

CITY OF HOPEWELL
VIRGINIA

PURCHASING DEPARTMENT

INVITATION FOR BID

ATMOSPHERIC VAPORIZER EQUIPMENT PROCUREMENT

BID: # **04-16**

DATE: **September 24, 2015**

Sealed Bids, subject to the general conditions and specifications hereby attached, will be received at the Office of the City Clerk, Second Floor, Municipal Building, 300 North Main Street, Hopewell, Virginia 23860 until, but not later than 11:00 a.m. **TUESDAY, OCTOBER 27, 2015** and then publicly opened in the Council Chambers, Municipal Building, 300 North Main Street, Hopewell, Virginia on the aforementioned date and time for furnishing the solicited supplies or services.

1. All bids must be submitted in a sealed envelope.
2. Regardless of delivery method of bid, the **outside** of each envelope must clearly indicate the following: *(if bid is delivered by Federal Express, UPS, USPS Priority, etc. or any other means, the outside of **each** envelope **must also** clearly indicate):*

**Office of the City Clerk
Second Floor
Municipal Building
300 North Main Street
Hopewell, Virginia 23860**

Closing Date of Bid: October 27, 2015

**Commodity Name: Atmospheric Vaporizer Equipment Procurement
Bid # 04-16**

FOR YOUR BID TO BE CONSIDERED, IT MUST BE SUBMITTED ON THIS INVITATION FOR BID IN THE PLACES PROVIDED. BIDDERS SHALL SIGN THIS FORM (PAGE 3) WITHOUT DETACHING FROM REST OF BID AND MUST RETURN BID IN ITS ENTIRETY.

ANY BID RECEIVED AFTER THE ANNOUNCED TIME AND DATE OF OPENING, WHETHER BY MAIL OR OTHERWISE, WILL NOT BE CONSIDERED AND WILL BE RETURNED UNOPENED.

The right is reserved to reject any or all Bids submitted and also to place the order where it appears it will be to the best interest of the city. All quoted prices shall be FOB locations.

If you desire not to bid on this invitation, please forward your acknowledgement of NO BID. FAILURE TO COMPLY WITH THIS REQUIREMENT WILL BE CAUSE FOR REMOVAL OF YOUR COMPANY'S NAME FROM THE BID LIST.

All bid quotations are subject to general terms and conditions hereby attached and will be rejected if not properly executed.

Individual contractors must provide their social security numbers and other types of firms must provide their federal employer identification numbers in the payment clauses to be included in contracts.

Quantities indicated herein are estimates of anticipated usage. It is understood and agreed to between the parties of a resulting contract that the City may increase or decrease quantities at the quoted price. Furthermore, it is agreed to between the parties of a resulting contract that the City shall not be obligated to purchase or pay for materials by such contract unless and until they are ordered and delivered.

The City reserves the right to be sole judge and to make the award in accordance with its own judgement as to what will best meet its requirements and be in the best interest of the City.

AVAILABILITY OF FUNDS: It is understood and agreed between the Bidder and the City that the City shall be bound hereunder only to the extent of the funds available or which may hereafter become available for the purpose of this quotation or agreement.

WITHDRAWAL OF BID: No bid may be withdrawn for a period of thirty (30) days from the date of bid opening unless the bidder has made a clerical error. The bidder shall give notice in writing of his claim of right to withdraw his bid within two (2) business days after the conclusion of the bid opening procedure and shall submit original work papers substantiating the error with such notice. The owner reserves the right to reject any or all bids, to waive all informalities, and to reject any or all items of any bid.

Bidding and contracting procedure shall conform to all applicable regulations and provisions of the *City of Hopewell Procurement Ordinance* effective July 1, 2005; a copy of which is available for inspection at the Office of the City Clerk.



Shayna J. Johnson
Purchasing Agent

Please return the bids to the Office of the City Clerk, Second Floor, Municipal Building, 300 North Main Street, Hopewell, Virginia 23860. Regardless of delivery method of bid, the **outside** of each envelope must clearly indicate the following: *(if bid is delivered by Federal Express, UPS, USPS Priority, etc. or any other means, the outside of each envelope must also clearly indicate):*

**Office of the City Clerk
Second Floor
Municipal Building
300 North Main Street
Hopewell, Virginia 23860
Closing Date of Bid: October 27, 2015
Commodity Name: Atmospheric Vaporizer Equipment Procurement
Bid # 04-16**

In compliance with Invitation for Bid **#04-16** and subject to all conditions thereof and attached thereto, the undersigned offers and agrees if the Bid price and conditions will be accepted within thirty (30) calendar days from the date of opening to evaluate, to furnish any and all of the items upon which the prices are quoted, at the price set opposite each item, delivered at the points as specified and as scheduled.

NAME OF ORGANIZATION

STREET ADDRESS

SIGNATURE

CITY, STATE, ZIP CODE

NAME (TYPE OR PRINT)

TELEPHONE NUMBER

OFFICIAL TITLE

FAX NUMBER

VA STATE CORPORATION COMM ID #

IRS I.D. #

EMAIL

DATE

GENERAL TERMS AND CONDITIONS

- A. **APPLICABLE LAWS AND COURTS:** This solicitation and any resulting contract shall be governed in all respects by the laws of the Commonwealth of Virginia and the City of Hopewell, Virginia; any litigation with respect thereto shall be brought in the courts of the City. The contractor shall comply with all applicable federal, state and local laws, rules and regulations. This compliance includes obtaining a Hopewell business license, if required, before work is performed.
- B. **EMPLOYMENT DISCRIMINATION/DRUG-FREE WORKPLACE BY CONTRACTOR:** By submitting the bids/proposals, the bidders/offerors certify to the City that they will conform to the provisions of the Federal Civil Rights Act of 1964, as amended, as well as the Virginia Fair Employment Contracting Act of 1975, as amended, where applicable, the Virginians With Disabilities Act, the Americans With Disabilities Act and §2.2-4311 of the *Virginia Public Procurement Act*. If the award is made to a faith-based organization, the organization shall not discriminate against any recipient of goods, services, or disbursements made pursuant to the contract on the basis of the recipient's religion, religious belief, refusal to participate in a religious practice, or on the basis of race, age, color, gender or national origin and shall be subject to the same rules as other organizations that contract with the City to account for the use of the funds provided; however, if the faith-based organization segregates public funds into separate accounts, only the accounts and programs funded with public funds shall be subject to audit by the City. (Code of Virginia, § 2.2-4343.1E).

Every contract over Ten Thousand Dollars (\$10,000) shall include the provisions below. During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability or other basis prohibited by state law relating to discrimination employment, except where there is a bona fide occupational qualification reasonably necessary to the normal operation of the contractor. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.
2. The contractor, in all solicitations or advertisements for employees placed by or on behalf of the contractor, will state that such contractor is an equal opportunity employer.
3. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting these requirements of this section.
4. To provide a drug-free workplace for the contractor's employees.
5. To post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against

employees for violations of such prohibition.

6. To state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace.

For the purposes of this section, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

The contractor will include the provisions of the foregoing paragraphs 1, 2, 3, 4, 5 and 6 in every subcontract or purchase order over Ten Thousand Dollars (\$10,000) so that the provisions will be binding upon each subcontractor or vendor.

- C. **DIRECT TAXES:** All bids/proposals shall be submitted exclusive of direct Federal, State, and local taxes. However, if the bidder/offeror believes that certain taxes are properly payable by the City, he may list such taxes separately in each case directly below the respective item bid/proposal price. Tax exemption certification will be furnished on request.
- D. **INDEMNITY:** The contractor agrees to defend, indemnify and hold harmless, the City of Hopewell and its members, officers, directors, employees, agents, and representatives from and against any and all claims, damages, demands, losses, costs and expenses, including attorney's fees, and any other losses of any kind or nature whatsoever including claims for bodily injuries, illness, disease, or death and physical property loss or damage in favor of contractor, its sub-contractors, their employees, agents, and third parties arising during the performance of services and resulting from tort, strict liability, or negligent acts or omissions of contractor, its sub-contractors and their employees or agents under the agreement, or resulting from breaches of contract, whatever by statute or otherwise.
Each contractor shall assume the responsibility for damage to or loss of its material, equipment or facilities located at the site and, in order to effect this limitation of liability, the contractor agrees to insure or self-insure such property against any such risk.
- E. **SALES TAXES:** The City is exempt from payment of State sales and use tax on all tangible personal property purchased or leased for its use or consumption. Certificate of Exemption will be furnished upon request.
- F. **QUOTATION FORM:** The bidder/offeror must sign and properly fill out all forms in this Bid/Proposal or be subject to being declared unresponsive. If unable to submit a Bid/Proposal, please sign and return this solicitation form, advising reason for no Bid/Proposal.
- G. **CONTRACTOR'S DEFAULT:** In case of default of the contractor, the City may procure the articles of service from other sources and hold the contractor responsible for any excess cost incurred thereafter.
- H. **COMPUTATION OF TIME FOR DISCOUNTS:** Time in connection with discount offered, will be computed from date of delivery of the supplies or materials to carrier when final inspection and acceptance are at those points or from date correct invoice is received if

latter is later than the date of delivery.

- I. **ETHICS IN PUBLIC CONTRACTING:** By submitting the bids/proposals, the bidders/offerors certify that the bids/proposals are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other bidder/offeror, supplier, manufacturer or subcontractor in connection with the bid/proposal, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal value, present or promised, unless consideration of substantially equal or greater value was exchanged.
- J. **GOVERNMENTAL RESTRICTIONS:** In the event any governmental restrictions may be imposed which would necessitate alteration of the materials, quality, workmanship, or performance of the items offered in this Bid/Proposal prior to their delivery, it shall be the responsibility of the successful bidder/offeror to notify this office at once, indicating in his letter the specific regulation which requires such alterations. The City reserves the right to accept any such alterations, including any price adjustments occasioned thereby, or to cancel the contract.
- K. **IMMIGRATION REFORM AND CONTROL ACT OF 1986:** By entering into a written contract with the City of Hopewell, the Contractor certifies that the Contractor does not, and shall not during the performance of the contract for goods and services in the City, knowingly employ an unauthorized alien as defined in the federal Immigration Reform and Control Act of 1986.
- L. **DEBARMENT STATUS:** By submitting the bids/proposals, the bidders/offerors certify that they are not currently debarred by the Commonwealth of Virginia from submitting bids or proposals on contracts for the type of goods and/or services covered by this solicitation, nor are they an agent of any person or entity that is currently so debarred.
- M. **ANTITRUST:** By entering into a contract, the contractor conveys, sells, assigns, and transfers to the City of Hopewell, Virginia all rights, title and interest in and to all causes of action it may now have or hereafter acquire under the antitrust laws of the United States and the Commonwealth of Virginia, relating to the particular goods or services purchased or acquired by the City of Hopewell, Virginia under said contract.
- N. **PAYMENT:** Payment by the City is due thirty days (30) after delivery is made to the City of Hopewell and inspection unless otherwise specifically provided: subject to any discounts allowed.

To Prime Contractor:

Invoices for items ordered, delivered and accepted shall be submitted by the contractor directly to the payment address shown on the purchase order/contract. All invoices shall show the contract number and/or purchase order number, social security number (for individual contractors) or the federal employer identification number (for proprietorships, partnerships, and corporations).

All goods or services provided under this contract or purchase order, that are to be paid for

with public funds, shall be billed by the contractor at the contract price, regardless of which public agency is being billed.

The following shall be deemed to be the date of payment: the date of postmark in all cases where payment is made by mail, or the date of offset when offset proceedings have been instituted as authorized.

Unreasonable Charges: Under certain emergency procurements and for most time and material purchases, final job costs cannot be accurately determined at the time orders are placed. In such cases, contractors should be put on notice that final payment in full is contingent on a determination of reasonableness with respect to all invoiced charges. Charges, which appear to be unreasonable, will be researched and challenged, and that portion of the invoice held in abeyance until a settlement can be reached. Upon determining that invoiced charges are not reasonable, the City shall promptly notify the contractor, in writing, as to those charges, which it considers unreasonable, and the basis for the determination. A contractor may not institute legal action unless a settlement cannot be reached within thirty (30) days of notification.

To Subcontractors:

A contractor awarded a contract under this solicitation is hereby obligated:

1. To pay the subcontractor(s) within seven (7) days of the contractor's receipt of payment from the City for the proportionate share of the payment received for work performed by the subcontractor(s) under the contract; or
2. To notify the City and the subcontractor(s), in writing, of the contractor's intention to withhold payment and the reason.
3. The contractor is obligated to pay the subcontractor(s) interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by the contractor that remain unpaid seven (7) days following receipt of payment from the City, except for amounts withheld as stated in (2) above. The date of mailing of any payment by U. S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under the primary contract. A contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of the City.

O. **PRECEDENCE OF TERMS:** Paragraphs A-N of these General Terms and Conditions shall apply in all instances. In the event there is a conflict between any of the other General Terms and Conditions and any Special Terms and Conditions in this solicitation, the Special Terms and Conditions shall apply.

P. **TESTING AND INSPECTION:** The City reserves the right to conduct any test/inspection it may deem advisable to assure goods and services conform to the specifications.

Q. **ASSIGNMENT OF CONTRACT:** A contract shall not be assignable by the contractor in

whole or in part without the written consent of the City.

R. **CHANGES TO THE CONTRACT:** Changes can be made to the contract in any of the following ways:

1. The parties may agree in writing to modify the scope of the contract. An increase or decrease in the price of the contract resulting from such modification shall be agreed to by the parties as a part of their written agreement to modify the scope of the contract.
2. The Purchasing Department may order changes within the general scope of the contract at any time by written notice to the contractor. Changes within the scope of the contract include, but are not limited to, things such as services to be performed, the method of packing or shipment, and the place of delivery or installation. The contractor shall comply with the notice upon receipt. The contractor shall be compensated for any additional costs incurred as the result of such order and shall give the Purchasing Department a credit for any savings. Said compensation shall be determined by one of the following methods:
 - a. By mutual agreement between the parties in writing; or
 - b. By agreeing upon a unit price or using a unit price set forth in the contract, if the work to be done can be expressed in units, and the contractor accounts for the number of units of work performed, subject to the Purchasing Department's right to audit the contractor's records and/or to determine the correct number of units independently; or
 - c. By ordering the contractor to proceed with the work and keep a record of all costs incurred and savings realized. A markup for overhead and profit may be allowed if provided by the contract. The same markup shall be used for determining a decrease in price as the result of savings realized. The contractor shall present the Purchasing Department with all vouchers and records of expenses incurred and savings realized. The Purchasing Department shall have the right to audit the records of the contractor, as it deems necessary to determine costs or savings. Any claim for an adjustment in price under this provision must be asserted by written notice to the Purchasing Department within thirty (30) days from the date of receipt of the written order from the Purchasing Department. If the parties fail to agree on an amount of adjustment, the question of an increase or decrease in the contract price or time for performance shall be resolved in accordance with the procedures for resolving disputes provided by the Disputes Clause of this contract or, if there is none, in accordance with the disputes provisions of the Virginia Public Procurement Act. Neither the existence of a claim nor a dispute resolution process, litigation or any other provision of this contract shall excuse the contractor from promptly complying with the changes ordered by the Purchasing Department or with the performance of the contract generally.

S. **DEFAULT:** In case of failure to deliver goods or services in accordance with the contract terms and conditions, the City, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs. This remedy shall be in addition to any other remedies, which the City may have.

- T. **AUTHORIZATION TO CONDUCT BUSINESS IN THE COMMONWEALTH:** A contractor organized as a stock or non-stock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership shall be authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia or as otherwise required by law. Any business entity described above that enters into a contract with the City pursuant to the Virginia Public Procurement Act shall not allow its existence to lapse or its certificate of authority or registration to transact business in the Commonwealth, if so required under Title 13.1 or Title 50, to be revoked or cancelled at any time during the term of the contract. The City may void any contract with a business entity if the business entity fails to remain in compliance with the provisions of this section.
- U. **INSURANCE:** The contractor shall secure and maintain in force, at his/her own expense all required forms of insurance and payment bonds to insure the completion for the work under contract to the satisfaction of the City and without damage to, or claims against the City. The contractor shall provide satisfactory evidence of bonds and insurance on behalf of the sub-contractors, before entering into an agreement to sublet any part of the work to be done under this contract.

The following performance and payment bonds and forms of insurance shall be secured by the contractor to cover all work under contract and to protect the contractor, the City, and general public against any damage of claims in connections with the performance of the contract. The bonds and insurance shall be by companies duly authorized to do business in the State of Virginia. Certificates of Insurance, naming the City as an additional insured for each type of coverage shall be required.

At the discretion of the purchasing agent, bidders/offerors may be required to submit with their bid/proposal a bid/proposal bond, or a certified check, in an amount to be determined by the purchasing agent, which shall be forfeited to the City as liquidated damage upon the bidder's/offeror's failure to execute a contract awarded to him/her or upon the bidder's/offeror's failure to furnish any required performance or payment bonds in connection with a contract awarded to him/her.

At the discretion of the purchasing agent, the winning contractor(s) may be required to submit a performance and payment bond to the City which shall be evoked upon contractor's failure to execute a contract awarded or the failure to satisfactorily complete work for which a contract or purchase order was awarded. Performance bond and payment bond in the amount of one hundred (100) percent of contract price is required as security of contract, or security for payment of all persons performing labor and furnishing materials in connection with the contract, and protecting the City from all damages or claims resulting from, or in connection with the performance of the contract or purchase order.

The performance bond and payment bond shall and does bind the surety company to protect the City from damages, claims or costs by failure of the contractor to make corrective action due to his financial solvency or for any other cause whatever.

INSURANCE COVERAGES AND LIMITS REQUIRED:

1. Worker's Compensation - Statutory requirements and benefits; require that the City of Hopewell, Virginia be added as an additional named insured on contractor's policy.
2. Employers Liability - \$500,000.
3. Comprehensive general liability for bodily injury liability and property damage liability shall be provided as to limits specified.
4. Contractor's protective liability shall be provided for bodily injury liability and property damage liability.
5. Fire and extended coverage shall be provided on the completed builder risk form if specified in bid specifications.
6. The contractor shall require each of his subcontractors to carry Workmen's Compensation Insurance and public liability and property damages liability.
7. Commercial General Liability - \$1,000,000 combined single limit. The City of Hopewell, Virginia is to be named as an additional named insured with respect to the services being procured. This coverage is to include Products and Completed Operations Coverage.
8. Automobile Liability – bodily injury and property damage shall be provided as to limits set forth in the specifications.

The contractor shall have executed and delivered to the City copies of all insurance certificates. Executed copies of the performance bond shall become a part of all copies of the contract.

SPECIAL TERMS AND CONDITIONS

- A. **ADVERTISING:** In the event a contract is awarded for supplies, equipment, or services resulting from this bid/proposal, no indication of such sales or services to the City of Hopewell, Virginia will be used in product literature or advertising. The contractor shall not state in any of its advertising or product literature that the City of Hopewell, Virginia or any department or institution of the City has purchased or uses its products or services.
- B. **AUDIT:** The contractor shall retain all books, records, and other documents relative to this contract for five (5) years after final payment, or until audited by the City of Hopewell, whichever is sooner. The agency, its authorized agents, and/or state auditors shall have full access to and the right to examine any of said materials during said period.
- C. **AWARD OF CONTRACT:** An award will be made to the lowest responsive and responsible bidder/offeror. Evaluation will be based on net prices. Unit prices, extensions and grand total

must be shown. In case of arithmetic errors, the unit price will govern. If cash discount for prompt payment is offered, it must be clearly shown in the space provided. Discounts for prompt payment will not be considered in making awards. The City reserves the right to reject any and all bids/proposals in whole or in part, to waive any informality, and to delete items prior to making an award.

- D. **BID/PROPOSAL ACCEPTANCE PERIOD:** Any bid/proposal in response to this solicitation shall be valid for 120 days. At the end of the 120 days the bid/proposal may be withdrawn at the written request of the bidder/offeror. If the bid/proposal is not withdrawn at that time it remains in effect until an award is made or the solicitation is canceled.
- E. **CANCELLATION OF CONTRACT:** The Purchasing Department reserves the right to cancel and terminate any resulting contract, in part or in whole, without penalty, upon 30 days written notice to the contractor. In the event the initial contract period is for more than 12 months, the resulting contract may be terminated by either party, without penalty, after the initial 12 months of the contract period upon 30 days written notice to the other party. Any contract cancellation notice shall not relieve the contractor of the obligation to deliver and/or perform on all outstanding orders issued prior to the effective date of cancellation.
- F. **EXTRA CHARGES NOT ALLOWED:** The bid/proposal price shall be for complete installation ready for the City's use, and shall include all applicable freight and installation charges; extra charges will not be allowed.
- G. **MINORITY/WOMEN-OWNED BUSINESSES SUBCONTRACTING AND REPORTING:** Where it is practicable for any portion of the awarded contract to be subcontracted to other suppliers, the contractor is encouraged to offer such business to minority and/or women-owned businesses. Names of firms may be available from the buyer and/or from the Division of Purchases and Supply. When such business has been subcontracted to these firms and upon completion of the contract, the contractor agrees to furnish the purchasing office the following information: name of firm, phone number, total dollar amount subcontracted and type of product/service provided.
- H. **PREPARATION AND SUBMISSION OF BIDS/PROPOSALS:** Bids/proposals must give the full business address of the bidder/offeror and be signed by him/her with his/her usual signature. Bids/proposals by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership or any authorized representative, followed by the designation of the person signing. Bids/proposals by corporations must be signed with the legal name of the corporation followed by the name of the State in which it is incorporated and by the signature and designation of the president, secretary, or other person authorized to bind it in the matter. The name of each person signing shall also be typed or printed below the signature. A bid/proposal by a person, who affixes to the signature the word "President," "Secretary," "Agent" or other designation without disclosing the principal, may be held to be the bid/proposal of the individual signing. When requested by the City, satisfactory evidence of the authority of the officer signing in behalf of the corporation shall be furnished.
- I. **WITHDRAWAL OR MODIFICATION OF BIDS/PROPOSALS:** Bids/proposals may be

withdrawn or modified by written notice received from bidders/offerors prior to the deadline fixed for bid/proposal receipt. The withdrawal or modification may be made by the person signing the bid/proposal or by an individual(s) who is authorized by him on the face of the bid. Written modifications may be made on the bid/proposal form itself, on the envelope in which the bid/proposal is enclosed, or on a separate document. Written modifications, whether the original is delivered, or transmitted by facsimile, must be signed by the person making the modification or withdrawal.

- J. **RECEIPT AND OPENING OF BIDS/PROPOSALS:** It is the responsibility of the bidder/offeror to assure that his bid/proposal is delivered to the place designated for receipt of bids/proposals and prior to the time set for receipt of bids/proposals. Bids/proposals received after the time designated for receipt of bids/proposals will not be considered. Bids/proposals will be opened at the time and place stated in the advertisement, and their contents made public for the information of bidders/offerors and others interested who may be present either in person or by representative. The officer or agent of the City, whose duty it is to open them, will decide when the specified time has arrived. No responsibility will be attached to any officer or agent for the premature opening of a bid/proposal not properly addressed and identified.
- K. **NEGOTIATION WITH THE LOWEST BIDDER:** Unless all bids are cancelled or rejected, the City of Hopewell reserves the right granted by §2.2-4318 of the *Code of Virginia* to negotiate with the lowest responsive, responsible bidder to obtain a contract price within the funds available to the agency whenever such low bid exceeds the city's available funds. For the purpose of determining when such negotiations may take place, the term "available funds" shall mean those funds which were budgeted by the agency for this contract prior to the issuance of the written Invitation for Bids. Negotiations with the low bidder may include both modifications of the bid price and the Scope of Work/Specifications to be performed. The city shall initiate such negotiations by written notice to the lowest responsive, responsible bidder that its bid exceeds the available funds and that the agency wishes to negotiate a lower contract price. The times, places, and manner of negotiating shall be agreed to by the city and the lowest responsive, responsible bidder.



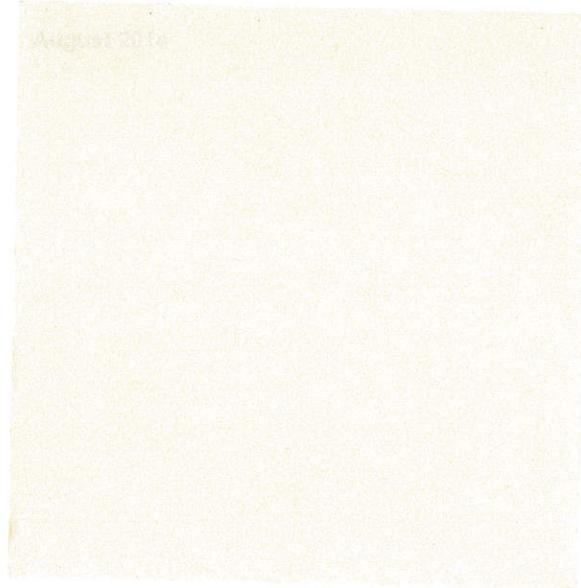
Hopewell Regional Wastewater Treatment Facility

Atmospheric Vaporizer Equipment Procurement

Issued for Bid

Technical Specifications

Hopewell, Virginia



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CITY OF HOPEWELL
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY
ATMOSPHERIC VAPORIZER SYSTEM PROCUREMENT
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PROJECT DESCRIPTION

PROJECT DESCRIPTION: ATMOSPHERIC VAPORIZER SYSTEM

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11000	ATMOSPHERIC VAPORIZER SYSTEM	11000-1
15065	PIPE: STAINLESS STEEL	15065-1

FIGURES

FIGURE 1	ATMOSPHERIC VAPORIZER LOCATION PLAN
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PROJECT DESCRIPTION ATMOSPHERIC VAPORIZER SYSTEM

The City of Hopewell's Hopewell Regional Wastewater Treatment Facility (HRWTF) is soliciting bids for a Contractor to provide full turn key project delivery on a new Liquid Oxygen (LOX) Atmospheric Vaporizer System. The project includes the replacement of the existing LOX water bath vaporizers with atmospheric vaporizers having a continuous supply rating of 100 TPD of gaseous oxygen. The Contractor shall be responsible for design, layout, installation, startup, and testing of all equipment, piping, support structures, power, and instrumentation necessary for a fully functioning system. The Contractor shall coordinate with HRWTF on all system interfaces with the existing Oxygen Generating Facility and shall execute the project in a manner that maintains continuous feed of Oxygen to the treatment facilities during construction. The project includes, but is not limited to the following key elements:

1. Supply and complete installation, in the location shown in the procurement package, of the LOX atmospheric vaporizers, including all structural foundations, equipment, automatic switching valve module, instrumentation, piping modifications, signal wiring, and electrical necessary for a complete, operating LOX vaporizer system with the desired production capacity.
2. Removal of the existing water bath vaporization system, including piping, coils, and other connected equipment.
3. Vaporizer system sizing and configuration will be the responsibility of the Contractor and will be submitted to the owner for review and approval prior to installation. Vaporizer system will be natural draft and designed to provide product flow rate and meet the design criteria listed in Section 11000.
4. Startup, testing, and training services to facilitate a smooth transition a fully operational system.

The procurement package establishes basic standards for the Contractor to follow in the design and installation of the new facilities. System components shall be submitted to the HRWTF for review and approval prior to installation in accordance with the requirements of this document. The contractor is encouraged to visit the site prior to bid to inspect the existing system and discuss tie-in requirements with owner. Specification Section 11000 describes technical information to be submitted with the Bid.

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SECTION 01340
SUBMITTALS

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Mechanics and administration of the submittal process for:
- 7 a. Shop Drawings.
- 8 b. Samples.
- 9 c. Informational submittals.
- 10 2. General content requirements for Shop Drawings.
- 11 B. Shop Drawings, Samples and Information Submittals will be included in Purchaser's
- 12 construction documents for reference purposes or made available to Purchaser's prospective
- 13 contractors for reviewing, bidding purposes or any other needs.
- 14 C. Related Specification Sections include but are not necessarily limited to:
- 15 1. Section 01342 - Operations and Maintenance Manuals.
- 16 2. Section 02200 - Earthwork.
- 17 3. Section 03002 - Concrete.
- 18 4. Section 11000 - Atmospheric Vaporizer System.
- 19 5. Section 15065 - Piping: Stainless Steel.

20 **1.2 DEFINITIONS**

- 21 A. Shop Drawings:
- 22 1. Product data and samples are Shop Drawing information.
- 23 2. Initial and Revised Construction Baseline Schedules.
- 24 B. Informational Submittals:
- 25 1. Submittals other than Shop Drawings and samples required by the Contract Documents that
- 26 do not require approval.
- 27 2. Representative types of informational submittal items include but are not limited to:
- 28 a. Construction Record Schedules (progress schedules).
- 29 b. Installed equipment and systems performance test reports.
- 30 c. Manufacturer's installation certification letters.
- 31 d. Instrumentation and control commissioning reports.
- 32 e. Warranties.
- 33 f. Service agreements.
- 34 g. Construction photographs.
- 35 h. Survey data.
- 36 i. Health and safety plans.
- 37 j. Work plans.
- 38 k. Delegated designs per performance specification requirements.
- 39 3. For-Information-Only submittals upon which the Engineer is not expected to conduct
- 40 review or take responsive action may be so identified in the Contract Documents.

41 **1.3 SUBMITTAL SCHEDULE**

- 42 A. Submittals required with the Bid:
- 43 1. See Section 11000 for Technical Information required with the Bid.
- 44 2. The Technical Information required with the Bid is not considered Shop Drawings and will
- 45 not be reviewed for equipment acceptance. The Technical Information provided with the
- 46 Bid does not relieve the Equipment Supplier from any required Submittals.

- 1 B. Schedule submittals to expedite the equipment delivery. Equipment Supplier shall assume the
2 risk for all materials or equipment which is fabricated or delivered prior to the approval of Shop
3 Drawings.
- 4 C. Informational Submittals:
5 1. Reports and installation certifications submitted within five (5) working days of conducting
6 testing or examination.

7 **1.4 PREPARATION OF SUBMITTALS**

- 8 A. Legibility:
9 1. All submittals and all pages of all copies of a submittal shall be completely legible.
10 2. Submittals which, in the Purchaser's sole opinion, are illegible will be returned without
11 review.
- 12 B. Shop Drawings and Samples:
13 1. Scope of any submittal and letter of transmittal:
14 a. Limited to one (1) Specification Section.
15 b. Do not submit under any Specification Section entitled (in part) "Basic Requirements"
16 unless the product or material submitted is specified, in total, in a "Basic Requirements"
17 Specification Section.
18 2. Numbering letter of transmittal:
19 a. Use the Specification Section number followed by a series number ("-xx" and
20 beginning with "01"); increase the series number sequentially with each additional
21 transmittal for that Specification Section.
22 3. Describing transmittal contents:
23 a. Provide listing of each component or item in submittal capable of receiving an
24 independent review action.
25 b. Identify for each item:
26 1) Manufacturer and Manufacturer's Drawing or data number.
27 2) Contract Document tag number(s).
28 3) Unique page numbers for each page of each separate item.
29 c. When submitting "or-equal" items that are not the products of named manufacturers,
30 include the words "or-equal" in the item description.
31 4. Equipment Supplier's certification of review and approval:
32 a. Equipment Supplier's review and approval certification stamp shall be applied either to
33 the letter of transmittal or a separate sheet preceding each independent item in the
34 submittal.
35 1) Stamp may be either a wet ink stamp or electronically embedded.
36 2) Clearly identify the person who reviewed the submittal and the date it was
37 reviewed.
38 b. Equipment Supplier shall execute Exhibit AA, Equipment Supplier's Submittal
39 Certification form, to indicate Equipment Supplier has reviewed and approved the
40 submittal contents.
41 1) Clearly identify the person who reviewed the submittal and the date it was
42 reviewed."
43 c. Submittals containing multiple independent items shall be prepared with each item
44 listed on the letter of transmittal or on an index sheet for all items listing the discrete
45 page numbers for each page of each item, which shall be stamped with the Equipment
46 Supplier's review and approval stamp.
47 1) Each independent item shall have a cover sheet with the transmittal number and
48 item number recorded.
49 a) Provide clear space of 3 IN SQ for Engineer stamping.
50 2) Individual pages or sheets of independent items shall be numbered in a manner that
51 permits the entire contents of a particular item to be readily recognized and
52 associated with Equipment Supplier's certification.

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5. Resubmittals:
 - a. Number with original Specification Section and series number with a suffix letter starting with "A" on a (new) duplicate transmittal form.
 - b. Do not increase the scope of any prior transmittal.
 - c. Account for all components of prior transmittal.
 - 1) If items in prior transmittal received "A" or "B" Action code, list them and indicate "A" or "B" as appropriate.
 - a) Resubmit all Shop Drawing information to maintain a complete Shop Drawing submittal. Approved Shop Drawings will be included in the Purchaser's construction documents for reference, as such, it is necessary to maintain a complete approved Shop Drawing submittal.
 - 2) Indicate "Outstanding-To Be Resubmitted at a Later Date" for any prior "C" or "D" Action item not included in resubmittal.
 - a) Obtain Engineer's approval to exclude items.
 6. Equipment Supplier shall not use red color for marks on transmittals.
 - a. Duplicate all marks on all copies transmitted, and ensure marks are photocopy reproducible.
 - b. Engineer will use red marks and/or enclose marks in a cloud.
 7. Transmittal contents:
 - a. Coordinate and identify Shop Drawing contents so that all items can be easily verified by the Purchaser.
 - b. Provide submittal information or marks defining specific equipment or materials utilized on the Project.
 - 1) Generalized product information, not clearly defining specific equipment or materials to be provided, will be rejected.
 - c. Identify equipment or material project application, tag number, Drawing detail reference, weight, and other Project specific information.
 - d. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
 - e. Do not modify the manufacturer's documentation or data except as specified herein.
 - f. Submit items such as equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8-1/2 x 11 IN pages.
 - 1) Indicate exact item or model and all options proposed.
 - g. When a Shop Drawing submittal is called for in any Specification Section, include as appropriate, scaled details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout Drawings, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data in addition to information specifically stipulated in the Specification Section.
 - 1) Arrange data and performance information in format similar to that provided in Contract Documents.
 - 2) Provide, at minimum, the detail specified in the Contract Documents.
 - h. If proposed equipment or materials deviate from the Contract Drawings or Specifications in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet.
 8. Samples:
 - a. Identification:
 - 1) Identify sample as to transmittal number, manufacturer, item, use, type, project designation, tag number, Specification Section or Drawing detail reference, color, range, texture, finish and other pertinent data.
 - 2) If identifying information cannot be marked directly on sample without defacing or adversely altering samples, provide a durable tag with identifying information securely attached to the sample.
 - b. Include application specific brochures, and installation instructions.

- 1 c. Provide Equipment Supplier's review and approval certification stamp or Equipment
- 2 Supplier's Submittal Certification form as indication of Equipment Supplier's checking
- 3 and verification of dimensions and coordination with interrelated work.
- 4 d. Resubmit revised samples of rejected items.

5 C. Informational Submittals:

- 6 1. Prepare in the format and detail specified in Specification requiring the informational
- 7 submittal.

8 **1.5 TRANSMITTAL OF SUBMITTALS**

9 A. Shop Drawings and Samples:

- 10 1. Transmit all submittals to the City of Hopewell at the following email address:
- 11 hwalker@hopewellva.gov.
- 12 2. Utilize digital copies of attached Exhibit A to transmit all Shop Drawings and samples.
- 13 3. All submittals must be from Equipment Supplier.
- 14 a. Submittals will not be received from or returned to others.
- 15 4. Provide submittal information defining specific equipment or materials utilized.
- 16 a. Generalized product information, not clearly defining specific equipment or materials
- 17 to be provided, will be rejected.

18 B. Electronic Transmission of Submittals:

- 19 1. Transmittals shall be made electronically.
- 20 a. Use email address identified above.
- 21 2. Scan all transmittals into Adobe Acrobat Portable Document Format (PDF), latest version,
- 22 with printing enabled.
- 23 a. Do not password protect or lock the PDF document.
- 24 b. Rotate sheets that are normally viewed in landscape mode so that when the PDF file is
- 25 opened the sheet is in the appropriate position for viewing.
- 26 3. Required signatures may be applied prior to scanning for transmittal.

27 C. Fax transmittals are not acceptable.

28 **1.6 PURCHASER'S REVIEW ACTION**

29 A. Shop Drawings and Samples:

- 30 1. Items within transmittals will be reviewed for overall design intent and will receive one (1)
- 31 of the following actions:
- 32 a. A - FURNISH AS SUBMITTED.
- 33 b. B - FURNISH AS NOTED (BY ENGINEER).
- 34 c. C - REVISE AND RESUBMIT.
- 35 d. D - REJECTED.
- 36 e. E - PURCHASER'S REVIEW NOT REQUIRED.
- 37 2. Submittals received will be initially reviewed to ascertain inclusion of Equipment Supplier's
- 38 approval stamp.
- 39 a. Submittals not stamped by the Equipment Supplier or stamped with a stamp containing
- 40 language other than that specified herein will not be reviewed for technical content and
- 41 will be returned without any action.
- 42 3. In relying on the representation on the Equipment Supplier's review and approval stamp,
- 43 Purchaser reserves the right to review and process poorly organized and poorly described
- 44 submittals as follows:
- 45 a. Submittals transmitted with a description identifying a single item and found to contain
- 46 multiple independent items:
- 47 1) Review and approval will be limited to the single item described on the transmittal
- 48 letter.

1 **PART 2 - PRODUCTS - (NOT USED)**

2 **PART 3 - EXECUTION - (NOT USED)**

3



EXHIBIT A

Shop Drawing Transmittal No. _____

(Spec Section) (Series)

Project Name:		Date Received:
Project Owner:		Checked By:
Contractor:	HDR Engineering, Inc.	Log Page:
Address:	Address:	HDR No.:
		Spec Section:
		Drawing/Detail No.:
Attn:	Attn:	1st. Sub ReSub.
Date Transmitted:	Previous Transmittal Date:	

Item No.	No. Copies	Description	Manufacturer	Mfr/Vendor Dwg or Data No.	Action Taken*

Remarks:

* The Action designated above is in accordance with the following legend:

- | | |
|--|--|
| <p>A - Furnish as Submitted</p> <p>B - Furnish as Noted</p> <p>C - Revise and Submit</p> <ol style="list-style-type: none"> 1. Not enough information for review. 2. No reproducibles submitted. 3. Copies illegible. 4. Not enough copies submitted. 5. Wrong sequence number. 6. Wrong resubmittal number. 7. Wrong spec. section. 8. Wrong form used. 9. See comments. <p>D - Rejected</p> | <p>E - Engineer's review not required</p> <ol style="list-style-type: none"> 1. Submittal not required. 2. Supplemental Information. Submittal retained for informational purposes only. 3. Information reviewed and approved on prior submittal. 4. See comments. 5. Delegated Design - Submittal received as requested by the Contract Documents. The Engineer did not review the engineering or technical content of the submittal. <p>Engineer's review and approval is limited to determine whether items covered by this submittal will, after installation or incorporation in the Work, conform in general to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole. Any deviation from plans or specifications not depicted in the submittal or included but not clearly noted by the Contractor may not have been reviewed. Review by the Engineer shall not serve to relieve the Contractor of the contractual responsibility for any error or deviation from contract requirements.</p> |
|--|--|

Comments:

By _____ Date _____

Distribution: Contractor | | File | | Field | | Owner | | Other | |

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Contractor's Submittal Certification

Shop Drawing Transmittal No.:

Contract/Project Name:

Company Name:

has

1. reviewed and coordinated this Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
2. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
3. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
4. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

This Submittal **does not** contain any variations from the requirements of the Contract Documents.

This Submittal **does** contain variations from the requirements of the Contract Documents. A separate description of said variations and a justification for them is provided in an attachment hereto identified as:

"Shop Drawing Transmittal No. _____ Variation and Justification Documentation"

Insert picture file or electronic signature of Authorized Representative

Authorized Representative

Date

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1 **SECTION 01342**
2 **OPERATION AND MAINTENANCE MANUALS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Administration of the submittal process for Operation and Maintenance Manuals.
 - 7 2. Content requirements for Operation and Maintenance Manuals.
- 8 B. Related Specification Sections include but are not necessarily limited to:
- 9 1. Section 01340 - Submittals.
 - 10 2. Section 02200 - Earthwork.
 - 11 3. Section 03002 - Concrete.
 - 12 4. Section 11000 - Atmospheric Vaporizer System.
 - 13 5. Section 15065 - Piping: Stainless Steel.

14 **1.2 DEFINITIONS**

- 15 A. Equipment Operation and Maintenance Manuals:
- 16 1. Contain the technical information required for proper installation, operation and
 - 17 maintenance of process, electrical and mechanical equipment and systems.

18 **1.3 SUBMITTALS**

- 19 A. Operation and Maintenance Manuals:
- 20 1. Draft and final electronic copies.
 - 21 2. Final paper copies: One (1).

22 **1.4 SUBMITTAL SCHEDULE**

- 23 A. Draft Operation and Maintenance Manuals:
- 24 1. Submit approvable draft manuals in electronic format (PDF) within 30 days following
 - 25 approval of the respective Shop Drawing.
- 26 B. Final Operation and Maintenance Manuals:
- 27 1. Final approval of Operation and Maintenance Manuals in electronic format (PDF) must be
 - 28 obtained 20 days prior to equipment start-up.
 - 29 2. Provide paper copies and CD-ROMs of approved final Operation and Maintenance Manuals
 - 30 in electronic format (PDF), a minimum of 10 days prior to equipment start-up.

31 **1.5 PREPARATION OF SUBMITTALS**

- 32 A. General:
- 33 1. All pages of the Operation and Maintenance Manual submittal shall be legible.
 - 34 a. Submittals which, in the Purchaser's sole opinion, are illegible will be rejected without
 - 35 review.
 - 36 2. Identify each equipment item in a manner consistent with names and identification numbers
 - 37 used in the Contract Documents, not the manufacturer's catalog numbers.
 - 38 3. Neatly type any data not furnished in printed form.
 - 39 4. Operation and Maintenance Manuals are provided for Purchaser's use, to be reproduced and
 - 40 distributed as training and reference materials within Purchaser's organization.
 - 41 a. This requirement is:
 - 42 1) Applicable to both paper copy and electronic files.
 - 43 2) Applicable to materials containing copyright notice as well as those with no
 - 44 copyright notice.
 - 45 5. Notify supplier and/or manufacturer of the intended use of Operations and Maintenance
 - 46 Manuals provided under the Contract.

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- c. 3-Ring Binder:
 - 1) Provide D-ring binder with clear vinyl sleeves (i.e. view binder) on front and spine.
 - 2) Insert binder title sheet with the following information under the front and spine sleeves:
 - a) Project name.
 - b) Specification Section.
 - c) Equipment names and tag(s).
 - d) Manufacturer name.
 - e) Date (month, year).
 - 3) Provide plastic sheet lifters prior to first page and following last page.
 - d. Drawings:
 - 1) Provide all drawings at 11 x 17 IN size, triple folded and three-hole punched for insertion into manual.
 - 2) Where reduction is not practical to ensure readability, fold larger drawings separately and place in three-hole punched vinyl envelopes inserted into the binder.
 - 3) Identify vinyl envelopes with drawing numbers.
 - e. Use plastic coated dividers to tab each section of each manual in accordance with the Table of Contents.
- C. Equipment Operation and Maintenance Manual Content:
1. Provide a cover page as the first page of each manual with the following information:
 - a. Manufacturer(s) Name and Contact Information.
 - b. Vendor's Name and Contact Information.
 - c. Date (month, year).
 - d. Project Owner/Purchaser and Project Name.
 - e. Specification Section.
 - f. Project Equipment Tag Numbers.
 - g. Model Numbers.
 - h. Engineer's Name.
 - i. Equipment Supplier's Name.
 2. Provide a Table of Contents for each manual.
 3. Provide Equipment Record sheets as follows:
 - a. Printed copies of the Equipment Record (Exhibits B1, B2 and B3), as the first tab following the Table of Contents.
 - b. Exhibits B1-B3 are available as Fillable PDF Form documents from the Engineer.
 - c. Each section of the Equipment Record must be completed in detail; simply referencing the related equipment Operation and Maintenance Manual sections for nameplate, maintenance, spare parts or lubricant information is not acceptable.
 - d. For equipment involving separate components (for example, a motor and gearbox), a fully completed Equipment Record is required for each component.
 - e. Submittals that do not include the Equipment Record(s) will be rejected without further content review.
 4. Provide a printed copy of the Manufacturer's Field Services report following the Equipment Record sheets.
 5. Provide the following detailed information:
 - a. Use equipment tag numbers from the Contract Documents to identify equipment and system components.
 - b. Equipment function, normal and limiting operating characteristics.
 - c. Instructions for assembly, disassembly, installation, alignment, adjustment, and inspection.
 - d. Operating instructions for start-up, normal operation, control, shutdown, and emergency conditions.
 - e. Lubrication and maintenance instructions.
 - f. Troubleshooting guide.

- 1 g. Mark each sheet to clearly identify specific products and component parts and data
- 2 applicable to the installation for the Project; delete or cross out information that does
- 3 not specifically apply to the Project.
- 4 h. Parts lists:
- 5 1) A parts list and identification number of each component part of the equipment.
- 6 2) Exploded view or plan and section views of the equipment with a detailed parts
- 7 callout matching the parts list.
- 8 3) A list of recommended spare parts.
- 9 4) List of spare parts provided as specified in the associated Specification Section.
- 10 5) A list of any special storage precautions which may be required for all spare parts.
- 11 i. General arrangement, cross-section, and assembly drawings.
- 12 j. Electrical diagrams, including elementary diagrams, wiring diagrams, connection
- 13 diagrams, and interconnection diagrams.
- 14 k. Test data and performance curves.
- 15 l. As-constructed fabrication or layout drawings and wiring diagrams.
- 16 m. Copy of the equipment manufacturer's warranty meeting the requirements of the
- 17 Contract.
- 18 n. Copy of any service contracts provided for the specific piece of equipment as part of
- 19 the Contract.
- 20 6. Additional information as required in the associated equipment or system Specification
- 21 Section.
- 22 D. Building Materials and Finishes Operation and Maintenance Manual Content:
- 23 1. Building products, applied materials and finishes:
- 24 a. Include product data, with catalog number, size, composition and color and texture
- 25 designations.
- 26 b. Provide information for ordering custom manufactured products.
- 27 2. Necessary precautions:
- 28 a. Include product MSDS for each approved product.
- 29 b. Include any precautionary application and storage guidelines.
- 30 3. Instructions for care and maintenance:
- 31 a. Include manufacturer's recommendations for cleaning agents and methods, precautions
- 32 against detrimental agents and methods and recommended schedule for cleaning and
- 33 maintenance.
- 34 4. Moisture protection and weather exposed products:
- 35 a. Include product data listing, applicable reference standards, chemical composition, and
- 36 details of installation.
- 37 b. Provide recommendations for inspections, maintenance and repair.
- 38 5. Additional requirements as specified in individual product specifications.

39 1.6 TRANSMITTAL OF SUBMITTALS

- 40 A. Operation and Maintenance Manuals.
- 41 1. Transmit all submittals to:
- 42 a. The email address specified in Specification Section 01340 - SUBMITTALS.
- 43 2. Transmittal form: Use Operation and Maintenance Manual Transmittal, Exhibit A.
- 44 3. Transmittal numbering:
- 45 a. Number each submittal with the Specification Section number followed by a series
- 46 number beginning with "-01" and increasing sequentially with each additional
- 47 transmittal, followed by "-OM" (for example: 11061-01-OM).
- 48 4. Submit draft and final Operation and Maintenance Manual in electronic format (PDF) to
- 49 Purchaser, until manual is approved.
- 50 B. Expedited Return Delivery:
- 51 1. Include prepaid express envelope or air bill in submittal transmittal package for any
- 52 submittals Equipment Supplier expects or requires express return mail.
- 53 2. Inclusion of prepaid express envelope or air bill does not obligate Purchaser to conduct
- 54 expedited review of submittal.

1 **1.7 PURCHASER'S REVIEW ACTION**

2 A. Draft Electronic (PDF) Submittals:

- 3 1. Purchaser will review and indicate one of the following review actions:
- 4 a. A - ACCEPTABLE.
- 5 b. B - FURNISH AS NOTED.
- 6 c. C - REVISE AND RESUBMIT.
- 7 d. D - REJECTED.
- 8 2. Submittals marked as Acceptable or Furnish As Noted will be retained; however, the
- 9 transmittal form will be returned with a request for the final paper and electronic documents
- 10 to be submitted.
- 11 3. Copies of submittals marked as Revise and Resubmit or Rejected will be returned with the
- 12 transmittal form marked to indicate deficient areas.
- 13 4. Resubmit until approved.

14 B. Final Paper Copy Submittals:

- 15 1. Purchaser will review and indicate one (1) of the following review actions:
- 16 a. A - ACCEPTABLE.
- 17 b. D - REJECTED.
- 18 2. Submittals marked as Acceptable will be retained with the transmittal form returned as
- 19 noted.
- 20 3. Submittals marked as Rejected will be returned with the transmittal form marked to indicate
- 21 deficient areas.
- 22 4. Resubmit until approved.

23 **PART 2 - PRODUCTS - (NOT USED)**

24 **PART 3 - EXECUTION - (NOT USED)**

25 **END OF SECTION**

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EXHIBIT A **Operation and Maintenance Manual**
Transmittal _____ - _____ - OM
 (Spec Section) (Series)

Project Name: _____ Date Received: _____

Project Owner: _____ Checked By: _____

Contractor: _____ Owner: _____ Log Page: _____

Address: _____ Address: _____ HDR No.: _____

Attn: _____ Attn: _____

1st. Sub. _____ ReSub. _____

Date Transmitted: _____ Previous Transmittal Date: _____

No. Copies	Description of Item	Manufacturer	Dwg. or Data No.	Action Taken*

Remarks: _____

To: _____ From: *HDR Engineering, Inc.*

Date: _____

- * The Action designated above is in accordance with the following legend:
- A - Acceptable
 - B - Furnish as Noted
 - C - Revise and Resubmit
 - D - Rejected

Comments: _____

By _____ Date _____

Distribution: Contractor | | File | | Field | | Owner | | Other | |

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Equipment Data and Spare Parts Summary

Project Name	Specification Section:
Equipment Name	Year Installed:
Project Equipment Tag No(s).	

Equipment Manufacturer	Project/Order No.	
Address	Phone	
Fax	Web Site	E-mail

Local Vendor/Service Center	Phone	
Address		
Fax	Web Site	E-mail

MECHANICAL NAMEPLATE DATA

Equip.	Serial No.			
Make	Model No.			
ID No.	Frame No.	HP	RPM	Cap.
Size	TDH	Imp. Sz.	CFM	PSI
Other:				

ELECTRICAL NAMEPLATE DATA

Equip.	Serial No.							
Make	Model No.							
ID No.	Frame No.	HP	V.	Amp.	HZ	PH	RPM	SF
Duty	Code	Ins. Cl.	Type	NEMA	C Amb.	Temp. Rise	Rating	
Other:								

SPARE PARTS PROVIDED PER CONTRACT

Part No.	Part Name	Quantity

RECOMMENDED SPARE PARTS

Part No.	Part Name	Quantity

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Lubrication Summary

Equipment Description	Project Equip. Tag No(s).
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Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
	4					
	5					

Lubricant Point						
Lubricant Type	Manufacturer	Product	AGMA #	SAE #	ISO	
	1					
	2					
	3					
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	5					

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SECTION 02200
EARTHWORK

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Earthwork - Excavation, removal, backfilling and compaction.
- 7 B. Related Sections include but are not necessarily limited to:
- 8 1. Section 01340 - Submittals.
- 9 2. Section 03002 - Concrete.

10 **1.2 QUALITY ASSURANCE**

- 11 A. Referenced Standards:
- 12 1. ASTM International (ASTM):
- 13 a. C33, Standard Specification for Concrete Aggregates.
- 14 b. D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard
- 15 Effort (12,400 ft-lbf/ft³).
- 16 c. D1556-00, Standard Test Method for Density and Unit Weight of Soil in Place by the
- 17 Sand-Cone Method.
- 18 d. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using
- 19 Modified Effort (56,000 ft-lbf/ft³(2,700 kN-m/m)).
- 20 e. D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil
- 21 Classification System).
- 22 f. D2992-01, Standard Test Methods for Density of Soil and Soil-Aggregate in Place by
- 23 Nuclear Methods (Shallow Depth).
- 24 g. D3017-01, Standard Test Method for Water Content of Soil and Rock in Place by
- 25 Nuclear Methods (Shallow Depth).
- 26 h. D3786, Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven
- 27 Fabrics: Diaphragm.
- 28 i. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory
- 29 Table.
- 30 j. D4254, Test Methods for Minimum Index Density of Soils and Calculation of Relative
- 31 Density.
- 32 k. D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of
- 33 Soils.
- 34 2. Virginia Department of Transportation (VDOT):
- 35 a. Standard Drawings (current edition).
- 36 b. Road and Bridge Specifications (current edition).

37 **1.3 DEFINITIONS**

- 38 A. Excavation: Consists of removal of material encountered to subgrade elevations required or
- 39 indicated.
- 40 1. Earth excavation includes excavation of pavements and other obstructions visible on
- 41 surface; underground structures, utilities, and other items indicated to be demolished and
- 42 removed; boulders; and rock.
- 43 B. Unauthorized Excavation: Consists of removal of materials beyond indicated subgrade
- 44 elevations or dimensions without specific direction of Owner. Unauthorized excavation, as well
- 45 as remedial work directed by Owner shall be at Contractor's expense.

- 1 1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by
2 extending indicated bottom elevation of footing or base to excavation bottom, without
3 altering required top elevation. Lean concrete fill may be used to bring elevations to proper
4 position.
- 5 2. In locations other than those above, backfill and compact unauthorized excavations as
6 specified for authorized excavations of same classification, unless otherwise directed by
7 Owner.
- 8 C. Subgrade: The undisturbed earth or the compacted soil layer immediately below foundation
9 bearing, elevation, subbase material, or topsoil materials.
- 10 D. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features
11 occurring above or below ground surface.
- 12 E. Unsuitable Soil Materials: Soil materials encountered at or below subgrade elevation of
13 insufficient character to support construction as determined by the Owner (ref. 2.1 "Materials").
- 14 F. Non-Structural Fill/Backfill: Soil materials placed and compacted to achieve finish grade
15 elevations that do NOT support utilities, foundations, slabs, paving, or other flatwork.

16 **1.4 SUBMITTALS**

- 17 A. Shop Drawings:
 - 18 1. See Section 01340 for requirements for the mechanics and administration of the submittal
19 process.
 - 20 2. Product technical data including:
 - 21 a. Acknowledgement that products submitted meet requirements of standards referenced.
 - 22 b. Manufacturer's installation instructions.
 - 23 3. Certifications.
 - 24 4. Test reports:
 - 25 a. Report and certification of granular fill and drainage course.
 - 26 b. Test reports on borrow material.
 - 27 c. Verification of suitability of each footing subgrade material, in accordance with
28 specified requirements.
- 29 B. Samples:
 - 30 1. Submit samples and source of fill and backfill materials proposed for use.
 - 31 2. Submit samples and source of borrow materials proposed for use.

32 **1.5 PROJECT CONDITIONS**

- 33 A. Existing Utilities: Prior to excavating, Contractor shall locate all existing underground utilities
34 in areas of excavation work. If utilities are indicated to remain in place, provide adequate means
35 of support and protection during earthwork operations.
 - 36 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during
37 excavation, consult utility owner immediately for directions. Cooperate with Owner and
38 utility companies in keeping respective services and facilities in operation.
 - 39 2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during
40 occupied hours, except when permitted in writing by Owner and then only after acceptable
41 temporary utility services have been provided. Obtain Owner's approval prior to
42 disconnecting any utility service.
 - 43 3. Demolish and completely remove from site existing underground utilities indicated to be
44 removed. Coordinate with utility companies for shutoff of services.
 - 45 4. Relocation of existing utilities shall be the responsibility of the Contractor.
- 46 B. Protection of Persons and Property: Provide adequate means of protection as required by
47 regulating authorities, but by no means less than that which is called for in the Contract
48 Documents.

- 1 1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused
2 by settlement, lateral movement, undermining, washout, and other hazards created by
3 earthwork operations.
- 4 2. Perform excavation by hand within dripline of large trees designated by Owner to remain.
5 Protect root systems from damage or dryout to the greatest extent possible. Maintain moist
6 condition for root system and cover exposed roots with moistened burlap.

7 **PART 2 - PRODUCTS**

8 **2.1 MATERIALS**

- 9 A. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil
10 classification groups MH, CH, OL, OH, PT, and CL (PI>20), unless modified by the Owner, and
11 shall not be used for any component of the Project. Disposal of excavated unsatisfactory
12 materials on-site shall conform to the requirements in the Contract Documents.
- 13 B. Structural Fill: Satisfactory structural fill soil materials are defined as those complying with
14 ASTM D2487 soil classification groups GW, GM, SM, and SW (PI<20) with a maximum of 17
15 percent fines passing the No. 200 sieve, unless modified by the Owner. Material shall be free of
16 clay, rock, or gravel larger than 4 IN in any dimension, debris, waste, frozen materials,
17 vegetation, and other deleterious matter.
 - 18 1. Non-structural fill shall include structural fill and GC, GP, SC, SP, ML, and CL (PI<20).
 - 19 2. Excavated on-site material may be used for structural fill if in compliance with the Contract
20 Documents.
 - 21 3. The Owner makes no representations as to the suitability of on-site materials for use as fill
22 and backfill.
- 23 C. Base Course Material: Naturally or artificially graded mixture of natural or crushed gravel,
24 crushed stone, crushed slag, and natural or crushed sand.
- 25 D. Granular Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel,
26 with 100 percent passing a 1-1/2 IN sieve and not more than 5 percent passing a No. 4 sieve
27 used where specified in the Contract Documents.
- 28 E. Crushed Stone: Free draining stone VDOT Coarse Material #57.
- 29 F. Drainage Course: Same as Crushed Stone.
- 30 G. Borrow Soil Materials: Satisfactory soil materials as defined above, that originate and are
31 obtained off the construction site.
- 32 H. Mud Mat: 3 to 4 IN of unreinforced concrete.

33 **PART 3 - EXECUTION**

34 **3.1 PROTECTION**

- 35 A. Erosion Control:
 - 36 1. Clean paved roadways daily of any spillage of dirt, rocks or debris from equipment entering
37 or leaving site.
 - 38 2. Conduct work to minimize erosion of site. Remove eroded material washed off site. If
39 necessary or requested by Owner, construct stilling areas to settle and detain eroded
40 material.
- 41 B. Protect new and existing structures from becoming damaged due to construction operations or
42 other reasons.
 - 43 1. Prevent subgrade under new and existing utilities and structures from becoming wet and
44 undermined during construction due to presence of surface or subsurface water or due to
45 construction operations.

- 1 C. Protect existing surface and subsurface features on-site and adjacent to site as follows:
2 1. Provide barricades, coverings, or other types of protection necessary to prevent damage to
3 existing items indicated to remain in place.
4 2. Protect and maintain bench marks, monuments or other established reference points and
5 property corners.
6 a. If disturbed or destroyed, replace at own expense to full satisfaction of Owner and
7 controlling agency.
8 3. Verify location of utilities.
9 a. Omission or inclusion of utility items does not constitute non-existence or definite
10 location.
11 b. Secure and examine local utility records for location data.
12 c. Take necessary precautions to protect existing utilities from damage due to any
13 construction activity.
14 d. Repair damages to utility items at own expense.
15 e. In case of damage, notify Engineer at once so required protective measures may be
16 taken.
17 4. Maintain free of damage, existing sidewalks, structures, and pavement, not indicated to be
18 removed.
19 a. Any item known or unknown or not properly located that is inadvertently damaged
20 shall be repaired to original condition.
21 b. All repairs to be made and paid for by Contractor.
22 5. Provide full access to public and private premises, fire hydrants, street crossings, sidewalks
23 and other points as designated by Owner to prevent serious interruption of travel.
24 6. Maintain stockpiles and excavations in such a manner to prevent inconvenience or damage
25 to structures on-site or on adjoining property.
26 7. Avoid surcharge or excavation procedures which can result in heaving, caving, or slides.
27 D. Salvageable Items: Carefully remove items to be salvaged, and store on Owner's premises
28 unless otherwise directed.
29 E. Dispose of waste materials, legally, off site. Burning, as a means of waste disposal, is not
30 permitted.

31 3.2 SITE EXCAVATION AND GRADING

- 32 A. The site excavation and grading work includes:
33 1. All operations in connection with excavation, borrow, construction of fills and
34 embankments, rough grading, and disposal of excess materials in connection with the
35 preparation of the site(s) for construction of the proposed facilities.
36 2. The work includes the offsite disposition of all material that:
37 a. Exceed quantities required for earthwork on the project.
38 b. That the Owner classifies as unacceptable.
39 c. That the Owner classifies as potentially contaminated.
40 3. The Owner will provide for the offsite disposal location at the landfill for soils classified as
41 contaminated, and land-filling cost for the delivered contaminated soils will be borne by the
42 Owner. All other excavated materials that exceed quantities required for earthwork on the
43 project shall be disposed of off site by the Contractor at the Contractor's expense.
44 B. Excavation and Grading: Perform as required by the Contractor's Equipment Pad Design.
45 1. Contractor's Drawings may indicate both existing grade and finished grade required for
46 construction of Project.
47 a. Stake all units, structures, piping, roads, parking areas and walks and establish their
48 elevations.
49 b. Perform other layout work required.
50 c. Replace property corner markers to original location if disturbed or destroyed.
51 2. Preparation of ground surface for fills:
52 a. Before fill is started, scarify to a minimum depth of 6 IN in all proposed embankment
53 and fill areas.

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2. Structures:

LOCATION	COMPACTION DENSITY
Inside of structures under foundations, under equipment support pads, under slabs-on-grade and scarified existing subgrade under fill material	95 percent per ASTM D1557
Outside structures next to walls, piers, columns and any other structure exterior member and scarified existing subgrade under fill material	90 percent per ASTM D1557

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3.4 EXCAVATION, FILLING, AND BACKFILLING FOR STRUCTURES

5

A. General:

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1. In general, work includes, but is not necessarily limited to, excavation for structures and retaining walls, removal of underground obstructions and undesirable material, backfilling, filling, and fill, backfill, and subgrade compaction.

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2. Obtain fill and backfill material necessary to produce grades required.

10

11

a. Materials and source to be approved by Owner.

b. Excavated material approved by Owner may also be used for fill and backfill.

12

B. Excavation work shall be sequenced such that the final excavation subgrade shall remain undisturbed. Excavation shall be sequenced such that equipment travel does not occur on interim subgrade within 2 FT of final subgrade, in the case where in-situ soil subgrade is the foundation support. In this case, place backfill by spreading backfill in front of the equipment to avoid travel on excavated subgrade.

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C. Where excavation subgrade is below the groundwater table, ensure groundwater level has been lowered to 2 FT below subgrade.

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D. Proof-roll granular subgrades prior to placing backfill or concrete materials.

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E. Where compressible, fine-grained soils exist at design subgrade level and where pile foundation are not used, over-excavation shall be performed to a depth of up to 2 FT. Subgrade after over-excavation shall be maintained in undisturbed condition and dry. Equipment or human travel on subgrade shall not occur if over-excavated subgrade is a fine-grained soil.

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25

F. Balance excavations such that excavation adjacent to a structure is not greater than 5 FT below the ground surface on the other side of the structure.

26

G. Excavation Requirements for Structures:

27

1. General:

28

a. Do not commence excavation for foundations for structures until Owner approves:

29

30

1) The removal of topsoil and other unsuitable and undesirable material from existing subgrade.

31

32

2) Density and moisture content of site area compacted fill material meets requirements of specifications.

33

b. Owner grants approval to begin excavations.

34

2. Dimensions:

35

a. Excavate to elevations and dimensions indicated or specified.

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b. Allow additional space as required for construction operations and inspection of foundations.

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3. Removal of obstructions and unsuitable materials in excavation includes, but is not necessarily limited to, removal of old foundations, existing construction, unsuitable subgrade soils, expansive type soils, and any other materials which may be concealed beneath present grade, as required to execute work indicated on Contractor's Drawings.

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- a. If unsuitable material and obstructions are encountered during excavation, remove material and replace as directed by Owner.
- 4. Level off bottoms of excavations to receive foundations, floor slabs, equipment support pads, or compacted fill.
 - a. Remove loose materials and bring excavations into approved condition to receive concrete or fill material.
 - b. Where compacted fill material must be placed to bring subgrade elevation up to underside of construction, scarify existing subgrade upon which fill material is to be placed to a depth of 6 IN and then compact to density stated in this Specification before fill material can be placed thereon (reference Compaction Density Requirements).
 - c. Do not carry excavations lower than shown for foundations except for over-excavation of unsuitable soils as noted in the Contract Documents.
- 5. Notify Owner as soon as excavation is completed in order that subgrades may be inspected.
 - a. Do not commence further construction until subgrade under compacted fill material, under foundations, under floor slabs-on-grade, under equipment support pads, and under retaining wall footings has been inspected and approved by the Owner as being free of undesirable material, being of compaction density required by this specification, and being capable of supporting the allowable foundation design bearing pressures and superimposed foundation, fill, and building loads to be placed thereon.
 - b. Owner shall be given the opportunity to inspect subgrade below fill material both prior to and after subgrade compaction.
 - c. Place fill material, slabs-on-grade, and equipment support pads as soon as weather conditions permit after excavation is completed, inspected, and approved and after forms and reinforcing are inspected and approved.
 - d. Before concrete or fill material is placed, protect approved subgrade from becoming loose, wet, frozen, or soft due to weather, construction operations, or other reasons.
- 6. Subgrade stabilization:
 - a. If subgrade under, fill material, or structures is in a frozen, loose, wet, or soft condition before construction is placed thereon, remove frozen, loose, wet, or soft material and replace with approved compacted material as directed by Owner. Provide compaction density of replacement material as stated in this specification section.
 - b. Remove and replace frozen materials as directed by Owner. Method of stabilization shall be performed as directed by Engineer.
 - c. Do not place further construction on the repaired subgrades, until the subgrades have been approved by the Owner.
- 7. Drainage:
 - a. Control grading around structures so that ground is pitched to prevent water from running into excavated areas or damaging structures.
 - b. Maintain excavations where foundations, floor slabs, equipment support pads or fill material are to be placed free of water.
 - c. Provide pumping required to keep excavated spaces clear of water during construction.
 - d. Should any water be encountered in the excavation, notify Owner.
 - e. Provide free discharge of water by trenches, pumps, wells, well points, or other means as necessary and drain to point of disposal that will not damage existing or new construction or interfere with construction operations, plant operations or cause soil erosion.
- 8. Frost protection:
 - a. Do not place foundations, slabs-on-grade, equipment support pads, or fill material on frozen ground.
 - b. When freezing temperatures may be expected, do not excavate to full depth indicated, unless foundations, floor slabs, equipment support pads, or fill material can be placed immediately after excavation has been completed and approved.
 - c. Protect excavation from frost if placing of concrete or fill is delayed.
 - d. Where a concrete slab is a base slab-on-grade located under and within a structure that will not be heated, protect subgrade under the slab from becoming frozen until final acceptance of the Project by the Owner.

1 e. Protect subgrade under foundations of a structure from becoming frozen until structure
2 is completed and heated to a temperature of at least 50 DegF.

3 H. Fill and Backfill for Structures:

- 4 1. General:
- 5 a. Subgrade to receive fill or backfill shall be free of unsuitable material as determined by
6 Engineer.
- 7 b. Surface may be stepped by at not more than 12 IN per step or may be sloped at not
8 more than 2 percent.
- 9 c. Do not place any fill or backfill material until subgrade under fill or backfill has been
10 inspected and approved by Owners being free of unsuitable material and compacted to
11 specified density.
- 12 2. Obtain approval of fill and backfill material and source from Owner prior to placing the
13 material.
- 14 3. Drainage course under foundations: All foundations and footings shall be placed on a
15 properly compacted drainage course; thickness as indicated on the Drawings.
- 16 4. Fill and backfill placement:
- 17 a. Prior to placing fill and backfill material, optimum moisture and maximum density
18 properties for proposed material in thin lifts as necessary to obtain the required
19 compaction density. Place fill and backfill material in thin lifts as necessary to obtain
20 required compaction density.
- 21 b. Compact material by means of equipment of sufficient size and proper type to obtain
22 specified density.
- 23 c. Use hand operated equipment for filling and backfilling next to walls.
- 24 d. Do not place fill and backfill when the temperature is less than 40 DegF and when
25 subgrade to receive fill and backfill material is frozen, wet, loose, or soft.
- 26 e. Use vibratory equipment to compact granular material; do not use water.
- 27 5. Where fill material is required below foundations, place fill material, conforming to the
28 required density and moisture content, outside the exterior limits of foundations located
29 around perimeter of structure the following horizontal distance whichever is greater:
- 30 a. As required to provide fill material to indicated finished grade.
- 31 b. 5 FT.
- 32 c. Distance equal to depth of compacted fill below bottom of foundations.
- 33 d. As directed by Owner.

34 I. Backfilling Outside of Structures Under Piping or Paving:

- 35 1. When backfilling outside of structures requires placing backfill material under piping or
36 paving, the material shall be placed from bottom of excavation to underside of piping or
37 paving at the density required for fill under piping or paving as indicated in this Section.
- 38 2. This compacted material shall extend transversely to the centerline of piping or paving a
39 horizontal distance each side of the exterior edges of piping or paving equal to the depth of
40 backfill measured from bottom of excavation to underside of piping or paving.
- 41 3. Provide special compacted bedding or compacted subgrade material under piping or paving
42 as required by other sections of these Specifications.

43

END OF SECTION

1 **SECTION 03002**
2 **CONCRETE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Addresses:
6 1. Cast-in-place concrete and grout.
- 7 B. Related Specification Sections include but are not necessarily limited to:
8 1. Section 01340 - Submittals.
9 2. Section 02200 - Earthwork.
10 3. Section 11000 - Atmospheric Vaporizer System.

11 **1.2 REFERENCED STANDARDS**

- 12 A. American Concrete Institute (ACI):
13 1. 116R, Cement and Concrete Terminology.
14 2. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass
15 Concrete.
16 3. 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
17 4. 212.3R, Chemical Admixtures for Concrete.
18 5. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
19 6. 304.2R, Placing Concrete by Pumping Methods.
20 7. 305R, Hot Weather Concreting.
21 8. 306R, Cold Weather Concreting.
22 9. 318, Building Code Requirements for Structural Concrete.
23 10. 347R, Recommended Practice for Concrete Formwork.
- 24 B. Quality Control:
25 1. Concrete testing agency:
26 a. Contractor to employ and pay for services of a testing laboratory to:
27 1) Perform materials evaluation.
28 2) Design concrete mixes.
29 b. Concrete testing agency to meet requirements of ASTM E329.
30 2. Do not begin concrete production until proposed concrete mix design has been approved by
31 Owner.
32 a. Approval of concrete mix design by Owner does not relieve Contractor of his
33 responsibility to provide concrete that meets the requirements of this Specification.
34 3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength
35 test results or other circumstances warrant.
36 a. Do not use revised concrete mixes until submitted to and approved by OWNER.
37 4. Perform structural calculations as required to prove that all portions of the structure in
38 combination with remaining forming and shoring system has sufficient strength to safely
39 support its own weight plus the loads placed thereon. See Section 11000 for structural
40 design requirements.
- 41 C. Qualifications:
42 1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association
43 (NRMCA).

1 **1.3 SUBMITTALS**

2 A. Shop Drawings:

- 3 1. See Section 01340 for requirements for the mechanics and administration of the submittal
4 process.
- 5 2. Concrete mix designs proposed for use.
- 6 a. Concrete mix design submittal to include the following information.
- 7 1) Sieve analysis and source of fine and coarse aggregates.
- 8 2) Test for aggregate organic impurities.
- 9 3) Test for deleterious aggregate per ASTM C289.
- 10 4) Proportioning of all materials.
- 11 5) Type of cement with mill certificate for cement.
- 12 6) Type of fly ash with certificate of conformance to specification requirements.
- 13 7) Slump.
- 14 8) Air content.
- 15 9) Brand, type, ASTM designation, and quantity of each admixture proposed for use.
- 16 10) 28-day cylinder compressive test results of trial mixes per ACI 318 and as
17 indicated herein.
- 18 11) Shrinkage test results.
- 19 12) Standard deviation value for concrete production facility.
- 20 3. Product technical data including:
- 21 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 22 b. Manufacturer's installation instructions.
- 23 c. Manufacturers and Types:
- 24 1) Joint fillers.
- 25 2) Curing agents.
- 26 3) Chemical sealer.
- 27 4) Bonding and patching mortar.
- 28 5) Construction joint bonding adhesive.
- 29 6) Non-shrink grout with cure/seal compound.
- 30 7) Waterstops.
- 31 4. Reinforcing Steel:
- 32 a. Show grade, sizes, number, configuration, spacing, location and all fabrication and
33 placement details.
- 34 b. In sufficient detail to permit installation of reinforcing without having to make
35 reference to Contract Drawings.
- 36 c. Obtain approval of Shop Drawings by OWNER before fabrication.
- 37 d. Mill certificates.
- 38 5. Strength test results of in place concrete including slump, air content and concrete
39 temperature.

40 **PART 2 - PRODUCTS**

41 **2.1 PORTLAND CEMENT**

- 42 A. Conform to ASTM C150 Type V.

43 **2.2 FLY ASH**

- 44 A. ASTM C618, Class F or Class C.
- 45 B. Nonstaining.
- 46 C. Hardened concrete containing fly ash to be uniform light gray color.
- 47 D. Maximum Loss on Ignition: 4 percent.

- 1 E. Compatible with other concrete ingredients.
- 2 F. Obtain proposed fly ash from a source approved by VDOT.

3 **2.3 ADMIXTURES**

- 4 A. Air Entraining Admixtures: ASTM C260.
- 5 B. Water Reducing, Retarding, and Accelerating Admixtures:
 - 6 1. ASTM C494 Type A through E.
 - 7 2. Conform to provisions of ACI 212.3R.
 - 8 3. Do not use retarding or accelerating admixtures unless specifically approved in writing by
 - 9 Engineer.
 - 10 4. Follow manufacturer's instructions.
 - 11 5. Use chloride-free admixtures only.
- 12 C. Maximum total water soluble chloride ion content contributed from all ingredients of concrete
- 13 including water, aggregates, cementitious materials and admixtures by weight percent of cement:
- 14 0.10.
- 15 D. Do not use calcium chloride.
- 16 E. Pozzolanic Admixtures: ASTM C618.
- 17 F. Provide admixtures of same type, manufacturer and quantity as used in establishing required
- 18 concrete proportions in the mix design.

19 **2.4 WATER**

- 20 A. Potable, clean, free of oils, acids and organic matter.

21 **2.5 AGGREGATES**

- 22 A. Normal Weight Concrete: ASTM C33, except as modified below.
- 23 B. Fine Aggregate:
 - 24 1. Clean natural sand.
 - 25 2. No manufactured or artificial sand.
- 26 C. Coarse Aggregate:
 - 27 1. Crushed rock, natural gravel, or other inert granular material.
 - 28 2. Maximum amount of clay or shale particles: 1 percent.
- 29 D. Gradation of Coarse Aggregate:
 - 30 1. Lean concrete and concrete topping: Size #7.
 - 31 2. All other concrete: Size #57 or #67.

32 **2.6 GROUT**

- 33 A. Nonshrink, Nonmetallic Grout:
 - 34 1. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
 - 35 2. Grout to produce a positive but controlled expansion.
 - 36 3. Mass expansion not to be created by gas liberation.
 - 37 4. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.
 - 38 5. In accordance with COE CRD-C621.
- 39 B. Epoxy Grout:
 - 40 1. Three-component epoxy resin system.
 - 41 2. Two liquid epoxy components.
 - 42 3. One inert aggregate filler component.
- 43 C. Each component packaged separately for mixing at jobsite.

1 **2.7 REINFORCING STEEL**

- 2 A. Reinforcing Bars: ASTM A615, Grade 60.
3 B. Welded Wire Fabric: ASTM A185, Minimum yield strength: 60,000 psi.
4 C. Column Spirals: ASTM A82.

5 **2.8 CONCRETE MIXES**

- 6 A. General:
7 1. All concrete to be ready mixed concrete conforming to ASTM C94.
8 2. Provide concrete of specified quality capable of being placed without segregation and, when
9 cured, of developing all properties required.
10 B. All concrete to be normal weight concrete.
11 C. Strength:
12 1. Provide specified strength and type of concrete for each use in structure(s) as follows:
13

TYPE	WEIGHT	SPECIFIED STRENGTH*
Concrete fill	Normal weight	3000 psi
Lean concrete	Normal weight	3000 psi
Concrete topping	Normal weight and lightweight	4000 psi
Precast concrete	Normal weight and lightweight	5000 psi
All other general use concrete	Normal weight	4000 psi

14 * Minimum 28-day compressive strength.
15

- 16 D. Air Entrainment:
17 1. Provide air entrainment in all concrete resulting in a total air content percent by volume as
18 follows:
19

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	5 to 7
1/2 IN	5 1/2 to 8

- 20 2. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM
21 C138.
22

- 23 E. Slump:
24 1. Four inches maximum, 1 inch minimum.
25 2. Measured at point of discharge of the concrete into the concrete construction member.
26 3. Concrete of lower than minimum slump may be used provided it can be properly placed and
27 consolidated.
28 4. Pumped concrete:
29 a. Provide additional water at batch plant to allow for slump loss due to pumping.
30 b. Provide only enough additional water so that slump of concrete at discharge end of
31 pump hose does not exceed maximum slump specified above.
32 5. Determine slump per ASTM C143.

- 33 F. Selection of Proportions:
34 1. Proportion ingredients to:
35 a. Produce proper workability, durability, strength, and other required properties.
36 b. Prevent segregation and collection of excessive free water on surface.

- 1 2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:
2

SPECIFIED STRENGTH	MINIMUM CEMENT, LB/CY			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	MAXIMUM AGGREGATE SIZE			
	1/2 IN	3/4 IN	1 IN	
3000	---	517	517	0.45
4000	611	611	611	0.45
5000	---	686	665	0.40

- 3
4 3. Substitution of fly ash: Maximum of 25 percent by weight of cement at rate of 1 LB fly ash
5 for 1 LB of cement.
6 4. Sand cement grout:
7 a. Three parts sand.
8 b. One part Portland cement.
9 c. Entrained air: Six percent plus or minus one percent.
10 d. Sufficient water for required workability.
11 e. Minimum 28-day compressive strength: 3,000 psi.
12 5. Normal weight concrete:
13 a. Proportion mixture to provide desired characteristics using one of methods described
14 below:
15 1) Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein:
16 a) Air content within range specified above.
17 b) Record and report temperature of trial mixes.
18 c) Proportion trial mixes per ACI 211.1.
19 2) Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
20 a) Field test records must be acceptable to Owner to use this method.
21 b) Test records shall represent materials, proportions and conditions similar to
22 those specified.
23 b. Required average strength to exceed the specified 28-day compressive strength by the
24 amount determined or calculated in accordance with the requirements of Paragraph 5.3
25 of ACI 318 using the standard deviation of the proposed concrete production facility as
26 described in Paragraph 5.3.1 of ACI 318.

27 PART 3 - EXECUTION

28 3.1 PLACING CONCRETE

- 29 A. Placing Concrete:
30 1. Place concrete in compliance with ACI 304R and ACI 304.2R.
31 2. Place in a continuous operation within planned joints or sections.
32 3. Begin placement when work of other trades affecting concrete is completed.
33 4. Place concrete by methods which prevent aggregate segregation.
34 5. Do not allow concrete to free fall more than 4 ft.
35 6. Where free fall of concrete will exceed 4 ft, place concrete by means of tremie pipe or
36 chute.
37 B. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand
38 rodding and tamping, so that concrete is worked around reinforcement and embedded items into
39 all parts of forms.
40 C. Protection:
41 1. Protect concrete from physical damage or reduced strength due to weather extremes.
42 2. In cold weather comply with ACI 306R except as modified herein:
43 a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars
44 coated with frost, ice or snow.

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b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30 Deg F	70 Deg F
Between 30-45 Deg F	60 Deg F
Above 45 Deg F	50 Deg F

- c. Do not place heated concrete that is warmer than 80 Deg F.
- d. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 Deg F for 7 days or 70 Deg F for 3 days.
- e. Do not allow concrete to cool suddenly.
- 3. In hot weather, comply with ACI 305R except as modified herein:
 - a. At air temperature of 90 Deg F and above, keep concrete as cool as possible during placement and curing.
 - b. Do not allow concrete temperature to exceed 90 Deg F at placement.
 - c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 - d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs./SF/hr. as determined from ACI 305R, Figure 2.1.5.

D. Curing:

- 1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
- 2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
- 3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
- 4. Provide curing for minimum of 7 days.
- 5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
- 6. In hot weather follow curing procedures outlined in ACI 305R.
- 7. In cold weather follow curing procedures outlined in ACI 306R.
- 8. If forms are removed before 7 days have elapsed, finish curing of formed surfaces by one of above methods for the remainder of the curing period.
- 9. Curing vertical surfaces with a curing compound:
 - a. Cover vertical surfaces with a minimum of two coats of the curing compound.
 - b. Allow the preceding coat to completely dry prior to applying the next coat.
 - c. Apply the first coat of curing compound immediately after form removal.
 - d. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
 - e. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

3.2 FIELD QUALITY CONTROL

- A. Contractor will employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.
- B. Tests During Construction:
 - 1. Strength test - procedure:
 - a. Three cylinders, 6 IN DIA x 12 IN high, will be taken from each sample per ASTM C172 and ASTM C31.
 - b. Cylinders will be tested per ASTM C39:
 - 1) One at 7 days.
 - 2) Two at 28 days.

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2. Strength test - frequency:
 - a. Not less than one test each day concrete placed.
 - b. Not less than one test for each 50 CY or major fraction thereof placed in one day.
 - c. Not less than one test for each type of concrete poured.
 - d. Not less than one test for each concrete structure exceeding 2 CY volume.
 3. Slump test:
 - a. Per ASTM C143.
 - b. Determined for each strength test sample.
 - c. Additional slump tests may be taken.
 4. Air content:
 - a. Per ASTM C231, ASTM C173, and ASTM C138.
 - b. Determined for each strength test sample.
 5. Temperature: Determined for each strength test sample.
- C. Evaluation of Tests:
1. Strength test results:
 - a. Average of 28-day strength of two cylinders from each sample.
 - 1) If one cylinder manifests evidence of improper sampling, molding, handling, curing or testings, strength of remaining cylinder will be test result.
 - 2) If both cylinders show any of above defects, test will be discarded.
- D. Acceptance of Concrete:
1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
 - a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
 - b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
 2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by OWNER.
 - a. Perform additional tests and/or corrective measures at no additional cost to OWNER.

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END OF SECTION

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SECTION 11000
ATMOSPHERIC VAPORIZER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Requirements for replacing the existing liquid oxygen (LOX) water bath vaporizers with atmospheric vaporizers and associated controls, piping, and valves.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 01340 - Submittals.
 - 2. Section 01342 - Operation and Maintenance Manuals.
 - 3. Section 02200 - Earthwork.
 - 4. Section 03002 - Concrete.
 - 5. Section 15065 - Pipe: Stainless Steel.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. All local and national building and electrical codes that apply.
 - 2. Compressed Gas Association Standards and Specifications including but not necessarily limited to:
 - a. CGA E-8: Standard for Oxygen Gas Flowmeters.
 - b. CGA G-4.1: Cleaning Equipment for Oxygen Service.
 - c. CGA G-4.4: Oxygen Pipeline Systems.
 - d. CGA P-56: Cryogenic Vaporization Systems.
- B. Qualifications:
 - 1. Vaporizer system Vendor and Contractor are used interchangeably in this section since for this work the Vendor and Contractor are considered the same entity. Vendor must have demonstrated prior in-the-field experience supplying LOX vaporizer installations. "Third party," or "pass-through," experience is not acceptable. "Third party," as defined herein, means a non-vendor owned subcontractor to the system vendor who performs all or essentially all of the LOX vaporizer system conversion work.
 - 2. See Section 01340 for detailed submittal requirements.

1.3 SYSTEM DESCRIPTION

- A. The project includes the replacement of the existing LOX water bath vaporizers with atmospheric vaporizers having a continuous supply rating of 100 TPD of gaseous oxygen.
 - 1. This project includes the supply and complete installation in the location shown in the procurement package of the LOX atmospheric vaporizers, including all foundations, equipment, automatic switching valve module, piping, valving, instrumentation, signal wiring, and electrical necessary for a complete, operating LOX vaporizer system with the desired production capacity.
 - 2. Removal of the existing water bath vaporization system, including piping, coils, and other connected equipment. Drain the concrete water bath and fill with gravel after the new vaporization system is operational.
 - 3. Vaporizer system sizing and configuration will be the responsibility of the Contractor and will be submitted to the Owner for review and approval prior to installation. Vaporizer system will be natural draft and designed to provide product flow rate and meet the design criteria listed in Section 11000, paragraph 2.2 without operator intervention. Operator intervention means manual or other forms of assisted defrosting during operation at site location specified.

- 1 4. Descriptions of the conversion and a list of replacements - including tag numbers - shall be
2 supplied for plant approval, including new valves, instruments, and controllers.
- 3 B. The vaporizer system shall include a standalone PLC, sized to accommodate all LOX
4 control/monitoring points, allowing the LOX system operations of receiving, distributing, and
5 product header control regardless of Oxygen plant status. The PLC shall be located in the
6 existing Oxygen plant Control Building. Contractor shall coordinate with Owner to establish the
7 location of PLC within the Control Building.
- 8 C. In addition to the LOX atmospheric vaporizers, atmospheric pressure building coils for each
9 LOX storage tank and an atmospheric cold box drain vaporizer system, and a LOX tank
10 economizer vaporizer shall be part of the complete water bath vaporizer replacement project.
- 11 1. Pressure building coils, the drain vaporizer, and the economizer vaporizer sizing shall be
12 confirmed by vendor and shall include all equipment, piping modifications, and field
13 electronic instrumentation required for complete, operable systems properly sized for the
14 use intended.
- 15 2. Field instrumentation associated with the pressure building and economizer coils
16 (vaporizers) shall be connected to the vaporizer PLC. Contractor shall provide appropriate
17 interface between the vaporizer PLC and the Oxygen plant control system for a seamless
18 control experience. It shall be the Contractor's responsibility to coordinate with the Owner
19 on existing control and power supply equipment in order to determine appropriate system
20 interface requirements.
- 21 D. Replace/ add the following items to the LOX system:
- 22 1. Add a pressure transmitter to each LOX tank. Connect to the vaporizer PLC.
- 23 2. Add a level transmitter to each LOX tank. Connect to the vaporizer PLC.
- 24 3. Replace the existing low temperature devices with RTD's and transmitters. Connect to the
25 vaporizer PLC.
- 26 4. Connect signals from the existing PV635X to the vaporizer PLC.
- 27 5. Replace the LOX tank pressure building control system(s) and the economizer control
28 system(s) and connect as necessary to the vaporizer PLC.
- 29 E. The project includes providing "As Built" Drawings and O & M manuals for the modified
30 systems described above, performance testing of the new atmospheric vaporization system, and a
31 complete training program on the new vaporization system installed.
- 32 F. Contractor shall determine, furnish, and install the interconnections of those devices that are
33 ancillary to the Oxygen plant but are not specifically a part of it.
- 34 G. Provide a vaporizer control system that is integrated with the plant SCADA system and has
35 appropriate pneumatic signals transferred from the main cryogenic plant control system to
36 enable the cryogenic plant and vaporizer system to work together. Provide a local HMI control
37 panel and PLC with digital control components for the new vaporizer system. The control panel
38 and PLC shall be located in the existing Oxygen Plant Control Building. The Contractor shall
39 Coordinate with Owner to establish final location of control panel and PLC within the Control
40 Building.

41 **1.4 SUBMITTALS**

- 42 A. Submittals Required with the Bid:
- 43 1. Layout Drawings showing proposed system configuration.
- 44 2. Product technical data including:
- 45 a. Manufacturer's technical data sheets on each vaporizer component (LOX, pressure
46 building, drain, and economizer).
- 47 b. Acknowledgement that products submitted meet requirement of standards referenced.
- 48 3. Description of proposed system including:
- 49 a. Basis for sizing for each vaporizer component.
- 50 b. System Process and Instrumentation Diagram.
- 51 c. Plan for all required tie-ins and maintenance of plant operation (MOPO) during
52 construction.

- 1 B. Shop Drawings:
- 2 1. See Specification Section 01340 for requirements for the mechanics and administration of
- 3 the submittal process.
- 4 2. Product technical data including:
- 5 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 6 b. Manufacturer's installation instructions.
- 7 3. Fabrication and/or layout Drawings.
- 8 4. Certifications.
- 9 5. Pressure test reports for all fabricated piping systems.
- 10 C. Operation and Maintenance Manuals:
- 11 1. See Specification Section 01340 for requirements for:
- 12 a. The mechanics and administration of the submittal process.
- 13 b. The content of Operation and Maintenance Manuals.

14 **1.5 PERFORMANCE TESTING**

- 15 A. Prior to System Acceptance, a field test shall be conducted to demonstrate that the Atmospheric
- 16 vaporizer system can produce a continuous supply of 100 TPD of gaseous oxygen product
- 17 without the need for vaporizer bank de-icing intervention of any kind on the part of operations
- 18 personnel.
- 19 1. Vaporizer system performance shall be confirmed by a two elapsed week operating test.
- 20 a. Test will be conducted by Owner's personnel after receipt of training on operation of
- 21 new vaporizers by Contractor.
- 22 b. Vaporizer test may be witnessed by Contractor's personnel and shall be conducted at
- 23 prevailing ambient temperatures during the test period.
- 24 c. Data collection shall be by "in place" instrumentation readings and shall include
- 25 gaseous feed rate to Activated Sludge System and temperature of gaseous oxygen
- 26 exiting vaporizer PIC/TIC station.

27 **1.6 WARRANTY**

- 28 A. All mechanical and instrumentation equipment supplied for this project shall be warrantied
- 29 against defects in materials and workmanship for a period of 2 years (24 months) following
- 30 acceptance by the Owner. Acceptance shall be either the agreed to project termination date or
- 31 the mutually agreed to date of "beneficial use" of the equipment to which the warranty applies,
- 32 whichever shall first occur.

33 **PART 2 - PRODUCTS**

34 **2.1 ACCEPTABLE MANUFACTURES**

- 35 A. Subject to compliance with the Contract Documents, the following manufacturers, or equal, are
- 36 acceptable:
- 37 1. Atmospheric Vaporizers:
- 38 a. Cryoquip, Inc.
- 39 b. Cryogenic Experts, Inc.
- 40 c. Thermax, Inc.

41 **2.2 PERFORMANCE AND DESIGN REQUIREMENTS**

- 42 A. Design Criteria for Atmospheric Vaporizers:
- 43 1. Maximum Allowable Working Pressure (MAWP): 150 psi.
- 44 2. Duty cycle time: Continuous whenever Cryogenic Plant is down or inoperable. Vaporizer
- 45 system will operate without excessive icing that would require de-icing by operations
- 46 personnel.
- 47 3. Structural Design: Provide signed and sealed calculations by a structural engineer licensed
- 48 in the Commonwealth of Virginia certifying that equipment and concrete support pads have
- 49 been designed to meet applicable state and local building codes for the facility location.

- 1 B. Performance Requirements, LOX and pressure building coil vaporizers:
2 1. 100 TPD of gaseous oxygen, continuous.
3 2. Site location: Hopewell, VA.
4 3. LOX tank operating pressure: ≤ 150 psi.
- 5 C. Performance Requirements, coldbox drain vaporizer:
6 1. Site location: Hopewell, VA.
7 2. Mixture of LOX and liquid air: 1,300 GAL (Contractor to verify volume of coldbox for
8 final sizing of the coldbox drain vaporizer).
9 3. Vaporization time: ≤ 8 HRS.
10 4. Contractor will confirm drain vaporizer size and locate drain vaporizer appropriately for the
11 existing facility. Provide basis for sizing as part of bid package.
- 12 D. Performance Requirements, LOX Tank Economizer Vaporizer:
13 1. Site location: Hopewell, VA.
14 2. Vaporized LOX (cold gaseous oxygen) from top of each LOX tank: 0.75 TPD O₂ (total).
15 3. Use: To warm normal daily LOX loss due to vaporization from LOX tanks for use in CAS
16 tanks.
17 4. Duty cycle time: 24 HRS/day without icing.
18 5. Contractor will confirm economizer sizing and locate economizer vaporizer appropriately
19 for the existing facility. Provide basis for sizing as part of bid package.
- 20 E. Performance Requirements, Vaporizer System Control:
21 1. Provide new digital PLC based control components for control of the atmospheric vaporizer
22 system.
23 2. All instrumentation components, individually and collectively, must interface with the
24 plant's existing control system and existing multiplex data collection system in place at the
25 Oxygen plant. The Contractor will identify critical pneumatic controls in the cryogenic
26 oxygen plant and provide digital conversions for those controls in order to interface with the
27 digital vaporizer control system.
28 3. Vaporizer controls should be independent of the oxygen plant with connections to the
29 existing controls for main actuation of the system. Switching, temperature, and pressure
30 controls should act independently of the main plant controls.
31 4. Coordinate with the Owner for tie-in of the vaporizer control system with the plant's
32 existing SCADA system.
33 5. Digital control system shall provide sufficient controls to allow the cryogenic oxygen
34 generation plant to automatically adjust product oxygen flow in response to variations in
35 product oxygen pipeline pressure. Critical pneumatic signals from the cryogenic plant
36 control system shall be converted to interface with the digital vaporizer system controls.

37 2.3 ANCILLIARY COMPONENTS

- 38 A. All components supplied for this project shall be unused and new. Previously used and/or
39 refurbished materials are unacceptable.
- 40 B. Replace all piping and valves from the front of the LOX storage tanks up to valves PV635X
41 (GOX pipeline) and X640X (economizer pipeline). Provide new piping and valves for a fully
42 functional system that can be isolated as part of vaporizer system operation and for routine
43 maintenance. Working with the equipment manufacturer's, the contractor is responsible for final
44 design, layout, and installation of vaporizer piping systems.
45 1. Piping materials: stainless steel, in accordance with Specification Section 15065.
46 2. Valve materials: stainless steel consistent with piping system requirements.

47 2.4 MAINTENANCE MATERIALS

- 48 A. Contractor shall supply at no additional cost to the Owner any and all necessary special
49 maintenance tools and materials required for normal maintenance of the systems or equipment
50 supplied.
51 1. "Special" means any and all tools, equipment, or materials not normally locally sourced in
52 the Hopewell, VA area.

- 1 2. This could include, by way of example not limitation, unique tools, special coatings, special
2 fittings, adaptors, or the like needed to render the equipment functioning and/or protected on
3 a long term basis.
4 3. Contractor shall supply a list of such special maintenance items with his bid.

5 **PART 3 - EXECUTION**

6 **3.1 INSTALLATION**

- 7 A. Install products in accordance with all manufacturer's instructions so as to maintain
8 manufacturer's warranty.
9 1. Installation of all equipment should adhere to general footprint requirements as indicated on
10 the Contract Drawings.
11 B. For identification and tagging provide stainless steel tags for all valves. Valve tag numbers shall
12 be as consistent as possible with the original P&IDs and identification systems.
13 1. Warning and safety signage shall adhere to requirements of codes and Specifications listed
14 in paragraph 1.2.A of this Section.
15 C. Coordinate electrical and instrumentation connections with the Owner.
16 1. Notify the Owner in writing no less than ten (10) working days prior to any connections that
17 require an outage to a process system. Outages for process systems must be limited to four
18 (4) hours in duration.
19 2. The Owner has the final decision concerning any process shutdown scheduled and reserves
20 the right to cancel any planned shutdown.

21 **3.2 FIELD QUALITY CONTROL**

- 22 A. Employ and pay for services of equipment manufacturer's field service representative(s), as
23 required, to:
24 1. Inspect equipment covered by these Specifications.
25 2. Supervise adjustments and installation checks.
26 3. Provide test equipment, tools, and instruments necessary to accomplish equipment and
27 warranty confirmation testing.

28 **3.3 TRAINING**

- 29 A. Vaporization Systems:
30 1. The Contractor shall provide knowledgeable, competent personnel who are thoroughly
31 familiar with the theory, design, and operation of the systems supplied for training of
32 Owner's personnel.
33 2. Training shall be provided on the LOX vaporizer system, the LOX tank pressure building
34 coils, and the drain vaporizer(s).
35 3. Theory of operation, "hands-on" operation, and general preventative maintenance
36 instruction shall be given to Owner's personnel. Training can include both classroom and
37 in-the-field training, as well as "over-the-shoulder" operator observance assistance, as
38 deemed appropriate by the Engineer.
39 a. Training sessions shall be provided to all operator shifts.
40 b. Training sessions shall be conducted during each operator shift period.
41 4. Contractor shall provide a total of 2 man days of vaporizer system operator training.
42 a. Actual shift training schedule will be approved by the Owner and engineer.
43 5. "Man day" is defined as one 8 HR shift.

44 **3.4 SEQUENCE OF WORK**

- 45 A. The anticipated construction scheduling and sequencing requirements are as follows. The
46 Contractor may propose an alternative approach for Owner approval as part of the MOPO
47 procedures submitted with the Bid Package.
48 1. Install and test the Atmospheric Vaporizer system prior to taking the existing LOX system
49 out of service for connection to the Cryogenics plant.

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2. Connect the new atmospheric vaporizers to the LOX tanks and connect GOX piping from the vaporizers to the existing LP02 pipeline at valve PV635X. Connection to the Cryogenics plant will not exceed 8 continuous hours.
 - a. Connect new LOX piping between valves X615X, X625X, and the new atmospheric vaporizers during this shutdown.
 - b. Following this connection, the new atmospheric vaporizers will be on-line.
 3. Connect new cold-box drain piping from valve X330X to the new cold-box drain vaporizer.
 4. Connect LOX Tank #1 to economizer and pressure building vaporizers.
 - a. Owner will drain LOX Tank #1 and reduce tank pressure to <5 psi.
 - b. LOX Tank #2 will be designated "ADD" tank during this period.
 - c. Replace with new all piping and valves mounted to face of LOX Tank #1, including valve X615X.
 - d. Connecting LOX Tank #1 to new piping and valves will not exceed 4 calendar days.
 5. Connect LOX Tank #2 to economizer and pressure building vaporizers.
 - a. Owner will drain LOX Tank #2 and reduce tank pressure to <5 psi.
 - b. LOX Tank #1 will be designated "ADD" tank during this period.
 - c. Replace with new all piping and valves mounted to face of LOX Tank #2, including valve X625X.
 - d. Connecting LOX Tank #1 to new piping and valves will not exceed 4 calendar days.
- B. Coordinate with the Owner to lock-out/tag-out process valves that need to be closed during each of the above operations to isolate the work from process hazards.

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END OF SECTION

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SECTION 15065
PIPE: STAINLESS STEEL

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes: Stainless steel pipe, fittings, and appurtenances.
- 6 B. Related Sections include but are not necessarily limited to:
- 7 1. Section 01340 - Submittals.
- 8 2. Section 01342 - Operation and Maintenance Manuals.
- 9 3. Section 11000 - Atmospheric Vaporizer System.

10 **1.2 QUALITY ASSURANCE**

- 11 A. Referenced Standards:
- 12 1. American Society of Mechanical Engineers (ASME):
- 13 a. B1.1, Unified Inch Screw Threads (UN and UNR Thread Form).
- 14 b. B1.2, Gages and Gaging for Unified Inch Screw Threads.
- 15 c. B16.3, Malleable Iron Threaded Fittings.
- 16 d. B16.5, Pipe Flanges and Flanged Fittings.
- 17 e. B16.9, Factory-Made Wrought Steel Butt-Welding Fittings.
- 18 f. B16.11, Forged Steel Fittings, Socket Welding and Threaded.
- 19 g. B31.1, Power Piping.
- 20 h. B31.3, Process Piping.
- 21 i. B31.9, Building Services Piping.
- 22 j. Section IX, Qualification Standard for Welding and Brazing Procedures, Welders,
- 23 Brazers, and Welding and Brazing Operators.
- 24 2. ASTM International (ASTM):
- 25 a. A312, Standard Specification for Seamless, Welded and Heavily Cold Worked
- 26 Austenitic Stainless Steel Pipe.
- 27 b. A182, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe
- 28 Flanges, Forged Fittings and Valves and Parts for High-Temperature Service.
- 29 c. A774, Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings
- 30 for General Corrosive Service at Low and Moderate Temperatures.
- 31 d. A778, Standard Specification for Welded, Unannealed Austenitic Stainless Steel
- 32 Tubular Products.
- 33 e. A403, Standard Specification for Wrought Austenitic Stainless Steel Pipe and Fittings.
- 34 B. Qualifications:
- 35 1. Use only certified welders meeting procedures and performance outlined in ASME Section
- 36 IX, AWWA C200 Section 3.3.3 and other codes and requirements per local building and
- 37 utility requirements.

38 **1.3 SUBMITTALS**

- 39 A. Shop Drawings:
- 40 1. See Specification Section 01340 for requirements for the mechanics and administration of
- 41 the submittal process.
- 42 2. Factory test reports.
- 43 3. Welder's certificates.

1 **PART 2 - PRODUCTS**

2 **2.1 ACCEPTABLE MANUFACTURERS**

- 3 A. Subject to compliance with the Contract Documents, the following manufacturers are
4 acceptable:
- 5 1. Flexible connectors for hot water equipment:
 - 6 a. Flexonics (FLG Series).
 - 7 b. Thermo Tech (F/J/R Series).
 - 8 2. Factory-applied plastic or epoxy coatings:
 - 9 a. "Encoat" Division of Energy Coating Company.
 - 10 b. "Scotchkote" Division of 3M Company.

11 **2.2 MATERIALS**

- 12 A. All materials used in steel piping systems shall meet or exceed pressure test requirements
13 specified for each respective system.
- 14 B. Stainless Steel Pipe (Mill Type): ASTM A312 TP-316L.
- 15 C. Fittings (For Mill Type Pipe):
 - 16 1. ASTM A403.
 - 17 2. ASME B16.9.
- 18 D. Flanges (Mill Type Pipe):
 - 19 1. ASME B16.5.
 - 20 2. Flat faced.
 - 21 3. Slip-on, or Butt-weld flanges.
- 22 E. Nuts and Bolts:
 - 23 1. Exposed: Stainless Steel.
 - 24 2. Heads and dimensions per ASME B1.1.
 - 25 3. Threaded per ASME B1.1.
 - 26 4. Project ends 1/4 to 1/2 IN beyond nuts.
- 27 F. Gaskets: See individual piping systems in Section 15060.

28 **2.3 FABRICATION**

- 29 A. Provide piping (mill or fabricated) for use in this Project with minimum wall thicknesses as
30 follows:
 - 31 1. All sizes: Schedule 40.

32 **PART 3 - EXECUTION**

33 **3.1 INSTALLATION**

- 34 A. Install products in accordance with manufacturer's instructions.
- 35 B. Joining Methods - Flanges:
- 36 1. Facing method:
 - 37 a. Insert slip-on flange on pipe.
 - 38 b. Assure maximum tolerances for flange faces from normal with respect to axis of pipe is
39 0.005 IN per foot of flange diameter.
 - 40 c. Test flanges after welding to pipe for true to face condition and reface, if necessary, to
41 bring to specified tolerance.
 - 42 2. Joining method:
 - 43 a. Leave 1/8 to 3/8 IN of flange bolts projecting beyond face of nut after tightening.
 - 44 b. Coordinate dimensions and drillings of flanges with flanges for valves, pumps,
45 equipment, tank, and other interconnecting piping systems.

- 1 c. When bolting flange joints, exercise extreme care to assure that there is no restraint on
- 2 opposite end of pipe or fitting which would prevent uniform gasket compression or
- 3 cause unnecessary stress, bending or torsional strains being applied to cast flanges or
- 4 flanged fittings.
- 5 1) Allow one (1) flange free movement in any direction while bolts are being
- 6 tightened.
- 7 d. Do not assemble adjoining flexible coupled, mechanical coupled or welded joints until
- 8 flanged joints in piping system have been tightened.
- 9 e. Gradually tighten flange bolts uniformly to permit even gasket compression.
- 10 f. Do not overstress bolts to compensate for poor installation.

11 C. Joining Method - Welded Joints:

- 12 1. Perform welding in accordance with AWWA C206 and this Section.
- 13 2. For flange attachment perform in accordance with AWWA C207.
- 14 3. Have each welding operator affix an assigned symbol to all his welds.
- 15 a. Mark each longitudinal joint at the extent of each operator's welding.
- 16 b. Mark each circumferential joint, nozzle, or other weld into places 180 degrees apart.
- 17 4. Welding for all process piping shall conform to ASME B31.3.
- 18 a. Welding of utility piping 125 psi and less shall be welded per ASME B31.9.
- 19 b. Utility piping above 125 psi shall conform to ASME B31.1.
- 20 5. Provide caps, tees, elbows, reducers, etc., manufactured for welded applications.
- 21 6. Weldolets may be used for 5 IN and larger pipe provided all slag is removed from inside the
- 22 pipe.
- 23 7. Weld-in nozzles may be used for branch connections to mains and where approved by
- 24 Engineer.
- 25 8. Use all long radius welding elbows for expansion loops and bends.
- 26 9. Use long radius reducing welding elbows 90 degree bends and size changes are required.

- 27 D. Support exposed piping as required for the final piping layout.

28 **3.2 FIELD QUALITY CONTROL**

29 A. Field test piping systems.

- 30 1. Pipe Testing - General:
- 31 a. Test piping systems as follows:
- 32 1) Test exposed, non-insulated piping systems upon completion of system.
- 33 2) Test exposed, insulated piping systems upon completion of system but prior to
- 34 application of insulation.
- 35 3) Test concealed interior piping systems prior to concealment and, if system is
- 36 insulated, prior to application of insulation.
- 37 b. Isolate equipment which may be damaged by the specified pressure test conditions.
- 38 c. Perform pressure test using calibrated pressure gages and calibrated volumetric
- 39 measuring equipment to determine leakage rates.
- 40 1) Select each gage so that the specified test pressure falls within the upper half of the
- 41 gage's range.
- 42 d. Completely assemble and test new piping systems prior to connection to existing pipe
- 43 systems.
- 44 e. Acknowledge satisfactory performance of tests and inspections in writing to Engineer
- 45 prior to final acceptance.
- 46 f. Bear the cost of all testing and inspecting, locating and remedying of leaks and any
- 47 necessary retesting and re-examination.
- 48 2. Air testing methodology:
- 49 a. General:
- 50 1) Assure air is ambient temperature.

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- b. Low pressure air testing:
 - 1) Place plugs in line and inflate to 25 psig.
 - 2) Check pneumatic plugs for proper sealing.
 - 3) Introduce low pressure air into sealed line segment until air pressure reaches 4 psig greater than ground water that may be over the pipe.
 - a) Use test gage conforming to ASME B40.100 with 0 to 15 psi scale and accuracy of 1 percent of full range.
 - 4) Allow 2 minutes for air pressure to stabilize.
 - 5) After stabilization period (3.5 psig minimum pressure in pipe) discontinue air supply to line segment.
 - 6) Record pressure at beginning and end of test.
- 3. Allowable leakage rates:
 - a. All exposed piping systems, all pressure piping systems and all buried, insulated piping systems which are hydrostatically pressure tested shall have zero leakage at the specified test pressure throughout the duration of the test.
 - b. Air systems which are tested with air shall have a maximum pressure drop of 5 percent of the specified test pressure throughout the duration of the test.
 - c. For low pressure (less than 25 psig) air testing, the acceptable time for loss of 1 psig of air pressure shall be:

PIPE SIZE (IN DIA)	TIME, MINUTES/100 FT
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4

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END OF SECTION

