THRASHER

ARCHITECTURE
ENGINEERING
FIELD SERVICES

CRAIGSVILLE PUBLIC SERVICE DISTRICT
NICHOLAS COUNTY, WEST VIRGINIA

CONTRACT NO. 2 – WASTEWATER TREATMENT PLANT UPGRADE

OCTOBER 20, 2020

ADDENDUM NO. 1

To whom it may concern:

A. BOILER PLATE

1. Bids will be received by the Craigsville Public Service District, located at 18740 Webster Rd., Craigsville, WV 26205. Bids shall be mailed, or hand delivered by November 17, 2020 at 2:00 p.m. Social distancing guidelines will be followed. Conference call information has changed and is as follows: Call-in Number: 1-646-558-8656; Meeting ID: 892 7612 7009; Passcode: 743433; and at the following address:

   https://us02web.zoom.us/j/89276127009?pwd=M1pvZmh5dXI4eUhqUG5kZnVZcktFZz09.

2. A **MANDATORY** Pre-Bid Meeting for Contract #2 will be held on Wednesday, October 28th at 10:00 a.m. Conference Call information for the Pre-Bid Meeting has changed to the following: Call-in Number: 1-646-558-8656; Meeting ID: 826 7996 2185; Passcode: 493593; and at the following address:

   https://us02web.zoom.us/j/82679962185?pwd=Y2lyWUNTbkIrY0ptYmRDWjJ2WVZrUT09

B. SPECIFICATIONS

1. **INSERT** Section 464322 – Positive Displacement Blower Systems

C. DRAWINGS

1. NOT APPLICABLE

D. QUESTIONS AND CLARIFICATIONS

1. NOT APPLICABLE

E. GENERAL

1. Last day for receiving Contractor questions will be close of business, Friday, November 6th, 2020.
2. American Iron and Steel (AIS) requirements DO apply to this project.
3. Davis Bacon requirements DO apply to this project.
4. Bidders are hereby notified to acknowledge receipt of all addenda in space provided on the Bid Form.

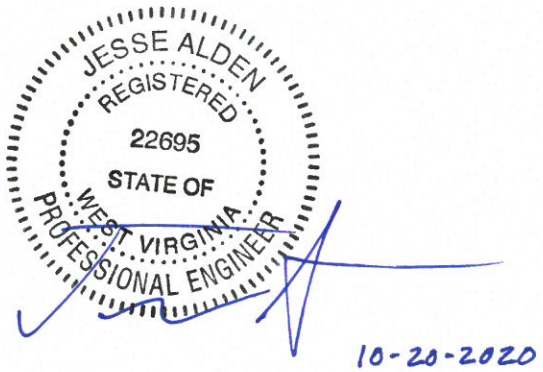
If you have any questions or need any other information, please do not hesitate to contact me.

Sincerely,

THE THRASHER GROUP, INC.

JESSE ALDEN, P.E.
Project Manager

Enclosures



10-20-2020

SECTION 464322 – Positive Displacement Blower Systems

PART 1 - GENERAL

1.1 SCOPE

A. Description of Work

1. Provide all labor, material and equipment to furnish and install one (1) complete of positive displacement blower system as specified and detailed on the drawings.
2. This specification covers the general requirements for the design, fabrication and testing of the blower and its appurtenances.
3. The blower package specified in this section replaces an existing unit with “in kind” equipment.

B. Work and components included 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. Engineered Subbase
8. Inlet filter silencer
9. Pressure relief valve
10. Check valve
11. Discharge isolation valve
12. Pressure gauge (inlet and discharge)
13. Temperature Gauge (discharge)
14. Temperature Switch (discharge)
15. Pressure Switch (discharge)
16. Vibration isolation pads
17. Prime and Finish paint
18. Spare parts

D. Manufacturer's Experience

1. The equipment manufacturer shall have not less than twenty-five (25) successful systems of the type and size specified, in operation for a period of minimum five (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. Contractor shall provide a copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked (✓) to indicate specification compliance or marked to indicate requested deviations from specification requirements.

1. Check marks (✓) shall denote full compliance with a paragraph.
2. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined shall signify compliance on the part of the Contractor with the specifications.
3. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

B. The following information shall be submitted to the Engineer, in accordance with Section 013300 – Submittal Procedures:

1. Copies of all materials required to establish compliance with this Section
2. Product Data
3. Shop Drawings
4. Operation and Maintenance Manual(s)
5. Manufacturer's Warranty
6. Other information, as required

C. Product Data: Include the following:

1. Literature, brochures, catalogs, cut sheets and other detailed descriptive material of the equipment.
2. Motor characteristics and performance information.
3. Gear reducer data including service factor, efficiency, torque rating, and materials.
4. Parts list including a list of recommended spare parts.

D. Shop Drawings: Include the following:

1. Manufacturer's installation drawings including, but not limited to, the following:

    a. Equipment weights and lifting points.
    b. Recommendations for short- and long-term storage.

2. Wiring and schematic diagrams.
3. Failure to include all drawings applicable to the equipment specified in this section will result in rejection of the entire submittal with no further review.

E. Operations and Maintenance Manuals: See Section 017823 – Operation and Maintenance Data.

F. A copy of the Manufacturer's Warranty

1.3 WARRANTY

A. The equipment furnished under this section and referenced sections shall be warranted to be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of two (2) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Owner and Engineer believe the following manufacturers are capable of producing equipment and products, which will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's product, nor shall it be construed that a named manufacturer's standard product will comply with the requirements of this Section. It shall be the responsibility of the contractor to coordinate with the "selected" equipment manufacturer by use of this specification and all related Drawings for any necessary adjustments, modifications or alterations to standard products to ensure that the product complies with all sections of this specification.

1. Candidate manufacturer is United Blower, Inc. located in Ball Ground, Georgia, USA.

2.2 DESIGN CRITERIA

A. Blower shall be positive displacement rotary type with top inlet and bottom outlet.

B. Blower shall be V-belt driven by an electric motor.

C. Operating conditions and blower characteristics are provided in PART 2 - PRODUCTS of this Specification.

D. All piping shall be installed so that no weight or strain will be imposed on the blower.

E. Design point noise levels for each blower furnished shall not exceed the dbA limits indicated in this specification. The dbA limits 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. Values stated to refer to noise as measured in a "Free Field" condition. The vendor shall provide the engineer with the manufacturer's certification of the design point dbA level for each blower system furnished.

2.3 DATA SHEET

A. Number of Blower assemblies: One (1)

B. Blower Characteristics:

1. Air Flow (216) SCFM at 14.30 psia, 100 °F, and 36 % relative humidity.
2. Design Discharge Pressure - (6.8) psig

3. Maximum Allowable RPM: 80 % of curve
4. Maximum Allowable Blower Gear Tip Speed - (2000) FPM
5. Maximum Design Brake Horsepower – (13) BHP
6. Maximum Average Noise Level (75) 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: (460) volts, 3 phase, 60 Hz
   Insulation: Class F or better
   Enclosure: (TEFC)
   Service Factor: 1.15
   Duty Cycle: Continuous
   Ambient Temperature Rating: 40ºC
   Starting Method: Full voltage, across the line
   Bearing Lubrication: Manufacturer's standard
   Bearing Life 50,000 hours rating life as defined by AFBMA standards

2.4 DESCRIPTION OF EQUIPMENT

A. Blower

8. Housing

   a. Casing shall be made of high-grade, close-grained grey cast iron, (ASTM 48 No. 35) 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 shall have two cast-in ports to provide “pulsation control”. Casing has flanged inlet and discharge connections. Screwed connections will not be acceptable. Casing integrity is tested @ 35 PSIG.
   b. 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.
   c. 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, or aluminum.

9. Rotors and Shaft

   a. 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.

   b. Each rotor and shaft shall be ductile iron (ASTM A536, 65-45-12), integrally cast, and shall be accurately machined and ground to tolerance. Then the complete rotor

assembly shall be dynamically balanced, following ISO 1940/ANSI S2.19 G2.5. Rotor cavities shall be plugged to prevent imbalance due to contaminants.

10. Timing Gears

    a. Both rotors shall be positively timed by a pair of accurately machined, heat treated ground alloy steel, helical tooth timing gears (20 CrMnTi). 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. Gears shall meet or exceed AGMA 12 in quality and carry a minimum of 1.70 service factor.
    b. Connections shall be provided for a hydraulic pump for expansion to adjust and/or remove gears.

11. Bearings

    a. Each blower shaft shall be supported by cylindrical roller or ball bearings sized for a minimum of 100,000 hours B-10 life, at design speed and maximum radial and thrust load conditions.
    b. Drive shaft bearing is sized for an overhung V-belt drive maximum continuous operating load.
    c. 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.

12. Seals and Lubrication

    a. 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 endplate. Lip type oil seals in the endplate 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.
    b. The timing gears and bearings shall be splash oil lubricated from oil slingers mounted on the drive shaft and dipping in oil. Grease lubricated bearings are NOT acceptable.

B. Base/Discharge Silencer Combination

13. Base material is 3/8” – 5/8” thick steel pipe, depending on blower and motor size and weight. Internal construction provides pulsation reduction through the design principle of noise wave cancellation. End plates and reinforcing/supporting members are also 3/8” – 5/8” thick plate.

14. 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.

15. No fibrous materials can be in contact with the air stream. Provide four (4) vibration isolation pads located under the base channel to reduce overall vibration. Provide six (6) vibration pads for 125 hp and larger packages.

16. Blower and motor are mounted on their supports to provide near perfect belt alignment.

17. For units that include a sound enclosure, provide an engineered subbase which includes at minimum 3" x 6" fork tubes for lifting access of the entire package. The sound enclosure shall sit atop the subbase and firmly be secured to it. A full-size drip tray shall be incorporated in the subbase design. The underside of the drip tray shall be insulated using 2" foam slabs. The subbase shall have a neat clean appearance and be consistent with the envelope size of the sound enclosure. Material of construction shall be carbon steel, coated with a primer and urethane topcoat. The subbase shall include four heavy duty tabs for anchoring the subbase to the concrete pad or slab.

C. Drive System

1. Each blower shall be equipped with a TEFC electric motor of the type and horsepower listed in this specification.

2. Motor shall be sized to accept load at pressure relief valve pop pressure without exceeding rated FLA. Motors shall meet NEMA M61 Part 31 for VFD applications. Motors shall be all cast iron.

3. Each blower shall be driven by a multiple V-belt drive system with a 1.4 service factor over the motor horsepower. A two-part OSHA drive guard shall be provided for each blower. Guard shall have a quick removable front, without the use of tools.

2.5 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:

i. On the inlet side of the blower system: 150°F
ii. On the discharge side of the blower system: 300°F
iii. 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.
iv. Expansion joints must always be provided on the discharge side of the discharge silencer. United Blower, Inc. model AMSE or equal.

b. The expansion joints shall be equipped with floating ANSI drilled flanges at the size shown on the drawings. Flex connector and/or hose material with hose clamps, shall not be allowed.

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). Efficiency shall be 98% on 2-micron particles or better.
b. Filters for blowers shall have a (4") inch flanged connection and be rated for (450) CFM.
c. Any absorption material used in the intake filter silencer shall be upstream of the inlet filter element.
d. Inlet flange of the blower shall be directly connected to the inlet filter silencer housing without intermediate pieces.
e. Filter elements must be removable from the housing without the use of any tools.
f. Intake filters shall be as manufactured by United Blower Inc. model UBRB, or equal.
    i. Inlet filters must be sized at least 150% of specified inlet air flow (see part 2) for clean environments and 200% for dusty environments.

3. Pressure Relief Valves

a. Provide a weighted or spring type pressure relief valve installed after the discharge silencer. This valve is to be shop tested to relieve at 1 psig. above specified pressure.
    i. 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 nodular iron 10 position lock lever handle. Provide valve equivalent to United Blower Inc. model BFV or equal.

6. Vibration Isolation Pads

a. Provide four (4) molded, synthetic rubber and cork, vibration isolation pads for each blower, sized to fit the structural steel base. Provide isolators as manufactured by United Blower Inc. model 1" N/C or equal.

7. Inlet Vacuum Gauge

a. Provide a differential pressure gauge to indicate pressure drop through the air filter equal to Model 2020 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, die cast case. Graduated phenolic case with color coded scale divisions is also acceptable.
4) Mount Vacuum gauge as shown in the drawings.

8. Discharge Pressure Gauge

a. Provide a liquid filled pressure gauge equal to type 1008A manufactured by Ashcroft or equal.

1) Range: 0 to 15 psig.
2) Accuracy: 2% 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 1/4" NPT black connection.
9) Mount discharge pressure gauge as shown in the drawings.

9. Discharge Temperature Gauge

a. Provide a 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.

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 1 3/4" brass bulb.

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. The face of the switch/gage shall be provided with an adjustable set point mechanism.

12. Blower system supplier is to provide a flanged spool piece following the expansion joints equipped with a welded tap for the pressure relief valve(s). Two additional 1/2" NPT taps shall be provided for mounting pressure & temperature sensors.

B. Acoustical Foam Insulated Noise Enclosure

1. General

a. The acoustical enclosure shall be compatible with the rotary positive displacement blower furnished in this specification section and shall comprise a complete system.
b. Enclosure shall be constructed to easily accommodate service and maintenance functions without dismantling of the enclosure. The enclosure shall have a minimum of three removable wall access doors appropriately placed for viewing and maintenance purposes.
c. In addition, enclosure shall include a removable roof panel, which will permit removal of blower and/or the motor without removal of the enclosure.
d. Enclosure ventilation inlet shall be mounted directly in line with motor fan such as to allow ventilation for motor cooling.
e. Enclosure exhaust fan shall be located away from enclosure inlet vent to create cross ventilation within enclosure for equipment cooling.
f. When applicable, enclosure sub-frame shall be designed so that completed blower package is mounted to sub-frame and enclosure is installed over blower package and fastened to sub-frame mounts. Sub-frame shall also have four anchor bolt mounts and have provisions for easy lifting by forklift.

2. Materials and Construction

a. Acoustical Panel Construction

1) All panels shall be constructed as follows:

Material: Galvanized G-90 steel, powered coated exterior.

Outer skin: 18 GA. Thickness.

b. Acoustical insulation: each panel assembly shall be filled with polyester foam acoustical insulation with PSA backing. Acoustical insulation shall have the following physical properties:

i. Density (per ASTM D3574-856 test A): 4lb./c.f.2
ii. Thermal Conductivity (per ASTM C177): BTU/HR., Ft., °F/in. .25
iii. Tensile Strength (per ASTM D3574-86 test E): 20 PSIG
iv. Heat Resistance (per ASTM D3574-86 test K): 70% after 22 hours day heat again @ 140°C
v. Humidity Resistance (per ASTM D3574-86 test J): 70% after 6 hours steam autoclave @,105°C
vi. Service Temperature: -40°F to 275°F (325°F intermittent)
vii. Flammability MVSS 302, UL-94 HFI, and FAR 25.853(b)
viii. Chemical Resistance, excellent for the following fluids: water, petroleum, solvents, and alkalis

c. Each panel shall have two lifting handles to ease removal and a minimum of four lift and twist fasteners to secure the removable panels in the frame fasteners shall be Zinc plated. (Zinc is a compatible with aluminum, galvanized and carbon steel).
d. Frame: The frame rails shall be made of 2" square extruded aluminum with two 1" lips to be utilized as panel shoulders. The rails shall be connected together to create the outer shape of the enclosure with the use of cast aluminum end connectors. The end connectors shall have three protrusions that slide into each adjoining frame rail. Each protrusion shall have a polyurethane strip on one side to ensure a tight fit with the adjoining frame rail. The frame rails shall be secured in place to the end connectors with two low profile Tec screws.
e. Weather Hoods: The inlet ventilation and exhaust fan openings shall be covered with an acoustical foam insulated weather hood. The outer skin of the weather hood shall be made from the same material as the panel walls. In addition, the inner surface shall be lined with 2" acoustical foam in the same manner as the rest of the panels.
f. Sub-Base: Outer frame is made of 3" x 6" x 1/4"ASTM A36 tubing, with 4 welded on mounting tabs for procuring to concrete, inside the perimeter. Forklift tubes, also 6" x 3" x 1/4" steel, are welded in to provide a blower package mount. Cavities between outer members and forklift tubes are filled with the same acoustical foam material used in enclosure walls. Top cavity of sub-base is covered with an 11 GA galvanized steel oil drip pan.

3. Performance

a. Noise levels measured at three feet from the enclosure with one blower in operation using 1" foam lined panels, shall be reduced 5 to 7 dBA decibels on average (compared to same blower package with no noise enclosure). Noise levels should reduce 14-18 dBA at 3 feet when upgrading to 2" foam, as measured on the "A" scale of a standard sound level meter at slow response. For attenuation of 18-22 dBA at 3 feet, provide 2" mineral wool covered by a galvanized metal perforated cover. Noise levels are determined by octave band analysis, the equivalent A-weighted sound level shall be computed as set forth in 29 CFR 190.95 (a).

4. Accessories

a. Provide enclosure cooling with a 120VAC high volume exhaust fan thermostatically controlled. Fan shall be fed external 15-amp 120VAC power. The fan shall be protected with a solid-state starter/breaker set at max 5 amps. Cooling shall limit the temperature rise in the enclosure to 20°F above ambient.

2.6 TESTING

A. Factory Testing

1. After assembly, the 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 (7) 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 at full load:

   a. Amperage draw, per leg.
   b. Voltage draw, per leg.
   c. Discharge 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.
   g. Alternative testing at the point of manufacturer of the blower is also acceptable. Such tests must be performed base on ISO1217 standards.

2.7 SHIPPING

A. All equipment supplied in this section, with the exception of instruments, check valves, outlet spool and butterfly valves, shall be assembled as one unit at the factory and shipped as one unit. Oil reservoirs shall be filled to the correct level, with oil prior to shipping.

2.8 PAINTING

A. Provide painting of all fabricated steel components in accordance with the specification listed below.

1. Preparation: Remove weld splatter, grind smooth sharp edges and welds, contour to rounded shape, and clean to SSPC 3 standard.
2. Primer Coat: Apply one coat at 3 to 4 mils DFT equivalent to Tnemec Series 37 Chem. Prime.
3. Finish Coat: Apply one coat of 2 to 3 mils DFT equivalent to Tnemec Series 73 Endura Shield III Polyurethane.
4. Touch Up Paint: Provide two quarts of finish coat paint for touch ups after installation of the blower package.
5. The blower and motor paint system can be offered as a standard factor offering, if it meets or exceeds that which is specified above.

2.9 SPARE PARTS

A. The Contractor shall deliver the following spare parts for <u>each</u> blower system.

1. One set of blower gaskets and seals.
2. One set of V-belts
3. Three sets of filter elements for each blower's air intake filter.
4. Sufficient oil for (2) changes per blower.

All 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, INSTALLATION, ADJUSTING, AND ACCEPTANCE

A. Equipment shall be installed in accordance with the manufacturer's recommendations to provide a complete and fully operational 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.

G. Equipment Startup

1. Provide for equipment startup of (1) eight (8) hour working day or as necessary to fully commission all specified blower equipment under loaded or simulated full load conditions.

3.2 FIELD PREPARATION AND PAINTING

A. Finish painting and field preparation shall be performed per Manufacturer's directions.

B. The Contractor shall touch up all shipping damage to the paint as soon as the equipment arrives on the job site.

C. Prior to the assembly all stainless-steel bolts and nut threads shall be coated with a non-seizing compound by the Contractor.

3.3 DEMONSTRATION AND TRAINING

A. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

B. After the CONTRACTOR has installed the equipment and the units are capable of being operated, the equipment manufacture shall furnish a qualified representative for a minimum of 2 working days (up to 16 hours) to inspect the equipment and to supervise field testing and startup for the CONTRACTOR.

END OF SECTION 464321.10