

## **TYPICAL SPECIFICATIONS**

### **BULK HYDRATED LIME SYSTEM** **Single Train- Recycle Loop**

#### **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 Hydrated Lime 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 Hydrated Lime 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 1995
- B. Uniform Building Code (UBC, 97)
- C. National Electric Code (NEC)
- D. Canadian Electrical Code
- E. American National Standards Institute (ANSI)
- F. Canadian Standards Association (CSA)
- G. American Society of Manufacturing Engineers (ASME)

## 1.05 Quality Assurance

- A. The equipment shall be the product of a systems supplier who is regularly engaged in chemical feed system design and supply.
- B. The major components of the Bulk Hydrated Lime 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 ten (10) 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 hydrated lime system shall be designed to receive, store, feed and prepare a lime slurry ready for use by the owner. 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.
  - Hydrated lime Feed Rate: \_\_\_\_\_ lbs/hr design
  - Lime Slurry Concentration \_\_\_\_\_ %
  - Lime Slurry Feed rate \_\_\_\_\_ usgph
- B. Electrical classification for the area is "Unclassified"

The system shall receive hydrated lime 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 lime from the silo shall be assisted by means of flow promotion devices into a rotary airlock valve. The rotary airlock valve shall feed the lime into a transition feed hopper operating in response to level signals in the hopper. The volumetric feeder shall draw from the transition hopper and meter lime at a rate proportional to ph/flow into the slurry tank wetting system. Dilution water shall be added continuously to maintain a constant level in the slurry tank. Slurry pumps/eductors will transport the slurry to the process at a fixed rate.

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 hydrated lime system shall be operable in an automatic mode without supervision.

## 2.02 System Components

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

- 1) Lime Storage Silo
- 2) Bin Vent Filter
- 3) Silo Level Sensors
- 4) Flow Promotion Devices
- 5) Rotary Airlock Valve
- 6) Transition Hopper
- 7) Volumetric Feeder
- 8) Lime Slurry tank
- 9) Transport pumps
- 10) Piping and Valves
- 11) Control System
- 12) Accessories

### 2.02.1 Lime Storage Silo

Lime Silo shall be of *welded/bolted* construction c/w a 60 degree cone bottom terminating in a 2' flanged 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 24" 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 hydrated lime at 25lb/cu.ft. (volumetric) 35 pcf (structural), seismic zone, \_\_\_ per UBC, 80 mph wind load and \_\_\_ PSF 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 250sq.ft. filter area, air backwash cleaning mechanism, solid state adjustable time, solenoid and purge valves, plant air manifold, bird screen, vent hood, air lubricator, filter and pressure regulator.

The bin vent filter shall use a maximum of 6 SCFM of compressed air @ 80 psig supplied by others for filter cleaning.

### **2.02.3 Silo Level Sensors**

One only capacitance type point 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 *load cell/radar reflex/capacitance/ ultrasonic* level device shall be provided on the silo. The device shall be capable of providing a continuous 4-20 ma signal to indicate level in addition to up to 5 selectable set points each with a Form C contact.

### **2.02.4 Flow Promotion Devices**

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 lime 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 lime 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 Transition Hopper**

A transition hopper fabricated of painted carbon steel shall be provided with a minimum capacity of 5 cu. ft. The hopper shall be designed to ensure free flow of lime and be equipped with an external electromagnetic vibrator to prevent product bridging. The hopper shall be furnished with a hinged, gasketed access door and a vent sock.

Two only capacitance type point level sensors shall be provided for indication of material level in the hopper, c/w stainless steel probes, solid state integral sensing electronics, DPDT contact and NEMA 4 enclosure. Rotating paddle wheel type level sensors shall not be acceptable.

### 2.02.7 Volumetric Feeder

\_\_\_ only volumetric feeder(s) shall be provided for mounting beneath the vented transition hopper for feeding of lime into the slurry makedown system. The volumetric feeder shall be of the screw type, sized for feeding from \_\_\_ to \_\_\_ cu.ft./hr of hydrated lime. Feeder shall be of carbon 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.

### 2.02.8 Lime Slurry Tank

A \_\_\_ usg painted carbon steel lime slurry tank shall be provided for mixing of lime and water. Slurry tank shall be c/w interior baffles, a hinged gasketed access manway, overflow, drain c/w valve, and flanged discharge connections. Tank design shall include provision for dust control. A \_\_\_ hp centre mounted agitator shall be provided to ensure positive mixing of the tank contents under wetting conditions. Agitator shall be supplied with carbon steel shaft and impellers.

An *ultrasonic level-control valve assembly /float valve device* shall be provided to maintain a constant water level in the slurry tank by controlling the dilution water flow. An overflow alarm device shall be provided on the slurry tank to warn of overflow conditions.

Water system addition assembly shall be supplied consisting of an isolation gate valve, solenoid valve and pressure gauge. Supply water to be supplied by others at a constant regulated pressure.

### 2.02.9 Lime Slurry Pumps

\_\_\_ lime slurry pumps shall be provided with one operating. Pumps shall be of the *centrifugal recessed impeller/ peristaltic/ eductor* type and be provided with a positive sealing arrangement. Gland seal water arrangements shall not be permitted. Each pump shall be sized to suit the system requirements and shall be complete with an overhead mounted TEFC drive motor, V-belt drive, guard and base plate.

Pumps shall be manifolded together such that either pump can be used. Each pump shall be supplied with suction and discharge shut off valves. Valves to be Saunders diaphragm type or equal.

Each pump shall be equipped with a *manual/automatic* flushing system.

Design data

Feed rate lime slurry	_____ usgpm
TDH	_____ ft.
Line size	_____ ”
Slurry concentration	_____ %

### 2.02.10 Piping and Valves

Lime slurry piping shall be supplied as shown on the drawings. Piping material shall be Sch. 40 PVC with a diameter of \_\_\_”. Care shall be taken to minimize changes in direction. Where bends are required they shall be long radius bends.

The slurry piping shall be supplied with a check valve and an isolation sleeve type pressure sensor . Sensor to be supplied by Moyno/RKL or equal.

### 2.02.11 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 as required

#### B. Main System Control Panel

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

- Lamicoid graphic system representation
- Main Disconnect Switch
- Transformer
- Circuit breakers as required
- H/O/A and status indication lights for the following:
  - Aeration Cone and Diffusers
  - Impactors
  - Rotary Airlock Valve
  - Volumetric feeder
  - Lime Slurry Agitator
  - Slurry pumps
- Status indication light for the Bin Vent Filter, silo levels, transition hopper levels
- Allen Bradley 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:

- Lime Silo high level
- Transition hopper low level
- Slurry tank high level

It “is/is not” intended for the PLC to communicate to the in plant DCS system via DH+ 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 lime system flow/pH based control.

## 2.02.12 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) Air compressor and refrigerated dryer suitable for operation of all system components.
- g) Lighting for the skirt area consisting of a minimum of \_\_\_\_ high intensity light fixtures.
- 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 epoxy primer, 1.5 mil min. DFT and exterior only enamel finish coat. Hopper interior area to be coated with low friction coating 1.5 mil DFT for flow promotion.
3. Machined and polished surfaces, stainless steel, or non-ferrous or galvanized metals are not painted. Drive units and motors are not painted and will be shipped with manufacturers standard coatings.

## 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 hydrated lime 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.