

**Fisheries and Oceans Canada
Atnarko River Development
Water Supply Upgrades**

Specifications

2019



2019-03-01

**Fisheries and Oceans Canada
Atnarko River DFO Site – Water Supply Upgrades**

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Division 01 - General Requirements

**GENERAL
INSTRUCTIONS**

Section 01005

Page 1

- | | | | |
|----|--------------------------|----|--|
| 1. | General | .1 | Not used |
| 2. | Documents Required | .1 | Maintain at job site, one (1) copy of each of the following: <ol style="list-style-type: none">1. Contract Drawings2. Specifications3. Addenda4. Reviewed Shop Drawings5. Change Orders6. Other modifications to Contract7. Field test reports8. All reference standards required by this contract. |
| 3. | Work Schedule | .1 | Submit with Tender, a construction schedule on the "Construction Schedule" form included in the Tender Documents, showing anticipated progress stages and final completion of work within time period required by Contract Documents. The schedule is to be updated monthly or as required by the Departmental Representative. |
| 4. | Contractor's Use of Site | .1 | Do not unreasonably encumber site with materials or equipment. |
| | | .2 | Move stored products or equipment which interfere with operations of Departmental Representative or other contractors. |
| | | .3 | Obtain and pay for use of additional storage or work areas needed for operations. |
| | | .4 | Maintain reasonable access. |
| | | .5 | Maintain a reasonably clean and safe site. |
| 5. | Codes and Standards | .1 | Perform work in accordance with National Building Code of Canada, latest edition, and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply. |
| | | .2 | Observe and enforce construction safety measures required by Canadian Construction Safety Code, Provincial Government, WorkSafeBC, Workplace Hazardous Materials Information System Requirements, |

- including training of all workers on the job site, and municipal status and authorities.
- .3 Meet or exceed requirements of specified standards, codes and referenced documents.
- .4 Where work is situated on land managed by different legislative bodies the contractor will meet the requirements set out by the authorities responsible. In any case of conflict between the requirements set out by the authorized body and these contract documents, the more stringent requirements shall apply.
6. Project Meetings .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.
7. Existing Conditions .1 Inspect surfaces and conditions before commencing work and report defects to the DFO Representative. No work to commence until conditions are acceptable. Commencement of work will indicate acceptance of surfaces and conditions.
8. Setting out of Work .1 Locate and preserve general reference points.
- .2 Employ competent person to lay out work in accordance with control lines and grades provided by Departmental Representative.
- .3 Supply stakes and other survey markers required for this work.
- .4 The detailed layout is the responsibility of the Contractor.
9. Location of Equipment and Fixtures .1 Location of equipment, fixtures and outlets indicated or specified is to be considered as approximate.
10. Additional Drawings .1 Departmental Representative may furnish additional drawings to assist proper execution of work. These drawings will be issued for clarification only. Such drawings shall have same meaning and intent as if they

were included with plans referred to in Article 1 of Articles of Agreement.

11. Relics and Antiquities .1 Relics and antiquities such as cornerstones and similar objects found on site or in buildings to be demolished, shall remain property of the Owner. Protect such articles and request directives from Departmental Representative.
- .2 Give immediate notice to Departmental Representative if evidence of archaeological finds are encountered during construction, and await his written instructions before proceeding with work in that area.
12. Site Maintenance and Clean-up .1 Maintain the working area in an orderly manner and not encumbered with equipment, materials, or debris.
- .2 Clean-up to be a continuing process from the start of the work to final acceptance of the project. At all times, and without further order, keep property on which work is in progress free from accumulations of waste materials or rubbish caused by employees or by the work. Accumulations of waste materials which might constitute a fire hazard will not be permitted. Spillage from the Contractor's hauling vehicles on traveled public or private roads to be promptly cleaned up. On completion of construction, remove all temporary structures, rubbish, and waste materials resulting from construction operations.
13. Ambiguities .1 In the event of discrepancies and ambiguity in the contract document, manufacturers guidelines and relevant provincial and federal regulations the Contractor shall notify the Departmental Representative for clarification. The more stringent requirement shall apply unless otherwise instructed in writing by the Departmental Representative.

END OF SECTION

Part 1 General

1.1 Work Covered by Contract Documents

- .1 Work of this Contract comprises and shall be further identified as “the Work” and shall include the following:
 - .1 Install two new submersible well pumps in two existing 12” diameter casing (well#1 and well#2), including two new pitless units and all the associated equipment.
 - .2 Install a small domestic water pump in well#1 c/w a 29m long Ø25mm water service line to a future building,
 - .3 Connect the pumps to a proposed water supply system, including approximately 68m of Ø200mm PVC pipe, 59m of Ø300mm PVC pipe, 9 m of 150mm pipe and 23m of 50mm pipe c/w a standpipe
 - .4 Associated electrical and control work to be done by others.
 - .5 All work as indicated in the contract drawings and specifications.

1.2 Work Sequence

- .1 Construct Work in a single stage to accommodate Owner's continued use of premises during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3 Maintain fire access/control.

1.3 Contractor Use of Premises

- .1 Unrestricted use of site until Substantial Performance.
- .2 Co-ordinate use of premises under direction of.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.4 Owner Occupancy

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to

minimize conflict and to facilitate Owner usage.

1.5 Existing Services

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 72 hours' notice for necessary interruption of Mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to vehicular traffic and tenant operations.
- .3 Provide alternative routes for personnel and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.
- .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .8 Protect, relocate or Departmental Representative maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 Documents Required

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.

SUMMARY OF WORK

Section 01111

Page 3

- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.

Part 2 Products

2.1 NOT USED

- .1 Not Used

Part 3 Execution

3.1 NOT USED

- .1 Not Used

END OF SECTION

Part 1 General

1.1 Administrative

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

1.2 Shop Drawings and Product Data

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in British Columbia of Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 15 days for Departmental Representative review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.

- .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative review, distribute copies.
- .10 Submit electronic copy and 6 prints of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit 6 electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit 6 copies of test reports for requirements requested in specification Sections and as requested

- by Departmental Representative.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit 6 copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit 6 copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit 6 copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit 3 copies and electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

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- .18 Delete information not applicable to project.
 - .19 Supplement standard information to provide details applicable to project.
 - .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.3 Photographic Documentation

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.

1.4 Certificates and Transcripts

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

Part 2 Products

2.1 NOT USED

- .1 Not Used

Part 3 Execution

3.1 NOT USED

- .1 Not Used

END OF SECTION

PART 1 - GENERAL

- 1.1 General**
- .1 Submit to the Departmental Representative, for review, shop drawings, product data and samples specified.
 - .2 Until submission is reviewed, work involving relevant product may not proceed.
- 1.2 Shop Drawings**
- .1 Drawings to be originals prepared by Contractor, Sub- Contractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate Sections.
 - .2 Identify details by reference to sheet and detail numbers shown on Contract Drawings.
 - .3 Maximum sheet size 860 mm x 1120 mm.
 - .4 Reproductions for submissions: opaque diazo prints, photocopies and original manufacturers' information.
 - .5 Shop Drawings are to be sealed before submission by a Professional Departmental Representative registered in British Columbia.
- 1.3 Product Data**
- .1 Certain Specification Sections, specify that manufacturer's standard schematic drawings, catalogue sheets, diagram, schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings.
 - .2 Above will only be accepted if they conform to the following:
 - .1 Delete information which is not applicable to project.
 - .2 Supplement standard information to provide additional information applicable to project.
 - .3 Show dimensions and clearances required.
 - .4 Show performance characteristics and capacities.
 - .5 Show wiring diagrams and controls.
- 1.4 Coordination of Submissions**
- .1 Review shop drawings, product data and samples prior to submission.

- .2 Verify:
 - .1 Field measurements.
 - .2 Field construction criteria.
 - .3 Catalogue numbers and similar data.
- .3 Coordinate each submission with requirements of work and Contract Documents.
- .4 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review of submission, unless Departmental Representative gives written acceptance of specified deviations.
- .5 Notify Departmental Representative, in writing at time of submission of deviations from requirements of Contract Documents.
- .6 After Departmental Representative's review, distribute copies.

1.5 Submission Requirements

- .1 Schedule submissions at least 14 days before dates reviewed submissions will be needed.
- .2 Accompany submissions with transmittal letter, in duplicate, 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 Submission shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name of:
 - .1 Contractor
 - .2 Sub-Contractor
 - .3 Supplier
 - .4 Manufacturer
 - .5 Separate detailer when pertinent.
- .4 Identification of product or material.
- .5 Relation to adjacent structure or materials.
- .6 Field dimensions, clearly identified as such.

- .7 Specification Section number.
 - .8 Applicable standards, such as CSA or CGSB numbers.
 - .9 Contractor's stamp, initialed or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.
 - .10 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- 1.6 Samples and Mock-ups**
- .1 Submit samples in sizes and quantities specified.
 - .2 Where colour, pattern or texture is criterion, submit full range of samples.
 - .3 Construct field samples and mock-ups at locations acceptable to Departmental Representative.
 - .4 Construct each sample or mock-up complete, including work of all trades required to finish work.
 - .5 Reviewed samples or mock-ups will become standards of workmanship and material against which, installed work will be checked on project.
- 1.7 Distribution of Submittals After Review**
- .1 Distribute copies of shop drawings and product data which carry Departmental Representative's stamp to:
 - .1 Job site file.
 - .2 Record documents file.
 - .3 Other prime Contractors.
 - .4 Sub-Contractor.
 - .5 Supplier.
 - .6 Fabricator
 - .2 Distribute samples as directed.

END OF SECTION

PART 1 - GENERAL

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|------------|---|----|--|
| 1.1 | General | .1 | Not used |
| 1.2 | Related Requirements Specified Elsewhere | .1 | The particular requirements for Inspection and Testing required under this contract is detailed throughout the contract document. |
| 1.3 | Contractor's Responsibilities | .1 | All Inspection and Testing required by the contract document and/or relevant provincial and federal regulations shall be completed by the Contractor at his cost. All inspections and testing shall be carried out by an independent certified testing agency. |
| | | .2 | Supply certifications for all independent testing agencies to the Departmental Representative prior to commencement of work. |
| | | .3 | The Contractor shall promptly provide copies of all inspection and tests to the Departmental Representative. |
| | | .4 | The Contractor shall notify the Departmental Representative at least 48 hours in advance of all testing, for an opportunity to be present. |
| | | .5 | All subsequent work and testing required due to unsatisfactory work shall be completed by the Contractor at his cost. |
| | | .6 | The contractor shall provide access and assistance when additional sampling / testing is required by the Departmental Representative. |

END OF SECTION

PART 1 - GENERAL

- | | | | |
|------------|--|----|--|
| 1.1 | General | .1 | Not used |
| 1.2 | Access | .1 | Provide and maintain adequate access to project site. |
| | | .2 | If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads. |
| 1.3 | Departmental Representative's Site Office | | Not Required. |
| 1.4 | Storage Sheds | .1 | Provide adequate weather tight sheds with raised floors, for storage of materials, tools, and equipment which are subject to damage by weather. |
| 1.5 | Sanitary Facilities | .1 | Provide sanitary facilities for work force in accordance with governing regulations and ordinances. |
| | | .2 | Post notices and take such precautions as required by local health authorities. Keep areas and premises in sanitary condition. |
| 1.6 | Power | .1 | Arrange, pay for and maintain temporary electrical power supply in accordance with governing regulations and ordinances. |
| 1.7 | Water Supply | .1 | Arrange, pay for and maintain temporary water supply in accordance with governing regulations and ordinances. |
| 1.8 | Heating and Ventilating | .1 | Maintain minimum temperature of 10°C or higher where specified as soon as finishing work is commenced and maintained until acceptance of structure by Departmental Representative. |
| | | .2 | Maintain ambient temperature and humidity levels as required for comfort of office personnel. |
| 1.9 | Drainage | .1 | Refer to Section 01575 for site drainage and pumping requirements. |

END OF SECTION

Part 1 General

1.1 Related Requirements

- .1 Section 01 33 00 – SUBMITTAL PROCEDURES.

1.2 Reference Standards

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of British Columbia
 - .1 Workers Compensation Act, RSBC 1996 - Updated 2012.

1.3 Action and Informational Submittals

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 1 weekly submittal to Departmental Representative.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit pies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 3 days.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .10 SPEC NOTE: If there are specific emergency response procedures for the Building, Facility or Site, then the Departmental Representative/DCC Representative or Consultant must provide the Contractor with the details for

consideration of incorporation into the Contractor's on-site Contingency and Emergency Plan as a component of the site specific health and safety plan.

.11 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 Filing of Notice

.1 File Notice of Project with WorkSafeBC authorities prior to beginning of Work.

.2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award. Contractor to submit written acknowledgement to CSST along with Ouverture de Chantier Notice.

.3 Work zone locations include:

.1 Atnarko DFO Site - Contractor to confirm legal address with DFO

.4 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.5 Safety Assessment

.1 Perform site specific safety hazard assessment related to project.

1.6 Meetings

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.7 Regulatory Requirements

.1 Not used.

1.8 Project Site Conditions

.1 Work at site will involve contact with:

.1 Departmental Representative.

1.9 General Requirements

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 Responsibility

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 SPEC NOTE: Use the following paragraph for Construction Projects in the Province of Ontario: N/A

.3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 Compliance Requirements

.1 Comply with Workers Compensation Act, B.C.

.2 Comply with R.S.Q., c. S-2.1, an Act respecting Health and Safety, and c. S-2.1, r.4 Safety Code for the Construction Industry.

.3 Comply with Occupational Health and Safety Regulations, 1996.

.4 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C.

.5 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.12 Unforeseen Hazards

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of BC having jurisdiction and advise the Departmental Representative verbally and in writing.

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise WorkSafeBC and follow procedures in accordance with Acts and Regulations of BC having jurisdiction and advise Departmental Representative verbally and in writing.

Health and Safety Co-Ordinator

- .3 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with the site.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to Departmental Representative and be under direction of the site supervisor.

1.13 Posting of Documents

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of BC having jurisdiction, and in consultation with Departmental Representative.

1.14 Correction of Non Compliance

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 Blasting

- .1 Not used.

1.16 Powder Actuated Device

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.17 Work Stoppage

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

- 1.1 General** .1 Not used
- 1.2 Traffic Management** .1 Traffic management shall comply with the requirements of British Columbia's Ministry of Transport and Infrastructure over the entire contract period, specifically the latest edition of "Traffic Control Manual for Work on Roadway".
- .2 The Contractor shall be responsible for acquiring and compiling with all required permitting required by British Columbia's Ministry of Transport and Infrastructure.
- .3 During progress of the Works, make adequate provision to accommodate normal traffic along streets and highways immediately adjacent to or crossing the Works so as to minimize inconvenience to the general public.
- .4 Inform all owners or occupants of properties where access is affected in advance of proposed works.
- .5 When working on travelled ways:
1. Place equipment in such position as to present a minimum of interference and hazard to the travelling public.
 2. Keep equipment units as close together as working conditions will permit and preferably on same side of travelled way.
 3. Do not leave equipment on travel led way overnight.
 4. Do not close any lanes of road or highway without prior approval of the Departmental Representative. Before re-routing traffic erect suitable signs and devices as approved by the Departmental Representative.
 5. Provide and maintain reasonable road access and egress to property fronting along or in vicinity of work under contract unless approved otherwise by the Departmental Representative.

**** END of SECTION ****

PART 1 - GENERAL

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|-----|------------------------------------|----|--|
| 1.1 | General | .1 | Not used |
| 1.2 | Disposal of Wastes | .1 | All waste and rubbish materials shall be disposed to an approved landfill. Disposal of waste or rubbish material to land or burning will NOT be accepted. |
| | | .2 | Discharge of water containing chlorine or other chemical compounds into waterways is prohibited. |
| 1.3 | Drainage | .1 | Provide temporary drainage and pumping as necessary to keep excavations and site free from surface water and groundwater. |
| | | .2 | Pumping of water containing silt in suspension into waterways, sewer or drainage systems prohibited. |
| | | .3 | The Contractor shall control disposal or runoff of water containing suspended materials or harmful substances in accordance with this contract document and applicable Federal and Provincial standards. |
| 1.4 | Site Clearing and Plant Protection | .1 | Protect trees and plants on site and adjacent properties where indicated. |
| | | .2 | Minimize stripping of topsoil and vegetation. |
| | | .3 | Restrict tree removal to those areas designated by Departmental Representative. |
| 1.5 | Work Adjacent to Waterways | .1 | Prohibit operation of construction equipment in waterways without Departmental Representative's approval and approval of Fisheries authorities. |
| | | .2 | Do not use waterway beds for borrow material. |
| | | .3 | Do not dump excavated fill, waste material or debris in waterways. |
| | | .4 | Design and construct temporary crossings so that minimum erosion is caused to waterways. |
| | | .5 | Do not skid logs or construction materials across waterways. |

- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Blasting under water or within 100 m of indicated spawning beds not permitted.
- 1.6 Erosion and Sedimentation Control
- .1 The Contractor must prepare Erosion and Sedimentation Control Plan and implement siltation control measures for all excavation to minimise siltation of ditches, watercourses and storm water systems.
- .2 Siltation control shall include but not be limited to installation of silt fences and construction of sedimentation ponds as shown in the contract documents. Siltation control shall meet the standards described in Land Development Guidelines for the Protection of Aquatic Habitat published jointly by the BC Ministry of Environment and Department of Fisheries and Oceans. Siltation control measures shall remain in place until completion of construction. Contractor shall implement erosion and sedimentation control measures during the construction process.
- .3 Contractor shall ensure that all works is performed to prevent release of sediment laden or hydrocarbon contaminated (e.g. oil, grease, hydraulic fluid, or fuel) water from the site boundary. This includes ensuring no water flows are pumped or channeled to bypass the sediment control facilities.
- .4 Erosion and sedimentation control measures shall include but not be limited to retention of existing vegetation, installation of silt fences, and construction of settlement ponds. Sedimentation control measures shall remain in place until completion of construction.
- .5 Contractor shall ensure that sediment and hydrocarbon control facilities are frequently visually inspected and repaired as necessary.
- 1.7 Hazardous Materials Handling and Storage
- .1 Hazardous materials including, but not limited to, fuels, bitumens, cement, paints, solvents, cleaners, dust suppressants, used fuel and oil filters, and other construction materials shall be stored and handled to minimize lose and to allow containment and recovery in the event of a spill.

- .2 The Contractor shall designate area(s) for the transfer and temporary storage of hazardous materials and wastes. The designated area(s) shall be used by the Contractor as a transfer and temporary storage area for potentially hazardous materials and wastes. The area(s) shall be clearly labeled and appropriately controlled.
 - .3 The Contractor shall maintain proper Workplace Hazardous Material Information Systems (WHMIS) labels and Material Safety Data Sheets (MSDS) for all hazardous materials used and stored on site.
 - .4 Discharge of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers is prohibited.
 - .5 Discharge of water containing chlorine or other chemical compounds into waterways is prohibited.
- 1.8 Special and General Waste, Rubbish and Garbage
- .1 Special Waste generated in the course of the construction activities shall be handled and disposed of in compliance with the British Columbia Special Waste Regulation. As defined by these regulations, Special Wastes include, but are not limited to, such things as waste asbestos, oils, greases, lubricants, solvents, batteries, polychlorinated biphenyls (PCBs), paints and used spill cleanup materials.
 - .2 When handling, storing, and removing Special Wastes, the Contractor shall maintain the following records: Inventories of types and quantities of Special Wastes generated, stored, or removed; manifests identifying Special Waste haulers and disposal destinations; MSDS and disposal certification documents.
 - .3 Non-hazardous solid wastes, such as but not limited to, waste wood, asphalt, concrete, and metals shall be disposed of at an approved and licensed disposal facility in compliance with the British Columbia Waste Management Act.
 - .4 The Contractor shall establish regular clean up and disposal programs so as to prevent the unnecessary accumulation of excessive solid waste and contain all garbage related to the project.
- 1.9 Equipment Operation
- .1 Contractor shall maintain construction equipment in good condition and free of excess oil and grease.

- .2 Waste oils and other materials related to equipment shall be removed from site upon completion of project.
- .3 Maintenance of equipment shall be confined to specific areas such that spills can be contained and collected before contaminants reach ditches, watercourses, and storm water systems.
- .4 There shall be no discharge of wash water to ditches, watercourses or storm water systems from trucks and equipment related to concrete supply, pumping, or placing equipment.
- .5 Equipment operation shall be limited to hours acceptable to the community.
- .6 Any fuel spills shall be absorbed immediately.
- .7 Contractor shall have fuel absorbents on site and shall deal with any spills which should occur immediately.

1.10 Work Adjacent
to Drainage Courses and
Waterways

- .1 Contractor shall implement siltation control measures for all excavation. Siltation shall include but not be limited to installation of silt fences and construction of sedimentation ponds. Siltation control measures shall remain in place until completion of construction.
- .2 The Contractor must develop and implement an Erosion and Sediment Control Plan and have this plan reviewed by the Departmental Representative prior to site preparation and construction of works involving excavation and fill placement. These facilities must be maintained by the Contractor and be working effectively to control discharges from the site.
- .3 Prohibit operation of construction equipment in waterways without Departmental Representative's approval and approval of Fisheries authorities.
- .4 Do not use waterway beds for borrow material.
- .5 Do not dump excavated fill, waste material or debris in waterways.
- .6 Design and construct temporary crossings so that minimum erosion is caused to waterways.
- .7 Construction and excavation wastes, overburden, soil, or other substances deleterious to aquatic life must be disposed of or placed in such a manner so as to prevent their entry into any ditch, watercourse, or storm water system.

- .8 All excavated material is to be side-cast as far as possible from ditches, trenches, or storm water systems to prevent its re-entry into the watercourse. Spoil must be removed offsite or spread out, levelled and seeded to promote re-vegetation and reduce surface erosion.
 - .9 Do not skid logs or construction materials across waterways.
 - .10 Avoid indicated spawning beds when constructing temporary crossings of waterways.
 - .11 Blasting under water or within 100 m of indicated spawning beds not permitted.
 - .12 Contractor shall remove any equipment from near watercourse area if not required, or broken down.
- 1.11 Revegetation and Site Restoration
- .1 Disturbed areas adjacent to ditches, watercourses and storm water systems shall be re-seeded to prevent surface erosion and/or downstream water quality impacts.
 - .2 Ditches and newly constructed diversion channels shall be seeded and planted with grasses and/or native vegetation, to reduce surface erosion.
- 1.12 Spill Prevention and Emergency Response
- .1 The Contractor shall develop a Spill Prevention and Emergency Response Plan and distribute it to the DFO Representative and Owners of the project prior to commencing any work.
 - .2 The Contractor shall complete a daily visual inspection of all hazardous material and equipment for signs of leakage. Daily visual inspection will include, among other things ensuring that all personal protective equipment and other emergency response equipment is in its place.
 - .3 The Contractor shall maintain a readily available supply of spill emergency response material and equipment on site at all times in effective working condition appropriate to the scale of the project.
 - .4 The Contractor shall deal with any spills which occur immediately.

- .5 The Contractor shall report any environmental incident or spill/release of a substance to the Departmental Representative and to the Provincial Emergency Program of the Ministry of Attorney General in accordance with the Spill Reporting Regulations of the Waste Management Act.

END OF SECTION

PART 1 - GENERAL

- 1.1 General**
- .1 Use new material and equipment unless otherwise specified.
 - .2 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
 - .3 Use products of one manufacturer for equipment or material of some type or classification unless otherwise specified.
- 1.2 Manufacturers' Instructions**
- .1 Unless otherwise specified, comply with manufacturers' latest printed instructions for materials and installation methods.
 - .2 Notify Departmental Representative in writing of any conflict between these Specifications and manufacturers' instructions. Departmental Representative will designate which document is to be followed.
- 1.3 Delivery and Storage**
- .1 Deliver, store, and maintain package material and equipment with manufacturers' seals and labels intact.
 - .2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.
 - .3 Store material and equipment in accordance with supplier's instructions.
 - .4 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use primer or enamel to match original. Do not paint over name plates.
- 1.4 Conformance**
- .1 When material or equipment is specified by standard or performance specifications, upon request of Departmental Representative, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.5 Substitution .1 Not Applicable

END OF SECTION

PART 1 - GENERAL

- 1.1 General .1 Not used

- 1.2 Documents Required .1 Maintain at job site, one (1) copy of each of the following:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed shop drawings.
 - .5 Change orders.
 - .6 Other modifications to Contract.
 - .7 Field test records.

- .2 Maintain documents in clean, dry legible condition.

- .3 Make documents available at all times for inspection by Departmental Representative.

- 1.3 Workmanship Standards .1 Make available on site one (1) copy of each workmanship standard called for under "Reference Standards" in project Specifications.

- 1.4 Record Drawings .1 Departmental Representative will provide two (2) sets of white prints for record drawing purposes.

- .2 Maintain project "as-built" record drawings and record accurately significant deviations from Contract Documents caused by site conditions and changes ordered by Departmental Representative.

- .3 Mark "as-built" changes in red.

- .4 Record following information:
 - .1 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
 - .2 Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - .3 Field changes of dimension and detail.
 - .4 Changes made by Change Order or Field Order.
 - .5 At completion of project and prior to final inspection, neatly transfer "as-built" notations to second set and submit both sets to Departmental Representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 General** .1 Not used
- 1.2 Maintenance Manual** .1 On completion of project, submit to Departmental Representative four (4) copies of Operations Data and Maintenance Manual in English made up as follows:
- .1 Bind data in vinyl hard covered, 3-ring loose leaf binder for 215 x 280 mm size paper.
 - .2 Enclose title sheet, labeled "Operation Data and Maintenance Manual", project name, date, and list of contents.
 - .3 Organize contents into applicable Sections of work to parallel project specification break-down. Mark each Section by labeled tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .2 Include following information plus data specified.
- .1 Maintenance instruction for finished surface and materials.
 - .2 Copy of hardware and paint schedules.
 - .3 Description, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts list. Indicate nameplate information such as make, size, capacity, serial number.
 - .4 Names, addresses and phone numbers of sub-contractors and suppliers.
 - .5 Guarantees, warranties and bonds showing:
 - .1 Name and address of projects.
 - .2 Guarantee commencement date of Final Certificate of Completion.
 - .3 Duration of guarantee.
 - .4 Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
 - .5 Signature and seal of Contractor.
 - .6 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.
- .3 Neatly type lists and notes. Use clear Drawings, diagrams or manufacturers' literature.

- .4 Include one complete set of final shop Drawings bound separately indicating corrections and changes made during fabrication and installation.

**1.3 Maintenance
Materials**

- .1 Where supply of maintenance materials is specified, deliver to Departmental Representative as follows:
 - .1 Materials in unbroken cartons, or if not supplied in cartons, they shall be strongly packaged.
 - .2 Clearly mark as to content.
 - .3 If applicable give colour, room number or area where material used.

END OF SECTION

PART 1 - GENERAL

- 1.1 General** .1 Not used
- 1.2 Description** .1 Commissioning includes the start-up of individual systems and equipment, the start-up of the entire system as a cohesive unit, and the training of operators and turnover of the operating water treatment plant.
.2 Commissioning shall include the General Contractor and all necessary Sub-contractors and/or Suppliers involved in equipment or systems installation.
- 1.3 Related Work Specified Elsewhere** .1 Operations and Maintenance Section 01730
- 1.4 Owners Operators** .1 The contractor shall have the owners operators in attendance at all system start-ups.
.2 The contractor is to facilitate the training of owners operator in accordance with Section 3.4 System Operation.

PART 2 - PRODUCTS

- 1.1 General** .1 Contractor to supply all required equipment and material for startup, commissioning and hand over period of the water supply infrastructure.

PART 3 – EXECUTION

- 3.1 Power Supply** .1 Where modifications and/or additions to existing electrical equipment or apparatus are required, ensure that all changes are made in accordance to CSA 22.2. Obtain CSA re-certification of the modified electrical equipment.
- 3.2 Treatment System** .1 Retain and pay for the services of the authorized manufacturers' representatives to be on-site for the startup of both mechanical and electrical/control systems and operator training.
- 3.3 Supply and distribution** .1 After sterilization of the supply pipe open valve on new supply line to fill storage tank.

- .2 Take records of operation of storage tank sensors at low and high water level.
 - .3 Take records of booster pump, pressure tank and water treatment equipment functioning.
 - .4 Take records of pressure in system before and after treatment.
 - .5 Departmental Representative to be informed if any component is not working as intended.
- 3.4 Maintenance Manual**
- .1 Refer to Section 01730. These manuals to be prepared and reviewed and approved and distributed to the Owner, prior to turn-over.
- 3.5 System Operation**
- .1 The System shall be handed over during a minimum two week period in which the contractor is to facilitate the authorized training of the proposed operator(s) and oversee the initial operation of the system. Ensuring that the system is operating as designed.
 - .2 Substantial Completion under the terms of the contract may be granted after, but not before, the two week hand over period with the owners operators.

***** END OF SECTION *****

Division 02 – Civil Works

PART 1 - GENERAL

- 1.1 **General** .1 Not used
- 1.2 **Description** .1 This section specifies requirements for supplying, producing and placing gravel or quarried stone as a granular sub-base to lines, grades and typical cross-sections indicated on plans or as directed.
- 1.3 **Related Work Specified Elsewhere**
 - .1 Excavation, Trenching and Backfilling Section 02223
 - .2 Granular Base Section 02233

PART 2 - PRODUCTS

- 2.1 **Materials** .1 Granular sub-base material to Section 02225 and following requirements:
 - .1 Gradation to be within following limits when tested to ASTM C136-76 and ASTM C117-80, (AASHTO T11-78 and T27-78) and having a smooth curve without sharp breaks when plotted on a semi-log grading chart to ASTM E11-70 (1977).

ASTM Sieve Designation	% Passing
75 mm	- 100
25 mm	55 - 100
4.75 mm	25 - 100
2.00 mm	15 - 80
0.425 mm	4 - 50
0.075 mm	0 - 8

- .2 Other properties as follows:
 - .1 Liquid Limit: ASTM D423-66(1972) (AASHTO T89-70) Maximum 25
 - .2 Plasticity Index: ASTM D424-59(1971) (AASHTO T90-70) Maximum 6
 - .3 Los Angeles Abrasion: ASTM C131-76 (AASHTO T96-77) Gradation 'A' Max % Loss by Weight 50

PART 3 - EXECUTION

- 3.1 **Inspection of Existing Sub-grade Surface** .1 Do not place granular sub-base until finished sub-grade is inspected and approved.

-
- 3.2 Placing**
- .1 Place material only on a clean, unfrozen surface, properly shaped and compacted and free from snow or ice.
 - .2 Place granular sub-base materials using methods which do not lead to segregation or degradation.
 - .3 Place material in uniform layers not exceeding 200 mm when compacted or to such other depth as approved.
 - .4 Shape each layer to a smooth contour and compact to specified density before the succeeding layer is placed.
 - .5 Remove and replace portion of a layer in which material has become segregated during spreading.
- 3.3 Compacting**
- .1 Compact to a density of not less than 95% maximum dry density in accordance with ASTM D698.
 - .2 Shape and roll alternately to obtain a smooth, even and uniformly compacted sub-base.
 - .3 Apply water as necessary during compaction to obtain specified density. If sub-base is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
 - .4 In areas not accessible to rolling equipment compact to specified density with approved mechanical tampers.
- 3.4 Finish Tolerances**
- .1 Finish compacted surface to within + 25 mm of established grade but not uniformly high or low.
 - .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

- 3.5 Proof Rolling**
- .1 For proof rolling, use a fully loaded tandem dump truck.
 - .2 DFO representative may authorize use of other acceptable proof rolling equipment.
 - .3 Proof roll at level in sub-base indicated. If alternative proof rolling equipment is authorized, DFO representative will determine level of proof rolling.
 - .4 Make passes as directed by DFO representative.
 - .5 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.
- 3.6 Maintenance**
- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by DFO representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 General** .1 The "General Conditions" and "Supplementary General Conditions" shall form part of this section.
- 1.2 Related Work Specified elsewhere** .1 Watermains Section 02555
- 1.3 Definitions**
- .1 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.
- .2 Over-excavation: excavation below design elevation of bottom of specified bedding, and including backfilling of resultant excavation with specified material, as authorized by the Departmental Representative.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- 1.4 Protection of Existing Features** Existing Utility Services
- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .2 Prior to commencing any excavation work, notify applicable owner or authorities, establish location and state of use of buried utilities and structures. Clearly mark such locations to prevent disturbance during work.
- .3 Confirm locations of buried utilities by careful test excavations and/or radio detection equipment.
- .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered. Obtain direction of Departmental Representative before moving or otherwise disturbing utilities or structures.
- .5 Record location of maintained, re-routed and abandoned underground lines.
- .6 Any damage to existing utility services caused by the Contractor shall be rectified by the Contractor at his or her own cost.

EXCAVATION, TRENCHING AND BACKFILLING

Existing Bulding and Surface Features:

- .1 The Contractor and Departmental Representative shall perform a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.
- .2 Protect existing buildings and surface features which may be affected by work from damage while work is in progress and repair damage resulting from work.
- .3 Where excavation necessitates root or branch cutting, do so only with written approval of the Departmental Representative.

1.5 Shoring, Bracing and Underpinning

- .1 Comply with Section 01545 - Safety Requirements and applicable local regulations and to protect existing features.
- .2 Engage services of qualified professional Departmental Representative who is registered in province or territory in which work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for work.
- .3 At least 2 weeks prior to commencing work, submit design and supporting data.
- .4 Design and supporting data submitted to bear the stamp and signature of qualified professional Departmental Representative registered in the Province of British Columbia.
- .5 Professional Departmental Representative responsible for design of temporary structures to submit proof of insurance coverage for professional liability except where Departmental Representative is employee of contractor, in which case contractor shall submit proof that work by professional Departmental Representative is included in contractor's insurance coverage.

1.6 Submission of Imported Material Specifications

- .1 At least one week prior to commencing work, inform the Departmental Representative of proposed source of fill materials, proposed use/location within the contract and provide associated specifications/grading curves for review by the Departmental Representative.

PART 2 - PRODUCTS

2.1 Materials

.1 Approved Trench/Native Material:

.1 Approved trench/native material is selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials

.2 Bedding Material:

- .1 Crushed, pit run or screened stone, gravel or sand consisting of hard durable particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Gradations to be within limits specified when tested to ASTM C136-84a and ASTM C117-84. Sieve sizes to CAN/CGSB-8.1-87 rather than ASTM E11-81.

Sieve Designation		% Passing		
25 mm	[100]	-	-	-
19 mm	[75-100]	-	-	-
12.5 mm	-	-	-	-
9.5 mm	[50-100]	-	-	-
4.75 mm	[30-70]	-	-	-
2.00 mm	[20-45]	-	-	-
0.425 mm	[10-25]	-	-	-
0.180 mm	-	-	-	-
0.075 mm	[3-8]	-	-	-

.3 Imported Granular Fill:

- .1 Crushed, pit run or screened stone, gravel or sand consisting of hard durable particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Gradations to be within limits specified when tested to ASTM C136-84a and ASTM C117-84. Sieve sizes to CAN/CGSB-8.1-87 rather than ASTM E11-81.

Sieve Designation

**EXCAVATION, TRENCHING
AND BACKFILLING**

200 mm	-	-	-	-
75 mm	[100]	-	-	-
50 mm	-	-	-	-
37.5 mm	-	-	-	-
25 mm	[45-100]-	-	-	-
19 mm	-	-	-	-
12.5 mm	-	-	-	-
9.5 mm	-	-	-	-
4.75 mm	[25-70]	-	-	-
2.00 mm	-	-	-	-
0.425 mm	[5-25]	-	-	-
0.180 mm	-	-	-	-
0.075 mm	[0-10]	-	-	-

PART 3 - EXECUTION

- 3.1 Site Preparation**
- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
 - .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.
- 3.2 Stripping of Topsoil**
- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Commence topsoil stripping of areas as directed by the Departmental Representative after area has been cleared of brush, weeds, and grasses and removed from site.
 - .3 Strip topsoil to depths as directed by the Departmental Representative. Avoid mixing topsoil with subsoil.
 - .4 Stockpile in locations as directed by the Departmental Representative. Stockpile height not to exceed 2 m.
 - .5 Dispose of unused topsoil as directed by the Departmental Representative.
- 3.3 Stockpiling**
- .1 Stockpile fill materials in areas designated by the Departmental Representative. Stockpile granular materials in manner to prevent segregation.
 - .2 Protect fill materials from contamination.
- 3.4 Cofferdams, Shoring, Bracing and**

Underpinning

- .1 Construct temporary works to depths, heights and locations as indicated or approved by .
- .2 During backfill operation:
 - .1 Unless otherwise indicated or directed by the Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 300 mm above toe of sheeting.
- .3 When sheeting is required to remain in place, cut off tops at elevations indicated or directed by the Departmental Representative.
- .4 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore water courses to conditions indicated or as directed by the Departmental Representative.

3.5 Excavation

- .1 Excavate to lines, grades, elevations and dimensions as directed by the Departmental Representative.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble, and other obstructions encountered during excavation.
- .3 Excavation must not interfere with normal 45° splay of bearing from bottom of any footing.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw. Seal cuts with approved tree wound dressing.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Dispose of surplus and unsuitable excavated material off site.
- .7 Do not obstruct flow of surface drainage or natural watercourses.

EXCAVATION, TRENCHING AND BACKFILLING

- .8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .9 Notify Departmental Representative when soil at bottom of excavation appears unsuitable and proceed as directed by Departmental Representative.
- .10 Obtain Departmental Representative approval of completed excavation.
- .11 Remove unsuitable material from trench bottom to extent and depth directed by Departmental Representative.
- .12 Where required due to unauthorized over- excavation, correct as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Imported fill compacted to at least 95% maximum density.
 - .3 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

3.6 Backfilling

- .1 Do not proceed with trench backfilling operations until Departmental Representative has inspected installations.
- .2 Do not place backfill in freezing weather without written permission of Departmental Representative.
- .3 Backfilling around pipe and installation:
 - .1 Place bedding and surround material as specified by contract drawings and manufacturers instruction.
 - .2 Place layers simultaneously on sides of installed work to equalize loading.
 - .3 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
- .4 Place backfill material in uniform layers not exceeding 300 mm in thickness up to restoration zone in traveled areas or top of trench in untraveled areas. Compact each layer before placing succeeding layer.

- .5 Compact backfill materials to the following Modified Proctor densities in accordance with ASTM D1557
 - .1 In untraveled areas, to a density at least equal to density of adjacent undisturbed soil.
 - .2 Where any part of the neat trench width is under a traveled area, to a minimum of 95% of maximum laboratory density obtained using ASTM Method D698-70, Method D.
 - .3 Use caution in the pipe bedding zone to avoid damage to the pipeline. Compaction of bedding material to be in accordance with manufacturer's instructions.

**3.8 Inspection
and Testing**

- .1 Testing of materials and compaction will be carried out by a independent testing laboratory, at the cost of the Contractor.
- .2 Perform nuclear densitometer test minimum every 150m length of installed pipe or conduit within road or travelled areas.
- .3 Contractor to pay all costs of testing and re-testing if compaction is below standard.

3.9 Restoration

In untraveled areas:

- .1 Reinstate subbase in accordance with 02222 Granular Subbase specification
- .2 Reinstate base in accordance with 02233 Granular Base specification
- .3 Reinstate pavement to match existing or as otherwise stated on the contract drawings.

In gravel surfaced traveled areas:

- .1 Reinstate sub-base course with approved excavated material similar to the original road surface, or use imported pit-run gravel, as directed by Departmental Representative.
- .2 Gravel or approved material to be 75 mm minus, uniformly graded gravel.
- .3 Gravel sub-base to be 200 mm deep.
- .4 Provide a 100 mm minimum course of 20 mm minus, crushed, base material on the surface.

**EXCAVATION, TRENCHING
AND BACKFILLING**

END OF SECTION

PART 1 - GENERAL

- 1.1 **General** .1 Not used
- 1.2 **Description** .1 This section specifies requirements for supplying, producing and placing crushed gravel or quarried stone as a granular base to lines, grades and typical cross-sections indicated, or as directed.
- 1.3 **Related Work Specified Elsewhere**
 - .1 Excavation, Trenching and Backfilling Section 02223
 - .2 Granular Sub-Base Section 02222

PART 2 - PRODUCTS

- 2.1 **Materials** .1 Granular base material to Section 02225 and following requirements:
 - .1 Gradation to be within following limits when tested to ASTM C136-76 and ASTM C117-80 (AASHTO T11-78 and T27-78) and giving a smooth curve without sharp breaks when plotted on a semi-log grading chart.

ASTM Sieve	%
Passing Designation	
19.0 mm	100
9.5 mm	60 - 100
4.75 mm	40 - 80
2.36 mm	30 - 60
1.18 mm	20 - 40
0.30 mm	8 - 20
0.075 mm	2 - 7

- .2 Liquid Limit:
ASTM D423-66(1972) (AASHTO T89-76) Maximum 25
- .3 Plasticity Index
ASTM D424-59(1971) (AASHTO T90-70) Maximum 6
- .4 Los Angeles Abrasion
ASTM C131-76 (AASHTO T96-77) Gradation 'A'
Max. % loss by weight 45

- .2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- 3.5 Proof Rolling**
- .1 For proof rolling, use a fully loaded tandem axle dump truck.
- .2 DFO representative may authorize use of other acceptable proof rolling equipment.
- .3 Proof roll top of base upon completion of fine grading and compaction.
- .4 Make passes as directed by DFO representative.
- .5 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent directed and replace with new materials in accordance with Section 02222 and Section 02233 at no extra cost.
- 3.6 Maintenance**
- .1 Maintain finished base in a condition conforming to this section until succeeding material is applied or until acceptance.

END OF SECTION

PART 1 - GENERAL

- | | | | | |
|------------|---|----|--|---------------|
| 1.1 | General | .1 | Not used | |
| 1.2 | Description | .1 | This section specifies requirements for constructing manholes, catch basins, and valve chambers shown on the Drawings or as directed by the DFO representative. | |
| 1.3 | Related Work Specified Elsewhere | .1 | Trenching, Backfilling and Restoration | Section 02221 |
| | | .2 | Sanitary Sewers | Section 02517 |
| | | .3 | Concrete | Section 03010 |
| 1.4 | Certification | .1 | Provide DFO representative with certified copy of test results showing materials supplied meet specified requirements. | |
| 1.5 | Scheduling of Work | .1 | Schedule work to minimize interruptions to existing services. | |
| | | .2 | Submit schedule of expected interruptions for approval by the DFO representative and adhere to interruption schedule as approved by the DFO representative. | |
| | | .3 | Notify building occupants a minimum of 24 hours in advance of any interruption in services. | |
| | | .4 | Do not interrupt water service for more than three (3) hours and confine this period between 10:00 and 16:00 hours local time, unless otherwise authorized. | |
| 1.6 | Alternatives | .1 | To promote development and use of new proprietary products to increase efficiency in installation and provide better service life, alternative materials to those specified will be considered if full descriptive data is submitted to the DFO representative in ample time to permit approval without delaying work. | |
| | | .2 | Such data must fully document description and specifications met by such alternative materials including certification from manufacturer that materials meet or exceed requirements for use intended and history, if any, of service in other installations. | |
| | | .3 | Variations to tendered unit price, if any, to be proposed when requesting use of alternative materials. | |

PART 2 - PRODUCTS

- 2.1 Manholes,
Catch Basins
and Valve Chambers**
- .1 Concrete and reinforcing steel to: Section 03010
 - .2 Precast concrete sections: to ASTM C478-75. Ladder rungs to be cast integral with unit; field installation not permitted unless otherwise specified. Monolithic bases not acceptable unless approved by DFO representative.
 - .3 Jointing Materials:
 - .1 Manufacturer's rubber ring gaskets;
 - .2 Mastic joint filler;
 - .3 Cement mortar; or
 - .4 Combination of above types.
 - .4 Mortar: aggregate to CSA A82.56M-1976, masonry cement to CSA A8-1970.
 - .5 Ladder runs: 20 mm diameter deformed billet bars to CSA G30.12M-1977 and CSA G30.13-1972 respectively, hot dipped galvanized after fabrication to CSA G164-1965. Rungs to be safety pattern.
 - .6 Frames, gratings, covers: to plan dimensions and to following requirements:
 - .1 Metal gratings and covers to bear evenly on frames.
 - .2 Gray iron castings to AASHTO M105-76, minimum tensile strength.
 - .3 Castings to be sand blasted or cleaned and ground to eliminate surface imperfections and coated with two applications of approved asphalt coatings.
 - .4 Manhole frames and covers: minimum 215 kg per set. Design and dimensions as shown on Drawings.
 - .5 Covers to be marked as specified or shown on Drawings.
 - .7 Brick: to CSA A82.1-1965, Type 1, Class B.
 - .8 Drop manhole pipe to be same as sewer.
 - .9 Bituminous caulking compound: to CGSB 56-GP-4a.

PART 3 - EXECUTION

- 3.1 Excavation, Backfilling and Restoration**
- .1 Excavation, backfilling and restorations to: Section 02221
 - .2 Excavation requires approval prior to installing manholes, catch basins or valve chambers.
- 3.2 Concrete Works**
- .1 Do concrete work to Section 03010.
 - .2 Position metal inserts to dimensions and details shown.
- 3.3 Installation**
- .1 Construct units as indicated, plumb and true to alignment and grade.
 - .2 Units not to rest upon pipe.
 - .3 Pump manhole excavation dry and remove soft and foreign material before placing concrete base.
 - .4 Cast bottom slabs directly on undisturbed ground or when permitted by DFO representative, set precast concrete slab on 150 mm minimum of well compacted granular material.
 - .5 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab. Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar, or combination thereof.
 - .6 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .7 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
 - .8 For sanitary sewers:
 - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
 - .2 Bench to provide a smooth U-shaped channel. Side height of channel to be full diameter of sewer. Adjacent floor to be sloped at 1 vertically to 10 horizontally. Channels to be curved smoothly. Slope invert to establish sewer grade.
 - .9 Installing units in existing systems:
 - .1 Where a new unit is to be installed within an existing run of pipe, carefully remove that portion of existing

MANHOLES AND CLEANOUTS

- pipe to dimensions required and install new unit as specified.
 - .2 Make joints watertight between new unit and existing pipe.
 - .3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
 - .10 Set frame and cover to required elevation on at least four and not more than six courses of brick. Make brick joints and joint brick to frame with cement mortar, parge and make smooth and watertight.
 - .11 Clean units of debris and foreign materials; remove fins or sharp protuberances.
- 3.4 Adjusting Tops of Existing Units**
- .1 Remove existing gratings and frames and store for re-use at locations designated by DFO representative.
 - .2 Sectional units:
 - .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
 - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.
 - .3 Monolithic units:
 - .1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with:
 - .1 Mortared brick course for 150 mm or less alteration.
 - .2 Cast-in-place concrete.
 - .2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.
 - .3 Install additional manhole ladder rungs in adjusted portion of units as required.
 - .4 Re-use existing gratings and frames.
 - .5 Reset gratings and frames to required elevation on at least four and not more than six courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.
 - .6 Reset gratings and frames to required elevation on full bed of cement mortar, parge and trowel smooth.

END OF SECTION

PART 1 - GENERAL

- | | | | | |
|------------|---|----|---|---------------|
| 1.1 | General | .1 | Not used | |
| 1.2 | Description | .1 | This section specifies requirements for supplying and installing watermains, fittings, services and appurtenances to lines, grades and dimensions shown on the Drawings or as directed by the Departmental Representative. | |
| 1.3 | Related Work Specified Elsewhere | .1 | Trenching, Backfilling and Restoration | Section 02223 |
| | | .2 | Concrete | Section 03010 |
| 1.4 | Certification | .1 | Provide Departmental Representative with certified copy of pipe tests, showing that pipe and gaskets meet specified requirements. | |
| | | .2 | Include manufacturer's drawings and pertinent information and Shop Drawings where required. | |
| 1.5 | Scheduling of Work | .1 | Schedule work to minimize interruptions to existing services. | |
| | | .2 | Submit schedule of expected interruptions for approval by the Departmental Representative and adhere to interruption schedule as approved by the Departmental Representative. | |
| | | .3 | Notify building occupants a minimum of 24 hours in advance of any interruption in services. | |
| | | .4 | Do not interrupt water service for more than 3 hours and confine this period between 10:00 and 16:00 hours local time unless otherwise authorized. | |
| | | .5 | Notify the fire department of any planned or accidental interruption to hydrants. | |
| 1.6 | Alternatives | .1 | To promote development and use of new proprietary products to increase efficiency in installation and provide better service life, alternative materials to those specified will be considered if full descriptive data is submitted to the Departmental Representative in ample time to permit approval without delaying work. | |

- .2 Such data must fully document description and specifications met by such alternative materials including certification from manufacturer that materials meet or exceed requirements for use intended and history, if any, of service in other installations.
- .3 Variations to tendered unit price, if any, to be proposed when requesting use of alternative materials.

PART 2 - PRODUCTS

2.1 Pipe and Fittings

- .1 Latest revision of all referenced specifications to govern.
- .2 Ductile iron pipe: to AWWA C151 (latest edition), cement mortar lined to AWWA C104 (latest edition).
 - .1 Joints:
 - .1 Mechanical, rubber gaskets with lead tip and double duck backing.
 - .2 Push-on joint with continuous rubber molded ring gasket.
 - .3 Grooved type coupling joint with malleable iron couplings and gaskets.
 - .4 Ensure electrical conductivity across joints.
 - .2 Fittings: to AWWA C110 (latest edition).
 - .3 Polyvinylchloride pressure pipe:
 - .1 Polyvinylchloride class rated pipe: to AWWA C900 (latest edition).
 - .2 Polyvinylchloride series rated pipe: to CSA B137.3 (latest edition).
 - .3 Ductile iron fittings: to AWWA C153 (latest edition).
 - .4 Joints: to be of the elastomeric gasket form.
 - .4 Polyethylene pressure pipe: nominal diameter less than 90 mm to CSA B137.1 (latest edition). Nominal diameter 90 mm or greater to CGSB 41-GP-25M.
 - .1 Polyethylene pipe sizes to be Iron Pipe Size (IPS) outside diameter.
 - .2 Insulation where called for to be 50 mm thick. Insulation to be jacketed in HDPE suitable for continuous exposure to sunlight.

-
- .3 Polyethylene to polyethylene joints: to be thermal butt fusion or to AWWA C207 (latest edition) flanged with steel backing flanges.
 - .4 Cast iron fittings with flanged ends: to AWWA C110 (latest edition) for pipe size above 90 mm. Ends flanged to meet ANSI B16.1 (latest edition), 1 725 kPa flanges do not match AWWA C110 (latest edition) flanges and special order must be made if a match to ANSI B16.1 (latest edition), 1 725 kPa flange is required. AWWA C110 (latest edition) flanges are rated for 1 725 kPa water service working pressure.
 - .5 Polyethylene fittings: to CSA B137.1 (latest edition) for pipe sizes less than 90 mm.
- .5 Steel water pipe: to AWWA C200 (latest edition).
 - .1 Exterior finish: to AWWA C203 (latest edition), hot applied coal tar enamel.
 - .2 Interior finish: to AWWA C205 (latest edition), cement mortar lined, or coal-tar epoxy to AWWA C210.
 - .3 Pipe joints: to be mechanical joints, field welded slip joints, butt welded joints, field welded butt straps, flanged joints, threaded joints and grooved victaulic couplings.
 - .4 Flanges: to AWWA C207(latest edition).
 - .5 Pipe fittings: to AWWA C208 (latest edition), cement mortar lined to AWWA C205 (latest edition), and exterior protected with hot applied coal tar enamel to AWWA C203-89.
- 2.2 Valves and Valve Boxes**
- .1 Gate valves: iron body, bronze mounted, to AWWA C500 (latest edition).
 - .1 Valves to be solid wedge gate with non-rising stems.
 - .2 Ends to be flanged at junctions with cast iron fittings.
 - .3 Ends to be bell or mechanical at junctions with pipe. Joints to be formed with a mechanical seal equivalent to pipe joint.
 - .4 Position of the valve in line to be vertical.
 - .5 Stem seal: O-ring or stuffing box type.
 - .6 Valves to open on counter-clockwise rotation of the wrench nut.
-

- .7 Extension pieces to be used where valve bury is deeper than 1.5 m.
- .8 Thrust blocking to be provided on all valves.
- .2 Valves: to open in direction corresponding to local standard. Counter-clockwise where no local standard.
- .3 Cast iron valve boxes: Nelson type adjustable over a minimum of 450 mm, complete with valve operating extension rod, 30 mm diameter, of such length that when set on valve operating nut top of rod will not be more than 300 mm below cover. Provide stone ring beneath operating nut. Base to be large round type with minimum diameter of 300 mm. Top of box to be marked "WATER".
- .4 Underground type indicator valve where required by Departmental Representative. Indicator post to accurately indicate position of valve.
- .5 Air release valves: air release valves employing direct acting kinetic principle. Valves to be fabricated of cast iron body and cover with bronze trim, stainless steel floats with shockproof synthetic seat. Ends to be flanged to AWWA C110 (latest edition).
- 2.3 Service Connections**
 - .1 Copper tubing: To CSA Hc7.6 (latest edition), Type K, annealed, for 1 MPa working pressure.
 - .2 Copper pipe joints: To be of compression type suitable for 1 MPA working pressure.
 - .3 Brass corporation stops: red brass to ASTM B62 (latest edition), compression type, having threads to AWWA C800 (latest edition).
 - .4 Brass inverted key-type curb stops: red brass to ASTM B62 (latest edition) compression type without drains. Curb stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury. Mark top of cast iron box "WATER".
 - .5 Double strap service clamps.
 - .6 Appropriate sized "tee" connections for services larger than sizes permitted for direct tap or service clamps. Tee connections to be fabricated of same material and to

same standards as specified pipe fittings and have ends matching pipe to which they are joined.

- .7 Pressure Reducing Valves to be Watts No. 5U with inlet and outlet threaded to suit individual services applications, if called for on the Drawings.

2.4 Hydrants

- .1 Post type hydrants: to AWWA C502 (latest edition) with 65 mm threaded hose outlets, and 150 mm connection for main. Depth of bury as shown on Standard Detail.
 - .1 Hydrants to be painted red above ground.
 - .2 Hydrants to be Terminal City C-71 with pumper port as manufactured by Terminal City Ironworks with clockwise opening and standard pentagon operating nut, or equal.

2.5 Granular Bedding

- .1 Shall be in accordance with 02223 Excavation, Trenching and Backfilling specification.
- .2 Concrete required for cradles, encasement, supports, reaction backing: to Section 03010.

2.6 Chlorine

- .1 Disinfection of watermain shall conform to AWWA C601 (latest edition). Granular hypochlorite shall not be used for disinfection of PVC with solvent welded joints as there may be a potentially explosive reaction.

PART 3 - EXECUTION

3.1 Preparation

- .1 Clean pipes, fittings, valves, hydrants and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects. Remove defective materials from site.

3.2 Trenching, Backfilling and Restoration

- .1 Trenching, Backfilling and Restoration to Section 02221.

3.3 Concrete Bedding and Encasement

- .1 Do concrete work to Section 03010. Place as indicated or directed.
- .2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipes to prevent flotation when concrete is placed.

- .3 Do not backfill over concrete within 24 hours after placement.
- 3.4 Pipe Bedding**
- .1 Place and compact granular bedding to dimensions indicated and provide continuous even support beneath and around the pipe.
- .2 Use bedding material as pipe support during laying and jointing.
- .3 Provide 100 mm (150 mm on rock) minimum bedding material beneath, 200 mm minimum around both sides of pipe and 300 mm above top of pipe as standard trench detail.
- .4 Under wet laying conditions use bedding stone.
- .5 Compact full width of pipe zone to at least 95% maximum density as per ASTM Standard D698 (latest edition), Method D.
- 3.5 Pipe Installation**
- .1 Lay pipes to AWWA C600 (latest edition) for cast iron and ductile iron pipe, and/or manufacturer's standard instructions and specifications. Do not use blocks except as permitted in 3.3.2. Contract bedding details shall govern.
- .2 Joint pipes to AWWA C600 (latest edition), AWWA C603 (latest edition), AWWA C206 (latest edition), and/or manufacturer's recommendations.
- .3 Handle pipe by approved methods. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends.
- .4 Lay pipes true to line and grade. Take up and replace defective pipe. Relay pipe which shows undue settlement after installation.
- .5 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends upgrade.
- .6 Joint deflection to be not more than half the pipe manufacturer's recommended maximum deflection.

- .7 Protect installed pipes from ingress of dirt and water or other foreign materials. Whenever work is suspended, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Position and joint pipes with approved equipment. Do not use excavating equipment to force pipe sections together.
- .9 Cut pipes as required for special fittings or closure pieces, in a neat manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.
- .10 Align pipes carefully before jointing.
- .11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .12 Maintain pipe joints clean and free from foreign materials.
- .13 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed to be removed, cleaned, lubricated and replaced before jointing is attempted.
- .14 Complete each joint before laying next length of pipe.
- .15 Minimize deflection after joint has been made to avoid damage.
- .16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .17 Block pipes when stoppage of work occurs, in an approved manner to prevent creep during downtime.
- .18 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .19 Do not lay pipes when conditions are such that water may enter pipe.
- .20 Do not lay pipe on frozen bedding.

- .21 Protect pipework, hydrants, valves and appurtenances from freezing.
- .22 Upon completion of pipe laying and after the Departmental Representative has inspected work in place, surround and cover pipes with specified material placed to dimensions indicated or directed.

3.6 Valve Installation

- .1 Mount valves to manufacturer's recommendations in locations indicated.
- .2 Support valves located in valve boxes or valve chambers by means of a concrete block, located between valve and solid ground. Valves not to be supported by pipe.
- .3 Install 100 mm x 100 mm x 240 mm pressure treated wood post to mark location of valve box, if required by drawings. Align front face of post toward valve box and write distance to valve box on front face, using white enamel paint. Set post into concrete, 600 mm deep.

3.7 Service Connections

- .1 Construct service connections at right angles to watermain unless otherwise directed. Locate curb stops 300 mm from all existing houses, or as shown on the Drawings.
- .2 Tappings on cast iron or ductile iron pipe may be threaded without service clamps. Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used. Tappings to conform to the following:

Pipe Diameter	Maximum Tap Without Clamp	Maximum Tap With Clamp
100 mm	20 mm	25 mm
150 mm	20 mm	40 mm
200 mm	25 mm	50 mm
250 mm	25 mm	50 mm
300 mm	40 mm	75 mm

- .3 Tappings on PVC pipe to be either PVC valve tees or bronze type service clamps. Service clamps shall have maximum outlet size 25 mm for pipe diameter 100 mm, 40 mm for pipe diameter 150 mm and 50 mm for pipe diameter 200 mm and greater. For larger services use valve tees.
- .4 Tappings for PE pipe shall be PE tapping tees.
- .5 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.
- .6 Tap main at 2:00 o'clock or 10:00 o'clock position only, not closer to a joint nor closer to adjacent service connections than recommended by manufacturer, or 1000 mm, whichever is greater.
- .7 Leave corporation stop valves fully open.
- .8 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
- .9 Install rigid stainless steel liners in small diameter plastic pipes with compression fittings.
- .10 Install curb stop with corporation box on services 50 mm or less in diameter. Equip larger services with a gate valve and cast iron box. Set box plumb over stop and adjust top flush with final grade elevation. Leave curb stop valves fully closed.
- .11 Place temporary location marker at ends of plugged or capped unconnected waterlines. Each marker to consist of a 50 mm by 100 mm stake extending from pipe end at pipe level to 60 mm above grade. Paint exposed portion of stake blue with designation "WATER SERVICE LINE".

3.8 Hydrants

- .1 Install hydrants at locations indicated or directed.
- .2 Install hydrants in accordance with AWWA Manual of Practice M-17 (latest edition).
- .3 Install gate valve and cast iron valve box on hydrant service leads as indicated.

- .4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation 75 mm above final grading in paved areas and 150 mm in unpaved areas.
- .5 Place concrete reaction backing as indicated and specified herein, ensuring that drain holes are unobstructed.
- .6 To provide proper draining for each hydrant, excavate a pit measuring not less than 1 meter by 1 meter by 50 mm deep and backfill with coarse gravel or crushed rock to a level 150 mm above drain holes, unless indicated otherwise on drawings.
- .7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.9 Thrust Blocks

- .1 Do concrete work to Section 03010.
- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and solid ground as shown on Drawings or as directed by the Departmental Representative.
- .3 Keep joints and couplings free of concrete.

3.10 Undercrossing

- .1 Excavate working pit outside right-of-way to be crossed.
- .2 Excavate working pit to a minimum of 50 mm below lowest invert of encasing pipe or structure.
- .3 Dewater excavation.
- .4 Dewater area of undercrossing.
- .5 Install heavy timber or steel frame backstop.
- .6 Place encasing pipe to exact line and grade indicated. Where practical, use 90 degree crossing. Crossing shall never be less than 45 degrees. When encasement pipe not required, delete 3.11.7 to 3.11.9 and 3.11.11 to 3.11.13.

- .7 Install encasing pipe by jacking, boring or tunneling as indicated on Drawings.
- .8 Encasing pipe not to be in tension.
- .9 Joints for encasing pipe to be welded type.
- .10 Provide Shop Drawings showing proposed method of installation for carrier pipe.
- .11 Use approved blocking method to guide carrier pipe in true alignment.
- .12 Clearance between blocks and encasement pipe to be maximum 10 mm when carrier pipe is in position.
- .13 Join carrier pipe one length at a time outside encasement pipe. Push or pull carrier pipe into position.

3.11 Hydrostatic and Leakage Testing

- .1 Upon completion of construction of any section, which shall be defined as that pipeline and appurtenances located between any two adjacent line valves, make section ready for testing. Carry out testing in accordance with point 2 of this Section .
- . 2 Before pipe is filled with water, pipe bedding, concreting of all valves and fittings and backfilling to be completed as required in this specification. Fill each section of pipe and allow to remain full of water for a period of at least 24 hours prior to commencement of any pressure tests. Submit pipeline to a test of 1.5 x working pressure applied at highest elevation in each section, with a minimum of 1380 kPa applied at lowest point of test section. Ensure that test pressure does not exceed pipe or thrust restraint design pressures. Maximum allowable leakage rate at test pressure to not exceed 1.25 litres per millimetre diameter of pipe per kilometre per 24 hour period . Minimum duration of test period to be 2 hours. Maximum test pressures should not exceed those specified in CSA B137.3.
- . 3 Perform pressure and leakage testing of ductile iron piping to AWW C600 and AWWA M41.
- .4 Perform pressure and leakage testing of polyvinyl chloride (PVC) piping to AWWA M23 and AWWA C605

- . 5 Perform testing of welded steel piping to AWWA C206 no leakage allowed .
- . 6 Should any test disclose excessive leakage, repair or replace defect and retest section until specified testing requirement is achieved .

3.12 Flushing and Disinfection

- .1 Do in accordance with AWWA-C601-81 or latest revision.
- .2 Flushing and disinfection operations to be under direct control of Departmental Representative. Notify Departmental Representative at least four (4) days in advance of proposed date when disinfection operations to commence.
- .3 Flush water mains through outlets as directed by Departmental Representative. Use sufficient flow to produce a velocity of 1.5 m per second, for 10 min., or until foreign materials have been removed and flushed water is clear.

.4 Flushing flows to be as follows:

Pipe Size (mm)	Flow (L/s) Minimum
150 and below	38
200	75
250	115
300	150

- .5 Provide connections and pumps required.
- .6 Open and close valves, hydrants, and service connections to ensure thorough flushing.
- .7 When flushing has been completed to satisfaction of Departmental Representative, introduce a strong solution of chlorine into watermain and ensure that it is distributed throughout entire system.
- .8 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.

- .9 After free chlorine residual not less than 25 mg/l has been obtained, leave system charged with chlorine solution for 24 hours. Further samples to be taken to ensure that there is still not less than 10 mg/l of chlorine residual throughout system.
- .10 After chlorination, thoroughly flush system at discharge locations directed by Departmental Representative, avoiding environmental damage.
- .11 After flushing, take at least one sample at the end of each main and branch. Samples to be taken from main stop and copper service line or blow-off. Do not take samples from hydrants or hoses of any kind.
- .12 Samples to be taken in sterilized sample bottles in accordance with the instructions of the Environmental Health Officer, Medical Services, Health & Welfare Canada. Submit for analysis to approved testing laboratory. Samples to show absence of coliform bacteria.
- .13 If sample results are unsatisfactory, flush, chlorinate and sample system until results are satisfactory, or until approved by the Environmental Health Officer.

END OF SECTION

Division 03 – Concrete

PART 1 - GENERAL

- | | | | |
|------------|---|-----------|---|
| 1.1 | General | .1 | Not Used |
| 1.2 | Description | .1 | This section specifies requirements for all plain and reinforced cast-in-place concrete as described herein and as shown on the Drawings, or reasonably implied to provide a complete structure. |
| 1.3 | Reference Standards | .1 | <p>Do cast-in-place concrete work in accordance with the latest issues of:</p> <ul style="list-style-type: none"> .1 CSA CAN3-A23.1-M - Concrete Materials and Methods of Concrete Construction. .2 CSA CAN3-A23.2-M - Methods of Test for Concrete. .3 CSA CAN3-A23.3-M - Code for the Design of Concrete Structures for Buildings. <p>.2 Keep a copy of the above CSA Standards on site for the duration of the work. "Standard" referred to later in this Specification means these CSA Standards.</p> |
| 1.4 | Related Work Specified Elsewhere | .1 | Not Applicable |
| 1.5 | Mix Design | .1 | Submit certified copy of mix design showing concrete mix design conforming to specified requirements. |
| 1.6 | Measurement and Payment | .1 | See the Tender Form - Schedule 3, Unit Measurement and Payment. |

PART 2 - PRODUCTS

- | | | | |
|------------|------------------|-----------|---|
| 2.1 | Materials | .1 | Cement: to CSA CAN3-A5-M, normal Type 10 unless otherwise specified. |
| | | .2 | Water, fine aggregates, normal weight coarse aggregates: to CSA CAN3-A23.1-M, Group 1, unless otherwise specified. |
| | | .3 | Form work lumber: plywood and wood form work materials to CSA CAN3-A23.1-M. |

- .4 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .5 Reinforcing bars: billet steel, grade 400 deformed bars to CSA G30.12-M unless indicated otherwise. Provide with identifying marks.
- .6 Welded steel wire fabric: to CSA G30.5; provide in flat sheets only.
- .7 Air-entraining admixtures: to CSA CAN3-A266.1-M.
- .8 Non-shrink grout: premixed compound consisting of metallic aggregate, cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 50 MPa at 28 days.
- .9 Dry pack: premixed or non-premixed composition of non-metallic aggregate, cement and sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

2.2 Concrete Mix

- .1 Except where indicated or specified otherwise, use concrete designed to meet all of the following:
 - .1 Compressive cylinder strength at 28 days of 28 MPa.
 - .2 Maximum coarse aggregate size of 20 mm.
 - .3 Water/cement ratio maximum of .55.
 - .4 Slump between 50 mm and 80 mm at time and point of deposit.
 - .5 Air content of 5%, plus or minus 1%, except in slabs requiring hard trowelling where it is not to exceed 3%.
- .2 Admixtures: obtain written approval of Departmental Representative before using admixtures other than air entraining agents or water reducing agents. When permitted, use only in accordance with Standard.
- .3 Mass density: supply only concrete with air dry unit mass between 2,150 and 2,500 kg/m³ unless otherwise specified.

- .4 Prior to execution of the work, provide a statement certifying that the materials, including admixtures, are in accordance with this Specification and evidence that the mix proportions selected will produce concrete of the specified quality and strength.

PART 3 - EXECUTION

- 3.1 Workmanship
 - .1 Notify Departmental Representative 24 hours prior to the anticipated time of any concrete pour.
 - .2 Obtain the inspection and approval by the Departmental Representative of the preparation for all pours before placing concrete.
 - .3 Ensure pipework are not disturbed during concrete placement.
- 3.2 Waterpipe
 - .1 Correctly position all pipes, sleeves, bolts, hangers and other inserts in the concrete as required by other trades or as shown on the Drawings.
 - .2 Obtain approval by the Departmental Representative of all sleeves, ducts, pipes or other openings (except openings less than 100 x 100 mm in floors and walls) which are not shown on the Structural Drawings before placing concrete.
- 3.3 Inspection and Testing
 - .1 Where required, the Owner will employ an independent testing firm to make the required field and laboratory tests in accordance with the Standard for field control of concrete quality during construction. Make available materials, space and equipment as are necessary for the tests.
- 3.4 Curing
 - .1 Cure concrete in accordance with the Standard. Obtain approval of the Departmental Representative for each method used.
- 3.5 Ready-Mix Concrete
 - .1 Obtain approval by the Departmental Representative of the ready-mix manufacturers before ordering.

- 3.6 Failure to Meet Requirements**
- .1** When any concrete is not in accordance with these Specifications or the Standard, obtain Departmental Representative's ruling on whether to remove and replace it or apply the remedies provided in the Standard to the Departmental Representative's approval.

END OF SECTION

Division 15 – Mechanical

PART 1 - GENERAL

- 1.1 General** .1 Not Used
- 1.2 Scope** .1 This section includes general requirements for mechanical work.
- 1.3 Shop Drawings** .1 The Contract Drawings show the locations of major components and the piping configuration in schematic form with only major components identified.
- .2 Prior to fabrication, submit four complete sets of Shop Drawings and data sheets covering all details of equipment, materials and fabrication intended for installation under this Contract, and in accordance with the Contract Documents.
- .3 All Shop Drawings submitted for approval shall be certified by the manufacturer and carefully checked by the Contractor, noting all changes required and shall bear the Contractor's approval stamp and signature prior to submitting to the Departmental Representative for approval; drawings will not be considered if not previously checked by the Contractor.
- 1.4 Equipment Requirements and Installation** .1 Permit equipment maintenance and disassembly by use of unions or flanges to minimize disturbance to connecting piping and duct systems and without interference from the building structure or equipment.
- .2 Provide accessible means for lubricating equipment including permanent lubricated "lifetime" bearings.
- .3 Base mounted equipment to be mounted on chamfered edge housekeeping pads a minimum of 50 mm high and 50 mm larger than equipment dimensions all around.
- .4 Pipe drain lines to drains. Provide piped drains from pump packing glands to building drain.
- .5 Equipment, floor plates and ceiling plates shall line up with building walls wherever possible.
- .6 Provide all structural work required for foundation and support of the units, foundation bolts, sleeves, washers, nuts, shims, and templates to locate position of bolts.

- .7 Install pumps, motors and other equipment as shown on the drawings, in accordance with the manufacturer's instructions and as directed by the Departmental Representative.
- .8 Motors shall be aligned, shimmed, and coupled to fit driven shaft to satisfy the tolerance given by the equipment manufacturer.
- .9 For anchorage, embed anchor bolts sufficiently to prevent pull-out. Provide minimum of 25 mm of grout between bedplate and foundation; fill void; finish to approval; do not remove wedges before grout is set.
- .10 Align piping to avoid excessive forces on fixed equipment when piping connections are tightened.
- .11 Pipes shall not be bolted to equipment until grouting and alignment are completed. Bolting shall be done so that no stresses are set up in the flanges.

**1.5 Pipe Hangers
and Supports**

- .1 Fabricate hangers, supports and sway braces in accordance with ANST B31.1 and requirements of ULC C203.
- .2 Suspend hangers from steel channels or angles. Submit anchorage system for review. Acceptable products Grinnell Fig. 202, 194, 213, 195.
- .3 Use split adjustable steel ring hanger on piping less than 38 mm diameter. Use clevis type for 38 mm diameter and above. Acceptable products Grinnell Fig. 104, 160, 65.
- .4 For copper pipe, use copper finish tubing hangers Grinnell Fig. CT-109, CT-65 tube strap.
- .5 For pipes supported from floor, use adjustable pipe support saddle welded to pipe support and fabricated base to suit, bolted to floor. Grinnell Fig. 264.
- .6 Pipe 38 mm diameter and smaller may rest on cast wall bracket and held by U-bolt, Grinnell Fig. 213, 137; or may be strapped to wall using Fig. 126, 231, 262.

- .7 Use rod diameters and spacing for pipe supports as shown in table with the following exceptions.
 - .1 Support plumbing piping in accordance with more stringent requirements of authorities having jurisdiction.
 - .2 Support plastic piping in accordance with manufacturer's recommendations.

Pipe Size	Rod Diameter	Maximum Steel	Spacing Copper
NPS 1/2	-	-	1.5m
NPS 1, 3/4	10 mm	2.1m	1.8m
NPS 1 1/2	10 mm	2.7m	2.4m
NPS 2	10 mm	3.0m	2.7m
NPS 2 1/2-3	10 mm	3.6m	3.0m
NPS 4	16 mm	4.2m	3.6m

- .8 Submit arrangement and type of hangers and wall hooks for review.
 - .1 Place support within 300 mm of each horizontal elbow.
 - .2 Hangers shall be three piece minimum standard, consisting of hanger, rod and pipe attachment.
 - .3 Med steel wall hooks may be used to support non-expanding piping.
 - .4 Isolate copper piping from ferrous hanger.

1.6 Escutcheons and Plates

- .1 Provide on pipes passing through finished walls, partitions, floors and ceilings.
- .2 Use chrome or nickel plated brass with set screws for ceiling or wall mounting.
- .3 Inside diameter shall fit around finished pipe. Outside diameter shall cover opening or sleeve.

1.7 Tests

- .1 Give 24 hours notice of date when tests will be made.
- .2 Conduct tests in presence of Departmental Representative.
- .3 Leave work exposed until tested and approved.
- .4 Bear costs including re-testing and making good.

- .5 Hydraulically test water supply systems at 860 kPa and maintain test pressure without loss for 4 hours.
- .6 Test fuel oil systems to CSA B139.
- .7 Test drainage, waste and vent piping to code.
- 1.8 Dielectric Couplings**
 - .1 Provide wherever pipes of dissimilar metals are joined.
 - .2 Provide insulating unions for pipe sizes NPS 2 and under and flanges for pipe sizes over NPS 2.
 - .3 Provide felt or rubber gaskets to prevent dissimilar metals contact.
- 1.9 Instruction of Operating Staff**
 - .1 Provide nameplates for all valves and pieces of equipment, supplied by either the Contractor or others, as directed by the Departmental Representative.
 - .2 Nameplates to be laminated plastic with black face and white centre of minimum size 90 x 40 x 2.5 mm nominal thickness, engraved with 6 mm high lettering. Use 25 mm lettering for major equipment, as directed by Departmental Representative.
 - .3 Fasten nameplates securely in conspicuous place. Where nameplates cannot be mounted on a cool surface, provide standoffs or hang from chain.
 - .4 Identify equipment type and number of service zone, as applicable. eg. shut-off valve, pressure relief valve, etc.
 - .5 Submit list of equipment nameplates for review prior to engraving.
- 1.10 Identification of Piping**
 - .1 Identify all piping with markers showing identification of pipe and directional flow arrows.
 - .2 Use block capital letters 50 mm high for pipes of 75 mm nominal and larger diameter, and not less than 20 mm high for smaller diameters.
 - .3 Use direction arrows 150 mm long by 50 mm wide for piping of 75 mm nominal or larger diameter and 100 mm long by 20 mm wide for smaller diameters.

- .4 Use waterproof plastic marker tapes for pipes and tubing of 19 mm and smaller diameter.
- .5 Acceptable Product: WH Brady identification tapes and bands and Seton Name Plate Corporation Setmark pipe markers.
- .6 Locate identification as follows:
 - .1 Identify piping runs at least once in each room.
 - .2 Do not exceed 5 m between identifications in open areas.
 - .3 Identify both sides where piping passes through walls, partitions and floors.
 - .4 Where piping is concealed in pipe chase or other confined space, identify at point of entry and leaving, and at each access opening.
 - .5 Identify piping at starting and ending points of runs and at each piece of equipment.
 - .6 Identify piping at major manual and automatic valves immediately upstream of valves. Where this is not possible, place identification as close to valve as possible.
 - .7 Identify branch, equipment or building served after such valve.

**1.11 Temporary and
Trial Usage**

- .1 Temporary or trial usage by the Owner of any mechanical machinery, apparatus, equipment, or any other work or materials supplied under the contract before final written acceptance by the Departmental Representative, is not to be construed as an evidence of the acceptance of same by the Owner. The Owner shall have the privilege of such temporary and trial usage as soon as the Contractor shall claim that said work is completed. Any damage caused by defective material or workmanship through temporary or trial usage by the Owner shall be the responsibility of the Contractor.

END OF SECTION

PART 1 - GENERAL

- 1.1 General** .1 Not Used
- 1.1 Scope** .1 The work and materials covered by this section include the furnishing and installation of the pump and associated mechanical equipment.
- 1.3 Related Work Specified Elsewhere** .1 Mechanical General Provisions Section 15010
- 1.4 Standard** .1 Cast Iron Pipe: AWWA C151
Cast Iron Flanges: ASA B16.1
Galvanized Iron Pipe: ASTM A120
Malleable Iron Pipe Fittings: ASTM A107
- .2 Install piping in accordance with the requirements of the latest edition of the British Columbia Plumbing Code.
- 1.5 Certificates** .1 Provide written certificate that components are compatible, and where applicable, certified for intended use by nationally recognized testing agency.

PART 2 – PRODUCTS .1 Refer to Construction Drawings**PART 3 - EXECUTION**

- 3.1 General** .1 Install all pipework, fittings, equipment and fixtures to the satisfaction and approval of the Departmental Representative.
- .2 Run exposed pipework parallel to walls and ceilings neatly grouped in parallel lines.
- .3 Temporarily plug ends of pipework to keep foreign matter out before final connections are made.
- 3.2 Tolerances** .1 All horizontal drain leaders above ground shall be graded to one percent slope, unless otherwise shown on the Drawings.

**3.3 Installation
of Pipework**

- .2 All drain lines and horizontal lines of soil and waste piping shall be graded two percent minimum unless otherwise shown on the Drawings.
- .3 Horizontal branches of all pipework shall be graded downwards so that they may be completely drained through risers, fixtures or drain cocks. Minimum slope one-half of one percent.
- .1 Do no cutting that may impair the strength of the building. Drill no holes, except for expansion bolts and small screws in the structure without obtaining prior approval from the Departmental Representativeing.
- .2 Pipes passing through roofs, floors or other areas requiring waterproofing shall be flashed by the Contractor. Seal pipe passing through walls and floors inside the building with flexible caulking applied into space between pipe and sleeve or as detailed.
- .3 Run all piping parallel to building lines. Fasten supports to inserts in concrete. Do not use perforated band iron for hangers. All hanger rods are to have machine threads capable of vertical adjustment after pipe is erected.
- .4 Piping, ducts, and equipment shall be thoroughly cleaned of dirt, cuttings and other foreign substances. Should any pipe, duct or other part of systems be obstructed by any foreign matter, disconnect, clean and re-connect whenever necessary for purpose of locating and removing obstructions. Repair work damaged in the course of removing obstructions.
- .5 Provide temporary bracing and supports to adequately support the pipe during installation.
- .6 Take care to prevent damage to the pipe, pipe coatings and the adjacent structure during erection. Make good all damage. Completely repaint all ferrous pipework and fittings after installation is completed.
- .7 Where the required piping is not shown on the plans or shown only diagrammatically, install pipes 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.

- .8 Install all valves so as to facilitate servicing or re-packing.
- .9 Erect and support all piping in a manner that will not put undue strain on pumps, tanks, equipment or adjacent piping.
- .10 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.
- .11 Where pipe sizes differ from connections to equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.
- .12 Use non-corrosive lubricant or teflon tape applied to male threads.
- .13 Install flanges or unions to permit removal of equipment without disturbing piping systems.

3.4 Welding of Steel Pipe

- .1 Do pipe welding in accordance with the current AWWA Specification C-206-62. The welding operators and supervisors employed and the welding procedure shall be qualified in accordance with the current CSA Standard W-47 Welding Specification Code. Each operator's certificate of qualification and experience record shall be on file at the site, and shall be made available to the Departmental Representative on request. Each operator shall be currently qualified for the P number covering the material on which he will be engaged as prescribed in the Welding Qualification Code, latest revision.
- .2 The Departmental Representative reserves the right to specifically test, at no cost to the Owner, the qualification of individual welders employed by the Contractor. Any welder who does not perform satisfactorily in the Departmental Representative's test shall be removed from the job at no cost to the Owner.
- .3 All welding shall be shielded metal-arc welding process. Welded pipe joints shall be single-V butt joints, using a root gap of 1.6 mm. Welds shall be full penetrating welds. Care shall be exercised to keep the interior pipe lining free from damage during welding. Longitudinal weld seams shall be on opposite sides of the pipe at the joint. Welding shall not

be carried on when weather conditions, in the opinion of the Departmental Representative, are unsatisfactory and would impair the quality of the welds.

- .4 The minimum distance between the edges to adjacent circumferential welds shall be 50 mm. If this requirement cannot be satisfied, stress-relieving of the welds must be undertaken.

3.5 Valve, Equipment and Appurtenance

- .1 Install all valves, equipment and appurtenances to manufacturer's instructions and these Specifications.

3.6 Final Inspection and Start-up

- .1 Subject to systems and equipment to operational test.
- .2 During tests, stop any leaks and remove and repair any defective part. Perform test over again until satisfactory results are obtained.
- .3 Provide pump, temporary connections and labour required for tests.
- .4 Carry out the following before final inspection:
 - .1 complete construction and site restoration
 - .2 complete all painting and finishing
 - .3 align and adjust all equipment
 - .4 where applicable, mail equipment warranty form to manufacturer. Provide the Owner with a copy of the original warranty for any equipment which has a warranty period longer than one year.
- .5 Notify Departmental Representative at least 48 hours prior to start-up.

END OF SECTION