

ATTACHMENT 1: Existing Equipment Drawings

DRAFT TUBE NOT TO BE REPLACED. DIMENSIONAL INFORMATION SHOWN FOR ORIGINAL MIXERS AND DRAFT TUBE INSTALLATION.

Faulschlammlicher/Mixer MFS 4
 Volumenstrom Q= 857 USGPM(1512m³/h)
 P_{max} = 8.6 kW

Antriebs-E-Motor
 Fabrikat/Manufacturer: General Electric
 Frame: 364 HP16
 P = 30 HP
 n = 720 1/min
 U = 460 V/ 60 Hz
 Degree of protection: Explosion - Proof
 Type of construction: vertical motor

Lieferung HALBERG, 3 Unterlagen Röhren
 3 adjusting screws BM24x200
 3 Einstellschrauben BM24x200 DIN561
 Oberstand nach Montage abtrennen!
 Remove projecting length after installation.
 Mischergewicht: 1200 kg
 weight of mixer: 2843 lbs
 Motorgewicht: 366 kg
 weight of motor: 1200 lbs

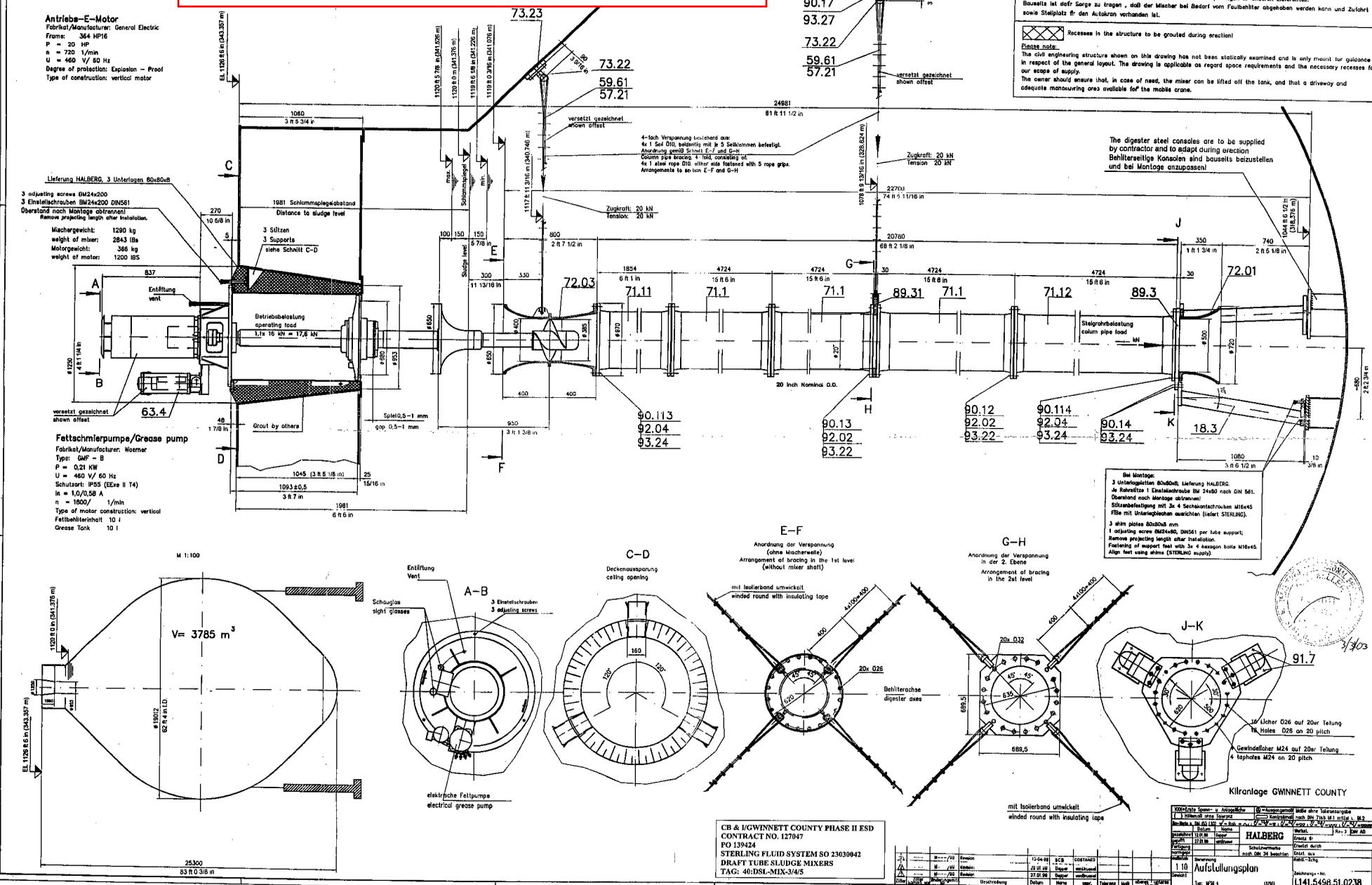
Fettschmierpumpe/Grease pump
 Fabrikat/Manufacturer: Wörmser
 Type: GMP - B
 P = 0,21 kW
 U = 460 V/ 60 Hz
 Schutzart: IP55 (Exe II T4)
 n = 1,0/0,58 A
 n = 1600/ 1/min
 Type of motor construction: vertical
 Fettbehälter: 10 l
 Grease Tank: 10 l

Bauerkassenspannungen nach Montage vergrößern
 Zur Beachtung:
 Der in der Zeichnung eingezeichnete bauliche Teil ist statisch nicht untersucht und gilt nur als Hinweis für die Inaugestaltung.
 Die Zeichnung gilt für den Platzbedarf und die erforderlichen Aussparungen für unseren Lieferant.
 Bauteile sind selbst Sorge zu tragen, sind der Mischler bei Bedarf vom Fabrikant abgehoben werden kann und Zufahrt sowie Stellplatz für den Autokran vorhanden ist.

Recesses in the structure to be grouted during erection
 Please note:
 The civil engineering structure shown on this drawing has not been statically examined and is only meant for guidance in respect of the general layout. The drawing is applicable as regard space requirements and the necessary recesses for our scope of supply.
 The owner should ensure that, in case of need, the mixer can be lifted off the tank, and that a driveway and adequate manoeuvring area available for the mobile crane.

The digester steel casings are to be supplied by contractor and to adapt during erection.
 Behälterseitige Konsolen sind bauteils beizustellen und bei Montage anzupassen

Die Montage:
 3 Unterlagene Röhren; Lieferung HALBERG.
 4 Rotaxlöse 1 Einstellschraube BM 24x80 nach DIN 561.
 Oberstand nach Montage abtrennen!
 Siltzahnbelastung mit 3x 4 Schweißschrauben M16x45
 Filze mit Unterlagelagern ausrichten (Lieferant STERLING).
 3 alte Rollen Röhren
 1 adjusting screw BM24x80, DIN561 per late support;
 Remove projecting length after installation.
 Fastening of support feet with 3x 4 hexagon bolts M16x45.
 Align feet using filze (DELTA/SLANG supply).



CB & UGWINNETT COUNTY PHASE II ESD
 CONTRACT NO. 127047
 PO 139424
 STERLING FLUID SYSTEM SO 23030042
 DRAFT TUBE SLUDGE MIXERS
 TAG: 40:DSL-MIX-3/4/5

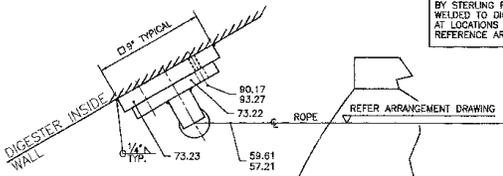
Kilronlage GWINNETT COUNTY

Verzeichnis	Spez. u. Abstände	30	Inspektion	Mitte ohne Teilung	10
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9
10	10	10	10	10	10

Aufstellungsplan
 1:10
 Zeichnung-Nr. 141.5498.51.0238

WALL PLATE MOUNTING DETAIL

PART No. 73.23 -
WALL ANCHOR PLATE TO BE FURNISHED
BY STERLING FLUID SYSTEMS AND
WELDED TO DIGESTER WALL BY OTHERS
AT LOCATIONS SHOWN.
REFERENCE ARRANGEMENT DRAWING.



PROJECT NAME: _____

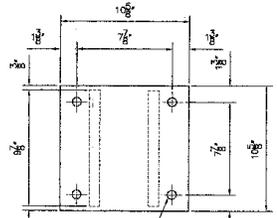
FLOOR CONSOLE TABULATION (INCHES)		
MIXER SIZE	A	REFERENCE ARRANGEMENT DRAWING NO.
MFS 4	1.25	L141.5498-51.0229 Rev. 3
MFS 8	1.25	
MFS 8	1.025	

MATERIAL: A36 TO BE COATED PER SPEC BY OTHERS.

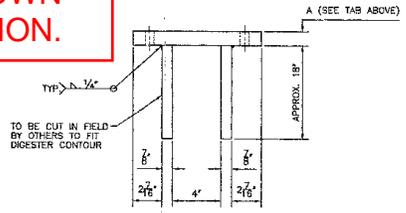
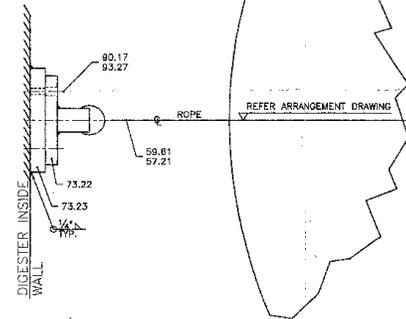
FLOOR CONSOLE - SUPPLIED BY OTHERS

REFERENCE ARRANGEMENT DRAWING

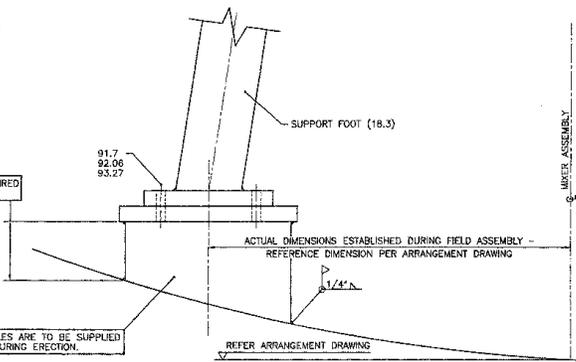
IMPORTANT:
1.) SUPPORT FEET, POS. 18.3, TO BE MOUNTED WITH SUPPORT PLATE, POS. 89.5, AND STEEL CONSOLES OF DIGESTER.
2.) HORIZONTAL ADJUSTMENT OF THE SUPPORT PLATE TO THE DIGESTER CENTER.
3.) FINISHING WELDING OF THE STEEL CONSOLES TO THE DIGESTER.



DIMENSIONAL INFORMATION SHOWN FOR ORIGINAL MIXER INSTALLATION.



MINIMUM OF 3 INCHES REQUIRED FOR WELDING CLEARANCE



THE DIGESTER STEEL CONSOLES ARE TO BE SUPPLIED BY OTHERS AND TO ADAPT DURING ERECTION.

DIMENSIONAL TOLERANCES

0" - 12"	±0.125"
13" - 36"	±0.250"
37" - 72"	±0.500"
73" AND LARGER	±1.000"

1	REVISED	SEE ECN No. A153/99	JAB	PC	12/6/99
0	ISSUED	STANDARD DRAWING	SCB		
<p>STERLING-FLUID</p> <p>Sterling Fluid Systems (USA) 200 HAWTHORNE INDUSTRIAL CENTER, SUITE 111, HAWTHORNE, NJ 07030 Telephone: 781-773-5459 Fax: 770-773-2000 An ISO 9001 Registered Company</p>					
SCALE	1" = 1'	DRAWING NUMBER	2253		
CUSTOMER					
CUSTOMER P.O.					
<p>MIXER - ANCHORING PARTS MOUNTING DETAILS</p> <p><small>THIS DOCUMENT IS THE PROPERTY OF STERLING FLUID SYSTEMS (USA) AND IS LOANED TO YOU FOR THE PURPOSE OF INFORMATION CONTAINED HEREIN AND RETURNED TO STERLING FLUID SYSTEMS (USA) UPON COMPLETION OF THE PROJECT. NO REPRODUCTION OR DISSEMINATION OF THIS INFORMATION MAY BE MADE WITHOUT THE WRITTEN CONSENT OF STERLING FLUID SYSTEMS (USA).</small></p>					

ATTACHMENT 2: Phase 2 O&M

Separate Document

SPECIFICATIONS

Gwinnett County Department of Water Resources

F. Wayne Hill Water Resources Center

TECHNICAL REQUIREMENTS

for the equipment procurement of the

Replacement Mixers for Digesters 1 and 2

JACOBS

Atlanta, GA

12/12/2025

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Project No. **GCDWR064**

Copy No. 1

BL011-26 PURCHASE OF REPLACEMENT MIXERS FOR DIGESTERS 1 AND 2
AT THE F WAYNE HILL WATER RESOURCES CENTER

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TECHNICAL SPECIFICATIONS

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01 78 23	Operation and Maintenance Data.....	1-8

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DIVISION 26—ELECTRICAL

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DIVISION 43—PROCESS GAS AND LIQUID HANDLING, PURIFICATION,
AND STORAGE EQUIPMENT

43 24 13.40	Draft Tube Mixers.....	1-11
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DIVISION 44 THROUGH DIVISION 49 (NOT USED)

DRAWINGS (BOUND SEPARATELY)

END OF SECTION

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SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Submittals for equipment to be provided for the mixer replacement shall be made in accordance with this section.
- B. Action Submittal: Written and graphic information submitted by Vendor that requires Engineer's approval.
- C. Informational Submittal: Information submitted by Contractor that requires Engineer's review and determination that submitted information is in accordance with the Conditions of the Contract.

1.02 PROCEDURES

- A. Direct submittals to Engineer at the following, unless specified otherwise.
 - 1. JACOBS
Attn: Michael Stowers
 - 2. E-mail: Michael.stowers@jacobs.com
- B. Electronic Submittals: Submittals shall, unless specifically accepted, be made in electronic format.
 - 1. Each submittal shall be an electronic file in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.
 - 2. Electronic files that contain more than 10 pages in PDF format shall contain internal bookmarking from an index page to major sections of the document.
 - 3. PDF files shall be set to open "Bookmarks and Page" view.
 - 4. Add general information to each PDF file, including title, subject, author, and keywords.
 - 5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.
 - 6. Submit new electronic files for each resubmittal.
 - 7. Engineer will reject submittal that is not electronically submitted, unless specifically accepted.

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8. Provide Engineer with authorization to reproduce and distribute each file as many times as necessary for Project documentation.
9. Detailed procedures for handling electronic submittals will be discussed at the preconstruction conference.

C. Transmittal of Submittal:

1. Equipment Vendor shall:
 - a. Review each submittal and check for compliance with Contract Documents.
 - b. Stamp each submittal with uniform approval stamp before submitting to Engineer.
 - 1) Stamp to include Project name, submittal number, Specification number, Equipment Vendor's reviewer name, date of approval, and statement certifying submittal has been reviewed, checked, and approved for compliance with Contract Documents.
 - 2) Engineer will not review submittals that do not bear
2. Complete, sign, and transmit the submittal package, one Transmittal of Submittal form attached at end of this section.
3. Identify each submittal with the following:
 - a. Numbering and Tracking System:
 - 1) Sequentially number each submittal.
 - 2) Resubmission of submittal shall have original number with sequential alphabetic suffix.
 - b. Specification section and paragraph to which submittal applies.
 - c. Project title and Engineer's project number.
 - d. Date of transmittal.
4. Identify and describe each deviation or variation from Contract Documents.

D. Format:

1. Do not base Shop Drawings on reproductions of Contract Documents.
2. Package submittal information by individual specification section. Do not combine different specification sections together in submittal package, unless otherwise directed in specification.
3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract Documents.
4. Index with labeled tab dividers in orderly manner.

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- E. Timeliness: Schedule and submit in accordance Schedule of Submittals and requirements of individual specification sections.
- F. Processing Time:
 - 1. Time for review shall commence on Engineer's receipt of submittal.
 - 2. Engineer will act upon Vendor's submittal and transmit response to Vendor not later than 30 days after receipt, unless otherwise specified.
 - 3. Resubmittals will be subject to same review time.
- G. Resubmittals: Clearly identify each correction or change made.
- H. Incomplete Submittals:
 - 1. Engineer will return entire submittal for revision if preliminary review deems it incomplete.
 - 2. When any of the following are missing, submittal will be deemed incomplete:
 - a. Vendor's review stamp; completed and signed.
 - b. Transmittal of Contractor's Submittal; completed and signed.
 - c. Insufficient number of copies.
- I. Submittals not required by Contract Documents:
 - 1. Will not be reviewed and will be returned stamped "Not Subject to Review."
 - 2. Engineer will keep one copy and return submittal to Vendor.

1.03 ACTION SUBMITTALS

- A. Prepare and submit Action Submittals required by individual specification sections.
- B. Shop Drawings:
 - 1. Copies: Six, and one reproducible, except copyrighted documents.
 - 2. Identify and Indicate:
 - a. Applicable Contract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.
 - b. Equipment and Component Title: Identical to title shown on Drawings.

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- c. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
 - d. Project-specific information drawn accurately to scale.
 3. Vendor's standard schematic drawings and diagrams as follows:
 - a. Modify to delete information that is not applicable to the Work.
 - b. Supplement standard information to provide information specifically applicable to the Work.
 4. Product Data: Provide as specified in individual specifications.
- C. Action Submittal Dispositions: Engineer will review, comment, stamp, and distribute as noted:
 1. Approved:
 - a. Contractor may incorporate product(s) or implement Work covered by submittal.
 - b. Distribution: Electronic.
 - 1) One copy furnished Owner.
 - 2) One copy retained in Engineer's file.
 - 3) Remaining copies returned to Supplier appropriately annotated.
 2. Approved as Noted:
 - a. Vendor may incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
 - b. Distribution: Electronic.
 - 1) One copy furnished Owner.
 - 2) One copy retained in Engineer's file.
 - 3) Remaining copies returned to Vendor appropriately annotated.
 3. Partial Approval, Resubmit as Noted:
 - a. Make corrections or obtain missing portions, and resubmit.
 - b. Except for portions indicated, Vendor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
 - c. Distribution: Electronic.
 - 1) One copy furnished Owner.
 - 2) One copy retained in Engineer's file.
 - 3) Remaining copies returned to Vendor appropriately annotated.
 4. Revise and Resubmit:
 - a. Vendor may not incorporate product(s) or implement Work covered by submittal.
 - b. Distribution: Electronic.

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- 1) One copy retained in Engineer's file.
- 2) Remaining copies returned to Vendor appropriately annotated.

1.04 INFORMATIONAL SUBMITTALS

A. General:

1. Copies: Submit five copies, unless otherwise indicated in individual specification section.
2. Refer to individual specification sections for specific submittal requirements.
3. Engineer will review each submittal. If submittal meets conditions of the Contract, Engineer will forward copy to appropriate parties. If Engineer determines submittal does not meet conditions of the Contract and is therefore considered unacceptable, Engineer will retain one copy and return remaining copy with review comments to Vendor, and require that submittal be corrected and resubmitted.

B. Certificates:

1. General:
 - a. Provide notarized statement that includes signature of entity responsible for preparing certification.
 - b. Signed by officer or other individual authorized to sign documents on behalf of that entity.
2. Welding: In accordance with individual specification sections.
3. Installer: Prepare written statements on vendor's letterhead certifying installer complies with requirements as specified in individual specification section.
4. Material Test: Prepared by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
5. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual specification sections.
6. Vendor's Certificate of Compliance: In accordance with Section 01 61 00, Common Product Requirements.
7. Vendor's Certificate of Proper Installation: In accordance with Section 01 43 33, Vendors' Field Services.

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- C. Vendor's Instructions: Written or published information that documents vendor's recommendations, guidelines, and procedures in accordance with individual specification section.
- D. Operation and Maintenance Data: As required in Section 01 78 23, Operation and Maintenance Data.
- E. Test, Evaluation, and Inspection Reports:
 - 1. General: Shall contain signature of person responsible for test or report.
 - 2. Factory:
 - a. Identification of product and specification section, type of inspection or test with referenced standard or code.
 - b. Date of test, Project title and number, and name and signature of authorized person.
 - c. Test results.
 - d. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
 - e. Provide interpretation of test results, when requested by Engineer.
 - f. Other items as identified in individual specification sections.
 - 3. Field:
 - a. As a minimum, include the following:
 - 1) Project title and number.
 - 2) Date and time.
 - 3) Record of temperature and weather conditions.
 - 4) Identification of product and specification section.
 - 5) Type and location of test, Sample, or inspection, including referenced standard or code.
 - 6) Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
 - 7) If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
 - 8) Provide interpretation of test results, when requested by Engineer.
 - 9) Other items as identified in individual specification sections.
- F. Training Data: In accordance with Section 01 43 33, Vendors' Field Services.

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1.05 SUPPLEMENTS

A. The supplements listed below, following “End of Section”, are part of this specification.

1. Forms: Transmittal of Submittal.

END OF SECTION

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TRANSMITTAL OF VENDOR'S SUBMITTAL (ATTACH TO EACH SUBMITTAL)			
DATE: _____			
TO: _____ _____ _____ _____ FROM: _____ <div style="text-align: center;">Vendor</div> _____ _____ _____	Submittal No.: _____ <input type="checkbox"/> New Submittal <input type="checkbox"/> Resubmittal Project: _____ Project No.: _____ Specification Section No.: _____ (Cover only one section with each transmittal) Schedule Date of Submittal: _____		
SUBMITTAL TYPE:	<input type="checkbox"/> Shop Drawing	<input type="checkbox"/> Sample	<input type="checkbox"/> Informational
	<input type="checkbox"/> Deferred		

The following items are hereby submitted:

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Spec. and Para. No.	Drawing or Brochure Number	Contains Variation to Contract	
				No	Yes

Vendor hereby certifies that (i) Vendor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By: _____
Vendor (Authorized Signature)

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SECTION 01 43 33
VENDORS' FIELD SERVICES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Person-Day: One person for 8 hours within regular working hours.

1.02 SUBMITTALS

- A. Informational Submittals:

1. Training Schedule: Submit, in accordance with requirements of this Specification, not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.
2. Lesson Plan: Submit, in accordance with requirements of this Specification, proposed lesson plan not less than 21 days prior to scheduled training and revise as necessary for acceptance.

1.03 QUALIFICATION OF VENDOR'S REPRESENTATIVE

- A. Authorized representative of the vendor, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment vendor to issue the certifications required of the vendor. Additional qualifications may be specified in the individual specification section.
- B. Representative subject to acceptance by Owner and Engineer. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

- A. Furnish vendors' services, when required by an individual specification section, to meet the requirements of this section.
- B. Where time is necessary in excess of that stated in the Specifications for vendors' services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.

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- C. Schedule vendor' services to avoid conflict with other onsite testing or other vendors' onsite services.
- D. Determine, before scheduling services, that conditions necessary to allow successful testing have been met.
- E. Only those days of service approved by Engineer will be credited to fulfill specified minimum services.
- F. When specified in individual specification sections, vendor's onsite services shall include:
 - 1. Field verification to ensure that proposed replacement equipment will match existing installation.
 - 2. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation or application procedures.
 - 3. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by vendor and necessary to furnish Vendor's Certificate of Proper Installation.
 - 4. Providing, on a daily basis, copies of vendors' representatives field notes and data to Engineer.
 - 5. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Engineer.
 - 6. Resolution of assembly or installation problems attributable to or associated with respective vendor's products and systems.
 - 7. Assistance during functional testing, equipment startup, and evaluation.
 - 8. Training of Owner's personnel in the operation and maintenance of respective product as required.

3.02 VENDOR'S CERTIFICATE OF PROPER INSTALLATION

- A. When so specified, a Vendor's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by equipment vendor's representative.
- B. Such form shall certify signing party is a duly authorized representative of vendor, is empowered by vendor to inspect, approve, and operate their equipment and is authorized to make recommendations required to ensure equipment is complete and operational.

3.03 TRAINING

- A. General:

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1. Furnish vendors' representatives for detailed classroom and hands-on training to Owner's personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.
2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with Owner, and familiar with operation and maintenance manual information specified in Section 01 78 23, Operation and Maintenance Data.
3. Vendor's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.

B. Training Schedule:

1. List specified equipment and systems that require training services and show:
 - a. Respective vendor.
 - b. Estimated dates for installation completion.
 - c. Estimated training dates.
2. Allow for multiple sessions when several shifts are involved.
3. Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by vendors' representatives. Adjust schedule for interruptions in operability of equipment.

C. Lesson Plan: When vendor or vendor training of Owner personnel is specified, prepare a lesson plan for each required course containing the following minimum information:

1. Title and objectives.
2. Recommended attendees (such as, managers, engineers, operators, maintenance).
3. Course description, outline of course content, and estimated class duration.
4. Format (such as, lecture, self-study, demonstration, hands-on).
5. Instruction materials and equipment requirements.
6. Resumes of instructors providing training.

D. Prestartup Training:

1. Coordinate training sessions with Owner's operating personnel and vendors' representatives and with submission of operation and

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maintenance manuals in accordance with Section 01 78 23, Operation and Maintenance Data.

2. Complete at least 14 days prior to beginning of equipment startup.
- E. Post-startup Training: If required in Specifications, furnish and coordinate training of Owner's operating personnel by respective vendor's representatives.

3.04 SUPPLEMENTS

- A. The supplement listed below, following "End of Section," is part of this specification.
1. Vendor's Certificate of Proper Installation.

END OF SECTION

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VENDOR'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____
EQPT TAG NO: _____ EQPT/SYSTEM: _____
PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- Installed in accordance with Vendor's recommendations.
- Inspected, checked, and adjusted.
- Serviced with proper initial lubricants.
- Electrical and mechanical connections meet quality and safety standards.
- All applicable safety equipment has been properly installed.
- Functional tests.

Comments: _____

I, the undersigned Vendor's Representative, hereby certify that I am (i) a duly authorized representative of the vendor, (ii) empowered by the vendor to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the vendor is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20__

Vendor: _____

By Vendor's Authorized Representative: _____
(Authorized Signature)

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SECTION 01 61 00
COMMON PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Products:

1. New items for incorporation in the Work, whether purchased by Contractor or Owner for the Project, or taken from previously purchased stock, and may also include existing materials or components required for reuse.
2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change meaning of such other terms used in Contract Documents, as those terms are self-explanatory and have well recognized meanings in construction industry.
3. Items identified by vendor's product name, including make or model designation, indicated in vendor's published product literature, that is current as of the date of the Contract Documents.

1.02 ENVIRONMENTAL REQUIREMENTS

- A. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at 1,200 feet above sea level.
- B. Provide equipment and devices installed outdoors or in unheated enclosures capable of continuous operation within an ambient temperature range of 15 degrees F to 104 degrees F.

1.03 PREPARATION FOR SHIPMENT

- A. When practical, factory assemble products. Mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable protective coating.
- B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and Owner, equipment number, and approximate weight. Include complete packing list and bill of materials with each shipment.

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- C. Mark or tag outside of each package or crate to indicate the following:
1. Purchase order number.
 2. Bill of lading number.
 3. Contents by name.
 4. Name of Project and Owner.
 5. Equipment number.
 6. Approximate weight.
 7. Date of manufacture and shelf life, where applicable.
- D. Extra Materials, Special Tools, Test Equipment, and Expendables:
1. Furnish as required by individual Specifications.
 2. Schedule:
 - a. Ensure that shipment and delivery occurs concurrent with shipment of associated equipment.
 3. Packaging and Shipment:
 - a. Package and ship extra materials and special tools to avoid damage during long term storage in original cartons insofar as possible, or in appropriately sized, hinged-cover, wood, plastic, or metal box.
 - b. Prominently displayed on each package, the following:
 - 1) Vendor's part nomenclature and number, consistent with Operation and Maintenance Manual identification system.
 - 2) Applicable equipment description.
 - 3) Quantity of parts in package.
 - 4) Equipment manufacturer and vendor.
 4. Deliver materials to Site at the following address.

GCDWR ATTN: Jacobs and Gresham Smith
Name

1500 One Water Way, Buford, GA 30519
Street City State Zip
 5. Notify Engineer and Owner upon arrival for transfer of materials.
 6. Replace extra materials and special tools found to be damaged or otherwise inoperable at time of transfer to Owner.
- E. Request a minimum 14-day advance notice of shipment from Vendor. Upon receipt of Vendor's advance notice of shipment, promptly notify Engineer of anticipated date and place of equipment arrival.

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- F. Factory Test Results: Reviewed and accepted by Engineer before product shipment as required in individual Specification sections.

1.04 DELIVERY AND INSPECTION

- A. Deliver products in accordance with accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at Site.
- B. Deliver products in undamaged condition, in Vendor's original container or packaging, with identifying labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.
- C. Provide Vendor's instructions for unloading. Owner and Vendor shall record receipt of products at Site.
- D. Remove damaged products from Site and expedite delivery of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.05 HANDLING, STORAGE, AND PROTECTION

- A. Vendor's instructions for material requiring special handling, storage, or protection shall be provided prior to delivery of material.

WARRANTY

- A. The time of warranty for mechanical parts shall be 36 months from delivery and ends at the latest 42 months after advice of readiness for shipment.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide vendor's standard materials suitable for service conditions, unless otherwise specified in the individual Specifications.
- B. Where product specifications include a named Vendor, with or without model number, and also include performance requirements, named Vendor's products must meet the performance specifications.
- C. Like items of products furnished and installed in the Work shall be end products of one Vendor and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, Vendor's services, and implement same or similar process instrumentation and control functions in same or similar manner.

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- D. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- E. Provide interchangeable components of the same Vendor, for similar components, unless otherwise specified.
- F. Equipment, Components, Systems, and Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations.
- G. Regulatory Requirement: Coating materials shall meet federal, state, and local requirements limiting the emission of volatile organic compounds and for worker exposure.
- H. Safety Guards: Provide for all belt or chain drives, fan blades, couplings, or other moving or rotary parts. Cover rotating part on all sides. Design for easy installation and removal. Use 16-gauge or heavier; galvanized steel, aluminum coated steel, or galvanized or aluminum coated 1/2-inch mesh expanded steel. Provide galvanized steel accessories and supports, including bolts. For outdoors application, prevent entrance of rain and dripping water.
- I. Authority Having Jurisdiction (AHJ):
 - 1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
 - 2. Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories, Inc. shall conform to those standards and shall have an applied UL listing mark.
- J. Equipment Finish:
 - 1. Provide Vendor's standard finish and color, except where specific color is indicated.
- K. Special Tools and Accessories: Furnish to Owner, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), special tools, and other spare parts as required for maintenance.

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- L. Lubricant: Provide initial lubricant recommended by equipment Vendor in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by Owner.

2.02 FABRICATION AND MANUFACTURE

A. General:

1. Manufacture parts to U.S.A. standard sizes and gauges.
2. Two or more items of the same type shall be identical, by the same Vendor, and interchangeable.
3. Design structural members for anticipated shock and vibratory loads.
4. Use 1/4-inch minimum thickness for steel that will be submerged, wholly or partially, during normal operation.
5. Modify standard products as necessary to meet performance Specifications.

B. Lubrication System:

1. Require no more than weekly attention during continuous operation.
2. Convenient and accessible; oil drains with bronze or stainless steel valves and fill-plugs easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
3. Provide constant-level oilers or oil level indicators for oil lubrication systems.
4. For grease type bearings, which are not easily accessible, provide and install stainless steel tubing; protect and extend tubing to convenient location with suitable grease fitting.

2.03 SOURCE QUALITY CONTROL

- A. Calibration Instruments: Bear the seal of a reputable laboratory certifying instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).
- B. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

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PART 3 EXECUTION

3.01 VENDOR'S CERTIFICATE OF COMPLIANCE

- A. When so specified, a Vendor's Certificate of Compliance, a copy of which is attached to this section, shall be completed in full, signed by entity supplying the product, material, or service, and submitted prior to shipment of product or material or execution of the services.
- B. Engineer may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.
- C. Such form shall certify proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.
- D. May reflect recent or previous test results on material or product, if acceptable to Engineer.

3.02 ADJUSTMENT AND CLEANING

- A. Perform required adjustments, tests, operation checks, and other startup activities.

3.03 LUBRICANTS

- A. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by Owner.

3.04 SUPPLEMENTS

- A. The supplement listed below, following "End of Section", is part of this specification.
 - 1. Form: Vendor's Certificate of Compliance.

END OF SECTION

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VENDOR'S CERTIFICATE OF COMPLIANCE

OWNER: _____ PRODUCT, MATERIAL, OR SERVICE
PROJECT NAME: _____ SUBMITTED: _____
PROJECT NO: _____

Comments: _____

I hereby certify that the above-referenced product, material, or service called for by the Contract for the named Project will be furnished in accordance with all applicable requirements. I further certify that the product, material, or service are of the quality specified and conform in all respects with the Contract requirements, and are in the quantity shown.

Date of Execution: _____, 20__

Vendor: _____

Vendor's Authorized Representative (*print*): _____

(Authorized Signature)

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Detailed information for the preparation, submission, and Engineer's review of Operations and Maintenance (O&M) Data, as required by individual Specification sections.

1.02 DEFINITIONS

- A. Preliminary Data: Initial and subsequent submissions for Engineer's review.
- B. Final Data: Engineer-accepted data, submitted as specified herein.
- C. Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

1.03 SEQUENCING AND SCHEDULING

- A. Equipment and System Data:
 - 1. Final Data: Submit Instructional Manual Formatted data at least 30 days prior to installation of equipment. Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project and Final Invoice.
- B. Materials and Finishes Data:
 - 1. Final Data: Submit within 10 days after final inspection.

1.04 DATA FORMAT

- A. Prepare final data in the form of an instructional manual. Prepare final data on electronic media.
- B. Instructional Manual Format:

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1. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
2. Size: 8-1/2 inches by 11 inches, minimum.
3. Cover: Identify manual with typed or printed title "OPERATION AND MAINTENANCE DATA" and list:
 - a. Project title.
 - b. Designate applicable system, equipment, material, or finish.
 - c. Identity of separate structure as applicable.
 - d. Identity of equipment number and Specification section.
4. Spine:
 - a. Project title.
5. Title Page:
 - a. Contractor name, address, and telephone number.
 - b. Vendor, installer, or maintenance contractor's name, address, and telephone number, as appropriate.
 - 1) Identify area of responsibility of each.
 - 2) Provide name and telephone number of local source of supply for parts and replacement.
6. Table of Contents:
 - a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
 - b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
7. Paper: 20-pound minimum, white for typed pages.
8. Text: Vendor's printed data, or neatly typewritten.
9. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

C. Electronic Media Format:

1. Portable Document Format (PDF):
 - a. After all preliminary data has been found to be acceptable to Engineer, submit Operation and Maintenance data in PDF format in electronic format.
 - b. Files to be exact duplicates of Engineer-accepted preliminary data. Arrange by specification number and name.
 - c. Files to be fully functional and viewable in most recent version of Adobe Acrobat.

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1.05 SUBMITTALS

A. Informational:

1. Data Outline: Submit one electronic copy of a detailed outline of proposed organization and contents of Final Data prior to preparation of Preliminary Data.
2. Preliminary Data:
 - a. Submit two copies for Engineer's review.
 - b. If data meets conditions of the Contract:
 - 1) One copy will be retained in Owner's file.
 - 2) One copy will be retained in Engineer's file.
 - c. If data does not meet conditions of the Contract:
 - 1) All copies will be returned with Engineer's comments (on separate document) for revision.
 - 2) Engineer's comments will be retained in Engineer's file.
 - 3) Resubmit copies revised in accordance with Engineer's comments.
3. Final Data: Submit two hard copies and one electronic copy of the final approved manual for Owner's usage.

1.06 DATA FOR EQUIPMENT AND SYSTEMS

A. Content For Each Unit (or Common Units) and System:

1. Product Data:
 - a. Include only those sheets that are pertinent to specific product.
 - b. Clearly annotate each sheet to:
 - 1) Identify specific product or part installed.
 - 2) Identify data applicable to installation.
 - 3) Delete references to inapplicable information.
 - c. Function, normal operating characteristics, and limiting conditions.
 - d. Performance curves, engineering data, nameplate data, and tests.
 - e. Complete nomenclature and commercial number of replaceable parts.
 - f. Original Vendor's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
 - g. Spare parts ordering instructions.
 - h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).

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2. Drawings: Supplement product data with Drawings as necessary to clearly illustrate:
 - a. Format:
 - 1) Provide reinforced, punched, binder tab; bind in with text.
 - 2) Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
 - 3) Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
 - 4) Identify Specification section and product on Drawings and envelopes.
 - b. Relations of component parts of equipment and systems.
 - c. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
3. Instructions and Procedures: Within text, as required to supplement product data.
 - a. Format:
 - 1) Organize in consistent format under separate heading for each different procedure.
 - 2) Provide logical sequence of instructions for each procedure.
 - 3) Provide information sheet for Owner's personnel, including:
 - a) Proper procedures in event of failure.
 - b) Instances that might affect validity of guarantee or Bond.
 - b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
 - c. Operating Procedures:
 - 1) Startup, break-in, routine, and normal operating instructions.
 - 2) Test procedures and results of factory tests where required.
 - 3) Regulation, control, stopping, and emergency instructions.
 - 4) Description of operation sequence by control manufacturer.
 - 5) Shutdown instructions for both short and extended duration.
 - 6) Summer and winter operating instructions, as applicable.
 - 7) Safety precautions.
 - 8) Special operating instructions.
 - d. Maintenance and Overhaul Procedures:
 - 1) Routine maintenance.
 - 2) Guide to troubleshooting.
 - 3) Disassembly, removal, repair, reinstallation, and re-assembly.

B. Content for Each Electric or Electronic Item or System:

1. Description of Unit and Component Parts:

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- a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data, nameplate data, and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Interconnection wiring diagrams, including control and lighting systems.
2. Electrical service.
 3. Control requirements and interfaces.
 4. Communication requirements and interfaces.
 5. List of electrical relay settings, and control and alarm contact settings.
 6. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
 7. Operating Procedures:
 - a. Routine and normal operating instructions.
 - b. Startup and shutdown sequences, normal and emergency.
 - c. Safety precautions.
 - d. Special operating instructions.
 8. Maintenance Procedures:
 - a. Routine maintenance.
 - b. Guide to troubleshooting.
 - c. Adjustment and checking.
 - d. List of relay settings, control and alarm contact settings.
 9. Vendor's printed operating and maintenance instructions.
 10. List of original Vendor's spare parts, Vendor's current prices, and recommended quantities to be maintained in storage.
- C. Maintenance Summary:
1. Compile individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.
 2. Format:
 - a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.
 - b. Each Maintenance Summary may take as many pages as required.
 - c. Use only 8-1/2-inch by 11-inch size paper.
 - d. Complete using typewriter or electronic printing.
 3. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.
 4. Recommended Spare Parts:

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- a. Data to be consistent with Vendor's Bill of Materials/Parts List furnished in O&M manuals.
- b. "Unit" is the unit of measure for ordering the part.
- c. "Quantity" is the number of units recommended.
- d. "Unit Cost" is the current purchase price.

1.07 SUPPLEMENTS

A. The supplements listed below, following "End of Section", are part of this Specification.

1. Forms: Maintenance Summary Form.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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MAINTENANCE SUMMARY FORM

PROJECT: _____ CONTRACT NO.: _____

1. EQUIPMENT ITEM _____

2. VENDOR _____

3. EQUIPMENT/TAG NUMBER(S) _____

4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) _____

5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____

6. VENDOR'S LOCAL REPRESENTATIVE _____

a. Name _____ Telephone No. _____

b. Address _____

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	Frequency	Lubricant (If Applicable)
List briefly each maintenance operation required and refer to specific information in Vendor's standard maintenance manual, if applicable. (Reference to Vendor's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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SECTION 26 20 00
LOW-VOLTAGE AC INDUCTION MOTORS

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. This section applies to low-voltage AC induction motors, whether or not referenced by a motor-driven equipment specification. If equipment specification section deviates from this section in requirements such as, application, horsepower, enclosure type, mounting, shaft type, or synchronous speed, then those listed requirements shall take precedence over this section.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Bearing Vendors Association (ABMA):
 - a. 9, Load Ratings and Fatigue Life for Ball Bearings.
 - b. 11, Load Ratings and Fatigue Life for Roller Bearings.
 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
 - b. 620, Guide for the Presentation of Thermal Limit Curves for Squirrel Cage Induction Machines.
 - c. 841, Standard for Petroleum and Chemical Industry—Premium Efficiency Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors—Up to and Including 370 kW (500 hp).
 3. National Electrical Vendors Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. C50.41, Polyphase Induction Motors for Power Generating Stations.
 - c. MG 1, Motors and Generators.
 4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
 5. UL:
 - a. 83, Standard for Safety for Thermoplastic-Insulated Wire and Cables.
 - b. 674, Standard for Safety for Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.
 - c. 2111, Standard for Safety for Overheating Protection for Motors.

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1.03 DEFINITIONS

- A. CISD-TEFC: Chemical industry, severe-duty enclosure.
- B. EXP: Explosion-proof enclosure.
- C. Inverter Duty Motor: Motor meeting applicable requirements of NEMA MG 1, Section IV, Parts 30 and 31.
- D. Inverter Ready Motor: Motor meeting applicable requirements of NEMA MG 1, Section IV, Part 31.4.4.2.
- E. Motor Nameplate Horsepower: That rating after any derating required to allow for extra heating caused by the harmonic content in the voltage applied to the motor by its controller.
- F. ODP: Open drip-proof enclosure.
- G. TEFC: Totally enclosed, fan-cooled enclosure.
- H. TENV: Totally enclosed, nonventilated enclosure.
- I. VPI: Vacuum pressure impregnated.
- J. WPI: Open weather protected enclosure, Type I.
- K. WPII: Open weather protected enclosure, Type II.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Descriptive information.
 - 2. Nameplate data in accordance with NEMA MG 1.
 - 3. Additional Rating Information:
 - a. Service factor.
 - b. Locked rotor current.
 - c. No load current.
 - d. Safe stall time for motors 50 hp and larger.
 - e. Multispeed load classification (for example, variable torque).
 - f. Adjustable frequency drive motor load classification (for example, variable torque) and minimum allowable motor speed for that load classification.
 - g. Guaranteed minimum full load efficiency and power factor.
 - 4. Enclosure type and mounting (such as, horizontal, vertical).

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5. Dimensions and total weight.
6. Conduit box dimensions and usable volume as defined in NEMA MG 1 and NFPA 70.
7. Bearing type.
8. Bearing lubrication.
9. Bearing life.
10. Space heater voltage and watts.
11. Description, ratings, and wiring diagram of motor thermal protection.
12. Motor sound power level in accordance with NEMA MG 1.
13. Maximum brake horsepower required by the equipment driven by the motor.

B. Informational Submittals:

1. Factory test reports, certified.
2. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
3. Vendor's Certificate of Proper Installation, in accordance with Section 01 43 33, Vendors' Field Services.

PART 2 PRODUCTS

2.01 VENDORS

A. Materials, equipment, and accessories specified in this section shall be products of:

1. General Electric.
2. MagneTek.
3. Siemens Energy and Automation, Inc., Motors and Drives Division.
4. Baldor.
5. U.S. Electrical Motors.
6. TECO-Westinghouse Motor Co.
7. Toshiba International Corp., Industrial Division.
8. WEG Electric Motors Corp.
9. or approved equal.

2.02 GENERAL

- A. For multiple units of the same type of equipment, furnish identical motors and accessories of a single vendor.
- B. In order to obtain single source responsibility, use a single vendor to provide drive motor, its driven equipment, and specified motor accessories.

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- C. Meet requirements of NEMA MG 1.
- D. For motors used in hazardous (classified) locations, Class I, Division 1, Groups B, C, and D, and Class II, Division 1, Groups E, F, and G provide motors that conform to UL 674 and have an applied UL listing mark.
- E. Provide motors specifically designed for the use and conditions intended, with a NEMA design letter classification to fit the application.
- F. Lifting lugs on motors weighing 100 pounds or more.
- G. Operating Conditions:
 - 1. Maximum ambient temperature not greater than 50 degrees C.
 - 2. Provide motors suitable for operating conditions without reduction in nameplate rated horsepower or exceeding rated temperature rise.
 - 3. Overspeed in either direction in accordance with NEMA MG 1.

2.03 HORSEPOWER RATING

- A. As designated in motor-driven equipment specification.
- B. Constant Speed Applications: Brake horsepower of driven equipment at any operating condition not to exceed motor nameplate horsepower rating, excluding service factor.
- C. Adjustable Frequency and Adjustable Speed Applications (Inverter Duty Motor, Inverter Ready Motor): Driven equipment brake horsepower at any operating condition not to exceed motor nameplate horsepower rating, excluding service factor.
- D. Special Project Requirement: The two (2) new mixer motors shall each include a nameplate horsepower rating not to exceed 20 HP. The motor nameplate rating of the new mixer motors shall also include a maximum FLA rating of 26A in order to match the FLA rating of the existing motors that are currently installed.

2.04 SERVICE FACTOR

- A. Inverter-Duty Motors: 1.0 at rated ambient temperature, unless otherwise noted.
- B. Other Motors: 1.15 minimum at rated ambient temperature, unless otherwise noted.

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2.05 VOLTAGE AND FREQUENCY RATING

- A. System Frequency: 60 Hz.
- B. Voltage Rating: Unless otherwise indicated in motor-driven equipment specification: 480V, 3 Phase.
- C. Suitable for full voltage starting.
- D. Suitable for accelerating the connected load with supply voltage at motor starter supply terminals dipping to 90 percent of motor rated voltage.

2.06 EFFICIENCY AND POWER FACTOR

- A. For all motors except single-phase, under 1 hp, multispeed, short-time rated and submersible motors, or motors driving gates, valves, elevators, cranes, trolleys, and hoists:
 - 1. Efficiency:
 - a. Tested in accordance with NEMA MG 1, Paragraph 12.59.
 - b. Guaranteed minimum at full load in accordance with NEMA MG 1 Table 12-12, Full-load Efficiencies for NEMA Premium Efficiency Electric Motors Rated 600 Volts or Less (Random Wound), or as indicated **in motor**-driven equipment specification.
 - 2. Power Factor: Guaranteed minimum at full load shall be vendor's standard or as indicated in motor-driven equipment specification.

2.07 LOCKED ROTOR RATINGS

- A. Locked rotor kVA Code F or lower, if motor horsepower not covered by NEMA MG 1 tables.
- B. Safe Stall Time: 12 seconds or greater.

2.08 INSULATION SYSTEMS

- A. Three-phase and Integral Horsepower Motors: Unless otherwise indicated in motor-driven equipment specification, Class F with Class B rise at nameplate horsepower and designated operating conditions.
- B. Motors With Form-Wound Coils: Locked coil bracing system in accordance with NEMA C50.41.

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2.09 ENCLOSURES

- A. Conform to NEMA MG 1.
- B. TEFC and TENV: Furnish with drain hole with porous drain/weather plug.
- C. Explosion-Proof (EXP):
 - 1. TEFC listed to meet UL 674 and NFPA 70 requirements for Class I, Division 1, Group C and D hazardous locations.
 - 2. Drain holes with drain and breather fittings.
 - 3. Integral thermostat opening on excessive motor temperature in accordance with UL 2111 and NFPA 70.
 - 4. Terminate thermostat leads in terminal box separate from main terminal box.

2.10 TERMINAL (CONDUIT) BOXES

- A. Oversize main terminal boxes for motors.
- B. Diagonally split, rotatable to each of four 90-degree positions. Threaded hubs for conduit attachment.
- C. Except ODP, furnish gaskets between box halves and between box and motor frame.
- D. Minimum usable volume in percentage of that specified in NEMA MG 1, Section 1, Paragraph 4.19 and NFPA 70, Article 430:

Terminal Box Usable Value		
Voltage	Horsepower	Percentage
Below 600	15 through 125	500

- E. Terminal for connection of equipment grounding wire in each terminal box.
- F. Coordinate motor terminal box conduit entries versus size and quantity of conduits shown on Drawings.

2.11 BEARINGS AND LUBRICATION

- A. Horizontal Motors:
 - 1. 1 hp through 400 hp: Regreasable ball bearings in labyrinth sealed end bells with removable grease relief plugs.

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2. For Direct Drive Equipment: Minimum 100,000 hours L-10 bearing life for ball and roller bearings as defined in ABMA 9 and ABMA 11.
3. For Belt Driven Equipment: Minimum 30,000 hours L-10 bearing life for ball and roller bearings as defined in ABMA 9 and ABMA 11.

B. Vertical Motors:

1. Thrust Bearings:
 - a. Antifriction bearing.
 - b. Vendor's standard lubrication 100 hp and smaller.
 - c. Minimum 50,000 hours L-10 bearing life.
2. Guide Bearings:
 - a. Vendor's standard bearing type.
 - b. Vendor's standard lubrication 200 hp and smaller.
 - c. Minimum 100,000 hours L-10 bearing life.

C. Regreasable Antifriction Bearings:

1. Readily accessible, grease injection fittings.
2. Readily accessible, removable grease relief plugs.

D. Oil Lubrication Systems:

1. Oil reservoirs with sight level gauge.
2. Oil fill and drain openings with opening plugs.
3. Provisions for necessary oil circulation and cooling.

2.12 NOISE

- A. Measured in accordance with NEMA MG 1.
- B. Maximum Sound Level for Motors Controlled by Adjustable Frequency Drive Systems: 3 dBA higher than NEMA MG 1.

2.13 BALANCE AND VIBRATION CONTROL

- A. In accordance with NEMA MG 1, Part 7.

2.14 EQUIPMENT FINISH

- A. Protect Motor for Service Conditions:
 1. ODP Enclosures: Indoor industrial atmospheres.
 2. Other Enclosures: Outdoor industrial atmospheres, including moisture and direct sunlight exposure.

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- B. External Finish: Prime and finish coat vendor's standard.
- C. Internal Finish: Bore and end turns coated with clear polyester or epoxy varnish.

2.15 SPECIAL FEATURES AND ACCESSORIES

- A. Screen Over Air Openings: Stainless steel **on** motors with ODP, WPI, and WPII enclosures meeting requirements for guarded machine in NEMA MG 1, and attached with stainless steel screws.
- B. Winding Thermal Protection:
 - 1. Thermostats:
 - a. Motors for constant speed application through 20 hp.
 - b. Bi-metal disk or rod type thermostats embedded in stator windings.
 - c. Automatic reset contacts rated 120 volts ac, 5 amps minimum, opening on excessive temperature. (Provide manual reset at motor controller.)
 - d. Leads extending to separate terminal box for motors 100 hp and larger.
- C. Space Heaters:
 - 1. Provide winding space heaters with leads wired out to motor terminal box.
 - 2. Provide extra hole or hub on motor terminal box as required.
 - 3. Unless shown otherwise, heater shall be suitable for 120V ac supply, with wattage suitable for motor frame size.
- D. Nameplates:
 - 1. Raised or stamped letters on stainless steel or aluminum.
 - 2. Display motor data required by NEMA MG 1, Paragraph 10.39 and Paragraph 10.40 in addition to bearing numbers for both bearings.
 - 3. Premium efficiency motor nameplates to display NEMA nominal efficiency, guaranteed minimum efficiency, full load power factor, and maximum allowable kVAR for power factor correction capacitors.
- E. Anchor Bolts: Provide meeting vendor's recommendations and of sufficient size and number for specified seismic condition.

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2.16 SPECIAL MOTORS

- A. Requirements in this article take precedence over conflicting features specified elsewhere in this section.
- B. Chemical Industry, Severe-Duty (CISD-TEFC):
 - 1. In accordance with IEEE 841.
 - 2. TEFC in accordance with NEMA MG 1.
 - 3. Suitable for indoor or outdoor installation in severe-duty applications including high humidity, chemical (corrosive), dirty, or salty atmospheres.
 - 4. Motor Frame, End Shields, Terminal Box, and Fan Cover: Cast iron.
 - 5. Ventilating Fan: Corrosion-resistant, nonsparking, external.
 - 6. Drain and Breather Fittings: Stainless steel.
 - 7. Nameplate: Stainless steel.
 - 8. Gaskets between terminal box halves and terminal box and motor frame.
 - 9. Extra slinger on rotor shaft to prevent moisture seepage along shaft into motor.
 - 10. Double shielded bearings.
 - 11. 125,000 hours minimum L-10 bearing life for direct-connected loads.
 - 12. External Finish: Double-coated epoxy enamel.
 - 13. Coated rotor and stator air gap surfaces.
 - 14. Insulation System, Windings, and Connections:
 - a. Class F insulation, Class B rise or better at 1.0 service factor.
 - b. Multiple dips and bakes of nonhygroscopic polyester varnish.
 - 15. Service Factor:
 - a. At 40 Degrees C Ambient: 1.15.
 - b. At 65 Degrees C Ambient: 1.00.
 - 16. Safe Stall Time Without Injurious Heating: 20 seconds minimum.
- C. Severe-duty Explosion-proof: Meet requirements for EXP enclosures and CISD-TEFC motors.
- D. Multispeed: Meet requirements for speeds, number of windings, and load torque classification indicated in motor-driven equipment specification.
- E. Inverter Duty Motor:
 - 1. Motor Supplied Power by Adjustable Voltage and Adjustable Frequency Drives: Inverter duty rated in accordance with NEMA Parts 30 and 31.
 - 2. Provide winding insulation rated 1,600 peak volts, minimum.
 - 3. Meet or exceed NEMA MG 1 corona inception voltage rating.

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4. Provide one insulated bearing.
5. Suitable for operation over entire speed range indicated.
6. Provide forced ventilation where speed ratio is greater than published range for motor provided.
7. When installed in Division 1 hazardous (classified) location, provide motor identified by vendor as suitable use with a variable speed drive in a Division 1 location.
8. Shaft Grounding Device, Motors Larger than 20 hp: Furnish with shaft grounding brush or conductive micro fiber shaft grounding ring solidly bonded to grounded motor frame in accordance with vendor's recommendations.
 - a. Vendors:
 - 1) Grounding Brush: Sohre Turbomachinery, Inc.
 - 2) Grounding Ring: EST-Aegis.

2.17 FACTORY TESTING

A. Tests:

1. In accordance with IEEE 112 for polyphase motors.
2. Routine (production) tests in accordance with NEMA MG 1. Test multispeed motors at all speeds.
3. For energy efficient motors, test efficiency and power factor at 50 percent, 75 percent, and 100 percent of rated horsepower:
 - a. In accordance with IEEE 112, Test Method B, and NEMA MG 1, Paragraph 12.59. and Paragraph 12.60.
 - b. For motors 500 hp and larger where facilities are not available to test by dynamometer (Test Method B), determine efficiency by IEEE 112, Test Method F.
 - c. On motors of 100 hp and smaller, furnish certified copy of motor efficiency test report on an identical motor.
4. Additional Required Tests: Temperature rise at rated horsepower for motors 800 hp and larger.
5. Provide certified test reports for all polyphase motors.

B. Test Report Forms:

1. Routine Tests: IEEE 112, Form A-1.
2. Efficiency and power factor by Test Method B, IEEE 112, Form A-2, and NEMA MG 1, Table 12-12.
3. Temperature Test: IEEE 112, Form A-2.

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PART 3 EXECUTION

3.01 VENDOR'S SERVICES

- A. Furnish vendor's representative at Site in accordance with Section 01 43 33, Vendors' Field Services, for installation assistance, inspection, equipment testing, and startup assistance for motors larger than 20 hp.
- B. Vendor's Certificate of Proper Installation.

END OF SECTION

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SECTION 43 24 13.40
DRAFT TUBE MIXERS

PART 1 GENERAL

1.01 SUMMARY OF WORK

- A. Provide and test mechanical draft tube mixers for mixing sludge in the egg-shaped digesters as indicated and specified.

1.02 RELATED WORK

- A. Section 01 33 00B, Submittal Procedures.
- B. Section 01 61 00B, Common Product Requirements.
- C. Section 01 78 23B, Operation and Maintenance Data.
- D. Section 26 20 00B, Low Voltage AC Induction Motors.

1.03 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Society for Testing and Materials (ASTM):
 - a. A36, Specification for Structural Steel.
 - b. A48, Specification for Gray Iron Castings.
 - c. A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - d. A105, Specification for Forgings, Carbon Steel, for Piping Components.
 - e. A153, Specification for Zinc Coating (Hot-Dip) on the Iron and Steel Hardware.
 - f. A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Plate, Sheet, and Strip.
 - g. A193, Specification for Alloy-Steel and Stainless Bolting Materials for High-Temperature Service.
 - h. A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service.
 - i. A307, Specification for Carbon Steel Bolts and Studs, 60.000 psi Tensile.
 - j. A385, Specification for Providing High-Quality Zinc Coatings (Hot-Dip).

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- k. A516, Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature.
 - l. A563, Specification for Carbon and Alloy Steel Nuts.
 - m. A573, Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
 - n. F436, Specification for Hardened Steel Washers.
- B. American National Standards Institute (ANSI):
- 1. A21.15, Flanged Ductile-Iron Pipe with Threaded Flanges.
 - 2. B3.15, AFBMA Standard, Load Ratings and Fatigue Life for Ball Bearings.
 - 3. B3.16, AFBMA Standard, Load Ratings and Fatigue Life for Roller Bearings.
- C. American Gear Manufacturers Association (AGMA).
- D. American Welding Society (AWS).
- E. Institute of Electrical and Electronic Engineers (IEEE):
- 1. Standard 112, Test Procedure for Polyphase Induction Motors and Generators.
 - 2. Standard 85, Test Procedures for Airborne Sound Measurements on Rotating Electronic Machinery.
- F. Instrument Society of America (ISA): Bulletin S5.1.
- G. Vibration Test and Analysis Guide (VTAG).

1.04 SUBMITTALS

- A. Informational Submittals:
- 1. Shop Drawings: Submit the following in accordance with Section 01 33 00B, Submittal Procedures.
 - a. Shop Drawings, catalog cuts, and other materials required to completely describe and specify system and equipment shall be submitted to Engineer for review.
 - b. Where required, documentation required to confirm that any equivalent standards equal or exceed the specified standards.
 - c. Detailed Shop Drawings shall include, but not be limited to:
 - 1) Detailed Drawings and specifications of all items of equipment showing all dimensions, parts, and construction details and materials, and install details and requirements.

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- 2) Performance specifications of all items of equipment.
- 3) Instrument layout of control panels.
- 4) Complete instrumentation and control and wiring diagrams in sufficient detail to allow installation of equipment, instrumentation and controls, and electrical components.

B. Action Submittals:

1. Submit for each unit at least the following data and specifications:
 - a. Name of Vendor.
 - b. Type of model.
 - c. Net weight of motor and shaft/propeller.
 - d. Method of motor removal and mixer shaft/propeller removal.
 - e. Type of bearings and lubrication.
 - f. Rated size of motor, HP.
 - g. Temperature rating of motor.
 - h. Full load rotative speed of motor.
 - i. Motor efficiency at full, 3/4 and 1/2 load.
 - j. Full load current of motor.
 - k. Locked rotor current of motor.
 - l. Size of shafting at all points.
 - m. Method of draft tube support.
 - n. Date of shop and field surface preparation and painting.
 - o. Vibration signature.
 - p. Operating and maintenance manuals in accordance with Section 01 78 23B Operation and Maintenance Data.
 - q. Setting plans, with tolerances, for anchor bolts.
 - r. Bearing temperature range for specified service conditions.
 - s. Field inspection and testing reports.
 - t. Recommended spare parts other than those specified.
 - u. Mixer shop test results.
 - v. Recommendations for long and short term storage.
 - w. Shop and field testing procedures and equipment to be used.
 - x. Training lesson plan.
 - y. Tag names and numbers for all equipment as indicated and specified.
 - z. Shop painting data and color charts.
 - aa. Vendor's technical representative qualifications.
 - bb. Vendor's published field service rates and travel costs.

1.05 DEFINITIONS

- A. Person-Day: One person for 8 hours within regular Contractor working hours.

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1.06 QUALITY ASSURANCE

- A. Welding: In accordance with latest applicable American Welding Society Code.
- B. Base the use of other materials not specified on Vendor's continuous and successful experience with proposed material for same specified conditions of service. Confirm to ASTM specifications where such exist.
- C. Service of Vendor's Technical Representative:
 - 1. Provide services of Vendor's technical representative, specifically trained on type of equipment specified, in accordance with Section 01 43 33B Vendor's Field Services. Submit qualifications of Vendor's technical representative for approval.
 - 2. Vendor's technical representative shall be present on site for all items listed below. Person-day requirements listed are exclusive of travel time, and do not relieve Contractor of the obligation to place equipment in operation as specified.
 - 3. Installation: Supervise location of anchor bolts, setting, leveling, field erection, coordination of piping, electrical, miscellaneous utility connections.
 - a. 4 person-days, 2 per mixer installation
 - 4. Field and Functional Testing: Calibrate, check alignment and perform a functional test with water. Tests to include all items specified in Article Field Performance Test.
 - a. 2 person-days, 1 per mixer testing
 - 5. Vendor Training: Provide classroom and field operation and maintenance instructions including all materials, slides, videos, handouts and preparation to lead and teach classroom sessions.
 - a. 1 person-day
 - 6. Credit to Owner, all unused service person-days specified above, at the Vendor's published field service rate plus travel costs.
- D. Shop Test:
 - 1. Upon completion of the manufacture of mixers to be installed on this Project, shop tests shall be conducted as follows:
 - a. Running test on each machine with minimum of 8 hours of continuous operation.
 - 1) Measurements of shaft speed, power draw, upward and downward pumping rate, and vibration to be taken and recorded at intervals, recommended by the Vendor, during

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- the running test. As a minimum, the measurements shall be taken once per hour.
- b. Demonstrate that all equipment is capable of continuous operation in satisfactory manner without mechanical defects or operational difficulties.
 - 1) If necessary, tests shall be repeated until satisfactory results are obtained.
 - 2) All defects or defective equipment revealed by or noted during test shall be corrected or replaced promptly at no additional compensation.
 - c. Motor: Each motor shall be given a routine commercial test as well as additional electrical tests as outlined below. Tests may be performed at motor vendor's factory. All tests shall be as required to meet NEMA and ANSI standards and shall be performed in accordance with IEEE Standard 112. The additional tests, beyond commercial tests, shall be as follows:
 - 1) Tests at full load, 3/4 load and 1/2 load to establish motor efficiencies and temperature rise.
 - 2) Tests to establish starting characteristics.
 - 3) Tests to establish noise pressure levels per IEEE Standard 85.
2. All facilities, lubricating oil, instruments, equipment and electric power shall be supplied by the Vendor at his expense.
 3. Upon completion of the tests, provide six certified copies of the shop test results to the Engineer.
- E. Equivalent Standards:
1. Equivalent German (DIN) standards will be considered for the welding and material requirements, subject to review and acceptance by the Engineer before fabrication begins.
 2. The requirements of the proposed German standards shall equal or exceed the standards specified herein.
 3. Requests for review of the equivalent standards shall include the requested revision and a complete copy of all proposed German standards translated into English.
 4. Documentation and cross-references shall be submitted to confirm that proposed equivalent standards equal or exceed the specified standards. All documents shall be submitted in the first submittal to allow time for review.

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1.07 DELIVERY, STORAGE, AND HANDLING

- A. Provide in accordance with Section 01 61 00B Common Product Requirements and as specified.
- B. Shipping: Ship equipment and material complete except where partial disassembly is required by transportation regulations or for protection of components.
- C. Receiving:
 - 1. Assume responsibility for equipment and material just before unloading from carrier at site.
 - 2. Inspect and inventory items upon delivery to site.

1.08 WARRANTY

- A. Provide in accordance with Section 01 61 00B Common Product Requirements.

PART 2 PRODUCTS

2.01 VENDORS

- A. SIHI Pumps, FLOWSERVE.
- B. Or Engineer approved equal.

2.02 MATERIALS

- A. Structural Steel: ASTM A36.
- B. Propeller: ASTM A576, GR1043 or ASTM A36.
- C. Steel Pipe: ASTM A53. Grade B.
- D. Shaft: ASTM A576. GR1043.
- E. Iron Castings: ASTM A48, Class 35 or better.
- F. Stainless Steel: ASTM A167.

2.03 DESIGN CRITERIA

- A. The mixer replacement is based on replacing the mixers with equipment manufactured by the original Vendor. Alternate designs will be considered

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subject to the review by the Owner and Engineer. Designs that require modification of the existing draft tubes will be considered if the cost of any draft tube modifications, including any electrical modifications needed to support larger motor loads, are included in the price of the mixer. All modifications of the draft tube assemblies are to be designed and provided by the alternate Vendor.

- B. Amply proportion all parts for long, continuous, and uninterrupted service. Make provision for easy access for service or replacement of parts. Make corresponding parts of multiple units interchangeable.
- C. Design and proportion all parts to provide adequate strength, stability, and thickness to meet conditions of service.
- D. Design and construct mixer to intimately mix new feed sludge and scum with digesting sludge and minimize top scum and bottom silt accumulations.
- E. Vendor shall schedule a site visit with Engineer and Owner prior to equipment submittal. Vendor representative shall field verify equipment dimensions of existing egg-shaped digester mixer. Vendor shall incorporate all modifications from field visit observations in proposed replacement equipment submittal. Replacement equipment must match existing installation.
- F. Vibration in excess of this limit shall be sufficient cause for rejection of the equipment.
 - 1. Vibration displacement (peak-to-peak) of the mixer as measured at any point on the mixer shall not exceed 5 mils.
 - 2. Mixer shaft vibration shall not exceed one mil while under full operating conditions.
- G. Enclose all electrical components of system in explosion proof NEMA Type 7 enclosures.
- H. Mixers shall be designed for the following service conditions:
 - 1. WAS/Primary Sludge (PSL) Feed
 - a. Dry Solids Content feed at the inlet: 4-7.5%
 - b. Organic particles: Approximately: 79%
 - c. Mineral particles: Approximately: 21%
 - d. Makes up 85% of the combined influent sludge.
 - 2. FOG Feed
 - a. Dry Solids Content feed at the inlet: 12-13%
 - b. Organic particles: Approximately: 90%

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- c. Mineral particles: Approximately: 10%
- d. Makes up 15% of the combined influent sludge.
3. Outlet
 - a. Dry Solids Content feed at the outlet: 3%
 - b. Organic part: 70%
 - c. Mineral part: 30%
4. Specific Gravity at digester: 1-1.05
5. Digested sludge temperature to be maintained at approximately 95 degrees F, but could range between 80 and 100 degrees F.
6. Digester Capacity: 1.0 million gallons.
7. Pumping Capacity: 6,500 gpm.

2.04 CONSTRUCTION

A. General:

1. Mixer shall be a top-mounted, propeller-type mechanical mixer with propeller installed in a central draft tube.
2. Provide mixer that allows entire drive assembly (motor, coupling and motor stand) to be removed as a unit without releasing gas to the atmosphere or allowing air to enter the digester.
3. Provide rotating parts that are machined and that are in as nearly perfect rotational balance as practicable.

B. Propeller:

1. Propeller shall be fabricated from carbon steel.
2. Blades shall be designed for operation without accumulation of stringy material.
3. Propeller shall be designed to provide the specified pumping rate in either the upward or the downward flow direction.

C. Shaft:

1. Provide solid shaft fabricated from carbon steel.
2. Shaft shall be mounted in thrust and guide bearing with accessible lubricating pipes and grease fittings.
3. Provide rotating splash plate, attached to shaft, to deflect flow outward, away from shaft.
4. Provide hardened shaft sleeves with double lipseal.
5. Provide positive gastight seal with O-ring seals where shaft penetrates into tank.

D. Bearings:

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1. Provide grease lubricated, rolling element, antifriction bearing for all bearings.
2. Design to resist maximum axial and radial loads under normal operation conditions.
3. All bearings shall be above the liquid level.
4. Thrust bearings to be designed to carry all shafting and propeller loads plus an allowance of at least 25 percent of the weight of the shaft and propeller. Thrust bearing to be provided with grease lubricated double lipseals.
5. Bearings shall have an L-10 life expectancy of 100,000 hours minimum at 24 hours-per-day service.

E. Lubrication System:

1. When the mixer is operating, the mixer shaft bearings and seals shall be supplied with grease from an automated grease pump.
2. Provide individual adjustable outlets to each application point. Outlets to provide from 0 to 100 cubic centimeters per hour for the grease pump.
3. Design system to not allow excessive or flushed grease to enter the digester.
4. Bearings shall have an L-10 life expectancy of 100,000 hours minimum at 24 hours-per-day service.
5. Provide grease pump container with at least 8.8 pounds capacity.

2.05 MOTORS

- A. All motors and appurtenances shall be designed for operation in a Class I, Division 2, Group D (methane) hazardous area.
- B. Motors shall be provided meeting the following characteristics:
 1. Horsepower:
 - a. 20, maximum (mixer).
 - b. 1/2, maximum (grease pump).
 2. Voltage: 480 volt, 60 Hz, 3 phase.
 3. Motor Speed:
 - a. 900 rpm, maximum (mixer).
 - b. 1800 rpm, maximum (grease pump).
 4. Enclosure: Explosion proof.
 5. Insulation: Class "F" with Class "B" temperature rise in ambient air of 40 degrees C.
 6. Service Factor: 1.15.

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7. Bearing Life: 100,000 hours as defined by AFBMA L-10 Standards.
 8. Full Load Efficiency: Not less than 94 percent and power factor of 0.88.
- C. Provide single phase, 60 Hz, 120 volt space heaters.
- D. Provide motor pedestal suitable for mounting to a seat ring on the digester.
- E. Provide flexible coupling to connect motor shaft to propeller shaft. Design coupling to withstand continuous motor horsepower including torques to 250 percent of full load running torques and a minimum 1.5 service factor.

2.06 DRAFT TUBE

- A. Existing 20-inch diameter cylinder draft tube shall be reused.

2.07 SHOP PAINTING

- A. Shop apply to all exterior ferrous surfaces (motor), with the exception of stainless steel, and interior components (mixer shaft, impeller).
1. Surface Preparation: SSPC-SP10/NACE 2 (Near-White Blast Cleaning) or ISO Sa 2 ½ (Very Thorough Blast Cleaning) with a minimum angular anchor profile of 1.5 mils. Ensure the substrate is clean, dry, and free of contaminants before coating.
 2. Primer: Series N69, 3-5 mils DFT
 3. Intermediate:
 - a. Exterior(exposed): Series N69, 3-5 mils DFT
 - b. Interior (H₂S/methane exposed): Series G435, 15-20 mils DFT
 4. Finish:
 - a. Exterior (exposed): Series 1094, 3-4 mils DFT
 - b. Interior (H₂S/methane exposed): Series G435, 15-20 mils DFT
- B. Surface preparation, mixing and application and safety requirements shall be in accordance with the paint manufacturer's printed instructions.
- C. Ferrous surfaces obviously not to be painted shall be given a shop applied coat of grease or rust resistant coating.
- D. Do not shop paint galvanized and aluminum surfaces.

2.08 SPARE PARTS

- A. Provide in accordance with Section 01 78 23 Operation and Maintenance Data and as specified.

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- B. Provide spare parts that are identical to and interchangeable with parts installed.
- C. Furnish and deliver the following spare parts:
 - 1. Two impeller pins.
 - 2. One set of seals.
 - 3. One set of bearings.
 - 4. Two refills for grease pump container.
 - 5. One set of all special tools required.

PART 3 EXECUTION

3.01 EQUIPMENT STARTUP

- A. Operate unit to demonstrate ability to operate continuously without vibration, jamming, leakage, or overheating and to perform specified functions, after installation, and after Vendor's representative check of installed equipment.

END OF SECTION