**DIVISION 46 – WATER AND WASTEWATER EQUIPMENT**

**SECTION 46 51 13 – FLOATING MECHANICAL AERATORS**

1. GENERAL
	1. Summary
		1. Section includes furnishing and the installation of the following equipment:
			1. Floating mechanical aerators of the vertical pump agitator style.
	2. REFERENCES
		1. Reference Standards:

1. ETL – Edison Testing Laboratories (Intertek).

2. ASTM – American Society of Testing and Materials.

3. UL – Underwriters Laboratory.

4. CSA – Canadian Standards Association.

5. NEC – National Electrical Code.

6. NEMA – National Electrical Manufacturer’s Association.

* 1. SUBMITTALS
		1. Shop Drawings and Product Data: Submit detailed specifications, drawings, unit anchorage details, aeration capacity rating, test results, and data covering all materials, parts, devices, equipment, and other accessories forming part of the equipment for the complete operational system. Mark each submittal to show which products and options are applicable to the project.
		2. Include the following information, as applicable:
			1. Manufacturer catalog cut sheets.
			2. Aerator oxygen transfer performance data for the aerators.
			3. Installation, start-up, operation, and maintenance manuals/instructions from the equipment manufacturer.
			4. Notation of coordination requirements.
			5. Availability and delivery time information.
		3. 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.
		4. Operations and Maintenance Data: Submit data on all parts, devices, equipment, and other accessories furnished forming the complete operational system.
	2. quality assurance
		1. 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.

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* + 1. Manufacture must have a dedicated engineering team including design, mechanical, quality, and electrical qualifications.
		2. 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.
		3. Manufacturer must have dedicated service and repair department in house.
		4. Manufacturer must have dedicated customer service team with at least 4 employees.
		5. Aerators, complete with motor, power cable, anchoring lines, and optional control panel shall be furnished by the aerator manufacturer to ensure compatibility and integrity of the individual components and provide the specified warranty for all components.
		6. In order to assure uniform quality, ease of maintenance, and minimal parts storage, it is the intent of these specifications that all floating mechanical aerator 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 proper installation and functioning of the equipment if contracted for the installation and maintenance of the aerators.
	1. factory testing

* + 1. Aerators shall be factory tested as a complete unit and documentation shall be provided demonstrating the oxygen transfer of at least 2.3 pounds oxygen per horsepower hour using ASTM standards.
		2. Each aerator shall be tested and pass a Hi Pot test, pressure decay test, and direction of rotation check prior to shipment.

1.06 THIRD PARTY TESTING

A. Aerators 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.

1.07 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.

* + 1. Contractor shall inspect materials upon delivery for loss or damage in transit. 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.

1. Products
	1. acceptable Manufacturer
		1. 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 the oxygen transfer.

2.02 PERFORMANCE

A. The manufacturer guarantees that the floating mechanical aerator shall provide an oxygen transfer of at least 2.3 pounds oxygen per horsepower hour.

B. Floating aerator units shall be designed for the following operating, performance, and design requirements:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Quantity | Model Number | Horsepower | Voltage/Phase/Frequency | Power Cord Length | Optional Control Panel | Optional Bottom Screen |
|  |  |  |  |  |  |  |

2.03 GENERAL

A. Each floating aerator unit shall be complete with a close-coupled, high-efficiency, submersible electric motor suitable for municipal primary wastewater pond mixing and aeration application.

B. Each floating aerator shall be saltwater compatible and shall be protected by a sacrificial zinc anode installed on the 316 series stainless steel motor shaft.

* + 1. Provide each aerator complete with all accessories, optional controls, and appurtenances, as required, for a complete operational system.

D. The power source for the aerator shall be 120VAC or 208/240VAC single phase or 240VAC or 460VAC 3 phase (3 phase only available in 2HP and larger) grid power to allow the unit to operate continuously, (24 hours per day, 7 days per week, 365 days per year), where necessary.

2.04 CONSTRUCTION

A. Stainless Steel Construction. Metallic parts of the aerator shall be constructed of Series 300 stainless steel.

B. The non-metallic propeller shall be protected by an aerator cage or aerator ring. The manufacturer may provide a bottom screen as an option.

C. The motor housing shall be 300 Series stainless steel and oil-filled with a non-detergent, low weight, turbine oil (optional food grade mineral oil available). The motor top shall be sealed with an O-ring and the shaft area shall be sealed with a two piece, carbon-ceramic seal. All fasteners exposed to the pumped liquids shall be Series 300 stainless steel.

D. 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.

E. 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.

F. Stainless steel motor top upgrade shall be offered and include a double o-ring seal and both internal and external, two-piece, carbon-ceramic mechanical seals.

2.05 FEATURES

 Each floating mechanical aerator system shall consist of the following components regardless of the power source selected:

A. Aerator:

1. The floating mechanical aerator(s) shall push water vertically into the air to encourage mixing and aeration in the basin. The aerator units provided under this section shall be suitable for the following service conditions:

 a. Maximum liquid temperature: 90 degrees F.

 b. Aerators shall operate in depths as shallow as:

15-inches for ½ Hp

17.5-inches for 3/4Hp

19-inches for 1Hp

20-inches for 2Hp

24-inches for 3Hp

26-inches for 5Hp

2. Motors shall be 1750 RPM, single speed, oil cooled, Class B insulated, continuous duty rated, with built-in thermal overload protection.

3. Propellers shall be custom, non-metallic, and designed to maximize the unit’s water moving performance and operate through considerable aquatic vegetation without increasing the amp draw.

4. Aerators shall be self-contained units that float on the surface and are moored with a maximum of three (3) anchoring lines.

5. Units shall be easily installed and maintained by one or two persons.

6. Provide power cords with flex sleeve cord protectors and mooring lines suitable for the intended application.

B. Underwater Power Cable:

1. The power cable shall be UL, CSA, and NEC approved underwater rated, 3 conductor (4 conductor for 3 phase) cable with open wires for hard wiring (120V single phase shall have 5-15 molded plug)

2. The power cable shall be available in either 50, 100, 150, or 200 feet cord lengths for 120V units and up to 500 feet cord lengths for 208-240V units, as well as 3 phase.

3. 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.

C. Control Panel: (*Optional)*

Each 120VAC or 208/240VAC or 240VAC or 460VAC 3 phase control panel shall be built to the following specifications:

1. Each aerator shall be provided with a control panel capable of disconnecting power to the aerator unit(s).

2. Enclosure shall include a pad-lockable enclosure door.

3. Control panel shall be UL Listed per UL 508 standard.

4. Include a Class A human rated 5ma trip level GFCI/GFCB (30ma for 460V, 3 phase).

5. Circuit breaker sized per control panel model requirements.

6. Include a 24-hour built-in mechanical timer.

7. Built-in photo cell (120V) or secondary timer for optional low voltage lighting kits.

8. Enclosure shall be UL type rated 3R and NEMA 3R rated.

9. Matching warranty to unit selected.

10. Enclosure shall be provided with integral mounting tabs. Enclosure door shall have integral sealing gasket.

11. Power source required shall be supplied by others.

1. Execution
	1. EXAMINATION AND PREPARATION
		1. Contractor shall inspect all equipment immediately upon receipt.
		2. The equipment shall not be installed, if damaged, until repairs have been made in accordance with the manufacturer’s written instructions.
	2. INSTALLATION
		1. Contractor shall furnish the unit(s) 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, start-up, and on-site water testing of all equipment shall be per the manufacturer's recommendations. Contractor shall:
			1. Ensure proper machine spatial placement in the reservoir.
			2. Ensure proper intake depth setting.

3. Aeration system shall be installed complete with all necessary connections.

* + 1. Coordinate locations of each aerator with Owner and Engineer prior to installation.
		2. The aeration system shall be installed in accordance with manufacturer’s procedures, unless otherwise approved in writing from the manufacturer.
		3. Systems shall be installed complete with all necessary floats, mooring, cords, cables, and anchors for the intended application.
		4. Contractor shall be responsible for providing and installing a complete and functional system.

3.03 FIELD SERVICE

## A. Contractor (or a representative of the manufacturer) shall check and inspect the aerator unit(s) after installation, place the aerator unit(s) in operation, and make necessary adjustments.

## B. The aerator unit manufacturer (or their representative) shall instruct designated Owner personnel in the safe and proper operation of the aerator system. This training shall reference the operations manual provided and demonstrate proper function of the equipment.

3.04 SPARE PARTS

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

3.05 warranty requirements

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: two (2) years for 1 Hp and smaller aerators (three (3) years for 2 Hp and larger aerators), from the date of delivery. 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. Optional Extended warranties up to 5 total years shall be available on 2HP and larger units.

END OF SECTION