

# **SECTION III-B**

## **Environmental Requirements**

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## ENVIRONMENTAL REQUIREMENTS

### 1. Ice Conditions

The ship will operate in annual ice from the ice edge up to and including consolidated pack and fast ice. The ship is expected to routinely operate in partial coverage of first-year ice floes. Glacial ice and therefore glacial ice fragments also exist in the operating area and care will be exercised by the vessel operator to detect and avoid this type of ice. Icebreaking capability in annual ice is specified in Section III-C 1.

### 2. Sea State

Data on sea states in the primary area of operation are shown below. Ship performance in these sea states is specified in Section III-C.

**Table 1:** Sea states in primary area of operation.

Sea State	Percentage of Time Exceeded	Significant Wave Height (feet)	Associated Wind Speed (knots)	Average Modal Period (seconds)
4	66	6	20	8.0
5	37	10	25	9.5
6	18	16	38	12.0
7	4	25	50	15.0

### 3. Sea Water Temperature

Sea water temperatures can be expected to range from 28°F (-2°C) to 85°F (29°C). The ship should be capable of operation in this water-temperatures range.

### 4. Air Temperature

- A. Ship operations during the Antarctic winter can be expected to encounter very cold temperatures. The ship shall be capable of operation in a minimum expected winter air temperature of -22°F (-30°C).
- B. Conversely, based on the need for the ship to periodically transit to lower, more temperate latitudes, the ship shall also be capable of operation in warmer air temperatures of about 90°F (32°C).

### 5. Wind Velocity

Very high winds occur in the Southern Ocean. The ship shall be capable of enduring a maximum sustained wind speed of 100 knots.

6. Precipitation

Precipitation in the form of rain, freezing rain, sleet, and snow can be expected. The Owners shall consider ship layout and equipment in regards to all these conditions with the intent of minimizing accumulation aboard the ship, the potential adverse effect on ship operations, and providing for removal.

7. Fog and Reduced Visibility

Reduced visibility will occur during ship operations. The ship shall have the navigational capability to operate safely in these conditions.

8. Topside Icing

- A. The combination of cold sea water and air temperatures with high sea states in the primary operating area will cause severe topside icing at times. Spray icing rates of a 1/2-inch (13 mm) per hour can be expected in extreme events. The extreme icing event has been estimated to be a 24-hour exposure at this icing rate. This extreme event may result in the following ice accumulations and loads on the main deck forward of the superstructure.

**Table 2:** Typical topside icing accumulation.

Location	Accumulation (inches)	Load (lbs/sq ft)
Horizontal Surfaces	12.0	43.6
Vertical Surfaces	9.6	34.8
Exposed Gear	10.8	39.4
Radius Rigging and Stays	10.8	111.1 lb/ft

- B. These loads should be reduced linearly with height such that all loads are zero at 100 feet above the Design Waterline (DWL). Icing is assumed not to occur on the shell plating or area below the main deck (uppermost watertight deck). Icing loads should also be reduced linearly with distance aft along the ship. Icing loads should be constant with length over the foredeck and start to reduce aft of the forward end of the superstructure, resulting in zero load at the stern of the vessel. The ship should be capable of maintaining acceptable stability margins in such an icing event. Stability in this icing condition is addressed in Section III-C 8.
- C. Given the severity of the icing loads, decks and superstructure shall be free of all but essential fittings and equipment, to minimize ice accretion.