

TYPICAL SPECIFICATIONS

BULK PAC SYSTEM **DIRECT INJECTION TYPE**

Part 1 - GENERAL

1.01 Scope

The contractor shall furnish all labour, materials, equipment and incidentals required and deliver, and place into satisfactory operation, one complete Bulk PAC System as specified herein and as shown on the plans.

1.02 Related Work

- A. Concrete work is included in Section ()
- B. Electrical Work is included in Section ()
- C. Instrumentation is included in Section ()
- D. Piping, valves and appurtenances, except as specified herein is included in Section ()
- E. Instrumentation, except as specified herein is included in Section ().
- F. Painting is included in Section ()

1.03 Submittals

The contractor shall obtain from the system supplier and submit as a minimum the following information for the Bulk PAC System:

- A. Data Sheets and Shop Drawings for approval per Section ():
 - General Arrangement
 - Process and Instrumentation
 - Single Line AC Control System Schematic
 - Three Line AC Control System Schematic
 - Field Wiring Diagram
 - Description of Sequence of Operation
 - Shop Drawings for custom fabricated items
 - Cut Sheets for Standard items
- B. Operation and Maintenance Manuals per Section (), to be submitted upon shipment of equipment giving:
 - General Description
 - Active Components - Detailed Description
 - Controls and Electrical Schematic
 - PLC Programming Logic

Startup and Operation Instructions
Individual Component O&M Manuals
List of Manufacturer's recommended spare parts

1.04 Reference Standards

- A. National Building Code NBC 1990
- B. Universal Building Code (UBC, 97)
- C. National Electric Code (NEC)
- D. American National Standards Institute (ANSI)
- E. Canadian Standards Association (CSA)
- F. American Society of Manufacturing Engineers (ASME)

1.05 Quality Assurance

- A. The equipment shall be the product of a manufacturer who is regularly engaged in chemical feed system design and supply.
- B. The major components of the Bulk PAC System shall be furnished by a single supplier to ensure full coordination of all units and to establish a single source of responsibility and control over the system
- C. The manufacturer must have installed and had in satisfactory operation for a period of not less than five (5) years a minimum of five (5) installations of similar size.
- D. The drawings and specifications covered by this section are based on the equipment manufactured by Stanco Projects Ltd.

Part 2 - PRODUCTS

2.01 Design Requirements

The bulk PAC system shall be designed to receive, store, feed PAC slurry direct to the process. The intent of this specification is to provide a complete operating system that will automatically respond to changes in process conditions. As a minimum the system shall be designed for the following:

- A. Capacities:
 - Usable Storage Silo Capacity : _____ Cu.Ft.
 - PAC Bulk density _____#/cu.ft.
 - PAC Feed Rate: _____ lbs/hr design
 - Dilution water flow rate; _____ usgph
- B. Electrical classification for the area is *“Unclassified”, “Class 11, Group F, Div. 1”*
Class 11, Group F, Div. 2”

The system shall receive PAC in bulk quantities from self-unloading trucks equipped with pneumatic conveying equipment. Conveying air shall be vented through the bin vent filter. Truck operator shall initiate the filter operation at the truck fill panel; an alarm shall sound automatically when the silo reaches a high level condition.

Flow of PAC from the silo shall be assisted by means of fluidization into a rotary airlock valve. The rotary airlock valve shall feed the PAC into a loss in weight feeder system. The volumetric feeder shall draw from the transition hopper and meter PAC at an adjustable rate into the wetting cone eductor system in response to plant generated flow signals.

A main control panel shall control and indicate the status of components in the system. With exception of silo filling, all activities of the bulk PAC system shall be operable in an automatic mode without supervision.

2.02 System Components

The bulk PAC system shall consist of, but not be limited to, the following components;

- 1) PAC Storage Silo
- 2) Bin Vent Filter
- 3) Silo Level Sensors
- 4) Silo Fluidization
- 5) Rotary Airlock Valve
- 6) Loss in weight Volumetric Feeder
- 7) Wetting cone/Eductor
- 8) Piping and Valves
- 9) Control System
- 10) Accessories

2.02.1 PAC Storage Silo

PAC Silo shall be of welded construction c/w a 60 degree cone bottom outlet elevated to provide sufficient clearance for the feeding and pumping equipment. Silo to be **skirt/leg** supported with 2'8" X 6'8" door(s) in the skirt. Accessories shall include a 20" diameter combination pressure/vacuum relief manway, filter flange, level sensor connections, OSHA approved full height caged ladder and perimeter guard rail, 4" /Sch. 40 fill line with long radius elbows and Kamlock type truck hose fitting with dust cap.

Silo shall be designed for storage of PAC at **TBA** lb/cu.ft., seismic zone __ per UBC, 100 mph wind load and __PSF ground snow load. Minimum working volume shall be _____ cu. ft.

2.02.2 Bin Vent Filter

Bin vent filter shall be supplied for mounting on the silo roof to vent the conveying air. Bin vent filter shall be of the pleated cartridge type with stainless steel construction, complete with polyester felt cartridges with a minimum of 350 sq.ft. filter area, air backwash cleaning mechanism, solid state adjustable time, solenoid and purge valves, plant air manifold, side access door, bird screen, vent hood, air lubricator, filter and pressure regulator.

The bin vent filter shall use a maximum of 6 SCFM of compressed air supplied by others for filter cleaning.

2.02.3 Silo Level Sensors

One only tuning fork type level sensor shall be provided for indication of high material level in the storage silo, c/w a stainless steel probe, solid state integral sensing electronics, DPDT contact and NEMA 4 enclosure. Rotating paddle wheel type level sensors shall not be acceptable. Probe is to be located in the roof of the silo with a cable extension sized to suit the silo high level design point.

For continuous level measurement a radar reflex level device shall be provided on the roof of the silo. The device shall be capable of providing a continuous 4-20 ma signal to indicate level in addition to up to 3 selectable set points each with a DPDT contact.

2.02.4 Silo Fluidization

Flow promotion devices shall be provided to ensure positive flow of the contents from the silo and prevent bridging, jamming, and segregation. A 2' diam. aeration cone shall be provided at the discharge of the silo. Eight (8) fluidized air pads shall be provided to be located in the silo cone above the aeration cone. Two (2) pneumatically operated high amplitude low frequency impactors shall be provided on the silo cone. All flow promotion devices shall be provided with adjustable timers with the timers located in the main control panel.

Air control sets shall be provided to regulate and control each type of device.

Compressed air to operate the devices shall be provided by the **owner/contractor**.

Silo shall be equipped with a _____ inch discharge isolation gate valve mounted on the bottom of the aeration cone with a **handwheel or chainwheel** actuator, 316SS wetted components, and flexible discharge transition to allow positive isolation of silo contents for service of equipment downstream.

2.02.5 Rotary Airlock Valve

A rotary airlock valve shall be provided beneath the isolation gate valve to control flooding. Valve shall be sized to feed ___ lbs/hr PAC at a constant rate into the transition feed hopper. Valve body shall be cast iron, with fabricated steel rotor, adjustable blade tips, fully outboard bearings, minimum ___ hp TEFC drive motor, gear reducer, chain drive and guard, inlet and discharge transitions as required.

Rotary valve shall operate in response to level signals in the transition hopper.

2.02.6 Loss in weight Volumetric Feeder

____ only loss-in-weight volumetric feeder(s) systems shall be provided. The volumetric feeder shall be of the screw type, sized for feeding from ___ to ___ cu.ft./hr of PAC. Feeder shall be of **carbon steel/stainless steel** construction, complete with full flight spiral feed screw, helical conditioning screw, flanged inlet, variable speed ___ hp DC drive motor, gear reducer and SCR drive controller with 4-20mA receptacle for remote speed control. Feeder shall be c/w stainless steel surge hopper with a minimum capacity of _____ cu. ft. c/w vent sock. A platform scale fabricated of **carbon steel/stainless steel** to provide accurate weighing of the hopper contents. A loss in weight controller shall be provided c/w totalizer, instantaneous and cumulative feed registers, programmable monitoring and alarm devices.

2.02.7 Wetting Cone/Eductor

A wetting cone eductor system shall be provided to thoroughly wet the PAC. Wetting cone shall be a min. of 2' diam., fabricated of stainless steel and be complete with inspection hatch, inlet, vent, overflow, level control and suction connections. A float valve arrangement shall be provided to prevent air entrainment into the solution. An immersion level probe and controller shall be provided to monitor the level in the wetting cone. The eductor shall be fabricated of cast stainless steel construction sized for the application parameters.

An in line static mixer shall be provided c/w 304 stainless steel wetted parts and housing to ensure positive mixing.

Design data

Feed rate PAC	_____ lbs/hour
TDH	_____ ft.
Line size	_____ ”
Motive water pressure	_____ psig
Pressure at receiving point	_____ psig

2.02.8 Piping and Valves

Piping shall be supplied as shown on the drawings. Piping material shall be 304SS with a diameter of ____”. Care shall be taken to minimize changes in direction. Where bends are required they shall be long radius bends.

2.02.9 Control System

Electrical components, shop wiring and design shall be system suppliers standard with the following minimum requirement for control panels: Power supply to be ____v/3 phase/____ cycle with a minimum ____ amp. service

A. Truck Fill Panel

For mounting adjacent to silo fill pipe, one only fill system control panel complete with the following features:

- NEMA 4 enclosure
- Silo high/low indication lights
- Silo High level alarm and silence pushbutton
- Bin Vent Filter H/O/A selector switch and indicator light
- Control Power on/off indication light
- Circuit breakers or fuses as required

B. Main System Control Panel

For mounting adjacent to feeder, one only main control panel complete with the following features:

- Graphic system representation

- Main Disconnect Switch
- Transformer
- Circuit breakers or fuses as required
- H/O/A and status indication lights for the following:
 - Bin Activator
 - Rotary Airlock Valve
 - Volumetric feeder
- Status indication light for the Bin Vent Filter, silo levels, transition hopper levels,
- Allen Bradley SLC series programmable logic controller, factory programmed for automatic control of all sequences.
- Motor starters as required for equipment supplied.

Alarm lights, audible alarm, and silence pushbutton for the following conditions:

- PAC Silo high level
- Transition hopper low level

It “**is/is not**” intended for the PLC to communicate to the in plant SCADA system via Modbus or equal protocol. Provide program documentation to the Consultant with a list of appropriate variables and parameters to be monitored on the plant HMI.

A plant **flow/pH** signal shall be provided to the system supplier to enable the PAC system flow/pH based control.

2.02.10 Accessories

The following accessories shall be provided with the system;

- a) Lightning protection for the silo
- b) Insulation and cladding of silo skirt area with R-10 rigid insulation and 26 ga. prepainted steel cladding
- c) Skirt exhaust fan 150 cfm min. Exhaust fan motor shall be 1/10 hp, 115 v, single phase, 60 Hz. Provide a wall mounted on/off switch.
- d) Skirt electric heater 10 kw min. c/w contactor and temperature controller.
- e) Shower and eyewash assembly
- f) Lighting for the skirt area consisting of a minimum of ____ high intensity light fixtures.
- g) Air compressor c/w refrigerated dryer suitable for operation of all system components.
- h) Spare parts sufficient for 2 years operation at design rate. As a minimum these parts will consist of the following:

2.03 Painting

1. The equipment described herein shall be factory primed and painted in accordance with the manufacturer's recommendations.

2. Silo surfaces shall be steel grit blasted to SSPC-SP 6 standards, with one coat baked epoxy primer, 1.5 mil min. DFT and exterior only baked enamel finish coat.
3. Machined and polished surfaces, stainless steel, or non-ferrous or galvanized metals are not painted. Drive units and motors are not painted.

2.04 Concrete and Grout for Support Pads

- A. Concrete: Class 1; Follow Section ()
- B. Grout: Non shrink, non corrosive; Follow Section ()

Part 3 - EXECUTION

3.01 Installation

The contractor shall assume full responsibility for installation of the PAC system, including sub-assembly of major components, field piping, interconnecting wiring and all supports and miscellaneous hardware not specifically stated herein. This work shall include bringing sources of power, water and compressed air to system supplier's termination points

3.02 Manufacturer's Representative Services

The contractor shall make an allowance in his bid for the performance of startup and operator training by the system supplier or his representative. As a minimum, this allowance shall include for ____ separate trips to the site for the purpose of ____ days for startup and ____ days for operator training.