.6 Alkaline Surfaces: Wash and neutralize using proper type of solution compatible with paint to be used.

3.6 APPLICATION OF COATINGS

.1 Applied and cured coatings shall be uniform in thickness, sheen, colour, and texture and be free of defects detrimental to appearance and performance. Such defects include brush marks, streaks, runs, laps, heavy stippling, pile up of paints and skipped or missed areas. Edges of paint adjoining other materials shall be clean and sharp with no overlapping.

.2 Apply paint and finish materials with suitable equipment.

.3 Apply paint by brush or roller, except on wood or metal surfaces, apply paint by brush only.

.4 Use rollers which will produce the least possible stipple effect; maximum 10 mm pile for smooth surfaces. Heavier pile rollers may be permitted for use on rough surfaces, subject to the Engineer's approval.

.5 Spray painting may be permitted where advantageous, subject to the Engineer's approval. Airless spray application shall be followed with back rolling.

.6 Use same brand of paint for primer, intermediate and finish coats.

.7 Vary slightly the colour of successive coats to differentiate between coats.

.8 Each coat of finish shall be dry and hard before succeeding coats are applied, with a minimum of twenty-four (24) hours between coats, except where manufacturer's instructions state otherwise.

3.7 PATCHING

.1 Repair, rough-up and refinish damaged finishes and finishes unsatisfactory to the Engineer.

.2 Refinish entire wall or area where deemed necessary by the Engineer.

END OF SECTION

Contents

1.0 GENERAL

1.1 Work Included

.1 This section describes the basic functioning of the water treatment facility to be included in the work. It shall be sued for evaluating the completeness of the work and shall be read in conjunction with Division 13 and 16, and with the piping and instrumentation diagrams in the drawings, to obtain a description of plant operations.

1.2 Related Work Specified in Other Sections

.1	Intake Structures	Division 15
.2	Process Equipment	Division 13
.3	Controls and Instrumentation	Division 16

2.0 PRODUCTS

2.1 Processing Numbering

.1 The process equipment, piping and valves have been numbered for clarity. Refer to Drawing 401 (Process Flow Diagram).

2.2 Process Alarm

.1 The alarms are related to equipment malfunctions which, if not rectified immediately, could lead to damage of process units, severe deterioration in effluent quality, or plant flooding. Alarms shall activate the plant alarm beacon and autodialer.

2.3 Control

.1 Controls are classified in two categories, as follows:

.1 Automatic: Control functions are coordinated by a central plant control panel or at local control panels. Control is accomplished according to preset sequencing and protocol.

.2 Manual: The operator controls the functioning of a process unit by manipulation from a local control panel.

.2 The location and operation of the plant control is described in Section 16825.

3.0 EXECUTION

3.1 Raw Water Supply

.1 Untreated water from one lake intakes enters the treatment plant through one HDPE line, encased in large HDPE pipe and heat traced. Submersible pump RWP-1 is normally used to supply raw water to the package treatment plant.

3.2 Potable Water Production

.1 Potable water is produced to maintain a minimum level of storage in the treated water reservoir. Ultrasonic level sensors in the reservoir start and stop the water treatment plant as the level varies.

.2 Potable water is produced by a package multi-media plant, which start, stops, and operates automatically. The multi-media are periodically cleaned using an air backwash cycle; backwash wastes are discharged to an external sump.

.3 Filtered water from the multi-media unit is chlorinated then discharged to the treated water reservoir. Chlorination is achieved by adding sodium hypochlorite solution by means of a chemical metering pump, which runs whenever a flow switch in the treated water line senses flow.

3.3 Potable Water Storage

.1 Treated water is stored in a two-cell, above-ground reservoir. Either cell can be taken out of service for maintenance. Water is pumped from the reservoir to the truckfill system as required.

3.4 Truckfill System

.1 Activating the system in the control panel adjacent to the truckfill arm signals the truckfill pump TWP-1 or TWP-2 to start, to allow the truck to be filled. A flow sensor closes a solenoid valve on the truckfill arm drain whenever it senses flow in the truckfill arm, and opens the solenoid valve to allow the arm to drain when there is no flow.

END OF SECTION

1.0 GENERAL

1.1 Work Included

.1 Supply, installation and testing of process piping, fittings and piping supports.

1.2 Related Work

.1	General Process Provisions:	Section 13010
.2	Detailed Process Piping Specification Sheets:	Section 13105
.3	Process Valves	Section 13110
.4	Factory Applied Maintenance and Corrosion Protection Coatings:	Section 13900
.5	Field Applied Maintenance and Corrosion Protection Coatings:	Section 13901
.6	Identification:	Section 13910
.7	Disinfection of Structures and Piping:	Section 13950
.8	Mechanical Piping and Equipment:	Division 15

1.3 Standards

.1 All work covered by these specifications shall be carried out in accordance with, but not limited to, the following standards which shall be deemed to be and form part of these specifications:

.1 NWT Boiler and Pressuer Vessel Regulations

.2 American Society of Mechanical Engineers

.3 American National Standards Institute

.4 American Society for Testing and Materials

ASTM A 53	Specification of Welded and Seamless Steel Pipe
ASTM A181	Specification for Forged or roller Steel Pipe Flanges. Forged Fittings and Valves and Parts for General Service
ASTM D1785	Polyvinyl Chloride Pipe and Fittings and F-441
A385	Galvanized Bolts and Nuts

.5 American Water Works Association

AWWA C208	Dimensions for Steel Water Pipe Fittings
AWWA C210	Coal Tar Epoxy Coating System for the Interior and Exterior of Steel Water Pipe
AWWA C500	Gate Valves, 3 through 48 in NPS
AWWA C504	Specification for Rubber-Seated Butterfly Valves
AWWA C507	Specifications for Ball Valves

.6 Chlorine Institute Standards

.7 Manufacturer's Standardization Society

1.4 Submissions

.1 Shop Drawings: If required by the Engineer, shop drawings for all piping systems shall be furnished prior to fabrication. Indicate in orthogonal and/or isometric drawings, as required: to furnish the assembly details, the welds, flanges, valve placement, supports, and the provisions for thrust restraint, as well as other pertinent details. The drawings, when supplied, will be reviewed by the Engineer for general compliance with the design intent.

.2 Where specified or when directed by the Engineer, provide mill test results or produce samples.

1.5 Delivery and Storage

.1 Deliver pipe to site using loading methods which do not damage pipe or coatings.

.2 Pipe delivered to site will be clearly identified as to size, type and coatings.

.3 Until ready for incorporation in the work, store on site as recommended by the pipe manufacturer to prevent damage, undue stresses, or weathering.

.4 All gasket surfaces, flange faces and butt welding connections of valves shall be thoroughly cleaned, greased and protected with suitable wood, metal or other substantial type covering to ensure their full protection.

.5 All exposed male threaded parts shall be greased and protected with metallic or other substantial type protectors. All female threaded openings shall be cleaned and closed with pipe, plugs or steel or plastic snap in protectors.

.6 When storing plastic piping, provide adequate support to prevent pipe deformation.

1.6 Process Piping Identifying Codes

.1 Process piping is identified in the drawings by a three component alpha-numeric code.

.2 The first part of the code identifies the pipe material.

.3 The second part of the code identifies the nominal pipe diameter.

.4 The third part of the code defines the process fluid being conveyed in the pipe.

.5 The process fluid codes are defined in the drawings.

2.0 PRODUCTS

2.1 Pipe Materials

.1 Pipe materials shall be new, free from defects and shall conform to the reference standards identified in the detailed piping specification sheets.

.2 Where a materials or procedures standard is indicated in the specification sheets, it is current at the time of preparation of the specifications. Where the standard has been superseded prior to bidding, the contractor shall comply with the new standard.

2.2 Flanges

.1 Unless otherwise noted, flanges on steel pipe shall be 150# conforming to ANSI B16.5.

.2 Flanges for mating to equipment or valves shall be compatible with those items.

.3 Flat-faced flanges shall be provided on each side of butterfly valves. Flat-faced flanges shall be used when mated to cast iron flanges.

.4 For steel piping, weld neck flanges shall be provided for both sides of wafer or lug body valves.

.5 For steel piping, where not specified or shown otherwise, slip-on flanges shall be furnished.

.6 Where a piping system is indicated to be grooved joint, grooved joint flange adapters shall be provided for the connection to equipment, and for connections from grooved pipe and fittings to flanged fittings, valves, meters and sensing devices. Grooved joint flange adapters shall have an overall length of not less than 200 mm and not greater than 400mm. The adapter shall consist of a straight pipe section with a flange at one end and a grooved joint at the other. Grooved joint flanges may be used for connections between meters and sensing devices and straight pipe runs. Grooved joint flanges may be used in other locations only with the prior approval of the Engineer.

.7 Grooved joint flange adapters shall be used only where indicated and shall be Victaulic as follows:

Class 150 steel pipe – Style 741 or 742

Adapters shall be installed in accordance with the manufacturer's recommendations.

.8 Slip-on flanges that are attached to a pipe by means of set screws and gaskets (uni-flange), etc) shall only be used with the prior approval of the Engineer.

.9 Flat face flanges and full face gaskets shall be used on check valves 75 mm to 200 mm.

2.3 Threaded Couplings

.1 Unless specifically noted in the drawings, threaded couplings shall only be used on piping with nominal diameters equal or less than 50mm.

.2 Screwed joints shall be made using American Standard threads.

.3 Thread lubricant for threaded joints shall be Teflon tape (or pipe dope).

2.4 Grooved Joint Couplings

.1 Grooved joint couplings shall be fabricated of cast iron to ASTM A 30, Class B and shall comply with AWWA C606.

.2 They shall consist of two halves with reinforced shoulders to lock into the grooves formed in the pipe. An annular space shall be provided for a gasket. The couplings shall be bolted on two sides. Suitable style for pipe material and pressure rating.

.3 Approved Products:

.1 Victaulic.

.2 Gruv-Lok.

2.5 Reducers

.1 Reducers shall be concentric unless indicated otherwise.

2.6 Elbows

.1 Elbows shall be short radius unless indicated otherwise.

2.7 Gauges

.1 Bourdon tube type gauges 0.5% accuracy, 115mm (4.5") diameter face, liquid silicone filled, dual (pascal / psi) scale, complete with phenolic turret case. Provide brass needle type isolating valve and snubber for gauge.

.2 Approved products:

.1 Ashcroft Duragauge 45 – 1279 ASL-4L.

2.8 Gaskets

.1 For flat-faced flanges, use full-face gaskets. For raised-face flanges, use ring type gaskets.

.2 Gasket materials for flanged connections shall be as follows:

.1 Material Thickness:
- 1.6 mm thick, pipe dia. 80 to 250 mm.
- 3.2 mm thick, 80 mm and 100mm PVC

.2 Liquid Service:

- Service temperature, less than or equal to 40?V: Black neoprene or red rubber.

- PVC: Cloth inserted red rubber or black neoprene.

.3 Grooved joint gaskets shall be as recommended by the manufacturer for the service conditions indicated.

2.9 Bolts and Nuts

.1 Bolts and nuts shall be hex head.

.2 For general service, bolts and nuts shall be forged steel to ASTM A193, Grade B7 and ASTM A124, Grade 2H.

.3 For submerged, buried and concrete encased service or when used with stainless steel to ASTM A 193, Grade B8 and ASTM A194, Grade 8.

2.10 Pipe Support System

.1 No attempt has been made to indicate all necessary pipe supports in the drawings for piping inside the plant. The intent has been to indicate general arrangements and typical spacings, but not relieve the contractor of the responsib ility of designing and supplying a complete support system.

.2 All pipe shall be supported in accordance with the manufacturer's recommendations.

.3 Pipe support systems shall be designed to support the operating loads with a factor of safety of 5.0.

.4 Make provision for expansion, contraction, longitudinal thrust, slope and anchorage.

.5 Do not support piping from equipment or other pipes.

.6 Where structural bearings are not in suitable locations, provide supplementary structural members. Obtain approval of the Engineer for the location and type of supports.

.7 Provide hangers and/or base supports within one meter of each change in direction on each leg, on one side of each valve, and on the first spool piece or fitting from a piece of equipment.

.8 Maximum support spacing shall be as listed in the following table:

PIPE SIZE (Nominal, mm)	MAXIMUM SPACING (m)		
	STEEL OR IRON	PVC (100°f)	FRP
30 and under	1.8	1.0	1.5
30 to 40	2.7	1.3	1.8
40 to 50	3.0	1.5	2.1
60 to 75	3.0	1.6	2.4
100	3.6	2.0	2.7
150	3.6	2.2	3.0

.9 Cooper piping up to 15 mm in size shall be supported every 1.8 m on centre. Piping larger than 15 mm shall be supported every 2.4 m on centre. Provide a double thickness of Plycoflex 310 on Greenline accessory tape between the copper pipe and the supports.

2.11 Pipe Racks

.1 Metal framing for pipe racks shall consist of a system of aluminum channel members and bolted connections.

.2 Metal framing materials shall conform to ASTM A570, Grade L and shall be hot dipped galvanized after fabrication.

.3 All flexible tubing for chemical solution, feed and transfer lines shall be supported or mounted on continual galvanized mild steel trays for all horizontal, inclined or vertical runs.

The lines shall be tied to the trays at intervals of not greater than 3 metres for horizontal runs and 2.5 metres for all other runs.

Standard of Acceptance: Canstruct - Burndy Electray Ventrib.

2.12 Pipe Hangers

.1 Hangers shall be fabricated in accordance with ANSI B31.1, Part 5 and the requirements of ULC Standard C203.

.2 Do not use perforated band, wire chain, or solid ring type hangers.

.3 Hangers shall be of the following type:

PIPE SIZE	HANGER TYPE
40 mm and less	Split adjustable ring, Hunt Fig. 269
50 mm to 100 mm	Clevis, Hunt Fig. 260
Greater than 100 mm	Roller and Clevis, Hunt Fig. 174

.4 Hangers shall be black finish raw steel except as detailed otherwise. Use stainless steel hangers (304) where detailed on the drawings.

.5 Provide spring hangers where required to offset expansion in horizontal runs which follow vertical risers longer than 3.0 metres.

.6 Rod material shall conform to ASTM A307 as a minimum and shall be hot dipped galvanized. Stainless steel hangers shall be used where detailed.

.7 Hanger rod sizing, as a minimum, shall as follows:

PIPE SIZE (Nominal, mm)	HANGER ROD DIAMETER (mm)
50	10
80	12
100	16
150	20
200	22
150	25
300	25

.8 Length adjustment collars shall be provided for hanger rods.

.9 Threaded expansion type inserts shall be used to connect piping supports to concrete.

.10 Aluminum or galvanized steel clips shall be used to support piping from aluminum or steel structural members. Where metals of different type are to be connected, provide isolation to prevent galvanic corrosion.

2.13 Pedestal Pipe Supports

.1 Pedestal pipe supports shall be fitted with manufactured cradles and adjustment bolts as indicated in the drawings.

.2 The pipe used for the pedestal shall conform to ASTM A53, Grade B. The base plate shall be steel to ASTM A36.

2.14 Base Elbows

.1 Where elbows change the run of a horizontal pipe to a vertical direction supports shall be secured to the elbow.

.2 Dimensions for the supports shall be as follows:

PIPE SIZE (Nominal, mm)	SUPPORT PIPE (Diameter, mm)	BASE PLATE (mm x mm)
100 or less	50 Schedule 40	100 x 6
150	80 Schedule 40	125 x 6

2.15 Thrust Restraints

.1 Pipe movement and the transmission of thrust forces onto equipment flanges or connections shall be prevented by pipe thrust restraints. Such restraints shall be provided as required.

.2 Thrust restraints shall be designed for thrust loads developed by 1.5 times the maximum test pressure.

.3 All metal parts shall be of galvanized mild steel.

.4 Compression coupling joints shall be provided with the rod type thrust harnesses. The harness anchorage shall be in accordance with the latest edition of AWWA M11. Design pressure shall be as listed in Section 2.16.2 for the relevant piping type.

.5 Details of pipe thrust restraints and harness shall be submitted to the Engineer for review prior to fabrication.

2.16 Pipe Venting and Drainage

.1 The Contractor shall provide adequate air vent valves with blowout lines at high points on all piping under hydraulic pressure.

.2 The Contractror shall provide ball-type drain valves at least 25 mm in diameter at low points on piping under hydraulic pressure.

2.17 Pressure Signal Tubing

.1 Tubing for pressure control elements shall be annealed type 304 S.S. to ASTM A269.

.2 Tubing shall be minimum 6 mm diameter with minimum 0.71 mm wall thickness.

.3 Supply all isolation valves, couplings and NPT male end connectors as shown on drawings or as required to make a complete installation.

2.18 Welding Materials

.1 Welding materials shall conform to CSA W48.1.

.2 Electrodes shall be compatible with the material welded and shall deposit metal with strength and corrosion resistance properties at least equivalent to the base metal.

.3 The Contractor shall submit to the Engineer at least 21 days prior to commencing welding, a written statement of proposed welding techniques and materials for the Engineer's review.

2.19 Dissimilar Metal Connections

.1 Where dissimilar metals are to be connected, furnish dielectric fittings and/or isolating flanges.

2.20 Structural Elements Penetrations

.1 Where exposed piping penetrates laboratory, storage, control room or other similar finished area, chrome plates, escutcheon plates or equivalent shall be provided.

2.21 Field Joint Material

.1 Polyurethane sealant shall be burtyl rubber vapour barrier "Butyln" manufactured by Chemtron, Calgary or approved equal.

.2 Strapping shall be stainless steel "Band-It" type or approved equal, applied with the manufacturer's recommended banding tool. Other sheet metal fasteners shall be as used on shop fabrications.

.3 Caulking between enclosures and piping at all banded, screwed, bolted or riveted joints shall be Tremco JS-700 Permagum, or approved equal, to provide a totally water proof assembly.

2.22 Exterior Finishes

.1 Unless specified otherwise, the exterior of plain steel pipe shall be shop primed as specified in Section 13901.

.2 Plastic and stainless steel pipe shall not be shop coated.

.3 Coal Tar Enamel: where specified, coal tar enamel and kraft paper shall be applied to the exterior of piping in accordance with AWWA C203.

2.23 Interior Finishes

.1 Unless specified otherwise, the internal surfaces of steel pipe shall be factory cleaned prior to delivery by commercial sandblast to SSPC-SP6. Water pipe greater than 50 mm diameter is to be factory double epoxy lined as per Section 13900.

.2 The internal surface of stainless steel and plastic piping shall not be shop coated.

.3 Unless noted otherwise, fittings shall be finished in the same manner as the pipe run.

2.24 Galvanizing

.1 Where piping is to be galvanized, it shall be hot dip zinc coated to CSA G164 with a minimum coating of 500g/m^2.

2.25 Grout

.1 Non-shrink grout shall be used.

3.0 EXECUTION

3.1 Preparation

.1 Prior to installation, inspect and field measure to ensure that previous work is not prejudicial to the proper installation of piping.

.2 Piping arrangements indicated on the drawings have been established on the basis of the dimensions from the first listed equipment in the list of approved manufacturers and approved products contained in the specific process equipment sections. AT no expense to the Owner, modify the piping arrangement as necessary to suit the equipment supplied under this contract.

.3 Advise the Engineer of all modifications. Do not commence work on the related piping until the Engineer's approval has been received.

.4 Include any piping modifications in the shop drawings submitted prior to fabrication or installation.

3.2 Pipe Handling

.1 Each pipe and fitting shall be inspected prior to installation. Damaged pipe or pipe with damaged protective coatings shall not be installed.

.2 Remove all foreign matter from inside of pipe prior to installation.

.3 Repair pipe with damaged protective coatings with material similar to the original, as recommended by the applicable standard.

.4 Use proper implements, tools and facilities for the proper protection of the pipe. Exercise care in the installation so as to avoid damage to pipe or coatings.

.5 Do not drop or roll pipe. Move pipe and fittings, using canvas, leather or rubber padded belt slings. Do not move pipe using bar cables, chains, hooks or clamps.

.6 Remove and replace any material which is damaged or defective.

3.3 Conflicts

.1 Review the drawings prior to installation of piping, conduit and fixtures by this or any other division. Identify any conflicts and cooperate with the Engineer to determine the amendments necessary to resolve the conflict.

.2 Confirm the routing of each section of pipework with the Engineer prior to commencement of installation. Advise the Engineer of any conflicts with existing services or services yet to be installed. Where necessary, amend the routing of pipework to avoid conflict, as instructed by the Engineer.

3.4 Interior Installation

.1 Piping installed in Interior building spaces shall be fabricated and installed in accordance with the ASME pressure vessel code and the N.W.T. Boiler and Pressure Vessel Regulations.

.2 Made adequate provision in piping runs for expansion, contraction, slope and anchorage.

.3 Install pipe support system to adequately secure the pipe and to prevent undue vibration, sag and stress.

.4 Provide temporary support as necessary during construction to prevent overdressing of equipment, valves or pipe.

.5 Accurately cut all piping for fabrication to filed measurements.

.6 Pipe shall be installed in straight alignment. Variance from the true alignment shall not exceed 10 mm in any direction. Pipe runs shall be fabricated and assembled to ensure that the pipework is not stressed to achieve the desired alignment and that no stresses are transferred to equipment or equipment flanges. The "springing" of pipework to ensure alignment shall not be permitted. The Contractor shall undo the subsequently remake all pipework connections where to instructed by the Engineer to ensure that springing does not occur. Take care not to damage equipment, valves or flanges.

.7 Do not cut or weaken the building structure to facilitate installation.

3.5 Welding

.1 Use manual shielded metallic arc, submerged arc, or inert gas shield arc welding.

.2 Welding procedures shall conform to ANSI B31.3 or B31.1

.3 Plain pipe ends shall be bevelled prior to welding.

.4 Clean and dry welding surfaces thoroughly prior to welding.

.5 Maintain flanges, pipes, fittings, etc. In alignment during welding. Ensure that no part of the weld is offset by more than 20 percent of the pipe wall thickness.

.6 Tack welds shall be made of material equal to the root pass. Tack welds which have not cracked may be incorporated in the root grass.

.7 Ensure the first bead obtains full root penetration with a minimum of weld material projecting within the pipe.

.8 For butt welds of pipe diameters less than 200 mm, welding shall be done in a minimum of two passes.

.9 For lap joints, weld joint in two passes minimum.

.10 Between passes, visually inspect bead of pinholes or other defects. Repair ay defects prior to the placement of the next pass.

.11 Clean all flux, slab and other foreign material from the weld prior to applying a successive bead, and on completion of the weld.

.12 Do not start successive passes at the same point.

.13 Completed welds shall completely fill the joint. It shall have a reinforcement greater than 1.5mm and less than 3.0mm, with no undercutting at the weld edges.

.14 Welding shall not proceed when the metal temperatures fall below -18?C. With metal temperatures below 0?C, supplemental heat will be applied to heat the metal to 20?C.

3.6 Threaded Joints

.1 Ream the end of all pipes to remove all burrs and cuttings when fabricating threaded joints.

.2 Clean out pipe prior to joining.

.3 Apply Teflon tape and/or pipe dope to male threads and join pipe. Do not use extra tape to make up for slack in the joint. A minimum of two full threads shall be exposed after the joint is tightened.

.4 Pipelines shall be installed with a few joints as possible. Short length of pipe coupled together shall not used.

.5 If it is necessary to back off a screwed joint after it is made, the thread shall be cleaned and new compound applied.

.6 Threads shall not be caulked.

.7 Bushings shall not be used.

.8 Nipples in screwed piping shall be shoulder nipples. Close nipples shall not be used unless specifically indicated.

3.7 Flanged Joints

.1 Flanges and gaskets shall be cleaned prior to connection.

.2 Gaskets shall be lubricated with soapy water and anti-seize compound shall be applied to the bolts.

.3 Bring flanges into close parallel and lateral alignment.

.4 Bolts shall be tightened progressively. Bolt tightening shall proceed from side to side of the flange. Wrenches used for tightening bolts shall be in good condition and properly sized to prevent rounding of nut and bolt heads.

.5 Washers may not be used to take up excess bolt length.

.6 Bolts projection beyond nuts shall be approximately two full threads and no more than five threads.

.7 When joining steel to cast iron flanges, take care to avoid damage to the cast iron flange. Ensure both flanges are flat-faced and use full-face gaskets.

.8 Align flanges which connect piping to mechanical equipment to close parallel and lateral alignment prior to tightening bolts. Do not place undue strain on the equipment.

3.8 Grooved Pipe Joints

.1 Groove all pipes to be joined by this method in accordance with the manufacturer's recommendations.

.2 At pipe-to-pipe connections, flexible style grooved joints shall be used.

.3 At pipe-to-fitting connections, rigid style grooved joints shall be used.

.4 For all buried pipe connections, use flexible style grooved joints.

.5 Where connecting grooved joint pipe to flanged equipment or valves, use a transition coupling a minimum of 100 mm in length with a Class 125 or 150 flange at one end and a grooved joint at the other.

.6 Where specifically indicated on the drawings or when approved by the Engineer, split flanges fabricated specifically for grooved joint pipe may be used to connect the flanged equipment or valves.

3.9 Vents and Drains

.1 Install air vents at all high points.

.2 Install drains at all low points and above all valves in vertical legs in liquid lines.

.3 Vents and drains shall be installed using saddles, weldolets, threadolets any other approved fitting. Systems which minimize damage to pipe coating system shall be the preferred method.

3.10 Testing

.1 Give Engineer 1 week notice of testing.

.2 Do not insulate or conceal work until piping systems are tested and accepted.

.3 Supply all water required for pressure testing.

.4 Supply all pumps, compressors, gauges, etc., required for testing.

.5 Where necessary, install air threadolets, air relief valves and line fittings valves as necessary to complete testing. Remove after testing and plug the threadolets.

.6 Cap or plug all lines which are normally open ended. Remove on completion of testing.

.7 Isolate all low pressure equipment during testing so as not to place any excess pressure on the operating equipment.

.8 Where defective material or equipment is identified, repair or replace using new material.

.9 Flush and drain liquid pipes after pressure tests. Purge all gas pipes after pressure tests.

3.11 Pressure Testing of Liquid Lines

.1 All lines normally used for the conveyance of liquid shall be pressure tested.

.2 Test pressures and times shall be as follows:

System	Test Pressure (kPa)	Duration of Test (hours)
Intakes – See Section 15011		
Raw Water Supply Piping (not including intakes)	1,000	4
Pump Suction Supply Piping	525	4
Filter Backwash Effluent Piping	140	2
Chemical Solution Lines	700	4
Plant Service Water Piping	1,000	4
Gravity Lines	350	4
Pressure which Discharge To Open Tanks	700	4

.3 The test duration and pressure drop shall conform to the requirements of AWWA C600, but test duration's shall not be less than those indicated in 3.14.2.

.4 There shall be no visual evidence of leakage.

.5 Instruments having a maximum pressure rating less than the test pressure for the line upon which they are installed, shall be removed or isolated during the pressure test.

.6 Upon successful completion of the system pressure test, removed or isolated instruments shall be replaced and tested with a pressure within the instrument range.

.7 Safety relief valves shall be supplied with test gauges for hydrostatic testing purposes. Upon completion of testing, the gauges shall be removed and the system shall be repressured to the relieving pressure of the relief valves to ensure proper valve operation.

.8 All pressure testing shall be done in the presence of the Engineer.

.9 Prior to hydrostatic or pressure testing or disinfection, all water retaining structures, pipework and conducts shall be thoroughly cleaned.

3.12 Disinfection

.1 Lines intended for potable water service shall be disinfected after testing as specified in Section 13950.

END OF SECTION

1.0 GENERAL

1.1 Work Included

.1 The piping specification sheets on the following pages detail the requirements for each type of pipe included in the work.

.2 The piping materials are listed on the piping and instrumentation drawings

1.2 Related Work

.1	Processing Piping	Section 13100
.2	Process Valves	Section 13110

2.0 PRODUCTS

2.1 Schedule

.1 Page 2 to Page 5 following.

Pipe Specification No. ST 40		Reference Document
Pipe Material:	Carbon Steel – Standard Duty Seamless or ERW 125 mm and less – Schedule 40 150 mm and greater – standard weight to AWWA C200	ASTM A53B
Pipe to Equipment Connections:	50 mm and less – ANC threads 65 mm and greater – 125# FF flanges or 150# RF flanges	ANSI B2.1 ANSI B16.1 ANSI B16.5
Pipe Joints:	50mm and less – threaded Above 50 mm: Welded or 150# Flanged or Grooved Joint	ANSI B16.3 ANSI B16.5
Service Conditions:	Process Fluids: RW, TW Pressure Range: 0 – 1000 kPa Temperature Range: 40?C Size Range: 30 mm to 300mm	
Flanges:	Weld-Neck Flanges Class 150 Victaulic flanges Class 150 Style 741 (used only where specifically indicated)	ANSI B16.5
Fittings:	50 mm and less – threaded connection 150 lb. Malleable iron. Above 500 mm – carbon steel, standard weight, seamless butt weld. Where shown use standard weight victaulic full flow, grooved end style 77	ANSI B16.3 ASTM A234 Grade WPB
Unions:	Up to 50 mm (threaded piping only) Class 150 malleable iron, ground-joint bronze to iron ends as required.	
Standard Treatment:	Above 50mm – factory sandblast, solvent clean, white metal blast, inorganic zinc prime and double epoxy liner as per Section 13900. Schedule A2. 50mm and less – galvanized (ST40G)	 ASTM A53

Notes:

1. Design is based on grooved fittings used other type will require addition of unions.