

TABLE OF CONTENTS

	DIVISION 11	
11050	Process Piping	6
11055	Detailed Piping Specification	4
11059	Process Piping and Equipment Insulation	3
11363	Diaphragm Metering Pump Skid	4
11800	Soda Ash Silo Dehumidifier And Air Cannon Activators	3

PROCESS PIPING

1. GENERAL

1.1 Description

- .1 This Section describes the pipe materials, fittings, appurtenances, installation and testing of the process systems.
- .2 Use the general requirements specified in this Section integrally with the more specific requirements listed in Section 11055 – Detailed Piping Specification Sheet.
- .3 Piping supports are generally not shown on the process Drawings. Provide the design of piping supports, pipe guides, expansion joints and anchors based upon final piping layout. Typical support details and structural attachments shown on the Drawings indicate the level of quality that will be considered acceptable.
- .4 The Contractor must provide the necessary submittals and ensure the proper registration of piping systems and system components as required by the Manitoba Labour and Immigration.
- .5 Standard of Acceptance: items specified by manufacturer's name and/or catalogue number form part of this Specification in order to define the standard regarding performance, quality of material and workmanship. When used in conjunction with a referenced standard, shall be deemed to supplement the standard.

1.2 Definitions

- .1 Pressure terms used in this and other related sections are defined as follows:
 - .1 Operating Limits: the minimum and maximum pressure at which the piping system operates for sustained periods of time
 - .2 Test Pressure: the hydrostatic pressure used to determine system compliance.
- .2 Pipe and appurtenance location terms used in this and other related sections are defined as:
 - .1 Tunnels, Pumphouse and Buildings: within an environmentally controlled enclosure where temperature is maintained above 5°C.
 - .2 Exposed, Aboveground: outside or within an enclosure which is not environmentally controlled so that the temperature is maintained above 5°C. For the purpose of defining exterior protection systems, this definition is extended to vertical piping to a point of 0.5 m below finished ground level.
 - .3 Submerged: regularly or occasionally immersed in liquid; inside tanks or channels, and within 3.0 m above maximum water level of open tankage, including pipe and appurtenances within manholes, vaults, and chambers.

1.3 Reference Standards

- .1 Conform to the most recent version of the following reference standards:
 - .1 ANSI/ASME A13.1, Scheme for the Identification of Piping Systems

PROCESS PIPING

- .2 ANSI/ASME B31.3, Process Piping
- .3 ANSI/ASME B31.9, Building Services Piping
- .4 CPC, Canadian Plumbing Code
- .5 CSA CAN3-Z299.3, Quality Verification Program Requirements
- .6 EJMA STDS-93, Standards of Expansion Joint Manufacturers' Association, Edition No. 6
- .7 Fluid Sealing Association Technical Handbook, Rubber Expansion Joint Division
- .8 MIL-STD-810C, Environmental Test Methods
- .9 MSS SP25, Standard Marking System for Valves, Fittings, Flanges and Unions
- .10 SSPC-P3, Canadian Government Standards Board
- .11 SSPC-SP6, Canadian Government Standards Board
- .12 SSPC-SP10, Canadian Government Standards Board
- .13 National Fire Code of Canada
- .14 NFPA 300 (2003 Edition)
- .15 NPC, National Plumbing Code
- .16 TSSA, Technical Standards and Safety Association
- .17 Provincial Building Code
- .18 Provincial Plumbing Code

1.4 Design Requirements

- .1 The design has been completed to the degree necessary for the Contractor to Bid. It is not fully detailed and will require the Contractor to undertake design of and responsibility for minor aspects for the piping systems to be installed.
- .2 All process piping shall meet requirements of the Process Piping Code, B31.3, whether or not it falls within the Code scope. Manitoba Department of Labour and Immigration shall be the Code Authority whenever the piping system falls within the Code scope. The Contract Administrator shall be the Code Authority for process piping that does not fall within the Code scope.
- .3 Piping and Instrumentation Drawings, piping schematics, and piping layout Drawings are contained in the Drawings set. The Piping and Instrumentation Drawings (P&IDs) indicate all major pipework, valves, and appurtenances (other than cleanouts, purge points, etc.) The layout Drawings indicate the design concepts and are intended to illustrate a constructible method for the piping systems. Some appurtenances, supports, guides and anchors, and expansion joints are not fully shown. The Contractor's design will complement and detail these Drawings.

PROCESS PIPING

- .4 It is understood that some conflicts will arise that will require that the Contractor re-route some of his piping to allow for the installation of wiring, ventilation duct, or similar.

1.5 Submittals

- .1 For each piping system refer to Section 11055, submit documentation listing pipe, fittings, flexible connectors, expansion joints, linings, coatings, and valving to be used for each pipe size and category.
- .2 A copy of this Specification Section and all referenced sections with each paragraph check-marked to show compliance or highlighted to indicate deviation.
- .3 Provide hanger, guide, and anchor, support system design details including locations, load information, design calculations and illustrative drawings, signed and sealed by a Professional Engineer registered in the Province of Manitoba. Refer to Section 11055.
- .4 For expansion joints submit manufacturer's catalogue data, Shop Drawings and assembly drawings confirming general arrangement, dimensions, tolerances, materials of construction, weights and installation details. Submit calculations to substantiate expansion joint selection and amount of pre-compression, signed and sealed by a Professional Engineer registered in the Province of Manitoba. Refer to Section 11055.

1.6 Coordination

- .1 Process and Utility Piping identification
- .2 Process and utility piping is identified in the Drawings by a two component alpha-numeric code, (Line Label) as follows:
 - .1 The first component of the code indicates the nominal line size.
 - .2 The second component of the code identifies the process fluid being conveyed, (Commodity).
 - .3 The process fluid (commodity) codes are defined in the Drawings.
- .3 Routing
 - .1 Coordinate piping installation routes and elevations with installation of sheet metal, process equipment, HVAC, instrumentation, and electrical work.

1.7 Conflicts

- .1 Review the Drawings prior to installation of piping, conduit services, and fixtures by this or any other division. Identify any conflicts and cooperate with the Contract Administrator to determine the adjustments necessary to resolve these conflicts.
- .2 Confirm the routing of each section of pipework with other services prior to commencement of installation. Advise the Contract Administrator of any conflicts with existing services or services yet to be installed. Where necessary, amend the routing of pipework to avoid conflict and confirm with the Contract Administrator.

PROCESS PIPING

1.8 Shipment, Protection and Storage

- .1 Deliver pipe, fittings, and specials to Site using loading methods which do not damage pipe or coatings.
- .2 Piping materials delivered to Site will be clearly marked to indicate size, type, class/schedule, and coatings.

1.9 Warranty

- .1 Contractor shall supply new materials and re-do the Work should materials be found to be defective or not in compliance with the Specifications, or should the workmanship be found to be inadequate or the Work was not performed in accordance with the Specifications and referenced standards, codes and regulations. This warranty shall remain in effect for the maximum period of time allowed under Law.
- .2 Neither the Contract Administrator's inspections, checks, or any other tests or subsequent authorization to proceed with the Work, nor the Contract Administrator's waiving of the Contract Administrator's right to perform such tests, nor the Contract Administrator's decision not to solicit submission of material certificates or other quality assurance documentation relieve the Contractor from any degree of responsibility in regard to the Work or the corresponding warranty above. The Contractor agrees that the Contract Administrator's ability to fully assess the suitability of materials, procedures, worker qualifications and other relevant issues is limited. The Contractor bears full responsibility and is solely liable in these matters.

2. PRODUCTS

2.1 Function

- .1 Provide the pipe materials, fittings, and appurtenances as described below, for the piping systems shown.

2.2 Pipe Materials – General

- .1 All pipe materials to be new, free from defects and conforming to the reference standards identified in Section 11055.
- .2 Where any standard referenced has been superseded prior to bidding, the Contractor shall comply with the new standard.

2.3 Pipe Sizes

- .1 Where the pipe size is not specified, provide pipe with the sizes required by the National Plumbing Code. For small piping not described by the National Plumbing Code, use 12 mm nominal diameter.

2.4 Fittings

- .1 General
 - .1 Provide eccentric reducers in horizontal lines with the flat side on top, unless shown otherwise.

PROCESS PIPING

- .2 Provide concentric reducers in vertical lines unless indicated otherwise.
- .3 Provide long radius elbows unless otherwise shown. Provide smooth flow carbon or stainless steel elbows 350 mm and less, to ANSI B16.9. Provide mitred elbows greater than 350 mm, to AWWA C208 unless otherwise shown or specified. Use three piece construction unless otherwise shown or specified.

2.5 Structural Element Penetrations

- .1 Structural element penetrations are shown and referenced to a detail or Process/Mechanical Standard Detail. Where a structural element penetration is not referenced, conform to the Standard Detail relevant to the type of structure, exposure, and type of pipe.

2.6 Insulation

- .1 Provide insulation where shown on drawings. Minimum insulation thickness: 25 mm. Use greater thicknesses as recommended by the manufacturer if more than 25 mm is required to lower the outer skin temperature to below 40°C.
- .2 Provide stainless steel bands over the insulation at a maximum of 300 mm centers.
- .3 Provide insulation and recovering for all piping where the pipe surface will sweat, where heat retention is required, and at the locations indicated on the Drawings.
- .4 Do not insulate over expansion joints or flexible hose connectors, in order to permit periodic inspection of connector bolting.
- .5 Recover all insulated pipe. Align longitudinal seams in aluminum recovering to shed water. Overlap radial seams a minimum of 50 mm.

3. 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 Make all minor modifications to suit installed equipment and structural element locations and elevations.
- .3 Piping arrangements indicated on the Drawings have been established on the basis of the "Design Standard" listed in the specific process equipment sections. If the equipment to be provided is not the Design Standard, modify the piping arrangement as necessary at no additional expense to the City.
- .4 Advise the Contract Administrator of all modifications. Do not commence work on the related piping until all modifications have been reviewed by the Contract Administrator.
- .5 Include any piping modifications in the Shop Drawings submitted prior to fabrication or installation.

PROCESS PIPING

3.2 Pipe Handling

- .1 Inspect each pipe and fitting prior to installation. Do not install damaged pipe..

3.3 Installation

- .1 Make adequate provision in piping and pipe support systems for expansion, contraction, slope, and anchorage. Supports, bracing, and expansion joints shown in the Drawings are schematic only. The Contractor is responsible for the design, supply, and installation of the piping system in general accordance with the indicated requirements.
- .2 Install pipe support system to adequately secure the pipe and to prevent undue vibration, sag, or stress.
- .3 Install expansion joints where shown and at other locations as necessary to allow for piping expansion and contraction.
- .4 Provide temporary supports as necessary during construction to prevent overstressing of equipment, valves, or pipe.
- .5 Slope instrument air piping to condensate traps. Provide condensate traps as recommended by the manufacturer of the instrument air compressor.
- .6 Do not cut or weaken the building structure to facilitate installation.

3.4 Testing

- .1 Give the Contract Administrator 24 hours notice prior to testing.
- .2 Do not insulate or conceal Work until piping systems are tested and accepted.
- .3 Supply all water, air, and inert gases required for pressure testing.
- .4 Supply all pumps, compressors, gauges, etc., required for testing.
- .5 Test all existing piping where it connects to new piping to the first valve in the existing piping. Repair any failures in existing piping which occur as a result of the test after informing the Contract Administrator of such failure.
- .6 Isolate all low pressure equipment and appurtenances during testing so as not to place any excess pressure on the operating equipment.
- .7 Release pressure safely, flush and drain liquid pipes after pressure tests. Release pressure safely and purge if needed all gas pipes after pressure tests.
- .8 Dispose of flushing water in manner approved by the Contract Administrator, which causes no damage to buildings or Siteworks.

END OF SECTION

DETAILED PIPING SPECIFICATION

1. GENERAL

1.1 Work Included

- .1 The piping specification sheets on the following pages detail the requirements for each type of process pipe included in the Work.
- .2 The piping materials are listed on the specification sheets.

1.2 Process Piping Commodity Summary

DA	Dry Air	PVC Sch80
SA	Soda Ash	PVC Sch80
SEA	Service Air	Aquatherm Greenpipe SDR 7.4, working pressure 200 psi (1400 kPa)

2. PRODUCTS

2.1 Schedule

- .1 Pages 2 to 4 following.
- .2 Piping located in the Sequencing Batch Reactor headspace is defined as "submerged".

DETAILED PIPING SPECIFICATION

DA

GENERAL					
PROCESS FLUID	SYMBOL	MAXIMUM CONDITIONS		TEST CONDITIONS	
		PRESSURE (kPa)	TEMP. (°C)	PRESSURE (kPa)	DURATION
Dry Air	DA	750	30	1000	120 minutes
PIPE					
LOCATION	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
All	10 – 200	PVC	Schedule 80	ASTM D1785, CSA 137.3	
COATINGS					
LOCATION	SIZE (mm)	MATERIAL		SPECIFICATIONS	REMARKS
All	10 – 200	N/A			
LININGS					
LOCATION	SIZE (mm)	MATERIAL		SPECIFICATIONS	REMARKS
All	10 – 200	N/A			
JOINTS					
LOCATION	SIZE (mm)	TYPE	MAXIMUM SPACING	SPECIFICATIONS	REMARKS
All	≥75	Solvent Weld	N/A	ASTM D2467, D2564	Note 1
	≥75	Flanges	12m	ASTM D2467	
FITTINGS AND APPURTENANCES					
ITEM	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
Flanges	10 – 200	PVC	Schedule 80		
ELL - Short Radius ELL - Long Radius, Couplings, Tees, Reducers, Reducing Outlets and Laterals	10 – 200	PVC	Schedule 80	ASTM D2467, Solvent Weld	
Plug	10 – 200	PVC	Schedule 80	ASTM D2467, Solvent Weld	
Cap	≥75	PVC	Blind Flange Schedule 80		
Flange Gaskets		Bl. Neoprene, Viton		ASTM F477	Note 3
PVC Solvent				ASTM D2564	Note 3
NOTES					
1. Provide Unions or flanges as shown on Drawings to allow for pipe disassembly. 2. Where pipe crosses a structural joint, install at the joint location an EPDM lined elastomer spherical moulded type expansion joint capable of 0.25 degrees angular movement and ±20 mm axial movement. 3. Gaskets and solvent material to be compatible with designated chemical solution.					

DETAILED PIPING SPECIFICATION

SA

GENERAL					
PROCESS FLUID	SYMBOL	MAXIMUM CONDITIONS		TEST CONDITIONS	
		PRESSURE (kPa)	TEMP. (°C)	PRESSURE (kPa)	DURATION
Soda Ash	SA	750	30	1000	120 minutes
PIPE					
LOCATION	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
All	10 – 200	PVC	Schedule 80	ASTM D1785, CSA 137.3	
COATINGS					
LOCATION	SIZE (mm)	MATERIAL		SPECIFICATIONS	REMARKS
All	10 – 200	N/A			
LININGS					
LOCATION	SIZE (mm)	MATERIAL		SPECIFICATIONS	REMARKS
All	10 – 200	N/A			
JOINTS					
LOCATION	SIZE (mm)	TYPE	MAXIMUM SPACING	SPECIFICATIONS	REMARKS
All	≥75	Solvent Weld	N/A	ASTM D2467, D2564	Note 1
	≥75	Flanges	12m	ASTM D2467	
FITTINGS AND APPURTENANCES					
ITEM	SIZE (mm)	MATERIAL	RATING	SPECIFICATIONS	REMARKS
Flanges	10 – 200	PVC	Schedule 80		
ELL - Short Radius ELL - Long Radius, Couplings, Tees, Reducers, Reducing Outlets and Laterals	10 – 200	PVC	Schedule 80	ASTM D2467, Solvent Weld	
Plug	10 – 200	PVC	Schedule 80	ASTM D2467, Solvent Weld	
Cap	≥75	PVC	Blind Flange Schedule 80		
Flange Gaskets		Bl. Neoprene, Viton		ASTM F477	Note 3
PVC Solvent				ASTM D2564	Note 3
NOTES					
1. Provide Unions or flanges as shown on Drawings to allow for pipe disassembly. 2. Where pipe crosses a structural joint, install at the joint location an EPDM lined elastomer spherical moulded type expansion joint capable of 0.25 degrees angular movement and ±20 mm axial movement. 3. Gaskets and solvent material to be compatible with designated chemical solution.					

DETAILED PIPING SPECIFICATION

SEA

GENERAL					
PROCESS FLUID	SYMBOL	OPERATING LIMITS		TEST CONDITIONS	
		PRESSURE (kPa)	TEMP. (°C)	PRESSURE (kPa)	DURATION
Service Air	SEA	0-750	5-30	1400	120 minutes
PIPE/FITTINGS					
LOCATION	SIZE (mm)	MATERIAL	RATING		
All	<75	Aquatherm Greenpipe SDR 7.4			

END OF SECTION

PROCESS PIPING AND EQUIPMENT INSULATION

1. GENERAL

1.1 Scope

- .1 Process piping and equipment insulation.

1.2 Quality Assurance

- .1 Install insulation employing skilled workers regularly engaged in this type of Work.
- .2 Materials shall meet or exceed fire and smoke hazard ratings as stated in this Section and defined in applicable building codes.

1.3 Submittals

- .1 Submit Shop Drawings which indicate complete material data, "K" value temperature rating, density, finish, recovery jacket of materials proposed for this project and indicate thickness of material for individual services.

1.4 Job Conditions

- .1 Deliver material to Site in original non-broken factory packaging, labeled with manufacturer's density and thickness.
- .2 Perform Work at ambient and equipment temperatures as recommended by the adhesive manufacturer. Make good separation of joints or cracking of insulation due to thermal movement or poor workmanship.

2. PRODUCTS

2.1 General

- .1 Insulation Materials, Recovery Jackets, Vapour Barrier Facings, Tapes and Adhesives:
 - .1 Composite fire and smoke hazard ratings shall not exceed 25 for flame spread and 50 for smoke developed rating when tested in accordance with CAN4-S102, NFPA 255 or ASTM E84.
 - .2 Provide insulating materials and accessories that withstand service temperatures without smouldering, glowing, smoking, or flaming when tested in accordance with ASTM C441.
 - .3 All insulation materials shall meet current Building Code Standards, and packages or containers of such materials shall be appropriately labeled.
 - .4 Insulate fittings and valve bodies with preformed removable insulated fittings.

2.2 Materials

- .1 Cold piping exterior: foamglass insulation with factory applied aluminum vapour barrier jacket, factory moulded to conform with piping. "K" value: maximum 0.035 W/m°C at 24°C. Service temperature: -40°C to 150°C.

PROCESS PIPING AND EQUIPMENT INSULATION

- .2 Recovery jackets: 0.9 mm smooth aluminum sheet or paintable canvas for all new insulated piping.

2.3 Above-ground Piping

- .1 Provide insulation for all piping where heat retention is required, at the locations indicated on the Drawings and for other piping systems where insulation is indicated on the process Drawings.
- .2 On exterior piping, provide aluminum jacketing with a minimum thickness of 0.9 mm, unless indicated otherwise.
- .3 Provide aluminum banding, 12 mm wide by a minimum of 0.5 mm thick with matching seals.
- .4 Provide polypropylene jacketing at elbows, tees or other changes of direction and where indicated. Use the heat-shrink type jacketing, with a minimal thickness of 0.1 mm.

3. EXECUTION

3.1 Preparation

- .1 Do not install insulation and recovering before piping and equipment has been tested and approved.
- .2 Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application. Finish with systems at operating conditions.

3.2 Installation

- .1 Finish insulation neatly on hangers, supports, and other protrusions.
- .2 Locate insulation or cover seams in least visible locations. Locate seams on piping in ceiling spaces on the underside of the pipe.
- .3 Cover all insulated piping throughout with aluminum or paintable canvas recovery jacket secured with aluminum bands on 200 mm centres or screws on 150 mm centres, unless otherwise noted. Lap the joints a minimum of 75 mm. Align longitudinal seams in aluminum recovering to shed water. All bands and screws are to be accessible for service and removal.
- .4 Cold piping: seal lap joints with 100 percent coverage of vapour barrier adhesive. Seal butt joints with 50 mm wide strips of vapour barrier sealed with vapour barrier adhesive. For fittings and valves, apply hydraulic insulating cement; or apply factory fabricated insulation half shells, seal all laps and joints.

PROCESS PIPING AND EQUIPMENT INSULATION

3.3 Process Pipe Insulation Installation Thickness Schedule

Piping or Equipment		Insulation Thickness (fibreglass) mm	Insulation Thickness (closed cell phenolic) mm	Recovery Jacket
Insulated Process Piping, as shown on drawings	15 to 50 Over 50	25 50	25 25	As noted in 2.2

END OF SECTION

DIAPHRAGM METERING PUMP SKID

1. GENERAL

1.1 Work Included

- .1 Supply and installation, testing, and commissioning of a complete and functional diaphragm pump systems for designated chemicals dosing application, as per the Drawings.

1.2 Submittals

- .1 Submit Shop Drawings in accordance with Section 01300.
- .2 Operation and maintenance data: provide for incorporation in O&M Manual as specified in Section 01735. Include complete description of operation together with general arrangement and detailed drawings, wiring diagrams for power and control schematics, parts catalogue with complete list of repair and replacement parts with section drawings illustrating the connections and identifying numbers.

1.3 Shipment, Protection, and Storage

- .1 Ship pre-assembled to the degree possible.
- .2 Provide storage instructions indicating specific requirements to ensure there is no uneven wear, distortion or weathering of components.
- .3 Identify all other special storage requirements.

2. PRODUCTS

2.1 Description

- .1 Provide equipment capable of pumping ClearTech LimeClear™ from a 205 L storage drum in the configuration shown on the Drawings.
- .2 Each pumping system includes a diaphragm metering pump, pressure relief valve, pulsation damper, pressure, backpressure valves, drip tray, and all associated piping and fittings, in accordance with the Drawings.
- .3 The whole system shall take into account the atmospheric temperature, the specific gravity, viscosity, flammability, and temperature of the fluid being pumped.

2.2 Tag Numbers

- .1 C661-P-P (Duty).
- .2 C662-P (Standby).

2.3 Acceptable Manufacturers

- .1 Abel (as supplied by Power & Mine).

DIAPHRAGM METERING PUMP SKID

- .2 Prominent (as supplied by Metcon).
- .3 Blue-White Flex-Pro A2
- .4 Watson Marlow Q-DOS

2.4 Capacities and Performance

- .1 Liquid properties:
 - .1 Specific gravity: 1.00 to 1.03.
 - .2 Boiling point: not available.
 - .3 Freezing point: -1°C.
 - .4 Classification: Class 1B liquid.
 - .5 Non-flammable.
- .2 Ambient environment temperature -40°C to 35°C.
- .3 Diaphragm Metering Pumps:
 - .1 Pump shall discharge between 11 and 27 mL of product to each batch (corresponding to 3 to 7 mg/L per 3800 L batch).
 - .2 Maximum backpressure: 100 kPa (before backpressure valve).
 - .3 Maximum negative suction lift (barrel empty): 2.5 m.
 - .4 Maximum differential pressure pump suction and discharge: 135 kPa.

2.5 Materials

- .1 Diaphragm: EPDM or PTFE capable of operation over the range of specified fluid temperatures.

2.6 Diaphragm Pumps

- .1 Provide diaphragm metering pump with hydraulic double diaphragm.
- .2 Provide gearbox with manual speed adjustment for altering pump frequency.
- .3 The pumps shall provide a constant flow rate for a particular stroke length and provide constant output flow over the full range of fluid levels in the storage tanks.
- .4 The pumps shall have a pumping accuracy of ± 5 percent.
- .5 Construct the pump parts in contact with the fluid from materials suitable for the specified fluids.

DIAPHRAGM METERING PUMP SKID

- .6 Provide pressure relief valve and backpressure regulating valve for each pump discharge, sized for the maximum pump flow with an adjustable pressure range. Valve material to be compatible with the fluids being pumped.
- .7 Provide motors in suitable for Phase 120V.
- .8 Provide heat tracing on enclosure together with a thermostat, if required for protection of the equipment at low temperatures.

2.7 Control Description

- .1 The pump is started automatically by the Distributed Control System (DCS) at the start of the soda ash batch preparation sequence. The metering pump shall inject the volume of chemical required to produce the desired concentration in the 3800 L batch tank and then shut off.

2.8 Spare Parts and Maintenance Materials

- .1 Provide the following spare parts:
 - .1 Two (2) pump diaphragms.
 - .2 One (1) set of ball check valves.
 - .3 One (1) set of ball check valve seats.
 - .4 One (1) set of gaskets and O-rings.
 - .5 One (1) backpressure valve diaphragm.
 - .6 One (1) pressure relief valve diaphragm.
- .2 Provide a list of spare parts which would be expected to be required over a period of five years under normal conditions. At the Contract Administrator's request, provide a price for the listed parts.

3. EXECUTION

3.1 Manufacturer's Representative

- .1 To ensure the equipment is installed, operated, and maintained in accordance with the manufacturer's recommended procedures, arrange for a technically qualified manufacturer's representative to witness the installation Work, certify correct installation, train operating and maintenance staff, and undertake system testing.

3.2 Installation

- .1 Ensure the equipment is installed as required to provide satisfactory service.
- .2 Instruct installer in the methods and precautions to be followed in the installation of the equipment.

DIAPHRAGM METERING PUMP SKID

3.3 Testing

- .1 Ensure the equipment, including all component parts, operates as intended.
- .2 Cooperate with the installer to fulfill the requirements for successful testing of the equipment by completing Form 103, included in Section 01670.

3.4 Commissioning

- .1 Attend during commissioning of the process system which includes the equipment.

END OF SECTION

SODA ASH SILO DEHUMIDIFIER AND AIR CANNON ACTIVATORS

1. GENERAL

1.1 Work Included

- .1 Supply and installation, testing, and commissioning of a complete and functional dehumidifier to prevent soda ash from absorbing humidity that will affect product flow inside the silo, as per the Drawings.
- .2 Supply and installation, testing, and commissioning of a complete and functional air canon activator system to minimize compaction of soda ash inside the silo, and to ensure the soda ash flows satisfactorily inside the silo, as per the Drawings.

1.2 Submittals

- .1 Submit Shop Drawings in accordance with Section 01300.
- .2 Operation and maintenance data: provide for incorporation in O&M Manual. Include complete description of operation together with general arrangement and detailed drawings, wiring diagrams for power and control schematics, parts catalogue with complete list of repair and replacement parts with section drawings illustrating the connections and identifying numbers.

1.3 Shipment, Protection, and Storage

- .1 Ship pre-assembled to the degree possible.
- .2 Provide storage instructions indicating specific requirements to ensure there is no uneven wear, distortion or weathering of components.
- .3 Identify all other special storage requirements.

2. PRODUCTS

2.1 Dehumidifier

- .1 Provide CON-V-AIR Solutions Model HC-300 dehumidifier sized appropriately for the silo and material being protected.

2.2 Air Cannons

- .1 Provide CON-V-AIR Solutions Model P4040 air canon activator system capable of fluidizing of the soda ash to aide its movement within the silo, achieved through the sudden air expansion coming out of the activators. Include CON-V-AIR Solutions Model P5E04 factory-assembled control panel.

2.3 Tag Numbers

- .1 SA C626-1
- .2 SA C626-2

SODA ASH SILO DEHUMIDIFIER AND AIR CANNON ACTIVATORS

.3 SA C626-3

.4 C627-AD

2.4 Acceptable Manufacturers

.1 CON-V-AIR Solutions

2.5 Dehumidifier

- .1 Provide one (1) dehumidifier.
- .2 Provide dehumidifier housing with desiccant wheel and drive.
- .3 Provide electric reactivation heater and reactivation fan assembly.
- .4 Provide factory-wired control enclosure with indicating package.
- .5 Including piping and supports for connection between dehumidifier and silo roof.

2.6 Air Cannon Activator System

- .1 Provide three (3) air cannon bin activator assemblies each including:
 - .1 One (1) 38 mm (1.5 inch) carbon steel injector
 - .2 One (1) 56 L (2 cu ft) carbon steel high pressure tank
- .2 Provide one (1) factory-assembled control panel.
- .3 Provide three (3) kits to mount the injectors onto silo cone complete with rigid and flexible connections.

2.7 Control Description

- .1 System sequencing and operation to be controlled by manufacturer supplied control panels.
- .2 The dehumidifier will continuously blow dry atmospheric air into the silo.
- .3 The air cannon activator system will receive a control signal from the manufacturer-supplied panel to initiate the “blast” cycle based on an adjustable timer. Upon initiation of the “blast” cycle, the solenoid on one of the air cannons will be energized for an adjustable period of time, and then will shut down. Once the “blast” cycle of the first air cannon has been completed, there is an operator adjustable time delay before the “blast cycle” for the next air cannon is initiated. Similarly, after the second air cannon is finished, the third air cannon will go through its cycle.
- .4 Provide the control panel with sufficient I/O to allow integration into the plant DCS system (being upgraded as part of main plant expansion).

SODA ASH SILO DEHUMIDIFIER AND AIR CANNON ACTIVATORS

2.8 Painting

- .1 Shop prime and paint equipment in accordance with manufacturer's standard.

2.9 Spare Parts and Maintenance Materials

- .1 Provide the following spare parts:
 - .1 One (1) solenoid valve
 - .2 One (1) injector assembly
- .2 Provide a list of spare parts which would be expected to be required over a period of five years under normal conditions. At the Contract Administrator's request, provide a price for the listed parts.

3. EXECUTION

3.1 Manufacturer's Representative

- .1 To ensure the equipment is installed, operated, and maintained in accordance with the manufacturer's recommended procedures, arrange for a technically qualified manufacturer's representative to witness the installation Work, certify correct installation, train operating and maintenance staff, and undertake system testing.

3.2 Installation

- .1 Ensure the equipment is installed as required to provide satisfactory service.
- .2 Instruct installer in the methods and precautions to be followed in the installation of the equipment.
- .3 Cooperate with the installer to fulfill the requirements for a successful installation.

3.3 Testing

- .1 Ensure the equipment, including all component parts, operates as intended.
- .2 Cooperate with the installer to fulfill the requirements for successful testing of the equipment.

3.4 Commissioning

- .1 Attend during commissioning of the process system which includes the equipment specified in this section and to ensure the equipment functions as intended in the process system.

END OF SECTION