.2 Co–ordination of construction and removal of temporary facilities.

.3 Co–ordination, review, and processing of submittals.

.4 Participation in project meetings.

.5 Following Contract acceptance procedures.

.6 Preparation of change order proposals.

1.5 CONTRACTOR'S ADDRESS FOR CORRESPONDENCE

.1 Submit the name, address, telephone number, facsimile number, and e-mail address to be used for correspondence with the Contractor within 10 days of the date of commencement of the Contract. Update whenever information changes during the Contract.

1.6 OWNER'S ADDRESS FOR CORRESPONDENCE

.1 The Owner will provide to the Contractor the name, address, telephone number, facsimile number, and e-mail address to be used for correspondence with the Owner within 10 days of the date of commencement of the Contract. This information will be updated as required during the Contract.

1.7 CONTRACTOR'S REPRESENTATIVES AND SITE MANAGEMENT

.1 Submit an organization chart showing the names, positions, telephone numbers, and responsibilities and levels of authority for the Contractor's representatives and site management organization, within 10 days of the date of commencement of the Contract, and update whenever information changes during the Contract.

1.8 OWNER'S REPRESENTATIVES AND ASSISTANTS

.1 The Owner will provide to the Contractor an organization chart showing the names, positions, telephone numbers, and responsibilities and levels of authority for the Owner's Representative and assistants, within 10 days of the date of commencement of the Contract, and will update whenever information changes during the Contract.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 ADMINISTRATIVE RESPONSIBILITIES

.1 The Owner will be responsible for administrative requirements for the following Contract meetings:

.1 Pre–construction

.2 Construction Progress

.3 Environment

.2 The Contractor shall be responsible for administrative requirements for the following Contract meetings:

.1 Workplace Orientation

.2 Safety

.3 The Owner or the Contractor may request additional meetings related to installation of equipment, commissioning progress, warranty, dispute resolution, environmental issues. Unless otherwise specifically requested by the Contractor, the Owner will be responsible for administrative duties related to these meetings. The agenda for these meetings may be combined with that of the construction progress meetings.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 The administrative requirements for Contract meetings include the following:

.1 Scheduling and administering the Contract meetings throughout the progress of the Work.

.2 Preparing the agenda for the meetings.

.3 Distributing to the relevant attendees written notice of each meeting and the proposed agenda at least 3 days in advance of the meeting date.

.4 Presiding at the meetings.

.5 Recording the minutes including attendance, significant proceedings and decisions, and action required by the parties.

.6 Reproducing and distributing copies of the minutes within 7 days after each meeting to the meeting participants and affected parties not in attendance.

.2 Representatives of the Contractor, Subcontractors, and Suppliers shall attend meetings as necessary and be authorized to act on behalf of the party each represents.

1.3 PRE–CONSTRUCTION MEETING

.1 Frequency: Within 15 days after award of the Contract and prior to commencement of activities at the Site.

.2 Purpose: To review personnel assignments, responsibilities, schedules, submissions, and administrative and procedural requirements.

.3 Attendees:

.1 Contractor's representatives: senior management, site superintendent, major Subcontractors, and others as necessary.

.2 Owner's representatives: as determined by the Owner.

.4 Agenda may include the following:

.1 Appointment of representatives of participants in the Work.

.2 Schedule of the Work and progress scheduling.

.3 Schedule of submittals.

.4 Requirements for temporary facilities, site signage, offices, storage sheds, utilities, and fences.

.5 Schedule of equipment delivery.

.6 Site safety and security.

.7 Contemplated changes, change orders, approvals required, costing and mark–up percentages permitted, time extensions, overtime, and administrative requirements.

.8 Products and materials provided by the Owner.

.9 Record documents.

.10 Maintenance manuals.

.11 Takeover procedures, acceptance, and warranties.

.12 Monthly progress claims, administrative procedures, and holdbacks.

.13 Inspection and testing.

.14 Insurance and transcripts of policies.

.15 Environmental management principles.

.16 Mobilization to the Site.

1.4 CONSTRUCTION PROGRESS MEETINGS

.1 Frequency: Weekly during the course of the Work.

.2 Purpose: To monitor construction progress, to identify problems and actions required for their solution, and to expedite the Work.

.3 Attendees:

.1 Contractor's representatives: site superintendent and, when so requested by the Owner, Subcontractors, Suppliers, and other parties involved in the Work.

.2 Owner's representatives: as determined by the Owner.

.4 Agenda may include the following:

.1 Review and approval of minutes of the previous meeting.

.2 Review of the Work progress since the previous meeting.

.3 Field observations, problems, and conflicts.

.4 Problems that impede the construction schedule.

.5 Off–site fabrication delivery schedules.

.6 Corrective measures and procedures to regain the Contract schedule.

.7 Revisions to the construction schedule.

.8 Progress and schedule for the succeeding work period.

.9 Submittal schedules.

.10 Adherence to quality standards.

.11 Contemplated changes effect on the construction schedule and Contract Time.

.12 Contentious items of the Work.

.13 Contract closeout issues.

.14 Safety and security issues.

.15 Environmental issues.

.16 Other business.

1.5 WORKPLACE ORIENTATION MEETINGS

.1 Frequency: As required for all new workers prior to commencement of Work on the Site.

.2 Purpose: To familiarize new workers with site conditions, rules, regulations, safety, and security requirements.

.3 Attendees: All new Contractor and Owner personnel scheduled to work on the Site.

.4 Agenda may include the following:

.1 Project description including areas of work and other concurrent construction contracts.

.2 Hazardous areas including open excavations, construction equipment traffic, blasting, and chemical or explosive storage, etc.

.3 Safety equipment to be worn by workers, including areas with special requirements.

.4 Traffic routes on the Site.

.5 Evacuation procedures.

.6 First aid procedures.

.7 Excavation or work permit procedures.

.8 WHMIS (Workplace Hazardous Materials Information System) requirements for handling and storage of chemicals.

.9 Fire safety rules and regulations.

.10 Rules and regulations regarding wildlife, environmental concerns, drugs, alcohol, etc.

1.6 SAFETY MEETINGS

.1 Frequency: Weekly during the course of the Work for each area of work.

.2 Purpose: To review safety concerns and implement preventive safety measures.

.3 Attendees: Contractor's and Owner's personnel for each area of work.

.4 Agenda may include the following:

.1 Review and discussion of safety concerns, accidents, and "near misses."

.2 Remedial or preventive actions to be taken.

1.7 ENVIRONMENTAL MEETINGS

.1 Frequency: During the course of Work, schedule environment meetings weekly or as required by the Owner to deal with issues that may arise**.** Dependent on the issues, the Owner may combine the agenda for environmental meetings with that of the construction progress meetings.

.2 Purpose: To review environment issues and implement mitigative measures.

.3 Attendees:

.1 Contractor's representatives: Contractor's site superintendent and when so requested by Owner, subcontractors, suppliers and other parties involved in the Work**.** Contractor's representatives shall be qualified and authorized to act on behalf of the party each represents.

.2 Owner's representatives: as determined by Owner.

.4 Agenda to include the following:

.1 Review and discussion of environment concerns, accidents and “near misses”.

.2 Identify environmental emergency notification procedures.

.3 Identify remedial or preventative action to be taken.

.5 All employees must attend environmental orientation.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 FORMAT OF SCHEDULE

.1 Base the format of the Network Analysis Construction Progress Schedule, hereinafter referred to as the "NACP Schedule," on one of the following formats:

.1 Critical Path Method.

.2 Project Evaluation and Review Technique.

.2 Incorporate legends as required to identify symbols used.

.3 Incorporate appropriate time scales covering calendar and working days, months, and years.

.4 As a minimum requirement, indicate the earliest start date, earliest finish date, and total float time for each activity. Indicate work restriction and milestone dates, and the Contract Time specified in Section 01110 – Summary of Work. Clearly identify the critical path and first level sub–critical paths broken down by activity.

1.2 QUALITY OF SCHEDULE

.1 Prepare the NACP Schedule by personnel or organizations specializing in such work.

.2 Prepare the NACP Schedule using Microsoft Project.

.3 Include concise and appropriate activity descriptions.

.4 Separate the Contractor's workforce from the Subcontractors' workforces.

.5 Break down activities to provide a level of detail that enables ready interpretation and facilitates performance monitoring.

.6 Break down long duration activities and sub–activities that are continuous, repetitive, or sequential in nature, representing the actual construction activity planned. Include separate sub–network diagrams as appropriate.

1.3 SUBMITTALS

.1 Provide the following submittals.

.2 NACP Schedule including sub–network diagrams:

.1 An initial NACP Schedule, and required sub–network diagrams, for the Owner's review within 15 days after the date of commencement of the Contract.

.2 Within 15 days of receipt, the Owner will either return the submitted construction schedule to the Contractor with no exceptions taken or require revisions to the construction schedule. Provide a revised construction schedule within 7 days of receiving the Owner's comments, if any.

.3 Progress revisions within 7 days after receiving notice to do so from the Owner.

.4 Updated NACP Schedule within 5 days after the end of each month.

1.4 USE OF THE NACP SCHEDULE

.1 Adhere to, and require all Subcontractors and Suppliers to adhere to, the NACP Schedule.

.2 Requests for an extension to Contract Time will be based on the most recent accepted NACP Schedule.

1.5 PROGRESS REVISIONS

.1 Revise the NACP Schedule upon request by the Owner, if in the Owner's opinion:

.1 The progress of the Work is substantially different from the latest NACP Schedule and the date of Substantial Performance of the Work appears to be in jeopardy;

.2 The Work is being performed in a sequence that is not in keeping with the general work sequence of the latest NACP Schedule; or

.3 A revision is necessary to reflect a required adjustment to the Contract Time that has been authorized by the Owner.

.2 Outline methods to be used to complete the Work within the Contract Time.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 DEFINITIONS

.1 "Administrative Submittals" means data presented for review to ensure administrative requirements of the Contract are met.

.2 "Shop Drawings" means technical data specifically prepared for work of this Contract including drawings, diagrams, schedules, templates, patterns, and similar information not in standard printed form.

.3 "Product Data" means standard printed information describing materials, products, equipment, and systems not specifically prepared for work of this Contract. Product Data consisting of manufacturers' standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations, and descriptive data will be accepted in lieu of Shop Drawings provided that:

.1 Information not applicable to the work of this Contract is deleted; and

.2 Standard information is supplemented with information specifically applicable to the Work of this Contract.

.4 "Samples" means cuts or containers of materials or partial sections of manufactured or fabricated components that are physically identical to products proposed for use.

.5 "Field Samples" means volumes of materials as specified, which are physically representative of the materials proposed for use.

1.2 SCHEDULE OF SUBMITTALS

.1 Submittals required for the Contract are specified in each section of the Contract Documents.

.2 Submittals required by this section are appended to this section.

1.3 SUBMITTAL PREPARATION

.1 Determine and verify:

.1 Field measurements.

.2 Field construction criteria.

.3 Catalogue numbers and similar data.

.4 Compliance with the Contract Documents.

.2 Co–ordinate each submittal with requirements of the Work and the Contract Documents.

.3 Notify the Owner, in writing, on the submittal and at the time of submission, of any deviations from the requirements of the Contract Documents.

1.4 SUBMITTAL REQUIREMENTS

.1 Make submittals within the times required by the Contract Documents and sufficiently in advance of the date that reviewed submittals will be required, and in such sequence as to cause no delay in the Work.

.2 Make submittals in the form specified or in a form considered as an industry standard.

.3 Provide a transmittal letter with each submittal containing:

.1 Date.

.2 Project Name.

.3 Contract Name.

.4 Tender Number.

.5 Contractor's name and address.

.6 Number of each Shop Drawing, Product Data, and Sample submitted.

.7 Other pertinent data.

.4 Include in the submittals:

.1 Date and revision dates.

.2 Project Name.

.3 Contract Name.

.4 Tender Number.

.5 Name of:

.1 Contractor.
.2 Subcontractor.
.3 Supplier.
.4 Manufacturer.
.5 Name of detailer when details are not prepared by the Contractor, Subcontractor, or Supplier.

.6 The Contractor's stamp, signed, certifying its review of the submittal, verification of field measurements, and compliance with the Contract Documents, or that deviations, if incorporated, will be compatible with other elements of the Work.

1.5 REVIEW OF SUBMITTALS

.1 The Owner will review each submittal within 10 working days of receipt of the submittal unless specified otherwise in the Contract Documents.

.2 Make corrections or changes to reviewed submittals and resubmit as specified for the initial submission.

.3 Until a reviewed submittal is received, do not proceed with the Work related to the submittal.

.4 The Owner's review of any submittal does not relieve the Contractor from responsibility for errors and omissions, nor deviations from the requirements of the Contract Documents.

1.6 CASH FLOW FORECAST

.1 Submit to Owner for review, 15 days before submission of first application for payment, a forecast of approximate progress payments for the duration of the Contract.

.2 Submit revised cash flow forecasts of progress payments as the Work progresses and as requested by Owner.

1.7 LIST OF SUPPLIERS

.1 Submit a list of suppliers to Owner for review 15 days prior to commencement of activities at the Site.

.2 Submit revised list of suppliers as the work progresses and as requested by the Owner.

1.8 LIST OF CONSTRUCTION EQUIPMENT

.1 Submit a list of construction equipment to Owner for review 15 days prior to commencement of activities at the Site.

.2 Submit revised list of construction equipment as the work progresses and as requested by the Owner.

1.9 SCHEDULE OF WORKERS

.1 Not applicable.

1.10 SITE MANAGEMENT PERSONNEL

.1 Submit a list of site management personnel to Owner for review 15 days prior to commencement of activities at the Site.

.2 Submit revised site management personnel as the work progresses and as requested by the Owner.

1.11 CONSTRUCTION NOTIFICATIONS - PUBLIC

.1 Seven days prior to construction, notify all affected businesses, institutions, facilities and residents informing them in writing of the nature of the work to be performed, how long the inconvenience will last, who to contact in the event of damages to the home, business or property, and what to do for access and alternative parking arrangements. The Contractor shall submit the proposed notification to the Owner's Representative for review before issuance.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

.1 Submit for review, shop drawings, product data and samples called for by the Contract Documents and for such other items as the Owner's Representative may reasonably request.

.2 Until submittal is reviewed, do not proceed with work involving the relevant product.

2. SHOP DRAWINGS

.1 Shop drawings means technical data specially prepared for work of this Contract; including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form.

.2 Present shop drawings in a clear and thorough manner to appropriately illustrate the work.

.3 Identify field dimensions on drawings.

.4 Identify shop drawings by appropriate references to sheet, detail, schedule or room numbers.

.5 Maximum drawing size: 860 × 1120 mm.

.6 Leave a clear space of 100 mm × 75 mm on each sheet of shop drawings for placement of Engineer's review stamp.

.7 Submit PDFs for each required shop drawing.

3. PRODUCT DATA

.1 Product data means standard printed information describing materials, products, equipment and systems; not specially prepared for work of this Contract, other than the designation of selections.

.2 Clearly mark product data to identify products.

.3 Manufacturer's standard schematic drawings, catalogue sheets, diagrams, schedules, performance charts, illustrations and descriptive data will be accepted in lieu of shop drawings provided that:

.1 Information not applicable to work of this Contract is deleted, and

.2 Standard information is supplemented with information specifically applicable to the work of this Contract.

.4 Submit clear reproducible information in PDF format.

4. SAMPLES

.1 Samples means cuts or containers of materials or partial sections of manufactured or fabricated components which are physically identical to products proposed for use and which establish minimum standards by which the work will be judged.

.2 Label samples as to origin and intended use in the Work.

5. SUBMITTAL PREPARATION

.1 Review, date and sign, shop drawings, product data and samples, prior to submission.

.2 Determine and verify:

.1 Field measurements.

.2 Field construction criteria.

.3 Catalogue numbers and similar data.

.4 Conformance with Contract Documents.

.3 Coordinate each submittal with requirements of work and Contract documents. Individual drawings will not be reviewed until all related shop drawing and product data are available.

.4 Notify Owner’s Representative, in writing, on the submittal and at the time of submission, of deviations from requirements of Contract Documents.

6. SUBMISSION REQUIREMENTS

.1 Make submittals sufficiently in advance of date that reviewed submittals will be required and in such sequence as to cause no delay in the Work.

.2 Accompany submittals with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Number of each shop drawing, product data and sample submitted.

.5 Other pertinent data.

.3 Submittals shall include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name of:

.1 Contractor.
.2 Subcontractor.
.3 Supplier.
.4 Manufacturer.
.5 Name of detailer when details not prepared by Contractor, sub-contractor, or supplier.

.4 Contractor's stamp, initialled or signed, certifying review of submittal, verification of field measurements, and compliance with Contract Documents.

.4 Make corrections or changes to rejected submittals and resubmit, as specified for initial submission.

7. RESPONSIBILITY FOR ERRORS, OMISSIONS AND DEVIATIONS

.1 Owner’s Representative's review of submittals does not relieve Contractor from responsibility for errors and omissions, nor deviations from requirements of the Contract Documents.

8. REPRODUCTION OF SUBMITTALS

.1 After final review, Owner’s Representative will reproduce at his expense, the number of copies he requires, and return reviewed reproducible documents. Contractor shall reproduce at his expense the number of copies required for performance of the Work.

END OF SECTION

1. GENERAL

1.1 ENVIRONMENTAL LEGISLATION

.1 Adhere to the latest editions of all applicable federal, provincial and municipal legislation, regulations and Codes of Practice concerning environmental protection and conduct activities in accordance with such legislation, codes and regulations. This includes but not necessarily limited to, the provincial Environmental Protection and Enhancement Act and Water Act; and the federal Fisheries Act and Navigable Waters Protection Act.

.2 In the event of conflicting statements between the various Acts, Authorizations, Permits, and Codes of Practice, the more stringent requirement shall apply.

.3 The Owner will obtain the environmental approvals, permits, licences, and authorizations required for the Project.

.4 Comply with the conditions of all environmental approvals, permits, licences and authorizations issued for the Contract. Obtain any further environmental approvals, permits, licences and authorizations for temporary work as may be required for the Contract.

.5 Provide the Owner with written confirmation of Contractor's full compliance with all approvals, permits, licences and authorizations before the Final Mobilization / Demobilization payment is released.

.6 Keep on Site copies of approvals, permits, licences and authorizations. Make these documents readily available to authorized persons at the Site. Keep documents on Site until the date of Warranty Performance of the Work or at such earlier dates accepted by the Owner.

1.2 ENVIRONMENTAL CONSTRUCTION OPERATIONS (ECO) PLAN

.1 Prepare, submit and implement an Environmental Construction Operations (ECO) Plan for each phase of the Contract in accordance with the Alberta Transportation's manual entitled "Environmental Construction Operations (ECO) Plan Framework," (most current edition). Completed ECO Plans consist of written procedures and drawings that address the environmental protection issues relevant to the site specific activity being performed and shall detail temporary environmental control measures that the Contractor undertakes to comply with all applicable approvals, permits, licenses and authorizations during the course of construction and during "winter shut down," and other similar "shut downs."

.2 Prepare the ECO Plan specific to the Work and the Site. Ensure effective implementation of the ECO Plan by assigning responsibility for the implementation, and maintenance of the work prescribed by the ECO Plan, including temporary erosion control measures, to one individual, herein called the work zone representative. The work zone representative shall be identified at the pre-construction meeting.

.3 The ECO Plan shall not cover any permanent or long term environmental or erosion control devices or work specified in the Contract.

.4 Submit the ECO Plan to the Owner at least 14 calendar days prior to the pre-construction meeting. The Owner will review the ECO Plan and communicate any concerns to the Contractor at least seven calendar days prior to the pre-construction meeting. Address any issues or concerns regarding the proposed ECO Plan to the satisfaction of the Owner prior to the commencement of the Work.

.5 Finalized ECO Plans shall be agreed to by all parties and shall be signed by the Contractor's 'Principal-In-Charge' and the Contractor's work zone representative before the commencement of Work. If the Contractor's work zone representative changes; provide a letter of acknowledgement to the Owner indicating that the new work zone representative has reviewed the ECO Plan and will comply with its requirements.

.6 The finalization of the ECO Plan to the mutual satisfaction of the Owner and the Contractor does not constitute an approval or assurance from the Owner to Provincial or Federal Regulatory Agencies that the "temporary environmental control measures" detailed in the ECO Plan are sufficient to ensure compliance with all applicable permits legislation, regulations or conditions of approval. The Contractor is ultimately responsible to ensure all measures, used on the Work, are sufficient to ensure compliance with all applicable authorities. This may mean increasing the number of installations, providing alternate devices or modifying procedures.

.7 If at any time during the performance of the Work of the contract, it is determined that the devices or procedures detailed in the ECO Plan (any specific measures, locations or quantities proposed) are inappropriate or insufficient, the Owner will notify the Contractor in writing and the ECO Plan shall be modified accordingly, and resubmitted in a timely manner for Owner's approval..

.8 The Owner may suspend work in cases where in the Owner's opinion the Contractor fails to comply with procedures stated in the ECO Plan. If the Contractor fails to adhere to finalized ECO Plans, or fails to address the concerns the Owner has given the Contractor (in writing) within seven days of notification, the Owner may make other arrangements to have the work done, and deduct the cost thereof from any money owing to the Contractor.

.9 The cost of preparing the ECO Plan and the performance of all Work necessary to ensure compliance with the ECO Plan and applicable legislation, regulations or conditions of approval will be incidental to the Work and will not be paid for separately.

1.3 ENVIRONMENTAL RESOURCE PROTECTION

.1 Surficial Aquatic Resources:

.1 Protect fish and fish habitat in rivers, streams, and other surface bodies of water located within the Site in accordance with the Contract Documents and Regulatory Requirements.

.2 Unless otherwise provided for in the Contract Documents, do not divert, alter, or disrupt water flows in rivers, streams, and other surface bodies of water.

.3 Prevent bark, slash, wood chips, sawdust, ashes, organic debris, topsoil, fuel and lubricants, or other substances harmful to aquatic life from entering a river, stream, or other surface bodies of water.

.4 Do not perform construction operations within the wetted perimeter of a river, stream, and other surface bodies of water unless such work is part of the Permanent Work or Temporary Work.

.5 Manage construction operations to limit equipment crossings of rivers and streams and prevent turbidity and siltation during crossings. Install temporary culverts or bridge structures where frequent crossings are required.

.6 Use clean granular fill with less than 5% fines passing the 80µm sieve size when exposed to a river or stream for Temporary Work such as cofferdams, causeways, and access ramps. Fine-grained soils may be used, provided only clean granular fill is exposed to the body of water at any time during construction and restoration operations.

.7 Remove Temporary Work, including culverts and bridges, and reclaim river and stream banks and bed, and other disturbed areas, prior to attaining Substantial Performance of the Work unless specified otherwise.

.2 Ground Water Resources:

.1 Do not change ground water levels in wells located on adjacent lands.

.2 Do not change ground water quality in adjacent landowner wells.

.3 Wildlife Management:

.1 Do not allow pets on the Site.

.2 Do not allow firearms, hunting, or shooting on the Site.

.3 Prevent livestock from entering the Site by installing new fences as specified in the Contract Documents; and temporary fences as necessary.

.4 Do not harass wildlife.

.4 Vegetation and Weed Control:

.1 Remove or control existing and new adverse vegetation that affects adjacent landowners and their croplands, lawn or landscaping, construction operations, or the function of the Permanent Work.

.2 Do not import any materials to the Site that are contaminated with weed seeds. Clean dirty construction and reclamation equipment prior to mobilization, to prevent importing weed seeds.

.3 Notify the Owner prior to commencing adverse vegetation control measures.

.4 Be responsible for damage to crops, lawns or other vegetation, both on and off the Site, resulting from the Contractor’s use of herbicides, or other adverse vegetation control measures.

.5 Maintain records of the types and amounts of herbicides purchased, delivered, stored, mixed, and used, and the means of disposal of all excess. Maintain the records current and accurate, and make them available for review by the Owner.

.6 Monitor the site for early detection of weed growth during the growing season.

.7 Control weeds once by mechanical equipment before they go to seed, but not before August 1, and at no extra cost to the Owner.

.5 Historical and Archaeological Resources:

.1 Protect known heritage resources specified in the Contract Documents with the specified fencing and marking devices.

.2 Protect new heritage resources found during the Contract work. Flag an area of 15 m beyond the edge, and surrounding, a new found heritage resource, and report the finding immediately to the Owner.

.3 Additional works required to protect new found heritage resources will be authorized by Change Order and valued in accordance with Section 00725 – General Conditions, Article 8.3 – Valuation of Changes in the Work.

.6 Socio-Economic Considerations:

.1 Prevent the discharge of atmospheric contaminants from construction operations in accordance with Regulatory Requirements.

.2 Do not operate equipment, including Construction Equipment that shows excessive emissions of exhaust gases, or fluid leaks, until corrective repairs or adjustments are made.

.3 Control dust on the Site, and prevent dust from the Site from damaging crops, orchards, cultivated fields, and dwellings, or causing a nuisance to persons. Be responsible for damages from dust caused by construction operations.

.4 Direct all stationary floodlights to shine downward at an angle less than horizontal. Provide shielding for all floodlights and do not direct at residences.

1.4 GENERAL ENVIRONMENTAL PROTECTION REQUIREMENTS

.1 Reporting:

.1 Spills or releases of hazardous materials and any other substances that cause or could cause impairment of, or damage to the environment or human health or safety shall be immediately reported to the Owner as well as applicable Regulatory Agencies; and remediation measures undertaken as required and legislated.

.2 Silt Fence Management:

.1 Be responsible for and maintain silt fences until date of Warranty Performance of the Work.

.2 Inspect silt fencing at intervals appropriate to weather events. Based on inspections maintain silt fencing in functional condition, remove silt accumulations and dispose on site at locations acceptable to the Owner.

.3 Unless otherwise specified in the Contract Documents, or otherwise requested by the Owner, remove temporary silt fencing within 30 days after date of Warranty Performance of the Work.

.3 Waste Management:

.1 Remove construction waste, including demolition waste, from the Site unless otherwise specified. Dispose of such waste at the waste disposal facility identified in the Environmental Management Plan.

.2 Do not burn, bury or otherwise discharge construction or demolition waste on the Site unless specified otherwise.

.3 When practical, minimize the amount of waste generated from construction operations and demolitions by salvaging materials for recycling. Salvage and segregate metal, plastic, paper, cardboard, and glass and transfer them to the nearest appropriate collection facility.

.4 Hazardous Materials:

.1 Transport hazardous materials to and from the Site in accordance with Regulatory Requirements.

.2 Use and store hazardous materials in accordance with Regulatory Requirements.

.3 Take all reasonable measures to contain spills, remove spilled materials, and cleanup as required in accordance with the applicable legislation and regulations, at the contractor's expense.

.5 Handling of Construction Equipment Fuels and Lubricants:

.1 Employ persons qualified to handle construction equipment fuels and lubricants.

.2 Carry the following protection materials in all fuel and service vehicles:

.1 10 kg of suitable sorbant material.
.2 30 m^2 of 6 mil polyethylene.
.3 A shovel.
.4 An empty fuel barrel with the lid removed.

.3 Maintain a setback distance of 100 m between stored Construction Equipment fuels and lubricants and rivers, streams, and other surface bodies of water.

.4 Prevent handling and fuelling operations from contaminating the ground, surface water, and ground water. Use containment berms and an impermeable base course or other system during fueling operations, in order to contain possible spilled fuel.

.5 Clearly mark and barricade fuel storage areas and non-portable transfer lines. Use markers that are visible under all weather conditions.

.6 Store waste Construction Equipment lubricants in a tank or closed container, and dispose of off-site in accordance with the Regulatory Requirements.

2. PRODUCTS - NOT USED

3. EXECUTION - NOT USED

END OF SECTION

1. GENERAL

1.1 REGULATORY RESPONSIBILITY

.1 Conform to Regulatory Requirements and pay all fees and give all notices required by them.

.2 Obtain approvals necessary for the Work and the Contract from the regulatory agencies having jurisdiction, except those approvals obtained by the Owner as identified in this section.

.3 The Owner will obtain the approvals necessary for the Project that involve agreement between the Owner and the regulatory agency having jurisdiction.

1.2 VARIATIONS BETWEEN THE CONTRACT DOCUMENTS AND THE REGULATORY REQUIREMENTS

.1 If the Contract Documents are at variance with Regulatory Requirements, notify the Owner in writing, requesting direction, immediately after such variance becomes known.

.2 The Owner may make Changes in the Work due to Regulatory Requirements, and such changes will be authorized by Change Order and valued in accordance with Section 00725 – General Conditions, Article 8.3 – Valuation of Changes in the Work.

.3 If the Contractor fails to notify the Owner in writing and obtain the Owner's direction related to variations in Regulatory Requirements and performs work knowing it to be contrary to Regulatory Requirements, the Contractor accepts responsibility for correcting violations thereof, and bears the costs, expenses, and damages attributable to the Contractor's failure to comply with the provisions of such Regulatory Requirements.

1.3 CONTRACT DOCUMENTS

.1 Contractor shall not be responsible for verifying that Contract Documents comply with regulatory requirements. If Contract Documents are at variance therewith, or changes which require modification to Contract Documents are made to regulatory requirements, by authorities having jurisdiction, subsequent to date of tender closing, Contractor shall notify Owner's Representative in writing, requesting direction, immediately such variance or change becomes known to him. Owner's Representative may make changes required to Contract Documents and any resulting change in Contract Price or Contract Time will be made in accordance with the General Conditions of Contract.

.2 If Contractor fails to notify Owner's Representative in writing and obtain Owner's Representative's direction as required in paragraph 1.3.1 and performs work knowing it to be contrary to regulatory requirements, Contractor shall be responsible for and shall correct violations thereof and shall bear costs, expenses and damages attributable to his failure to comply with provisions of such regulatory requirements.

1.4 ALBERTA BUILDING CODE

.1 Conform to and perform work in accordance with the Alberta Building Code, except as otherwise indicated in Contract Documents.

1.5 ALBERTA ENVIRONMENT

.1 The Owner has made application for the proposed work under the Environmental Protection and Enhancement Act and the Water Act. Do not commence work on the project until approval has been obtained by the Owner.

1.6 PERMITS

.1 Development Permit: Owner will apply for, obtain, and pay for development permit if required.

.2 Building Permit:

.1 Apply for, obtain and pay for building permit and other permits required for the Work and its various parts.

.2 Display the building permit and such other permits in a conspicuous location at the Place of the Work.

.3 Occupancy Permits:

.1 Where required by authority having jurisdiction, apply for, obtain, and pay for occupancy permits, including partial occupancy permits.

.2 Where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits, Owner's Representative will issue appropriate instructions to correct the Work.

.3 Turn occupancy permits over to Owner's Representative.

1.7 LINEAR LAND RECLAMATION

.1 Adhere to all requirements as stipulated by Alberta Environment and Parks relative to linear land reclamation of pipeline right of ways.

2. PRODUCTS - NOT USED

3. EXECUTION - NOT USED

END OF SECTION

1. GENERAL

1.1 WORK SITE SAFETY – THIS CONTRACTOR IS "PRIME CONTRACTOR"

.1 For the purposes of the *Occupational Health and Safety Act* (Alberta), and for the duration of the Work of this Contract:

.1 Be the "prime contractor" for the "work site"; and

.2 Do everything that is reasonably practicable to establish and maintain a system or process that complies with the Act and its regulations, and as required to provide for the health and safety of all persons at the "work site."

.2 Direct all Subcontractors, Sub–subcontractors, Other Contractors, employers, workers, and any other persons at the "work site" on safety related matters, to the extent required to fulfil "prime contractor" responsibilities pursuant to the Act, regardless of:

.1 Whether or not any contractual relationship exists between the Contractor and any of these entities; and

.2 Whether or not such entities have been specifically identified in this Contract.

1.2 CERTIFICATE OF RECOGNITION (COR)

.1 Maintain a valid COR for the duration of the Work of this Contract.

1.3 SAFETY REQUIREMENTS

.1 Establish and maintain a system or process to provide for the safety for all persons at the Site during the Contract Time, including:

.1 The development and implementation of satisfactory safety plans for all aspects of work and the co-ordination of all plans;

.2 The establishment of a safety committee; and

.3 Conducting safety meetings and workplace orientation meetings.

.2 Communicate and co–operate on safety matters with the Owner and Occupational Health and Safety.

.3 Comply with federal, provincial, and municipal legislation, including the Workplace Hazardous Materials Information System.

.4 Rectify unsafe conditions, and be responsible for all related costs and delays.

.5 Advise the Owner as soon as possible of all accidents.

.6 Investigate any accident that causes injury, and complete accident forms and prepare accident reports.

.7 Provide and maintain a first aid room and equipment as required by the Occupational Health and Safety Regulations.

.8 Maintain first aid supplies, space, and trained personnel on Site as required by the Occupational Health and Safety Regulations.

.9 Have at least one qualified first aider on Site for each work shift.

1.4 SUBMITTALS

.1 Provide the following submittals.

.2 The Certificate of Recognition (COR) prior to commencing Work at the Site.

.3 The name of the person responsible for supervision of the Contractor's safety plan at the Site prior to commencing Work at the Site.

.4 The names of workers qualified as first aiders prior to commencing Work at the Site including monthly updates.

.5 At the end of each month, a list of accidents including lost time injuries incurred for the month, and a cumulative summary of all accidents and total lost time including a comparison with the total work time since the start of the Contract.

.6 Completed accident forms and reports as soon as possible.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 QUALITY CONTROL

.1 Establish and maintain an effective quality control system including quality control procedures and testing to ensure compliance with the requirements of the Contract Documents.

.2 Conduct tests incorporated in the quality control system and as required in the Specifications.

.3 Engage qualified personnel, professional engineers, and independent CSA certified materials engineering and testing companies to carry out designs and to perform tests when required by the Specifications.

1.2 QUALITY ASSURANCE

.1 The Owner will perform quality assurance testing and inspection as the Owner deems appropriate.

.2 Co-operate with the Owner and provide assistance required by the Owner for testing, inspection, and sampling; provide access including off-Site locations; and provide equipment and labour to obtain samples.

.3 If the quality assurance testing identifies quality deficiencies, the extent of removal and replacement of potentially deficient materials will be at the discretion of the Owner and will include, at least, all related materials placed after the Owner's previous quality assurance testing indicated acceptable quality.

.4 If the quality assurance testing identifies ongoing quality deficiencies, submit to the Owner in writing, proposed revisions to the quality control procedures and testing that will prevent quality deficiencies. Continue the work only when the proposed quality control revisions have been reviewed with no exceptions taken by the Owner and implemented by the Contractor.

1.3 TESTING BY CONTRACTOR

.1 Contractor shall furnish to Owner's Representative, upon request, test results from testing performed by Contractor.

1.4 TESTING BY OWNER

.1 Owner reserves the right to employ services of independent testing agencies to establish if work complies with Contract Documents. Owner will appoint and pay for services of such testing agency.

.2 Where tests or inspections, by Owner appointed testing agency, indicate work is not in accordance with the Contract Documents, additional tests or inspections, as Owner may require, to verify acceptability of corrected work, shall be paid for by Contractor.

1.5 REFERENCE STANDARDS

.1 Within the text of these specifications, reference may be made to the following standards:

.1 ANSI - American National Standards Institute

.2 ASTM - American Society for Testing and Materials

.3 CGSB - Canadian General Standards Board

.4 CSA - Canadian Standards Association

.5 CAN 2 - National Standard of Canada (published by CGSB)

.6 FM - Factory Mutual Engineering Corporation

.7 ULC - Underwriters Laboratories of Canada

.8 CAN 3 - National Standard of Canada (published by CSA)

.2 The testing of materials may be requested by the Owner, to prove conformance with Standards, and shall be paid for by the Contractor.

.3 The referenced standard and any amendments in force on the day of receipt of tenders shall be applicable to the work during the duration of the Contract.

2. PRODUCTS - NOT USED

3. EXECUTION - NOT USED

END OF SECTION

1. GENERAL

1.1 REFERENCES

.1 Reference are made to standards as listed in the Specifications.

.1 Conform to these standards, in whole or in part, as required in the Specifications.

.2 Conform to the latest date of issue of the standards in effect on the date of the submission of bids, except where another date or issue is specified.

1.2 SUBMITTALS

.1 When requested by the Owner, a complete description of the procedures for installing the product.

.2 When requested by the Owner, appropriate design calculations for the products to be installed.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Inspect each shipment of products and timely replace any missing or damaged items.

.2 Handle and store products in a manner to prevent damage, alteration, deterioration, and soiling, and in accordance with the manufacturer's written instructions when applicable.

.3 Store packaged or bundled products in original and undamaged condition with the manufacturer's seal and label intact. Do not remove products from packaging or bundling until required in the Work.

.4 Store products subject to damage from weather in weatherproof enclosures.

2. PRODUCTS

2.1 PRODUCT QUALITY

.1 Provide products that conform to the Contract Documents, are new, not damaged or defective, and of the best quality (compatible with the Specifications) for the purpose intended. If requested by the Owner, furnish evidence as to the type, source, and quality of products provided.

.2 Defective products, whenever identified prior to the completion of the Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility from the Contractor, but provides a precaution against oversight or error.

.3 Unless otherwise indicated in the Contract Documents, maintain uniformity of manufacture for any particular or like items.

.4 Do not place permanent labels, trademarks, or nameplates on products in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

2.2 PRODUCT AVAILABILITY

.1 Immediately upon signing Contract, review Product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of Products are foreseeable, notify the Owner's Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In the event of failure to notify the Owner's Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Owner's Representative reserves the right to substitute more readily available Products of similar character, at no increase in Contract Price.

3. EXECUTION

3.1 PRODUCT CONTROL

.1 Maintain an inventory of all products delivered to the Site and placed in temporary storage.

.2 Record the use of products during the course of construction.

.3 When requested by the Owner, provide inventory records for verification of quantities.

3.2 TRANSPORTATION, STORAGE, HANDLING AND PROTECTION

.1 Pay costs of transportation of products required in the performance of Work.

.2 Handle and store products in a manner to prevent damage, alteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.3 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and label intact. Do not remove from packaging of bundling until required in the Work.

.4 Store products subject to damage from weather in weatherproof enclosures.

.5 Store cementitious products clear of earth or concrete floors, and away from structures or undrained depressions.

.6 Store and handle miscellaneous steel products and reinforcing steel by methods such that materials are not contaminated by mud, soil, dust or other debris.

.7 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.8 Stockpile sand, gravel or processed granular materials on a well drained prepared pad with low exposure to dust accumulation.

.9 Store sheet materials and lumber in flat, solid supports and keep clear of ground. Slope to shed moisture.

.10 Remove and replace damaged products at own expense and to the satisfaction of the Owner.

3.3 INSTALLATION STANDARDS

.1 Unless otherwise specified in the Contract Documents, install products in accordance with the manufacturer's instructions. Do not rely on labels or enclosures provided with the products. Obtain written instructions directly from the manufacturers.

.2 Notify the Owner, in writing, of conflicts between the Contract Documents and the manufacturer's instruction, so that the Owner may establish a course of action.

3.4 REMEDIAL WORK

.1 Repair or replace the parts or portions of the Work identified by the Owner as defective or unacceptable.

.2 Retain specialists familiar with the products affected to perform remedial work in a manner that neither damages nor endangers any portion of the Work.

END OF SECTION

1. GENERAL

1.1 DEFINITIONS

.1 "Proprietary Specification" means a specification that lists one or more proprietary names of products or manufacturers and may also include descriptive language, references to standards, or lists performance requirements, or any combination thereof.

.2 "Non–proprietary Specification" means a specification that uses descriptive language, references to standards, or lists performance requirements, or any combination thereof, but does **not** include proprietary names of products or manufacturers.

.3 "Substitute Product" means a product not specified by proprietary name that may be acceptable in place of a product which is specified by proprietary name.

.4 "Substitute Manufacturer" means a manufacturer not specified by proprietary name that may be acceptable in place of manufacturer which is specified by proprietary name.

.5 "Substitution" means a Substitute Product or Substitute Manufacturer.

1.2 PRODUCT OPTIONS

.1 For products specified by Non–proprietary Specification:

.1 Select any product by any manufacturer that meets the requirements of the Contract Documents.

.2 For products specified by Proprietary Specification:

.1 Select any product or manufacturer named; or

.2 Select a substitute product or manufacturer in accordance with Article 1.3.

.3 For products specified by Proprietary Specification and accompanied by words indicating that substitutions will not be accepted:

.1 Select any product or manufacturer named; Substitutions will not be permitted.

1.3 SUBSTITUTIONS

.1 Where Substitute Products are permitted; unnamed products will be authorized by the Owner, subject to the following:

.1 Substitute Products shall be the same types as, be capable of performing the same functions as, and meet or exceed the standards of quality and performance of the named product(s). Substitute Products shall not require revisions to the Contract Documents nor to work of Other Contractors.

.2 Do not order or install Substitutions without the Owner's authorization.

.3 If, in the Owner's opinion, a Substitution does not meet the requirements of the Contract Documents, provide a product that, in the Owner's opinion, does meet the requirements of the Contract Documents.

1.4 CHANGES TO AUTHORIZED PRODUCTS AND MANUFACTURERS

.1 Do not change products or manufacturers, authorized by the Owner for use in performance of the Work, without the Owner's written authorization.

.2 Submit requests to change authorized products and manufacturers to the Owner in writing, including the product data indicated in Article 1.5.

1.5 PRODUCT DATA

.1 When requested by the Owner, submit complete data substantiating compliance of a product with the requirements of the Contract Documents. Include the following:

.1 Product identification, including the manufacturer's name and address.

.2 Manufacturer's literature providing product description, applicable reference standards, and performance and test data.

.3 Samples, as applicable.

.4 Name and address of projects where the product has been used and the date of each installation.

.5 For Substitutions and requests for changes to authorized products, include, in addition to the above, the following:

.1 Itemized comparison of the substitution with the named product(s). List significant variations.

.2 Availability of maintenance services and sources of replacement products and parts.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

.1 Perform final cleaning operations prior to the request for inspection for Total Performance.

.2 Remove surplus products, tools, construction machinery, and equipment not required for the performance of the remaining Work prior to the request for inspection for Substantial Performance.

.3 Remove waste products and debris resulting from the Work of the Contractor, and leave the Work clean and suitable for use by the Owner.

.4 Repair, patch, and touch–up marred surfaces to match adjacent finishes.

.5 Leave all surfaces in a neat, levelled condition.

.6 Excavate and dispose of contaminated soils from equipment service and maintenance areas.

.7 Excavate and dispose of excess soils including impervious, random, granular, and riprap materials.

.8 Clean up and dispose of all foreign matter including wire, posts, logs, branches, roots, rocks, and construction debris.

.9 Remove all temporary work.

.10 Clean and sweep all new and existing roadways affected by contract work.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 SUMMARY OF PROCESS

.1 A Contract acceptance process will be used to facilitate the Owner's acceptance of the Work. The process can be summarized as follows:

.1 Substantial Performance of the Work:

.1 Fulfilment of prerequisites to Substantial Performance.
.2 Inspection for Substantial Performance.
.3 Issuance of a Certificate of Substantial Performance.

.2 Total Performance of the Work:

.1 Fulfilment of prerequisites to Total Performance.
.2 Inspection for Total Performance.
.3 Issuance of a Certificate of Total Performance.

.3 Warranty Performance of the Work:

.1 Fulfilment of prerequisites to Warranty Performance.
.2 Inspection for Warranty Performance.
.3 Issuance of Certificate of Warranty Performance.

1.2 SUBSTANTIAL PERFORMANCE OF PART OF THE PERMANENT WORK

.1 When utilization of part of the Permanent Work is required and Substantial Performance of part of the Permanent Work is a condition of such utilization, the applicable requirements specified in this section will apply to the part of the Permanent Work to be utilized.

1.3 PREREQUISITES TO SUBSTANTIAL PERFORMANCE

.1 Prior to requesting the Owner's inspection for Substantial Performance carry out the following:

.1 Perform Initial Commissioning.

.2 Obtain and submit evidence of compliance with Regulatory Requirements.

.3 Remove from the Site temporary facilities along with construction tools, equipment, mock–ups, and similar items not required for the performance of the remaining work.

.4 Correct all Contract Deficiencies that may affect operation of the canal and structures.

.5 Complete the Work and have it ready for the purpose intended except for the parts of the Permanent Work specified in Articles 1.3.2 and 1.6.

.6 Review the Contract Documents and inspect the Work to confirm that prerequisites to Substantial Performance have been fulfilled and that the Work is ready for inspection for Substantial Performance.

.7 Submit product warranties and extended warranties when specified in the Contract Documents.

.8 Make final change–over of locks and transmit keys to the Owner.

.9 Complete installation of architectural finish items, including all mechanical and electrical covers and trims.

.2 Complete all work items such that the water pipeline can be used for the purpose intended. Work that does not have to be completed to obtain Substantial Performance follows:

.1 Subsoil and topsoil placement.

.2 Drill seeding and hydroseeding.

.3 Permanent barbed wire fencing.

.4 Removal of temporary roads.

.5 Signs.

.6 Final clean-up.

.7 Road gravel.

.8 Record drawings.

1.4 INSPECTION FOR SUBSTANTIAL PERFORMANCE

.1 Submit a written request to the Owner for inspection for Substantial Performance, certifying that prerequisites have been fulfilled and specifying known exceptions in the form of a list of items to be completed, corrected, or submitted.

.2 The Owner will, within a reasonable time after receipt of the Contractor's request:

.1 Proceed with the inspection; or

.2 Advise the Contractor that prerequisites are not adequately fulfilled.

.3 Results of the Owner's inspection for Substantial Performance will form the Substantial Performance Contract Deficiency List (SPC Deficiency List).

1.5 SUBSTANTIAL PERFORMANCE OF THE WORK

.1 Following inspection, the Owner will:

.1 Accept the Certificate of Substantial Performance of the Work stating the effective date of Substantial Performance, with a copy of the SPC Deficiency List attached; or

.2 Reject the Certificate of Substantial Performance and advise the Contractor that prerequisites to Substantial Performance are not fulfilled and repeat the inspection for Substantial Performance as necessary.

.2 Upon acceptance of a Certificate of Substantial Performance of the Work, the Owner will assume responsibility for care, custody, and control of the Work, including responsibility for the following:

.1 Facility operation, including all systems and equipment.

.2 Maintenance.

.3 Security.

.4 Property insurance.

.5 Utility costs.

1.6 PREREQUISITES TO TOTAL PERFORMANCE

.1 Prior to requesting the Owner's inspection for Total Performance, carry out the following:

.1 Perform the entire Work, including the correction of all Contract Deficiencies, including items listed in Article 1.3.2 and except those items arising from the warranty provisions of the Contract Documents.

.2 Review the Contract Documents and inspect the Work to confirm that prerequisites to Total Performance have been met and that the Work is ready for inspection for Total Performance.

1.7 INSPECTION FOR TOTAL PERFORMANCE

.1 Submit a written request to the Owner for inspection for Total Performance, including a copy of the Owner's most recent SPC Deficiency List, and certify that each Contract Deficiency has been corrected or otherwise resolved in a manner agreed to between the Owner and the Contractor. List known exceptions, if any, in the request.

.2 The Owner will, within a reasonable time after receipt of the Contractor's request:

.1 Proceed with the inspection; or

.2 Advise the Contractor that prerequisites are not adequately fulfilled.

1.8 TOTAL PERFORMANCE OF THE WORK

.1 Following the inspection, the Owner will:

.1 Accept the Certificate of Total Performance of the Work, stating the effective date of Total Performance; or

.2 Reject the Certificate of Total Performance and advise the Contractor of Contract Deficiencies that must be corrected prior to issuance of a Certificate of Total Performance of the Work.

1.9 PREREQUISITES TO WARRANTY PERFORMANCE

.1 The prerequisites to Warranty Performance are:

.1 Total Performance of the Work;

.2 Expiry of the warranty period; and

.3 Correction of items arising from the warranty period required by the Contract Documents.

1.10 INSPECTION FOR WARRANTY PERFORMANCE

.1 Thirty to sixty days prior to the end of the warranty period, the Contractor shall apply to the Owner for acceptance of the Warranty Performance of the Work.

.2 Just prior to the end of the warranty period, the Owner will conduct an inspection for Warranty Performance.

1.11 WARRANTY PERFORMANCE OF THE WORK

.1 Following the inspection, the Owner will:

.1 Issue a Certificate of Warranty Performance of the Work; or

.2 Advise the Contractor of items that must be corrected prior to issuance of the Certificate of Warranty Performance of the Work.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 DESIGNATION OF CONTRACT RECORD DOCUMENTS

.1 At the commencement of the Work, the Owner will provide the following documents to be designated and retained as Contract Record Documents:

.1 One copy of the Specifications.

.2 Two complete sets of the Drawings.

.3 One set of all addenda issued.

.2 Maintain one record copy of the following:

.1 Change Orders and other modifications to the Contract.

.2 Reviewed Shop Drawings, Product Data, and Samples.

.3 Field–test records.

.4 Inspection certificates.

.5 Manufacturers' certificates.

.6 Final survey data.

.7 Environmental Construction Operations Plan.

1.2 MAINTENANCE OF CONTRACT RECORD DOCUMENTS

.1 Store Contract Record Documents in the Contractor's Site office apart from documents used for construction. Provide files, racks, and secure storage.

.2 Label each document "CONTRACT RECORD" in large, neatly printed letters.

.3 Maintain Contract Record Documents in a clean, dry, and legible condition. Do not use these documents for construction purposes.

.4 Keep Contract Record Documents available for inspection by the Owner. Revise the content of the documents as required prior to final submittal.

.5 Maintain Contract Record Documents as work progresses. Record information for each area of work within 14 days after completion.

1.3 RECORDING INFORMATION ON CONTRACT RECORD DOCUMENTS

.1 Record information on the Contract Record Documents provided by the Owner.

.2 Use coloured erasable pencils to record information.

.3 Use a different colour to record information pertaining to each major system.

.4 Record changes and variations from the Drawings concurrently with construction progress. Do not cover any work until the required information is recorded.

.5 Legibly mark Contract Record Drawings to record actual construction, including the following:

.1 Measured dimensions, depths, elevations, and horizontal co-ordinates of foundation excavations and fill surfaces, including the interfaces of fill zones.

.2 Measured dimensions, elevations, and horizontal co-ordinates of structure components and foundations.

.3 Measured depths, elevations, and horizontal co-ordinates of underground utilities and appurtenances. Reference locations to permanent surface improvements.

.4 Measured depths, elevations, and horizontal co-ordinates of internal utilities and appurtenances covered in construction. Reference to visible and accessible features of construction.

.5 Measured depths, elevations, and horizontal co-ordinates of instrumentation installed in foundations and structures.

.6 Field changes of dimensions and details.

.7 Changes to equipment layout and services.

.8 Details not on the original Drawings.

.9 References to related Shop Drawings and modifications.

.6 Legibly mark the Specifications to record actual construction including the following:

.1 Manufacturer trade name and catalogue number of each product actually installed, particularly optional and substitute items.

.2 Changes made by addenda and Change Orders.

.7 Maintain other documents including manufacturer’s certifications, inspection certifications, field test records required by individual Specification sections.

1.4 SUBMITTALS

.1 Provide the following submittals.

.2 Prepare Contract Record Drawings at least monthly throughout the course of the Work as the information becomes available or the information is received. The Owner's representative will check the Contract Record Drawings and confirm the accuracy of the information by field notes, surveys, photographs, or other field observation methods and return the Contract Record Drawings to the Contractor after review for ongoing revisions.

.3 Completed Contract Record Documents before or with the request for inspection for Total Performance. The owner reserves the right to withhold monies until record documents are provided.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 DESCRIPTION OF TYPES OF OPERATION AND MAINTENANCE DATA

.1 The following documents are designated as Operation and Maintenance Data.

.2 For systems designed by the Contractor, Contractor Designed System Data includes the following:

.1 System Design and Performance Criteria.

.2 System and Controls Descriptions.

.3 System and Controls Schematics.

.4 Operating Instructions.

.5 Equipment Data.

.6 Other data as required by the Owner.

.3 Installation Instructions includes the manufacturer's printed instructions describing the recommended installation procedures, and photographs, video footage, and computer software.

.4 Operating Instructions includes the manufacturer's printed instructions describing proper operation, and photographs, video footage, and computer software.

.5 Equipment Identification includes the nameplate information for each piece of equipment, in a form, and with content acceptable to the Owner.

.6 Maintenance Instructions includes the manufacturer's printed instructions describing the manufacturer's recommended maintenance and photographs, video footage, and computer software.

.7 Spare Parts Lists includes parts lists and the manufacturer's recommended maintenance products and spare parts.

.8 Suppliers and Contractors List includes a list of Contractor, Subcontractors, and Suppliers who supplied and installed equipment, systems, materials, or finishes, organized by the Division of Specifications and system, and company names, addresses, and telephone numbers.

.9 Tag Directory includes a directory identifying tag number and equipment description and location.

.10 Drawings List includes a list of Drawings.

.11 Shop Drawings includes the final reviewed Shop Drawings.

.12 Product Data includes the manufacturer's product data for equipment, systems, materials, and finishes, and photographs, video footage, and computer software.

.13 Material Safety Data Sheets (MSDS) includes the MSDS for all relevant products.

.14 Certifications includes the following:

.1 Copies of inspection reports prepared by authorities having jurisdiction.

.2 Certified copies of test reports prepared by independent testing agencies.

.3 Any other certificates required by the Contract Documents.

.15 Warranties and Bonds include the Owner's copy of manufacturer's warranties, maintenance bonds, and service contracts.

.16 Reports includes the following:

.1 Documentation certifying the performance of tests required by the Contract Documents and the results of those tests.

.2 Documentation of other material, equipment, or system related information required by the Contract Documents.

1.2 OPERATION AND MAINTENANCE MANUAL BY THE CONTRACTOR

.1 Prepare the operation and maintenance manual as follows:

.2 General organization of each volume:

.1 Include the following in each volume:

.1 Title page.

.2 Table of contents. Identify volume number where listed information is located.

.3 Ten percent free space for additional data.

.2 Present textual information, schematics and data on 21.5 X 28 cm, 75 g/m2, white bond paper.

.3 Manual contents organization:

.1 For each major equipment, system, materials or finishes area, organize operation and maintenance data as follows:

.1 Operation Division: include the following, as applicable:

.1 System Design Criteria.

.2 System and Controls Descriptions.

.3 System and Controls Schematics.

.4 Operating Instructions.

.2 Maintenance Division: include the following, as applicable:

.1 Maintenance Tasks and Schedules.

.2 Spare Parts.

.3 Suppliers and Contractors.

.4 Tags and Directories.

.3 Contract Document Division: include the following, as applicable:

.1 Drawings List.

.2 Shop Drawings and Product Data.

.3 Certifications.

.4 Warranties and Bonds.

.5 Maintenance Brochures.

.6 Reports.

.4 Document Binding Methods:

.1 Standard 21.5 X 28 cm sheets: punch sheets to fit binder.

.2 Sheets up to 28 X 41.5 cm: punched and neatly folded to allow use without removing from binder.

.3 Drawings larger than 28 X 41.5 cm: insert drawings in sturdy vinyl envelopes with reinforced binding holes, open on one side and overall folded size not exceeding 21.5 X 28 cm. Do not punch holes in drawings.

.5 Binders:

.1 Commercial quality, fabric coated, hard covers attached to spine with metal piano hinges, three post, designed to accommodate 21.5 X 28 cm paper. Maximum 100 mm thick.

.2 Silk-screen project title and identification, in gold, on front cover and spine of binder. All binders to be forest green with gold lettering.

.3 Covers to read as follows:

Operation and Maintenance
Manual

Saddle Hills County

Bonanza Water Treatment Plant Pumps Replacement

{Date}

Prime Consultant: MPE a division of Englobe
General Contractor:
Mechanical Contractor:
Electrical Contractor:

The Spine to read as follows:

Operation and Maintenance
Manual

Saddle Hills County

Bonanza Water Treatment Plant Pumps Replacement

{Date}

.4 Divider tabs:

.1 Heavy-weight coloured paper, mylar laminated with tab number and title printed on tab as follows.

.2 Main divisions: white tabs, labelled with division name, 2 bank tab length.

.3 Sections of a main division: colour coded tabs, labelled with section name, 4 bank tab length.

.4 Subsections: same colour tabs as the section, printed label, 8 bank tab length.

.5 Co-ordinate tab colour codes and labelling format with the Owner.

1.3 SUBMITTALS

.1 Provide the following submittals:

.1 One draft copy of the operation and maintenance manual prior to requesting inspection for Substantial Performance.

.2 Three copies and one digital copy of the completed operation and maintenance manual prior to requesting inspection for Total Performance.

.2 The Owner reserves the right to withhold any amount of payment up to a maximum of $10,000 until the Contractor provides satisfactory copies of the O&M manuals.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. GENERAL

1.1 SOURCE OF SUPPLY

.1 Provide spare parts manufactured by original equipment manufacturer.

.2 Provide maintenance materials identical to those installed.

1.2. DELIVERY, STORAGE, AND HANDLING

.1 Deliver required items to the Place of the Work and store in temporary locations determined by Contractor or permanent locations designated by Owner.

.2 Deliver and store items in original factory packaging or other securely packaged form.

.3 Identify, on carton or package, name of item, colour or part number, as applicable. Identify equipment, system, area, room no., etc. for which each item is intended.

.4 Maintain an inventory list of all items delivered. For each item, record description of item, quantity, and location where stored.

.5 Stored items shall remain in Contractor's care, custody, and control until the completion of the Work. Protect stored items against theft or damage.

.6 Handle items as necessary, until stored in permanent locations designated by Owner's Representative.

1.3 ACCEPTANCE

.1 Prior to requesting Owner's final inspection, do the following:

.1 Review Contract Documents and compare with inventory list to verify that all required items have been delivered.

.2 Verify that items listed on inventory list are in there designated storage locations.

.3 Inspect items to verify that they meet specified requirements and are in serviceable condition.

.4 Arrange for delivery of any missing items.

.5 Arrange for replacement of items not meeting specified requirements or not in serviceable condition.

.6 Provide Owner with copy of inventory list indicating status of all required items.

.2 Review inventory list with Owner's Representative during final inspection.

2. PRODUCTS – NOT USED

3. EXECUTION – NOT USED

END OF SECTION

1. SCHEDULE

.1 Present detailed Schedule of start-up, commissioning and continuous operating phases for review by Owner's Representative and Owner at least 4 weeks prior to this phase of work. Do not commence start-up and commissioning until schedule has been reviewed by the Owner's Representative.

2. NOTICE

.1 Notwithstanding Clause 1.1 above, give Owner's Representative and Owner at least 48 hours prior notice before Start-up or Commissioning is due to commence. Supply at this time all documentation relating to testing of equipment, supplier's certification of satisfactory installation and Contractor's certification that all systems can be started up.

3. SEQUENCE OF EVENTS

.1 Testing, Start-up and Commissioning:

.1 Test, start-up and commission the works in an orderly fashion by "system", where "system" is defined as an integral operating entity or loop. On completion of construction of a system, test and otherwise check the system and be satisfied that it is ready for a pre start-up inspection by Owner's Representative, prior to start-up of system.

.2 All systems shall be satisfactorily started up by the Contractor and for all major systems. All Start-up Completion Certificates describing system equipment, start-up results, test deficiencies, start-up deficiencies and rectification procedures shall be submitted to the Owner's Representative for review prior to commencement of commissioning of the works.

.3 The following constraints in testing, start-up and commissioning will be taken into account:

.1 Cleaning, leakage testing and disinfection of all systems is required prior to start-up.

.2 Test individual compartments within a system individually prior to testing entire system.

.3 A complete "dry-run" test of every system is required to demonstrate satisfactory installation, prior to "wet-run" testing, start-up and commissioning. e.g., each pump control system shall be fully checked and tested with pump motor locked out, prior to pump start-up.

4. DEFINITIONS AND PROCEDURES

.1 Testing:

.1 Related testing includes hydrostatic and pressure testing, disinfection, and all other pre start-up tests on equipment as described in the Contract Document.

.2 Start-up:

.1 Notify the Owner's Representative in writing 48 hours prior to system start-up. Owner's Representative's approval of all supporting documentation is required prior to start-up.

.2 Start-up shall consist of placing individual systems into operation, re-confirming all equipment test results, performing any tests not yet carried out which may be deemed necessary by Owner's Representative to demonstrate satisfactory performance of equipment, calibration or balancing of equipment, and confirming operation of control systems and protective devices. All suppliers' representatives for equipment in the systems, and qualified electrical, control and instrument personnel shall be on site for full duration of start-up of a system.

.3 Commissioning:

.1 Commence commissioning following successful start-up of all individual systems.

.2 Commissioning shall consist of placing all various systems of the works into simultaneous continuous operation, in an orderly manner. All suppliers' representatives and qualified electrical, control and instrumentation personnel shall be on site for the initial period of commissioning or as required until all systems are up and successfully running, simultaneously. Commissioning is deemed complete when all systems have been operating continuously without fault and all process, mechanical and electrical equipment is free of vibration, overloading or overheating, and is functioning in accordance with specified rates, methods and performance.

.3 The period for continuous operation for completion of commissioning shall be 80 hours, during which time the system shall operate without fault or failure as described above. Provide competent staff to oversee the operation and shall arrange for manufacturer's service personnel and subcontractors' personnel, if so required, to attend to any problems that arise. Failure of any part of the works during this period will require restart of the 80 hour period following rectification of the fault or failure.

.4 Operator Training:

.1 Special training of Town staff to take place following successful start-up of all systems, during commissioning period. Co-ordinate visits of equipment suppliers' supervisors and schedule mutually agreeable times for special training periods.

5. RESPONSIBILITY

.1 Be responsible for testing, start-up commissioning and continuous operation.

.2 Coordinate equipment suppliers' representatives and all sub-trades personnel for start-up and commissioning.

.3 Arrange for the services of the equipment manufacturer's technical representative, when equipment installation has been completed.

.4 Equipment manufacturer's technical representative to inspect installation to ensure that equipment has been installed in accordance with manufacturer's requirements. Make adjustments in accordance with instructions of equipment manufacturer's technical representative.

.5 Advise Owner's Representative in writing that installation has been checked, installed correctly and is in working order following satisfactory start-up.

.6 Cost of equipment manufacturer's representative shall be borne by Contractor. Do not designate a subtrade as a representative during construction, testing, start-up, commissioning and continuous operation.

.7 Owner's Representative will request that equipment be operated to demonstrate that it will perform as specified. Owner's Representative will note deficiencies. Correct deficiencies immediately. Advise Owner's Representative in writing when deficiencies have been corrected.

.8 If deficiencies are of a sufficiently serious nature that manufacturers' representatives are required to make additional visits, additional costs shall be borne by Contractor.

.9 If it is necessary to suspend start-up, or commissioning, or continuous operation due to deficiencies in any system, the full cost of interruption, call back and resumption of start-up, or commissioning, or continuous operation shall be paid by Contractor.

.10 Commission and operate the works during continuous operating period. Operation personnel may observe and assist during commissioning and continuous operating period.

6. SYSTEMS DEMONSTRATION

.1 Special training of Town staff shall take place following successful start-up of all systems, during the commissioning period. Co-ordinate visits of equipment suppliers' supervisors with Operations Staff and schedule mutually agreeable times for special training periods.

.2 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times.

.3 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed upon times.

.4 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.5 Review contents of manual in detail to explain all aspects of operation and maintenance.

.6 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent.

.7 The individual providing training must be a manufacturer's certified technician with competent instructional skills and fully familiar with the detailed operation and maintenance of the provided equipment. The Owner will be the sole judge of the competence of the instructor and quality of instruction. The Owner reserves the right to withhold any amount of payment up to a maximum of $15,000 until the Contractor provides training to the satisfaction of the Owner.

.8 Training to cover the following items:

.1 Overview of equipment;

.2 Review of Operations and Maintenance Manual documentation for the equipment;

.3 Instruction and demonstration of operation. Includes start-up, shut down, all possible equipment faults and possible rectification;

.4 Instruction and demonstration of maintenance to include daily, weekly, monthly, quarterly and annual preventative maintenance checks/actions as recommended by the manufacturer as well as trouble shooting summarized clearly on trouble shooting sheets for the specific model of each major piece of equipment.

.9 All instructional training, supplemented by training and manual handouts, must be in sufficient detail to cover all Owner responsible operations and maintenance requirements to maintain manufacturers' warranties in tack. Training and documentation must highlight specific requirements that if completed or not completed may or would, void or jeopardize the equipment warranty.

.10 Refer to specific equipment section for training requirements. Training will be required on the following equipment with the suggested minimum hours of training required:

Equipment	**Hours**
VFDs	2
Soft Starts	2
Instrumentation Section 13312	-
(minimum of 1 hour training per device unless otherwise noted)	
Vertical Turbine Pumps	2
Chemical Feed / Analyzers	1

7. DOCUMENTATION

.11 Provide documentation for start-up, commissioning and continuous operation of the works. Provide a detailed written description of proposed procedure for start-up of each system, including methods of calibration, flow routes, tests, and personnel involved. Submit proposed procedure with detailed commissioning and operating schedule specified in clause 1.2 above to Owner and Owner's Representative at least 4 weeks prior to start-up of system.

.12 Prepare a written procedure for commissioning and continuous operation of the works for review by Owner and Owner's Representative prior to commencing commissioning and continuous operation.

8. START-UP

.1 Undertake start-up of systems of the work in an orderly manner. Coordinate start-up so that adequate staff are available and that conflicts do not occur due to multiple start-ups at the same time.

9. COMMISSIONING

.1 Commission the works in accordance with written procedure for commissioning. Provide sufficient manpower for duration of commissioning period. Make necessary adjustments during commissioning to enable the works to be put into continuous operation.

END OF SECTION

1. GENERAL

1.1 RELATED SECTIONS

N/A.

1.2 WORK INSTALLED BUT SUPPLIED UNDER OTHER SECTIONS

.1 Install following materials specified to be supplied under other Sections of these project specifications:

.1 Fabricated components, anchor bolts, bearing plates, sleeves and other inserts to be built into concrete.

1.3 QUALITY ASSURANCE

.1 Cast-in-place concrete to conform to CSA-A23.1

.2 Testing shall conform to CSA-A23.2

.3 These standards shall be available in Contractor's site office for use of Contractor and Engineer.

1.4 REFERENCE DOCUMENTS

.1 Perform cast-in-place concrete work in accordance with the following standards except where specified otherwise.

.2 ASTM C109/C109M-most current version, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars Using 2-in. of 50-mm Cube Specimens.

.3 ASTM C295- most current version, Standard Guide for Petrographic Examination of Aggregates for Concrete.

.4 ASTM C309-most current version, Standard Specification for Liquid Membrane –Forming Compounds for Curing Concrete.

.5 ASTM C330-most current version, Standard Specification for Lightweight Aggregates for Structural Concrete.

.6 CAN/CGSB-51.34-M most current version, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.7 CAN/CSA-A3000- most current version, Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).

.8 CAN/CSA-A23.1- most current version, Concrete Materials and Methods of Concrete Construction.

.9 CAN/CSA-A23.2- most current version, Methods of Test for Concrete.

.10 CAN/CSA-A23.1- most current version, Design of Concrete Structures.

.11 CAN/CSA G30.5- most current version, Welded Steel Wire Fabric for Concrete Reinforcement.

.12 CAN/CSA G30.14-M most current version, Deformed Steel Wire for Concrete Reinforcement.

.13 CAN/CSA G30.15-M most current version, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

.14 CAN/CSA G30.18- M most current version, Billet Steel Bars for Concrete Reinforcement.

.15 CAN/CSA-S269.3, Concrete Formwork.

.16 CAN/CSA W186-M most current version, Welding of Reinforcing Bars in Concrete Construction.

.17 American Concrete Institute (ACI) Detailing Manual - SP-66, ACI 315, most current versions.

.18 Concrete Reinforcing Steel Institute (CRSI) – Reinforcing Steel Manual of Standard Practice.

1.5 INSPECTION AND TESTING

.1 Concrete work may be tested to CAN/CSA A23.2 or as specified herein by a testing firm retained by the Owner.

.2 Submit the following:

.1 Proposed concrete mix design.
.2 Results of petrographic examination of aggregates conforming to ASTM C295 representative of aggregates to be supplied for project, when requested by Engineer.
.3 Samples of fine and coarse aggregate, when requested by Engineer.

.3 Provide casual labour for the purpose of obtaining and handling sample materials.

.4 Advise testing firm in advance of concrete placement.

.5 Provide and maintain facilities at the site for storage of concrete test cylinders for the first 24 hours.

.6 Provide copies of mill test reports of cement and reinforcing steel as required.

.7 Secure sufficient cylinders for testing to ensure concrete quality control.

.8 Provide at least one ASTM cube test on grout used under base plates and machinery.

.9 Conduct core tests when required.

.10 Obtain Consultant's approval of reinforcing before placement of concrete commences. Refer to Section 3 for notification requirements.

.11 The testing firm may perform the following tests:

.1 Take three test cylinders from each 60 m^3 of concrete, or fraction thereof, of each type of concrete placed in any one day.
.2 Take samples of concrete mix close to the point of final deposit in the form. Contractor is required to provide suitable access to the Work for obtaining samples.
.3 Moist cure and test one cylinder in 7 days and moist cure and test the remaining two cylinders in 28 days.
.4 Take one additional test cylinder when the temperature is likely to fall below 0°C within 48 hours after placing and no provisions have been made to heat the concrete to greater than 10°C. Cure the additional test cylinder on the job-site under same conditions as concrete it represents and test in 7 days.
.5 Make at least one slump test and one entrained air test for each set of test cylinders taken.
.6 Monitor Temperature of concrete.
.7 Results of field tests will be reported immediately to the Contractor by the field representative of the testing firm. These results do not imply approval or disapproval of the work, but are for the Contractor's information. The Engineer will determine acceptability of the work.
.8 Results of concrete tests will be forwarded to the Engineer and to the Contractor. Included with the results will be the following information: Name of Project, Date of Sampling, Name of Supplier, Delivery Truck Number, Identification of Sampling and Testing Technician and exact location in the structure of the concrete sampled.
.9 Testing firm personnel are not authorized to revoke, relax, enlarge or release any requirements of the specification, nor to accept or reject any portion of the work.

1.6 SHOP DRAWINGS

.1 Submit Shop Drawings, including placing drawings for reinforcing steel and welded steel wire fabric in accordance with Division 1.

.2 Identify support and placing details of reinforcing conforming to ACI 315 and CRSI.

1.7 ACCEPTABILITY

.1 Failure to comply with the requirements which control strength and durability will result in the structure being considered potentially deficient.

.2 A structure will be considered potentially deficient when:

.1 Concrete is not as specified in Concrete Mix Schedule in this Section.
.2 Reinforcing steel size, quantity, position, quality or arrangement are not as specified or detailed.
.3 Improper curing methods or materials are used.
.4 Inadequate protection of concrete is provided from extremes of temperature during early stages of hardening and strength development.
.5 Mechanical injury occurs from fire, construction overload or premature removal of forms.
.6 Poor workmanship is evident.
.7 Placed concrete differs from the required dimensions.
.8 The Engineer has not reviewed formwork and reinforcement before concrete placement.

.3 Strength evaluation tests and analysis.

.1 The Engineer may order an independent testing firm to obtain cores, x-rays, or similar non-destructive tests.

.2 The Engineer may order a load test and/or analysis as defined by CSA-A23.3 Section 20, if the non-destructive tests are impractical or inconclusive.

.3 The Contractor shall reinforce by additional construction or replace, as directed by the Engineer at own expense, concrete judged inadequate by structural analysis or by results of load tests.

.4 The Contractor shall pay the cost of testing and/or analysis which is required to demonstrate the adequacy of the structure, which does not meet the requirements for strength, or which has been placed before formwork and reinforcing have been inspected and approved by the Engineer.

.5 The Engineer may order additional testing at any time even though the required tests indicate that the strength requirements have been met. In this instance the Engineer will pay for those tests that meet the specified requirements and the Contractor shall pay for those that do not.

.4 Concrete not conforming to the lines, detail, strength and grade specified herein or as shown on drawings shall be modified or replaced at the Contractor's expense, to the satisfaction of the Engineer.

2. PRODUCTS

2.1 CONCRETE MATERIALS

.1 Portland Cement: to CAN/CSA-A3000.

.2 Aggregates: to CSA-A23.1 and as follows:

.1 Ironstone content of aggregates in exposed interior or exterior concrete subject to intermittent or continuous wetting not to exceed the following, when tested to ASTM C295:

.1 Coarse Aggregate: maximum 1% by mass.

.2 Fine Aggregate Retained on 2.5 mm Sieve: maximum 1.5% by mass.

.3 Water: potable, to CSA-A23.1.

.4 Lightweight Aggregates For Structural Lightweight Concrete: to ASTM C330.

.5 Air Entraining Admixtures: to CSA-A23.1

.6 Chemical Admixtures: to CSA-A23.1 and as approved by the Engineer. Calcium chloride will not be permitted.

.7 Supplementary Cementing Materials: to CAN/CSA-A3000.

2.2 CONCRETE ACCESSORIES

.1 Liquid Membrane Forming Curing Compound: to CSA-A23.1.

.2 Grout: Non-shrink premixed types with a minimum of 30 MPa compressive strength at 24 hours.

.3 Concrete Topping: SikaTop 122 PLUS.

.4 Bonding Agent: High polymer resin emulsion mixed with cement mortar or grout to form a water resistant adhesive bond.

.5 Control Joint Sealant: Sikaflex 2C SL (Horizontal), Sikaflex 2C NS (Vertical)

.6 Waterstops: Voclay WATERSTOP-RX complete with WB-ADHESIVE.

.7 Dampproof Membrane: 150 micrometre polyethylene film to CAN/CGSB-51.34.

2.3 REINFORCING MATERIALS

.1 Reinforcing Steel: to CSA G30.18 400 MPa yield grade deformed billet steel bars except for beam stirrups and column ties use only 300 MPa yield grade or 400 MPa yield grade to CSA G30.18.

.2 Reinforcing Steel: to CSA G30.18, 400 MPa yield grade special low alloy deformed billet steel for welding and/or bending.

.3 Welded Steel Wire Fabric: to CSA G30.5.

.4 Chairs, Bolsters, Bar Supports, Spacers: to CSA A23.1, adequate for strength and support of reinforcing. Non-corrosive and non-staining where specified.

2.4 FORMWORK MATERIALS

.1 Formwork: design to CSA A23.1, CSA S269.1, ACI 347, and all applicable construction safety regulations for the place of work. Formwork to be free of bends, dents and residual concrete, well matched, tight fitting and adequately stiffened to support concrete weight without deflection detrimental to appearance of finished concrete surfaces.

.2 Form Ties:

.1 Concrete without special architectural features: use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface. Non-corrosive and non-staining at surfaces where concrete will be exposed.

.3 Form Oil: non-staining and non-volatile type.

.4 Void Forms: low density bead board; structurally sufficient to support weight of wet concrete mix until initial set; thickness noted on Drawings mm thick.

.5 Falsework materials: to CSA-S269.1.

2.5 MIX

.1 Supply concrete mix proportioned to produce concrete specified in Concrete Mix Schedule.

.2 For requirements not specified in Schedule, conform to CSA A23.1.

.3 Use of admixtures, other than air-entraining admixtures, are not permitted without prior approval of the Engineer.

2.6 FABRICATION OF CONCRETE REINFORCEMENT

.1 Fabricate reinforcing steel in accordance with CSA A23.1, ACI 315 and the (CRSI) Reinforcing Steel Manual of Standard Practice.

.2 Obtain Engineer's approval for locations of reinforcing splices other than those shown on placing drawings.

.3 Upon approval of Engineer, weld reinforcing steel in accordance with CSA W186.

.4 For Hooks, Bends, Laps and Similar Details conform to ACI Detailing Manual SP-66.

.5 Dowel columns and walls into foundations using same reinforcing as in column and wall unless noted otherwise in the Contract Documents.

.6 Provide horizontal "L" shaped corner bars of same cross section and spacing as horizontal bars or welded wire fabric around wall and grade beam corners.

.7 Provide 10M stirrup support bars in hooks or corners of beam stirrups unless noted otherwise in the Contract Documents.

.8 Provide 4 extra 15M diagonal corner bars around holes larger than 100 mm in floor slabs and walls. Provide corner bars 1.5 times the length of shortest side of hole or minimum 750 mm long.

.9 Provide one 15M bar each face for holes larger than 1000 mm in walls.

.10 Cover electrical conduit, ductwork or piping buried in slabs with 600 mm wide strip of 102 x 102 x MW13.3 x MW13.3 welded wire fabric. When principal slab reinforcement is placed above conduit then place 600 mm strip under conduit. Position of reinforcing steel takes precedence over conduit, ductwork or piping.

3. EXECUTION

3.1 PREPARATION

.1 Obtain Engineer's approval before placing concrete. Provide Engineer and testing agency 2 working days notice prior to placing concrete.

.2 Coordinate placement of waterstops, inserts and joint devices with erection of concrete formwork and formwork accessories.

.3 Pumping of concrete is permitted only after approval of equipment, mix, and additives.

.4 Ensure reinforcement and inserts are not disturbed during concrete placement.

.5 Prior to placing concrete obtain Engineer's review of method for protection of concrete during placing and curing and in conformance with CSA-A23.1.

.6 If the Engineer finds any portion of the preparation is not in conformance with the Contract Documents and/or good workmanship, the Contractor shall rectify the deficiency, and no concreting shall be done until the deficiency is rectified.

3.2 FORMWORK

.1 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

.2 Apply form release agent in accordance with manufacturer's recommendations, prior to placing reinforcing steel, anchoring devices and embedded parts.

.3 Do not apply form release agent where concrete surfaces are to receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces moist prior to placing concrete.

.4 Fabricate and erect falsework in accordance with CSA-S269.1.

.5 Do not place shores and mud sills (if required) on frozen ground.

.6 Provide site drainage to prevent washout of soil supporting shores and mudsills.

.7 Align form joints and make watertight. Keep form joints to a minimum.

.8 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners of concrete members, unless specified otherwise.

.9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.10 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections. Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including paint.

.11 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings in bottom of forms to allow flushing water to drain.

.12 Close temporary ports or openings with tight fitting panels, flush with inside face of forms, neatly fitted so no leakage occurs and to provide uniform surface on exposed concrete.

3.3 INSERTS, EMBEDDED ITEMS, AND OPENINGS

.1 Provide formed openings where required for pipes, conduits, sleeves or other work to be embedded in and passing through concrete members. Obtain Engineer's approval before framing openings not shown on drawings.

.2 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated on Structural Drawings or approved by the Engineer.

.3 Do not cut, bend, eliminate or displace reinforcement to accommodate sleeves, ducts, pipes and embedded items. If these cannot be located as specified, obtain approval of modifications from the Engineer before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings. Accurately locate and set in place items which are to be cast directly into concrete. Coordinate installation of concrete accessories.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.6 Conduit and pipe embedded in concrete shall:

.1 Not displace more than 4% of the cross sectional area of a column, including the area of concrete displaced by the bending of the conduit, or the exit path of the conduit out of the column.
.2 Not exceed one-third of the solid portion of the slab thickness.
.3 Not be spaced closer than three diameters on centre.
.4 Have a minimum concrete cover of 25 mm.

3.4 ANCHOR BOLTS AND BASE PLATES

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete. "Wet placement" of anchor bolts is not acceptable.

.2 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

3.5 WATERSTOPS

.1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in any way to hamper performance.

.2 Do not displace reinforcement or inserts when installing waterstops.

.3 Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.

.4 Use only straight heat sealed butt joints in field. Lapping of waterstops, use of adhesives or solvents will not be allowed *for PVC waterstops ONLY*. Use factory corners and intersections unless otherwise approved by the Engineer.

.5 Bridge construction joints with waterstops in walls against earth and where indicated in the Contract Documents.

3.6 FORM REMOVAL

.1 Contractor to provide proposed form removal schedule.

.2 Leave formwork in place for following minimum periods of time after placing concrete [or as otherwise directed by the Engineer for specific locations].

.1 Seven days for walls, sides of beams, and columns, **or** three days if a strength test indicates that 60% of the 28 day compressive design strength is achieved.
.2 Fourteen days for beam soffits, slabs, decks and other structural members, or seven days when replaced immediately with adequate shoring to standard specified for falsework **and** a seven day strength test indicates that 70% of the 28 day compressive design strength is achieved.
.3 Two days for footings and abutments.
.4 Where forms are providing curing protection, they shall be left in place a minimum of seven days.

.3 Remove falsework progressively, in accordance with CSA 269.1 and ensure that no shock loads or unbalanced loads are imposed on the structure.

.4 Loosen forms carefully. Do not wedge pry bars, hammers or tools against finish concrete surfaces scheduled for exposure to view.

.5 Do not place load upon or against new concrete until authorized by the Engineer.

3.7 RESHORING

.1 Prepare a schedule of reshoring and submit to Engineer for review.

.2 Reshore structural members where required due to design requirements or construction conditions. Remove load supporting forms only when concrete has attained 80 percent of required 28-day strength and reshore.

.3 Install reshoring as required to permit progressive construction. Provide reshoring under the previously constructed concrete floors for two levels below the floor being constructed.

.4 If a concrete floor is supporting shoring for the floor above, forms for the bottom floor shall be left in place not less than 28 days.

3.8 PLACING REINFORCING STEEL

.1 Place reinforcing steel as indicated on reviewed shop drawings and in accordance with CSA A23.1.

.2 Prior to placing concrete, obtain Engineers approval of reinforcing and placement.

.3 Ensure cover to reinforcement is maintained during concrete pour.

.4 Do not field bend or field weld reinforcement, except where indicated in the Contract Documents or as authorized by the Engineer.

.5 Remove all loose scale, loose rust and other deleterious matter from surfaces of reinforcing.

.6 Place reinforcement within a tolerance of + or - 6 mm for slab steel and to within + or -12 mm for other steel. Locate bends and end of bars within 50 mm of specified location.

.7 Place reinforcing steel to provide concrete cover to the most stringent requirements of either the minimum requirements of CSA A23.1, as indicated elsewhere in the Contract Documents, or as follows:

Item	Cover (mm)
Beam Stirrups	40
Supported Slabs and Joists	20
Column Ties	40
Interior Walls not exposed to weather or backfill	25
Walls Exposed to weather or backfill	50
Footings and concrete formed against earth	75
Slabs on Fill	50

.8 Where a structural concrete member is required to have a fire resistance rating, provide minimum concrete cover to reinforcing steel in accordance with Appendix B of the Alberta Building Code, except where indicated otherwise in the Contract Documents.

.9 Provide 10M "U" spacers at 3 m on centre horizontally and 1.5 m on centre vertically to hold wall reinforcing mats in position.

.10 Provide non-corrosive and non-staining reinforcing steel supports at surfaces where concrete will be exposed.

.11 Support welded wire mesh and reinforcing steel in slabs on grade, using concrete bricks or high chairs located at maximum 1 m on centre each way.

.12 Placing reinforcing on or in layers of fresh concrete as the work progresses is not permitted.

3.9 PLACING CONCRETE

.1 Perform concrete work in accordance with CAN/CSA-A23.1.

.2 Place concrete as a continuous operation stopping only at construction joints indicated on the drawings or as follows:

.1 At center of span of suspended slabs, beams and joists;
.2 in walls and columns immediately above or below floor construction;
.3 At center of steel beam that supports concrete slab.

.3 Construction joints at center of span of suspended slabs beams and joists shall be adequately doweled and keyed.

.4 Place floor slabs on grade as one continuous pour between construction joints indicated on drawings. Control joints for each pour shall be formed by sawing a continuous 25 mm deep slot at 6 m centers each way unless otherwise indicated on drawings. Sawing shall be done as soon as the concrete has sufficiently hardened to prevent raveling of the edges but in no case later than 24 hours after the concrete slab has been placed.

.5 Isolate slabs on grade from vertical concrete using pre-moulded joint fillers extending from bottom of slab to within 12 mm of slab surface unless otherwise indicated.

.6 Use winter concreting methods in accordance with CAN/CSA A23.1 when the mean daily temperature falls below 5°C.

.7 Use procedures noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surfaces are not damaged.

.8 Vibrate concrete using the appropriate size equipment as placing proceeds in strict accordance with Clause 19.5 of CSA-A23.1. Check frequency and amplitude of vibrations prior to use. Provide additional standby vibrators in the event of equipment failure.

.9 Do not place concrete if carbon monoxide producing equipment has been in operation in the building during the 12 hours preceding the pour. This equipment shall not be used during placing, or for 24 hours after placing. During placing and curing concrete, surfaces shall be protected by formwork or by an impermeable membrane from direct exposure to carbon monoxide, combustion gases or drying from heaters.

.10 Honeycomb or embedded debris in concrete is not acceptable. Honeycombed areas discovered after the removal of the forms shall not be repaired until inspected by the Engineer. Where honeycombing has occurred, the corrective method of treatment shall be carried out as directed by the Engineer.

.11 Remove and replace concrete deemed to be defective by the Engineer.

.12 Revise, re-seat and correct improperly positioned reinforcing, immediately before placing concrete.

.13 Maintain accurate records of poured concrete items to indicate date, location of pour, quality of concrete, ambient air temperature and test samples taken.

3.10 FINISHING FORMED SURFACES

.1 Rough Form Finish Concrete Surfaces not Exposed to View: in accordance with CSA A23.1. Place concrete against forms reasonably true and plane. Cut off form ties a minimum of 10 mm below concrete surface. Patch tie holes and defects. Remove fins exceeding 5 mm.

.2 Smooth Form Finish Concrete Surfaces Exposed to View: in accordance with CSA A23.1. Place concrete against plywood, steel or tempered hardboard. Patch tie holes and defects. Remove fins.

.3 On all surfaces, cavities produced by form ties, air bubbles, all other holes, broken edges or corners and all other defects shall be repaired. The resulting surfaces shall be true and uniform.

3.11 FINISHING FLATWORK

.1 [Surfaces to be level to within 3mm in 3.0M with a maximum total variance of +/- 6mm. *Very stringent requirement*] [Surfaces to be level to within 6mm in 3.0M with a maximum total variance of +/- 12mm.]

.2 Interior floor slabs to be left exposed or to receive carpet, sheet vinyl or other covering requiring a smooth surface: initial finishing operations followed by mechanical floating and steel trowelling as specified in CSA A23.1, to produce hard, smooth, dense trowelled surface free from blemishes. Finish tolerance classification: flat.

.3 Equipment pads: smooth trowelled surface.

3.12 TREATMENT OF SLAB OR FLOOR SURFACES

.1 Not applicable.

3.13 CURING AND PROTECTION

.1 Initial Curing: Keep concrete surface continuously moist until concrete temperature has dropped several degrees.

.2 Final Curing: Immediately following initial curing and before the concrete has dried cure for an additional seven days. During that time, ensure that the temperature of the air in contact with the concrete is above 10°C.

.3 Acceptable Curing Methods:

.1 Ponding or continuous sprinkling.
.2 Absorptive mat or fabric kept continuously wet.
.3 Damp sand, earth, or similar moist material.
.4 Continuous steam vapour mist bath not exceeding 66°C.
.5 Curing compound, except where chemical hardener is to be used.
.6 Waterproof paper or plastic film
.7 Forms in contact with the concrete surface and left in place for 7 days.

.4 Do not use curing compounds on concrete surfaces to receive topping or other type of bonded finish unless approved by the Engineer.

.5 Protect freshly placed and consolidated concrete against damage or defacement from adverse weather conditions.

.6 Exposed Concrete Walking Surfaces Not to Receive an Integral Hardener: Coat with curing compound of type that provides permanent seal.

.7 Provide appropriate cold weather protection as specified in CSA A23.1.

3.14 COLD AND HOT WEATHER CONCRETING

.1 Conform to the requirements of CSA A23.1.

.2 Protect slabs being finished during drying conditions above 25° C, and/or during high winds with moisture retention film.

3.15 DAMPPROOF MEMBRANE

.1 Place dampproof membrane on prepared sub-grade under slabs on grade. Lap each sheet minimum 150 mm. Seal laps and penetrations using materials recommended by membrane manufacturer.

3.16 GROUT

.1 Mix grout to flowable consistency and apply in accordance with manufacturer's instructions.

3.17 EQUIPMENT PADS

.1 Provide concrete pads for equipment where indicated on drawings. Adjust dimensions of pads to reviewed shop drawings.

.2 Insert bolts and sleeves and pack with non-shrink grout, in accordance with setting details and templates.

.3 Steel trowel surfaces smooth. Chamfer exposed edges.

3.18 CONCRETE MIX SCHEDULE

Component	Type	Min. Comp. Strength @ 28 Days (MPa)	Max. Water/ Cement Ratio	Air Content Range (%)	Slump Range* (mm)	Nominal Aggregate Size (mm)
Structural Concrete Excluding Slabs Exposed to Flowing Water	50	30	0.45	5-8	50-80	20-5
Structural Concrete Slabs Exposed to Flowing Water	50	30	0.45	5-8	40-80	20-5
Mass Concrete	50	30	0.45	5-8	20-60	20-5
Interior Slabs-on-grade	10	25	0.50	Max. 4	30-70	20-5
Exterior Slabs-on-grade	10	25	0.50	4-7	30-70	20-5
Masonry Core Fill	10	20	0.60	Max. 4	Max. 150	6
Floor Topping	10	20	0.65	Max. 4	55-95	10-2.5
Lean Concrete	50	15	0.60	Max. 4	50-110	Sand

*Subject to Engineer's prior written approval, maximum slump may be increased beyond specified range by the use of chemical admixtures, except for zero slump mixes.

Fly-ash to a maximum of 20% of cementitious content by weight may be substituted for cement content, subject to Engineer’s approval. **Fly ash is not permitted in exterior walkways, driveways or sidewalks.

END OF SECTION

1. GENERAL

1.1 RELATED SECTIONS

.1 Cast-in-Place Concrete Section 03300

.2 Painting and Finishing General Requirements Section 09901

1.2 PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Refer to Division 1 for requirements pertaining to product options and substitutions.

1.3 QUALIFICATIONS

.1 The work of this Section shall be applied only by experienced applicators of the specified products.

1.4 SAMPLES

.1 Submit 300 mm x 300 mm representative sample of flooring in selected colour. Identify sample by project name including material and colour identification.

.2 Site apply sample installation to minimum 2 m^2 area, to surface as directed, for approval by the Owner’s Representative. Retain approved sample until work is completed and accepted.

1.5 MANUFACTURER'S LITERATURE

.1 Make available copies of the material literature, clearly indicating conditions of acceptance for surfaces and methods of application on site before, and during, period of application of the work of this Section.

1.6 DELIVERY

.1 Deliver materials undamaged, in original containers, with manufacturer's labels and seals intact.

1.7 ENVIRONMENTAL CONDITIONS

.1 For exterior coatings: Comply with coating manufacturer's recommendations. Do not apply under adverse weather conditions which could affect coating performance.

.2 For interior coatings: Ensure minimum surface temperature 20°C 48 hours before, during and 48 hours after application or until cured; adequate controlled ventilation; bright, uniform lighting; broom clean; reasonably dust free.

1.8 PROTECTION

.1 Protect adjacent surfaces from damage or overspray resulting from work of this Section. Mask and/or cover adjacent surfaces. Make good any damage at own expense, to the Minister's satisfaction.

.2 Post "Wet Coatings" and "No Smoking" signs, while work is in progress and curing.

2. PRODUCTS

2.1 EPOXY COATING

.1 General Flooring Acceptable Products:

.1 Sikafloor 261 – System 1, low odour, glossy, orange peel textured, epoxy flooring coating system or,

.2 Stonkote GS4 – gloss finish, orange peel textured, epoxy flooring system.

2.2 COLOURS

.1 Standard colour – Owner to select from standard colour range.

3. EXECUTION

3.1 EXAMINATION

.1 Examine all surface conditions to which the work of this Section is to be applied. Report unacceptable surfaces to the Owner's Representative. Commencement of work shall imply acceptance of surfaces and conditions.

3.2 PREPARATION/APPLICATION

.1 Prepare surfaces and apply as directed in the manufacturer's literature.

.2 Match finished work to approved samples. Maintain uniform thickness, sheen, colour, texture and free from defects detrimental to appearance of performance.

3.3 CLEANING

.1 Promptly, as the work proceeds and upon completion, clean up excess materials and rubbish.

3.4 APPLICATION SCHEDULE

Room No./Name	Material	Finish	Colour
Building floor, Curbs, housekeeping pads	Sikafloor 261 or Stonkote GS4	Glossy orange peel textured	Select by Owner from standard range

END OF SECTION

1. GENERAL

1.1 RELATED SECTIONS

.1 Pipe and Equipment Painting: Section 09907.

1.2 REFERENCES

.1 The painting and finishing specifications for new, not previously painted or finished, substrates are based on and make reference to the "Canadian Painting Contractors' Architectural Painting Specification Manual", 1993 edition, including the "CPCA Approved Products Lists".

.2 The painting and finishing specifications for previously painted or finished substrates are based on and make reference to the "Maintenance Repainting Specification Manual", 1991 edition, including the "CPCA Approved Products Lists".

1.3 PRODUCT DATA

.1 Submit list of all products proposed for use. Include manufacturer's name, product name, product code and CPCA number of each product.

.2 Products identified in submitted products list and approved by Owner shall be used in the applications for which they are scheduled and shall not be changed without Owner's consent.

1.4 SAMPLES

.1 Prepare and submit colour chip samples for all paint to be used on this project.

1.5 FIELD SAMPLES

.1 Not applicable.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials in sealed original labeled containers bearing manufacturer's name, type of material, brand name, colour designation, and where applicable, instructions for mixing and reducing.

.2 Store paint and other materials in a single heated and well ventilated area with a minimum ambient temperature of 7°C.

.3 Take precautionary measures to prevent fire hazards or spontaneous combustion.

1.7 SITE CONDITIONS

.1 Interior:

.1 Temperature: Maintain temperature at minimum 8°C for at least 24 hours before and during application and until coatings have cured.

.2 Ventilation: Adequately ventilate areas where coatings are being applied and maintain a reasonably dust free atmosphere.

.3 Lighting: Maintain bright and uniform levels of lighting in areas where coatings are being applied.

.2 Exterior:

.1 Temperature: Apply coatings only when temperature is above 10°C.

.2 Precipitation: Do not apply coatings during periods of precipitation nor when precipitation is imminent.

.3 Wind: Do not apply coatings under high wind conditions resulting in wind blown dust and debris.

1.8 COORDINATION

.1 Ensure that site applied paints and finishes are compatible with primers or other finishes applied in the shop or factory.

.2 Notify Owner's Representative of any incompatibilities.

1.9 SEQUENCING AND SCHEDULING

.1 Co-ordinate with other trades as required.

1.10 MAINTENANCE MATERIALS

.1 Leave on premises not less than 4 L of unused material of each colour and finish sheen used.

.2 Tightly seal and clearly label containers.

2. PRODUCTS

2.1 MATERIALS

.1 Paint and Other Finishing Materials:

.1 Use only "top line quality" products. Refer to schedules Sections for product descriptions and product numbers. Product numbers are from the CPCA Approved Product Lists, Rev. 1/93.

.2 Where a product number is specified in a schedule, use any corresponding CPCA approved product from the CPCA Approved Product Lists.

.3 Where a product number is followed by an asterisk, use any corresponding environmental choice certified product from the CPCA Approved Product Lists. Such products are certified for the EcoLogo under Environment Canada's Environmental Choice Program.

.4 Paint materials for each coating formula to be products of a single manufacturer.

.2 Thinners: Odorless paint thinner, pure and clean with no deleterious material.

.3 Patching compounds: Spackling compound or oil base putty for substrates receiving a paint finish. Oil base putty, coloured to match finish, for substrates receiving a transparent finish.

2.2 MIXING

.1 Except as otherwise specified, paints shall be ready mixed. Materials in paste or powder form, or to be field-catalyzed, shall be field mixed in accordance with manufacturer's directions. Pigments shall be fully ground and shall maintain a soft paste consistency in vehicle during storage that can and shall be dispersed readily and uniformly by paddle to a complete homogeneous mixture.

.2 Thinning of materials will be permitted only where specified herein or upon Owner's approval. Do not use solvent for thinning.

.3 Thoroughly strain all materials prior to each application.

2.3 COLOURS

.1 Colour Schedule:

Substrate	Prime Coat	Second Coat	Third Coat
Exterior metals, doors and frames	Steel: Exterior Alkyd Primer Galvanized Metal: Cementitious Primer	Exterior Alkyd Enamel, Colour for Doors and Frames to match Metal Roofing.	Exterior Alkyd Enamel, Colour for Doors and Frames to match Metal Roofing.
Interior metals, doors and frames	Steel: Interior Alkyd Primer Galvanized Metal: Cementitious Primer	Interior Alkyd Enamel, Colour for Doors and Frames to match Metal Roofing.	Interior Alkyd Enamel, Colour for Doors and Frames to match Metal Roofing.
Gypsum Board	Latex Sealer (CPCA 42)	Interior Alkyd Enamel White, (CPCA 41)	Interior Alkyd Enamel White, (CPCA 41)
Wood and Plywood	(Spot prime knots and resinous areas CAN/CGSB-1.126) Enamel undercoat CAN/CGSB-1.38	Interior Alkyd Enamel White, (CPCA 41)	Interior Alkyd Enamel White, (CPCA 41)
Concrete Floors	Silicone Acrylic Concrete Stain Benjamin Moore 78-72 Stain – Grey	Not applicable	Not applicable
Exterior of Masonry Block Walls	Clear Acrylic Sealer	Clear Acrylic Sealer	Not applicable
Shop primed ferrous metals	(touch up with shop primer as provided by fabricator) Cold cured epoxy primer CAN/CGSB-1.165 (Type 1)	Cold Cured Epoxy, White, CAN/CGSB-1.146	Cold cured epoxy, White, CAN/CGSB-1.146
HVAC and electrical surface mount conduit	Primer	100% Acrylic Latex, White	100% Acrylic Latex, White

2.4 GLOSS LEVELS

.1 Except as otherwise specified, gloss levels shall be as follows:

.1 Exterior metals, doors and frames: Ex. 12A gloss finish

.2 Interior metals, doors and frames: In. 13 A semi-gloss finish.

.3 Gypsum Board: In. 5 B flat finish.

.4 Wood and Plywood: In. flat finish.

.5 Concrete Floors: Not applicable.

.6 Exterior of Masonry Block Walls: Not applicable.

.7 Shop primed ferrous metals: Gloss

.8 HVAC and electrical surface mount conduit: In. semi-gloss finish.

.2 Where gloss level is not specified, confirm required gloss level with Owner prior to proceeding with finish coats.

3. EXECUTION

3.1 GENERAL

.1 Perform all painting operations in accordance with CAN/CGSB-85.100 except where specified otherwise.

.2 Perform all painting operations in accordance with CPCA Painting Specifications Manual except where specified otherwise.

.3 Apply all paint materials in accordance with paint manufacturers written application instructions.

3.2 VERIFICATION OF CONDITIONS

.1 Prior to commencement of painting and finishing work, thoroughly examine all substrates scheduled to receive coatings.

.2 Do not apply coatings to substrates whose condition will adversely affect execution, permanence, or quality of work and which cannot be put into an acceptable condition through preparatory work specified herein.

.3 Verify compatibility of any previously applied coatings with specified coatings.

.4 Notify Owner’s Representative of any incompatibilities.

3.3 PROTECTION OF EXISTING SURFACES

.1 Provide sufficient quantity of clean drop cloths and take necessary protective measures to prevent spray, splashings, and droppings from fouling adjacent surfaces.

.2 Remove electrical plates, surface hardware, fittings and fastenings prior to painting and finishing operations. Carefully store and replace these items on completion of work in each area.

.3 Take special care to keep sprinkler heads and smoke detectors free of paint. Replace those which do receive paint.

3.4 CONDITION OF SUBSTRATES

.1 Sound, non-dusting, and free of grease, oil, dirt and other matter detrimental to adhesion and appearance of coatings.

.2 Temperature: Minimum 8°C.

.3 Moisture Content: Maximum 15% for wood, maximum 12% for other substrates. Test for moisture content using electronic moisture meter.

.4 Alkalinity: Test cementitious substrates for alkalinity using litmus paper test.

3.5 PREPARATION OF NEW/UNFINISHED SUBSTRATES

.1 Prepare substrates in accordance with requirements of Chapter 3, Surface Preparation, of the CPCA Manual and as specified herein.

.2 All Substrates: Thoroughly broom, vacuum and wipe clean as required to produce acceptable surface. Sand lightly and dust prior to application of each coat. Use proper type and grade of sandpaper to avoid scratching or gouging of surfaces.

.3 Wood Generally: Clean soiled surfaces, sand smooth and dust off. Fill nail holes, splits, scratches, small joints and other minor imperfections with patching compound after paint prime coat or first varnish coat has been applied and dried. Apply putty with putty knife, press firmly in place, and finish off flush with surface.

.4 Wood for Paint Finish: Clean knots, pitch streaks, and sappy sections of residue and seal such areas with shellac before applying prime coat.

.5 Wood for Transparent Finish: Clean knots, pitch streaks, and sappy sections of residue and seal with sanding sealer or shellac after applying stain, if stain is required. Sand between coats using minimum #400 grit wet and dry sandpaper.

.6 Bare Ferrous Metal: Remove rust and scale and wash with solvent.

.7 Previously Primed Metal: Remove loose shop paint and rust; make good shop coat, feather out edges of touch-up.

.8 Zinc Coated Metal: Remove surface contaminants and wash with solvent.

.9 Unit Masonry and Concrete: Fill minor cracks, holes and fissures with cement grout and smooth to a flush surface. Include bonding agent in cement grout mix.

.10 Gypsum Board and Plaster: Fill minor cracks, holes, and imperfections with tinted patching compound after prime coat has been applied and dried. Allow patching compound to dry, sand smooth and remove dust. Use minimum #150 grit sandpaper.

.11 Alkaline Surfaces: Wash and neutralize using proper type of solution compatible with paint to be used.

3.6 PREPARATION OF PREVIOUSLY COATED SUBSTRATES

.1 Thoroughly inspect existing conditions to determine degree of deterioration of each previously coated substrate required to be repainted or refinished. Degrees of deterioration shall be as defined in Chapter 3, Surface Preparation, of the "Maintenance Repainting Specification (MRS) Manual", i.e. sound, slight to moderately deteriorated, or severely deteriorated.

.2 Prepare substrates using surface preparation procedures, including cleaning and removal systems, specified for the degree of deterioration, in Chapter 3, Surface Preparation, of the MRS Manual.

3.7 APPLICATION OF COATINGS, GENERALLY

.1 Applied and cured coatings shall be uniform in thickness, sheen, colour, and texture and be free of defects detrimental to appearance and performance. Such defects include brush marks, streaks, runs, laps, heavy stippling, pile up of paints and skipped or missed areas. Edges of paint adjoining other materials shall be clean and sharp with no overlapping.

.2 Use rollers which will produce the least possible stipple effect; maximum 10 mm pile for smooth substrates. Heavier pile rollers may be permitted for use on rough substrates, subject to Owner's approval.

.3 Airless spray application shall be followed with back rolling.

.4 Use a single manufacturer's products for all coats required for each finish system.

.5 Vary slightly the colour of successive coats to differentiate between coats.

.6 Each coat shall be dry and hard before succeeding coats are applied with a minimum of 24 hours between coats, except where manufacturer's instructions state otherwise.

.7 For open grain woods to receive a clear finish, tint wood filler to match wood. Work filler well into grain and before it sets, wipe off excess to provide a clean surface.

3.8 FINISHING OF NEW/UNFINISHED SUBSTRATES

.1 Site paint or finish all work and substrates indicated as requiring site painting or finishing in Schedules, Drawings, or Specifications.

.2 Leave following surfaces unfinished:

.1 Masonry block walls.

.3 Site apply all prime and finish coats as scheduled, whether or not factory prime coats have been applied.

3.9 FINISHING OF PREVIOUSLY COATED SUBSTRATES

.1 Repaint or refinish all work and substrates indicated as requiring repainting or refinishing in Schedules, Drawings, or Specifications.

3.10 BACK-PRIMING EXTERIOR WOOD

.1 Backprime concealed surfaces of all wood components with one or more surfaces exposed to the exterior and one or more surfaces concealed after installation, prior to their installation:

.2 Use exterior alkyd primer for components scheduled to receive a paint finish.

.3 Use semi-transparent stain for components scheduled to receive a solid or semi-transparent stain finish.

.4 Use gloss varnish, reduced 25% with thinner, for components scheduled to receive a varnish finish.

3.11 BACK-PRIMING INTERIOR WOOD

.1 Backprime following concealed surfaces of interior wood components, prior to their installation:

.1 Surfaces in contact with concrete or masonry.

.2 Surfaces in contact with any floors or floor finishes.

.3 Other surfaces which may be subjected to moisture during normal use or cleaning operations.

.2 Use white alkyd wood primer for components scheduled to receive a paint finish.

.3 Use semi-transparent stain for components scheduled to receive a solid or semi-transparent stain finish.

3.12 FINISHING NEW/UNFINISHED DOORS AND FRAMES

.1 Finish edges of doors in accordance with specified finish system. For top and bottom edges, final coat may be omitted.

.2 Apply finishes specified for exterior doors to both door faces.

3.13 FINISHING MISCELLANEOUS SUBSTRATES

.1 Paint substrates behind surface mounted fixtures, wall mounted heating units and unbacked cabinet work with specified finish systems, including specified number of coats.

3.14 PATCHING OF COMPLETED WORK

.1 Repair, touch-up, and refinish damaged finishes and finishes unsatisfactory to Owner.

.2 Refinish entire wall or area where deemed necessary by Owner.

3.15 CLEANING

.1 Place cotton waste, cloths and other material which may constitute a fire hazard in metal containers and remove from site daily.

END OF SECTION

1. GENERAL

1.1 REFERENCES

.1 CGSB 1-GP-12c-68, Standard Paint Colours.

.2 CGSB 1-GP-48M-78, Primer, Marine, for Steel.

.3 CAN/CGSB-1.59-M89, Alkyd, Exterior Gloss Enamel.

.4 CGSB 1-GP-61Ma-85, Enamel, Alkyd, Marine, Exterior and Interior.

.5 CAN/CGSB-1.93-92, Aluminum Marine Paint.

.6 CGSB 1-GP-171M-79, Coating, Inorganic Zinc.

1.2 RELATED SECTIONS

.1 Mechanical General Requirements Section 15015

.2 Coordinate work with other trades as required.

1.3 SAMPLES

.1 Submit colour chip samples of all paints to be used on this project.

.2 Paints that do not appear on qualified products list must be approved by Owner's Representative before use on project. When it is proposed to use non-qualified paint, submit one 2 L sample of paint to Owner's Representative at least 3 weeks prior to commencement of painting for analysis and acceptance. Mark samples with name of project, its location, paint manufacturer's name and address, name of paint, CGSB standard number and manufacturer's paint code number.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Do not apply paint finish in areas where dust is being generated.

.2 Do not apply paint to work at temperatures below 10 degrees Celsius or minimum temperature recommended by manufacturer, whichever is more stringent.

.3 Do not apply paint if the ambient temperature is not at least 5 degrees Celsius above the dew point or as recommended by manufacturer. Maintain room temperature at least 5 degrees Celsius above dew point during drying of paint.

1.5 COLOUR SCHEDULE

.1 All piping, valves and equipment shall be colour coded and the finish colours shall be as shown on the following schedule or as directed by the Owner's Representative.

.2 Colour Schedule

Process Piping	Symbol	Colour
Treated (Potable) Water	PW	Deep Space Blue (Pittsburgh 7060)
Chlorine	CLS	Safety Yellow (Glidden)
Sample Lines	SAM	Same as process pipe being sampled
Valve Body and Bonnet		Colour to match line colour
Valve Handles		Safety Red (Glidden)

"Color Codes for Water Treatment Plant Piping" as prepared by Alberta Environment, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems (January, 2012).

A copy of the colour code Table is appended to the rear of this section.

1.6 HANDLING AND STORAGE OF MATERIALS

.1 Deliver all materials in unopened original packages or containers of a suitable size for the particular application. Use without alteration of any kind, except where specifically recommended by the manufacturer and with the Owner's Representative's review.

.2 Prior to storage, the store shall be clean, dry and heated to at least 15 degrees Celsius.

2. PRODUCTS

2.1 MATERIALS

.1 All paint materials shall be first line, first quality products.

.2 Paint materials for each coating formula to be products of a single manufacturer.

.3 Approved Manufacturers are Sherwin Williams, Benjamin Moore, Canadian Pittsburgh Industries, Bapco (Canadian Industries Ltd.) and General Paint or approved equal.

.4 Paint Schedule (General Pipe and Equipment Exterior):

.1 Ungalvanized steel and cast iron pipe, fittings and valves, supports, exterior of steel tanks and non-submerged structural steel:

.1 Spot Primer: to CGSB 1-GP-40M.

.2 1st Coat: enamel primer to CGSB 1-GP-38M.

.3 2nd Coat: gloss enamel to CGSB 1-GP-60M.

.4 3rd Coat: gloss enamel to CGSB 1-GP-60M.

.2 Ungalvanized steel and cast iron piping, fittings, valves, equipment supports immersed or in contact with water, wet by spray or condensation, or exposed to high humidity:

.1 1st Coat: Amerlock #400.

.2 2nd Coat: Amerlock #400.

.3 3rd Coat: Amerlock #400.

.4 4th Coat: Amerlock #400.

.3 Galvanized steel piping and miscellaneous galvanized metals:

.1 The galvanized metals shall be unpassivated (active).

.2 1st Coat: zinc chromate primer CGSB 1-GP-132.

.3 2nd Coat: Amerlock #400.

.4 3rd Coat: Amerlock #400.

.5 4th Coat: Amerlock #400.

.4 Machinery and equipment (for units having factory applied finish):

.1 Primer: Touch up with primer compatible with manufacturer's finish.

.2 Finish: Enamel, compatible with primer and factory applied finish, colour as per colour schedule.

.5 Machinery and equipment (for units supplied with prime coat only):

.1 1st Coat: Touch up prime coat with primer compatible with manufacturer's paint.

.2 2nd Coat: Enamel (semi-gloss) compatible with factory applied primer.

.3 3rd Coat: Enamel (gloss) compatible with factory applied primer.

.6 PVC pipe and conduit (non-submerged):

.1 1st Coat: Acrylic Latex, CGSB 1-GP-100M.

.2 2nd Coat: Acrylic Latex, CGSB 1-GP-100M.

.7 Copper piping:

.1 1st Coat: Vinyl wash primer CGSB 1-GP-121.

.2 2nd Coat: Enamel undercoat (tinted) CGSB 1-GP-38M.

.3 3rd Coat: Enamel (gloss) CGSB 1-GP-57M.

.8 Canvas insulation covering:

.1 1st Coat: Canvas sealer.

.2 2nd Coat: Enamel (semi-gloss) to CGSB 1-GP-57M.

3. EXECUTION

3.1 PREPARATION

.1 New metal surfaces.

.1 Clean surfaces of new metal to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with the following:

.1 Solvent cleaning: SSPC-SP-1.

.2 Power tool cleaning: SSPC-SP-3.

.2 Metal surfaces to be repainted – General.

.1 Clean surfaces by removing loose, cracked, brittle or non-adherent paint, rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with the following:

.1 Solvent cleaning: SSPC-SP-1.

.2 Power tool cleaning: SSPC-SP-3.

.2 Scrape edges of old paint back to sound material where remaining paint is thick and sound, feather exposed edges.

.3 Compressed air to be free of water and oil before reaching nozzle.

.4 Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, by blowing with clean dry compressed air, or by vacuum cleaning.

.5 Touch up shop primer to CGSB 85-GP-10M with primer as specified in applicable section. Touch up to include cleaning and painting of field connections, welds, rivets, nuts, washers, bolts and damaged or defective paint and rusted areas.

.6 Prepare galvanized steel and zinc coated steel surfaces to CGSB 85-GP-16M.

.7 Prepare copper and copper alloys surfaces to CGSB 85-GP-20M.

.8 Prepare new steel surfaces exposed normally to dry conditions to CGSB 85-GP-14M.

.9 Prepare previously painted steel surfaces exposed normally to dry conditions to CGSB 85-GP-15M.

.10 Prepare steel surfaces exposed to industrial environments to CGSB 85-GP-13M.

.11 Prepare steel surfaces exposed to water or high humidity levels to CGSB-85-GP-11M CGSB 85-GP-18M.

.12 Do not apply paint until prepared surfaces have been accepted by Owner's Representative.

.13 Prior to commencing paint application, the degree of cleanliness of surfaces to be in accordance with SSPC-Vis 1.

.14 Protection of surfaces.

.1 Protect surfaces not to be painted and if damaged, clean and restore such surfaces as directed by Owner's Representative.

.2 Apply primer, paint or pretreatment as soon as possible after surface has been cleaned and before deterioration of surface occurs.

.3 Clean surfaces again if rusting occurs after completion of surface preparation.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Remove contaminants from surface and apply paint immediately.

.5 Protect cleaned and freshly painted surfaces from dust to approval of Owner's Representative.

.15 Mixing paint.

.1 Do not dilute or thin paint for brush application; use as received from manufacturer.

.2 Mix ingredients in container before and during use and ensure breaking up of lumps, complete dispersion of settled pigment and uniform composition.

.3 Do not mix or keep paint in suspension by means of air bubbling through paint.

.4 Thin paint for spraying according to manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Owner's Representative.

3.2 APPLICATION

.1 Apply paint by spraying, brushing, or combination of both. Use sheepskins or daubers only when no other method is practical in places of difficult access.

.2 Follow manufacturer's recommendations for coverage and film thickness.

.3 Use dipping or roller coating method of application only when specifically authorized by Owner's Representative in writing.

.4 Caulk open seams at contact surfaces of built up members with material approved by Owner's Representative, before second undercoat of primer is applied.

.5 Where surface to be painted is not under cover, do not apply paint when:

1. Air temperature is below 5ºC or when temperature is expected to drop to 0ºC before paint has dried.
2. Temperature of surface is over 50ºC unless paint is specifically formulated for application at high temperatures.
3. Fog or mist occurs at site; it is raining or snowing; there is danger of rain or snow; relative humidity is above 85%.
4. Surface to be painted is wet, damp or frosted.
5. Previous coat is not dry.

.6 Provide cover when paint must be applied in damp or cold weather. Protect, shelter or heat surface and surrounding air to comply with manufacturer's recommendations for temperature and humidity conditions. Protect until paint is dry or until weather conditions are suitable.

.7 Remove paint from areas that have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

.8 Apply each coat of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.9 Brush application.

.1 Work paint into cracks, crevices and corners and paint surfaces not accessible to brushes by spray, daubers or sheepskins.
.2 Brush out runs and sags.
.3 Remove runs, sags and brush marks from finished work and repaint.

.10 Spray application.

.1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
.2 Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.
.3 Keep paint ingredients properly mixed in spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
.4 Apply paint in uniform layer, with overlapping at edges of spray pattern.
.5 Brush out immediately all runs and sags.
.6 Use brushes to work paint into cracks, crevices and places that are not adequately painted by spray. In areas not accessible to spray gun, use brushes, daubers or sheepskins.
.7 Remove runs, sags and brush marks from finished work and repaint.

.11 Shop painting.

.1 Do shop painting after fabrication and before any damage to surface occurs from weather or other exposure.
.2 Spray paint contact surfaces of field assembled, bolted, friction type joints with primer coat only. Do not brush primer after spraying.
.3 Do not paint metal surfaces that are to be embedded in concrete.
.4 Paint metal surfaces to be in contact with wood with either full paint coats specified or three shop coats of specified primer.
.5 Do not paint metal within 50 mm of edge to be welded. Give unprotected steel one coat of boiled linseed oil or other approved primer protective coating after shop fabrication is completed.
.6 Remove weld spatter before painting. Remove weld slag and flux by methods as specified in paragraph 3.2.2 and 3.2.3 Metal Surfaces to be Repainted.
.7 Protect machine finished or similar surfaces that are not to be painted but that do require protection, with coating of rust inhibitive petroleum, molybdenum disulphide, or other coating approved by Owner's Representative.

.8 Copy previous erection marks and weight marks on areas that have been shop painted.

.12 Field painting.

.1 Paint steel structures as soon as practical after erection.
.2 Touch up metal which has been shop coated with same type of paint and to same thickness as shop coat. This touch-up to include cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas.
.3 Field paint surfaces (other than joint contact surfaces) which are accessible before erection but which are not to be accessible after erection.
.4 Do not apply final coat of paint until concrete work is completed, except as directed by Owner's Representative. If concreting or other operations damage any paint, clean and repaint damaged area. Remove concrete spatter and droppings before paint is applied.
.5 Where painting does not meet with requirements of specifications, and when so directed by Owner's Representative remove all defective paint, thoroughly clean affected surfaces and repaint in accordance with these specifications.

.13 Handling painted metal.

.1 Do not handle painted metal until paint has dried, except for necessary handling for painting or stacking for drying.
.2 Scrape off and touch up paint which is damaged in handling, with same number of coats and kinds of paint as were previously applied to metal.

3.3 COLOUR CODES FOR WATER TREATMENT PLANT PIPING

RECOMMENDED COLOUR CODING FOR WATER TREATMENT PLANT PIPING

Piping to be identified	Basic Colour	Bands	
		No.	Colour
Raw or unfinished water	Dark Green	-	-
Clarified Water	Dark Green	1	Black
Filtered Water	Dark Green	2	Black
Filtered and Chlorinated (Potable) Water	Blue	1	-
Backwash Water	Light Green	-	-
Chemical Feed Lines	Pink	-	-
Coagulant	Pink	1	Black
pH Control	Pink	2	Black
Taste and Odour	Pink	3	Black
Fluoride	Pink	1	Green
Chlorine and Water	Pink	1	Yellow

Piping to be identified	Basic Colour	Bands	
		No.	Colour
Chlorine Gas	Yellow	-	-
Plumbing (Waste)	Brown	-	-
Electrical	Purple	-	-
Compressed Air	White	-	-
Heating	Silver	-	-
Fire Protection	Red	-	-
Natural Gas	Orange	-	-

Notes:
1. Entire length of pipe to be painted in basic colour.
2. Bands, if required, are to be placed as follows:
   (a) at 9 m intervals, and/or
   (b) where the pipe enters and leaves a room.
3. Individual bands are to be 25 mm wide, and a 25 mm space is to be left between bands where multiple bands are required.

Source: ***Alberta Environment, "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems", January, 2006.***

END OF SECTION

1. INTENT

.1 The work under this Division shall include the supply, delivery, installation, testing start-up and adjusting of all equipment and devices to provide a fully operational system as shown on the drawings and as specified herein in complete accord with applicable codes and ordinances.

.2 Also included in the work, even though not minutely specified or detailed on the Drawings, shall be the supply and installation of connections to process piping for instruments (e.g., a tapping or a welded coupling complete with nipple and shut-off valve). Block and bleed header piping and manifolds for instrumentation shall be included within the scope of Division 15 including the block and bleed header isolation valves.

.3 The requirements of HVAC and Plumbing, where applicable, shall also apply to Division 15. However, where there are conflicts, requirements of Division 15 shall govern.

.4 The work will also include installation into the piping of instruments supplied under Division 11, 13, and 16, including the supply and installation of piping runs and any isolation valves where shown. Include block and bleed installations for instrumentation where so indicated by Division 11, Division 13, or Division 16 details.

2. DOCUMENT PRECEDENCE

.1 Special Provisions of Section 15000 have document precedence over all other specifications in Division 15.

3. DEFINITION TO TRADES/JURISDICTION

.1 Refer to General Conditions, Section 00725.

4. LOCATION OF EQUIPMENT

.1 The process drawings do not show all structural details and any information involving accurate measurement of the building shall not be taken from the process drawings.

.2 The location of small pipe runs or copper tubing may be altered without charge to the Owner, provided that the change is requested by the Engineer before installation and does not require additional material.

.3 Where pipe and tubing runs are not shown on the drawings or are shown only schematically, they shall be installed in such a way as to conserve head room and interfere as little as possible with free use of the space through which they pass.

5. PAINTING

.1 All equipment shall be suitably finished, coated and painted at the factory before shipment.

.2 Without restricting the generality of the above, the items to be painted shall include, but are not necessarily limited to the following:

.1 Equipment which is prime coated only.
.2 Equipment factory finished which require touch-up.
.3 All piping external surfaces, hangers, supports whether copper, galvanized, black iron or plastic.

.3 The following items shall not be painted unless otherwise specified or directed by the Engineer: stainless steel, bronze or brass surfaces, polished shafts and trim on equipment, stems of control valves, stem or valves, instrument dials, thermometers and instrument bodies and cases.

.4 Piping and equipment shall be colour coded as described in Section 15000 Pipe Colour Coding.

.5 Further to 5.3, visibly exposed stainless steel process piping is required to be colour coded by appropriately applied painting or colour coded banding sleeves.

.6 Items requiring painting, as described above, shall be finished in accordance with Division 9.

6. EQUIPMENT INSTALLATION

.1 Install all equipment in strict accordance with the manufacturer's instructions and recommendations.

.2 No equipment shall be securely fastened in place until items that tie to it have been located to determine any slight discrepancies that can be corrected by modifications in locations. The decision as to what modifications shall be permitted shall rest solely with the Engineer.

.3 The equipment and machinery shall be assembled, properly located, positioned and fastened securely in such a manner as to give proper performance.

.4 After proper installation, subject each item of equipment to an operating test to be witnessed by the Engineer.

.5 Assist the Engineer in conducting such tests as may be required. All defects in the operation of equipment units due to faulty installation or damage, shall be made good by the Contractor at his own expense.

.6 Obtain all necessary instructions and assistance services, which are required for the installation of the various items of equipment which the Contractor is supplying and/or installing. The costs of the services provided by the manufacturers or suppliers shall be borne by the Contractor.

7. START-UP, TESTING & OPERATION OF EQUIPMENT

.1 When a sufficient portion, or portions, of the work have been completed and warrant testing, notify the Engineer of intention to start testing and outline plans for testing procedure and timing.

.2 Arrange for an inspection and start-up by an authorized and skilled representative of the equipment manufacturer.

.3 The Owner's operating personnel will normally be present during testing procedures for training purposes but they will not in any way participate in operating the equipment.

8. LUBRICANTS

.1 For designated equipment, furnish all lubricants used during testing and prior to acceptance. In addition, furnish an estimated six months' supply of grease and oil necessary for proper lubrication of the equipment.

.2 Provide a complete listing of recommended lubricants with designated application as an integral part of the instruction and maintenance manuals.

.3 Provide all lubricants of Canadian manufacture or readily available in Canada from a Canadian supplier.

9. COUPLINGS

.1 Gasketted sleeveless type.

.2 Gaskets shall be rubber based compound suitable for use with potable water.

.3 Nuts, bolts and washers shall be stainless steel.

.4 Metal pieces to be coated with corrosion resistant coating.

.5 Acceptable materials:
- .1 Dresser, Smith-Blair, Robar Long Body, Romac, Viking.

10. PROCESS PIPING MATERIALS

.1 Refer to Mechanical General Requirements Section 15015 and Detailed Piping Specifications Section 15020.

.2 Steel Pipe: (Supplemental Specifications to Division 15 Pipe Specification Line Codes: A1, A2, and A3)

- .1 Weld neck flanges to be used except where noted otherwise.
- .2 Long radius elbows to be used except where noted otherwise.
- .3 Epoxy Lined – NSF-61 approved. Pipes located below the reservoir roof to be also epoxy coated on exterior with NSF-61 approved coating.
- .4 Any couplers used on the pipe must be epoxy coated to a minimum standard equivalent to the pipe on which the coupler is installed.

.5 Grooved couplings used in submerged conditions or installed below the reservoir roof shall have body constructed of Type 316 stainless steel conforming to ASTM-A351, A743 and A744 Grade CF-8M. Gaskets shall be Grade E EPDM and certified to NSF 61 standards.

.6 Grooved couplings used in buried underground conditions shall have body constructed of Type 316 stainless steel conforming to ASTM-A351, A743 and A744 Grade CF-8M. Gaskets shall be Grade E EPDM and certified to NSF 61 standards.

.7 All gasket materials shall be compatible with potable water applications. Garlock NSF 61 approved or equivalent.

.3 Stainless Steel Pipe: (Supplemental Specifications to Div 15 Pipe Specification Line Codes: D1, D2, D3, and D4)

.1 Weld neck flanges to be used except where noted otherwise.

.2 Long radius elbows to be used except where noted otherwise.

.3 Any couplers used on the pipe must be to a minimum standard equivalent to the pipe on which the coupler is installed.

.4 All gasket materials shall be compatible with potable water applications. Garlock NSF 61 approved or equivalent.

11. UNDERGROUND PIPE MATERIALS

.1 Refer to Mechanical General Requirements Section 15015 and Detailed Piping Specifications Section 15020.

.2 All flanges, fittings, and couplings to be entirely wrapped with cold applied tape system, Denso or equivalent.

.3 Provide sacrificial anodes to Section 02517.

.4 For HDPE (pipe specification line code D) specifications refer to Division 02 of the Contract Documents.

.5 For underground PVC (pipe specification line code B3 to B11) specifications refer to Division 02 of the Contract Documents.

12. EXTERIOR AND INTERIOR PIPE COATINGS FOR STEEL PIPE

.1 In accordance to Mechanical General Requirements Section 15015.

13. TESTING OF PIPE

.1 Prior to initial operation, all piping under the Contract shall be pressure tested with water to assure tightness.

.2 Provide all necessary labour, materials and equipment for the test including pump, pressure hoses, connections, plugs, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording pressure losses.

.3 Where leaks are found, the line shall be retested after making repairs.

.4 If make up water is required to maintain pressure, continue testing until leaks are located. Retesting will not be waived on pipes where complete visual examination is not possible.

.5 Accept full responsibility for introduction of water into a line for testing or other purposes and to provide adequate temporary support, protection from frost and such other measures as are necessary to prevent damage to the line. In a case where damage results, it shall be made good by the Contractor at no cost to the Owner.

.6 All pressure tests shall be witnessed by the Engineer.

.7 Test equipment shall be from approved laboratory or manufacturer and shall be furnished with certificate showing degree of accuracy.

.8 Isolate all low pressure equipment during testing so as not to place any hydrostatic head in excess of design operating pressure on the equipment.

.9 Flush and clean out piping after pressure tests.

.10 Dispose of flushing water in an acceptable manner.

.11 Permanently plug all taps at the completion of the testing.

14. PIPE HANGERS AND SUPPORTS

.1 Further to Mechanical General Requirements Section 15015, pipe hangers and supports shall be provided in accordance to the project drawing details.

.2 Acceptable Materials:

.1 Steel Pipe Hangers:
Double Bolt pipe clamp. Myatt Fig. 135, 136, 137 Adjustable Clevis, Myatt Fig. 124 Turnbuckle, Myatt Fig. 475

.2 Trapeze Hangers:
Myatt Fig. 173, Myatt Fig. 174

.3 Copper Pipe Hangers:
Myatt Fig. 150 CT, 151 CT, 152 CT, 153 CT

.4 Vertical Support at Floor Penetration:
Myatt Fig. 182, Myatt Fig. 183

.5 Floor Supports:
Fabricate as shown on drawings.

.6 Hanger Rods:
Myatt or ITT Grinnell

.3 Perforated band iron, wire or chain will not be permitted for use as a pipe hanger.

.4 Piping or equipment shall not be used for hanger supports.

.5 The use of uni-strut material for pipe supports shall not be permitted unless specifically directed by the Engineer.

15. DISTRIBUTION PUMPS P0803 AND P0804

.1 Unless stated herein or waived in writing by the Engineer, vertical turbine pump construction, materials, methods and performance shall conform to AWWA Standard E103, latest revision.

.2 Water lubricated vertical turbine pump compatible with potable water applications.

.3 Cast iron enamel lined, epoxy coated bowls, lead free bronze, or 316 SS enclosed impellers. NSF 61 approved internal and external coatings.

.4 Setting depths as indicated in the drawings.

.5 416 stainless steel pump shaft and line shaft, bronze bearing retainers c/w rubber bearings.

.6 Minimum 100 mm dia. threaded carbon steel column and 25 mm dia. shaft in maximum 1.5 m lengths.

.7 Threaded carbon steel column and line shaft couplers to have epoxy coating on interior and exterior.

.8 100 mm dia. discharge head, cast iron, epoxy lined and coated, bronze bushing, gland type packed stuffing box, 2 piece head shaft. Discharge head must be supplied by the same manufacturer as the pump.

.9 All bronze components to be lead free.

.10 Driven by 25 HP 600V/3Ph/60Hz – 1800 rpm Premium Efficient Vertical Hollow Shaft motor, with non-reverse ratchet, TEFC enclosure, inverter duty, NEMA design B, Class F insulation, compatible with variable speed drive control. Motor is to be provided with insulated bearings and grounding ring to provide a separate discharge path for grounding of the shaft.

.11 Capacity of not less than 21 L/s at 66 m (333 USgpm at 220 feet). Preference will be given to pump selections with their performance point on their curve to the right of the best efficiency point and with appropriately sloped curve suitable for variable speed drive applications

.12 Shutoff Head not less than 70 m (230 feet).

.13 Complete with fabricated steel sole plate.

.14 Acceptable products:

.1 Goulds 10WALC – 6 Stg. as supplied by Superior Equipment Sales Inc ph. (780) 426-6991 – Mike McDonald

.2 Sulzer JTS-8CC – 9 Stg. as supplied by TDH Fluid Systems Inc. ph (587) 525-9701 – Scott Keeler

END OF SECTION

1. GENERAL

1.1 INTENT

.1 This section of the specifications refers to the piping, fittings, valves and all piping specialties and supporting devices to be installed under this contract. Also included are the equipment, valve and commodity identification legends for all piping systems to be installed.

.2 Control valves and other in-line equipment, such as flow meters, pumps, flow control valves, flow switches, pressure switches, solenoid valves, pressure gauges, etc., supplied under Divisions 11 and 13, are to be installed under this Section.

1.2 RELATED SECTIONS

.1 Section 01340 – Shop Drawings, Product Data and Samples

.2 Section 01790 – Operation and Maintenance Manuals

.3 Section 15000 – Mechanical Special Provisions

.4 Section 15020 – Detailed Piping Specifications

.5 Section 15190 – Hydrostatic and Pressure Testing

.6 Section 15191 – Disinfection of Potable Water Piping and Storage Facilities

1.3 REFERENCE STANDARDS

.1 Conform to the following reference standards:

.1 ASME A13.1, Scheme for the Identification of Piping Systems
.2 ASME B1.20.1, Pipe Threads, General Purpose
.3 ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
.4 ASME B16.3, Malleable Iron threaded Fittings Class 150 and 300
.5 ASME B16.5 Steel Pipe Flanges and Flanged Fittings
.6 ASME B16.9, Factory-Made Wrought Steel Butt Welding Fittings
.7 ASME B16.11, Forged Steel Fittings, Socket Welding and Threaded
.8 ASME B16.12, Cast Iron Threaded Drainage Fittings
.9 ASME B16.15, Cast Copper Threaded Fittings: Class 125 and 250
.10 ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings
.11 ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
.12 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes
.13 ASME B16.47, Large Diameter Steel Flanges: NPS 26 through NPS 60
.14 ASME B31.1, Power Piping
.15 ASME B31.3, Process Piping
.16 ASME B31.9, Building Services Piping
.17 ASME B32, Solder Metal
.18 ASME B36.10M, Welded and Seamless Wrought Steel Pipe
.19 ASME B36.19M, Stainless Steel Pipe

.20 ASME Section IX, Boiler and Pressure Vessel Code; Welding and Brazing Requirements
.21 ASTM A47, Malleable Iron Castings
.22 ASTM A53, Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless
.23 ASTM A74, Cast Iron Soil Pipe and Fittings
.24 ASTM A105/A105M, Forgings, Carbon Steel, for Piping Components
.25 ASTM A106, Seamless Carbon Steel Pipe for High Temperature Service
.26 ASTM A126, Grey-Iron Castings for Valves, Flanges, and Pipe Fittings
.27 ASTM A135, Electric-Resistance-Welded Steel Pipe
.28 ASTM A139, Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4 and Over)
.29 ASTM A167, Stainless Steel and Heat-Resisting Chromium- Nickel Steel Plate
.30 ASTM A181/181M, Forgings, Carbon Steel, for General Purpose Piping
.31 ASTM A182/182M, Forged or Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
.32 ASTM A193/193M, Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
.33 ASTM A194/194M, Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
.34 ASTM A197, Cupola Malleable Iron
.35 ASTM A234/A234M, Pipe Fittings of Wrought Carbon Steel and Alloy steel for Moderate and Elevated Temperatures
.36 ASTM A240, Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
.37 ASTM A269, Seamless and Welded Austenitic Stainless Steel Tubing for General Service
.38 ASTM A276, Stainless and Heat-Resisting Steel Bars and Shapes
.39 ASTM A307, Carbon steel Bolts and Studs, 60,000 psi Tensile Strength
.40 ASTM A312/312M, Seamless and Welded Austenitic Stainless Steel Pipe
.41 ASTM A320/320M, Alloy Steel Bolting Materials for Low-Temperature Service
.42 ASTM A403/A403M, Wrought Austenitic Stainless Steel Piping Fittings
.43 ASTM A409/A409M, Welded Large Diameter Austenitic Steel Pipe for Corrosive or High Temperature Service
.44 ATSM A480/A480M, General Requirements for Flat-Rolled Stainless for Heat-Resisting Steel Plate, Sheet and Strip
.45 ASTM A536, Ductile Iron Castings
.46 ASTM A563, Carbon and Alloy Steel Nuts
.47 ASTM A570/A570M, Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
.48 ASTM A774/A744M, As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures
.49 ASTM A778, Welded, Unannealed Austenitic Stainless Steel Tubular Products
.50 ASTM B88, Seamless Copper Water Tube
.51 ASTM C76, Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
.52 ASTM C564, Rubber Gaskets for Cast Iron Soil Pipe and Fittings
.53 ASTM D638, Test Method for Tensile Properties of Plastics
.54 ASTM D792, Test Method for Specific Gravity and Density of Plastics by Displacement
.55 ASTM D1248, Polyethylene Plastics Moulding and Extrusion Materials
.56 ASTM D1457, PTFE Moulding and Extrusion Materials

.57 ASTM D1784, Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
.58 ASTM D1785, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
.59 ASTM D2241, Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
.60 ASTM D2466, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
.61 ASTM D2467, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
.62 ASTM D2513, Thermoplastic Gas Pressure Pipe, Tubing and Fittings
.63 ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
.64 ASTM D2665, Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
.65 ASTM D2996, Filament-Wound Reinforced Thermosetting Resin Pipe
.66 ASTM D3212, Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals
.67 ASTM D3261, Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Fittings
.68 AST D4101, Propylene Plastic Injection and Extrusion Materials
.69 ASTM D4174, Cleaning, Flushing, and Purification of Petroleum Fluid Hydraulic Systems
.70 ASTM F441, Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
.71 ASTM F894, Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
.72 AWWA C105, Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
.73 AWWA C110, Ductile-Iron and Grey-Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids
.74 AWWA C111, Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pipe and Fittings
.75 AWWA C115, Flanged Ductile-Iron and Grey-Iron Pipe with Threaded Flanges
.76 AWWA C151, Ductile-Iron Pipe, Centrifugally Cast in Metal Moulds or Sand-Lined Moulds, for Water and Other Liquids
.77 AWWA C200, Steel Water Pipe, 6 Inches and Larger
.78 AWWA C203, Coal Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied
.79 AWWA C205, Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4 Inches through 144 Inches
.80 AWWA C206, Field Welding of Steel Water Pipe
.81 AWWA C207, Steel Pipe Flanges for Waterworks Services – Sizes 4 Inch Through 144 Inch
.82 AWWA C208, Dimensions for Fabricated Steel Water Pipe Fittings
.83 AWWA C209, Cold-Applied Tape Coating for Special Sections, Connections, and Fittings for Steel Water Pipelines
.84 AWWA C210, Liquid-Epoxy Coating System for the Interior and Exterior of Steel Water Pipe
.85 AWWA C213, Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings
.86 AWWA C214, Tape Coating Systems for the Exterior of Steel Water Pipelines
.87 AWWA C217, Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines

.88 AWWA C301, Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
.89 AWWA C303, Reinforced Concrete Pressure Pipe – Steel Cylinder Type, Pretensioned, for Water and Other Liquids
.90 AWWA C600, Installation of Ductile-Iron Water Mains and their Appurtenances
.91 AWWA C606, Grooved and Shouldered Joints
.92 AWWA C651, Disinfecting Water Mains
.93 AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water
.94 AWWA M11; Steel Pipe – A Guide for Design and Installation
.95 CGA, Canadian Gas Association Standards
.96 CAN/CGA B105 – Installation Code for Digester Gas Systems
.97 CISPI 301, Specification Data for Hubless Cast Iron Sanitary System with No-Hub Pipe and Fittings
.98 CPC, Canadian Plumbing Code
.99 CSA B52, Mechanical Refrigeration Code
.100 CSA B64 Series CSA Standards on Vacuum Breakers and Backflow
.101 CAN3-B70, Cast Iron Soil Pipe, Fittings, and Means of Joining
.102 CSA B137.3, Rigid PVC Pipe for Pressure Applications
.103 CSA B139, Installation Code for Oil Burning Equipment
.104 CSA B140.0 General Requirements for Oil Burning Equipment
.105 CSA B158.1 Cast Brass Solder Joint Drainage, Waste and Vent Fittings
.106 CAN3-B181.2 PVC Drain, Waste and Vent Pipe and Pipe Fittings
.107 CSA CAN3-Z299.3, Quality Verification Program Requirements
.108 CSA CAN-Z183, Oil Pipeline Systems
.109 CSA Z184 Gas Pipeline Systems
.110 CSA B242 Groove and Shoulder Type Mechanical Pipe Couplings
.111 EJMA STDS, Standards of Expansion Joint Manufacturers' Association, Edition No. 6
.112 Fluid Sealing Association Technical Handbook, Rubber Expansion Joint Division
.113 FEDSPEC, L-C530B(1), Coating, Pipe, Thermoplastic Resin or Thermosetting Epoxy
.114 MIL-H-13528B, Hydrochloric Acid, Inhibited, Rust Removing
.115 MIL-S-8660C, Silicone Compound
.116 MIL-STD-810C, Environmental Test Methods
.117 MSS SP25, Standard Marking System for Valves, Fittings, Flanges and Unions
.118 MSS SP43, Wrought Stainless Steel Butt Welding Fittings
.119 SAE J1227, Assessing Cleanliness of Hydraulic Fluid Power Components and Systems
.120 SSPC-P3, Canadian Government Standards Board
.121 SSPPC-SP6, Canadian Government Standards Board
.122 SSPC-SP10, Canadian Government Standards Board
.123 Plumbing and Drainage Regulations of Province of Alberta
.124 Gas Protection Branch Regulations of the Province of Alberta
.125 Pressure Vessels Act of the Province of Alberta
.126 The American Society of Mechanical Engineers. (ASME)
    .1 ASME Boiler and Pressure Vessel Code, Part I – Power Boilers
    .2 ASME Boiler and Pressure Vessel Code, Part IV – Heating Boilers
    .3 ASME Boiler and Pressure Vessel Code, Part VIII – Pressure Vessels

.4 ASME Boiler and Pressure Vessel Code, Part IX – Welding and Brazing Qualifications

.127 The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.128 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

.129 Department of Environment of the Province of Alberta

.130 Air-Conditioning and Refrigeration Institute (ARI)

.131 National Fire Protection Association (NFPA)

.132 Air Movement and Control Association (AMCA)

.133 Canadian Gas Association

.1 CAN/CGA B149.1 Natural Gas Installation Code

.2 CAN/CGA-B149.2 Propane Installation Code

.134 Alberta Building Code

.135 National Sanitation Foundation (NSF)

.136 American Petroleum Institute (API)

.137 CSA B214-07 Installation code for hydronic heating systems

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01340.

.2 Shop drawings and product data to include the following:

.1 Performance curves, which include differential head, efficiency, water NPSHR, and brake horsepower (where applicable).

.2 Outline and arrangement drawings.

.3 Cross-section drawings.

.4 Materials of construction.

1.5 UNIFORMITY OF EQUIPMENT

.1 All valves, gauges and other equipment to be supplied by one manufacturer throughout to the extent practical. Variations will be permitted only where the major supplier cannot supply a particular piece of equipment as specified.

1.6 DRAWINGS AND DESIGN

.1 The drawings are intended to show the major details of the mechanical work but it is the Contractor's responsibility to examine the electrical, mechanical, structural and architectural drawings before beginning the work and report to the Owner's Representative any discrepancies or interferences which may occur.

1.7 MAINTENANCE DATA

.1 Provide maintenance data for incorporation into the manual specified in Section 01790 - Operation and Maintenance Manuals.

.2 Include the reviewed tag lists.

1.8 PIPE MATERIALS – GENERAL

.1 All pipe materials to be new, free from defects and conforming to applicable reference standards.

.2 All materials, linings and coatings in contact with water to be NSF approved for potable water.

.3 Where any standard referenced has been superseded prior to bidding, the Contractor shall comply with the current standard.

1.9 PIPE SIZES

.1 Where the pipe size is not specified, provide pipe with the sizes required by the Plumbing Code. Small piping not described by the Plumbing Code or otherwise specified herein shall be 12 mm nominal diameter.

1.10 JOINTS – GENERAL

.1 Connect piping using joints not readily disassembled only where shown and where not otherwise specified. Provide joints which maybe disassembled at the minimum, within 1.0 metre of any connection to equipment, on both sides of structural penetrations, within 0.6 metres of all threaded end valves, and at the spacing specified in the detailed piping specification sheets.

.2 For carbon steel piping less than 75 mm in diameter, butt-weld or use threaded couplings. Use unions where disassembly is required.

.3 For steel piping equal to or greater than 75 mm in diameter, where not specified or shown otherwise, butt-weld according to ASME Boiler and Pressure Vessel Code or furnish slip-on flanges, conforming to ASME B16.5, Class 150. Unless indicated otherwise on the drawings or detail specifications, where disassembly is required, use flanges.

.4 For stainless steel tubing use stainless steel compression fittings.

.5 For schedule rated stainless steel pipe smaller than 75 mm in diameter, socket-weld pipe. Where disassembly is required, use threaded unions.

.6 For thin wall or schedule rated stainless steel pipe equal to or greater than 75 mm in diameter, butt-weld pipe unless otherwise shown or specified.

.7 For copper or brass piping, use soldered couplings. Where disassembly is required, use compression unions.

.8 For ductile iron piping, where not shown or otherwise specified, and for other piping where specified or shown, use grooved joints in accordance with AWWA C606.

.9 Where not shown or otherwise specified, use solvent weld joints for PVC and FRP piping. Provide flanges or unions where disassembly is required.

1.11 TAGGING

.1 Provide each piece of equipment with a tag stamped or engraved with the appropriate equipment number, as listed in this Specification.

.2 Tags to be 20mm high, 75mm long, and 1.5mm thick Lamecoid with 10 mm high alphanumeric characters, Helvetica font, reverse engraved. Characters to be white on coloured background. Background colour to be red.

.3 The code lettering and number system shall be as shown on the P & I drawings or as directed by the Engineer.

.4 Affix tags to equipment securely.

2. PRODUCTS

2.1 PIPE, FITTINGS AND VALVES

.1 All, fittings and standard valves to be in accordance with the line code sheet accompanying this section. All piping materials to be in accordance with the line code sheet accompanying section 15020.

2.2 FLANGES

.1 Unless otherwise noted, make flanges on steel or stainless steel pipe Class 150, conforming to ASME B16.5. Provide weld-neck flanges unless otherwise noted. Companion flanges for connection to cast iron or ductile iron equipment flanges shall be refaced to be flush with the companion flange.

.2 Make flanges on schedule 10S (only) stainless steel piping stainless steel slip-on, rolled-angle Van-Stone type, with a stainless steel back-up ring drilled to ASME B16.1, Class 125. Make the angle ring thickness equal or greater than the pipe or fitting to which it is welded. For digester gas services, make the flanges Lap-joint type with galvanized steel Lap-joint flange and in accordance with CGA B105. For instrument air services, make the flanges Lap-joint type with a stainless steel Lap-joint flange.

.3 Provide Class 125 flanges on cast or ductile pipe, conforming to ASME B16. 1.

.4 General requirements for flanges are as follows:

.1 Compatible flanges for mating to equipment or valves.
.2 Provide flat-faced flanges on each side of butterfly valves.
.3 For steel piping, provide weld neck flanges on both sides of wafer or lug body valves.

.5 Do not use slip-on flanges that are attached to a pipe by means of set screws and gaskets unless specifically directed by the Owner’s representative.

2.3 LINK SEALS

.1 Seal pipes passing through concrete walls as indicated on drawings, in a watertight manner, with link type expanding rubber seals as manufactured by the Thunderline Corporation.

.2 Link seals shall have EPDM seal element, composite pressure plates, and 316 stainless steel bolts.

.3 Size to suit cored hole or sleeved hole as required.

.4 Support pipe on either side of seal so that seal is not load bearing.

2.4 DIELECTRIC COUPLINGS

.1 Wherever pipes of dissimilar metals are joined use dielectric couplings.

.2 Use insulating unions for pipe sizes 50 mm and smaller and insulating flanges for pipe sizes larger than 50 mm.

2.5 UNIONS

.1 Provide unions at all locations for all pipe materials so that the Operator can easily perform required maintenance of all equipment.

2.6 SOLDERED COUPLINGS

.1 Soldered couplings for copper pipe conform to ASME B16.26. Solder to be lead free conforming to ASTM B32 and the Plumbing Code.

2.7 THREADED COUPLINGS

.1 Make screwed joints using American Standard threads to ASME B1.20.1 .

.2 Use paste as thread lubricant for threaded joints, Loctite or approved equal.

.3 Conform to ASTM Al82 or ASTM A276, Class 150, for threaded connections to stainless steel pipe, threadolets to be shop welded to the pipe at the locations specified.

.4 Provide threaded-end to flanged-end adaptors where required to connect to flanges.

2.8 COMPRESSION COUPLINGS

.1 Furnish compression couplings for stainless steel tubing of the same material as the pipe, capable of withstanding the maximum pressure to which the pipe is subjected.

.2 Furnish compression couplings for copper and brass tubing of copper, suitable for the maximum pressure of the pipe, conforming to ASME B16.26.

2.9 GROOVED JOINT COUPLINGS

.1 Fabricate grooved joint couplings of ductile iron to ASTM A536, and in accordance with AWWA C606. Provide cut grooves in pipe and fittings in accordance with AWWA C606. Rolled grooves and roll-groove type joints are not acceptable.

.2 Steel Pipe: Use flexible style couplings for all buried service pipe, all pipe greater than 300 mm in diameter, for pipe less than 300 mm in diameter in rack mounted piping assemblies, and for grooved joints adjacent to pump or blower suction and discharge where grooved joints are used for noise and vibration control. Use rigid style couplings in all other applications.

.3 Where grooved joint piping systems connect to equipment or to flanged valves, meters, or other sensing devices; use grooved joint flanges or flange adapters. Acceptable products are: Tyler Groove to Flange Fittings or Victaulic Flange adaptors. Where the Contractor chooses to use grooved joint flanges rather than the indicated adapters, piping modifications required to suit this change are the responsibility of the Contractor. Make full allowance for piping disassembly and access to the face of equipment.

.4 All couplings to be internally and externally epoxy coated.

2.10 FLEXIBLE COUPLINGS

.1 Flexible Couplings for non-buried to be Brico D-0-L:

.1 Stainless steel construction with stainless steel bolts, nuts and washers.
.2 Gaskets: fabricated of material suitable to the service conditions.

2.11 FITTINGS

.1 For steel pipelines 75 mm in diameter or greater, fittings to conform to ASME B16.9, ASME B16.11 or ASME B16.5. Provide fittings with a wall thickness equal to or greater than the pipe. In steel pipelines less than 75 mm in diameter provide threaded malleable iron fittings, conforming to ASME B16.3.

.2 Provide long radius steel grooved-joint fittings conforming to ASME B16.9 in steel grooved-joint pipeline systems. Grooved joint adapters may be welded to fitting ends; dimension and cut the groove of the adapter in accordance with the coupling manufacturer's recommendations; materials and inside diameter to be the same as the pipe; grind the interior weld smooth and meet the lining manufacturer's recommendations.

.3 For steel grooved-joint pipe of diameters of 150 mm and less, the Contractor may provide ductile iron grooved-joint fittings which have an outside diameter equal to the steel pipe diameter. Provide ductile iron to ASTM A536, dimensioned to 1.5 diameter radius bends, and cut grooving dimensions to AWWA C606 EPS dimensions. The lining and coating of the ductile iron fittings must equal the lining and coating of the steel pipeline system.

.4 Standard radius elbows to dimensions of ASME B16.5 may be provided on clean water grooved-joint piping systems only.

.5 Provide butt welding fittings in stainless steel pipelines less than 75 mm of the same class as the pipe, conforming to ASTM A403 and ASME B16.11. Provide socket welding fittings in stainless steel pipelines less than 75 mm to Cl. 3000, same material as the pipe, and ASME B16.1 1. Fabricate fittings in stainless steel pipelines equal to or greater than 75 mm in diameter using similar materials and classes as the pipe and conform to ASTM A774.

.6 Provide fittings in flanged ductile iron pipelines that conform to ASME B16.1 and in grooved end or mechanical joint ductile iron pipelines to AWWA C110.

.7 Provide ductile iron fittings in PVC pipelines that conform to AWWA C110 or provide PVC to CSA B137.3, of the same material and class as the pipe.

.8 Provide fittings in FRP pipelines of the same material and class as the pipe.

.9 Provide copper fittings in copper pipelines conforming to ASME B16.26.

.10 Provide eccentric reducers in horizontal lines with the flat side on top, unless shown otherwise.

.11 Provide concentric reducers in vertical lines unless indicated otherwise.

.12 Provide long radius elbows unless otherwise shown. Provide smooth flow carbon or stainless steel elbows 350 mm and less, to ASME B16.9. Provide mitred elbows greater than 350 mm, to AWWA C208 unless otherwise shown or specified. Use 3 piece construction unless otherwise shown or specified.

.13 Provide fittings in concrete cylinder pipe fabricated from metal plate, cement lined and coated, and in accordance with AWWA C301. Dimensions to AWWA C208.

2.12 GASKETS

.1 For flat faced flanges, use full-face gaskets. For raised-face flanges, use ring type gaskets. Conform to ASTM B16.21.

.2 Use gasket materials for flanged connections suitable for the temperature, pressure, and corrosivity of the fluid conveyed in the pipeline. Refer to detailed pipe specifications for recommended gasket material. Material designations used in the detailed pipe specification sheets are as follows:

.1 EPDM: ethylene-propylene-diene-terpolymer 70 durometer.
.2 Bl. Neoprene: neoprene (black) 70 durometer.
.3 Nitrile: nitrile (Buna N).
.4 SBR: Styrene-butadiene (red).
.5 Natural rubber: natural rubber.
.6 Compressed synthetic fibres (Kevlar): ASTM F104 (F7712400), and neoprene binder: 1.7 MPa (ASTM F152), 0.2 mL/h Leakage Fuel A (ASTM F37).
.7 Compressed synthetic fibres (Kevlar): ASTM F104 (F712400) and SBR binder: 1.7 MPa (ASTM F1 52), 0.1 mL/h Leakage Fuel A (ASTM F37).
.8 Gylon - Type 1: Garlock Style 3500,1.35 MPa (ASTM F152), 0.22 mL/h Leakage Fuel A (ASTM F37).

.9 Gylon-Type2: Garlock Style 3510,1.35 MPa (ASTM F152), 0.04 mL/h Leakage Fuel A (ASTM F37).
.10 CPE - Chlorinated Polyethylene.

.3 Unless otherwise specified, minimum Gasket Material Thickness for full face gaskets:

.1 75 to 250 mm pipe diameter; 1.6 mm thick.
.2 Greater than 250 mm pipe diameter; 3.2 mm. thick.

.4 Unless otherwise specified, minimum gasket material thickness for raised face ring gaskets:

.1 75 to 100 mm pipe diameter; 1.6 mm thick.
.2 Greater than 100 mm. pipe diameter; 3.2 mm thick.

.5 Grooved joint gasket materials to be as recommended by the manufacturer for the service conditions indicated. Unless otherwise specified, provide flush seal type gaskets for all grooved joint systems. Acceptable products: Gustin-Bacon Rigigrip, Victaulic Flush-Seal.

2.13 BOLTS AND NUTS

.1 Provide hex head bolts and nuts. Threads to be ASME B1.1, standard coarse thread series.

.2 For general interior service, use bolts and nuts conforming to ASTM A307, Grade A; nuts conforming to ASTM A563, Gr.A.

.3 For exposed (exterior), submerged, buried, installed below the main floor slab and concrete encased service, provide stainless steel bolts, nuts and washers; bolts conforming to ASTM A193, Gr.B8, C1.1; nuts conforming to ASTM A194, Gr.8.

.4 Provide hot dip galvanized bolts, nuts and washers for use with hot dip galvanized Van Stone flange back-up rings and Lap-joint flange back-up rings.

.5 Provide hex nuts equal to or less than 25 mm. Greater than 25 mm, provide heavy hex.

2.14 ANCHOR BOLTS

.1 Provide hot dip galvanized, L – type anchor bolts, nuts and washers for use with concrete support blocks.

.2 Use bolts and nuts conforming to ASTM A307, Grade A; nuts conforming to ASTM A563, Grade A.

.3 Refer to the standard drawings.

2.15 EPOXY COATING (INTERIOR/EXTERIOR PIPING & VALVE SURFACES)

.1 General:

.1 Coat all non-galvanized/non-stainless steel surfaces in contact with water.
.2 Coatings to be factory applied to pipe and fittings to conform to AWWA standards and manufacturer's specifications by the fitting, piping, or valve manufacturer, or by a specialized coating firm approved by the Owner's Representative.
.3 Make coating at ends of pipe and fittings compatible with method of joining.
.4 Factory applied coatings to be labelled with applicator's name and date of application.
.5 Protect factory-applied coatings during handling, transportation and storage in accordance with manufacturer's recommendations.
.6 Field applied coatings at joints and repair locations to conform to AWWA standards and manufacturer's specifications.

.2 Coating Materials: Fusion-Bonded Epoxy Coating for Interior and Exterior application.

.1 Conform to AWWA C213.
.2 Conform to ANSI/NSF 61 potable standard for interior application.
.3 Use for pipe and fittings that can be heated without damage.
.4 Application: The coating shall be applied holiday free in accordance with the coating manufacturer's specifications.
.5 Acceptable products:
.1 3M Company Skotchkote 206N or Owner approved equal for factory application
.2 3M Company Skotchkote 306 or Owner approved equal for field application repair of factory-applied coatings

.3 Coating Materials: Liquid Epoxy Coating for Interior and Exterior application.

.1 Conform to AWWA C210.
.2 Conform to ANSI/NSF 61 potable standard for interior application.
.3 Application: The coating shall be cold applied and holiday free in accordance with the coating manufacturer's specifications.
.4 Acceptable products:
.1 Tnemec Series N140 Pota-Pox Plus, or Owner approved equal for factory application.
.2 Devoe BAR-RUST 233H (NSF approved) Multi-Purpose Epoxy Coating, DFT 12 - 16 mils, or Owner approved equal for factory application.
.3 3M Company Skotchkote 306 or Owner approved equal for field application repair of factory-applied coatings.

.4 Surface Preparations:

1. All surfaces shall be blast cleaned to SSPC-SP5 prior to and within 4 hours of coating. Newly cast objects need not to be sandblasted if not contaminated with soil, oil, grease etc. and if coating takes place within 4 hours after casting.

.5 Field Applied Coatings:

.1 Apply to damaged areas of shop coated surfaces and at field welds.
.2 Clean and prepare surfaces in accordance with the manufacturers recommendations.
.3 Repair coating with an epoxy compatible with the factory-applied epoxy and finish in accordance with the coating manufacturers specifications.

.6 Inspection:

.1 The coating shall be pinhole free.
.2 All inspections to be performed by Charter Coating Service Ltd. – Inspection Division (403) 250-9317 or equivalent inspection agency, at the Contractor's expense.
.3 Full inspections to be carried out before and after coating application. Coating inspector to submit testing results to Engineer within 2 days of completion of testing.
.4 Inspection of the coating application to the field welds to be performed after installation.
.5 The Owner's Representative reserves the right to obtain independent testing at the Owner's expense.

.7 Color Schedule:

.1 All piping, valves, and equipment shall be color coded as per Alberta Environment recommended color coding for water treatment plant piping and the finish colors shall be as shown on the color schedule in Section 9907 or as directed by the Engineer.

2.16 COATING AND WRAPPING FOR UNDERGROUND PIPING

.1 Buried steel piping shall have an external protective wrapping to protect against corrosion.

.2 Extruded Type Factory Applied Material: Extruded High Density Polyethylene coating for exterior application to underground piping.

.1 Conform to AWWA C105.
.2 Factory apply Shaw Pipe Protection Limited's Yellow Jacket No. 1 or engineer approved equal for pipe and fittings.
.3 Field apply Canusa polyethylene heat shrink sleeves conforming to AWWA C216 as supplied by Shaw Pipe Protection Limited or Owner approved equal for joints.
.4

.3 Tape Wrapped Type Factory and Field Applied Material: Cold-Applied Tape Coatings for exterior application to underground piping special sections, connections and fittings.

.1 Conform to AWWA C209 or AWWA 217.
.2 Pipe wrapping shall consist of a primer followed by a polyken tape covering with butyl rubber backing and then a polyethylene rock shield. The system of primer and tape shall conform to AWWA C209.

.3 Primer shall have a base of rubber and synthetic resins, compatible with tape, and suitable for hand application.
.4 The rock shield shall be black polyethylene, 40-mil thickness, supplied in rolls 1050-mm wide, Renfrew 350-40 or as approved.
.5 Factory apply with minimum 75 mm overlap to special sections.
.6 Field apply for repairs to damaged exterior coatings and at joints. Use double thickness with a minimum of two complete wraps around pipe.
.7 Use Greenline tape, Denso Plast and Denso Tape or engineer approved equal.
.8 Buried steel flanges shall have an external protective wrapping to protect against corrosion. The wrapping shall consist of a primer followed by a Denso tape covering conforming to AWWA C217.

2.17 GALVANIZING

.1 Where piping is to be galvanized, hot dip zinc coat to CSA G164 with a minimum coating of 550 g/m^2.

2.18 RPVC CONDUIT

.1 Tubing shall be installed in RPVC conduit where indicated on Contract Drawings.

.2 Tubing of 10 mm diameter and smaller is to be installed in 25 mm diameter RPVC conduit complete with long radius elbows.

.3 Tubing of 12 mm diameter to be installed in 50 mm diameter RPVC conduit complete with long radius elbows.

2.19 TRACER WIRE

.1 Buried nonmetallic piping shall be installed with insulated tracer wire.

.2 Insulated tracer wire; 2.0mm (14 gauge) shall be placed above the pipeline and directly over the centre of the pipeline. The Contractor must ensure that the tracer wire is not cut, scraped, or nicked during installation. Termination points shall be installed on Pipeline Warning Sign Posts at approximately 100 m spacing unless otherwise specified.

.3 The Contractor shall test and the Engineer shall check the tracer wire. It shall be the Contractor's responsibility to locate and repair any malfunctions discovered by either the Contractor or the Engineer.

2.20 PIPE HANGERS AND SUPPORTS

.1 General:

.1 Fabricate hangers, supports and sway braces in accordance with ASME B31.1 1983 and MSS-SP58-1983.
.2 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.
.3 Dielectrically isolate all piping from dissimilar metal supports.

.2 Upper Attachments:

.1 Concrete:

.1 Inserts for cast-in-place concrete: galvanized steel wedge to MSS-SP58-1983, type 18. ULC listed for pipe 20 mm size through 200 mm.

.1 Acceptable product: Anvil Fig. 281; Myatt.

.2 Carbon steel plate with clevis, for surface mount - malleable iron socket, expansion case and bolt. Minimum two expansion cases and bolts for each hanger.

.1 Acceptable product: Anvil - Fig. 49, Socket Fig. 290, Expansion Case Fig. 117; Myatt.

.2 Steel Beam (bottom flange):

.1 Cold piping 50 mm size or smaller: malleable iron C clamp to MSS-SP58-198 type 19, ULC listed.

.1 Acceptable product: Anvil Fig. 61; Myatt.

.2 Cold piping 65 mm size and larger and all hot piping: malleable iron beam clamp to MSS-SP58-1983 type 28 or 29, ULC listed.

.1 Acceptable product: Anvil Fig. 229; Myatt.

.3 Steel Beam (top):

.1 Cold piping 50 mm size or smaller: malleable iron "top of beam" clamp to MSS-SP58-1983 type 19, ULC listed.

.1 Acceptable product: Anvil Fig. 61; Myatt.

.2 Cold piping 65 mm size and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS-SP58-1983 type 25, ULC listed.

.1 Acceptable product: Anvil Fig. 227: Myatt.

.4 Steel Joist:

.1 Cold piping 50 mm size and smaller: steel washer plate with double locking nuts.

.1 Acceptable product: Anvil Fig. 60; Myatt.

.2 Cold piping 65 mm size and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket.

.1 Acceptable product: Anvil - washer plate Fig. 60, clevis Fig. 66, socket Fig. 290, Myatt.

.5 Steel Channel or Angle (bottom):

.1 Cold piping 50 mm size and smaller: malleable iron C clamp to MSS-Sp58-1983 type 23, ULC listed.

.1 Acceptable product: Anvil Fig. 86; Myatt.

.2 Cold piping 65 mm size and larger and all hot piping: universal channel clamp, ULC listed.

.1 Acceptable product: Anvil 226; Myatt.

.6 Steel Channel or Angle (top):

.1 Cold piping 50 mm size or smaller: malleable iron "top of beam" C clamp to MSS-SP58-1983 type 19 ULC listed.

.1 Acceptable product: Anvil Fig. 61; Myatt.

.2 Cold piping 65 mm size and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS-SP58-1983 type 25, ULC listed.
.1 Acceptable product: Anvil Fig. 227: Myatt.
.3 Middle Attachment (rod):
.1 Carbon steel threaded rod, electro-galvanized for finish.
.1 Acceptable product: Anvil Fig. 146: Myatt.
.4 Pipe Attachment:
.1 Cold piping, steel or cast iron: hot piping, steel with less than 25 mm horizontal movement: hot piping, steel with more than 300 mm middle attachment rod length: adjustable clevis to MSS-SP58-1983 type 1, ULC listed.
.1 Acceptable product: Anvil Fig. 260; Myatt.
.2 Cold piping, hot copper with less than 25 mm horizontal movement; hot copper with more than 300 mm middle attachment rod length: adjustable clevis to MSS-SP58-1983 type 1, copper plated.
.1 Acceptable product: Anvil Fig. CT-65; Myatt.
.3 Suspended hot piping, steel and copper with horizontal movement in excess of 25 mm; hot steel with middle attachment rod 300 mm or less: pipe roller to MSS-1983 type 43.
.1 Acceptable product: Anvil Fig. 181; Myatt.
.4 Bottom supported hot piping, steel or copper: pipe roller stand to MSS-SP58-1983 type 45.
.1 Acceptable product: Anvil Fig. 271; Myatt.

.7 Riser Clamps:
.1 Steel or cast iron pipe: galvanized carbon steel to MSS-SP58-1983 type 42, ULC listed.
.1 Acceptable product: Anvil Fig. 261; Myatt.
.2 Copper pipe: carbon steel copper finished to MSS-SP58-1983 type 42.
.1 Acceptable product: Anvil Fig. CT-121; Myatt.

.8 Strut Mounted (galvanized carbon steel):
.1 Copper piping: cushion clamp c/w thermoplastic rubber.
.1 Acceptable product: Anvil PS1400; Hydra-Zorb.

.9 Saddles and Shields:
.1 Cold piping 30 mm and larger: protection shield with high density insulation under shield with interrupted vapour barrier.
.1 Acceptable product: Anvil Fig. 167; Myatt.
.2 Hot piping 30 mm size and larger: protective saddle with insulation under saddle.
.1 Acceptable product: Anvil Fig. 160 to 166; Myatt.

2.21 DUCT HANGERS AND SUPPORTS

.1 Hangers: Galvanized steel band iron or rolled angle and 10 mm rods.

.2 Wall Supports: Galvanized steel band iron or fabricated angle bracket.

.3 Vertical Support at Floor: Rolled angle.

2.22 RACK AND TRAPEZE SUPPORTS

.1 Provide steel trapeze and pipe rack components having a minimum thickness of 2.7 mm (12 gauge) with a maximum deflection of 1/240 of the span unless otherwise noted.

.2 Provide trapeze pipe support cross members and general fittings as required.

2.23 FINISHES ON HANGER RODS, HANGERS AND SUPPORTS

.1 All steel hanger rods, hangers and supports shall be galvanized or factory primed with alkyd red oxide primer to CAN/CGSB-1.40-M89.

2.24 INSTRUMENT AIR CONNECTIONS

.1 Provide instrument air connections to each instrument with a run of 6 mm nylon tubing from the nearest instrument air header to within close proximity of each device requiring instrument air.

.2 Terminate each tubing run with a 12 mm ball valve (stainless steel) within 1500 mm horizontal distance of the device and 1,500 mm off the floor. Group multiple valves neatly together with a common orientation.

.3 Provide a vertical riser connection at the header to avoid condensate entrainment. From the top of the riser, slope the tubing generally down to the device.

2.25 QUICK DISCONNECTS

.1 Provide quick disconnects which are not disconnectable under pressure. Unless otherwise shown or specified, provide products listed below.

.2 For air service, acceptable products are:

.1 Dixon Air King
.2 Tomco, 12 mm diameter. Tomco, THK

.3 For water service, sizes as shown. Acceptable products are:

.1 For 25 mm or less diameter hose, two lug, malleable iron, female NPT: Dixon Air King.
.2 For 38 mm and 50 mm diameter hose, two four lug, malleable iron, female NPT: New Line Dixon Air King.
.3 For 75 and 100 mm diameter or greater; quick-acting, dual clip: Rite-pro, Dixon.

2.26 FLUSHING CONNECTIONS

.1 Provide flushing connections on all piping for the conveyance of sludge, scum, grit or other liquid containing solids greater than 0.5 percent. Locate flushing connections adjacent to all isolation valves, on dead end branches, at tees and 90 degree elbows, and

at intermediate locations which limit the distance between flushing connections to less than 30 metres. Show flushing connections on piping submittals.

.2 Allow for 5 – 12.5 mm sample ports tapped into 150 to 300 mm pipes. Engineer will provide location during commissioning.

2.27 PURGE CONNECTIONS

.1 Provide purge connections on all gas lines. Locate adjacent to both sides of all isolation valves and spectacle flanges, and at any other locations shown in the drawings. Purge points shall be a minimum of 20 mrn NPS pipe, fitted with a shut off valve which shall be capped.

2.28 MECHANICAL BRANCH CONNECTIONS

.1 Provide mechanical branch connections as required for flushing connections and pipe tappings. Provide branch connection recommended by the manufacturer for the service and pipe installed. Acceptable products are:

- .1 Gruvlock Clamp T
- .2 Ford Service Saddles (F/FS)
- .3 Victaulic Mechanical T

2.29 DRAIN VALVES

.1 Locate at all low points and section isolating valves unless otherwise specified.

.2 Minimum 20 mm size unless otherwise specified: straight pattern bronze with hose end male thread and complete with cap and chain.

2.30 ELECTRICAL MOTORS

.1 Supply mechanical equipment complete with electrical motors.

.2 Provide motors to CEMA and CSA standards for hard, continuous service, designed to limit temperature rise to 40°C for open housing and 50°C for drip proof housing, and operate at 1200 or 1800 RPM unless otherwise specified.

.3 Motors shall have ball or roller type bearings.

.4 Provide grease lubrication fittings on motors with frame sizes 254T and larger.

.5 Refer to electrical specification for voltage, phase and cycle.

2.31 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

.3 For motors under 7.5 kW: standard adjustable pitch sheaves, having +/- 10% range. Use mid-position of range for specified r/min.

.4 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.5 Motor slide rail adjustment plates to allow for centre line adjustment.

2.32 GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives:

.1 Expanded metal screen welded to steel frame.
.2 Minimum 1.2 mm sheet metal tops and bottoms.
.3 38 mm diameter holes on both shaft centers for insertion of tachometer.
.4 Removable for servicing.
.5 Install guards to allow movement of motors for adjusting belt tension.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Guard for flexible coupling:

.1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
.2 Securely fasten in place.
.3 Removable for servicing.

.5 Unprotected inlets and outlets:

.1 Wire or expanded metal screen, galvanized, 19 mm mesh.
.2 Net free area of guard: not less than 80% of fan openings.
.3 Securely fasten in place.
.4 Removable for servicing.

2.33 SPARE PARTS AND SPECIAL TOOLS

.1 To section 01795 – Spare Parts as follows:

.1 One set of belts for each piece of machinery.
.2 Spare filter cartridge(s) or set of filter media for each filter or filter bank in addition to the final operating set. A minimum of one spare to be provided or as otherwise noted in the specifications for the particular equipment or component.
.3 Sufficient lubricating oils and greases of correct grade and specification for 12 months' operation of all equipment requiring such.
.4 Any other spares which may be required to comply with the manufacturer's operating and maintenance instructions and recommendations during the course of the first 12 months of operation.

.2 Provide one set of special tools required to service equipment as recommended by the equipment manufacturer.

2.34 ACCESS DOORS

.1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting, and servicing.

.2 Flush mounted 600 mm x 600 mm for body entry and maximum size possible to 300 mm x 300 mm for hand entry unless otherwise noted. Doors to open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as tiles or marble surfaces: use stainless steel with brushed satin or polished finish as directed by consultant.
.2 remaining areas: use prime coated steel.

.4 Installation:

.1 Locate such that all concealed items are accessible.
.2 Locate such that hand or body entry is achieved.
.3 Installation is specified in applicable sections.

2.35 FLASHING

.1 Steel Flashing: 0.55 mm galvanized steel.

.2 Lead Flashing: sheet lead, as follows:

.1 For Waterproofing: 25 kg/m^2.
.2 For Soundproofing: 5 kg/m^2.
.3 Lead Sheet Size:
.1 Roof Plumbing Vents: as required to provide base flashing overlap to ARCA detail.
.2 Floor Drains: minimum 920 x 920 mm and as specified.
.3 Other Locations: as specified.

.3 Safes: 25 kg/m^2 sheet lead or 200 micrometre neoprene.

.4 Caps: Steel, 0.70 mm thickness minimum, 1.6 mm thickness at fire resistance structures.

2.36 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment, and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting, and servicing of all systems and equipment during regular work hours, prior to acceptance.

2.37 TEMPORARY OR TRIAL USAGE

.1 Temporary or trial usage by the engineer of mechanical equipment supplied under contract shall not represent acceptance.

.2 Repair or replace permanent equipment used temporarily.

.3 Repair or otherwise rectify damage caused by defective materials or workmanship during temporary or trial usage.

3. EXECUTION

3.1 EXAMINATION

.1 Examine areas where work is to be performed for:

.1 Anything that affects execution and quality of work.
.2 Piping clearances.

3.2 VALVES AND EQUIPMENT IDENTIFICATION

.1 Tagging:

.1 See Section 1.11.

.2 The drawings designate the size and line service specification of all pipe, fittings, valves and equipment to be supplied by the Contractor in the following manner.

.3 Valve Identification Symbols:

.1 Valve Identity Symbols:

Symbol	Valve Type
ARV	Air Release Valve
BAV	Ball Valve
BBV	Block and Bleed Valve
BPV	Back Pressure Valve
BUV	Butterfly Valve
BV	Block Valve
CAV	Combination Air Vacuum
CHV	Check Valve
DCVA	Double Check Valve Assembly
FCV	Flow Control Valve
GAV	Gate Valve
GLV	Globe Valve
NEV	Needle Valve
PRV	Pressure Reducing Valve
PSV	Pressure Sustaining, Pressure Relief Valve
SV	Solenoid Valve

.2 Valve Marking:

Each valve to bear the manufacturer's name or trademark and reference symbol to indicate the service conditions for which the manufacturer guarantees the valve. The marking to be in accordance with MSS-SP-25.

.3 Manual Valve Actuators:

.1 Actuators for valves to be as follows:

Type of Valve	Size	Valve Actuator
Gate Valve	250 mm & smaller	Handwheels
Globe Valve	250 mm & smaller	Handwheels
Butterfly Valves	100 mm & smaller	Lever operated
	150 mm & larger	Gear operated
Ball Valves	100 mm & smaller	Lever operated
	150 mm & larger	Gear operated
Plug Valves	100 mm & smaller	Lever operated
	150 mm & larger	Gear Operated

.4 Valve operators to turn in a counter-clockwise direction to open unless otherwise indicated on the drawings.

.4 Equipment Identification:

.1 Processes:

Symbol	**Equipment**
AC	Air Compressor
B	Blower
EXP	Expansion Joint
FI	Flow Indicator
M	Mixer
PI	Pressure Indicator
P	Pump
SK	Skimmer
STR	Strainer
TK	Tank

.2 Plumbing:

Symbol	**Equipment**
CO	Cleanout
DWH	Domestic Water Heater
ED	Equipment Drain
FD	Floor Drain
FFD	Funnel Floor Drain
FSL	Flow Switch
HB	Hose Bibb
HD	Hub Drain
NFHB	No Freeze Hose Bib
PTK	Pressure Tank
PS	Pressure Switch
RD	Roof Drain

.3 Heating, Ventilation, and Air Conditioning:

Symbol	Equipment
B	Boiler
BDD	Back Draft Damper
CC	Cooling Coil
CF	Ceiling Fan
CU	Condensing Unit
DM	Damper
EF	Exhaust Fan
ET	Expansion Tank
FC	Fan Coil Unit
FF	Force Flow Unit
GC	Glycol Fill Tank
L	Louvre
P	Pump
SF	Supply Fan
T	Thermostat
UH	Unit Heater

3.3 PIPING INSTALLATION

.1 General:

.1 Conform to requirements of ASME B31 code for pressure piping.
.2 Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.
.3 Install groups of piping parallel to each other, spaced to permit application of insulation (when required), identification, and service access, on hangers.
.4 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.
.5 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.
.6 Install flanged or welded nozzles, branch connections, welding outlets, adapters and taps, true and faced at right angles to the axis of the pipe. Do not extend connection inside of pipe.
.7 Make pipe ends round and true, suitable for weld connection.
.8 Prepare pipe ends in accordance with ASME B16.25 for butt welding.
.9 Copper pipe and tubing to be free from surface damage. Replace damaged pipe or tubing.
.10 Ream ends of pipe and tubes before being made up.
.11 Lay metal tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.
.12 Use non-corrosive lubricant or Teflon tape applied to male thread only.
.13 Groove pipe ends, cut square, seating surface clean and free from indent and score marks.
.14 Install dielectric fittings wherever piping of dissimilar metals are joined.
.15 Install flanges or unions to permit removal of equipment and valves without disturbing piping systems, as required by piping standard.

.16 Clean ends of pipes or tubing and recesses of fittings to be brazed or soldered. Assemble joints without binding.
.17 Support piping during construction to prevent abnormal stresses on the pipe works.
.18 Install pipe supports as required.
.19 Install pipe hangers as required.

.2 Flanges Bolting to Valves:

.1 Do not weld adjacent flanges when any valve is in place.
.2 Remove valve prior to welding.
.3 Clean gasket surfaces, flange faces and butt welding connections.
.4 Protect connecting surfaces.

.3 Bolted Connections:

.1 Clean pipe ends and gaskets.
.2 Lubricate gaskets with soapy water and bolts with thread lubricant.
.3 Tighten bolts progressively by crossover method and not in rotation around the joint.
.4 Tighten bolts to the torque recommended by the manufacturer.
.5 Use properly sized wrenches for bolt tightening to prevent rounding of nut and bolt heads.

.4 Threaded Connections:

.1 Clean pipe ends and threads.
.2 Use appropriate pipe dope for potable use when threading pipe.

3.4 WELDING SPECIFICATIONS

.1 Welders Qualifications:

1. All welders shall have qualified under ASME B31.3-2006 Standard and have an Alberta Class "B" Pressure Welding Certificate. Welders shall be qualified by a local approved testing agency.

.2 Welding Procedures:

.1 Submit details of the procedures for Owner’s Representative's review.
.2 All welding shall be carried out in accordance with ASME B31.3-2006 Standards.
.3 The Contractor shall use adequate weather shields to protect the welding operation from rain, snow and wind. The Owner’s Representative has the right to stop all welding if in his opinion adverse weather conditions will affect the quality of the weld.
.4 Where more than one pass is required, each pass, except the first and the final one, shall be peened to relieve shrinkage stresses. All dirt, slag and flux shall be removed before the succeeding bead is applied.

.3 Standard of Acceptability:

.1 The Engineer shall have the right to inspect all welds by visual, radiological or other non-destructive test method. Inspection may be made during welding or after the weld has been completed. Under visual examination welds shall be free of cracks, inadequate penetration, unrepaired burn-through and other defects, and shall present a neat workmanlike appearance. Radiological examination may be used at the discretion of the Owner's Representative to determine the penetration, slag inclusion, cracks and other defects. The Owner's Representative shall be the sole judge as to the acceptability of each weld.

.2 If a dispute results as to the acceptability of a weld, a specimen may be taken of the weld at the location determined by the Owner's Representative and subjected to tests in accordance with ASME B31.3-2006 Standards. An acceptable weld shall be per Z183.

.3 If the specimen test shows that the weld is unacceptable as outlined above, the Contractor shall bear the full cost of all testing and repairing the pipe where the specimen is removed to the satisfaction of the Owner's Representative. The Owner's Representative shall have the right to reject any weld if in his opinion the weld defects are detrimental to the strength of the weld.

.4 The cost of all radiological inspection shall be born by the Owner unless the inspection was requested by the Contractor.

.4 Leakage Testing:

.1 Leakage testing on completed butt joints shall normally be made by testing the line hydrostatically to the pressure rating of the pipe.

.5 Repair of Defective Welds:

.1 Minor defects in welds may be removed by grinding out the defective portion. Replacement welds in joints may be checked by repeating the original test.

.2 Major defects and all cracks shall be cut out mechanically and the joint re-welded.

.3 All cost for repairing defective welds, including radiographic inspection of the corrected work, shall be borne by the Contractor.

3.5 VALVE INSTALLATION

.1 Storage of Valves:

.1 Store valves in cool and clean location, away from moving vehicles or other objects.

.2 Prevent dirt and debris entering the valve internals.

.3 Protect the valve seats against painting.

.4 Store valves with their handwheels, operator shafts and operators in an upright position.

.2 Handling Valves:

.1 Do not place chains, cables and ropes through valve ports or attached to operators or handwheels.

.2 Use sling either around valve body or with bolts or rods through the flange holes.

.3 Installation of Valves:

.1 Installation of valves to be by competent personnel and in strict accordance with manufacturer's instructions.
.2 Inspect pipe and remove all foreign debris or objects that may prevent closing of valve prior to the installation of any valves.
.3 Install butterfly valves with their operating shafts in the horizontal position unless otherwise directed by the Owner's Representative.
.4 Flanges or fittings adjacent to butterfly valves shall not be welded with the valve in place.

3.6 PUMP INSTALLATION

.1 Setting Depths:

.1 The Contractor shall be responsible for ascertaining and confirming the exact pump setting length. The setting length shall also be confirmed by site measurement prior to manufacturing the pumps.
.2 The dimension from the underside of the pump suction bell to the bottom of the sump shall conform to the manufacturer's recommendations and this dimension shall be clearly indicated on the pump shop drawings.

.2 Accessories:

.1 Provide all anchor bolts, shims and miscellaneous accessories necessary for installation of the pumping equipment and drivers.
.2 Turn over to the Owner any spare parts at the time of commissioning in accordance to the specified Spare Parts provisions of Section 15015.

.3 Installation of Pumps:

.1 Install all pumping equipment in strict accordance with manufacturer's and supplier's instructions.
.2 Any damage resulting from either failure to observe the installation instructions or as a result of proceeding with the work without complete knowledge of how it is to be done will be the Contractor's responsibility.
.3 Make equipment installation and connections by skilled tradesmen to the best standard.
.4 Carry out work to produce a neat, accurate, secure, functional installation.
.5 Repair at own expense, any damage done to the installation of materials while carrying out the work.
.6 Install anchor bolts and concrete bases in advance of equipment installation in accordance with manufacturer's instructions.
.7 Set sole plates in place and shim to correct alignment. Grout as required.
.8 Upon completion of installation, fill, add to, and check equipment requiring lubricating oils, greases and coolants. Types and amounts to be in strict accordance with manufacturer's recommendations.

.4 Pump Testing Procedure:

.1 Pump testing to be conducted in accordance to the specifications provided in Division 15 of the Contract. Refer also to the provisions of Section 15015 related to Equipment Testing Procedure.

3.7 INSERTS

.1 Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

.2 Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying piping over 100 mm or ducts over 1500 mm wide.

.3 Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

.4 Where inserts are omitted, drill through concrete slab from below and provide rod with recessed square steel plate and nut above slab.

3.8 PIPE HANGERS AND SUPPORTS

.1 Hanger Spacing:

Spacing and middle attachment rod diameter as specified in paragraphs below or as table below, whichever is more stringent.

.1 Plumbing piping: most stringent requirements of the Plumbing Code for the Province Alberta or authority having jurisdiction.
.2 Fire protection: to applicable fire code.
.3 Gas piping: up to 15 mm size - every 1.8 m.
.4 Copper piping: up to 15 mm size - every 1.5 m.
.5 PVC piping: To manufacturer's recommendation for the maximum temperature of the service and to prevent any visible deflection or movement.
.6 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.
.7 Within 300 mm of each horizontal elbow.
.8 Table:

Maximum Pipe Size mm	Rod Diameter mm	Maximum Spacing Steel m	Maximum Spacing Copper m
To 30	10	2.1	1.8
40	10	2.7	2.4
50	10	3.0	2.7
65	10	3.6	3.0
75	10	3.6	3.0
100	16	4.2	3.6
150	22	5.1	
200	22	5.7	
250	22	6.6	
300	22	6.9	

.2 Hanger Installation:
.1 Offset Hanger so that rod is vertical in operating position.
.2 Adjust hangers to equalize load.

3.9 EQUIPMENT BASES AND SUPPORTS

.1 Provide for major equipment, reinforced concrete housekeeping bases poured directly on structural floor slab 100 mm thick minimum, extended 100 mm minimum beyond machinery bedplates. Provide templates, anchor bolts and accessories required for mounting and anchoring equipment.

.2 Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

.3 Rigidly anchor ducts and pipes immediately after vibration connections to equipment.

3.10 LOW VELOCITY DUCT HANGERS AND SUPPORTS

.1 Hanger Minimum Sizes:

.1 Up to 750 mm wide: 25 x 1.6 mm at 3 m spacing.
.2 790 to 1200 mm wide: 40 x 1.6 mm at 3 m spacing.
.3 Over 1200 mm wide: 40 x 1.6 mm at 2.4 m spacing.

.2 Horizontal Duct on Wall Supports Minimum Sizes:

.1 Up to 450 mm wide: 40 x 1.6 mm or 25 x 25 x 3 mm at 2.4 m spacing.
.2 480 x 1000 mm wide: 40 x 40 x 3 mm at 1.2 m spacing.

.3 Vertical Duct on Wall Supports Minimum Sizes at 3.65 m spacing:

.1 Up to 610 mm wide: 40 x 1.6 mm.
.2 640 to 900 mm wide: 25 x 25 x 3 mm.
.3 Over 1520 mm wide: 50 x 3 mm.
.4 940 to 1200 mm wide: 30 x 30 x 3 mm.

.4 Vertical Duct Floor Supports Minimum Sizes, riveted or screwed to ducts:

.1 Up to 1520 mm wide: 40 x 40 x 3 mm.
.2 Over 1520 mm wide: 50 x 3 mm.

3.11 FLASHING

.1 Flash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.

.2 Flash vent and soil pipes projecting 75 mm minimum above roof membrane with lead worked 25 mm minimum into hub, 200 mm minimum clear on sides. For pipes through outside walls turn flange back into wall and caulk.

.3 Flash floor drains over finished areas with lead minimum 250 mm clear on sides. Fasten flashing to drain clamp device.

.4 Provide curbs for mechanical roof installations, minimum 200 mm high.

.5 Attach counterflashings to mechanical equipment and lap base flashings on roof curbs.

.6 All joints in counterflashings shall be flattened and soldered double seam. Storm collars shall be adjustable to draw tight to pipe with bolts. Caulk around the top edge. Use storm collars above all roof jacks.

.7 Screw vertical flange section of roof jacks to face of curb.

.8 Provide lead flashing around ducts and pipes passing from equipment rooms, installed according to manufacturer's data for sound control.

3.12 PROTECTION OF OPENINGS

.1 Protect equipment and system openings from dirt, dust and other foreign materials.

.2 Thoroughly clean piping, ducts and equipment of dirt, cuttings, and other foreign substances prior to being put into operation.

3.13 EQUIPMENT PIPING CONNECTIONS

.1 Where equipment connections are a different size from the piping serving it all associated isolating valves and fittings to be the larger pipe size unless specifically indicated otherwise on the drawings. This rule to also apply in the case of control valves.

3.14 SLEEVES

.1 Provide individual metal sleeves for all pipes, tubes or ducts penetrating all walls and floor slabs. Grout tightly in place for full depth of wall or slab.

.2 Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

.3 Standard sleeves to be 22 Ga. galvanized sheet steel with lock seam joints.

.4 Use cast iron or steel pipe sleeve with annular fin continuously welded at midpoint:
- .1 Through foundation walls.
- .2 Where sleeve extends above finished floor.

.5 Sizes:

- .1 Refer to mechanical drawings for details.
- .2 Provide 6 mm clearance all around, between sleeves and pipe or between sleeve and insulation.

.6 Terminate sleeves flush with surface of concrete and masonry and above floors.

.7 For pipes passing through roofs, use cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make water-tight, durable joint.

.8 Voids Around Pipes:

.1 Where sleeves pass through walls or floors, caulk space between sleeve and insulation or between sleeve and pipe with dry oakum. Seal space at each end of sleeve with waterproof, fire retardant, non-hardening mastic.
.2 Ensure no contact between copper tube or pipe and ferrous sleeve.
.3 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint.

.9 Where pipes and ducts pass through walls and floors having a fire separation rating, pack the space with approved caulking material and seal in accordance with CGSB19-GP-9.

3.15 ESCUTCHEONS AND PLATES

.1 Install on pipes passing through finished walls, floors, and ceilings.

.2 Use chrome or nickel plated brass, solid type with set screws for ceiling or wall mount.

.3 Inside diameter to fit around finished pipe. Outside diameter to cover opening or sleeve.

.4 Where sleeve extends above finished floor, escutcheons or plates to clear sleeve extension.

.5 Secure to pipe or finished surface but not to insulation.

3.16 CUTTING AND PATCHING

.1 Minimize cutting and patching required. Set sleeves and mark openings in concrete forms and masonry structure prior to the placement of concrete or masonry.

3.17 GENERATORS

.1 All exhaust equipment for generator to be provided by division 16 and installed by division 15, as per specification **16410**.

3.18 EQUIPMENT TESTING PROCEDURE

.1 Detailed Description and Notification:

.1 Submit a thorough description of the procedures to be employed in testing this equipment. The procedure will be reviewed by the Engineer for suitability and should be submitted 3 weeks prior to any testing.

.2 Field Testing:

.1 When equipment installation has been completed to the standards indicated by these specifications, arrange for the services of the equipment manufacturer's technical representative.

.2 The equipment manufacturer's technical representative shall inspect the installation to ensure that the equipment has been installed in accordance with the manufacturer's requirements. If the installation is not in order, correct the deficiencies indicated by the technical representative. Start, run and adjust equipment at this time. The technical representative shall then advise the Engineer in writing that the installation has been checked, has been installed correctly and is in working order.

.3 Bear all the costs of the equipment manufacturer's technical representative.

.4 Use only personnel who have taken an active part in the actual installation of the system. Do not designate a subtrade as representative at any time during the construction prior to final inspection.

.3 Equipment Manufacturer's Representative:

.1 The equipment manufacturer's technical representative shall be familiar with the equipment supplied and shall come prepared with both knowledge and equipment to perform and interpret the test, inspections and procedures recommended by the manufacturer for the starting of equipment that has not previously been run.

.2 The equipment manufacturer's technical representative shall, immediately after completion of the inspection, convey to the Engineer in writing, confirmation of the tests and inspections carried out and the result of this examination of the work.

.3 If the inspection reveals defects in the work, correct as soon as possible and repeat the entire inspection procedure. Repeat until the work passes the inspection.

.4 Document the results of the inspection by the equipment manufacturer's representative.

.5 Ensure the installation meets all manufacturer's requirements for durable and trouble-free operation.

.4 Field Inspection:

.1 Final inspection will be made by the Engineer only after the equipment manufacturer's technical representative has advised that equipment installation is in order and the Contractor has advised in writing that the system can be operated.

.2 The Engineer will request that the equipment be operated to demonstrate that it will perform as specified. The Engineer will note deficiencies, and if possible, the deficiency will be corrected immediately by the Contractor. All deficiencies that cannot be corrected at the time of inspection will be noted by the Engineer who will advise the Contractor of these deficiencies in writing. Correct the deficiencies as soon as possible and advise the Engineer of their correction. Should the deficiencies be of a sufficiently serious nature to require the work to be re-inspected, the cost of the inspection will be borne by the Contractor.

END OF SECTION

1. GENERAL

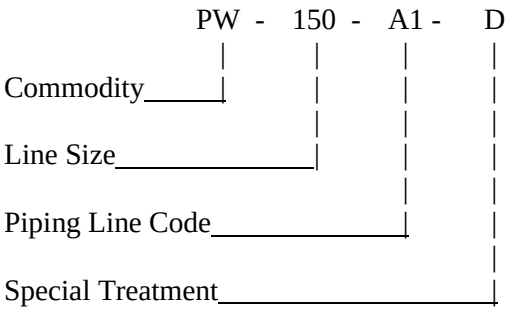
1.1 INTENT

.1 This section contains detailed piping specifications.

1.2 PIPING IDENTIFICATION

.1 The drawings designate the size and line service specification of pipe to be supplied by the Contractor in the following manner.

.1 Line Identification is placed on each line in the following manner:



e.g. potable water, 150 mm line size, standard weight steel, internal epoxy coated

.2 Legends and tables identifying the commodity, line code and special treatment symbols are included in this section of the specifications.

.1 Commodity Symbols for Line Identification:

AA	Aqua Ammonia
ACI	Acid (pH Adjustment)
ACS	Powdered Activated Carbon Solution
AD	Air Distribution
AS	Air Supply
AL	Alum
ALS	Alum Solution
ALG	Algaecide Solution
AMG	Ammonia Gas
AMS	Ammonia Solution
BWS	Backwash Supply
BYP	Bypass
CA	Citric Acid
CAS	Citric Acid Solution
CDG	Carbon Dioxide Gas
CDS	Carbon Dioxide Solution
CIPS	Clean in Place Supply
CIPR	Clean in Place Return
CIPD	Clean in Place Drain
CLG	Chlorine Gas
CLS	Chlorine Solution

CO	Coagulant
COS	Coagulant Solution
CS	Caustic Soda
DCW	Domestic Cold Water
DHW	Domestic Hot Water
DHWR	Domestic Hot Water Recirculation
DE	DAF Effluent
DW	DAF Waste
DL	Diesel Fuel
DR	Drain
EW	Effluent Water
FL	Fluoride
FTW	Filter to Waste
FW	Filtered Water
G(H)	Natural Gas (High Pressure)
G(L)	Natural Gas (Low Pressure)
GLS	Glycol Supply
GLR	Glycol Return
HWS	Hot Water Supply
HWR	Hot Water Return
IA	Instrument Air
OF	Overflow
PLY	Polyelectrolyte (Liquid)
PLYS	Polyelectrolyte Solution
PO	Polymer
POS	Polymer Solution
PPS	Potassium Permanganate Solution
PSW	Plant Service Water
PW	Potable Water
RAS	Return Activated Sludge
RF	Refrigerant
RJW	Reject Water
RLF	Relief
RW	Raw Water
S	Sanitary Waste
SAM	Sample Line
SAS	Soda Ash Solution
SB	Sodium Bisulphate
SEN	Sensing Line
SH	Sodium Hypochlorite
SLG	Sludge
SPSW	Softened Plant Service Water
SU	Supernatant
SV	Sanitary Vent
TEW	Tempered Effluent Waste

VE	Vent
WAS	Waste Activated Sludge
WT	Weeping Tile
XR	Excess Recirculation

.3 Line Codes:
The following is a description of the general line code classifications.

Line Code	Flange Rating	Schedule/ Thickness	Basic Material	Special Notes	Maximum Design Pressure
A1	Class 150	-	Carbon Steel	Standard Weight	Varies
A2	Class 150	-	Carbon Steel	Extra Strong	Varies
A3	Class 300	-	Carbon Steel	Extra Strong	Varies
B1	Class 150	Sch 80	PVC	-	Varies
B2	Class 150	Sch 40	PVC	-	Varies
B3	-	SDR 18	PVC	-	1620 kPa
B4	-	SDR 21	PVC	-	1380 kPa
B5	-	SDR 26	PVC	-	1100 kPa
B6	-	SDR 28	PVC	-	-
B7	-	SDR 32.5	PVC	-	860 kPa
B8	-	SDR 35	PVC	-	-
B9	-	SDR 41	PVC	-	690 kPa
B10	-	SDR 51	PVC	-	550 kPa
B11	-	C900 & C 905	PVC	-	1050 kPa
B12	-	SCH 80	PVC (Well Riser Pipe)	Certa-Lock	-
C1	-	Type K	Copper	-	-
C2	-	Type L	Copper	-	-
C3	-	Type M	Copper	-	-
D1	Class 150	SCH 10S	Stainless Steel 304L	-	Varies
D2	Class 150	SCH 10S	Stainless Steel 316L	-	Varies
D3	Class 150	SCH 40S	Stainless Steel 304L	-	Varies
D4	Class 150	SCH 40S	Stainless Steel 316L	-	Varies
D5	Class 300	SCH 80S	Stainless Steel 304L	-	Varies
D6	Class 300	SCH 80S	Stainless Steel 316L	-	Varies
E1	-	-	PVC-DWV	-	Plumbing Code
E2	-	-	ABS-DWV	-	Plumbing Code
F1	-	-	Big “O” Drain	c/w filter sock	-
G1	Class 125	-	Ductile Iron	-	-
G2	Class 125	-	Cast Iron	-	-
H1	-	DR 9	HDPE, C906	-	1380 kPa
H2	-	DR 11	HDPE, C906	-	1100 kPa
H3	-	DR 13.5	HDPE, C906	-	900 kPa
H4	-	DR 15.5	HDPE, C906	-	760 kPa
H5	-	DR 17	HDPE, C906	-	690 kPa
H6	-	DR 32	HDPE, C906	-	315 kPa
H7	-	DR 11	PE2406, Yellow	-	522 kPa
H11	-	-	PEX A, Water Service	-	690 kPa
J1	-	-	Asbestos Cement Pipe	-	-
J2	-	Class V	Reinforced Concrete Pipe	-	-
K1	-	-	PE OD Tubing	-	-

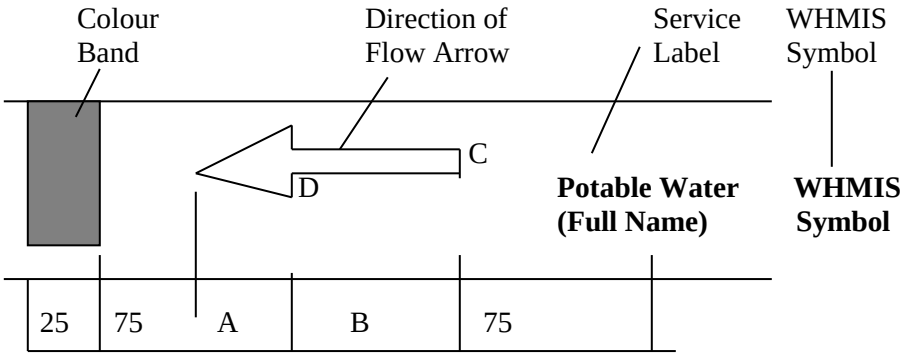
K2	-	-	PE ID Tubing	-	-
K3	-	-	LLDPE OD Tubing	-	-
K4	-	-	PP OD Tubing	-	-

.4 Special Treatment Code:

Symbol	**Description**
(A)	Cement mortar lining
(B)	Internal hot applied coal tar lining
(C)	External hot applied coal tar lining
(D)	Internal epoxy coated
(E)	External epoxy coated
(F)	External yellow jacketed
(G)	External double wrap polyken tape
(H)	Externally insulated
(I)	External shop prime
(J)	Densyl mastic wrap - buried flanges, couplers, and valves
(K)	Galvanized
(L)	Rock shield
(M)	Frost shield
(N)	Installed in RPVC conduit
(O)	Tracer wire installed above pipe

.5 Pipe Identification Symbols:

.1 The marking of the piping is to correspond to the following sketch:



.2 Sizing Requirements - The sizing and spacing of the various components in relation to the outside diameter of the pipe on which they are to be painted is to be as follows:

OUTSIDE DIA OF PIPE (OVER INSULATION)	A	B	C	D
12min - 25 mm	12mm	50mm	6mm	3mm
32 mm - 50 mm	25mm	75mm	2mm	6mm
64 mm. and up	38mm	87mm.	25 mm	12mm

.3 Application:

.1 All pipeline identification symbols are to be adhesive labels.
.2 Surface of pipe or insulation, on which symbols are to be applied, must be clean and dry.

.4 Symbol Colours:

.1 Colour **Band - width of colour band is to be** 25 mm on all diameters of pipe. Colour is to correspond to Section 09907 - Painting of Process Pipe and Equipment.
.2 Direction of Flow Arrow - arrow is to indicate direction of flow of media in pipe. If direction is either way, a double headed arrow is to be used as shown in "Sizing Requirements". Colour arrow is to be black when pipe is a light colour. Colour of arrow is to be white when pipe is a dark colour.
.3 Service Label – Labels are to designate what is in pipe.

.5 Location of Symbols- No hard and fast rules for the location of piping identification symbols are laid down, however some general requirements and guidelines are noted below.

.6 The purpose is to present the information to the maintenance person at the point in the building where it is likely to be needed.

.7 The maintenance person must not have to climb around objects, over pipes, etc., to read a pipe symbol. They shall be presented in such a manner that they are clearly visible when standing in a normal manner in the room or space. If the normal access to a space is above the pipes, then they should be identified on their tops so that they can be seen when looking down. The line of sight of the maintenance person shall always be kept in mind.

.8 Places for pipe identification are as follows:

.1 On lateral runs where they leave risers at various floor levels.
.2 On risers in pipe spaces near locations where entry to personnel is provided.
.3 Near valves or branches where a number of pipes are racked together on a pipe rack.

.4 Near pipe connection points to major pieces of equipment. Keep symbols far enough away so they would not get damaged by maintenance activity around equipment.
.5 Near major shut-off valves at entry point of utility to building.
.6 Near pipe exit point from building.

.9 Long runs of pipe in building shall be identified approximately every 15 m (50').

.10 A pipe passing through a wall should be identified on both sides of wall.

.11 Before undertaking the work, the Contractor is to complete a sample for viewing by the Consultant and Owner in order to obtain approval to proceed. The stencils prepared and the proposed paint are to be checked at that time by these parties.

SERVICE: Refer to Contract Drawings		LINE CODE: A1
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	650 mm to 900 mm	Steel, ASTM A139 Grade B, or AWWA C200.91 seamless or welded, 9.5 mm wall.
	600 mm or smaller	Steel, ASTM A53 Grade B, seamless or welded, standard wall (STD).
Fittings	75 mm to 900 mm	Steel, ASTM A234 Grade WPB, butt weld, standard wall (STD).
	65 mm or smaller	Steel, ASTM A197 Class 300, malleable iron, screwed.
NOTE: Elbows to be long radius unless otherwise specified.		
Flanges	650 mm to 900 mm	Steel, AWWA C207 Class D, slip-on, flat faced with serrated finish.
	75 mm to 600 mm	Standard is steel to ASME B16.5 Class 150, or AWWA C207 Class D, weld-neck or slip-on type as shown on drawings, raised face. Orifice Flanges to be Class 300 Carbon Steel to ASTM A105, slip-on, raised face. Flanges mated to equipment with cast iron flat faced flanges or rubber seated butterfly valves to be flat faced. Flanges for use on grooved pipe to be Victaulic Style 741.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class E flange.		
Bolts	All sizes	ASTM A193 Grade B7 hex head. To be plated for corrosion resistance.
Nuts	All sizes	ASTM A194 Grade 2H, hex head semi-finished. To be plated for corrosion resistance.
Submerged Bolts & Nuts	All sizes	Stainless Steel 316L.
Flange Gaskets	40 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.

SERVICE: Refer to Contract Drawings		LINE CODE: A1
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Flange Gaskets (cont'd)	300 mm to 450 mm	Red Rubber, ring type for RF flanges, full face for FF flange, 3 mm thick.
	500 mm & larger	Red Rubber, ring type for RF flanges, full face for FF flange, 6 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to by type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 300, malleable iron, ground joint, bronze to iron seat.
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 316L bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victualic Style 44 w/ Type "D" Vic-ring. For submerged or buried service coupling to be Stainless Steel Victaulic Style 77S.
Victaulic Gasket	All Sizes	Ductile Iron Pipe: Grade "M" Halogenated Butyl or Grade "S" Nitrile seal ring to AWWA Standards.
	50 mm to 300 mm	Steel Pipe: Grade "E" EPDM suitable up to 110 deg C or Grade "EHP" EPDM suitable up to 121 deg C or Grade "T" Nitrile.

SERVICE: Refer to Contract Drawings		LINE CODE: A1
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Victaulic Gasket (con't)	350 mm to 600 mm	Steel Pipe: Grade "E" EPDM FlushSeal gasket suitable up to 110 deg C or "T" Nitrile FlushSeal gasket.
Thread Compound	As required	Teflon tape CAN/ULC-S642.
Gate Valves	75 mm to 450 mm	Class 125, OS&Y, rising stem, FF flange, IBBM, Crane No. 465 ½; Red-White/Toyo No. 421A. Class 250, OS&Y, rising stem, FF flange, IBBM, Crane 7½E; Kitz 300CLS (Class 300).
	65 mm & smaller	Class 300 WOG, Bronze, rising stem, wedge disk, Crane No. 431; Red-White/Toyo No. 298.
Globe Valves	75 mm to 200 mm	Class 125, OS&Y, rising stem, FF flange, IBBM, Crane No. 251; Red-White/Toyo No. 400A. Class 250, OS&Y, rising stem, FF flange, IBBM, Crane No. 21E; Kitz 300 SCO (Class 300).
	65 mm & smaller	Class 300 WOG, Bronze, rising stem, screwed, Crane No. 7; Red-White/Toyo No. 221.
Check Valves	75 mm to 750 mm	See Section 15015:Mechanical General Requirements
	50 mm & smaller	Class 200, Y pattern swing check bronze, screwed, Crane No. 36; Red-White/Toyo No. 360.
Butterfly Valves	50 mm to 75 mm	Resilient or rubber seated, wafer lug style, bronze disk, with lever operator. Dezurik, Bray, Dresser, Mueller, American Darling, Watts.
	75 mm to 1050 mm	See Section 15015:Mechanical General Requirements
Ball Valves	75 mm to 350 mm	Class 150, full bore, cast steel body, TFE seat and seal, SS ball and stem, RF flange, W-K-M Dynaseal 310; Kitz No. 150SCTA.
	65 & smaller	Class 1000, cast steel body, TFE seat and seal, SS ball and stem, screwed, W-K-M Dyanseal 310; M.A.S. No. CSSDR-1 unless otherwise noted

SERVICE: Refer to Contract Drawings		LINE CODE: A1
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Ball Valves (con't)	25 mm	Kitz Class 600, Fig. AKUTKM 316, screwed.
Plug Valves	75 mm to 600 mm	Class 150, semi-steel body, resilient plug, Buna-N seal, nickel seat, FF flange. Dezurik Fig. 118F-6-RS17; Homestead Ballcentric 1532-EWG.
	65 mm & smaller	Class 300 WOG, bronze body, resilient plug, Buna filled, TFE U-ring seal, screwed. Dezurik Fig. 1205-1-RS16; Homestead Ballcentric Fig. 6112.
Strainers	65 mm & larger	Iron body, Y pattern, flanged, 20 mesh model screen, Crane No. 989 ½; Red-White/Toyo No. 381A, SS screen unless otherwise noted.

NOTE: .1 If class 125 iron body, bronze mounted, FF flanged gate valve is used the design pressure to be limited to 1035 kPa for valves 400 mm size and larger, and 1380 kPa for gate valves 300 mm and smaller.

.2 If Class 125 iron body, bronze mounted, FF flanged globe valve is used the design pressure to be limited to 1380 kPa.

SERVICE: Refer to Contract Drawings		LINE CODE: A2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	900 mm or smaller	Steel, ASTM A53 Grade B, seamless or welded, extra strong (XS).
Fittings	75 mm to 900 mm	Steel, ASTM A234 Grade WPB, butt weld, extra strong (XS).
	65 mm or smaller	Steel, ASTM A197 Class 300, malleable iron, screwed.
NOTE: Elbows to be long radius unless otherwise specified.		
Flanges	650 mm to 900 mm	Steel, AWWA C207 Class D, slip-on, flat faced with serrated finish.
	75 mm to 600 mm	Standard is steel to ASME B16.5 Class 150, or AWWA C207 Class D, weld-neck or slip-on type as shown on drawings, raised face. Orifice Flanges to be Class 300 Carbon Steel to ASTM A105, slip-on, raised face. Flanges mated to equipment with cast iron flat faced flanges or rubber seated butterfly valves to be flat faced. Flanges for use on grooved pipe to be Victaulic Style 741.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class E flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: A2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	ASTM A193 Grade B7 hex head. To be plated for corrosion resistance.
Nuts	All sizes	ASTM A194 Grade 2H, hex head semi-finished. To be plated for corrosion resistance.
Submerged Bolts & Nuts	All sizes	Stainless Steel 316L.
Flange Gaskets	40 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges, full face for FF flange, 3 mm thick.
	500 mm & larger	Red Rubber, ring type for RF flanges, full face for FF flange, 6 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to by type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 300, malleable iron, ground joint, bronze to iron seat.
Pipe Couplings	65 mm & smaller	Use unions.

SERVICE: Refer to Contract Drawings		LINE CODE: A2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings (cont'd)	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 316L bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victualic Style 44 w/ Type "D" Vic-ring.
Victaulic Gasket	All Sizes 50 mm to 300 mm	Ductile Iron Pipe: Grade "M" Halogenated Butyl or Grade "S" Nitrile seal ring to AWWA Standards. Steel Pipe: Grade "E" EPDM suitable up to 110 deg C or Grade "EHP" EPDM suitable up to 121 deg C or Grade "T" Nitrile.
	350 mm to 600 mm	Steel Pipe: Grade "E" EPDM FlushSeal gasket suitable up to 110 deg C or "T" Nitrile FlushSeal gasket.
Thread Compound	As required	Teflon tape CAN/ULC-S642.
Gate Valves	75 mm to 450 mm	Class 125, OS&Y, rising stem, FF flange, IBBM, Crane No. 465 ½; Red-White/Toyo No. 421A. Class 250, OS&Y, rising stem, FF flange, IBBM, Crane 7½E; Kitz 300CLS (Class 300).
	65 mm & smaller	Class 300 WOG, Bronze, rising stem, wedge disk, Crane No. 431; Red-White/Toyo No. 298.
Globe Valves	75 mm to 200 mm	Class 125, OS&Y, rising stem, FF flange, IBBM, Crane No. 251; Red-White/Toyo No. 400A. Class 250, OS&Y, rising stem, FF flange, IBBM, Crane No. 21E; Kitz 300 SCO (Class 300).
	65 mm & smaller	Class 300 WOG, Bronze, rising stem, screwed, Crane No. 7; Red-White/Toyo No. 221.

SERVICE: Refer to Contract Drawings		LINE CODE: A2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Check Valves	75 mm to 750 mm	See Section 15015:Mechanical General Requirements
	50 mm & smaller	Class 200, Y pattern swing check bronze, screwed, Crane No. 36; Red-White/Toyo No. 360.
Butterfly Valves	50 mm to 75 mm	Resilient or rubber seated, wafer lug style, bronze disk, with lever operator. Dezurik, Bray, Dresser, Mueller, American Darling, Watts.
Butterfly Valves	75 mm to 1050 mm	See Section 15015:Mechanical General Requirements
Ball Valves	75 mm to 350 mm	Class 150, full bore, cast steel body, TFE seat and seal, SS ball and stem, RF flange, W-K-M Dynaseal 310; Kitz No. 150SCTA.
Ball Valves	65 & smaller	Class 1000, cast steel body, TFE seat and seal, SS ball and stem, screwed, W-K-M Dyanseal 310; M.A.S. No. CSSDR-1 unless otherwise noted
	25 mm	Kitz Class 600, Fig. AKUTKM 316, screwed.
Plug Valves	75 mm to 600 mm	Class 150, semi-steel body, resilient plug, Buna-N seal, nickel seat, FF flange. Dezurik Fig. 118F-6-RS17; Homestead Ballcentric 1532-EWG.
	65 mm & smaller	Class 300 WOG, bronze body, resilient plug, Buna filled, TFE U-ring seal, screwed. Dezurik Fig. 1205-1-RS16; Homestead Ballcentric Fig. 6112.
Strainers	65 mm & larger	Iron body, Y pattern, flanged, 20 mesh model screen, Crane No. 989 ½; Red-White/Toyo No. 381A, SS screen unless otherwise noted.

SERVICE: Refer to Contract Drawings		LINE CODE: A2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Strainers	50 mm & smaller	Iron body, Y pattern, screwed, 20 mesh model screen, Crane No. 988 ½; Red-White/Toyo No. 380, SS screen, c/w BAV on Drain.

NOTE: .1 If class 125 iron body, bronze mounted, FF flanged gate valve is used the design pressure to be limited to 1035 kPa for valves 400 mm size and larger, and 1380 kPa for gate valves 300 mm and smaller.

.2 If Class 125 iron body, bronze mounted, FF flanged globe valve is used the design pressure to be limited to 1380 kPa.

SERVICE: Refer to Contract Drawings		LINE CODE: A3
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	900 mm or smaller	Steel, ASTM A53 Grade B, seamless or welded, extra strong (XS).
	650 mm to 900 mm	Steel, ASTM A234 Grade WPB, butt weld, extra strong (XS).
	75 mm to 600 mm	Steel, ASTM A234 Grade WPB, butt weld extra strong (XS).
Fittings	65 mm or smaller	Steel, ASTM A197 Class 300, malleable iron, screwed.
NOTE: Elbows to be long radius unless otherwise specified.		
Flanges	650 mm to 900 mm	Steel, AWWA C207 Class D, slip-on, flat faced with serrated finish.
	75 mm to 600 mm	Standard is steel to ASME 16.5 Class 300, or AWWA C207 Class D, weld-neck (or slip-on if specified), raised face. Orifice Flanges to be Class 300 Carbon Steel to ASTM A105, slip-on, raised face. Flanges mated to equipment with cast iron flat faced flanges or rubber seated butterfly valves to be flat faced. Flanges for use on grooved pipe to be Victaulic Style 741.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class E flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: A3
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	ASTM A193 Grade B7 hex head. To be plated for corrosion resistance.
Nuts	All sizes	ASTM A194 Grade 2H, hex head semi-finished. To be plated for corrosion resistance.
Submerged Bolts & Nuts	All sizes	Stainless Steel 316L.
Flange Gaskets	40 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges, full face for FF flange, 3 mm thick.
	500 mm & larger	Red Rubber, ring type for RF flanges, full face for FF flange, 6 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to by type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 300, malleable iron, ground joint, bronze to iron seat.
Pipe Couplings	65 mm & smaller	Use unions.

SERVICE: Refer to Contract Drawings		LINE CODE: A3
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings (cont'd)	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 316L bolts & nuts). Victaulic Style 77 standard weight; Victualic Style 44 w/ Type "D" Vic-ring. 2065 kPa maximum working pressure
Victaulic Gasket	All Sizes 50 mm to 300 mm	Ductile Iron Pipe: Grade "M" Halogenated Butyl or Grade "S" Nitrile seal ring to AWWA Standards. Steel Pipe: Grade "E" EPDM suitable up to 110 deg C or Grade "EHP" EPDM suitable up to 121 deg C or Grade "T" Nitrile.
	350 mm to 600 mm	Steel Pipe: Grade "E" EPDM FlushSeal gasket suitable up to 110 deg C or "T" Nitrile FlushSeal gasket.
Thread Compound	As required	Teflon tape CAN/ULC-S642.
Gate Valves	75 mm to 450 mm	Class 125, OS&Y, rising stem, FF flange, IBBM, Crane No. 465 ½; Red-White/Toyo No. 421A. Class 250, OS&Y, rising stem, FF flange, IBBM, Crane 7½E; Kitz 300CLS (Class 300).
	65 mm & smaller	Class 300 WOG, Bronze, rising stem, wedge disk, Crane No. 431; Red-White/Toyo No. 298.
Globe Valves	75 mm to 200 mm	Class 125, OS&Y, rising stem, FF flange, IBBM, Crane No. 251; Red-White/Toyo No. 400A. Class 250, OS&Y, rising stem, FF flange, IBBM, Crane No. 21E; Kitz 300 SCO (Class 300).
	65 mm & smaller	Class 300 WOG, Bronze, rising stem, screwed, Crane No. 7; Red-White/Toyo No. 221.

SERVICE: Refer to Contract Drawings		LINE CODE: A3
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Check Valves	75 mm to 750 mm	See Section 15015:Mechanical General Requirements
	50 mm & smaller	Class 200, Y pattern swing check bronze, screwed, Crane No. 36; Red-White/Toyo No. 360.
Butterfly Valves	50 mm to 75 mm	Resilient or rubber seated, wafer lug style, bronze disk, with lever operator. Dezurik, Bray, Dresser, Mueller, American Darling, Watts.
Butterfly Valves	75 mm to 1050 mm	See Section 15015:Mechanical General Requirements
Ball Valves	75 mm to 350 mm	Class 150, full bore, cast steel body, TFE seat and seal, SS ball and stem, RF flange, W-K-M Dynaseal 310; Kitz No. 150SCTA.
Ball Valves	65 & smaller	Class 1000, cast steel body, TFE seat and seal, SS ball and stem, screwed, W-K-M Dyanseal 310; M.A.S. No. CSSDR-1 unless otherwise noted
	25 mm	Kitz Class 600, Fig. AKUTKM 316, screwed.
Plug Valves	75 mm to 600 mm	Class 150, semi-steel body, resilient plug, Buna-N seal, nickel seat, FF flange. Dezurik Fig. 118F-6-RS17; Homestead Ballcentric 1532-EWG.
	65 mm & smaller	Class 300 WOG, bronze body, resilient plug, Buna filled, TFE U-ring seal, screwed. Dezurik Fig. 1205-1-RS16; Homestead Ballcentric Fig. 6112.
Strainers	65 mm & larger	Iron body, Y pattern, flanged, 20 mesh model screen, Crane No. 989 ½; Red-White/Toyo No. 381A, SS screen unless otherwise noted.

SERVICE: Refer to Contract Drawings		LINE CODE: A3
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Strainers	50 mm & smaller	Iron body, Y pattern, screwed, 20 mesh model screen, Crane No. 988 ½; Red-White/Toyo No. 380, SS screen, c/w BAV on Drain.

NOTE: .1 If class 125 iron body, bronze mounted, FF flanged gate valve is used the design pressure to be limited to 1035 kPa for valves 400 mm size and larger, and 1380 kPa for gate valves 300 mm and smaller.

.2 If Class 125 iron body, bronze mounted, FF flanged globe valve is used the design pressure to be limited to 1380 kPa.

SERVICE: Refer to Contract Drawings		LINE CODE: B1
PRIMARY FLANGE RATING: CLASS 150		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	300 mm & smaller	PVC, rigid, to ASTM D 1785 and CSA B137.3, or NSF14. Sch. 80.
Fittings	300 mm & smaller	PVC, socket weld, to ASTM D 2467. Sch. 80.
Flanges	All sizes	Class 150, PVC socket weld.
Bolts (dry)	All sizes	To ASTM A193 Grade B7. To be plated for corrosion resistance.
Nuts (dry)	All sizes	Semi-finished, hex head, to ASTM A194 Grade 2H. To be plated for corrosion resistance.
Ball Valves	All sizes	PVC body and ball TFE seat, socket ends, true-union safe-block design, PTFE seats, viton O-ring seals, Chemline or as approved.
Check Valves	50 mm & larger	See Section 15015:Mechanical General Requirements
Check Valves for chemical feed lines	38 mm & smaller	True Union Ball or Swing Check, Chemline or as approved
Butterfly Valves	75 mm to 1050 mm	See Section 15015:Mechanical General Requirements
Air Release Valves	12 mm to 50 mm	See Section 15015:Mechanical General Requirements
Needle valves	All sizes	316 Stainless steel, Century valves or approved equal
Unions	75 mm & larger	Use flanges
	65 mm & smaller	Use Class 150 PVC
Strainers	50 mm & smaller	Iron body, Y pattern, screwed, 20 mesh model screen, Crane No. 988 ½; Red-White/Toyo No. 380, SS screen, c/w BAV on Drain.

SERVICE: Refer to Contract Drawings		LINE CODE: B1
PRIMARY FLANGE RATING: CLASS 150		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type to be as shown on the drawings and to suit outside diameter of pipe .1 Victaulic Style 77 standard weight. .2 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "M" seal ring to AWWA Standards.
Diaphragm Valves	40 mm & smaller	Class 150 PVC Type 1, Grade 1, Body with Neoprene or teflon diaphragm, true union, screwed, socket, Chemline, ITT Grinnel, Chemtrol.
Diaphragm Valves	50 mm to 150 mm	Class 150 PVC Type 1, Grade 1 with neoprene or teflon diaphragm, flanged, Chemline, ITT Grinnel, Chemtrol.

SERVICE: Refer to Contract Drawings		LINE CODE: B2
PRIMARY FLANGE RATING: CLASS 150		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	300 mm & smaller	PVC, rigid, to ASTM D 1785 and CSA B137.3, or NSF14. Sch. 40.
Fittings	300 mm & smaller	PVC, socket weld, to ASTM D 2467. Sch. 80.
Flanges	All sizes	Class 150, PVC socket weld.
Bolts (dry)	All sizes	To ASTM A193 Grade B7. To be plated for corrosion resistance.
Nuts (dry)	All sizes	Semi-finished, hex head, to ASTM A194 Grade 2H. To be plated for corrosion resistance.
Ball Valves	All sizes	PVC body and ball TFE seat, socket ends, true-union safe-block design, PTFE seats, viton O-ring seals, Chemline or as approved.
Check Valves	50 mm & larger	See Section 15015:Mechanical General Requirements
Check Valves for chemical feed lines	38 mm & smaller	True Union Ball or Swing Check, Chemline or as approved
Butterfly Valves	75 mm to 1050 mm	See Section 15015:Mechanical General Requirements
Air Release Valves	12 mm to 50 mm	See Section 15015:Mechanical General Requirements
Needle valves	All sizes	316 Stainless steel, Century valves or approved equal
Unions	75 mm & larger	Use flanges
	65 mm & smaller	Use Class 150 PVC
Strainers	50 mm & smaller	Iron body, Y pattern, screwed, 20 mesh model screen, Crane No. 988 ½; Red-White/Toyo No. 380, SS screen, c/w BAV on Drain.

SERVICE: Refer to Contract Drawings		LINE CODE: B2
PRIMARY FLANGE RATING: CLASS 150		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type to be as shown on the drawings and to suit outside diameter of pipe .1 Victaulic Style 77 standard weight. .2 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "M" seal ring to AWWA Standards.
Diaphragm Valves	40 mm & smaller	Class 150 PVC Type 1, Grade 1, Body with Neoprene or teflon diaphragm, true union, screwed, socket, Chemline, ITT Grinnel, Chemtrol.
Diaphragm Valves	50 mm to 150 mm	Class 150 PVC Type 1, Grade 1 with neoprene or teflon diaphragm, flanged, Chemline, ITT Grinnel, Chemtrol.

SERVICE: Refer to Contract Drawings		LINE CODE: C1
PRIMARY FLANGE RATING:		DESIGN PRESSURE: 2800 kPa
TEMPERATURE (MAX): 100°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	50 mm & smaller	Copper, Type K, to ASTM B88.
Fittings	50 mm & smaller	Wrought copper or cast brass to ASTM B75.
Joints	All sizes	For hard drawn – solder, ASTM B32, 95-5 wire solder, Gr. 95 TA. (Solder and flux to be less than 0.2% lead). For soft drawn – use flare or compression type couplings.
Gate Valves	50 mm & smaller	Class 200 WOG, bronze body, non-rising stem, solder joint, Crane Fig. 1701; Red-White/Toyo Fig. 281A; Jenkins Fig. 993AJ; Kitz No. 41.
Ball Valves	50 mm & smaller	Bronze 2-piece body, chrome-plated brass ball, PTFE seats, solder joint, 4100 kPa CWP, handle operator, Crane 9322.
Globe Valves	50 mm & smaller	Class 200 WOG, bronze body, non-rising stem, replaceable composition disc to 95°C, solder joint, Crane Fig. 1310; Red-White/Toyo Fig 221 (requires adaptors); Jenkins Fig. 106BPJ; Kitz No. 10.
Strainer	50 mm & smaller	Class 150, bronze body, screwed ends, 80 mesh stainless steel screen, Hayward Y-strainer model 80 or as approved.

SERVICE: Refer to Contract Drawings		LINE CODE: C2
PRIMARY FLANGE RATING:		DESIGN PRESSURE:
TEMPERATURE (MAX): 100°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	100 mm & smaller	Copper, Type L, to ASTM B88.
Fittings	100 mm & smaller	Wrought copper or cast brass to ASTM B75.
Joints	All sizes	For hard drawn – solder, ASTM B32, 95-5 wire solder, Gr. 95 TA. (Solder and flux to be less than 0.2% lead). For soft drawn – use flare or compression type couplings.
Gate Valves	100 mm & smaller	Class 200 WOG, bronze body, non-rising stem, solder joint, Crane Fig. 1701; Red-White/Toyo Fig. 281A; Jenkins Fig. 993AJ; Kitz No. 41.
Ball Valves	100 mm & smaller	Bronze 2-piece body, chrome-plated brass ball, PTFE seats, solder joint, 4100 kPa CWP, handle operator, Crane 9322.
Globe Valves	100 mm & smaller	Class 200 WOG, bronze body, non-rising stem, replaceable composition disc to 95°C, solder joint, Crane Fig. 1310; Red-White/Toyo Fig 221 (requires adaptors); Jenkins Fig. 106BPJ; Kitz No. 10.
Strainer	100 mm & smaller	Class 150, bronze body, screwed ends, 80 mesh stainless steel screen, Hayward Y-strainer model 80 or as approved.

SERVICE: Refer to Contract Drawings		LINE CODE: D1
PRIMARY FLANGE RATING: CLASS 150 ASME B16.9		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	100 mm & smaller	Stainless Steel, ASTM A312 Type 304L, seamless or straight seam welded, Schedule 10S
	150 mm & larger	Stainless Steel, ASTM A778 Type 304L, seamless or straight seam welded, Schedule 10S
Fittings	100 mm & smaller	Stainless Steel, ASTM A403 Type 304L, welded, Schedule 10S
	150 mm & larger	Stainless Steel, ASTM A774 Type 304L, welded, Schedule 10S
NOTE: 1. All structural penetrations shall consist of a type 304 stainless steel Schedule 10S thimble 2. Elbows to be long radius unless otherwise specified.		
Angle Collars	100 mm & smaller	Stainless Steel, ASTM A403 Type 304L, slip-on or butt weld
	150 mm & larger	Stainless Steel, ASTM A774 Type 304L, slip-on or butt weld
Van Stone Flanges, Rolled Angle, FF or RF	All Sizes	Stainless steel Type 304L, Class 150, ASTM A182 / ASME SA-182
Flange Adapters	50 mm to 300 mm 50 mm to 150 mm	Flanges for use on grooved pipe to be Victaulic Style 741 Style 441 stainless steel flange adapter.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class D flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: D1
PRIMARY FLANGE RATING: CLASS 150 ASME B16.9		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	Stainless Steel 304L.
Nuts	All sizes	Stainless Steel 304L.
Submerged Bolts & Nuts	All sizes	Stainless Steel 304L.
Flange Gaskets	75 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges for RF flanges, full face for FF flange, 3 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to be type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 150, stainless steel Type 304L, Teflon O-Ring

SERVICE: Refer to Contract Drawings		LINE CODE: D1
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 316L bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victaulic Style 44 w/ Type "D" Vic-ring. For submerged or buried service coupling to be Stainless Steel Victaulic Style 77S. .3 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "E" EPDM suitable up to 230 deg F or Grade "T" Nitrle.
Thread Compound	As required	Teflon tape.
Plug Valves	All Sizes	Cast iron body and cover, ASTM A126 Class B; Cast iron plug, ASTM A126 Class B, c/w resilient facing, ASTM D2000-BG. Val-Matic or Dezurik.
Ball Valves	50 mm to 32 mm	Crane model 9502.

SERVICE: Refer to Contract Drawings		LINE CODE: D2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.9		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	100 mm & smaller	Stainless Steel, ASTM A312 Type 316L, seamless or straight seam welded, Schedule 10S
	150 mm & larger	Stainless Steel, ASTM A778 Type 316L, seamless or straight seam welded, Schedule 10S
Fittings	100 mm & smaller	Stainless Steel, ASTM A403 Type 316L, welded, Schedule 10S
	150 mm & larger	Stainless Steel, ASTM A774 Type 316L, welded, Schedule 10S
NOTE: 1. All structural penetrations shall consist of a type 316L stainless steel Schedule 10S thimble 2. Elbows to be long radius unless otherwise specified.		
Angle Collars	100 mm & smaller	Stainless Steel, ASTM A403 Type 316L, slip-on or butt weld
	150 mm & larger	Stainless Steel, ASTM A774 Type 316L, slip-on or butt weld
Van Stone Flanges, Rolled Angle, FF or RF	All Sizes	Stainless steel Type 316L, Class 150, ASTM A182 / ASME SA-182
Flange Adapters	50 mm to 300 mm 50 mm to 150 mm	Flanges for use on grooved pipe to be Victaulic Style 741 Style 441 stainless steel flange adapter.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class D flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: D2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.9		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	Stainless Steel 316L.
Nuts	All sizes	Stainless Steel 316L.
Submerged Bolts & Nuts	All sizes	Stainless Steel 316L.
Flange Gaskets	75 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges, full face for FF flange, 3 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to be type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 150, stainless steel Type 316L, Teflon O-Ring

SERVICE: Refer to Contract Drawings		LINE CODE: D2
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 316L bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victaulic Style 44 w/ Type "D" Vic-ring. For submerged or buried service coupling to be Stainless Steel Victaulic Style 77S. .3 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "E" EPDM suitable up to 230 deg F or Grade "T" Nitrle.
Thread Compound	As required	Teflon tape.
Plug Valves	All Sizes	Cast iron body and cover, ASTM A126 Class B; Cast iron plug, ASTM A126 Class B, c/w resilient facing, ASTM D2000-BG. Val-Matic or Dezurik.
Ball Valves	50 mm to 32 mm	Crane model 9502.

SERVICE: Refer to Contract Drawings		LINE CODE: D3
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	100 mm & smaller	Stainless Steel, ASTM A312 Type 304L, seamless or straight seam welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A778 Type 304L, seamless or straight seam welded, Schedule 40S
Fittings	100 mm & smaller	Stainless Steel, ASTM A403 Type 304L, welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A774 Type 304L, welded, Schedule 40S
NOTE: 1. All structural penetrations shall consist of a type 304 stainless steel Schedule 40 thimble 2. Elbows to be long radius unless otherwise specified.		
Flanges	650 mm to 900 mm	Stainless steel, ASTM A182 and ASME B16.47 grade F304L Class 150 weld-neck or slip-on type as shown on drawings.
	75 mm to 600 mm	Standard is stainless steel to ASTM A182 and ASME B16.5 grade F304L Class 150, weld-neck or slip-on type as shown on drawings, raised face. Flanges mated to equipment with cast iron flat faced flanges or rubber seated butterfly valves to be flat faced.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class D flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: D3
PRIMARY FLANGE RATING: CLASS 150 ASME B16.9		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	Stainless Steel 304L.
Nuts	All sizes	Stainless Steel 304L.
Submerged Bolts & Nuts	All sizes	Stainless Steel 304L.
Flange Gaskets	75 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges for RF flanges, full face for FF flange, 3 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to be type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 150, stainless steel Type 304L, Teflon O-Ring

SERVICE: Refer to Contract Drawings		LINE CODE: D3
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 304 bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victaulic Style 44 w/ Type "D" Vic-ring. For submerged or buried service coupling to be Stainless Steel Victaulic Style 77S. .3 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "E" EPDM suitable up to 230 deg F or Grade "T" Nitrile.
Thread Compound	As required	Teflon tape.
Plug Valves	All Sizes	Cast iron body and cover, ASTM A126 Class B; Cast iron plug, ASTM A126 Class B, c/w resilient facing, ASTM D2000-BG. Val-Matic or Dezurik.
Ball Valves	50 mm to 32 mm	Crane model 9502.

SERVICE: Refer to Contract Drawings		LINE CODE: D4
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	100 mm & smaller	Stainless Steel, ASTM A312 Type 316L, seamless or straight seam welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A778 Type 316L, seamless or straight seam welded, Schedule 40S
Fittings	100 mm & smaller	Stainless Steel, ASTM A403 Type 316L, welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A774 Type 316L, welded, Schedule 40S
NOTE: 1. All structural penetrations shall consist of a type 316L stainless steel Schedule 40 thimble 2. Elbows to be long radius unless otherwise specified.		
Flanges	650 mm to 900 mm	Stainless steel, ASTM A182 and ASME B16.47 grade F316L Class 150 weld-neck or slip-on type as shown on drawings.
	75 mm to 600 mm	Standard is stainless steel to ASTM A182 and ASME B16.5 grade F316L Class 150, weld-neck or slip-on type as shown on drawings, raised face. Flanges mated to equipment with cast iron flat faced flanges or rubber seated butterfly valves to be flat faced.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class D flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: D4
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	Stainless Steel 316L.
Nuts	All sizes	Stainless Steel 316L.
Submerged Bolts & Nuts	All sizes	Stainless Steel 316L.
Flange Gaskets	75 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges, full face for FF flange, 3 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to be type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 150, stainless steel Type 316L, Teflon O-Ring

SERVICE: Refer to Contract Drawings		LINE CODE: D4
PRIMARY FLANGE RATING: CLASS 150 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 316L bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victaulic Style 44 w/ Type "D" Vic-ring. For submerged or buried service coupling to be Stainless Steel Victaulic Style 77S. .3 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "E" EPDM suitable up to 230 deg F or Grade "T" Nitrle.
Thread Compound	As required	Teflon tape.
Plug Valves	All Sizes	Cast iron body and cover, ASTM A126 Class B; Cast iron plug, ASTM A126 Class B, c/w resilient facing, ASTM D2000-BG. Val-Matic or Dezurik.
Ball Valves	50 mm to 32 mm	Crane model 9502.

SERVICE: Refer to Contract Drawings		LINE CODE: D5
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	100 mm & smaller	Stainless Steel, ASTM A312 Type 304L, seamless or straight seam welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A778 Type 304L, seamless or straight seam welded, Schedule 40S
Fittings	100 mm & smaller	Stainless Steel, ASTM A403 Type 304L, welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A774 Type 304L, welded, Schedule 40S
NOTE: 1. All structural penetrations shall consist of a type 304 stainless steel Schedule 40 thimble 2. Elbows to be long radius unless otherwise specified.		
Flanges	650 mm to 900 mm	Stainless steel, ASTM A182 and ASME B16.47 grade F304L Class 300 weld-neck or slip-on type as shown on drawings.
	75 mm to 600 mm	Standard is stainless steel to ASTM A182 and ASME B16.5 grade F304L Class 300, weld-neck or slip-on type as shown on drawings, raised face. Flanges mated to equipment with cast iron flat faced flanges or rubber seated butterfly valves to be flat faced.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class D flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: D5
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	Stainless Steel 304L.
Nuts	All sizes	Stainless Steel 304L.
Submerged Bolts & Nuts	All sizes	Stainless Steel 304L.
Flange Gaskets	75 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges for RF flanges, full face for FF flange, 3 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to be type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 300, stainless steel Type 304L, Teflon O-Ring

SERVICE: Refer to Contract Drawings		LINE CODE: D5
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 304 bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victaulic Style 44 w/ Type "D" Vic-ring. For submerged or buried service coupling to be Stainless Steel Victaulic Style 77S. .3 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "E" EPDM suitable up to 230 deg F or Grade "T" Nitrle.
Thread Compound	As required	Teflon tape.
Plug Valves	All Sizes	Cast iron body and cover, ASTM A126 Class B; Cast iron plug, ASTM A126 Class B, c/w resilient facing, ASTM D2000-BG. Val-Matic or Dezurik.
Ball Valves	50 mm to 32 mm	Crane model 9502.

SERVICE: Refer to Contract Drawings		LINE CODE: D6
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°c		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	100 mm & smaller	Stainless Steel, ASTM A312 Type 316L, seamless or straight seam welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A778 Type 316L, seamless or straight seam welded, Schedule 40S
Fittings	100 mm & smaller	Stainless Steel, ASTM A403 Type 316L, welded, Schedule 40S
	150 mm & larger	Stainless Steel, ASTM A774 Type 316L, welded, Schedule 40S
NOTE: 1. All structural penetrations shall consist of a type 316L stainless steel Schedule 40S thimble 2. Elbows to be long radius unless otherwise specified.		
Flanges	650 mm to 900 mm	Stainless steel, ASTM A182 and ASME B16.47 grade F316L Class 300 weld-neck or slip-on type as shown on drawings.
	75 mm to 600 mm	Standard is stainless steel to ASTM A182 and ASME B16.5 grade F316L Class 300, weld-neck or slip-on type as shown on drawings, raised face. Flanges mated to equipment with cast iron flat faced flanges or rubber seated butterfly valves to be flat faced.
NOTE: Flanges attached to fittings to be weld neck type equal in material, dimensions and rating to the Class D flange.		

SERVICE: Refer to Contract Drawings		LINE CODE: D6
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Bolts	All sizes	Stainless Steel 316L.
Nuts	All sizes	Stainless Steel 316L.
Submerged Bolts & Nuts	All sizes	Stainless Steel 316L.
Flange Gaskets	75 mm to 250 mm	Red Rubber, ring type for RF flanges, full face for FF flanges, 2 mm thick.
	300 mm to 450 mm	Red Rubber, ring type for RF flanges, full face for FF flange, 3 mm thick.
Cathodically isolating flange kit	All sizes	Gaskets to be type "E", full faced, G-10 or G-11, 3 mm thick, epoxy glass, c/w homogeneous (jointless) nitrile O-rings. Bolt sleeves to be spirally wound mylar materials. Double washers to be G-10 or G-11 epoxy glass backed up with zinc plated steel washers. Pikotek "PGE" WS; PSI, Gasket Seal.
Unions	75 mm & larger	Use Flanges.
	65 mm & smaller	Class 300, stainless steel Type 316L, Teflon O-Ring

SERVICE: Refer to Contract Drawings		LINE CODE: D6
PRIMARY FLANGE RATING: CLASS 300 ASME B16.5		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE: 1.3 mm
ITEM	SIZES	GENERAL DESCRIPTION
Pipe Couplings	65 mm & smaller	Use unions.
	75 mm & larger	The coupling type c/w harness (to AWWA M11) to be as shown on the drawings and to suit outside diameter of pipe (for submerged or buried service use Stainless Steel 316L bolts & nuts). .1 Flexible couplings to be Dresser Style 38, Robar. Couplings to be epoxy coated. .2 Victaulic Style 77 standard weight; Victaulic Style 44 w/ Type "D" Vic-ring. For submerged or buried service coupling to be Stainless Steel Victaulic Style 77S. .3 Use Victaulic adapters, length to suit pipe diameter.
Victaulic Gasket	All Sizes	Grade "E" EPDM suitable up to 230 deg F or Grade "T" Nitrle.
Thread Compound	As required	Teflon tape.
Plug Valves	All Sizes	Cast iron body and cover, ASTM A126 Class B; Cast iron plug, ASTM A126 Class B, c/w resilient facing, ASTM D2000-BG. Val-Matic or Dezurik.
Ball Valves	50 mm to 32 mm	Crane model 9502.

SERVICE: Refer to Contract Drawings		LINE CODE: E1
PRIMARY FLANGE RATING: CSA B181.2		DESIGN PRESSURE: Plumbing Code
TEMPERATURE (MAX): 60°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	40 mm to 200 mm	PVC – DWV to CSA B181.2
Fittings	40 mm to 200 mm	PVC – DWV, Type 1, socket ends.
Joints	All sizes	Solvent cement to conform to CSA B181.2

SERVICE: DR, SW, SV		LINE CODE: E2
PRIMARY FLANGE RATING: CSA B181.2		DESIGN PRESSURE: Plumbing Code
TEMPERATURE (MAX): 60°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Pipe	40 mm to 200 mm	PVC – DWV to CSA B181.2
Fittings	40 mm to 200 mm	PVC – DWV, Type 1, socket ends.
Joints	All sizes	Solvent cement to conform to CSA B181.2

SERVICE: Refer to Contract Drawings		LINE CODE: K1
PRIMARY FLANGE RATING:		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Tubing	6 mm – 25 mm	Polyethylene (PE) OD Tubing. Contractor to field confirm all tubing lengths and suitability for service.
Fittings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Couplings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Adapters	6 mm – 25 mm	Quick-disconnect (push to connect) to NPT threaded adapters with acetal bodies, nitrile, O-rings, acetal collets. NSF approved.
Ball Valves	12 mm – 25 mm	Chemline Type 21 true union ball valves with end connections suitable for connecting to tubing.
Back Pressure Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.
Pressure Relief Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.

SERVICE: Refer to Contract Drawings		LINE CODE: K2
PRIMARY FLANGE RATING:		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Tubing	6 mm – 25 mm	Polyethylene (PE) ID Tubing. Contractor to field confirm all tubing lengths and suitability for service.
Fittings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Couplings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Adapters	6 mm – 25 mm	Quick-disconnect (push to connect) to NPT threaded adapters with acetal bodies, nitrile, O-rings, acetal collets. NSF approved.
Ball Valves	12 mm – 25 mm	Chemline Type 21 true union ball valves with end connections suitable for connecting to tubing.
Back Pressure Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.
Pressure Relief Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.

SERVICE: Refer to Contract Drawings		LINE CODE: K3
PRIMARY FLANGE RATING:		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Tubing	6 mm – 25 mm	Linear Low Density Polyethylene (LLPE) OD Tubing. Contractor to field confirm all tubing lengths and suitability for service. Rated for 150 psi (minimum). Temperature range -40 to +40 degrees Celsius.
Fittings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Couplings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Adapters	6 mm – 25 mm	Quick-disconnect (push to connect) to NPT threaded adapters with acetal bodies, nitrile, O-rings, acetal collets. NSF approved.
Ball Valves	12 mm – 25 mm	Chemline Type 21 true union ball valves with end connections suitable for connecting to tubing.
Back Pressure Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.
Pressure Relief Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.

SERVICE: Refer to Contract Drawings		LINE CODE: K4
PRIMARY FLANGE RATING:		DESIGN PRESSURE:
TEMPERATURE (MAX): 40°C		CORROSION ALLOWANCE:
ITEM	SIZES	GENERAL DESCRIPTION
Tubing	6 mm – 25 mm	Polypropylene (PP) OD Tubing. Contractor to field confirm all tubing lengths and suitability for service. Rated for 150 psi (minimum). Temperature range -40 to +40 degrees Celsius.
Fittings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Couplings	6 mm – 25 mm	Quick-disconnect (push to connect) fittings with acetal bodies, nitrile, O-rings, acetal collets. Rated for 150 psi (minimum)
Adapters	6 mm – 25 mm	Quick-disconnect (push to connect) to NPT threaded adapters with acetal bodies, nitrile, O-rings, acetal collets. NSF approved.
Ball Valves	12 mm – 25 mm	Chemline Type 21 true union ball valves with end connections suitable for connecting to tubing.
Back Pressure Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.
Pressure Relief Valves	12 mm – 25 mm	Chemline SB10/11 series with end connections suitable for connecting to tubing.

END OF SECTION

1. GENERAL

1.1 REFERENCE DOCUMENTS

.1 Pipe supports shall meet the requirements of ANSI/ASME B31.1-1995, Power piping.

.2 Duct hangers shall follow the recommendations of the SMACNA Duct Manuals.

1.2 GENERAL REQUIREMENTS

.1 Provide hangers and supports to secure equipment in place, prevent vibration, maintain grade, provide for expansion and contraction and to accommodate insulation; provide insulation protection saddles.

.2 Install supports of strength and rigidity to suit loading without unduly stressing building. Locate adjacent to equipment to prevent undue stresses in piping and equipment.

.3 Select hangers and supports for the service and in accordance with the manufacturer's recommended maximum loading. Hangers shall have a safety factor of 5 to 1.

.4 Fasten hangers and supports to building steel or inserts in concrete construction.

.5 Provide and set sleeves required for equipment, including openings required for placing equipment.

.6 Dielectrically isolate dissimilar metals.

.7 Pipe, duct and conduit supports are not all necessarily shown on the Contract Drawings. The Contractor is responsible to ensure sufficient supports are supplied, fabricated, and installed to properly secure all pipe, fittings, and equipment to satisfy manufacturer’s recommendations.

1.3 APPROVALS

.1 Obtain approval from the Engineer prior to drilling for inserts and supports for piping systems.

.2 Obtain approval from the Engineer prior to using percussion type fastenings.

.3 Use of perforated band iron, wire or chain as hangers is not permitted.

2. PRODUCTS

2.1 INSERTS

.1 Inserts shall be galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.

.2 Size inserts to suit threaded hanger rods.

2.2 PIPE HANGERS AND SUPPORTS

.1 Hangers: Pipe sizes 15 mm to 40 mm: Adjustable wrought steel ring.

.2 Hangers: Pipe sizes 50 mm to 100 mm and Cold Pipe Sizes 150 mm Over: Adjustable wrought steel clevis.

.3 Hangers: Hot Pipe Sizes 150 mm: Adjustable steel yoke and cast iron roll.

.4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods, cast iron roll and stand for hot pipe sizes 150 mm and over.

.5 Wall Support: Pipe Sizes to 80 mm: Cast iron hook.

.6 Wall Support: Pipe Sizes 100 mm and Over: Welded steel bracket and wrought steel clamp, adjustable steel yoke and cast iron roll for hot pipe sizes 150 mm and over.

.7 Vertical Support: Steel riser clamp.

.8 Floor Support: Pipe Sizes to 100 mm and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and concrete pier to steel support.

.9 Floor Support: Hot Pipe Sizes 150 mm and over: Adjustable cast iron roll and stand, steel screws and concrete pier or steel support.

.10 Design hangers so they cannot become disengaged by movements of supported pipe.

.11 Provide copper plated hangers and supports for copper piping or provide sheet lead packing between hanger or support and piping.

.12 Insulate all piping from dissimilar metal supports.

2.3 HANGER RODS

.1 Provide steel hanger rods, threaded both ends, threaded one end, or continuous threaded.

2.4 DUCT HANGERS AND SUPPORTS

.1 Hangers: Galvanized steel band iron or rolled angle and 10 mm rods.

.2 Wall Supports: Galvanized steel band iron or fabricated angle bracket.

.3 Vertical Support at Floor: Rolled angle.

2.5 FLASHING

.1 Steel Flashing: 0.55 mm galvanized steel.

.2 Lead Flashing: sheet lead, as follows:

- .1 For Waterproofing: 25 kg/m^2.
- .2 For Soundproofing: 5 kg/m^2.
- .3 Lead Sheet Size:
  - .1 Roof Plumbing Vents: as required to provide base flashing overlap to ARCA detail.
  - .2 Floor Drains: minimum 920 x 920 mm and as specified.
  - .3 Other Locations: as specified.

.3 Safes: 25 kg/m^2 sheet lead or 200 micrometre neoprene.

.4 Caps: Steel, 0.70 mm thickness minimum, 1.6 mm thickness at fire resistance structures.

2.6 SLEEVES

.1 Pipes through Floors: Form with 1.2 mm galvanized steel.

.2 Pipes through Beams, Walls, Fire Proofing, Footings, Potentially Wet Floor: Form with steel pipe or 1.2 mm thickness galvanized steel.

.3 Round Ducts: Form sleeves with galvanized steel.

.4 Rectangular Ducts: Form sleeves with galvanized steel or wood.

.5 Size large enough to allow for expansion with continuous insulation.

2.7 FINISHES ON HANGER RODS, HANGERS AND SUPPORTS

.1 All steel hanger rods, hangers and supports shall be galvanized or factory primed with alkyd red oxide primer to CAN/CGSB-1.40-M89.

3. EXECUTION

3.1 INSERTS

.1 Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

.2 Set inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying piping over 100 mm or ducts over 1500 mm wide.

.3 Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

.4 Where inserts are omitted, drill through concrete slab from below and provide rod with recessed square steel plate and nut above slab.

3.2 PIPE HANGERS AND SUPPORTS

.1 Support horizontal steel and copper piping as follows:

Nominal Pipe Size	Distance Between Supports	Hanger Rod Diameter
15 mm	1.8 m	10 mm
20 mm to 40 mm	1.8 m	10 mm
50 mm & 65 mm	3 m	10 mm
80 mm & 100 mm	3.6 m	16 mm
150 mm to 300 mm	4.3 m	22 mm
350 mm to 450 mm	6.1 m	25 mm

.2 Install hangers to provide minimum 12 mm clear space between finished covering and adjacent work.

.3 Place a hanger within 300 mm of each horizontal elbow.

.4 Use hangers which are vertically adjustable 40 mm minimum after piping is erected.

.5 Support horizontal soil pipe near each hub with 1.5 m maximum spacing between hangers.

.6 Support vertical piping at every other floor. Support vertical soil pipe at each floor at hub.

.7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

.8 Where practical, support riser piping independently of connected horizontal piping.

3.3 LOW VELOCITY DUCT HANGERS AND SUPPORTS

.1 Hanger Minimum Sizes:

.1 Up to 750 mm wide: 25 x 1.6 mm at 3 m spacing.
.2 790 to 1200 mm wide: 40 x 1.6 mm at 3 m spacing.

.2 Horizontal Duct on Wall Supports Minimum Sizes:

.1 Up to 450 mm wide: 40 x 1.6 mm or 25 x 25 x 3 mm at 2.4 m spacing.
.2 480 x 1000 mm wide: 40 x 40 x 3 mm at 1.2 m spacing.

.3 Vertical Duct on Wall Supports Minimum Sizes at 3.65 m spacing:

.1 Up to 610 mm wide: 40 x 1.6 mm.
.2 640 to 900 mm wide: 25 x 25 x 3 mm.
.3 940 to 1200 mm wide: 30 x 30 x 3 mm.

.4 Vertical Duct Floor Supports Minimum Sizes, riveted or screwed to ducts:

.1 Up to 1520 mm wide: 40 x 40 x 3 mm.

3.4 EQUIPMENT BASES AND SUPPORTS

.1 Provide for major equipment, reinforced concrete housekeeping bases poured directly on structural floor slab 100 mm thick minimum, extended 100 mm minimum beyond machinery bedplates. Provide templates, anchor bolts and accessories required for mounting and anchoring equipment.

.2 Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

.3 Rigidly anchor ducts and pipes immediately after vibration connections to equipment.

3.5 FLASHING

.1 Flash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.

.2 Flash vent and soil pipes projecting 75 mm minimum above roof membrane with lead worked 25 mm minimum into hub, 200 mm minimum clear on sides. For pipes through outside walls turn flange back into wall and caulk.

.3 Flash floor drains over finished areas with lead minimum 250 mm clear on sides. Fasten flashing to drain clamp device.

.4 Provide curbs for mechanical roof installations, minimum 200 mm high.

.5 Attach counterflashings to mechanical equipment and lap base flashings on roof curbs.

.6 All joints in counterflashings shall be flattened and soldered double seam. Storm collars shall be adjustable to draw tight to pipe with bolts. Caulk around the top edge. Use storm collars above all roof jacks.

.7 Screw vertical flange section of roof jacks to face of curb.

.8 Provide lead flashing around ducts and pipes passing from equipment rooms, installed according to manufacturer's data for sound control.

3.6 SLEEVES

.1 Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

.2 Extend sleeves through potentially wet floors 25 mm above finished floor level. Caulk sleeves full depth and provide floor plate.

.3 Where piping or ductwork passes through floor, ceiling or wall, close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.

.4 Install chrome plated escutcheons where piping passes through finished surfaces.

END OF SECTION

1. GENERAL

1.1 INTENT

.1 The hydrostatic and pressure testing procedures outlined in this section are applicable to all non-buried piping systems. Refer to Section 02520 – Hydrostatic Pressure Testing for buried piping system.

.2 All water retaining or carrying pipes and structures, and all chemical solution components shall be tested for leakage.

.3 Where work is undertaken within existing structures or piping, they shall be leakage/pressure tested and disinfected prior to being put back into operation.

.4 All testing shall be as specified herein or elsewhere in these specifications or as directed by the Owner's Representative.

.5 The Contractor shall furnish the suitable temporary service connections, testing plugs or caps, pressure pumps, pipe connections, gauges, thrust supports, and all other required equipment and labour necessary for filling the pipeline or structure, expelling air, pumping to the required test pressure, and dewatering the line or structure without additional compensation.

1.2 RELATED SECTIONS

.1 Section 15015 – Mechanical General Requirements

.2 Section 15020 – Detailed Piping Specifications

.3 Section 15091 – Disinfection of Water Mains and Water Storage Facilities

1.3 REFERENCE STANDARDS

.1 All materials, equipment, substances, etc. that will come in contact with potable water shall conform to ANSI/NSF standards 60/61 and the manufacturers shall be included on the list of approved manufacturers published by ANSI/NSF.

.2 Hydrostatic testing procedures for PVC pipe systems, as outlined in *AWWA Manual M23 – PVC Pipe –Design and Installation*, latest edition.

.3 Hydrostatic testing procedures for steel pipe systems, as outlined in *AWWA Manual M11 – Steel Pipe – A Guide for Design and Installation*, latest edition.

2. PRODUCTS

2.1 WATER

.1 All water used for the hydrostatic and pressure testing will be made available by the Owner from the distribution system. Pay Owner invoiced costs for water used. The Contractor will not be compensated for any additional water usage costs resulting from a failed test and re-test. All water required for re-testing, following the failure of the initial test, will be supplied by the Owner at the Contractor's expense. The water rate will be based on current commercial rates.

.2 The Contractor shall be responsible for the supply and installation of all temporary pipework, pumps, water trucks or other equipment required to transport the water from the point of supply to the structure or piping to be tested.

.3 The Contractor shall provide the Owner and Owner's Representative with 72 hours of notice of his requirement for water for testing.

3. EXECUTION

3.1 CLEANING

.1 Prior to hydrostatic or pressure testing, all water retaining structures, pipework and conduits shall be thoroughly cleaned. All dirt and loose material shall be removed.

3.2 HYDROSTATIC TESTING OF FIBERGLASS AND OTHER PREFABRICATED RESERVOIRS

.1 An initial hydrostatic test shall be undertaken by the supplier prior to shipping and a certificate supplied to the Owner. A second hydrostatic test shall be completed after installation. Test duration shall be for 24 hours.

.2 The Owner's Representative shall be notified at least 48 hours before any testing begins, and the procedures and leak detection method shall be submitted in writing to the Owner's Representative for his review. Perform test in the presence of Owner's Representative.

.1 If any test shows leakage, or if leaks or persistently damp patches are visible, the structure shall be emptied, carefully examined, and all defects repaired by the method outlined elsewhere in these specifications or by other means approved by the Owner's Representative. Such tests shall be repeated until no leak or persistently damp patches are present.

3.3 HYDROSTATIC TESTING OF WATER RETAINING CONCRETE STRUCTURES

.1 Hydrostatic testing shall be carried out only after the structures have been completely constructed and structural concrete has achieved (28-day) design strength.

.2 Backfilling or damp proofing shall not be started until testing has shown the structures to be watertight.

.3 Prior to commencing the hydrostatic testing of structures, the Contractor shall repair all visible cracks in the walls, roof and floor.

.4 The Owner's Representative shall be notified at least 72 hours before any testing begins, and the procedures and leak detection method shall be submitted in writing to the Owner's Representative for his review. Perform test in the presence of Owner's Representative.

.5 The Contractor shall ensure that the exterior surface of the water retaining structures which are being hydrostatically tested are maintained at a minimum temperature of 5 degrees Celsius during the entire testing period. The cost of heating and hoarding (if required) to achieve this minimum testing temperature shall be borne by the Contractor.

.6 Fill the water retaining structure to overflow level (which will be designated by a mark scored on the tank wall) at a rate of not more than 600mm (2 ft) per day. The test shall begin once the level is at overflow level and continue for 48 hours. Any detectable leakage shall result in a failed test. There shall be no persistent damp areas on exterior walls or visible leakage at any point on the structure and no lowering of the water level during the test period.

.7 If any test shows leakage or if leaks or persistently damp patches are visible, the structure is to be emptied, carefully examined, and all defects repaired by the method outlined elsewhere in these specifications, or by other means approved by the Owner's Representative. Such tests to be repeated until no leak or persistently damp patches are present.

.8 Upon mutual agreement between the Contractor and the Owner's Representative, the reservoir may be backfilled completely before the leakage test is undertaken. The leakage test is to then be performed by filling the structure to overflow elevation and monitoring for leakage over a period of not less than 168 consecutive hours. During this period, there shall be no detectable leakage allowed. If leakage is detected during the test period, the Contractor is responsible for all costs incurred to correct the leakage, including any excavation and backfilling required to facilitate repairs, if necessary.

3.4 PRESSURE TESTING OF PIPING

.1 Pressure testing shall be conducted on the piping to the pressures and durations as follows (or the maximum rated pressure of the pipeline, whichever is less):

.1 Steel pipe systems:
- .1 Test Pressure: 125% of design operating pressure. Minimum test pressure shall not be less than 1,035 kPa.
- .2 Test Duration: 2 Hours

.2 PVC pipe systems:
- .1 Test Pressure: 150% of design operating pressure.
- .2 Test Duration: 2 Hours

.2 Where any section of piping is provided with concrete thrust blocks, do not conduct tests until at least 5 days after placing concrete or 2 days if high early strength concrete is used.

.3 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied, if necessary.

.4 Thoroughly examine exposed parts while under pressure and correct for leakage as necessary. Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.

.5 The amount of leakage during the test period shall be zero. Repeat hydrostatic test until all defects have been corrected and no loss of water is observed**.**

3.5 INSTRUMENTATION PROTECTION

.1 All instruments that have a maximum range of less than the hydrostatic or pneumatic test pressure noted above shall be removed or isolated during the pressure tests. On successful completion of the system test, the pressure shall be lowered to a pressure within the range of the instruments, and the isolated or removed instruments shall then be tested in accordance with other sections of these specifications.

3.6 SAFETY RELIEF VALVES

.1 All safety relief valves for water services shall be supplied with test gauges for hydrostatic testing purposes. Upon completion of the hydrostatic testing, the Contractor shall remove the test gauges and re-pressurize the system to the relieving pressure of the relief valves to ensure that the valves are relieving at their setpoint.

3.7 DEFECTS AND REPAIRS

.1 Defects disclosed in the work shall be made good and retested or the work replaced without additional cost to the Owner.

.2 Repairs to the piping systems shall be made with new material. No caulking of screwed joints, cracks or holes will be accepted. Where it becomes necessary to replace pieces of pipe, such replacements shall be the same lengths as the defective pieces. Where the repairs are required to PVC pipe, the pipe shall be replaced as far as the first detachable fitting in each direction from the defect. Under no circumstances shall a new section of pipe be installed with solvent welded couplings.

.3 Tests shall be repeated after any work has been replaced if, in the judgement of the Owner’s Representative, it is necessary.

.4 All pressure testing shall be done in the presence of the Engineer or Owner’s Representative.

3.8 LEAKAGE TESTING OF CORED PIPE PENETRATIONS THROUGH EXISTING RESERVOIR OR TANK WALLS

.1 Where so directed by the Owner's Representative to undertake coring through existing concrete walls for pipe penetrations, the finished penetration must be tested for leakage.

.2 Any new pipe penetrations cored through existing treated water reservoir exterior walls must be tested for leakage prior to backfilling of the wall penetration.

.3 The affected reservoir cell shall be filled with water and the link sealed pipe penetration shall be monitored for a period of 24 hours. During this period, there shall be no detectable leakage allowed. If leakage is detected during the test period, the Contractor is responsible to make adjustments to correct the leakage until the penetration seal is confirmed to be entirely leak free for a continuous period of 24 hours.

.4 For link sealed pipe penetrations through existing treated water reservoir interior walls, the penetration must be leakage tested by filling the chamber with water on one side of the wall penetration only and monitoring for leakage at the penetration seal for a period of 24 hours.

.5 Failed tests shall be repeated after any adjustments.

.6 All leakage testing shall be done in the presence of the Owner's Representative.

END OF SECTION

1. GENERAL

1.1 INTENT

.1 The disinfection procedures outlined in this section are applicable to water storage facilities and all non-buried piping systems. Refer to Section 02521 – Flushing and Disinfection for buried pipe systems.

.2 Where work is undertaken within existing structures or piping, they shall be pressure tested and disinfected prior to being put back into operation.

.3 All testing and disinfection shall be as specified herein or elsewhere in these specifications or as directed by the Owner's Representative.

.4 The Contractor shall furnish the disinfecting chemicals, suitable temporary service connections, testing plugs or caps, pressure pumps, pipe connections, gauges, thrust supports, and all other required equipment and labour necessary for filling the pipeline or structure, expelling air, and dewatering the line or structure without additional compensation

1.2 RELATED SECTIONS

.1 Section 15015 – Mechanical General Requirements

.2 Section 15020 – Detailed Piping Specifications

.3 Section 15090 – Hydrostatic and Pressure Testing

1.3 REFERENCE STANDARDS

.1 All materials, equipment, substances, etc. that will come in contact with potable water shall conform to ANSI/NSF standards 60/61 and the manufacturers shall be included on the list of approved manufacturers published by ANSI/NSF.

.2 ANSI/AWWA C6561-05 – Disinfecting Water Mains, latest revision.

.3 ANSI/AWWA C652-02 – Disinfection of Water-Storage Facilities, latest revision.

.4 AWWA Manual M12 – Simplified Procedures for Water Examination, latest revision.

2. PRODUCTS

2.1 WATER

.1 All water used for the initial disinfection will be made available by the Owner from the distribution system. Pay Owner invoiced costs for water used. The Contractor will not be compensated for any additional water usage costs resulting from a failed test and re-test. All water required for re-testing, following the failure of the initial test, will be supplied by the Owner at the Contractor's expense. The water rate will be based on current commercial rates.

.2 The Contractor shall be responsible for the supply and installation of all temporary pipework, pumps, water trucks or other equipment required to transport the water from the point of supply to the structure or piping to be disinfected.

.3 Where the Contractor obtains water through a connection to the distribution system, appropriate measures should be undertaken to ensure there is no possibility of cross contamination, including the use of suitable backflow prevention devices.

.4 The Contractor shall provide the Owner and Owner's Representative with 72 hours of notice of his requirement for water for testing.

2.2 CHLORINE

.1 Chlorine used in disinfection to be calcium hypochlorite or sodium hypochlorite which conforms to AWWA B300-10 – Hypochlorites, latest revision.

3. EXECUTION

3.1 CLEANING

.1 Prior to disinfection, all water retaining structures, pipework and conduits shall be thoroughly cleaned. All dirt and loose material shall be removed to the satisfaction of the Owner.

3.2 DISINFECTION OF WATER MAINS

.1 The Contractor is to perform disinfection of potable water mains to the specifications herein, with reference to ANSI/AWWA C651-05, latest revision.

.1 All water mains shall undergo hydrostatic testing prior to disinfection. Refer to Section 15190 – Hydrostatic and Pressure Testing.

.2 Where required, the Contractor shall measure the concentration of free chlorine using approved methods, as detailed in AWWA Manual M12, latest revision.

.3 Chlorination:

.1 Pipework shall be disinfected by adding chlorine or a chlorine compound to the water to produce an initial concentration of not less than 25 mg/L free chlorine. Chlorine concentration is to be measured at regular intervals.

.2 Heavily chlorinated water shall be retained in the pipework for a period of 24 hours. During the 24 hour period, all valves in the piping system shall be operated to ensure all appurtenances have been contacted with the chlorine solution.

.3 Upon the conclusion of the 24 hour period, the Contractor shall measure the chlorine concentration. Measurements shall indicate a concentration of not less than 10 mg/L free chlorine.

.4 Flushing:

.1 Method for system flushing is to be reviewed with the Engineer and approved by the Owner prior to implementation by the Contractor.

.2 At the conclusion of the 24 hour period, the system is to be flushed so as to prevent damage to piping systems which may result from extended periods of contact with the heavily chlorinated solution. Water used for the test shall not be permitted to be used for plant production. The water shall be pumped gradually to the sanitary sewer system so that the rate of discharge is within the capacity of the sewer. If the chlorine residual is above 5 mg/L then it shall be reduced to below 5 mg/L before discharge.

.3 Alternately, chlorinated water used for disinfection may be dechlorinated using sodium bisulfite, or other suitable neutralization chemical. The Contractor shall measure the chlorine concentration to ensure that the chlorine is sufficiently neutralized. Water is then suitable for discharge to storm sewer system. A list of suitable neutralization chemicals is provided as an appendix to ANSI/AWWA C651-05, latest revision.

.5 Bacteriological Testing:

.1 At the completion of disinfection and system flushing, the water main is to be filled with potable water by the Contractor before bacteriological tests are carried out by the Owner.

.2 The Owner shall obtain samples from the disinfected piping system and shall submit to Alberta Health Services for testing, at the Owner's expense. Should the Contractor require immediate results and request that samples be taken to a private, recognized laboratory, the costs associated with bacteriological tests shall be borne by the Contractor.

.3 Do not put system into service until a certificate stating that the water is free from contamination has been issued by Alberta Health Services or a recognized laboratory.

.4 If there is any indication of contamination, the Contractor shall be required to repeat disinfection. This shall be done by the Contractor at his expense under the supervision of the Owner's Representative in accordance with this specification.

3.3 DISINFECTION OF WATER STORAGE FACILITIES

.1 The Contractor is to perform disinfection of potable water storage facilities to the specifications herein, with reference to ANSI/AWWA C652, latest revision.

.1 All water storage facilities shall undergo hydrostatic testing prior to disinfection. Refer to Section 15190 – Hydrostatic and Pressure Testing.

.2 Where required, the Contractor shall measure the concentration of free chlorine using approved methods, as detailed in AWWA Manual M12, latest revision.

.3 Chlorination:

.1 One of the three chlorination methods outlined in this section shall be selected by the Contractor. The Contractor is to review the preferred option with the Engineer prior to implementation.

.2 Chlorination Method 1:

.1 The potable water storage facility is to be filled with potable water to the overflow elevation. The Contractor is to add chlorine to the storage facility such that the free chlorine concentration in the entire facility is not less than 10 mg/L, after a retention period of not less than 24 hour.

.2 Suitable methods for dosing chlorine to the potable water storage facility are outlined in ANSI/AWWA C652, latest revision.

.3 Chlorination Method 2:

.1 All interior surfaces of the potable water storage facility and all permanent equipment and piping that will be in contact with potable water when the storage facility is filled to overflow elevation are to be disinfected by spraying or swabbing the surfaces with a concentrated chlorine/water solution. The minimum chlorine content of water used for spray disinfection shall be 200 mg/L.

.2 Potable water is to be introduced into the water storage facility, up to the overflow elevation.

.3 The Contractor shall sample water and results shall indicate a free chlorine concentration of not less than 2.0 mg/L.

.4 The water storage facility shall remain full to overflow level, in contact with the chlorine solution for a period of not less than 30 minutes.

.4 Chlorination Method 3:

.1 A solution of 50 mg/L free chlorine shall be added to the potable water storage facility, to a level that equates to 5% of the total storage facility volume.

.2 The solution shall be retained in the storage facility for a period of not less than 6 hours.

.3 Potable water is to be introduced to the water storage facility, up to the overflow elevation.

.4 The solution shall be retained in the storage facility for a period of not less than 24 hours.

.4 Flushing:

.1 Method for system flushing is to be reviewed with the Engineer and approved by the Owner prior to implementation by the Contractor.

.2 At the conclusion of the retention periods indicated for each of the chlorination methods, the potable water storage facility is to be flushed to purge the chlorinated water. Water used for the test shall not be permitted to be used for plant or pumping station production. The water shall be pumped gradually to the sanitary sewer system so that the rate of discharge is within the capacity of the sewer. If the chlorine residual is above 5 mg/L then it shall be reduced to below 5 mg/L before discharge.

.3 Alternately to .2, chlorinated water used for disinfection may be dechlorinated using sodium bisulfite, or other suitable neutralization chemical. The Contractor shall measure the chlorine concentration to ensure that the chlorine is sufficiently neutralized. Water is then suitable for discharge to storm sewer system. A list of suitable neutralization chemicals is provided as an appendix to ANSI/AWWA C651-05, latest revision.

.5 Bacteriological Testing:

1 At the completion of disinfection and flushing, the water storage facility is to be filled with potable water by the Contractor before bacteriological tests are carried out by the Owner.

.2 The Owner shall obtain samples from the disinfected storage facility and shall submit to Alberta Health Services for testing, at the Owner's expense. Should the Contractor require immediate results and request that samples be taken to a private, recognized laboratory, the costs associated with bacteriological tests shall be borne by the Contractor.

.3 Do not put system into service until a certificate stating that the water is free from contamination has been issued by Alberta Health Services or a recognized laboratory.

.4 If there is any indication of contamination, the Contractor shall be required to repeat disinfection. This shall be done by the Contractor at his expense under the supervision of the Owner's Representative in accordance with this specification.

3.4 ENTRY INTO EXISTING OR PREVIOUSLY DISINFECTED POTABLE WATER STORAGE STRUCTURES

.1 Where entry is required either into existing potable water retaining structures or piping, or into previously disinfected new structures, the Contractor shall ensure that the following measures are taken.

.1 All personnel shall wear clean, dirt free protective overalls and disinfected, clean rubber footwear. Such footwear shall be reserved solely for use within the affected areas and shall not be worn in undisinfected areas.

.2 All tools and equipment shall be clean, grease free and spray disinfected before use. Equipment which shows evidence of fuel, oil or grease leakage shall not be used.

.3 The immediate area surrounding the access point for the structures concerned shall be cleaned and spray disinfected prior to the start of work. All previously disinfected footwear, tools or equipment removed outside this area of the affected structures shall be redisinfected on return.

.4 Disinfection of footwear, tools, equipment and access area shall be by spraying with a 200 mg/L concentrated chlorine/water solution.

.5 Personnel who show signs of illness shall not work within the affected structures or surrounding access area.

3.5 INSTRUMENTATION PROTECTION

.1 All instrumentation installed on potable water piping systems shall be removed or isolated from the system during the disinfection process. On successful completion of the system disinfection and flushing, the isolated or removed instruments shall then be reintroduced to the system and tested in accordance with other sections of these specifications.

3.6 CLEANING EXISTING LOCATION 4 PUMPING CHAMBER CELL 2 AND EXISTING ELEVATED TREATED WATER STORAGE RESERVOIR CELL 1

.1 Thoroughly clean existing treated water storage reservoir cell 1 and existing pumping chamber cell 2.

.2 Wash down walls and floor using pressure washer. Use specialized Blue Earth Labs Floran Top Ultra cleaning solution c/w Blue Earth Labs Floran Catalyst suitable for potable water applications within the existing reservoir and pumping chamber cells for cleaning. Apply multiple applications as required sufficient to achieve cleaning of reservoir surfaces. Provide removal of any staining or mineral deposits. Any products used to facilitate cleaning of the reservoir must be approved for use with potable water applications to NSF-60 certification. Apply cleaning compounds in accordance to manufacturer's recommendations.

.3 Dispose of wastewater to wastewater drain. De-chlorinate wastewater as required prior to discharge.

.4 Following cleaning, disinfect walls and floor using Chlorination Method 2 per Specification 3.3.

.5 Schedule cleaning of existing reservoir/pumping chamber after coring operations and other activities affecting the cells are complete.

.6 Refer to Section 00800 Maintaining Existing Water Supply regarding maximum duration that existing reservoir or pumping chamber can be taken out of service.

END OF SECTION

1. GENERAL REQUIREMENTS

.1 This specification is to be considered applicable for all electrical drawings and specification related to these contract documents.

2. REGULATORY REQUIREMENTS

.1 Comply with Safety Codes Act and rules and regulations made pursuant thereto, including the Canadian Electrical Code.

.2 Unless otherwise indicated, all references to "Canadian Electrical Code" or "CEC" shall mean the edition of the Canadian Electrical Code, Part I, CSA C22.1, and the variations made thereto by local provincial regulation, which are in force on the date of bid closing for the Contract.

.3 All electrical products shall be tested, certified and labeled in accordance with a certification program accredited by the Standards Council of Canada. Where a product is not so labeled, provide written approval by the authority having jurisdiction.

.4 Submit to authority having jurisdiction and Utility Company, necessary number of drawings and specifications for examination and approval prior to commencement of electrical work. Pay associated fees.

.5 Submit to Owner, copy of electrical permit obtained from authority having jurisdiction.

.6 If authority having jurisdiction conducts an electrical inspection, submit copy of certificate of acceptance provided by authority having jurisdiction.

3. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 Submit shop drawings, product data and samples of equipment and materials. Shop drawings to include but not be limited to the following:

.1 Complete product part numbers for each piece of equipment

.2 Corresponding equipment tag numbers with part numbers

.3 Product specification sheets indicating product features and options

.4 Dimensions in metric measurement (mm or meters)

.5 Weights in metric measurement

.6 Wiring/interconnection diagrams with manufacturer terminals numbers

.7 Any additional information requested by Owner or Owners representative

4. OPERATION AND MAINTENANCE DATA

.1 Provide the following for all systems and components:

.1 Manufacturer's product data, including performance curves, schematics, and wiring diagrams for all electrical control systems.

.2 Manufacturer's installation instructions.

.3 Manufacturer's operation instructions.

.4 Manufacturer's maintenance instructions, including complete parts list for all serviceable components.

.2 Provide a comprehensive list of subcontractors and suppliers who supplied and installed systems and components.

.3 Provide copies of all inspection certification reports from authorities having jurisdiction.

.4 Refer to section 01790 Operation and Maintenance Manuals for additional information.

5. RECORD DRAWINGS

.1 Record actual locations of all pull boxes, panelboards and electrical equipment.

.2 Record any changes to circuit designations.

.3 Include on record drawings, revisions due to engineering change orders, site alterations, additions and field ordered changes made during construction.

.4 Record any changes to control circuit wiring including but not limited to terminal numbering, wire and cable labels, interconnect wiring between equipment.

.5 Record any changes to schedules including panel, luminaire, mechanical, and conduit/cable schedules.

6. COORDINATION

.1 Coordinate work specified in Division 16 with work specified in other Divisions. Ensure that proper arrangements and provisions are made for work specified in Division 16.

7. SOURCE OF SUPPLY

.1 All like materials shall be by a single manufacturer.

8. REFERENCE STANDARDS

.1 Comply with standards of following organizations:

.1 Electrical and Electronic Equipment Manufacturers Association of Canada (EEMAC).

.2 National Electrical Manufacturers Association. (NEMA).

.3 Institute of Electrical and Electronic Engineers (IEEE).

9. PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Refer to Section 01621 for requirements pertaining to product options and substitutions.

10. TESTING

.1 Prior to energizing any portion of the electrical system, perform megger tests on all parts of the distribution system. Results shall meet the requirements of the CEC, authority having jurisdiction and the Contract Documents.

.2 Test results shall be consolidated into a typed report and included in the Operation and Maintenance Manuals.

11. COMMISSIONING

.1 Commission all instruments as described in Section 01810 - Startup and Commissioning.

.2 Retain the services of the equipment Manufacturers Technical Representative as required in each specification section.

.3 Upon completion of construction, all circuits are to be operational and all instruments operating within manufacturer's specifications.

.4 Prior to notifying Owner’s Representatives Commissioning Team to begin commissioning activities, verify all control logic, inputs, and outputs, and complete Record Drawings as described in this section.

.5 Electrical controls, circuits and systems shall be tested by trial operation of control equipment after all wiring is completed to see that each interlock and control function operates in accordance with the contract drawings and the description of operation for the equipment. Where field conditions prevent actual equipment functioning during testing, the contractor shall simulate the intended operating condition in the associated control circuits.

.6 The contractor shall locate the cause of any malfunction and make the necessary wiring and / or equipment changes or corrections to obtain the particular systems intended operation as defined by the contract drawings. Such changes shall be included in the test report.

.7 Control Panels shall be operated through all design functions. This shall include remote operation of all equipment and actuation of alarms and indicating devices according to design requirements.

.8 Complete operation tests shall be given to all relays, and control devices to show that the equipment performs all design functions and meets design and procurement specifications.

.9 During start-up, assist Commissioning Team in debugging system operation and correct any deficiencies and omissions which appear.

12. AMBIENT ENVIRONMENT

.1 Unless otherwise indicated, supply equipment enclosures, boxes, electrical materials and products suitable for ambient environment of the following areas:

	Area	General Classification	Equipment Enclosure Type	Cable / Raceway
1.	Main Floor	Wet	NEMA 3R	Note 1
2.	Mezzanine	Dry	NEMA 1	Note 1

Note 1 Install cables as per drawings.

13. SPECIAL REQUIREMENTS

.1 Delivery, Storage and Handling (Products, Waste Management, Disposal, etc.): Equipment delivered to site to be protected from all-weather elements. Should equipment be exposed to physical or environmental conditions that the equipment is not rated for, it is the contractor's responsibility to ensure the conditions are identified to the manufacturer and remedial action is undertaken according to manufacturer instructions. Contractor to ensure equipment is site tested to confirm equipment still meets all manufacturer and relevant standard requirements.

.2 Touch-up paint to repair any damaged surfaces using manufacturer-furnished paint. Leave remaining touch-up paint with owner.

END OF SECTION

1. GENERAL

1.1 REQUIREMENTS

.1 The Electrical Contractor shall be responsible for the disconnection, removal, relocation, reconnection, etc., of electrical devices, equipment, material, etc., as indicated on the drawings and/or as required by renovations to existing building and the installation of new facilities.

.2 All electrical devices and equipment which are disconnected, removed from service, etc., and which are not reused on the job and not required to be retained by the Owner shall be removed from the site.

2. PRODUCTS

2.1 MANUFACTURERS & COMPONENTS

.1 Manufacturers of existing devices and equipment, where known, are indicated on the drawings or in the specifications.

.2 Material and equipment added in renovation area shall match existing, wherever possible, unless otherwise noted.

3. EXECUTION

3.1 GENERAL

.1 Visit site prior to submitting Tender and make survey of renovation areas. Check out locations and operation of all systems and be aware of all requirements involved in changes and modifications to systems. Consult maintenance staff for any information regarding type and operation of systems. Take into account and allow for all work required to existing facilities to meet requirements as indicated on the drawings and in the specifications.

.2 Check and be aware of work requirements of the project. This includes reading of the specifications and verifying with the General Contractor to ensure that all requirements of the contract are covered and allowed for and that all necessary existing facilities are maintained and operational during construction period.

3.2 DEMOLITION

.1 Provide all labour and equipment required to remove existing electrical facilities in the area to be renovated. All miscellaneous conduit, boxes, wiring, etc., no longer required shall be removed.

.2 The work shall include, but is not necessarily limited to, the following:
- .1 Removal and replacement of the existing breakers.
- .2 Removal and replacement of existing Pumps/Motors.
- .3 Removal and replacement of existing VFDs and Harmonic Filters.
- .4 Removal and replacement of the Power and Control wiring.

Refer to 00800 Supplementary Conditions for details on demolition and modification restrictions for this work.

3.3 PHASING OF WORK

.1 Disconnection, relocation, reconnection, etc. of existing facilities will be required to accommodate phasing of the work and the installation of new facilities. Be aware of all requirements and make all allowances to accommodate these requirements.

3.4 INSTALLATION

.1 Provide all labour and materials required to revise existing electrical facilities as indicated on the drawings and/or as required by building renovations and for installation of new facilities.

.2 Existing facilities shall remain operational as much as possible during construction period. When renovations are complete, all facilities shall be checked and tested and shall be left in a proper working order and to the satisfaction of the Owner and Owner's Representative.

.3 Where walls, ceilings, floors, etc. containing electrical devices, material and equipment, etc., are removed and the deletion of outlets in said areas disrupts service to adjacent devices and equipment, then conduit and wiring shall be provided to pick up adjacent devices and equipment to maintain continuity of service.

END OF SECTION

1. GENERAL

.1 Not applicable.

2. PRODUCTS

2.1 IDENTIFICATION MATERIALS

.1 Lamacoid Nameplates: 3 mm thick plastic engraving sheet, black face, white core (lettering), mechanically attached, sizes as follows:

.1 Size 1: 12 mm high with 5 mm high letters.
.2 Size 2: 20 mm high with 8 mm high letters.
.3 Size 3: 25 mm high with 12 mm high letters.

.2 Wire Identification Materials: Use one of the following:

.1 Heat shrink sleeves, blank.
.2 Clear plastic tape wrap-on strips with white writing section.
.3 Wrap-on strips, pre-numbered.
.4 Slip-on identification bead markers or sleeves, blank or pre-numbered.

.3 Colour Banding Tape: Adhesive backed plastic tape, integrally coloured.

.4 Receptacle Circuit Designations: Clear Adhesive tape with machine printed black lettering.

.5 Armoured Cable Materials:

.1 Lamacoid nameplates with holes drilled at each end to accept zip ties and attached with two zip ties

3. EXECUTION

3.1 COLOUR IDENTIFICATION OF EQUIPMENT

.1 Electrical equipment shall be prefinished in coded colours designating voltage or system, as indicated in Equipment Identification Schedule.

.2 Voltage colour identification for line voltage equipment shall be as follows:

	Voltage	**Colour**
.1	120/208 V or 120/240 V:	Grey
.2	277/480 V:	Grey
.3	347/600 V:	Grey
.4	High voltage (above 750 V):	Brown

3.2 NAMEPLATE IDENTIFICATION OF EQUIPMENT

.1 Identify equipment with lamacoid nameplates, as indicated in Equipment Identification Schedule.

3.3 PANELBOARD DIRECTORIES

.1 Identify loads controlled by each overcurrent protective device in each panelboard, by means of a typewritten panelboard directory.

3.4 COLOUR IDENTIFICATION OF WIRING

.1 Identify No. 2 AWG wiring and smaller by continuous insulation colour.

.2 Identify wiring larger than No. 2 AWG by continuous insulation colour or by colour banding tape applied at each end and at splices.

.3 Colour coding shall be in accordance with Canadian Electrical Code, and as follows:

	Voltage	**Colour**
.1	120/208 V, 3 phase:	Red, black and blue.
.2	120/208 V emergency:	Red, black and blue with yellow tracer.
.3	277/480 V 3 phase:	Red, black and blue.
.4	347/600 V 3 phase:	Red, black and blue.

.4 Where multi-conductor cables are used, use same colour coding system for identification of wiring throughout each system.

.5 Maintain phase sequence and colour coding throughout each system.

3.5 RECEPTACLE IDENTIFICATION

.1 Identify the panel and circuit number(s) of all the new and existing receptacles by attaching a type written label to the top portion of the cover plate.

3.6 MULTIPLE VOLTAGE SOURCES

.1 Where multiple voltage sources are present in one panel, junction box, electrical compartment etc. Provide and install a lamacoid label indicating each voltage and the source panel of that voltage.

3.7 EQUIPMENT IDENTIFICATION SCHEDULE

Equipment	Colour	Nameplate Identification	Lamacoid Nameplate Size
Main Distribution Centre	Voltage Colour	- Building name, consulting engineer, date installed, amperage, voltage	3
		- Main breaker	2
		- Metering cabinet	2
		- Instrument transformer enclosure	2
		- Loads controlled by each overcurrent protective device	1
		- Metering devices	1
Distribution Centres	Voltage Colour	- Distribution centre designation, amperage, and voltage	2
		- Loads controlled by each overcurrent protective device	1
Panelboards	Voltage Colour	- Panelboard designation	2
Motor Control Centres	Voltage Colour	- M.C.C. designation, amperage and voltage	2
		- Motors or loads controlled by each unit and mnemonics	1
		- Relay terminal and transformer compartments	1
Manual Motor Starters	N/A	- Load controlled and mnemonics	1
Ground Bus	N/A	- System Ground	1
On/Off Switches	N/A	- Load controlled	1

cont'd

3.7 EQUIPMENT IDENTIFICATION SCHEDULE (Cont'd)

Equipment	Colour	Nameplate Identification		Lamicoid Nameplate Size
Disconnect Switches, Magnetic Motor Starters and Contactors:	Voltage Colour	-	Voltage and equipment controlled and mnemonics	2
Transformers	Voltage Colour	-	Transformer designation, capacity, secondary and primary voltages	2
Emergency Power Equipment	Voltage Colour	-	Designation and voltage	2
Wireways	N/A	-	Voltage and system designation	2
Line Voltage Cabinets and Enclosures	Voltage Colour	-	Designation and voltage	2
Low Voltage Cabinets and Enclosures	System Colour	-	System name; system name and number if more than one cabinet or enclosure	2
		-	Major components within cabinets and enclosures	1
Communication Outlet and Outlet Assemblies	N/A	-	Outlet Designation	1
Communication Panels	N/A	-	Panel Designation	1
Communication Ports	N/A	-	Port Designation	1

END OF SECTION

1. GENERAL

1.1 REFERENCES

.1 CAN / CSA C22.2 No. 131-M89

1.2 SUBMITTALS

.1 Product Data: Submit for cable, terminations, and accessories.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Protect cable ends from entrance of moisture. Cables affected by moisture ingress shall not be used.

1.4 SPECIAL CONSIDERATIONS

.1 Where conductors are installed in a plenum (combustible or non-combustible) the conductor insulation rating shall be FT-6.

2. PRODUCTS

2.1 BUILDING WIRING

.1 Building Wiring: to CSA C22.2 No. 75-M1983 and as follows:

.1 Conductors: stranded or solid copper for No. 10 AWG and smaller, stranded copper for No. 8 AWG and larger.
.2 Insulation: RW90 X-link.
.3 Insulation Rating: 600V, Sunlight resistant
.4 Sizes: as indicated in Conduit and Cable Schedule.

2.2 CABLES

.1 Type 600V TECK 90 Cable: to CSA C22.2 No. 131-M89 and as follows:

.1 Conductor: copper.
.2 Insulation: cross linked polyethylene (XLP).
.3 Rating: 600V.
.4 Size: as indicated.
.5 Configuration: as indicated.
.6 Inner Jacket: PVC -40°C.
.7 Armour: interlocking aluminum.
.8 Outer Jacket: PVC -40°C, sunlight resistant.
.9 Approvals: hazardous location (HL) rated where required by CEC

.2 Control Cable for Class 2 Remote Control and Signal Circuits:

.1 Conductor: copper.

.2 Insulation: 300 V insulation, rated 60°C.
.3 Configuration: individual conductors twisted together, shielded, and covered with a PVC jacket.
.4 Flame Rating: FT-6

.3 Type (Tray Cable) TC Cable: to CSA C22.2 No. 230 and as follows:

.1 Conductor: copper.
.2 Insulation: cross linked polyethylene (XLP).
.3 Rating: 1000V.
.4 Size: as indicated.
.5 Configuration: as indicated.
.6 Outer Jacket: PVC -40°C.

.4 Type 600V ACIC instrument Cable: to CSA C22.2 No. 239-M91 and as follows:

.1 Conductor: copper.
.2 Insulation: cross linked polyethylene (XLP).
.3 Rating: 600V.
.4 Size: as indicated.
.5 Configuration: Individually foil Shielded Pairs with Overall Shielding
.6 Inner Jacket: PVC -40°C.
.7 Armour: interlocking aluminum.
.8 Outer Jacket: PVC -40°C.

2.3 CONNECTORS

.1 Provide factory fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated.

3. EXECUTION

3.1 WIRING, GENERAL

.1 Splice only in junction or outlet boxes.

.2 Conductor length for parallel circuits shall be identical.

.3 Neatly train and lace conductors inside cabinets, equipment and panelboards.

.4 Provide protection for exposed cables where subject to damage.

3.2 WIRING INSTALLATION IN RACEWAYS

.1 Swab raceway system before installing wiring.

.2 Use pulling lubricant for conductors No. 4 AWG and larger.
.3 Support horizontal runs on cable tray complete with spacers and clamps.

.4 Support vertical runs on channels complete with spacers and clamps.

.5 Use stranded conductors for all connections to motors and vibrating equipment.

3.3 WIRING INSTALLATION IN CABLE TRAYS

.1 All teck cable shall be installed in the cable trays as indicated on the drawings and according to the Canadian Electrical Code.

.2 When running 120VAC and higher cables in the same cable tray as 4-20mA signals, 24VAC, 24VDC and general data cables the 120VAC and greater cables shall be separated from the lower voltage cables via a grounded cable tray barrier.

.3 4-20mA signal cables shall be separated from the 24VAC and 24VDC cables via a grounded cable tray barrier.

.4 Cables of unlike signals and voltages shall cross at 90 degree angles to each other.

.5 Teck cable drops to equipment shall be supported by vertical cable tray risers. Single or double teck cable drops may be run in vertical cantruss.

.6 All power and lighting cables shall be separated in the cable tray according to the Canadian Electrical Code. It will be the responsibility of the Contractor to de-rate and upsize the conductors if the ventilation spacing requirements are not met.

3.4 WIRE CONNECTIONS AND TERMINATIONS

.1 Use solderless pressure connectors with insulated covers for copper wire splices and taps, No. 8 AWG and smaller.

.2 Use insulated spring wire connectors with plastic caps for conductors No. 10 AWG and smaller.

.3 Use split bolt connectors for copper wire splices and taps, No. 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150% of insulation value of conductor.

.4 For high voltage termination provide approved terminations installed in accordance with manufacturers recommendations.

3.5 WIRE SIZE SCHEDULE

.1 Lighting Circuits: No. 12 AWG minimum.

.2 Power Circuits: No. 12 AWG minimum.

.3 Motor Circuits: No. 12 AWG minimum, except as otherwise indicated on drawings or in schedules.

.4 Feeder Circuits: as indicated on drawings or in schedules.

3.6 TESTING PRIOR TO ENERGIZING

.1 See section 16971.

END OF SECTION

1. GENERAL

1.1 PRODUCT DATA

.1 Comply with requirements of Section 16005.

.2 Provide manufacturer's product data for all devices.

.3 Provide following information:

.1 Time current characteristic curves on full size (280 mm x 432 mm) log-log time/current graph paper.
.2 Fault interrupting capability of each device in symmetrical amperes at applied voltage.
.3 Time current curves for all circuit breaker overload, overcurrent and ground current tripping devices.
.4 Current limiting let-through information for HRC fuses in graph form.
.5 Minimum melting and maximum clearing time/current curves for HRC fuses.

1.2 SOURCE OF SUPPLY

.1 Supply all overcurrent protective devices in each of the following categories by a single manufacturer:

.1 Moulded case circuit breakers.
.2 Fuses.

2. PRODUCTS

2.1 MOULDED CASE CIRCUIT BREAKERS - GENERAL

.1 Moulded Case Circuit Breakers: to CAN/CSA-C22.2 No. 5.1-M91.

2.2 BRANCH MOULDED CASE CIRCUIT BREAKERS

.1 Trip Type: thermal/magnetic.

.2 Voltage: as indicated in schedules.

.3 Poles: as indicated in schedules.

.4 Interrupting Capacity: 10,000 symmetrical.

.5 Mounting: bolt-in any position.

.6 Normal operation: in 40°C ambient.

.7 Features:

.1 Thermal and instantaneous magnetic trip.
.2 Trip free, toggle type operation.
.3 Quick-make, quick-break action.
.4 Positive handle trip indication.
.5 Trip rating visible with panel trim installed.

2.3 FEEDER MOULDED CASE CIRCUIT BREAKERS

.1 Trip Type: thermal/magnetic.

.2 Voltage: as indicated in schedules.

.3 Poles: as indicated in schedules.

.4 Interrupting Capacity: 22kAic.

.5 Mounting: bolt-in any position.

.6 Normal operation: in 40°C ambient.

.7 Features:

.1 Thermal and instantaneous magnetic trip.
.2 Trip free, toggle type operation.
.3 Quick-make, quick-break action.
.4 Positive handle trip indication.
.5 Trip rating visible with panel trim installed.
.6 Fixed pad lockable hasp to lockout breaker in the on and off position.
.6 Electronic Long, Short, Instantaneous dial adjustable protection.

2.4 FUSES

.1 Plug and Cartridge Standard (STD) Fuses: to CSA-C22.2 No**.** 59.1-M1987 and as follows:

.1 Standard fuse interrupting ratings: 10 kA symmetrical.
.2 HRC fuses: to CAN/CSA-C22.2 No. 106-M92 and as follows:
  .1 HRC fuse interrupting ratings: 200 kA symmetrical.
  .2 HRC fuse types:
    .1 HRCI-J non-time delay.
    .2 HRCI-J time delay.
    .3 HRCI-R non-time delay.
    .4 HRCI-R time delay.
    .5 HRCII-C (motor protection only).
    .6 HRC-L non-time delay.
    .7 HRC-L time delay.

.3 Voltage: as indicated on drawings.
.4 Ampacity: as indicated in drawings and schedules.

.5 Fuse Types: as indicated on drawings.

3. EXECUTION

3.1 INSTALLATION

.1 Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions.

.2 Fasten overcurrent protective devices without causing mechanical stresses, twisting or misalignment of equipment in final position.

.3 Set field-adjustable trip settings as indicated subsequent to installation.

.4 Overcurrent protective device sizes and identification as specified in respective equipment schedules.

END OF SECTION

1. GENERAL

1.1 RELATED SECTIONS

.1 Start-up and commissioning

1.2 CODES AND STANDARDS

.1 Design and construct the VFD in accordance with the applicable sections of the following standards or as modified in the specification:

.1 ANSI C84.1982 Voltage Ratings for Electric Power Systems and Equipment.
.2 CAN/CSA-C22.2 Industrial Control Equipment No. 14-M91
.3 ANSI C37-90.1-1989 Guide for Surge Withstand Capability Tests.
.4 Equipment shall have CSA approval.
.5 Equipment shall comply with the electrical bylaws of the local electrical authority.
.6 Equipment shall be designed and manufactured in compliance with ISO-9001 quality standards.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01340 (or 01330) - Submittals.

.2 Submit full technical data, service and parts facilities complete with manufacturer's published data.

.3 Full shop drawings to be submitted for VFD equipment, submit as a minimum:

.1 Specification and Data Sheets. Clearly indicate complete part number and associated tag.
.2 Manufacturer's published warranty documents.
.3 Shop drawings showing plan and elevation views with certified overall and interconnection point dimensions.
.4 Interconnection wiring diagrams showing all external connections required; with all field wiring terminals marked in a consistent manner.
.5 Manufacturer's installation instructions.
.6 Complete programming instructions.
.7 Manufacturer's recommended spare parts.
.8 Complete parts list.
.9 Line harmonic distortion calculations for the drive and the motor the drive is controlling.
.10 VFD Manufacturer to provide indication of overcurrent device sizing for line side of the VFD

1.4 COORDINATION

.1 It shall be the responsibility of the Variable Frequency Drive manufacturer to obtain all operating data and operating characteristics of the electric motors and the pump/motor

combinations as may be required to ensure that the VFD's will safely and efficiently drive the intended equipment over the full range of intended operating conditions for the expected service life of 25 years.

2. PRODUCTS

2.1 GENERAL

.1 The Contractor shall ensure full and complete coordination of the drive and motor characteristics which shall include, but not be limited to, the following:

.1 A guarantee that the drive and motor meet the load demands and acceleration requirements of the driven equipment throughout the speed range when the input voltage varies over a range of 10%; and,
.2 Ensuring complete compatibility of the drive's current limit protection with the motor thermal withstand capability.

.2 The drive shall be 97% efficient at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads.

.3 Controlled acceleration and deceleration times, separately adjustable, shall be provided. When requested on the Data Sheet, the vendor shall provide adjustable damping for the response to speed change.

.4 Separately adjustable minimum and maximum frequency limits shall be provided.

.5 The drive shall be capable of regulating the frequency to a +-1% of the setpoint over the full input voltage and ambient temperature operating range.

.6 The vendor data shall indicate the efficiency, power factor, kW output, heat rejection and harmonic distortion of the drive 25%, 50%, 75% and 100% operating points.

.7 Audible noise levels produced by the drive shall be limited 80 dBA sound pressure at one meter, at any point throughout the operating range of the drive.

.8 The drive input shall be protected to withstand surges as defined in ANSI Std. (C37.90.1 - 1989, Guide for Surge Withstand Capability (SWC) Tests.

2.2 FRONT PANEL CONSTRUCTION REQUIREMENTS

.1 Provide the following features as a minimum on the drive enclosure door:

.1 HOA selector switch
.2 Elapsed time meter
.3 Two (2) Pilot lights (Run-Green, Fault-Red)
.4 Digital VFD Display
.5 Equipment limacoid
.7 Removable air intake filters (where required)
.8 Exhaust fan(s) (where required)

.2 All the pilot devices indicated are to be Allen Bradley 800T or Furnas 52

.3 All front panel control and pilot devices to be clearly marked as to operation with 3mm thick, black face, white core, mechanically attached lamacoid nameplates with 8mm high letters.

2.3 CONSTRUCTION REQUIREMENTS

.1 The drive shall be enclosed in:

.1 Separate control panel with the following features:
- .1 Enclosure Rating: Nema 1
- .2 Hinged front door access
- .3 Latch: ¼ turn or 2 point handle latch, bolted covers will not be accepted
- .4 Back pan: Included

.2 The drive shall be complete with cable compartments for connection of incoming and outgoing cables.

.3 When auxiliary cooling is required, the drive shall have fans and the required thermostatic controls for proper operation.

.4 Terminal blocks for control, alarms, metering and diagnostics shall each be readily accessible, grouped and shall be segregated from power devices, for personnel safety.

.5 Each terminal block, fuse, control switch, circuit breaker, auxiliary switch, relay, instrument transformer and other auxiliary component shall be permanently labeled to correspond with the schematics and wiring diagrams.

.6 Line Filtering 5% Line reactors or 3% line reactors and DC link choke to be provided and installed on the line side of each VFD as a minimum and Load filters to be provided and installed as indicated on the contract drawings.

.1 Line reactors and load filters to be installed integral to the same enclosure as the applicable VFD and be clearly marked as to operation.

.7 Line side Passive Harmonic Filter (PHF) to be provided and installed on the line side of VFD as indicated on the contract drawings.

.1 Harmonic filter to be installed integral to the same enclosure as the applicable VFD and be clearly marked as to operation.

- .1 Acceptable manufacturers: TCI, MTE. No alternates.
- .2 Filter connected on the line side of VFD to mitigate harmonic line distortion from the drive to 5% THD or less between 50% and 100% of rated drive load.
- .3 Contactor to disconnect filter capacitors when drive input current is below set threshold.

.4 Current Transformer Relay with adjustable pickup to control capacitor contactor based on drive input current.

.5 Filter properly sized for indicated motor load and drive characteristics.

.6 One Form C contact for PLC input to indicate fault or high temperature condition.

.8 Drive enclosure shall have overcurrent protection as per contract drawings and shall have a local disconnecting means as a minimum. Disconnect or circuit breaker handle shall be accessible from the exterior of the enclosure when the door is closed and be capable of being locked in the off position. Opening the VFD enclosure shall be restricted by the use of a defeater screw, unless switch is in the "Off" position.

2.4 CONTROL FEATURES

.1 The drive shall have, as a minimum discrete/dry contact input connections and circuits within the drive for connection of remote signals as follows:

.1 Drive “enable” permissive signal, normally open contact, operable drive is in remote or local control mode.
.2 Run signal, closed to run, open to stop in remote mode.
.3 Emergency Stop Device (ESD) which will stop the drive in both manual and automatic modes.

.2 The drive shall provide the following relay outputs (form C, rated 2 amp at 120 VAC) as minimum:

.1 Running
.2 In Auto
.3 Fault

.3 The drive shall provide the following isolated analogue outputs (4-20 mA) as minimum:

.1 One (1) programmable to - frequency, speed, current, torque, power.

.4 The drive shall provide the following isolated analogue inputs as a minimum:

.1 4-20mA programmable input for speed set point from the facility control system.
.2 Manual speed adjust device (typ. 0-10VDC).

.5 The diagnostic system shall monitor each alarm and shutdown function and shall display the status of each point on the enclosure front panel.

2.5 PROTECTION SYSTEMS

.1 All power connections, cables and buswork shall be braced to withstand the available asymmetric short circuit current.

.2 The drive shall be equipped with a minimum of 15 ms power loss ride-through capability.

.3 The loss of AC input power longer than 15 ms shall cause the drive to shutdown in an orderly fashion, without causing pulsations in the drive or motor systems.

.4 The drive shall have the capability of being restarted with a remote signal from the PLC control system.

.5 The drive shall not be affected by radio frequencies emitted by portable radios/transmitters.

.6 The drive shall protect itself against the following as a minimum:

.1 Under/over voltage
.2 Overcurrent
.3 Overtemperature
.4 Output short circuit
.5 Output ground fault
.6 Stall

2.6 OPERATING PARAMETERS

.1 The VFD shall be connected and programmed to provide the following control operation as a minimum:

.1 When the HOA selector switch is in the Hand position:

.1 The drive shall not accept start/stop signals or speed control signals from the remote controlling device.

.2 When the HOA selector switch is in the Off position:

.1 The drive shall if running decelerate and come to a stop and while in the Off position and not accept start/stop signals or speed control signals from remote control device

.3 When the HOA selector switch is in the Auto position:

.1 The drive shall not accept start/stop signals or speed control signals as described above when controlled in the Hand position.

.2 While in Auto position, the drive shall be controlled by a remote controlling device, which is typically, but not necessarily a Programmable Logic Controller. The drive shall accept start/stop signals and speed control signals from the remote controlling device.

.2 Questions about the wiring of or operation and control of the VFD's to be addressed to the owners representative prior to commissioning.

.3 Switching the control of the VFD between Hand and Auto operations to be seamless without the requirement of entering extra parameters or operation menus from the keypad of the VFD:

.4 Fault Input: permissive signal from remote device, normally closed or open contact. Drive shuts down and provides fault status upon change of state.

2.7 ACCEPTABLE SUPPLIERS

.1 Qualifications: service and parts facilities in the Province of Alberta with 24 hour service, experienced in installation and operation of VFD's.

.2 Acceptable VFD Manufacturers and models:
- .1 Yaskawa P1000, A1000, GA800
- .2 Mitsubishi FR-A800 Series
- .3 Toshiba AS3 Series
- .4 No alternates.

.3 To maintain uniformity of structures and equipment, the VFD's are to be provided by a single manufacturer.

3. EXECUTION

3.1 INSTALLATION

.1 Install variable speed drives with the assistance of Manufacturer's representative and in accordance with the manufacturer's specifications.

.2 Protect against dust and damage during entire construction period.

.3 After connections have been made, vacuum-clean interior. Hand-clean exterior and touch-up damaged paint.

3.2 STARTUP AND COMMISSIONING

.1 Retain the services of the manufacturer's representative for commissioning of the equipment after installation. Testing to be in accordance with the specifications and shall include but not be limited to:

- .1 All equipment shall be function tested, calibrated and load tested.
- .2 Prior to performing any tests or applying power to the drives, verify all cable and wiring connections as well as equipment setup and mounting arrangement (i.e. Foundation, cable entry, operation of the HMI etc.)
- .3 Verify the interface with the facility's PLC system.
- .4 Provide written report of the commissioning test including all parameter settings.

3.3 WARRANTY

.1 Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment.

.2 The warranty shall include all parts, labor, travel time and expenses.

END OF SECTION

1. GENERAL

.1 Coordinate all startup and testing with section 01810 Startup and Commissioning.

2. PRODUCTS

.1 Not applicable.

3. EXECUTION

3.1 GENERAL

.1 Ensure equipment is properly labeled prior to testing.

.2 Review manufacturer's instructions prior to testing. Testing shall not contravene manufacturer's published recommendations without prior written consent from the manufacturer.

.3 Retain and start equipment in the presence of qualified technical representatives as specified in project documents.

3.2 CONDUCTORS FOR POWER AND CONTROL SYSTEMS LESS THAN 750 VOLTS

.1 Perform visual inspection of all conductors after installation. Ensure conductors are correctly terminated, required clearances are maintained, and insulation is according to contract documents and adequate for application.

.2 Inspect and test all current carrying conductors 3 AWG or larger, all service conductors, and all feeder conductors, in accordance with ANSI/NETA ATS (Latest Edition)-Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems. Testing shall occur after conductors are installed. Pre-installation testing and inspection shall also occur where required. Temporarily disconnect conductors from common terminals and sensitive equipment prior to testing as required.

.3 Ensure bolted connections are properly torqued using a calibrated torque wrench or verified using a low resistance ohmmeter. Re-torque or re-test connections where conductors are removed for any reason after installation.

.4 Continuity tests to ensure correct connection.

.5 Insulation resistance testing (megger test) on each conductor with respect to ground and adjacent conductors Applied potential shall be 500 volts dc for 300-volt rated cable and 1000 volts dc for 600-volt rated cable. Test duration shall be one minute.

3.3 WIRING DEVICES

.1 Test all wiring devices for correct operation and circuitry.

3.4 MOTORS

.1 Prior to starting motors:
- .1 Confirm motor nameplate data with motor starter heater overloads and overcurrent devices.
- .2 Verify rotation.
- .3 Ensure disconnects are installed.
- .4 Confirm labeling of motors, disconnects and starters.
- .5 Confirm operation of connected I/O
- .6 Confirm protection relay settings and operation

3.5 MOTOR CONTROL CENTRES

.1 Ensure all buckets are properly labeled prior to testing.

.2 Ensure bolted connections are properly torqued using a calibrated torque wrench and/or verified using a low resistance ohmmeter. Re-torque or re-test connections where conductors are removed for any reason after installation.

.3 Inspect physical and mechanical condition including anchorage, grounding, area clearances, terminations, and dielectric materials. Check for signs of damage or contamination.

.4 Install all barriers, filters, covers, and required safety devices.

.5 Lockout equipment as required.

END OF SECTION

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