

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

SECTION 46 41 46 – POTABLE WATER TANK MIXER

Insert Project Name and Location here

Part 1 GENERAL

1. SUMMARY

A. Section includes furnishing and the installation of the following equipment:

1. Potable water storage tank mixing system.

2. REFERENCES

A. Reference Standards:

1. Occupational Safety and Health Administration, OSHA.
2. NSF / ANSI Standard 61 and 372.
3. Underwriters Laboratories Inc., UL 508.
4. AWWA C652-11, Disinfection of Water Storage Facilities.
5. ETL – Edison Testing Laboratories (Intertek).
6. CSA – Canadian Standards Association.
7. NEC – National Electric Code.
8. NEMA – National Electrical Manufacturer's Association.

3. SUBMITTALS

A. Shop Drawings and Product Data: Submit detailed specifications, drawings, electrical wiring diagrams, and data covering all materials, parts, devices, equipment, and other accessories forming part of equipment for the complete operational system. Mark each submittal to show which products and options are applicable to the project.

B. Include the following information, as applicable:

1. Manufacturer catalog cut sheets.
2. NSF Certification listings for all wetted parts of the mixer, mount, and power cable placed inside of the tank.

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3. Installation, start-up, operation, and maintenance manuals/instructions from the equipment manufacturer.
 4. Availability and delivery time information.
- C. Manufacturer's Instructions: Furnish manufacturer's printed instruction for delivery, handling, storage, assembly, installation, start-up, wiring diagrams, and factory-recommended maintenance schedule, as appropriate.
- D. Operations and Maintenance Data: Submit data on all parts, devices, equipment, and other accessories furnished forming the complete operational system.

4. QUALITY ASSURANCE

- A. Regulatory Requirements:
1. All Products that may come into contact with water intended for use in a public water system shall meet ANSI/NSF International Standard 61/ANSI 372 certified to conform with new lead content requirements for "lead-free" plumbing as defined by the US Safe Drinking Water Act.
- B. Equipment shall have no visual defects and shall have high quality welds, assembly.
- C. Qualified US Manufacturer: The equipment shall be manufactured in the continental United States.
- D. The equipment manufacturer must have at least 50 continuous years' experience in the design, application, and manufacture of mechanical agitation, mixing, and aerator assemblies of similar size and capacity. All material and equipment shall be new and of the highest quality.
- E. Manufacture must have a dedicated engineering team including design, mechanical, quality, and electrical qualifications.
- F. Manufacture must have documented quality requirements and procedures which include component sampling and testing, build instructions, Hi Pot and pressure decay testing, as well as bench rotation verification.
- G. Manufacturer must have a dedicated in-house service and repair department.
- H. Manufacturer must have dedicated customer service team.
- I. Mixers, complete with motor, power cable, and optional control panel shall be furnished by the manufacturer to ensure compatibility and integrity of the individual components and provide the specified warranty for all components.
- J. In order to assure uniform quality, ease of maintenance, and minimal parts storage, it is the intent of these specifications that all mixer assemblies and accessories called for under this section shall be supplied by a single manufacturer or authorized sales representative. The authorized sales representative shall, in addition to the Contractor, assume the responsibility for

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proper installation and functioning of the equipment if contracted for the installation and maintenance of the equipment.

5. FACTORY TESTING

- A. Each mixing system shall be factory tested and certified to UL778 and CSA C22.2#108 prior to leaving the place of manufacture
- B. Each mixer shall be tested and pass a Hi Pot test, pressure decay test, and direction of rotation check prior to shipment.

6. THIRD PARTY TESTING

- A. Mixers shall be third party tested by an accredited testing facility such as ETL, ETL-C, CSA, or UL, as a complete package assembly. Individual component testing only is not allowed.
- B. Mixers shall be certified by NSF International to NSF61 and 372 standards.

7. DELIVERY, STORAGE, AND HANDLING

- A. Delivered materials shall be stockpiled and stored at locations approved by the Owner until required for installation. Materials shall be stored in accordance with manufacturer's instructions.
- B. Contractor shall inspect materials for loss or damage in transit immediately upon delivery. Contractor shall be responsible for the replacement of damaged materials. All damaged materials shall be removed from the Site.
- C. Delivery and start-up shall be supplied by a factory trained and authorized equipment distributor representative.

2. PRODUCTS

2.1.ACCEPTABLE MANUFACTURER

- A. Approved Manufacturers:
 - 1. Kasco Marine, Inc. of Prescott, Wisconsin (Contact factory at 715-262-4488).
 - 2. Or be a pre-approved equivalent by the Engineer. To offer equipment as a pre-approved equivalent, a written application from the alternative supplier shall be submitted to the Engineer a minimum of TEN (10) days prior to the scheduled bid opening. Provide a list of at least five (5) installations of the proposed equipment in a similar application for review by the Engineer. The list shall include the contact name and phone number for each installation. Alternates must meet or exceed blend time performance.

2.2.PERFORMANCE

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- A. The manufacturer guarantees that the subject tank will be completely mixed by the mixer. Requirements are to be validated by Owner after installation. In continuous operation of the mixer:
 - 1. The Temperature Uniformity for tanks up to *(insert project specified tank size in gallons)* in volume shall converge to (.5 degree C)0.9-degree F within eight (8) hours after mixer activation.
 - 2. The Chlorine Concentration Uniformity for tanks up to *(insert project specified tank size in gallons)* in volume shall converge to 0.2 mg/l within eight (8) hours after mixer activation.
- B. Submersible potable water mixer system shall be designed with the operating and design requirements to meet the project objectives. The following quantity and model number of equipment are required.
 - 1. Kasco Marine Certisafe model *(specify model number with mount and control panel – contact factory for recommendation 715-262-4488. Model selections are 2400C61XXXCSX, 3400H/C61XXXCSX, 4400H/C61XXXCSX, and 8400C61XXXCSX)*.

2.3.GENERAL

- A. The uniquely designed mixing unit shall consist of a non-metallic propeller mounted on a submersible motor to produce maximum thrust while using minimum horsepower.
- B. Operation of the mixing unit shall be independent of the tank drain and fill cycles to ensure constant mixing.
- C. The Mixer assembly shall be supported either from the tank floor, roof, or a pipe mount.
- D. The mixer shall be capable of operating in depths of up to 50 feet of water (20 psi) above the mixer.
- E. The mixing system installation shall be designed to be completed by on-site personnel without additional lifting equipment.
- F. The submerged portion of the mixing system shall weight less than 65 pounds.
- G. The propeller shall be constructed of proprietary non-metallic materials and shall be sized and designed according to the mixer horsepower.
- H. The Mixing unit shall have a low center of gravity and maximum height not exceeding 30 inches to prevent accidental tip-over.
- I. Mixers using a submersible pump with a slit, “water sheet” are not acceptable.
- J. Mixers that provide a downward thrust of water directly on the tank floor are not acceptable.
- K. Mixers that are free-floating and/or can move around the tank are not acceptable.

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- L. The power source for the mixer shall be 120VAC or 240VAC single phase grid power to allow the unit to operate continuously, (24 hours per day, 7 days per week, 365 days per year), where necessary.

2.4.CONSTRUCTION

- A. **Stainless Steel Construction.** Metallic parts of the mixer shall be constructed of Series 300 stainless steel.
- B. Equipment entering the tank shall not adhere to, scratch, or otherwise cause damage to internal tank coatings or put undue stress on the materials of the tank construction.
- C. Equipment shall fit through a standard hatch of size 24-inch x 24-inch or larger.
- D. The motor housing shall be 300 Series stainless steel and oil-filled food grade mineral oil. The motor top shall be sealed with a double O-ring and the shaft area shall be sealed with a two-piece, carbon-ceramic seal. All fasteners and metal components exposed to the pumped liquids shall be Series 300 stainless steel.
- E. The pump and motor shall be designed so that they will operate in a fully-submerged condition in the water. Each motor shall be capable of and rated for continuous operation duty without exceeding temperature rise limits for the motor insulation system. Unit shall be tested to withstand 20 psi external pressure.
- F. A thermal overload shall be attached to the motor winding and shall stop the motor if motor winding temperature reaches 140 degrees C (applies only to single phase motors). Thermal overload shall reset automatically when motor cools.
- G. The motor shall be constructed with bearings providing a L-10 life of >200,000 service hours.

2.5.FEATURES

- A. Each submersible mixer system shall consist of the following components regardless of the power source selected:
 - 1. Mixer:
 - a. Body shall be constructed of Series 300 stainless steel.
 - b. Mechanical seals shall consist of two unitized heavy-duty carbon ceramic seals.
 - c. Mixer shall be fully submersible with direct drive with no gearbox.
 - d. Mixer shall include a PVC coated cage surrounding the propeller to keep the propeller from contacting any storage tank coatings, power cable, retrieval chain or water storage tank structure.
 - e. Mixer shall have food grade mineral oil lubrication.

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- f. Motors shall be 1750 RPM, single speed, oil cooled, Class B insulated, continuous duty rated, with built-in thermal overload protection.
 - g. Motors shall be custom built per manufacture's specifications for use in submersible mixing applications.
 - h. Propellers shall be custom, non-metallic, and designed to maximize the unit's water moving performance without increasing the amp draw.
 - i. Mixer shall not exceed 65 lbs.
 - j. Units shall be easily installed and maintained by one or two persons.
2. Underwater Power Cable:
- a. The underwater power cable shall be UL, CSA, and NEC approved underwater rated, 3 conductor cable with open wires for hard wiring.
 - b. The power cable shall be available in either 50, 100, or 200 feet cord lengths.
 - c. An underwater approved, potted, O-ring sealed quick disconnect shall be available on all cables with 12 gauge or larger cables approximately 30 inches from the motor housing. The quick disconnect shall be a UL and CSA recognized and IP68 rated connector.
 - d. The power cable shall fit through a one-inch diameter penetration.
3. Mixer Mounting Options: (Select one mount per mixer)
- a. Suspended Mount – for mounting mixer in elevated water towers and standpipes.
 - i. Suspension kit shall include 316 Stainless Steel hardware. The mixer body shall be connected to the suspension bar so that the propeller is oriented upwards.
 - ii. Stainless steel retrieval chains, power cable strain relief, and tank penetration fittings shall be provided.
 - b. Floor Mount - for mounting mixer on the floor of a ground storage tank.
 - i. Floor kit shall include 316 Stainless Steel hardware and consist of three legs equally spaced at 120 degrees and shall clamp around the motor housing body. The outside diameter shall be approximately 30 inches in

- circumference when the legs are attached to the mixer body.
 - ii. The legs shall be provided with EPDM molded feet.
 - iii. Stainless steel retrieval chains, power cable strain relief, and tank penetration fittings shall be provided.
 - iv. The stand and the mixer body shall allow the propeller to be located approximately 24 inches above the floor and face upwards from the floor.
 - v. Chemical passivation shall be performed on stainless steel.
 - c. Pipe Mount - for mounting in a shallow or irregular shaped tank or clearwell.
 - i. Hardware shall be Series 300 stainless steel including the upper and lower brackets.
 - ii. The bracket clamps shall be connected by means of a 1-1/2" Schedule 40 Series 300 stainless steel pipe not to exceed 10 feet in length. The pipe shall be supplied and field-cut by Others.
 - iii. The bottom motor body support bracket shall be designed and provided to allow the motor body/propeller to easily rotate so that the flow from the propeller can be directed upwards, horizontally, or downwards.
- 4. Control Panel Options: Each 120VAC or 240VAC control panel shall be built to the following specifications:
 - a. Each mixer shall be provided with a control panel capable of disconnecting power to the mixer.
 - b. Panel shall include a pad-lockable enclosure door.
 - c. NEMA 4X UL Type rated control panel with integral mounting tabs.
 - d. UL 508A Listed industrial enclosed control panel.
 - e. Exterior mounted HOA switch, "RUNNING" indicator LED pilot light, and "FAULT" indicator LED pilot light all UL Type 4X rated.
 - f. SCADA monitoring and control interface:
 - i. Motor current: 4-20ma current transducer output to SCADA system. Transducer shall be 24VDC loop powered.
 - ii. SCADA start/stop: Auto mode, relay shall provide interface to existing SCADA system for remote start/stop function.

- iii. Auxiliary interlock: Shall be a local low tank level inhibit. If utilized, the terminal jumper shall be replaced with a dry contact relay closure.
 - iv. Automatic low water level shut-off inhibit.
 - g. Shall include a circuit breaker for 120/240VAC, single-phase power.
 - h. Power source required shall be supplied by others.
- (Select one panel per mixer)
- i. CS-100/CS-200 control panel features:
 - i. Dry contact relay closure provided by others.
 - ii. GFCI protection (sized per mixer) shall be supplied by others.
 - j. CS-150/CS-250 control panel additional features:
 - i. Dry contacts (to SCADA) for: H-O-A in Hand, H-O-A in Auto, Mixer Running, and Mixer Fault.
 - ii. GFCI 6ma trip circuit breaker.
 - iii. Upgradable to stainless steel enclosure by special order.

3. EXECUTION

3.1.EXAMINATION AND PREPARATION

- A. Contractor shall inspect all equipment immediately upon receipt.
- B. The equipment shall not be installed, if damaged, until repairs have been made in accordance with the manufacturer's written instructions.

3.2.INSTALLATION

- A. Contractor shall furnish a trained installation team familiar with installation procedures and requirements for the specified mixer system. The mixer may be installed with or without draining the tank.
- B. Contractor shall furnish the unit and install per manufacturer's recommendations. Coordinate work with the Electrical Contractor for all wiring and controls work to make a complete and operational system. Installation and start-up of all equipment shall be per the manufacturer's recommendations. Contractor shall:
 - 1. Ensure proper machine spatial placement in the tank.
 - 2. Ensure proper intake depth setting.

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3. Mixing system shall be installed complete with all necessary connections.
 4. Disinfect all wetted components prior to installing unit in water storage tank in accordance with AWWA C652-11 standards. Standard recommends spraying with a 200ppm NSF60 approved chlorine solution.
- C. Tank penetrations are recommended to be above the tank high water level.
1. Fittings shall prevent moisture intrusion into the tank.
 2. Fittings shall be sized with the appropriate diameter to allow electrical power cable to pass through.
 3. A cable strain relief for power cable shall be supplied with each mixer.
- D. Installation of the submerged components may be performed by the following methods:
1. Certified potable water tank diver.
 2. Personnel with confined space training while the tank is drained and empty.
 3. Tank manufacturer personnel during tank manufacture or construction.
 4. Contractor from a tank hatch opening.
- E. Installation of the control components may be performed by:
1. Third party representatives or the Contractor.
 2. The Owner in accordance with the manufacturer supplied manual.
- F. The mixing system shall be installed in accordance with manufacturer's procedures, unless otherwise approved in writing from the manufacturer.

3.3.FIELD SERVICE

- A. Manufacturer's authorized representative shall check and inspect the mixer(s) after installation, place the mixer(s) in operation, and make necessary adjustments including low water inhibit feature in control panel.
- B. Manufacturer's authorized representative shall instruct designated Owner personnel in the safe and proper operation of the mixing system. This training shall reference the operations manual provided and demonstrate proper function of the equipment.

3.4.SPARE PARTS

- A. Contractor shall provide spare parts as recommended or supplied with this mixer assembly by the equipment manufacturer.

3.5.WARRANTY REQUIREMENTS

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- A. Warranty: A written manufacturer's warranty shall be provided for the equipment specified in this Section. The Product shall be warranted to be substantially free from defects in material and workmanship for three (3) years from the date of delivery of all mixing equipment. This equipment warranty shall be directly from the manufacturer of the equipment to the Owner. Such warranty shall cover all defects or failures of materials or workmanship that occur as the result of normal operation and service.

END OF SECTION