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June 6, 2022

ADDENDUM NO. 01

CONTRACT NO.: 20518.1 – Biological Nutrient Removal (BNR) System Equipment RFP
OWNER: Coweta County Water & Sewerage Authority
PROJECT: Shenandoah WWTF – Biosolids Dryer Equipment RFP

BID DATE: June 15, 2022
TO: ALL PROSPECTIVE CONTRACTORS AND SUPPLIERS

The changes, modifications, and/or additions covered by and set forth in this Addendum No. 01 shall become part of and be incorporated in the Contract Documents for the above referenced project:

SPECIFICATIONS TO BE REVISED BY ADDENDUM:

AD1.1 SECTION 44 42 13 – BIOLOGICAL NUTRIENT REMOVAL SYSTEM.
a. Replace entire section with attached.
b. Modifications include edits to Section 3.4.D.2 and Section 3.4.E.2.

This Addendum No. 01 shall be attached to the front of your set of specifications and made a part of the Contract Documents. Receipt of this Addendum No. 01 shall be acknowledged on the Proposal Form.

Krebs Engineering, Inc.

By_____
Jarred M. Jackson, PE
Senior Associate

SECTION 44 42 13 – BIOLOGICAL NUTRIENT REMOVAL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The equipment specified in this section will be pre-selected by the Owner through a request for proposal (RFP) process.

B. The Supplier shall provide single-source responsibility for the complete biological nutrient removal (BNR) system including equipment, controls, programming, delivery, startup, and training.

C. The scope of supply shall include the following components at a minimum:

1. Modulating control valves
2. Fine bubble aeration
3. System control panel
4. Instrumentation

D. The Supplier shall have in-house process engineers with experience in activated sludge processes and in process training and commissioning support.

E. The Supplier shall provide installation and start-up assistance training, and guarantee the process performance as specified herein.

F. It is the intent of these specifications that a single Supplier, regularly engaged in the design, manufacture, assembly and production of biological processes and controls of the type specified, shall have complete responsibility for the final design, furnishing, coordination, assembly, and installation supervision of all components in the biological process.

G. Detailed drawings, including arrangement and erection drawings of the equipment and control equipment; schematic control diagrams, electrical connection diagrams, and complete description of the control systems; and equipment operating characteristics shall all be furnished.

1.3 SUBMITTALS

A. Submittals shall include the following:

1. Submit required copies of Supplier's literature, dimensional drawings, wiring diagrams, motor data, performance data, materials of construction, a description of the process design (Operational Description), a description of the control system software logic (Functional Design Specification), Alarm and I/O List, and any other information necessary to determine compliance of the equipment to the specification and project requirements.
2. Highlight project-specific model numbers and options in equipment data sheets.
3. Submittal drawings showing plan, elevation and cross sections of the equipment.
4. Component details of the aeration equipment showing diffusers, diffuser holders, gaskets, retainer rings, supports, threaded union and/or flanged joints and a purge system.

5. Materials and Manufacturing specifications.
6. Aeration System submittal information to include:

    a. Equipment data sheets
    b. Performance data including oxygen transfer calculations
    c. Certified SOTE curves from previous test runs on equivalent system shop transfer testing.
    d. Headloss calculations and pressure requirements.
    e. Customer contact list with telephone numbers (minimum of 3 contacts from similar size facilities).

B. Operation and maintenance manual with installation instructions. Submit after approval of equipment and prior to shipment.
C. Process Performance Guarantee

1.4 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be delivered in unopened, undamaged crates designed for handling and storage.
B. Equipment shall be stored and protected in accordance with the Supplier's recommendations.

PART 2 - PROCESS DESCRIPTION

2.1 SYSTEM DESCRIPTION

A. The system shall incorporate activated sludge treatment and shall include zones for anoxic and/or anaerobic treatment as required for the necessary BOD, ammonia and nutrient removal.
B. The functions of aeration and mixing shall be independent and not be provided by a single piece of equipment.

2.2 INFLUENT CHARACTERISTICS AND EFFLUENT REQUIREMENTS

A. See table in the Request for Proposals

PART 3 - SYSTEM EQUIPMENT

3.1 MODULATING CONTROL VALVES

A. The BNR supplier shall furnish the motor-operated (480V/3Phase/60Hz, modulating) butterfly valves to control independent aeration grids in the aerated tanks. The valves shall be supplied with an electric actuator, compartment heaters, and handwheel for manual operation. I/O provisions for each actuator shall be as required by the point lists on electrical plans.

3.2 FINE BUBBLE AERATION

A. Furnish all materials, equipment, services, and testing for the fine bubble aeration system. Provide the components listed below at a minimum:

1. Stainless steel drop legs, supports, and anchors.
2. PVC manifolds, air distributors, diffuser holders, and retainer rings
3. Bolts, nuts and gaskets for aeration system flange connections.
4. Air distributor purge systems.
5. Membrane disc diffusers with integral O-ring gaskets.

B. System Design and Performance

1. Design aeration oxygen transfer shall be at 14.7 PSI, 20°C and zero dissolved oxygen at the specified submergence, air rate and pressure.
2. Design air distributors with centerline spacing not to exceed 4 feet to maximize oxygen transfer efficiency and mixing efficiency and to minimize solids deposition between air distributors.

C. Materials Fabrication and Finishing

1. Stainless Steel – Pipe, Fittings and Supports

   a. Fabricate all welded parts and assemblies from sheets and plates of 304L stainless steel with a 2D finish conforming to ASTM A240, 554, 774, 778.
   b. Fabricate non-welded parts and flanges from sheets, plates or bars of 304 stainless steel conforming to ASTM A240 or ASTM A276.
   c. Welds & Welding Procedure

      1) Weld in the factory using latest standards according to AWS. Continuously weld both sides of face rings and flanges to eliminate potential for crevice corrosion.
      2) Corrosion Protection and Finishing clean all welded stainless steel surfaces and welds after fabrication by using the following procedure:

         a) Pre-clean outside and finish clean all interior and exterior welds and piping by full immersion pickling and rinse with water to remove all carbon deposits and contaminants to regenerate a uniform corrosion resistant chromium oxide film per ASTM A380 Section 6.2.11, Table A2.1 Annex A2 and Section 8.3.

2. Natural Rubber – Furnish all fixed and expansion joint O-ring gaskets of natural rubber/SBR with a Shore A durometer of 45 ± 5.
3. Polyvinyl Chloride (PVC) – Pipe and Fittings

   a. Produce all PVC pipe and fittings from PVC compound with a minimum tensile strength of 7000 psi.
   b. Provide lower drop pipe, manifold and air distributors as follows:

Diameter	Wall Thickness	ASTM
4 inch	SDR 33.5	D3915, 3034
5 inch & larger	Schedule 40	D1784, 1785, 2466

   c. Factory solvent weld all PVC joints. Field solvent welding will NOT be permitted.

4. EPDM - Membrane Diffusers and Gaskets

   a. Manufacture circular membrane diffuser discs with integral O-ring of EPDM synthetic rubber compound with precision die formed slits. Thermoplastic materials (i.e. plasticized PVC or polyurethane) are not acceptable.
   b. Add carbon black to the material for resistance to ultraviolet light.
   c. Design diffuser as one piece injection molded part with a minimum thickness of 9-inch diameter unit. Compression molded diffuser elements are not acceptable.
   d. Limit the maximum tensile strength of the diffuser to 10 psi when operating at 2.4 SCFM/ft² of material. Furnish proportionately thicker material for larger diameter disc diffusers to limit the maximum tensile stress and to resist stretching.
   e. Produce diffusers free of tears, voids, bubbles, creases or other structural defects.
   f. Furnish diffuser material to meet the following:

Item	Value/Units	ASTM
Base Polymer	EPDM	D573
UV Resistance	Carbon Black	
Specific Gravity	1.25 or less	
Durometer – Minimum	58% ± 5%	D2240
Modulus of Elasticity	500 psi	D412
Ozone Resistance (72 hrs: 40°C pphm)	No cracks @ 2X magnification	D1171 Test A
Tensile Strength	1200 psi	D412
Elongation - % - Retained 70 hrs @ 100°C - minimum at break	 75% Max 350%	 D573 D412

   g. Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.
   h. Membrane Longevity
   i. Longevity of the proposed membrane diffusers shall have been demonstrated in at least three (3) full-scale municipal installations operating continuously for a period of three (3) years.
   j. Test reports, prepared by an independent testing agency, shall confirm membrane longevity through compliance with the following maximum allowed percent (+/-) change in each membrane property. Tests conducted in-house by the Supplier shall not be acceptable.
   k. Data for a minimum of three diffusers from each installation shall be provided.

Property	Maximum Change
Durometer	5%
Weight	5%
Permanent Set	0.5%

   l. Test reports shall be submitted with the equipment submittals.

5. Dropleg - Provide a stainless steel dropleg from the air main connection to the dropleg connection above the manifold.

    a. Provide a Van Stone style flange with a 150 pound bolt pattern for the top connection.
    b. Provide a band clamp coupling with gasket for the lower dropleg to manifold
    c. Provide a Van Stone style flange with a 150 pound bolt pattern for the top connection.
    d. Provide a band clamp coupling with gasket for the lower dropleg to manifold.

6. Manifold – Provide a PVC manifold for connection to the air distribution headers

    e. Provide a band clamp coupling with gasket for the lower dropleg to manifold.
    f. Outlets shall be provided along the bottom centerline of the manifold.
    g. Fabricate manifolds with 4 inch diameter fixed threaded union or flanged joints for connection to the air distributors.
    h. Design manifold, distributor connections and supports to resist thrust generated by expansion/contraction of the air distributors over a temperature range of 125° F
    i. Support manifold with a minimum of two supports.
    j. Connect manifolds with fixed threaded union or flanged joints to prevent rotation or blow apart.
    k. Manifolds shall be raised to allow for interlacing two separate grids of air distribution headers per tank.

7. Air Distributors and Diffuser Holders - Provide 4 inch diameter air distributors perpendicular to the air manifold.

    a. Fabricate distributors with single diffuser holders solvent welded to the crown of the air distributor for complete air seal and strength.
    b. Provide minimum solvent weld area of 15 square inches.
    c. Design distributors and holders to resist a dead load of 200 lbs applied vertically to the outer edge of the diffuser holder.
    d. Provide 4 inch diameter threaded removable end caps complete with gasket, threaded coupling and end plate for clean out at the end of each distributor.

8. Air Distributor and Manifold Connection Joints

    a. Join air distributor sections with positive locking fixed threaded union or flange type joints for all submerged header joints to prevent blow apart and rotation.
    b. Bell and spigot, slip on or expansion type joints are not acceptable for submerged joints.
    c. Design threaded union joints with spigot section connected to one end of the distribution header, an O-ring gasket and a threaded screw on retainer ring. Solvent welding shall be done in the factory.

9. Supports - Provide each section of manifold and air distributor with a minimum of two (2) supports.

    a. Limit maximum support spacing to 8 feet.
    b. Design all supports to allow for thermal expansion and contraction forces over a temperature range of 125° F and to minimize stress build up in the piping system.
    c. Design supports to be adjustable without removing the air distributor from the support.
    d. Design supports to allow for complete removal from the tank to facilitate installation of additional headers and in-tank maintenance. Support structures which consist of rods Epoxied directly into the tank floor are not acceptable.
    e. Manifold Support – 6 inch diameter and larger

        1) Design supports to include hold down guide straps, support structure and anchor bolts.
        2) Design guide straps with a 2 inch minimum width to eliminate point load on manifold and minimize binding.
        3) Design support for 2 inches plus or minus vertical adjustment for leveling of manifold.
        4) Air Distributor and Manifold Supports – 4 inch diameter.
        5) Design supports with hold down straps, support structure and anchor bolt.
        6) Design support for 1 1/2 inch(plus or minus) vertical adjustment for leveling air distributor to plus or minus 1/4 inch.

    f. Guide support

        1) Guide straps to have 1 1/2 inch wide top and bottom contoured bearing surface with chamfered edges to minimize binding and resistance to movement of air distributor under full buoyant uplift load.
        2) Design strap with 1/8 inch clearance around distributor so strap is self-limiting and cannot be over tightened.

    g. Fixed supports

        1) Fixed straps to have 1 1/2 inch wide top and bottom contoured bearing surface with punched burrs to positively grip the air distributor when tightened.
        2) Design strap to be self-limiting to prevent stressing the distributor if the clamp is over tightened.
        3) Attach supports to tank floor with one stainless steel anchor bolt.

10. Diffuser Assemblies: Furnish diffuser assemblies including diffuser, diffuser gasket, holder, retaining ring and air flow control orifice.

    a. Membrane Diffuser

1) Incorporate an integral check valve into the membrane diffuser.
2) Design and test aeration diffusers for a dynamic wet pressure (DWP) of 12 inches ± 20% water column @ 1.0 SCFM/diffuser and 2 inches submergence in the Aeration Tanks.
3) Visual Uniformity – Observe diffusers for uniform air distribution across the active surface of the diffuser at 1.0 SCFM- 1.5 SCFM/diffuser and 2 inches submergence. Active surface is defined as the perforated horizontal projected area of the diffuser.
4) Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.
5) Diffuser Support Plate – Provide a PVC support plate to form an air plenum under the diffuser and support for the membrane when the air is off.

b. Diffuser Holders and Retainer Rings

1) Design holder to provide peripheral support for the diffuser.
2) Design holder with air flow control orifice below the diffuser.
3) Design retainer ring to seal the diffuser and o-ring in the holder to prevent air leakage around gasket.
4) Design retainer ring threads with minimum cross section of 1/8 inch and allow for one complete turn to engage threads.

11. Anchor Bolts: Provide a mechanical 304 SS expansion anchor bolts for embedment in 4000 psi concrete with a pullout safety factor of 4.
12. Liquid Purge System: Provide a continuous purge assembly for each air distribution header.

3.3 CONTROL PANEL

A. Scope of Work

1. The biological process equipment supplier shall furnish a control panel that shall include the following:

a. Schneider Harmony GTU 12.1” Graphic Operator Interface (or Equal)
b. Modicon Programmable Logic Controller with I/O as required (or Equal)
c. Ethernet switch, Ethernet communications to SCADA, Uninterruptible Power Supply (UPS) for entire panel, DC power supplies, 120VAC discrete I/O provisions, NEMA 12 enclosure
d. Control Switches, and Pilot lights.

B. Biological Process Control Logic

1. The operator shall be able to enable or disable any of the process control logic functions at any time through the HMI. When a control logic function is disabled, the equipment may be operated manually through operator inputted setpoints.

2. Blower and Mixer Control: The control system will interface with the blowers and mixers to provide the proper amount of air and mixing required for the system.

3.4 INSTRUMENTATION AND PROCESS CONTROL

A. Scope of Work

1. The Aeration equipment supplier shall furnish, configure and commission the instrumentation for the biological process. In addition, the Aeration equipment supplier shall furnish the control algorithms detailed below to control the process with the supplied instrumentation.

B. Air Flow Meters

1. The aeration equipment supplier to furnish insertion mass air flow meters for monitoring and feedback of airflow to each zone of each aeration basin.
2. The air flow meter shall be mounted downstream of the air control valve.
3. Construction – Flow Element

    a. Connection Type: Male NPT Stainless Steel
    b. Type: Insertion Thermal Dispersion
    c. Body Material: 316 Stainless Steel with Adjustable Teflon Ferrule
    d. Sensor Material: Hastelloy C
    e. Temperature Range: 4 to 37 Degree C
    f. Accuracy: +/- 1.0% of upper range value
    g. Pressure Range: 0 to 15 PSIG

4. Construction – Transmitter

    a. Casing: NEMA 4X Cast Aluminum, Epoxy Coated
    b. Mounting: Remote
    c. Output: 4-20 mA
    d. Display Type: LCD (rate) in engineering units (scfm)

5. Surge Protection: Supplier shall provide external surge protection device(s) for all field wiring connections at transmitter in accordance with Specification Section 27 60 05 requirements.
6. Acceptable Suppliers: FCI ST50 Series

C. Air Pressure Transmitters

1. The aeration equipment supplier shall furnish insertion air pressure transmitters for monitoring and feedback of air pressure in the blower discharge/air header.
2. Type: Force balance or electro-mechanical, two-wire, indicating with a remote diaphragm.
3. Function: Measure a pressure (either absolute, gauge, differential or vacuum) and produce an analog output signal directly proportional to that pressure.
4. Performance Specifications:

a. Range: As shown in table
b. Accuracy: +0.5 percent of the calibrated range
c. Deadband: +0.075 percent of span maximum
d. Rangeability: 100:1
e. Temperature Range: 0-300 degrees F
f. Output: 4-20mA DC

5. Required Features:

a. Positive over-range protection of at least 1.25 times the maximum span limit
b. Electronic zero and span adjustments
c. Temperature compensation
d. Static pressure compensation
e. Adjustable internal dampening
f. Field wiring Reversal: Accidental reversal of field wiring shall not damage transmitter
g. Built-in electrical surge and RFI protection. Also provide an integral transient protection terminal block which meets IEEE standard 587 category B and IEEE standard 472.
h. Weatherproof and splash proof NEMA 4X enclosure.
i. ¾-inch NPT electrical conduit connection
j. Designed to operate on power from receiver or other remote power supply at 24VDC
k. Integral output digital LCD signal indicator
l. ½-inch NPT process connection

6. Materials: Use transmitters constructed of the following materials. Materials shall be suitable for mounting on the blower discharge pipe which will have a temperature of up to 350 degrees F.

a. Measuring element: Type 316 or 430 Stainless Steel
b. Flanges: Type 316 or 430 Stainless Steel
c. Bolts and mounting brackets: type 316 Stainless Steel
d. Gaskets: Teflon
e. Base and Cover: Die cast low copper aluminum with epoxy-based finish

7. Surge Protection: Supplier shall provide external surge protection device(s) for all field wiring connections at transmitter.
8. Acceptable Suppliers

a. Hach
b. Approved equal

D. DO/ORP Terminal/Controller

1. The analyzer shall be a digital multi-channel, multi-parameter system capable of controlling up to 20 sensors, in any combination, for the determination of water and wastewater parameters.

    a. The controller must be configurable to include the following measurements: COD, TOC, DOC, SAC, BOD, pH, ORP, NH_4-N, NO_3-N, PO_4-P, Conductivity, DO, Turbidity, TSS, Temperature and Sludge Level Monitor.
    b. The controller shall receive 4 to 20 mA signals from third party instruments.
    c. Communication between controller and sensor shall be 4-20mA per parameter measured (multiple parameters are measured at some locations)
    d. The system will provide up to 20 programmable analog outputs (max. load 500 ohms) and 20 programmable alarm relays (rated to 5A at 250VAC). System shall also be capable of Ethernet/IP and Profibus IP communication.
    e. 90VAC-264VAC power required.
    f. Enclosure is NEMA-4X rated.
    g. Entire system including the sensors shall have built in lightning and surge protection.
    h. Ambient operating temperature –20°C to +55°C.
    i. System diagnostics shall be standard.
    j. System shall also have a USB interface port, data storage capability, and 3 levels of security.
    k. System must have integrated lightening and overvoltage protection.
    l. Backup controller function to increase reliability.

2. The terminal controller shall be Hach or approved equal.
3. All instruments associated with the biological system must be connected to a terminal/controller for 4-20mA signaling back to the Control Panel.
4. Universal Mounting Kits with all necessary hardware shall be provided for each sensor.
5. A sunshield and mounting bracket shall be provided for the system display/controller and each local component to be mounted outside per the detail shown on electrical plans.
6. Surge Protection: Supplier shall provide external surge protection device(s) for all field wiring connections at transmitter in accordance with Specification Section 27 60 05 requirements.

E. DO/ORP Instrumentation

1. Each aerated zone in shall be equipped with dissolved oxygen and/or oxidation reduction potential probes as shown on the drawings and recommended by the supplier.

2. Dissolved oxygen probes shall be Hach or approved equal.

    a. Communication to controller shall be analog 4-20mA.
    b. Connection to IQ Sensor Net shall be through two wire shielded cable.
    c. The sensor shall be calibration free using intelligent membrane technology.
    d. Membranes shall last up to two years with replacement membranes containing calibration data chip.
    e. Sensor shall use soft green fluorescent light with calibrated optics and equal path reference system.
    f. Sensor shall have a measuring range of 0-20.00 mg/l.
    g. Sensor shall integrate temperature measurement and compensation.
    h. Temperature operating range of -5° C to + 50° C and measuring range of -5° C to + 50° C.
    i. System accuracy shall be ± 0.05 mg/l < 1.00 mg/l, ± 0.1 mg/l > 1.00 mg/l.
    j. Sensor shall include self-diagnostics.

3. The dissolved oxygen signals shall be displayed at the main control panel display unit and be an input to the PLC. The PLC, using a control algorithm will output a 4-20ma signal to control the air flow to each aeration basin. The control system will control the airflow to provide only the amount of air required to maintain the dissolved oxygen setpoints.
4. Probes and terminal controllers shall be handrail mounted as shown in the drawings.

F. Aeration Control System

1. The control system will interface with the blowers and mixers to provide the proper amount of air required for the system.
2. The control system will control the airflow to each aerated zone with an airflow modulating valve and airflow meter.
3. The control system will promote low system pressure by adjusting the air main pressure setpoint while ensuring adequate air supply to the process.
4. The DO and ORP signals shall be displayed at the main control panel display unit and be an input to the PLC. The PLC, using a control algorithm will output a 4-20ma signal to control the air flow to each aeration basin. The control system will control the airflow to provide only the amount of air required to maintain the dissolved oxygen setpoints.

G. Aeration Controller

1. If pulsed aeration is provided for mixing, then an aeration control algorithm shall be provided to intermittently cycle the air supply rate to the aeration grids in the system as described herein.
    a. Under normal operation, the airflow rate to each grid will be controlled by a DO and/or ORP probe.

b. At any time during automatic aeration control, the air supply rate to a grid drops below the minimum airflow needed to maintain mixing liquor solids in suspension, a mixing timer shall start.

c. If the air supply rate to that grid rises above the minimum airflow needed to maintain mixing liquor solids in suspension, the mixing timer will be re-set to zero.

d. If the value of the mixing timer exceeds a user-defined set-point, the controller shall pulse the aeration rate to that grid to the minimum airflow needed to maintain mixing liquor solids in suspension for a period of time sufficient to re-suspend any settled solids, and then re-set the mixing timer to zero.

e. The controller shall determine the maximum allowable number of aeration grids allowed to pulse simultaneously using the user-defined time between pulses and the pulse time required to re-suspend any settled solids.

f. The controller shall be designed to ensure uniform air distribution to all diffusers in each grid at the minimum airflow rate allowed for each aeration grid.

g. The controller shall adjust the airflow rates to each grid gradually to avoid sudden variations in pressure to the blowers.

2. The system airflow rate shall be controlled using most open valve (MOV) or pressure header control as described in this specification.
3. The user-defined set-point for time between mixing pulses and the status of each grid (Aeration Control or Pulse) shall be displayed on the HMI.

3.5 SHOP OXYGEN TRANSFER TEST

A. Conduct a performance test to demonstrate capability of the aeration equipment to meet the specified oxygen transfer requirements.

B. Base all tests on the following criteria:

1. A minimum of 3 tests for each specified condition in complete accordance with ASCE Clean Water Test Procedure (1992 or latest edition).
2. Aeration Supplier to conduct tests in a full scale aeration test tank (minimum of 300 sq. ft.) at the specified submergence and water depth with a diffuser density equivalent to the specified tank configuration. Diffuser density is defined as the ratio of the total tank surface area to the total active diffuser surface area.
3. Conduct shop test with air rate and mass rate of oxygen transfer directly proportional to the ratio of the shop test tank volume and the design tank volume.
4. Plot of pounds of oxygen per day per 1000 cubic feet of tank volume versus air per 1000 cubic feet of tank volume in tap water at 14.7 Asia, 20°C and zero dissolved oxygen at the specified submergence.

C. Certify and stamp all tests by a registered Professional Engineer.

D. Include all costs for testing (exclusive of witness expenses) in the equipment price. All tests may be witnessed at Owner/Engineer. Cost of travel and living expenses for Owner/Engineer to be paid by the Owner.

E. Submit all test data from oxygen transfer tests for approval by the Engineer prior to manufacturing equipment.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Contractor shall furnish, inspect, store, and install aeration system and blower components in accordance with Supplier's written instructions and approved submittals.
B. Diffuser assemblies on a common grid shall be installed within an elevation tolerance of ±1/2 inches.
C. Contractor shall provide all valves, air header piping, wall sleeves with seals, wall pipes, and concrete pedestals as necessary to complete the system as shown on the plans.
D. Air piping including blower manifold, header, and in-basin piping must be clean prior to delivering air up the diffusers.
E. Contractor shall be responsible for cleanliness of piping and may be required to manually clean pipe, or air or water flush piping as required.

4.2 QUALITY ASSURANCE

A. The supplier shall have experience in the design, Manufacture, supply, and commissioning of fine pore, flexible membrane aeration equipment of the type specified for this project.
B. Supplier shall have available skilled supervision and start-up services as specified.
C. The Contractor shall provide the services of the Supplier service/start-up technician to supervise and inspect and certify the equipment is operating as designed. The Supplier will provide classroom and field training on the operation and maintenance required at each installation. The Supplier shall provide a factory trained service/start-up technician for two (2) trips including a total of eight (8) workdays to inspect the installation, observe/assist in start-up and supervise the performance testing and Owner's training. The Suppliers service/start-up technician days on site shall be 8 hours per day not including travel time. The Suppliers service/start-up technician shall provide additional time on site at no cost to the Owner if required to resolve start-up issues associated with the system equipment, programming or other issues due to system design or performance. Any additional days on site, if requested by the owner, shall be negotiated between the Owner and the Supplier.
D. Equipment shall not be energized, or "bumped" to check the electrical connection for motor rotation without the service engineer present.
E. The service engineer shall make all necessary adjustments and settings to the controls.
F. The service engineer shall demonstrate proper and sequential operation of the system. The system shall be able to operate fully automatically.

4.3 OWNER ACCEPTANCE

G. In addition to the documentation associated with the completion of the Acceptance Testing, the Supplier shall provide the Owner with documentation that states the installation of the system has been inspected, meets the Supplier's guaranteed requirements, and is free from faults and defects.

4.4 PERFORMANCE GAURANTEE AND WARRNTY

H. The Supplier shall provide a performance guarantee that states the following:

1. The Supplier hereby unconditionally and irrevocably guarantees to the Owner, the performance and operating parameters described in these specifications and as submitted in the Suppliers proposal.
2. The Supplier agrees the system performance shall be based on field measurements from instrumentation as monitored by the Owner. The Owner agrees to immediately notify the BNR Supplier if the guaranteed performance and operating parameters are not met.
3. In the event that the system fails to perform at the guaranteed levels of performance and operation, the supplier agrees to pay the Owner 100-percent of the operating costs differential for the period of time beginning after written notification of non-compliance is received by the supplier and continuing until the system is again operating within these specifications.
4. The supplier agrees to pay to the Owner all reasonable costs and expenses, engineering, legal or otherwise, which may be incurred in the successful enforcement of any liability of the Supplier under this performance guarantee.
5. The Supplier shall furnish a three (3) year performance bond covering satisfactory performance of the BNR system equipment; FOB to Shenandoah WWTF and shall include parts only (not labor). The performance bond shall be in an amount to cover complete replacement of all system equipment, all of which will comply with the performance requirements required and guaranteed by the Supplier. Obliges of the Bond shall be the Owner and the Contractor. Bonds shall be furnished with the Supplier as principal and with corporate surety satisfactory to the owner and authorized to do business in the State of Georgia and countersigned by an agent whose office is located in the State of Georgia.

I. Supplier shall provide a 1 year warranty for all system components from the date of successful startup and Owner acceptance.

4.5 SPARE PARTS

A. A recommended spare parts list shall be furnished by the Supplier.

END OF SECTION 44 46 13

THIS IS THE LAST PAGE

Attachments to Addendum No. 01 preceding this page:

A total of 16 pages or sheets of drawings (including this page) have been included in Addendum No. 01.

General Contractors are requested to return this page as an acknowledgment that you have received this Addendum by email. This will NOT be mailed. A copy of this Addendum may be picked up at the office of the Engineer.

Return to Krebs Engineering, Inc. by email to Jarred.Jackson@krebseng.com

Received By_____

Contractor_____

Date_____