

ADDENDUM NO. 1

TO

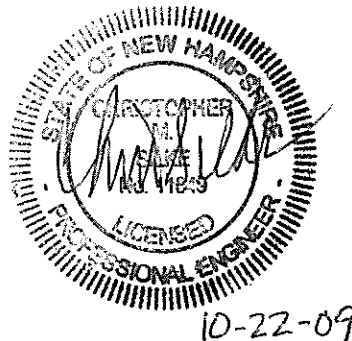
**City of Rochester
Rochester, New Hampshire**

BIDDING AND CONTRACT REQUIREMENTS AND SPECIFICATIONS

FOR

**COCHECO WELL NO. 1
WATER TREATMENT FACILITY**

OCTOBER 22, 2009



**PREPARED BY:
WRIGHT-PIERCE ENGINEERS
230 Commerce Way, Suite 302
Portsmouth, NH 03801
Tel. 603-430-3728
Fax 603-430-4083**

ADDENDUM NO.1

CITY OF ROCHESTER ROCHESTER, NEW HAMPSHIRE COCHECO WELL NO. 1 WATER TREATMENT FACILITY

This addendum amends and/or supplements the bid documents as indicated below. Only these items alter the Bid Documents; any verbal discussions or responses are hereby declared null and void.

SPECIFICATIONS

1. Pg A-1.1, BID ADVERTISEMENT - Bids will now be received until **2:15 PM, October 29, 2009** - **REPLACE "2:30 PM" with "2:15 PM"**
2. Pg A-2.1, INFORMATION TO BIDDERS - Bids will now be received until **2:15 PM, October 29, 2009** - **REPLACE "2:30 PM" with "2:15 PM"**
3. **REPLACE** SECTION 11378 "AERATION SYSTEM" with attached specification. Piping between blowers and aeration units is stainless steel.

SPECIFICATIONS

SECTION 11378

AERATION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide, install and test a complete air stripper system as shown on the Drawings and specified herein.

B. Equipment:

1. Aeration equipment provided by system supplier: Blower and steel intake and discharge stubs with flanges, Aeration Tank and associated appurtenances, tank level instruments, pressure switches, Filter/Silencer, blower intake manometer, flexible couplings on the tank vent discharge.
2. The blower discharge piping from the check valve to the aerator drop pipe shall not be provided by the aeration system manufacturer, but shall be provided by the Contractor.
3. Contractor shall provide all other equipment, labor, power and control wiring for a complete system installation.

C. Related Work Specified Elsewhere:

1. Concrete is specified in Division 3.
2. Standard Equipment requirements are specified in Sections 11000 and 01800.
3. Instrumentation and Process Control is specified in Division 13.
4. Mechanical and piping is specified in Division 15.
5. Electrical is specified in Division 16.

D. System Function:

1. Operation: The air stripper system shall remove radon gas and carbon dioxide present in the well water supply by means of providing air for gas transfer and mixing. The aeration unit will introduce fine bubbles of air into the well water order to increase the area of contact between air and water which, in turn, promotes the diffusion of radon and carbon dioxide from the water into the air. The raw water pipeline from the well(s) will connect to the inlet of the aeration unit. The air stripper unit and blower shall be sized to treat water from the well with water quality and flow rate described below. The air blower will operate whenever raw water flow is detected in the inlet piping. The air emerging from the air stripper shall be vented to outside the building through a vent pipe attached to the vent flange located on the unit's lid. Refer to Division 13 for complete control descriptions.

11302A

11378-5
AERATION SYSTEMS

2. Design Criteria:

a.	Design Water Flow	600 gpm, Total
b.	Water Temperature	8-12 °C
c.	Elevation	as shown on Drawings
d.	No. of Air Stripper Units	2 maximum
e.	Raw Water Radon	3200 pCi/L
f.	Raw Water Carbon Dioxide	25 mg/L
g.	Raw Water Total Dissolved Solids (TDS)	160 mg/L
h.	Raw Water Hardness	<5 mg/L as CaCO ₃
i.	Raw Water pH	5.8 - 6.1 pH units
j.	Raw Water Iron	0.1 mg/L
k.	Raw Water Managanese	0.03 mg/L

3. Performance Criteria:

- | | | |
|----|------------------------------|--|
| a. | Effluent Radon Concentration | 200 pCi/L or less |
| b. | Effluent carbon dioxide | 7 mg/L of free carbon dioxide
(removal of 90% minimum). |
| d. | Effluent pH | 7.2 |
- e. Design of the air stripper piping shall be such that at normal operating conditions there is uniform air distribution to each perforation in the aerators.
- f. The aerators shall be suited for the intended service and shall not be subject to fouling or clogging.
- g. The aerators shall be type 040 or equivalent.
- h. Suitable provisions shall be made to prevent flotation of all internal equipment and piping inside the air stripper vessel.
- i. Headloss through the unit shall not exceed the capacity of the blowers to maintain treatment capacity and vent air to the outside.

E. System Control: (Refer to Division 13 for complete control details):

1. Blower operation will be governed by detection of flow by the raw water magnetic flow meter (FE-132, located within the pipe gallery). Air stripper sensors and controls will discontinue operation and send alarms to the main control panel (CP-1) to prevent operational conditions that may damage either the air stripper or the blower. Such conditions include constrictions of either outlet water piping or air outlet piping, blower inlet and discharge pressure conditions, and vessel water levels. Refer to Division 13 for complete control detail.
2. Sensors and Controls

11302A

11378-6
AERATION SYSTEMS

- i. The programmable logic controller (PLC-1 located in CP-1 shall be configured for control of air stripper, including switches, shutdown of blower, shutdown of well pump, output of alarm conditions as necessary, and starting/stopping blower in normal operation.
- ii. High inlet air pressure switch shuts down blower and sends an alarm if the air stripper piping pressure is greater than 60" WC.
- iii. Low blower pressure switch shuts down blower and sends alarm if the blower fails to start or operate normally.
- iv. High water level switch shuts down the blower and sends a signal to shut down the well pump if the water level in the air stripper exceeds the high level setpoint.

1.2 QUALITY ASSURANCE

- A. The manufacturer shall be experienced in the design, manufacture, installation, operation and maintenance of air strippers.
- B. The air stripper system including the vessel, distribution header, aerators, discharge assembly, blower, controls and appurtenances to form an integrated system, and as such shall be supplied by one supplier who shall provide all the equipment and appurtenances regardless of manufacturer, and who shall be responsible to the Contractor for satisfactory operation and performance of the entire system.
- C. System shall be furnished by the manufacturer complete with properly sized air blowers and other appurtenances as required to provide a fully operational multi-staged air stripper system.
- D. Acceptable Manufacturers:
 - a. The air stripper treatment unit shall be Model DB86 Multi-Staged Bubble Air Stripper as manufactured by Lowry Systems, Inc., Blue Hill, Maine.
 - b. Or approved equivalent.

1.3 SUBMITTALS

- A. Submit the following items and other items as specified in Section 11000 in Division 11 and Section 01340 in Division 1.
- B. Certified radon removal data at standard conditions from an independent certified testing laboratory or professional engineer, with at least 5-years experience in testing air stripper systems, and calculations demonstrating the capability of the aeration equipment proposed to meet the radon and carbon dioxide removal rates and power requirements specified.
- C. Air pipe sizing computations and system headloss calculations for the unit at air flow rates at least equal to 1400 SCFM.
- D. Complete plans and specifications for all the equipment and appurtenances to be furnished.
- E. Operation and maintenance manuals in accordance with Division 1.

1.4 DELIVERY, STORAGE & HANDLING

- A. All equipment shall be boxed, crated or otherwise protected during shipment, handling and storage in strict accordance with the manufacturer's written instructions.
- B. If damage does occur, immediately make all repairs and replacements necessary to the satisfaction of the Engineer at no costs to the Owner.

1.5 GUARANTEE

- A. The Contractor shall obtain a warranty from the manufacturer, in the name of the Owner, in accordance with Section 11000.
- B. Contractor shall obtain a performance warranty from the manufacturer in the name of the Owner. The performance warranty shall be in effect for a two year period from the date of Substantial Completion as defined in the General Conditions. The warranty shall guarantee compliance with the performance requirements stated in this specification. Should any part of the system fail to comply with the specified performance requirements within the specified two year period, the manufacturer shall make any and all necessary modifications to bring the system up to the specified performance level at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Air Stripper Vessel:
 - 1. The air stripper vessel shall be constructed of 10 GA 304 stainless steel sheet, with 304 angle and tubing. The vessel shall be insulated with closed cell foam and covered with brushed stainless steel sheets. Vessel construction shall be suitable for use for drinking water system components and shall meet ANSI/NSF Standard 61 certification for drinking water components.
 - 2. The vessel shall consist of vessel body with removable stainless steel lid(s), to provide access to the internals. The vessel lid(s) shall be completely removable from the vessel body and fastened to the vessel by means of stainless steel bolt/wing-nut assemblies located along the lid perimeters. The vessel lid(s) shall have a continuous gasket seal between lid and vessel.
 - 3. All hardware used in the construction of the air stripper vessel shall be stainless steel.
 - 4. The vessel walls and bottom shall be constructed such that condensation on the surfaces does not occur.
 - 5. Pipe penetrations to the vessel shall be fitted with flexible flanges (similar to Proco).
 - 6. The vessel shall be divided into aerated stages by properly designed dividers. Dividers shall be constructed of Type 304 stainless steel and polyethylene sheet,

11302A

11378-8
AERATION SYSTEMS

and shall be designed with sufficient area to allow proper water flow without short circuiting.

7. A graduated sight tube shall be provided to visually inspect water level in the last stage from the exterior end of the vessel.
8. Discharge from the vessel will be by an internal weir box with gravity flow to the clear well via a 10-inch ductile iron pipe.
9. The vessel shall be protected from overflow with a SS float with a range of 8 inches, giving a 4-20 mA signal, and will be installed in an external 3" PVC standpipe on the discharge end of the vessel.
10. The vessel shall have a 2" drain fitting (NPT). The drain must be capable of removing water to a depth of ~1".
11. The vessel shall have a sample tap at discharge weir.

B. Aerator Assemblies:

1. The system shall be capable of providing the specified removal performance of removal of radon and carbon dioxide gases as specified above at 600 gallons per minute.
2. Air delivery to the aerator assemblies shall be provided via internal ducting above each stage. Fittings and pipes shall be sized for proper headloss. Aerator assemblies shall be connected to air delivery ducting with quick disconnect fittings.
3. Aerators shall be fabricated of PVC in a manifold and lateral design. Aerators shall be configured to provide necessary headloss at the bubble orifice to ensure even and equal distribution of air to each stage.
4. All air and vent connections to the vessel shall be with expansion joints with a loose flange end for external connection and as specified in Section 15088.
5. Manufacturer to supply a spare aerator assembly to the Owner.

C. Air System/Blower:

1. The blower shall be centrifugal, single stage scroll blower,
2. Capable of providing a minimum air flow to provide an air to water ratio of 17:1 through the vessel and a pressure adequate to achieve treatment goals above.
3. Direct drive with impeller mounted directly on motor shaft.
4. Blower shall be Model 2020 SS manufactured by Spencer Turbine Company, Windsor, CT, or equal.

D. Blower Motor:

1. Mounted on common base with blower. The motor shall be able to start under the starting conditions required. Blower manufacturer shall be responsible for coordinating the starting torque requirement of the blower and the motor.
2. The brake horsepower requirement with the relief valve fully open shall not exceed the motor nameplate horsepower rating with service factor.
3. 3 phase, 60 hertz, 480 volt, motor.
4. Blower motor power requirement shall not exceed 30 horsepower.

11302A

11378-9
AERATION SYSTEMS

5. Motor shall be NEMA rated with Class F insulation.
6. Motor shall be UL listed and CSA certified.
7. Similar to Model EM4108T by Baldor Electric Company.
8. Motor shall be of nationally known manufacture and conform to NEMA standards and specifications. Motor shall follow the CEE (Consortium for Energy Efficiency) criteria for minimum efficiency as specified below:

Nominal Full Load Motor Efficiencies						
HP	Open Motors			Enclosed Motors		
	2-Pole	4-pole	6-Pole	2-Pole	4-pole	6-Pole
1	77.0*	85.5	82.5	77.0	85.5	82.5
1.5	84.0	86.5	86.5	84.0	86.5	87.5
2	85.5	86.5	87.5	85.5	86.5	88.5
3	85.5	89.5	88.5	86.5	89.5	89.5
5	86.5	89.5	89.5	88.5	89.5	89.5
7.5	88.5	91.0	90.2	89.5	91.7	91.0
10	89.5	91.7	91.7	90.2	91.7	91.0
15	90.2	93.0	91.7	91.0	92.4	91.7
20	91.0	93.0	92.4	91.0	93.0	91.7
25	91.7	93.6	93.0	91.7	93.6	93.0
30	91.7	94.1	93.6	91.7	93.6	93.0
40	92.4	94.1	94.1	92.4	94.1	94.1
50	93.0	94.5	94.1	93.0	94.5	94.1
60	93.6	95.0	94.5	93.6	95.0	94.5
75	93.6	95.0	94.5	93.6	95.4	94.5
100	93.6	95.4	95.0	94.1	95.4	95.0
125	94.1	95.4	95.0	95.0	95.4	95.0
150	94.1	95.8	95.4	95.0	95.8	95.8
200	95.0	95.8	95.4	95.4	96.2	95.8
250	95.0	95.8	95.4	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8
400	95.8	95.8	95.8	95.8	96.2	95.8
450	95.8	96.2	96.2	95.8	96.2	95.8
500	95.8	96.2	96.2	95.8	96.2	95.8

E. Inlet Vacuum Air Filter:

1. The blower shall be furnished with an indoor inline inlet vacuum air filter/silencer rated to handle the rated air flow.
2. Provide 10-inch spool piece as required to connect air filter and filter silencer.
3. The filter (10" flanged inlet and outlet) shall be located inside the building, with the 10" intake line (Sch 40 PVC) piped outdoors, through the wall via a ductile iron spool piece, ending in a 90 degree ductile iron elbow fitted with an insect screen.
4. The polyester filter element shall remove 99% of 5 micron particles from the incoming air, and shall be washable and replaceable.
5. SMI Model CSL 685-1000F

6. Manufactured by Solberg Manufacturing, Inc., of Itasca, Illinois

F. Filter Silencer:

1. Absorptive filter silencer consisting of concentric perforated cylinders lined with acoustical pack.
2. Primer coated exterior
3. Universal, Model SU5-8, or equal.

G. Blower Accessories:

1. Blower shall have an air pressure gage (range as required to cover the operating pressure range with standard pressure units) on the blower air discharge piping.
2. Flexible Connector -Each blower shall be isolated from the piping system by single arched flexible pipe couplings designed to minimize the transfer of mechanical vibration from the blower and minimize the radiation of high frequency noise.
3. Expansion joints shall be as specified in Section 15088.
4. Provide means of measuring differential pressure across the air filter using pressure taps on air inlet and outlet. Dwyer Minihelic differential gauge (or equivalent).

H. Piping (Refer to Section 15050):

1. All air piping shall be constructed of SCH 40 PVC (flanged connections) and Stainless Steel Type 304 (flanged and welded connections).
2. Air piping internal to the air stripper unit shall be PVC or stainless steel.
3. External vent piping from air stripper vessel to inside wall of the building shall be constructed of PVC. Pipe passing through the walls shall be ductile iron.
4. Air delivery piping shall be matched to air stripper headloss, and aerator headloss to provide even distribution of air throughout unit.
5. The Contractor shall furnish and install insulation, as specified in Section 15180, on the air intake line.

Pipe Description	Pipe Size	Pipe Material	Notes
Water Inlet to Vessel	8-in	Ductile Iron	Contractor furnishes
Water Outlet from vessel	8-in tee	Ductile Iron	Contractor furnishes (blind flanged tee tapped for air inlet).
Outdoor Air Intake to Blower	10-in	Sch 40 PVC, Insulated	Contractor furnishes PVC and Ductile Iron Sleeve through wall w/ 90 deg bend, screened outlet.
Blower Air Discharge to Vessel	10-in	Sch 10 SS Type 304	Contractor furnishes
Air Vent from Vessel	10-in	Sch 40 PVC	Contractor furnishes PVC and Ductile Iron Sleeve through wall w/ 90 deg bend, screened outlet.

- I. Controls and Accessories:
 - a. Aeration system controls are described in Division 13.
- J. Thermometers:
 - 1. 2½-inch dial, 40 to 160 degrees F. intake range; and 20 to 250 degrees F discharge range.
 - 2. Sensors to have 12-inch bendable extension with union connection with 20 feet of line and shall be mounted on the intake and discharge of each blower.
 - 3. Thermometer shall be as manufactured by Ashcroft or equal.
- K. Pressure Gauges:
 - 1. 2½-inch dial, 0 to 15-inch water column vacuum intake range, and 0 to 15 psig discharge range, with snubbers.
 - 2. Suction and discharge pressure gauges shall be supplied for each blower. The pressure gauges shall meet the specific applicable requirements of the Section 11000.
 - 3. Pressure gauges shall be as manufactured by Ashcroft, or equal.
- L. Pressure relief valves:
 - 1. Each blower shall be supplied with a single spring loaded pressure relief valve on the discharge side of the blower, mounted before the check valve.
 - 2. The valves shall be designed to relieve 100 percent of the maximum air volume of the blower.
 - 3. The relief valves shall be set in the factory to open at 10% higher than the normal operating pressure with an opening accuracy of between two inches of water column pressure at any set pressure.
 - 4. The valves shall have a bottom inlet and a side discharge with either threaded or ANSI 125-pound flange connections. Dielectric gaskets shall be provided at all bolts and flanged connections of dissimilar metals.
 - 5. Valve shall have a cast aluminum body with brass internals.
 - 6. Valves shall be rated for a minimum 225 deg. F working temperature and suitable for air service.

PART 3 - EXECUTION

3.1 INSTALLATION AND STARTUP

- A. The air stripper shall be installed, cleaned and tested for air tightness in strict accordance with the manufacturer's written instructions.
- B. All piping shall be straight and true as shown on the Drawings.
- C. The Contractor shall pressure test all the air piping to insure an air-tight system. All joints and connections shall be soap tested.
- D. The interior of the vessel shall be disinfected after cleaning and testing of the aeration system. The vessel and interior aeration piping and aeration trays or diffusers shall be

11302A

11378-12

AERATION SYSTEMS

scrubbed with 1% sodium hypochlorite solution (bleach diluted 4:1 with drinking water) and rinsed with drinking water. If the subsequent adjustments allow contamination of the interior of the vessel, the disinfection procedure shall be repeated after system adjustment and prior to operator training.

- E. The Contractor shall furnish the service of a factory representative to advise him during installation, to inspect and adjust the final installation and to instruct the Owner's personnel in the operation and maintenance of the equipment at a time acceptable to the Owner. A minimum of 3 days shall be spent in instructing the Owner's personnel.
- F. The unit shall not be started until the Engineer receives the manufacturer's certification that the complete system was installed, tested and adjusted in accordance with the manufacturer's written instructions and that the system is ready for operation.
- G. All necessary measures shall be taken to ensure that the aeration system is not damaged. Once the system is ready for operation, the Contractor shall be responsible for startup, certification and training in accordance with Specification Section 01800.

3.2 PERFORMANCE TESTS

- A. Once the equipment startup is complete, the Contractor will be required to demonstrate that the system will operate as specified. This will include but not be limited to demonstrating uniform air distribution over the range of air flows specified and the ability of the pressure monitoring system to measure the pressure in the air distribution system.
- B. Samples of well water prior to air stripping and after air stripping shall be collected when the system is operating within the specified design criteria. The samples shall be analyzed for radon and carbon dioxide (or pH) to determine that the unit is performing within the criteria outlined in part 1.1.D. Should any portion of the system fail to meet the requirements specified then the manufacturer shall make any and all necessary modifications such that the system does meet the requirements of this specification at no additional cost to the Owner.
- C. The Contractor shall also provide a manufacturer's representative to inspect the installation a minimum of one time; one year from the date of substantial completion. During the inspection, the representative will be required to verify compliance with the specified performance. Should any portion of the system fail to meet the requirements specified then the manufacturer shall make any and all necessary modifications such that the system does meet the requirements of this specification at no additional cost to the Owner. The Contractor shall provide a representative to accompany the manufacturer's representative for the inspection one-year after the date of substantial completion.

END OF SECTION