

TYPICAL SPECIFICATIONS

BULK QUICK LIME SYSTEM

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 Quick Lime Slaking 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 Quick Lime Slaking 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 Quick Lime Slaking 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 quick lime system shall be designed to receive, store, slake, 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.
 - Quick lime Slaking Rate: _____ lbs/hr design
 - Quick Lime Quality _____ % CaO, _____ Size
 - Lime Slurry Concentration _____ %
 - Lime Slurry Feed rate _____ usgph
- B. Electrical classification for the area is "Unclassified"

The system shall receive quick 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 a bin activator into a surge hopper feeding a volumetric screw feeder. The volumetric feeder shall draw from the transition hopper

and meter lime at an adjustable rate into the slaking system. Lime slurries shall be prepared automatically in response to level signals from the slurry tank. Slurry pumps will re-circulate the lime slurry in a recycle loop with the lime slurry being added to the process through automatically operated pinch valves at the use point(s) in response to a plant supplied signal based on **pH/flow**.

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

2.02 System Components

The quick 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) Bin Activator
- 5) Transition Hopper
- 6) Volumetric Feeder
- 7) Lime Slaker
- 8) Grit remover
- 9) Lime Slurry tank
- 10) Recycle pumps
- 11) Piping and Valves
- 12) Control System
- 13) Accessories

2.02.1 Lime Storage Silo

Lime Silo shall be of *welded/bolted* construction with a 60 degree cone bottom terminating in a ___' flanged outlet elevated to provide sufficient clearance for the feeding and slaking 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 quick lime at 65lb/cu.ft., seismic zone ___ per UBC, 80 mph wind load and ___ PSF snow load. Minimum working volume of the silo 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 250 sq.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 an *ultrasonic level/ load cell/ strain gauge/ microwave device* shall be provided for 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 Bin Activator

A vibrating bin activator shall be provided to assist in flow promotion of the silo contents. The bin activator shall have a diameter of at least 1/3 of the silo diameter. The bin activator shall be fabricated of carbon steel and be c/w a secondary inverted internal cone assembly to minimize the head load on the discharger. The bin activator unit shall be mounted to the silo with isolation hangars and be equipped with a dust tight inlet flexible skirt. Unit shall be supplied with an integral gyrator motor, and flexible discharge chute.

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

2.02.5 Volumetric Feeder

_____ only volumetric feeder(s) shall be provided, one for mounting beneath each vented transition hopper for feeding of lime into the slurry makedown sytem.. The volumetric feeder shall be of the screw type, sized for feeding from ___ to ___ cu.ft./hr of quick lime. Feeder shall be of carbon steel construction, complete with full flight spiral feed screw, flanged inlet, variable speed _____ hp DC drive motor, gear reducer and SCR drive controller with 4-20mA receptacle for remote speed control.

2.02.6 Lime Slaker

_____ only lime slaker shall be provided with a maximum slaking capacity of _____ #/hr. Slaker shall be of the paste type with the ability to achieve a self sustaining slaking temperature of 170 deg. F or above without the use of a heat exchanger or heated water. The slaker will automatically control the slaking water flow rate by means of a microprocessor based water control system to maintain a consistent water to lime ratio. An electronic water control torque valve shall be provided c/w two bypass assemblies; one to admit water to the slaking compartment for washdown and one c/w a solenoid valve which will dilute the paste in the slaking compartment in the event of a power failure. The slaker shall be equipped with a proximity switch to provide a zero speed alarm on the slaker paddle shafts.

The slaker shall be constructed of *stainless steel/ heavy gauge steel painted with corrosion resistant epoxy paint.*

Lime slaker shall be equipped with a low water pressure switch in the torque valve piping designed to stop the feeder when the water pressure falls below the minimum operating requirement. A slaker exhaust fan and ducting shall be provided to ensure positive venting of produced steam away from the lime feeder and slaker.

2.02.7 Grit Remover and Conveyor

A vibrating screen type grit separator shall be provided to remove all grit down to 20/ 40 mesh in size from the produced lime slurries at concentrations up to 21%. The separator shall be c/w a slurry velocity reducer, flexible discharge hoses and a 1/3 or ½ hp, 230VAC, 3 ph. TENV motor and three spare screens.

OR

A grit removal screw conveyor shall be provided to remove the grit separated from the lime slurry and discharge the grit to a suitable container. Conveyor shall be of the screw type with a 6” minimum screw size and c/w a 1 hp TENV drive motor.

2.02.8 Lime Slurry Tank

A _____ usg painted carbon steel lime slurry tank shall be provided for the lime slurry. Slurry tank shall be c/w interior baffles, hinged, gasketed access manway, overflow, drain c/w valve, and flanged discharge connections.

A _____ hp low speed centre mounted agitator shall be provided to ensure positive suspension of the tank contents. Maximum agitator speed is 350 rpm. Agitator shall be supplied with carbon steel shaft and impellers.

An ultrasonic level device shall be provided to monitor and control the slurry makedown procedure. Indicator to provide an analog output c/w a minimum of 4 digital relays. Setpoints shall be programmable by the supplied handheld programmer.

2.02.9 Lime Slurry Pumps

_____ lime slurry pumps shall be provided with one operating. Pumps shall be of the centrifugal recessed impeller 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. Pump(s) to be Wilfley Model K or equal.

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 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

Recycle loop 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 recycle loop shall be supplied with a manually operated pinch valve to maintain system back-pressure located at the return to the slurry tank. An isolation sleeve type pressure sensor shall be supplied on the recycle loop piping. Sensor shall be supplied by Moyno/Red Valve or equal.

Pneumatically operated pinch valve(s) shall be supplied at each application point. Each discharge valve to be supplied with a manual by-pass assembly. Pneumatic operator shall be controlled by the main control panel logic. Pinch valves shall be Moyno/Red Valve 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/3ph/ __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:
 - Bin activator
 - Volumetric feeder
 - Lime slaker
 - Grit remover
 - Lime Slurry Agitator
 - Slurry pumps

- Pinch valve(s)
- Status indication light for the Bin Vent Filter, silo levels, transition hopper levels and slurry tank 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
- Slaker paddle shaft alarm
- Slurry tank high high and low low levels
- Low water pressure alarm

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) Lighting for the skirt area consisting of a minimum of _____ high intensity light fixtures.
- g) 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 quick lime system 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.