

Requirements for Building and Classing

Wind Farm Support Vessels



December 2023



REQUIREMENTS FOR BUILDING AND CLASSING

WIND FARM SUPPORT VESSELS
DECEMBER 2023

**American Bureau of Shipping
Incorporated by Act of Legislature of
the State of New York 1862**

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Foreword (1 December 2023)

The ABS *Requirements for Building and Classing Wind Farm Support Vessels* contains the requirements for such vessels specifically fitted with equipment for maintaining and repairing facilities in offshore wind farms, as well as transporting industrial personnel between a shore-based facility and offshore wind farms. Wind Farm Support Vessels may also carry cargo as part of their normal operations.

During development, requirements applied to ABS classed Offshore Support Vessels and High-Speed Craft are considered and customized in view of the unique configurations and the typical service routines of Wind Farm Support Vessels. As a result, the hull scantlings for High-Speed Wind Farm Support Craft are derived based on the anticipated en-route weather conditions.

This document is primarily intended for Offshore Support Vessels and High-Speed Craft, but may be applied to other vessel types as indicated in 1/5.1.

The May 2021 edition includes revisions to this document for the addition of a new notation • **AMS** as given in Section 1.

The July 2022 version changed the document type from “Guide” to “Requirements”. “Requirements” documents contain mandatory criteria for Classification and issuance of Class Certificates, while Guides contain only requirements for optional Notations (see 1-1-4/1.5 of the *ABS Rules for Conditions of Classification (Part 1)*). The title was changed from "*Guide for Building and Classing Wind Farm Support Vessels*" to "*Requirements for Building and Classing Wind Farm Support Vessels*". Accordingly, editorial changes were made throughout this document.

The December 2023 version incorporates a reduction factor for superstructure and deckhouse pressures for external bulkheads on limited-service craft based on vessel type, requirements for window bonding and testing for bonded windows, requirements for testing for laminated windows, optional **E** for **Wind-SC(A)** vessels, and a new Section 11 to consolidate all wind farm vessel survey requirements.

This document becomes effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.



REQUIREMENTS FOR BUILDING AND CLASSING
WIND FARM SUPPORT VESSELS

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1 Application (1 October 2018)

The criteria contained in this document are meant to be applicable to those features that are permanent in nature and can be verified by plan review, calculation, physical survey or other appropriate means. Any statement in this document regarding any other feature is to be considered as guidance.

ABS may also consider the flag Administration’s Ship Safety Regulations as an alternative to satisfying specific portions of the applicable Rule and this document.

1.1 Offshore Support Vessels (1 October 2018)

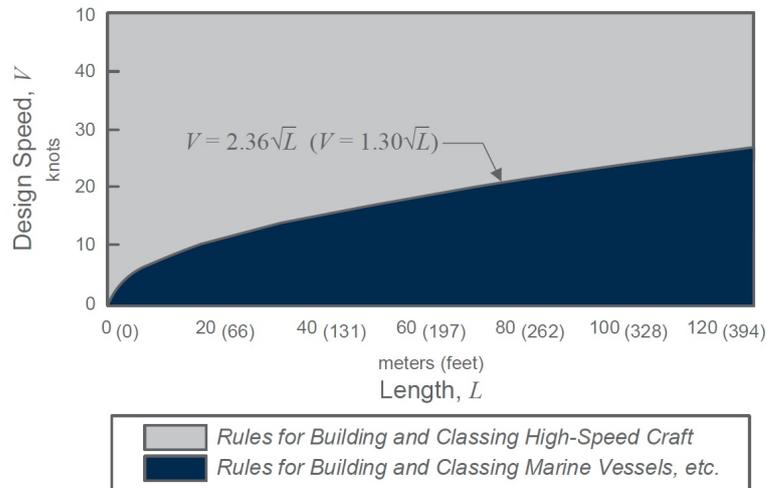
Offshore support vessels are to comply with the applicable portions of the ABS *Rules for Building and Classing Marine Vessels (Marine Vessel Rules)* in their entirety, except as modified herein. Offshore support vessels with more than twelve (12) Industrial Personnel are to comply with the requirements of the flag Administration. At the request of the Owner, the **SPS** notation will be assigned if the vessel fully complies with Section 5D-1-2 of the *Marine Vessel Rules*. Other standards acceptable to the flag Administration will also be considered.

1.3 High-Speed Craft

This document is applicable to high-speed craft for commercial or governmental use constructed of steel, aluminum, or FRP and having V/\sqrt{L} not less than 2.36 (1.30) where L is as defined in 1/3.11 and V is as defined in 1/3.13. Applicable craft type and length are as follows:

<i>Vessel Type</i>	<i>Applicable Length</i>
Mono-hull	< 130 m (427 ft.)
Multi-hull	< 100 m (328 ft.)
Surface Effects Ship (SES)	< 90 m (295 ft.)
Hydro Foil	< 60 m (197 ft.)

Application of Requirements - Design Speed vs. Length $\left(\frac{V}{\sqrt{L}}\right)$



High-speed wind farm support craft are to comply with the ABS *Rules for Building and Classing High-Speed Craft (High-Speed Craft Rules)* in its entirety, except as modified herein.

3 Definitions

Definitions of the following terms are used in this document. For additional terms, reference is made to Section 3-1-1 and 4-1-1/13 of the *High-Speed Craft Rules*.

3.1 Wind Farm Support Vessel

A *Wind Farm Support Vessel* is a vessel specifically designed for maintaining and repairing offshore wind turbines/towers, as well as transporting industrial personnel between the offshore wind farm and a shore-based facility. The wind farm support vessel may also carry cargo.

3.3 Administration

Administration refers to the flag State of the wind farm support vessel.

3.5 Gross Tonnage

Gross Tonnage is the measurement of the internal volume of spaces within the vessel as defined by the International Convention on Tonnage Measurement of Ships, 1969 (ITC).

3.7 Industrial Personnel (1 October 2018)

Industrial Personnel means every person transported or accommodated on board a wind farm support vessel for the purpose of offshore industrial activities (i.e., carrying out the business or functions of maintaining/ repairing of wind turbines/towers).

Examples of industrial personnel include:

- Tradesmen, such as mechanics, plumbers, electricians, and welders
- Laborers, such as wreckers and construction workers, and
- Other persons such as supervisors, engineers, technicians, and divers

3.9 Place of Refuge

A *Place of Refuge* is any naturally or artificially sheltered area which may be used as a shelter by a vessel under conditions likely to endanger its safety.

3.11 Length

L is the distance, in meters (feet), on the summer load line, or if applicable, the design load waterline in the displacement mode, from the fore side of the stem to the centerline of the rudder stock. For use with this document, *L* is not to be less than 96% and need not be greater than 97% of the length on the summer load line. The forward end of *L* is to coincide with the foreside of the stem on the waterline on which *L* is measured.

3.13 Speed

Speed is the design speed in knots with the vessel running ahead at the maximum continuous rated shaft rpm and at the summer load waterline. Operational speed is 90% of design speed.

5 Classification

5.1 General

5.1.1 Wind-SC(A) and Wind-SC(B) notations for High-Speed Wind Farm Support Craft (1 May 2021)

The Class Notation of **⊗ A1, HSC Wind-SC(A)** or **⊗ A1, HSC Wind-SC(B)** is to be assigned to a high-speed wind farm support craft based on the specifications described in Section 1, Table 1 provided that all the applicable requirements in this document are fully satisfied. For **HSC** notation, refer to 1-2-2/1 of the *Rules for Conditions of Classification – Light and High-Speed Craft (Part 1)*.

All craft being certified as **⊗ A1, HSC Wind-SC(A)** are to comply with the **OE** notation as defined by 1-1-3/5 TABLE B of the *Rules for Conditions of Classification – Light and High-Speed Craft (Part 1)*, and the operational envelope is to be entered into the *Record*.

TABLE 1
Types of Wind Farm Support Craft

<i>Gross Tonnage (GT)</i>	<i>Industrial Personnel (IP)</i>	<i>Domestic Voyage</i>	<i>International Voyage</i>
< 500	≤ 12	Wind-SC(A)	Wind-SC(A)
	> 12	Wind-SC(A)	Wind-SC(B)
≥ 500	Any	Wind-SC(B)	

Note: * Maximum number of persons onboard is subject to flag Administration approval.

For new construction high-speed wind farm support craft receiving the **⊗ A1, HSC Wind-SC(A)** or **⊗ A1, HSC Wind-SC(B)** notation, the notation **● AMS** may be assigned in lieu of the **⊗ AMS** notation, provided the following conditions are met.

- Craft's machinery, boilers, and systems meet the requirements for **⊗ AMS** except for propulsion engines and their associated reduction gears, as well as auxiliary generators and their prime movers, and for hybrid or electrical installation power generating components below 25 kW. Propulsion engines and their associated reduction gears, as well as auxiliary generators and their prime movers may be accepted based on Manufacturer's certificate and ABS Type Approval certificate, inclusive of Product Design Assessment (PDA) and Manufacturing Assessment (MA) with Product Quality Assurance (PQA) certification, as per Tier 4 definition in Appendix 1-1-A3 of the *ABS Rules for Conditions of Classification – Light and High Speed Craft (Part 1)*. Unit Certification via Survey During Fabrication will not be required in this instance. See also Appendix 1-1-A2 of the *ABS Rules for Conditions of Classification – Light and High Speed Craft (Part 1)* and 5.1.1 TABLE 2 of this document.

- Craft's Gross Tonnage is to be < 500. Craft with Gross Tonnage \geq 500 and for domestic voyage are subject to special consideration.
- Bore sizes of propulsion engines and generator prime movers are not exceeding 300 mm (11.8 in).
- Propulsion engines and generator prime movers are not using gases or other low-flashpoint fuels.
- Craft has multiple propulsion units and has the capability of returning to place of refuge after a single failure.

TABLE 2
Machinery Certification for ☒ AMS and ● AMS Notations (1 May 2021)

<i>Machinery Notation</i>	<i>Design Approval</i>	<i>Certification of Propulsion Engines and Their Associated Reduction Gears, Auxiliary Generators and Their Prime Movers</i>
☒ AMS	ABS	ABS
● AMS	ABS	1) ABS, or 2) Manufacturer's certificate and ABS Type Approval Certificate inclusive of PDA and MA with PQA

5.1.2 Wind-SC notation for Offshore Support Vessels (1 May 2021)

The **Wind-SC** notation is available to offshore support vessels that comply with Subsections 2/3, 2/5, 2/6, 3/3, 4/3, and Sections 9 & 10.

5.3 Operational Limits (1 October 2018)

For high-speed wind farm support craft, the Operational Limits, described in 1/5.3.1 to 1/5.3.3 of this document are to be included in the Operating Manual. See 1/5.5 of this document and 3-2-1/9 of the *High-Speed Craft Rules*.

5.3.1 Domestic Voyages

Where wind farm support craft are limited to domestic voyages, the course of its voyage is not to exceed 200 nautical miles from a place of refuge (refer to 1/3.9).

5.3.2 Transit Voyages

The craft's maximum range, in nautical miles, from a place of refuge is to be such that, in the normal course of the voyage, there is a minimum reserve fuel capacity equal to 25% of the craft's aggregate fuel oil capacity. Calculations to verify the maximum range from a place of refuge are to be submitted for review.

5.3.3 Special Consideration

In addition to 1/5.3.1 and 1/5.3.2, any specific operational limits required by the flag Administration and/or port State are to be specially considered, and be documented in the craft's Operating Manual.

5.5 Operating Manual

In addition to the requirements of the 3-2-1/9 of the *High-Speed Craft Rules*, the high-speed wind farm support craft's Operational Limit (i.e., maximum range from a place of refuge) per 1/5.3 of this document shall be specifically defined in the craft's Operating Manual.

The craft shall be operated in accordance with the ABS Approved Operating Manual, and reference to the Operating Manual will be distinguished in the *Record* by a Special Comment as well as placed on the face of the Load Line Certificate for the guidance of the Master.

7 Scope

The hull and machinery requirements to class a vessel as a wind farm support vessel are covered in this document. The requirements for Navigational Equipment and Radio Communications are not addressed except for Emergency Position Indicating Radio Beacon (EPIRB).

9 Administration Approval

In general, the approval of material for use within the accommodation, and in safety equipment, life-saving appliances, etc., is a function of the Administration.

When given specific instructions from the Administration, ABS may approve and accept material, equipment, life-saving appliances, etc., fitted on the vessel. See Section 8 for specific requirements for the life-saving arrangements.

1 Stability

1.1 General (1 October 2018)

Intact stability of the vessel is to be in accordance with the requirements of Part 3, Chapter 3 of the *Marine Vessel Rules* or *High-Speed Craft Rules*, as applicable.

1.3 For High-Speed Wind Farm Support Craft (1 October 2018)

For **Wind-SC(A)** craft where the Administration has no specific subdivision and damage stability requirements, the craft is to comply with one of the following standard:

- i) The IMO High Speed Craft Code – Chapter 2, regardless of tonnage, or
- ii) A published standard from an organization recognized by the ABS

For **Wind-SC(B)** craft where the Administration has no specific subdivision and damage stability requirements, the craft is to comply with 3-3-1/3.3 of the *High-Speed Craft Rules*.

3 Intact Stability for Vessels Equipped with Cranes

3.1 Specific Applicability

This section applies to each vessel that:

- i) Is equipped for lifting of cargo or other objects; and
- ii) Has a maximum heeling moment due to hook load greater than or equal to:

$$(0.67)(\Delta)(GM)(F/B) \text{ meter-metric tons (foot-long tons)}$$

where:

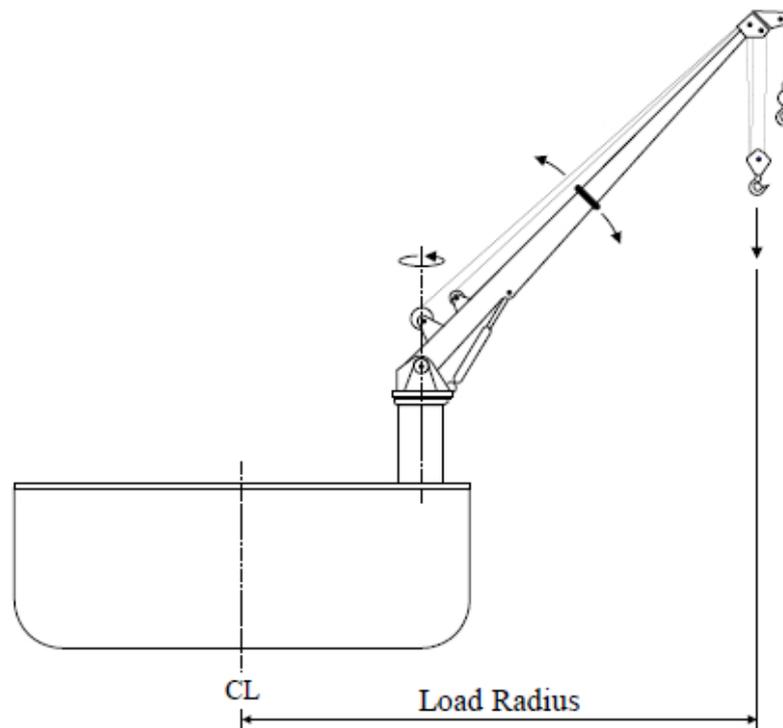
- Δ = displacement of the vessel with the hook load included, in metric (long) tons
- GM = metacentric height with hook load included, in meters (feet)
- F = freeboard to the deck edge amidships, in meters (feet)
- B = beam, in meters (feet)

3.3 Definitions

- i) *Hook load* is the weight of the object lifted by the crane.
- ii) *Load radius* is the distance illustrated in 2/3.3 FIGURE 1

- iii) *Crane Heeling Moment* is the maximum heeling moment developed by multiplying the weight of the hook load and boom by the horizontal distance from the vessel's centerline to the hook load and boom center of gravity, considering the full range of crane elevations and weights. The resulting heeling moment is to be converted to a heeling arm at zero degrees by dividing it by the vessel displacement. The heeling arm is to be assumed constant for all heel angles.
- iv) *Equilibrium heel angle* is the angle of heel under the combined effects of the hook load, counterballasting and a beam wind.

FIGURE 1
Load Radius



5 Intact Stability Requirements for Vessels Equipped to Lift

5.1 Counter-ballasted and Non-counter-ballasted Vessels

5.1.1

The following loading conditions are to be included in the Trim and Stability Booklet and submitted to ABS for review:

- i) Vessels at the maximum Load Line draft, with full stores and fuel and fully loaded with all liquid and dry cargo distributed below deck and with remaining deadweight distributed as above deck cargo (specified by weight, longitudinal center of gravity, vertical center of gravity and total height above deck) corresponding to the worst service departure condition in which all the relevant stability criteria are met.
- ii) Vessels with 10% stores and fuel and fully loaded cargo of i) above, in arrival condition.
- iii) Vessels with full stores and fuel and loaded with the maximum design deck cargo (specified by weight, longitudinal center of gravity, vertical center of gravity and total height above deck) and with remaining deadweight distributed below deck in liquid and dry cargo spaces corresponding to the worst service departure condition in which all the relevant stability criteria are met.

- iv) Vessels with 10% stores and fuel and fully loaded cargoes of *iii*) above, in arrival condition.
- v) Vessels with full stores and fuel in ballast departure condition.
- vi) Vessels with 10% stores and fuel in ballast arrival condition.
- vii) Vessels in the worst anticipated operating condition (i.e., arrival condition with deck cargo only – 100% deck cargo with 10% stores and fuel).

5.1.2

Each vessel is to comply with the following conditions:

- i) Either for each loading condition (see 2/5.1.1) and pre-lift condition, or the range of conditions, including pre-lift conditions, delineated by the lifting operations guidelines contained in the trim and stability booklet; and
- ii) Crane Heeling Moment, and
- iii) The effect of beam wind on the projected area of the vessels (including deck cargo) should be evaluated for 25.7 m/s (50 knots) wind speed. Should a lesser wind speed be used, that wind speed shall be listed in the trim and stability booklet as an operational restriction during lifting operations.

The wind heeling moment shall be calculated as:

$$P \times A \times H \quad \text{N – m (kgf – m, lbf – ft)}$$

where

P = wind pressure, calculated as per below

A = projected lateral area, in square meters (square feet), of all exposed surfaces (including deck cargo), in the upright condition

H = vertical distance, in meters (feet), from the center of A to the center of the underwater lateral area or approximately to the one-half draft point

This wind heeling moment is to remain constant for all heel angles.

$$P = fV_k^2 C_h C_s \quad \text{N/m}^2 (\text{kgf/m}^2, \text{lbf/ft}^2)$$

where

f = 0.611 (0.0623, 0.00338)

V_k = wind velocity in m/s (m/s, knots)

C_s = 1.0, shape coefficient

C_h = height coefficient from 2/5.1.2 TABLE 1

TABLE 1
Values of C_h

H (meters)	H (feet)	C_h
0.0–15.3	0–50	1.00
15.3–30.5	50–100	1.10
30.5–46.0	100–150	1.20

<i>H (meters)</i>	<i>H (feet)</i>	<i>C_h</i>
46.0–61.0	150–200	1.30
61.0–76.0	200–250	1.37
76.0–91.5	250–300	1.43
91.5 and above	300 and above	1.48

5.1.3

Each vessel is to have a righting arm curve with the following characteristics:

- i)* The area under the righting arm curve from the equilibrium heel angle (based upon the wind heeling moment) up to the smallest of the following angles must be at least 0.080 meter-radians (15 foot-degrees):
 - a)* The second intercept
 - b)* The downflooding angle
 - c)* 40 degrees
- ii)* The lowest portion of the weather deck and downflooding point should not be submerged at the equilibrium heel angle.
- iii)* The heeling angle based on the crane heeling moment and effect of the beam wind shall not exceed the maximum heel angle from the crane manufacturer.

The righting arm curve is to be corrected for the increase in the vertical center of gravity due to the lifting operation. (The increase in the vertical center of gravity is due to the boom being in the elevated position, and the hook load acting at the elevated end of the boom).

5.3 Additional Intact Stability Standards – Counter-ballasted Vessels

Vessels carrying out lifts using counter-ballasting are to be reviewed to a recognized standard acceptable to ABS.

6 Intact Stability for Vessels Equipped with Walk to Work Gangways (1 October 2018)

In evaluating the stability for the vessels equipped with gangways, the following loads are to be included:

- i)* The overturning moments due to environmental and operational loads on the gangway systems. When the gangway system is in both stowed and operational mode, the full range of gangway operating configurations (refer to 3/5 of the *ABS Guide for Certification of Offshore Access Gangways*) is to be considered in order to investigate the most critical scenarios.
- ii)* The effect of any deck and bulk cargoes for each operating condition.
- iii)* The appropriate free surface effect for all conditions if the vessel is intended to carry deck cargoes that may accumulate water, such as open cargo bins.
- iv)* The estimated weight and height of the center of gravity in the worst possible scenario if large and heavy equipment or structures are intended to be stowed on deck, or if the gangway system is going to be raised up on a grillage to add extra height.
- v)* Requirements of International Load Line Regulations and applicable international regulations, as well as the regulatory requirements of the flag Administrations for accommodation service vessel.

7 Other Features

Operations such as towing and firefighting impose heeling moments that affect the stability of the vessel. The stability review is to verify that the Master has sufficient stability information to cover all operational conditions. Vessels fitted with fire monitors, towing bits, etc., are to comply with intact stability criteria acceptable to ABS.

SECTION 3
Construction

1 General (1 October 2018)

The scantlings and arrangements of the hull structure are to be in accordance with the applicable requirements of Part 3 of the *Marine Vessel Rules* or *High-Speed Craft Rules*, as applicable.

3 Provisions for Industrial Personnel (1 October 2018)

Accommodation spaces for industrial personnel are to be designed so that the occupants are protected from unfavorable environmental conditions. These spaces are to be provided with heat, air conditioning, light and ventilation. For high-speed wind farm support craft, each industrial person carried onboard shall be provided with a seat.

5 Operational Parameters for High-Speed Wind Farm Support Craft (1 October 2018)

The modifications listed in 5-2-3/5 of the *High-Speed Craft Rules* are applicable to craft classed **Wind-SC(A)**.

7 Superstructure and Deckhouse Pressures (1 December 2023)

For limited service craft (**Wind-SC(A)**, Coastal Craft or Riverine Craft) the superstructures and deckhouses design pressures for exterior bulkheads listed in 3-2-2/Table 4 of the *High-Speed Craft Rules* are to be multiplied by factor F as per the table below. Additionally, the second tier and above front facing pressure is to be reduced to aft and side pressure.

TABLE 1
Service Factor, F

<i>Craft Type</i>	<i>Max Design Significant Wave Heights</i>	<i>F</i>
Wind-SC(A)	2.5 m < $h_{1/3}$ ≤ 3.3 m (8.5 ft < $h_{1/3}$ ≤ 11 ft)	0.8
Coastal Craft, Wind-SC(A)	0.5 m < $h_{1/3}$ ≤ 2.5 m (1.75 ft < $h_{1/3}$ ≤ 8.5 ft)	0.7
Riverine Craft	0.5 m (1.75 ft)	0.5
All other craft	3.3 m < $h_{1/3}$ ≤ 4 m (11 ft < $h_{1/3}$ ≤ 13 ft)	1

9 Window Bonding and Testing Requirements (1 December 2023)

For windows utilizing solely adhesives to secure glazing into their frames, the following conditions are to be fully complied with:

- i) The designer or shipyard is to provide a process for the installation of the window glazing material using the adhesive. The process is to be either written by, or approved by, the manufacturer of the adhesive.
- ii) The designer or shipyard, in conjunction with the adhesive manufacturer, is to provide calculations justifying the dimensions of the bondline (length and depth).
- iii) The adhesive manufacturer is to indicate in writing that the proposed detail of the window glazing to structure joint and the location of this joint is an acceptable use of their product.
- iv) Because some adhesives may be sensitive to ultraviolet light, the adhesive manufacturer is to indicate the ultraviolet tolerances of the glazing material for their products.
- v) The installation of the window glazing material using the adhesive is to be performed by technicians trained in the manufacturer approved procedure.
- vi) A sample of the proposed installation is to be tested by an external bearing pressure against the window frame and an internal pressure that puts the adhesive bonding in tension. The applied external head of water is to be equal to or in excess of the pressure indicated in 3-2-2/Table 4 of the *High-Speed Craft Rules* for the specific location of the window. The internal pressure head is to be not less than an equivalent to 703.1 kgf/m² (1 psi). In lieu of an internal pressure test, a separation test of the bonding may be carried out as prescribed in ISO 12216. This testing requirement is to be witnessed by the attending Surveyor or may be waived if previous test data is provided showing that the testing was witnessed by a recognized body (e.g., IACS Class Society), and that the tests were performed on substrates, window sizes, and glazing thickness similar to that being proposed.
- vii) Bonded windows are not acceptable for boundaries that are to comply with structural fire protection requirements, unless test data is provided indicating that the joint complies with the necessary regulations.
- viii) The window installation is to be weathertight to the satisfaction of the attending Surveyor.
- ix) Approval of the flag Administration is to be obtained in all cases.

11 Testing of Laminated Glass (1 December 2023)

11.1 Minimum Laminated Glass Thickness When Using Tested Properties

$t = 9.5 \text{ mm (0.375 in.)}$ for front windows
 $t = 8 \text{ mm (0.3125 in.)}$ for side windows

11.3 Glazing Material Mechanical Properties

Where it is intended to utilize higher flexural strength and moduli for a glazing design other than those listed in 3-2-11/Table 3 of the *High-Speed Craft Rules*, a satisfactory destructive test plan to a recognized standard such as ISO 1288-3, is to be submitted to ABS Engineering. Glazing specimens are to be tested using a four-point bend test to a recognized standard. A minimum of 10 specimens of each material thickness and glazing configuration type are to be tested in order to validate the use of alternative mechanical properties for design.

11.5 Hydrostatic Verification

Where it is intended to proof test glazing configurations through the use of hydrostatic testing, a satisfactory test plan is to be submitted to ABS Engineering. All hydrostatic testing is subject to special consideration depending on the intent of the testing. Hydrostatic testing is not to be used as an overall or

unilateral approval of a glazing material in lieu of the requirements in this section. Testing results are only to be considered for a specific batch of glazing material associated with a specific craft and witnessed by an ABS Surveyor.

The test plan and results are to contain the following as a minimum:

- Test conditions, date, and location
- Purpose of testing
- Descriptions and drawings of the sample closure being tested
- Details of the testing equipment
- Overall procedure including any additional criteria set by ABS Engineering
- Test results and conclusions based on results
- Witnessing Surveyor

A minimum of three (3) specimens of each material thickness and glazing configuration type are to be tested for the test to be considered satisfactory. The design test pressure (P_D) and design factor of safety (FOS) are to be established prior to the test.

Commentary:

The minimum factor of safety (FOS) used by ABS in the scantling formula is $1/0.3 = 3.33$ (see definition of σ_a in 3-2-11/7.1 of the *High-Speed Craft Rules*).

End of Commentary

The overall procedure is to meet the following as a minimum:

- i)** The test chamber pressure is to be raised up to the design pressure and maintained for at least five minutes.
- ii)** The pressure in the test chamber is then to be raised up to the FOS times the P_D ($FOS \times P_D$) and held for one minute.
- iii)** A dynamic load of three unloading/loading cycles is to be performed within the pressure range from $1 \times P_D$ to $FOS \times P_D$ starting at minimum from $1 \times P_D$ and reaching at minimum $FOS \times P_D$, each time held at the full test pressure for one minute before releasing pressure back down to P_D .
- iv)** The chamber pressure is to be measured and recorded continuously during the test. Additionally, central deflection is to be measured and recorded.
- v)** Any occurrences such as the loss of watertightness (from the glazing or from the fixing system), glazing failure (cracking), or overall structural yielding is to be recorded by the test operators with the associated test pressure.

SECTION 4 Anchoring and Stationkeeping

1 General (1 December 2023)

All wind farm support vessels are to have anchor and chain that comply with the requirements in Part 3, Chapter 5 of the *Marine Vessel Rules or High-Speed Craft Rules*, as applicable.

The symbol ⓔ indicates that the equipment of the vessel is in compliance with the requirements in Section 3-5-1 of the *Marine Vessel Rules or High-Speed Craft Rules* and tested in accordance with 3-5-1/7 of the *Marine Vessel Rules or High-Speed Craft Rules*, as applicable.

The Class Notation ⓔ is optional for **Wind-SC(A)**. If the symbol ⓔ is not requested, the vessel is required to be fitted with anchors and chains that are sized in accordance with 3-5-1/Table 1A and 3-5-1/Table 1B, Appendix 3-5-A1, or Section 5-2-4 of the *High-Speed Craft Rules* in association with the EN so calculated with modification in 3-5-1/5.7 of the *High-Speed Craft Rules*.

Where the symbol ⓔ is not desired in accordance with HSC 3-5-1/1 of the *High-Speed Craft Rules*, the testing is to be carried out in accordance with the approved specification, and the manufacturer's test certificate is to be submitted to the attending Surveyor.

3 Stationkeeping (1 October 2018)

3.1 Dynamic Positioning System

For OSVs, dynamic positioning (DP) systems are required to maintain the vessel's position during lifting or offshore access gangway operations and are to comply with the requirements for the class notation **DPS-2** or **DPS-3** (see the *ABS Guide for Dynamic Positioning Systems*).

Where the DP system has interfaces with the gangway control system, the potential effects of the operations of the gangway control system on the DP station keeping capability are to be addressed in the DP FMEA.

SECTION 5 Vessel Systems and Machinery

1 General (1 October 2018)

Vessel systems and machinery installations for all vessels are to be in accordance with the applicable requirements of Part 4, Chapters 1, 2, 3, 6 and 9 of the *Marine Vessel Rules* or Part 4, Chapters 1 through 4 and 7 of the *High-Speed Craft Rules*, as applicable.

3 Failure Mode and Effects Analysis (1 October 2018)

3.1 Dynamic Positioning System (1 October 2018)

A Failure Mode and Effects Analysis is to be submitted wind farm support vessels with the class notation **DPS-2** or **DPS-3**. Refer to Subsection 2/11 of the *ABS Guide for Dynamic Positioning Systems* for requirements.

3.3 Wind-SC(A) Craft (1 October 2018)

A Failure Mode and Effects Analysis is to be submitted for all **Wind-SC(A)** craft. Refer to Section 5-2-5 of the *High-Speed Craft Rules* for requirements.

The alternatives listed in the Section 5-2-5 of the *High-Speed Craft Rules* may be considered for craft classed **Wind-SC(A)**.

SECTION 6**Fire Safety and Extinguishing Systems****1 General (1 October 2018)**

All wind farm support vessels are to satisfy the applicable requirements in Part 4, Chapter 7 of the *Marine Vessel Rules* or Part 4, Chapter 5 of the *High-Speed Craft Rules*, as applicable.

3 Wind-SC(A) Craft (1 October 2018)

The alternatives listed in the Section 5-2-6 of the *High-Speed Craft Rules* may be considered for craft classed **Wind-SC(A)**.

SECTION 7 Electrical Installations

1 **General** (1 October 2018)

Electrical apparatus and wiring systems for all vessels are to be constructed and installed in accordance with Part 4, Chapter 8 of the *Marine Vessel Rules* or Part 4, Chapter 6 of the *High-Speed Craft Rules*, as applicable.

3 **Wind-SC(A) Craft** (1 October 2018)

For **Wind-SC(A)** craft, requirements listed in Section 5-2-7 of the *High-Speed Craft Rules* may be considered as an alternative.

SECTION 8 Life-Saving Appliances

1 **General** (1 October 2018)

Where the Administration has no specific requirements, vessels are to comply with either of the following:

- i)* A published standard from an organization recognized by ABS.
- ii)* Or for high-speed wind farm support craft, Chapter 8 of the IMO HSC Code for cargo craft, regardless of tonnage, except that a rescue boat and children's life-saving appliances are not required

3 **Emergency Position Indicating Radio Beacon (EPIRB)**

For **Wind-SC(A)** craft not restricted to domestic voyages, one satellite EPIRB is to be provided.

For **Wind-SC(B)** craft, EPIRBs are to be provided in accordance with the Administration's requirements.

1 General

Upon the Owner’s request, vessels may be assigned the optional class notation **CRC** provided that lifting appliances are in compliance with the requirements for certification of cranes found in the *ABS Guide for Certification of Lifting Appliances (Lifting Appliance Guide)*.

3 Supporting Structure for Crane

3.1 Acceleration Loads

Ship structures supporting cranes are to be designed considering acceleration loads given below. Acceleration loads need not be combined with normal lifting operation loads of the cranes.

$$\begin{aligned}
 P_V &= 0.102 * [(x - L/70)]W && \text{kN(tf)} \\
 &= 0.102 * [(x - L/229.7)]W && \text{Lt} \\
 P_L &= P_T = 0.5W
 \end{aligned}$$

where

- P_V = vertical force, in kN (tf, Lt)
- P_L = longitudinal force, in kN (tf, Lt)
- P_T = transverse force, in kN (tf, Lt)
- L = length as defined in 3-1-1/3.1 of the *High-Speed Craft Rules*, in m (ft)
- W = supported weight, in kN (tf, Lt)

The value of “ x ” is dependent on the location of the center of gravity of the specific equipment and is to be taken as that given in the table below. The value of “ x ” at intermediate locations is to be determined by interpolation. L is to be measured from AP to forward.

AP & aft of AP	0.1L	0.2L	0.3L~0.6L	0.7L	0.8L	0.9L	FP & forward
$x = 18$	17	16	15	16	17	18	19

Alternatively, accelerations derived from other recognized standards, or direct calculations, or model tests considering the most severe environmental conditions anticipated for the vessel may be considered.

3.3 Lifting Loads

Maximum anticipated operational loads are to be applied for calculating scantlings of supporting structure. Lifting loads shall consider a minimum dynamic factor according to the *Lifting Appliances Guide* or one submitted by the crane manufacturer, if that be greater.

3.5 Acceptable Stresses

Scantlings of structure supporting cranes are to be based on the permissible stresses given below:

Normal Stress = $0.7Y$

Shear Stress = $0.4Y$

Equivalent stress = $0.8Y$

where Y is the specified minimum tensile yield strength or yield point.

1 General

Each vessel is to have a designated personnel transfer area and transfer platform. Special built systems may be accepted as an alternative to the transfer arrangement requirements of this section.

The Operating Manual is to specify the environmental limits at which crew transfer may take place.

2 Gangways for Personnel Transfer (1 October 2018)

When permanently installed gangways are used for personnel transfer, the underdeck supporting structure on the vessel is to comply with the structural requirements in Subsection 3/7 of the *ABS Guide for Certification of Offshore Access Gangways* regardless of application of notation or certification.

At the request of the owner, the vessel may be distinguished by the class notation **GRC(Type I or II, PS or AS)** if the requirements in the *ABS Guide for Certification of Offshore Access Gangways* are complied with in full.

3 Fender (1 October 2018)

High-speed wind farm support craft are to have appropriate fender arrangements for safe landing and transferring between the craft and wind tower.

The required energy absorption of the fender(s) is:

$$E_f = 0.5\Delta V_i^2 C_s C_m \quad \text{kN} - \text{m(Ltf} - \text{ft)}$$

where

- Δ = displacement of the vessel, in metric (long) tons
- V_i = approach speed 0.6 m/s (1.16 knots)
- C_s = hardness coefficient, 1 for soft fenders and 0.9 for hard fenders.
- C_m = added mass coefficient of sea water moving with a vessel
 - = 1.1 for longitudinal approach
 - = 1.5 for sideways approach

The required energy absorption of the fender(s) is to satisfy the following:

$$E_{60} \geq E_f$$

where

E_{60} = energy absorption at 60% compression. This may be accepted based on the manufacturers' documentation on design and quality.

5 Occupational Safety

Within the personnel transfer area the deck and any surfaces used as a step are to have non-skid surfaces. The personnel transfer area is to be kept free of objects that may pose a physical hazard to personnel.

The navigation bridge is to have a clear view of the transfer area and transfer platform, regardless of weather conditions.

Personnel transfer is to occur away from the propellers of the service vessel. Stern transfer may only be permitted where special arrangements are made to protect a man overboard.

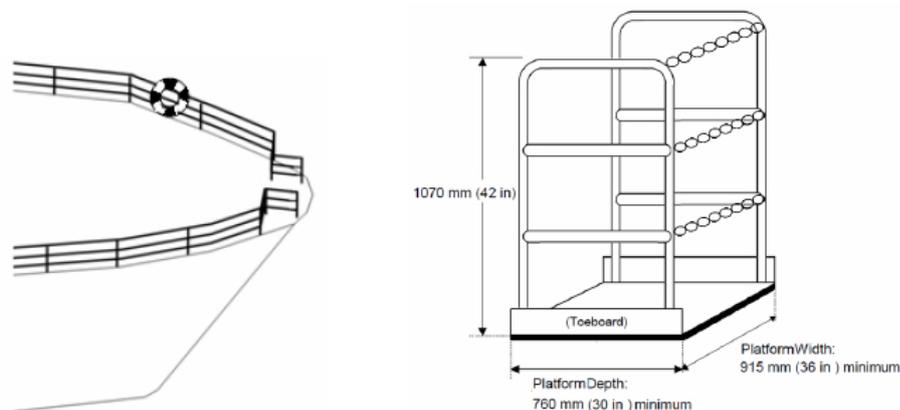
A first aid station is to be provided and equipped with a blanket and first aid kit. This area is to be provided with a heating system if the vessel is operating in low temperature environments.

Additional optional requirements can be found in the *ABS Guide for Vessels Operating in Low Temperature Environments*.

7 Transfer Platform (1 October 2018)

Where gangways for personnel transfer are not provided, a transfer platform is to be provided with minimum dimensions of 760 mm (30 in.) wide and 915 mm (36 in.) deep and constructed of a non-slip surface with foot stops and grab rails. See 10/7 FIGURE 1.

FIGURE 1
Transfer Area and Platform Arrangement



9 Handrails and Grab Rails

Three course handrails are to be installed around the transfer area to enable personnel to stand safely when the vessel is rolling and pitching in heavy weather. In addition, grab rails are to be installed perpendicular to the vessel edge on either side of the transfer platform where the transfer is to take place. The handrails are to be designed in accordance with the International Convention on Loadlines. However, the height of the handrail should be 1070 mm (42 in.) from the walking surface.

Three course wire ropes or chains capable of being made taut are to be provided at the open end of the transfer platform. Portable handrails or gates may also be accepted at the open end.

11 Personal Life-Saving Appliances

One lifebuoy is to be located within the transfer area. This buoy may be one of the buoys required by Section 8. In addition, a rope ladder is to be stored within the transfer area.

13 Lighting

Sufficient lighting should be provided to enable personnel to transfer at sea and in port in both day and night conditions.

1 Surveys During Construction

1.1 High-speed Wind Farm Support Craft

High-speed wind farm support craft are to comply with Part 3, Chapter 7 of the *ABS Rules for Building and Classing High-speed Craft (High Speed Craft Rules)* as well as the additional requirements in this section.

1.3 Offshore Wind Farm Support Vessels

Offshore wind farm support vessels are to comply with the applicable portions of the *ABS Rules for Building and Classing Marine Vessels (Marine Vessel Rules)* as well as the additional requirements in this section.

1.5 Windows - Bonding Verification Testing

For windows solely utilizing adhesives to secure glazing into their frames, the following conditions are to be fully complied with and verified to the satisfaction of the attending Surveyor:

- i) Verify that Subsection 3/9 of this document has been reviewed by ABS Engineering. The proposed installation is to be tested by an external bearing pressure against the window frame and an internal pressure that puts the adhesive bonding in tension.
- ii) External head of water is to be applied equal to or in excess of the pressure indicated in 3-2-2/ Table 4 of the *High-Speed Craft Rules* for the specific location of the window per the reviewed test plan.
- iii) The internal pressure head is to be not less than 703.1 kgf/m² (1 psi).
 - a) In lieu of an internal pressure test, a separation test of the bonding may be carried out as prescribed in ISO 12216.

Commentary:

Testing may be waived if previous test data is provided showing that the testing was witnessed by a recognized body (e.g., another IACS Class Society), and that the tests were performed on substrates, window sizes, and glazing thickness similar to those being proposed.

End of Commentary

1.7 Window Laminated Glass - Glazing Material Mechanical Properties

Where glazing designs with higher flexural strength and moduli than those listed in 3-2-11/Table 3 of the *High-Speed Craft Rules* are to be utilized, the Surveyor is to witness either 11/1.7.1 or 11/1.7.2:

1.7.1 Window Laminated Glass - Destructive Testing

- i) Verify that destructive testing plan has been reviewed by ABS Engineering per Subsection 3/11.
- ii) Glazing specimens are to be tested using a four-point bend test.
- iii) A minimum of 10 specimens of each material thickness and glazing configuration type are to be tested.
- iv) Upon completion of installation, all windows are to be hose tested in position under a water pressure of at least 2 bar (2 kgf/cm², 30 lb/in²)

1.7.2 Window Laminated Glass - Hydrostatic Verification

Hydrostatic testing results are applicable only to a specific batch of glazing material associated with a specific craft and are to be witnessed to the satisfaction of the attending ABS Surveyor.

A minimum of three (3) specimens of each material thickness and glazing configuration type are to be tested. The design test pressure (P_D) and design factor of safety (FOS) are to be established prior to the test per reviewed test procedure.

- i) Verification hydrostatic proof testing of glazing configurations through the use of hydrostatic testing, test plan has been reviewed by ABS Engineering per Subsection 3/11.
- ii) The test chamber pressure is to be raised to the design pressure and maintained for at least five minutes.
- iii) The pressure in the test chamber is then to be raised to the design test pressure and held for one minute (Design test pressure = $P_D \times \text{FOS}$ per the reviewed test plan).
- iv) A dynamic load of three unloading/loading cycles is to be performed from the design pressure (P_D) to the full test pressure ($P_D \times \text{FOS}$) and held for one minute before releasing pressure back to design test pressure (P_D).
- v) The chamber pressure is to be measured and recorded continuously during the test. Additionally, central deflection is to be measured and recorded.
- vi) Upon completion of installation, all windows are to be hose tested under a water pressure of at least 2 bar (2 kgf/cm², 30 lb/in²).

1.9 Window Testing

Upon completion of window installation, all windows are to be hose tested under a water pressure of at least 2 bar (2 kgf/cm², 30 lb/in²) per 3-2-11/7.3 of the *ABS Rules for Building and Classing High Speed Craft*.

3 Surveys After Construction

High-speed wind farm support craft and offshore wind farm support vessels with the **Wind-SC(A)** or **Wind-SC(B)** notation are to be surveyed per the applicable requirements for High-Speed Craft or Offshore Support Vessels within *ABS Rules for Survey After Construction (Part 7)*.