[Note from Ixom Watercare, Inc. to Specifying Authority:  The success of your project depends on you becoming somewhat familiar with reservoir circulation equipment and the application engineering for your type of reservoir.  We encourage you to visit our manufacturing facility to learn more about our equipment if desired, contact some of our many references, review our peer-reviewed papers or case studies, and/or call us with questions.  Please note Ixom Watercare, Inc. can provide a Sole Source Letter on request due to some of the patented features and the benefit of not having to take the tank out of service for placement, most cities Sole Source the GridBee SN THM Spray Nozzle Technology but, if other services are required as part of a Bid Project, the below following specifications would apply.  The full written specifications have the most critical features first, followed by other important features.]

#### PART 1 GENERAL

1.01 EQUIPMENT OVERVIEW

 A. These specifications provide the requirements to furnish and place into operation Trihalomethane removal (THMR) floating spray equipment at xxxxxxxxxxxxxxxxx.

1.02 REFERENCES

 A. Occupational Safety and Health Administration, OSHA

 B. Department of Transportation, DOT

 D. NSF / ANSI Standard 61

##### 1.03 QUALITY ASSURANCE

1. Continuous Operation Equipment. The THMR floating spray equipment shall operate continuously as required to meet performance requirements.
2. No Visual Defects. The THMR floating spray equipment shall have no visual defects, and shall have high quality welds, assembly, and corrosion resistant finish.

C. Qualified US Manufacturer. The manufacturer of the equipment shall have extensive experience in the production of such equipment, and the equipment shall be manufactured in the continental United States.

D. Factory Startup Services. Delivery, placement and startup services by equipment manufacturer’s factory personnel shall be available. For equipment manufacturer’s factory delivery and placement, services shall be performed by full time factory employees experienced in the operation of this equipment and who have completed OSHA safety trainings applicable to this type of equipment placement and startup.

E. Warranty. The THMR floating spray equipment shall be warranted to be free of defects in materials and workmanship for a period of 2 years. This equipment warranty would run directly from the manufacturer of the equipment to the owner.  The equipment warranty would not be part of the contract or any required bond.

1.04 SUBMITTALS

 A. The awarded Bidder shall provide an electronic copy of the following documents. Upon acceptance of these documents by the Engineer, the Bidder will be issued a Notice to Proceed, and may then proceed to place the equipment. (When required, please specify here how many printed copies are required)

 1. Manufacturer Qualification Document

2. List of Supplied Equipment

3. Manufacturer Product Sheets

4. Equipment Placement Drawing

 5. Electric Power Source Requirements

 6. NSF / ANSI Standard 61 Documentation

 7. Warranty Statement

 8. Operation Manuals

##### 1.05 FIELD SERVICES

A. Placement and startup. Equipment manufacturer shall offer placement and startup performed by equipment manufacturer’s full time factory employees trained in the operation of the THMR floating spray equipment who have completed OSHA safety trainings applicable to this type of equipment placement and startup.

#### PART 2 PRODUCT SPECIFICATIONS

2.01 MANUFACTURER

 A. Specified Equipment. The Trihalomethane removal (THMR) floating spray equipment shall be manufactured by Ixom Watercare, Inc. of Dickinson, ND, or be a pre-approved alternative.

 B. Pre-approved Alternative(s). Alternatives to the specified equipment will be considered on the following basis only.

 1. Fourteen (14) Days Before Bid. To offer equipment as a pre-approved alternative, written application from the alternative supplier shall be made to the Engineer at least 14 days in advance of the bid opening.

 2. No Material Difference in Quality of Equipment or in Vendor Support. The application should include:

1. A description of how the offered alternative does or does not meet each of the specifications in this document.
2. Any potential supplier proposing alternative to equipment described herein, prior to the bid date, must provide equipment on site for customer to conduct independent testing of actual water onsite for \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Water Treatment Plant.  The testing equipment shall simulate the proposed spray aeration operation and shall be capable of providing measurable water for a TTHM lab test.

 c. An analysis of how acceptance of the alternative equipment would affect the overall water quality goals of the project. Analysis should include obtaining 10 successful placements having similar objectives to the project.

 d. A statement of the science and support background of the supplier of the alternative equipment, so that the benefits and costs of the alternative equipment to the Owner can be estimated by the Engineer.

 3. Five (5) Days Notice to Bidders. If the alternative equipment is accepted by the Engineer, an informational addendum to these specifications shall be distributed by the Engineer to plan holders at least 5 days in advance of the bid opening.

2.02 PERFORMANCE AND FEATURES

1. (List Tank / Reservoir Specific Objectives Here)

 B. Complete Water Circulation Required. To meet the project objectives, the stated water flow rate shall be achieved by a single or multiple floating units within the reservoir capable of providing long distance circulation of water. The specified flow rate shall be measurable water flow where suction shall enter specified equipment’s intake positioned within 1” of reservoir floor and discharging water into air within the headspace of the tank or reservoir. Floating units must be placement flexible in design to allow best hydraulic positioning for tank or reservoir conditions to prevent hydraulic short circuiting within tank or reservoir. Ceiling supported piping or plumbing not allowed. Suction not within 12” of tank or reservoir floor not allowed to contribute to specified total water flow rate. Water discharge other than into tank or reservoir headspace not allowed to contribute toward specified total water flow rate.

 C. Flow Rates Required. To meet the project objectives, the following water flow and air flow rates are required of the supplied equipment.

|  |  |
| --- | --- |
| Tank / Reservoir Name: | Insert Tank / Reservoir Name |
| Total Water Flow Rate, GPM: | Insert Total Water Flow Rate Required, GPM |
| Total Floating Spray Power, HP: | Insert Floating Spray Power Required, HP |
| Total Air Flow Rate, CFM at “H2O: | Insert Total Air Flow Rate Required, CFM at “H2O |
| Total Fan / Blower Power, HP: | Insert Fan / Blower Power Required, HP |

D. Fit Through Small Hatch Opening. The THMR floating spray equipment must be able to fit through an unobstructed hatch opening of 24 Inch diameter (61cm) round.

• An unobstructed hatch opening 18 Inch diameter (46 cm) round can be used for placement of smaller THMR floating spray equipment. Consult with Ixom Watercare, Inc. for hatch requirement applicable based on required THMR floating spray equipment required.

 E. Continuous Operation With (Insert Voltage and Phase from the table below based on model being specified), 60Hz Power Source. The THMR floating spray equipment shall operate continuously during day and night while connected to electric grid power.

 \*\*\*Delete Table – For reference only. Also used in Section 2.02 G.5.\*\*\*

|  |  |  |
| --- | --- | --- |
|  | Single Phase | Three Phase |
| SN Model | 230 | 200 | 230 | 380 | 460 | 575 |
| SN1 | ✓ | \* | \* | \* | \* | \* |
| SN5 | ✓ | \* | ✓ | \* | ✓ | \* |
| SN10 |  |  | ✓ | \* | ✓ | \* |
| SN15 |  |  |  | \* | ✓ | \* |

\* Non-standard, special order items. May require additional lead time and/or coordination with Ixom Watercare, Inc. Consult with Ixom Watercare, Inc. if desired system is not marked.

 F. Stainless Steel Construction. The THMR floating spray equipment shall be constructed primarily of Type 316 stainless steel metal, for strength and superior corrosion resistance. Other non stainless steel materials shall be of NSF approved materials and rated for contact with potable water.

 G. Motor. The THMR floating spray equipment shall be mechanically operated by a submersible motor that meets the following criteria.

 1. Direct Drive, with no gearbox

 2. No motors requiring lubrication maintenance allowed.

 3. Designed for submersible operation. Inside reservoir, TEFC motors not allowed above or below water line.

 4. Designed for Continuous Operation without overheating or compromising motor life expectancy.

 5. Powered by a (Insert Voltage and Phase), 60Hz Power Source. The THMR floating spray equipment shall operate continuously while connected to electric grid power.

 • Voltage limitations may apply to some models THMR floating spray equipment. Refer to Table in Section 2.02 E.

 H. Equipment Control and Motor Protection. Power source to each separate piece of equipment shall contain a combination motor starter with motor protection meeting at least the minimum required items below:

 1. External Disconnect

 2. Properly Sized Contactor

 3. Properly Sized Overloads

 4. External Hand / Off / Auto Switch Control

 5. External Run Indicator Light or LED

 6. Capable of running each separate piece of equipment (motor) independently

 • See end of specifications for replacing Section 2.02 (H) with Ixom Watercare, Inc. supplied electrical control panels for each piece of equipment and insert here if required.

1. Horizontal, Low Velocity intake. The THMR floating spray equipment shall be supplied with an intake capable of being positioned at the lowest elevation of the tank or reservoir floor. The intake level setting shall bring water into the THMR floating spray at a horizontal layer within 1 inches (2.5 cm) of the tank or reservoir floor. The intake shall include a singular hose of adequate length to reach the required intake depth setting.

J. Exposed Rotating Protection. The THMR floating spray equipment shall not have any rotating equipment openly exposed. Rotating shafts, impellers, and motors shall not be openly exposed and in the event of equipment contacting floor, shall not cause damage to tank or reservoir. Open impeller designs shall not be allowed.

K. Nozzles. The THMR floating spray equipment shall be equipped with a nozzle assembly sized for the specified water flow rate required. Nozzle shall be constructed of 316 stainless steel for optimal corrosion resistance and long wear life. The THMR floating spray equipment must be able operate without contacting the reservoir ceiling where the headspace clearance is 30” height between water level and reservoir ceiling.

• For tanks having small headspace clearance, i.e. less than 30” height, consult with Ixom Watercare, Inc. for evaluating if a special nozzle requirement is applicable based on placement and reservoir headspace clearance.

 L. Restraint System. All components of the THMR system shall be restrained from lateral and rotational movement, and self adjust at all water elevations. The restraining system shall not require any brackets, penetrations, or fixed connections to the tank or reservoir columns, walls, or floor below the overflow elevation. The restraint system used shall allow for placement and servicing without requiring tank or reservoir to be drained. The THMR system shall not require the use of a diver or diving team to enter the tank or reservoir to complete placement or service of the specified equipment.

 M. Forced Headspace Ventilation. To meet project objectives, a blower unit must be provided that produces the specified air flow rate and pressure (Select from table below). The blower unit shall meet the following criteria.

 \*\*\*Delete Table – For reference only.\*\*\*

|  |  |
| --- | --- |
|  | Blower Performance (SCFM) at varying Static Pressures (Inches of Water) |
| Blower Model | 0” | 1” | 2” | 3” | 4” | 6” |
| F1 (1/2HP) | 60 | 59 | 58 | 57 | 56 | 54 |
| F4 (2HP) | 780 | 775 | 770 | 765 | 760 | 750 |
| F8 (3HP) | 5250 | 4500 | 3800 | 3400 | 3000 | - |
| F11 (7.5HP) | 11000 | 10250 | 8800 | 7750 | 7000 | - |

 1. Fan or Blower discharge air shall be forced into the tank or reservoir head space. Suction of air out of tank or reservoir using a fan, blower, or ventilator shall not be allowed to meet specified air flow requirement.

 2. Fan or Blower air entering reservoir shall be filtered by filter elements to be within 98% of 10 micron or less.

 3. Suction filter elements and housing shall have a total air flow rating of at least 1.5 greater than specified air flow rate.

 4. Substantial spatial separation required between Fan or Blower air discharge into reservoir and exhausted air out of reservoir to prevent short circuiting of headspace ventilation. Use of same reservoir opening for Fan or Blower discharge and exhaust air not allowed.

 5. Powered by a (Insert Voltage and Phase), 60Hz Power Source. The blower equipment shall operate continuously while connected to electric grid power.

\*\*\*Delete Table – For reference only.\*\*\*

|  |  |  |
| --- | --- | --- |
|  | Single Phase | Three Phase |
| Blower Model | 120 | 230 | 200 | 230 | 380 | 460 | 575 |
| F1 | ✓ | ✓ | \* | \* | \* | \* | \* |
| F4 | ✓ | ✓ | ✓ | ✓ | \* | ✓ | \* |
| F8 |  | \* | \* | ✓ | \* | ✓ | \* |
| F11 |  | \* | \* | ✓ | \* | ✓ | \* |

\*Non-standard, special order items. May require additional lead time and/or coordination with Ixom Watercare, Inc.. Consult with Ixom Watercare, Inc. if desired system is not marked.

 6. Fan Wheel to Motor coupling shall be direct drive, no belts or sheaves required.

 N. Safe Contact for Potable Water. The THMR floating spray equipment shall be listed as a system with NSF / ANSI Standard 61 approved materials and components for safe contact with potable water. A set of equipment without a product or system having NSF / ANSI Standard 61 listing not allowed.

 O. Placing and Servicing Without Requiring Tank or Reservoir Draining. The THMR system shall be designed for placement and servicing without requiring tank or reservoir to be drained. The THMR system shall not require the use of a diver or diving team to enter the tank or reservoir to complete placement or service of the specified equipment.

 P. Maintenance Requirements. The THMR floating spray equipment shall operate normally with the following maintenance features.

 1. No scheduled lubrication is required of any system components including motor.

 2. No spare parts shall be required to be kept on hand.

 Q. Equipment Support. The THMR floating spray equipment manufacturer shall offer full factory support with the following staff and support services.

 1. Customer Service, Application Engineering, and Equipment Engineering staff available by email or toll free phone.

 2. Field personnel for placing and servicing the specified THM floating spray equipment.

 3. Public website with detailed information available describing the THMR floating spray equipment for this project and related applications of this equipment into potable water tanks and reservoirs.

 4. Service plans for preventative maintenance and continued technology improvements for the specified THM floating spray equipment.

PART 3 EXECUTION

 3.01a FACTORY PLACEMENT

A. Factory Personnel. The placement and startup shall be performed by full time factory employees trained in the operation of the THMR floating spray equipment.

B. Safety. Placement personnel shall have received job-specific safety training on (a) Working over Water, (b) Boating Safety, (c) Disinfecting Procedures, (d) Confined Space Entry, (e) Fall Protection, (f) Self Rescue, and (g) DOT Compliance.

C. Safety Equipment. Placement personnel shall be equipped with job-specific safety equipment to complete the placement of a THMR floating spray equipment following all OSHA safety regulations. Safety equipment shall include confined space, fall protection, rescue, decontamination, and communication tools such as (air monitor, ventilation fan, tri-pod, winches, FBH’s, retractables, ropes, lanyards, descenders, radios, hard hats, step pools, disinfectant sprayer, etc.)

 3.01b CONTRACTOR PLACEMENT (Only If Applicable, Delete 3.01a)

 A. Placement and Startup Services. Shall be provided by others and not the factory equipment manufacturer.

 2.02 ELECTRICAL CONTROL PANELS (Only If Applicable, remove and replace 2.02 H with below)

\*\*\*Three-Phase Control Systems\*\*\*

 H. Three-phase equipment control and motor protection. Power source to each separate piece of equipment shall contain a combination motor starter with electronic overload motor protection meeting the following:

1. Lockable External Disconnect

2. UL 489 circuit breaker disconnect for branch and short circuit protection

3. Hand-Off-Auto switch rated IP69K for dust tight, high pressure spray-down applications.

4. External Run Indicator Light or LED

5. Wide range, adjustable, class 5-30 electronic motor overload including:

• Underload (dry-run protection), for time-based automatic restart

• Over/under voltage

* Current phase unbalance
* Reverse phase
* Easy access to input and output terminals
* 32-character, backlit, NEMA 4x, wash-down rated screen, visible from the front of the panel with door panel mount kit included, displays voltage, amperage, faults, and parameter settings

6. Real-time and date stamped fault logging including:

• Pre-programmed real time clock with a 10-year battery backup

* Contains separate fault, configuration change, and start logs
* Records up to 150 faults

7. Multiple Connectivity features including:

• Easy Access I/O terminals

* Modbus RTU communication
* Bluetooth with free FE Connect app for parameter setup, operation screen, log viewing, and settings/logging downloadable files that can be emailed

8. 12-240 VAC/VDC wet input for remote start/stop

9. Dry contacts for auto run/shutdown or high float/low float

10. Automatic fault reset and on and off delay settings

11. Capable of running each separate piece of equipment (motor) independently

\*\*\*Single-Phase Control Systems\*\*\*

 H. Single-phase equipment control and motor protection. Power source to each separate piece of equipment shall contain a combination motor starter with electronic overload motor protection meeting the following:

1. Lockable External Disconnect

2. UL 489 circuit breaker disconnect for branch and short circuit protection

3. Hand-Off-Auto switch rated IP69K for dust tight, high pressure spray-down applications.

4. External Run Indicator Light or LED

5. Wide range, adjustable, class 5-30 electronic motor overload including:

• Underload (dry-run protection), for time-based automatic restart

• Over/under power (dry run)

* Over/under voltage
* Ground fault (UL 1053 certified)
* Easy access to input and output terminals
* Intuitive display to view voltage, amperage, faults, and parameter settings

6. Fault log, counter and parameter change logging:

• Records last 15 fault types with power condition values with fault type count stores up to 255 count

* Logs changes to parameter settings

7. Multiple tap control transformer with integrated secondary protection

8. 12-240 VAC/VDC wet input for remote start/stop

9. Dry contacts for auto run/shutdown or high float/low float

10. Automatic fault reset and on and off delay settings

11. Capable of running each separate piece of equipment (motor) independently