

SECTION 009113 - ADDENDA

1.1 ADDENDUM NO. 2

A. Project Information

1. To: Prospective Bidders.
2. Project Title: Wastewater Treatment Plants Rehabilitation.
3. Bid No.: WW-16-10-02.
4. Date: October 14, 2016.
5. Owner: Laguna Madre Water District.
6. Engineer: Charles Ortiz, P.E., District Engineer.
7. This Addendum forms a part of the Contract Documents and modifies the Bidding Documents dated September 13, 2016, and Addendum Number 1 issued October 3, 2016, with amendments and additions noted below.
8. Acknowledge receipt of this Addendum in the space provided in the Bid Form. Failure to do so may disqualify the Bidder.
9. Addendum No. 2 consists of 2 pages and no modification to Drawings.

B. Changes to the Contract Documents and Specifications:

1. Section 004143 – Bid Form:
 - a. (Article 1.5, Paragraph A): Revise Unit Price Schedule in response to Vendor comments.
 - 1) Isla Blanca WWTP: Master Control Panel and related instrumentation and controls became subsidiary to Turbo Blower Package.
 - 2) Laguna Vista WWTP: Positive Displacement with Rotary Screw Blower (40 BHP) will be considered for base bid, and both Turbo Blower (30 HP) and Positive Displacement Blower with three-lobe rotors will be alternative equipment to be evaluated by the District.
2. Section 400564 – Butterfly Valves:
 - a. (Article 2.1, Paragraph A): Add ABZ as an approved manufacturer.
 - b. (Article 2.2, Paragraph A): Add ABZ as an approved manufacturer.
3. Section 407055 – Master Control Panel:
 - a. (Article 2.6, Paragraph A.1.a): Provide Hach LDO probe with SC200 Controller or approved equal.
4. Section 407506 – Analyzers Dissolved Oxygen (DO):
 - a. Hach LDO probe with Hach SC200 controller.
5. Section 461371 – High Speed Turbo Blower:
 - a. (Article 2.13, Paragraph A): Revise last sentence to state, “Valves shall be manufactured by Crane, Duo-Check II model, US Valve, or equal.”
 - b. (Article 2.18, Paragraph A): Only one (duty) main air header pressure indicating transmitter located in the main air header is required for the Project.
 - c. (Article 2.18, Paragraph B): Remove temperature indicating transmitters from scope of work.

6. Section 461372 – Positive Displacement with Rotary Screw Blower System
 - a. (Article 2.1, Paragraph A): Add the following to approved Manufacturer List:
 - 1) Aerzen USA
 - a) Isla Blanca WWTP: D 62S Hybrid with 100 HP motor
 - b) Laguna Vista WWTP: D 24S Hybrid with 40 HP motor
7. Section 461373 – Positive Displacement Blower (three lobe rotors): Technical specification added for alternative equipment to be evaluated by District.
8. Section 461380 – Coarse Bubble Diffused Aeration System: Technical specification added to support 1” G-O Diffuser Assembly as shown in drawings and related process aeration system requirements.
 - a. H&L Fabrication, Inc. of Dripping Springs, Texas, added to approved Manufacturers list.
9. Section 463111 – Chlorine Gas Feed Equipment
 - a. (Article 1.9, Paragraph B.1): Delete items a. and b. from required Spare Parts list as follows:
 - 1) ~~One flow rate indicator for each vacuum regulator.~~
 - 2) ~~One spare remote gas flowmeter with rate valve.~~
 - b. (Article 2.3, Paragraph B.2.a): Delete “Replace trunions” and Add “Existing rails to remain in place.”
10. Section 463113 – Sulfur Dioxide Feed Equipment
 - a. (Article 1.6, Paragraph B.1): Delete the items a. and b. from required Spare Parts list as follows:
 - 1) ~~One flow rate indicator for each vacuum regulator.~~
 - 2) ~~One spare remote gas flowmeter with rate valve.~~
 - b. (Article 2.3, Paragraph F.2.a): Delete “Replace trunions” and Add “Existing rails to remain in place.”

C. Clarifications:

1. The Laguna Madre Water District is authorized to dispose of sludge from both Isla Blanca WWTP and Andy Bowie WWTP at the monofill located at Port Isabel WWTP, 205 Woody’s Lane, Port Isabel, TX 78578. District will reactivate monofill as needed to receive sludge (i.e. grit) removed from sites by Contractor. Sludge may only be transported using a registered transporter. Sludge shall be dewatered to a minimum solids content of 20% prior to disposal.
 - a. Our existing sludge hauler is Denali. Their contact for coordinating sludge hauling & disposal for this project is Mike Wertz at 832-795-5409.
 - b. Frank Retz with Dredgit Environmental Corporation, (713) 875-2524, has also expressed interest in grit removal services.
 - c. Both Vendors have visited project sites to assess grit removal requirements for this Project.
2. Belt Filter Press Control Panel – The District will run power from two spares located on existing Panel “L4” (100A, 120/240V., 1φ, 3W, 10 K.A.I.C., 24 Spaces with 60A/2P Main C/B in a NEMA-4X-NM Enclosure) to a location adjacent to existing control panel (in-house electrician will provide plenty of slack) to facilitate proposed Wallmount Air Conditioner and transformer as needed to help cool the drives and keep new panel door closed to minimize exposure of the internal components to salt air.

1.2 ADDENDUM NO. 1

A. Project Information:

1. To: Prospective Bidders.
2. Project Title: Wastewater Treatment Plants Rehabilitation.
3. Bid No.: WW-16-10-02.
4. Date: October 3, 2016.
5. Owner: Laguna Madre Water District.
6. Engineer: Charles Ortiz, P.E., District Engineer.
7. This Addendum forms a part of the Contract Documents and modifies the Bidding Documents dated September 13, 2016, with amendments and additions noted below.
8. Acknowledge receipt of this Addendum in the space provided in the Bid Form. Failure to do so may disqualify the Bidder.
9. This Addendum consists of 4 pages and following Drawings:
 - a. No. 4, Isla Blanca WWTP Site Plan and Mechanical Modifications.
 - b. No. 5, Isla Blanca WWTP Blower Modifications.
 - c. No. 6, Isla Blanca WWTP Chlorination & Dechlorination Equipment.
 - d. No. 7, Andy Bowie WWTP Site Plan and Mechanical Modifications to Air Supply Line.
 - e. No. 8, Andy Bowie WWTP Chlorination and Dechlorination Equipment.
 - f. No. 9, Port Isabel WWTP Chlorination and Dechlorination Equipment.
 - g. No. 10, Laguna Vista WWTP Design Data and Process Schematic.
 - h. No. 11, Laguna Vista WWTP Chlorine System Feed / Blower Building Mechanical Modifications.
 - i. Issue Date: October 3, 2016.

B. Changes to the Contract Documents and Technical Specifications:

1. Table of Contents:
 - a. Added "Section 016120 – Seismic Design Criteria" to listing.
 - b. Added "Section 407055 – Master Control Panel" to listing.
 - c. Added "Section 407305 – Flow Measurement: Thermal Mass" to listing.
 - d. Corrected title "Section 461372 – Positive Displacement with Rotary Screw Blower System."
 - e. Revised number of pages as applicable for specification revisions.
2. Section 001116 - Invitation to Bid:
 - a. (Article 1.2, Paragraph A): Extend Bid Date as follows: "... Owner will receive Bids ... until 2:00 PM local prevailing time on the 18th day of October, 2016 ..."
3. Section 004143 – Bid Form:
 - a. (Article 1.5, Paragraph A): Revise Unit Price Schedule to reflect all revisions to Drawings and Specifications.
4. Section 005213.12 – Agreement Form”
 - a. (Article 4.5): Remove Article 4.5 Special Damages in its entirety.

- b. (Article 5.1, Paragraph A): Revise Unit Price Work to reflect all revisions to Drawings and Specifications.
 - 5. Added “Section 016120 – Seismic Design Criteria” to provide guidance for anchorage of mechanical and electrical equipment.
 - 6. Added “Section 407055 – Master Control Panel” to provide general requirements for a MCP designed to monitor and control all local control panels for each turbo blower and field instruments required for a complete package control system.
 - 7. Added “Section 407305 – Flow Measurement: Thermal Mass” to improve control of air modulating valves.
 - 8. Section 407506 – Analyzers: Dissolved Oxygen (DO) and Common Work Results for Process Control and Instrumentation Systems:
 - a. (Article 2.1, Paragraph A.1): Revise to specify Hach SC100 controller.
 - b. (Article 3.8): Revise Schedule to state that one aeration controller may be used for up to two DO probes. For Isla Blanca WWTP: Aeration Basins 1 & 2 will have one transmitter, and Aeration Basins 3 & 4 will have one transmitter.
 - 9. Section 461371 – Direct Drive High-Speed Turbo Blower Systems: Revise specification to address comments from prospective Bidders and Manufacturers and to correct sizing requirement for blower at Laguna Vista WWTP. Addendum No. 1 replaces the previous specification in its entirety.
 - 10. Section 461372 – Positive Displacement with Rotary Screw Blower System:
 - a. (Article 1.1, Paragraph A.1) – Add requirements for alternate blower for Laguna Vista WWTP to the end of the paragraph.
 - b. (Article 2.1, Paragraph N) – Add Performance and Design Criteria for alternate blower at Laguna Vista WWTP site.
 - c. (Article 3.5, Paragraph A) – Revise minimum time for services of the representative to one 8-hour day for each blower.
 - d. (Article 3.5, Paragraph B.1) – Revise start-up time for services of the representative to one 8-hour day.
 - 11. Section 463111 – Chlorine Gas Feed Equipment
 - a. Revise vacuum regulator and ejector assembly capacity to 250 ppd.
 - b. Remove automatic switchover module from plans and specifications.
 - c. Propose to replace trunions rather than refurbish at Isla Blanca WWTP.
 - 12. Section 463113 – Sulfur Dioxide Feed Equipment
 - a. Revised Sulfur Dioxide capacity to 250 ppd.
 - b. Remove automatic switchover module from plans and specifications.
 - c. Propose to replace trunions rather than refurbish at Isla Blanca WWTP.
- C. Changes to the Drawings:
- 1. Drawing 4 – Isla Blanca WWTP Site Plan and Mechanical Modifications:
 - a. Revise Air Supply Modifications to include thermal mass flowmeter.
 - b. Specify Schedule for all stainless steel air supply lines.

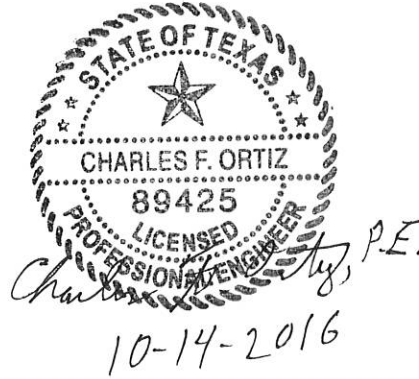
2. Drawing 5 - Isla Blanca WWTP Blower Modifications:
 - a. Revise Turbo Blower to show that blower must be elevated 12-inches above finished floor elevation to stay above the 100-yr floodplain.
 - b. Layout is preliminary is subject to revision during Submittal phase.
3. Drawing 6 - Isla Blanca WWTP Chlorination & Dechlorination Equipment:
 - a. Revise all proposed rotameters for 250 ppd.
 - b. District does not use induction pumps for chlorination and dechlorination equipment. Existing venturi system to remain in place.
 - c. Automatic switchover modules removed from plan.
4. Drawing 7 - Andy Bowie WWTP Site Plan and Mechanical Modifications to Air Supply Line:
 - a. Add restoration of 14" DI Wall Pipe at Bar Screen to plan.
 - b. Specify Schedule for all stainless steel air supply lines.
5. Drawing 8 – Andy Bowie WWTP Chlorination and Dechlorination Equipment:
 - a. Provide dual sensor for chlorine and sulfur dioxide leak detectors.
 - b. Add Bar Screen Mechanical Plan and Profile Details to plans.
6. Drawing 9 – Port Isabel WWTP Chlorination and Dechlorination Equipment:
 - a. Revise all proposed rotameters for 250 ppd.
 - b. District does not use induction pumps for chlorination and dechlorination equipment. Existing venturi system to remain in place.
 - c. Automatic switchover modules removed from plan.
7. Drawing 10 – Laguna Vista WWTP Design Data and Process Schematic:
 - a. Changed proposed to existing as needed to show existing conditions
 - b. Revise proposed Turbo Blower to Neuros Model No. NX30-C050 or approved equal.
8. Drawing 11 – Laguna Vista WWTP Chlorine System Feed / Blower Building Mechanical Modifications:
 - a. Revise proposed Turbo Blower to Neuros Model No. NX30-C050 or approved equal.
 - b. Provide dual sensor for chlorine leak detector.

D. Clarifications:

1. Grit removal means “remove from the WWTP and disposal by the Contractor.”
2. To be qualified for the award of a contract, BIDDERS must satisfy the following minimum criteria:
 - a. The Bidder must demonstrate successful completion during the last five (5) years of at least three (3) projects comparable in nature and scope to this project.
 - b. At least two key personnel, and their potential alternate, employed by the Bidder must have a minimum of five (5) years’ experience in similar construction projects. A Superintendent meeting the experience criteria will be required to be on site at all times during the course of construction.

- c. The Bidder must have an employee, to be dedicated to this project, who is experienced in scheduling, with demonstrated ability in employing scheduling techniques similar to those to be used for this project.

END OF DOCUMENT 009113



SECTION 004143 - BID FORM - UNIT PRICE (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION

- A. To: Laguna Madre Water District.
- B. Project Name: Wastewater Treatment Plants Rehabilitation.
- C. Bid No.: WW-16-10-02.
- D. Date:
- E. Submitted by:
 - 1. Name:
 - 2. Address:

1.2 OFFER

- A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by the Owner for the above-referenced Project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Unit Prices listed in this Bid Form in lawful money of the United States of America.
- B. Include Bid security as required by the Instructions to Bidders.
- C. All applicable federal taxes are excluded and State of Texas taxes are excluded from the Unit Prices.

1.3 ACCEPTANCE

- A. This offer shall be open to acceptance for 60 days from the Bid closing date.
 - 1. If this Bid is accepted by the Owner within the time period stated above, we will:
 - a. Execute the Agreement within 15 days of receipt of Notice of Award.
 - b. Furnish the required bonds within 15 days of receipt of Notice of Award.
 - c. Commence Work within seven days after written Notice to Proceed.
- B. If this Bid is accepted within the indicated time, and we fail to commence the Work or we fail to provide the required bonds, the Bid security shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid security or the difference between this Bid and the Bid upon which a Contract is signed.
- C. In the event our Bid is not accepted within the time stated above, the required Bid security will be returned to the undersigned, according to the provisions of the Instructions to Bidders, unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.4 CONTRACT TIME

A. If this Bid is accepted, we will:

1. Complete the Work in 180 calendar days from Notice to Proceed.

1.5 UNIT PRICES

A. Following are Unit Prices for specific portions of the Work as listed:

| UNIT PRICE SCHEDULE | | | | | |
|---|---|------|--------------------|------------|--------------------------|
| Item Number | Description | Unit | Estimated Quantity | Unit Price | Total Estimated Price \$ |
| BASE BID | | | | | |
| 1 | Mobilization | LS | 1 | | |
| <u>Isla Blanca Wastewater Treatment Plant</u> | | | | | |
| 2 | Install 38x48 Waterman Slide Gate | EA | 4 | | |
| 3 | Install 30x30 Waterman Slide Gate | EA | 1 | | |
| 4 | 3 in. SS316 (Sch. 40) Air Supply Line | LF | 124 | | |
| 5 | 6 in. SS316 (Sch. 40) Air Supply Line | LF | 34 | | |
| 6 | 6 in. Tap into Exist 14 in. pipe | EA | 1 | | |
| 7 | Disconnect 6" Pipe from 14" Air Supply and Replace with 14" Spool Piece | EA | 1 | | |
| 8 | 8 in. SS316 (Sch. 40) Air Supply Line | LF | 34 | | |
| 9 | 4"x8" Tee SS316, Sch. 40 | EA | 1 | | |
| 10 | 6"x6" Tee SS316, Sch. 40 | EA | 1 | | |
| 11 | 8"x6" Tee SS316, Sch. 40 | EA | 2 | | |
| 12 | 10"x8" Tee SS316, Sch. 40 | EA | 1 | | |
| 13 | 12"x10" Reducer, SS316, Sch. 40 | EA | 1 | | |
| 14 | 4" – 90 Deg. Bend Air Supply | EA | 3 | | |
| 15 | 6" – 90 Deg. Bend Air Supply | EA | 1 | | |
| 16 | 8" – 90 Deg. Bend Air Supply | EA | 1 | | |
| 17 | Remove 6" Pipe and install blind flanges as shown on Plan | LS | 1 | | |
| 18 | Install 1" G-O Diffuser Assembly | EA | 80 | | |

| | | | | | |
|---|--|----|-------|--|--|
| 19 | 3" Butterfly Valve with Manual Actuator | EA | 3 | | |
| 20 | 4" Butterfly Valve with Manual Actuator | EA | 2 | | |
| 21 | 6" Butterfly Valve with Manual Actuator | EA | 1 | | |
| 22 | 10" Butterfly Valve with Manual Actuator | EA | 2 | | |
| 23 | Pipe Supports - Air Supply | LS | 1 | | |
| 24 | Bypass Operation | LS | 1 | | |
| 25 | Grit Removal | CY | 1,475 | | |
| 26 | Turbo Blower Package includes 12" & 14" Butterfly Valves with Electric Actuators; Analyzers-Dissolved Oxygen; Master Control Panel; & Thermal Mass Flowmeter | LS | 1 | | |
| 27 | Positive Displacement IQ-HE Blower Package | EA | 1 | | |
| 28 | Furnish and Install Chlorine Feed Equipment | LS | 1 | | |
| 29 | Furnish and Install Sulfur Dioxide Feed Equipment | LS | 1 | | |
| 30 | Effluent Weir, Chlorine Contact Chamber "A" | LS | 1 | | |
| 31 | Ultrasonic Level Transmitter | EA | 3 | | |
| 32 | Refurbish Jib Crane and Replace Hoist and Trolley | EA | 2 | | |
| 33 | Isla Blanca WWTP Electrical System | LS | 1 | | |
| 34 | Replace Belt Filter Press Control Panel | EA | 1 | | |
| Subtotal Isla Blanca Wastewater Treatment Plant: | | | | | |

| <u>Andy Bowie Wastewater Treatment Plant</u> | | | | | |
|--|---|----|-----|--|--|
| 35 | 14 in. DI Wall Pipe | LS | 1 | | |
| 36 | 6 in. Plug Valves | EA | 3 | | |
| 37 | 12 in. SS316 (Sch. 10) Air Supply Line | LF | 44 | | |
| 38 | 4 in. SS316 (Sch. 40) Air Supply Line | LF | 74 | | |
| 39 | Install 1" G-O Diffuser Assembly | EA | 41 | | |
| 40 | 4" Butterfly Valve with Manual Actuator | EA | 3 | | |
| 41 | Pipe Supports - Air Supply | LS | 1 | | |
| 42 | Bypass Operation | LS | 1 | | |
| 43 | Grit Removal | CY | 194 | | |
| 44 | Furnish and Install Chlorine Feed Equipment | LS | 1 | | |
| 45 | Furnish and Install Sulfur Dioxide Feed Equipment | LS | 1 | | |
| 46 | Refurbish Monorail, and Replace Hoist and Trolley (Chlorine) | EA | 1 | | |
| 47 | Refurbish Monorail, Restore Festoon Hardware and Wire, and Replace Hoist and Trolley (Sulfur Dioxide) | EA | 1 | | |
| Subtotal Andy Bowie Wastewater Treatment Plant: | | | | | |
| <u>Port Isabel Wastewater Treatment Plant</u> | | | | | |
| 48 | Furnish and Install Chlorine Feed Equipment | LS | 1 | | |
| 49 | Furnish and Install Sulfur Dioxide Feed Equipment | LS | 1 | | |

| | | | | | |
|---|--|----|---|------------------------|--|
| 50 | Refurbish Monorail, Furnish and Install New Festoon Hardware and Wire, and Replace Hoist and Trolley | EA | 2 | | |
| Subtotal Port Isabel Wastewater Treatment Plant: | | | | | |
| <u>Laguna Vista Wastewater Treatment Plant</u> | | | | | |
| 51 | Positive Displacement With Rotary Screw Blower Package | EA | 1 | | |
| 52 | Furnish and Install Chlorine Feed Equipment | LS | 1 | | |
| 53 | Replace Hoist and Trolley | EA | 1 | | |
| Subtotal Laguna Vista Wastewater Treatment Plant: | | | | | |
| Total Base Bid Wastewater Treatment Plants Rehabilitation: | | | | | |
| | | | | (price in figures) | |
| | | | | _____ (price in words) | |

1.6 ALTERNATE BID ITEMS

- A. At Owner's option, alternate blowers will be selected in lieu of the Turbo Blowers shown in Base Bid. The following table is to be completed to allow the District to evaluate alternative equipment. In the spaces below, the Contractor may enter the price of supply and installation of equipment. If the District chooses other than that which the tenderer has included in the tender, extra or credit adjustments will be made based on the prices entered. No extension to time of completion will be provided for any alternatives.

| UNIT PRICE SCHEDULE | | | | | |
|--|--|------|--------------------|------------|--------------------------|
| Item Number | Description | Unit | Estimated Quantity | Unit Price | Total Estimated Price \$ |
| <u>Isla Blanca Wastewater Treatment Plant</u> | | | | | |
| 26A | Positive Displacement IQ-HE Blower Package for Aeration Basins | EA | 2 | | |
| <u>Laguna Vista Wastewater Treatment Plant</u> | | | | | |
| 51A | Turbo Blower Package | EA | 1 | | |
| 51B | Positive Displacement Blower Three-lobe rotors | EA | 1 | | |

1.7 ADDENDA

- A. Following Addenda have been received, and the modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Price.
1. Addendum No., dated
 2. Addendum No., dated
 3. Addendum No., dated

1.8 APPENDICES

- A. Following documents are attached to and made a condition of the Bid:
1. Bid security in form of a certified check, bank money order, or Bid Bond issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.
 2. Bidder's qualifications statement and supporting data.

1.9 BID FORM SIGNATURES

- A. Full Name of Bidder:
- B. Hereunto affixed in the presence of
- C. Authorized Signing Officer and Title:
- D. [Seal:]

END OF DOCUMENT 004143

SECTION 461373 - POSITIVE DISPLACEMENT BLOWER WITH THREE LOBE ROTORS

PART 1 GENERAL

1.1 SUMMARY

A. Description of Work:

1. Provide all labor, material and equipment to furnish and install (1) complete set of positive displacement blower system as specified or detailed on the drawings.
2. This specification covers the general requirements for the design, fabrication and testing of the blowers and their appurtenances.

B. Work and components included (but not limited to the following items) for each blower assembly.

1. Positive displacement blower
2. Drive unit
3. V-Belt drive
4. Flexible expansion joints
5. Drive guard
6. Common steel base discharge silencer
7. Inlet filter silencer
8. Pressure relief valve
9. Check valve
10. Discharge isolation valve
11. Pressure gauge (inlet and discharge)
12. Temperature Gauge (inlet and discharge)
13. Temperature Switch (discharge)
14. Pressure Switch (discharge)
15. Vibration isolation pads
16. Prime and Finish paint
17. Spare parts

C. Related Requirements:

1. Part numbers or trade names are used in the body of this specification only to facilitate the description of the equipment and in no way implies that equipment of other approved manufacturers cannot be used.

D. Manufacturer's Experience

1. The equipment manufacturer shall have not less than twenty-five (25) successful systems of the type specified in operation for a period of minimum 5 years. The engineer may require evidence in the form of operating records from these plants to substantiate any claims concerning the ability of the equipment to perform as required.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures specifies requirements for submittals.

- B. Shop Drawings: Show layout of all equipment; including layout and erection details for all blowers; include mounting details.
- C. Certification: Show characteristic curves for blower(s); including pressure and brake horsepower plotted against CFM capacity for full blower range. Clearly identify the design point specified.
- D. Operation and Maintenance Manuals and Drawings: Submit two (2) sets of operating and equipment maintenance instructions and detailed drawings in accordance with Section 017000.

1.3 MANUFACTURER'S SERVICE REPRESENTATIVE

- A. Equipment Startup:
 - 1. Provide for equipment startup of one eight (8) hour working day(s).
- B. Operating Instructions:
 - 1. Provide for one (1) eight (8) hour working day total to instruct Plant Operations on the equipment supplied. The training period will be integrated by the owner with overall training. Trainer shall have a minimum of 10 years experience in providing blower system training. A resume and/or training outline may be required at the owner's discretion.

1.4 EXISTING CONDITIONS

- A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

1.5 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for warranties.
- B. Furnish two-year manufacturer's warranty from the date of successful startup to meet or exceed the design criteria detailed in Part 2 – PRODUCTS and Part 4 – DATA SHEET of this Specification.

PART 2 PRODUCTS

2.1 EQUIPMENT

- A. Manufacturer List:
 - 1. United Blower, Inc.
 - 2. Gardner-Denver
 - 3. Roots Systems Ltd.
 - 4. Substitutions: Specified in Section 01 60 00 - Product Requirements.
- B. Description:
 - 1. Blower
 - a. Housing
 - 1) Casing shall be made of high-grade, close-grained grey cast iron, annealed for stress relief and ribbed to prevent distortion. The casing shall be of one-piece

- construction for positive bearing alignment, with separate head plates for easy access. Casing has two cast in ports to provide “pulsation control”. Casing has flanged inlet and discharge connections. Screwed connections will not be acceptable.
- 2) Both end plates shall be bolted and pinned to the casing. End plates as an integral part of the casing will not be acceptable. Bearing fits shall be precision machined to ensure accurate positioning of the rotors in the casing. Materials of construction shall be high grade, close grained grey cast iron.
 - 3) End covers shall be bolted to the end plates. Oversized oil sight glasses shall be provided on both sides of each cover. Materials of construction shall be high grade, close grained grey cast iron.
- b. Rotors and Shaft
- 1) The rotors shall be of the straight, three-lobe involute type and shall operate without rubbing, liquid seals or lubrication. Two lobe rotors will not be acceptable.
 - 2) Each rotor and shaft shall be ductile iron, integrally cast, and shall be accurately machined and ground to tolerance. Then the complete rotor assembly shall be dynamically balanced. Rotor cavities shall be plugged to prevent imbalance due to contaminants.
- c. Timing Gears
- 1) Both rotors shall be positively timed by a pair of accurately machined, heat treated ground alloy steel, helical tooth timing gears. To increase gear life and reduce noise, the use of spur gears is NOT acceptable. The timing gears shall be mounted on tapered shafts to provide positive locking of gears and shaft.
 - 2) Connections shall be provided for a hydraulic pump for expansion to adjust and/or remove gears.
- d. Bearings
- 1) Each blower shaft shall be supported by cylindrical roller or ball bearings sized for a minimum of 100,000 hrs. B-10 life.
 - 2) Drive shaft bearing is sized for an overhung V-belt drive maximum continuous operating load.
 - 3) The bearing housing shall have a retainer providing positive containment of the bearings. Ground gear spacers shall maintain permanent rotor clearances within the blower casing.
- e. Seals and Lubrication
- 1) The blower shall incorporate two (2) separate oil chambers each with adequately sized sight glasses, and ample reservoir capacity.
 - 2) Labyrinth type cast iron split elastic rotary piston ring shaft air and oil seals shall be provided at the point where the shaft passes through the end-plate. Lip type oil seals in the end-plate are NOT acceptable. Provision shall be made to vent the rotor side of the oil seal to atmosphere to eliminate carryover of lubricant into the air stream.
 - 3) The timing gears and bearings shall be splash oil lubricated from oil slingers mounted on the driven shaft and dipping in oil. Grease lubricated bearings are NOT acceptable.
2. Base/Discharge Silencer Combination
- a. Base material is 3/8” – 5/8” thick steel pipe, depending on blower and motor size and weight. Internal construction provides pulsation reduction. End plates and reinforcing/supporting members are also 3/8” – 5/8” thick plate.

- b. Blower is directly mounted on discharge silencers inlet flange. Motor is mounted on pivoting steel channel supports. Two (2) adjustable steel springs (to fine tune belt tension) and motor weight provide for automatic belt tensioning.
 - c. No fibrous materials can be in contact with the air stream. Four (4) vibration isolation mounts secured to base channels reduce vibration levels onto the concrete floor or the acoustical enclosure sub base if provided.
 - d. Blower and motor are mounted on their supports to provide perfect belt alignment.
3. Drive System
- a. Each blower shall be equipped with an electric motor of the type and horsepower listed in part 4 – Data Sheet.

C. Design Criteria:

- 1. Blower shall be positive displacement rotary type with top inlet and bottom outlet.
- 2. Blower shall be V-belt driven by an electric motor.
- 3. All bearings shall be anti-friction type rated by AFBMA standards to have a minimum B10 life of 100,000 hours at design speed and maximum radial and thrust load conditions.
- 4. Operating conditions and blower characteristics are provided in PART 4 – DATA SHEET of this Specification.
- 5. All piping shall be installed so that no weight or strain will be imposed on the blower.
- 6. Design point noise levels for each blower furnished shall not exceed the dbA limits indicated on the Data Sheets in Part 4 of this specification. The dbA limits listed in Part 4 are expressed as measurements taken at a distance of three feet in any direction from the blower system or from the acoustical enclosure if it is provided. The engineer must state if the noise level specified is measured in the “ROOM” or in a “FREE FIELD”. With its submittals, the contractor shall provide the engineer with the manufacturer’s certification of the design point dbA level for each blower system furnished.

2.2 ACCESSORIES

A. Each blower shall be furnished with the following accessory items:

- 1. Expansion Joints
 - a. Suitable reinforced, rubber, flanged to match pipe sizes as shown on the drawings. The single arch expansion joints shall be capable of withstanding the following temperatures on a continuous basis:
 - 1) On the inlet side of the blower system: 150°F
 - 2) On the discharge side of the blower system: 300°F
 - 3) Notes:
 - a) If a second inlet filter or a second enlarged air inlet is located remotely from the blower system, an inlet expansion joint must be provided between the inlet filter silencer inlet flange and any piping to the blower system.
 - b) Expansion joints must always be provided on the discharge side of the discharge silencer.
 - b. The expansion joints shall be a manufactured by API or equal.
- 2. Intake Filter Silencer
 - a. Each blower shall be furnished with a dry type element inlet filter silencer located inside the sound enclosure (if provided)
 - b. At Laguna Vista WWTP, filters for blowers shall have a 6 inch flanged connection, rated at 1,200 CFM.
 - c. Total pressure drop through the filter silencer shall not exceed 6” wc.

- d. Any absorption material used in the intake filter silencer shall be upstream of the inlet filter element.
 - e. Inlet flange of the blower shall be directly connected to the inlet filter silencer housing without intermediate pieces.
 - f. Filter elements must be removed from the housing without the use of any tools.
 - g. Inlet filters must be sized at least 150% of specified inlet air flow (see part 4) for clean environments and 200% for dusty environments.
3. Pressure Relief Valves
 - a. Provide a weighted or spring pressure relief valve installed after the discharge silencer. This valve is to be shop tested to relieve at 1 psig above specified pressure.
 - b. The motor shall be sized to accept load at pressure relief valve pop pressure without exceeding rated FLA.
 4. Check Valve
 - a. Provide wafer, cast iron body, double disc-type check valve for mounting on blower discharge piping. Furnish valve with aluminum bronze internals and EPDM seat material.
 5. Discharge Butterfly Valve
 - a. Provide wafer body, resilient-seated, lever operated, tight closing butterfly valve for positively isolating the blower from the discharge manifold piping. Furnish valve with cast iron body, ductile iron disc, 416 SS valve stem and disc screws, EPDM seat; acetal stem bushing; Buna N O-ring and stem packing, and nickel plated modular iron 10 position lock lever handle.
 6. Vibration Isolation Pads
 - a. Provide molded, synthetic rubber and cork, vibration isolation pads for each blower, sized to fit the structural steel base.
 7. Inlet Vacuum Gauge
 - a. Provide a differential pressure gauge to indicate pressure drop through the air filter equal to Model 2010 by Dwyer Instruments, Inc. or equal.
 - 1) Range: 0 to 20 inches water gauge.
 - 2) Accuracy: 2% of full scale.
 - 3) Dial: 4"; 120° scale; .20 WC minor divisions.
 - 4) Mounting: Vertical
 - 5) Construction: Die cast aluminum case; silicone rubber diaphragm; calibrated range spring; samarium-cobalt magnet; heli of high magnetic permeability mounted in sapphire bearings; clear plastic cover with O-ring seal and zeroing screw; litho-printed scale; red-tipped pointer with rubber pointer stops.
 - 6) Mount Vacuum gauge as shown in the drawings.
 8. Discharge Pressure Gauge
 - a. Provide a liquid filled pressure gauge equal to type 108A manufactured by Ashcroft or equal.
 - 1) Range: 0 to 15 psig.
 - 2) Accuracy: 1% of full scale.
 - 3) Dial: 4" diameter; 270° scale; heavy gauge aluminum with white background and black markings; 0.25 psig minor divisions.
 - 4) Case: Stainless steel.
 - 5) Ring: Stainless steel.
 - 6) Movement: Stainless steel.

- 7) Bourdon Tube: Phosphor bronze, large bore tubing which is silver soldered to socket and tip.
- 8) Connection: forged brass ¼" NPT black connection.
- 9) Mount discharge pressure gauge as shown in the drawings.
9. Discharge Temperature Gauge
 - a. Provide a liquid filled bimetal thermometer manufactured by Ashcroft or equal.
 - 1) Range: 50 to 300°F Series EL discharge.
 - 2) Accuracy: 1% full span.
 - 3) Dial: 5" diameter; 270° scale; heavy gauge stainless steel with white background and black markings; 5°F minor divisions.
 - 4) Case: Stainless steel.
 - 5) Ring: Stainless steel.
 - 6) Movement: Stainless steel.
 - 7) Actuating Element: Type 304 stainless steel, precision rolled, fully annealed tubing.
 - 8) Compensation: Bimetal compensator to offset ambient temperature changes in case area.
 - 9) Adjustable collar to facilitate angular positioning.
10. High Temperature Shut-Down Switch
 - a. H.T. switch shall be Ashcroft or equal with an operating range of 150° to 260°F. The maximum temperature capability shall be 400°F. Sensor is to be capillary type with remote 3 ¾" brass bulb. Contractor to provide ½" FPT in discharge piping near blower for thermostat well. Piping under 4 inches will require a tee with bushings to mount the well. Piping 4 inches and over may be drilled and tapped.
11. High Pressure Shut-Down Switch
 - a. H.P. Switch be Ashcroft type 400, B4 series or equal with an operating range of 1 psig to 15 psig. Actuator seal must be Viton.

2.3 TESTING

A. Factory Testing

1. After assembly, blower system shall be factory lubricated, aligned and operationally tested. Run time on each blower shall be at least one hour after which each blower shall be rechecked for alignment and tension of V-belts and adjusted if necessary. If adjustments are made, the blower(s) shall be restarted and run an additional 15 minutes, shut down and rechecked again.
2. The blower supplier shall notify the Engineer at least (5) days before any testing occurs. The Engineer will notify the supplier within three days of such notice, if the engineer and/or owner wish to witness this operational run testing of the blower system.
3. A report on each blower system, signed by an officer of the company, shall be furnished with the O&M manuals giving as a minimum the following readings taken at/or near the end of the one hour run time:
 - a. Amperage draw, per leg.
 - b. Voltage draw, per leg.
 - c. Pressure.
 - d. Housing surface temperatures of motor bearings, blower bearings, and blower discharge air.
 - e. Noise level in dbA measured at 3 ft from the blower system in (6) locations.

- f. Vibration levels in in/sec of blower and motor bearing housing in horizontal, vertical and axial direction and in (6) locations on the common base.

2.4 SHIPPING

- A. All equipment supplied in this section, with the exception of instruments, check valves and butterfly valves, shall be assembled as one unit at the factory and shipped as one unit.

2.5 PAINTING

- A. Shop paint assembly frame, blower, silencers, motor, and sliding motor base separately and then assemble using grade 5 zinc plated hardware.
 - 1. Preparation: Remove weld splatter, grind smooth sharp edges and welds, contour to rounded shape, and pressure (2000) psig) clean with grease/oil removing solvent.
 - 2. Primer Coat: Apply one coat at 3 to 4 mils DFT equivalent to Tnemec Series 37 Chem. Prime.
 - 3. Interim Coat: Apply one coat, 3 to 4 mils DFT, equivalent to Tnemec Series 66 Epoxoline after all components are assembled and system has been performance tested.
 - 4. Finish Coat: Apply one coat of 2 to 3 mils DFT equivalent to Tnemec Series 73 Endura Shield III Polyurethane.
 - 5. Touch Up Paint: Provide two quarts of finish coat paint for touch ups after installation of the blower package.

2.6 SPARE PARTS

- A. The Contractor shall deliver the following spare parts for each blower system.
 - 1. One set of blower bearings.
 - 2. One set of blower gaskets and seals.
 - 3. One set of V-Belts.
 - 4. Three filter elements for the air intake filter.
 - 5. Sufficient oil for changes.
- B. All of the above parts shall be provided as spare parts and shall be packaged for potential long-term, dry storage.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for installation examination.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for installation preparation.

3.3 INSTALLATION

- A. Equipment shall be installed in accordance with manufacturer’s recommendations to provide a complete installation.
- B. All piping shall be supported to prevent exerting undue forces and moments on the blower flanges. Single arch expansion joints shall be furnished to isolate the blower package from the piping system.
- C. Each blower unit will be installed on a flat and level concrete pad, suitable for supporting the dead weight of the unit. Vibration isolation pads must always be placed between concrete pad and common base.
- D. All piping and fittings to mount the specified instruments must be provided by the blower system manufacturer.
- E. If required all blower oil drains must be piped away from the blower to easily drain oil.
- F. The blower manufacturer will furnish the services of a factory-based engineer to check the installation of the blower system and make any field adjustments necessary to insure proper mechanical operation. The blower system manufacturer will submit, to the Contractor, a written report certifying that the equipment has been satisfactorily installed and lubricated.

3.4 ELECTRICAL CONNECTIONS AND CONTROLS

- A. Electrical motor controls, instrumentation, power and instrumentation wiring and conduits will be provided by the Electrical Contractor under Division 26, Electrical.

PART 4 DATA SHEET

- A. Number of Blower assemblies: 1 unit.
- B. Location: Laguna Vista Wastewater Treatment Plant.
- C. Blower Characteristics:
 - 1. Air Flow – SCFM at 14.7 psia, 68°F, and 36% relative humidity.
 - 2. Discharge Pressure – 6.8 psig
 - 3. Local Conditions – 10.5 feet elevation, inlet air temp 110°F and 80% relative humidity.
 - 4. Maximum Allowable Blower Gear Tip Speed – ()FPM
 - 5. Design Brake Horsepower – 40 BHP
 - 6. Maximum Average Noise Level 91 dbA measured at (6) locations at a distance of 3 ft. from the blower system. Noise level will be measured in a “free-field”.
 - 7. Drive Motor(s)
 - a. Designed, manufactured, and tested in accordance with the latest revised edition of NEMA MG-1. The motor shall be a squirrel cage induction type, single-speed, horizontally mounted. The motors shall conform to the following:

| | |
|-------------------|------------|
| Synchronous Speed | (1800) RPM |
|-------------------|------------|

| | |
|-----------------------------|---|
| Voltage, Phase, & Frequency | 480 volts, 3 phase, 60 Hz |
| Insulation | Class F or better |
| Enclosure | (TEFC) |
| Service Factor | 1.15 |
| Duty Cycle | Continuous |
| Ambient Temperature Rating | 40 degrees C |
| Starting Method | Full voltage, across the line |
| Bearing Lubrication | Manufacturer's standard by AFBMA standards |

END OF SECTION

SECTION 461380 - COARSE BUBBLE DIFFUSED AERATION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. 1" G-O Diffuser Assembly requirements or approved equal.
- B. Scope: This section governs all work necessary to furnish, install and place into operation a complete process aeration system.
- C. Description of System.
 - 1. The aeration system shall be provided as shown on the contract drawings and described in this specification.
 - 2. The equipment to be provided includes, but is not limited to, the following:
 - a. Blower Manifold with connections to each blower discharge,
 - b. Air Supply System from the blower manifold,
 - c. Aeration Equipment with valve, headers, diffusers, etc., for the Aeration Basin.
- D. Design Criteria.
 - 1. The aeration basin aeration equipment shall be based on the Design Data provided in drawings.

1.2 SUBMITTALS

- A. Section 013300 – Submittal Procedures specifies requirements for submittals.
- B. Instructions of receiving, storage, handling and installation of equipment.
- C. Material specifications describing the size, type, quality of individual items to be provided. Catalog cut sheets shall be provided when appropriate.
- D. Equipment description for each component explaining scope of supply.
- E. Shop drawings with all dimensions showing the location of equipment and connecting piping. Shop drawings shall clearly and completely depict all equipment.
- F. Provide Installation, Operation and Maintenance Manuals prior to delivery of equipment. Revise, as necessary, during installation. Manuals must include the following as a minimum:
 - 1. Name, address and phone number of the nearest competent service organization who can supply parts and service. If this is not the Manufacturer's own service department, then furnish a letter certifying that the named organization is authorized to represent the manufacturer and to perform warranty service.
 - 2. Complete descriptive literature and drawings of all material furnished, including "as built" erection drawings providing up-to-date information on the actual fabrication and erection of the equipment and documentation of any field modifications made during installation, start-up and testing.

3. All required assembly, installation, alignment, leveling, adjustment, start-up and testing instructions.
 4. All required operating instructions.
 5. All required maintenance instructions, including routine maintenance and lubrication schedules.
- G. Provide a field certification report from manufacturer stating that equipment is properly installed and ready for operation. The field certification report shall be based on an actual jobsite assessment of the installed equipment.

1.3 QUALITY ASSURANCE

- A. All fabricated equipment shall be carefully inspected at the site of fabrication by factory inspectors who shall use whatever means are necessary, including shop assembly, to assure the proper fit of all field connections and compliance with all material requirements of this specification.
- B. Field welding shall be allowed for assembly of any equipment in this specification.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements specifies requirements for transporting, handling, storing, and protecting products.
- B. Deliver materials in manufacturer's packaging including application instructions. All pieces shall be delivered in the largest pieces practical for field assembly by the Contractor.
- C. Individual pieces shall be permanently tagged with welded erection marks or stainless steel tags cross referenced with information on the manufacturer's erection and assembly drawings.
- D. All mechanical equipment shall be kept thoroughly dry at all times and shall be stored indoors.
- E. Storage of Equipment:
 1. All equipment stored on the job shall be protected and maintained in accordance with the manufacturer's recommendations.
 2. Structural materials may be stored outdoors on pallets or other wooden supports providing for the proper support and drainage. Equipment shall not be allowed to contact the ground directly.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturer List:
 1. H&L Fabrication, Inc. of Dripping Springs, Texas – Model H-L Diffused Aeration System.
 2. Substitutions: Specified in Section 01 60 00 - Product Requirements.

2.2 Performance and Design Criteria:

A. Aeration System.

1. The aeration system shall be able to properly distribute design airflow within the limitations of the air supply system for the lifetime of the installation.
 - a. The equipment manufacturer shall demonstrate uniform air delivery to all diffusers at design airflow in compliance with the air supply pressure requirement.
 - b. The equipment manufacturer shall guarantee that the increase in diffuser back pressure at the design airflow specified shall not exceed 0.1 psig after one year of operation and 0.2 psig after five years of operation.
 - c. The equipment manufacturer shall demonstrate compliance with the air supply pressure requirement and provide baseline data for the increase in diffuser back pressure requirement.
2. Each air header and/or air bridge shall include a control valve. The location of air control valves is shown on the contract drawings.
3. All air piping shall be sized so that the velocity in the pipe at 150% of the design airflow is less than or equal to the following values.

| Pipe Size | Velocity, fpm |
|-----------|---------------|
| 1" – 3" | 1,800 |
| 4" – 10" | 3,000 |
| 12" – 24" | 4,000 |

4. All orificing shall be sized by the equipment manufacturers to provide balanced air distribution for proper mixing and aeration.
 - a. All orificing shall be interchangeable without draining the tank contents or interrupting the supply of process air.
 - b. To ensure structural integrity the orifice must be removable without disassembly of any rigid piping.
 - c. Orifice sizing shall be based on the air distribution system and provide a maximum of 10" of water column headloss at maximum conditions and at least 3" of water column headloss at minimum conditions.
5. An individual air drop shall be furnished for each air diffuser assembly.
 - a. Each drop shall be supported by the orifice-tee assembly attached to the air supply and by a lower drop support.
 - b. Individual air drops shall be positively and securely fixed in place at the proper elevation and must be capable of being individually and positively cleaned from above the water surface without being removed.
6. Diffuser assemblies shall have no moving parts. Air bubbles shall be generated by a hydraulic shearing action at the surface of the diffuser and not be any underwater orificing.
 - a. Diffusers shall be constructed with an inlet diameter and vertical hollow section the same diameter as the air drop.
 - b. Air diffusion equipment using underwater orificing or restricting devices such as couplings shall not be accepted.
 - c. The connection between the drop pipe and the diffuser shall be male threads on the drop pipe to female threads on the diffuser.
7. Supports for the aeration system shall be generally as required by the equipment manufacturer.

2.3 MATERIALS AND METHODS OF FABRICATION

A. Aeration System.

1. Air control valves.
 - a. Valves 3" and smaller valves shall be Plug Valves.
 - b. Valves larger than 3" shall be Butterfly Valves.
 - c. Butterfly valves 8" and larger shall have actuators as shown in Drawings.
2. Air supply piping.
 - a. Piping smaller than 8"φ shall be fabricated from Schedule 40 steel pipe.
 - b. Piping 8"φ and larger shall be fabricated from ¼" wall steel pipe.
 - c. All air piping shall be Type 316 stainless steel.
 - d. Couplings for air piping shall be Type 316 stainless steel or stainless steel.
 - e. Gaskets for air piping couplings shall be EPDM with a temperature rating of 250°F or higher.
3. The air control orifice shall be Type 316 stainless steel. Orificing using plastic or dissimilar metals shall not be acceptable.
4. The 1" drop pipes shall be 1.3125" O.D., 0.120" wall, Type 316 stainless steel tubing.
5. The air diffusers shall be injection molded, ABS (Acrylonitrile-Butadiene-Styrene) having a maximum temperature rating of 220°F to 245°F.
6. Supports:
 - a. All supports shall be minimum ¼" thick steel and shall be Type 316 stainless steel after fabrication.
 - b. Lower drop pipe supports shall include a polypropylene clamp block with minimum 10 gauge Type 316 stainless steel backing plate.

2.4 PROTECTIVE COATINGS

- A. All fabricated steel equipment described as Type 316 stainless steel shall conform to ASTM A182.
 1. Individual components shall be fabricated in maximum sizes suitable for shipping.
 2. The equipment shall be designed and fabricated in accordance with ASTM A-143, A384 and A-385 for bolt together assembly.
 3. Field welding shall be allowed on Type 316 stainless steel equipment.
- B. Mechanical components, such as valves, gear reducers and bearing, shall be furnished with the original manufacturer's standard finish.

2.5 ANCHORAGE AND FASTENERS

- A. All anchors shall be minimum ½"φ, Type 316 stainless steel with stainless steel nuts and washers.
- B. All fasteners shall be Type 316 stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for installation examination.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for installation preparation.
- B. Inspect all concrete and piping and determine that all dimensions and elevations relating to the equipment are correct. All modifications to cured concrete require approval of the Engineer.
- C. The Contractor shall have sufficient copies of the equipment manufacturer's installation, operation and maintenance manuals onsite prior to installation.

3.3 INSTALLATION

- A. The Contractor shall install all equipment in accordance with the manufacturer's written instructions and as directed during onsite inspection by the manufacturer's representative.
- B. Deviations from the manufacturer's written or verbal instructions shall be subject to approval of the Engineer.

3.4 FIELD QUALITY CONTROL

- A. Prior to start-up, test all valves, switches, and gauges for proper setting and operation.
- B. Check assembly alignment.
- C. Ensure all equipment is properly lubricated.

3.5 START-UP SERVICES

- A. The Manufacturer shall provide the services of a field service representative to inspect the equipment installation and place the equipment into initial operation.
- B. The field service representative shall instruct operating personnel in the proper operation and maintenance of the equipment.
- C. A minimum of one (1) eight hour day and one (1) trip to the jobsite shall be provided.

END OF SECTION