SECTION III-D
Science Requirements

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SCIENCE REQUIREMENTS

Bidders are required to address all of the science requirements outlined below. Areas where proposals diverge from the stated requirements should be highlighted and specifically addressed in terms of proposed approach.

1. External Work Areas

   A. Main Science Mast

      i. A science mast is required for mounting meteorological and other scientific instruments.

         a. The mast shall be tall enough and located in such a way as to provide mounting surfaces that are clear of air turbulence created by the ship's superstructure and all ship's exhaust when the ship is underway.

         b. The mast must also be 100 percent free of shadowing from any other part of the ship.

         c. This mast shall have, at its base, a wire conduit outlet, with a threaded cap, where the conduit provides for internal cable way to two areas immediately below the bridge where scientific sensors and equipment may be installed and operated, and to the Electronics Workshop. The outboard end cap of this conduit shall be fitted with stuffing tubes to accommodate Charterers' data and electrical wires from the science mast. Cable runs for Science Mast shall accommodate power and shielded data cables.

         d. The mast and its platform shall provide for an unobstructed 360-degree sky view for radiometers, and the ability to support IMET sensors unobstructed by smokestack exhaust plume and radar sweep.

         e. Other instruments, such as GPS antennae shall be mounted on the Mast and its platform.

      ii. Specific Requirements

         a. The mast must be accessible by ladder and have an upper catwalk. The entire length of the ladder shall be surrounded by a protective enclosure.

         b. The catwalk shall be at least 30 inches wide and equipped with safety handrails.

         c. Details of required services can be found in attached tables.

         d. Wire way access- There shall be a 6-inch (minimum) diameter conduit from the top of the mast to the laboratory spaces and the secure server room. This conduit must be installed to accommodate wiring for science instrumentation located on the mast.

(1.) This conduit shall include 3R (bend radius three times the diameter of the conduit) turns and shall include access ports every 50 feet.

(2.) The use of 90-degree turns should be avoided. If 90-degree turns are unavoidable, there shall be an access port at each one to aid in running cables.

B. Bow Science Mast

A bow science mast is required for mounting scientific instruments that will need a clean area for sampling, especially air samples. This mast will be located as far forward on the ship as possible to facilitate collecting air samples before it moves into the air envelope of the vessel. A ladder shall be provided for accessing the top of the mast.

i. Specific Requirements

a. Details of required services can be found in attached tables.

b. Wire way access - The bow mast must be serviced by a minimum of two, 3-inch diameter conduits from the top of the mast to the laboratory spaces. This conduit must be installed to accommodate wiring for science instrumentation located on the mast.

(1.) This conduit shall include 3R turns and shall include access ports every 50 feet.

(2.) There shall be no 90-degree turns in this conduit. If 90-degree turns are unavoidable, there shall be an access port at each one to aid in running cables.

C. Working Deck Area

i. The vessel should be configured so that one side of the vessel is the "working" or "clean" side and one the "dirty" side. To avoid as much as possible contaminating samples taken from the working or clean side, all overboard discharges and drains shall opposite the working side.

ii. A fantail working deck area of about 1,000 square feet is required with additional contiguous working area along the working side to facilitate deployment of scientific instrumentation (about 25 feet long by 12 feet wide). This area shall be capable of withstanding local deck loads of 750 pounds per square foot. The work areas shall be about 8 feet above the working draft to make them as dry as possible while still allowing over-the-side work. A portion of the bulwark in this area shall be gated or removable to facilitate loading heavy or bulky objects from the sea or pier side.

iii. Stainless steel, threaded, deck sockets that are flush with the deck (internally threaded 1-inch unified course thread (UNC) shall be provided throughout the working deck area on 2-foot centers.

iv. Bidders should consider a deck heating system to maintain the main deck working areas free of ice accretion.

v. About 200 square feet of deck workspace above the main deck with minimal obstruction to ambient light for light incubation experiments shall be provided. This area shall also have flush deck stainless steel threaded deck sockets on 2-foot centers.

vi. Uncontaminated seawater (discussed in section III-D 10) per attached.

vii. The ship shall also have a clear area on the foredeck near the bow for erection of specialized towers and booms that reach forward of the bow wave for gathering uncontaminated air samples. This area shall also have similar flush deck threaded sockets on two-foot centers.

viii. All working decks shall be provided with 208 VAC 3-phase and 480 VAC 3-phase, 60 Hertz power supplied from IEC-309 standard receptacles, and 110 VAC 60 Hertz power supplied from NEMA 5 receptacles. Power outlets shall be located in interior spaces that are accessible from the working decks via a minimum of 6-inch diameter bulkhead pass-throughs.

ix. Additionally, working decks shall be provided with uncontaminated sea water supply and hydraulic service as supplied to the ship's cranes, A-Frames and deck machinery. There shall be at least two hydraulics service points from this system, on the aft deck available for Charterers' equipment.

x. Provision shall be made for allowing the discharge of expendable probes. This may take the form of an exterior mounted launching platform or a hull penetration such that the probes can be dropped from an interior space.

xi. Working decks and areas aft and outboard under A-frames must be adequately illuminated, preferably with white light, as to not cast shadows across working areas.

xii. All external areas of the vessel: walkways, doors, and ladders, shall have accommodations to prevent ice buildup that will create a hazardous work environment.

D. Weather Deck Storage

There must be at least 500 square feet of weather deck area available for break-bulk storage that is within service range of the ship's crane. Special provisions must be made to maintain walkways and hand rails and access around or immediately adjacent to the designated storage area.

2. Internal Work Areas

A. All spaces described in Section 2 will conform to the following general specifications. Detailed, space-specific specifications are provided in the appropriate sub-section.

i. Safety and engineering controls shall meet or exceed the standard of an equivalent land-based work site in the continental United States as defined under 29 CFR Occupational Safety and Health Administration (OSHA), American National Standards Institute (ANSI) (Z358.1 and others), and National Institute for Occupational Safety and Health (NIOSH) guidelines in effect at the time of the Charter award. In the event of conflict with any regulation, then 46 CFR Subchapter U shall take precedence.

ii. Unless otherwise specified, all science spaces and science berthing shall conform to a minimum guideline of the American Bureau of Shipping HAB+ notation for crew habitability on ships.

B. Laboratory Spaces

i. A total of 1,400 square feet of laboratory space is required, configurable or partitionable into 3 smaller lab spaces. These spaces shall function as research laboratory spaces where chemistry, biology, geology, and other scientific disciplines' experiments are performed.

ii. One laboratory must be able to receive a 20-foot core from the working deck. This could be accomplished, if needed, through another space such as the oceanographic staging hangar (Baltic Room).

iii. One laboratory located near the working deck shall have a sink drain arrangement of 40 gpm and fitted with a large removable sink equipped with a sediment trap which can be mounted or removed within the flexible arrangement of laboratory furniture for mud work or other applications.

iv. In addition to the above requirements, there are requirements for the following spaces:

a. Environmentally Controlled Laboratory (about 100 square feet)

b. Aquarium Room (about 250 square feet)

c. Oceanographic Staging Hangar ("Baltic Room") (about 400 square feet)

d. Laboratory space of about 20 square feet shall be provided for a government-furnished reverse osmosis water unit

e. Laboratory space of 14 feet by 5 feet high shall be provided for a seawater instrumentation wall (3/4-inch sealed plywood) over a stainless steel slop sink

C. Workshops

There is a requirement for workshop areas in addition to the above spaces. These workshops must include:

i. a science workshop of about 300 square feet and

ii. a science electronics workshop of about 80 square feet.

D. Office Spaces

There is a requirement for office areas as follow:

i. Computer workstations (about 225 square feet)

ii. Marine Projects Coordinator office (about 115 square feet)

iii. Chief Scientist Office (about 115 square feet)

iv. Science Support Office (about 60 square feet)

v. Library and Conference Room (about 550 square feet)

E. Special Spaces

Provisions shall be made for the following special spaces:

i. Secure server locations and communications equipment (about 120 square feet)

ii. Hospital (per 46 CFR72.20-35)

iii. Hazardous materials locker (about 65 square feet)

iv. Compressed gas storage locker (about 30 square feet)

v. Science sonar transducer wells and acoustic system (For detailed discussion see Section III-D 8)

F. Electrical

i. Each internal science area shall have a separate electrical circuit on a clean bus to provide continuous power of at least 60 VA per square foot of work space.

ii. Voltages shall be both 110 and 220 VAC at 60 Hertz with US standard NEMA 5 and 6 receptacles unless otherwise indicated.

iii. There shall be a maximum of four 110 VAC, 15 A receptacles or three 110V, 20A receptacles on any feeder circuit. There shall be about one 20 A receptacle for every two 15 A receptacles.

iv. Each 208 VAC receptacle shall be on a dedicated circuit.

v. The total estimated power demand for the work spaces is 100 kVA at any given time.

vi. All science area receptacles must be grounded to the distribution panel, and such panels shall be equipped with a dedicated ground to the main distribution center in the generator room.

vii. Uninterruptible and conditioned power supply (UPS) is required in all internal science spaces. The UPS system shall be capable of supplying a sustained load of 30 kVA.

viii. Breaker Panels for the UPS shall match capacity of the unit (i.e. a minimum of three 100 A panels). Secondary power supply for UPS unit shall come from the emergency generator.

ix. All outlets must be labeled to indicate amperage, breaker location, and UPS or Ship's power.

x. All outlets on UPS power shall be of a unique color different from other receptacles.

xi. All breaker panels must also be appropriately labeled.

xii. Each breaker panel should have about 35 percent of the panel available for future expansion.

xiii. All 110 VAC electrical outlets located in wet areas shall be GFCI protected.

xiv. Outlet locations shall be determined in final design.

xv. The ship shall operate with sensitive electronic equipment, computers, and data acquisition systems intended for scientific sensing and analysis. This equipment shall be placed primarily in the labs, other scientific spaces, the winch control room, the bridge, and on any of the working decks. The Owners shall install electrical, navigational, communication, or other cabling in a configuration that precludes any inductive coupling or other types of interference on one cable due to proximity of other cables. Traps, filters, grounds, etc. shall be installed as necessary to prevent any electro-magnetic interference with scientific equipment. Special attention shall be given to preventing 60-Hertz interference from fluorescent light fixtures.

G. Lighting

Ship's lighting shall conform to guidelines of the Illuminating Engineering Society of North America (IESNA) and ABS HAB+ notation for Crew Habitability on Ships. See Section III-E 1 for notations on vessel classification. A combination of direct and indirect lighting to reduce glare and provide uniform lighting on work surfaces shall be used.

H. Heating, Ventilation & Air Conditioning

i. Temperature range and control and ventilation will be maintained in accordance with ABS HAB+ or 46 CFR Subchapter U, whichever is more stringent. HVAC systems must be able to provide these requirements regardless of outside air conditions, i.e., working in the Antarctic or crossing the equator.

ii. HVAC system shall provide minimum outside air change rates within these spaces per the following schedule:

a. Laboratories – nine to 11 changes per hour normal, complying to 46 CFR Subchapter U for emergencies

b. Workshops – seven to 10 changes per hour

c. Office Spaces – five to eight changes per hour

d. Storage only rooms – two to three changes per hour

iii. If any spaces are combined into a dual role, the more strict ventilation requirement shall apply, e.g., if storage room and office are combined, ventilation for an office space shall apply.

iv. Hazardous materials exhaust must not be to any working deck, locations where personnel are likely to be, or interfere with science experiments.

v. The system shall provide air filtration.

vi. HVAC systems for internal science spaces shall be separate and isolatable from other berthing, cooking, and shipboard systems.

I. Floor covering

Interior deck surfaces must be of a slip-resistant design with suitable underlayment to reduce temperature fluctuation, vibration, and noise.

J. Pass Throughs and Wire Runs

Wire ways must be provided to all science and specialty van areas, working decks and winch locations, and shall have minimum 6-inch bulkhead pass throughs to facilitate running science related cable without removing end fittings. Conduit crossing hallways or other service facilities must also meet the minimum 6-inch requirement.

K. Data and Voice Drops (Serial, LAN, CCTV, Other)

i. Each internal science area shall have the following data connections:

a. LAN connections - GG-45 female jack connectors for connection to the Charterers' computer network located in the server and communications room, over Category 7 (ISO/IEC 11801:2002 Category 7/class F) Ethernet cable. These shall be wired according to ISO/IEC standard 11801.

b. CCTV connections - RG-6U or better coaxial cable terminated with F-type connectors, for connection to the Charterers' CCTV distribution system located in the server and communications room.

c. Telephone connections - RJ-11 female connectors shall be wired according to standard EIA/TIA.

d. T586A for communication over the ship's PBX.

ii. There shall be at least one telephone in each science space.

iii. The ship's PBX system shall be digital and allow easy expansion to at least 150 percent of initial capacity.

iv. Provision shall be made for wire ways such that serial and other data can be connected to the Charterers' data acquisition system in the secure server and communications room.

L. Ship's Alarm

i. Alarms, bells, firefighting equipment, doors, hatches, cable runs, and fittings shall be located in such a way as to maximize available science space and shall all be built for maximizing lab cleanliness.

ii. In addition, provision shall be made to interface science and special purpose ISO vans to the following shipboard systems:

a. General alarm

b. Fire zone monitoring

c. Telephone

d. CCTV, serial data, and network.

iii. See Section III-D 3 for additional details on science and specialty vans.

M. Fire Suppression

Fire suppression in all science spaces shall meet all U.S. Coast Guard (USCG) specifications under 46 CFR Subchapter U for Science Laboratories. In addition, CO_2 (Carbon Dioxide) fire extinguishers shall be provided in laboratory spaces and areas where sensitive electronics and scientific equipment are located.

N. Furniture Standards

i. Furniture will be designed for maximum efficiency and of sturdy construction to withstand continual use and forces experienced during high-sea states. See additional specific requirements in subsequent sections.

ii. All furniture shall have suitable latches, shelf retainers, and other necessary equipment to keep furniture closed during heavy seas.

O. Port Holes

Port holes shall meet ABS and USCG requirements and shall be fitted with deadlight covers.

P. Compressed Air Service

i. A ship's service compressed air system is required to supply science spaces defined in this section, and all working deck areas.

ii. A 120 psi air supply shall be filtered, free of moisture to -50°F and of oil to meet ISO standard 8573.1 class 1.2.1.

iii. The volume must be at least 50 cubic feet per minute.

iv. The inlet for the laboratory air feed shall be away from stack or other hydrocarbon emitting area.

v. Oiling for use with power tools will be accomplished in each space as required.

Q. Fresh Water Service

i. Supply

The Vessel's potable water system shall meet standards of the United States Antarctic Program (USAP) drinking water action levels and EPA Regulations and Analytical Criteria.

a. Potable water shall be distributed in plastic lined piping or flexible Unipipe.

b. Consideration should be given to a continuous recirculating loop water feed so that water doesn't sit stagnant.

c. Potable water pressure to laboratories shall be between 60 and 80 psi.

d. Flow rate to laboratory spaces shall be at least 5 gallons per minute.

e. The Charterers will install a GFP Reverse osmosis water for laboratory support. Charterers will provide detail in design period.

f. Deionized water. Specific GFP deionizing "polishers" shall be provided by the Charterers for at least two lab spaces and shall be bulkhead-mounted above sinks and fed by the Charterers' GFP RO Unit distributed into the lab spaces.

ii. Drainage

a. All science and related space deck drains shall lead to suitably-sized stainless steel overboard discharge lines fitted beneath the vessel's waterline on the 'dirty' or non-working side.

(1.) All such discharge lines shall be fitted with back-flow preventer valves as close to the actual discharge as possible.

(2.) The Owners shall also install shut-off valves upstream and downstream of these preventers for maintenance purposes.

(A.) One such shut-off valve shall be fitted for each branch leading to the discharge if more than one line leads to any such underwater discharge.

b. All drainage shall be functional under all sea states and under all conditions.

c. All science and related space deck drain and associated piping installations shall be heated by electrical trace tape, or other suitable means, to prevent build up or clogging by ice.

d. There shall be an emergency shutoff valve in any space where hazardous materials could be discharged through the drains.

e. Drainage runs shall be as short as possible to minimize the risk of plugging with mud, silt, and ice slush that might be introduced into the drain system.

f. Drain lines shall have a cleanout available.

g. All drains shall have individual backflow preventers so that water flowing in one drain doesn't return out another on the same system.

h. All floor and sink drains must have removable strainers for easy cleaning and maintenance.

i. All drains and back flow preventers are to be positioned so that they can be easily inspected, maintained, and repaired.

R. Laboratory-Specific Requirements

i. These spaces shall function as research laboratory spaces where chemistry, biology, geology, and other scientific disciplines' experiments are performed.

ii. All spaces in this section shall comply with the specifications as defined in the general section of III-D 2 and in addition shall provide the following.

iii. Safety

a. Wall space must be provided for spill containment cabinets, laboratory coat racks, safety eyewear, glove storage, and first aid supplies.

b. Safety Showers – Shall comply with current ANSI standard (ANSI - Z358.1 and others) for temperature, pressure, volume, and placement. No safety shower shall be located next to an electrical panel or electrical service. There shall be a safety shower located in Labs 1-3.

c. Safety Eyewash – Shall comply with current ANSI standard (ANSI - Z358.1 and others).

d. Safety eyewash or drench hose shall be included with every laboratory sink but a minimum of one permanently plumbed eyewash must be in each laboratory space.

iv. Ventilation

a. Must comply to 46 CFR 194.15-5

b. General – Laboratory spaces shall have a separate system from the general ventilation system. Laboratories with hoods and snorkel exhaust installed may require additional heating to comply with general requirements of this section.

c. Any ventilation of hazardous materials shall be independent of other ventilation systems and accommodations shall be made so that hazardous exhaust cannot be pulled into other ventilation system intakes.

d. Fume Hoods

(1.) Labs 1-3 shall have provisions for the installation of four government-furnished low-volume, 6-foot fume hoods (one each per space). Ventilation shall be provided by remote blowers to reduce noise in the laboratory spaces. Remote blowers shall monitor air flow from the hood at all times, they shall be designed to control air flow, automatically adjusting blower speed to maintain an even air flow within the hood using variable air volume (VAV) technology or damper/controller technology.

(2.) Design must meet the Scientific Equipment and Furniture Association (SEFA), OSHA, ANSI, and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards. Flow rate shall be between 60 and 100 fpm linear face velocity. Each hood shall have a continuous monitoring device to allow convenient confirmation of adequate hood performance, proximity detectors to conserve vessel heat, and sash opening sensors that adjust face velocity. The positioning of the blowers shall be easily accessible for calibration, testing, and repair. The design shall offset interior pressure changes. The hood remote blower shall be designed with full dampers to prevent back drafting when not in use. Fume hood exhaust must not be on any working deck or location where personnel are likely to be located.

(3.) Ventilation requirements shall meet regulatory standards listed previously at all times regardless of wind direction, pressure or temperature gradients within the vessel or working environment.

e. Snorkel or Special Fume Hood Details

(1.) Ventilation ports shall also be incorporated into the integrated overhead systems listed in laboratory furniture standards where GFP portable snorkel-type exhaust apparatus can be used. Remote blower configuration shall meet the same regulatory requirements as chemical fume hoods above.

f. Electrical

(1.) Fume hood installations shall be hard wired directly to circuit breakers within labeled electrical distribution panels.

(2.) It is preferred that all electrical breaker boxes be located external to the laboratory space near the entrance to the laboratory.

g. Laboratory Furniture Standard

(1.) Cabinetry shall be constructed to provide for flexibility through the use of Unistrut (ceiling, wall, and floor) or wall rail system, and threaded deck sockets. Since the ship will be engaged in multi-disciplinary research, its equipment and the investigations it undertakes will change frequently. Equipment mounted in the labs and on the working decks shall be installed such that it can be easily removed, rearranged, or reinstalled.

(2.) Final furniture design shall include a self-closing combination corrosives and flammable storage cabinet, about 35.5 inches high x 48 inches wide x 22 inches deep in each 250 square feet of the main laboratory spaces (Labs 1-3). If necessary, two separate smaller cabinets may be substituted, provided that they provide the same amount of storage as indicated above.

(3.) Integrated overhead utility runs would be preferred in the design of the flexible laboratory furniture. A Thermo Fisher Scientific Max Lab Wall Rail adaptable furniture system or equivalent should be considered as guidance.

(4.) Placement of furniture should maximize usability. Offeror may consider the following, but as a guide all furniture should conform to Scientific Equipment and Furniture Association (SEFA) guidelines.

(5.) Furniture shall be modular in design, and island core design shall be incorporated.

(6.) Countertops and working surfaces shall be Trespa phenolic resin work surfaces (30-inch depth) with adequate splash guards and mounting hardware for sealed plywood tops.

(7.) Provision shall be made for installation of GFP Low-Volume Fume Hoods with lighting, attached electrical outlets, and Trespa phenolic resin work surface.

(8.) GFP additional Snorkel type exhausts shall be incorporated into an overhead utility run.

(9.) Corrosive and Flammable resistant cabinets could be the base support for fume hood requirement and also allow for incorporated cabinet exhaust.

h. Compressed Gases

(1.) Pass throughs and stainless steel piping of at least 1/8-inch inner diameter shall be provided into all laboratory spaces so that at least four types of high-purity gases, in addition to Nitrogen and dry air, can be provided to laboratory overhead gas manifold.

(2.) The design and placement of gas cylinders and the gas line distribution of the gas to the laboratories shall meet the requirements of 46 CFR subchapter U; subpart 194.15-17 (the gas cylinder placement and storage of bottles shall meet subpart 194.15-15 standards and shall facilitate the replacement of gas cylinders during a cruise.)

(3.) An integrated overhead design of the laboratory furniture for delivery of gases shall be incorporated into the overall lab design. The design will include a distribution manifold so that each laboratory can be isolated from the main cylinder manifold or gas supplies.

(4.) Space for compressed gas cylinder restraints shall be provided in Laboratories 1-3. This can be accommodated with the Unistrut design of these spaces.

i. Uncontaminated Seawater Feed

An uncontaminated sea water supply is required in most laboratory spaces. The uncontaminated sea water system is a critical component of the vessel's science mission and as such a representative description in Section 4.10 is provided as guidance.

j. Sinks

(1.) Labs 1-3 and the environmentally controlled lab shall have provisions for hot and cold freshwater with chemical resistant sinks and drains that are discharged overboard.

(2.) Scientific Plastics Company of Kansas City, KS, can be used for guidance.

(3.) Freshwater sinks shall have a flexible arrangement so that quick disconnects in the floor for water sources and drains allow re-configuration of bench layouts and sink placement.

(4.) Covers shall be provided for floor connects when sinks are not connected.

(5.) Fresh water spigots shall include vacuum breakers and aerators.

(6.) All sinks shall also have an emergency eyewash or flush hose integrated into the design.

(7.) Sinks shall include a removable basket strainer in the drains to catch small debris.

(8.) Any sink that is located on an exterior wall must be insulated or heated to prevent freezing.

(9.) Sink material must not crack when subjected to temperature swings such as from dry ice or boiling water.

k. Drainage

(1.) Sink Drains in all labs should be capable of discharging at 20 gallons per minute (gpm).

(2.) Floor Drains – Drainage shall be calculated by area and function of the lab space.

(A.) At least six inches of standing water shall drain from a lab area in two minutes. 500 square feet lab with six drains installed in the floor shall have drainage rate of 13 gallons per minute per drain (231 cubic inches per gallon).

(3.) Emergency Shower should be 25 gpm.

(4.) Seawater wall (Section 4.2.W.2) manifold drains –

(A.) Five 10 gpm drain ports and 40 gpm for the deep sink drain.

(B.) As much as possible seawater drains shall be constructed from a non-corrosive material. (e.g., Schedule 80 PVC, fiberglass, stainless steel)

l. Lighting

(1.) Light banks shall be individually controlled for laboratory spaces so that parts of the laboratory can be kept dark for specific experiments.

(2.) Lighting shall meet guidelines for laboratories as described in the Illuminating Engineering Society of North America (IESNA) Lighting Handbook. A combination of direct and indirect lighting to reduce glare and provide uniform lighting on work surfaces shall be used.

(3.) Lighting shall be at least 810 Lux (75.33 foot-candles) as defined in ABS HAB+ guidelines.

m. Unistrut

Unistrut shall be provided in the deck, overhead, and bulkheads where applicable.

(1.) Floor and ceiling Unistrut shall run fore and aft, be vertically aligned, and be positioned at two-foot centers from the centerline of the space.

(2.) Drain facilities and sump collection will be positioned at the fore and aft ends of each space to drain any water collecting in the Unistrut to floor drains and to facilitate cleaning of the floor.

n. Layout

(3.) There shall be convenient access between all laboratory spaces, working deck areas and scientific storage spaces.

(4.) Laboratories shall be located as close as possible to each other

(5.) Laboratories shall not serve as general passageways.

o. Environmentally Controlled Laboratory - about 100 ft2

The environmental room is designed for use of instruments requiring a constant temperature or other processes requiring a constant temperature. All of the general lab requirements outlined in Section III-D 2 and Section III-D 2.A shall apply to the environmental room. The following are specific requirements for the environmental room:

(1.) Heating, Ventilation, and Air Conditioning

(2.) Temperature requirements of this space will be able to hold +/- 1°C of set point within a range of 18°C to 26°C (65°F to 78°F) and shall have its own control independent from the rest of the ship's HVAC system. It is estimated that GFP and personnel operating in this space will generate a heat load of about 1,800 BTU/hour.

(3.) Environmentally Controlled Laboratory Specific Requirements

(4.) Service drop requirements can be found at the end of this section.

(5.) About 18 ft of linear bench space (30 in deep) shall be provided.

p. Aquarium Room - about 250 ft2

An enclosed aquarium room, contiguous to, and accessible from, the working deck and cranes, is to be provided for in-situ experiments. All of the general lab requirements outlined in section 4.2 shall apply to the aquarium room. The following are specific requirements for the aquarium room.

(1.) Drainage
The space must be fitted with floor drains with starboard-side overboard discharge for tanks supplied by the Charterers. Rate of drainage from this space shall be 125 gpm as there will be continually flowing seawater in this space and the potential for waves from the working deck to enter the space. Floor shall be fiber grate or similar to aid drainage.

(2.) Heating, Ventilation, and Air Conditioning
This space is exempt from the temperature requirements in the general requirements called out in Section III-D 2. However, the space must be equipped with locally controllable heating to maintain temperatures above freezing. Heaters shall provide at least 30,000 BTUs per hour.

(3.) Seawater Feed

(A.) This space shall be supplied with uncontaminated seawater as described in this section. Seawater supply and distribution shall be easily coupled and uncoupled through the use of flexible hosing and quick-connect cam lock type fittings common to all Xactic brand tanks to allow for ease of configuration.

(B.) Each tank shall be provided with its own dedicated seawater drop, control valve, and strainer with removable basket.

(C.) A seawater wash down system capable of supplying two ¾-inch garden hoses at 25-40 psi during continuous use will be provided for the purposes of washing equipment on deck. This system shall have its own dedicated seawater drop and the entire system shall be sized such that with all tanks running, flow in the Xactic tanks is not reduced.

(D.) This space should have no sill or a low sill watertight double-door with dimensions no less than 78 inches high by 60 inches wide to allow for the use of pallet jacks for moving aquaria tanks.

(E.) Threaded deck sockets (internally threaded 1-inch UNC) shall be provided throughout the Aquarium Room on two-foot centers (not to interfere with movement or securing of aquarium tanks) for use in securing other items in this space when tanks are not onboard.

(4.) Tanks

(A.) The Aquarium Room shall be capable of housing six insulated polyethylene fish tanks such as Xactic brand with dimensions of 4-foot length, width and height, with 2-foot wide walk ways between tanks. Appropriate means shall be provided for securing these tanks when full of water.

(B.) Aquaria tanks shall be standardized in regards to hookups so that they are fully interchangeable in any location without re-configuration.

(5.) Additional Requirements

(A.) Access to the Aquarium Room from within the vessel is desirable.

(B.) Unistrut shall be provided on all walls in three different heights not to interfere with securing of tanks and position to be determined during final layout. Any walls where Unistrut is not possible, pad eyes or tie down points shall be provided every two horizontal feet, at two feet and four feet above deck.

(C.) There shall be three six-inch watertight pass-throughs provided from this space to the main deck.

(D.) A permanently plumbed safety eye wash or eyewash/drench hose that is protected from freezing shall be provided in this space.

(6.) Service requirements can be found in the table at the end of this section.

q. Oceanographic Staging Hangar (Baltic Room) about 400 ft2

(1.) The Science Staging Hangar must be an internal space located on the working side, contiguous to the main deck, and close to midships. This space is used for deploying over-the-side oceanographic instrumentation through a Baltic door. The staging Hangar could be designed and constructed in a manner similar to that in use on other USAP research vessels.

(2.) The Oceanographic Hangar shall be constructed as to provide access to the main deck and adjacent interior spaces through water tight doors with low or no sill.

(3.) All of the general lab requirements outlined in III-D 2 shall apply to the Oceanographic Staging Hangar. The following are specific requirements for the Staging Hangar:

(A.) Safety

A permanently plumbed and heat traced (to prevent from freezing) safety shower/eye wash shall be provided in this space. A model S19-300T or a S19-300B from Bradley Corporation, Menomonee Falls, WI should be used as an example.

(B.) Drainage

This space shall be fitted with sufficient deck drains that lead to a port side overboard fitting such that the deck will remain free of water accumulation when water is introduced to the space at a rate of 100 gpm.

(C.) Heating Ventilation and Air Conditioning

This space is exempt from the general temperature requirements in this Section. However, the space must be equipped with locally controllable heating to maintain temperatures above freezing. Heaters shall provide at least 30,000 BTUs per hour.

(D.) Winch

A government-furnished Markey DUSH 5 or equivalent oceanographic winch shall be installed in this space. It must be located in line with the telescoping boom defined in this section.

(E.) Boom

A telescoping boom will be fitted in this space centered to the Baltic door. The boom shall meet the following requirements:

(i.) 6-ton capacity
(ii.) Outboard reach of 15 feet
(iii.) Boom must be able to retract into the hangar a sufficient distance from the Baltic door to allow placement of a 24-position Sea-Bird CTD/Rosette (about 5 feet in diameter) in a position clear of the swing of the Baltic door.
(iv.) Minimum vertical clearance of the boom to the bottom sill of the Baltic door must be 14 feet.
(v.) Must be self securing so that it will not move when not in use.

(F.) Baltic Door

The door to the outboard side shall be hydraulically actuated and shall have the following requirements:

(vi.) 8 feet of clearance side to side
(vii.) Overhead clearance from the sill must be no less than 15 feet.
(viii.) When open, the Baltic door shall not obscure the view of the winch operator.

(G.) Flooring

(i.) Shall be fiber grate or similar to aid drainage.
(ii.) Deck sockets, threaded, stainless steel, (internally threaded 1-inch UNC) shall be provided throughout the hangar on 2-foot centers.

(H.) Reverse Osmosis (RO) water access

There shall be an insulated access port to the GFP RO water system described in Section III-D.

(I.) Hangar Mezzanine Storage

(i.) This storage area shall be as large as possible, but shall not interfere with the boom or winch operation. Access shall be provided from the 01 Deck and from the Hangar. Minimum height must be 122 inches from hangar deck to the underside of the mezzanine decking and 88 inches from mezzanine deck to the overhead above mezzanine.

(ii.) Cabinets, shelves, and tie downs in mezzanine required.

(J.) Ventilation

This space is exempt from the temperature requirements in the general portion of this Section. However, the space must be equipped with locally controllable heating to maintain temperatures above freezing. Heaters shall provide at least 30,000 BTUs per hour.

r. Science Workshops

Scientific workshops are areas separate from normal ship maintenance operations where maintenance and construction of scientific equipment and infrastructure can be carried out by contractor representatives and scientists.
There shall be at least 1,400 cubic feet of storage spaces (shelves, cabinets, lockers) for tools, rigging, and other similar equipment All general requirements from Section 4.2 will apply to these spaces unless noted otherwise. In addition, the following requirements are applied to the spaces in this sub-section.

(1.) Science Workshop - About 300 ft2

(A.) This workshop shall have access to main deck working area through water tight doors. It should have one door (or split doors) with dimensions no less than 60 inches wide by 66 inches high, centered on an overhead rail trolley system of approximately 2 tons with access to main working deck for the movement of heavy items for repair or storage. Interior access from this to other interior science spaces located on the same deck is desirable.

(B.) Activities such as welding, basic carpentry, and mechanical manipulations occur in this space, especially activity directly related to work on the main deck areas.

(C.) Safety

There shall be at least one permanently plumbed eyewash station in this space.

(D.) Drainage

There shall be a direct overboard floor drain with removable strainer basket and backflow prevention in this space capable of draining 30 gpm.

(E.) Service Drops are provided at the end of this section.

(F.) Additional Requirements

(i.) 66 square feet of bench space - minimum 30 inches deep shall be provided.

(ii.) Storage space shall be fitted with securing devices (fiddles, latches, doors, etc.).

(iii.) Lighting shall meet industrial standards – 810 Lux, 75.33 foot-candles.

(iv.) Overhead lighting fixtures shall include at least four locations to be determined by final furniture layout.

(v.) Steel non-skid deck floor with flush threaded deck sockets (internally threaded 3/8 inch UNC) shall be provided throughout the working deck area on 2 foot centers.

(vi.) Space shall be provided for a GFP flammable-storage cabinet (43 inches W x 65 inches H x 18 inches D).

(2.) Science Electronic Workshop - About 120 ft2

This area will house multiple computer racks in a manner that allows access from front and back of the racks. These racks will contain the bulk of the data collection hardware.

It will also be used for repair and maintenance of electronic and computer hardware. It shall be at least 120 square feet and have room for multiple 19-inch computer racks.

There shall be about 32 square feet of counter area, and it shall be suitable for electronics and computer storage. It is desirable that this room be contiguous to the computer workstation room and may be contiguous with the secure server room.

(A.) General

(i.) There will be two computer workstations in this area, and there shall be counter space and under-counter leg room to accommodate these stations.

(ii.) Each workstation shall have a minimum of 10 square feet of counter space.

(iii.) There shall be additional space for an electronics work area with at least 12 square feet of counter space.

(B.) Service drop requirements are found at end of this section.

(C.) Additional Requirements

(i.) There must be space for and a method of shock mounting at least four 19-inch computer racks.

(ii.) Each rack must be individually lockable front and back.
(iii.) Each rack must be accessible from front and back.
(iv.) Overhead lighting fixtures shall include at least four locations to be determined by final furniture layout.
(v.) Wall space shall be provided for storage cabinets, book shelves, racks, and first aid supplies.
(vi.) This space shall include a flammable chemical storage cabinet of about 10 cubic feet.

s. Office Spaces

All general requirements from Section 4.2 will apply to these spaces unless noted otherwise. In addition the following requirements are applied to the spaces in this sub-section:
All office spaces shall be provided with a suitably sized white board and bulletin board
All desks and workstations for computers shall be designed with ergonomics as a priority and include accommodations for keyboard, mouse, and monitor height adjustment. There shall be storage for office supplies.

(1.) Computer Workstation/Printing Room - about 225 ft2
This shall be a multi-use computer area of at least 225 square feet. This area must support multiple computer workstations, printers and plotters and act as a small computer reference library. Additionally, this area may act as a planning and chart reference area. This area shall include the following:

(D.) Additional Requirements

(i.) Furniture will be designed for maximum efficiency with adjustable height computer workstations.
(ii.) There shall be desk space and leg room for a minimum of 6 personal computers. Each workstation shall have a minimum of 12 square feet of counter space.
(iii.) Overhead lighting fixtures shall include at least 4 locations to be determined by the final furniture layout.
(iv.) Wall space shall be provided for storage cabinets, book shelves, racks, and first aid supplies.
(v.) Provision shall be made for a chart table and planning area to be located in this room.
(vi.) Additional 110 VAC and 208 VAC NEMA receptacles, 110V UPS power and network connections shall be included with overhead service. Final placement of all electrical service will be determined during final furniture layout.

(2.) Contractor Representative Office (about 115 ft2)

This space will be the primary location from which all shipboard contractor business is conducted. It shall be at least 115 square feet. This area must support a computer workstation, one or more printers and plotters and act as a small meeting area. This area shall include the following:

(E.) Ship Service requirements are listed in the table at the end of this section.

(F.) Port Holes

(1) Port hole desired

(3.) Chief Scientist's Office - about 115 ft2

This space will be the chief scientist's office from which cruise planning and meetings will be conducted. It shall be at least 115 square feet. This area must support a computer workstation, one printer and act as a small meeting area. This area shall include the following:

(G.) Port Holes

(1) Port hole desired

(4.) Science Support Office - about 60 ft2

(H.) This office space is for use of the onboard laboratory supervisor and marine science technicians.

(A.) General

Shelving shall be provided to maintain technical documents and catalogs for reference.
A suitable desk and computer station of adjustable height shall be provided in this space.

(B.) Service drop requirements listed in table at the end of this section.

(C.) Port Holes

Desired, but not required.

(5.) Library, Conference Room, & Lounge - about 525 ft2

(D.) This space shall be a multi-use area of at least 525 square feet. In addition to serving as a conference room and lounge, this area must support computer workstations, a printer, and act as a library.

(A.) Furnishings

(i.) This area must be able to comfortably accommodate a 10-person conference table.

(ii.) There shall be counter space and under-counter leg room for a minimum of three personal computers. Modular computer workstation furniture will be designed for maximum efficiency with adjustable height computer workstations.

(iii.) Lounge furniture shall be modern, rugged, comfortable and resistant to stains.

(iv.) Each workstation shall have a minimum of 6 square feet of counter space.

(v.) Shelving shall be provided adequate for a 2000 volume library of varied books and media. Included in the shelving design shall be a means of securing books/media during rough seas.

(vi.) Cabinets shall be provided for an entertainment center which shall be able to accommodate, at a minimum, a 40-inch (635 mm) color LCD or tube television, 2 DVD players, a multi-CD player, and additional audio equipment.

(B.) Port Holes

Two or more desired.

(C.) Additional Requirements

(vii.) There shall be a whiteboard of at least 4 feet x 3 feet oriented so as to be easily visible from the lounge furniture.

(viii.) Wall space shall be provided for additional storage cabinets, book shelves, racks, and first aid supplies.

(ix.) (1) Integrated overhead LCD projector is required.

t. Information Technology Spaces

(6.) IT spaces shall provide multiple format data services and infrastructure. All IT spaces shall conform to NIST 800-53 guidelines for fire suppression (control object PE-13), environmental protection (control object PE-14), water damage protection (control object PE-15) and physical access control (control object PE-3).

(1.) Vessel Security Burden

(D.) The vessel's security plan as required by the USCG and other governing bodies shall not rely on these spaces or the equipment therein. In particular (but not limited to), any USCG surveillance requirement placed upon the vessel shall not rely upon the Charterers' equipment including LAN, CCTV, or external communications equipment.

(2.) Secure Server and Communications Room

(E.) A secure, environmentally controlled space of at least 120 square feet that will house multiple computer racks in a manner that allows access from front and back of the racks. This area must be securable in accordance with NIST 800-53 (latest version) or current superseding NIST guidance. It is preferred that this space may be combined with the Electronics workshop if the workshop square footage is more than 200 square feet. This shall be the central location of the premises distribution system. It shall contain the core switching equipment, the main cross connect for all trunk cabling and the core science computer servers. Potentially, more than 400 LAN connections (Work Area Outlets - WAOs) shall terminate here. This shall be the primary terminus for fiber cabling as well.

(F.) This area shall include the following:

(A.) Physical Security

The Secure Server and Communications Room must be lockable and each rack must be lockable.

(B.) Ship service drops are listed in the table at the end of this section.

(C.) Notes on electrical

(i.) Additional electrical supply shall be provided beyond what is called out in this section.

(ii.) This room will require one dedicated 100 A ship's power breaker panel and one dedicated 100 A UPS breaker panel.

(D.) Fire Suppression

Fire Suppression for sensitive electronic equipment shall be provided by the Owners.

(E.) Additional Requirements

(i.) There must be space for and a method of shock mounting a minimum of four 19-inch computer racks.

(ii.) Each rack must be individually lockable front and back.

(iii.) Each rack must be accessible from front and back.

(iv.) Overhead fixtures shall include at least four locations to be determined by final furniture layout.

(v.) Noise emissions from ship's equipment in this area must be in compliance with ISO 9296.

u. Ancillary Science Spaces

(1.) Science Observer Space on the Bridge

(F.) An internal science space in the forward part of the bridge for observing wildlife, and for other science is required. This space shall be forward facing with good unobstructed views of the horizon. About 8 linear feet of counter space is required.

(2.) Aloft Observation Tower

(G.) The aloft observation tower for wildlife observation is highly desirable. Ideally this area will provide space for two researchers, with a 180-degree view of the horizon, or have access to exterior areas that provide such views. Windows shall be heated.

(3.) Deck Changing Room

(H.) A room should be provided on the main deck aft to provide for the changing of interior to exterior clothing, and vice versa. This space is intended to accommodate wet, dirty, and cold weather articles to minimize the transmission of dirt and water throughout the vessel. Space should be easily cleanable with fresh water supply for equipment/clothing wash down. Access should be provided directly to the weather deck and to an interior passageway.

(4.) Science Chemical Locker - Minimum 66 ft2

(I.) This space shall be used to properly store quantities (larger than working quantities) of hazardous chemicals needed for science use.

(5.) Hazardous Materials Storage - Minimum 66 ft2

(J.) A locker shall be provided on the main deck for scientific hazardous materials storage that is at least 66 sq. ft, with full deck height, with shelving, fitted with fire suppression and fire safety lighting and electrical fixtures. The locker must have a lockable door. This space shall comply with 46 CFR 194.20

(K.) General

(i.) This space is to be maintained in accordance to 46 CFR Subchapter U.

(ii.) This space must meet the general temperature requirements of this Section.

(iii.) A permanently plumbed eyewash/drench hose shall be provided for this space.

(iv.) It is preferable if this space has access to interior spaces.

(6.) Compressed Gas Storage Locker - about 27 ft2
This space shall be used to properly store compressed gas cylinders needed for science use.

(i.) General

This space is to be maintained in accordance to 46 CFR Subchapter U.

It is desired that it be a temperature controlled space but not in a space considered to be a chemical store room under 46 CFR194.20-17(a).

Suitable means for securing compressed gas cylinders in racks and space for regulator manifolds to feed the laboratory spaces shall be provided.

This would ideally be an exterior space shielded from wave action and protected from weather. Drainage shall be incorporated if water does intrude into the space. An intrinsically safe heater shall provide adequate temperature control to this space. This space will be tied into the compressed gas requirement in Section 4.2.S.6.

(7.) General Cargo Storage
Below deck storage is required for about 10,000 cu ft of general cargo that will include standard 8 by 8 by 20 foot ISO containers as well as specialty 8 by 8 by 10 ft ISO containers (2 ea in a standard 20-foot spot). The cargo hatch should be sized to handle these containers conveniently and safely. The cargo hold shall also be outfitted with means to secure break-bulk cargo.

v. Other Special Requirements

(1.) Reverse Osmosis System
Scientific laboratories have special support requirements such as a means of producing laboratory grade water. A GFP centralized reverse osmosis (RO) unit will provide continually circulating RO water to the laboratories where individual “polishers” will provide research grade de-ionized (DI) water. The location of the RO unit must be close to the main laboratory spaces (Labs 1-3, oceanographic hangar, and environmental room) and will require Teflon or other suitable plastic lined pass throughs between these spaces. The exact location of the pass throughs will be determined during the final lab layout. The unit will require fresh potable water feed between 30 and 100 psi at 45-100°F and suitable drainage at 20 gpm for operation; (1) 208 VAC, 20 A, GFCI, duplex receptacle; (1) Fresh water connection; and (1) Drain at 20 gpm.

(2.) Seawater Instrumentation Wall

This instrumentation wall, complete with an uncontaminated seawater as defined later in this section, sink, and manifold drain arrangement, is for the mounting and use of a variety of underway scientific instrumentation.

(A.) General

(i.) The wall shall be about 14 feet long by 5 feet high. The wall will be ¾-inch sealed plywood or a similar material that is water proof and securely fastened to the ship. The wall will be designed to make the best use of available space and will be used to mount underway instrumentation.

(ii.) The science circuit of the uncontaminated seawater system will pass over top of this wall and will provide five 2-inch non-metallic valve drops to feed instruments or manifolds with seawater. At the base of the seawater wall shall be at least five ancillary drain openings above and behind a deep stainless steel sink that runs along the entire length of the wall.

(iii.) Although this shall be incorporated into one of the laboratory spaces, the instrumentation located at this station is sensitive to temperature fluctuation and as such, shall be located well away from doors opening to the outside deck where practical or other areas where temperature swings could be introduced.

(iv.) The drains will not create back pressure on any installed instrument, will allow for minimal splash, and will discharge on the discharge side of the vessel.

(3.) GFP Dive Compressor

(B.) A GFP Dive compressor shall be installed to support scientific diving operations and emergency chemical spill response by staff. The space for this unit will be in accordance with requirements for a Bauer Utilus U-E1 Breathing Air Compressor (3 horsepower, single phase).

(4.) Ice Maker

(C.) In one of the main labs there is a requirement for an under-counter flake ice maker for scientific uses only. It shall be of a similar type to the series 200 flake ice machine manufactured by IMI Cornelius, Anoka, Minnesota. All utilities (power, water, drainage) shall meet manufacturer requirements.

3. Scientific and Specialty Van Storage

The USAP, University-National Oceanography Laboratory System (UNOLS), and other institutions have designed scientific and specialty ISO dimension vans for a wide variety of applications. These may be specialty laboratories, hazardous material storage, or even berthing units that can be quickly and easily loaded, configured, and secured for a single cruise and offloaded at the end of the cruise.

A. General

i. Specialty vans will be of a standard 10- or 20-foot ISO configuration. All containers and containerized laboratories locations shall be fitted with Peck & Hale type securing sockets and weight rated to accept a fully loaded container. Several locations on deck and several locations in the sheltered areas shall provide additional securing points between the standard 20-foot footprint to accept two specialty ISO containers of 8 feet high by 8 feet wide by 10 feet long.

ii. Additionally, the ship shall be capable of carrying at least five more 20-foot ISO containers or containerized laboratories on the superstructure or deck at separate locations aft of the forward superstructure. Two 10-foot ISO containers shall be able to be secured in a standard 20-foot ISO slot in at least two locations to be determined during final design layout. Fresh water, uncontaminated sea water and heated drain capabilities shall be provided for three science laboratory vans through standard deck threaded inserts with positions to be determined in final design.

iii. The ship shall be capable of accommodating up to four 20-foot ISO standard shipping containers within a dry, watertight space, accessible from inside the vessel. Two 10-foot ISO containers shall be able to be moved to and secured in any standard 20-foot slot in this space.

iv. Configuration shall be such that van end doors can be opened and side personnel doors can be accessed when van is secured.

v. Provision shall be made to interface all vans to the following shipboard systems through a modular connection such as Harting Han type connectors. This connection shall include general alarm, fire zone monitoring, telephone, CCTV, serial, and network.

vi. Three 6-inch water tight pass throughs shall be provided from this space to the main deck.

a. Ship Service drops are listed in the table at the end of this section.

B. Science Storage - about 650 ft2

i. This storage is for science equipment and supplies separate from the laboratory spaces. This is not necessarily a stand-alone space, but may be made up of various separate spaces that total about 650 square feet.

ii. All general requirements from Section 4.2 will apply to these spaces unless noted otherwise. In addition, the following requirements are applied to the spaces in this sub-section:

b. This space shall be capable of storing up to 15 sheets of 4 foot by 8 foot by ¾-inch plywood, 300 pounds of dimensional lumber in 10-foot lengths, and 600 pounds of various metal stock in 10 foot lengths. Access to these materials shall be safe and convenient while at sea. This space shall be easily accessed from the science workshop.

c. Furnishings

Heavy-duty shelves, cabinets and other suitable storage arrangements.

d. Location

This storage requirement can be broken into several spaces but should be located as conveniently as possible. Space for overhead storage in the Aquarium Room and Oceanographic Staging Hangar is included in this square footage. Storage space in the laboratories is expressly separate from this requirement.

e. Ship service drops are listed in the table at the end of this section.

4. Winches

A. Space, weight-handling, clearance, and electrical or hydraulic service must be provided for at least three government-furnished oceanographic winches to be permanently installed aboard the vessel. These winches consist of the following:

Table 1: Government-furnished winches to be mounted on the vessel.

Type of Winch	**Quantity**
Markey DUSH 4 with independent power pack	1
Markey DUSH 5 with independent power pack	1
Markey DUSH 11 with independent power pack	1

B. For space and weight considerations assume that each winch will have 10,000 meters of wire per drum. The types of oceanographic cables will vary depending on science mission and may be one of the following: 0.322-inch electromechanical cable, 0.225-inch hydrographic cable, 0.680-inch coaxial, 0.680-inch fiber optic cable, or 9/16-inch trawl wire.

C. Location of these winches shall allow for efficient and safe operation. These winches should be installed in an enclosed space provided all wires can be safely and efficiently fair-lead to the intended over-the-side location. Detailed drawings and specifications for these winches are in Attachment B. The Owners are to provide preventive maintenance and repair of these winches, and shall keep routine logbooks of maintenance and repairs completed. The cost of the spare parts inventory is to the Charterers' account.

D. There shall be a government-furnished winch monitoring system (by Measurement Technology NW) or equivalent showing wire out, wire tension and wire speed tied into the vessel data acquisition system is required. The Owners shall plan for local and remote control stations with a clear view of the winch working areas and with reliable communications to vessel laboratories and ship control stations are required.

5. Cranes

Several types of marine cranes are required.

A. All cranes require load cells, and shall be man-rated.

B. One articulated crane shall have a safe working load of 13.5 long tons to be able to load and unload containers and heavy equipment from the pier to the aft working deck and cargo in three minutes or less under fair loading conditions, and be capable of fine control for container placement.

C. Cranes shall be provided to reach all working deck areas, the cargo hold, and all locations where vans, drums and aquaria will be stored.

D. Any crane with a cab shall have heat, windshield defrosters, windshield wipers, base station VHF radio, ship's phone, and load-cell display.

E. An articulated crane shall be provided for dedicated launching and recovery of inflatable boats (Zodiac MK V) and be usable while underway.

F. Additionally, a second articulated crane shall be positioned near the starboard side of the transom servicing the after work area for lifting equipment aboard from the sea or pier side, and for supporting fairlead sheaves for cables.

i. This crane shall be rated with a 3.5 long tons safe working load, and a 20-foot reach.

ii. Such a crane shall be rated for side loading and capable of being used to tow light packages (~500 lbs) at reduced ship speeds (~6 knots).

6. A-frames

A. Stern A-frame

The ship shall be fitted with an A-frame to work off the stern with at least a 20-foot vertical clearance from the main deck and at least a 20-foot horizontal clearance at the base.

a. The A-frame shall extend beyond the stern at least 15 feet. This measurement is from a plumb line rove through the trawl block and hanging vertically beyond the transom.

b. The safe working load shall be no less than 13 long tons. Bulwarks shall be gated or removable in this area.

B. Side A-frame

There shall be an A-frame for deploying oceanographic instrumentation on the main deck, close to midships with a safe working load of not less than 5.5 long tons.

a. This boom shall extend beyond the side of the ship at least 15 feet. This measurement is from a plumb line rove through the trawl block and hanging vertically beyond the side of the hull.

b. A vertical clearance of at least 15 feet above the working deck is required and a horizontal clearance at the base of the A-frame shall be no less than 12 feet.

c. Bulwarks shall be gated or removable in this area.

7. Inflatable Work Boat Storage and Deployment

The ship must provide storage off the main deck or on the superstructure for two government-furnished 20-foot inflatable work boats (Zodiac Mark V HD or equivalent) with appropriately sized and redundant outboard motors and spare parts. A dedicated crane (refer to Section 4.5) and/or launch/recovery system that will allow safe and effective launch and recovery of boats when underway shall also be provided by the Owners.

8. Sonar Systems

A. All sonar transducers shall be hull mounted in an area of the hull free of bubble sweep down.

B. No machinery shall be mounted in such a way as to introduce mechanical or electrical noise into the transducer wells that will diminish the effectiveness of the sonars.

C. All sonar systems shall be installed in such a manner that the operation of each system does not interfere with operation of another.

D. Navigation sonars shall be provided and wholly supported by the Owners. Science sonars shall be provided and supported by the Charterers. However, the Owners shall provide the following to support all sonar systems:

i. Navigation Sonars

a. Navigation sonars shall be compliant with CFR 46 195.27.

b. All navigation sonars shall have their display and operation consoles on the bridge. Refer to Section 5 for more details.

ii. Science Sonars

The following sonars are current standard GFP:

Table 2: GFP Sonar Systems

3.5 or 4.0 kHz full-ocean-depth chirp system, 4 kHz sweep, with a 12-transducer array
12 kHz full-ocean-depth sonar, with one transducer, for bottom and pinger tracking
150 kHz Narrow-Band Acoustic Doppler Current Profiler, 300-meter depth range, with one transducer
38.4 kHz Phased-Array Acoustic Doppler Current Profiler, 1,000-meter depth range, with one transducer

E. The Owners shall provide design, installation, and maintenance of owner-supplied acoustic window material as specified by the transducer manufacturer.

F. Liaison with the American Bureau of Shipping regarding any future design changes, specifically in regards to maintaining watertight integrity.

G. 90 percent fresh water, 10 percent propylene glycol solution shall be used for all wells.

H. A head tank (shared or per well)

I. In addition, the Owners may propose pressurized wells to facilitate the safe replacement of transducers or cabling without dry docking the vessel.

J. Acoustic Positioning System

An acoustic positioning system with a minimum depth range of 2,000 meters is required. The system shall be purchased, including spares parts, installed, and commissioned by the Owners. This system shall provide the latitude, longitude, and depth of underwater packages such as ROVs, benthic cameras, and towed sonars.

K. Multi-Beam Sonar

i. In addition to the above-supplied sonars, the Owners may propose a multi-beam system with a depth range of 2,000 to 6,000 meters. The vessel Owners shall purchase, install, and commission the system. In addition, the Owners shall provide a manufacturer-recommended set of spares for the system. The Charterers shall operate the system. All other maintenance and repair costs shall be the Owners' responsibility.

ii. Consumables such as paper and printer ink shall be provided by the Charterers.

iii. Should such a system be proposed, the Owners shall demonstrate that the installed system will function to manufacturer's specifications, through model tests or other supporting data.

9. Ship Command and Control During Science Operations

The functions, communications, and layout of the ship control station shall maximize coordination of ship control and scientific operations. Additionally, the vessel shall be outfitted with an enclosed Aft Control Room, located on the starboard side of the vessel with clear views of the aft work deck, with appropriate controls for the full operation of the ship. There shall be good visibility of all working deck areas from the ship control stations on the bridge or starboard bridge wing.

10. Uncontaminated Sea Water Service

The ship's system that collects uncontaminated sea water provides a mission-critical component of the vessel's science mission requirements. This "clean" seawater is used for underway science measurements, filling of aquaria, and on-deck incubation experiments.

The general description of the system is provided below. All piping measurements are called out using the internal dimension.

A. The system should be capable of sampling surface seawater with the least possible contamination which may be introduced by hull paint or overboard discharges. Special consideration needs to be given to ice in the system which may result during icebreaking operations, or when operating in extreme cold temperatures. Experience has shown that multiple intakes located in different hull locations facilitate the collection of water under differing sea/ice conditions. Also the use of redundant macerator pumps help handle incoming ice and provide positive pressure flow via crossover piping which is required for aquaria, deck, and science laboratory systems. This must be a self-regulating system with high pressure cutoffs in the event ice blockages do occur so that piping and equipment is not damaged. A strainer shall be included in line to keep debris such as ice and krill from plugging the system.

B. That portion of the water stream which is free of ice or bubbles shall be directed for data collection via scientific instrumentation or aquaria. The remaining water which may be a significant portion of the water stream that contains ice crystals and air bubbles is discharged overboard.

C. A sterilization component of the system shall be integrated.

D. The system will require periodic maintenance such as cleaning, replacement of valves, and servicing of the sterilization system, therefore easy access to the overall system is required.

E. Specific details of the uncontaminated sea water system components are given in the paragraphs to follow.

F. Seawater supply to labs shall run through the overhead so that distribution points are below supply piping. This will help prevent bubbles and ice from being drawn into the sampling gear.

i. Inlet

a. Inlets should be located at the bow and skeg with a third location desired. Inlets shall be about 9 inches in diameter with a stainless steel grate with openings of no more than 1 inch.

b. There shall be injection ports at all intakes so that fresh water and/or a sterilizing agent can be introduced to clean the entire system.

c. The installation of remote temperature probes located as close as possible to the inlets is required. Therefore space, access and wire-ways shall be provided.

d. Each intake will have an automated isolation valve allowing the bridge and/or vessel engineers to change the supply intake to the pumps from a remote station on the bridge or the engine control room.

ii. Piping

a. The piping shall be a lined or inert piping suitable for scientific purposes such as Green Thread fiberglass pipe or “Red Thread II®" fiberglass piping manufactured by Smith Fiberglass, Little Rock, AR. A higher grade of USCG approved piping may also be considered.

b. No bend in the installed distribution piping shall have a radius of less than three times the pipe diameter so as to minimize the formation of frazil ice.

c. The ability to collect seawater and maintain the surface water temperature at the inlet through the piping to the scientific instrumentation is critical. Piping shall be insulated from intakes to all access ports so as to maintain the temperature range within +/- 0.5° C.

d. Crossovers shall be provided between systems so that either the aquarium pump or the science pump can supply the other system.

e. Piping from the inlets to the pump shall be 6 inches in diameter.

f. Aquaria and Deck system piping shall be 4-inch diameter from the pump piping from the pump to the uncontaminated seawater wall shall be 3 inches.

g. Laboratories and aquarium piping discharge points shall be run overhead and sampled from the bottom of the piping so that ice and bubbles bypass access ports.

h. Each overboard discharge line shall be 4-inches in diameter throughout the system.

i. Sample manifolds, wash-down pump, and aquarium tanks shall be located along the 4-inch pipe to feed specific laboratory spaces. The contiguous piping shall allow ice to pass through the system without clogging instrumentation or aquaria. The overboard discharge will be via a regulated gate valve controlling variable flow requirements created by scientific demands. In this way, water flow and pressure are constantly maintained with manifold ports being opened and closed. If designed properly the gate valve should also open and clear the 4-inch pipe of accumulated ice that would normally clog a pipe.

j. System shall be configured so that the isolated contents of the system can be drained to the ship's bilge for maintenance or cleaning.

k. Distribution to the science specialty vans shall be off the science lab system via a 1-inch pipe. Plumbing will be valved and isolatable from the continuous plumbing to prevent stagnating water or backflow.

l. Distribution to the deck incubators shall be off the aquarium system via a 1-inch pipe.

m. Design shall be such that it is installed with minimal turns, unions, and or splices.

iii. Pumps

Each positive pressure supply pump shall be a variable speed, reversible, non-contaminating, 100 gpm macerator pump such as those manufactured by Mono Pumps, Ltd., Manchester, England (model SB101*X1R5\V), or equivalent.

iv. Valves

a. There shall be a gate valve or a full-way seacock valve located at the thru-hull penetrations in order to isolate the system for maintenance while at sea.

b. At all seawater distribution points, a 2-inch valve with threaded Cam-Lok fittings shall be provided.

c. On discharge lines there shall be a backflow preventer (check valve) located near the point of discharge.

d. An automated, regulated gate valve shall be on each discharge line to control pressure through entire system.

e. Any component requiring periodic maintenance shall have isolation valves on either side to allow for maintenance at sea.

f. Inert valve materials shall be used to not contaminate system.

g. System shall provide variable flow (manually set at pumps) and constant pressure (automatically controlled by the gate valves) measured at the manifolds.

h. Over pressurization of system resulting from ice blockage or improper valve position shall shut down pump to protect piping and instrumentation.

v. Strainer

a. A lined or inert ice/gas/seawater separating system shall be incorporated with the science system to minimize materials transfer (ice, bubbles, biological matter, rocks) from intake to science manifold.

b. Dedicated overboard discharge shall be provided for the ice/gas strainer.

vi. Sterilization

Ancillary ports, plumbing, and access shall be provided at the intakes so that fresh water and/or sterilizing agent can be introduced to sterilize entire system.

11. Overboard Discharges

The vessel shall be designed such that all overboard discharges shall be on the opposite side from the vessel's working side such that potential contamination of scientific samples is minimized.

12. Habitability for the Scientific Party

A. As stated earlier, all ship accommodations shall meet the ABS HAB+ notation. In addition, the requirements below shall be met:

B. A minimum of two single staterooms (Marine Projects Coordinator and Chief Scientist) shall be provided with a dayroom/office and private shower and toilet facilities. These two single staterooms shall also be provided with a fold-away or Pullman-style bunk such as to accommodate an additional person. In these offices provision shall be made for connection of a VHF base station to a VHF whip type antenna located on the top of the bridge or other suitable location. This connection shall be over RG-8 or better coaxial cable.

C. Each of the single staterooms shall be sized to accommodate additional office furniture such as a desk, a two drawer file cabinet, arm chairs, and a bulletin board. These office areas in the single cabins shall be configured separately from, or partitioned from, the berthing space in the cabin. A minimum of twelve two person staterooms with adjoining head and shower shall be provided for other scientists. Staterooms shall be about 115 square feet. All berthing spaces shall be easily cleanable, well lighted, and provide a berth sized to a standard twin-size (38 x 75 inches) mattress, drawers, hanging space, 20 cubic feet of locker space, a book shelf for each person, and a desk and chair in each room. Berths shall not be obstructed by pipes, ducts or other obstructions, and fitted with privacy curtains of flame retardant materials in multiple person spaces. Bunk lights shall be provided. Red floor lighting (controlled separately) so that sleeping occupants are not disturbed by overhead lighting is desirable. Bunks shall be provided with access ladders and with leeboards or other method of restraint system for foul weather. All drawers and doors shall be latched to prevent opening in a seaway. Portable furniture shall contain a fastening mechanism for securing in a seaway. Lash points low on the bulkheads and permanently installed appointments for securing luggage and other belongings.

D. Additional accommodation must be made available within the vessel for up to 10 personnel transiting to Palmer Station, Antarctica in addition to the 28 Charterers' personnel. The maximum scientific complement including personnel would not exceed 38 persons total. Public access toilets and showers shall be provided appropriate to the total number of scientific persons (38) aboard.

E. Sanitary spaces with a sink, toilet, and associated hardware should be provided near the mess room, the laboratories and other public spaces.

F. All doors from staterooms and toilet and sanitary spaces must be fitted with kick out panels for emergency egress.

G. 110 VAC, 15 A each stateroom shall have a minimum of one duplex receptacle near the desk and a single receptacle in each bunk. Each Dayroom/office shall have at least four duplex receptacles spaced throughout the room.

H. CCTV connections - one for each stateroom.

I. Duplex LAN connections- two for each stateroom, four for each office. Hence, each state room shall have a minimum of four LAN connections, and each office shall have a minimum of eight LAN connections.

Table 3: ARSV Communications, Power, Water, Air, Service Drops.

ARSV Communication, Power, Water, Air Service Drops

	480 VAC 3F IEC-309 100 A Connects	208 VAC 3F IEC-309 Connects			110 VAC NEMA 5 30 A Receptacle	110 VAC NEMA 5 20 A duplex Receptacle			110 VAC NEMA 5 15 A duplex Receptacle			INMARSAT Connects	Ship Phone Connects	CCTV Connects	Duplex LAN Connects	Fiberoptics Connects	Serial Data Connects	Ship's Service Air Connects	Fresh Water/Sink Connects	Uncontaminated Sea Water Connects	Port Holes	Wireway Access	Ceiling speakers compatible w/ MP3 stereo system	Iridium
		100 A	60A	30 A			UPS	GFCI		UPS	GFCI													
Laboratory 1				5	3	6			17	15	TBD		2	4	22		4	2	3	3	2	1 OH 1 ROX	2	
Laboratory 2				3	3	6			10	16	TBD		2	4	16		4	1	2	2	1	1 OH 1 ROX	2	
Laboratory 3				5	3	6			10	16	TBD		2	4	16		6	1	3	1	2	2 OH 1 ROX	2	
Main Science Mast									4						2		8							
Bow Science Mast						1																		
Main Working Deck		TBD																						
Environ. Controlled Lab				1	2			2	4	6	TBD		1	2	10			1	1	1	1	1 ROX	2	
Aquarium Room	2	1	2								10		1	1	2		4	1	1	7		2 ROX		
Oceanographic Staging hangar	2	1	2					2			8		2	2	3		4	1	1	1		3 ROX		
Overhead Mezzanine	1	1	1					2			6		1	1	6		2					2 ROX		
Science workshop	1	1	4	2	3 Dedicated			12					2	2	6			1	1 hose 1sink		1 DES	2 ROX		
Science Electronic workshop				1		15	18		10			1	3	2	12	2		1			1	2 OH 2 ROX	2	1
Computer workstation and printing room		1 OH				2 2 OH			12	10 2 OH			2	4	20 2 OH						2	2 OH		
Contractor Representative Office									8	2		1	4	2	4		2				1		2	1
Chief Scientist Office									6	2			1	2	2		2				1			
Science Support Office									6	2			1	2	4						1		2	
Library, Conference room and Lounge				2 OH					14 2 OH	4 2 OH			2	5	8		2				2		7	1
Secure Server and Comms room				2		12	12		4			1	3	2	12	2		1			1	2 OH 2 ROX	2	1
Science Observer Space									2						1									
Observation Tower									2															
Hazardous Materials storage																			1					
Compressed gas storage											2							1						
Seawater Wall Added to the space where located				2				2		3 GFCI					2			1	2	6				
Van storage	2	2	4		2	4			6				7	6	8	5	6	1	4	3		3 ROX		
Science Storage							4		4				1											