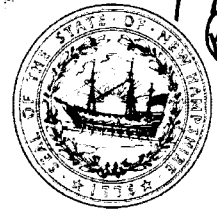




The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Thomas S. Burack, Commissioner



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Burack

May 23, 2016

Her Excellency, Governor Margaret Wood Hassan
 and the Honorable Council
 State House
 Concord, New Hampshire 03301

REQUESTED ACTION

Authorize the Department of Environmental Services (DES) to enter into a contract with Advanced Radon Mitigation; Inc. (VC #272954) of Hooksett, New Hampshire, in the amount of \$1,210,000 to provide treated water for residences and communities served by contaminated drinking water wells, effective as of July 1, 2016 through June 30, 2020, with the option to renew for one additional year, upon Governor and Council approval. 7% Oil Pollution Control Fund, 43% Hazardous Waste Cleanup Fund, 30% Ethers Fund, and 20% MtBE Settlement Fund.

Funding is available in the accounts as follows with the authority to adjust encumbrances in each of the State fiscal years through the Budget Office if needed and justified. Funding for FY 2018-2020 is contingent upon the availability and continued appropriation of funds.

Fund Name and Account Number 03-44-44	FY 2017	FY 2018	FY 2019	FY 2020	Totals
Oil Pollution Control Fund 444010-1400-102-500731	\$20,000	\$20,000	\$20,000	\$20,000	\$80,000
Gasoline Remed. & Elim. Ethers 444010-1419-102-500731	\$92,500	\$92,500	\$92,500	\$92,500	\$370,000
Hazardous Waste Cleanup Fund 444010-5392-102-500731	\$130,000	\$130,000	\$130,000	\$130,000	\$520,000
MtBE Settlement Fund 444010-8893-102-500731	\$60,000	\$60,000	\$60,000	\$60,000	\$240,000
	\$302,500	\$302,500	\$302,500	\$302,500	\$1,210,000

EXPLANATION

RSA 146-A, RSA 146-D and RSA 485-A authorizes DES to remediate properties impacted by oil and hazardous waste contamination, a component of which consists of providing safe drinking

water to residents affected by such contamination. Since 1990, DES has fulfilled this remedial element by funding the installation of contaminant-specific point-of-entry (POE) and point-of-use (POU) water treatment systems. These systems are installed in communities located throughout the state at properties that are typically privately owned. The contract approval requested herein is to provide services to maintain existing POE systems installed under previous contracts, and to provide new POE systems where needed. These POE systems are critical to reducing or eliminating public health risks for well owners affected by oil and hazardous waste contamination. This contract covers the operation and maintenance of existing POE treatment systems at 60 locations, with the oldest in operation since 1997. The number of contaminated properties that will require replacement of an existing POE or installation of a new POE and/or POU at a newly impacted well is estimated at 20 per year for a total of 80 new installations. Additional POEs will likely be required to address the emerging discovery of perfluorooctanoic acid (PFOA) and perfluorinated compound (PFC) impacted wells.

DES solicited prequalification statements by sending Invitations for Prequalification on October 28, 2015 to interested companies. A total of ten companies received the Prequalification Form, and five companies submitted the completed forms to DES. The following five companies were evaluated and scored by DES to prequalify as potential bidders for this contract.

Names	Location	Total Scores	Pre-Qualified
Absolute Water System	Windham	264	No
Advanced Radon Mitigation	Hooksett	705	Yes
Capital Well Company	Dunbarton	749	Yes
Epping Well & Pump Co.	Epping	756	Yes
Secondwind Water Systems	Manchester	787	Yes

On March 9, 2016, in accordance with the State's standard contract procurement process, DES solicited sealed bids from the four prequalified bidders by supplying contract documents for the Design, Installation, and Maintenance of Point of Entry Treatment Systems. A pre-bid conference was subsequently held by DES on March 21, 2016 to answer questions from the four prequalified bidders. Following the conference and addressing questions, three addenda were issued to update or clarify the contract documents.

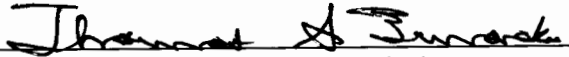
The bid opening was held on April 5, 2016. Three responsive bids were received and the results are shown below.

Bidders	Total Bid \$	Bid Rank
Advanced Radon Mitigation	\$992,614.00	#1
Capital Well Company	\$1,746,300.00	#2
Secondwind Water Systems	\$1,807,070.00	#3

Each bidder submitted a bid schedule that provided unit pricing for each bid item and a bid item total based on a reference estimated quantity for each bid item and a total bid price based on that total. Contractor bid item unit prices varied greatly and this bid structure allowed DES to evaluate bids to determine which bidder provided the greatest benefit to DES. The lowest responsive bidder was selected for contract award. The lowest reference bid was \$992,614. The final contract award amount was \$1,210,000 which includes an additional \$217,386 for the installation of POE systems to address the emerging PFOA and PFC impacts to drinking water supply wells.

The lowest responsive bidder is Advanced Radon Mitigation; Inc. and a Notice of Award was issued by DES on April 14, 2016. This contract has been approved by the Department of Justice as to form, content, and execution.

We respectfully request your approval.


Thomas S. Burack, Commissioner

Attachments

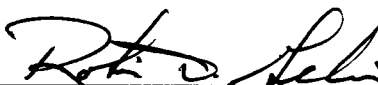
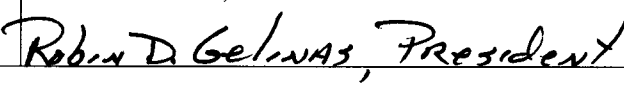

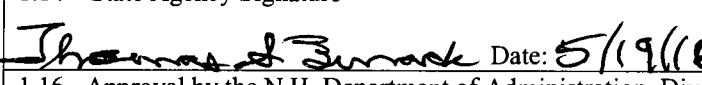
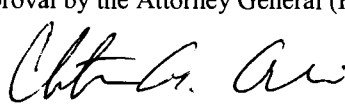
Notice: This agreement and all of its attachments shall become public upon submission to Governor and Executive Council for approval. Any information that is private, confidential or proprietary must be clearly identified to the agency and agreed to in writing prior to signing the contract.

AGREEMENT

The State of New Hampshire and the Contractor hereby mutually agree as follows:

GENERAL PROVISIONS

1. IDENTIFICATION.

1.1 State Agency Name Department of Environmental Services		1.2 State Agency Address 29 Hazen Drive, P.O. Box 95, Concord, NH 03302	
1.3 Contractor Name Advanced Radon Mitigation Inc.		1.4 Contractor Address 180 Londonderry Turnpike, Unit #, Hooksett, NH 03106	
1.5 Contractor Phone Number 603-644-1207	1.6 Account Number 03-44-44-444010-1400, 1419, 5392, 8893 -102-500731	1.7 Completion Date June 30, 2020	1.8 Price Limitation \$1,210,000.00
1.9 Contracting Officer for State Agency Steven A. Croce, P.E.		1.10 State Agency Telephone Number 603-271-2229	
1.11 Contractor Signature 		1.12 Name and Title of Contractor Signatory Robin D. Gelinias, President 	
1.13 Acknowledgement: State of _____, County of _____ * On <u>05/02/2016</u> , before the undersigned officer, personally appeared the person identified in block 1.12, or satisfactorily proven to be the person whose name is signed in block 1.11, and acknowledged that s/he executed this document in the capacity indicated in block 1.12.			
1.13.1 Signature of Notary Public or Justice of the Peace  [Seal]		BRENDA C. HOOD Notary Public - New Hampshire My Commission Expires February 28, 2019	
1.13.2 Name and Title of Notary or Justice of the Peace Brenda C. Hood, Notary Public			
1.14 State Agency Signature  Date: <u>5/19/16</u>		1.15 Name and Title of State Agency Signatory Thomas S. Burack, Commissioner	
1.16 Approval by the N.H. Department of Administration, Division of Personnel (if applicable) By: _____ Director, On: _____			
1.17 Approval by the Attorney General (Form, Substance and Execution) (if applicable) By:  On: <u>5/27/16</u>			
1.18 Approval by the Governor and Executive Council (if applicable) By: _____ On: _____			

2. EMPLOYMENT OF CONTRACTOR/SERVICES TO BE PERFORMED. The State of New Hampshire, acting through the agency identified in block 1.1 ("State"), engages contractor identified in block 1.3 ("Contractor") to perform, and the Contractor shall perform, the work or sale of goods, or both, identified and more particularly described in the attached EXHIBIT A which is incorporated herein by reference ("Services").

3. EFFECTIVE DATE/COMPLETION OF SERVICES.
3.1 Notwithstanding any provision of this Agreement to the contrary, and subject to the approval of the Governor and Executive Council of the State of New Hampshire, if applicable, this Agreement, and all obligations of the parties hereunder, shall become effective on the date the Governor and Executive Council approve this Agreement as indicated in block 1.18, unless no such approval is required, in which case the Agreement shall become effective on the date the Agreement is signed by the State Agency as shown in block 1.14 ("Effective Date").
3.2 If the Contractor commences the Services prior to the Effective Date, all Services performed by the Contractor prior to the Effective Date shall be performed at the sole risk of the Contractor, and in the event that this Agreement does not become effective, the State shall have no liability to the Contractor, including without limitation, any obligation to pay the Contractor for any costs incurred or Services performed. Contractor must complete all Services by the Completion Date specified in block 1.7.

4. CONDITIONAL NATURE OF AGREEMENT. Notwithstanding any provision of this Agreement to the contrary, all obligations of the State hereunder, including, without limitation, the continuance of payments hereunder, are contingent upon the availability and continued appropriation of funds, and in no event shall the State be liable for any payments hereunder in excess of such available appropriated funds. In the event of a reduction or termination of appropriated funds, the State shall have the right to withhold payment until such funds become available, if ever, and shall have the right to terminate this Agreement immediately upon giving the Contractor notice of such termination. The State shall not be required to transfer funds from any other account to the Account identified in block 1.6 in the event funds in that Account are reduced or unavailable.

5. CONTRACT PRICE/PRICE LIMITATION/PAYMENT.
5.1 The contract price, method of payment, and terms of payment are identified and more particularly described in EXHIBIT B which is incorporated herein by reference.
5.2 The payment by the State of the contract price shall be the only and the complete reimbursement to the Contractor for all expenses, of whatever nature incurred by the Contractor in the performance hereof, and shall be the only and the complete compensation to the Contractor for the Services. The State shall have no liability to the Contractor other than the contract price.

5.3 The State reserves the right to offset from any amounts otherwise payable to the Contractor under this Agreement those liquidated amounts required or permitted by N.H. RSA 80:7 through RSA 80:7-c or any other provision of law.
5.4 Notwithstanding any provision in this Agreement to the contrary, and notwithstanding unexpected circumstances, in no event shall the total of all payments authorized, or actually made hereunder, exceed the Price Limitation set forth in block 1.8.

6. COMPLIANCE BY CONTRACTOR WITH LAWS AND REGULATIONS/ EQUAL EMPLOYMENT OPPORTUNITY.
6.1 In connection with the performance of the Services, the Contractor shall comply with all statutes, laws, regulations, and orders of federal, state, county or municipal authorities which impose any obligation or duty upon the Contractor, including, but not limited to, civil rights and equal opportunity laws. This may include the requirement to utilize auxiliary aids and services to ensure that persons with communication disabilities, including vision, hearing and speech, can communicate with, receive information from, and convey information to the Contractor. In addition, the Contractor shall comply with all applicable copyright laws.
6.2 During the term of this Agreement, the Contractor shall not discriminate against employees or applicants for employment because of race, color, religion, creed, age, sex, handicap, sexual orientation, or national origin and will take affirmative action to prevent such discrimination.
6.3 If this Agreement is funded in any part by monies of the United States, the Contractor shall comply with all the provisions of Executive Order No. 11246 ("Equal Employment Opportunity"), as supplemented by the regulations of the United States Department of Labor (41 C.F.R. Part 60), and with any rules, regulations and guidelines as the State of New Hampshire or the United States issue to implement these regulations. The Contractor further agrees to permit the State or United States access to any of the Contractor's books, records and accounts for the purpose of ascertaining compliance with all rules, regulations and orders, and the covenants, terms and conditions of this Agreement.

7. PERSONNEL.
7.1 The Contractor shall at its own expense provide all personnel necessary to perform the Services. The Contractor warrants that all personnel engaged in the Services shall be qualified to perform the Services, and shall be properly licensed and otherwise authorized to do so under all applicable laws.
7.2 Unless otherwise authorized in writing, during the term of this Agreement, and for a period of six (6) months after the Completion Date in block 1.7, the Contractor shall not hire, and shall not permit any subcontractor or other person, firm or corporation with whom it is engaged in a combined effort to perform the Services to hire, any person who is a State employee or official, who is materially involved in the procurement, administration or performance of this

Contractor Initials *RS*
Date *05/02/2016*

Agreement. This provision shall survive termination of this Agreement.

7.3 The Contracting Officer specified in block 1.9, or his or her successor, shall be the State's representative. In the event of any dispute concerning the interpretation of this Agreement, the Contracting Officer's decision shall be final for the State.

8. EVENT OF DEFAULT/REMEDIES.

8.1 Any one or more of the following acts or omissions of the Contractor shall constitute an event of default hereunder ("Event of Default"):

8.1.1 failure to perform the Services satisfactorily or on schedule;

8.1.2 failure to submit any report required hereunder; and/or

8.1.3 failure to perform any other covenant, term or condition of this Agreement.

8.2 Upon the occurrence of any Event of Default, the State may take any one, or more, or all, of the following actions:

8.2.1 give the Contractor a written notice specifying the Event of Default and requiring it to be remedied within, in the absence of a greater or lesser specification of time, thirty (30) days from the date of the notice; and if the Event of Default is not timely remedied, terminate this Agreement, effective two (2) days after giving the Contractor notice of termination;

8.2.2 give the Contractor a written notice specifying the Event of Default and suspending all payments to be made under this Agreement and ordering that the portion of the contract price which would otherwise accrue to the Contractor during the period from the date of such notice until such time as the State determines that the Contractor has cured the Event of Default shall never be paid to the Contractor;

8.2.3 set off against any other obligations the State may owe to the Contractor any damages the State suffers by reason of any Event of Default; and/or

8.2.4 treat the Agreement as breached and pursue any of its remedies at law or in equity, or both.

9. DATA/ACCESS/CONFIDENTIALITY/PRESERVATION.

9.1 As used in this Agreement, the word "data" shall mean all information and things developed or obtained during the performance of, or acquired or developed by reason of, this Agreement, including, but not limited to, all studies, reports, files, formulae, surveys, maps, charts, sound recordings, video recordings, pictorial reproductions, drawings, analyses, graphic representations, computer programs, computer printouts, notes, letters, memoranda, papers, and documents, all whether finished or unfinished.

9.2 All data and any property which has been received from the State or purchased with funds provided for that purpose under this Agreement, shall be the property of the State, and shall be returned to the State upon demand or upon termination of this Agreement for any reason.

9.3 Confidentiality of data shall be governed by N.H. RSA chapter 91-A or other existing law. Disclosure of data requires prior written approval of the State.

10. TERMINATION. In the event of an early termination of this Agreement for any reason other than the completion of the Services, the Contractor shall deliver to the Contracting Officer, not later than fifteen (15) days after the date of termination, a report ("Termination Report") describing in detail all Services performed, and the contract price earned, to and including the date of termination. The form, subject matter, content, and number of copies of the Termination Report shall be identical to those of any Final Report described in the attached EXHIBIT A.

11. CONTRACTOR'S RELATION TO THE STATE. In the performance of this Agreement the Contractor is in all respects an independent contractor, and is neither an agent nor an employee of the State. Neither the Contractor nor any of its officers, employees, agents or members shall have authority to bind the State or receive any benefits, workers' compensation or other emoluments provided by the State to its employees.

12. ASSIGNMENT/DELEGATION/SUBCONTRACTS. The Contractor shall not assign, or otherwise transfer any interest in this Agreement without the prior written notice and consent of the State. None of the Services shall be subcontracted by the Contractor without the prior written notice and consent of the State.

13. INDEMNIFICATION. The Contractor shall defend, indemnify and hold harmless the State, its officers and employees, from and against any and all losses suffered by the State, its officers and employees, and any and all claims, liabilities or penalties asserted against the State, its officers and employees, by or on behalf of any person, on account of, based or resulting from, arising out of (or which may be claimed to arise out of) the acts or omissions of the Contractor. Notwithstanding the foregoing, nothing herein contained shall be deemed to constitute a waiver of the sovereign immunity of the State, which immunity is hereby reserved to the State. This covenant in paragraph 13 shall survive the termination of this Agreement.

14. INSURANCE.

14.1 The Contractor shall, at its sole expense, obtain and maintain in force, and shall require any subcontractor or assignee to obtain and maintain in force, the following insurance:

14.1.1 comprehensive general liability insurance against all claims of bodily injury, death or property damage, in amounts of not less than \$1,000,000 per occurrence and \$2,000,000 aggregate; and

14.1.2 special cause of loss coverage form covering all property subject to subparagraph 9.2 herein, in an amount not less than 80% of the whole replacement value of the property.

14.2 The policies described in subparagraph 14.1 herein shall be on policy forms and endorsements approved for use in the State of New Hampshire by the N.H. Department of Insurance, and issued by insurers licensed in the State of New Hampshire.

14.3 The Contractor shall furnish to the Contracting Officer identified in block 1.9, or his or her successor, a certificate(s) of insurance for all insurance required under this Agreement. Contractor shall also furnish to the Contracting Officer identified in block 1.9, or his or her successor, certificate(s) of insurance for all renewal(s) of insurance required under this Agreement no later than thirty (30) days prior to the expiration date of each of the insurance policies. The certificate(s) of insurance and any renewals thereof shall be attached and are incorporated herein by reference. Each certificate(s) of insurance shall contain a clause requiring the insurer to provide the Contracting Officer identified in block 1.9, or his or her successor, no less than thirty (30) days prior written notice of cancellation or modification of the policy.

15. WORKERS' COMPENSATION.

15.1 By signing this agreement, the Contractor agrees, certifies and warrants that the Contractor is in compliance with or exempt from, the requirements of N.H. RSA chapter 281-A (*"Workers' Compensation"*).

15.2 To the extent the Contractor is subject to the requirements of N.H. RSA chapter 281-A, Contractor shall maintain, and require any subcontractor or assignee to secure and maintain, payment of Workers' Compensation in connection with activities which the person proposes to undertake pursuant to this Agreement. Contractor shall furnish the Contracting Officer identified in block 1.9, or his or her successor, proof of Workers' Compensation in the manner described in N.H. RSA chapter 281-A and any applicable renewal(s) thereof, which shall be attached and are incorporated herein by reference. The State shall not be responsible for payment of any Workers' Compensation premiums or for any other claim or benefit for Contractor, or any subcontractor or employee of Contractor, which might arise under applicable State of New Hampshire Workers' Compensation laws in connection with the performance of the Services under this Agreement.

16. WAIVER OF BREACH. No failure by the State to enforce any provisions hereof after any Event of Default shall be deemed a waiver of its rights with regard to that Event of Default, or any subsequent Event of Default. No express failure to enforce any Event of Default shall be deemed a waiver of the right of the State to enforce each and all of the provisions hereof upon any further or other Event of Default on the part of the Contractor.

17. NOTICE. Any notice by a party hereto to the other party shall be deemed to have been duly delivered or given at the time of mailing by certified mail, postage prepaid, in a United States Post Office addressed to the parties at the addresses given in blocks 1.2 and 1.4, herein.

18. AMENDMENT. This Agreement may be amended, waived or discharged only by an instrument in writing signed by the parties hereto and only after approval of such amendment, waiver or discharge by the Governor and Executive Council of the State of New Hampshire unless no

such approval is required under the circumstances pursuant to State law, rule or policy.

19. CONSTRUCTION OF AGREEMENT AND TERMS.

This Agreement shall be construed in accordance with the laws of the State of New Hampshire, and is binding upon and inures to the benefit of the parties and their respective successors and assigns. The wording used in this Agreement is the wording chosen by the parties to express their mutual intent, and no rule of construction shall be applied against or in favor of any party.

20. THIRD PARTIES. The parties hereto do not intend to benefit any third parties and this Agreement shall not be construed to confer any such benefit.

21. HEADINGS. The headings throughout the Agreement are for reference purposes only, and the words contained therein shall in no way be held to explain, modify, amplify or aid in the interpretation, construction or meaning of the provisions of this Agreement.

22. SPECIAL PROVISIONS. Additional provisions set forth in the attached EXHIBIT C are incorporated herein by reference.

23. SEVERABILITY. In the event any of the provisions of this Agreement are held by a court of competent jurisdiction to be contrary to any state or federal law, the remaining provisions of this Agreement will remain in full force and effect.

24. ENTIRE AGREEMENT. This Agreement, which may be executed in a number of counterparts, each of which shall be deemed an original, constitutes the entire Agreement and understanding between the parties, and supersedes all prior Agreements and understandings relating hereto.

EXHIBIT A

STATEMENT OF SERVICES

State of New Hampshire

NHDES Contract: Design, Installation, and Maintenance of Point of Entry Treatment Systems

The major items of work involved in this contract for the design, installation and maintenance of point of entry (POE) drinking water treatment systems, located at various locations throughout the state of New Hampshire, shall include the following primary assignments:

- a. Maintenance of approximately 80 existing treatment systems.
- b. Installation and maintenance of approximately 80 treatment systems over a four year period.
- c. Installation and maintenance of approximately 160 carbon contactors of various sizes ranging from two cubic feet to four cubic feet in capacity.
- d. Collection and analysis of approximately 1,500 water samples from operating treatment systems throughout the state.
- e. Remove, replace and dispose of approximately 1,600 cubic feet of granular activated carbon.
- f. Provide the services of a certified plumber for the repair and replacement of damaged water fixtures and leaks caused by DES employees during sampling and investigations activities.

All work shall be performed in accordance with the DES bid document titled: "DESIGN, INSTALLATION AND MAINTENANCE OF POINT OF ENTRY TREATMENT SYSTEM EQUIPMENT - Technical Specifications", incorporated herein by reference.

The State shall assign work to the Contractor on an assignment basis, similar to a Job Order methodology for contract services, and compensate the Contractor for the services completed based on the bid prices accepted by DES.

The State makes no guarantee of a minimum or maximum amount of work and assignments to be issued to the Contractor during any Fiscal year in the contract period.

RL
5/11/16

EXHIBIT B

CONTRACT PRICE AND PAYMENT PROCESS

State of New Hampshire

NHDES Contract: Design, Installation, and Maintenance of Point of Entry Treatment Systems

The Contract Price is \$1,210,000 covering a four year period with \$302,500 encumbered each of the four years for this DES contract.

Item 1. DES agrees to pay Advanced Radon Mitigation Inc. (ARM) for the POE services and plumbing repairs as specified in the ARM Bid Schedule, dated April 4, 2016, attached as Exhibit B-1.

Item 2. DES shall pay for all work in accordance with the DES bid document titled: "DESIGN, INSTALLATION AND MAINTENANCE OF POINT OF ENTRY TREATMENT SYSTEM EQUIPMENT - Technical Specifications, Section 01150 MEASUREMENT AND PAYMENT", incorporated herein by reference.

Item 3. The total amount of payments to ARM authorized by DES shall not exceed the annual amounts set forth in this contract unless the terms of this contract are revised or a contract amendment has been approved by Governor and Executive Council to exceed the original contract award amount stated above.

Submission of Invoices by Advanced Radon Mitigation (ARM):

A. Invoices shall be submitted for each installation, repair and maintenance assignment and shall contain at a minimum the following standard information:

1. Vendor name and vendor code.
2. Invoice date and invoice number.
3. Residence/Community name and Site number (originated by DES).
4. Period of work being invoiced (start and end dates).
5. Work scope and price based on bid amounts approved by DES.
6. Item numbered tasks/activities performed at bid prices.
7. A brief explanation of the tasks performed/completed during the billing period.
8. Copies of invoices and bills from all subcontractor services.

RM
5/11/14

EXHIBIT B

CONTRACT PRICE AND PAYMENT PROCESS

(Continued)

Payments to Advanced Radon Mitigation (ARM):

- A. Invoices will be reviewed for completeness and compliance with the contract and the assignment by the DES-POE coordinator and may be returned to ARM if incomplete or in error. An invoice approval cover sheet will be completed by the DES Contract Manager. Once appropriate signatures have been obtained, the cover sheet and invoice will be forwarded to the DES Accounting Office for processing and payment.

- B. DES will pay ARM the approved invoice amount for each assignment within 45 days of the Contract Manager's approval. Full payment of the approved amount shall be paid. However, DES reserves the right to make partial or incremental payments of an approved invoice if encumbered state funds become unavailable.

- C. DES may make partial payment where invoiced costs are not in accordance with the contract bid prices, terms and conditions, or where the approved assignment budget/quote has been exceeded without DES's written approval. The DES Contract Manager shall e-mail short-pay information and may send copies of marked up invoices, as needed, to ARM for resolution or re-submission to DES.

RM
5/11/14

BID SCHEDULE

The Bidder agrees to perform all the work described in the Contract Documents for the following unit and lump sum prices:

ITEM NO.	DESCRIPTION OF ITEM W/ UNIT BID STATEMENTS	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ITEM TOTAL
1	Site Evaluations* <u>Three Hundred Dollars</u> Per Site	Each	\$ <u>300</u> ⁻	80	\$ <u>24,000</u> ⁻ ✓
2	Site Installations <u>One Hundred Fifty Dollars</u> Per Site	Each	\$ <u>150</u> ⁻	80	\$ <u>12,000</u> ⁻ ✓
3	Furnish/Install Backwashing Filters <u>Six Hundred Fifty Dollars</u> Per Unit	Each	\$ <u>650</u> ⁻	20	\$ <u>13,000</u> ⁻ ✓
4A	Furnish/Install Water Softener (0 - 3 mg/L iron) <u>Eight Hundred Dollars</u> Per Unit	Each	\$ <u>800</u> ⁻	20	\$ <u>16,000</u> ⁻ ✓
4B	Furnish/Install Water Softener (3 to 10 mg/L iron) <u>Nine Hundred Fifty Dollars</u> Per Unit	Each	\$ <u>950</u> ⁻	10	\$ <u>9,500</u> ⁻ ✓
5	Furnish/Install Residential Aerator <u>Three Thousand Two Hundred Dollars</u> Per Unit	Each	\$ <u>3,200</u> ⁻	40	\$ <u>128,000</u> ⁻ ✓
6	Furnish/Install Air Injection Unit <u>Seven Hundred Fifty Dollars</u> Per Unit	Each	\$ <u>750</u> ⁻	15	\$ <u>11,250</u> ⁻ ✓
7A	Furnish/Install Granular Activated Carbon Unit (2 cu ft) <u>Seven Hundred Dollars</u> Per Unit	Each	\$ <u>700</u> ⁻	110	\$ <u>77,000</u> ⁻ ✓

290,750.

BID SCHEDULE (continued)

ITEM NO.	DESCRIPTION OF ITEM W/ UNIT BID STATEMENTS	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ITEM TOTAL
7B	Furnish/Install Granular Activated Carbon Unit (3 cu ft) <u>Seven Hundred Fifty Dollars</u> Per Unit	Each	\$ <u>750⁰⁰</u>	40	\$ <u>30,000</u> ✓
7C	Furnish/Install Granular Activated Carbon Unit (4 cu ft) <u>One Thousand Two Hundred Forty Nine Dollars</u> Per Unit	Each	\$ <u>1,249</u>	10	\$ <u>12,490</u> ✓
8	Furnish/Install Ultraviolet Sterilizer <u>Four Hundred Fifty Two Dollars</u> Per Unit	Each	\$ <u>452</u>	12	\$ <u>5,424</u> ✓
9	Furnish/ Install Water Meter <u>One Hundred Fifty Dollars</u> Per Unit	Each	\$ <u>150</u>	100	\$ <u>15,000</u> ✓
10	POE Maintenance Coordination and Site Visits <u>One Hundred Fifteen Dollars</u> Per Site Visit	Each	\$ <u>115</u>	600	\$ <u>69,000</u> ✓
11	Service and Replace Air Stripper Pump <u>Six Hundred Fifty Dollars</u> Per Unit	Each	\$ <u>650</u>	15	\$ <u>9,750</u> ✓
12	Service and Re-Bed Activated Carbon (AC), and Dispose of used AC <u>Two Hundred Five Dollars</u> Per Unit	Cu. Ft.	\$ <u>205</u>	1600	\$ <u>328,000</u> ✓
13	Service, Remove, and Dispose of Used AC, no AC Re-Bed <u>One Hundred Dollars</u> Per Unit	Cu. Ft.	\$ <u>100</u>	130	\$ <u>13,000</u> ✓

482,664.

BID SCHEDULE (continued)

	DESCRIPTION OF ITEM W/ UNIT BID STATEMENTS	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ITEM TOTAL	
14	Service and Bed AC in contactors <u>One Hundred Fifty Dollars</u> Per Unit	Cu. Ft.	\$ <u>150</u> ⁻	50	\$ <u>7,500</u> ⁻	✓
15	Service and Replace Lamp in Ultraviolet Sterilizer <u>One Hundred Dollars</u> Per Unit	Each	\$ <u>100</u> ⁻	12	\$ <u>1,200</u> ⁻	✓
16A	Furnish/Install 2 X 10, 5.0 micron Cartridge Filter <u>One Hundred Dollars</u> Per Filter	Each	\$ <u>100</u> ⁻	15	\$ <u>1,500</u> ⁻	✓
16B	Furnish/Install 4 X 10, 5.0 micron Cartridge Filter <u>Two Hundred Dollars</u> Per Filter	Each	\$ <u>200</u> ⁻	50	\$ <u>10,000</u> ⁻	✓
16C	Furnish/Install 4 X 20, 5.0 micron Cartridge Filter <u>One Hundred Eighty Dollars</u> Per Filter	Each	\$ <u>180</u> ⁻	15	\$ <u>2,700</u> ⁻	✓
16D	Furnish/Service Cartridge Filters, regardless of size <u>Fifty Dollars</u> Per Filter	Each	\$ <u>50</u> ⁻	400	\$ <u>20,000</u> ⁻	✓
17A	Provide 2 X 10, 5.0 micron Cartridge Filter Replacement <u>Five Dollars</u> Per Filter	Each	\$ <u>5</u> ⁻	80	\$ <u>400</u> ⁻	✓
17B	Provide 4 X 10, 5.0 micron Cartridge Filter Replacement <u>Fourteen Dollars</u> Per Filter	Each	\$ <u>14</u> ⁻	240	\$ <u>3,360</u> ⁻	✓
17C	Provide 4 X 20, 5.0 micron Cartridge Filter Replacement <u>Twenty Six Dollars</u> Per Filter	Each	\$ <u>26</u> ⁻	80	\$ <u>2,080</u> ⁻	✓

BID SCHEDULE (continued)

ITEM NO.	DESCRIPTION OF ITEM W/ UNIT BID STATEMENTS	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ITEM TOTAL
18A	Service/Maintain AC Contactor, no Re-Bed <u>Twenty Six Dollars</u> Per Unit	Each	\$ <u>26</u>	60	\$ <u>1,560</u> ✓
18B	Service/Maintain Air Injection Unit <u>Seventy Five Dollars</u> Per Unit	Each	\$ <u>75</u>	20	\$ <u>1,500</u> ✓
18C	Service/Maintain Backwashing Filter <u>Twenty Five Dollars</u> Per Unit	Each	\$ <u>25</u>	40	\$ <u>1,000</u> ✓
18D	Service/Maintain Residential Aerator <u>One Hundred Twenty Dollars</u> Per Unit	Each	\$ <u>120</u>	120	\$ <u>14,400</u> ✓
18E	Service/Maintain Calcite Neutralizer <u>Seventy Five Dollars</u> Per Unit	Each	\$ <u>75</u>	30	\$ <u>2,250</u> ✓
18F	Service/Maintain Water Softener + Brine Tank <u>Seventy Five Dollars</u> Per Unit	Each	\$ <u>75</u>	80	\$ <u>6,000</u> ✓
19A	Water Sampling, Collect 1-3 water samples for testing* <u>One Hundred Dollars</u> Per Site	Each	\$ <u>100</u>	50	\$ <u>5,000</u> ✓
19B	Water Sampling, Collect 1-3 water samples for testing during POE Maintenance* <u>Fifty Dollars</u> Per Site	Each	\$ <u>50</u>	500	\$ <u>25,000</u> ✓
20	Remove, Clean, sanitize POE Components; Plumb water supply to original configuration <u>One Hundred Dollars</u> Per Site	Each	\$ <u>100</u>	30	\$ <u>3,000</u> ✓

59,710.

BID SCHEDULE (continued)

ITEM NO.	DESCRIPTION OF ITEM W/ UNIT BID STATEMENTS	UNIT	UNIT PRICE	ESTIMATED QUANTITY	ITEM TOTAL
21	Transport and Dispose of POE Components <u>Twenty Five Dollars</u> Per Site	Each	\$ <u>25⁻</u>	30	\$ <u>750⁻</u> ✓
22	Technician Labor, blended rate (includes support staff, technical staff & managers) <u>Seventy Dollars</u> Per Hour	Hour	\$ <u>70⁻</u>	1000	\$ <u>70,000⁻</u> ✓
23	Licensed Plumber Services, specific quote for each assignment needed <u>One Hundred Dollars</u> Per Hour	Hour	\$ <u>100⁻</u>	400	\$ <u>40,000⁻</u> ✓

TOTAL BID PRICE \$ 992,614⁰⁰ ✓ 110,750.
(In figures) *See*

Nine Hundred Ninety Two Thousand Six Hundred Fourteen Dollars
(In words)

Contractor/Bidder Name:

Advanced Radon Mitigation, Inc.

(Bid forms shall be completed in ink or by typewriter. In case of a conflict between the unit price and the total amount for the item, the unit price will take precedence. In conflict between the Total Bid Price in numerals and written words, the written words take precedence.)

*The associated cost for analytical laboratory testing by the DHHS Public Health Lab shall not be included in these bid items but invoiced to DES and paid directly by DES.

BID SCHEDULE (continued)

The Bidder hereby agrees to commence the Work under this contract on or before a date to be specified in the Notice to Proceed and to fully complete all Project work by June 30, 2020.

The approved low Bidder hereby agrees that they will not withdraw their Bid within 120 consecutive calendar days after the actual date of the Opening of Bids and that, if the Owner shall accept their Bid, the Bidder will duly execute and acknowledge the Agreement and furnish, duly executed and acknowledged, the required Contract Bonds within ten (10) days after notification that the Agreement and other Contract Documents are ready for signature.

Should the Bidder fail to fulfill any of their agreements as herein above set forth, the Owner shall have the right to retain as liquidated damages the amount of the bid security which shall become the Owner's property.

The Bidder, by submittal of their Bid, agrees with the Owner that the amount of the Bid security deposited with their Bid fairly and reasonably represents the amount of damages the Owner will suffer due to the failure of the Bidder to fulfill their agreements as above provided.

(SEAL) Advanced Radon Mitigation, Inc.
(Name of Bidder)
Robin D. Gelin Robin D. GELINAS, President
(Signature and title of Authorized Representative)
180 Londonderry Turnpike, Suite 1
(Business Address)
Hooksett, NH 03106
(City and State)
04/04/2016
(Date)

Brenda C. Hood
BRENDA C. HOOD
Notary Public - New Hampshire
My Commission Expires February 28, 2019

The Bidder is a (corporation) (~~partnership~~)(~~individual~~) incorporated in the State
(~~Commonwealth~~) of NEW HAMPSHIRE.

*Bidder must strike out as necessary to make the above sentence read correctly.

(NOTE: If the Bidder is a corporation, affix the corporate seal and give below the names of their president, treasurer, and general manager; and if an individual, give residential address if different from business address.)

Robin D. GELINAS, President
Phyllis GELINAS, TREASURER

EXHIBIT C

SPECIAL PROVISIONS

ARTICLE 18 - CONTRACT EXTENSIONS

18.1 This contract may be extended one additional year under the existing terms and conditions contained herein, with \$302,500 encumbered for the one year extension upon written Owner notification of the Contractor. Contract work completed during the one year extension will be subject to the approved bid prices and items of work as defined in the New Hampshire Department of Environmental Services (DES) bid document titled: "DESIGN, INSTALLATION AND MAINTENANCE OF POINT OF ENTRY TREATMENT SYSTEM EQUIPMENT - Technical Specifications" and incorporated herein by reference.

ARTICLE 22 A – EXTRA WORK AND CHANGE ORDERS

22.1 The Owner, meaning the State of New Hampshire, may require the performance of extra work or emergency work as deemed necessary or desirable by issuance of a Change Order approved by the Owner. The amount of compensation paid to the Contractor for work authorized under a Change Order shall be made in accordance with the approved bid item prices. Parts and equipment not covered by the bid prices shall be paid at actual cost plus a 10% markup to the Contractor.

In the case of extra work or emergency work which is done by subcontractors and approved by Change Order, the Contractor shall compensate one or more subcontractors in accordance with the approved bid prices. Parts and equipment not covered by the bid prices shall be paid at actual cost plus a 10% markup to the Contractor. The Contractor shall not be entitled to extra compensation or markup for oversight of subcontractors on any of the POE assignments or plumber's work on damaged/broken water system components.

ARTICLE 22 B – CLAIMS FOR EXTRA WORK

23.1 No claim for extra work or cost adjustment shall be allowed unless the same was done pursuant to a written order by the Owner. If the claim is accepted for payment and is not covered by any approved bid item price, the Contractor shall provide all bills,

RA
5/11/14

EXHIBIT C

SPECIAL PROVISIONS

(continued)

payroll vouchers, purchase orders, and statements in an invoice package to the Owner for compensation.

Claims that have been approved and compensated by the Owner, shall not set a precedence for future claims for similar work such that there is an expectation that future claims will be approved for payment.

ARTICLE 22 C – PROPRIETARY EQUIPMENT

22.2 The Contractor shall not install equipment or system components that are subject to the Contractor's status as a proprietary equipment dealer under subcontracts or of the Owner. For the previously installed proprietary parts needing replacement, the Contractor may need to identify "approved equal" replacement parts for use under this contract. Any replacement parts approved for use in this contract shall not be considered for extra claims unless the Owner considers the costs significant enough to adjust the original cost.

RD
5/11/16

Certificate of Authority # 2

(Corporation or LLC - Contract Specific, date specific)

Corporate Resolution

I, Robin D. Gelinas, hereby certify that I am duly elected Clerk/Secretary of
(Name)
Advanced Radon Mitigation hereby certify the following is a true copy of a vote taken at
(Name of Corporation or LLC)

a meeting of the Board of Directors/shareholders, duly called and held on 05/02, 2016
at which a quorum of the Directors/shareholders were present and voting.

VOTED: That Robin D. Gelinas, President duly authorized to enter a
(Name and Title)

contract on behalf of Advanced Radon Mitigation, Inc. with the
(Name of Corporation or LLC)

Dept. of Environmental Services State of New Hampshire and further is
(Name of State Agency)

authorized to execute any documents which may in his/her judgment be
desirable or necessary to effect the purpose of this vote.

I hereby certify that said vote has not been amended or repealed and remains in full
force and effect as of the 05/02, 2016. I further certify that it is understood that the
State of New Hampshire will rely on this certificate as evidence that the person listed above
currently occupies the position indicated and that they have full authority to bind the
corporation to the specific contract indicated.

DATED: 05/02/2016

ATTEST: Robin D. Gelinas, President
(Name & Title)

State of New Hampshire Department of State

CERTIFICATE

I, William M. Gardner, Secretary of State of the State of New Hampshire, do hereby certify that ADVANCED RADON MITIGATION INC. is a New Hampshire corporation duly incorporated under the laws of the State of New Hampshire on September 30, 1999. I further certify that all fees and annual reports required by the Secretary of State's office have been received and that articles of dissolution have not been filed.



In TESTIMONY WHEREOF, I hereto set my hand and cause to be affixed the Seal of the State of New Hampshire, this 20th day of April, A.D. 2016

A handwritten signature in black ink, appearing to read "William M. Gardner".

William M. Gardner
Secretary of State



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
4/21/2016

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Foy Insurance Group - Manchester 1889 Elm St Manchester NH 03104		CONTACT NAME: Robin Maddox PHONE (A/C No. Ext): (603) 641-8111 FAX (A/C No.): (603) 641-0222 E-MAIL ADDRESS: robin.maddox@foyinsurance.com	
INSURED Advanced Radon Mitigation Inc 180 Londonderry TPKE Ste 1 Hooksett NH 03106		INSURER(S) AFFORDING COVERAGE INSURER A: Colony Insurance NAIC # 36927 INSURER B: Central Mutual Insurance 20230 INSURER C: INSURER D: INSURER E: INSURER F:	

COVERAGES **CERTIFICATE NUMBER** Master 2016-17 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	GENERAL LIABILITY					EACH OCCURRENCE \$ 1,000,000
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY					DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 100,000
	<input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR		PACEP304714	3/10/2016	3/10/2017	MED EXP (Any one person) \$ 5,000
	<input checked="" type="checkbox"/> Professional Liability		\$1m Ea Occ/\$2m Gen Agg			PERSONAL & ADV INJURY \$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:					GENERAL AGGREGATE \$ 2,000,000
	<input checked="" type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC					PRODUCTS - COMPI/OP AGG \$ 2,000,000
B	AUTOMOBILE LIABILITY					COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000
	<input type="checkbox"/> ANY AUTO					BODILY INJURY (Per person) \$
	<input type="checkbox"/> ALL OWNED AUTOS <input checked="" type="checkbox"/> SCHEDULED AUTOS		BAP 9767262	2/12/2016	2/12/2017	BODILY INJURY (Per accident) \$
	<input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS					PROPERTY DAMAGE (Per accident) \$
						Uninsured motorist combined \$ 1,000,000
	UMBRELLA LIAB					EACH OCCURRENCE \$
	EXCESS LIAB					AGGREGATE \$
	DED					\$
	RETENTION \$					\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY					WC STATUTORY LIMITS
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)					OTHER
	if yes, describe under DESCRIPTION OF OPERATIONS below					E.L. EACH ACCIDENT \$
						E.L. DISEASE - EA EMPLOYEE \$
						E.L. DISEASE - POLICY LIMIT \$
A	Pollution Liability		PACEP304714	3/10/2016	3/10/2017	Each Occurrence/Aggregate Limit 1M/2M
B	Property/Installation		TBD	4/21/2016	4/21/2017	Limit 10,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
New Hampshire Department of Environmental Services is additional insured if written signed contract, agreement, or permit to such exists prior to loss subject to form indicated above in General Liability section.

CERTIFICATE HOLDER New Hampshire Department of Environmental Waste Management Division 29 Hazen Drive, P.O. Box 95 Concord, NH 03302-0095	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE Robin Maddox/MLISA
---	--



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

05/25/2016

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Automatic Data Processing Insurance Agency, Inc. 1 Adp Boulevard Roseland, NJ 07068	CONTACT NAME: PHONE (A/C, No, Ext): _____ FAX (A/C, No): _____ E-MAIL ADDRESS: _____																				
	<table border="1"> <tr> <th colspan="2">INSURER(S) AFFORDING COVERAGE</th> <th>NAIC #</th> </tr> <tr> <td>INSURER A : Technology Insurance Company, Inc.</td> <td></td> <td>42376</td> </tr> <tr> <td>INSURER B :</td> <td></td> <td></td> </tr> <tr> <td>INSURER C :</td> <td></td> <td></td> </tr> <tr> <td>INSURER D :</td> <td></td> <td></td> </tr> <tr> <td>INSURER E :</td> <td></td> <td></td> </tr> <tr> <td>INSURER F :</td> <td></td> <td></td> </tr> </table>	INSURER(S) AFFORDING COVERAGE		NAIC #	INSURER A : Technology Insurance Company, Inc.		42376	INSURER B :			INSURER C :			INSURER D :			INSURER E :			INSURER F :	
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INSURER B :																					
INSURER C :																					
INSURER D :																					
INSURER E :																					
INSURER F :																					
INSURED ADVANCED RADON MITIGATION INC 180 LONDONDERRY TPKE SUITE 1 Hooksett, NH 03106																					

COVERAGES

CERTIFICATE NUMBER: 496778

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER: _____						EACH OCCURRENCE \$ _____ DAMAGE TO RENTED PREMISES (Ea occurrence) \$ _____ MED EXP (Any one person) \$ _____ PERSONAL & ADV INJURY \$ _____ GENERAL AGGREGATE \$ _____ PRODUCTS - COMP/OP AGG \$ _____ \$ _____	
	AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> NON-OWNED AUTOS						COMBINED SINGLE LIMIT (Ea accident) \$ _____ BODILY INJURY (Per person) \$ _____ BODILY INJURY (Per accident) \$ _____ PROPERTY DAMAGE (Per accident) \$ _____ \$ _____	
	UMBRELLA LIAB <input type="checkbox"/> OCCUR EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE DED _____ RETENTION \$ _____						EACH OCCURRENCE \$ _____ AGGREGATE \$ _____ \$ _____	
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N	N/A	N	TWC3545988	05/13/2016	05/13/2017	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER E.L. EACH ACCIDENT \$ _____ 100,000 E.L. DISEASE - EA EMPLOYEE \$ _____ 100,000 E.L. DISEASE - POLICY LIMIT \$ _____ 500,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER**CANCELLATION**

New Hampshire Department of Environmental Waste Management Division 29 Hazen Drive Concord, NH 03302	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE
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ATTACHMENTS

#1 IRREVOCABLE LETTER OF CREDIT

#2 TECHNICAL SPECIFICATIONS

Citizens
Commercial Banking

International Division
20 Cabot Road
Medford, MA 02155 USA
888 868.0212 tel
SWIFT: CTZIUS33 TELEX 211047 CTZINTL

IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER S910969

ISSUING BANK:
CITIZENS BANK, N.A.
INTERNATIONAL TRADE DEPT.
20 CABOT ROAD, M/S MMF470
MEDFORD, MA 02155 U.S.A.

PLACE AND DATE OF ISSUE:
MEDFORD, MA
APRIL 27, 2016

PLACE AND DATE OF EXPIRY:
AT OUR COUNTERS
APRIL 26, 2017

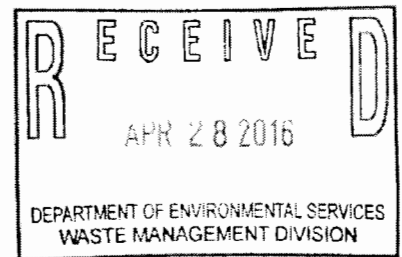
BENEFICIARY:
STATE OF NH
C/O NHDES WASTE MANAGEMENT DIV.
29 HAZEN DR., P.O. BOX 95
CONCORD, NH 03302
ATTN: TREASURER

APPLICANT:
ADVANCED RADON MITIGATION, INC.
180 LONDONDERRY TURNPIKE
HOOKSETT, NH 03106
ATTN: ROBIN D. GELINAS

UP TO AN AGGREGATE AMOUNT THEREOF: USD 40,000.00

PARTIAL DRAWINGS: PERMITTED

CREDIT AVAILABLE WITH:
CITIZENS BANK, N.A.
INTERNATIONAL TRADE DEPT.
20 CABOT ROAD, M/S MMF470
MEDFORD, MA 02155 U.S.A.



AGAINST PRESENTATION OF DOCUMENTS AS DETAILED HEREIN.

DRAFTS: AT SIGHT
DRAWN ON: CITIZENS BANK, N.A.

WE HEREBY ESTABLISH OUR IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER S910969 IN YOUR FAVOR FOR THE ACCOUNT OF ADVANCED RADON MITIGATION, INC. IN THE AGGREGATE AMOUNT UP TO FORTY THOUSAND AND 00/100 U.S. DOLLARS (USD40,000.00) AVAILABLE BY YOUR DRAFT(S) AT SIGHT DRAWN ON CITIZENS BANK, N.A., 20 CABOT ROAD, M/S MMF470, MEDFORD, MA 02155 U.S.A., AND ACCOMPANIED BY THE FOLLOWING:

CONTINUED ON NEXT PAGE

Citizens
Commercial Banking

International Division
20 Cabot Road
Medford, MA 02155 USA
888 868.0212 tel
SWIFT: CTZIUS33 TELEX 211047 CTZINTL

OUR REFERENCE NUMBER S910969

PAGE 2

1) THE ORIGINAL LETTER OF CREDIT AND ANY AMENDMENTS THERETO, IF ANY.

2) BENEFICIARY'S STATEMENT PURPORTEDLY SIGNED BY AN AUTHORIZED REPRESENTATIVE STATING:

"WE HEREBY CERTIFY THAT THE AMOUNT OF THIS DRAFT REPRESENTS FUNDS DUE AS A RESULT OF THE FAILURE OF ADVANCED RADON MITIGATION, INC. TO COMPLY WITH THE TERMS OF A CERTAIN CONTRACT BETWEEN TREASURER, STATE OF NH AND ADVANCED RADON MITIGATION, INC. FOR NHDES DESIGN, INSTALLATION AND MAINTENANCE OF POE TREATMENT SYSTEM EQUIPMENT"

EACH DRAFT MUST BE MARKED: "DRAWN UNDER CITIZENS BANK, N.A. LETTER OF CREDIT NUMBER S910969, DATED APRIL 27, 2016".

IT IS A CONDITION OF THIS LETTER OF CREDIT THAT IT SHALL BE DEEMED AUTOMATICALLY EXTENDED WITHOUT AMENDMENT, FOR AN ADDITIONAL PERIOD(S) OF ONE YEAR FROM THE PRESENT OR EACH FUTURE EXPIRATION DATE, UNLESS AT LEAST SIXTY (60) CALENDAR DAYS PRIOR TO SUCH DATE, WE SEND YOU A WRITTEN NOTIFICATION BY REGISTERED MAIL OR OVERNIGHT COURIER SERVICE AT THE ABOVE ADDRESS, THAT WE ELECT NOT TO EXTEND THIS LETTER OF CREDIT FOR SUCH ADDITIONAL PERIOD AND SUCH NOTICE SHALL BE EFFECTIVE UPON DISPATCH. UPON YOUR RECEIPT OF SUCH NOTICE, YOU MAY DRAW ON US BY YOUR SIGHT DRAFT FOR THE FULL AMOUNT OF THEN AVAILABLE BALANCE WITHIN THEN APPLICABLE EXPIRATION DATE, ACCOMPANIED BY YOUR STATEMENT PURPORTEDLY SIGNED BY ONE OF YOUR OFFICIALS READING:

"THE AMOUNT OF THIS DRAWING USD _____ REPRESENTS FUNDS DUE AS WE HAVE RECEIVED NOTICE FROM CITIZENS BANK, N.A. OF THEIR DECISION NOT TO EXTEND THE LETTER OF CREDIT NO. S910969 FOR AN ADDITIONAL YEAR."

HOWEVER, IN NO EVENT WILL THIS LETTER OF CREDIT BE EXTENDED BEYOND JUNE 30, 2020, THE FINAL EXPIRATION DATE.

WE HEREBY AGREE WITH YOU THAT THE DRAFT DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS LETTER OF CREDIT WILL BE DULY HONORED IF PRESENTED TO US AT CITIZENS BANK, N.A., 20 CABOT ROAD, MAIL STOP MMF470, MEDFORD, MA 02155 U.S.A. ON OR BEFORE THE ABOVE MENTIONED EXPIRATION DATE OR ANY AUTOMATICALLY EXTENDED EXPIRATION DATE.

CONTINUED ON NEXT PAGE

OUR REFERENCE NUMBER S910969

PAGE 3

THIS LETTER OF CREDIT SETS FORTH IN FULL THE TERMS OF OUR UNDERTAKING, SUCH UNDERTAKING SHALL NOT IN ANY WAY BE MODIFIED, AMENDED OR AMPLIFIED BY REFERENCES TO ANY DOCUMENT OR INSTRUMENT REFERRED TO HEREIN OR IN WHICH THIS LETTER OF CREDIT RELATES AND ANY SUCH REFERENCE SHALL NOT IN ANY WAY BE DEEMED TO INCORPORATE HEREIN BY REFERENCE ANY DOCUMENT OR INSTRUMENT.

EXCEPT SO FAR AS OTHERWISE EXPRESSLY STATED, THIS CREDIT IS SUBJECT TO THE INTERNATIONAL STANDBY PRACTICES 1998 ("ISP98"), INTERNATIONAL CHAMBER OF COMMERCE PUBLICATION NO. 590.

PLEASE ADDRESS ANY INQUIRIES TO THE ATTN: LETTER OF CREDIT DEPT., QUOTING OUR REF. NO: S910969 ATTN: CARNATION CHIN BY PHONE: (781)655-4378 BY SWIFT: CTZIUS33



AUTHORIZED SIGNATURE



AUTHORIZED SIGNATURE

SIGHT DRAFT

DATE: 04/14/2010

DRAWN UNDER CITIZENS BANK, N.A. LETTER OF CREDIT NUMBER _____
DATED _____.

→ *Treasurer state of NH*
TO THE ORDER OF *S/O NHDES waste management* (BENEFICIARY), PLEASE
PAY *(\$ 70,000.00)* US DOLLARS AT
SIGHT FOR VALUE RECEIVED FOR THE ACCOUNT OF *Advanced Radon Mitigation, Inc.*
(APPLICANT).

BY: *[Signature]*
Authorized officer

The signature below constitutes our endorsement to the draft

BY: *[Signature]*
Authorized officer

To,
CITIZENS BANK, N.A.
INTERNATIONAL DEPARTMENT
20 CABOT ROAD, MEDFORD, MA 02155

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
WASTE MANAGEMENT DIVISION

DESIGN, INSTALLATION, AND MAINTENANCE OF
POINT OF ENTRY TREATMENT SYSTEM EQUIPMENT

TABLE OF CONTENTS

<u>Section Number</u>	Technical Specifications	<u>Page</u>
	DIVISION 1 - GENERAL REQUIREMENTS	
01010	Summary of Work	1
01090	Abbreviations and Symbols	2
01150	Measurement and Payment	4
01340	Shop Drawings, Samples and Project Data	16
01400	Quality Control	20
	DIVISION 2 - SITE WORK	Not Used
	DIVISION 3 - CONCRETE	Not Used
	DIVISION 4 - MASONRY	Not Used
	DIVISION 5 - METALS	Not Used
	DIVISION 6 - WOOD AND PLASTIC	Not Used
	DIVISION 7 - THERMAL AND MOISTURE PROTECTION	Not Used
	DIVISION 8 - DOORS AND WINDOWS	Not Used
	DIVISION 9 - FINISHES	Not Used
	DIVISION 10 - SPECIALTIES	Not Used
	DIVISION 11 - EQUIPMENT	Not Used
	DIVISION 12 - FURNISHINGS	Not Used
	DIVISION 13 - SPECIAL CONSTRUCTION	Not Used
13650	Point of Entry Treatment Systems	21
	DIVISION 14 - CONVEYING SYSTEMS	Not Used
	DIVISION 15 - MECHANICAL	Not Used
	DIVISION 16 - ELECTRICAL	Not Used
16000	Electrical Provisions	39
16100	Basic Materials and Methods	43
16120	Wires and Cable	47
16131	Pull, Junction, Termination Boxes and Wiring Troughs	52
16140	Wall Plates, Switches and Receptacles	55
16450	Grounding	58

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5/11/16

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 ITEMS OF WORK

The major items of work involved in installation and maintenance of point of entry drinking water treatment systems located at various locations throughout the state of New Hampshire may include the following:

- a. Maintenance of approximately 80 existing treatment systems.
- b. Installation and maintenance of approximately 80 treatment systems over a four year period.
- c. Installation and maintenance of approximately 160 carbon contactors of various sizes ranging from two cubic feet to four cubic feet in capacity.
- d. Collection and analysis of approximately 1,500 water samples from operating treatment systems throughout the state.
- e. Remove, replace and dispose of approximately 1,600 cubic feet of granular activated carbon.

1.2 WORK PERFORMED UNDER SEPARATE CONTRACT

None for this project

END OF SECTION

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SECTION 01090

ABBREVIATIONS AND SYMBOLS

PART I - GENERAL

1.1 DESCRIPTION

- a. The following is a listing of common abbreviations and symbols which may be found in the Contract Documents. Since this is a general listing, it is to be expected that not all abbreviations will appear.
- b. Abbreviations for published codes, standards, regulations, organizations and state and federal agencies are defined elsewhere in the text.
- c. Abbreviations and/or symbols not specifically defined shall be industry used standard definitions. Clarification of symbols and/or abbreviations shall be forwarded to the Owner, who will furnish definitions in writing by addendum.

1.2 ABBREVIATIONS

The following is a partial listing of abbreviations and meanings which may apply in the Specifications:

cc	Cubic Centimeter
cu	Cubic
c.f.	Cubic Feet
CFM	Cubic Feet Per Minute
dia.	Diameter
Ft. or ft	Feet
GAC	Granular Activated Carbon
Gal. or gal.	Gallon
gm	Gram
gpd	Gallons Per Day
gpm	Gallons Per Minute
grains/cc	Grains Per Cubic Centimeter
I.D.	Inside Diameter
Lbs. or lbs.	Pounds
L.S.	Lump Sum
m	Meter
Max. or max.	Maximum
mg/g	Milligrams Per Gram
mg/L	Milligrams Per Liter
Min. or min.	Minimum
mJ/cm ²	Millijoules/centimeters square
mm	Millimeter
No. or no.	Number

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5/11/14

O.D.	Outside Diameter
POE	Point Of Entry Treatment System
ppm	Parts Per Million
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch, Gauge Pressure
PVC	Poly Vinyl Chloride
PWS	Public Water Supply
s.f.	Square Foot
TDH	Total Dynamic Head
UV	Ultra Violet
VOC	Volatile Organic Compound
Vol.	Volume

1.3 SYMBOLS

The following is a list of commonly used symbols and meanings which may be found in the Specifications;

°F. °C	Degrees (F=Fahrenheit, C=Centigrade)
'	Feet
"	Inches
#	Number or pound
/	Plus, Per, or Divided By

END OF SECTION

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SECTION 01150

MEASUREMENT AND PAYMENT

1.0 BASIS OF PAYMENT

The following paragraphs describe the measurement and payment for work to be performed under the respective items listed in the Bid Schedule.

Each unit or lump sum price stated in the Bid Schedule shall constitute full compensation for each completed item of the work as specified.

The actual number of units of each unit price item of work may be more, less, or not stated in the Bidding Schedule or included in the Contract Documents. No variation in the contract price will be made until the original cost for components installed are varied by more than 50% over the Contract period or a hardship exists for the Contractor or the Owner. Payment will be made only for the actual number of units or work performed, and at the contract unit price for each such unit with measurement for payment made as defined in the paragraphs below.

No partial payments for equipment delivered and/or installed under this Contract will be made until the required installation report and operation and maintenance manuals have been received by the Owner.

ITEM 1 - SITE EVALUATIONS

- a. Measurement for payment for site evaluations will be based on the actual number of site evaluations conducted.
- b. Payment for site evaluations will be made at the corresponding unit price stipulated and shall constitute full compensation for conducting the site visit, including: interviewing the User and Property Owner if the Property Owner is different from the User; obtaining water samples; delivering the samples to an approved laboratory; design of the appropriate POE system for the specific Residence; submittal of the proposed design to DES for approval; making any changes to the design determined to be necessary by DES; completion of the **Installation Report**; and furnishing all labor, materials, equipment, travel and tolls necessary to conduct a site evaluation.
- c. Payment for analytical laboratory sample analysis will be based on the DHHS Public Health laboratory's invoiced costs to DES and not included in Bid Schedule price.

ITEM 2 - SITE INSTALLATIONS

- a. Measurement for payment for site installations will be based on the actual number of site installations conducted.
- b. Payment for site installations will be made at the corresponding unit price stipulated and shall constitute full compensation for performing the site installation, including: labor, materials, tools, equipment, and travel and tolls to and from the site. This item does not include furnishing and installing equipment at each site installation which are covered in the appropriate items listed in the Bid Schedule. Payment for this item shall include: preparing a location within the building for the installation of the POE treatment system; supplying and installing valves, piping, and fittings necessary for the installation, including treatment system bypass piping; connections to existing piping; providing and making electrical connections, where necessary, for the operation of the treatment system; testing; repairing leaks; and cleanup following completion of the installation for a complete installation of the treatment system.
- c. Payment for supplying individual treatment system components shall be paid for under the corresponding item contained in the Bid Schedule.

ITEM 3 - BACKWASHING FILTERS

- a. Measurement for payment for backwashing filters will be as a unit for the actual number of backwashing filters installed.
- b. Payment for backwashing filters shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment to install backwashing filters and shall include piping, furnishing and installing backwashing filters, complete including filter media and control valves, by-pass valve, connections to existing piping, connections to waste piping, connecting to upstream and downstream treatment units, testing, repairing of leaks, and making necessary electrical connections.

ITEMS 4A and 4B- WATER SOFTENER

- a. Measurement for payment for water softeners will be as a unit for the actual number of water softeners installed.
- b. Payment for water softeners shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials, and equipment to install water softeners and shall include piping, furnishing and installing water softeners, complete including exchange cation resin, brine tank and

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5/11/16

safety float, and control valves, by-pass valve, connections to existing piping, connections to waste piping, connecting to upstream and downstream treatment units, testing, repairing leaks and making necessary electrical connections.

ITEM 5 - RESIDENTIAL AERATOR

- a. Measurement for payment for residential aerators (or "air stripper") will be as a unit for the actual number of residential aerators installed.
- b. Payment for residential aerators shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials, and equipment to install residential aerators and shall include piping, furnishing and installing aerators, complete with aeration tank, air blower, by-pass valve, exhaust air vent, treated water holding tank, re-pressurization pump and pump controls, re-pressurization tank, connections to existing piping, connecting to upstream and downstream treatment units, testing, repairing of leaks and making electrical connections.

ITEM 6 - AIR INJECTION UNIT

- a. Measurement for payment for air injection units will be as a unit for the actual number of air injection units installed.
- b. Payment for air injection units shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials, and equipment to install air injection units and shall include piping, furnishing and installing air injection units, complete including process tank with air release valve, air pump, by-pass valve, connections to existing piping, connecting to upstream and downstream treatment units, testing, repairing of leaks and making electrical connections.

ITEMS 7A, 7B, and 7C - GRANULAR ACTIVATED CARBON CONTACTOR SYSTEMS

- a. Measurement for payment for granular activated carbon contactors will be as a unit for each granular activated carbon contactor installed.
- b. Payment for granular activated carbon contactors shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials, and equipment to install granular activated carbon contactor and shall include piping, furnishing and installing the contactor, complete including granular activated carbon and control valve, by-pass valve, connections to existing piping, connecting to upstream and downstream treatment units, testing, repairing leaks and making electrical connections.

- c. Where multiple units are installed, the price contained in the Bid will be paid for each contactor installed.
- d. Re-generated activated carbon shall not be used for any treatment system.

ITEM 8 - ULTRAVIOLET STERILIZER

- a. Measurement for payment for ultraviolet sterilizer units will be as a unit for the actual number of ultraviolet sterilizer units installed.
- b. Payment for ultraviolet sterilizer units shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials, and equipment to install ultraviolet sterilizers and shall include piping, furnishing and installing ultraviolet sterilizer units, complete including UV chamber, UV lamp and sleeve, light sensor, alarm and intensity meter, connections to existing piping, connecting to upstream and downstream treatment units, testing, and repairing leaks, and making electrical connections.

ITEM 9 - WATER METER

- a. Measurement for payment for water meters will be as a unit for the actual number of water meters installed.
- b. Payment for water meters shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials, and equipment to install water meters and shall include piping, furnishing and installing water meters, complete including, connections to existing piping, connecting to upstream and downstream treatment units, testing, and repairing of leaks.

ITEM 10 - POE MAINTENANCE COORDINATION AND SITE VISITS

- a. Measurement for payment for POE maintenance coordination and site visits will be as a unit for the actual number of POE maintenance events conducted.
- b. Payment for POE maintenance coordination and site visits shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials, and equipment necessary to coordinate maintenance events and shall include communication, travel, tolls, and computers required for scheduling and coordination. Payment shall include labor, travel, and tolls from the Contractor's office to and return from the site where maintenance activities are performed.

- c. Payment under this item shall be for general maintenance activities at the site. Specific maintenance activities beyond general maintenance shall be paid for under separate items in the Bid.

ITEM 11 - SERVICE AND REPLACE AIR STRIPPER PUMP

- a. Measurement for payment for servicing and replacing air stripper pumps will be as a unit for the actual number of air stripper pumps serviced and replaced.
- b. Payment for servicing and replacing air stripper pumps shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to service and replace the air stripper pump and shall include providing and installing the replacement pump, transportation, and disposal of the old pump, cleaning and sanitizing the new pump and piping, reconnections to existing piping, testing, sanitizing the new pump and piping, reconnections to existing piping, testing, and repairing leaks, electrical connections, and all other work and expenses incidental thereto.

ITEM 12 - SERVICE AND RE-BED CARBON CONTACTORS

- a. Measurement for payment for servicing and re-bedding activated carbon contactors will be by the cubic foot for the actual volume of activated carbon used in re-bedding the contactors.
- b. Payment for servicing and re-bedding activated carbon contactors shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to remove the media in the contactors and supply and place new media in the vessel and shall include transportation and disposal of spent media, and all other work and expenses incidental thereto.
- c. Re-generated activated carbon shall not be used for any treatment system.

ITEM 13 - SERVICE, REMOVE AND DISPOSE OF MEDIA FROM CARBON CONTACTORS,
NO REBED OF CARBON CONTACTORS

- a. Measurement for payment for servicing, removing, and disposing of media from activated carbon contactors will be by the cubic foot for the actual volume of activated carbon removed and disposed of.
- b. Payment for servicing and removing and disposing of activated carbon shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to remove the media from the contactors and shall include transportation and disposal of spent media,

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5/11/16

securing the treatment system for extended shutdown, and all other work and expenses incidental thereto.

- c. This item is to be used where the treatment system is to be shut down or by-passed for an extended period and the media is to be removed, leaving the vessels empty.

ITEM 14 - SERVICE AND BED CARBON CONTACTORS

- a. Measurement for payment for servicing and bedding activated carbon contactors will be by the cubic foot for the actual volume of activated carbon used in bedding the contactors.
- b. Payment for servicing and bedding activated carbon contactors shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to clean and sanitize treatment vessels with a cleaning solution and supply and place new media in the vessel, and shall include all other work and expenses incidental thereto, and to place the system on-stream and be fully operational.
- c. Re-generated activated carbon shall not be used for any treatment system.
- d. This item is to be used after seasonal inactivity or where a system has been by-passed for extended periods of time.

ITEM 15 - SERVICE AND REPLACE ULTRAVIOLET LAMPS

- a. Measurement for payment for servicing and replacing ultraviolet lamps will be as a unit for the actual number of ultraviolet lamps serviced and replaced.
- b. Payment for servicing and replacing ultraviolet lamps shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to remove and replace an ultraviolet lamp in a sterilizer unit, and to clean and sanitize the component. Payment shall be full compensation for providing and placing the new lamp and removal, transportation and disposal of the old lamp, and for all other work and expenses incidental thereto.

ITEM 16A, 16B & 16C- FURNISH AND INSTALL CARTRIDGE FILTER ASSEMBLIES

- a. Measurement for payment for providing and installing cartridge filter assemblies will be as a unit for the actual number of cartridge filters installed.
- b. Payment for cartridge filter assemblies shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all labor, materials,

and equipment to install a cartridge filter assembly and shall include piping, furnishing and installing the cartridge filter assembly, complete including connections to existing piping, pipe supports, connections to upstream and downstream treatment units, testing, and repairing of leaks.

ITEM 16D – FURNISH AND SERVICE CARTRIDGE FILTERS

- a. Measurement for payment for servicing and replacing cartridge filters will be as a unit for the actual number of cartridge filters serviced regardless of the size of the filters.
- b. Payment for servicing cartridge filters shall be made at the corresponding unit price stipulated for the size filter replaced and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to place the replacement cartridge filter and clean and sanitize cartridge filter assemblies and components. Payment shall be full compensation for placing the new cartridge filter and removal, transportation and disposal of the old filter, and for all other work and expenses incidental thereto.

ITEMS 17A, 17B & 17C – REPLACING CARTRIDGE FILTERS

- a. Measurement for payment for replacing cartridge filters will be based on the type and number of cartridge filters replaced.
- b. Payment for providing cartridge filters shall be made at the corresponding unit price for the number and type of filter provided and shall be full compensation for providing new cartridge filters of the size and type called for in the specs.

ITEM 18A, 18B, 18C, 18D, 18E & 18F- SERVICE AND MAINTENANCE OF POE TREATMENT SYSTEM COMPONENTS

- a. Measurement for payment for servicing and performing maintenance of specific treatment system components will be as a unit for the type and actual number of treatment system components serviced and maintained.
- b. Payment for servicing and maintaining treatment system components shall be made at the corresponding unit price stipulated for the specific type of system component and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to conduct the service and maintenance of the component, and to clean and sanitize the components. Payment shall be full compensation for performing the service and maintenance activities described in the specifications.

- c. Planning, coordination and travel to and from the site of the servicing, and maintenance shall be paid for under Item 10 of this section.

ITEM 19A & 19B - COLLECTING WATER SAMPLES

- a. Measurement for payment for collecting and delivering water samples will be as a unit for the actual number of water sampling events conducted. Each event may consist of collecting up to three water samples at a single location.
- b. Payment for collecting and delivering water samples shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to travel to the sampling locations, collect up to three water samples, and deliver the samples to the designated laboratory. Payment shall be full compensation for providing labor, travel and tolls to and from the site and to and from the analytical laboratory, and for all other work and expenses incidental thereto.
- c. Payment for collecting and delivering water samples in conjunction with servicing a treatment system shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to collect up to three water samples and deliver the samples to the designated laboratory. Payment shall be full compensation for providing labor and travel and tolls to and from the analytical laboratory and for all other work and expenses incidental thereto.
- d. Payment for analytical laboratory sample analysis will be based on the DHHS Public Health laboratory's invoiced costs to DES and not included in Bid Schedule price.

ITEM 20 - REMOVE POE TREATMENT SYSTEM COMPONENTS AND REPLUMB PIPING

- a. Measurement for payment for removing treatment system components and re-plumb piping for a site will be as a unit for the actual number of treatment system components removed. Components will be considered as a unit, i.e. two carbon contactors, water softening system, residential aerator, backwashing filter, and ultraviolet sterilizer are each considered to be one component.
- b. Payment for removing treatment system components and re-plumbing the piping shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to remove the treatment system component, clean and sanitize the treatment system component, transport and deliver the treatment system component to the State Surplus Facility located at 144 Clinton Street, Concord, New Hampshire and re-plumb the piping to at least an equivalent condition to what it was like prior to the

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installation of the treatment system. The size and material of the piping shall match or be an improvement to what was there prior to the installation of the POE treatment system. Payment shall be full compensation for providing labor, materials, transportation, tolls, piping, and incidentals necessary to remove and transport the treatment system components, re-plumb the piping at the site to connect it to the piping system and for all other work and expenses incidental thereto. This shall include cleaning the area where the treatment system had been installed and leaving the area in a workman-like condition.

- c. Payment under this item shall be for the removal of each treatment system component. Where more than one component is present at an installation, payment shall be made for each component removed.
- d. Removal and transportation to the State Surplus Facility of minor POE components such as cartridge filters, water meters, and in-line static mixers shall be incidental to the Work under this item.

ITEM 21 - DISPOSAL OF UNSALVAGEABLE POE TREATMENT SYSTEM COMPONENTS

- a. Measurement for payment for disposing of unsalvageable POE treatment system components will be as a unit for the actual number of treatment system components disposed of. Components will be considered as a unit, i.e. two carbon contactors, water softening system, residential aerator, backwashing filter and ultraviolet sterilizer, are each considered to be one component.
- b. Payment for disposal of unsalvageable POE system components shall be made at the corresponding unit price stipulated and shall constitute full compensation for furnishing all tools, labor, materials, and equipment necessary to transport the unsalvageable POE system component from either the location where the system was removed from or the State Surplus Facility located at 144 Clinton Street, Concord to the disposal facility and to cover the cost for disposal of the component. Payment shall be full compensation for providing labor, materials, transportation, tolls, incidentals necessary to transport the treatment system component, and pay the disposal fee.
- c. Payment under this item shall be for the number of treatment system components disposed of including all components that were not accepted at the State Surplus Facility. Disposal of each individual component from the same POE treatment system will be paid for separately. Transport and disposal of water meters, valves, piping, pipe supports, etc. shall be incidental to the disposal of the individual components and shall not be paid for separately.

ITEM 22 - TECHNICIAN LABOR

- a. Measurement for payment for technician labor will be by the hour for each hour worked in the field. Travel time for the technician from the contractor's office to the place of work and back shall be included in the measurement. Measurement shall be to the nearest 0.5 hours.
- b. Payment for technician labor shall be made at the contract unit price per hour and shall be full compensation for all expenses involved, including salary of the technician, company overhead, profit, travel, tolls and incidentals necessary. Bid Item 10 shall be used to cover all conveyance costs.
- c. The Contractor shall document the technician labor hours by maintaining time sheets for all technicians involved in carrying out the work. Time sheets shall be submitted with the payment request for the payment period.
- d. The cost of home office coordination and supervision of the technician shall not be paid for separately and shall be included in the Bid rate.
- e. This item shall be for conducting activities authorized by the Owner related to maintenance, user complaint, and/or repair of POE systems and/or residential water system components not otherwise specified in the Bid Schedule.

ITEM 23 - CERTIFIED PLUMBER LABOR

- a. Measurement for payment for plumber labor will be by the hour for each hour worked in the field. Travel time to the place of work and back shall be included in the measurement. Measurement shall be to the nearest 0.5 hours. Bid Item 10 shall be used to cover all conveyance costs.
- b. Payment for plumber labor shall be made at the Bidder's price per hour and shall be full compensation for all expenses involved, including salary of the certified plumber, company overhead, profit, travel, tolls, parts and incidentals necessary. The plumber shall be certified a Master Plumber in the State of New Hampshire.
- c. The Contractor shall document the plumber's labor hours by submitting separate invoices and receipts involved in carrying out the work. The Contractor shall confirm that all work is complete and meets the Owner's needs.
- d. This item shall be for conducting activities authorized by the Owner related to maintenance, user complaint, and/or repair of water lines **and/or non-POE residential water system components** not otherwise specified in the Bid Schedule.

2.0 INCIDENTAL WORK

The following work items shall not be measured for separate payment and should be included in the above payment items as appropriate:

- a. Clean-up at each POE installation site.
- b. Piping, valving, pipe supports, as necessary to connect the POE treatment system to the internal piping of the residence.
- c. Transportation and disposal of piping, valving, pipe supports, cartridge filters, in-line static mixers etc. determined to be unsalvageable.
- d. Electrical provisions including wiring, circuit breaker, connection to circuit breaker, electrical outlet, etc. necessary for the proper operation of the POE system and/or individual POE system components.
- e. Repairing leaks from POE system components resulting from maintenance work or sampling events.
- f. Photos of existing and new water system components during all phases of installation and maintenance.

END OF SECTION

SECTION 01340

SHOP DRAWINGS, SAMPLES, AND PROJECT DATA

PART 1 - GENERAL

1.1 MATERIALS

Unless otherwise specified, only new materials and equipment shall be incorporated in the Work. All materials and equipment furnished by the Contractor to be incorporated in the Work shall be subject to the inspection and approval of the Owner. No material shall be processed for, fabricated for, or delivered to the Work without prior approval of the Owner.

Maintenance and repairs to the components shall be made with new materials, equipment and/or parts. Worn-out equipment and plumbing (including valves, unions, connectors, etc.) shall be replaced based on an equipment replacement schedule created by the Contractor and approved by the Owner. NOTE: Useful product life conditions shall be established by the Contractor for replacement of worn-out units for specific Bid Items in Section 01150.

1.2 SUBMISSION SCHEDULE

- a. Within thirty days after the formal execution of the Contract, the Contractor shall submit to the Owner a Shop Drawing Schedule, including the names and addresses of the manufacturers and suppliers of all materials and equipment they propose to incorporate into the Work. Where such names have been directly specified in the Bid, or where substitutions have been made in compliance with the Contract Documents, repetitive submission will not be necessary.
- b. When Shop Drawings are required as specified below, the names and addresses of the manufacturers and suppliers shall be submitted prior to the submittal of the Shop Drawings so that the Owner may consider and evaluate the manufacturer and/or the supplier as to their ability to furnish a product meeting the Specifications, subject to final approval of the particular material or equipment. As requested, the Contractor shall also submit data relating to the materials and equipment they propose to incorporate into the Work, in sufficient detail, to enable the Owner to identify the particular product in question and to form an opinion as to its conformity to the contract requirements. Such data shall be submitted in a manner similar to that specified for Shop Drawings.

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1.3 MATERIAL SAMPLES

- a. If the Owner so requires, either prior to beginning or during the progress of the Work, the Contractor shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the Specifications. Such samples shall be furnished, taken, stored, packed, and shipped as directed at the expense of the Contractor.
- b. All samples shall be packed so as to reach their destination in good condition, and shall be labeled to indicate the material represented, the name of the work and location for which the material is intended, and the name of the subcontractor submitting the sample.
- c. To ensure consideration of samples, the Contractor shall notify the Owner, in writing prior to shipping, that the samples have been shipped and shall properly describe the samples in the letter. In no case shall the letter of notification be enclosed with the samples.
- d. The Contractor shall submit data and samples, or place his orders, sufficiently early to permit consideration, inspection, testing, and approval before the materials and equipment are needed for incorporation in the Work. Delay resulting from their failure to do so shall not be used as the basis for a claim against the Owner.
- e. When required, the Contractor shall furnish to the Owner, a sworn copy of manufacturer's shop or Mill tests (or reports from independent testing laboratories) relative to materials and equipment performance ratings.
- f. After approval of the samples, data, etc., by the Owner, the materials and equipment may be used in the Work.

1.4 SHOP DRAWINGS

- a. The Contractor shall submit, for approval, at least one reproducible copy and two print copies of Shop Drawings of materials fabricated especially for this contract, and of equipment and materials for which such drawings are specifically requested. The reproducible and at least one print copy will be returned to the Contractor.
- b. Such drawings shall show the principal dimensions, weight, structural and operating features, performance characteristics and wiring diagrams, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this contract.

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5/11/16

- c. When so specified, or if considered by the Owner to be acceptable, manufacturer's specifications, catalog data, descriptive matter, illustrations, etc., may be submitted for approval in place of Shop Drawings. In such case, the requirements shall be as specified for Shop Drawings, insofar as applicable.
- d. The Contractor shall be responsible for the prompt submission of all Shop Drawings in accordance with the Shop Drawing Schedule so that there shall be no delay to the Work due to the absence of such drawings.
- e. No material shall be purchased or fabricated especially for this contract until the required Shop Drawings have been submitted and reviewed as conforming to the Contract requirements. All materials and work involved in the project shall then be as represented by said drawings.
- f. Only Shop Drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by their subcontractors and vendors. Prior to submitting Shop Drawings to the Owner, the Contractor shall check thoroughly all such drawings to assure the subject matter thereof conforms to the Drawings and Specifications in all respects. Shop Drawings which are correct shall be marked with the date, checker's signature, and certification by the Contractor that the equipment/materials meet the specified requirements, and then shall be submitted to the Owner; other drawings shall be returned for correction.
- g. The Owner's review of the Shop Drawings will follow a general check made to ascertain conformance with the design concept and functional result of the Project and compliance with the information given in the Contract Documents. The Contractor shall be responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.
- h. The Owner's review classifications are as follows:

"No exceptions taken"	"Comments attached"
"Note markings"	"Resubmit"
"Rejected"	"Contractor confirm"
- i. The Contractor shall make any corrections required by the Owner and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved.
- j. At the time of each submission or resubmission, the Contractor shall direct specific attention, in writing, to deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents or corrections required by the

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Owner on previous submissions or any materials, fittings or equipment necessary for a complete and operating system.

- k. The Contractor's stamp of approval on the Shop Drawings and samples shall constitute a representation to the Owner that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, or the Contractor assumes full responsibility for doing so, and that they have reviewed or coordinated each Shop Drawing and sample with the requirements of the Contract Documents.
- l. The Owner's approval of Shop Drawings and samples shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents, unless the Owner has been notified, in writing, and has given his written approval to such deviation, nor shall any approval by the Owner relieve the Contractor from responsibility for errors and/or omissions in Shop Drawings.

END OF SECTION

RF
5/11/10

SECTION 01400

QUALITY CONTROL

1.1 MATERIALS CERTIFICATION

- a. For certain products, assemblies and materials, in lieu of on-site sampling and testing procedures, the Owner will accept from the Contractor, the Manufacturer's certification with respect to the product(s) involved, upon the conditions set forth in the following paragraphs:
1. Certification shall state that the named product conforms to the Specifications and that representative samples have been sampled and tested as specified.
 2. Certification shall be accompanied with a certified copy of the test results.
 3. The certification shall give the name and address of the Manufacturer and the testing agency, the date of the test, and shall set forth the means of identification which will permit field determination of the products delivered to the project as being the product covered by the certification.
 4. The certification shall be duplicated with one copy sent with the shipment of the covered product to the Contractor and one copy sent to the Owner.
 5. The Owner will not be responsible for any additional costs for certification or for any costs of sampling and testing.
 6. The Owner reserves the right to require samples and test products to assure compliance with pertinent requirements with respect to fire certification of the products by the Manufacturer thereof.

END OF SECTION

RT
5/11/14

SECTION 13650

POINT OF ENTRY TREATMENT SYSTEMS

PART 1 – GENERAL

1.1 SCOPE

This Section covers the furnishing of all materials, labor, tools, and equipment and the performance of all operations for the proper manufacturer, installation, start-up, and maintenance of Point of Entry (POE) drinking water treatment systems in accordance with these Specifications.

1.2 GENERAL REQUIREMENTS

The principle items of each POE treatment system may include but not necessarily be limited to:

- a. Backwashing filter;
- b. Water softener and brine systems;
- c. Air strippers and external venting;
- d. Air injectors;
- e. Cartridge filters;
- f. Activated carbon contactors;
- g. Ultraviolet disinfection unit;
- h. Water meter; and
- i. All necessary piping, valving, piping supports, external venting, wiring, and electrical connections to assemble and place into operation the POE treatment systems.

1.3 RELATED WORK SPECIFIED ELSEWHERE

The products specified below are the types, sizes, models and selections made by the State Contractor(s) that were awarded the contract in the past and have been maintaining and repairing these components for each operating system. The Contractor shall have the option to provide the specified items or fabricate, provide, install, and maintain components that meet the "approved equal" provision, and satisfy Section 01340 requirements for shop drawings, samples, and data.

Rd
5/11/16

PART 2 - PRODUCTS

2.1 WATER METERS

- a. Water meters shall meet or exceed the latest AWWA C700 standard. Meters shall be magnetic drive, low flow torque registration.
- b. Meter shall have a normal operating range at 100% accuracy of 0.75 to 30 gallons per minute and shall read in US gallons.
- c. Maximum operating pressure shall be 150 psi and a maximum operating temperature of 80°F.
- d. Meter shall be direct reading with bronze box and cover.
- e. Inlet and outlet connections shall be 3/4 inch diameter.
- f. Meter shall be Neptune Model T-10 or approved equal.
- g. All POE system installations shall be metered.

2.2 ULTRAVIOLET DISINFECTION

- a. Ultraviolet disinfection unit shall use ultraviolet light to disinfect drinking water.
- b. The unit shall have a flow rate of 16 GPM at a dose of 16mJ/cm² at 85% UVT.
- c. Maximum operating pressure shall be 125 psi.
- d. UV chamber shall be 304 stainless steel and shall have 3/4 inch inlet and outlet connections.
- e. Power supply shall be 120 volt, single phase.
- f. Unit shall have a quartz sleeve covering the UV bulb.
- g. Unit shall be capable of operating with a maximum hardness of 120 ppm and a maximum iron concentration of 0.3 ppm.
- h. Control panel shall have lamp operation indicator, power supply operation indicator, lamp timer display, lamp timer reset button, alarm and mute button.
- i. Ultraviolet disinfection unit shall be Trojan UVMAX Model D4 Plus or approved equal.

2.3 AIR STRIPPERS

Air stripper shall be multi-stage diffused bubble aeration process capable of treating a flow rate of 1.0 to 16.0 gallons per minute at 40 psi and providing 20-40 CFM of air flow.

- a. The sump tank or bottom chamber shall be 44 gallon capacity or larger.
- b. The vapor discharge shall be 2-inch diameter.
- c. The water inlet shall be 3/4" diameter quick connect.
- d. Air blower shall be 0.5 hp regenerative type.
- f. The discharge pump to the 20 gal. expansion tank shall be 1 hp Grundfos pump, single phase, 115 volt or approved equal.
- g. Air stripper shall be AIRaider 433-S50X or approved equal.

2.4 ACTIVATED CARBON

- a. Granular Activated Carbon (GAC) shall be Coal or Coconut Shell Carbon (CS-GAC) based or be an approved equal item with both having a 12 X 40 mesh size and a minimum iodine number of 1000 mg/g.
- b. The bulk density shall be 28 lbs./cu.ft.
- c. Ash content shall be a maximum of 3 % and the minimum hardness shall be 95.
- d. Carbon shall be packaged in bags containing one cubic foot of carbon.
- e. Carbon shall be virgin and shall be manufactured by Calgon Carbon Corporation or approved equal.

2.5 WATER SOFTENERS

- a. Water softeners shall be fitted with control valves to control influent and effluent flow and regeneration flow.
- b. Water softeners are intended primarily for the removal of dissolved iron. For raw water with an iron concentration of up to 3 ppm, the unit shall contain a minimum of one cubic foot of exchange resin and have a capacity of 30,000 grains.
- c. For water with an iron concentration of from 3 ppm to 10 ppm, the unit shall contain a minimum of two cubic feet of exchange resin and have a capacity of 60,000 grains. The resin tanks shall have 10 gpm service flow rate and a 3 gpm backwash flow rate.

- d. Piping between the brine tank and the softener tank shall be 3/8 inch.
- e. Waste piping for the regenerate shall be 5/8 inch diameter.
- f. Brine tank shall be 18 inch diameter and 30 inches high and shall be made of high density polyethylene. The brine tank shall have a safety float to prevent overflows.
- g. The control valves shall time the operation of the softener and shall backwash the exchange resin at intervals that can be set by the user. The valve shall be 110 volt, single phase.
- h. Inlet and outlet connections for the control valve shall be 3/4 inch.
- i. Exchange resin shall be sulfonated polystyrene cation resin. Beads shall be uniform spherical. Resin shall be suitable for use for potable water. Resin shall be ResinTech CGS-BL or approved equal.
- J. Control valves shall be Fleck 5600 or Fleck 6700 or approved equal.
- k. Resin tank shall be spiral-wound fiberglass and have a pressure rating of 125 psi. Tank shall be manufactured by Structural Fibers or approved equal.

2.6 BACKWASHING FILTERS

- a. Backwashing filters shall be fitted with control valves to control influent and effluent flow and backwash flow.
- b. Filter media shall have a bulk density of 24 to 26 lbs/cu. ft., a specific gravity of 2.25 gm/cc, effective size of 0.67 mm, and a uniformity coefficient of 1.8. Filter media shall be Filter-Ag or approved equal.
- c. Waste piping for the backwash shall be 5/8 inch diameter.
- d. Control valve shall be Fleck 5600 or approved equal.
- e. Inlet and outlet connections for the control valve shall be 3/4 inch.
- f. The control valves shall time the operation of the softener and shall backwash the exchange resin at intervals that can be set by the user. The valve shall be 110 volt, single phase.
- g. Filter tank shall be spiral-wound fiberglass and have a pressure rating of 125 psi. Tank shall be as manufactured by Structural Fibers or approved equal.
- h. Service flow rate shall be 5 gpm/s.f. and backwash flow rate shall be 8-10 gpm/s.f.
- i. The filter tank shall be sized to provide a minimum of 50% of bed depth freeboard during normal operation.

RT
5/11/16

j. Media depth shall be a minimum of 24 inches.

2.7 ACTIVATED CARBON CONTACTORS

- a. Contactor tank shall be spiral wound fiberglass and have a pressure rating of 125 psi. Tank shall be as manufactured by Structural Fibers or approved equal.
- b. Activated carbon used in the contactors shall be as specified in Section 2.4.
- c. Contactors shall be non-backwashing down-flow units.
- d. Two contactors shall be installed to operate in series.
- e. For installations with 6 cubic foot contactors, piping and valving shall be installed to permit either contactor to be lead or lag.
- f. Normal operating pressure for carbon contactors shall be 40 to 60 psig.
- g. Surface loading rate shall be 10 gallons per minute per square foot.
- h. Contactors shall conform to the requirements in the table below:

	2 Cu. Ft.	3 Cu. Ft.	4 Cu. Ft.	6 Cu. Ft.
Size of contactor vessel	12" dia. by 48" high	13" dia. by 54" high	21" dia. by 36" high	24" dia. by 50" high.
Size of piping connections	¾"	¾"	1"	1"
Service flow rate	6 gpm	8 gpm	14 gpm	18 gpm
Carbon bed depth	32"	41"	24"	33"

2.8 AIR INJECTION UNITS

- a. Air injection unit shall consist of an air compressor with pressure gauge and air regulator valve, check valves, air injection valve, interconnecting tubing, aerator tank, and air vent.
- b. Air compressor shall deliver 0.2 CFM at a pressure of 40 psig.
- c. Compressor motor shall be 115 volt, single phase.
- d. Air compressor shall be Model API, manufactured by Air Pump Water Solutions, Inc. or approved equal.
- e. Compressed air feed from the air compressor to the injection point shall be 3/8" tubing.
- f. Air vent shall be Honeywell Braukman, Model number 6781 or approved equal.

RF
5/11/10

- g. Aerator tank shall be spiral wound fiberglass and have a pressure rating of 125 psi. Tank shall have a minimum capacity of 2 cubic feet. Tank shall be as manufactured by Structural Fibers or approved equal.
- h. Air injection valve shall have a Celcon plastic body with a venturi passage and a by-pass passage. Inlet and outlet connections shall be 1" diameter. Water flow through the venturi shall be controlled by a valve gate. Air injection valve shall be a Mironizer by Waterrite or approved equal.

2.9 PIPING

- a. All water supply piping shall be copper, Schedule L.
- b. All waste piping shall be polyethylene tubing.
- c. All vent piping shall be hollow core PVC.

PART 3 - EXECUTION

3.1 WIRING

All wiring shall be completely in accordance with applicable wiring standards set forth by the National Electric Code.

3.2 MANUFACTURED EQUIPMENT

If the Contractor selects equipment other than the basis of design, it shall be his responsibility and expense to adjust any structures, piping, electrical or controls as required to meet the intention of the specifications.

3.3 ELECTRICAL INSTALLATION

- a. Electrical installation shall meet the latest requirements of the National Electrical Code of the National Board of Fire Underwriters AND as specified in Division 16 - ELECTRICAL. In addition, State, municipal or local authorities' laws, rules or regulations applicable to the Work shall be followed.
- b. Where grounding type receptacles are required by the latest Underwriters' Code, they shall be installed in accordance with the latest Underwriters' Code using the green ground wire and grounding type receptacle.
- c. Contractor shall secure and pay for any and all permits and inspections required by any of the foregoing authorities, and pay for all other costs, in connection with the Work. Upon completion of the Work, the contractor shall secure from the local authority

certificates of inspection by them. All certificates shall be in triplicate and shall be delivered to the Owner.

- d. Electrical installation shall be performed by an electrician or other person licensed by the New Hampshire Electricians' Board.

3.4 CONTRACTOR IDENTIFICATION

- a. The Contractor's field personnel shall wear uniforms and be provided with identification badges. Badges shall be worn in a conspicuous manner at all times. The identification badges shall have the name and photograph of the employee.
- b. All vehicles used by the Contractor shall be clearly identified with the Contractor's company logo.

3.5 LIMITATIONS ON ENTRY TO RESIDENCE

- a. Except as may be provided by express agreement between the NHDES, the Contractor and a specific Homeowner, business owner or PWS owner, the Contractor shall not attempt to access a property to conduct work related to this contract after dark, nor shall the Contractor attempt to access a property without the permission of an adult resident.
- b. The Contractor shall perform only those tasks approved by the NHDES that are necessary to complete the work and will not accept payment from any resident in relation to these tasks.

3.6 INSTALLATION APPOINTMENTS

Except as may be provided by express agreement between the NHDES, the Contractor and a Homeowner, the Contractor shall have sole responsibility for making installation appointments. Contacts with the Residents/Users shall be made in a courteous and professional manner during normal business hours 8:00 AM until 5:00 PM or when necessary no later than 8:00 PM in the evening.

3.7 INTERRUPTION OF WATER SERVICE

The Contractor shall proceed with the installation in a manner that minimizes the interruption of water service to the Homeowner. The Contractor shall advise the Homeowner and/or User that the installation will require an interruption of water services and the approximate duration of the interruption. The Contractor shall minimize the interruption in water service. If previous arrangements are made with the User, water service interruption shall not exceed 8 hours.

RFJ
5/11/16

3.8 POE EQUIPMENT INSTALLATION

- a. All installations shall be directed by an employee of the Contractor who is thoroughly trained and experienced in the installation of POEs and who is a licensed Plumber or certified Water Treatment Technician by the New Hampshire Board of Licensure.
- b. The licensed Plumber or certified Water Treatment Technician shall be responsible for the means, methods, techniques, sequences and procedures for the design and installation of the POE, and its operation and maintenance.
- c. The Contractor shall provide documentation to the NHDES for all of his staff who are licensed Plumber Water Treatment Technicians.
- d. This contract shall not be used for POE installations for public water supplies that have 50 or more service connections or that have a design flow equal to or greater than 20,000 gpd.

3.9 INSTALLATION OF TREATMENT SYSTEMS

The Contractor shall install and maintain point of entry treatment systems (POEs) at various locations throughout the state. Generally, the following sequence of events will occur prior to the installation of a POE.

- a. NHDES shall identify residential or commercial locations where a POE shall be installed. NHDES will provide water quality analytical results to the Contractor which describe the degree of volatile organic contamination present due to petroleum hydrocarbons and/or hazardous waste constituents.
- b. The Contractor shall conduct a site visit to interview the water system user and/or homeowner relative to specific operational characteristics of the water supply system and evaluate potential installation locations and configurations for the treatment system. Site specific conditions such as taste and odor complaints shall be noted. The Contractor shall collect water samples and have them analyzed for pH, hardness, iron, manganese, arsenic, radon, chlorides, sodium, bacteria, volatile organic compounds, or other contaminants as necessary and appropriate. Samples shall be delivered to the State's DHHS Public Health laboratory located at 29 Hazen Drive in Concord for analysis.
- c. The Contractor shall review the raw water analytical data and propose a POE to treat the contaminated water supply for removal of VOCs and other contaminants, as necessary. In general, NHDES anticipates that the POE will consist of a minimum of two granular activated carbon (GAC) adsorbers configured in series followed by a meter to monitor water usage. The first GAC unit in the treatment-train should be sized to remove VOC contamination to levels below Ambient Groundwater Quality Standards (AGQS). The second GAC unit will be similarly sized and will function as a

RJ
5/11/16

redundant unit to accommodate fluctuation in contaminant concentrations and/or water usage. If analytical results indicate that the non-hydrocarbon contamination exists at levels that may interfere with efficient operation of the POE, the Contractor shall also provide a pretreatment unit, such as a backwashing filter or water softener, to condition the water prior to GAC treatment. If the non-hydrocarbon contamination consists of significant concentrations of radon or high concentrations of VOCs, an air stripper will be installed prior to GAC treatment to prevent adverse impacts to the carbon or to reduce carbon loading.

- d. The Contractor shall make a determination of whether the water supply system constitutes a Public Water System. A Public Water System is classified as a water system that serves 25 people or 15 service connections for 60 days of the year or more. Reference the NH Safe Drinking Water Act, RSA 485:1-a Definitions XV.
- e. If the POE is to be installed on a Public Water System, the proposed POE system shall be subject to review and approval by the New Hampshire Department of Environmental Services, Drinking Water and Groundwater Bureau. The proposed POE system shall conform to Env-Dw 100 through 1200. For any POE to be installed on a Public Water System, two complete sets of plans for the POE shall be submitted to the DES a minimum of two weeks prior to the scheduled installation.
- f. The NHDES shall review the proposed treatment scheme and either approve or require modification to the proposed scheme.
- g. Upon NHDES approval, the Contractor shall contact the Property Owner, business owner or PWS owner to arrange an appointment and coordinate installation of the POE.

3.10 INSTALLATION WHERE PLUMBING IS DETERIORATED OR WHERE EXISTING WATER QUALITY CONTAINS NON-VOC CONTAMINANT

- a. The Contractor shall inform NHDES and shall not commence installation without authorization from NHDES if:
 - The condition of existing water supply interior piping is deteriorated or configured in such a way that significantly more time and/or materials will be required to complete the installation; or
 - Existing raw water contains high concentrations of a non-VOC contaminant such as bacteria or other impurities/odors.
- b. Under these conditions, the Property Owner will be required to upgrade the existing plumbing or eliminate the source of the non-VOC contamination, as necessary. If the

RA
5/11/14

Property Owner is unable or unwilling to comply with this requirement, the Contractor shall take no further action on the installation until directed or authorized by NHDES.

3.11 POST-INSTALLATION ACTION

After the installation is complete, the Contractor shall open all valves and check for leaks. Water shall be run through the POE to make sure that it is functioning properly. The Contractor shall correct any defects observed as quickly as possible. The Contractor shall also leave information with the User which identifies and describes POE system components and provides instruction for operation of the POE, as necessary. Operations Manuals will be available upon request.

3.12 POE TREATMENT SYSTEM AGREEMENT

A Treatment System Agreement will be signed by the Property Owner and User, as appropriate, and an authorized representative of the State (i.e., the NHDES Program Manager or the Contractor). The signed Agreement shall include an original and three copies. The original Treatment System Agreement is to be given to the Property Owner; one copy is to be given to the User if different from the Property Owner; one copy to the NHDES Program Manager; and the final copy retained by the Contractor.

3.13 INSTALLATION REPORT

The Contractor shall complete an Installation Report for each installation. The Installation Report format shall be prepared by the Contractor and shall be approved by NHDES. The report documents shall include an original and two copies and shall at a minimum contain the following information:

- a. Name, address and telephone number of Property Owner;
- b. Name, address and telephone number of User if different from Property Owner;
- c. Date of installation and name of Contractor's employee(s) overseeing installation;
- d. Water quality parameters: hardness, ferric iron, ferrous iron, pH, manganese, bacteria, radon, VOCs, etc.;
- e. Type, size and condition of existing water service and pump;
- f. Type, yield, size, and depth of well (as provided by Property Owner or User);
- g. Type and size of existing pressure tank;
- h. Any leaks or other noteworthy conditions found prior to beginning the installation;
- i. Any repairs required;

RT
5/11/12

- J. Serial number of all installed treatment components;
- k. Sketch or photo of installation showing existing plumbing, location within the building, vent pipe, and other data as appropriate;
- l. Name of person consenting to installation;
- m. Indication of Property Owner/User consent/acknowledgment of the following items:
 - 1. Consent to installation and full-time operation of POE;
 - 2. Temporary disruption of water service;
 - 3. Acknowledgment of any pre-installation leaks, etc.;
 - 4. Acknowledgment that there were no leaks or other damage done to the plumbing or the building as a result of the installation;
 - 5. Acknowledgment that the installation is to be made at no charge to the Property Owner/User and that no such payment was made;
 - 6. NHDES inspection and acceptance/rejection of installation, in accordance with specifications and approved drawings;
 - 7. Advisory notice that noise levels of the aerator (if installed) will be equivalent to those of a forced hot air furnace and that the water may appear "cloudy" due to the presence of tiny air bubbles which should not be harmful to building plumbing;
 - 8. Advisory notice that holes made in the exterior of the building structure for installation of an air stripper vent will be repaired by filling the hole around the vent pipe with insulation and capping the vent pipe with a standard clothes dryer vent;
 - 9. Other comments, as necessary and appropriate.

The original installation report is to be kept by the Property Owner; one copy to NHDES; and the final copy retained by the Contractor. Electronic copies are required to be submitted to NHDES.

3.14 NORMAL MAINTENANCE OF POE TREATMENT SYSTEMS

Backwashing filters, water softeners, and aerators will be maintained every six months. Granular activated carbon (GAC) contactors will require normal maintenance every twelve months. When maintaining the units, the Contractor shall at a minimum perform the following activities for the types of treatment units in operation:

- a. Activated carbon contactors - Contractor shall:
 - Check for leaks and repair unless item is replaced;
 - Manipulate all valves;
 - Check that all sample taps are labeled and operational;
 - Check the pressure loss and any odors from the tanks; and
 - Wipe down the system components.
- b. Backwashing filter - Contractor shall:
 - Check for leaks and repair unless item is replaced;
 - Manipulate all valves and bypasses;

RT
5/11/16

- Verify proper operation of control valves;
 - Disassemble and clean control valve if necessary;
 - Test and record raw water iron concentration;
 - Test and record filtered water iron;
 - Verify proper backwashing frequency;
 - Record valve settings if different from the initial installation;
 - Check that all sample taps are labeled and operational; and
 - Wipe down system components.
- c. Cartridge filter - Contractor shall:
- Check for leaks and repair unless item is replaced;
 - Note condition of current cartridge filter;
 - Replace the used cartridge filter;
 - Disinfect the cartridge housing;
 - Leave a spare cartridge on site; and
 - Wipe down system components.
- d. Water softener - Contractor shall:
- Check for leaks and repair unless item is replaced;
 - Manipulate all valves;
 - Verify proper operation of control valves;
 - Disassemble and clean control valve if necessary;
 - Test and record raw water iron;
 - Test and record softened water iron;
 - Verify regeneration frequency and salt dosage;
 - Check brine valve and clean if necessary;
 - Check control float on brine tank to ensure proper operation;
 - Replenish salt in brine tank;
 - Record valve settings if different from the initial installation;
 - Check that all sample taps are labeled and operational; and
 - Wipe down system components.
- e. Air stripper - Contractor shall:
- Check spray nozzles;
 - Check tank and tray gaskets;
 - Clean aeration tray and tank;
 - Disinfect tank;
 - Check float control;
 - Change air filter;
 - Verify proper blower operation;
 - Check condition of vent;
 - Check exhaust fan operation;
 - Set bladder tank pressure for repressurization pump;
 - Set pump cycle;

RF
5/11/16

- Check function of low flow pump shutoff;
 - Clean gauge tee and casing port;
 - Operate and lubricate the bypass as necessary;
 - Check and tighten hose clamps, as necessary;
 - Check all valves are left in proper operating positions; and
 - Wipe down system components.
- f. Ultraviolet disinfection system - Contractor shall:
- In installations where a cartridge filter immediately precedes the UV unit, follow the procedure outlined in this section for servicing and maintaining a cartridge filter;
 - Check by-pass integrity;
 - Remove and clean quartz sleeve;
 - Clean light sensor;
 - Replace bulb if this is an annual servicing;
 - Check all valves are left in proper operating positions; and
 - Wipe down system components.
- g. Air injection unit - Contractor shall:
- Check the air draw for the venturi and adjust;
 - Clean the venturi if necessary;
 - Note the cut in and cut out of the well system;
 - Check the air pressure;
 - Adjust and note settings;
 - Change the air filter;
 - Replace the pressure relief valve;
 - Blow down and sanitize the air pressure tank;
 - Change the air release valve;
 - Check all valves are left in proper operating positions; and
 - Wipe down system components.
- h. Calcite neutralizer unit - Contractor shall:
- Check for leaks and repair unless item is replaced;
 - Manipulate all valves and bypasses;
 - Add calcite media to the "full" point in the neutralizer;
 - Check all valves are left in proper operating positions; and
 - Wipe down system components.

3.15 EMERGENCY MAINTENANCE OF POE TREATMENT SYSTEMS

- a. The Contractor shall maintain an emergency maintenance service capable of responding to any emergency related to a POE within 12 hours of receiving a call from the User or Property Owner.

RD
5/11/16

- b. The Contractor's agent receiving calls shall be knowledgeable in POE operation and shall be capable of giving clear operational or mechanical instructions to the User or Property Owner until the Contractor's repair personnel arrive.
- c. The Contractor shall maintain a 24 hour emergency telephone and messaging service for the term of the contract to receive calls outside of normal business hours. Said service shall be incidental to the Work under this contract.
- d. If possible, NHDES shall be contacted for authorization of the required repairs or maintenance prior to commencement of the work. However, NHDES shall be contacted the next business day of any emergency repairs performed.
- e. Following an emergency repair or maintenance incident, a report shall be submitted to NHDES which details the following, as applicable:
 - Time of initial call to Contractor;
 - Nature of problem;
 - Flow meter total;
 - Steps taken to solve the problem without a service call;
 - Time and duration of service call;
 - Parts used/Hours worked/Costs incurred;
 - Signature of User/Property Owner and Contractor's repair person verifying performance of the work; and
 - Date and time and name of NHDES employee authorizing the emergency maintenance, if so authorized.
- f. Emergency maintenance shall be carried out in accordance with the Bid Items 22 and 23 in the Bid Schedule. Activities related to emergency maintenance shall be paid at the hourly rate bid under the item labeled Licensed Technician and Licensed Plumber in the Bid Schedule. Parts required to accomplish the emergency repairs and/or maintenance and not included in the Bid Items will be paid for as a Change Order.

3.16 WARRANTY

- a. The equipment, apparatus and parts furnished by the Contractor shall be guaranteed for a period of one year from acceptance of each POE project installation by the Owner.
- b. Major components, such as pumps, pump motors, etc., failing to perform as specified by these specifications or as represented by the manufacturer, or proven defective in services during the guarantee period, shall be replaced, repaired or satisfactorily modified by the manufacturer without cost of parts or labor to the Owner. After startup and acceptance by the Owner, labor to replace accessory items such as valves, electrical components, or other accessible and easily serviced parts, shall be the responsibility of the Contractor. Such components, parts or repairs determined by the

RA
5/11/10

manufacturer and Owner to have failed because of defective workmanship or materials will be replaced or repaired by the manufacturer at no cost to the Owner.

RA
5/11/16

POINT OF ENTRY TREATMENT SYSTEM AGREEMENT

Agreement between

Property Owner

hereinafter called the "Owner" and

Property Resident (if different than Property Owner)

hereinafter called the "resident" and the State of New Hampshire Department of Environmental Services, hereinafter called the "State".

WHEREAS, Owner is owner of property ("Property") located at

Property Address

and

further described on _____ tax map as

Name of City or Town

Tax Map & Lot Number

WHEREAS sampling of water from the well serving Owner's has detected

List Contaminants

levels that are greater than acceptable health risks;

WHEREAS, the source of contamination in Owner's well is unknown;

NOW, THEREFORE, to protect the health of residents of the state, and without admitting liability or responsibility, the State and Owner(s) and Resident(s) agree as follows:

1. The State shall:

- A. Install, maintain, and remove a POE treatment system ("POE System") to treat Owner's well water supply;
- B. Sample the POE System influent and effluent at least annually;

RDJ
5/11/14

POINT OF ENTRY TREATMENT SYSTEM AGREEMENT (continued)

- C. Remove all POE System equipment, piping, and materials upon completion of operation of the System;
 - D. Return the area of Owner's property where the POE System was installed to substantially the same condition which existed prior to installation. Note that at locations where an air stripper is installed, holes made in the exterior of the building structure for installation of an air stripper vent will be repaired by filling the hole with insulation and capping the outside wall with a dryer vent;
 - E. Pay all costs related to installation, maintenance, periodic sampling of the water, and removal of the POE System;
 - F. Leave in place and maintain the POE System until such time as: (a) Owner's water supply meets applicable standards or (b) the installation of an alternative water supply to replace Owner's current water supply is completed. Conformance with the standard shall be demonstrated by the contaminant concentration in at least three consecutive samples, taken no less than three months apart, being less than 80% of the AGQS. State will provide Owner reasonable advance notice of scheduled maintenance, sampling and removal of the POE System; and
 - G. Remove POE System from Owner's property as soon as practicable following the first to occur: conformance with drinking water standards as set forth in paragraph F above or the installation of an alternative water supply.
2. In consideration of the State's promises, enumerated above, the Owner and/or Resident shall:
- A. Provide an area, protected against freezing, suitable for installation of the System;
 - B. Grant the State access to Owner's property and the System for operation and maintenance, and removal of the POE System during normal business hours;
 - C. Protect the POE System from damage;
 - D. Take no action that could result in damage to the POE System and follow all instructions for use and care of the POE System;
 - E. Pay for ordinary operating costs related to POE System such as salt replacement and electricity;
 - F. Be liable for costs associated with repair of POE System if Owner damages the POE System;

RA
5/11/10

**POINT OF ENTRY TREATMENT SYSTEM AGREEMENT
(continued)**

- G. Agree that the State makes no warranties, express or implied concerning the quality of the water produced by the POE System or the impact of the POE System or its installation or removal on Owner's property;
- H. Agree that the POE System and all of its components are the property of the State of New Hampshire; and
- I. Agree to execute any documents that are necessary for the State to file fixture filings for the POE System and its components with the registry of deeds and the Secretary of State pursuant to RSA 383-A:9-313, and owner hereby expressly disclaims any interest in the System and its components.

Signed this _____ day of _____, 2016.

Owner:

Signature

Printed Name

Resident (if different than Owner):

Signature

Printed Name

Authorized State Representative:

Signature

Printed Name & Title

END OF SECTION

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5/11/20

SECTION 16000
ELECTRICAL PROVISIONS

PART 1 – GENERAL

1.1 SPECIAL CONDITIONS

- a. The general provisions of the contract, including General Provisions, and Special Provisions shall apply to the work specified under Division 16 of these Specifications.
- b. The Specifications written herein, and the associated Drawings, are complementary, and any portion of the work described in one shall be provided as if described in both. In the event of discrepancies on the Drawings and Specifications, this Contractor shall advise the Owner of same prior to proceeding with the work involved, in order that correct progress of the work may be insured.
- c. Coordination with Utilities: It shall be the responsibility of this Contractor to coordinate his work with the local Building Code Department(s) and utility providers to insure that his work is terminated in a satisfactory manner and meets all service requirements.
- d. All public and private property damaged as a result of work performed under this contract shall be repaired and replaced by the Contractor, to the satisfaction of regulations and authorities having jurisdiction.
- e. The Contractor shall guarantee all material and installation under normal use, to be free from defects and poor workmanship for a period of one (1) year from the date of acceptance, Any replacement of parts or adjustments, including labor, made necessary by inherent defects, shall be provided by the Contractor without cost to the Owner, within the guarantee period.

1.2 REGULATIONS

- a. The electrical installation shall meet the latest requirements of the National Electrical Code of the NFPA. In addition, State, Municipal, or other authority laws, rules or regulations applicable to the work shall be followed.
- b. Where grounding type receptacles are required by the latest Code, they shall be installed using the green ground wire and grounding type receptacle.

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5/11/16

- c. Contractor shall secure and pay for any and all permits and inspections required by any of the foregoing authorities, and pay for all other costs in connection with the work. Upon completion of the work, the Contractor shall secure certificates of inspection. All certificates shall be in triplicate and shall be delivered to the applicable Town/City and shall become the property of the Owner.

1.3 STANDARDS

- a. The work manufactured and furnished under any part of this specification shall satisfy all applicable Federal, State and Local Codes, Ordinances and Regulations in force in the locality of the Project, regulations of local Power Company and Telephone Company, and applicable standards of ANSI, IEEE, ISA, NEMA, UL, NFPA and NBC.
- b. Where standards differ, the Contractor shall state which standard applies. Unless modified by provisions of this specification, these standards apply, whether mentioned in the text or not. The Contractor shall also note where existing standards are not satisfied or only partially satisfied. Where non-standard hardware or services are offered; the Contractor shall defend their adequacy in relation to the functions to be performed, and the cost of fully satisfying existing standards.
- c. All materials, treatment equipment, and control fixtures shall bear a U.L. label or shall be U.L. listed, unless U.L. does not have an examination service for the item in question.
- d. Before submitting bids, the Contractor shall consult the above necessary provisions for same bid, and call to the Owner's attention any work conflicting with the above codes, regulations, and requirements so proper addenda can be issued.

1.4 APPROVAL OF MATERIALS

- a. The Contractor shall submit to the applicable Town/City, a complete list of the materials and equipment they propose to use in the electrical work giving the name and address of the manufacturer and when required for proper identification, the trade name or catalog number. This list shall itemize each type of material and each piece of equipment (omitting duplicates).

1.5 SHOP DRAWINGS AND MANUALS

- a. The Contractor shall submit to the Owner, shop drawings in accordance with Section 01340 giving performance data, physical size, wiring diagrams, catalog cuts and/or brochures describing materials, etc., on the following if applicable:

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5/11/10

- 1) Motor control center
 - 2) Motor control apparatus
 - 3) Panel boards
 - 4) Safety switches
 - 5) Circuit breakers
 - 6) Heavy-duty, oil-tight, pushbutton stations, selector switches and indicating lights
 - 7) Dry-type transformers
 - 8) Timers
 - 9) Conduit, wire and cable
 - 10) Lighting fixtures
 - 11) Thermostats
 - 12) Convenience outlets
 - 13) Light switches
- b. None of the aforementioned items shall be installed in the work until final approval has been given by the Owner.
- c. The requirements of each electrical component shall be identified by the Contractor before submission of shop drawings, and all necessary accessory parts required between items of electrical equipment shall be identified (on separate drawings, if necessary, showing the particular system) in sufficient detail to prove that the total equipment furnished and installed will operate as specified and shown on the drawings.
- d. Construction drawings showing detailed conduit routing, wiring, equipment locations, etc., shall be generated by the Contractor and submitted to the Owner for approval in the same manner as shop drawings.
- e. Capacities of equipment and materials shall be not less than those specified.
- f. Any equipment incorporated into the project without prior approval by the Owner will be replaced by the Contractor at his own expense and without delay to the project's completion.
- g. Operation and Maintenance Manuals shall be furnished for electrical equipment in accordance with Section 01730.
- h. In addition to the above, the Contractor shall instruct his workmen to save all literature and instructions shipped with equipment furnished and installed under his contract. All literature shall be compiled by the Contractor in an approved binder and submitted to NHDES at the termination of his work.

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5/11/16

1.6 FINAL ACCEPTANCE

- a. The Owner shall consider final acceptance of the power and control systems when all wiring considered as a complete system functions to operate all connected electrical equipment in the proper manner as indicated in the detailed specifications and drawings. All motors, pumps, blowers shall be properly connected to protective devices and control panels, give proper motor acceleration, and correct motor rotation as indicated on the drawings and as required by the driven equipment. The control wiring shall be properly interconnected to all the control devices associated with a component or a group of components to produce the correct operating, timing and sequencing necessary for the proper functioning of the mechanical equipment as set forth by the specifications. After start of operations, the Contractor shall make all necessary adjustments and alterations within 90 days of installation at no additional cost.
- b. Prior to final acceptance of the Division 16 work, the Contractor shall refinish or replace all damaged or imperfect materials, remove from the premises all waste material present as a result of their work, including cartons, crating, paper, stickers, scaffolding, tools, etc., they shall clean all pieces of equipment installed under this contract to present a neat and clean installation.

END OF SECTION

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5/11/16

SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 MATERIALS, STANDARD PRODUCTS AND WORKMANSHIP

- a. Unless otherwise indicated, the materials to be furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements.
- b. Materials shall be delivered to the site in the original sealed containers or packages bearing the manufacturer's name and brand designation. All materials shall be stored in a clean, well ventilated, warm area. Care shall be exercised in handling materials during delivery, storage, and installation. All material damaged, in the opinion of the Owner shall be replaced at no additional cost to the Owner.
- c. Obtaining Information: The Contractor shall obtain detailed information from the manufacturers of apparatus which is to be provided for the proper methods of installation. They will also obtain all information from the Owner files and from other subcontractors which may be necessary to facilitate his work and the completion of the whole project.
- d. Giving Information: The Contractor shall stay informed as to the shape, size, and position of all openings and foundations required for his apparatus and shall give full information to the electrician/technician sufficiently in advance of the work, so that all such openings and foundations may accounted for in advance. He shall also furnish all supports herein specified.
- e. All the work shall be executed in a workmanlike manner by experienced licensed electricians, in accordance with the most modern engineering practice and shall present a neat appearance when completed. The work shall be carefully laid out in advance, and where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to the building, piping, or water supply equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner.
- f. After installation, all electrical equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent entrance of foreign materials. The interior of boxes and cabinets shall be left clean, exposed surfaces shall be cleaned and plated surfaces polished.

1.2 WIRING METHOD AND CONDUCTORS

- a. Generally, and unless otherwise specified or indicated on the drawings, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduits, and sealtight (explosion-proof where required) flexible conduit connection at motors and vibrating equipment.
- b. All conductors for this project will be copper with 600 volt insulation, type XHHW cross-linked polyethelene approved by the National Electrical Code as flame retardant and for operating temperature of 75 degrees C in wet or dry location. It shall meet IPCEA Standards and be U.L. labeled XHHW.
- c. Minimum size of power conductors shall be No. 12 AWG; minimum size of control conductors shall be No. 14 AWG.
- d. Where multiple circuits are run together in a conduit, wire sizes shall be increased to allow for de-rated ampacities per National Electrical Code.
- e. Wire in sizes #12 AWG and smaller shall be furnished solid. No. 10 AWG and larger must be stranded.
- f. All wire furnished under this specification shall be not less than 98% conductivity copper.
- g. All joints #8 AWG and smaller shall be made with insulated Scotchlox connectors. Joints #6 AWG and larger shall be made with suitable solderless connectors wedge or screw type and taped with Scotch #33 plastic tape.
- h. All electrical wiring shall be installed continuous between outlets and boxes without any joints or splices present within the conduit. Conductors in panelboards shall be neatly grouped, laced and fanned out to terminals.

1.3 MATERIALS

- a. Furnish, install and wire all electrical equipment specified herein and indicate on the drawings, unless noted otherwise.
- b. Manufacturer's catalog and/or model numbers specified herein or on the drawings are intended to indicate the type and quality of design and materials, as well as operating features required by the specifications. Equipment of other manufacturers will be considered if, in the opinion of the Owner, the standards of performance, quality and appearance meet the requirements of that specified.

RDH
5/11/14

1.4 NAMEPLATES

- a. Furnish and install a nameplate on each circuit breaker, panelboard, switch and motor starters provided under this section of the specifications. Nameplates should be black laminated plastic (3"x1"x1/16" thick) engraved to white core. Edges of the nameplates shall be beveled. Letters shall be 1/18" high. Adhesives will not be permitted for fastening nameplates.
- b. Provide each panelboard with a typed index card identifying equipment serviced by each branch circuit breaker.

1.5 GROUNDING

- a. The conduit system, the system neutral, all distribution equipment enclosures, cabinets, boxes, motor frames, building structures, etc., shall be grounded in compliance with the standards set forth in Articles 250 and 5010-16 of the National Electrical Code, and in conformance with Local codes and servicing utilities, and as shown on the drawings.
- b. Provide Owner with certified test that the grounding system resistance does not exceed 25 ohms for electrical work installed under this contract.
- c. Provide a separate bonding conductor in each conduit installed under this project. All bonding conductors shall be copper with green insulation and sized per table 250-95 of the National Electrical Code.

1.6 MISCELLANEOUS

- a. Switches and convenience outlets shall have a rating as specified on the drawings, and shall be installed in cast outlet boxes approved for surface mounting and provided with a suitable cover for the device to be installed. Both cover and box shall be galvanized. Each box shall have sufficient volume to accommodate the device and number of conductors entering the box in accordance with the requirements of the National Electrical Code.
- b. Each motor shall be provided with a disconnecting means under this contract when required by the National Electrical Code whether or not indicated on the Drawings.
- c. The Electrical Contractor shall check each motor for proper operation and rotation and motor starter overload heater ratings shall be compared to actual motor running current. If the overload heaters are not properly sized, the contractor shall advise the motor starter supplier in order that corrective action may be taken.
- d. Motor horsepower indicated on the electrical drawings are noted for the convenience of the Contractor, and final motor horsepower will be dictated by

specific equipment installed. In the event of deviations between motor horsepower indicated and actually furnished, it shall be the responsibility of this Contractor to advise the Owner in order that feeder, switch and fuse or breaker sizes may be checked. This Contractor shall provide required feeder, switch and fuse or breaker changes, necessary as a result of motor horsepower deviations, without additional cost to the Owner.

END OF SECTION

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5/11/14

SECTION 16120

WIRES AND CABLE

PART 1 - GENERAL

1.1 CODES, STANDARDS AND APPROVALS

- a. All wiring shall be in accordance with the sizes specified on the drawings; however, if sizes shown are smaller than required by local, state or NEC codes, the codes shall take preference. If the drawings indicate sizes larger than code requirements, then the drawings shall take precedence.
- b. As a minimum requirement, all wiring shall be installed in accordance with the latest revision of the National Electrical Code and National Electrical Safety Code.
- c. Minimum bending radii for cables shall be in accordance with the manufacturer's standards.
- d. All rubber and rubber-like insulated wire and cable shall be manufactured and tested in accordance with IPCEA Publication No. S-19-81 (latest edition), NEMA Publication No. WC3 .
- e. All thermoplastic insulated wire and cable shall be manufactured and tested in accordance with IPCEA Publication No. S-61-402 (latest edition), NEMA Publication No. WC7.
- f. All cross-linked polyethylene insulated wire and cable shall be manufactured and tested in accordance with IPCEA Publication No. S-66-524 (latest edition), NEMA Publication No. WC7.
- g. Cable shall be manufactured by General Electric Co., Okonite Rockbestos or approved equivalent. Catalog numbers referred to in this section are provided to identify the cable type, used as a basis for sizing conduits and ducts.

1.2 DELIVERY

- a. All wire shall be delivered to the job in complete coils with the manufacturer's name and approval tag indicating wire size and type of insulation.

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5/11/16

1.3 MARKING

- a. Wire size, grade of insulation and manufacturer's name shall be marked on the finish at regular intervals.

1.4 SIZING

- a. Minimum size of power conductors shall be no. 12 AWG; minimum size of control conductors shall be No. 14 AWG.
- b. Where multiple circuits are run together in a conduit, wire sizes shall be increased to allow for de-rated ampacities per National Electrical Code.
- c. Wire in sizes No. 12 AWG and smaller shall be furnished solid. No. 10 AWG and larger must be stranded.

PART 2 - PRODUCTS

2.1 WIRES AND CABLE

- a. Indoor lighting branch circuits and control circuits shall be single conductor stranded copper, 600 volt insulation, type XHHW or dual rated type THHN-THWN moisture and heat resistant, approved by National Electrical Code as flame retardant.
- b. For 600 volt standard service, single conductor stranded copper cable shall have heat and moisture resistant thermoplastic insulation or cross-linked synthetic polymer insulation, or approved equal, rated to withstand a copper temperature of 75 degrees C in wet locations and 90 degrees C in dry locations without deterioration. It shall meet applicable IPCEA standards and be UL labeled.
- c. Unless otherwise specified, all wire furnished under this specification shall be not less than 98% conductivity copper.
- d. Type 90 degree C heat resistant wire shall be used for wiring of lighting fixtures, and between fixtures and their adjacent outlets.

2.2 SHIELDED SINGLE, PAIR, OR TRIPLES (Triad) (Instrument Cable)

- a. For general shielded service, single pair or triad cables shall consist of two or three conductors, with drain wire, twisted together, served with a continuous grounding shield and protected with an insulating jacket.
- b. Individual conductors shall consist of a tinned, soft, annealed copper conductor, No. 16 AWG, stranded, insulated with 90 degrees C flame retardant cross-linked

polyethylene insulation rated 600 volts. The twisted pair or triad shall have a maximum lay of 2 inches (6 twists per foot). The drain wire shall be tinned, stranded copper No. 18AWG. The twisted assembly shall be shielded with a spirally applied aluminum mylar shield, and covered with a 45 mil heavy duty thermosetting jacket meeting the requirements of paragraph 7.4.7 of IPCEA S-66-524 for thermosetting jackets. The cable shall pass the U.L. flame test for tray cable. Okonite 267-32-5501 and 267-33-5504 or "approved equal".

2.3 PORTABLE CORDS

- a. Portable cords shall consist of flexible, bunch stranded, plan channeled copper conductors with a 600 volt heat and moisture resistant rubber insulation suitable for operation with a 60 degree C copper temperature. Individual conductors shall be color coded for identification and cabled with a green ground conductor and suitable high strength fillers to give the completed cable a circular cross-section.
 - 1) The completed conductor assembly shall be covered with an overall sheath of heavy duty neoprene.
 - 2) This cable shall be N.E.C. type SO and conform to IPCEA specification S-19-81.

2.4 EQUIPMENT GROUND CONDUCTOR

- a. In addition to the number of conductors indicated on the drawings, this Contractor shall provide an equipment ground conductor with green insulation in each conduit installed under this project. Refer to Section 16450 for equipment grounding requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- a. All wiring shall be run in conduit. The voltage drop at the end of any circuit shall not exceed 2% of the normal voltage under full load.
- b. The use of lubricants in pulling wire and cable shall be restricted to those types having a neutral effect on both metallic and non-metallic materials, and having no aging and/or deteriorating effect on natural or synthetic covering compounds other than those recommended by the wire manufacturer shall be used to assist in the pulling of wires.
- c. Cable pulling forces shall not exceed cable manufacturer's recommended maximum values. Cable manufacturer's recommended pulling and laying methods shall be followed.

- d. Where single conductor wire is used in large boxes, the single conductor wires comprising a circuit shall be grouped and laced together using nylon self-locking cable ties. Circuits shall be tagged and identified.
- e. For convenience in maintenance and testing, the Contractor shall make full use of color coded wire in all installations. The neutral-wire in all cases shall be white. Ground wire shall be green.
- f. All conductors shall be identified by circuit numbers and phase, at each terminal or splice connection. In addition, all control wires shall be color coded. Identification and color coding shall be by means of adhesive backed cable marking tapes of subsurface printed polyester film suitable for a temperature range of -20 degrees F to 300 degrees F.

3.2 CONNECTIONS

- a. All conductors shall be continuous from box to box; no splices shall be permitted in conduits.
- b. All splices, taps, or connections for 600 volt cable shall be crimp type insulated compression connections; Thomas and Betts "Stakon", Burndy "Hylug" or equal.
- c. Clamps or bolted-type connections, where specified for 600 volt cable, shall be made with Thomas and Betts Locktite connectors or equal.
- d. Where terminals, lugs, connections or splices are to be used or made for 600 volt cable, it is of prime importance that proper adhesion between wires and connectors is provided to secure maximum mechanical strength and electrical conductivity. The splice connection shall be wrapped with insulation putty in tape form until two times the cable insulation thickness is reached and this shall be covered with at least two layers of plastic electrical tape such as Scotch 33, Plymouth No. 7 or equal. Friction tape shall not be considered adequate insulation.
- e. Switches shall not be connected to the neutral conductor.

3.3 TESTS

- a. After the installation of apparatus and wiring has been completed. All electrical conductors shall be tested by the Contractor to insure continuity, phasing, proper splicing, freedom from unwanted grounds, and insulation values in accordance with Underwriters' requirements.

- b. A 1000 volt hand driven megger shall be used on all 480 volt service conductors and a 500 volt hand driven megger may be used on all lower voltage service conductors. Conductors shall be isolated from other equipment during test.
- c. All cables above 600 volts shall be given a high potential D.C. non-destructive "Proof Test" in accordance with IPCEA recommendations.
- d. All megger and high potential tests of multiple conductor cables shall be applied between one conductor and ground with all other conductors connected to the same ground. Each conductor shall be tested in like manner.
- e. All wiring not measuring up to cable manufacturer's recommended minimum megger readings shall be replaced.
- f. Tests shall be made with all conductor splices and terminations completed and with lightning arresters removed and disconnections made at points of final termination.
- g. Duplicate certified records of all insulation tests shall be furnished to the Owner.

END OF SECTION

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5/11/14

SECTION 16131

PULL, JUNCTION, TERMINATION BOXES AND WIRING TROUGHS

PART 1 – GENERAL

1.1 SIZE

- a. Wiring troughs pull and junction boxes shall be sized for the number and size of conductors and conduits in accordance with the National Electrical Code.
- b. Outlet boxes in ceilings shall be a minimum of 4" octagonal by 2-18" deep.
- c. Outlet boxes in wall shall be a minimum of 4" square by 2-18" deep with plaster ring in finished areas. Multiple gang switch boxes in finished areas shall be at least 2-1/4" deep. Boxes in poured concrete work shall be a minimum of 3" deep.
- d. Termination boxes or panels shall be sized to accommodate terminal strips as required with 25% spares. Terminal strips shall not be closer than four inches to the side wall of the box and eight inches on centers. All termination panels or boxes shall be of suitable construction for the location where they are used.

1.2 VOLTAGE SEPARATION

- a. Separate terminal boxes shall be used for different voltages, or use code approved barriers in the boxes to separate the voltages.

1.3 IDENTIFICATION

- a. Boxes shall have identification labels on their cover-plates to identify function and voltage levels within.

PART 2 - PRODUCTS

2.1 TYPES

- a. All boxes and troughs shall be standard code boxes of proper size and design for use in locations shown or specified.

RM
5/11/14

- b. At all locations where special boxes are required, the boxes shall be of the type and size recommended by the manufacturer of the equipment.
- c. Boxes and troughs shall be Underwriter's approved, vapor-proof or weather-proof where required by code or drawings.
- d. Pull boxes, junction boxes, and terminal boxes for use in dry locations, except where otherwise specified, shall be steel, either hot-dip galvanized or rust-proofed after fabrication with one coat of zinc chromate primer and one coat of tough enamel. Covers shall be gasketed and fastened with minimum No. 10 brass machine screws.
- e. In indoor areas, concealed ceiling boxes or wall boxes shall be of galvanized or sherardized formed sheet steel with plaster rings and fixture studs where required. FD condulets shall be used where switches and receptacles occur in exposed conduit runs.
- f. Pull boxes, junction boxes, and terminal boxes for use in wet locations or outdoors shall be of galvanized cast iron for steel conduits, with gasketed cover, conduit bosses, and mounting lugs.
- g. All boxes shall have ground lugs or busses suitable for grounding to the equipment ground system.

PART 3 - EXECUTION

3.1 MOUNTING

- a. Boxes and troughs shall be secured firmly in place, set true and square with building lines.
- b. All boxes and troughs attached to vertical surfaces shall be set off not less than one inch and not more than two inches from surface.
- c. Fixture studs shall be provided in outlet boxes and shall be securely fastened to the boxes.
- d. Outlet boxes for lighting switches, receptacles, telephone, etc., shall be flush mounted. Outlet boxes shall not be surface mounted without the electrician's approval.

RJ
5/11/16

3.2 TERMINAL STRIPS

- a. All instrument junction boxes and/or terminal panels shall be provided with terminal strips with the required number of terminals plus 25% spares. Terminal strips type shall be Allen Bradley Bulletin 1492, Square-D Class 9080 or equal rated 300 volts.
- b. Control junction boxes and/or terminal panels shall be provided with terminal strips as required with 25% spares. Terminal strips shall be Allen Bradley Bulletin 1492, Square-D Class 9080 or approved equal, rated 600 volts.

END OF SECTION

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5/11/16

SECTION 16140

WALL PLATES, SWITCHES AND RECEPTACLES

PART 1 - GENERAL

1.1 WALL PLATES

- a. All flush control switches, plug receptacles and similar wiring devices shall be provided with a wall plate of stainless steel with beveled edges. Where more than one switch occurs at one point, gang plates shall be used.
- b. All wall plates in indoor areas shall be flush stainless steel type 302 similar to Arrow-Hart Series 93000 or approved equivalent. Except where devices are in surface mounted FD condulets, standard FD conduit covers shall be provided to suit device installed.
- c. Flush stainless steel bushed plates shall be used at all locations where telephone outlets are indicated.
- d. At locations where F.D. condulets are used (with electricians approval) for switches and receptacle outlets, a zinc coated steel plate shall be used. Plate shall have beveled or rounded edges and shall fit flush with all sides of FD condulets.
- e. Outlets located outdoors shall be a weatherproof type as specified in Paragraph 1.2.d. in this Section of Specifications.

1.2 CONVENIENCE OUTLETS

- a. Duplex convenience outlets shall be specification grade, brown color, and shall be rated 20 amperes at 125 volts, 3 wire grounding type with "T" slot and U-shaped ground slot, having bases of molded phenolic. Arrow-Hart 5735 or approved equivalent.
- b. Single receptacle for the sump pump shall be a weatherproof type, complete with a 20A, 125 volt, 2 wire, 3-pole receptacle and cast housing, cover and screw cap. Crouse-Hinds No. DS-222 or "approved equal". Also provide a weatherproof plug No. WP-732 with a suitable type SO cord.
- c. GFI duplex receptacle, 20 amp, 125 volt A.C., 2-pole, 3-wire, Square-D #GFDR-120BC with a single gang cast back box and weatherproof cover with provision for padlocking similar to Bell #2357 or equivalent. Only GFI receptacles with a NEMA 5-20R configuration will be considered for approval.

RM
5/11/16

1.3 LIGHTING SWITCHES

- a. Lighting switches shall be specification grade, brown color, quiet toggle type, and shall be rated 20 amperes at 125 volts, having completely enclosed phenolic bases.
- b. Lighting switches shall be single pole, double pole, three-way, four-way, or type as noted on the drawings. Switches shall be Arrow-Hart Series No. 1991 thru 1994 or approved equivalent.
- c. Type-SB oil burner cut-out switches shall be rated 20 amp, 125 volt, A.C., 1-pole, A-H #1991 and provided with a flush type red plate engraved white lettering, A-H #93071-19.

1.4 SAFETY SWITCHES

- a. Safety switches shall be furnished and installed at locations shown on the drawings or where required by the National Electrical Code.
- b. Safety switches shall be heavy-duty, horsepower rated type (fused or unfused as indicated) with positive quick-make and quick-break, operating mechanism with external operating handle. Mechanism shall be enclosed in a code gauge sheet metal cabinet with hinged front cover. Each switch shall be equipped with solderless lugs to accommodate size wire shown on the drawings. Switches shall have a NEMA enclosure suitable for the area in which they are located.
- c. Contractor shall furnish and install for every fuse clip on the work to which a circuit has been connected, under Division 16 of the specifications, a renewable cartridge fuse holder fitted with drop-out fuse links of the size required. In addition, the Contractor shall provide the Resident/User at the completion of the project, a minimum of two spare fuse links of each rating they installed.

1.5 SWITCHES - MOTOR STARTING

- a. For use in starting single phase and fractional horsepower motors, the Contractor shall furnish and install a manual motor starter with thermal overload elements specifically designed for this purpose unless furnished as a part of the equipment. These shall, in general, be of the surface type as required, mounted adjacent to the motor locations. These switches shall be used for the power requirements as stated. Provide NEMA 4 enclosure for each motor starter switch.
- b. Each starter shall be provided with the heater element required for the motor to be controlled. Switches shall be quick-make and quick-break, trip free under overload

conditions and shall indicate whether ON or OFF or TRIPPED. Heater elements shall be readily removable and interchangeable.

END OF SECTION

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5/11/16

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

- a. Power system grounding.
- b. Communication system grounding.
- c. Electrical equipment and raceway grounding and bonding.
- d. Lighting systems.

1.2 SYSTEM DESCRIPTION

- a. Ground the electrical service system neutral at service entrance equipment to the ground grid system and to supplementary grounding electrodes.
- b. Ground each separately-derived system neutral to nearest effectively grounded building structural steel member, or separate grounding electrode.
- c. Provide communications system ground conductor at point of service entrance and connect to separate (isolated) grounding electrode.
- d. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, and receptacle ground connectors.
- e. Connect all metal tanks, building steel equipment frames and miscellaneous metal structures to the ground system.

1.3 SUBMITTALS

- a. Submit specification sheets on all substitutions and "or equals". Include specification sheets for both the specified item and the alternate, highlight the differences.

1.4 CODES AND STANDARDS

- a. Grounding shall be in accordance with this standard and the latest issue of the following Codes and Standards:

RM
5/11/14

1. NFPA, National Electrical Code
2. NFPA, Recommended Practice on Static Electricity
3. IEEE Std. 141, Recommended Practice for Electric Power Distribution for Industrial Plants
4. IEEE Std. 142, Recommended Practice for Grounding of Industrial and Commercial Power Systems

PART 2 - PRODUCTS

2.1 MATERIALS

- a. Ground Rods: Copper-encased steel, 3/4 inch diameter, minimum length 10 feet.
- b. Primary ground cable: Bare copper 4/0 AWG min.
- c. Tap cable: Bare copper 2 AWG min.
- d. Exothermic welded connectors: Cadweld or equal.
- e. Bolted connectors: Burndy or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- a. Ground Rods and Conductors
 1. The maximum spacing of ground electrodes shall be 50 feet. The ground electrodes shall be interconnected with minimum of 4/0 AWG stranded copper TW-insulated conductors to form a ground loop around the protected structure. Tap connections shall be made from the ground loop to the protected structure.
 2. The resistance of a single ground rod or a group of interconnected rods shall be nominally five ohms but not greater than ten ohms. If the measured resistance of a single rod is greater, additional rods shall be driven at least 10 feet apart from the original electrode until the minimum required resistance is obtained. The ground resistance test shall be measured by the "Fall-of-Potential" method preferably utilizing the Biddle Co. Cat. No. 63220 Megger Null Balance Earth Tester. Ground resistance testing in areas where cathodic protection is utilized shall be performed as stated in Paragraph 4.
 3. A ground test station, specified, shall be installed in conjunction with each ground rod.

4. Ground test in cathodically-protected area shall be performed as follows:
 - a) Set two reference ground electrodes, 100' apart and measure their resistance to plant ground with a ground megger in the usual manner. This resistance should be less than 25 ohms.
 - b) Connect adjustable AC Voltage source with voltmeter and ammeter to equipment under test and a known reference ground. Adjust the voltage to obtain a current reading of 5 amp.
 - c) Ground resistance is calculated $R_x = \frac{E}{I}$ and should be 1 ohms or less.

Caution: This is a dynamic test which could result in minor arcing if the ground system is defective. Proper precautions against this possibility should be taken when working in hazardous areas.

5. The grounding conductors shall have green colored insulation for identification purposes. Conductor jacket can be color coded with chemically compatible green color spray paint on exposed sections and at the terminating point of the grounding conductors or bare copper if green-colored insulation is not available.
6. Tap conductors emerging from underground, concrete slab or platform shall be protected by Schedule 40 PVC pipe.
7. All underground connections will be of the exothermic weld type. Restore removed insulation by taping with two layers of half-lapped Scotch 2210 tape extended at least one inch over the cable insulation.

b. Equipment and Structures

1. Conductors

- a) Conductors installed externally to the equipment shall be stranded copper, and insulated.
- b) Conductors routed together with power and control wiring in conduits shall be copper and have identical type insulation to the other conductors.
- c) Conductors routed together with power and control wiring in multi-conductor cables shall be either bare or insulated copper.
- d) The insulated grounding conductors shall be color-coded green.

RM
5/11/16

2. Size

- a) Grounding conductors provided for ground fault protection and routed with the power conductors shall be sized as follows:

<u>Conductor Size</u>	<u>Min. Ground Wire Size</u>
14	14
12	12
10-8	10
6-4-3-2	8
1-1/0	6
2/0-3/0	4
4/0	2
For larger wire sizes, size per NEC Table 250.94.	

- b) Grounding conductors within multi-conductor tray cable shall be sized per the NEC Table 250.95.
- c) Exposed grounding conductors shall be No. 2 AWG minimum.

3. Connectors

- a) Brazed or exothermic weld connectors shall be used for structural steel, equipment supports/bases and railroad tracks.
- b) Mechanical grounding connectors shall be used for tanks, vessels, towers, removable supporting bases, electrical enclosures and ground test stations.
- c) Grounding connections to the ground electrode system shall be as follows:
- 1) All grounding shall be connected to the ground electrode system, directly or via welded structural members, ground busses in MCC's, switchgear, etc.
 - 2) Process structures, metal frames of buildings, towers, piping systems, tanks and vessels shall have a minimum of two connections to the grounding system. The respective locations to be a 180° at diameter opposite corners.
 - 3) Grounded and bonded structural steel shall be considered as part of the grounding system.
 - 4) All electrical equipment and devices shall be grounded as follows:

RF
5/11/14

- i. Grounding conductors within multi-conductor cables shall be connected to the ground bus at the source and to a dedicated grounding buss at the user's end. Metal clad and armored cables shall be terminated with armor grounding fittings. The fittings shall be bonded to the separate grounding conductor at both ends except in the case of shielded instrumentation cables where insulation/isolation of the drain wire from the grounded armor is required. The armor and the drain wire shall be bonded and grounded together only at the supply end of the cable run. This separation shall be adhered to at all junction points.
- ii. All rigid metal conduit runs and all electrical metallic tubing shall contain a separate grounding conductor and shall also have grounding bushings. Expansion joints shall be installed with bond lug jumpers.
- iii. Ground bus bars of switchgears, motor control centers and casings of power transformers shall be connected directly to the ground electrode system at a minimum of separated two points.
- iv. Lighting fixtures in dry, non-hazardous areas may be grounded by utilizing the metallic raceway. Lighting fixtures in wet or hazardous areas and all receptacles shall be connected to the grounding conductor routed with the service conductor.
- v. Medium voltage circuits (over 1 KV) shall have dual grounding conductors; one externally routed to the ground electrode system, one routed with the service conductor.
- vi. Cable trays shall be grounded at the distribution source point (MCC, etc.). The splice plates of bare metal or metallic-coated trays are considered as effective means of bonding. Cable trays coated with non-conductive material (PVC, etc.) shall have bonding jumper across each splice point fabricated per the Manufacturer's instructions. Expansion splice plates shall have bonding jumpers. Interconnecting tray runs without metallic connection between them shall have bonding jumpers. The cross-sectional area of the smaller connected tray in aluminum or equivalent copper.
- vii. Process computers, electronic equipment and main control panels shall have one separate direct connection to an isolated ground electrode.

RM
5/11/14

- 5) For multilevel buildings using structural steel construction, building structural steel shall be bonded to the structural steel from the next lower elevation.

END OF SECTION

RJ
5/11/16