

SECTION III-E

General Ship Requirements

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GENERAL SHIP REQUIREMENTS

1. Classification

The ship must be classed for unrestricted ocean service by a U.S. recognized classification society that is a member of the International Association of Classification Societies (IACS). The vessel is to be certified by the U.S. Coast Guard as an oceanographic research vessel (46 CFR Subchapter U) and maintained in Certificated condition, U.S. registered, and manned by personnel with appropriate licenses, documents and experience, and operated in conformance with all applicable laws. Additional notations shall include American Bureau of Shipping (ABS) HAB+ notation or equivalent and ABS Ice Class A1 or equivalent.

2. Propulsion Plant

A. Main Propulsion Machinery

- i. The ship is required to have a minimum of two propulsion diesel engines. The reduction in propulsive power caused by the loss of any single main propulsion engine must not exceed fifty percent of the total installed power.
- ii. The use of single- or twin-propeller systems with or without nozzles is acceptable, provided the underwater noise criteria can be met. The propulsion plant must have the capability to:
 - a. absorb shocks caused by ice impacting the propellers;
 - b. absorb or generate enough propeller torque during ice impacts and/or ice milling to preclude stalling of the main propulsion engines; and
 - c. respond to load transients during ice blockage of the propeller nozzles, if installed.
- iii. The propulsion machinery must be capable of being controlled from the machinery control room, the bridge, the working side bridge wing, and aft control station.

B. Cold-Weather Starting

Provision should be made for the possible cold weather starting of the main propulsion engines. During certain operations such as ice docking, only hotel services may be required. After a period of time, the temperature of the lubricating oil may drop to a point where engine starting becomes difficult. Consideration should be given to having a lube oil heater or other method to heat lubricating oil in equipment and components.

C. Noise and Vibration Isolation

The propulsion engines, ship service generators, and associated auxiliary equipment shall be mounted in a manner that meets the criteria for vibration and

underwater noise as specified in Sections III-C 11 **Vibration and airborne noise** and III-C 12 **Underwater Noise**. Further detail on vessel sonar systems is in Section III-D 8.

D. Fuels

- i. Since fuel supplies are limited in Antarctica, it is necessary to require that the main propulsion and auxiliary machinery can operate on commercial marine diesel fuel. Power levels to meet operational requirements shall be achievable using this fuel type. A fuel monitoring and reporting system to optimize fuel efficiency should be considered.
- ii. Design consideration should be given to the storage of all fuels and other hydrocarbon materials in tanks or other containers separated from, not adjacent to, the hull of the ship.

E. Sea Chests

During ice transiting and ice breaking operations, snow, small ice pieces, and entrained air may accumulate in the sea chest. This accumulation may be of such a magnitude to cause overheating of the diesel engines and unscheduled shut-downs. To prevent clogging of the sea chests with snow and ice slush, it is recommended that the sea chests be located deep in the ship, be of adequate size, and be provided with baffles, large vent pipes to eliminate air, and be heated. A thermostatically controlled valve should regulate the recirculating flow based on water temperature in the sea chest. These features should not be used in the scientific sea chest for uncontaminated sea water.

3. Communications and Navigation

A. Internal Communications

i. Telephone Service

The ship must have an internal digital telephony communications system that provides high quality voice communications among all of the scientific spaces, the lounge/conference room, the mess room, the working deck areas, the Helicopter Hangar, and all ship control stations. This system is to be integrated with the ship's overall internal communication system that services all staterooms and other occupied spaces of the ship. The system must be capable of interoperation with onboard analog and satellite phone systems including Inmarsat and Iridium.

B. External Communications

- i. The ship shall be compliant with the Global Maritime Distress Safety System (GMDSS) requirements for a world-ranging vessel. The Owners shall provide and be compliant with a Federal Communications Commission (FCC) inspection of the GMDSS system every other year

regardless of the port and every year if the vessel is in U.S. ports in consecutive years. 47 CFR 80.1069.

- ii. Additional Communications Requirements:
 - a. The INMARSAT system shall be a Fleet-77 with at minimum a 256 kbps capability.
 - b. The HF radio suite shall have at least one transceiver capable of full sweep from 1.2 to 30 MHz in order to communicate with any and all vessels and international coastal research stations.
 - c. The HF weather fax shall be capable of both coastal and long-range reception.
 - d. The bridge shall also be equipped for aircraft voice communications.

C. Navigation Systems

- i. The ship shall be provided with a complete and modern suite, with appropriate redundancy, of standard marine navigation and safety equipment such as:
 - a. Electronic Chart Display and Information Systems (ECDIS),
 - b. GPS receivers,
 - c. shallow water fathometers,
 - d. dual gyro compasses suitable for high-latitude operation,
 - e. barographs,
 - f. anemometers, and
 - g. thermometers.
- ii. Forward-Looking Sonars
 - a. Navigation sonars shall be compliant with 46 CFR 195.27. All navigation sonars shall have their display and operation consoles on the bridge.
 - b. Due to the nature of the operational area, the vessel shall be outfitted with a retractable, forward-looking or sector-scanning sonar for navigation in minimally charted areas. This system will be operated from the vessel's navigation bridge under the control of the Officer on watch. The forward-looking sonar depth range shall be 700 meters and the data from this sonar shall be made available to the National Science Foundation for distribution and archiving.
- iii. Ship Control and Positioning System

For station keeping, it is desirable to have an integrated console where the operator can control all main propulsion and maneuvering systems. Control

consoles should be located on the bridge, on the working side bridge wing and in the aft control station. Master control should reside in the console on the bridge. Equipment to constantly display actual position relative to a target station, or actual course relative to a track line is required. These and other capabilities shall be facilitated by the Owners' provision and support of an Electronic Chart Display and Information System (ECDIS), that is current to the technology available at the commencement of this contract.

D. Surface Search Radar

The ship shall be outfitted with both 3 cm and 10 cm surface search radars. Both radars shall have independent and switchable display and operator stations. Both radars shall interface to the bridge ECDIS system. The primary radar will have one video output compatible with the closed-circuit television system.

E. Remote Sensing Weather System

The Owners may propose a remote sensing weather system (a SeaSpace WDS-2/Terascan system is preferred for program consistency) providing remote sensing capability for operational security. The system must be capable of receiving visual, infrared and DMSP SSMI satellite transmitted data. The antenna shall have unobstructed line of sight to the horizon in order to see the satellites. It will require space for the computer workstation including a large LCD screen; it could be rack mounted. The antenna cable may be limited to 100 meters without repeaters; the installation must account for this. The Charterers shall operate the system with all other costs to the Owners. Should such a system be proposed, the Owners shall subsequently demonstrate that such a system will function to manufacturer's specifications, through a manufacturer's site visit, and a field acceptance test. Any data must be available and of archival quality for science purposes.

4. Ship's Auxiliary Systems

A. Electrical Service Generators

- i. Ship service generators must be of sufficient number and size to provide power consistent with the mission of the ship.
- ii. Electric power must be 220 and 110 VAC, 60 Hertz (Hz), for all laboratories, scientific accommodations, vans, and at other select locations such as the bridge.
- iii. 480 VAC, 3-phase, 60 Hz is also required at locations specified in Section III-D. These other locations allow scientists to power portable electrical equipment, instrumentation, and computers. The ship will be calling at ports where shore-side power is not available; therefore one ship service generator must be capable of handling the in-port electrical load for the ship and for scientific needs.

B. Heating, Ventilation and Air Conditioning (HVAC)

The HVAC system should be able to maintain internal ship spaces between 65° (heating) and 78° F (air-conditioning) at 50 percent relative humidity with all Charterers' equipment operating. Laboratory spaces should have a system separate from the general berthing ventilation system and should be able to meet 46 CFR 194.15-5 requirements for an emergency. The HVAC system must be able to meet these requirements regardless of outside air conditions, i.e., working in the Antarctic or crossing the equator. Additional details regarding science spaces are included in Section III-D.

C. Potable Water Makers

Two identical evaporators must be provided, each having a capability of producing 3600 gal (13.7 m³) or 13.5 LT (13.7 MT) of fresh water per day. A minimum of two days fresh water storage must be provided. The Vessel's potable water system shall meet standards of the USAP drinking water action levels (equivalent to EPA Regulations and Analytical Criteria). Potable water shall be distributed in plastic-lined piping or flexible Unipipe®.

D. Waste Management System

i. Non-hazardous Waste Management

- a. An incinerator must be provided that is suitable for burning paper, wood products, and other burnables. The unit shall be sized consistent with the size of the complement and waste generated in the course of performing oceanographic research. Incineration by electric or fuel is acceptable, recognizing that the incineration unit must be capable of using the type of fuel onboard. International emission standards in effect at the time of vessel delivery must be met.
- b. In addition to the incinerator, a trash compactor of suitable size must be provided for the compaction of glass, metal containers, plastics, and other materials that will accrue from the galley and ship operations.
- c. Provision must be made throughout the ship for the segregation of waste. This may take the form of separate trash containers in laboratories, galley, and other spaces to eliminate or reduce the need to sort the trash following collection.
- d. Any human waste, garbage, or other effluents must be treated in compliance with the requirements of U.S. law, the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), the Law of the Sea, and the Antarctic Conservation Act. Holding tanks shall be provided such that all waste discharge from the ship can be stopped for a minimum period of five hours during critical science operations.

- e. The Bidder will be required to comply with additional USAP environmental protection policies which may come into effect during the course of the charter.
- ii. Hazardous Waste Storage
Provisions shall be made to store 15 standard 55-gallon (U.S) drums of hazardous waste generated during a cruise event. This space must have easy access to crane reach for movement of drums. It is preferable that this be an interior space. If the space is located on the exterior, special provisions must be made to maintain personnel walkways and hand rails and access around or immediately adjacent to the designated area.

5. Ship Outfitting

A. Messing Facilities

A single, cafeteria-style mess room for all personnel is desired. The mess room should be adequately sized for the entire crew and scientific complement. A hand sanitation station shall be located just prior to the food service line.

B. Refrigeration and Dry Stores

Storage facilities for refrigerated and dry stores must be consistent with the size of the crew and scientific complement for 75 days at sea. Accommodations shall be provided so foodstuffs that are subject to quarantine in a foreign port can be secured in these spaces without affecting operations of the galley while in said port. At no time shall science spaces be used for vessel food storage.

C. Laundry Facilities

As individuals will do their own laundry while onboard, multiple, smaller-capacity washers and dryers shall be provided in laundry facilities. Laundry facilities must be consistent with the size of the crew and scientific complement.

D. Exercise Room

An exercise room of about 200 square feet, for use by all personnel onboard, is required. The room should be outfitted with the usual set of gym equipment such as a stationary bicycle, treadmill, weight and rowing machines. The Owners shall maintain this equipment and replace promptly when equipment is damaged or worn out. Adjacent to exercise room, shower and sauna facilities shall be provided.

E. Heated Bridge Windows

At a minimum, every other window in the bridge must be heated to prevent icing. Windows in the aft control and aloft observation tower, if so fitted, shall also be heated.

F. Gasoline Drum Storage Rack

A gasoline drum storage rack must be provided for the storage of six U.S. standard 55-gallon gasoline drums. The rack must have the capacity for the remote release of all drums in case of fire. Additionally, space is to be provided to stow up to six each, 6 U.S. gallon, outboard motor ‘pony’ cans.

G. Floodlights

Floodlights must be provided and mounted on brackets that can be temporarily swung outboard and locked in position to illuminate the water and ice surface directly adjacent to the ship. In addition, all searchlights shall be Xenon, to assist in navigation during hours of darkness.

H. Repair Parts and Storage

Repair parts shall be provided onboard for all mechanical, electrical, and electronic equipment and components in accordance with manufacturer’s recommendations for one year of operation. Supply parts inventories onboard should be consistent with the mission of the ship which is typically in remote areas. Storage space should be provided that can maintain spare parts in good working order.

I. Deck Surfaces

All exterior decks must be covered with a durable non-skid coating. This coating should survive one full year of ship operation.