Natare® Air Cushion Sparger Systems

The following pages include a typical specification (in the Construction Specification Institute, CSI format) for an air sparger system. This specification is intended to be used as part of a project or as a stand-alone specification for the purchase of an air sparger system.

This specification is not proprietary or intended to limit competition. The purpose of this specification is to establish the minimum performance and quality standards for an air sparger system. The use of this specification does not preclude other manufacturers or suppliers from bidding. In fact, the use of a comprehensive and detailed specification ensures that the purchaser or owner actually receives the expected quality and performance required in an air sparger system.

There is a wide range of differences in air sparger specifications. Natare recommends that purchasers understand their needs, specify the air sparger system that meets their requirements, and demand that all potential suppliers meet those minimum requirements.

Air sparger system purchases are generally an once-in-a-lifetime purchase (if done correctly). Select the system your facility deserves—don't settle for something less. Please contact Natare for assistance in selecting and specifying your air sparger system.

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Understanding, Selecting and Specifying Air Cushion Safety Sparger Systems

Instant air cushion sparger systems utilize special stainless steel and polymer sparger "heads" (diffusers) installed in the pool floor directly under the plummet of spring boards or platforms. These heads provide a mound of bubbles to cushion the diver's impact into the water while providing the diver with a clear visual reference for the water surface.

Natare Air Sparger Systems are also used in water features, aquatic facilities, and special attractions where small or large mounds of aerated water enhance the attraction or provide a specific functionality, look or environment.

The bubble action is remotely activated on demand by the coach or trainer using a hand held remote control that starts and stops the release of air. The bubbling action normally lasts for between five to seven seconds, providing adequate time to coordinate the air release with the diver's entry into the water.

The sparger heads are supplied by a high capacity compressor and storage tank, which are located in a remote mechanical room or service area.

Air safety cushion systems can be installed for permanent or removable use, either during new construction or for existing pools.

How It Works

An air safety cushion sparger system is a combination of air compressor, sparger diffuser nozzles, control valves, filters and controls individually selected to provide the correct quantity and quality of air to the bottom of the diving pool. A uniform mixture of air and water in the diver's entry area lessens the fear of injury during training. The highly aerated foam cushion helps the diver to concentrate on the mechanics of learning new dives, particularly dives with a higher degree of difficulty. The froth of water also helps the diver to judge the water surface accurately.

The coach or trainer communicates with the diver to coordinate the initiation of the bubbling action as the diver leaves the tower of platform, then stops the air flow after the diver enters the water. Operation is simple and easy, and both coach and diver soon learn to maximize the beneficial effects of the system.

Air Safety Cushion Sparger Systems are designed and manufactured specifically for each application. The number, size and location of the aerating sparger diffuser nozzles are selected for specific configurations of diving pool depths, board heights and locations. Compressor, air storage and compressed air needs are based upon diffuser nozzle requirements and required cycle times.

Typical systems consist of a base mounted compressor with one or more air receivers (air storage units). Depending upon compressor sizing and storage capacity, dives can be completed as often as every two to four minutes. In addition to the air compressor and storage units, a complete air quality and control system is provided including pressure reducing valves, filters, air regulation valves, electric solenoid control valves and control panel. Remote handheld push button control pendants can be radio controlled or cable connected to the control panel.

Standard Configuration, Options, and accessories for Natare Air Sparger Systems

Natare air safety cushion sparger systems are complete and operational. A range of options is available to accommodate even the most complex diving facility or training environment. Sparger heads are selected as required to protect entry

positions for springboard and platform diving while duller heads provide water surface agitation and ensure surface visibility.

Standard systems include the required sparger and dulling heads, deck side and mechanical room controls with wireless remotes, air supply systems, along with the engineering, technical and support services to deliver a complete and functional system. A variety options are also available. The following pages describe those systems.

Sparger Heads

For designated springboard/platform heights

- 10.0 M platform
- 7.5 M platform
- 5.0 M platform
- 3.0 M platform
- 3.0 M springboard
- 1.0 M springboard
- 1.0 M springboard

Duller Heads

For water surface agitation and "dulling" in designated locations without sparger heads

- Duller heads platform or springboard

Control/Manifold Package

- Deck Side Control Panel with 10.4" Color LCD screen
- Master Control Panel (located in mechanical room or other secured area)
- Control Electronics (housed in Sparger Control Panel)
- Wireless Remote, single (additional remotes available)
- Sparger Control Panel (Primary), for up to 5 heads and 7 dulling heads
- Sparger Control Panel (Secondary), for up to 5 additional heads and 7 dulling heads

Air Supply Package

Compressors

- Standard 20-HP 84-cfm @125 psi Air Compressor

  Optional - 25-HP (106-cfm @ 125) output. Higher capacity compressor option for longer operating cycles

Compressor Accessories

- Refrigerated Air Dryer

  Optional - Tank Mount air dryer

Optional - High ambient temperature (122°F/48°C max) performance with high temperature with Graphic controller upgrade for hot climates

Optional - Rain protection for outdoor installation of the air supply system

Optional - HD Inlet filter for dusty locations

Optional - Tropical thermostat for warmer ambient installations

Optional - Anti-Condensate fan control for humid installations

Optional - Motor Thermistors and Anti-condensate heaters

Air Filter Options

- Coalescing Filter

Optional - for high capacity coalescing Filters

Receiver (air storage) Tanks

- 240 gallon/150-psi Receiver Tanks – standard is two, additional available for longer runs and sparger cycles.
- 400 gallon/150-psi Receiver Tanks – standard is one, additional available for longer runs and sparger cycles. standard is one

Optional -240gal/200-psi receiver, epoxy-lined interior/epoxy prime exterior with white urethane top coat – higher durability for humid, corrosive or outdoor installation

Optional -400 gal/200-psi receiver, epoxy-lined interior/epoxy prime exterior with white urethane top coat - higher durability for humid, corrosive or outdoor installation

Receiver (air storage) Tank Options

Receiver Certification (ASME) when required by local code/regulations

Pressure Gauge

Pressure Switch

Automatic Tank Drain Trap

Air Relief Valve

Ball Valve

Check Valve

Miscellaneous Fittings

Receiver accessories package – pressure relief valve for 175-psi, gauge, auto-drain

Engineering

Optional -Natare Engineering for special environmental, ambient or installation requirements

SECTION 13 11 60 – Air Cushion Sparger Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The provision of the Notice to Bidders, Instructions to Bidders, Proposals, General Conditions, Supplementary Conditions, General Requirements, related Sections and other Divisions of these documents, if used as part of this project, are included as a part of this Section as though bound herein.

1.2 SUMMARY:

A. It is the intent of this Specification to describe the design, installation, and execution of work related to the Natare Air Cushion Sparger System described and shown Project Documents. The system shall provide mounds of highly aerated water in the diver's entry area to help prevent injuries and aid divers during training in learning the mechanics of complicated dives. The system shall also provide water surface agitation to assist the divers to see the surface of water more clearly during training and competition.

1. The system shall be required to serve the diving boards and platforms as shown on the drawings via sparger heads located beneath each designated diving board or platform position. Unless otherwise noted, the system shall be provided for each take-off position above 1 meter in height, i.e. 10-m, 7.5-m, 5-m, and 3-m platform and/or 3-m springboards. The system shall also provide general water agitation under each springboard and platform for water agitation to break surface reflection. The system shall provide two air discharge functions as follows:
   a. Duller air flow - General water agitation to break up surface reflections.
   b. Cushion air flow - Bulk discharge of compressed air to produce a cushion effect to assist divers in training and operated via a hand held remote control unit by the training supervisor/coach.
2. This Specification includes, but is not limited to, the following components:
   a. Air Supply System
   b. Air Cushion Sparger Heads
   c. Duller Air Flow Heads
   d. Deck-side Sparger Control enclosure
   e. Tethered and Remote Control Pendants
   f. Master System Control Panel
   g. Sparger Air Supply System Control enclosure

B. Refer to Section _____ for alternates that may affect the Work of this Section.

C. This Specification describes an air sparger system that meets the project requirements. Should the requirements of this specification contradict any other section of the project specifications, this section shall govern.

D. Where items of the architectural, mechanical, or electrical general conditions, special conditions, and specifications are repeated in this Section of the Specifications, it is intended to call particular attention or qualify these items. It is not intended that any other parts of the documents shall be assumed to be omitted if not repeated herein.

E. The complete and operable air sparger system specified and shown on the detailed drawings is intended as the basis for receiving bids and is the preference of the Owner. It is assumed that unless otherwise stated, the bidder is offering the equipment in literal compliance with these Specifications.

1.3 SUBSTITUTIONS:

A. The air sparger system has been the subject of a detailed investigation and the design and operation of adjoining equipment and system is based upon the specified equipment. All base bids shall include only that equipment and systems listed herein or subsequently approved by addendum. The Owner reserves the right to reject any and all substitutions without cause and for any reason whatsoever, and the BIDDER is obligated to provide only the products, equipment, or systems as described herein from the specified manufacturer.

1.4 TRADE NAMES:

A. When a particular manufacturer's product, system, or brand name is designated in the project documents, either in the drawings, specifications or addenda thereto, only such designated products or systems by the named manufacturer may be provided.

1. When reference is made in the project documents to trade names, brand names or the products of a particular manufacturer, such references are made solely to indicate what products or systems may be furnished and are not intended to restrict competition. Should any bidder desire to use products, systems, trade names or brand names that are different from those mentioned in the project documents, application for the approval of such different products, systems, trade names or brand names must be provided to the Architect/Consultant in writing a minimum of 10 days prior to the date set for the opening of bids.
2. The burden of proving acceptability rests with the applicant and any application for approval must be accompanied with adequate and sufficient technical data, drawings, and details to establish beyond all doubt that the proposed product or system meets or exceeds all express requirements of the project documents.
3. Unless requests for approval of other products, systems, trade names, or brand names have been received and approvals have been published by addendum, only such designated products or systems by the named manufacturer may be provided.

1.5 DEFINITIONS:

A. Reference Standards: Certain applicable reference standards are incorporated herein to the extent such references are relevant, with the latest revision applicable including, but not limited to:

1. Fabrication and Manufacturing standards:
   a. AISI - American Iron and Steel Institute
   b. ANSI - American National Standards Institute
   c. AWS - American Welding Society
   d. ASTM - American Society for Testing Materials
   e. ASM International
2. The following are utilized as applicable:
   a. NCAA - National Collegiate Athletic Association
   b. FINA - Federation Internationale de Natation Amateur
   c. USA Swimming - United States of America Swimming Incorporated
   d. USA Diving
   e. Other as required by local codes, governing authority of sanctioning body

B. The term "Bidder", "Contractor" or "Supplier" are used interchangeably to describe the party or parties contractually obligated to provide the equipment, services and systems described herein.

C. The intent of these Specifications is not to establish specific quantities, amounts, or dimensions. Thus, the reference to "one", "each", "an", "a", or like wording is for semantic purposes only. Unless specifically stipulated

otherwise, provide materials, equipment, and items as reasonably required for a complete, operational air cushion sparger system.

1.6 SYSTEM PERFORMANCE REQUIREMENTS:

A. The system hereinafter specified consists of a complete air cushion sparger system of the type and configuration as described herein and detailed on the drawings, including all necessary equipment within this specification.

B. The air cushion sparger system shall be designed for regular daily use between various locations. Air supply systems are intended to minimize recovery times between system activation.

1.7 SEQUENCING AND SCHEDULING:

A. Coordinate all work activities and installation of the sparger system with other building components.

B. Coordinate appropriate openings in pool structure during progress of construction to allow for sparger head and supply piping.

C. Coordinate installation of sparger heads and related items in cast-in-place concrete and other structural components, as they are constructed.

1.8 DRAWINGS:

A. The drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement. The drawings are intended for bidders and manufacturers having experience, skill, and discretion in the execution of the work required for this project.

1.9 SUBMITTALS:

A. Upon notice to proceed under this Contract, installation details and submittal documents will be provided fully illustrating the materials and procedures to be utilized. These details and submittal documents, once accepted by the Owner or Consultant or Owner's Representative, shall be the basis for the fabrication, installation, and inspection.

B. Product Data: Submit manufacturer's technical information and product data including basic materials, analysis, and installation instructions for the air cushion sparger system, including the following:

1. List each material and application, cross-reference to the shop drawing, and identify by manufacturer's name.
2. Provide certified dimensional shop drawings showing all pertinent dimensions in plan, section, and elevation.

C. Submit manufacturer’s written recommendations for scheduling of maintenance, installation, and inspection procedures. Include recommendations for corrective action in typical situations that may be encountered.

1. Submit comprehensive operation and maintenance manuals covering all aspects of operating and maintaining the air cushion sparger system.

D. Maintenance Instructions and Maintenance Program: The Manufacturer shall provide complete descriptive information detailing proper care, maintenance and cleaning of the system. A five- (5) year Maintenance, Service, and Inspection Agreement shall be available for a specified sum per year. This Maintenance, Service and Inspection Agreement will include required parts, equipment, and labor for the proper maintenance and operation of the air cushion sparger system for a period of five (5) years after acceptance by the Owner and may be renewed for additional periods of five (5) years at the end of each five-year period.

1.10 QUALITY ASSURANCE:

A. The air cushion sparger system shall be the product of a Manufacturer having at least ten (10) years’ experience in the fabrication of such systems.

1. If alternate or substitute manufacturer's systems are offered for approval prior to bidding, the manufacturer shall submit a complete set of calculations and drawings certified by a registered Professional Engineer licensed to practice in the state where the system is to be installed and such certification shall state that this engineer assumes full responsibility for all aspects of the sparger installation.
2. Claims for additional compensation to comply with these specifications after bid for any reason whatsoever will not be considered. Only materials, equipment, or systems that absolutely comply with these specifications in all regards will be accepted. Any approved substitute systems from alternate manufacturers shall be in absolute compliance with all requirements of these Specifications.

B. Warranty: The sparger system shall be guaranteed by the Manufacturer for workmanship, materials, and performance for a period of fifteen (15) years. This warranty shall not include or cover abusive or improper treatment of the system by others either during construction or when operational.

1.11 EXTRA MATERIALS:

A. Furnish all required materials for the complete installation of the air cushion sparger system.

1.12 DELIVERY, STORAGE AND HANDLING:

A. The system components shall be shipped to the job site as complete units unless project site conditions require otherwise. Site assembly of any part of the main system components without the complete coordination and supervision of the manufacturer is strictly prohibited. Unloading and storage shall be coordinated between the Owner or Consultant and system manufacturer. The materials shall not be stored or handled in any manner that could cause damage or deformity.

1.13 PROJECT SITE CONDITIONS:

A. The project site shall be in accordance with the Manufacturers' technical bulletins.

1.14 COORDINATION:

A. The manufacturer shall provide complete descriptive information detailing the design, construction, and installation.

B. The Contractor shall require review all adjoining work, including perimeter gutter systems, pool structure or pool related construction, to ensure that such work is compatible with and appropriate for the installation and use of the air cushion sparger system. The manufacturer shall, immediately and before proceeding, advise the Owner or Consultant of any constraints, conflicts, inadequacies, or incompatibilities related to any aspect of the installation or use of the system and await instruction or clarification before proceeding. The absence of any such advice by the contractor shall constitute acceptance of full and complete responsibility for all aspects of the air cushion sparger system installation and performance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. The system specified is the product of a manufacturer with at least 10 years' experience in the construction of air cushion sparger systems and with at least three (3) systems of comparable size and design in satisfactory service.

B. The air cushion sparger system shall be designed to provide air cushion and surface dulling for the following locations as shown on the drawings and/or as specified herein.

1. 1-meter springboard(s)
2. 3-meter springboard(s)
3. 1-meter platform(s)
4. 3-meter platform(s)
5. 5- meter platform(s)
6. 7.5-meter platform(s)
7. 10-meter platform(s)

C. The air cushion sparger system described in these specifications and shown on any accompanying drawings is the basis of design and is the Owner's preference. It is a proprietary product and the exclusive design of Natare Corporation, 5905 W. 74th St., Indianapolis, IN 46278, USA (317) -290-8828 natare@natare.com | www.natare.com. This system shall be included and furnished under the base bid. There are no known equals, equivalents, or acceptable substitutions.

2.2 Materials:

A. All materials in the air cushion sparger system are to be compatible with the swimming pool environment. Except as designated, carbon steel, copper, aluminum, magnesium, wood, and fiberglass in any form are not acceptable. No copper shall be used in the air supply system. All stainless steel utilized in the air sparger system shall be a 300 series stainless, intended specifically for use in a swimming pool environment.

2.3 COMPONENTS & EQUIPMENT:

A. The air cushion sparger system shall consist of the following components supplied by one manufacturer. It must be of modular design that has been factory assembled and tested. Field assembly of pneumatic and electronic control systems will not be accepted. All pneumatic and electronic controls must be housed in non-metallic enclosures. All electrical control connections must be male-female type, factory assembled and tested, quick connect style that is suitable for the environment.

1. Air compressor(s) shall be provided to supply compressed air and shall be an industrial grade rotary screw air compressor with a minimum efficiency of 90% providing a minimum of 90-cfm at 125 psig actual delivery.

a. The air compressor unit shall be factory built with all components fully tested with all controls and shall be ready to operate. The air supply system shall be specifically intended for use with air cushion sparger systems and shall include compressors from Elgi, Atlas Copco, Kaeser or pre-approved equal.

b. Air compressor shall have high efficiency and low power consumption. The compressor(s) shall be lubricated rotary screw direct drive compressors providing a minimum of 90% efficient TEFC drive motor and Wye Delta motor starter. The compressor shall be air cooled type and fully enclosed in a low sound transmission enclosure. Fluid carry over shall be less than 2ppm. It shall doors or removable panels on all sides to allow easy access to all internal parts.

c. Compressor shall be equipped with air, oil pressure gauge, temperature gauge, hour meter, and a microprocessor-based control system with digital readout. It shall be complete with IP 55 motors, low voltage control circuit, and air pre-filter. Sound level for the compressor shall be less than 75 dB(A) measured at 1 meter. Compressor fluid shall be synthetic type, capable of preventing varnish and sludge formation. Compressors shall be from ISO certified manufacturer.

d. A refrigerated air dryer, integral, or free-standing, shall be included with the capability to supply the specified air volume at -37° to 42° dew point.

e. The air compressors shall be fitted with microprocessor control panel. The safety control panel shall indicate motor overload, excessive temperature, incorrect or no rotation.

f. An air filtration system shall be provided for each compressor to remove contaminants from compressed air

g. The air compressor shall be provided with an integral after cooler with moisture separator, integrated air dryer, 1.0-micron particulate and .01-micron coalescing filters. Air cooled after coolers shall have aluminum tubes and fining compactly assembled within a steel housing. The internal surface shall be metallurgically bonded to ensure maximum heat transfer whilst having a low density to minimize pressure drop. Cooling air shall be blown through the tube block by an axial flow impeller directly driven by an electric motor. Sealed pre-packed bearings shall be provided to reduce maintenance.

h. After-coolers shall incorporate an integral moisture separator and collector an automatic drain to discharge water from the after-cooler.

2. Air receiver: Furnish one or more vertical or horizontal air receivers suitable for 200 psig working pressure with a minimum total volume of 480-gallons (1817 liters).

a. All air receivers shall be built to ASME Code Section VIII requirements and shall bear the stamp of a National Board Registered manufacturer. Receivers shall be provided with integral base ring or support saddles. Furnish with and gray primer coating electrostatically applied. See related Project Documents for final finish coating requirements.

b. Each air receiver shall have all relevant safety features including pressure gauges, and pressure release valves plus all necessary compressed air lines, water drip units, valves and suitably rated distribution pipe work.

3. Air cushion sparger head in the length and quantity as indicated on the drawings, including 12-ft. (3.66-m) heads for spring board or platform positions up to 3-meter in height, 18-ft (5.49-m) for positions above 3-meter, and 21-ft (6.40-m) for use at overlapping platform locations when applicable.

a. Sparger heads shall be fabricated from 316L stainless steel with a high density polymer top in a color chosen from the manufacturer's standard colors that include black, shades of white, gray and tan.

b. Sparger heads shall include internal pressure diffusers to ensure adequate air distribution along the length of the sparger and to avoid over-pressurization of any section of the sparger head.

c. Sparger heads shall be provided with 2-in female NPT stainless steel connection to sparger head air supply systems. An (optional) NPT to ISO 7/1 adapter shall be provided for installations outside of the U.S.A.

d. Sparger heads shall be provided as a single piece unit which does not require field welding or splicing.

e. Sparger head designs requiring the use of check-valves will not be accepted.

4. Dulling heads in the quantity as indicated on the drawings, for positions not served by sparger heads.

a. Dulling heads shall be fabricated from 316L stainless steel with a high density polymer top in a color chosen from the manufacturer's standard colors that include black, shades of white, gray and tan.

b. Dulling heads shall include internal pressure diffusers to ensure adequate air distribution along the length of the sparger and to avoid over-pressurization of any section of the sparger head.

c. Dulling heads shall be provided with 1-in female NPT stainless steel connection to sparger head air supply systems. An (optional) NPT to ISO 7/1 adapter shall be provided for installations outside of the U.S.A.

d. Dulling head designs requiring the use of check-valves will not be accepted.

5. Deck-side system control panel: Furnish one modular deck-side system control panel ("DSSC") capable of controlling all functions for both duller and cushion airflow through touch entry on a full-color (64K-color) touch screen display. Deck side panel shall be key-lockable, and the screen accessible only by password. The deck-side control panel shall include the wireless receiver interface and attachment for the optional tethered pendant. All electrical power supplied to the panel must be 24-volt or less.

   a. The DSSC shall consist of a NEMA 4X PVC control panel suitable for wall mounting. This panel shall include a full-color (64K-color) touch screen display with a minimum size of 10.4-in and an active area of 800 x600 pixels (SVGA). Screen brightness shall be adjustable, and an internal seven-year backup battery is to be provided. The touch screen display shall provide real-time information to the operator including:

      1) System operating condition and fault conditions

      2) System air pressure and charging condition

   b. The DSSC must be capable of optional remote Ethernet, MODBUS, and remote access connectivity.

   c. The DSSC shall be lockable and the screen accessible only by password. The control panel shall include the wireless receiver and interface for the optional wired pendant. All electrical power is 24-volt and is supplied via the multi-conductor system CANBUS cable. No additional power connections are required. The touch screen display shall provide real-time information to the operator.

   d. DSSC panel size shall not exceed 16.5-in. (419-mm) x 14.5-in. (368-mm) and shall include a keyed switch for radio receiver control located on one side of the panel.

6. Hand held remote(s): Furnish a minimum of two (2) handheld remotes consisting of a wireless remote control pendant(s) allowing for the activation of individual sparger heads and optional tethered (wired) control pendant allowing for the activation of individual sparger heads.

   a. A wireless hand held remote unit (standard) is provided to communicate with the DSSC and distribution manifolds controlling the operation of the cushion air release valves. Individual push buttons to be provided for each sparger head that will control cushion air flow to any head at one time (dual head operation for synchronized diving is an option). Wireless pendant shall be complete with lanyard and housed in a NEMA 4X enclosure.

7. Tethered hand held remote unit (optional): Furnish is available to link a hand held tethered control pendant with connecting cable to communicate with the DSSC controlling the operation of the cushion air release valves. Individual push buttons to be provided for each sparger head that will control cushion air flow to any head at one time (dual head operation for synchronized diving is an option). Tethered pendants consist of a NEMA 4-x enclosure with heavy-duty waterproof connecting cable rated acceptable for submergence in swimming pool water. Standard pendant cable length is 50-ft. (15.24-m)

8. Master System Control: Furnish one modular mechanical room master system control ("MSC")panel shall be provided capable of providing all control interface and power supply for the DSSC and the sparger head air supply system panel, including the interface and control circuitry for the air supply package.

   A. Control panel shall be lockable with a master control switch on the panel face. All electrical power connections for the entire system are to be made through the panel via externally supplied input power from 93 to 132 or 186-264 volt AC power, 10-amp isolated individual circuit.

   B. Control panel must have front mounted main power switch and indicator lamp

   C. Furnish with heavy-duty waterproof connecting cable with factory-installed terminations for connection to sparger air system control and to deck-side sparger control panel. All cables are to be plenum rated and rated acceptable for submergence in swimming pool water. Standard cable lengths are 10-ft. (3-m) for connection to the sparger air system control enclosure, and 100-ft. (30.48-m) for connection to the modular DSSC panel.

9. Sparger Air System Control: Furnish one modular sparger air system control ("SASC") consisting of components, motorized control valves, control cabinet, and related equipment, all factory installed in a sealed, non-metallic NEMA 12 cabinet with stainless steel locking hardware. All internal air piping and valves shall be stainless steel, brass, or bronze. Pneumatic air control piping shall be high density polyethylene tubing.

   a. For safety and durability, no electrical controls or external power wiring shall be used for any sparger air supply function or SASC panel. All connections between the master control system panel and the air system control panel shall be via prewired multi-conductor cable with factory installed end connections. No field termination of control system cables is acceptable.

   b. All valves shall be slow-acting to eliminate excessive pressure head or water hammer in the sparger heads. The SASC shall be complete, factory-tested and certified, and functional in all respects when delivered to the project site. At a minimum, the SASC shall include the following equipment and/or perform the following functions:

      1) Stainless steel air supply manifold components
      2) Single Inlet air supply connection
      3) Multiple stainless steel outlet air supply connections one for each sparger head air delivery piping
      4) Outlet air supply for duller air discharge.
      5) Independent high pressure air reservoir
      6) Pressure transducers –pressure 16 bar
      7) Pressure gauges –pressure of 16 bar
      8) Air filter regulators – pressure of 16 bar
      9) Pressure regulators – pressure of 16 bar
      10) Airline valves – 200 psig working pressure
      11) Duller non return valves for each line
      12) Cushion pneumatic actuated valves and pneumatic control circuitry.
      13) Regulating valves for duller discharge rates and actuated valves for bulk air release for the cushion feature

10. Modular plug-in interface and control cables for all connections between the deck panel, mechanical room master control system panel and the sparger head air supply control system panel, including factory-terminated end connectors in the lengths as specified.

2.4 SEQUENCE OF OPERATION AND FUNCTIONS:

A. System Controls: The system is manually energized by releasing the system lockout and enabling power at the MSC panel located in the filtration plant room or mechanical room. When activated, the DSSC touch screen display will display the initial condition of the system, including the operating pressure available to the sparger heads. When activated, the system will provide continuous dulling (water surface agitation) to each position as indicated on the drawings. When dulling airflow begins, the system is armed and will report ready or air cushion deployment to the MSC. The modular control systems shall provide all the necessary relays, contacts, transformers etc., to operate the air supply valves on the pneumatic valves and other controls. Once activated, all control features shall be available to the touch screen on the deck-side control panel.

1. There shall be no field terminations made for control wiring to any modular control system panels, including any solenoid valves, pressure switches, or similar devices. All connections between the MSC panel and the SASC panel shall be factory assembled and tested prior to delivery to the project site. Connections between system components shall connect via a factory terminated and installed male-female plug system on the modular control panels.
2. When activated from either the handheld remote wireless pendants, tethered pendant, or deck side control panel touch screen, the air cushion will develop at the designated diver entry point within no more than 10-seconds and remain active until the control button is released, pre-set timer expires (optional), or system air pressure drops below the required level to sustain the air cushion.
3. Depending upon the length of time for each air cushion deployment, the system will allow immediate deployment of another air cushion or will report the status of the air system pressurization by providing a visual flashing display on the DSSC touch screen of “Low Air Pressure” indicating that the system is inadequate. When the system is adequately pressurized, the DSSC display shall indicate that the system is ready for another discharge.

2.5 PIPING:

A. Compressor air piping and interconnecting air supply piping to all components of the air supply system shall be rated for compressed air service with a minimum working pressure of 200 psig or equal and approved for such service under all relevant codes or regulations.

B. Air supply piping from the modular SASC (sparger head air supply control) to the individual sparger heads shall be stainless steel, high density polyethylene or schedule 80-CPVC, subject to the any and all requirements of the Mechanical Specifications and as approved for compressed air service with a minimum working pressure of 200 psig or equal and approved for such service under all relevant codes or regulations.

PART 3 - EXECUTION

A. Examination: All site conditions are in accordance with the Manufacturers' requirements, shop drawings, and/or technical bulletins.

B. Erection, Installation & Assembly: All installation shall be performed in accordance with Manufacturer's technical bulletins. Should the requirements of these bulletins contradict this or any other section of the Specifications, the procedures called for in the bulletins shall govern so that the complete system will operate in accordance with the intent of these Specifications and the requirements of the project. The Air Cushion Sparger System manufacturer or his representative shall supply the services of a competent and experienced field engineer to inspect the completed installation, make final adjustments, place the system in operation, and give operating instructions relative to its care and use.

C. Field Quality Control: Upon completion of installation, the air cushion sparger system shall be adjusted and demonstrated to produce the proper and appropriate air cushion and dulling at each individual sparger head location.

D. Demonstration: Provide a full set of submittal and installation drawings that show all the features of the system construction and indicating proper sizing and locations along with complete dimensional details and operating instructions.

Natare Corporation

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