PUBLIC WORKS DEPARTMENT

BID SPECIFICATIONS

AND

CONTRACT DOCUMENTS

FOR

Camas Blower Improvements Project - Equipment Purchase

CITY PROJECT NUMBER:
S1040

April 2024

CITY OF CAMAS, WASHINGTON
PUBLIC WORKS DEPARTMENT

Specifications and Contract Documents

Camas Blower Improvements Project - Equipment Purchase

in and for the
City of Camas
a Municipal Corporation

Consisting of

CALL FOR BIDS
BIDDING DOCUMENTS
CONTRACT DOCUMENTS
TECHNICAL SPECIFICATIONS

By Order of the Mayor and City Council
City of Camas

City Project No. S1040

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CALL FOR BIDS

CITY OF CAMAS PUBLIC WORKS DEPARTMENT
CITY PROJECT NO. S1040
Camas Blower Improvements Project - Equipment Purchase

Sealed bids will be received by the City of Camas, Administrative Services, 616 NE 4th Avenue, Camas, Washington, until 10:00 AM on Tuesday, May 7, 2024, and will then and there be publicly read in the City Hall Council Chambers.

All Bid Proposals shall be accompanied by a Bid Proposal deposit in certified check, cashier's check, or surety bond in an amount equal to five percent (5%) of the amount of such Bid Proposal. Should the successful Bidder fail to enter into such contract and furnish satisfactory performance bond within the time stated in the most recent version of the Washington State Department of Transportation (WSDOT) Standard Specifications for Road, Bridge, and Municipal Construction (standard specifications), the Bid Proposal deposit shall be forfeited to the City of Camas.

Access to project Bidder Documents, Contract Documents, Technical Specifications, and Addenda will be provided on the City of Camas Bids and RFPs webpage: https://www.cityofcamas.us/rfps. Contact Jennifer Hertz, City of Camas, at (360)817-7256 or jhertz@cityofcamas.us with any questions related to obtaining bid documents.

The improvement for which bids will be received follows:

Sealed bids in envelopes marked with the Bidder's Name, Project Title and Project Number will be received at the time and address noted above.

A virtual pre-bid meeting will be held at 10:00 AM on Tuesday, April 23, 2024.
This virtual pre-bid meeting is strongly recommended for all bidders wishing to submit a bid for this work. Please contact Jennifer Hertz at jhertz@cityofcamas.us to request a calendar invitation.

Statement of Work:
The purpose of this project is for the City of Camas to purchase two new manufactured high speed turbo aeration blowers and accessories in advance of a separate contract that will provide installation of said equipment at the City of Camas Wastewater Treatment Plant located at 1129 SE Polk Street Camas, WA 98607. Public bidding award of the installation contract is expected to occur in the Winter of 2025. The high-speed turbo aeration blowers and related equipment must meet all performance requirements through a single Manufacturer as indicated in the technical specifications 43 11 14 – High Speed Turbo Blower, Section 1.8.

For questions, please contact Rob Charles, 360-817-7003 or rcharles@cityofcamas.us at the City of Camas.

American Made:
In an effort to maximize the creation of American jobs and restoring economic growth, the City of Camas encourages the use of products and services that are made in the United States of America whenever and wherever possible.

Disadvantaged Businesses:
The City of Camas encourages the solicitation and recruitment, to the extent possible, of certified minority-owned (MBE), women-owned (WBE), emerging small (ESB) businesses, and other disadvantaged companies in the construction of this project.

Americans with Disabilities Act (ADA) Information
The City of Camas in accordance with Section 504 of the Rehabilitation Act (Section 504) and the Americans with Disabilities Act (ADA), commits to nondiscrimination on the basis of disability, in all of its programs and activities. This material can be made available in an alternate format by emailing Ronda Syverson at rlsyverson@cityofcamas.us or by calling collect 360-817-7256.

Civil Rights Act:
The City of Camas is an Equal Employment Opportunity employer. This Information is available in an alternate form by request by contacting 360-834-6864.

Spanish La información está disponible en un idioma alternativo a pedido,
Chinese Simplified kě gēn jù yāo qiú tí gòng tì dài yǔ yán de xìn xī,
Japanese Rikuesuto ni ōjite,-betsu no gengo de jōhō o nyūshu dekimasu,
Korean jeongboneun yocheong si daeche eon-eolo jegongdoebnida,
Vietnamese Thông tin có sẵn bằng ngôn ngữ thay thế theo yêu cầu,
Romanian Informaţiile sunt disponibile într-o limbă alternativă la cerere,
Russian Informatsiya dostupna na drugom yazyke po zaprosu, and
Ukranian Informatsiya dostupna inshoyu movoyu za zapytom.

Title VI Statement
The City of Camas, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

Indemnification:
The Contractor shall defend, indemnify and hold the City of Camas, its officers, officials, employees and volunteers harmless from any and all claims, injuries, damages, losses or suits including attorney fees, arising out of or in connection with the performance of this Agreement, except for injuries and damages caused by the sole negligence of the City of Camas.

However, should a court of competent jurisdiction determine that this Agreement is subject to RCW 4.24.115, then in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the Contractor and the City, its officers, officials, employees, and volunteers, the Contractor's liability hereunder shall be only to the

extent of the Contractor's negligence. It is further specifically and expressly understood that the indemnification provided herein constitutes the Contractor's waiver of immunity under Industrial Insurance, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the parties. The provisions of this section shall survive the expiration or termination of this Agreement.

Insurance Requirements:

The Contractor shall obtain and keep in force the following policies of insurance, unless otherwise indicated in the bid documents. Automobile Liability of $1,000,000 covering all owned, non-owned, hired, and leased vehicles; Commercial General Liability of $2,000,000 single limit and $2,000,000 aggregate; and, if applicable, Professional Liability insurance of $1,000,000.

This document and all associated public records will be released where required by the Public Records Act, Chapter 42.56 RCW (the "Act"). To the extent that public records then in the custody of the Contractor are needed for the City to respond to a request under the Act, as determined by the City, the Contractor agrees to make them promptly available to the City. If the Contractor considers any portion of any record provided to the City under this Agreement, whether in electronic or hard copy form, to be protected from disclosure under law, the Contractor shall clearly identify any specific information that it claims to be confidential or proprietary. If the City receives a request under the Act to inspect or copy the information so identified by the Contractor and the City determines that release of the information is required by the Act or otherwise appropriate, the City's sole obligation shall be to notify the Contractor (a) of the request and (b) of the date that such information will be released to the requester unless the Contractor obtains a court order to enjoin that disclosure pursuant to RCW 42.56.540. If the Contractor fails to timely obtain a court order enjoining disclosure, the City will release the requested information on the date specified.

The City of Camas expressly reserves the right to reject any or all Proposals and to waive minor irregularities or informalities and to Award the Project to the lowest responsible bidder as it best serves the interests of the City. The City of Camas also reserves the right to delete any or all portions of individual bid items.

DocuSigned by:
Sydney Baker
69FB889B76B3492...

Sydney Baker
City Clerk

PART ONE
BIDDING DOCUMENTS

BIDDER'S INFORMATION PAGE

CITY PROJECT NO. S1040

Camas Blower Improvements Project - Equipment Purchase

Proposal Submitted By:

_____

CONTRACTOR

_____

CONTRACTOR MAILING ADDRESS EMAIL

_____

CITY STATE ZIP CODE PHONE NO.

_____

WASHINGTON STATE CONTRACTORS LICENSE # EXPIRATION

BID OPENING: Date and time as noted in the call for bids.

City of Camas City Hall

616 NE 4th Avenue

Camas, Washington 98607

Contacts: **City of Camas**
Rob Charles
Phone: 360-817-7003
E-mail: rcharles@cityofcamas.us

PROPOSAL

Camas Blower Improvements Project - Equipment Purchase
Project No. S1040

To the Office of the City Clerk
Camas, Washington

The undersigned hereby certifies that he has examined the plans, specifications and contract governing the work embraced in this improvement, and the method by which payment will be made for said work is understood. The undersigned hereby proposes to undertake and complete the work embraced in this improvement, or as much thereof as can be completed with the money available in accordance with the said Plans, Specifications and contract, and the following schedule of rates and prices:

(Note: Unit prices for all items, all extensions, and total amount of bid should be shown. All entries must be typed or entered in ink.)

Table 4

ITEM NO.	DESCRIPTION	Total
1	Two Aeration Blowers	$
2	Sales Tax, 8.5%	$
Total Contract Amount (Item 1 + 2)		$_____ (use figures)

Note: this table is for award of the blower Contract. Bidder instructions for evaluation of the lowest responsible/responsive bidder are located in Specification 43 11 14 – High Speed Turbo Blower, Section 1.8.

1.1 BASIS OF BID

A. Determination of the lowest responsive manufacturer will be based on the lump sum price of the single Bid Item, sales tax and the 20-year present worth analysis of the operational and maintenance costs, combined. The number of hours for each operating condition will be calculated by multiplying the condition's evaluation factor by 8,760 (hours in one year). The operating hours will then be multiplied by the guaranteed power draw of the blowers (kW) and the electrical cost per kWh ($0.086 /kWh).
B. The Blower Manufacturer shall submit with the bid documents the guaranteed wire-to-air ("wire") kW for each blower unit. The wire kW shall include all losses associated with the blower unit at all specified operating points. Manufacturer to fill in the blank cells in Table 1.

Table 1						
Design Point	**Blower Flow, SCFM**	**Evaluation Factor**	**Discharge Pressure, psig**	**Inlet Temp, DegF**	**Rel Hum, %**	**Guaranteed Wire Power of Blower, kW**
1	675	0.10	9.20	15	20	
2	1,620	0.40	9.65	50	40	
3	2,000	0.30	9.95	80	80	
4	2,665	0.20	10.25	100	100	

*Wire kW consists of Blower, Motor, VFD or inverter, and any cooling or other auxiliary systems if used.

1. SCFM measured at conditions listed in table.
2. The guaranteed wire power kW numbers at the above specified operating points shall be "guaranteed" per ASME PTC-13 testing numbers with zero negative tolerance.
3. Temperature of the inlet air measured at the inlet to the inlet filter or external inlet flange to the cabinet.
4. Inlet pressure measured at the same location as the inlet temperature.

C. Present worth electrical cost shall be calculated using Table 2 below with values listed from Table 1 above:

Table 2						
(a) Design Point	**(b) Evaluation Factor**	**(c) Operating Hours per Year**	**(d) kW input(1)**	**(e) kWh/year = (b)*(c)*(d)**	**(f) Cost of Electricity $/kWh**	**Cost per year = (e) * (f)**
1	0.10	876			$0.086	$
2	0.40	3,504			$0.086	$
3	0.30	2,628			$0.086	$
4	0.20	1,752			$0.086	$
Total Cost of Power (Design Points 1 + 2 +3 + 4 Cost per year)						$
(4)Maintenance Costs (per year)						$
(3)Two New Blower Cores Cost						$
Present Worth = ($Total Cost of Power + (4)$Maintenance Costs) * (2)12.462 + (3)$(2 New Cores)						**$**

Notes:

(1) Guaranteed wire kW input of blower unit operating at each Design Point from Table 1

(2) Present worth factor based on interest rate of 5% and 20 years

(3) Guaranteed cost of new core at today's price which when required will be escalated at the CPI increase from bid day to repair date. Air bearing designs shall include this cost of new core for each blower and magnetic bearing with less than 15 years of experience of no core failures shall also include the cost of a new core for each blower. Core replacement cost shall include factory trained service technician to remove and reinstall core, all transportation costs, per diem, travel expenses, and factory labor and parts. Labor rates shall be the manufacturer's published rates for service. Documentation of the above items shall be included with the bid package based upon current labor rates and copies of most recent purchase orders for similar rebuilds.

(4) Maintenance costs shall assume blowers are operating 24/7 and shall include oil changes if lubricated bearings are supplied and cost of inlet filter replacement for any bearing style machine.

The lowest responsible manufacturers shall be based on the following Table 3:

[1]Table 3		
ITEM NO.	**DESCRIPTION**	**EVALUATED PRESENT WORTH**
Total price of All Blowers Being Provided		
1	Two Aeration Blowers	$
2	[2]20-year Present Worth Electrical and Maintenance Cost	$
3	[3]Sales Tax, 8.5%	$
Total 20-Year Net Present Worth (Items 1 + 2 +3)		$_____ (use figures)

Notes:

(1) Total Blower system consists of all blowers.
(2) 20-Year Present Worth Power Cost from Table 2 above.
(3) Sales Tax including all State, County, or local sales taxes required only on Item No. 1. Sales tax is not calculated for Item No. 2.

Alternate A		
ITEM NO.	**DESCRIPTION**	**Total**
3	Storage of Blowers until Installation – October 2025	$
Total Alternate A Amount (Item 3)		$_____ (use figures)

_____

Signature of Owner or Authorized Corporate Officer
(This is required for a valid bid)

Receipt is hereby acknowledged of Addendum(s) No._____ ,_____ , & _____.

By signing the Bid Proposal, the bidder hereby declares, under penalty of perjury under the laws of the United States that the Non-Collusion Declaration and Notice to All Bidders statements, as provided in these Bid Specifications and Contract Documents, are true and correct.

The City of Camas reserves the right to reject any or all proposals if found to be higher than the estimated cost and to waive any formality or technicality in any proposal in the interest of the City. The City of Camas also reserves the right to delete any or all portions of individual bid items.

NON-COLLUSION DECLARATION

I, by signing the Proposal, hereby declare, under penalty of perjury under the laws of the United States that the following statements are true and correct:

1. That the undersigned person(s), firm, association or corporation has (have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the project for which this proposal is submitted.

2. **That by signing the signature page of this Proposal, I am deemed to have signed and have agreed to the provisions of this declaration.**

NOTICE TO ALL BIDDERS

To report bid rigging activities call:

1-800-424-9071

The U.S. Department of Transportation (USDOT) operates the above toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m., Eastern Time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of USDOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the USDOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

DOT 272-036I EF

BID BOND
ACKNOWLEDGEMENT

The bidder is hereby advised that by signature of this proposal they are deemed to have acknowledged all requirements and signed all certificates contained herein.

A proposal guaranty in an amount of five percent (5%) of the total bid, based upon the approximate estimate of quantities at the above prices, must be provided as required by law. The following forms as indicated below are acceptable and shall be attached hereto:

	IN THE AMOUNT OF_____
_____ CASHIER'S CHECK	**_____ DOLLARS**
_____ CERTIFIED CHECK	**($_____) PAYABLE TO THE CITY**
_____ PROPOSAL BOND	**TREASURER OF CAMAS, WASHINGTON, IN**
	THE AMOUNT OF 5% OF THE BID.

The failure to furnish a Bid deposit of a minimum of 5 percent (5%) with the Bid or as a physical supplement to the electronic Proposal Form shall make the Bid nonresponsive and shall cause the Bid to be rejected by the Contracting Agency.

SIGNATURE OF OWNER OR AUTHORIZED CORPORATE OFFICER

_____

_____

FIRM NAME _____

ADDRESS _____

_____

BIDDER'S CHECK LIST

The bidder's attention is especially called to the following forms, which must be executed in full as required and submitted at the bid opening:

A. PROPOSAL

Unit prices for all items, all extensions, and total amount of bid must be shown, except those items designated in the estimate of quantities to be paid for as lump sum. Any item shown on the Plans that does not have a bid item shall be considered incidental to the project and the costs thereof shall be included in other bid items of the project. Pay special attention to the Non-Collusion Declaration before signing the proposal. An unsigned bid may be considered a non-responsive bid.

B. **BID BOND**

Proposals must be accompanied by a certified check, a cashier's check drawn on a bank of good standing, or a bid bond issued by a surety company authorized to issue such bonds in the State of Washington, in an amount of not less than five percent (5%) of the total amount of the bid submitted. The full amount will be returned within five (5) days after the contract has been executed.

C. DID YOU COMPLETE AND SUBMIT THE BIDDER'S INFORMATION PAGE?

D. DID YOU SIGN AND SUBMIT YOUR BID PROPOSAL?

E. IF APPLICABLE, DID YOU ACKNOWLEDGE RECEIPT OF ADDENDUMS?

F. DID YOU READ THE 'NON-COLLUSION DECLARATION' AND 'NOTICE TO ALL BIDDERS' STATEMENTS?

G. DID YOU COMPLETE AND SUBMIT THE BID BOND ACKNOWLEDGEMENT PAGE?

The following forms are to be executed and submitted to the contracting agency by the successful bidder after the contract is awarded:

A. CONTRACT
This agreement is to be executed by the successful bidder.

B. CONTRACT BOND
This form is to be executed by the successful bidder and his surety company.

D. PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE
This is to be executed by the successful bidder.

PART TWO
CONTRACT DOCUMENTS

CONTRACT

THIS AGREEMENT, made and entered into this _____ day of _____, 20___, between the City of Camas under and by virtue of Title 35A RCW (cities and towns), as amended

And, _____, hereinafter called the Contractor.

WITNESSETH:

That in consideration of the terms and conditions contained herein and attached and made a part of this agreement, the parties hereto covenant and agree as follows:

I. The Vendor shall do all work and furnish all equipment for **Camas Blower Improvements Project - Equipment Purchase , City of Camas Project No. S1040**, in accordance with and as described in the attached plans and specifications, and the standard specifications of the Washington State Department of Transportation which are by the reference incorporated herein and made part hereof and, shall perform any changes in the work in accord with the Contract Documents.

The Vendor shall provide and bear the expense of all equipment, work and labor, of any sort whatsoever that may be required for the transfer of materials and for constructing and completing the work provided for in these Contract Documents except those items mentioned therein to be furnished by the City of Camas. In all respects, the Vendor is an independent Vendor, and not an employee of the City of Camas.

II. The City of Camas hereby promises and agrees with the Vendor to employ, and does employ the Vendor to provide the materials and to do and cause to be done the above described work and to complete and finish the same in accord with the attached plans and specifications and the terms and conditions herein contained and hereby contracts to pay for the same according to the attached specifications and the schedule of unit or itemized prices at the time and in manner and upon the conditions provided for in this contract.

III. The Vendor for himself/herself, and for his/her heirs, executors, administrators, successors, assigns, does hereby agree to the full performance of all the covenants herein contained upon the part of the Contractor.

IV. The Vendor shall defend, indemnify and hold the City of Camas, its officers, officials, employees and volunteers harmless from any and all claims, injuries, damages, losses or suits including attorney fees, arising out of or in connection with the performance of this Agreement, except for injuries and damages caused by the sole negligence of the City of Camas.

However, should a court of competent jurisdiction determine that this Agreement is subject to RCW 4.24.115, then in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the Vendor and the City, its officers, officials, employees, and volunteers, the Vendor's liability hereunder shall be only to the extent of the Vendor's negligence. It is further specifically and expressly understood that the indemnification provided herein constitutes the Vendor's waiver of immunity under Industrial

Insurance, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the parties. The provisions of this section shall survive the expiration or termination of this Agreement.

V. The Vendor shall provide a material, labor, and equipment guarantee for the work performed under this contract for a period of one year from the Date of Acceptance. All work shall be free of defect in workmanship or materials. Upon notice, the Vendor shall make all repairs promptly at no cost to the City. Failure to repair or replace defects in a manner satisfactory to the Engineer will constitute a breach of this contract.

VI. As provided by Title VI of the Civil Rights Act of 1964, and the Civil Rights Restoration Act of 1987, the contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, sex or national origin in the selection and retention of sub-contractors, including procurement of materials and leases of equipment.

City of Camas, Washington in accordance with the provisions of Title VI of the Civil Rights Act of 1964 {78 Stat. 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notified all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, all contractors will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of the owner's race, color, national origin, sex, age, disability, income-level, or LEP in consideration for an award.

VII. The Contractor further acknowledges the following provisions and agrees to comply with the conditions as set forth therein:

THIS PROJECT REQUIRES A CONTRACT BOND FOR 100% OF THE CONTRACT AMOUNT.

VIII. The Contractor shall certify that they are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any State or Federal department or agency.

IX. The Contractor shall not propose or contract with any person or entity that is currently debarred, suspended, and ineligible contractors and grantees.

X. It is further provided that no liability shall attach to the City of Camas by reason of entering into this contract, except as provided herein.

XI. The Contractor shall maintain its records and accounts so as to facilitate audit requirements as established by the Office of the State Auditor and shall require subcontractors to do the same.

IN WITNESS WHEREOF, the Contractor has executed this instrument, on the day and year first below written and the Mayor of the City of Camas has caused this instrument to be executed by and in the name of the said City of Camas the day and year first above written.

Executed by the Vendor _____, 20___.

_____

_____

_____
Vendor

Executed by the Local Agency _____, 20___.

_____
Mayor of the City of Camas

Approved as to Form

_____
City of Camas Attorney

CONTRACT BOND

Camas Blower Improvements Project - Equipment Purchase
City of Camas Project No: S1040

KNOW ALL PERSONS BY THESE PRESENTS, That

of _____, as Principal, and _____

as Surety, are jointly and severally held and bound unto the City of Camas, Washington,

in the penal sum of Dollars ($_____), for the payment of which we jointly and severely bind ourselves, our heirs, executors, administrators, and assigns, and successors and assigns, firmly by these presents.

THE CONDITION of this bond is such that whereas, on the _____

day of _____ A.D., 20___, the said _____,

Principal, herein, executed a certain contract with the City of Camas, Washington,

by the terms, conditions and provisions of which contract the said _____,

Principal, herein, agree to furnish all material and do certain work, to wit: That

_____ will undertake and

complete the construction of these **Camas Blower Improvements Project - Equipment Purchase, City of Camas Project No. S1040**, according to the maps, plans and specifications made a part of said contract, which contract as so executed, is hereunto attached, is now referred to and by reference is incorporated herein and made a part hereof as fully for all purposes as if here set forth at length. The bond shall cover all approved change orders as if they were in the original contract.

NOW, THEREFORE, if the Principal herein shall faithfully and truly observe and comply with the terms, conditions and provisions of said contract in all respects and shall well and truly and fully do and perform all matters and things by **March 2025,** unless amended by change order**,** undertaken to be performed under said contract, upon the terms proposed therein, and within the time prescribed therein, and until the same is accepted, and shall pay all laborers, mechanics, subcontractors and material men, and all persons who shall supply such Vendor or subcontractor with provisions and supplies for the carrying on of such work, and shall in all respects faithfully

perform said contract according to law, then this obligation to be void, otherwise to remain in full force and effect.

WITNESS our hands this _____ day of _____, 20___

_____

_____

_____
PRINCIPAL

_____

_____

_____
ATTORNEY-IN-FACT, SURETY

_____
NAME AND ADDRESS, LOCAL OFFICE OF AGENT

APPROVED:

CITY OF CAMAS, WASHINGTON

BY:_____
MAYOR, CITY OF CAMAS

DATE: _____, 20___

SURETY BOND NUMBER _____

The United States Department of Transportation
Appendix A of the
Standard Title VI/ Non-Discrimination Assurances
DOT Order No. 1050.2A

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations: The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. Non-discrimination: The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin, sex, age, disability, income-level, or Limited English Proficiency (LEP) in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations as set forth in Appendix E, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 C.F.R. Part 21.
3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, national origin, sex. Age, disability, income-level or LEP.
4. Information and Reports: The contractor will provide all information and reports required by the Acts, the Regulations and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or the FHWA to be pertinent to ascertain compliance with such Acts, Regulations and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or the FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.
5. Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it or the FHWA may determine to be appropriate, including, but not limited to:
    a. withholding payments to the contractor under the contract until the contractor complies; and/or
    b. cancelling, terminating, or suspending a contract, in whole or in part.

Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

The United States Department of Transportation
Appendix E of the
Standard Title VI/ Non-Discrimination Assurances
DOT Order No. 1050.2A

During the performance of this contract, the contractor, for itself, its assignees, and succors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

Pertinent Non-Discrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq*., 78 stat.252), prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C.

§ 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 *et seq*.), prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, prohibits discrimination on the basis of disability; and 49 CFR Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 U.S.C. § 471, Section 47123, as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination of the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations 49 C.F.R. parts 37 and 38.
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately

high and adverse human health or environmental effects on minority and low-income populations;

- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 *et seq).*

PART THREE
TECHNICAL SPECIFICATIONS

City of Camas

Camas Blower Improvements Project

Construction Documents

Issued for Bid

January 23, 2024

HDR Project No. 10355353

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TABLE OF CONTENTS

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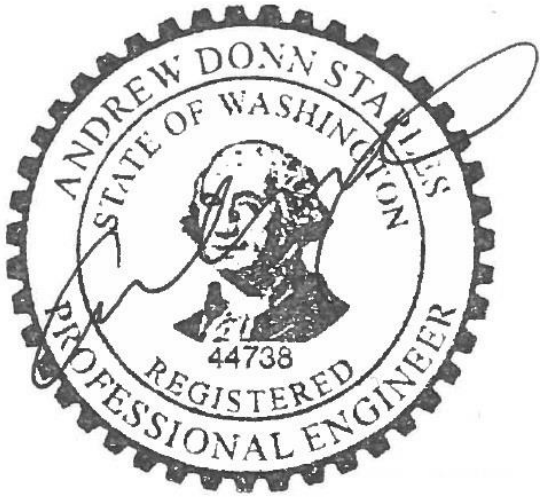
00 01 07
SEALS AND SIGNATURES

Owner Name: City of Camas
Facility or Site Name: Camas Wastewater Treatment Plant
Project Name: Camas Blower Improvements
Project or Contract Designation: 10355353
Engineer: HDR

Andrew Staples, PE License No. 44738 	The seal and signature to the left applies to the following Specifications divisions and sections of this project manual: • 43 11 14 - HIGH SPEED TURBO BLOWER

Engineer's seal and signature does not apply to the documents that comprise Division 00, Bidding and Contracting Requirements.

It is a violation of applicable laws and regulations governing professional licensing and registration for any person, unless acting under the direction of the licensed and registered design professional(s) indicated above, to alter in any way the Specifications in this project manual.

END OF SEALS AND SIGNATURES

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DIVISION 01

GENERAL REQUIREMENTS

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SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

1.1 SUMMARY

A. Section Includes:
   1. This Specifications section expands upon provisions of the General Conditions, as may be modified by the Supplementary Conditions, and includes:
      a. Requests for interpretation.
      b. Written clarifications.
      c. Minor changes in the Work and Field Orders.
      d. Work Change Directives.
      e. Proposal Requests.
      f. Change Proposals.
      g. Change Orders.

1.2 GENERAL – APPLICABLE TO ALL PROVISIONS OF THIS SECTION

A. Submit Contract modification documents to Engineer, addressed to the contact person and contact information indicated in Section 01 33 00 - Submittal Procedures, and in accordance with Section 01 31 26 - Electronic Communication Protocols.

B. Retain at Seller's office and at the Site complete copy of each Contract modification document, all interpretations and clarifications, related documents, and Engineer's response.

1.3 REQUESTS FOR INTERPRETATION

A. General.
   1. Transmit written requests for interpretation to Engineer. Seller and Owner may prepare and transmit requests for interpretation.
   2. Prepare and transmit request for interpretation to obtain clarifications or interpretations of the Contract Documents. Report conflicts, errors, ambiguities, and discrepancies in the Contract Documents by requesting an interpretation.
   3. Do not transmit request for interpretation when other form of communication is appropriate, such as Submittals, requests for approvals of substitutes, notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action by Engineer.
   4. Do not submit request for interpretation or clarification when:
      a. answer may be obtained by observations at the Site; or.
      b. required information is clearly indicated in the Contract Documents; or.
      c. required information is included in industry standards referenced in the Contract Documents or Supplier's instructions that are consistent with the Contract Documents; or.
      d. are reasonably inferable from any of foregoing.
   5. Engineer will return requests for interpretation without response for any of the following reasons:
      a. Request is regarding one of the items addressed in Paragraphs 1.3.A.3 and 4 of this Specifications section.
      b. Request is unclear or incomplete.
      c. Request was answered in Engineer's response to a prior request for interpretation.
      d. Request is related to construction means, methods, techniques, procedures, or sequences of construction that are not required by the Contract Documents.
      e. Request is related to safety and protection matters that are solely Contractor's responsibility.
      f. Request resulted in whole or in part to lack of adequate coordination by Seller, including coordination of Subcontractors and Suppliers.
      g. Requests that are otherwise frivolous or unnecessary.

6. Should requests be categorized by Engineer as within the limits of Paragraphs 1.3.A.3, 4, or 5 of this Specifications Section, Engineer may recommend and Owner may withhold from payments due Seller under the Contract set-off(s) sufficient to cover Owner's costs of Contractor's submittal of invalid, frivolous, unnecessary, or inappropriate requests for interpretation or clarification..
7. Seller shall have sole financial responsibility for Contractor's costs for requests for interpretation or clarification that are submitted late, out of sequence, or that are unnecessary.

B. Procedure.
1. Transmit requests for interpretation in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section. Include with each request for interpretation a separate letter of transmittal.
2. If Engineer requests additional information to make an interpretation, entity requesting the interpretation shall transmit the information requested within 10 days, unless Engineer allows additional time, via correspondence referring to request for interpretation number.
3. Engineer will review and respond to requests for interpretation with reasonable promptness. Allow sufficient time for review and response.
4. Engineer will maintain log of requests for interpretation. Upon request, copy of log will be transmitted to requestor.
5. Engineer's response to requests for interpretation will be transmitted in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section. Each response to a request for interpretation will include a separate letter of transmittal.
6. Engineer's response to each request for interpretation will be distributed to:
   a. Seller.
   b. Owner.
   c. Engineer.
7. If Contractor desires to appeal Engineer's interpretation or clarification, comply with the appeals procedure set forth in the General Conditions, as may be modified by the Supplementary Conditions.
8. Interpretations that One or Both Parties Believes Entails a Change to the Contract:
   a. If Seller or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of Engineer's interpretation, so advise Engineer in writing before proceeding with the Work associated with the request for interpretation.
   b. If, after this initial communication, either Owner or Seller believes that change in Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.

C. Preparation of Requests for Interpretation:
1. Prepare each request for interpretation on the "Request for Interpretation" form included with this Specifications section, or other form acceptable to Engineer.
2. Number each request for interpretation as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First request for interpretation on the general contract for project titled, "Camas Blower Improvements Project" would be, "RFI No. CBIP-GC-001".
3. In space provided on form, describe the interpretation requested. Provide additional sheets as necessary. Include text and sketches as required in sufficient detail to describe the need for interpretation.
4. When applicable, request for interpretation shall include Seller's recommended resolution.

1.4 WRITTEN CLARIFICATIONS

A. General:
1. Written clarifications, when required, will be initiated and issued by Engineer.

2. Written clarifications do not change the Contract Price or Contract Times, and do not alter the Contract Documents.
3. Written clarifications will be issued as correspondence or using clarification notice form acceptable to Engineer, with additional information as required.

B. Procedure.
1. Engineer's written clarifications will be transmitted in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section.
2. Each written clarification will be distributed to:
   a. Seller.
   b. Owner.
   c. Engineer.
3. If Seller desires to appeal Engineer's interpretation or clarification, comply with the appeals procedure set forth in the General Conditions, as may be modified by the Supplementary Conditions.
4. Written Clarifications that One or Both Parties Believes Entails a Change to the Contract:
   a. If Seller or Owner believe that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of Engineer's written clarification, so advise Engineer in writing before proceeding with the Work associated with the written clarification.
   b. If, after this initial communication, either Owner or Seller believes that change in the Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
5. If Engineer's written clarification is unclear, prepare and transmit a request for interpretation in accordance with the Contract Documents.

1.5 MINOR CHANGES IN THE WORK AND FIELD ORDERS

A. General:
1. Field Orders, when required, will be initiated and issued by Engineer.
2. Field Orders authorize minor changes in the Work but do not change the Contract Price or Contract Times.
3. Field Orders will be in the form of Engineers Joint Contract Documents Committee document EJCDC C-942, "Field Order".
4. Engineer will maintain a log of Field Orders issued. Copy of Engineer's log of Field Orders will be transmitted to Seller or Owner upon request.

B. Procedure:
1. Field Orders will be transmitted in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section. Each Field Order will include a separate letter of transmittal.
2. Each Field Order will be distributed to the following:
   a. Seller.
   b. Owner.
   c. Engineer.
3. Field Orders that One or Both Parties Believes Entails a Change to the Contract Price or Contract Times:
   a. If Seller or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required as a result of a Field Order, so advise Engineer in writing before proceeding with the Work associated with the Field Order.
   b. If, after this initial communication, Seller believes that change in Contract Price, Contract Times, both, or other relief with respect to the terms of the Contract is necessary, recourse shall be in accordance with the Contract Documents.
4. If the Field Order is unclear, submit request for interpretation.
5. If Owner disagrees with the Field Order, Engineer may issue a revised or amended Field Order, or a Change Order or Work Change Directive may be issued.

1.6 WORK CHANGE DIRECTIVES

A. General:
   1. Work Change Directives, when issued, order additions, deletions, or revisions to the Work. When issued, Seller shall promptly implement the changes ordered in the associated work Change Directive.
   2. Work Change Directives do not change the Contract Price or Contract Times but are evidence that the parties to the Contract expect that the change ordered or documented by the Work Change Directive will be incorporated in subsequently issued Change Order following agreement by the parties as to the Work Change Directive's effect, if any, on the Contract Price, Contract Times, or both.
   3. Work Change Directives will be in the form of EJCDC C-940, "Work Change Directive".

B. Procedure.
   1. Work Change Directives signed by Owner and Engineer will be transmitted in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section. Each Work Change Directive will include a separate letter of transmittal. Signed Work Change Directives will be transmitted to:
      a. Seller: One original.
      b. Owner: One original.
      c. Engineer: One original.
   2. Documentation of Costs:
      a. Promptly following receipt of the Work Change Directive:
         1) Advise Engineer and Owner in writing of the anticipated quantity and types of construction equipment and machinery required or anticipated for the associated Work.
         2) Advise Engineer and Owner in writing of which construction equipment and machinery is owned by the Seller or Subcontractor and which is, or will be, rented from an equipment rental firm.
         3) When construction equipment and machinery is rented from a rental firm, transmit to Engineer and Owner copy of the associated rental agreements(s) pertinent to the Work ordered by the Work Change Directive.
         4) For all construction equipment and machinery, indicate to Engineer and Owner whether each item is required only for the Work ordered by the Work Change Directive and whether each item is being, or will be, used for other Work on the Project or other projects for Owner.
         5) Advise Engineer and Owner in writing of information on anticipated temporary materials (including items such as temporary support of excavations, scaffolding, temporary barriers, temporary plates covering excavations, and other temporary materials) to the same extent as that required for construction equipment and machinery.
      b. When basis of payment for Work ordered under a Work Change Directive will be paid as Cost of the Work plus a fee, or when otherwise required by Engineer, document for the Work performed under each separate Work Change Directive, for each day, the following:
         1) Number and labor classifications of workers employed and hours worked each day on the Work ordered via the Work Change Directive.
         2) Construction equipment used, including manufacturer, model, and year of manufacture, and number of hours such equipment was onsite and used each day for the Work under the Work Change Directive. Indicate where the equipment was used for other Work under the Contract and idle time.
         3) Temporary materials; furnish the same information as required for construction equipment and machinery. Where rental costs of such items approaches the purchase cost of such item, or when otherwise requested by Engineer, furnish evidence, satisfactory to Engineer, of the purchase price of such temporary materials.

4) Consumables and similar materials used.
5) Suppliers' receipts, bills, or invoices for and descriptions of materials and equipment incorporated into the Work.
6) Invoices and labor and equipment breakdowns for Subcontractors.
7) Other information required by Owner or Engineer.
8) Transmit such documentation as a Change Proposal promptly after such documentation is available to Seller. Actively pursue Subcontractors and Suppliers for required documentation to promptly furnish required documentation to Engineer.

c. Separately track and document Work performed in accordance with each Work Change Directive and Work performed under stipulated price methods of compensation.
d. Submit such information in a format acceptable to Engineer.

3. Documentation of Time:
a. General:
1) Seller will be entitled to change of Contract Times Work ordered by a Work Change Directive in accordance with the requirements of the General Conditions, as may be modified by the Supplementary Conditions.
2) Seller will be entitled to a change in Contract Times only when the Work ordered by the Work Change Directive is implemented promptly and affects the Seller's ability to comply with the Contract Times.

b. Requirement Documentation: Submit the following as part of the Change Proposal documenting price-related impact of the Work ordered by the Work Change Directive:
1) Statement on whether the subject Work affected Seller's ability to comply with the Contract Times.
2) If Seller's ability to comply with the Contract Times was so affected, indicate the effect on each of the relevant Contract Times.
3) Document that Seller acted promptly and properly upon receipt of the Work Change Directive to promptly implement the Work ordered thereby.

4) Other time-related documentation required by Engineer.

1.7 PROPOSAL REQUESTS

A. General:
1. Proposal Requests may be initiated by Engineer or Owner.
2. Proposal Requests are for requesting the effect on the Contract Price and the Contract Times and other information relative to contemplated changes in the Work. Proposal Requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times or terms of the Contract.
3. Proposal Requests will be furnished using the "Proposal Request" form included with this Specifications section.

B. Procedure:
1. Proposal Requests will be transmitted in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Section. Each Proposal Requests will include a separate letter of transmittal.
2. Each signed Proposal Request will be transmitted to the following:
a. Seller.
b. Owner.
c. Engineer.
3. Transmit request for interpretation to obtain clarification of conflicts, errors, ambiguities, and discrepancies in Proposal Request.
4. Upon receipt of Proposal Request, Seller shall prepare and transmit to Engineer a Change Proposal, in accordance with the Contract Documents, for the proposed Work described in the Proposal Request.

1.8 CHANGE PROPOSALS

A. General:
   1. Prepare and transmit written Change Proposal to Engineer in response to each Proposal Request; or when Seller believes a change in the Contract Price, Contract Times, both, or other change to the terms of the Contract is required; or to appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract.

B. Procedure:
   1. Prepare and transmit Change Proposals within time limits indicated in the General Conditions, as may be modified by the Supplementary Conditions.
   2. Submit only one Change Proposal for each change issue, unless Engineer requires additional information or clarification. Do not submit repeated Change Proposals for the same change issue. Rather, when Seller is dissatisfied with Engineer's decision on a Change Proposal, recourse is set forth in the General Conditions, as may be modified by the Supplementary Conditions, and elsewhere in this Article.
   3. Transmit Change Proposals in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section. Include with each Change Proposal all required supporting documentation and a separate letter of transmittal.
   4. Engineer's Review and Requests for Additional Information:
      a. Engineer will review and act on each Change Proposal in accordance with, and within the time limits indicated in, the General Conditions, as may be modified by the Supplementary Conditions.
      b. When, Engineer requests additional information to render a decision, submit required information within five days of receipt of Engineer's request, unless Engineer allows more time. Submit the required information via correspondence that refers to the specific Change Proposal number.
      c. Owner shall transmit to Engineer such comments, if any, that Owner has on the Change Proposal, within 10 days of Owner's receipt of the Change Proposal.
      d. Engineer will render a written decision on the Change Proposal or take other action in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
      e. Engineer's response to Change Proposals will be transmitted in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section, the General Conditions, and the Supplementary Conditions.
   5. Engineer's response to each Change Proposal will be distributed to:
      a. Seller.
      b. Owner.
      c. Engineer.
   6. If Change Proposal is recommended for approval by Engineer and is approved by Owner, a Change Order will be issued or, when applicable, an appropriate use of an allowance (already included in the Contract Price) will be authorized by Owner.
   7. If parties do not agree on terms for the change, Owner or Seller may file a Claim against the other, in accordance with the General Conditions, as may be modified by the Supplementary Conditions.

C. Preparation of Change Proposals:
   1. Each Change Proposal shall be submitted on the "Change Proposal" form included with this Specifications section, or other form acceptable to Engineer.
   2. Number each Change Proposal as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First Change Proposal for the general contract for project named "Contract No. 8" would be, "Change Proposal No. 8-GC-001".

3. In space provided on Change Proposal form:
    a. Describe scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for Engineer's review and response. If a change item is submitted in response to Proposal Request, write in as scope, "In accordance with Proposal Request No." followed by the Proposal Request number. Submit written clarifications, if any, to scope of change.
    b. Submit justification for each proposed change. If change is in response to proposal request, write in as justification, "In accordance with Proposal Request No." followed by the Proposal Request number.
    c. Indicate the total change in the Contract Price and Contract Times for each separate change item included in the Change Proposal.
4. Proposed Effect on Contract Price: Unless otherwise directed by Engineer, attach to the Change Proposal detailed breakdowns of pricing (Seller's cost and Seller's fee) including:
    a. List of Work tasks to accomplish the change.
    b. For each task, labor cost breakdown including labor classification, total hours per labor classification, and hourly cost rate for each labor classification. Where overtime is included, indicate the overtime hours, labor classifications, and associated overhead rates.
    c. Construction equipment and machinery to be used, including manufacturer, model, and year of manufacture, and number of hours for each. Indicate whether the construction equipment or machinery is owned by Seller, Subcontractor, or leased from a rental firm; if leased, include with the Change Proposal a copy of the rental agreement. Indicate whether the construction equipment and machinery is already onsite and used for other activities, or whether it is required solely for the Work in the contemplated change. Indicate overtime hours budgeted, if any, and the associated cost rate for overtime compared with the straight-time rate.
    d. Indicate temporary materials required, including description of extent, scope, and quality, and associated cost. Temporary materials include items such as temporary sheeting for support of excavations, scaffolding, temporary plates to cover open excavations, temporary barriers, and other temporary items. Indicate ownership or source of such items. Include copy of rental agreement if rented from a third-party rental firm in which neither Seller nor any Subcontractor has a financial interest. Indicate intended duration of use for such items and purchase cost of such items.
    e. Detailed breakdown of cost of materials and equipment to be incorporated into the Work, including quantities, unit costs, and total cost, with Supplier's written quotations. When requested by Engineer, submit quotes by multiple prospective Suppliers.
    f. Breakdowns of each Subcontractors' pricing, including labor, construction equipment and machinery, temporary materials, and materials and equipment incorporated into the Work, other costs, and Subcontractor fees (e.g., overhead and profit). Breakdown of Subcontractors' pricing shall be the same level of detail as that for Seller.
    g. Breakdown of other costs eligible, in accordance with the General Conditions and the Supplementary Conditions under "Cost of the Work" provisions.
    h. Other information required by Engineer.
    i. Seller's fees (overhead and profit) applied to eligible Seller costs and eligible Subcontractor costs.
5. Proposed Effect on Contract Times: Unless otherwise directed by Engineer, attach to the Change Proposal detailed information substantiating the proposed change in Contract Times, including:
    a. Indication of whether the Work associated with the contemplated change will affect Seller's ability to comply with the Contract Times.
    b. Other time-related information requested by Engineer.

1.9 CHANGE ORDERS

A. General:

1. Change Orders will be recommended by Engineer (when required by the General Conditions) and will be signed by Owner and Seller (subject to the General Conditions related to a party withholding its signature from a contractually-required Change Order)), to authorize additions, deletions, or revisions to the Work, changes to the Contract Price, changes in the or Contract Times, changes to the terms of the Contract, or a combination thereof.
2. Change Orders will be in the form of EJCDC C-941, "Change Order".

B. Procedure.
1. Change Orders for signature by Seller will be transmitted in accordance with Section 01 31 26 - Electronic Communication Protocols, and requirements of this Specifications section. Each Change Order will include a separate letter of transmittal. Seller shall print three originals of Change Order for Seller's signature.
2. Seller shall promptly sign each original Change Order and, within five days of receipt, deliver all originals to Engineer.
3. Engineer will sign each original Change Order and forward them to Owner.
4. After approval and signature by Owner, original Change Orders will be distributed as indicated below.
5. Original, signed Change Orders will be distributed as follows:
   a. Seller: One original.
   b. Owner: One original.
   c. Engineer: One original.
6. Upon Seller's receipt of the fully-signed Change Order, promptly perform the Work ordered thereby in accordance with the Contract Documents and the Progress Schedule accepted by Engineer.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

A. The forms listed below and bound following this Specifications section's "End of Section" designation, are part of this Specifications section:
1. Request for Interpretation form (one page).
2. Proposal Request form (one page).
3. Change Proposal form (one page).

END OF SECTION

REQUEST FOR INTERPRETATION

Owner: _____

Project Name: _____

Seller: _____ RFI No. [_____]

Date Transmitted: _____ Date Received: [_____]

Date Response Requested: _____ Date Response Transmitted: [_____]

Subject: _____ [_____]

Specification Section and Paragraph: _____

Drawing References: _____

INTERPRETATION REQUESTED:

Signature: _____ Date: [_____]

ENGINEER'S RESPONSE:

Signature: _____ Date: [_____]

PROPOSAL REQUEST

Owner: _____

Project Name: _____

Proposal Request No.: _____ Date: [_____]

Contract Name and No.: _____

Seller: _____

Other Contracts Involved in Proposed Change: _____

TO SELLER: Please submit a complete Change Proposal for the proposed modifications described below. If the associated Change Proposal is approved, a Change Order or allowance authorization will be issued to authorize adjustment so the Contract. This Proposal Request is not a Change Order, Work Change Directive, Field Order, or an authorization to proceed with the proposed Work described below.

SCOPE OF PROPOSED CHANGE(S) IN THE WORK:

1. *[Title 1]*:
2. *[Title 2]*:
3. *[Title 3]*:

Attachments to this Proposal Request:

1. [None].

Proposal requested by: _____
HDR (Engineer)

Signature of Requestor: _____

CHANGE PROPOSAL

Owner: _____

Project Name: _____

Change Proposal No.: _____ Date: [_____]

Submitted in Response to Proposal No.: _____

Seller Name and No.: _____

Seller: _____

Subject: _____

_____

The following changes to the Contract are proposed:

SCOPE OF PROPOSED CHANGE TO CONTRACT: *(attach supporting information as required)*

1. *[Title 1]*:
2. *[Title 2]*:

JUSTIFICATION:

1. *[Title 1]*:
2. *[Title 2]*:

PROPOSED CHANGES IN CONTRACT PRICE AND CONTRACT TIMES:

We propose that the Contract Price and Contract Times be changed as follows:

For Contract Price, attach detailed cost breakdowns for Seller and Subcontractors, Supplier quotations, and other information required.

For the Contract Times, state increase, decrease, or no change to Contract Times for Substantial Completion, readiness for final payment, and Milestones, if any. If increase or decrease, state specific number of days for changes to the Contract Times. Submit supporting data, including time impact analysis for the Progress Schedule.

		Contract Times (days)	
Description	**Amount**	**Substantial**	**Final**
1. [Title 1]	$0.00	0	0
2. [Title 2]	$0.00	0	0
Total This Change Proposal	**$0.00**	**0**	**0**

Changes to Milestones, if any: [_____] [_____]

Seller represents that supporting data attached to this Change Proposal are accurate and complete. The requested time or price adjustment indicated in this Change Proposal is the entire adjustment to which Seller believes it is entitled as a result of the proposed change(s) indicated herein.

Change Proposal by: _____

Signature of Proposer: _____

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SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Administrative and procedural requirements for Seller's progress payments.

B. Scope:
   1. Seller's requests for payment shall be in accordance with the Agreement, General Conditions and Supplementary Conditions, and the Specifications.
   2. Form: Applications for Payment shall be the Engineers Joint Contract Documents Committee (EJCDC) document EJCDC C-620, "Seller's Application for Payment" (2018 edition or later) or other form acceptable to the Owner and Engineer.

1.2 CONTENT AND PROCEDURE FOR REQUESTING PROGRESS PAYMENTS

A. Procedure:
   1. Submit to Engineer 1 original, each with Seller's signature, of each complete Application for Payment and other documents to accompany the Application for Payment. Seller's Application for Payment shall be submitted electronically unless otherwise directed by the Engineer.
   2. Engineer will act on request for payment in accordance with the General Conditions and Supplementary Conditions.
   3. For procurement of the blowers Seller may apply for payment of 10% of the total blower cost after final approval of the blower submittals by the Owner and Engineer.

B. Content: Each request for payment shall include:
   1. Completed Application for Payment form, including summary/signature page, and progress estimate sheets, and Progress Payments per below schedule.
   2. Progress Payment Schedule:

Event	Percentage of Payment at each Event
Approval of Shop Drawings	10
Approval of Preliminary O&M Manuals	5
Delivery of Goods	50
Approval of Final O&M Manuals	5
Delivery of Final O&M Manuals	5
Performance of Manufacturer's Field Services	5
Satisfactory completion of Performance Testing	20

C. Final Payment:
   1. Requirements for request for final payment are in the General Conditions, as may be modified by the Supplementary Conditions, and Section 01 77 19 - Closeout Requirements.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

A. The forms listed below, following this Specifications section's "End of Section" designation, are part of this Specifications section:
   1. List of Subcontractors and Suppliers form (two pages).
   2. Not Used.

END OF SECTION

LIST OF SUBCONTRACTORS AND SUPPLIERS

Owner: [_____] [_____]
Project Name: [_____] [_____]

Seller: _____ Date: [_____]
Contract Designation: _____

Indicate below complete information for each Subcontractor and Supplier known to Seller, regardless of whether the firm has a direct contract with Seller. Include all lower-tier Subcontractors and associated Suppliers. Copy and paste the paragraphs below as required to indicate all Subcontractors and Suppliers.

SUBCONTRACTORS

1. **Subcontractor Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Work Under Specifications Section Nos.*:
   - *Brief Description of Work*:
   - *Current Subcontract Price*:
   - *Approximate Subcontract Start Date*:
   - *Approximate Subcontract End Date*:

2. **Subcontractor Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Work Under Specifications Section Nos.*:
   - *Brief Description of Work*:
   - *Current Subcontract Price*:
   - *Approximate Subcontract Start Date*:
   - *Approximate Subcontract End Date*:

3. **Subcontractor Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Work Under Specifications Section Nos.*:
   - *Brief Description of Work*:
   - *Current Subcontract Price*:
   - *Approximate Subcontract Start Date*:
   - *Approximate Subcontract End Date*:

Total of Subcontract Prices for all subcontracts equals approximately [_____] percent of the Contract Price *(Seller to fill in blank monthly)*

SUPPLIERS

1. **Supplier Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Furnishing Items Under Specifications Section Nos.*:
   - *Brief Description of Items*:
   - *Current Purchase Order Amount*:
   - *Approximate Purchase Order Date*:
   - *Approximate Purchase Order End Date*:

2. **Supplier Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Furnishing Items Under Specifications Section Nos.*:
   - *Brief Description of Items*:
   - *Current Purchase Order Amount*:
   - *Approximate Purchase Order Date*:
   - *Approximate Purchase Order End Date*:

3. **Supplier Name**:
   - *Address*:
   - *Contact Person*:
   - *Telephone No.*:
   - *E-mail Address*:
   - *Furnishing Items Under Specifications Section Nos.*:
   - *Brief Description of Items*:
   - *Current Purchase Order Amount*:
   - *Approximate Purchase Order Date*:
   - *Approximate Purchase Order End Date*:

SECTION 01 31 26
ELECTRONIC COMMUNICATION PROTOCOLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures with which Users will comply regarding transmission or exchange of Electronic Documents for the Project.

B. Related Requirements:
   1. Refer to the General Conditions, as may be modified by the Supplementary Conditions, regarding transmitting Electronic Documents by Electronic Means.
   2. In addition to the requirements of this Specifications Section, comply with the requirements for Electronic Documents in the following Specifications:
      a. Section 01 33 00 - Submittals.

1.2 DEFINITIONS

A. The following terms are defined for use in this Specifications Section and are indicated herein using initial capital letters. The terms have the associated meaning regardless of whether indicated in singular or plural.
   1. Electronic Documents Protocol (abbreviated as "EDP"): Procedures and requirements set forth in this Specifications Section for the exchange of Electronic Documents by Electronic Means.
   2. Project Website: An internet-based software platform, such as a website or other project management information system (PMIS) designated by Contract or mutual consent of Users as the means of exchanging Electronic Documents during the Project.
   3. System Infrastructure: Hardware, operating system(s) software, internet access, e-mail service and software, security software, and large-file transfer functions.
   4. Users: Owner, Seller, Engineer, and others exchanging Electronic Documents on the Project in accordance with the EDP.

1.3 ADMINISTRATIVE REQUIREMENTS.

A. Coordination:
   1. Seller shall require all Subcontractors and Suppliers to comply with the EDP established in the Contract Documents.

1.4 GENERAL PROVISIONS OF ELECTRONIC DOCUMENT PROTOCOL

A. EDP – General:
   1. To the fullest extent practical, Users agree to and will transmit and accept Electronic Documents transmitted by Electronic Means in accordance with the requirements of this Specifications Section. Use of the Electronic Documents and any information contained therein is subject to requirements of this Specifications Section and other provisions of the Contract Documents governing transmittal of Electronic Documents.
   2. Content of Electronic Documents will be the responsibility of transmitting User.
   3. Unless otherwise provided in: (1) the EDP, (2) elsewhere in the Contract Documents, or (3) or other agreement between two or more Users governing use of Electronic Documents, Electronic Documents exchanged in accordance with the Contract Documents may be used in the same manner as paper or other printed versions of the same documents exchanged using other than Electronic Means, subject to the same governing requirements, limitations, and restrictions set forth in the Contract Documents.
   4. Except as otherwise explicitly indicated in the EDP, the terms of this EDP will be incorporated into any other agreement or subcontract between a party and a third party for a

portion of the Work or Project-related services, where such third party is, either directly or indirectly, required to exchange Electronic Documents with Owner, Seller, or Engineer. Nothing in this EDP modifies the requirements of the Contract Documents regarding communications between and among Owner, Seller, and Engineer Subcontractors, Suppliers, consultants, and others for which each is responsible.

5. When transmitting Electronic Documents, transmitting User makes no representations regarding long-term compatibility, usability, or readability of the items resulting from the receiving User's use of software applications or System Infrastructure differing from those established in this EDP.
6. This EDP does not negate or mitigate any obligation: (1) in the Contract Documents to create, provide, or maintain an original paper record version of Drawings and Specifications, signed and sealed in accordance with Laws or Regulations; (2) to comply with Laws and Regulations governing signing and sealing of design documents or signing and electronic transmission of other documents; or (3) to comply with notice requirements of the General Conditions (as. May be modified by the Supplementary Conditions).
7. Modifications to EDP:
    a. When modifications to the EDP are necessary to address issues affecting System Infrastructure, Users shall cooperatively resolve the issues.
    b. If resolution within a reasonable time is not achieved, Owner is empowered to require reasonable and necessary changes to the EDP consistent with the original intent of the EDP.
    c. If such changes result in additional cost or delay to Seller, not reasonably anticipated under the original EDP, Seller may seek an adjustment in the Contract Price, Contract Times, or both in accordance with the Contract Documents.

B. System Infrastructure and Systems for Exchanging Electronic Document:
1. Each User will provide System Infrastructure (as defined in this EDP) at its own cost and sufficient for complying with EDP requirements. Except for minimum standards set forth in this EDP, it is the obligation of each User to determine, for itself, such User's own System Infrastructure.
    a. Maximum size of e-mail file attachment under this EDP is 18 megabytes (MB). Attachments larger than the maximum size indicated in this paragraph shall be exchanged via secure electronic transfer using method mutually acceptable to Owner, Engineer, and Seller.
    b. Each entity transmitting or receiving Electronic Documents has full responsibility for its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, and otherwise enabling its System Infrastructure for use in accordance with this EDP.
    c. Each User will provide its own printing facilities and will be responsible for its own costs of printing Electronic Documents.
2. Each User is responsible for its own system operations, security, back-up, archiving, audits, and other technology and resources for operations of its System Infrastructure during the Project, including coordination with the User's individual(s) or subcontractor(s) responsible for managing its System Infrastructure and capable of addressing communications and other technology issues affecting exchange of Electronic Documents.
3. Security:
    a. Each User will operate and maintain industry-standard, industry-accepted, ISO standard, commercial-grade security software and systems to protect against threats including software viruses and other malicious software including worms, trojans, adware; data breaches; loss of confidentiality; and other threats in transmission to, or storage of, Electronic Documents from other Users, including transmission of Electronic Documents by physical media including flash drives/thumb drives, hard drives, compact discs (CD), digital video discs (DVD), and other portable devices, whether connected physically or wirelessly.

b. To the extent that a User maintains and operates such security software and appropriate System Infrastructure, such User will not be liable to other Users participating in the Project for breach of system security.

4. Archiving and Electronic Document Backup:
   a. Each User is responsible for its own back-up and archive of Electronic Documents and data transmitted and received during the Project, unless this EDP establishes a Project Electronic Document archive, either as a mandatory Project Website or other communications protocol, upon which Users may rely for Electronic Document archiving for the duration of the Project Website or archiving system established in this EDP.
   b. Each User is solely responsible for its own post-Project back-up and archive of Electronic Documents after the Project is complete or after termination of the Project Website or other Project archive (as applicable), for the longer of: (1) required by the Contract Documents, (2) required by Laws and Regulations, and (3) as each User deems necessary for its purposes.
5. Receipt of Damaged, Incomplete, or Corrupt Electronic Documents: When a receiving User receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving User will advise the transmitting User of the incomplete transmission and transmitting User will retransmit the Electronic Document.
6. Completion of Transmittals: Users will bring non-conforming Electronic Documents into compliance with the EDP. Users will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the transfer of the Electronic Documents.
7. Principal means of exchanging Electronic Documents will be e-mail and files attached to e-mail, in accordance with the EDP.
8. Project Website:
   a. Owner will establish, operate, and maintain a Project Website (as defined in this EDP) for use of Owner, Engineer, Seller, and other Users as appropriate during the Project, for exchanging and storing Project Electronic Documents.
   b. Unless otherwise provided in the Contract Documents, use of Project Website by Owner, Seller, and Engineer is mandatory for exchanging Project documents as set forth in the EDP.
   c. Project Website Conditions and Standards:
      1) Software Platform: SharePoint and Newforma.
      2) Duration of Project Website Availability and Reliance by Users: Life of project.
      3) Minimum System Infrastructure Requirements for Project Website Use: web access.
      4) Services and Functions Available on Project Website: file storage and transfer.
      5) Not used.
   d. Address of Project Website will be furnished to Seller, and Project Website will be available to Seller, within 10 days following the Effective Date of the Contract.

C. General Requirements and Limitations for Software for Electronic Document Exchange:
1. Software and file formats for exchange of Electronic Documents shall be as indicated in Article 1.5 of this Specifications Section.
2. Software Versions:
   a. Each User will acquire the software and associated licenses necessary to create, transmit, receive, read, and us Electronic Documents for the Project, using the software and file formats indicate in Article 1.5 of this Specifications Section.
   b. Prior to using any updated version of the software required in the EDP for Electronic Document(s) transmitted to other User(s), the originating User will first notify and either (1) receive concurrence from receiving User(s) for use of the updated version, or (2) adjust its transmission to comply with the EDP.
3. Preservation of Intellectual Property and Confidentiality of Electronic Documents:

a. Users agree to not intentionally edit, reverse-engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes Electronic Documents, and information and data contained therein, transmitted in a file format, including portable document format (PDF), intended by transmitting User to not be modified, unless the receiving User (1) obtains permission from owner of the Electronic Document and intellectual property contained therein, or (2) is expressly allowed by the EDP to edit or modify the Electronic Document.
b. Where modifying, editing, decryption, or reverse-engineering is allowed by the EDP, such use is conferred only for the Project.
c. The EDP does not transfer any ownership or rights of any sort regarding use outside of the Project of Electronic Documents.
d. Users shall not cite or quote excerpts of Electronic Documents for purposes outside of the Project unless required to do so by Laws and Regulations.

D. Seller's Requests for Electronic Documents in Other Formats:
1. Release of Electronic Documents in format(s) other than those indicated in in Article 1.5 of this Specifications Section and elsewhere in the Contract Documents will be at the discretion of Owner and subject to terms and conditions required by the owner of such files and documents, and the provisions indicated below.
2. To extent determined by Owner, in its sole discretion, to be appropriate, release of Electronic Documents in alternative format(s) requested by Seller ("Request") are subject to provisions of Owner's response to the Request and to the following:
a. Seller's Request shall be in writing. Owner and others, as appropriate, will consider and respond to Request promptly, but neither Owner nor Engineer will be responsible for any time or cost impacts on Seller associated with timing of the Request, or with Owner's decision associated therewith.
b. When Engineer is the owner of the Electronic Documents requested by Seller in native format, prior to Engineer transmitting such Electronic Documents to Seller, Seller shall sign and deliver to Engineer, without modifying or amending, Engineer's "Electronic Media Release" agreement.
c. Content included in Electronic Documents created by Engineer and furnished in response to the Request was prepared by Engineer as an internal working document for Engineer's purposes solely and, when provided to Seller, is on an "as-is" basis without warranties of any kind, including, but not limited to any implied warranties of fitness for purpose. Seller acknowledges that content of Electronic Documents furnished in response to the Request may not be suitable for Seller's purpose(s), or may require substantial modification and independent verification by Seller. Content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other shown or indicated information that may affect subsequent use by Seller or others for whom Seller is responsible.
d. Electronic Documents containing text, graphics, metadata, or other types of data furnished by Engineer in response to the Request are only for Seller's convenience and any and all conclusions or information obtained or derived from such Electronic Documents will be at Seller's sole risk and expense. Seller waives any and all claims against Engineer, Owner, or both arising from Seller's use of Electronic Documents furnished in response to the Request.
e. Seller shall indemnify and hold harmless Owner, Engineer, and their respective consultants and subconsultants from any and all claims, damages, losses, and expenses, including attorneys' fees and defense costs, fees and costs of engineers, architects, geologists, accountants, and other professionals, and any and all other costs, direct and indirect, resulting from Seller's use, adaptation, or distribution of Electronic Document(s) furnished in response to the Request.

f. Seller shall not sell, copy, transfer, forward, give away or otherwise distribute the Electronic Documents (in source format or modified file format) to any third party without direct written authorization of Engineer or other entity that owns the Electronic document(s), unless such distribution is specifically indicated in the Request and is limited to Subcontractors and Suppliers. Seller warrants that subsequent use by Subcontractors and Suppliers complies with terms and conditions of the Contract Documents, Owner's response to the Request, and release agreement(s) (if any) by owner of the Electronic Documents (including Engineer, where applicable).

3. When the Request is for Electronic Documents in a format not other than that indicated in the Contract Documents, and Owner (and others, as applicable) decide to comply with the Request, and when the requested Electronic Documents are not easily available in the format(s) requested, Seller shall reimburse Owner for costs incurred by Owner, either directly or indirectly, to furnish Electronic Documents. In compensation, Owner may retain such amount(s) as set-off(s) under the Contract Documents.

1.5 EXCHANGE OF ELECTRONIC DOCUMENTS

A. Comply with the Electronic Document formats, transmission methods, and permitted uses set forth in Table 01 31 26-A, Exchange of Electronic Documents, below, when transmitting or using Electronic Documents on the Project. Where a row in the table has no indicated means of transmitting Electronic Documents, use for such documents only paper copies transmitted to the receiving party via appropriate delivery method.

TABLE 01 31 26-A – EXCHANGE OF ELECTRONIC DOCUMENTS

Electronic Document Type	Format	Transmitting User	Transmission Method	Receiving User	Allowed Uses	Notes
1.5.A.1. Project communications						
General communications & correspondence	EM, PDF	O, E, C	EM, EMA	O, E, C	R	
Meeting notices and agendas	EM, PDF	E	EM, EMA	O, C	R	
Meeting minutes	PDF	E	EM, EMA	O, C	R	
1.5.A.2. Seller's Submittals to Engineer						
Shop Drawings	PDF	C	EMA	E	M (1)	(1)
Product data Submittals, delegated design Submittals, and other action Submittals (except Samples)	PDF	C	EMA	E	M (1)	(1)
Informational and closeout Submittals:	PDF	C	EMA	E	M (1)	(1) (6)
Documentation of delivery of maintenance materials submittals	PDF	C	EMA	E	M (1)	
1.5.A.3. Engineer's return of reviewed Submittals to Seller						
Shop Drawings	PDF	E	EMA	O., C	R	
Product data Submittals, delegated design Submittals, and other action Submittals	PDF	E	EMA	O., C	R	
Informational and closeout Submittals:	PDF	E	EMA	O., C	R	(6)
Documentation of delivery of maintenance materials submittals	PDF	E	EMA	O. C	R	
1.5.A.4. Contract Modifications Documents						
Requests for interpretation to Engineer	PDF	C., O	EMA	E	M (1)	(1)

Electronic Document Type	Format	Transmitting User	Transmission Method	Receiving User	Allowed Uses	Notes
Engineer's interpretations (RFI responses)	PDF	E	EMA	C, O	R	
Engineer's clarifications to Seller	EM, PDF	E	EM, EMA	C, O	R	
Engineer's issuance of Field Orders	PDF	E	EMA	C, O	R	
Proposal Requests	PDF	E, O	EMA	C	R	
Change Proposals – submitted to Engineer	PDF	C	EMA	O, E	S	
Change Proposals – Engineer's response	PDF	E	EMA	C. O		
Work Change Directives (for Seller signature)	PDF	E	EMA	C	R	(2)
Change Orders (for Seller signature)	PDF	E	EMA	C	R	(2)
1.5.A.5. Applications for Payment						(3)
1.5.A.6. Claims and other notices						(4)
1.5.A.7. Closeout Documents						
Record drawings	DWG and PDF	C	EMA	E, O	M (5)	(5)
Other record documents	PDF	C	EMA	E. O	M (5)	(5)
Contract closeout documents						

1. Key to Table 01 31 26-A:
   a. Data Format:
      1) EM: .msg, .htm, .txt, .rtf, e-mail text.
      2) W: .docx, Microsoft Word 2013 or later.
      3) EX: .xlsx, Microsoft Excel 2013 or later.
      4) PDF: .pdf. portable document format.
      5) DWG: .dwg. Autodesk AutoCAD 2014 drawing.
   b. Transmitting User:
      1) O: Owner.
      2) C: Seller.
      3) E: Engineer.
   c. Transmission Method:
      1) EM: Via e-mail.
      2) EMA: Attachment to e-mail transmission.
      3) PORT: Delivered via portable media such as flash drive/thumb drive, CD, or DVD
      4) PW: Posted to Project Website via Newforma.
      5) FTP: File transfer via Newforma.
   d. Receiving User:
      1) O: Owner.
      2) C: Seller.
      3) E: Engineer.
   e. Permitted Uses:
      1) S: Store and view only.
      2) R: Reproduce and distribute.
      3) I: Integrate (incorporate additional electronic data without modifying data received)

4) M: Modify as required to fulfill obligations for the Project.

f. Notes:
   1) Modifications by Engineer to Seller's Submittals and requests for interpretations are limited to printing, marking-up, and adding comment sheets.
   2) May be distributed only to affected Subcontractors and Suppliers. Print, sign document, and return signed paper originals to Engineer.
   3) Submit printed Applications for Payment with original ("wet") signatures.
   4) Submit notices, including Claims, in accordance with the notice provisions of the General Conditions, as may be modified by the Supplementary Conditions.
   5) Submit record drawings in native CAD format indicated when Seller has signed Engineer's standard agreement for release of electronic media. In addition, always submit record drawings as PDF files. Comply with Contract Documents requirements for Project record documents.
   6) For operation and maintenance data, also submit paper copies as required by Section 01 78 23 - Operations and Maintenance Manuals.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Definition of various types of Submittals.
   2. Coordination requirements for Submittals.
   3. General provisions concerning Submittals.
   4. Schedule of Submittals.
   5. Seller's preparation of Submittals, including:
      a. Numbering.
      b. Marking.
      c. Organization and content.
      d. Proposed "or-equals", substitutes, and deviations from Contract requirements.
      e. Electronic Documents Submittals.
      f. Seller's review and approval of each Submittal.
      g. Resubmittals.
   6. Seller's transmittal of Submittals, including transmittal letters, transmittal and delivery method, and delivery of Samples, Closeout Submittals, and Maintenance Materials Submittals.
   7. Engineer's review, including:
      a. Timing.
      b. Meaning of Engineer's Submittal action code(disposition) assigned.
      c. Delivery of Engineer's responses on Submittals.

B. Scope:
   1. Seller shall provide all labor, materials, equipment, tools, services, incidentals, and other effort necessary to furnish Shop Drawings, product data Submittals, Samples, and other Submittals in accordance with the Contract Documents.
   2. This Section's Article, "General Provisions Concerning Submittals" includes a summary of the Contract Documents' locations of Submittals requirements.
   3. Shop Drawings, product data Submittals, Samples, and other Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Engineer's approval or acceptance, as applicable, of a Submittal does not alter or modify the Contract Documents.
   4. Engineer and Owner have the right to rely on Seller's representations and certifications made regarding each Submittal.

1.2 REFERENCES

A. References – Introduction:
   1. This Article presents definitions and terminology used in this Section and throughout the Contract Documents.
   2. Applicability of the Term "Submittals": Where reference is made to Shop Drawings, product data Submittals, Samples, or other Submittals in this Section and elsewhere in the Contract Documents, the term "Submittals", as defined in the Contract Documents, is intended. The foregoing applies regardless of whether such term is indicated with an initial capital letter, unless context of the subject provision clearly indicates otherwise.
   3. Types of Submittals:
      a. Submittal types are classified as follows: (1) Action Submittals, (2) Informational Submittals, (3) Closeout Submittals, and (4) Maintenance Materials Submittals.
      b. Type of each required Submittal is indicated in the associated Specifications section. When Submittal type is not clearly indicated in the associated Specifications section,

Submittal will be classified as indicated in this Article. Submit request for interpretation when Seller is uncertain of required Submittal type.

B. Action Submittals:
   1. Action Submittals require an explicit, written approval or other appropriate action by Engineer (or other entity to whom the Submittal is required to be furnished, in accordance with the Contract Documents) before Seller may release the associated item(s) for raw materials procurement, fabrication, production, and shipping.
   2. Unless otherwise indicated in the Contract Documents, Action Submittals include the following:
      a. Shop Drawings.
      b. Product data.
      c. Samples.
      d. Testing plans for quality control activities required by the Contract Documents.
      e. Delegated Designs: Delegated design professional's "instruments of service" Submittals required by the Contract Documents
   3. General Conditions' requirements for Shop Drawings and Samples hereby apply to all Action Submittals.

C. Informational Submittals:
   1. Informational Submittals are so indicated in the Contract Documents. Unless otherwise indicated, Informational Submittals include certifications, evaluation reports, results of source quality control activities, results of field quality control activities, Supplier instructions, reports of Suppliers' visits to the Site, sustainable design Submittals (that are not Closeout Submittals), delegated design Submittals that are not "instruments of service" Submittals, qualifications statements, and others.
   2. Informational Submittals, when submitted in accordance with the Contract and indicating full compliance with the Contract Documents, do not require explicit response from Engineer (or other entity to whom the Submittal is to be delivered); Engineer's (or other entity's) acceptance thereof will be indicated in the Engineer's Submittals log. Copy of Engineer's Submittals log is available to Seller upon Seller's written request.
   3. When Informational Submittal does not indicate full compliance with the Contract Documents, Engineer (or other entity to which Submittal is to be delivered) will indicate the non-compliance in a written response to Seller.

D. Closeout Submittals:
   1. Closeout Submittals are so indicated in the Contract Documents and are, in general, required before the associated Work is completed, unless earlier submittal is required by the Contract Documents.
   2. Unless indicated otherwise in the Contract Documents, Closeout Submittals include maintenance contracts, operation and maintenance data, warranties, bonds (other than performance and payment bonds required prior to the start of construction), record documents, sustainable design closeout Submittals, software, keys, and others.
   3. Closeout Submittals are processed in the same manner as described above for Informational Submittals.

E. Maintenance Materials Submittals:
   1. Maintenance materials include spare parts, extra materials, tools, and similar items required to be furnished in accordance with the Contract Documents.
   2. Furnish required physical maintenance materials, delivered to Owner or facility manager (if other than Owner), as applicable, at the location(s) indicated in the Contract Documents, for the corresponding required Maintenance Materials Submittals.
   3. Maintenance Materials Submittals are documentation of delivery to Owner's or facility manager, and their acceptance of, required physical maintenance materials.
   4. Maintenance Materials Submittals are processed in the same manner as described above for Informational Submittals.

F. Additional Terms:
1. The following terms have the meanings indicated below, regardless of whether such terms are indicated using initial capital letters, and apply to singular and plural of each:
a. "Product data" means illustrations, standard schedules, performance charts, Supplier's published instructions, brochures, diagrams, and other information furnished by Seller to illustrate or describe materials or equipment for some portion of the Work. In general, product data are manufacturers' pre-published information on the items proposed to be incorporated into the Work. Product data includes manufacturer's catalog pages and similar documents with Seller-made markings and indications of proposed products and proposed options.
b. The term "Shop Drawings", defined in the General Conditions, is supplemented by the following: Shop Drawings include: (1) fabrication and assembly drawings, usually having a title block, or (2) schedules, prepared specifically for the Project. Here, "schedules" means a Project-specific summary of systems and components, such as a schedule of HVAC equipment, schedules of doors and door hardware, or windows, or a schedule of paint systems by room and surface, or other, similar Project information in a tabular format. In contrast, construction Progress Schedules, Schedules of Submittals, and Schedules of Values are not Shop Drawings.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Furnish Submittals well in advance of need for the associated material or equipment, or procedure (as applicable), in the Work and with ample time necessary for delivery of materials and equipment and to implement procedures following Engineer's approval or acceptance of the associated Submittal.
2. Work covered by a Submittal will not be included in payments by Owner until approval or acceptance (as applicable) of related Submittals has been obtained in accordance with the Contract Documents.

1.4 GENERAL PROVISIONS CONCERNING SUBMITTALS

A. Locations of Requirements:
1. Requirements concerning Submittals are generally located as follows:
a. General Conditions, as may be modified by the Supplementary Conditions, applicable to the Project.
b. This Section, which presents general requirements for Submittals applicable to the Project.
c. Other Division 01 Specifications that include general requirements for certain types of Submittals, such as Section 01 78 23 - Operation and Maintenance Data,, and others.
d. The "Submittals" Article of the various Specifications sections, which indicates the required Submittals for the associated Work. Furnish all Submittals required by the Contract Documents regardless of whether explicitly indicated in the associated Specifications' "Submittals" Article.

B. This Section augments and supplements the requirements of the General Conditions, as may be modified by the Supplementary Conditions, relative to Submittals.

1.5 SCHEDULE OF SUBMITTALS

A. Informational Submittals: Submit the following:
1. Schedule of Submittals:
a. Timing:
1) Furnish Schedule of Submittals within time frames indicated in the General Conditions, as may be modified by the Supplementary Conditions.
2) Submit updated Schedule of Submittals with each submittal of the updated Progress Schedule.

b. Content: In accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent Submittals of the Schedule of Submittals are identical. Identify on Schedule of Submittals all Submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Clearly indicate Submittals that are on the Project's critical path. Indicate the following for each Submittal:
   1) Date by which Submittal will be received by Engineer.
   2) Whether Submittal will be for a substitution or "or-equal".
   3) Date by which Engineer's response is required. Allow not less than 14 days for Engineer's review, starting on Engineer's actual receipt of each Submittal. Allow increased time for large or complex Submittals.
   4) For Submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of others (if any).

c. Coordinate Schedule of Submittals with the Progress Schedule.

d. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate Submittals on the Project's critical path, or that places extraordinary demands on Engineer for time and resources, is unacceptable. Do not include Submittals not required by the Contract Documents.

e. In preparing Schedule of Submittals:
   1) Considering the nature and complexity of each Submittal, allow sufficient time for reviews and revisions.
   2) Allow reasonable time for: Engineer's review and processing of Submittals, for Submittals to be revised and resubmitted, and for returning Submittals to Seller.
   3) Identify and accordingly schedule Submittals that are expected to have long anticipated review times.

1.6 PREPARATION OF SUBMITTALS

A. Prior to Submittal Preparation:
   1. The General Conditions, as may be modified by the Supplementary Conditions, address Seller's responsibility for submitting for Owner's acceptance identification of Subcontractors and Suppliers. Obtain Owner's acceptance before entering into subcontracts and purchase orders for the Work.
   2. Comply with the Contract Documents relative to terms and conditions of subcontracts and purchase orders for the Work.
   3. Seller's responsibilities for the following are set forth in the General Conditions, as may be modified by the Supplementary Conditions, and as may be augmented elsewhere in the Contract Documents:
      a. Obtaining field measurements and dimensions.
      b. Determining and verifying required quantities.
      c. Verifying compatibility of materials.
      d. Apportioning the Work among Subcontractors, Suppliers, and Seller.
      e. Reconciling required materials, equipment, and other Contract requirements with Seller's means, methods, techniques, sequences, and procedures of construction and with Seller's safety and protection programs and precautions incident thereto.
      f. Reviewing applicable provisions of the Contract Documents and obtaining from Engineer necessary interpretations or clarifications.

B. Submittal Identification:
   1. Submittal Number: Shall be a unique number assigned to each individual Submittal. Assign Submittal numbers as follows:
      a. First part of Submittal number shall be the applicable Specifications section number, followed by a hyphen.

b. Second part of Submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate Submittal furnished under the associated Specifications section.
c. Example: Submittal number for the third Submittal furnished for Section 10 14 00 - Signage, would be "10 14 00-003".

2. Review Cycle Number: Each resubmittal of a given Submittal shall be indicated with a lower-case letter designation:
   a. No letter designation for initial (first) submittal of the Submittal number.
   b. "a" shall indicate first resubmittal of the Submittal number.
   c. "b" shall indicate second resubmittal of the Submittal number.
3. Examples:

Example Description	Submittal Identification	
	Submittal No.	Review Cycle
Initial (first) review cycle of the third Submittal furnished under Section 10 14 00 – Signage	10 14 00 - 003	
Second review cycle (first resubmittal) of third Submittal furnished under Section 10 14 00 - Signage	10 14 00 - 003a	2

C. Marking of Submittals:
1. Mark on each page of each Submittal and each individual component submitted with Submittal number and applicable Specifications paragraph.
2. Mark each page of each Submittal with the Submittal page number.
3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to Engineer.
4. For product data Submittals, operation and maintenance data Submittals, and other Submittals:
   a. Mark options to be furnished using broad, dark arrows or "clouds" clearly drawn around the relevant text or diagrams. Do not use highlighter for indicating options and features.
   b. Indicate options and features not furnished using clear strikeouts through the text or diagrams.

D. Submittal Organization and Content – General:
1. Page or Sheet Size; Furnish Submittals with one or more of the following page or sheet sizes: (a) 8.5 IN by 11 IN; (b) 11 IN by 17 IN; (c) 22 IN by 34 IN; unless another sheet size is acceptable to Engineer.
2. Language: All parts of each Submittal shall be in the English language.
3. Units of Measurement: Clearly indicate units of measurement on Shop Drawings, product data Submittals, record documentation, and operation and maintenance data Submittals. All unites of measure shall be US Imperial system.
4. Organize each Submittal logically to facilitate ease of understanding and review.
5. To the extent practicable, arrange Submittal information in same order as requirements are written in the associated Specifications section.
6. Each Submittal shall cover Work under only one Specifications section.
7. To the extent practicable, package together Submittals for the same Specifications section. Do not furnish required information piecemeal.
8. For large or complex Submittals, include a title page and table of contents.
9. Include appropriately labeled fly sheets to separate distinct parts of each Submittal.
10. Ensure legibility of all pages in each Submittal.

11. Minimize extraneous and unnecessary information in Submittals for materials and equipment. Do not submit information not relevant to the Submittal and associated requirements of the Contract Documents.
12. Seller's, Subcontractor's, and Supplier's written comments on Shop Drawings and product data diagrams shall be colored green
13. Do not submit under Specifications sections with title that include "Basic Requirements", unless the subject material or equipment is specified, in total, in a Specifications section with the words, "Basic Requirements" in its title.

E. Electronic Documents Submittals:
1. Format: Electronic Documents Submittals shall be "portable document format" (.PDF) files unless expressly required otherwise by applicable provisions of the Contract Documents.
2. Electronic Documents Submittals must be electronically searchable when delivered to Engineer and other recipients.
3. Organization and Content:
   a. Each Electronic Documents Submittal shall be one file; do not divide individual Submittals into multiple Electronic Documents files.
   b. When Submittal is large or contains multiple parts, furnish PDF file with suitably titled electronic bookmark for each section of the Submittal.
   c. Content shall be identical to paper or other original Submittal. First page of each Electronic Documents Submittal shall be transmittal letter required in this's Paragraph 1.7.A.
4. Quality and Legibility: Electronic Documents Submittal files shall be made from the original and shall be clear and legible. Markings applied by Seller, Subcontractor, or Supplier shall be clear, distinct, and readily apparent. Electronic Documents file shall be full size of original documents. Properly orient all pages for convenient reading on a computer display; do not furnish pages sideways or upside-down.
5. Provide sufficient internet service, software, and systems for Seller with capability appropriate for transmitting the necessary files and receiving responses from Engineer or other entities.
6. Check not less than once per day for distribution of Electronic Documents Submittals responses and related Electronic Documents correspondence.

F. Proposed "Or-Equals", Substitutes, and Deviations from Contract Requirements:
1. "Or-Equals":
   a. Expressly and prominently indicate, "Proposed Or-Equal" on the associated Action Submittals when Submittal is for an "or-equal".
   b. Submittals requesting approval of an "or-equal" but not accompanied by the required, supplemental information will be deemed incomplete by Engineer and returned to Seller without approval.
2. Substitutes:
   a. Seller's request for approval of substitute is separate from the associated Action Submittal(s). Action Submittals that request approval of a substitute when a separate, formal substitution request (furnished in accordance with the Contract Documents) was not previously furnished to Engineer, followed by formal approval in via an appropriate contract modification (typically either a Field Order or Change Order), will be deemed by Engineer as non-compliant with the Contract Documents and will be returned to Seller without approval.
   b. Seller is solely responsible for delays incurred due to substitutes proposed via Submittals that have not been previously duly approved via an appropriate Contract modification.
   c. Action Submittals for items or procedures approved via an appropriate Contract modification shall include a copy of the Contract modification in which the substitute was approved.

3. Submittals with Proposed Deviations from Contract Requirements:
    a. When Submittal proposes deviations from requirements of the Contract Documents, the Submittal shall clearly and expressly indicate each proposed deviation.
    b. Also comply with this Section's provision, in the Article below, on Seller's transmittal letter expressly alerting Engineer to the proposed deviations.
    c. Comply with requirements of the Contract regarding substitutes and "or-equals".
    d. When deviation is proposed, also appropriately revise text of Seller's approval, from that required below in this Article.
    e. When Submittal includes deviations from Contract requirements and either the Submittal itself, Seller's transmittal letter, or both, do not comply fully with Contract requirements for indicating deviations in Submittals and giving separate written notice thereof, Engineer's approval of such deviations will be deemed null and void unless Engineer's written response to the Submittal has expressly acknowledged such deviation and indicated Engineer's approval thereof.
    f. Seller is solely responsible for delays and costs incurred due to any and all Submittals with deviations from Contract requirements that were not properly, expressly indicated and approved in accordance with the Contract Documents. Deviations not duly approved in accordance with the Contract Documents may be deemed defective Work. Seller is solely responsible for remedying defective Work and all associated cost and time impacts.

G. Seller's Approval of Submittals:
1. Seller's Review: Before transmitting Submittals to Engineer, review each Submittal to:
    a. Ensure proper coordination of the Work.
    b. Determine that each Submittal is in accordance with Seller's desires.
    c. Verify that Submittal contains sufficient information for Engineer to determine compliance with the Contract Documents.
2. Incomplete or inadequate Submittals will be returned without detailed review by Engineer.
3. Seller's Approval Stamp and Signature:
    a. Each Submittal furnished shall bear Seller's approval stamp (or facsimile thereof) and signature, as evidence that the Submittal has been reviewed and approved by Seller and verified as complete and in accordance with the Contract Documents.
    b. Submittals without Seller's approval and signature (as required by the contract Documents) will be returned to Seller without further review by Engineer and deemed incomplete.
    c. Engineer reserves the right to reject as incomplete Submittals where Seller's approval signature appears computer-generated or reproduced without the active involvement or review of Seller's signatory.
    d. Seller's approval shall contain the following text:

        Project Name: _____
        Seller's Name: _____
        Contract Designation: _____
        Date: _____

        ---------- *Reference* ----------

        Submittal Title: _____
        Specifications:
            Section: _____
            Page No.: _____
            Paragraph No.: _____
        Drawing No.: _____ of _____
        Location of Work: _____

Submittal No. and Review Cycle: _____
Coordinated by Seller with Submittal Nos.: _____
_____

I hereby certify that Seller has satisfied Seller's obligations under the Contract Documents relative to Seller's review and approval of this Submittal, including: (1) reviewed and coordinated the Submittal with other Submittals 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 to the Submittal, (b) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work, and (c) all information relative to Seller's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; (3) confirmed the Submittal is complete with respect to all related data included in the Submittal; and (4) clearly and expressly indicated all proposed deviations (if any) from the requirements of the Contract Documents both in the Submittal itself and in the Submittal's transmittal letter. Accordingly, this Submittal is hereby approved for Seller by:

Approved for Seller by: _____

H. Resubmittals:
   1. Refer to the General Conditions, as may be modified by the Supplementary Conditions, for requirements regarding resubmitting required Submittals.
   2. In addition to limits on the quantity of resubmittals, as indicated in the General Conditions, Seller shall furnish Submittals with such completeness, accuracy, and compliance with the Contract Documents to obtain Engineer's approval or acceptance, as applicable, without the total quantity of Submittals furnished, including all initial Submittals and all resubmittals, exceeding 125% of the number of Submittals indicated on the Schedule of Submittals initially accepted by Engineer, plus a corresponding percentage of the quantity of Submittals required by Change Orders, Work Change Directives, and Field Orders.
   3. Do not increase the scope of prior review cycle of the same Submittal.
   4. Indicate on Seller's transmittal letter how Submittal was revised from previous review cycle of the Submittal and where the revisions or corrections are located within the resubmittal.
   5. Expressly address and provide response for all components previously transmitted by Engineer on prior review cycles of the subject Submittal. Where resubmittal lacks complete response to Engineer's prior comments, Engineer may deem such resubmittal as incomplete and return it to Seller without further review.
   6. Where part of the Submittal's prior review cycle was expressly approved or accepted, as applicable, by Engineer, do not include such items in subsequent resubmittals.
   7. Indicate, "Not Yet Resolved—To Be Resubmitted at a Later Date" for any items not approved in prior review cycle of the Submittal for items not included in the subject resubmittal. Engineer reserves the right to deem incomplete Submittals "Not Approved" or "Revise and Resubmit". Furnishing incomplete or partial resubmittals is discouraged.
   8. Resubmittal of Previously Approved or Accepted Items:
      a. Do not resubmit on a given item previously approved or accepted, as applicable, by Engineer, without Engineer's advance consent. Consent will be given for bona-fide unavailability of a previously approved or accepted item where Seller has acted in good faith in a timely manner with due diligence to comply with the Contract Times.
      b. Destroy or conspicuously mark "SUPERSEDED" on all documents having previously received Engineer's approval or acceptance, as applicable, that are superseded by a resubmittal.

1.7 TRANSMITTAL OF SUBMITTALS BY SELLER

A. Seller's Transmittal Letters for Submittals:
   1. Furnish separate transmittal letter with each Submittal. Use transmittal form attached to this Section (as Exhibit 01 33 00-A) unless other transmittal form is acceptable to Engineer at the start of the Project's construction.
   2. When transmittal form other than this Section's Exhibit 01 33 00-A is acceptable to Engineer, at beginning of each transmittal, include a reference heading indicating: Seller's name, Owner's name, Project designation, Contract designation, transmittal number, and Submittal number (with review cycle).
   3. "Or-Equals": When the Submittal is proposing an "or-equal", expressly so indicate on transmittal form submitted by Seller.
   4. Proposed Deviations from Contract Requirements: When the Submittal proposes deviations from requirements of the Contract Documents, transmittal letter shall specifically describe each proposed deviation:

B. Submittal Delivery Method:
   1. This provision presents general requirements for delivery or all Submittals unless otherwise required elsewhere in the Contract Documents.
   2. Furnish Submittals as Electronic Documents delivered as required by the Owner.
   3. Furnish Submittals to Engineer and each other entity indicated in the Contract Documents as receiving a Submittal directly from Seller.

C. Samples - Transmittal and Delivery:
   1. Labeling and Tagging Samples:
      a. Securely label or tag each Sample with Submittal identification number.
      b. Label or tag shall include clear space at least 4 IN by 4 IN in size for affixing Engineer's review stamp indicating disposition assigned by Engineer.
      c. Label or tag shall not cover, conceal, or alter Sample's appearance or features.
      d. Label or tag shall not be separated from the Sample.
   2. Timing: Deliver required Samples concurrently with other Action Submittals required for the same element of the Work, unless other delivery time frame is indicated in the Schedule of Submittals accepted by Engineer.
   3. Quantity Required:
      a. Where the Contract Documents require a Sample as a field mock-up, provide Sample at the Site or in the Work at location acceptable to Engineer. Provide the quantity of field mock-ups required by the contract Documents; if not otherwise shown or specified, provide one of each required field mock-up.
      b. For reasonably portable Samples, deliver the quantity of Samples required in the associated Specifications. If quantity of Samples is not indicated in the associated Specifications section, deliver to Engineer not less than 1 identical Samples of each item for which Sample is required.
      c. Samples will not be returned to Seller. If Seller requires Sample(s) for Seller's use, so advise Engineer in writing and furnish additional copies of the Sample. Seller is responsible for furnishing, shipping, and transporting additional Samples.
   4. Locations for Delivery of Reasonably Portable Samples for Review:
      a. Deliver 1 physical Sample to Owner at the Site.
      b. Deliver balance of required physical Samples to Engineer at address indicated in this Article for receipt of Submittals, unless otherwise directed by Engineer.

D. Closeout Submittals –Transmittal and Delivery:
   1. Furnish the following Closeout Submittals in accordance with general requirements for transmitting and delivering Submittals, indicated above in this Article: maintenance contracts; warranty bonds (when required) and other bonds required for specific materials, equipment, or systems; warranty documentation; and sustainable design closeout documentation (when required). On documents such as maintenance contracts and bonds, include on each document furnished original ("wet") signature of entity issuing said

document. When original "wet" signatures are required, furnish such Submittals to Engineer both on original paper and as Electronic Documents, and to other entities furnish as indicated above in this Article for general requirements for Submittals.

2. Operations and Maintenance Manuals: Submit in accordance with Section 01 78 23 - Operation and Maintenance Data.
3. Record Documents: Submit in accordance with Owner requirements.
4. Software: In addition to software installed on Owner's computer system, furnish number of copies of software required in the Specifications section where the software is specified. Preferred means of transmittal is via secure file transfer directly to Owner (or facility manager, if other than Owner) via secure file transfer method mutually acceptable to software developer and the receiving entity. When secure file transfer is used, submit to Engineer documentation signed or electronically acknowledged by Owner that the files were received. Where such software is available only on the software developer's portable media, furnish such software on software developer's original, portable media, sealed in software developer's original, unopened, clearly labeled packaging.

E. Maintenance Materials Submittals – Delivery:
1. Deliver physical maintenance materials required by the Contract Documents in accordance with applicable provisions of the Contract, including Section 01 78 43 - Spare Parts and Extra Materials.
2. Submit documentation of delivery of (Maintenance Materials Submittals) in accordance with general requirements for Submittals as indicated in this Section.

1.8 ENGINEER'S REVIEW OF SUBMITTALS

A. This Article applies to review of all Submittals by Engineer or other entity to whom the Contract Documents require such Submittal be furnished.

B. Timing:
1. Timing of Engineer's review will be in accordance with the Schedule of Submittals accepted by Engineer.
2. When Submittal is delivered to Engineer on a date other than that indicated in the Schedule of Submittals accepted by Engineer, duration of Engineer's review may differ from that indicated in the Schedule of Submittals, based on Engineer's availability and resources. Engineer will make good-faith effort to furnish responses to Submittals in a timely manner.
3. Seller is responsible for communicating to Engineer when a Submittal is on the Project's critical path.

C. Engineer's Review:
1. Markings:
   a. Comments or responses marked directly on Submittal by Engineer (or other entity reviewing Submittal) will be colored red.
   b. Engineer may also present narrative comments on a comment sheet inserted by Engineer into the Submittal or included on Engineer's transmittal letter for the Submittal. Such comments will be in black text. When a separate comment sheet is included by Engineer, such sheet will be clearly identified as Engineer's comments.
2. Engineer's review and disposition assigned to Submittal are subject to the following:
   a. Submittal disposition is subject to: Engineer's comments on the Submittal; disclaimer language on Engineer's Submittal transmittal letter; Engineer's Submittal review stamp (when used) or equivalent (when used); and this provision.
   b. Engineer's review is only for general compatibility with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, and for general compliance with the information given in the Contract Documents.
   c. Seller shall be solely responsible for complying with the Contract Documents, as well as with Supplier instructions consistent with the Contract Documents, Owner's directions, and Laws and Regulations. Seller is solely responsible for obtaining, correlating, confirming, and correcting dimensions at the Site; quantities; information

and choices pertaining to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.

d. Engineer is not responsible for resubmittals not yet furnished by Seller or tracking Seller's progress on resubmittals.

3. Documents not required by the Contract Documents but nonetheless furnished by Seller as submittals will not be reviewed by Engineer.

D. Meaning of Submittal disposition Assigned by Engineer:

1. Action Submittals:
   a. "Approved" (Action Code A): Upon return of Submittal marked "Approved", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of production-related qualifications statements and certifications, and required source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents.
   b. "Approved as Noted" (Action Code B): Upon return of Submittal marked "Approved as Noted", order, ship, or fabricate materials and equipment included in the Submittal (pending Engineer's approval or acceptance, as applicable, of production-related qualifications statements and certifications, and required source quality control Submittals) or otherwise proceed with the Work in accordance with the Submittal and the Contract Documents, and in accordance with Engineer's comments and notes indicated in Engineer's Submittal response
   c. "Revise and Resubmit" (Action Code C): Upon return of Submittal marked "Revise and Resubmit", make the revisions necessary and indicated and resubmit to Engineer for approval.
   d. "Not Approved" (Action Code D): This disposition indicates material or equipment that cannot be approved. "Not Approved" disposition may also be applied to Submittals that are incomplete. Upon return of Submittal marked "Not Approved", repeat initial submittal procedure utilizing approvable material or equipment, with a complete Submittal clearly indicating all information required.
2. Informational, Closeout, and Maintenance Materials Submittals:
   a. "Accepted" (Action Code F): Information included in Submittal complies with the applicable requirements of the Contract Documents and is acceptable. No further action by Seller is required relative to such Submittal, and the Work covered by the Submittal may proceed. Materials and equipment with Submittals with this disposition may be shipped or operated, as applicable. Submittals assigned "Accepted" by Engineer (or other reviewing entity) does not indicate Engineer's acceptance of the associated Work, which is indicated only as set forth in the General Conditions and Section 01 77 19 – Closeout Requirements.
   b. "Not Acceptable" (Action Code G): Submittal, or part thereof, does not indicate full compliance with applicable requirements of the Contract Documents and is not acceptable. Provide labor, materials, equipment, services, and incidentals necessary to properly and accurately revise Submittal and resubmit to indicate acceptability and compliance with the Contract Documents
3. Other:
   a. "Submittal Not Reviewed" (Action Code E): Documents so marked by Engineer are not required by the Contract Documents. Submittals may also be marked with this disposition when information in the document was previously reviewed and approved or accepted by Engineer, as applicable.

E. Distribution of Engineer's Responses:

1. Unless otherwise indicated in the Contract Documents, Engineer will distribute written responses (as Electronic Documents) to Submittals to the following:
   a. Seller.

b. Owner.
c. Engineer's file.

2. Engineer's acceptance of Informational Submittals, Closeout Submittals, and Maintenance Materials Submittals will be recorded in Engineer's Submittal log. Copy of Engineer's Submittals log is available from Engineer upon written request of Owner or Seller. If no such request is received by Engineer, Engineer will distribute copy of Engineer's Submittals log once per month (when Submittals have been received or acted on by Engineer). Engineer may distribute copy of Engineer's Submittals log as an Electronic Document or as handout at construction progress meetings.
3. Paper copies of Engineer's Submittal responses will not be distributed unless otherwise required by the Contract Documents or otherwise agreed to by Engineer.
4. Seller is responsible for forwarding Engineer's Submittals responses to Subcontractors and Suppliers as appropriate, and for coordinating the Work of all trades.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

A. The documents listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. "Exhibit 01 33 00-A – Transmittal for Submittal No. __" (one page).

END OF SECTION

Exhibit 01 33 00-A

Transmittal for Submittal No. _____-____

Project Name:		Date Received:	
Project Owner:		Checked By:	
Contractor:	HDR Engineering, Inc.	Log Page:	
Address:	Address:	HDR No.:	
		Spec Section:	
		Drawing/Detail No.:	
Attn (Contractor):	Attn (HDR):	Review Cycle	
Date Transmitted by Contractor:	Date of Engineer's Response Transmittal:		

Item No.	Submittal No.	Description (indicate number of copies where paper copies of physical Samples are returned)	Manufacturer	Supplier Dwg or Data No.	Engineer's Disposition (Action Code) *
1					
2					
3					
4					

Contractor's Remarks *(insert text)*:

Engineer's Remarks *(insert text)*: :

* **Legend for Action Code** indicated above, assigned by Engineer:

Action Submittal:
- A – Approved
- B – Approved as Noted
- C – Revise and Resubmit
- D – Not Approved
- E – Submittal Not Reviewed

Informational, Closeout, or Maintenance Materials Submittal:
- F – Accepted (this code normally recorded in Engineer's Submittals log).
- G – Not Acceptable

Engineer's Disclaimer (for Submittals that do not involve delegated design):

a. Submittal action code is subject to: Engineer's comments on the Submittal, comment sheets (if any), and this transmittal letter; disclaimer language on Engineer's Submittal review stamp or equivalent; and Specifications Section 01 33 00 – Submittal Procedures.

b. Engineer's review is only for general compatibility with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, and for general compliance with the information given in the Contract Documents.

c. Contractor shall be solely responsible for complying with the Contract Documents, as well as with Supplier instructions consistent with the Contract Documents, Owner's directions, and Laws and Regulations. Contractor is solely responsible for obtaining, correlating, confirming, and correcting dimensions at the Site; quantities; information and choices pertaining to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.

Reviewed for HDR by:	**Date of Engineer's Review:**

Distribution: Contractor ☐ File ☐ Field ☐ Owner ☐ Other ☐

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SECTION 01 61 03
EQUIPMENT - BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements of this Specification Section apply to all equipment provided on the Project including those found in other Divisions even if not specifically referenced in individual "Equipment" Articles of those Specification Sections.

B. Related Sections include but are not necessarily limited to:
   1. Section 01 81 10 - Wind and Seismic Design Criteria.
   2. Section 43 11 14 – High Speed Turbo Blower.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Bearing Manufacturers Association (ABMA).
   2. American Gear Manufacturers Association (AGMA).
   3. American Petroleum Institute
      a. API 686 - Recommended Practice for Machinery Installation and Installation Design
   4. ASTM International (ASTM):
      a. E1934, Standard Guide for Examining Electrical and Mechanical Equipment with Infrared Thermography.
      b. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   5. Hydraulic Institute (HI):
      a. 9.6.4, Rotodynamic Pumps for Vibration Measurements and Allowable Values.
   6. International Electrotechnical Commission (IEC).
   7. Institute of Electrical and Electronics Engineers, Inc. (IEEE).
   8. International Organization for Standardization (ISO):
      a. 1940, Mechanical Vibration - Balance Quality Requirements for Rotors in a Constant (Rigid) State - Part 1: Specification and Verification of Balance Tolerances.
      b. 21940-11, Mechanical Vibration - Rotor Balancing - Part 11: Procedures and Tolerances for Rotors with Rigid Behavior.
   9. National Electrical Manufacturers Association (NEMA):
      a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
      b. ICS 6, Enclosures for Industrial Control and System.
      c. MG 1, Motors and Generators.
   10. InterNational Electrical Testing Association (NETA):
      a. ATS, Acceptance Testing Specification for Electrical Power Distribution Equipment and Systems.
   11. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC):
   12. National Institute for Certification in Engineering Technologies (NICET).
   13. National Institute of Standards and Technology (NIST).
   14. Occupational Safety and Health Administration (OSHA):
      a. 29 CFR 1910, Occupational Safety and Health Standards, referred to herein as OSHA Standards.
   15. Underwriters Laboratories, Inc. (UL).
      a. 508, Standard for Safety Industrial Control Equipment.
      b. 508A, Standard for Safety Industrial Control Panels.
      c. 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.

16. Vibration Institute.

B. Supplier's Vibration Analyst:
   1. Supplier's vibration analyst shall prepare pre-Shop Drawing vibration analysis of equipment.
   2. Where required, Supplier's vibration analyst shall be either equipment manufacturer's qualified employee or independent business entity whose sole business, or principal part of its business, is evaluating and determining natural frequencies of rotating equipment.
   3. Shall possess not less than 10 years' relevant experience.
   4. Supplier's Vibration Analyst's Professional Engineer:
      a. Vibration analysis shall be performed by, or under the direct, personal supervision of, professional engineer licensed and registered the state of Washington, experienced in preparing finite element analyses, rotordynamic analyses, and experimental modal analysis similar to that required for the Work.
      b. Professional engineer shall possess not less than five years' combined experience in field testing and data analysis for vibration analysis.
      c. Vibration analysis professional engineer's seal and signature, with indication of date seal and signature were applied to the subject document, shall clearly appear on all results and reports furnished as Submittals.

C. Field Vibration Testing Subcontractor:
   1. Field vibration testing Subcontractor shall, where required by the Contract Documents, perform vibration testing of equipment installed at the Site and perform associated vibration analyses.
   2. Vibration testing Subcontractor shall be an independent entity that has performed as its sole business, or principal part of its business, for not less than 10 years, inspection, testing, calibrating, adjusting equipment and systems, and performing vibration testing of equipment.
   3. Entities whose principal business is one or more of the following are not considered independent vibration testing entities and, therefore, shall not be field vibration testing Subcontractor:
      a. Motor sales, service, or repairs.
      b. Process equipment sales, service, or repairs.
   4. Acceptable entities include, but are not necessarily limited to:
      a. AVS Engineering: https://www.avsengineering.net/
      b. Engineering Testing Services: https://etestinc.com/
      c. Maritech, LLC: http://www.maritech-llc.com/contact.html
      d. Or equal.
   5. Field vibration testing Subcontractor must have an established program for monitoring and testing equipment calibration, with accuracy traceable in an unbroken chain, in accordance with NIST requirements.
   6. Field Personnel: Each person employed for field vibration testing on the Work shall possess not less than the following qualifications:
      a. Three years' field experience covering all phases of field vibration testing and data gathering.
      b. Current, valid Vibration Category II certification from Vibration Institute or a licensed, registered professional engineer, who need not be licensed and registered in the same jurisdiction as the Site.
   7. Analysis Personnel: Personnel performing analysis for field vibration testing Subcontractor shall possess not less than the following qualifications:
      a. Five years' combined field testing and data analysis experience.
      b. Current, valid Vibration Category III certification from the Vibration Institute or a professional engineer licensed and registered in in the same jurisdiction as the Site. Where required by Laws and Regulations, field vibration analysis report shall be sealed, signed, and dated by professional engineer who personally prepared, or exercised

personal, supervisory control over subordinates in preparing, the field vibration analysis report.

8. Analysis Equipment: Field vibration testing Subcontractor shall have access to and use, where appropriate, the following testing equipment, properly maintained and calibrated:
   a. Impact Hammer:
      1) Frequency Range: 1 kHz.
      2) Range (5v output) 5,000 pounds-force (22,200 newtons).
      3) Hammer sensitivity (approx.) 1mV/lbf (0.23 mV/N)
   b. Analyzer:
      1) Frequency Range: 1 Hz to 10,000Hz.
      2) Frequency Accuracy: 0.02 percent.
      3) Non-Integrated Spectral Amplitude Accuracy: 5 percent, 3 Hz to 65 Hz.
      4) Single Integrated Spectral Amplitude Accuracy: 5 percent, 10 Hz to 20 Hz.
      5) Supports measurements of acceleration, velocity, and displacement.
   c. Vibration Sensor:
      1) Sensitivity: ±5 percent = 100 mV/g
      2) Acceleration Range: ±5 g.
      3) Amplitude Nonlinearity: ±1 percent
      4) Frequency Response: ±10Hz to 7kHz (±3 dB)
   d. Data logging equipment for simultaneous recording of the following data points:
      1) Vibration in the X, Y, and axial planes (for all pumps pursuant to ANSI/HI Standard).
      2) Digital tachometer recording RPM.
      3) Discharge Pressure Transmitter
         a) Accuracy: 0.3 percent of range
         b) Fluid Temperature Range: 32 to 100 DegF
      4) Suction Pressure Transmitter (when other than submersible pump or vertical turbine (suspended) pump.
         a) Accuracy 0.35 percent of range.
         b) Fluid Temperature Range: 32 to 100 DegF.
         c) For submersible pumps and vertical turbine (suspended) type pumps, suction liquid surface level signal from Site's monitoring and control system (e.g., plant PLC/SCADA system).
      5) For pumps, pumping rate (flow) signal from Site's monitoring and control system (e.g., plant PLC/SCADA system)
      6) Equipment/motor bearing temperature signal from Site's monitoring and control system (e.g., plant PLC/SCADA system)).
      7) Pump/motor vibration signal from Site's monitoring and control system (e.g., plant PLC/SCADA system).

D. Infrared Thermography Testing Program:
   1. Testing firm:
      a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration, and adjusting of systems.
      b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
   2. Field personnel:
      a. Minimum of one year field experience covering all phases of field thermography testing and data gathering.
      b. Supervisor certified by NETA or NICET.
   3. Analysis personnel:
      a. Minimum three years combined field testing and data analysis experience.
      b. Supervisor certified by NETA or NICET.

E. Electrical Equipment and Connections Testing Program:
   1. Testing firm:
      a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration, and adjusting of systems.
      b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.
   2. Field personnel:
      a. Minimum of one year field experience covering all phases of electrical equipment inspection, testing, and calibration.
      b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
      c. Supervisor certified by NETA or NICET.
   3. Analysis personnel:
      a. Minimum three years combined field testing and data analysis experience.
      b. Supervisor certified by NETA or NICET.

F. Miscellaneous:
   1. A single manufacturer of a "product" shall be selected and utilized uniformly throughout Project even if:
      a. More than one manufacturer is listed for a given "product" in Specifications.
      b. No manufacturer is listed.
   2. Equipment, electrical assemblies, related electrical wiring, instrumentation, controls, and system components shall fully comply with specific NEC requirements related to area classification and to NEMA 250 and NEMA ICS 6 designations shown on Electrical Power Drawings and defined in the Electrical specifications.
   3. Variable speed equipment applications: The driven equipment manufacturer shall have single source responsibility for coordination of the equipment and VFD system and verify their compatibility.

1.3 DEFINITIONS

A. Product: Manufactured materials and equipment.

B. Major Equipment Supports - Supports for Equipment:
   1. Located on or suspended from elevated slabs with supported equipment weighing 2000 LBS or greater, or;
   2. Located on or suspended from roofs with supported equipment weighing 500 LBS or greater, or;
   3. Located on slab-on-grade or earth with supported equipment weighing 5000 LBS or more.

C. Equipment:
   1. One or more assemblies capable of performing a complete function.
   2. Mechanical, electrical, instrumentation or other devices requiring an electrical, pneumatic, electronic or hydraulic connection.
   3. Not limited to items specifically referenced in "Equipment" articles within individual Specifications.

D. Installer or Applicator:
   1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
   2. Installer and applicator are synonymous.

E. Baseplate or equipment base plate or machine base
   1. Are fabricated frames of structural shapes and plates with enough strength and sturdiness to serve as the surface to which other equipment is attached to and supported by. Baseplates can be directly mounted and grouted to concrete equipment support bases or machined and bolted to a sole plate.

F. Sole plate
    1. A thick steel machined plate that is attached to and grouted to a concrete equipment support base.
    2. Base plates are bolted to a sole plate when a sole plate is specified and/or provide.

1.4 SUBMITTALS

A. Shop Drawings:
    1. General for all equipment:
        a. Data sheets that include manufacturer's name and complete product model number.
            1) Clearly identify all optional accessories that are included.
        b. Acknowledgement that products submitted comply with the requirements of the standards referenced.
        c. Manufacturer's delivery, storage, handling, and installation instructions.
        d. Equipment identification utilizing numbering system and name utilized in Drawings.
        e. Equipment installation details:
            1) Location of anchorage.
            2) Anchorage setting templates.
            3) Manufacturer's installation instructions.
        f. Equipment area classification rating.
        g. Shipping and operating weight.
        h. Equipment physical characteristics:
            1) Dimensions (both horizontal and vertical).
            2) Materials of construction and construction details.
        i. Equipment factory primer and paint data.
        j. Manufacturer's recommended spare parts list.
        k. Equipment lining and coatings.
        l. Equipment utility requirements include air, natural gas, electricity, and water.
        m. Ladders and platforms provided with equipment:
            1) Certification that all components comply fully with OSHA requirements.
            2) Full details of construction/fabrication.
            3) Scaled plan and sections showing relationship to equipment.
    2. Mechanical and process equipment:
        a. Operating characteristics:
            1) Technical information including applicable performance curves showing specified equipment capacity, rangeability, and efficiencies.
            2) Brake horsepower requirements.
            3) Copies of equipment data plates.
        b. Piping and duct connection size, type and location.
        c. Equipment bearing life certification.
        d. Equipment foundation data:
            1) Equipment center of gravity.
            2) Criteria for designing vibration, special or unbalanced forces resulting from equipment operation.
            3) Type, size, and materials of construction of anchorage.
    3. Electric motor:
        a. Motor manufacturer and model number.
        b. Complete motor nameplate data.
        c. Weight.
        d. NEMA design type.
        e. Enclosure type.
        f. Frame size.
        g. Winding insulation class and temperature rise.
        h. Starts per hour.

i. Performance data:
    1) Motor speed-torque curve superimposed over driven machine speed-torque curve during start-up acceleration and at rated terminal voltage a minimum permissible or specified terminal voltage for all motors.
    2) Time-current plots with acceleration versus current and thermal damage curves at the operating and ambient temperatures and at rated terminal voltage and minimum permissible or specified terminal voltage for all motors.
    3) Guaranteed minimum efficiencies at 100 percent, 75 percent, and 50 percent of full load.
    4) Guaranteed minimum power factor at 100 percent, 75 percent, and 50 percent of full load.
    5) Locked rotor and full load current at rated terminal voltage and minimum permissible or specified terminal voltage.
    6) Starting, full load, and breakdown torque at rated terminal voltage and minimum permissible or specified terminal voltage.
j. Bearing data and lubrication system.
k. Natural frequency calculations for:
    1) Completed assembly including but not limited to the equipment base, rotating piece of equipment, and the rotating piece of equipment driver.
    2) Individual piece of rotating equipment.
    3) Equipment driver and connected gear reducer, if applicable.
l. Thermal protection system including recommended alarm and trip settings for winding and bearing RTD's.
m. Maximum permissible capacitor (kVAC) that can be connected to the motor.
n. Recommended size of power factor correction capacitors to improve power factor to 0.95 lagging when operated at full load.
o. Fabrication and/or layout drawings:
    1) Dimensioned outlined drawing.
    2) Connection diagrams including accessories (strip heaters, thermal protection, etc.).
p. Certifications:
    1) When utilized with a reduced voltage starter, certify that motor and driven equipment are compatible.
    2) When utilized with a variable frequency controller, certify motor is inverter duty and the controller and motor are compatible.
        a) Include minimum speed at which the motor may be operated for the driven machinery.
q. Electrical gear:
    1) Unless specified in a narrow-scope Specification Section, provide the following:
        a) Equipment ratings: Voltage, continuous current, kVa, watts, short circuit with stand, etc., as applicable.
    2) Control panels:
        a) Panel construction.
        b) Point-to-point ladder diagrams.
        c) Scaled panel face and subpanel layout.
        d) Technical product data on panel components.
        e) Panel and subpanel dimensions and weights.
        f) Panel access openings.
        g) Nameplate schedule.
        h) Panel anchorage.
        i) Short Circuit Current Rating (SCCR) nameplate marking per NFPA 70. Include any required calculations.

4. Systems schematics and data:
    a. Provide system schematics where required in system specifications.
        1) Acknowledge all system components being supplied as part of the system.

2) Utilize equipment, instrument and valving tag numbers defined in the Contract Documents for all components.
3) Provide technical data for each system component showing compliance with the Contract Document requirements.
4) For piping components, identify all utility connections, vents and drains which will be included as part of the system.

5. Qualifications for:
   a. Natural frequency analysis firm and personnel.
   b. Vibration testing firm and personnel.
   c. Infrared thermography testing firm and personnel.
   d. Electrical equipment and connections testing firm and personnel.
6. Equipment Monitoring and Testing plans, in accordance with PART 3 of this Specification Section:
   a. Natural frequency analysis and calculations.
   b. Vibration testing.
   c. Thermography testing.
   d. Electrical equipment and connection testing.

B. Factory Test Reports:
1. Natural frequency bump test reports where required for rotating equipment.
   a. Minimum characteristics of impact hammer.
      1) Frequency Range 1 kHz.
      2) Range (5v output) 5,000 LBF (22,200 N).
      3) Hammer Sensitivity (7pprox.) 1 mV/lbf (0.23 mV/N).
      4) Resonant Frequency 12 kHz
2. Motor, equipment and final assembled equipment including motor.
   a. Determine natural frequency of assembled motor prior to shipping to equipment manufacturer or job site.
      1) Individual motor fastened to an “infinitely rigid” mass at the same bolt circle as the final assembled equipment.
   b. Determine natural frequency of the pump.
      1) Pump fastened to an “infinitely rigid” mass at the same bolt circle as the final assembled equipment.
   c. Determine natural frequency of the pump/motor assembly.
      1) Pump/motor assembly fastened to an “infinitely rigid” mass at the same bolt circle as the final field assembled equipment.
   d. For this use, the "infinitely rigid" mass shall be at least 10 times the weight of the equipment being tested.
3. Submit natural frequency report(s) for approval prior to shipment.
4. Equipment performance tests.
   a. As listed in individual equipment specifications.

C. Contract Closeout Information:
1. Operation and Maintenance Data:
   a. See Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

D. Informational Submittals:
1. Notification, at least one week in advance, that testing will be conducted at factory.
2. Certification from equipment manufacturer that all manufacturer-supplied control panels that interface in any way with other controls or panels have been submitted to and coordinated with the supplier/installer of those interfacing systems.
3. Submit sample Manufacturer's Field Service Report (MFSR). Report shall use manufacturer’s standard report or use the form in the Exhibits and have at least the following information:

a. Certification that equipment has been installed properly, has been initially started up, has been calibrated and/or adjusted as required, and is ready for operation.
b. Certification for major equipment supports that equipment foundation design loads shown on the Drawings or specified have been compared to actual loads exhibited by equipment provided for this Project and that said design loadings are equal to or greater than the loads produced by the equipment provided.
c. Motor test reports.
d. Field noise testing reports if such testing is specified.
e. Preliminary field quality control testing format to be used as a basis for final field quality control reporting.
f. Provide three bound final written reports documenting natural frequency testing, vibration monitoring and testing for specified equipment.
    1) Include the acceptance criteria of all equipment tested.
    2) Provide individual tabbed sections for information associated with each piece of tested equipment.
g. Certification prior to Project closeout that electrical panel drawings for manufacturer-supplied control panels truly represent panel wiring including any field-made modifications.
h. Testing and monitoring reports in accordance with PART 3 of this Specification Section.
i. Certification that driven equipment and VFD are compatible.

4. Submit completed Manufacturer's Field Service Report (MFSR) for each piece of equipment supplied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Motors:
    a. Baldor.
    b. General Electric.
    c. Hyundai Heavy Industries.
    d. Marathon Electric.
    e. Rockwell - Reliance.
    f. Siemens.
    g. TECO-Westinghouse.
    h. Toshiba U.S.
    i. U.S. Motors, Nidec Motor Corporation.
    j. WEG.
    k. Or equal.
2. Mechanical variable speed drives:
    a. Reeves.
    b. U.S. Motors (VariDrive).

2.2 MANUFACTURED UNITS

A. Electric Motors:
1. Where used in conjunction with adjustable speed AC or DC drives, provide motors that are fully compatible with the speed controllers.
2. Design for frequent starting duty equivalent to duty service required by driven equipment.
3. Design for full voltage starting.
4. Design bearing life based upon actual operating load conditions imposed by driven equipment.
5. Size for altitude of Project.

6. Furnish with stainless steel nameplates which include all data required by NEC Article 430.
7. Use of manufacturer's standard motor will be permitted on integrally constructed motor driven equipment specified by model number in which a redesign of the complete unit would be required in order to provide a motor with features specified.
8. AC electric motors less than 1/3 HP:
    a. Single phase, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Permanently lubricated sealed bearings conforming to ABMA standards.
    c. Built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element with stainless steel enclosure.
9. AC electric motors 1/3 to 1 HP:
    a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Permanently lubricated sealed bearings conforming to ABMA standards.
        1) For single phase motors, provide built-in manual reset thermal protector or integrally mounted manual motor starter with thermal overload element.
10. AC electric motors 1-1/2 to 10 HP:
    a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Permanently lubricated sealed bearings conforming to ABMA standards.
    c. For vertical motors provide 15-year, average-life thrust bearings conforming to ABMA standards.
11. AC electric motors greater than 10 HP:
    a. Single or 3 PH, 60 Hz, designed for the supply voltage shown on the Drawings.
    b. Oil or grease lubricated antifriction bearings conforming to ABMA standards.
        1) Design bearing life for 90 percent survival rating at 50,000 HRS of operation for motors up to and including 100 HP.
        2) For motors greater than 100 HP, design bearing life for 90 percent survival rating at 100,000 HRS of operation.
    c. For vertical motors provide 15-year, average-life thrust bearings conforming to ABMA standards.
    d. Thermal protection:
        1) For motors 50 HP and above controlled from a variable frequency drive and for all other motors 100 HP and above, provide one of the following:
            a) Integral thermal detectors (thermostat) per phase with normally closed contacts wired in series that will open on overtemperature
            b) Resistance type temperature detector (RTD) complete with monitor and alarm panel having a normally closed contact that will open on overtemperature.
                (1) Two thermal sensing devices per phase in each phase hot-spot location.
                (2) Monitor and alarm panel:
                    (a) For constant speed motors, install panel in and energize from the motor starter equipment.
                    (b) For variable speed motors, install panel in and energize from the variable speed drive equipment.
12. Severe duty motor to have the following minimum features:
    a. All cast iron construction.
    b. Gasketed conduit box.
    c. Epoxy finish for corrosion protection.
    d. Hydroscopic varnish on windings for corrosion protection.
    e. Drain plug and breather.

B. NEMA Design Squirrel Cage Induction Motors:
1. Provide motors designed and applied in compliance with NEMA and IEEE for the specific duty imposed by the driven equipment.
2. Motors to meet NEMA MG 1 (NEMA Premium) [local jurisdiction] efficiencies.
3. Do not provide motors having a locked rotor kVA per HP exceeding the NEMA standard for the assigned NEMA code letter.

4. For use on variable frequency type adjustable speed drives, provide:
    a. Induction motors that are in compliance with NEMA MG 1, Part 31.
    b. Nameplate identification meeting NEMA MG 1 Part 31 requirements.
    c. Insulated drive end bearing on all motors.
    d. Insulated non-drive end bearings, at a minimum, on all motors with horizontal shaft 100 HP and larger.
    e. An insulated bearing carrier on the non-drive end for vertical shaft motors 100 HP and larger.
    f. Shaft grounding ring on all motors:
        1) Factory installed, maintenance free, circumferential, bearing protection ring with conductive microfiber shaft contacting material.
        2) Electro Static Technology AEGIS SGR Bearing Protection Ring or approved equal.
    g. Have the following minimum turndown ratio without the use of additional cooling, such as a blower, to provide continuous supply of cooling air over the motor.
        1) Variable torque: 10:1.
        2) Constant torque: 6:1.
5. Design motor insulation in accordance with NEMA standards for Class F insulation with Class B temperature rise above a 40 DEGC ambient.
6. Design motors for continuous duty.
7. Size motors having a 1.0 service factor so that nameplate HP is a minimum of 15 percent greater than the maximum HP requirements of the driven equipment over its entire operating range.
    a. As an alternative, furnish motors with a 1.15 service factor and size so that nameplate HP is at least equal to the maximum HP requirements of the driven equipment over its entire operating range.
8. Motor enclosure and winding insulation application:
    a. The following shall apply unless modified by specific Specification Sections:

MOTOR LOCATION	MOTOR ENCLOSURE / WINDING INSULATION
Unclassified Indoor Areas	Seller's Standards

NOTE: Provide TENV motors in the smaller horsepower ratings where TEFC is not available.

9. Provide oversize conduit box complete with clamp type grounding terminals inside the conduit box.
10. Balance motors to ISO G2.5 level.
    a. Submit prior to shipping to equipment manufacturer or job site.

C. Vibration Isolators:
    1. Provide all equipment subject to vibration with restrained spring type vibration isolators or pads according to the manufacturer's written recommendation.

D. Space Heaters:
    1. Silicone rubber strip type, 120 V rated.
    2. Provided on:
        a. All motors 10 HP and larger mounted outdoors.
        b. Indoor motors in humid environments as indicated.

2.3 COMPONENTS

A. Gear Drives and Drive Components:
    1. Size drive equipment capable of supporting full load including losses in speed reducers and power transmission.
    2. Provide nominal input horsepower rating of each gear or speed reducer at least equal to nameplate horsepower of drive motor.

3. Design drive units for 24 HR continuous service, constructed so oil leakage around shafts is precluded.
4. Utilize gears, gear lubrication systems, gear drives, speed reducers, speed increasers and flexible couplings meeting applicable standards of AGMA.
5. Gear reducers:
    a. Provide gear reducer totally enclosed and oil lubricated.
    b. Utilize antifriction bearings throughout.
    c. Provide worm gear reducers having a service factor of at least 1.20.
    d. Furnish other helical, spiral bevel, and combination bevel-helical gear reducers with a service factor of at least 1.50.

2.4 ACCESSORIES

A. Guards:
1. Provide each piece of equipment having exposed moving parts with full length, easily removable guards, meeting OSHA requirements.
2. Interior applications:
    a. Construct from expanded galvanized steel rolled to conform to shaft or coupling surface.
    b. Utilize non-flattened type 16 GA galvanized steel with nominal 1/2 IN spacing.
    c. Connect to equipment frame with hot-dip galvanized bolts and wing nuts.
3. Exterior applications:
    a. Construct from 16 GA stainless steel or aluminum.
    b. Construct to preclude entrance of rain, snow, or moisture.
    c. Roll to conform to shaft or coupling surface.
    d. Connect to equipment frame with stainless steel bolts and wing nuts.

B. Anchorage:
1. Cast-in-place anchorage:
    a. Provide ASTM F593, Type 316 stainless steel anchorage for all equipment.
    b. Configuration and number of anchor bolts shall be per manufacturer's recommendations.
    c. Provide two nuts for each bolt.
2. Drilled anchorage:
    a. Threaded rods same as cast-in-place.

C. Data Plate:
1. Attach a stainless steel data plate to each piece of rotary or reciprocating equipment.
2. Permanently stamp information on data plate including manufacturer's name, equipment operating parameters, serial number and speed.

D. Lifting Eye Bolts or Lugs:
1. Provide on all equipment 50 LBS or greater.
2. Provide on other equipment or products as specified in the narrow-scope Specification Sections.

2.5 FABRICATION

A. Design, fabricate, and assemble equipment in accordance with modern engineering and shop practices.

B. Manufacture individual parts to standard sizes and gages so that repair parts, furnished at any time, can be installed in field.

C. Furnish like parts of duplicate units to be interchangeable.

D. Ensure that equipment has not been in service at any time prior to delivery, except as required by tests.

E. Furnish equipment which requires periodic internal inspection or adjustment with access panels which will not require disassembly of guards, dismantling of piping or equipment or similar major efforts.
   1. Quick opening but sound, securable access ports or windows shall be provided for inspection of chains, belts, or similar items.

F. Provide common, lipped base plate mounting for equipment and equipment motor where said mounting is a manufacturer's standard option.
   1. Provide drain connection for 3/4 IN PVC tubing.

G. Machine the mounting feet of rotating equipment.

H. Fabricate equipment which will be subject to Corrosive Environment in such a way as to avoid back to back placement of surfaces that cannot be properly prepared and painted.
   1. When such back to back fabrication cannot be avoided, provide continuous welds to seal such surfaces from contact with corrosive environment.

I. Natural frequency/critical Speed:
   1. All rotating parts accurately machined and in as near perfect rotational balance as practicable.
   2. Excessive vibration is sufficient cause for equipment rejection.
   3. Ratio of all rotative speeds to natural frequency/critical speed of a unit or components: Greater than 1.2.

J. Equipment Base
   1. Adequate grout and vent openings to allow grout to flow under entire base.

K. Control Panels Engineered and Provided with the Equipment by the Manufacturer:
   1. Manufacturer’s standard design for components and control logic unless specific requirements are specified in the specific equipment Specification Section.
   2. NEMA or IEC rated components are acceptable, whichever is used in the manufacturer’s standard engineered design, unless specific requirements are required in the specific equipment Specification Section.
   3. Affix entire assembly with a UL 508A or UL 698A label "Listed Enclosed Industrial Control Panel" prior to delivery.
      a. Control panels without an affixed UL 508A or UL 698A label shall be rejected.
   4. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
      a. Determine the SCCR rating by one of the following methods:
         1) Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
         2) Method 2: SCCR rating meets or exceeds the source equipment’s Amp Interrupting Current (AIC) rating as indicated on the Drawings.
         3) Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
      b. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the control panel circuit originates.
      c. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

2.6 SHOP OR FACTORY PAINT FINISHES

2.7 SOURCE QUALITY CONTROL

A. Motor Tests:
   1. Test motors in accordance with NEMA and IEEE standards.
   2. Provide routine test for all motors.

3. The Owner reserves the right to select and have tested, either routine or complete, any motor included in the project.
    a. The Owner will pay all costs, including shipping and handling, for all motors successfully passing the tests.
    b. Pay all costs, including shipping and handling, for all motors failing the tests.
    c. If two successive motors of the same manufacturer fail testing, the Owner has the right to reject all motors from that manufacturer.

B. Balance:
1. Unless specified otherwise, for all equipment 10 HP or greater, all rotating elements in motors, pumps, blowers, and centrifugal compressors shall be fully assembled, including coupling hubs, before being statically and dynamically balanced. Balance all rotating elements to the following criteria, per ISO 21940-11:

$$Uper = \frac{G\ x\ 6.015\ x\ W/2}{N}$$

Where:
Uper = Permissible residual unbalance for each correction plane in ounce-inches (OZ-IN). See ISO 21940-11 for acceptable values.
G = ISO Balance Quality Grade Number, per ISO 21940-11
W = Rotor weight in pounds
N = Maximum continuous operating RPM

a. Where specified, balancing reports, demonstrating compliance with this requirement, shall be submitted as product data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment as shown on the Drawings and other Contract Documents, in accordance with manufacturer's written instructions, and in accordance with Laws and Regulations. Where the Contract Documents, manufacturer's written instructions, or Laws and Regulations conflict, obtain interpretation or clarification from Engineer before proceeding.

B. Utilize appropriate templates for anchorage placement for equipment installed on concrete.

C. Equipment Drainage Discharges:
1. For equipment having drainage requirements, such as seal water, provide 3/4-inch copper, PVC, or clear plastic tubing from drainage discharge at equipment base to nearest floor drain or equipment drain. Do not discharge liquid across floors.
2. Furnish and install bell up at each equipment base.
3. Route equipment drainage piping clear of major traffic areas, to discharge to locations approved by Engineer. To extent practical, avoid creating tripping hazards.

D. Coordination of Equipment Supports and Bases with Structures:
1. Do not construct foundations until major equipment supports are approved by Engineer.

E. Equipment Lubrication Points:
1. Extend all non-accessible or difficult-to-access lubrication fittings to reasonably accessible locations to facility operation and maintenance personnel without use of ladders or elevating devices, by providing stainless steel tubing (of appropriate wall thickness for the service and application) to a location which allows easy access of fittings from closest operating floor level.

F. Concrete Equipment Support Bases:
   1. Install level in both directions, with acceptable vertical tolerance of 1/4-inch±.
   2. At anchorage locations, install bases flat and level.

G. Machine Bases / Sole Plates:
   1. Grease or tape anchorages and jack screws to inhibit grout from adhering to bolts and other anchors.
      a. Jack screws number and size by equipment manufacturer.
         1) Jack screw
            a) 304 Stainless Steel minimum
            b) 0.5 inches diameter minimum
         2) Jack Screw Pad
            a) 2 inch diameter minimum
            b) Anchored in place with a structural epoxy adhesive.
   2. Install machine base of rotating equipment on equipment base.
   3. Level in both directions using jack screws, with a machinist level, according to machined surfaces on base. Base shall be level within vertical tolerance of the lesser of (a) 0.005 inch per foot with no more than 0.0005 inches difference between any two points, or (b) equipment manufacturer's written instructions.
   4. Level machine base on equipment base and align couplings between driver and driven equipment.

H. Couplings for Rotating Equipment:
   1. Align in annular and parallel positions.
      a. For equipment rotating at 1200 RPM or less, align both annular and parallel within 0.001 inch tolerance for couplings four-inch size and smaller.
      b. Couplings larger than four-inch size: Increase tolerance 0.0005 inch per inch of coupling diameter above four-inch; for example: for six-inch coupling, tolerance is 0.002 inch. For 10 inch coupling, required tolerance is 0.004 inch.
      c. For equipment rotating at speeds greater than 1200 RPM, tolerance for both annular and parallel positions shall be rate of 0.00025 inch (or less) per inch of coupling diameter.
   2. If equipment is furnished by manufacturer as mounted unit, verify factory alignment after installation at the Site. Realign if as necessary, in accordance with equipment manufacturers' written instructions, to provide required factory tolerance.
   3. Inspect surfaces for runout before attempting to trim or align units.

I. Grouting:
   1. Level onto equipment base with jack screws in accordance with the Contract Documents, provide a dam or formwork around base to contain grout between equipment base and equipment support pad.
   2. Preparation:
      a. Extend dam or formwork to cover leveling shims and blocks.
      b. Anchor sleeves:
         1) Required for equipment (Pumps, Mixers, Blowers) greater than 50 HP
         2) If anchor sleeves were used, fill voids in anchor sleeves with foam or room temperature vulcanizing (RTV) silicone to keep grout from filling sleeves.
      c. Do not use nuts below the machine base to level the unit.
      d. Saturate top of roughened concrete surface with water before grouting.
   3. Grout Installation:
      a. Install grout until entire space under machine base is completely filled to underside of base. Voids are unacceptable.
      b. Puddle grout by working a stiff wire through the grout and vent holes, to ensure grout is installed properly and to release air entrained in grout or base cavity.
   4. After Grout Installation:
      a. When grout is sufficiently hardened, remove dam or formwork and finish exposed grout surface to fine, smooth surface.

b. Completely cover exposed grout surfaces with wet burlap and keep covering sufficiently wet to prevent too-rapid evaporation of water from grout.
c. Check for voids by tapping along the top deck of the mounting plate. A solid thud indicates grout-filled areas while a drum-like hollow sound indicates a void requiring filling.
    1) Void areas are to be filled by drilling 1/8 INCH NPT holes in opposite corners of each void area. Grout to be pumped into one void with a grout gun until grout emerges from the other vent hole.
d. When grout is fully hardened (after not less than seven days), remove jack screws, and tighten nuts on anchor bolts and similar anchors to required torque.
e. Inspect and verify levelness of machine base and, if not in accordance with requirements, remedy by removing base and reinstalling in accordance with the Contract Documents.
f. Inspect driver-driven equipment for proper alignment. When not in accordance with requirements, remedy so that the Work is not defective.

3.2 INSTALLATION CHECKS

A. For all equipment specifically required in detailed specifications, secure services of experienced, competent, and authorized representative(s) of equipment manufacturer to visit site of work and inspect, check, adjust and approve equipment installation.
    1. In each case, representative(s) shall be present during placement and start-up of equipment and as often as necessary to resolve any operational issues which may arise.

B. Secure from equipment manufacturer's representative(s) a written report certifying that equipment:
    1. Has been properly installed and lubricated.
    2. Is in accurate alignment.
    3. Is free from any undue stress imposed by connecting piping or anchor bolts.
    4. Has been operated under full load conditions and that it operated satisfactorily.
        a. Secure and deliver a field written report to Owner immediately prior to leaving jobsite.

C. No separate payment shall be made for installation checks.
    1. All or any time expended during installation check does not qualify as Operation and Maintenance training or instruction time when specified.

3.3 WIRING CONNECTIONS AND TERMINATION

A. Clean wires before installing lugs and connectors.

B. Coat connection with oxidation eliminating compound for aluminum wire.

C. Terminate motor circuit conductors with copper lugs bolted to motor leads.

D. Tape stripped ends of conductors and associated connectors with electrical tape.
    1. Wrapping thickness shall be 150 percent of the conductor insulation thickness.

E. Connections to carry full ampacity of conductors without temperature rise.

F. Terminate spare conductors with electrical tape.

3.4 FIELD QUALITY CONTROL

A. General:
    1. Furnish equipment manufacturer’s field quality control services and testing as specified in the individual equipment Specification Sections.
    2. Execute pre-demonstration requirements in accordance with Section 01 75 03.
    3. Perform and report on all tests required by the equipment manufacturer’s Operation and Maintenance Manual.
    4. Provide testing of electrical equipment and connections in accordance with the Electrical specifications.

5. Equip testing and analysis personnel with all appropriate project related reference material required to perform tests, analyze results, and provide documentation including, but not limited to:
    a. Contract Drawings and Specifications.
    b. Related construction change documentation.
    c. Approved Shop Drawings.
    d. Approved Operation and Maintenance Manuals.
    e. Other pertinent information as required.

B. Equipment Monitoring and Testing Plans:
1. Approved in accordance with Shop Drawing submittal schedule.
2. Included as a minimum:
    a. Qualifications of firm, field personnel, and analysis personnel doing the Work.
    b. List and description of testing and analysis equipment to be utilized.
    c. List of all equipment to be testing, including:
        1) Name and tag numbers identified in the Contract Documents.
        2) Manufacturer's serial numbers.
        3) Other pertinent manufacturer identification,

C. Instruments Used in Equipment and Connections Quality Control Testing:
1. Minimum calibration frequency:
    a. Field analog instruments: Not more than 6 months.
    b. Field digital instruments: Not more than 12 months.
    c. Laboratory instruments: Not more than 12 months.
    d. If instrument manufacturer's calibration requirements are more stringent, those requirements shall govern.
2. Carry current calibration status and labels on all testing instruments.
3. See individual testing programs for additional instrumentation compliance requirements.

D. Testing and Monitoring Program Documentation:
1. Provide reports with tabbed sections for each piece of equipment tested.
2. Include all testing results associated with each piece of equipment under that equipment's tabbed section.
    a. Include legible copies of all forms used to record field test information.
3. Prior to start of testing, submit one copy of preliminary report format for Engineer review and comment.
    a. Include data gathering and sample test report forms that will be utilized.
4. In the final report, include as a minimum, the following information for all equipment tested:
    a. Equipment identification, including:
        1) Name and tag numbers identified in the Contract Documents.
        2) Manufacturer's serial numbers.
        3) Other pertinent manufacturer identification,
    b. Date and time of each test.
    c. Ambient conditions including temperature, humidity, and precipitation.
    d. Visual inspection report.
    e. Description of test and referenced standards, if any, followed while conducting tests.
    f. Results of initial and all retesting.
    g. Acceptance criteria.
    h. "As found" and "as left" conditions.
    i. Corrective action, if required, taken to meet acceptance.
    j. Verification of corrective action signed by the Seller, equipment supplier, and Owner's representative.
    k. Instrument calibration dates of all instruments used in testing.
5. Provide three (3) bound final reports prior to Project final completion.

E. Electrical Equipment and Connections Testing Program:
   1. Perform testing on Electrical equipment and connections in accordance with the Electrical specification requirements.
   2. Testing of motors:
      a. After installation and prior to energizing the motor, perform inspections and tests per NETA ATS 7.15 for all motors 50HP or above.
      b. Ensure motor has been lubricated.
      c. Bump motor to check for correct rotation.
   3. Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.

F. Other Testing:
   1. Perform tests and inspections not specifically listed but required to assure equipment is safe to energize and operate.
   2. Subbase that supports the equipment base and that is made in the form of a cast iron or steel structure that has supporting beams, legs, and cross members that are cast, welded, or bolted shall be tested for a natural frequency of vibration after equipment is mounted.
      a. The ratio of the natural frequency of the structure to the frequency of the disturbing force shall not be between 0.5 and 1.5.

G. Infrared Thermography Testing Program:
   1. Perform infrared thermography testing for equipment specified in other Divisions during the Equipment Demonstration Period.
      a. Perform on all rotating and reciprocating equipment having drivers 25 HP or greater.
      b. Perform on electrical equipment and connections.
   2. Additional requirements for infrared thermography monitoring and testing equipment:
      a. Temperature range: -10 to 350 DEGC.
      b. Accuracy: ±2 percent or 2 DEGC, whichever is greater.
      c. Repeatability: ±1 percent or 1 DEGC, whichever is greater.
      d. Temperature indication resolution: 0.1 DEGC.
      e. Minimum focus distance: 0.3 meters.
      f. Output in color palettes: JPEG, BMP, or other digital format compatible with Windows.
   3. Perform inspection per ASTM E1934.
      a. Operate VFD driven equipment at 100 percent speed during thermographic inspection.
   4. Acceptability of electrical connections and components based on temperature comparison between components and ambient air temperatures not greater than 10 DEGC per ASTM E1934.
   5. Acceptability of motors and equipment bearings based on temperature rise not greater than 5 DEGC above the equipment and/or bearing manufacturers published criteria.
   6. Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.

H. Equipment Field Vibration Monitoring and Testing Program:
   1. Perform vibration monitoring and testing for equipment specified in other Divisions during the Equipment Demonstration Period.
   2. Perform field vibration testing on each item of rotating and reciprocating equipment having driver [50] HP and greater
   3. Acceptability of equipment conditions, except pumps, based on ISO 1940-1 Balance Quality Grade G6.3 criteria.
   4. Acceptability of pumping equipment to be based on current ANSI/HI criteria:
      a. ANSI/HI 11.6-2012 for Submersible Pumps in a Wet-pit or Dry-pit configuration.
      b. ANSI/HI 9.6.4-2016 for all other centrifugal pumps.
   5. Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.

6. Utilize an Engineer approved 3rd party testing agency to perform vibration monitoring and testing on equipment.
7. For variable speed equipment provide vibration testing at no more than 3 percent increments of maximum speed throughout entire operating range.
8. Provide machinery condition diagnosis based on an acceptable machinery vibration severity guide or machinery fault guide analysis provided by the testing agency.
9. Tolerances for pumping equipment shall be per HI published standards.
10. Repair or replace equipment shown to be out of range of the specified tolerance until the equipment meets the specified normal operation range required in the machinery fault guide analysis.
11. Document testing with written report.
    a. Report to include initial testing results, acceptance criteria, corrective action taken to meet acceptance, verification of corrective action and acceptance report and baseline.
    b. Natural frequency of installed equipment utilizing an impact hammer.
    c. Report to include graphical plots of vibration signature for each test point at a scale which illustrates all vibration levels greater than 0.025 ips RMS.

3.5 DEMONSTRATION

A. Demonstrate equipment in accordance with Section 01 75 03.

3.6 ABBREVIATION TABLE

A. As indicated on the Drawings.

END OF SECTION

EXHIBIT A

MANUFACTURER FIELD SERVICE REPORT

This field service report is generic in nature. An electronic copy of this form will be furnished upon request from the Engineer. This report is to reflect that all requirements of the Operations and Maintenance Manual and the individual equipment specification requirements have been performed for the installation and operation and also to provide a baseline for amperage draw for each phase, vibration readings, rotation, alignment and all other applicable tests required to ensure that the equipment has been installed properly. A MFSR will be required for each individual piece of equipment requiring a MFSR.

Definitions of Reports:

Initial service report: Required for construction preparations. Equipment delivered to site is in good condition and conforms to specification requirements. Anchor bolts, hardware and ancillary items (piping, flanges, conduits, fuel/power supply) are compatible with equipment.

Interim service report: Required for equipment installation onto base or foundation. Piping connections, electrical and control connections or structural attachment are complete. For equipment stored on site over four weeks, interim service report will document that manufacturer's long-term storage procedures have been incorporated and equipment has not been damaged, nor coatings deteriorated.

Final service report is to be completed when equipment can be started, electrical amperage and voltage draw measured, cold and hot alignments performed, vibration testing and monitoring performed and the equipment is found to be in compliance with Manufacturer's operating parameters and the requirements of the individual equipment specifications.

PROJECT: _____

Report Status:

Initial Service Report completed and submitted on _____

Interim Service Report completed and submitted on _____

Final Service Report completed and submitted on _____

Commencement of Warranty _____

I Description

A. Equipment Name and Identification: _____

_____

B. Serial Number: _____

C. Specification Section Number: _____

D. Manufacturer: _____

E. Representative: _____

F. Type of Service: Initial _____ Interim _____ Final _____

II General Review

A. The above referenced equipment/material/supplies have been inspected, checked, and adjusted. Yes _____ No _____

Summary: _____

_____

B. The above referenced equipment/material/supplies were placed upon properly prepared or suitable substrate. N/A _____ Yes _____ No _____

Summary: _____

_____

C. The above referenced equipment/material/supplies are free from any undue stress imposed by any connected piping, anchor bolts or any other load. N/A _____ Yes _____ No _____

Summary: _____

_____

D. The above referenced equipment/material/supplies have operated under design conditions. N/A _____ Yes _____ No _____

Summary: _____

_____

E. The above referenced equipment/material/supplies have been installed in accordance with the manufacturer's recommendations and the Procurement Documents, require no corrective work, and are hereby approved. Yes _____ No _____

Summary: _____

_____

F. The above referenced equipment/material/supplies are acceptable to the manufacturer as installed providing the following corrective action(s) are performed:

1. _____
2. _____
3. _____
4. _____
5. _____

III Inspection Checklist

Item	Acceptable (Yes/No)	Readings/Comments
Bearings (1)		
Belts (tension reading)		
Lubrication Levels		
Vibration (1) (2) (MILS/SEC)		
Infrared Thermography (1) (2)		
Starting AMPS		
Full Load AMPS		
Volts		
Rotation		
Jacket Temperature (DEGF)		
Seal Water Flow Rate (GPH or GPM)		
Seal Water Pressure (PSI)		
O-rings/Packing		
Alignment (1)		
Anchor Bolts		
Anchor Bolt Torque		

Item	Acceptable (Yes/No)	Readings/Comments
Grout		
Substrate Approval		
Other		

(1) Inspection or testing reports must be attached.
(2) Provide vibration testing and monitoring procedures for Engineer's review and approval prior to testing.

IV O&M Manuals

A. The O&M manual as presented contains all information required for proper operation, maintenance, and instruction of this system. N/A _____ Yes _____ No _____

Summary: _____

_____

V Preventive Maintenance

A. The preventive maintenance summary outlined in the O&M manual is acceptable for operation of the system throughout the warranty period. N/A _____ Yes _____ No _____

Summary: _____

_____

VI Operator Training/Classroom Instruction

A. Training and instruction have been performed in accordance with the requirements of the Procurement Documents. N/A _____ Yes _____ No _____

B. Final Training/Classroom Instruction Completed on: _____

Summary: _____

_____

VII Remarks

_____

_____

_____

VIII Certification

I hereby certify, that I, _____, am a duly authorized representative of the manufacturer, that I am empowered by the manufacturer to inspect, approve, and operate his equipment, and that I am authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as modified herein. I also certify that all information contained herein is true and accurate.

By: _____
(Authorized Representative)

For: _____

Date: _____

IX Acknowledgments

By: _____

For: _____
(Seller)

Date: _____

By: _____

For: _____
(Engineer)

Date: _____

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SECTION 01 65 50

PRODUCT DELIVERY, STORAGE, AND HANDLING FOR BLOWER PROCUREMENT CONTRACTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Scheduling of product delivery.
   2. Packaging of products for delivery.
   3. Protection of products against damage from:
      a. Handling.
      b. Exposure to elements or harsh environments.

B. Related Specification Sections include but are not necessarily limited to:
   1. Division 01 - General Requirements.

C. Payment:
   1. No payment will be made to Seller for equipment or materials not properly stored and insured or without approved Shop Drawings.
      a. Previous payments for items will be deducted from subsequent progress estimate(s) if proper storage procedures are not observed.

1.2 DELIVERY AND UNLOADING

A. Scheduling:
   1. Seller shall make all arrangements for transportation and delivery of equipment and materials to the Point of Delivery.
   2. Schedule delivery of products or equipment in accord with the Contract time requirements stipulated in the Procurement Bid Form.
   3. Indicate delivery on schedule and coordinate with Construction Contractor and Buyer accordingly.

B. Packaging:
   1. Deliver products or equipment in manufacturer's original unbroken cartons or other containers designed and constructed to protect the contents from physical or environmental damage.

C. Identification:
   1. Clearly and fully mark and identify as to manufacturer, project name, and installation location.
   2. Partial deliveries of component parts shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

D. Protection and Handling:
   1. Provide manufacturer's instructions for storage and handling to Construction Contractor.
   2. Provide Construction Contractor with lists of Goods which could be damaged by low or high temperature and require temperature controlled storage.
   3. Provide Construction Contractor with a list of Goods required to be protected from contamination by dust, dirt and moisture.
   4. Provide Construction Contractor with a list of Goods required to be maintained at manufacturer recommended humidity levels.
   5. Notice of Enclosed Instructions: All delivered packages containing Goods shall have notices clearly visible on the exterior of the package indicating that maintenance instructions are enclosed.

E. Delivery and Unloading:
   1. Seller shall deliver all parts and equipment for the blowers.
   2. Seller or representative shall supervise unloading of equipment, and Construction Contractor will unload equipment.
   3. Seller shall give Buyer and Construction Contractor a minimum of 48 HRS notice prior to shipping the goods.
   4. Seller shall give Buyer and Construction Contractor a minimum of 24 HRS written notice to the time and date of delivery.
   5. Seller shall inform Buyer and Construction Contractor of the type of equipment required to unload the goods 30 days prior to shipping.
   6. Goods must be delivered between 8:00 a.m. and 3:00 p.m., Mondays through Thursdays:
      a. No deliveries on weekends accepted.
      b. No deliveries on holidays accepted.
      c. Buyer and Construction Contractor have no obligation to accept products before or after specified times of day.
   7. Construction Contractor shall unload equipment within 24 HRS of the time of delivery:
      a. Seller shall pay for all delivery truck and driver's time except that due to Construction Contractor's failing to unload equipment within 24 HRS of time of delivery.
      b. Buyer shall pay for additional delivery truck and driver's time resulting from Construction Contractor's failure to unload equipment within 24 HRS of time of delivery.
   8. Seller or representative shall insure equipment is properly stored after off-loading.
   9. If equipment is not delivered within 2 HRS of the specified time and date in Seller's written notice:
      a. Seller shall reimburse Buyer or standby charges for unloading equipment and personnel.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 PROTECTION, STORAGE AND HANDLING

A. Manufacturer's Instruction:
   1. Protect all products or equipment in accordance with manufacturer's written directions.
      a. Store products or equipment in location to avoid physical damage to items while in storage.
      b. Handle products or equipment in accordance with manufacturer's recommendations and instructions.
   2. Protect equipment from exposure to elements and keep thoroughly dry.
      a. If necessary, provide packaging and equipment protection suitable for outdoor exposure during shipment.

B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage.
   1. Painted equipment surfaces that are damaged prior to acceptance shall be repainted.
   2. All parts shall be protectively wrapped and/or packaged, using materials commensurate with the weight and configuration of the part, the method of handling, and the method of transportation.
   3. Contact or pressure points shall be sufficiently protected when using steel or elastic banding.
   4. Cabinets and equipment too heavy to be handled or transported by one (1) personnel shall be adapted for handling with pallet trucks and/or forklifts.
   5. Painted surfaces which will come in contact with lifting forks or other handling equipment (such as the bottom of cabinets or skid base frame members) shall be sufficiently padded with heavy corrugated cardboard, foam or other protective material.

6. Small equipment and skids shall be mounted on wooden pallets designed for fork lifting.
    a. This equipment shall be bolted (using existing holes in from) or strapped to the pallet to prevent tipping.
    b. Equipment and skids too large to be mounted on pallets shall have wooden block bolted or strapped to the base foundation pads to prevent paint degradation during handling, assembly and installation,

C. Electrical equipment, controls, and instrumentation shall be protected against moisture or water damage.
    1. Space heaters provided in the equipment will be connected by the Construction Contractor as noted by the Seller and operated at all times until equipment placed in operation.

D. Blowers and accessories shall be delivered to the site as assembled units to the fullest degree possible.

E. Panel and Instrumentation Storage:
    1. All packages containing panels, electronic devices, and other microprocessor-based equipment shall contain a desiccant, volatile corrosion inhibitor (VCI) blocks, a moisture indicator, and maximum-minimum indicating thermometer.
    2. The Seller shall provide a spare set of such protective equipment including a desiccant, a moisture indicator, and VCI blocks for each package containing panels, electronic devices, and other microprocessor-based equipment for replacement by the Construction Contractor during the storage period.

3.2 STORAGE FACILITIES

A. Storage:
    1. Construction Contractor shall store equipment after delivery.
    2. Construction Contractor shall store and protect equipment in accordance with the following requirements:
        a. Store immediately upon delivery.
        b. Store products in accordance with Seller's instructions.
        c. Store electrical equipment in weather tight structures.
        d. Protect electrical equipment, controls and insulation against moisture, water, and dust damage.
        e. Connect and operate continuously all space heaters furnished in electrical equipment.
        f. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining.
        g. Arrange storage in a manner to provide easy access for inspecting.
            1) Make periodic inspections of stored products to assure that products are maintained under specific conditions, and free from damage or deterioration.

3.3 FIELD QUALITY CONTROL

A. Inspect Deliveries:
    1. Seller, or representative, shall inspect all products or equipment delivered to the site prior to unloading.
        a. Reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on Project.

END OF SECTION

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SECTION 01 75 03

SYSTEM START-UP AND ACCEPTANCE FOR HIGH SPEED TURBO AERATION BLOWER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures , required of Seller, necessary to achieve and demonstrate functionality and acceptable operaton of the Blowers as installed, as condition precedent to Seller's completion of Special Services and being eligible for the final inspection.

B. Related Specification Sections include but are not necessarily limited to:
   1. Section 43 11 14 – High Speed Turbo Blower.

1.2 DEFINITIONS

A. Pre-demonstration:
   1. The period after initial construction and installation activities during which Seller, with the assistance from the Contractor/Assignee, performs start-up functions without interrupting existing treatment.
      a. Supervise ordinary startup of equipment systems furnished by Seller.
      b. Assist Contractor/Assignee with work that directly interfaces with the equipment and systems furnished by Seller.
      c. Train Project Owner's personnel on the operation and maintenance of the equipment and systems furnished by Seller.
   2. Pre-demonstration shall be conducted for each blower individually such that four (4) individual pre-demonstration periods are conducted with Seller's personnel on site.

B. Functional Demonstration:
   1. The period, of specified duration after the Pre-demonstration that Seller demonstrates the functional integrity of the entire system using the aeration system as designated by the Owner.
   2. With assistance from the Contractor/Assignee, performs the following:
      a. Assists Owner with start-up and operation of the Seller's Systems, without exceeding specified downtime limitations, to prove the functional integrity of the mechanical and electrical equipment and components and the control interfaces of the respective equipment and components comprising the Project as evidence of Substantial Completion.
   3. Functional Demonstration shall be conducted for each blower individually such that four (4) individual Functional Demonstration periods are conducted with Seller's personnel on site.

C. Performance Demonstration:
   1. Seller and Contractor/Assignee demonstrate the system meets the minimum criteria as defined in the contract documents for operation of a fully automatic blower system
   2. Verify performance criteria defined in Section 43 11 14 – High Speed Turbo Blower.
   3. Performance Demonstration shall be conducted during a single desmonstration after all four blowers are installed, and after each blower has gone through Pre-demonstration and Functional Demonstration.

D. Acceptance Testing:
   1. A period, of specified duration, following Performance Demonstration during which the Seller and Contrator/Assignee, with Project Owner's assistance, initiates process air flow through the aeration system.
      a. Seller's LCP in conjunction with Project Owner's MCP (MCP) will provide steady state air flow/pressure to Owner's aeration system.

2. Acceptance Testing shall be conducted as a singular effort after all four blowers are installed, and after each blower has gone through Pre-demonstration and Functional Demonstration, and after the Performance Demonstration has been completed.

1.3 SUBMITTALS

A. Submit in the chronological order listed below prior to the completion of the Commissioning:
   1. Within five days following the completion of required onsite service, including but not limited to reports field logs, electronic data files etc., the Seller shall submit to the Owner copies of field notes and test data collected during the service visit.
      a. The data and notes collected shall include but not be limited to:
         1) Component instrument calibration certificates.
         2) Motor amperage readings to verify that the drives are properly sized.
         3) Tolerance and alignment measurements, where applicable.
         4) And all other information collected that demonstrate that the equipment has been properly installed.
   2. Master operation and maintenance training schedule:
      a. Submit 30 days (minimum) prior to first training session for Owner's personnel.
      b. Schedule to include:
         1) Target date and time for Owner witnessing of each system initial start-up.
         2) Target date and time for Operation and Maintenance training for each system, both field and classroom.
         3) Target date for Acceptance Testing.
      c. Submit for review and approval by Owner.
      d. Include holidays observed by Owner.
      e. Attend a schedule planning and coordination meeting 90 calendar days prior to first anticipated training session.
         1) Provide a status report and schedule-to-complete for requirements prerequisite to Seller's training.
         2) Identify initial target dates for individual Seller's training sessions.
      f. Owner reserves the right to insist on a minimum seven (7) days' notice of rescheduled training session not conducted on master schedule target date for any reason.
      g. Schedule to be resubmitted until approved.
   3. Substantial Completion Submittal:
      a. File Seller's Notice of Substantial Completion & Request for Inspection.
      b. Approved operation and maintenance manuals received by Engineer minimum of seven days prior to scheduled training.
      c. Written request for Owner to witness each system start-up.
         1) Request to be received by Owner minimum of seven days before scheduled training of Owner's personnel on that system.
      d. Equipment installation certifications including blower field performance test results herein specified.
      e. Letter verifying completion of all Commissioning start-up activities including receipt of all specified items from Seller or suppliers as final item prior to initiation of Acceptance Testing.

B. Acceptance Testing Submittals:
   1. Upon successful completion of acceptance testing, submit to Owner written report detailing the results of acceptance testing, including copy of field notes and test data.
   2. Owner will submit to Engineer, and Engineer and Project Owner will review written report and upon review and acceptance of report, the start of the warranty period will commence on the date the successful acceptance test was completed.

1.4 COST OF COMMISSIONING, ACCEPTANCE TESTING AND PERFORMANCE DEMONSTRATION

A. Seller shall pay all costs associated with:
   1. Seller's labor, travel and other labor-related expenses.
      a. Seller shall also pay for the services of any Seller's representatives required for equipment and systems furnished by Seller.
   2. The costs for work specified elsewhere as the Seller's responsibility.

B. Owner and Owner's Contractor/Assignee will pay costs associated with:
   1. Construction trades labor for commissioning and Acceptance Testing.
   2. Utilities from the time Acceptance Testing begins until Acceptance of the Work by Owner.
   3. Supervision of commissioning of the overall project and of the equipment and systems not furnished by Seller.

PART 2 - PRODUCTS - (NOT APPLICABLE FOR THIS SPECIFICATION SECTION)

PART 3 - EXECUTION

3.1 GENERAL

A. Start-up and Acceptance of the Goods are Divided into Four (4) Periods:
   1. Pre-Demonstration:
      a. Completion of construction work to bring Project to a state of readiness for start-up.
      b. Equipment Start-up.
      c. Training of Personnel.
      d. Completion of the filing of all required submittals.
   2. Functional Demonstration including demonstration of functional integrity of Seller's equipment using water.
   3. Performance Demonstration:
      a. LCP and MCP operation as a fully automated blower system supplying process air to the Owners activated sludge aeration system.
      b. Filing of Seller's Notice of Substantial Completion.
   4. Acceptance Testing including demonstration of blower system performance.

3.2 PRE-DEMONSTRATION PERIOD

A. Completion of Construction Work:
   1. Complete the work to bring the System to a state of readiness for Functional Demonstration.
   2. The Seller shall instruct the Contractor/Assignee in the proper installation procedures for the turbo blower system equipment.
      a. The training shall be conducted on-site by an authorized, experienced, and competent representative of the Seller, and shall include both verbal and written instructions, as specified herein.
   3. The Seller shall place the Goods into operation and perform tests to determine if equipment is operating properly.
      a. The purpose of these tests is to verify that both the System and each Unit are:
         1) Properly installed.
         2) Operational.
         3) Capable of completing an operating cycles free of problems.
         4) Free from overheating, overloading, vibration, or other operating problems.
         5) The Supplier shall verify that control programming has been configured with appropriate software time delays to avoid rapid cycling
            a) Interlocks shall be provided to prevent operation of any blower under a surge or overcurrent condition.
            b) The Seller's maximum number of starts per hour shall not be exceeded.

4. Contractor/Assignee will be responsible for making any adjustments and/or modifications to the installation process that may become necessary to ensure that all equipment is properly installed in accordance with the Seller's written instructions.
5. After the installation is complete, the Seller, Contractor/Assignee, and Engineer shall jointly inspect the system and list any equipment that has not been properly installed, detailing the problems and noting the party who shall be responsible for each correction.

B. Start-up of the Goods:
   1. Requirements are included in Specification Section 43 11 14 – High Speed Turbo Aeration Blower.
   2. Prepare the equipment so it will operate reliably and safely and be ready to demonstrate functional integrity during the Demonstration Period.
   3. Procedures include but are not necessarily limited to the following:
      a. Test or check and correct deficiencies of:
         1) Power, control, and monitoring circuits for continuity prior to connection to power source.
         2) Voltage of all circuits.
         3) Phase sequence.
         4) Alignment of connected machinery.
         5) Vacuum and pressure of all closed systems.
         6) Lubrication.
         7) Tagging and identification systems.
         8) All equipment: Proper connections, alignment, calibration and adjustment.
      b. Calibrate all components, instruments, and safety equipment.
      c. Manually rotate or move moving parts to assure freedom of movement.
      d. Bump start electric motors to verify proper rotation.
      e. Perform other tests, checks, and activities required to make the equipment ready for Demonstration Period.
   4. Obtain certifications, without restrictions or qualifications, and deliver to Engineer:
      a. Final Seller's Field Service Reports.
      b. Instrumentation supplier's instrumentation installation certificate(s).
   5. Perform start-up of the Goods to extent possible without being connected to diffuser system including but not limited to:
      a. Submittal of check list with verification of equipment functions with manual activation of LCP and MCP inputs and outputs.
      b. Submittal of check list of manual activation of equipment functions from HMI.
      c. Submittal of check list demonstrating manual HMI system activation of equipment functions from HMI including demonstration of field faults and instrument readings to MCP.
      d. Calibration of all primary elements and transmitters.
      e. Check list confirming input of all primary elements and transmitters.
      f. Check list confirming equipment and control system restart upon opening of main service entrance breaker.
      g. Check list describing the system status when power is lost to individual components demonstrated by opening disconnect, circuit breaker and fuses:
         1) LCP.
         2) Each individual instrument.
         3) Confirm loss of signal response and out of range response for each analog instrument.
         4) Checklist will be developed after P&ID Drawings and Control Loop Descriptions are provide by Seller.
      h. Document and verify point to point as-built drawings.

6. When requested by Contractor/Assignee, Engineer will review operation of the equipment to verify that the commissioning is complete.
    a. The Engineer shall perform random tests to determine if the equipment is operating properly and witness various operational sequences.
    b. The Engineer may initiate alarm conditions to determine if the control system is functioning properly.
    c. Engineer's review shall include a review of the LCP and HMI commissioning requirements to determine conformance with Specification Section 43 11 14 – High Speed Turbo Aeration Blower.
    d. Engineer's review shall identify any equipment that has not been properly installed, or operating, detailing the outstanding installation issues on a punch list and noting the party who shall be responsible for each correction and identify the items that require that correction.
7. Upon satisfactory completion of the review, the Engineer shall submit to the Seller a written Notice of Completed Commissioning.
    a. When the Notice of Completed Commissioning is issued, instruction of operation and maintenance personnel may commence.

C. Coordination
1. Note that although Pre-demonstration occurs four (4) times as each blower is sequencially installed, operator training is only required once.
2. Schedule and conduct all personnel training after completion of Equipment Start-up for the equipment for which training is being conducted.
    a. Personnel training on individual equipment or systems will not be considered completed unless:
        1) All pretraining deliverables are received and approved before commencement of training on the individual equipment or system a minimum of 14 days before training session.
        2) No system malfunctions occur during training.
        3) All provisions of field and classroom training specifications are met.
    b. Training not in compliance with the above will be performed again in its entirety by the Seller at no additional cost to Owner.
3. Field and classroom training requirements:
    a. Hold classroom training on-site.
    b. Notify each Seller specified for on-site training that the Owner reserves the right to video record any or all training sessions.
        1) Organize each training session in a format compatible with video recording.
    c. Training instructor: Factory trained and familiar with giving both classroom and hands-on instructions.
    d. Training instructors:
        1) Be at classes on time.
        2) Session beginning and ending times to be coordinated with the Owner and indicated on the master schedule.
        3) Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken.
    e. Organize training sessions into maintenance versus operation topics and identify on schedule.
    f. Provide sufficient classroom materials, samples, and handouts for those in attendance.
    g. Instructors to have a typed agenda and well prepared instructional material.
        1) The use of visual aids, e.g., films, pictures, and slides shall be provided in an electronic format (e.g., PowerPoint presentations) for use during the classroom training programs.
        2) Deliver agendas to the Engineer a minimum of seven (7) days prior to the classroom training.

3) Provide equipment required for presentation of films, slides, and other visual aids.
4) Provide copies in electronic format to Owner for Owner's subsequent use.

h. In the on-site training sessions, cover the information required in the Operation and Maintenance manuals submitted according to Specification Section 01 33 00 and the following areas as applicable to the System.
1) Utilization of the electronic O&M Manual during these training sessions is required.
2) Operation of equipment.
3) Lubrication of equipment.
4) Maintenance and repair of equipment.
5) Troubleshooting of equipment.
6) Preventive maintenance procedures.
7) Adjustments to equipment.
8) Inventory of spare parts.
9) Optimizing equipment performance.
10) Capabilities.
11) Operational safety.
12) Emergency situation response.
13) Takedown procedures (disassembly and assembly).

i. Address above paragraphs 1), 2), 8), 9), 10), and 11) in the operation sessions.
1) Address above paragraphs 3), 4), 5), 6), 7), 12) and 13) in the maintenance sessions.

j. Maintain a log of classroom training provided including: Instructors, topics, dates, time, and attendance.

k. Training shall be provided for Operators and Maintenance Personnel at a minimum of 2 time during a 30 day period ONLY on Tuesday through Thursday as Owner's personnel typically work rotating 12 hour shifts.

Level of training	Number of Shifts	Maximum Number of Participants	Classroom Training (Hours)	Hands-On Training (Hours)
Blowers	2	8	3	4
LCP/HMI/MCP	2	8	1	1

D. Complete the filing of all required submittals:
1. Shop Drawings.
2. Operation and Maintenance Manuals.
3. Training material (including electronic presentation materials).

E. Filing of Seller's Notice of Equipment Start-up and Request for Inspection of Project:
1. File the notice when the following Commissioning items have been completed:
a. Installation of Blowers and LCP are completed. Construction work of blowers, controls, piping and control valves complete.
1) Coordinate with Contractor/Assignee.
2) LCP and MCP communication checks are completed.
b. Equipment Start-up.
c. Personnel Training.
d. Submittal of required documents.
2. Upon notification of completion of the Pre-Demonstration testing by the Seller, the Engineer shall review the operation of the equipment to verify that the testing is complete.
a. The Engineer shall perform random tests to determine if the equipment is operating properly and witness various operational sequences.
b. The Engineer may initiate alarm conditions to determine if the control system is functioning properly.

3. Engineer will inform Seller in writing of the status of the Work reviewed.
    a. Work determined not meeting state of readiness:
        1) Seller: Correct deficiencies noted or submit plan of action for correction.
        2) Engineer: Reinspect work after Seller's notice of correction of deficiencies.
        3) Second reinspection costs incurred by Engineer will be billed to Owner who will deduct them from final payment due Seller.

3.3 FUNCTIONAL DEMONSTRATION PERIOD

A. General:
1. After all discrepancies noted during the pre-demonstration period have been corrected, Seller will schedule with Owner and Engineer the opening of the air control valves to the basin diffuser grid that Seller will make available for testing.
2. Owner and Contractor/Assignee at Sellers direction will place the blower system in manual operation.
3. Demonstration of Facility may require simulation of head on the air system by Owner throttling the manual isolation valves(s) on the air system if the aeration basins are not available.

B. Demonstration Period:
1. Demonstrate the functional integrity of the equipment and components comprising the Facility.
    a. During this demonstration period Seller shall perform the following tests and simulations and submit verification checklists:
        1) Equipment functions with manual activation of LCP.
        2) Manual activation of equipment functions from HMI.
        3) Manual system activation of equipment functions from MCP including demonstration of field faults and instrument readings to MCP.
2. Owner and Engineer may test system and confirm status when power is lost to individual components demonstrated by opening disconnect, circuit breaker and fuses:
    a. LCP.
    b. Each individual instrument.
    c. Confirm loss of signal response and out of range response for each analog instrument
    d. Loss of Utility Power to system.
3. If, during the Demonstration Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or system that renders the affected equipment or system inoperative exceed 10 percent of the Demonstration Period, the demonstration of functional integrity will be deemed to have failed.
    a. In the event of failure not caused by Owner/Engineer's testing of power failure described above, a new Demonstration Period will recommence after correction of the cause of failure.
    b. The new Demonstration Period shall have the same requirements and duration as the Demonstration Period previously conducted.
4. Conduct the demonstration of functional integrity under full operational conditions with the available volume of water in aeration tanks.
5. Seller will perform all functions including but not limited to equipment operation and maintenance until successful completion of the Demonstration Period.
6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
7. Time of beginning and ending any Demonstration Period shall be agreed upon by Seller, Owner and Engineer in advance of initiating Demonstration Period. The duration of demonstration period shall be no less than 120 hours.
8. Throughout the Demonstration Period, provide knowledgeable personnel to answer Owner's questions; provide final field instruction on all mechanical, pumping, electrical and control systems; and respond to any system problems or failures which may occur.

9. Contractor/Assignee to provide all of his labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary for Seller to operate and demonstrate all systems being demonstrated.

C. Upon notification of completion of the Functional Demonstration testing by the Seller, the Engineer shall review the operation of the equipment to verify that the testing is complete.
   1. The Engineer shall perform random tests to determine if the equipment is operating properly and witness various operational sequences.
   2. The Engineer may initiate alarm conditions to determine if the control system is functioning properly.

D. Engineer will inform Seller in writing of the status of the Work reviewed.
   1. Work determined not meeting state of readiness:
      a. Seller: Correct deficiencies noted or submit plan of action for correction.
      b. Engineer: Reinspect work after Seller's notice of correction of deficiencies.
      c. If more than one (1) reinspection, costs incurred by Engineer will be billed to Owner who will deduct them from final payment due Seller.

3.4 PERFORMANCE DEMONSTRATION

A. General:
   1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the System as evidence of acceptance.
   2. Each Unit shall be tested concurrently but evaluated separately for performance including, but not limited to, meeting airflow and pressure requirements.
   3. The length of time to demonstrate compliance with the contract requirement in no case shall be less than 120 consecutive hours.
   4. Upon successful completion of the Performance Demonstration period, Engineer will endorse certificate attesting to the successful demonstration, and citing the hour and date of as the effective date of Substantial Completion for the facility and defined as the date on which Owner has placed the Goods in continuous service providing air to the Owner's aeration system.
      a. Certificate tentatively issued subject to successful Acceptance Testing.
      b. Issued subject to completion or correction of items cited in the certificate (punch list).
      c. Issued with responsibilities of Owner and Seller cited.
      d. Executed by Engineer.
      e. Accepted by Owner.
      f. Accepted by Seller.

3.5 ACCEPTANCE TESTING

A. General:
   1. The Seller shall make arrangements with the Owner and the Contractor/Assignee to begin the Acceptance Testing immediately upon completion of the performance demonstration period but in no case longer than 30 days after completion of the performance demonstration period.
      a. The Seller shall notify the Owner at least 72 HRS prior to beginning the Acceptance Testing.
   2. Time of beginning and ending any Acceptance Test shall be agreed upon by Seller, Owner, and Engineer in advance of initiating the Test.
   3. Seller to provide all of his labor, supervision, utilities, , equipment, vehicles or any other item necessary for Seller to demonstrate blower systems acceptance test.
   4. Upon successful completion of Acceptance Test, Engineer will endorse certificate attesting to the successful demonstration, and citing the hour and date of ending the successful Acceptance Test as the beginning of the warranty period on the Blower System.

END OF SECTION

SECTION 01 77 19
CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for:
   1. Substantial Completion.
   2. Final inspection.
   3. Request for final payment and acceptance of the Work.

1.2 SUBSTANTIAL COMPLETION

A. Substantial Completion – General:
   1. Prior to requesting inspect no for Substantial Completion, perform the following for the substantially completed Work:
      a. Materials and equipment for which Substantial Completion is requested shall be fully ready for their intended use, including full operating and monitoring capability in automatic, manual, and other operating modes set forth in the Contract Documents.
      b. Permanent provisions for safety and protection, shown and indicated in the Contract Documents and associated with the substantially completed Work or for personnel accessing and using the substantially completed Work, shall be in place and ready for their intended use.
      c. Complete field quality control Work, including inspections and testing at the Site, indicated in Specifications sections for individual materials and equipment items and related Contract Documents. Submit results of, and obtain Engineer's acceptance of, field quality control tests and inspections required by the Contract Documents.
      d. Complete checkout and startup in accordance with Section 01 75 03 - System Start-Up and Acceptance for High Speed Turbo Aeration Blower, requirements of the Specifications for the various materials and equipment in the substantially completed Work, and related Contract Documents.
      e. Spare parts, tools, and extra materials shall be delivered and accepted in accordance with the Contract Documents and documentation of Owner's acceptance thereof has been submitted to Engineer in acceptable form in accordance with Section 01 78 43 - Spare Parts and Extra Materials.
      f. Training of the facility's operations and maintenance personnel shall be completed in accordance with the Contract Documents, including Section 01 79 23 - Instruction of Operations and Maintenance Personnel.
      g. Submit and obtain Engineer's acceptance of final operations and maintenance manuals in accordance with Section 01 78 23 - Operation and Maintenance Data.
      h. Obtain and submit to Engineer all required permits, inspections, and approvals of authorities having jurisdiction for the substantially completed Work to be occupied and used by Owner.
      i. Complete other tasks that the Contract requires be completed prior to Substantial Completion.
      j. Not Used.
   2. Procedures for requesting and documenting Substantial Completion are in the General Conditions, as may be modified by the Supplementary Conditions.
   3. Sample letter for Seller's request for inspection for Substantial Completion is attached to this Specifications section. Use the model language of the sample letter, modified to suit the Project and the needs of Seller's request.
   4. Unless decided otherwise by Owner and Engineer, form of certificate of Substantial Completion will be EJCDC C-625, "Certificate of Substantial Completion" (2018 edition or later), prepared by Engineer.

1.3 FINAL INSPECTION

A. Final Inspection – General:
   1. Prior to requesting final inspection, verify that all the Work is fully complete and ready for final payment. Partial checklist for this purpose is attached to this Specifications section.
   2. Sample letter for Seller to request final inspection is attached to this Specifications section. Use the model language of the sample letter, modified to suit the Project.
   3. Procedures for requesting and documenting the final inspection are in the General Conditions, as may be modified by the Supplementary Conditions, and as augmented in this Specifications section.

1.4 REQUEST FOR FINAL PAYMENT AND ACCEPTANCE OF THE WORK

A. Procedure:
   1. Acceptance of the Work:
      a. Upon Engineer's concurrence that the Work is complete and ready for final payment (as a result of the final inspection and other communications between the parties and Engineer) and receipt of the final Application for Payment, accompanied by other required Contract closeout documentation, all in accordance with the Contract Documents, Engineer will issue to Owner and Seller a notice of acceptability of the Work, in accordance with the General Conditions, as may be modified by the Supplementary Conditions.
      b. Unless decided otherwise by Owner and Engineer, form of acceptance will be EJCDC C-626, "Notice of Acceptability of Work", (2018 edition or later).
      c. Nothing other than receipt of such notice of acceptability from Engineer constitutes acceptance of the Work.
      d. Receipt of Engineer's notice of acceptability of the Work does not relieve Seller of Seller's continuing obligations under the Contract, including correction period obligations, warranty obligations, indemnification obligations, insurance requirements, and Seller's other obligations following acceptance of the Work by Engineer and final payment. Such obligations shall commence and remain in effect as indicated elsewhere in the Contract Documents.

B. Request for final payment shall include:
   1. Documents required in the General Conditions, as may be modified by the Supplementary Conditions.
   2. List, on Seller's letterhead, of all Change Proposals, Claims, and disputes that Seller believes are unsettled. If there are no such Change Proposals, Claims, or disputes, so indicate in writing.
   3. Releases of Liens:
      a. Submit complete and legally effective releases (satisfactory to Owner) of all Liens filed in connection with the Work, regardless of whether such Lien was filed by Seller, Subcontractor, or Supplier.
      b. Each release of Lien shall be signed by an authorized representative of the entity submitting the release of Lien, and shall include Seller's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.
   4. Waivers of Lien Rights:
      a. Submit legally-binding waivers of rights to file Liens, acceptable to Owner, as required in the General Conditions (as may be modified by the Supplementary Conditions) from Seller and each Subcontractor and Supplier that furnished or provided labor, material, or equipment totaling $1,000 or more for the Work.
      b. Furnish final list of Subcontractors and Suppliers indicating final amount of the associated subcontract or purchase order for each. Include on the list all lower-tier Subcontractors and Suppliers retained by higher-tier Subcontractors and Suppliers.
      c. Each waiver of Lien rights shall be signed by an authorized representative of the entity submitting waiver of Lien rights, and shall include Seller's, Subcontractor's, or Supplier's (as applicable) corporate seal, when applicable.

d. Waiver of Lien rights may be conditional upon receipt of final payment.
e. Required Affidavits: Submit the following:
    1) Affidavit of payment of debts and claims, submitted by Seller. Acceptable form includes AIA G706, "Seller's Affidavit of Payment of Debts and Claims" (1994 or later edition), or other form acceptable to Owner, and;
    2) Affidavit of release of Liens, submitted by Seller. Acceptable form includes AIA G706A, "Affidavit of Release of Liens" (1994 or later edition).
    3) Each affidavit shall be signed by an authorized representative of Seller and shall bear Seller's corporate seal, as applicable.
f. In the event Seller is unable to obtain one or more required waivers of Lien rights, recourse is set forth in the General Conditions, as may be modified by the Supplementary Conditions.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

A. The documents listed below, following this Specification section's "End of Section" designation, are part of this Specifications section:
    1. Sample letter for Seller's use in requesting inspection for Substantial Completion (two pages).
    2. Sample partial checklist to identify readiness for final inspection (four pages).
    3. Sample letter for Seller's use in requesting final inspection (one page).
    4. Not Used.

END OF SECTION

SAMPLE LETTER FOR SELLER'S USE IN REQUESTING INSPECTION FOR SUBSTANTIAL COMPLETION

SENT VIA E-MAIL AND U.S. CERTIFIED MAIL/RETURN RECEIPT REQUESTED

[Date]

[Name of Engineer's contact person]
HDR
[Street address]
[City, state, postal code]

Subject:
[Project name, Contract designation]
Request for Inspection for Substantial Completion

Dear [addressee]:

In our opinion, [all of] [or] [a portion of] the Work under the above-referenced Contract is substantially complete as of [insert month, day, year on which Substantial Completion was achieved]. [The specific portion of the Work that we believe is substantially complete is [insert identification of that portion of the Work that is substantially complete].]

Enclosed is our listing of uncompleted Work items ("punch list"). In accordance with Paragraph 15.03.A of the General Conditions, we hereby request: (1) That the Engineer schedule and perform the inspection for Substantial Completion as soon as possible, and (2) Issuance of the certificate of Substantial Completion.

In accordance with Paragraph 15.03.D of the General Conditions, upon Substantial Completion, we propose the following relative to apportionment of responsibilities between the Owner and the Seller:

1. Security, Protection, Insurance:
    a. Site Security: [insert proposal; address whether Owner or Contractor will be responsible for security of the Site].
    b. Protection of the Substantially Completed Work: [insert proposal; address whether Owner or Contractor will be responsible for protection].
    c. Property Insurance: [insert proposal; typically Owner assumes responsibility for property insurance upon Substantial Completion]
2. Operation and Maintenance:
    a. Operation: [insert proposal; address whether Owner or Contractor will be responsible for operating the substantially completed Work].
    b. Maintenance: [insert proposal; address whether Owner or Contractor will be responsible for maintaining the substantially completed Work].
3. Utilities: [for each of the following, indicate whether Owner or Contractor will be responsible for utilities and services, or whether responsibility will be shared; if shared, indicate proposed cost-sharing]
    a. Electricity: [insert proposal].
    b. Natural Gas/Fuel/Heating: [insert proposal].
    c. Water Supply: [insert proposal].

d. Wastewater: [insert proposal].

e. Communications (Telephone, Internet, Video): [insert proposal].

In accordance with Paragraph 15.08.A of the General Conditions, we understand that the Contract's correction period for the Work covered by the certificate of Substantial Completion commences on the Substantial Completion date documented in said certificate.

Should you have questions or comments regarding this notice, please contact [the undersigned] [or] [insert other contact person's name], at [insert telephone number and e-mail address].

Sincerely,

[Seller's company name]

[Signatory name]
[Signatory's title]

Attachments:
Preliminary list of uncompleted Work items ("punch list"; [##] pages)

Copies:
[Owner's project manager]

SAMPLE PARTIAL CHECKLIST TO IDENTIFY READINESS FOR FINAL INSPECTION

Project: _____
Contract: _____
Seller: _____

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
1. All Submittals, including all Shop Drawings and Samples, approved or accepted by Engineer	☐		☐	☐	☐		
Remarks:							
1. Final services completed by Suppliers, including submittal of "Manufacturer Field Service Report" in Section 01 61 03 Equipment - Basic Requirements	☐		☐	☐	☐		
Remarks:							
2. Final Work completed by Subcontractors	☐		☐	☐	☐		
Remarks:							
3. Permits closed out and regulatory compliance transitioned from construction to operations	☐		☐	☐	☐		
Remarks:							
4. All outstanding change issues are addressed and all Change Proposals submitted	☐		☐	☐	☐		
Remarks:							
5. All Change Proposals and Claims are resolved	☐		☐	☐	☐		

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
Remarks:							
6. All defective Work of which Seller is aware has been corrected in accordance with the Contract Documents	☐		☐	☐	☐		
Remarks:							
7. Issues related to Constituents of Concern and potential Hazardous Environmental Condition have been fully addressed	☐		☐	☐	☐		
Remarks:							
8. All spare parts, tools, and extra materials have been furnished in accordance with the Contract Documents, and documentation thereof submitted to Engineer	☐		☐	☐	☐		
Remarks:							
9. All final operations & maintenance manuals have been submitted and accepted by Engineer	☐		☐	☐	☐		
Remarks:							
10. Manufacturer warranties and software license(s) furnished	☐		☐	☐	☐		
Remarks:							
11. Instruction and training of operations and maintenance personnel is complete and records of training submitted	☐		☐	☐	☐		

Item No./Description	Completed/Date		In Progress	Not Started	Not Applicable	Target Date	Responsible Entity/Person
Remarks:							
12. All Work on "punch list" is complete in accordance with the Contract Documents	☐		☐	☐	☐		
Remarks:							
13. All record documents submitted to and accepted by Engineer	☐		☐	☐	☐		
Remarks:							
Remarks:							
14. Releases of Liens and waivers of Lien rights (or acceptable alternative) obtained from Subcontractors and Suppliers	☐		☐	☐	☐		
Remarks:							
15. All other required Contract closeout documents obtained	☐		☐	☐	☐		
Remarks:							
Remarks:							
16. All other Work and documentation required prior to final payment is complete and provided in accordance with the Contract Documents	☐		☐	☐	☐		
Remarks:							

SAMPLE LETTER FOR SELLER'S USE IN REQUESTING FINAL INSPECTION

SENT VIA E-MAIL AND U.S. CERTIFIED MAIL/RETURN RECEIPT REQUESTED

[Date]

[Name of Engineer's contact person]
HDR
[Street address]
[City, state, postal code]

Subject:
[Project name, Contract designation]
Request for Final Inspection

Dear [addressee]:

The Work under the above-referenced Contract is complete and ready for final payment as of [insert month, day, year on which final completion was achieved]. In accordance with Paragraph 15.05 of the General Conditions, we hereby request that the Engineer schedule and perform the final inspection as soon as possible. Upon successful completion of the final inspection, we will submit our final Application for Payment accompanied by the required Contract closeout documentation in accordance with the Contract Documents.

Should you have questions or comments regarding this notice, please contact [the undersigned] [or] [insert other contact person's name], at [insert telephone number and e-mail address].

Sincerely,

[Seller's company name]

[Signatory name]
[Signatory's title]

Attachments:
None

Copies:
[Owner's project manager]

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NOTICE OF ACCEPTABILITY OF WORK

Owner: Owner's Project No.:
Engineer: Engineer's Project No.:
Contractor: Contractor's Project No.:
Project:
Contract Name:
Notice Date: Effective Date of the Construction Contract:

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated [date of professional services agreement] ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer
By *(signature)*: _____
Name *(printed)*: _____
Title: _____

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1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: Owner's Project No.:
Engineer: Engineer's Project No.:
Contractor: Contractor's Project No.:
Project:
Contract Name:

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: [Enter date, as determined by Engineer]

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for Seller-furnished, manufacturers' operation and maintenance (O&M) data, including:
      a. Required operation and maintenance data groupings into operation and data manuals and timing of such Submittals.
      b. Requirements for paper copies of operation and maintenance data and related Electronic Documents.
      c. Content of operation and maintenance data Submittals.
   2. Requirements for furnishing program code and configuration files

B. Scope:
   1. Seller shall submit operation and maintenance data, and related information, in accordance with this Section and requirements elsewhere in the Contract Documents, as instructional and reference information for use by: (a) Owner's operation and maintenance personnel, and (b) others retained by or working for Owner.
   2. In addition to operation and maintenance data expressly required elsewhere in the Contract Documents, also submit operation and maintenance data for:
      a. All equipment and systems, including electrical equipment, and process equipment.
      b. Valves, gates, actuators, and related accessories.
      c. Instrumentation and control devices and systems.
      d. Building materials, systems, and finishes that need post-construction troubleshooting, cleaning, or maintenance, such as and other finishes.

C. Related Requirements:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 01 75 03 - System Start-Up and Acceptance for High Speed Turbo Aeration Blower.
   3. Section 01 78 36 - Warranties.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Submit operation and maintenance data, required by the Contract Documents, grouped into operation and maintenance manual Submittals indicated in Table 01 78 23-A.
      b. Where operation and maintenance data required by the Contract Documents, is not expressly indicated in table 01 78 23-A, obtain written clarification or interpretation from Engineer prior to preparing and transmitting such Submittal.
      c. For each required operation and maintenance manual Submittal, furnish preliminary Submittal and final Submittal. Timing of preliminary and final operation and maintenance manual Submittals, and differences between preliminary and final Submittals, are indicated in this Section.

Table 01 78 23-A
Required Groupings of Operation and Maintenance Data Submittals

Name of O&M Manual/Data	For Materials or Equipment Specified in Section(s)
Camas Blower Improvements Project O&M Manual	High Speed Turbo Blower, section 43 11 14

2. Program Code and Configuration Files:
   a. Engineer's review of such Electronic Documents will be only to verify required Submittals were furnished. Engineer is not responsible for verifying completeness or accuracy of program code and configuration file Submittals.

B. Timing of Submittals and Quantity Required:
1. Preliminary Operation and Maintenance Manual Submittals:
   a. Paper Copies: Three copies, exclusive of copies required for Seller's use.
   b. Submit to entity indicated in Section 01 33 00 – Submittal Procedures, by the earlier of: 90 days following approval of Shop Drawings and product data Submittals, or 14 days prior to starting training of operation and maintenance personnel, or 14 days prior to field quality control testing at the Site.
   c. Do not perform checkout, startup, and training without Engineer's acceptance of preliminary operation and maintenance data Submittals for the associated Work.
2. Final Operation and Maintenance Manual Submittals: Furnish final Submittal prior to Substantial Completion of the associated Work, unless submittal is required prior to an interim Milestone.
   a. Paper Copies: Three copies, exclusive of copies required for Seller's use.
   b. Work will not be eligible for Substantial Completion until associated, required final operation and maintenance data Submittals are accepted by Engineer.
3. Program code and Configuration Files:
   a. Paper Copies: Not required.
   b. Work will not be eligible for final payment until associated, required program code and configuration Electronic Documents Submittals are accepted by Engineer.
   c. If Seller (whether or not via Subcontractor or Supplier), revises program code or configuration files between acceptance of Submittal by Engineer and end of the Contract's correction period and Seller's general warranty obligation, furnish updated program code and configuration files to Owner. Before modifying program code and configuration files after Substantial Completion, verify with facility manager that Owner- or facility manager modifications of program code or configuration files were incorporated into the modified files, subject to the provisions of this Section.

1.3 PAPER COPIES OF O&M MANUALS

A. Binding and Cover:
1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy, as necessary.
2. Binders shall be not less than one inch wide and maximum of three inches wide. Binders for each copy of each volume shall be same size and color.
3. Binders shall be locking three-ring ("D"-ring) type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front and back of each volume.
4. Do not overfill binders.
5. Covers shall be oil-, moisture-, and wear-resistant, including identifying information on cover and spine of each volume.

6. Indicate the following information on cover of each volume:
    a. Title: “OPERATING AND MAINTENANCE INSTRUCTIONS”. For submittal of preliminary operation and maintenance data, include the word, “PRELIMINARY” in the title.
    b. Name or type of material or equipment covered in the manual.
    c. Volume number, if more than one volume is submitted, listed as “Volume __ of __”, with appropriate volume-designating numbers filled in.
    d. Name of Project and, when applicable, Contract name and number.
    e. Name of building or structure, as applicable.
7. Provide the following information on spine of each volume:
    a. Title: “OPERATING AND MAINTENANCE INSTRUCTIONS”. For submittal of preliminary operation and maintenance data, include the word, “PRELIMINARY” in the title.
    b. Name or type of material or equipment covered in the manual.
    c. Volume number, when more than one volume is submitted, listed as “Volume __ of __”, with appropriate volume-designating numbers filled in.
    d. Project name and building or structure name.

B. Pages:
1. Print pages in paper copies of operation and maintenance manuals on 30-pound (minimum) paper, 8.5-inch by 11-inch size.
2. Reinforce binding holes in each individual paper sheet with plastic, cloth, or metal. When published, separately-bound booklets or pamphlets are part of manuals, reinforcing of pages within booklet or pamphlet is not required.
3. Furnish each page with binding margin not less than 3/4-inch wide.
4. Properly punch each paper page with holes suitable for associated binding. Provide not less than 3/8-inch of paper between outer edge of punched holes and edge of paper. Manuals with improperly punched holes will be returned to Seller as unacceptable.
5. In paper copies of manuals, each page in each copy shall be properly bound-through by the binder’s rings or posts. Paper manuals where some pages are not so bound will be returned to Seller as unacceptable.

C. Drawings:
1. Bind into operation and maintenance manuals drawings, diagrams, and illustrations up to and including 11-inch by 17-inch size, with reinforcing and punched holes specified for paper pages.
2. Drawings or sheets larger than 11-inch by 17-inch shall be:
    a. Paper Copies: Neatly folded and inserted into clear plastic pockets bound into the manual. Neatly and permanently label each pocket with printed text indicating content and drawing numbers. Include not more than two drawings or sheets per pocket.
    b. Electronic Documents Copies: Included in electronic file at appropriate location.

D. Copy Quality and Document Clarity:
1. Provide original-quality copies. Documents in operation and maintenance manuals shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color. Manuals with copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable.
2. Clearly mark, using ink, to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished and cross out inapplicable content. Using highlighters to so indicate options furnished is unacceptable.

E. Organization:
1. Indexed tabs between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

1.4 ELECTRONIC DOCUMENTS O&M MANUALS

A. Electronic Documents of Operation and Maintenance Manuals:
   1. Each Electronic Document copy of operation and maintenance data shall include all information included in the corresponding paper copy.
   2. Submit Electronic Documents operation and maintenance data in accordance with and Section 01 33 00 - Submittal Procedures.
   3. File Format:
      a. Electronic Documents shall be electronically searchable upon delivery.
      b. Electronic Documents shall not be password-protected and shall not be protected against Owner's or facility manager's copying and printing such files for Owner's or facility manager's use in operating and maintaining the facility.
      c. Electronic Documents shall open to its first page.
      d. Submit each operation and maintenance manual as a single Electronic Document file, unless file size is over-large, in which case divide into as few separate files, each with similar filename, as possible.
      e. Within each Electronic Document, provide bookmarks for the following:
         1) Each chapter and subsection indicated in the corresponding printed copy document's table of contents.
         2) Each figure.
         3) Each table.
         4) Each appendix and attachment.

1.5 CONTENT OF OPERATION AND MAINTENANCE MANUALS

A. Operation and Maintenance Manual Content – General:
   1. Prepare each operation and maintenance manual specifically for the Project. Include in each manual all pertinent instructions, as-constructed drawings as applicable, bills of materials, technical information, installation and handling requirements, maintenance and repair instructions, and other information required for complete, accurate, and comprehensive data for safe and proper operation, maintenance, and repair of materials and equipment furnished for the Project. Include in manuals specific information required in the Specification Section for the material or equipment, data required by Laws and Regulations, and data required by authorities having jurisdiction.
   2. Provisions of this Article were written for equipment. Where operation and maintenance data are required for building products, such as finishes, openings, thermal and moisture protection, and similar items, comply with this Article to the extent practical and reasonable for the associated item.
   3. Completeness and Accuracy:
      a. Operation and maintenance manuals that include language stating or implying that the manual's content may be insufficient or stating that the manual's content is not guaranteed to be complete and accurate are unacceptable.
      b. Operation and maintenance manuals shall be complete and accurate.
      c. Operation and maintenance manuals shall indicate the specific alternatives and features furnished, and the specific operation and maintenance provisions for the material or equipment furnished.
   4. Provide dividers and Include manufacturer's information, diagrams, schematics, and equipment cutaways. Avoid submitting catalog excerpts unless they are the only document available showing identification or description of particular component of the equipment. Where published documents, included in operation and maintenance data, pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.
   5. Identify each equipment item consistent with names and identification numbers shown or indicated in the Contract Documents, rather than manufacturer's model numbers.

6. Neatly type data not furnished in computer-printed text. Handwriting, except for strikeouts, arrows, and the like, is unacceptable.
7. Include copy of warranty in accordance with the Contract Documents, including Section 01 78 36 - Warranties.
8. Include copy of proposed service contract, when applicable.
9. When copyrighted material is used in operation and maintenance manuals, obtain¬ copyright holder's written permission to use such material in the operation and maintenance manual.

B. Differences Between Preliminary and Final Operation and Maintenance Manuals:
1. In preliminary operation and maintenance manuals, include flysheet or placeholder for information to be included in final operation and maintenance manual Submittal.
2. In final operation and maintenance manuals, include information such as the following, as applicable for the associated materials and equipment:
    a. Equipment data that requires collection after startup, for example: (1) system and equipment balancing reports, including those for HVAC systems; and (2) final settings for electrical switchgear, automatic transfer switches, and circuit breakers: and (3) materials and equipment field testing results.
    b. Equipment startup reports and Suppliers' field service reports (the latter on form in Section 01 75 03 - System Start-Up and Acceptance for High Speed Turbo Aeration Blower).

C. Initial Documents in Operation and Maintenance Manuals:
1. Table of Contents:
    a. Provide table of contents in each volume of each operation and maintenance manual.
    b. In table of contents and not less than once in each chapter or section, identify materials and equipment by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is clearly indicated in a table bound at or near beginning of each volume. Using material or equipment model or catalog designations for identifying items is unacceptable.
2. Equipment Record:
    a. Provide "Equipment Record" section of operation and maintenance manual immediately following the table of contents. "Equipment Record" section is not required for operation and maintenance data for other than equipment (such as building materials and finishes).
    b. Provide "Equipment Record" on forms included as this Section's Attachments 1, 2, and 3.
    c. For instrumentation and control equipment, International Society of Automation (ISA) data sheets are acceptable in lieu of the forms included as this Section's Attachments 1, 2, and 3.
    d. This Section's Attachments 1, 2, and 3 are available from Engineer as "fillable PDF forms".
    e. Complete in detail each section of "Equipment Record". Merely referencing the associated equipment's operation and maintenance data for nameplate, maintenance, spare parts, lubricants, or other required information, is unacceptable.
    f. For equipment or systems with multiple, separate components (for example, motor and gearbox), fully completed "Equipment Record" is required for each component.
    g. Operation and maintenance data Submittals without complete and accurate "Equipment Record" sheets are unacceptable.
3. Supplier's Field Service Reports:
    a. Include in final operation and maintenance manuals copies of associated Supplier's field services reports in accordance with Section 01 75 03 - System Start-Up and Acceptance for High Speed Turbo Aeration Blower.
    b. Include Supplier's completed field service reports in operation and maintenance manual in section immediately following "Equipment Record" section.

D. Operation and Maintenance Instructions:
   1. Safety Considerations:
      a. Submit written descriptions of safety considerations relating to operation and maintenance procedures for materials and equipment.
      b. Describe safety devices and alarms provided with materials and equipment and proper operation and use.
      c. Indicate procedures for proper, safe operating and maintenance of materials and equipment furnished, including manufacturer's recommended personal protection equipment, apparatus, and devices not furnished under the Contract.
      d. Describe recommended safety-related training for personnel operating and maintaining the subject materials or equipment.
      e. Include in appendix to operation and maintenance manual manufacturers' relevant "safety data sheets" (SDS), formerly "material safety data sheets" (MSDS).
      f. Engineer's review of operation and maintenance data expressly does not extend to adequacy, completeness, and accuracy of SDS or other safety and protection practices and procedures indicated in the operation and maintenance data.
   2. Operation:
      a. Include in operation and maintenance data Submittals complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; and regulation and control. Also include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.
      b. Include pre-startup instructions and checklists and complete startup instructions for each material and equipment item.
      c. Indicate recommended operating instructions for all operating modes and conditions, with associated recommendations for safe operation.
      d. Explain available controls and instrumentation and associated function(s).
      e. Indicate required shutdown checklists and procedures for: normal shutdown, emergency shutdown, and long-term shutdowns.
      f. Troubleshooting instructions.
   3. Maintenance – General:
      a. Include in operation and maintenance data complete, written instructions for necessary and recommended maintenance, including mechanical maintenance and electrical/instrumentation and controls maintenance, as applicable.
      b. Include in operation and maintenance data complete instructions for necessary assembly, disassembly, installation, re-installation, storage, and shipping for materials and equipment.
      c. Tools: Include list of required maintenance tools and equipment.
      d. Spare Parts and Extra Materials:
         1) Submit complete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number) that will expedite the ordering process.
         2) Submit manufacturer's recommended inventory levels for spare parts, extra stock materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.
         3) Also refer to this Article's provision, "Bills of Materials", below, for additional requirements regarding ordering replacement parts.
   4. Routine and Preventative Maintenance:
      a. Submit complete, detailed, written instructions for routine and preventive maintenance including all information and instructions to keep materials, equipment, and systems

properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:

1) Written explanations with illustrations for each routine and preventive maintenance task such as inspection, adjustment, anchor bolt torque checks, lubrication, calibration, cleaning, replacement of filters, and the like.
2) Recommended schedule for each routine and preventive maintenance task.
3) Lubricants:
    a) Provide lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.
    b) Table of alternative lubricants.

5. Major Maintenance:
    a. Include detailed, written instructions and illustrations for required periodic (non-routine, non-preventative) maintenance.
    b. Indicate relative level of training and expertise required to perform such maintenance and recommended tools and equipment.
6. Special Maintenance:
    a. Include maintenance instructions for long-term shutdowns and storage.

E. Bills of Materials:
1. Include in operation and maintenance manuals complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:
2. Manufacturer's name, physical address, telephone number, internet website address.
3. Manufacturer's local service representative's or local parts supplier's name, physical address, telephone number, internet website address, and e-mail addresses.
4. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.
5. For each part or piece include the following information:
    a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.
    b. Part name or description.
    c. Manufacturer's part number.
    d. Quantity of each part used in each assembly.
    e. Current unit price of the part at the time the operation and maintenance manual is submitted. Price list shall be dated.

F. Record Copy of Shop Drawings, Product data, and Other Previously Approved and Accepted Submittals:
1. Submit original-quality copies of each approved and accepted (as applicable) Shop Drawing, product data Submittal, written results of source quality control activities, and other Submittals, updated to indicate as-installed condition. Do not include prior Submittals that were not approved or were not accepted. Reduced drawings are acceptable only when reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.

G. Electrical Schematics, Diagrams, and Information:
1. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.
2. Include as-constructed drawings of layouts of electrical panels (such as switchgear and motor control centers) and control panels.

H. NFPA 70 (National Electric Code) Documentation:
1. Include in operation and maintenance manuals for electrically-powered equipment documented calculations of: (1) arc-fault current, equipment available fault current and (2) short-circuit current rating (SCCR), provided as part of equipment Submittals.

1.6 COPIES OF PROGRAM CODE AND CONFIGURATION FILES

A. Copies of Program Code and Configuration Files – General:
   1. Submit as Electronic Documents only. Paper Submittals are not required for program code and configuration files.
   2. File Types: As indicated in this Section's "Submittals" Article.
   3. Timing: Submit not later than time indicated in this Section's "Submittals" Article.
   4. In accordance with the Contract Documents, following Substantial Completion, Owner and facility manager shall have right to: (a) modify program code and configuration files, (b) update software and firmware, (c) revise system security settings, such as passwords, IP addresses, and other security settings, and (d) implement related modifications, without restriction or interference from Seller, Subcontractor, Supplier, and others.
   5. Owner and facility manager agree to use program code and configuration files only with Owner's facilities, as may be transferred to Owner's successors and assigns.
   6. Owner and facility manager will not be subject to any Supplier-requested non-disclosure agreement that is not part of the Contract Documents.
   7. Engineer agrees to not distribute program code and configuration files obtained under the Project, except in exchanging such files with Owner, facility manager, or their successors and assigns. Engineer will not be party to any Supplier-requested non-disclosure agreement.

B. Configuration Files:
   1. Submit copies of system configuration prepared for the Project, such as setpoints for programmable controllers, facility SCADA display configurations, and similar configuration files.
   2. Submit as separate files configuration files for each separate control and monitoring device for which configuration files are furnished. Clearly distinguish the device(s) associated with each file.
   3. Seller (including Subcontractors and Suppliers) is not responsible for configurations and control setpoints subsequently changed by Owner, facility manager, or others for whom either is responsible, not in accordance with Supplier's written recommendations and operation and maintenance instructions.

C. Program Code:
   1. Submit copies of program code for programmable logic controllers (PLC), human-machine interfaces (HMI), operator interface terminals (OIT), and other programmable controllers, subject to the following:
      a. Submit for all PLCs, HMI, OITs, and other programmable controllers furnished as part of the Work, and where Owner's existing devices were modified as part of the Work, regardless of whether such program code is manufacturer's standard, or developed specifically for the Project, or a combination of manufacturer's standard program code and Project-specific program code. Seller and associated Subcontractors and Suppliers are not responsible for program code modifications made by Owner or facility manager (or third-parties retained by Owner or facility manager) that result in improper operation of materials, equipment, or systems or that invalidate applicable warranties and manufacturer's recommended operating instructions.
      b. Third-party, licensed, commercially available software (such as, but not limited to, Microsoft operating system software sold at retail, and commercial SCADA system software platforms) is excluded from requirements of this Article. Furnish copies of commercially-available, licensed, third-party software, where required, in accordance with the Contract Documents.
   2. Submit complete logic listings in ladder diagram format.
   3. Format Requirements:
      a. For ladder diagram logic, include complete cross-referencing of all logic elements. Annotate all elements with clearly understandable tags or descriptive labels.

b. For function block diagram, label each function block with understandable tags or descriptive labels. Describe purpose and action of each function block.
c. For sequential function chart, include extensive comments for each step to describe program step function.
d. For instruction list and structured text, include extensive comments for each program line to describe program line function.

4. Submit complete programmable logic controller listing of all input/output address assignments, tag assignments, and pre-set constant values, with functional point descriptions.
5. Submit complete manufacturer's program code manuals.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 ATTACHMENTS

A. The following, bound after this Section's "End of Section" designation, are part of this Section:
1. Attachment 1 - Equipment Data and Spare Parts Summary form (one page)
2. Attachment 2 - Recommended Maintenance Summary form (one page)
3. Attachment 3 - Lubrication Summary form (one page)

END OF SECTION

ATTACHMENT 1

Equipment Record

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
Website / Web Site	E-mail
Local Representative/Service Center	
Address	Phone
Website	E-mail

MECHANICAL NAMEPLATE DATA

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

ELECTRICAL NAMEPLATE DATA

Equip.				Serial No.				
Make				Model No.				
ID No.	Frame No.	HP	V.	Amp.	Hertz	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

ATTACHMENT 2

Equipment Record

Recommended Maintenance Summary

Equipment Description	Project Equip. Tag No(s).	

RECOMMENDED BREAK-IN MAINTENANCE (FIRST OIL CHANGES, ETC.)	INITIAL COMPLETION * FOLLOWING START-UP							
	D	W	M	Q	S	A	RT	Hours

RECOMMENDED PREVENTIVE MAINTENANCE	PM TASK INTERVAL *							
	D	W	M	Q	S	A	RT	Hours

*** D = Daily W = Weekly M = Monthly Q = Quarterly S = Semiannual A = Annual Hours = Run Time Interval**

ATTACHMENT 3

Equipment Record

Lubrication Summary

Equipment Description	Project Equip. Tag No(s).

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					
	4					
	5					

SECTION 01 78 36
WARRANTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. General requirements for warranties required in the various Specifications.
   2. Provisions addressing:
      a. Suppliers' standard warranties.
      b. Suppliers' special or extended warranties.
      c. Implied warranties.
      d. Commencement and duration of warranties.

1.2 SUBMITTALS

A. General:
   1. For each item of equipment furnished under the Contract, submit Supplier's standard warranty, regardless of whether such warranty or Submittal thereof is required by the associated Specifications for that item. Submit such warranties for materials where such Submittal is required in the Specifications for the material.
   2. For each item of material or equipment where Supplier's special (or extended) warranty is required by the Contract Documents, submit appropriate special warranty that complies with the Contract Documents.
   3. Supplier's warranties shall be specifically endorsed to Owner, Seller, and the entity purchasing the item (if other than Seller) by the entity issuing such warranty.
   4. Submit Suppliers' standard warranties and special warranties as Submittals in accordance with the Schedule of Submittals accepted by Engineer.

1.3 SELLER'S GENERAL WARRANTY AND CORRECTION PERIOD OBLIGATIONS

A. Seller's General Warranty and Guarantee: Comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions.

B. Seller's Warranty of Title: Comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions.

C. Correction Period: Comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions.

1.4 SUPPLIERS' WARRANTIES FOR MATERIALS AND EQUIPMENT

A. Warranty Types:
   1. Required by the General Conditions:
      a. Warranties specified for materials and equipment shall be in addition to, and run concurrent with, Seller's general warranty and guarantee and requirements for the Contract's correction period.
      b. Disclaimers and limitations in specific materials and equipment warranties do not limit Seller's general warranty and guarantee, nor does such affect or limit Seller's performance obligations under the correction period.
   2. Material or equipment manufacturer's standard warranty is pre-printed, written warranty published by item's manufacturer and specifically endorsed by manufacturer to the entities indicated in this Specifications Section's Article 1.2.
   3. Special warranty is written warranty that either extends the duration of material or equipment manufacturer's standard warranty or provides other, increased rights to Owner and other beneficiaries (if any) of such warranty. Where the Contract Documents indicate

specific requirements for warranties that differ from the manufacturer's standard warranty for that item, special warranty is implied.

B. Requirements for Special Warranties:
   1. Submit written special warranty document that contains appropriate provisions and identification, ready for signature by material or equipment manufacturer, Owner, and other beneficiaries indicated in Article 1.2 of this Specifications Section. Submit draft warranty with Submittals required prior to fabrication and shipment of the item from the Supplier's facility.
   2. Manufacturer's Standard Form: Modified to include Project-specific information and properly signed by product manufacturer and other entities as appropriate.
   3. Specified Form: When specified forms for special warranties are included in the Contract Documents, prepare written document, properly signed by item manufacturer, Owner, and other beneficiaries indicated in Article 1.2 of this Specifications Section, using the required form.
   4. Refer to the Specifications for content and requirements for submitting special warranties.

1.5 IMPLIED WARRANTIES

A. Warranty of Title and Intellectual Property Rights:
   1. Except as may be otherwise indicated in the Contract Documents, implied warranty of title required by Laws and Regulations is applicable to the Work and to materials and equipment incorporated therein.
   2. Provisions on intellectual property rights, including patent fees and royalties, are in the General Conditions, as may be modified by the Supplementary Conditions.

B. Warranty of Merchantability:
   1. Notwithstanding any other provision of the Contract to the contrary, implied warranties of merchantability required by Laws and Regulations apply to the materials and equipment incorporated into the Work.

C. Warranty of Fitness-for-Purpose:
   1. When Supplier is aware of, or has reason to be aware of, specified materials or features of the Work that are contrary to the intended use, purpose, service, application, or environment in which the material or item will be used, submit request for interpretation in accordance with Section 01 26 00 - Contract Modification Procedures. Where appropriate, such request for interpretation shall indicate the apparent discrepancy and propose appropriate, alternative materials or equipment.

1.6 COMMENCEMENT AND DURATION OF WARRANTIES

A. Commencement of Warranties:
   1. Contract correction period and Seller's general warranty commence as indicated in the General Conditions, as may be modified by the Supplementary Conditions.
   2. Suppliers' standard warranties and special warranties commence running on the date that the associated item is certified by Engineer as substantially complete in accordance with the Contract Documents. In no event shall special warranties commence running prior to Engineer's review and acceptance of special warranty Submittal for the item.
   3. Implied warranties commence in accordance with Laws and Regulations.

B. Duration of Warranties:
   1. Duration of correction period is set forth in the General Conditions, as may be modified by the Supplementary Conditions.
   2. Duration of Seller's general warranty and guarantee is in accordance with Laws and Regulations.
   3. Duration of Suppliers' standard warranties is in accordance with the applicable standard warranty document accepted for the Project by Engineer.
   4. Duration of required Suppliers' special warranties shall be in accordance with the requirements of the Contract Documents for the subject item.

5. Duration of implied warranties shall be in accordance with Laws and Regulations.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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SECTION 01 78 43
SPARE PARTS AND EXTRA MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Administrative and procedural requirements for furnishing spare parts, extra materials, maintenance supplies, and special tools required for maintenance (collectively, "spare parts and extra materials") required by the Contract Documents.

B. Scope:
   1. Seller shall furnish spare parts, extra materials, and associated information, for materials and equipment furnished in accordance with the Contract Documents. Furnish such items in accordance with the requirements of this Specifications section and the Specifications sections in which such items are indicated.
   2. Seller is fully responsible for loss and damage to spare parts and extra materials until such items are received by Owner's facility manager.
   3. Promptly replace spare parts and extra materials furnished by Owner to Seller for use in remedying defective Work.

C. List of Spare Parts and Extra Materials:
   1. With the Shop Drawings and product data Submittals for each Specifications section, submit a complete listing of spare parts and extra materials necessary for maintenance for two years of operation, together with unit prices in current United States funds, and source(s) of supply for each.
   2. Also include listing of spare parts and extra materials, with pricing and sources, in the operations and maintenance data submitted in accordance with Section 01 78 23 - Operation and Maintenance Data.

1.2 SUBMITTALS

A. Maintenance Material Submittals: Furnish and submit the following:
   1. Spare Parts and Extra Materials:
      a. Furnish to Owner or facility manager in accordance with requirements of this Specifications section, and the Specifications section in which the spare parts and extra materials are specified.
   2. Transfer Documentation: For each delivery of spare parts and extra materials, submit to Engineer the following:
      a. Submit, on Seller's letterhead, a letter of transmittal for spare parts and extra materials furnished under each Specifications section. Letter of transmittal shall accompany spare parts and extra materials. Do not furnish letter of transmittal separate from associated spare parts and extra materials.
      b. Furnish three original, identical, signed letters of transmittal for each delivery of spare parts and extra materials furnished under each Specifications section. Upon delivery of specified quantities and types of spare parts and extra materials to Owner or facility manager, designated person from Owner or facility manager will countersign each original letter of transmittal indicating Owner's or facility manager's receipt of spare parts and extra materials in the quantity, type, and quality required by the Contract Documents. Owner or facility manager will retain one fully-signed original, Seller shall submit one fully-signed original to Engineer. Seller shall retain one fully-signed original for Seller's records.
      c. Letter of transmittal shall include the following:
         1) Information required for letters of transmittal in Section 01 33 00 - Submittal Procedures.

2) Transmittal shall list spare parts and extra materials furnished under the associated Specifications section. Indicate each individual part, material, equipment item, tool, and product and the associated quantity furnished.
3) Include space for countersignature by Owner or facility manager as follows: space for signature, space for printed name, space for signatory's title, and date.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Labeling of Spare Parts and Extra Materials:
1. Furnish spare parts and extra materials in manufacturer's unopened cartons, boxes, crates, or other original, protective covering suitable for preventing corrosion and deterioration.
2. Protect and package spare parts and extra materials for maximum shelf life normally anticipated by manufacturer.
3. Packaging of spare parts and extra materials shall be clearly marked and identified with name of manufacturer, applicable material or equipment, part number, part description, and part location in the equipment or system.

B. Storage Prior to Delivery to Owner:
1. Prior to furnishing spare parts and extra materials to Owner or facility manager, store spare parts and extra materials in accordance with the Contract Documents and manufacturers' written recommendations.

C. Procedure for Delivery to Owner or Facility Manager:
1. Deliver spare parts and extra materials to Owner's or facility manager's permanent storage rooms at the Site or area(s) at the Site designated by Owner or facility manager.
2. When spare parts and extra materials are delivered, Seller and Owner (or facility manager) will mutually inventory the spare parts and extra materials delivered to verify compliance with the Contract Documents regarding quantity, part numbers, and quality.
3. Additional procedures for delivering spare parts and extra materials to Owner or facility manager, if required, will be developed by Engineer and complied with by Seller.
4. Seller shall reimburse Owner for all costs and expenses incurred by Owner and facility manager, including professional services, for delivery of inadequate, incorrect, or defective spare parts and extra materials. Owner may withhold such amounts from payments due Seller via set-offs in accordance with the Contract Documents.

D. Delivery Time and Eligibility for Payment:
1. Deliver to Owner or facility manager spare parts and extra materials prior to date of Substantial Completion for materials and equipment associated therewith.
2. Do not deliver spare parts and extra materials before commencing startup for associated material or equipment.
3. Spare parts and extra materials are not eligible for payment until delivered to Owner or facility manager and Seller's receipt of Owner's or facility manager's countersignature on letter of transmittal as required in this Specifications section.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

SECTION 01 79 23
INSTRUCTION OF OPERATION AND MAINTENANCE PERSONNEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Administrative and procedural requirements for instruction of operation and maintenance personnel.
   2. Qualifications requirements for Suppliers' training personnel.
   3. General requirements for training.
   4. Schedule of required training sessions.

B. Scope:
   1. Seller shall furnish services of Suppliers' operation and maintenance training specialists to instruct Owner's personnel in recommended operating and maintenance procedures for materials and equipment furnished, in accordance with the Contract Documents.
   2. Each Supplier shall provide a combination of classroom and field training at the Site, unless otherwise required elsewhere in the Contract Documents.
      Owner reserves the right to record training sessions on video for Owner's later use in instructing Owner's personnel.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Scheduling of Training Sessions:
   1. General:
      a. Seller shall coordinate training services with checkout, startup, and initial operation of materials and equipment on days and times, and in manner, acceptable to Owner, in accordance with the Contract Documents.
      b. Training may be required outside of normal business hours to accommodate schedules of operation and maintenance personnel. Provide training services at the required days and times at no additional cost to Owner.
   2. Prerequisites to Training:
      a. Training of facility operation and maintenance personnel shall commence after preliminary operation and maintenance data has been submitted and accepted by Engineer, and the Work required in Section 01 75 03, System Startup and Acceptance for High Speed Turbo Blower, is complete.
      b. At option of Owner or Engineer, training may be allowed to take place before, during, or after checkout and startup of materials and equipment.
   3. Training Schedule Submittal:
      a. Training Schedule Required: Seller shall prepare and submit proposed training schedule for review and acceptance by Engineer and Owner. Proposed training schedule shall show and indicate all training required in the Contract Documents, and shall demonstrate compliance with specified training requirements relative to number of hours of training for various elements of the Work, number of training sessions, and scheduling.
      b. Training Schedule Coordination: When Project has multiple prime contracts, prime Sellers shall comply with this Specifications section. All prime Sellers shall coordinate with the General Seller in developing a single training schedule Submittal for the entire Project, to be submitted by General Seller. All prime Sellers shall implement training in accordance with the approved training schedule.
      c. Timing of Training Schedule Submittal: Submit initial training schedule not less than 60 days before scheduled start of first training session. Submit final training schedule,

incorporating revisions in accordance with Engineer's comments, not later than 30 days prior to starting the first training session.

d. Owner reserves the right to modify personnel availability for training in accordance with process or emergency needs at the facility.

B. Training Scheduling Conference:

1. Prior to preparing initial training schedule Submittal, schedule and hold training scheduling conference at the location where progress meetings are held, to review:
   a. Training requirements indicated in the Contract Documents.
   b. Work to be completed prior to commencing training.
   c. Work progress and Progress Schedule relative to startup and training.
   d. Scheduling constraints for Owner's personnel, relative to days and times of training sessions.
   e. Preferred days for training.
   f. Location where training will be performed and facilities available.
   g. Required Submittals relative to training.
   h. Other issues relative to training of operation and maintenance personnel.
2. Attendance is mandatory for the following (can be via teleconference):
   a. Seller's project manager.
   b. Project manager of Subcontractors responsible for furnishing materials and equipment for which training of operation and maintenance personnel is required.
   c. Suppliers invited by Seller.
   d. Engineer.
   e. Owner's Site Representative (OSR).
   f. Facility manager's staff responsible for training coordination, and staff responsible for scheduling operation and maintenance personnel.
3. If additional information must be developed to adequately cover agenda items, reconvene conference as soon as possible.
4. Seller shall prepare minutes summarizing the discussions of conference, decisions made, and agreements and disagreements, and distribute the minutes to each conference attendee and others as appropriate.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Supplier's Instructors:
   a. Shall be factory-trained by manufacturer of material or equipment.
   b. Supplier's instructors shall be proficient and experienced in performing training of the types required.
   c. Instructors shall be proficient, clear, and easily understandable in spoken and written English language.
   d. Qualifications of instructors are subject to acceptance by Engineer. If Engineer does not accept qualifications of proposed instructor, provide services of replacement instructor with acceptable qualifications.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Training Schedule: Detailed schedule of training sessions, demonstrating compliance with number of training sessions, hours required in the Contract Documents, and complying with the Contract Times. Submit training schedule Submittals in accordance with time frames specified in this Specifications section.

B. Informational Submittals: Submit the following:

1. Lesson Plan: Acceptable lesson plan for training on each material or equipment item, in accordance with Table 01 79 23-A and the Contract Documents. Lesson plan shall comply with requirements of this Specifications section as may be supplemented by Specifications sections where materials and equipment are specified. Include with lesson plan copy of

handouts that will be used during training sessions. Submit lesson plan Submittals in accordance with time frames specified in this Specifications section.

2. Qualifications:
   a. Credentials of Supplier's proposed operation and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Specifications section and shall include brief resume' and specific details of instructor's operating, maintenance, and training experience relative to the specific material and equipment for which instructor will provide training.
3. Minutes of training scheduling conference.

C. Closeout Submittals: Submit the following:
   1. Trainee sign-in sheets for each training session. Submit to Owner training coordinator with copy to Engineer.

1.5 LESSON PLAN

A. Supplier's lesson plan shall describe specific instruction topics, system components for which training will be provided, and training procedures. Handouts, if any, to be used in training shall be included with the lesson plan. Describe in lesson plan "hands-on" demonstrations planned for training sessions.

B. Submit acceptable lesson plan not less than 21 days prior to starting associated training.

C. Indicate in lesson plan estimated duration of each training segment.

D. Lesson plan shall include the following:
   1. Material and Equipment Overview (required for all types of operation and maintenance training):
      a. Describe material and equipment's operating (process) function and performance objectives.
      b. Describe material and equipment's fundamental operating principles and dynamics.
      c. Identify equipment's mechanical, electrical, and electronic components and features. Group related components into subsystems and describe function of subsystem and subsystem's interaction with other subsystems.
      d. Identify all support materials and equipment associated with operation of subject equipment, such as air intake filters, valve actuators, motors, and other appurtenant items and equipment.
      e. Identify and describe safety precautions and potential hazards related to operation.
      f. Identify and describe in detail safety and control interlocks.
   2. Operations Personnel Training:
      a. Material and Equipment Overview: As described in Paragraph 1.5.D.1 of this Specifications section.
      b. Operation:
         1) Describe operating principles and practices.
         2) Describe routine operating, startup, and shutdown procedures.
         3) Describe abnormal or emergency startup, operating, and shutdown procedures that may apply.
         4) Describe alarm conditions and responses to alarms.
         5) Describe routine monitoring and recordkeeping procedures.
         6) Describe recommended housekeeping procedures.
      c. Troubleshooting:
         1) Describe how to determine if corrective maintenance or an operating parameter adjustment is required.
   3. Mechanical Maintenance Training:
      a. Material and Equipment Overview: As described in Paragraph 1.5.D.1 of this Specifications section.
      b. Material and Equipment Preventive Maintenance:
         1) Describe preventative maintenance inspection procedures required to:

a) Inspect materials and equipment in operation.
b) Identify potential trouble symptoms and anticipate breakdowns.
c) Forecast maintenance requirements (predictive maintenance).

2) Define recommended preventative maintenance intervals for each component.
3) Describe lubricant and replacement part recommendations and limitations.
4) Describe appropriate cleaning practices and recommend intervals.
5) Identify and describe use of special tools required for maintenance of materials and equipment.
6) Describe component removal, installation, and disassembly and assembly procedures.
7) Perform "hands-on" demonstrations of preventive maintenance procedures.
8) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
9) Define recommended torque, mounting, calibrating, and aligning procedures, tolerances, and settings, as appropriate.
10) Describe recommended procedures to check and test equipment following corrective maintenance.

c. Troubleshooting:
1) Define recommended systematic troubleshooting procedures.
2) Provide component-specific troubleshooting checklists.
3) Describe applicable materials and equipment testing and diagnostic procedures to facilitate troubleshooting.
4) Describe common corrective maintenance procedures with "hands-on" demonstrations.

4. Instrumentation/Controls and Electrical Maintenance Training:
a. Materials and Equipment Overview: As described in Paragraph 1.5.D.1 of this Specifications section.
b. Preventative Maintenance and Troubleshooting of Instrumentation and Control Systems: Engineer may grant waiver(s) to allow all training for a given system to be at the location of Owner's training facility.
c. Preventative Maintenance and Troubleshooting of Other Electrical Systems: In accordance with requirements for Paragraph 1.5.D.3 of this Specifications section.

1.6 TRAINING AIDS

A. Supplier's instructor(s) shall incorporate training aids as appropriate to assist in the instruction. Provide handouts of text, tables, graphs, and illustrations as required. Other appropriate training aids include:
1. Audio-visual aids, such as videos, Microsoft PowerPoint presentations, overhead transparencies, posters, drawings, diagrams, catalog sheets, or other items.
2. Equipment cutaways and samples, such as spare parts and damaged equipment.
3. Tools, such as repair tools, customized tools, and measuring and calibrating instruments.

B. Handouts:
1. Supplier's instructor(s) shall distribute and use descriptive handouts during training. Customized handouts developed especially for training for the Project are encouraged.
2. Photocopied handouts shall be good quality and completely legible.
3. Handouts shall be coordinated with the instruction, with frequent references made to the handouts.
4. Provide not less than 15 paper copies of each handout for each training session.

C. Audio-Visual Equipment: Training provider shall provide audio-visual equipment required for training sessions. If suitable equipment is available at the Site, Owner may make available facility's existing audio-visual equipment; however, do not count on facility's existing audio-visual equipment, if any, being available. Audio-visual equipment that training provider shall provide, as required, includes:
1. Laptop computer, presentation software, and suitable projector.

2. Power cords, power strips/surge protectors.
3. As required, extension cords, HDMI cables and other video cabling, and spare bulb for projector.
4. Laser pointer/slideshow remote controller with extra batteries.
5. Not used.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 TRAINING DELIVERY

A. Training Delivery – General:
   1. Instructors shall be fully prepared for the training sessions. Training delivery shall be communicative, clear, and proceed according to lesson plan accepted by Engineer, with lesson content appropriate for trainees. If Owner or Engineer deems that training delivery does not comply with the Contract Documents, training shall be postponed, rescheduled, and re-performed in acceptable manner at no additional cost to Owner.
   2. Trainee Sign-in Sheets: In format acceptable to Owner, furnish sign-in sheet for trainees for each session. Sign-in sheets shall include the Project name; materials, equipment, or system for which training was provided; and type of training (e.g., operations, mechanical maintenance, instrumentation/controls and electrical maintenance, or other), and full name and operator license number (when applicable) of each trainee. Upon completion of training, submit copy of each sign-in sheet as indicated in Article 1.4 of this Specifications section.

B. "Hands-on" Demonstrations:
   1. Supplier's instructor(s) shall present "hands-on" demonstrations of operation and maintenance of materials and equipment for each training session, in accordance with lesson plan accepted by Engineer.
   2. Seller and manufacturer shall furnish tools necessary for demonstrations.

3.2 SCHEDULE OF REQUIRED TRAINING

A. Supplier shall provide not less than the hours of training and number of sessions indicated in Table 01 79 23-A of this Specifications Section. Travel time and expenses are responsibility of Supplier and are excluded from required training time indicated in the Contract Documents.

B. Shifts and Training Sessions Required:
   1. Operations at the Site take place 24 HRS per day, divided into three shifts as follows: day, evening, and night shift.
   2. Training Sessions per Shift:
      a. Operators: Maximum training per day is four hours; sessions longer than four hours shall be spread over multiple, preferably consecutive, days. Provide identical training sessions as follows:
         1) Two identical sessions during day shift, each session in a different week.
         2) One session during evening shift.
         3) One session during night shift.
      b. Mechanical Maintenance: Provide two identical training sessions during day shift, each session in a separate week, for indicated materials and equipment. Maximum training per day is four hours; sessions longer than four hours shall be spread over multiple, preferably consecutive, days.
      c. Instrument/Controls and Electrical Maintenance: Provide two identical training sessions during day shift, each session in a separate week, for indicated equipment. Maximum training per day is four hours; sessions longer than four hours will be spread over multiple, preferably consecutive, days.

END OF SECTION

SECTION 01 81 10
WIND AND SEISMIC DESIGN CRITERIA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. The following types of design criteria for the Project, including Work designed by (a) Engineer and (b) delegated design professional(s) retained by Seller, Subcontractor, or Supplier and submitted for Engineer's approval under the Contract:
      a. Seismic.

B. Scope:
   1. Certain Work, expressly indicated, shall be designed, fabricated, and installed in accordance with the wind and seismic requirements of this Section and Laws and Regulations (including applicable building codes).
   2. This Section applies to all the Work. Where wind and seismic design criteria indicated in this Section conflict with wind and seismic design criteria set forth elsewhere in the Contract Documents, the more-stringent loading and requirements shall govern, unless clarified in writing by Engineer. Obtain Engineer's written interpretation or clarification of conflicts prior to performing the subject design and other associated Work.
   3. Seller shall provide all labor, materials, equipment, tools, professional services, and incidentals to provide wind and seismic design for the Work.
   4. Such Work includes, but is not necessarily limited to, the following:
      a. Anchorage of mechanical and electrical equipment and systems.
      b. Anchorage of supports for piping, electrical conduits and cable trays, and similar Work.
      c. Work requiring delegated professional design for the final, completed Project.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate all wind and seismic design required of Seller for the Work.

1.3 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society of Civil Engineers / Structural Engineering Institute (ASCE/SEI):
      a. 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
   2. When referenced standards conflict, the most-stringent governs, unless specifically indicated otherwise in the Contract Documents or unless approved otherwise in writing by the Engineer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following as part of the Submittals required in Divisions 02-49 Specifications that require wind and seismic delegated designs:
   1. Delegated Design Professional's "Instruments of Service" Submittals:
      a. Delegated design professional's "certification of compliance", regarding structural calculations:
         1) Indicate compliance with performance and design criteria indicated in the Contract Documents.
         2) Indicate compliance with specific reference standards indicated in the building code and the associated Contract Documents.
         3) Indicate other information required for "certification of compliance".

B. Informational Submittals: Submit the following as part of the Submittals required in Divisions 02-49 Specifications that require wind and seismic delegated designs:
   1. Delegated Design Professional's Calculations:
      a. Such calculations shall include delegated design professional's seal, signature, and date and are to indicate the following, which will not be reviewed by Engineer except for the limited purposes of confirming general conformance with the contract documents::
         1) Indicate basis of design and lateral analysis as necessary and required to derive each loading and to indicate system stability, including compatibility of deflections and compatibility with allowable soil parameters, as applicable.
         2) Indicate design load to each connection to structure (where connection will attach to or interface with, or supported by, elements designed by Engineer).
         3) Indicate and provide complete lateral load resisting system that transfers all wind and seismic loads through load path to ground.
   2. Shop Drawings and Product Data Approved by Delegated Design Professional: The following are required but will be reviewed by Engineer only for the limited purposes of confirming general conformance with the contract documents:
      a. Shop Drawings showing and indicating proposed wind and seismic controls Work designed by delegated design professional.
      b. Product data showing and indicating proposed wind and seismic controls Work designed by delegated design professional.

PART 2 - PRODUCTS

2.1 GENERAL DESIGN CRITERIA FOR WIND AND SEISMIC

A. This Article 2.1 applies to seismic design criteria.

B. Design by delegated design professional retained by Seller, Subcontractor, or Supplier shall comply with:
   1. Performance and design criteria indicated in the applicable Contract Documents, including this Section.
   2. Laws and Regulations, including applicable building code.
   3. Applicable reference standards indicated in the Contract Documents.

C. Risk Category: II.
   1. Design in accordance with building code load combinations for, at Seller's option, either service level or factored level.
   2. Mechanical and electrical equipment and systems loads are dead loads, except where mechanical elements, such as piping and tanks, are filled with material such as liquid or slurry (in which case the dead load of the pipe's or vessel's contents shall also be included).

2.2 SEISMIC DESIGN CRITERIA

A. Seismic Design Load Criteria:
   1. Design spectral acceleration at short period: $S_{DS} = 0.653$.
   2. Importance Factor: Ie = 1.0.
   3. Seismic Design Category: D.
   4. Component or system amplification factor, (a_P) and component response modification factor (R_P): In accordance with ASCE 7-16, Tables 13.5-1 and 13.6-1.
   5. Component Importance Factor:
      a. All Components: $I_P = 1.00$.

B. Seismic forces must be resisted by direct load transfer through fasteners to seismic-resisting elements. Do not use connections that employ friction to transfer seismic forces.

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

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DIVISION 40

PROCESS INTERCONNECTIONS

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SECTION 40 05 64
BUTTERFLY VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Butterfly valves.

B. Related Sections include but are not necessarily limited to:
   1. Section 43 11 14 – High Speed Turbo Blower.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society of Mechanical Engineers (ASME):
      a. B16.5, Pipe Flanges and Flanged Fittings - NPS 1/2 Through NPS 24.
   2. ASTM International (ASTM):
      a. A48, Standard Specification for Gray Iron Castings.
      b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
      c. A276, Standard Specification for Stainless Steel Bars and Shapes.
      d. A395, Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
      e. A436, Standard Specification for Austenitic Gray Iron Castings.
      f. A536, Standard Specification for Ductile Iron Castings.
   3. American Water Works Association (AWWA):
      a. C504, Standard for Rubber-Seated Butterfly Valves.
   4. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
      a. SP-67, Butterfly Valves.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Specification Section 43 11 14.
   2. For valves 8 inches and larger, furnish "Affidavit of Compliance" with Owner in accordance with AWWA C504.

B. Contract Closeout Information:
   1. Operation and Maintenance Data:
      a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. DeZurik.
   2. Mueller/Lineseal.
   3. Pratt a Mueller Water Company.
   4. Bray.

2.2 HIGH PERFORMANCE BUTTERFLY VALVES

A. In locations where reliability is critical, for automated valves that modulate for flow control or actuate periodically in intervals less than 2 hours, high performance butterfly valves with an offset disc design shall be used.

B. Design Requirements:
   1. One-piece shaft.
   2. Separate shaft seal.
   3. Minimum shaft diameter to conform to AWWA C504, Class 150B.

C. Materials of construction:
   1. Disc: 316 stainless steel.
   2. Shaft and pins: 17-4PH stainless steel or 316 stainless steel.
   3. Seals:
      a. Process air and high temperature: Graphite rings.
   4. Backing ring: Stainless steel.
   5. Bushings/Bearings: TFE/Glass liner with a 316 Stainless steel shell.
   6. Seat:
      a. Two part with encapsulated RTFE or PTFE.
      b. Seat Retainer: Stainless Steel.
      c. Or Stainless Steel.
   7. End connection: Lugged valves may be used.

2.3 GENERAL USE BUTTERFLY VALVES

A. For use in all location, except where high performance butterfly valves are required.

B. Comply only with AWWA C504, as noted in this Specification Section.

C. Materials:
   1. Valve bodies:
      a. ASTM A126, Class B or ASTM A536 Grade 65-45-12 ductile iron.
      b. Wafer valves may be constructed of ASTM A48, Class 40 cast iron.
   2. Valve shafts:
      a. One-piece stainless steel, Type 304.
      b. Pins: 304 stainless steel.
      c. Bushings/Packing/O-rings: EPDM, RTFE or TFE.
      d. Bearings: Reinforced TFE or equal.
   3. Valve discs:
      a. Cast iron with welded nickel edge or 304 Stainless Steel disk.
   4. Valve seats:
      a. Water: EPDM or Hycar.
      b. Compressed air: Teflon, PTFE.
      c. Process air: Viton, RTFE, rate for 300 degrees F minimum or higher if required by service.
   5. Shaft bearing: Bronze, TFE-coated stainless steel or reinforced TFE.
   6. Shaft seal in addition to any sealing provided by seat: Suitable synthetic rubber rings or PTFE V-ring suitable for operating conditions.

D. Design Requirements:
   1. Seat type: Resilient.
   2. Body type:
      a. Wafer Lug (laying length may vary from AWWA C504).
      b. Equip wafer type with fully tapped anchor lugs drilled per ASME B16.5.
   3. Direct buried valves:
      a. All valves: Working pressure rated for 150 psi (Class 150B per AWWA C504).
   4. Shaft diameter: One-piece constant diameter.

2.4 ACCESSORIES

A. Refer to Drawings and/or valve schedule for type of actuators.
   1. Furnish actuator integral with valve.

B. Valve Flange Seal Rings:
   1. If Steel Slip-on flanges are being used on the process piping, flange seals will be required for proper installation of valves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. See Section 43 11 14.

END OF SECTION

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DIVISION 43

PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE EQUIPMENT

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SECTION 43 11 14
HIGH SPEED TURBO BLOWER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. The requirements for the design, fabrication, and installation of high speed aeration blowers including:
      a. Integral variable frequency drive unit.
      b. Acoustic enclosure.
      c. Harmonic filter.
      d. Valves for blow-off, backflow prevention, and isolation.
      e. Inlet filter and silencer.
      f. Blow-off silencer.
      g. Flexible connectors.
      h. Inlet pressure, outlet pressure, inlet air filter differential pressure, vibration, speed, and temperature monitoring devices.
      i. Cooling system or chiller system (if required).
   2. Discharge header temperature transmitter.
   3. Discharge header pressure transmitter.
   4. Equipment control systems and interface with Plant Supervisory Control and Data Acquisition system (SCADA)
      a. Including one local control panel (LCP) for each blower,
      b. One master control panel (MCP) for control of the entire blower system.
         1) MCP will integrate the existing blowers into the controls in a lag position should the turbos fault.
         2) Including the existing aeration blowers
   5. Spare parts as specified herein.

B. Related Sections include but are not necessarily limited to:
   1. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Iron and Steel Institute (AISI):
      a. C1117, Type 416 Stainless Steel.
   2. American National Standard Institute (ANSI):
      a. B16.1, Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
   3. American Society of Mechanical Engineers (ASME):
      a. PTC-13 Wire-To-Air Performance Test Code for Blower Systems.
      b. PTC 36, Measurement of Industrial Sound.
      c. IEEE 519-2014, IEEE Recommended Practice And Requirements For Harmonic Control In Electric Power Systems
   4. American Society for Testing and Materials (ASTM):
      a. A48, Gray Iron Castings.
      b. B85, Aluminum-Alloy Die Castings.
   5. Institute of Electrical and Electronics Engineering (IEEE):
      a. 85, Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery.
      b. IEEE 519-2014, IEEE Recommended Practice And Requirements For Harmonic Control In Electric Power Systems

6. National Electrical Manufacturers Association (NEMA):
    a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    b. MG-1, Motors and Generators.
7. U S Department of Labor, Occupational Safety and Health Administration (OSHA).

B. Manufacturer's Qualifications:
1. For a manufacturer to be determined acceptable for providing the blower systems on this project, it must show:
    a. Evidence of a minimum of ten municipal U.S. installations in operation of the same or greater flow and discharge pressure as specified herein.
    b. Ten years of experience in the design and manufacture of high speed Turbo blower systems of similar size (within 50 horsepower) and type as specified herein.
    c. Ten years of experience of manufacturing blowers with the same bearing type in similar sizes as specified herein.
    d. Ten years of experience of providing Master Control Panels for controlling 2 or more blowers.

1.3 DEFINITIONS

A. SCFM (Standard Cubic Feet Per Minute): Flow of air or gas at standard conditions defined by American Society of Mechanical Engineers (ASME) with quantity expressed as volume in cubic feet per minute at 68 DegF, 14.70 pounds per square inch absolute pressure, and 36 percent relative humidity.

B. High speed turbo aeration blower: An oil-free, non-contact air-foil or magnetic bearing blower powered by a high speed (10,000-40,000 rpm) motor; or a high speed hybrid rotary screw. Provides low pressure air to the aeration system.

C. Personnel
1. Construction Contractor (Contractor): The person, firm or corporation with whom the Buyer will enter into a Contract for the general construction of and the installation of the Seller's equipment.
2. Buyer (Owner): City of Camas, Washington.
3. Seller: The manufacturer of the blower equipment.

1.4 SYSTEM DESCRIPTION

A. Provide and install new high speed turbo aeration blowers to meet performance requirements. Provide blower and accessories through a single Manufacturer. Contractor to provide and install all external piping, pipe supports, wiring, instrumentation, conduit and appurtenances not provided by the Manufacturer for a complete, functional blower system that meets all performance requirements specified herein.

1.5 SUBMITTALS

A. General:
1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. All products required for submittal under this section shall be furnished in one complete package.
3. All submittal dimensions, calculations and other information shall be in US English units of measure.

B. Product Data:
1. Acknowledgement that products submitted meet requirements of standards referenced.
2. Manufacturer's installation instructions.
3. Blower characteristics, specifications, and performance.
    a. Descriptive brochures and blower data, including general description of blower with all performance data, blower curves, and model.
    b. Factory certified performance curves indicating speed, capacity, horsepower, and

efficiency over the range of operation.
   c. SCFM at discharge pressure.
   d. Surge pressure and rise to surge.
   e. Wire-to-air power at identified points.
   f. Material list and catalog information showing the details of blower construction.
   g. Blower weight and weights of each separate item of equipment that is shipped loose.
   h. Complete bill of materials of all components and equipment supplied.
4. Motor characteristics, specifications, and performance (items marked with an asterisk (*) shall be included on the nameplate):
   a. Descriptive bulletins.
   b. Outline/mounting dimensions, weights, and conduit box details.
   c. Cut-away and exploded view drawings.
   d. *Manufacturer's type and frame designation.
   e. Parts list with material designations.
   f. Nameplate data.
   g. Description of insulation system.
   h. *Ambient temperature rating.
   i. *Insulation system designation.
   j. *RPM at full load.
   k. *Electrical supply (number of phases, frequency, voltage).
   l. *Temperature rise at full load and
   m. service factor load.
   n. Efficiency at ½, ¾, and full load.
   o. Power factor at ½, ¾, and full load.
5. Furnish a detailed identification of couplings, supports, and accessories, including but not limited to the following:
   a. Mechanical and structural components.
   b. Instruments.
   c. Programmable Logic controller.
   d. Operator Interface/machine monitors.
   e. Electrical components.
6. Variable frequency drive (VFD) dimensional drawings and schematics.
7. Harmonic filter data including dimensional data for the filters that are separately mounted.
8. Supply and exhaust ventilation rates for blower room.
9. Certifications:
   a. Submit data to verify and certify service life in accordance with specified parameters.
10. Manufacturer's Test reports:
   a. Certified acoustical test results for each blower package. Test reports from previously test machines of the same size will be acceptable.
   b. Certified report of dynamic balancing and maximum vibration amplitude.
   c. Certified blower performance test in accordance with ASME PTC 13.
      1) Inlet airflow conditions may be simulated or calculated to standard conditions. Equations used to calculate standard inlet conditions must be approved by the Engineer and noted in the Manufacturer's testing protocol. Ambient air temperature, relative humidity and pressure shall be used. Manufacturer to provide calibration standard used for each equipment item.
11. Factory Blower Testing:
   a. Submit a detailed test plan with complete piping and instrumentation configuration diagram per ASME PTC-13 showing inlet and discharge air test pipe size. The location, type, and quantity of all major instruments necessary for performance data, including those on air, water, and lube oil with corresponding distances from reference points, shall be identified per ASME PTC-13 requirements. As a minimum, the detailed test plan shall include:
      1) Quality control procedures.
      2) Air-end/gearbox ASME PTC-13 test procedure and method of calculating results.

3) Functional testing of entire package, including instrumentation, ancillary components, and LCP.
   a) Performance based on test site conditions will be used to calculate performance at standard conditions and additional project conditions.

12. Provide interconnect drawings between plant SCADA System and blower MCP and LCP.
13. Copies of software for MCP.
14. A list of manufacturer's recommended spare parts.
15. Surface preparation and shop paint specifications.

C. Shop Drawings:
   1. Unloading, handling, storage, and maintenance requirements.
   2. Certified dimensional drawings of the blower unit, including cutaway views.
   3. Mechanical drawings with general arrangement showing blower base dimensions, floor mounting, piping, pipe fittings, and connection locations.
   4. Instrumentation and control system schematics, tubing and conduit details, and wiring diagrams for electrical and control components furnished.
   5. Description of process control logic and process and instrumentation diagrams.
   6. Drawings of all control panels to include:
      a. Electrical ladder diagram.
      b. Interconnect to all components outside the panel.
      c. Door layout.
      d. Interior layout.
      e. Sample Operator Interface screens for:
         1) LCP.
         2) MCP.
      f. Preliminary input/output (I/O) listing for all control panel programmable logic controllers (PLC).
      g. Operating description for LCP.
      h. Operating description of MCP. Provide for back-up purposes a copy of the software ladder logic covering all logic and sequences of operation for MCP. Provide a soft copy of all documented PLC code on flash drive. Provide a list of instrument settings.

D. Information to indicate compliance with paragraph 1.2.B.

E. Operation and Maintenance Manuals:
   1. See Section 01 33 00.
   2. Spare parts recommendation list and those supplied per specifications.
   3. Instrument settings.
   4. Troubleshooting guide.
   5. Maintenance summary forms.
   6. ASME PTC-13 test report.

F. Software:
   1. Provide two copies of software for each equipment type:
      a. Protective relays.
      b. PLCs.
      c. VFDs.
      d. Controllers.
      e. Miscellaneous.
   2. Provide two cables of each type for connection from each equipment type to a laptop computer.

G. Programmed Settings:
   1. For each protective relay, PLC, etc. with programmable requirements, provide the final "as-built" settings for all devices.
   2. Submit on 8.5"x11" sheets in 3-ring binders.
   3. Provide in accordance with the submittals section.

H. Manufacturer certification of proper installation and satisfactory performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. All equipment shall be skid mounted or crated to protect against damage during shipment. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed, and the units and equipment are ready for operation.

B. Finished surfaces of all exposed flanges shall be protected by fiberboard blank flanges strongly built and securely bolted thereto.

C. Shipment is not to be made until the Manufacturer coordinates shipment to the jobsite with the Contractor, assuring that the equipment will be properly received and stored.

D. Upon receipt, store equipment in strict accordance with the Manufacturer's instructions.

1.7 WARRANTY

A. The manufacturer shall warrant against any defects in materials or workmanship to the blowers for a period of twenty four (24) months from successful completion of Acceptance Testing, not to exceed thirty (30) months from date of shipment from the manufacturer of the blowers. All other package components shall be warranted for a period of twelve (12) months from date of startup, not to exceed eighteen (18) months from the date of shipment.

B. The manufacturer shall repair or replace any equipment found to be defective in workmanship or materials during the warranty period and provide written notice of the defect's cause and manufacturer's remedy.

1.8 BASIS OF BID

A. Determination of the lowest responsive manufacturer will be based on the lump sum price of the single Bid Item and the 20-year present worth analysis of the operational and maintenance costs, combined. The number of hours for each operating condition will be calculated by multiplying the condition's evaluation factor by 8,760 (hours in one year). The operating hours will then be multiplied by the guaranteed power draw of the blowers (kW) and the electrical cost per kWh ($0.086 /kWh).

B. The Blower Manufacturer shall submit with the bid documents the guaranteed wire-to-air ("wire") kW for each blower unit. The wire kW shall include all losses associated with the blower unit at all specified operating points. Manufacturer to fill in the blank cells in Table 1.

Table 1

Design Point	Blower Flow, SCFM	Evaluation Factor	Discharge Pressure, psig	Inlet Temp, DegF	Rel Hum, %	Guaranteed Wire Power of Blower, kW
1	675	0.10	9.20	15	20	
2	1,620	0.40	9.65	50	40	
3	2,000	0.30	9.95	80	80	
4	2,665	0.20	10.25	100	100	

*Wire kW consists of Blower, Motor, VFD or inverter, and any cooling or other auxiliary systems if used.

1. SCFM measured at conditions listed in table.
2. The guaranteed wire power kW numbers at the above specified operating points shall be "guaranteed" per ASME PTC-13 testing numbers with zero negative tolerance
3. Temperature of the inlet air measured at the inlet to the inlet filter or external inlet flange to the cabinet.
4. Inlet pressure measured at the same location as the inlet temperature.

C. Present worth electrical cost shall be calculated using Table 2 below with values listed from Table 1 above:

Table 2						
(a) Design Point	**(b) Evaluation Factor**	**(c) Operating Hours per Year**	**(d) kW input[1]**	**(e) kWh/year = (b)*(c)*(d)**	**(f) Cost of Electricity $/kWh**	**Cost per year = (e) * (f)**
1	0.10	876			$0.086	$
2	0.40	3,504			$0.086	$
3	0.30	2,628			$0.086	$
4	0.20	1,752			$0.086	$
Total Cost of Power (Design Points 1 + 2 +3 + 4 Cost per year)						$
[4]Maintenance Costs (per year)						$
[3]Two New Blower Cores Cost						$
Present Worth = ($Total Cost of Power + [4]$Maintenance Costs) * [2]12.462 + [3]$(2 New Cores)						**$**

Notes:
(1) Guaranteed wire kW input of blower unit operating at each Design Point from Table 1
(2) Present worth factor based on interest rate of 5% and 20 years
(3) Guaranteed cost of new core at today's price which when required will be escalated at the CPI increase from bid day to repair date. Air bearing designs shall include this cost of new core for each blower and magnetic bearing with less than 15 years of experience of no core failures shall also include the cost of a new core for each blower. Core replacement cost shall include factory trained service technician to remove and reinstall core, all transportation costs, per diem, travel expenses, and factory labor and parts. Labor rates shall be the manufacturer's published rates for service. Documentation of the above items shall be included with the bid package based upon current labor rates and copies of most recent purchase orders for similar rebuilds.
(4) Maintenance costs shall assume blowers are operating 24/7 and shall include oil changes if lubricated bearings are supplied and cost of inlet filter replacement for any bearing style machine.

The lowest responsible manufacturers shall be based on the following Table 3:

[1]Table 3		
ITEM NO.	**DESCRIPTION**	**EVALUATED PRESENT WORTH**
Total price of All Blowers Being Provided		
1	Two Aeration Blowers	$
2	[2]20-year Present Worth Electrical and Maintenance Cost	$
3	[3]Sales Tax, 8.5%	$
Total 20-Year Net Present Worth (Items 1 + 2 +3)		$_____ (use figures)

Notes:
(1) Total Blower system consists of all blowers.
(2) 20-Year Present Worth Power Cost from Table 2 above.
(3) Sales Tax including all State, County, or local sales taxes required only on Item No. 1. Sales tax is not calculated for Item No. 2

1.9 CONTRACT PRICE ADJUSTMENT

A. The guaranteed wire kW of the blower unit (including the motor, VFD or inverter, PLC, and cooling system) shall be proven by measuring each guarantee point during the factory tests.

B. Should the factory tests show that the actual wire kW is more than the guaranteed wire kW, the contract price will be adjusted by a deductive change order as follows:

Adjusted contract price = A minus B, where

A = Contract price

B = Difference between present worth calculated using guaranteed wire kW and present calculated using actual wire kW. The present worth calculations will be based on the same methodology described in Paragraph 1.7 of this Section, including interest rate, period of analysis, power cost, and design points and associated evaluation factors.

C. Adjustment will be made to the payment at time the payment for blower unit(s) is approved.

D. No credit shall be allowed in the case where total actual wire kW is less than the total guaranteed wire kW.

E. Owner reserves the right to witness the performance test at the factory.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with Contract Documents, the following manufacturers are acceptable:
   1. ABS Sulzer.
   2. Aerzen.
   3. Kaeser.
   4. Neuros
   5. No like, equivalent or “or equal” item or substitution is permitted.

2.2 GENERAL

A. The blower system will be used for supplying air at variable volumes to wastewater treatment plant aeration tanks.

B. The blower system will operate based on a pressure setpoint or flow setpoint from the plant control system (via the MCP).

C. The Manufacturer is responsible for ensuring that the blower system can operate within the air flow ranges listed in part 2.3 below.

D. Blowers shall be a high speed blower design.

E. Motor to be premium high efficiency motor.

F. The blower Manufacturer shall supply, coordinate, start-up, and calibrate all items specified in this section.

G. After reaching operational speed, the maximum sound pressure at any point at a distance of three feet or more from the blower unit surface shall not exceed 80 dBa free field as defined in Standards on Noise Measurements, Rating Schemes, and Definitions: A Compilation as published by U.S. Department of Commerce National Bureau of Standards for free field measured in the test facility.

H. No special foundations shall be required for installation.

I. Blowers shall operate as specified without air conditioning of the blower room

J. The blowers shall be capable of operating continuously and satisfactorily at any point between the minimum and the maximum flows without surge, vibration, hunting, or excessive heating of the bearings.

2.3 PERFORMANCE AND DESIGN CRITERIA

A. Aeration Blowers:
   1. Design Conditions:
      a. Elevation of blower installation: 35 feet above mean sea level.

b. Blower Inlet Design Temperature ranges: 16 to 98 DegF.
    1) Extreme temperatures the blower must operate at: -3 to 116 DegF.
    2) Blower room temperature range: +10 DegF above ambient.
c. Relative humidity range: 20 to 100%
d. Assume maximum inlet pressure losses: 0.2 psi
e. Discharge pressure: 10.25 psig
f. Discharge pressure range from min to max air flow: 9.2 to 10.25 psig
g. Total System Design Flow: 675 scfm to 2665 scfm
h. Maximum Input Horsepower (each blower): 150

2. The blower shall be capable of delivering the rated flow at the rated discharge pressure for all conditions listed when operating at the maximum inlet air temperature, lowest listed barometric pressure, and with the maximum listed pressure loss to the blower inlet.
3. The MCP shall choose the optimum energy efficiency combination of the available blowers.
4. The blower shall maintain a minimum of 2.0 psig away from surge at any operating point in the capacity range above. The blowers shall be capable of operating continuously and satisfactorily at any point between the minimum and the maximum flows without surge, vibration, or excessive heating of the bearings.
5. The vibration of the blower shall not exceed 1.25 mils as measured at the volute flanges.
6. If additional air flow is required by Owner, Owner will manually start his existing standby multi-stage centrifugal machines at a constant flow rate, allowing the Seller's high speed blowers to modulate the flow. Owner's multi-stage centrifugal blower curves are included for reference.
    a. Seller in their O&M Manual and MCP programming documentation to list limitations when Owner is operating their standby muti-stage centrifugal blower(s).

2.4 COMPONENTS

A. Enclosures:
1. The standard enclosure shall also act as a sound enclosure and air intake for the blowers. The enclosures must be designed for easy inspection and maintenance of all blower package components. Hinged doors shall provide easy and quick access for routine maintenance of the blower and the package components. Doors shall use a frame, reinforcements and supporting elements as required.
2. Blower electrical components, instrumentation and instrument connections shall all be mounted inside the blower enclosure (with the exception of the MCP).

B. Blowers:
1. Blowers shall be capable of variable speed and output operation.
2. Blowers shall be UL or CSA/TUV/US certified by CSA International, with certification label shown on nameplate. Field evaluation for certification approval shall not be permitted.
3. Air or magnetic bearing;
    a. Blower casing shall have a maximum continuous duty design temperature of 400 DegF, and a design pressure of 50 PSIG.
    b. Backswept three dimensional high efficiency configuration, designed using Computational Fluid Dynamics (CFD) with two stages in one (axial and centrifugal), and milled from forged aluminum alloy or cast stainless steel and with first lateral critical speed at least 120 percent of the maximum allowable operating speed. The impeller shall be mounted directly to the motor shaft and shall be statically and dynamically balanced. The axial gap between the impeller and blower casing shall be adjusted by shims as needed.
4. High Speed Rotary Screw:
    a. Compressor casing shall be of one-piece construction, with separate sideplates that are bolted and pinned to the housing. Materials shall be close-grained cast iron ASTM A48 suitably ribbed to prevent distortion under the specified operating conditions. Inlet and outlet shall be flanged connections, not threaded.

b. Each rotor (male and female) shall be of the "stiff" design with first lateral critical speed at least 120% of the maximum allowable operating speed. The rotors shall operate without rubbing nor shall they require lubrication. Rotors shall be drop forged in one single piece of AISI 1043 or equivalent. Open rotors are not acceptable. Rotors shall be statically and dynamically balanced per ISO1940/ANSI S2.19 G2.5.
c. The impellers shall be timed by a pair of single helical gears with quality equivalent to AGMA 12. Gears shall have hardened and ground teeth and a minimum AGMA service factor of 1.70. Gears shall be mounted via hydraulic expansion onto the shafts with a tapered interference fit, and secured by a locknut.
d. Seals shall be designed to prevent lubricant from leaking into the air stream as well as to prevent oil from leaking out of the machine. The seal shall consist of two rotary slip rings mounted in a retainer with an atmospheric air gap in the center. The rotor shaft shall be protected by a shaft sleeve. A non-contact labyrinth seal on the rotor input end with no wearing parts shall be provided under the shaft sleeve to prevent oil migration along the shaft into the air conveying chamber.

5. Blower to provide a minimum rise to surge margin of 2.0 psig above the design discharge pressure and the head-capacity curve shall slope downward continuously (but not necessarily at the same slope) with increasing capacity and decreasing head. Blowers with curves that reflect two possible capacities for a given pressure (head) will not be acceptable.

C. Motors:
1. Each blower shall be supplied with a premium high-efficiency motor that shall operate on a 480 Volts, 3 Phase, 60 Hertz power supply.
a. The motor to have a 1.15 service factor, if applicable.
b. The motor to be able to start within 10 percent of rated voltage.
c. The Manufacturer to be responsible for coordinating the starting torque requirement of the blower and the motor.
d. The motor to be capable of continuous operation at full load and rated frequency with a voltage variance of +/- 10 percent of the nameplate voltage.
e. The motor to be capable of operation at the rated voltage with a variance of +/- 5 percent of the nameplate frequency.
f. Motor accessories:
1) The motor and controls shall not require any space heaters.
2) The windings shall be provided with embedded RTDs for temperature sensing and alarm.

D. Bearings:
1. Blowers shall be provided with a bearing system as follows:
a. Magnetic Bearing System:
1) The motor rotor shaft shall be continuously levitated in a magnetic field by the magnetic bearing system. This system shall consist of:
a) Two radial and two axial active magnetic bearings.
b) Two rotor position sensors.
c) Magnetic bearing controller (MBC).
2) The position sensors shall continuously measure the shaft position and send a signal to the MBC controlling the energy in the active magnetic bearings to keep the motor rotor shaft levitated and centered.
3) There shall be no mechanical contact between any moving surfaces at any time during the blower operation.
4) The magnetic bearing system shall not require any oil lubrication.
5) The magnetic bearing controller shall have a maximum input power of 1.3 HP (1 kW) and be powered by a 3 phase, 60 Hz, 480V power supply.
b. Air Foil Bearing System:
1) Composed of corrugated bump foil and an inner high temperature alloy core.
2) Bearing manufactured from synthetic media.
3) Bearing clearance of 1/30,000 inch.

4) The air bearing system shall not require any lubricants.

c. Rotary Screw System:
   1) Each rotor/shaft shall be supported by anti-friction bearings, and fixed to control the axial location of the rotor/shaft in the unit. Regardless of theoretical bearing life calculations, the bearings shall be sized for a minimum expected life of 5 years between overhauls. The applied design conditions shall yield a bearing load and minimal L-10 bearing life calculation of 300,000 hrs.
   2) The timing gears and the bearings shall be oil lubricated. Grease lubrication shall be not acceptable. An oil sight glass shall be provided on the exterior of the noise enclosure so the operator can easily view the oil level. Sight glasses inside the enclosure or that cannot be easily viewed by the operator shall not be acceptable

E. Inlet Filter (internal to blower enclosure):
   1. The filter media shall have an efficiency of 90 percent by weight per ASHRE 52-76 with synthetic dust equivalent to separation > 95 percent @ 10 microns.
   2. Maximum clean pressure loss across the filter shall be less than 0.01 PSIG.
   3. Filter (and silencer) performance losses across dirty filters to be included in the blower performance calculation.

F. Flexible Connector:
   1. Provide each blower with EPDM or stainless steel discharge and suction expansion joints capable of withstanding the anticipated vacuum, pressure, and temperature under all operating conditions. The expansion joint shall be included with steel flanges sized as required to fit the blower outlet.

G. Blow-off (Bypass) Valves if required by blower manufacturer:
   1. Provide Manufacturer's standard pneumatic actuated, electro pneumatic, or solenoid blow-off valve. Controls for the valve shall be incorporated in each blower LCP..

H. Discharge Valves:
   1. Provide blower with a discharge butterfly valve for shutoff service meeting the requirements of Section 40 05 64.
   2. Size shall be as indicated in the Drawings.

I. Check Valves:
   1. Provide each blower with a wafer type discharge check valve of the dual, flat-plate type with center hinge, spring closure, steel or cast iron body, Viton-B seal and aluminum-bronze plates, Inkonel or approved equal springs, and rated for temperatures up to 400 DegF.

J. Blow-off Silencer:
   1. A blow-off silencer shall be provided for the blow-off (bypass) valve. The blow off silencer shall be an integral unit, fitted with one flange for direct bolting to the blow off valve or connected to the blow off valve discharge pipe via a slip flit connection and set screws. Silencer sound attenuation shall be not less than 20 dB.

K. The enclosure shall have a rigid structure steel skid designed for forklift pick-up. No special foundations shall be required for installation.

2.5 INSTRUMENTATION

A. The Manufacturer shall provide the blower instrumentation described in this section. Instruments shall be as specified in this section. These components shall be mounted within the blower enclosure except as noted.

B. The controls shall be designed such that the blower cannot operate unless the controls are energized and functional. All controls and instruments shall fail into a safe condition.

C. Each blower shall be supplied with an integral UL/TUV certified VFD inverter for motor speed control.

D. Instrumentation for each blower shall include, as a minimum:
   1. Inlet air temperature sensor, if required.
   2. Inlet air filter differential pressure switches:
      a. Measure differential pressure across the inlet filter.
      b. Set switch alarm setpoint as recommended by Manufacturer.
   3. Discharge air pressure sensor.
   4. Blow-off valve limit switches position indicator (open/closed).
   5. Motor winding monitoring system:
      a. Monitor and display actual winding temperatures at the LCP.
      b. A high temperature (as determined by the Manufacturer) shuts down the blower and gives an alarm. The alarm/shutdown shall be displayed until reset.
      c. Provide necessary hardware for direct communication between RTDs, PLC, and Operator Interface.

E. Local Control Panel (LCP):
   1. Each blower shall be equipped with an integral touch screen PLC/CPU based control system or a keypad and display screen with control circuit card based control system.
   2. The LCP shall contain controls for blower start-up and shutdown including valve sequencing, surge and overload control, and equipment monitoring.
   3. All LCP controls, alarms and monitoring shall be accessible through a touch screen control panel or a keypad/display screen combination.
   4. Ethernet communication shall be provided for all status information.
   5. Timers, external or internal to the LCP, shall provide interlocks, time delays, and pulse signals for blower control.

F. Master Control Panel (MCP) :
   1. One PLC-based MCP shall be provided. The MCP shall contain controls for blower sequencing.
   2. Enclosure: Wall or freestanding, NEMA 12 enclosure with a PLC-based sequencing program and Operator Interface 256-color monitor shall be provided and tested by the Manufacturer for controlling multiple blowers automatically and to facilitate pressure set point control. Power for the MCP shall be 120/60/1, 20 amp.
   3. The MCP shall start and shutdown the blowers in a permissive sequence, receive input, and monitor and control operating variables.
   4. The MCP shall have a discharge temperature transmitter (TE/TIT-001) and a discharge pressure transmitter (PIT-001) as part of the MCP PLC analog inputs.
   5. The MCP shall provide air header pressure control with any single blower or with all of the blowers in service. The PLC shall receive the main air header pressure 4-20 mA signal, which calls for more or less air and increase/decrease on-line blower capacity to maintain the air header pressure at the set point. The air header pressure set point shall be adjustable from the MCP or from a remote input provided by the SCADA System.
   6. The MCP shall have status indicators for each blower as follows:
      a. Blower in remote.
      b. Blower ready for start.
      c. Blower on.
      d. Common alarm.
   7. External signals from the MCP to each LCP shall be as follows:
      a. Blower start/stop signal.
      b. The ability to select the manual mode, Air Flow Control or Pressure Control.
         1) Manual Speed control of the individual blowers.
         2) Air Flow (PID) control with flow setpoint and total flow feedback.
         3) Pressure control (PID) with pressure setpoint and use main header pressure transmitter (PIT-001).
      c. Over pressure control to wind down blower speed when pressure exceeds desired.
   8. The MCP shall contain a 24VDC UPS system with battery storage to support all MCP control and instrumentation circuits.

a. Manufacturer: Phoenix Contact, QUINT.
    1) Input sources:
        a) 24VDC from power supply.
        b) 24VDC from battery.
    2) Output: 24V.
    3) MCP shall contain distribution components, power supplies, and transformers, as required, to derive power for all instruments and equipment required to control the blower system.
    4) UPS shall be sized for 60 minutes of a power outage.

G. Communication:
    1. Aeration Blowers: Ethernet communication shall be provided between the LCPs and the MCP. Ethernet communication shall be provided between the MCP and the SCADA System. All hardware, software, and programming shall be furnished to implement these data links. The data links shall include remote/local status, current blower operating parameters, ready status, selection of group and individual blower control modes and setpoints, communication hand shaking, alarms and alarm settings.

H. Programmable Logic Controller (PLC):
    1. Acceptable Manufacturer:
        a. Allen Bradley.
    2. The MCP PLC shall have a test mode programmed to allow "static checking" of the PLC data link without having the equipment fully functional.

2.6 HARMONIC PROTECTION REQUIREMENTS

A. Each VFD shall be designed and provided with all necessary equipment to protect the VFD and the power system ahead of the VFD from voltage and current distortion. The equipment manufacturer shall provide harmonic filters as required. In accordance with and as defined by IEEE 519:
    1. Each VFD shall be designed to operate from a power bus that may contain up to 5 percent voltage distortion.
    2. Each single VFD powered from the same bus shall be designed to limit percent distortion factor to a maximum of 5 percent voltage distortion.
    3. Current distortion limits shall not exceed the values listed in Table 10.3 of IEEE 519.
    4. Line-to-line notching at the input to the drive shall have a maximum notch depth of 20 percent and a maximum notch area of 22,800 volt-microseconds reflected back to the power source.
    5. VFD shall be provided with 3 PCT line reactor, or 5 PCT total input impedance.

B. The Point of Common Coupling (PCC) for all harmonic calculations and field measurements for both the voltage and current distortion shall be defined as the primary (line side) connection of each VFD.

2.7 BLOWER VENTILATION REQUIREMENTS

A. Each blower enclosure shall be ventilated in accordance with the Manufacturer's recommended standards to ensure proper operation of the mechanical equipment, controllers, VFD and motors.

B. Blower Room is not airconditioned.
    1. Blower manufacturer to provide supply and exhaust ventilation rates necessary when ambient temperatures are in the extreme

2.8 SURFACE PREPARATION AND SHOP PAINTING

A. All carbon steel or iron surfaces shall be prepared, shop primed, and finish painted in accordance with Manufacturer's standard coating system.

B. Machine surfaces that are not painted shall be protected by coating with a corrosive-protective compound.

2.9 SOURCE QUALITY CONTROL

A. Upon completion of assembly, the entire blower package (all blower units) shall be functionally tested at the place of assembly, witnessed by a Witnessing Engineer (provided by, but independent of the Manufacturer) as specified in this section. Representatives of the Owner may witness test at the Owner's discretion.

B. At a minimum, the blower system shall be functionally tested for a duration of not less than four hours at maximum load and maximum temperature.

C. The entire blower system, blow-off valve, and LCP, shall be tested as an operational system before shipment; the MCP shall be tested separately in the MCP's shop. The LCP shall be connected to all enclosure instruments, electric valves, and internal appurtenances. All start/stop and running sequences and all safety and alarm systems shall be tested. The Witnessing Engineer shall sign the test procedure and results, certifying that the assembled blowers, blow-off valves, and LCP were tested together, as a system, in the Manufacturer's shop.

D. Each blower shall be performance tested in accordance with the ASME PTC-13. The test shall verify compliance with the performance and design criteria listed in this specification.

E. A calibrated wattmeter (or other power measuring device approved by the Engineer) shall measure the total power input to the blower unit. Measured power shall include wire-to-air and include all losses associated with electrical shaft power, including, but not limited to the motor, inverter, bearings, PLCs, harmonic filters, and cooling system, if used.

F. Net delivered flow rate and discharge pressure shall be guaranteed with no negative tolerance. There shall be no tolerances or measuring uncertainties used in reporting test results (i.e., the tests shall be reported with ± zero percent tolerance using the measured values).

G. The sound pressure level shall be measured to verify compliance with these specifications.

H. The Witnessing Engineer shall sign each copy of the test data log sheet certifying that the required tests were performed in strict accordance with these specifications and the ASME PTC-13 Code.

I. The blower test report shall present computations in exact accordance with ASME PTC-13 Code with performance curves showing capacity, pressure, and kilowatt inputs.

J. Test results of the motors and blowers shall be included in the Operations & Maintenance Manual.

K. Motor Tests:
   1. The motor shall be tested as a part of blower system and where it is applicable:
      a. Vibration on the motor frame shall be measured with the motor running.
      b. Prior to shipment to the blower Manufacturer, the motor supplier shall demonstrate that the motor shall meet the following criteria:
         1) Excessive noise and overheating shall be eliminated.
         2) Changes made to enable motor(s) to meet above requirements shall make initial test unacceptable and final shop tests shall be run after such changes have been made.

2.10 MAINTENANCE AND SPARE PARTS

A. Furnish all special tools and appliances necessary to disassemble, service, repair, and adjust the blower equipment and appurtenances. The following spare parts shall be furnished:
   1. One complete set of air filters for each blower furnished.
   2. One spare blow-off solenoid valve for each type of valve furnished, if not integral to the blower enclosure.
   3. Two Maintenance tool boxes, if special tools are required for maintenance.
   4. Oil necessary for first oil change of each blower if oil lubricated bearings are supplied. .

B. All spare parts shall be suitably packaged and clearly identified with indelible marking on the containers. Tools and spare parts (except for the air filters) shall be supplied in a tool chest for long-term storage and marked with manufacturer's name, along with a complete description of contents.

2.11 DAYS TO PROVIDE SPECIAL SERVICES

ITEM NO.	CONTRACT TIME	NOTICE TO BEGIN CONTRACT TIMES	BIDDER CALENDAR DAYS
1	Special Design Engineering Services (Shop Drawing Submittal)		
a	Individual Annotated Equipment Data Technical Cut Sheets	Notice to Proceed	_____ days
b	Electrical Power Drawings	Notice to Proceed	_____ days
c	Instrumentation Power and Control Wiring Diagrams	Notice to Proceed	_____ days
d	Control Panel I/O Wiring Drawings and Annotated Electrical Equipment Data Technical Cut Sheets	Notice to Proceed	_____ days
2	Installation Instruction Manuals	Notice to Proceed	_____ days
3	Completion of Pre-demonstration	Time Period after Construction Contractor has equipment installed	_____ days
4	Completion of Functional Demonstration Period	Time Period after Construction Contractor has Blower Equipment installed	_____ days
5	Preliminary O&M Manual	Notice to Proceed	_____ days
6	Final O&M Manual	Number of days after delivery of Blowers	
7	Operator Training	Time Period after Construction Contractor has Blower equipment installed and Seller has submitted Final O&M Manuals	_____ days
8	Completion of Performance Demonstration Period	Number of days Seller has to complete this task after the Construction Contractor has corrected all pumchlist items that effect the operation of the Blower system	_____ days
9	Acceptance Testing	Number of days Seller has to complete Acceptance Testing after successful completion of the Performance Demonstration Period	_____ days

PART 3 - EXECUTION

3.1 INSTALLATION

A. The blowers, LCP, MCP and appurtenances shall be installed in accordance with the instructions of the Manufacturer, as shown on the Drawings. All piping shall be supported so as to preclude the possibility of exerting undue forces and movements on the blower flanges. Each blower unit shall be floor mounted in accordance with the recommendations of the Manufacturer.

B. The Contractor shall furnish the required piping, pipe supports, flange gaskets, bolts, nuts, oil, and grease for initial operation in accordance with the Manufacturer's recommendations.

3.2 INTERFACE WITH PLANT SCADA SYSTEM

A. The Manufacturer shall assist the Engineer in the integration of the Master Control Panel PLC database information into the SCADA System, by supplying the Engineer a Register Mapping Table of all holding register information at least 120 days prior to the PLC Factory Acceptance Test (FAT).

B. The PLC shall have a test mode programmed, such that normally the Mapping table transfers information from the actual active program PLC registers, but have the feature that when a Holding Register test variable is set to non-zero that this will cause the Mapping Table Holding registers containing the SCADA information to be populated with test data. This will allow "static checking" of the PLC Data link without having to have the equipment fully functional. This functionality shall be demonstrated at the FAT.

3.3 MANUFACTURER'S FIELD SERVICES

A. The Manufacturer shall provide a factory-trained service representative to inspect the final installation and supervise the field start-up tests of the equipment and software.
   1. Provide, as a minimum, the following initial installation field services:
      a. Verify proper connection of piping and installation of accessories.
      b. Check leveling of blower enclosure.
      c. Confirm proper wiring of all instruments and field wired items.
   2. Provide written documentation of the field services performed, including but not limited to the following:
      a. Name(s) of representative(s) who performed the work.
      b. Dates and times when the work was performed.
      c. Documentation of final setting or tolerance.
      d. Name(s) of representative(s) who witnessed the final settings.
   3. Field acceptance testing:
      a. Field acceptance test shall demonstrate that, under all conditions of operation, each unit:
         1) Has not been damaged by transportation or installation.
         2) Has been properly installed.
         3) Has no mechanical defects.
         4) Has fully functional instrumentation, which is properly calibrated and set.
         5) Will start, run, and stop in the prescribed manner.
         6) Will run through the entire range of specified pressure and flow.
         7) Has the proper shutdown sequence of standard stop, soft stop, and emergency stop.
         8) Is free of overheating of any parts.
         9) Is free of objectionable vibration and noise.
         10) Is free of overloading of any parts.
      b. Field acceptance testing shall be conducted after the installation of all equipment has been completed and all instrumentation is calibrated and working as intended and the equipment has operated for a sufficient period to make all desirable corrections and adjustments. Contractor shall schedule testing with the full knowledge and consent of Owner.

4. System field functionality test:
    a. A system functionality test shall be conducted after the blower installation and successful completion of the field acceptance testing.
    b. The functionality test shall demonstrate the blower automatic operating strategy.
    c. Demonstrate the functionality of the discharge header pressure control loop to automatically stage blowers on and off and to adjust blower speed in a stable manner for all the full range of operating conditions stated in paragraph 2.2.C of this specification.
        1) Test discharge header pressure control loop operation at three different pressure set points to demonstrate stability of blowers operating in all conditions.

B. The Manufacturer's factory representative, who has complete knowledge of proper operation and maintenance shall instruct representatives of the Owner on proper operation and maintenance, including start-up and shut-down procedures, proper lubrication practices, and troubleshooting of all equipment in accordance with Section 01 75 03.

C. Provide a field service engineer to work with the Instrumentation Subcontractor during startup and commissioning to verify control and data transfer, test all input and output points, and verify correspondence at points between the MCP/LCP and the SCADA System.

3.4 MANUFACTURER'S REPRESENTATIVE REQUIREMENTS

A. Manufacturer's Equipment Representative is to plan for 8-hours minimum on site for each day listed. See specification 01 75 03 for the minimum time required for the Manufacturer's Equipment Representative to be at the Work project site to meet the inspection, testing, and training requirements of the Specifications.

B. All costs, including travel, lodging, sustenance, and incidentals for visits to the Site are included in the Contract Price.

C. Installation Check
1. Installation check shall take place during the Pre-Demonstration Period.
2. Specific requirements are described in Sections 01 61 03 and 01 75 03.

D. Training
1. Training shall take place during the Pre-Demonstration Period after the installation check has taken place and operation and maintenance data has been submitted and accepted by the Engineer.

END OF SECTION

APPENDIX A

EXISTING BLOWER CURVES

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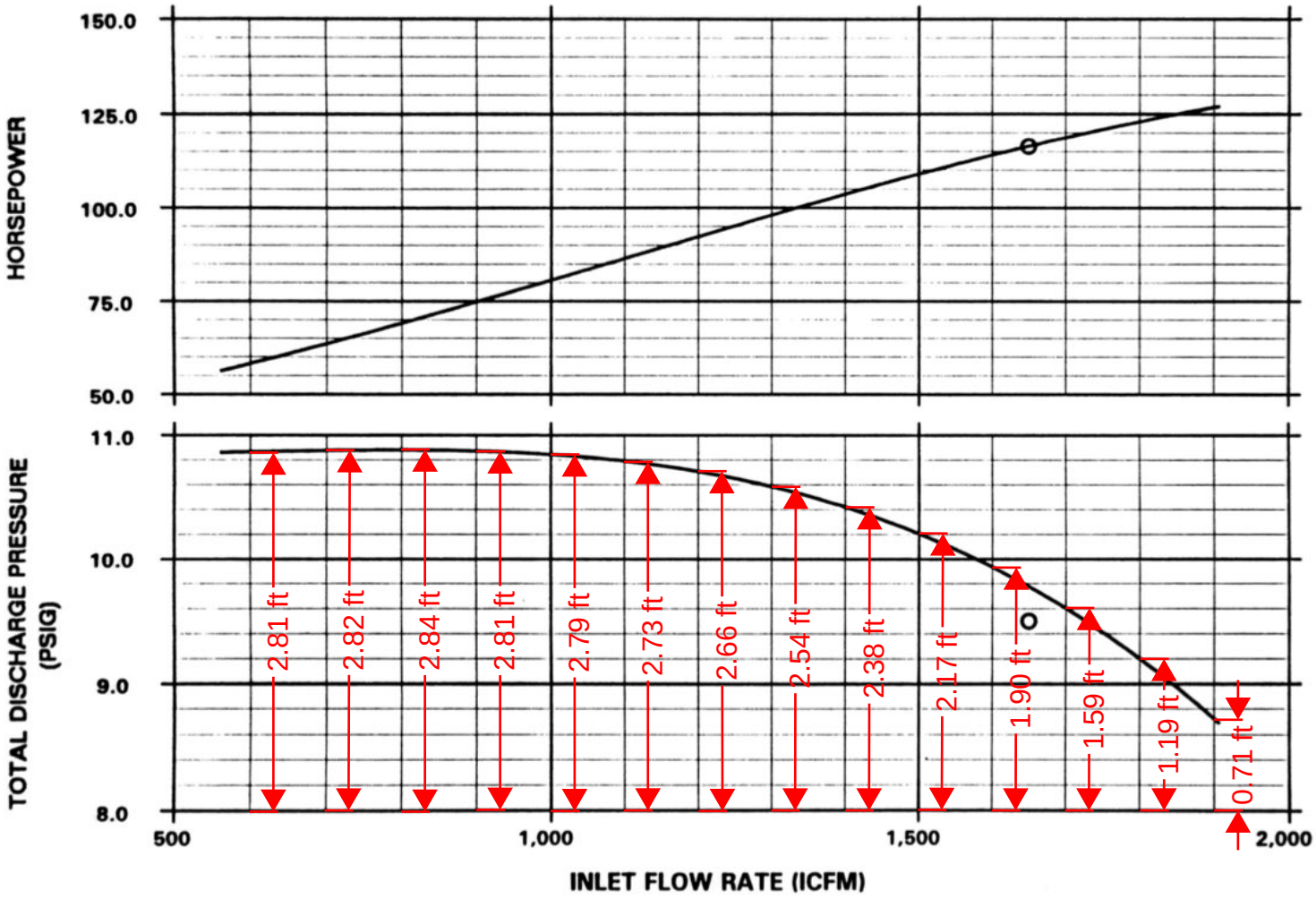
COMPRESSOR PERFORMANCE CURVES

CUSTOMER NAME : J W FOWLER CO.
CUSTOMER ADDRESS : CAMAS, WA
CUSTOMER ORDER NO. : 9830.34
HOFFMAN ORDER NO. : C005654

CERTIFIED CORRECT
BY : 6/15/99

SERIAL NO. : M096020
TEST NO. : A-99077
FRAME SIZE : 38309E



PLOT CONDITIONS

CONTRACT CONDITION NUMBER

1

Pi = 14.70 PSIA
Pa = 14.68 PSIA
Ti = 100.0 DEG. F
RH = 80.0
RPM = 3550.

GAS DATA (WET PROPERTIES)

S.G. = 0.9805
MW = 28.40
K = 1.40

DESIGN POINT AT CONDITION #1

Q = 1650.00 ICFM
Pd = 9.50 PSIG
HP = 115.0

IMPELLER USED

IMPELLER #1 : 8/20007210
IMPELLER #2 : 1/20007211
IMPELLER #3 :

HOFFMAN AIR & FILTRATION SYSTEMS
DIVISION OF CLARKSON INDUSTRIES, INC.
SYRACUSE, NEW YORK 13057

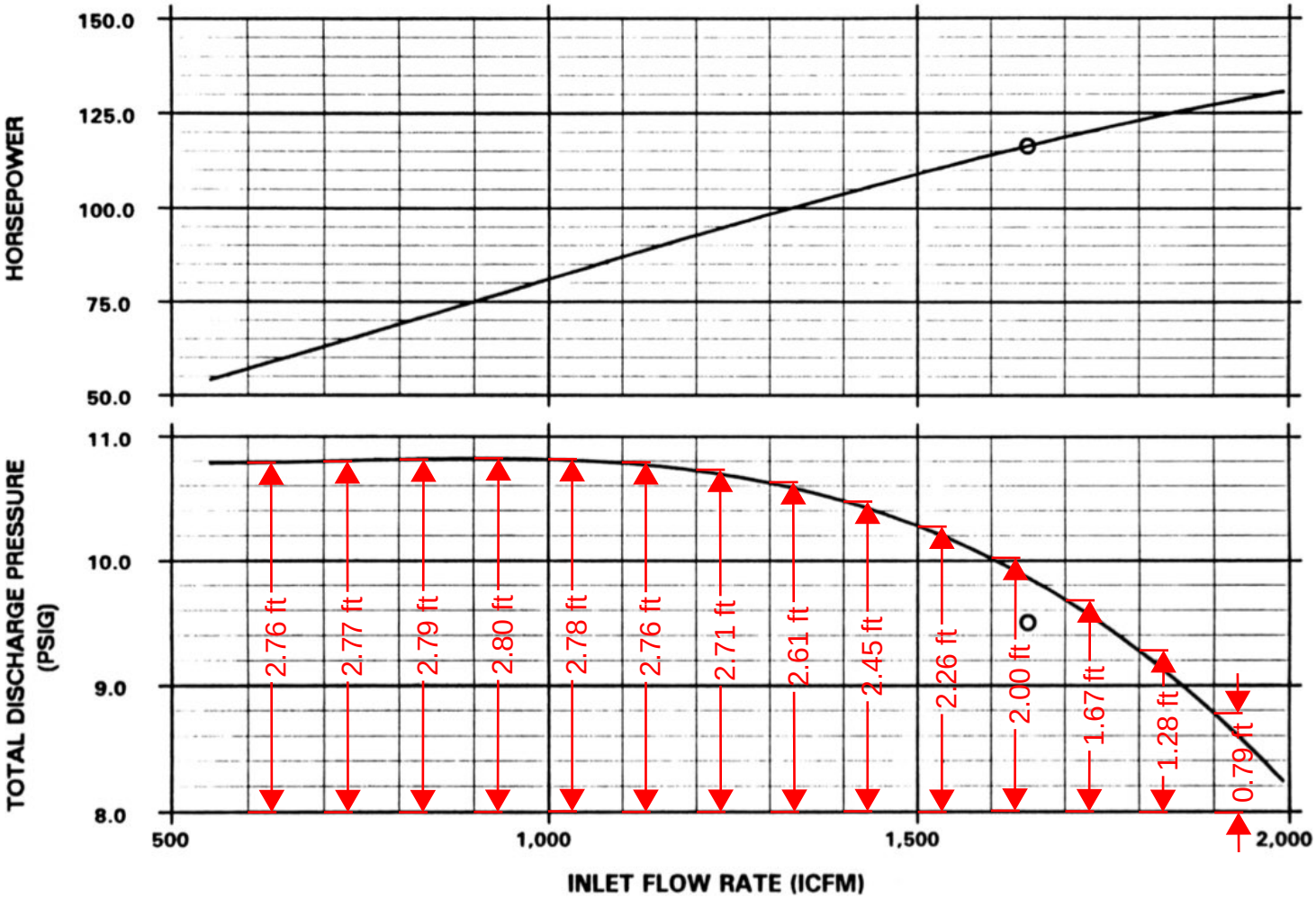
CURVE NO. : C005654-
DATE : 6/15/99
BY : WM

COMPRESSOR PERFORMANCE CURVES

CUSTOMER NAME : J W FOWLER CO.
CUSTOMER ADDRESS : CAMAS, WA
CUSTOMER ORDER NO. : 9830.34
HOFFMAN ORDER NO. : C005654

CERTIFIED CORRECT
BY : 6/14/99

SERIAL NO. : M096030
TEST NO. : A-99075
FRAME SIZE : 38309E



PLOT CONDITIONS

CONTRACT CONDITION NUMBER

1

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Ti = 100.0 DEG. F
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Pd = 9.50 PSIG
HP = 115.0

IMPELLER USED

IMPELLER #1 : 8/20007210
IMPELLER #2 : 1/20007211
IMPELLER #3 :

HOFFMAN AIR & FILTRATION SYSTEMS
DIVISION OF CLARKSON INDUSTRIES, INC.
SYRACUSE, NEW YORK 13057

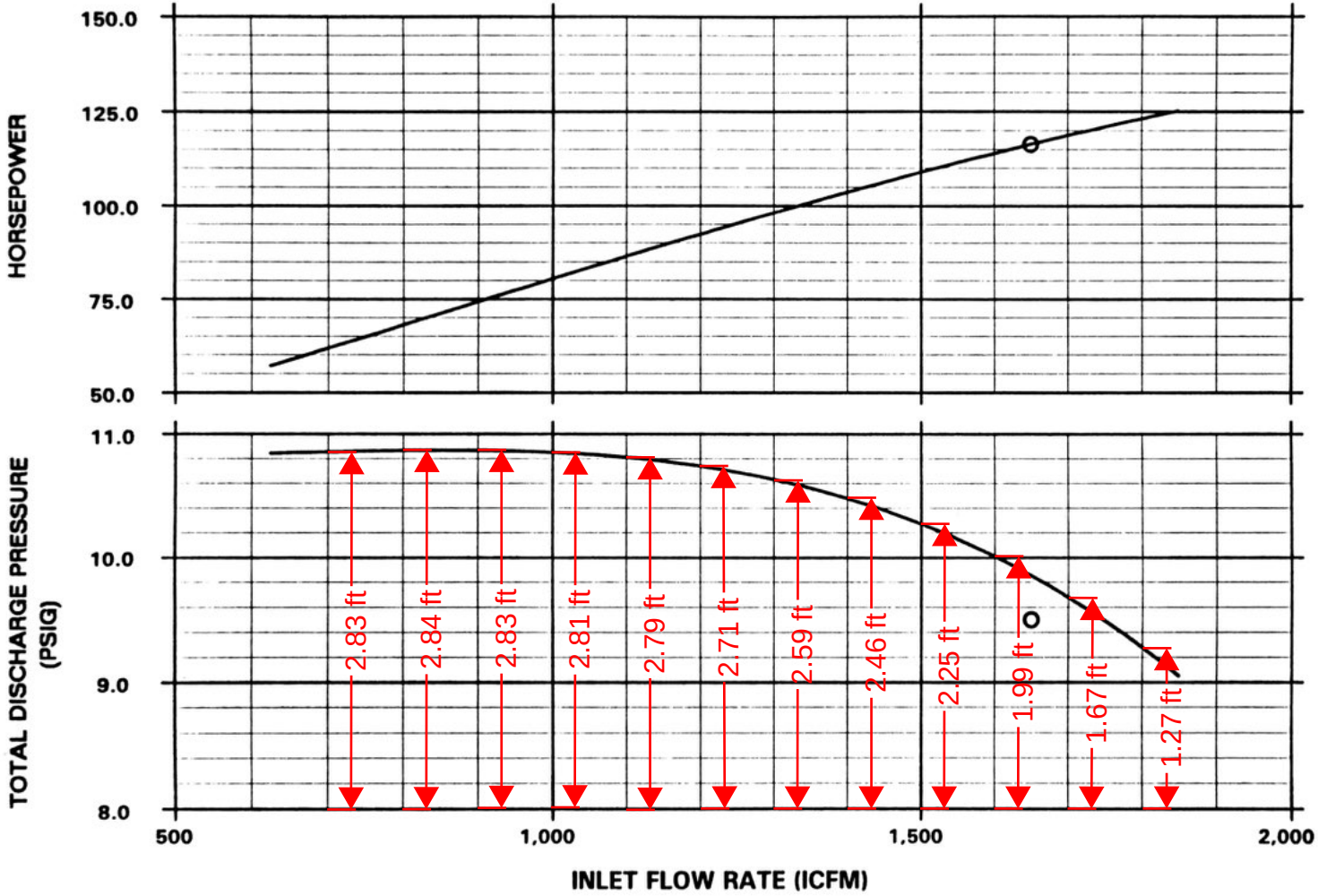
CURVE NO. : C005654-
DATE : 6/11/99
BY : WM

COMPRESSOR PERFORMANCE CURVES

CUSTOMER NAME : J W FOWLER CO.
CUSTOMER ADDRESS : CAMAS, WA
CUSTOMER ORDER NO. : 9830.34
HOFFMAN ORDER NO. : C005654

CERTIFIED CORRECT
BY : 6/15/99

SERIAL NO. : M096040
TEST NO. : A-99080
FRAME SIZE : 38309E



PLOT CONDITIONS

CONTRACT CONDITION NUMBER

1

Pi = 14.70 PSIA
Pa = 14.68 PSIA
Ti = 100.0 DEG. F
RH = 80.0
RPM = 3550.

GAS DATA (WET PROPERTIES)

S.G. = 0.9805
MW = 28.40
K = 1.40

DESIGN POINT AT CONDITION #1

Q = 1650.00 ICFM
Pd = 9.50 PSIG
HP = 115.0

IMPELLER USED

IMPELLER #1 : 8/20007210
IMPELLER #2 : 1/20007211
IMPELLER #3 :

HOFFMAN AIR & FILTRATION SYSTEMS
DIVISION OF CLARKSON INDUSTRIES, INC.
SYRACUSE, NEW YORK 13057

CURVE NO. : C005654-
DATE : 6/15/99
BY : WM

Maximize® Blower/Exhauster Design Datasheet

Datasheet No.: **39038**
Design Date : **12/15/2009**
Quote/Job No.:
Prepared By : **bquinton**

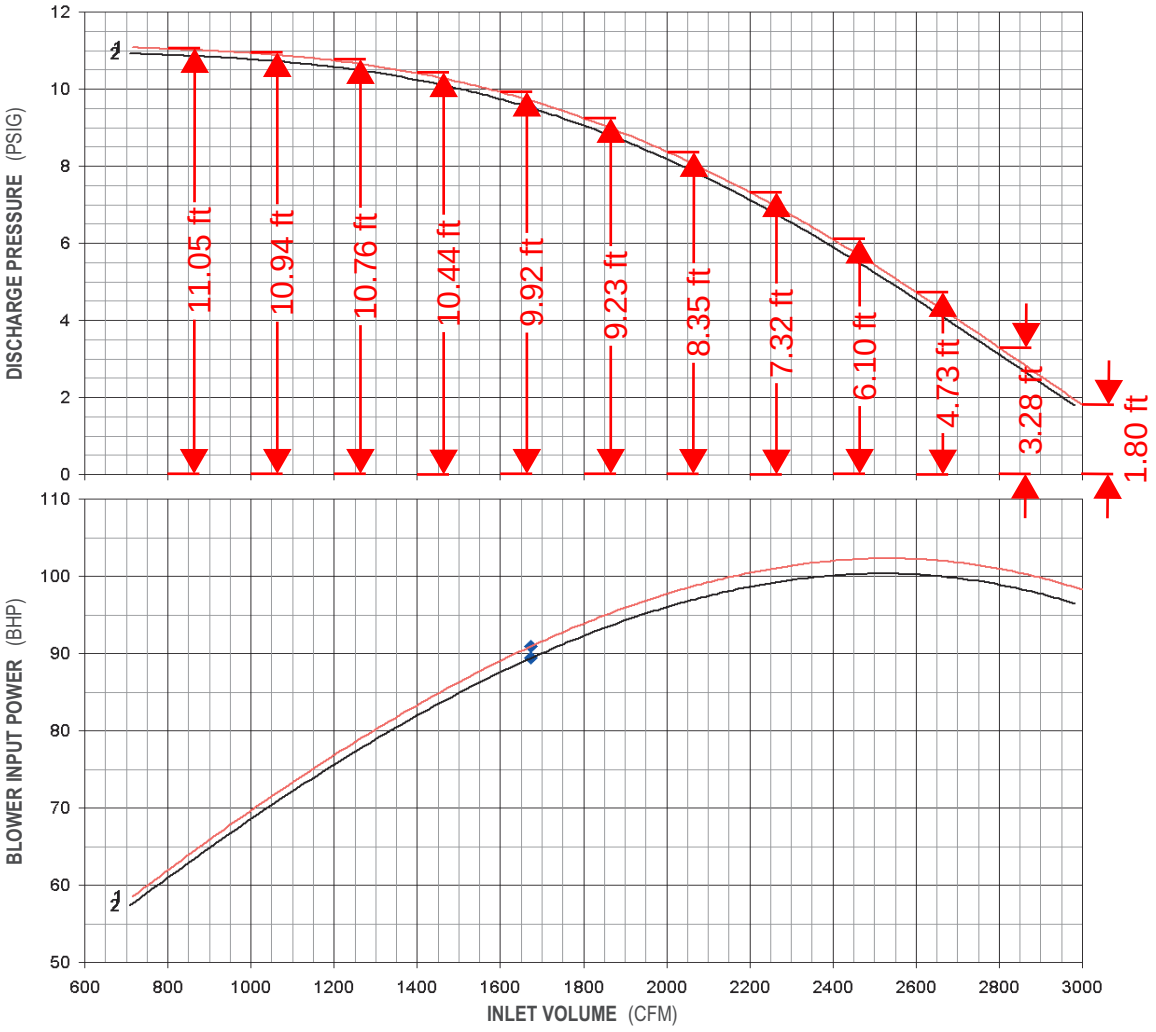
Customer
Beaver Equipment

Project
Camas

Site Data
Elevation: **0** ft a.s.l.

Gas Data
MW: **28.966** RH: **0.0%**
k : **1.3979** Cp: **0.2410**

Gas	Pct
Air (dry)	**100.00**



Curve Data

			1. Primary Curve	2. Auto Speed
BLOWER	Model		**HSI 8208**	**HSI 8208**
	Configuration			
	Impeller 1		**(8) 5011**	**(8) 5011**
	Impeller 2			
	Impeller 3			
	Driver			
	Control Method			
CONDITIONS	Op. Speed	[RPM]	**3,550**	**3,528**
	Inlet Throttling	[valve/%closed]	**none**	**none**
	Bar. Pressure	[PSIA]	**14.700**	**14.700**
	Inlet Pressure	[PSIA]	**14.500**	**14.500**
	Inlet Temp.	[°F]	**68.00**	**68.00**
	Inlet Humidity	[% RH]	**36.0**	**36.0**
	MW / k / Cp		**28.874/1.397/0.2421**	**28.874/1.397/0.2421**
PERFORMANCE	Volume (Std.)	[SCFM@68F]	**1650.0**	**1650.0**
	Volume (Inlet)	[CFM]	**1672.9**	**1672.9**
	Disch. Pressure	[PSIG]	**9.50**	**9.50**
	Diff. Pressure	[PSI]	**9.70**	**9.70**
	Power	[BHP]	**90.91**	**89.40**
	Efficiency	[%]	**65.30**	**65.36**
	Disch. Temp.	[°F]	**196.93**	**194.79**
	Pressure Rise	[PSI]	**1.58**	**1.42**
	Turndown	[%]	**57.32**	**57.65**
SURGE	Surge Pressure	[PSIG]	**11.08**	**10.92**
	Surge Volume	[CFM]	**714.0**	**708.5**