

## FRAC SAND STORAGE AND HANDLING SYSTEM

### SPECIFICATION BASED UPON 18M TERMINAL REQUIREMENTS

#### PART 1 – GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and provisions of the Contract Documents, including General and Supplementary Conditions, Special Conditions, and Division 1 specifications shall apply to this Section.
- B. Tank Connection proposal, and related inquiry documents from Buyer.

##### 1.2 SUMMARY

- A. This Section includes the following types of equipment used in frac sand storage and handling systems:
  - 1. Storage silo, flat panel bolted, complete with accessories.
  - 2. Manual and automatic gates.
  - 3. Bin vent filter.
  - 4. Level controls.
  - 5. Controls.
  - 6. Compressed air.
  - 7. Electrical.
  - 8. Compressed air piping.
  - 9. Retractable unloading spout and dust collection.
  - 10. Belt scale.
  - 11. Lighting
  - 12. Convenience Power.
  - 13. Foundation.
  - 14. Control Room.
- B. Related Sections include the following:
  - 1. RESERVED.

##### 1.3 DEFINITIONS

- A. Buyer: Purchaser of system, or representative thereof.
- B. Seller (System Supplier): Designer, fabricator, and installer of system and components.

## 1.4 SUBMITTALS

- A. Product Data: For each type of product and equipment indicated.
- B. Shop Drawings: Detail frac sand storage and handling system, silo and structural system, equipment assemblies, control, electrical and mechanical systems, foundation, and indicate dimensions, weights, loads, clearances, field installation procedures, components, and location and sizes.
  - 1. P&ID diagrams: From railcar unload through truck fill.
  - 2. Wiring diagrams: Power, signal and control wiring.
  - 3. Installation drawings and data: Components, accessories, and equipment.
  - 4. Color sample for silo.
- C. Certificates of shop inspections and quality control data reports: As requested by Buyer prior to award of Contract.
- D. Welding certifications: As requested by Buyer prior to award of contract.
- E. Source quality test reports: As requested by Buyer prior to award of contract.
- F. Field quality-control test reports.
- G. Operation and maintenance data: For system and components.
  - 1. Submit (5) hardcopy manuals, ring bound in heavy-duty binders, project data on cover and binding edge, Letter size format for typical pages, 11x17 format for drawings with "engineer" fold.
  - 2. Submit (2) digital media (CD or DVD) manuals, with hardcopy data in ".pdf" format.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each system component through one source from a single manufacturer.
- B. Product Options: System requirements are based upon the specific system and operational characteristics indicated.
- C. Welding: Quality process and operators according to AWS.
- D. Electrical Components, Devices, Accessories: Listed and labeled as defined in NFPA 70, Article 100, and marked for intended use.

E. RESERVED.

## 1.5 PROJECT CONDITIONS

A. Interruption of Existing Services: Do not interrupt existing power, water or other utility services without (5) days prior notice of proposed interruption to Buyer, and approval by Buyer.

B. Material Handling Properties:

1. Silo fill rate: 300 TPH
2. Silo fill method: Mechanical
  - a. Railcar hopper unload
  - b. Inclined belt conveyor with belt scale
  - c. Bucket elevator
  - d. Rotary distributor
  - e. Chutes
3. Silo discharge rate: 300 TPH
4. Silo discharge method: Mechanical
  - a. Manual slide gate
  - b. Pneumatic slide gate
  - c. Compact filter module (dust collection)
  - d. Retractable spout
  - e. Truck scale
5. Silo discharge receiver:
  - a. Enclosed frac sand truck, 2 to 3 ports

C. Frac Sand Analysis: Buyer to provide sample of frac sand for analysis, or provide material characteristics of the specific frac sand varieties.

D. RESERVED.

E. Design Criteria: Buyer to provide the following criteria. <Leave values blank if unknown or at the discretion of the system designer.>

1. Location City: <insert value>
2. Location State: <insert value>
3. Location Zip Code: <insert value>
4. Product: Frac Sand
5. Product Density, volume: <insert value> lb/cf
6. Product Density, design: 100 lb/cf or <insert value> lb/cf
7. Product Angle of Repose: 25 degrees or <insert value> degrees
8. Required Working Capacity: 1,125 tons each, 9,000 tons aggregate
9. Silo diameter: 24' ft nominal
10. Silo eave height: 82' ft nominal
11. Silo configuration: Skirt support with drive thru

12. Hopper Slope: 45 degrees
  13. Hopper Outlet Size: 12" to 14" diameter
  14. Drive thru clearance height: 23 ft
  15. Drive thru clearance width: 12 ft
  16. Side discharge clearance height: <insert value> ft
  17. Silo design load pattern: Funnel flow
  18. Operating pressures: 2 oz/si positive; 0.5 oz/si negative.
  19. Roof live load: 30 psf
  20. Platform live load: 100 psf
  21. Seismic Zone: per IBC 2006, or <insert value> adopted local building code.
  22. Wind Design: per IBC 2006, or <insert value> adopted local building code.
  23. RESERVED.
- F. RESERVED.
- G. Electrical Service: Buyer to provide metered electrical service for frac sand storage and handling system. Tie in point to be within 10' of Control Room, or 10' from system footprint. Electrical load requirements to be provided to Buyer by System Supplier.
1. Voltage Available: 480 V
  2. Phases Available: 3  $\phi$
  3. Frequency Available: 60 hz
  4. Locally adopted NEC: <insert year>
  5. RESERVED.
- H. Soil and Subsurface Conditions: System Supplier to provide Geotechnical Report and Investigation Services to determine soil characteristics for foundation. Seller shall base bid based upon the following conditions.
1. Assumed Soil Bearing Pressure: 2,500 psf
  2. Frost Depth: per site Zip Code.
  3. Assumed Foundation Style: Matt style foundation for silos; Concrete wall and base for rail pit.
  4. RESERVED.
- I. Work by Buyer: Buyer to provide, and Seller shall not include, the following.
1. Permits and taxes.
  2. Electric service to system.
  3. Water and/or sewer service to 10' from disturbed footprint, as required.

4. Civil design and site development, erosion control, paving and marking work, outside the system footprint. Within system footprint, general grading and subsurface remediation as required.
5. Access design, installation and maintenance work.
6. Security of site.
7. Site lighting.
8. Rail work.
9. RESERVED.

## 1.6 COORDINATION

- A. Coordinate system features with general site preparation and design work by others..
- B. Coordinate electrical system with local Utility and Buyer.
- C. Coordinate water and sewer system with local Utility and Buyer.
- D. Coordinate rail work with local Railroad.

## 1.7 EXTRA MATERIALS

- A. Furnish extra consumable materials at quantities indicated in equipment specification sections, with storage labels describing contents.
- B. Provide spare parts list, with current pricing, or all equipment consumables.

## **PART 2 – PRODUCTS**

### 2.1 MANUFACTURERS

- A. Seller shall determine acceptable equipment manufacturer's that meet or exceed system specifications and requirements. Buyer shall indicate preferred named manufacturer's below.
  1. Silo: Tank Connection LLC
    - a. Rolled-Tapered Panel (RTP) bolted storage silo.
    - b. Lap joint connections for both vertical and horizontal seams. API 12B "flanged panel" shall not be acceptable.
    - c. 1:12 roof slope.
    - d. Exterior spiral stair and crossovers, serrated grating treads and platform grating.
    - e. Minimum shell and hopper thickness of 3/16".

- f. Manufacturer's and applicable reference codes and standards for shell, hopper and roof design, allowable stresses, steel and fastener properties, and other material and design characteristics.
  - g. Coating System: Provide coatings as follows.
    - i. Interior: Fusion 5000 FBE primer, 5 mils DFT
    - ii. Exterior: EXT Fusion 5000 FBE primer, 3 mils DFT; EXT Fusion 5000 SDP, 3 mils DFT
    - iii. Exterior Color: To be selected by Buyer from Seller's standard color chart.
    - iv. Interior Color: Manufacturer's standard "White"
    - v. Accessories: As required for interior or exterior exposure, or hot dipped galvanized.
    - vi. Inspection: At regular intervals to ensure quality, after final coat and cure, inspect cure, adhesion, thickness, and holidays.
2. Transition Hopper:
    - a. Minimum slope angle: 45 degrees.
    - b. Materials: AR on wear surfaces.
    - c. Support: Ground supported by support frame.
    - d. Coating System: Hot dipped galvanized.
  3. Belt Conveyor:
    - a. Inclined belt conveyor, complete with discharge hood, tail pulley guard, channel frame construction, 2- ply belting, speed sensors, mating inlet flange, mating discharge transition, motor and reducer, drive guard, sealed idlers.
    - b. Incline: 18 degrees max.
    - c. Cover: Enclosed.
    - d. Supports: Frames to grade.
    - e. Motor: 30hp, 480V, 3ph, 60hz, with Dodge reducer
    - f. Coating System: Manufacturer's standard, topcoat color to match Silo exterior.
  4. Belt Scale:
    - a. Single idler, accuracy to +/-0.5%, single point strain gauge load cell with SS housing, heavy duty construction
    - b. Coating System: Manufacturer's standard, topcoat color to Belt Conveyor.
  5. Manual and automatic gates: DCL Inc.
    - a. Manual slide gate with hand wheel operator, and bearing cam hardened rollers, AR lined at wear points.
    - b. Slide gate with pneumatic operator, AR lined at wear points, 2 position with solenoid positioning package and limit switches, required compressed air.
    - c. Coating System: Manufacturer's standard, topcoat color to match Silo Interior.
  6. Bin vent filter:

- a. Cartridge style bin vent filter, with maximum air to cloth ratio of 4:1.
  - b. Reverse pulse jet, self cleaning.
  - c. Intervents between adjacent silos.
  - d. Sized for product displacement during mechanical fill process, with 2 times safety factor minimum.
  - e. NEMA 4 timer control board, 120V operation.
  - f. Motor: 1/2hp, 480V, 3ph, 60hz, fan top mount
  - g. Coating System: Manufacturer's standard, topcoat color to match Silo Exterior.
7. Silo Level controls: RESERVED
8. Controls and Power:
- a. PLC based control system, fully integrated with equipment for railcar unload (silo fill) and silo discharge (truck fill).
    - i. Main control panel with dependent remote panels for silo. Main control panel shall be touch screen with push-button redundancy for primary functions. Remote panels shall be push-button.
    - ii. NEMA 4 rated enclosures.
    - iii. Integrated with level controls and truck weigh scale.
    - iv. Main control panel located inside Control Room.
9. Compressed air:
- a. Rotary screw air compressor with desiccant dryer, cold weather package.
  - b. Sized for demand from pneumatic and dust collection.
  - c. Galvanized piping with threaded connections.
  - d. Motor: 15hp, 480V, 3ph, 60hz
  - e. Coating System: Manufacturer's standard.
10. Control Room:
- a. Prefabricated control room, complete and weathertight with mandoor, window, desk, insulation, siding, roofing, lighting, interior finished walls and floor.
  - b. Size: 10' x 12' x 8'
  - c. Thru-wall packaged HVAC system.
  - d. Motor: HVAC 1/2 hp, 208v
  - e. Coating System: Manufacturer's standard, exterior color to be determined from manufacturer's standard color chart.
11. Bucket Elevator:
- a. Rectangular cross section, carbon steel construction, 10g min. cap and 3/16 in min. head sections, 1/4 in min. boot section, 10g min. casing, AR lined discharge and inlet, heavy duty belting and cups, clean out and inspection doors/panels.
  - b. Motor: 60hp, 480v, 3ph, 60hz, with Dodge reducer, zero speed switch, belt guard
  - c. Platform, ladder, supports to silos. Jib boom for head section.

- d. Coating System: Manufacturer's standard, topcoat color to match Silo exterior color.
12. Rotary Distributor:
  - a. Gearmotor with break, AR lined inlets and outlets, position quantity as indicated on drawings, revolving spout with seals, limit switches on position, mating inlet and discharge flanges, AR lined inlet, spout internal, and outlet.
  - b. Motor: 1 hp, 480v, 3ph, 60hz
  - c. Coating System: Manufacturer's standard, topcoat color to match Silo exterior color.
13. Chutes:
  - a. Tank Connection "Riffle Chute" design, allowing minimal abrasion of product on chute surfaces.
  - b. Flanged sections, coordinated to mate to inlet and discharge points.
  - c. Designed for self-supporting spans.
  - d. Coating System: Manufacturer's standard, topcoat color to match Silo Exterior color
14. Mechanical piping and valves:
  - a. Galvanized piping with threaded connections for compressed and blower air.
  - b. Copper piping with soldered connections, with heat tracing and insulation, for water line.
  - c. Metering and shutoff valves suitable for the service, and located to allow isolation and bypass during service.
  - d. Strainers, traps, fittings as required by design.
  - e. RESERVED.
15. Retractable loading spout: DCL Inc.
  - a. Hypalon nylon with aluminum support rings, AR lined inner cone, worm drive HD motor, air withdrawl to and supported by loading spout dust collector.
  - b. Travel: 6 ft, or as required.
  - c. Motor: 1hp, 480v, 3ph, 60hz
  - d. Level sense: Tilt switch interfaced with control system.
  - e. Coating System: Manufacturer's standard, topcoat color to match Silo Interior.
16. Loading spout dust collection: DCL Inc.
  - a. Compact filter module, complete with filter cartridges, pressure gauge, AR lined inlet, TEFC withdrawl fan, pulse jet cleaning system, and required compressed air.
  - b. Motor: 10hp, 480v, 3ph, 60hz, fan
  - c. Support: From silo hopper outlet and gates.
  - d. Coating System: Manufacturer's standard, topcoat color to match Silo Interior.
17. Weigh scale:



- a. Surface mounted weigh scale, complete with side rails, foundation kit, 135 ton capacity, 45 ton CLC, minimum 120 ft length.
  - b. Deck: Metal
  - c. Load cells: SS, heavy duty compression
  - d. Indicator: Digital readout and printer, interfaced with control system.
18. Lighting:
- a. General Exterior lighting of work areas, providing minimum 2 foot-candles at ground level.
  - b. Interior lighting on equipment and controls areas inside skirt of silo, providing 15 foot-candles at 3' above working surfaces.
  - c. Lighting shall be Metal Halide of required wattage.
  - d. Interior and exterior lighting shall be controlled with disconnects at common location, and an adjustable timer in the control system.
19. Convenience Power:
- a. 120V, 20A service, GFCI receptacles with weather guards, at Silo skirt interiors, Silo roofs, and equipment transition points.
20. RESERVED.

## 2.2 GENERAL

- A. Motors: TEFC, high efficiency, 1.15 SF. VFD suitability as required. Exposure rating as required.
- B. Packaging and Shipping: Protect parts, equipment, sub-assemblies, accessories, and all components from damage during shipping. Notify Buyer (1) week prior to shipment.

## 2.3 WARRANTY

- A. Silo and System shall carry Manufacturer's Standard warranty on all components.
- B. Manufacturer equipment warranties shall be to the benefit of the Buyer, (1) year from installation minimum, or (18) months from date of shipment.

## PART 3 - EXECUTION

### 3.1 GENERAL AND EXAMINATION

- A. Seller shall execute all field work in a safe manner, and in accordance with the Contract Drawing documents and specifications. Subcontracting portions of the work may be done as indicated.

- B. Seller shall be familiar with the site and characteristics, and shall notify Buyer of unsuitable conditions prior to installation. Installation shall proceed only after unsuitable conditions are corrected.

### 3.2 SILO INSTALLATION

- A. Seller shall provide qualified direct labor for bolted silo installation. Seller may use certified bolted silo installation subcontractors.

### 3.3 FOUNDATION INSTALLATION

- A. Seller shall provide qualified direct or subcontracted labor, equipment and materials to install foundation components in accordance with the Contract Document plans and specifications.

### 3.4 MECHANICAL AND EQUIPMENT INSTALLATION

- A. Seller shall provide qualified direct or subcontracted labor, equipment and materials to install foundation components in accordance with the Contract Document plans and specifications, and Equipment Manufacturer's installation requirements.
- B. As required by Equipment Manufacturer, Seller shall provide qualified and certified installers to protect equipment warranties.

### 3.5 ELECTRICAL AND CONTROLS INSTALLATION

- A. Seller shall provide qualified, licensed, direct or subcontracted labor, equipment and materials to install foundation components in accordance with the Contract Document plans and specifications, and Equipment Manufacturer's installation requirements.

### 3.6 RESERVED

### 3.7 SAFETY

- A. Seller shall maintain an OSHA approved safety program. Seller shall designate a single "safety" point of contact for the project. Subcontractors shall operate under Seller's safety program.
- B. Seller shall maintain at project site Material Safety Data Sheets (MSDS) for all products in use or storage.
- C. OSHA Safety Ratings: Seller and Seller Subcontractors shall maintain the following OSHA safety ratings:
  - 1. EMR: Less than 1.0

2. RIR: Less than 5.0

### 3.8 SCHEDULE

- A. Seller shall develop a Project Schedule using Microsoft Project or similar schedule software, identifying major tasks, durations, predecessors and relationships, and critical path activities. Project schedule shall categorize Engineering, Procurement and Fabrication, and Installation Activities, and sub-activities of each. Seller shall prosecute the specified scope of work per the Schedule, and shall adjust resources as required to maintain the schedule.
- B. Schedule Requirements: Buyer requires system operational (to extent of Seller's scope) as follows:
  1. Notice to Proceed: <insert value>
  2. System Substantially Complete: <insert value>
  3. RESERVED.

### 3.9 FIELD QUALITY CONTROL

- A. Seller shall engage qualified installers, and equipment manufacturer's factory-authorized service representative to inspect, test and adjust field assembled components and equipment installation as required.
- B. Seller shall maintain written and photo documentation of field work activities, including manpower, weather, actions, issues, etc.
- C. Perform the following field tests and inspections:
  1. Leak Tests: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
  2. Silo Leak Test: Exterior spray water test per manufacturer's procedures.
  3. Operational Tests: After electrical circuitry has been energized, start units according to manufacturer's requirements. Verify correct operation, adjust and retest to confirm proper equipment operation.
  4. Safeties Test: After installation, test system and equipment for proper safety shutdown based upon the control system design and operating requirements.
  5. Calibration Test: After installation, test system equipment and components to be adjustable within the operational limits established.
- D. Repair, or remove and replace equipment that does not pass inspections and tests as specified above.

### 3.10 STARTUP AND TRAINING SERVICE

- A. Perform startup services on all systems and equipment, including inspection, testing, operation and adjustment.
- B. Adjust equipment and systems to provide a functionally operating fly ash conditioning system.
- C. Provide system training for Buyer personnel, consisting of written Installation, Operation and Controls (IOM) manuals for system, and field training of Buyer personnel during inspection, testing, startup and calibration services.

### 3.11 RESERVED