



**Guidance Circular for the  
Survey of Rigid Inflatable Boats  
less than 12m in Measured  
Length**

## FOREWORD

This Document was developed following an internal review of the procedures that have been used over the last 15 years by State Survey Authorities for surveying rigid inflatable boats (RIB's).

Difficulty has been found in the application of the Uniform Shipping Laws (USL) Code to this type of vessel. This has resulted in many varying interpretations being generated based on the USL Code, from first principle engineering, from hearsay about this type of vessel and also from lack of direction.

In preparing this document, consideration was given to a number of factors, including:

- a) The current USL Code.
- b) Input from industry leaders in the development of these vessels.
- c) Current designs and practices.
- d) Relevant national and international standards.
- e) Current survey practice, both formal and informal.

This document is intended to be read in conjunction with the Uniform Shipping Laws Code and the National Standard for Commercial Vessels as applicable.

Submissions requesting changes or clarifications to this document should be addressed to the Survey Authority in the State or Territory for which the vessel is undergoing survey.

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FINAL DRAFT

## CHAPTER 1 PRELIMINARY

### 1.1 SCOPE

This document provides guidance on alternative design, construction and survey requirements applicable to rigid inflatable boats (RIBs), less than 12m in measured length, intended for commercial service. This guidance does not replace the provisions of the Uniform Shipping Laws Code or National Standard for Commercial Vessels (as applicable). Rather, it provides an agreed set of criteria upon which to assess equivalent solutions to those deemed to satisfy under the USL Code or NSCV.

The guidance material should be read in conjunction with the applicable sections of the USL Code or NSCV.

#### NOTES

1. This guidance circular has been formulated under the assumption that the USL Code or NSCV will continue to apply to any matter not specifically addressed within this circular.
2. The enclosed information is not intended to explain all aspects of Survey. The information provided is designed to inform owners, operators, builders, etc. of the general requirements for Initial Survey, for additional information please contact the Authority.
3. For a typical RIB configuration, see Annex A.

### 1.2 APPLICATION

Unless permitted otherwise by the relevant Maritime Authority, this document is applicable to RIB's and RIB-like vessels of Class C, D or E up to 12 metres in length.

For this document to be applicable a rigid inflatable boat must satisfy the definition as listed in clause 1.9.

RIBs certified as rescue boats in accordance with "IMO Resolution MSC.81 (70), Revised Recommendations on Testing of Life-Saving Appliances" and suitably maintained would be deemed to comply with this Guidance Circular.

### 1.3 OBJECTIVE

To provide safety solutions for RIB technology that:

- a) achieve levels of safety equivalent to 'conventional' vessels under the USL Code or NSCV
- b) take into account the differences in the type of hazards and relative levels of risk associated with RIBs compared to conventional vessels; and
- c) are better suited to the geometric, operational and other characteristics of rigid inflatable boats

#### **1.4 MAXIMUM CAPACITY**

The maximum number of persons a vessel is permitted to carry should be governed by the minimum number permissible with regard to the following:

- a) The available deck area and facilities including seating, as defined in Chapter 6,
- b) The applicable lifesaving and safety equipment as determined in accordance with the clause 3.1.
- c) The stability assessment in accordance with Chapter 7.

#### **1.5 SEAWARD LIMITATIONS FOR SERVICE**

The maximum seaward limit for service for each vessel is determined based on various factors including but not limited to:

- a) Whether an open vessel or not,
- b) The protection of the crew and passengers from the elements,
- c) The propulsive power to the vessel and associated redundancy (refer to clause 5.2.2),
- d) The safety equipment carried on the vessel,
- e) The size of the vessel.

#### **1.6 EQUIVALENT STANDARD**

This document has been deemed an equivalent solution to the requirements of the Uniform Shipping Laws Code and National Standard for Commercial Vessels.

For any vessel that will transfer to the jurisdiction of another Authority, it is the responsibility of the designer/builder to ensure that the requirements of this document are acceptable to that Authority.

##### **1.6.1 Exemption from the USL Code / National Standard for Commercial Vessels**

Vessels issued a Certificate of Survey pursuant with the requirements of this document will be issued with the following clause on the face of the Certificate of Survey:

*This vessel has been surveyed in accordance with the Guidance Circular for the Survey of Rigid Inflatable Boats less than 12m in measured length as an equivalent to the USL Code and NSCV. Acceptance of this vessel by another Authority is at the discretion of the receiving Authority.*

#### **1.7 NOVEL DESIGNS, SEVERE WEATHER VESSELS, AND FAST VESSELS**

Vessels of novel design or that operate in severe weather conditions or at high speed with large accelerations should undergo appropriate trials and should have safety management systems in place. The authority may require a risk assessment to be conducted to determine the safety of the operation prior to accepting an application for survey.

Vessels are considered to be “high speed” if the power of the engine(s) fitted exceeds that permitted in clause 5.2.2 of these guidelines.

NOTE:

For guidelines on Hazard Identification, Risk Assessment and Control of Risk refer to Part B Annex B of the NSCV. For guidance on acceptable risk refer to Part B Annex C of the NSCV.

## 1.8 REFERENCED AND SOURCE DOCUMENTS

The following documents are referred to in this guidance circular or have been used as the source material. Any documents referenced in this paper should be considered to be the latest revision of the document, including amendments and supplements.

### AUSTRALIAN TRANSPORT COUNCIL

*National Standard for Commercial Vessels*

Part B – General Requirements

Part C – Design and Construction

Section 5: Engineering

Subsection 5A – Machinery

Section 7: Equipment

Subsection 7A – Safety Equipment

*Uniform Shipping Laws Code*

*Administrative Protocol for the Mutual Recognition of Vessel Certificates of Survey*

### AMERICAN BOAT AND YACHT COUNCIL

*Standards and Technical Reports for Small Craft*

H-4: Cockpits and Scuppers

### STANDARDS AUSTRALIA

AS 1799 – Small Pleasure Boats Code

Part 1: - General requirements for power boats

AS 2261 – Rescue Buoys

AS 2677 – Inflatable Boats

AS 2906 – Fuel Containers – Portable – plastic and metal

AS 4132 – Boat and Ship Design and Construction

Part 1: - Design Loads

Part 2: Aluminum construction

Part 3: Fibre-reinforced plastics construction

INTERNATIONAL MARITIME ORGANIZATION

IMO Resolution MSC.81(70) Revised Recommendation on testing of Life-Saving Appliances

COLREG 2003 – Convention on the International Regulations for Preventing Collisions at Sea, 1972

SOLAS 2002 - International Convention for the Safety of Life at Sea, 1974, and 1988 Protocol relation thereto

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO 6185 – Inflatable boats

Part 1: Engine maximum power rating of 4.5kW

Part 2: Boats with a maximum motor power rating of 4.5kW to 15kW inclusive

Part 3: Boats with a maximum motor power rating of 15kW and greater

Part 4: Boats with an overall length of between 8m and 24m with a motor maximum power rating of 75kW and greater

MARITIME AND COASTGUARD AGENCY

Small Vessels in Commercial use for Sport or Pleasure, Workboats and Pilot Boats – Alternative Construction Standards, MGN 280 (M), 2004

1.9

**DEFINITIONS**

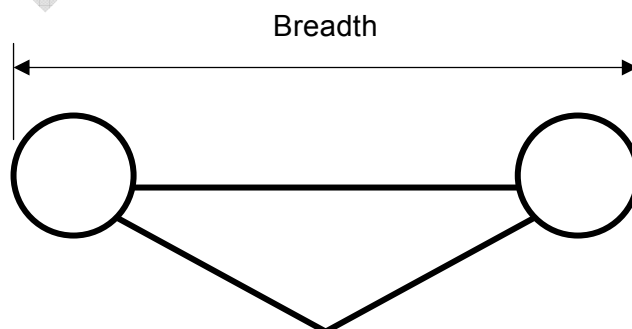
For the purpose of this document the following definitions should apply.

**Authority**

The statutory marine authority of the Commonwealth of Australia or of a State or Territory within the Commonwealth

**Breadth**

The overall beam of the vessel in metres (excluding handholds or other fittings)



**Collar**

The buoyant section of the vessel that is connected to the hull and runs from the transom to the stem along the periphery of the vessel (see Annex A).

### Competent person

A person who has acquired through training, qualification, experience, or a combination of these, the knowledge and skills enabling that person to perform the tasks required by this guidance circular and authorized to do so by the relevant Survey Authority

### $F(d)$

A dimensional factor related to the size of the vessel

$$F(d) = (L_{OA} * B)$$

where

$L_{OA}$  = The overall length in metres

B = The breadth in metres

### Inflatable boat

buoyant structure (hull), achieving all or part of its intended shape and buoyancy by the medium of inflation and which is intended for the transportation of people and/or loads on the water, and where the design and shape of it gives it the capacity of withstanding forces and movements arising from sea conditions.

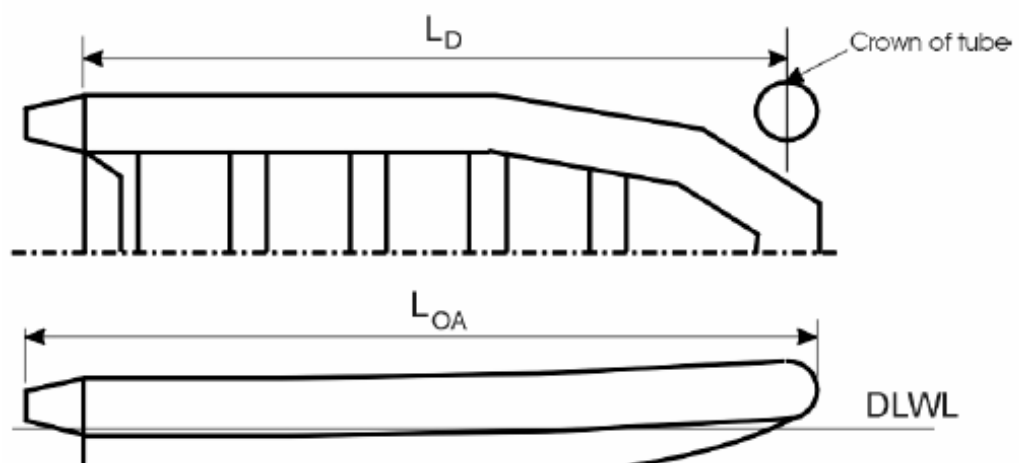
### Margin line (ML) —

in the case of class C a line drawn at least 76 mm below the upper surface of the weathertight bulkhead deck. The margin line may be relocated to the deck line in the case of class D and E vessels.

### Measured Length ( $L_m$ )

The greater of the following:

- i)  $L_m = L_D$
- ii)  $L_m = 0.96 L_{OA}$



### Open Vessel

A vessel which has no self draining weathertight deck, when the vessel is at rest, for the whole or part of the length of the vessel

Notes:

1. The self draining deck is to have a positive freeboard not less than that required in clause 7.8.2.
2. Open vessels should not be permitted to carry passengers beyond class D waters.

**RIB (Rigid Inflatable Boat)**

inflatable boat, but the lower part of the hull constructed as a rigid unit and the topsides (inflatable hull) achieving its intended shape and buoyancy (or part there of) by medium of inflation such that the inflatable portion constitutes at least one fifth of the buoyant volume of the vessel.

**Buoyant volume**

The buoyant volume of a RIB is the total volume made up from the following:

- a) The volume of all inflatable compartments which form the collars, or any other compartment that is permanently fixed to the hull;
- b) The volume of all sealed rigid compartments which form the hull or any other compartment that is permanently fixed to the hull.
- c) The volume of any foam buoyancy that is permanently fixed to the hull, but that is not fitted within any of the compartments that contribute to buoyant volume that are included in a) or b).

**1.10**

**ABBREVIATIONS**

**FRP –**

Fiber-Reinforced Plastics

**ISO –**

International Organization for Standardization

**NSAMS**

National Standard for the Administration of Marine Safety

**NSCV –**

National Standard for Commercial Vessels

**RIB –**

Rigid Inflatable Boat

**SMS –**

Safety Management System

**USL Code –**

Uniform Shipping Laws Code

**VCG –**

Vertical centre of gravity

## CHAPTER 2 INITIAL & PERIODIC SURVEY OF RIBS

### 2.1 SCOPE

This chapter sets out criteria for the initial and periodic survey of rigid inflatable boats (RIB's).

### 2.2 OTHER SURVEY PERIODS

The survey period for an item not specified in this chapter should be the period determined by the Authority.

### 2.3 ANNUAL SURVEYS

Annual surveys should be in accordance with the following schedule or in accordance with NSAMS when it comes into force.

#### 2.3.1 Annual Surveys

The following items as listed should be subject to survey inspection as applicable to the vessel.

- a) Safety Equipment.
- b) Running trial of each main engine and associated gear box.
- c) Operational test of bilge pumps, bilge alarms and bilge valves.
- d) Operational test of main and emergency means of steering.
- e) General examination of machinery installation and electrical installation.
- f) Inspection of anchors and cables.

#### 2.3.2 Two Yearly Surveys

- g) The collars as compliant with the requirements of clause 2.4.
- h) Hull externally and internally except in way of tanks forming part of the structure.
- i) Inspection of propellers, rudders and underwater fittings.

#### 2.3.3 Four Yearly Surveys

- j) Anchors and cables to range.
- k) Tanks forming part of the hull, other than oil tanks, internally.
- l) Void spaces internally.

Notes:

1. For the purposes of internal inspections, spin out, watertight deck fittings should be provided at a rate of not less than 1 for every 3m of vessel length unless alternate access is already provided.
2. The positioning of inspection points should be located adjacent to areas prone to the accumulation of water or where any entrapped water may collect.
3. Foam or other internal fit out should not be placed so as to obscure inspection through any ports.

#### 2.3.4 Eight Yearly Surveys

- m) Steering gear.

### **2.3.5 Twelve Yearly Surveys**

- n) Fuel oil tanks internally where the tank capacity exceeds 800L or where the tank is provided with a means of internal inspection; or a pressure test (to the specified pressure in the NSCV) where the capacity is less than 800L.

## **2.4 CERTIFICATION OF INFLATABLE COLLARS**

Initially and at intervals not exceeding two years or, a lesser period as specified by the collar manufacturer, the vessels collars are to be inspected and certified as fit for purpose by a competent person. Such a person should provide sufficient evidence to the Authority as to prove their competency and knowledge for the certification of the collars.

In certifying the collars as fit for purpose a statement should be drawn up attesting that the collars have been inspected and tested to a standard having requirements not less stringent than this document.

## **2.5 TESTS**

The following pressure tests are to be conducted. Where a collar or section of a collar fails to comply with the minimum prescribed tests, that collar or section should be repaired or replaced as necessary.

### **2.5.1.1 Pressure Tests**

When separate compartments have common internal partitions the compartments should be individually tested with the adjacent compartments deflated.

### **2.5.1.2 Overpressure Test**

Each compartment of an inflatable collar is to be pressurised to 1.5 times the manufacturer's design working pressure for 30 minutes. When separate compartments have common envelope parts (for example, internal partition bulkheads, these compartments should be individually tested with adjacent compartments deflated. No Damage or rupture should occur.

### **2.5.1.3 Airtightness Test**

The collar should be supported or insulated from the floor and it should not be exposed to any draught of air or direct sunlight. Then, all the compartments of the collar should be inflated for 30 minutes to a pressure that is 20% in excess of the manufacturers design working in order to pre-stretch the collar. The internal pressure should be brought to the design working pressure and kept at that point for a further 30 minutes period in order to stabilize conditions. Ambient temperature and atmospheric pressure should be noted.

Following a test period of 24 hours, the pressure drop should not be greater than 20% in any compartment. Final ambient temperature and atmospheric pressure should be recorded.

The temperature difference between the start of the test and the test readings should not exceed  $\pm 3^{\circ}\text{C}$ . The atmospheric pressure difference between the start of the test and the test readings should not exceed  $\pm 1\%$ .

For each rise or fall in ambient temperature of  $1^{\circ}\text{C}$ , an allowance of 0.004bar may be respectively subtracted from or added to the recorded collar pressure.

## **2.5.2 Connectivity Tests**

### **2.5.2.1 Collar – Hull Connection**

The connection of the collars to the hull should be tested by means of a force being applied to the connection equal to 95% of the collar bond load as determined in clause 4.2.3.1 for not less than 1 minute. At the conclusion of the load the connection should be inspected and accepted if there are no signs of physical damage to the connection or connected components.

### **2.5.2.2 Hull fittings**

A connectivity test should be performed for any load bearing fitting, grab rope or other point of attachment to the hull or collar.

A static load of not less than 2kN should be applied to the connection in the worst direction for shear and bending for not less than 1 minute.

For all fittings, it is important that the connection of the fitting to the collar or hull should be examined and it should be free from any defect.

## CHAPTER 3 MISCELLANEOUS PROVISIONS

### 3.1 SAFETY EQUIPMENT

Safety equipment should be in accordance with the relevant provisions in the USL Code / NSCV.

### 3.2 MEANS TO REINFLATE COLLARS

All vessels with inflatable collars should carry a collar repair kit and means of re-inflating a repaired collar.

The collar repair kit should be satisfactory to make temporary repairs to small punctures and tears of up to 20mm in diameter. The repair should be of a suitable standard to permit re-inflation of the collar and the vessel to proceed directly to shore.

The vessels crew should be trained in the appropriate repair procedure, which may form a part of the vessels SMS.

### 3.3 SAFETY MANAGEMENT SYSTEM

A Safety Management System may apply to the operation of the vessel. Guidance should be sought for applicability and requirements from the State or Territory Maritime Authority.

The following vessels should have a safety management system:

- a) Class 2C RIBs that carry passengers
- b) RIBs that have an engine power that exceeds the power derived from Clause 5.2.2.
- c) RIBs that operate in Class 1 service.
- d) RIBs that operate at speeds 25 knots or more.

## CHAPTER 4 STRUCTURE

### 4.1 SCOPE

This chapter sets out the criteria for the structure for rigid inflatable boats.

### 4.2 DESIGN LOADS

#### 4.2.1 General

The vessel should be subjected to the loadings in accordance with Australian Standard 4132 “Boat and Ship Design and Construction”, Part 1 “Design Loads”.

#### 4.2.2 Smooth Water Vessels

For vessels of smooth water operations (class E), the design pressures and/or loadings as calculated in accordance with clause 4.2.1, used in the determination of scantlings may be reduced by not more than 25%. In such a case the following statement should appear on the vessels certification:

*This vessel structure has been assessed for class E, smooth water operation, only.*

#### 4.2.3 Special Loadings

The collar to hull connection should be arranged to ensure that—

- i) the inflatable components are supported and restrained to the extent necessary for achieving the intended characteristics of buoyancy, stability, watertightness, impact resistance and freeboard;
- ii) The loads from the inflatable components are effectively transmitted to the rigid structure;
- iii) the connection will not fail before failure of the collar or rigid structure, unless specifically addressed in the design; and
- iv) chafing and point loading of the inflatable components are eliminated.

There should be provision for inspecting the condition of the connection during the service life of the vessel.

##### 4.2.3.1 Collar to hull bonding

The collars should be attached to the vessels hull through either mechanical fastening or chemical bonding. The attachment should be of sufficient strength to withstand the expected loads placed upon it.

The attachment should be of sufficient strength to withstand a load not less than:

$$F_B = 2PD$$

where

$F_B$  = The minimum force per metre of bonded joint applied pulling the collar from the hull in kilo newtons.

- P = The bottom design pressure over the collar in kilopascals, considering the collar as a panel as indicated in Figure 1.
- D = The diameter of the collar in metres.

The following clarifications of the notations as used in AS4132.1 should be followed:

1. The draft (t) as used should be the draft to the keel line of the vessel.
2. The structural design area ( $A_D$ ) should be a rectangle with sides equal to the diameter of the collar and twice the collar diameter as indicated in Figure 1.

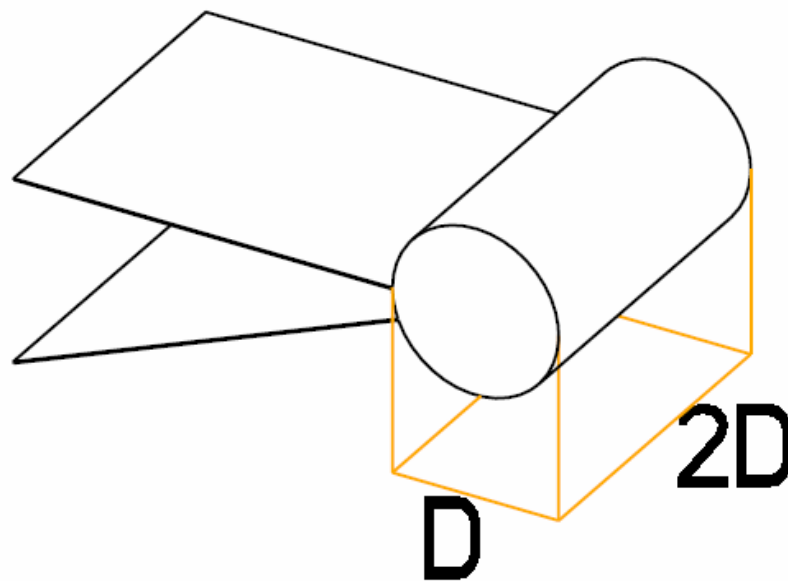


Figure 1 — Structural Design Area

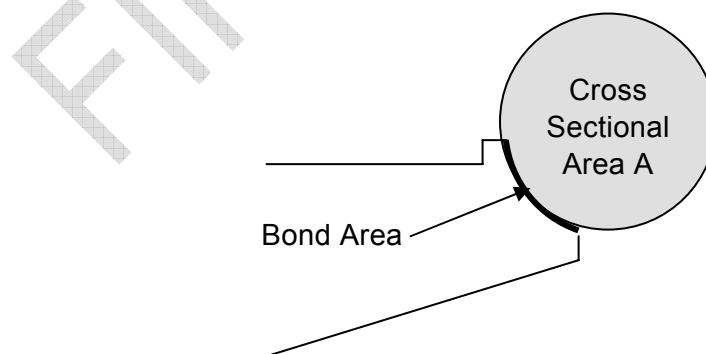
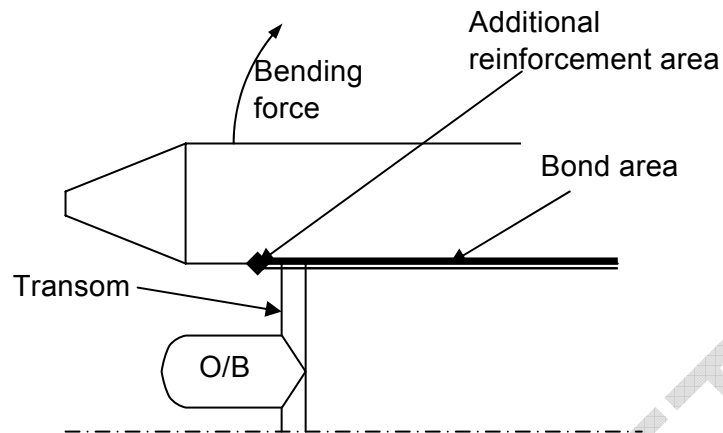


Figure 2 — Collar Bond Area

#### 4.2.3.2 Local Reinforcement

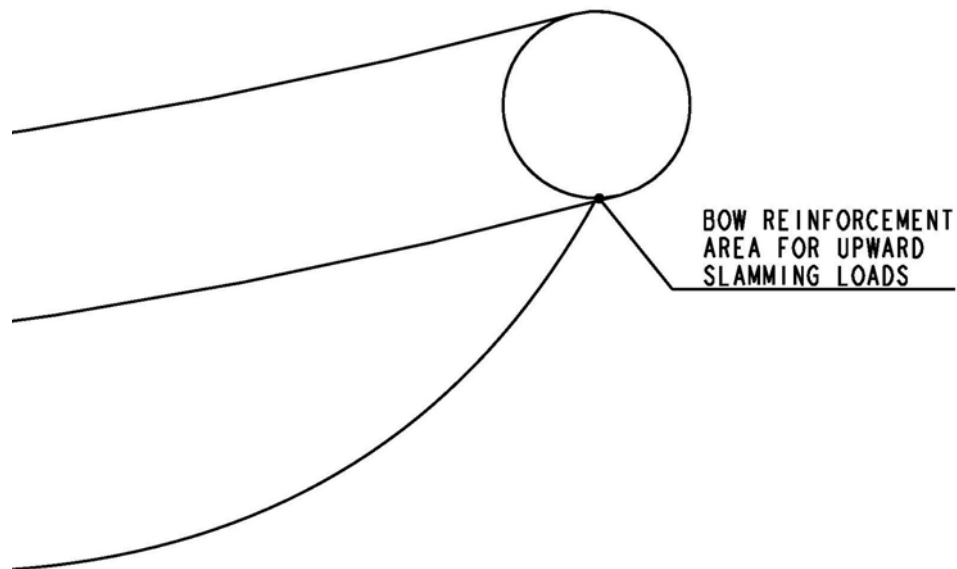
Where the collars extend beyond the transom, additional bonding strength should be provided to account for the force resulting from the bending of the aft section of the collar away from the hull.

The bending force should be equal to twice the buoyancy force of the collars aft of the collar bond area as shown in Figure 3.



**Figure 3 — Tubing Bending Area**

Localised reinforcement should be provided at the underside of the collar to hull connection at the bow. Figure 4, to accommodate upward slamming loads that may occur during service.



**Figure 4 — Bow Reinforcement Area**

#### 4.3 MATERIALS

The materials used in construction are to be examined for acceptability by the Authority on the basis of both test results of material properties and reliability of manufacture (through either service experience or approval by recognised classification societies).

The properties for all materials should be taken as those given in AS4132 as applicable. For materials whose properties do not appear in AS4132, it

is the responsibility of the designer/builder to provide certification for the properties of the proposed material.

#### **4.3.1 Rigid Components**

##### **4.3.1.1 Aluminium and Fibre Reinforced Plastics**

The vessels construction details should meet the requirements of Australian Standard AS.4132 “Boat and Ship Design and Construction”, Part 2 “Aluminium Construction” and Part 3 “Fibre-Reinforced Plastics Construction”.

Where a component or the whole vessel does not come within the scope of AS.4132 Part 2 or 3, the requirements applicable to its design and construction should be determined with reference to an alternate applicable Australian Standard or Classification Society Rule Set.

##### **4.3.1.2 Other Construction Materials**

Vessels constructed from materials other than those covered in 4.3.1.1, should be wholly in accordance with an alternate Australian Standard or Classification Society Rule Set as acceptable to the Authority.

#### **4.3.2 Inflatable Components**

All materials should have characteristics of strength and reliability suitable for the intended duty. Materials for inflated components should be manufactured to Australian Standard 2677 – 1983, ISO 6185, or another relevant national or international standard deemed acceptable by the authority.

Materials for inflated components should be assessed and verified as meeting the applicable standard by one or more of the following methods:

- o) Tested and specifically listed for the purpose by a NATA approved testing laboratory in Australia.
- p) Certified by a JAS-ANZ accredited product certification body.
- q) Approved by a ship classification society recognised by the Australian Maritime Safety Authority (AMSA).
- r) Certified by an AMSA-recognised Notified Body in accordance with the EU Marine Equipment Directive, Module B (MED-B).

Testing and listing, certification or type approval in the foregoing manner should be deemed proof of compliance with the relevant standard in this Section. Documentary evidence of compliance should be provided.

NOTE: It may be useful for applicants to check the Register of Compliant Equipment published by the NMSC at [www.nmsc.gov.au](http://www.nmsc.gov.au) to determine whether any materials for inflatable components are listed that have been verified as complying with relevant standards.

#### **4.3.3 Inflatable Collar construction**

Inflated components should be constructed in accordance with Australian Standard 2677 – 1983, ISO 6185, or another relevant national or international standard deemed acceptable by the authority.

Note:

The number of chambers required is to be in accordance with clause 6.4.

#### **4.3.4 Valves**

##### **4.3.4.1 Inflation**

The assemblies should be of corrosion resistant materials and should not be capable of damaging the vessel materials.

The type and arrangement of the inflation valves fitted to a vessel should ensure that:

- a) the valves will be readily accessible for connection of the inflation device whether the vessel is on land or in the water;
- b) the valves will not inconvenience the persons in their predetermined seating positions;
- c) the valves will not interfere with the operation of the vessel;
- d) the valves will not interfere with loading and unloading of the vessel;
- e) the valves cannot be damaged or torn off by lines, lifelines or movable components of the vessels construction or by normal movements of the passengers and load;
- f) the valves should be equipped with a cap that can independently seal the valve and that the cap should be connected to the valve in a secure manner that prevents it from being accidentally lost;
- g) a controlled reduction in buoyancy chamber pressure and of measuring that pressure is possible.

##### **4.3.4.2 Deflation**

Deflation of the collar should be by manual operation either by using the inflation valve or by using a separate device.

Where separate devices are fitted then these should be made of corrosion resistant materials and should not be capable of damaging the vessel material. The design and location of such devices should meet the requirements of 4.3.4.1 b) to e) inclusive.

The deflation of any one compartment should not cause a loss of air or gas from any of the remaining compartments.

#### **4.4 CONNECTION OF COLLAR AND HULL FITTINGS**

The connection of any load bearing fitting, grab rope, or other point of attachment to the hull or collar should be capable of withstanding a static load of not less than 2kN in any direction for not less than 1 minute.

The fitting should be tested by restraining the vessels hull and applying the load in any direction.

For fittings attached to the collar, both the connection of the fitting to the collar, and the collar to the hull should be examined and be free from any defects.

NOTE: For a typical test rig for collar connection, see Annex B.

## CHAPTER 5 MACHINERY

### 5.1 SCOPE

This chapter sets out the requirements for the machinery for rigid inflatable boats.

### 5.2 GENERAL

In addition to complying with Section 9 of the USL Code (or Section 5A of the NSCV), the machinery installation shall be installed in accordance with this chapter.

#### 5.2.1 Arrangement of Electrical installations

The electrical installations should be installed taking into account the risk of swamping.

#### 5.2.2 Maximum power capacity

The maximum power capacity should not exceed that given by the following equation.

Where multiple propulsion engines are fitted, the summation of the output power from each engine should be less than the maximum permitted power.

Vessels fitted without remote steering are restricted to 45kW.

$$P = 10 * F(d) - 33$$

where

$P$  = The maximum permissible power in kW

$F(d)$  = The dimensional factor for the vessel

NOTE: The power capacity may be increased to the next multiple of 5kW.

Vessels fitted with motors exceeding the above maximum power that operate at high speeds and are subjected to high accelerations should have safety management systems in place. SMS should be in accordance with NSCV Part E Annex A.

*The total power of the propulsion engine(s) is not to exceed ... kW and ... kg.*

### 5.3 TWIN OUTBOARD VESSELS

Where a vessel is fitted with twin outboard motors, and the combined installed power exceeds the power derived from Clause 5.2.2, the motors are to be controlled by two steering rams with a tie bar connection between the tiller arms on the motors, see Figure 5.

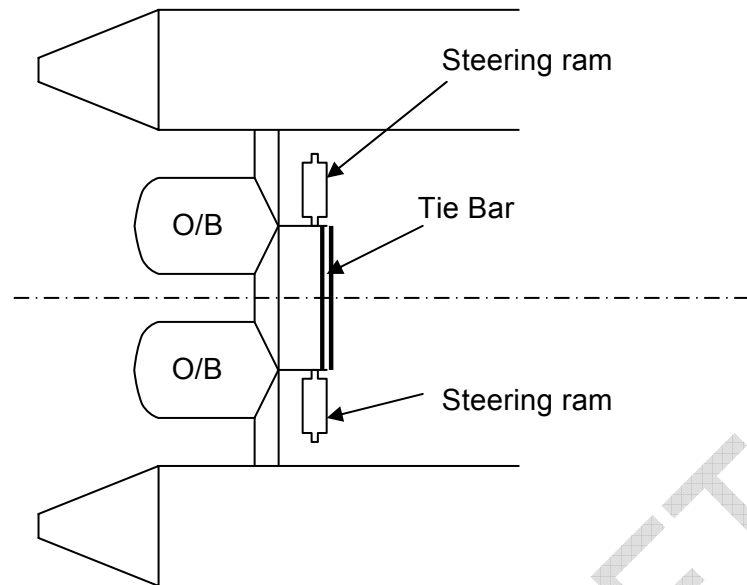


Figure 5 — Outboard Tie Bar

## 5.4 BILGE PUMPING SYSTEMS

### 5.4.1 General

The bilge system should be in accordance with NSCV 5A or the USL Code Section 9, unless the requirements of Clause 5.4.1.1 are satisfied.

#### 5.4.1.1 *Alternative arrangement for low permeability voids*

Underdeck voids filled with foam to over 90% of the void volume are not required to have a bilge system to pump those spaces.

## CHAPTER 6 ARRANGEMENT

### 6.1 SCOPE

This chapter sets out the requirements for the arrangement for rigid inflatable boats.

### 6.2 OBJECTIVE

The scope of this chapter is to ensure vessels are provided with adequate facilities for the protection and safety of personnel carried onboard.

### 6.3 GENERAL

Reference is to be made to the USL Code unless identified within this chapter.

### 6.4 CHAMBERS IN THE COLLARS

The inflatable collar should be divided into multiple compartments individually sealed from each other with an airtight boundary. The number of chambers in the tubing should be in accordance with Table 1.

**Table 1 — Minimum number of compartments**

Maximum Power Rating (kW)	Dimensional Factor $F(d) = (L_{OA} * B)$	Number of Compartments
$P \leq 15$	All	3
$15 \leq P \leq 45$	$F(d) \leq 8$	3
	$F(d) > 8$	4
$45 < P$	$F(d) \leq 8$	4
	$F(d) > 8$	5

The volume of each compartment should be within the limits of  $\pm 20\%$  of the mean compartment volume.

$$V_c = \frac{V}{N} \pm 20\%$$

where

$V_c$  = The volume of the compartment in question in cubic metres.

$V$  = The total volume of all compartments in cubic metres.

$N$  = The number of buoyancy chambers

## **6.5 PASSENGER AND CREW SPACES**

### **6.5.1 Protection from the Elements**

Vessels operating more than 15 nautical miles from shore or a safe haven or on trips of duration greater than 2 hours should have protection from the effects of exposure to the elements, for all persons for which the vessel is certificated, as appropriate for the area of operation and prevailing climatic conditions.

### **6.5.2 Deck Areas**

The minimum deck area requirements should be in accordance with USL 5E except, that in the case of vessels where all passengers are allocated seating positions and remain seated during voyages not exceeding 2 hours, a reduction to 0.4 square metres for each passenger may be permitted.

The deck area should be measured to the inboard side of the collar.

### **6.5.3 Seating**

#### **6.5.3.1 Provision of seating**

For vessels which operate in the planing speed region, seating should be provided for each person. For vessels operating in the displacement mode on voyages not exceeding 30 minutes, standing persons may be permitted provided a minimum of two hand holds per standing person are provided.

Bench seating should not be fitted to RIB's capable of speeds in excess of 25knots.

#### **6.5.3.2 Seat Restraints**

Operators should consider the risk to passengers and crew with regard to seat restraints and the possibility of passengers not remaining in their seats during the operation of the vessel. A risk assessment should be conducted prior to the commencement of operation to determine if the fitting of seat restraints are warranted and to what extent they should be fitted.

The means of restraint, if fitted, should have a quick release mechanism that is suitable for use in a marine environment, and a passenger briefing for the release mechanism is to be incorporated into the SMS.

A restraint should be of the form of a seatbelt, harness, or restraining bars but not rely on hand holds and/or foot straps only.

Note:

The type of seating installed must be considered in with regard to the risk assessment as this may influence if a seat restraint is required and the type fitted of restraints installed.

#### **6.5.3.3 Vessels carrying passengers other than divers**

Fixed seating should be provided for all passengers, seating on the vessels tubing is not acceptable for the carriage of passengers.

#### **6.5.3.4 Vessels carrying divers only**

On vessels carrying divers only, other than high speed RIB's, seating may be provided on the tubing arranged in the following manner:

- a) The upper surface of the collars should be not less than 400mm above the cockpit deck.
- b) The surface of the collars should be provided with a non-slip surface at the point where each diver is seated with a minimum of 700mm of collar length provided for each diver.
- c) A minimum of two points of attachment to the vessel must be provided such that the diver may use to prevent falling overboard. Only one point of attachment may be direct to the collar itself.

Notes:

1. The points of attachment may be in the form of a rope or equivalent strap secured to the centre of the vessel or the vessels superstructure.
2. The weight force of the diver sitting on the collar does not form a point of attachment.

### **6.6 GUARD RAILS AND BULWARKS**

#### **6.6.1 Locations and Strength**

Bulwarks and/or guard rails should be provided near the periphery of every space to which any passenger has access.

Bulwarks and guard rails together with supporting stanchions should be designed, constructed and placed as to prevent any person falling overboard.

#### **6.6.2 Passenger vessels**

##### **6.6.2.1 *Minimum Height***

The minimum height above the deck of guard rails or bulwarks or a combination of both, or cockpit coamings, should not be less than 750mm.

Where the fitting of guard rails or bulwarks is not practical the omission of such rails or bulwarks may be considered. Where guard rails are omitted from the periphery of the vessel, some acceptable equivalent solutions are:

- a) fitting passenger restraints and all passengers to remain seated,
- b) Relocating the guardrails to the ends of fixed seating or an alternate internal area of the vessel where the passengers are located during the voyage,
- c) Other proposals that achieve an equivalent safety outcome.

##### **6.6.2.2 *Maximum Spacing***

The maximum spacing between guard rail courses should not exceed 230mm for horizontal rails and 125mm for vertical rails.

### **6.6.3 Vessels Carrying Divers Or Crew Only**

When the principal operation of a vessel requires the discharge of personnel in a seaway, the peripheral rails may be wholly or partially omitted. Where such rails are omitted, centre rails and suitable hand grabs should be substituted.

FINAL DRAFT

## CHAPTER 7 STABILITY & BUOYANCY

### 7.1 SCOPE

This chapter sets out the requirements for the intact stability, damaged stability and reserve buoyancy for rigid inflatable boats.

### 7.2 OBJECTIVE

The objectives of this chapter are:

- a) to minimize the risk of capsize in conditions the vessel is likely to operate; and
- b) to mitigate the risk to personnel on the vessel should the vessel become swamped or damaged.

### 7.3 WITNESS OF TESTS

Tests must be conducted in the presence of a representative of the State or Territory Marine Authority, or by a person accredited by a State or Territory Marine Authority to witness or perform such tests.

### 7.4 APPLICABLE CRITERION

The intact stability criterion applicable to a vessel is dependant on the vessels arrangement and the area of operation. The stability tests are distinguished into two categories being:

- a) Practical test
- b) Full assessment

The applicable stability test should be determined by reference to clauses 7.4.1 and 7.4.3.

#### 7.4.1 Stability Factor

To determine the type of test for a vessel in accordance with clause 7.4 the vessels stability factor should be determined as:

$$f_s = \frac{A_{SS}}{A_{hull}}$$

where

$f_s$  = Stability factor

$A_{hull}$  = Profile area of the hull and collars above the waterline in square metres, see Figure 6

$A_{SS}$  = Profile area of the vessel above the top of the collars in square metres

## 7.4.2 Hull & Superstructure Area Determination

### 7.4.2.1 Hull Windage

The area of the vessels hull should be determined as the area of the rigid hull and inflatable tubing excluding any appendages, motors, seating, etc. as shown in Figure 6.

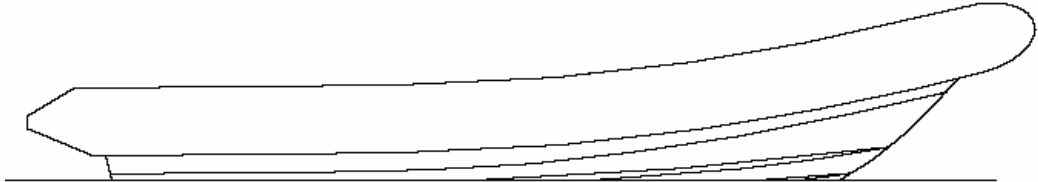


Figure 6 — Hull Windage

### 7.4.2.2 Superstructure Windage

The area of the vessels superstructure should be determined as the total transverse sectional area of the vessel including any superstructures, consoles, side screens, appendages, motors, seating, etc. minus the area of the hull as defined in 7.4.2.1.

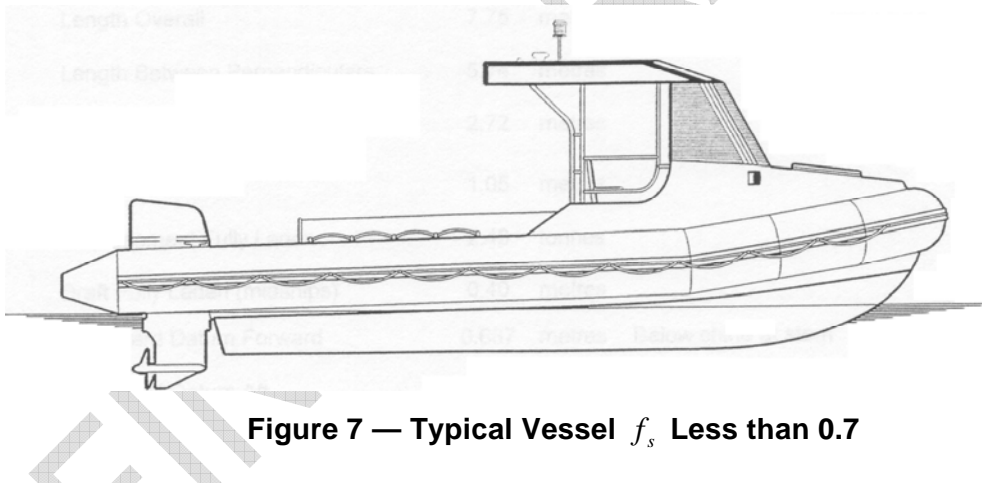


Figure 7 — Typical Vessel  $f_s$  Less than 0.7

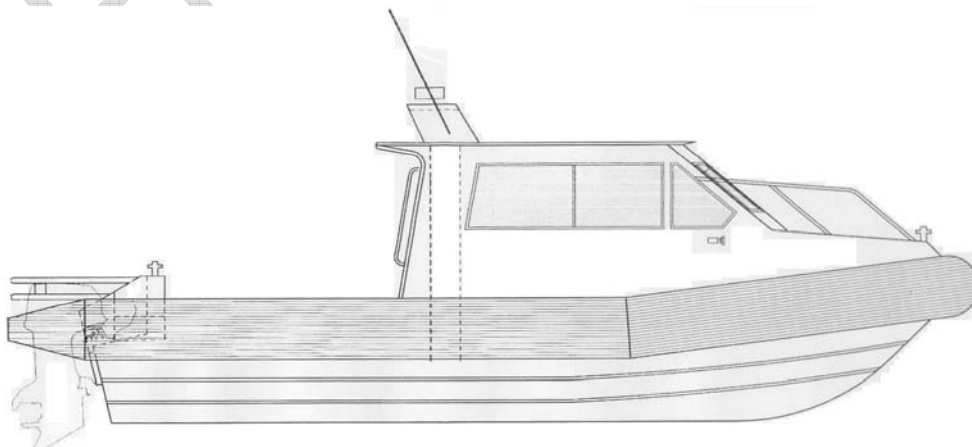


Figure 8 — Typical Vessel  $f_s$  More than 0.7

### 7.4.3 Stability test

The stability criterion should be in accordance with the category defined in Table 2.

**Table 2 — Stability Test**

Stability Factor	Category	Clause Reference
$f_s < 0.70$	Practical	7.6.2
$f_s \geq 0.70$	Full assessment	7.6.3
All Class 1C	Full assessment	7.6.3

## 7.5 VESSEL LOADINGS

### 7.5.1 Personnel Heeling

#### 7.5.1.1 *Passenger Crowding and Heeling*

For the purpose of this section the following assumptions regarding passengers are to be made.

Passengers are to be distributed to produce the most unfavourable combination of passenger heeling moment and/or height of the centre of gravity.

#### 7.5.1.2 *Passenger Mass*

Passenger loadings are to be taken assuming a standard mass of 75kg per passenger. When divers are being carried they are to be assumed to be 105kg to allow for the additional equipment required. For vessels carrying passengers' overnight an additional 15kg is to be assumed for the luggage and associated stores.

Note: The additional 30kg for divers accounts for the diver plus 2 bottles.

#### 7.5.1.3 *Passenger distribution*

The standard distribution of passengers when crowded should be taken as 4 passengers per square metre. Each passenger in the crowded distribution should be considered to cover an area of 625mm x 400mm.

#### 7.5.1.4 *Vertical centre of gravity*

The vertical centre of gravity of a standing passenger should be taken as 1 metre above the deck. The vertical centre of gravity of a seated passenger should be taken as 300 millimetres above the seat.

#### 7.5.1.5 *Heeling Moment*

The effect of the passengers crowding to one side of the vessel is to be determined from the following formula:

$$M_p = \frac{Nwb}{1000} \cos(\theta)$$

where

- $M_p$  = Passenger heeling moment at angle of heel  $\theta$  in t-m.  
 $N$  = The number of passengers on the vessel.  
 $w$  = The mass per passenger or diver, not including luggage, in kg.  
 $b$  = The transverse distance from the vessels centreline to the transverse geometric centre of the passengers.  
 $\theta$  = The transverse angle of heel of the vessel.

For the purpose of this section the vessels crew are not included in the passenger heeling moment; however the mass of each crew is to be taken at 75kg per person.

## 7.5.2 Wind Heeling

The effect of wind on the stability of the vessel should be assessed by the determination of the wind heeling moment resulting from wind acting on the vessels transverse profile. For the purpose of this section the following assumptions regarding the effect of wind are to be made.

### 7.5.2.1 Areas of consideration

The profile area to be considered should be the maximum profile area above the loaded waterline and should include the projected area of all bulwarks, deck fittings, masts, deck cargo, safety equipment, guardrails and rigging.

Where vessels are fitted with portable side screens or other similar additions to the profile area, compliance must be shown with these in place.

### 7.5.2.2 Wind Pressures

The wind pressures applied to the vessel are to be taken from Table 3.

**Table 3 — Wind Pressures**

Area of Operation	Wind Pressure (Pa)	Gusting Wind Speed (kn)
C	450	50 – 55
D	360	45 – 49
E	300	40 – 45

### 7.5.2.3 Heeling moment

The wind heeling moment is to be calculated from the following formula:

$$M_w = \frac{PAh}{1000g} \cos(\theta)$$

where

- $M_W$  = Wind heeling moment at angle of heel  $\theta$  in t-m.  
 $P$  = The applicable wind pressure for the area of operation in Pa.  
 $A$  = The wind profile area of the vessel in square metres.  
 $h$  = The lever arm being the vertical distance in metres from the centre of area A to the centre of the projected lateral underwater area.  
 $g$  =  $9.81\text{ms}^{-2}$   
 $\theta$  = The transverse angle of heel of the vessel.

### 7.5.3 Heel Due to Turn

The effect of turning on the stability of the vessel should be assessed by the determination of the heeling moment resulting from the separation of the centre of mass and the centre of lateral resistance of the vessel.

For the purpose of this section the following assumptions regarding turning are to be made.

#### 7.5.3.1 Heeling moment

The formula to be used in calculating the heel due to the effect turning should be:

$$M_T = \frac{0.0053V^2 \Delta d}{L} \cos(\theta)$$

where

- $M_T$  = The moment from the effect of turn at angle  $\theta$  in t-m.  
 $V$  = The maximum service speed of the vessel in knots, but need not to be taken as greater than  $4\sqrt{L_{WL}}$ .  
 $\Delta$  = The vessels displacement in tonnes.  
 $d$  = Vertical distance between the vertical centre of gravity of the vessel and the centre of the projected lateral underwater area in metres.  
 $L$  = The waterline length of the vessel in meters.  
 $\theta$  = The transverse angle of heel of the vessel.

## 7.6 STABILITY TESTS

### 7.6.1 Loading Conditions

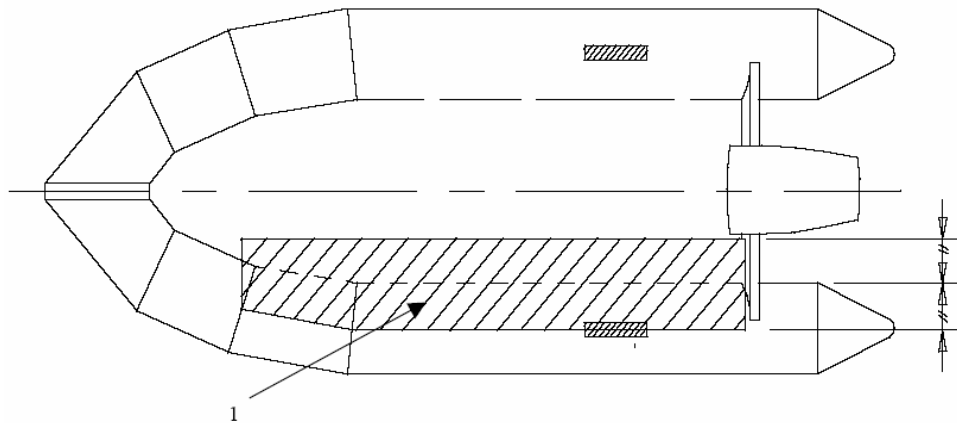
The mass of the total complement and any equipment is to be distributed to simulate normal trim and the most unfavourable vertical centre of gravity (VCG).

## 7.6.2 Stability factor less than 0.7

For vessels where the stability factor is less than 0.7, two alternate options are permitted for compliance, either the requirements from clause 7.6.2.1 or 7.6.2.3.

### 7.6.2.1 Stability Test A

The following practical assessment may be conducted.



Note: 1 = the test load area

**Figure 9 — Practical Stability test load area**

The greater heeling moment resulting from either the wind heeling moment or the moment resulting from the total mass of crowding of all the complement evenly distributed within the test area as shown in Figure 9 should be applied to the vessel. In the case where obstructions exist to reduce movement, the worst crowding heeling moment that could be achieved is to be applied.

The test is to be repeated to both port and starboard with the mean heel angle ( $\theta_m$ ) calculated.

The vessels stability should be considered satisfactory if:

- a) After heeling, the maximum allowable loss of freeboard at any point on the perimeter (including the transom) must not exceed the loss specified in Table 4 for of the upright freeboard. Freeboard is measured from the top of the collar or transom as required. Reference can be made to Figure 10 showing the points for the freeboard to be measured.

Note: The measurements are to be taken at the point of lowest freeboard; however it need not be taken aft of the transom.

**Table 4 — Permissible loss of freeboard**

Class	Maximum Loss
C	25%
D	35%
E	50%

- b) The angle of heel does not exceed the maximum permissible as shown in Figure 11 or Table 5.

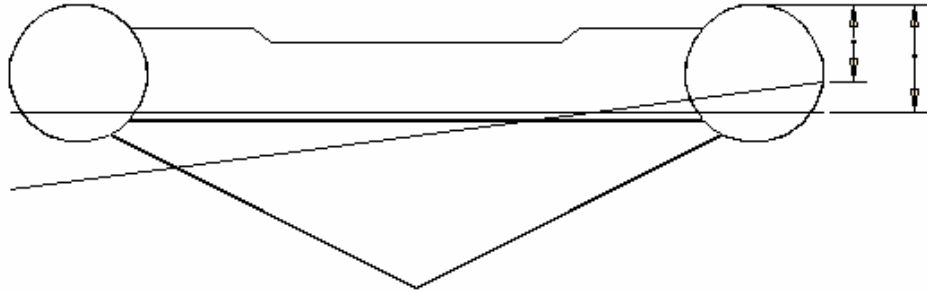


Figure 10 — Small RIB Stability

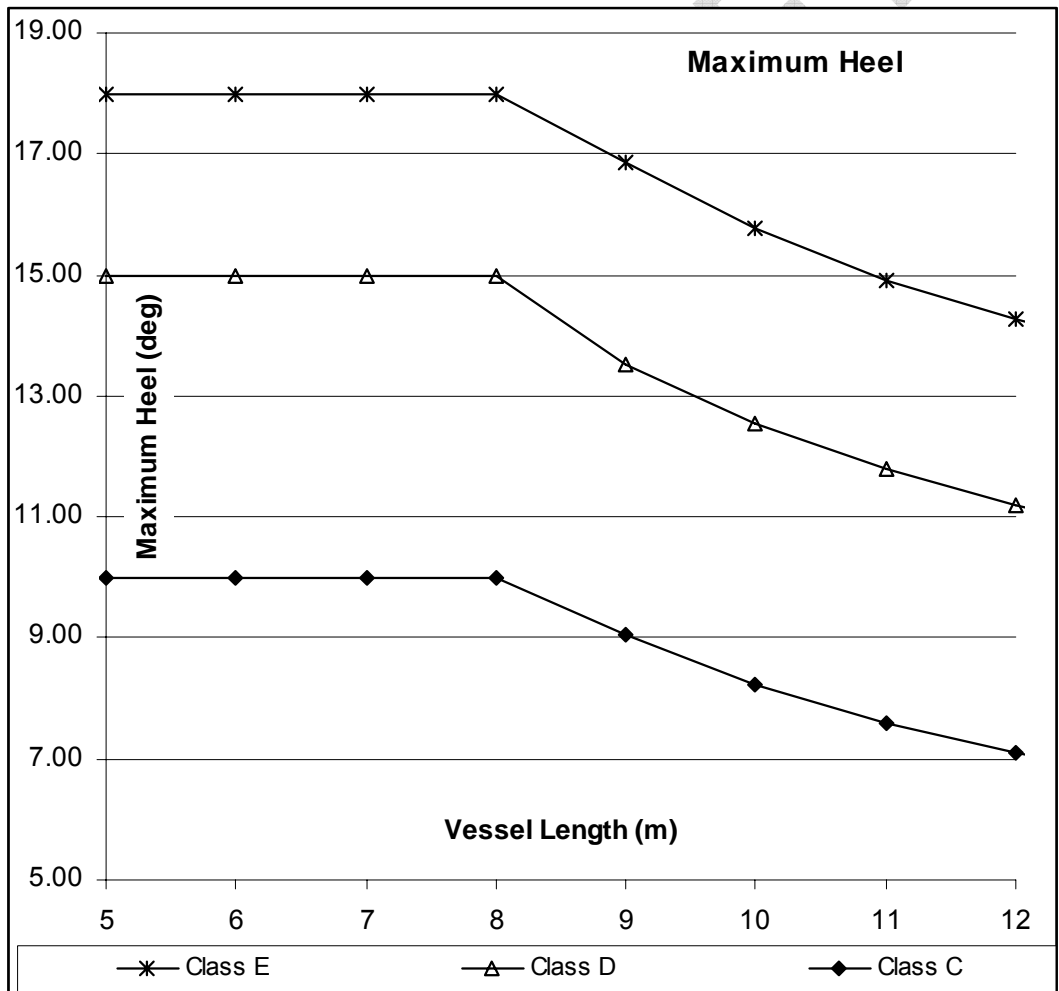


Figure 11 — Maximum Permissible Heel

7.6.2.2 Table 5 — Maximum Permissible Heel

Length (m)	Class E	Class D	Class C
------------	---------	---------	---------

Length (m)	Class E	Class D	Class C
5	18.0	15.0	10.0
6	18.0	15.0	10.0
7	18.0	15.0	10.0
8	18.0	15.0	10.0
9	16.9	13.5	9.1
10	15.8	12.5	8.2
11	14.9	11.8	7.6
12	14.3	11.2	7.1

### 7.6.2.3 **Stability Test B**

The tests required under this sub-clause should be carried out with all the vessels' equipment, fuel, cargo, activity related equipment (e.g. diving equipment) and number of persons for which it is to be certificated, on-board. The engine, equipment and cargo may be replaced by an equivalent mass. Each person may be substituted by a mass of 75kg for the purpose of the tests.

For the purposes of these tests the cargo, or equivalent alternative mass, should be retained at its normal stowage position.

#### 7.6.2.3.1 *Personnel crowding*

The maximum number of persons for which a boat is certified should be crowded to one side, with half this number seated on the buoyancy tube. This procedure should be repeated with the persons seated on the other side and at each end of the vessel.

In each case the freeboard to the top of the buoyancy tube should be recorded. Under these conditions the freeboard should be positive around the entire periphery of the boat.

#### 7.6.2.3.2 *Damage tests*

The tests will be successful if, for each condition of simulated damage, the persons for which the vessel is to be certificated are supported within the inflatable boat or rigid inflatable. The conditions are:-

- c) with forward buoyancy compartment deflated (both sides if appropriate);
- d) with the entire buoyancy, from the centreline at the stem to the transom, on one side of the inflatable boat or rigid inflatable boat deflated.

#### 7.6.2.3.3 *Swamp test*

It should be demonstrated that, when fully swamped, the vessel is capable of supporting its full outfit of equipment, the total number of persons and equivalent mass of cargo for which it is to be certificated, and a mass equivalent to its engine and full tank of fuel.

In the swamped condition the vessel with a buoyant collar, should not be seriously deformed.

An adequate means of draining the boat should be demonstrated at the conclusion of this test.

#### 7.6.2.3.4 Person recovery stability test

Two persons should recover a third person from the water into the vessel. The third person should feign to be unconscious and be back towards the vessel so as not to assist the rescuers. Each person involved should wear an approved lifejacket. The vessel should remain stable throughout the operation, and should not capsize.

Note:

The person being recovered may be simulated by the use of a dummy or mannequin of comparable human proportion and mass.

### 7.6.3 Stability factor greater or equal to 0.7

The vessel should be assessed in accordance with the following requirements. The vessel should also achieve a dynamic balance from the most severe single heeling moment before  $40^\circ$  or the angle of down flooding ( $\theta_f$ ), whichever is less.

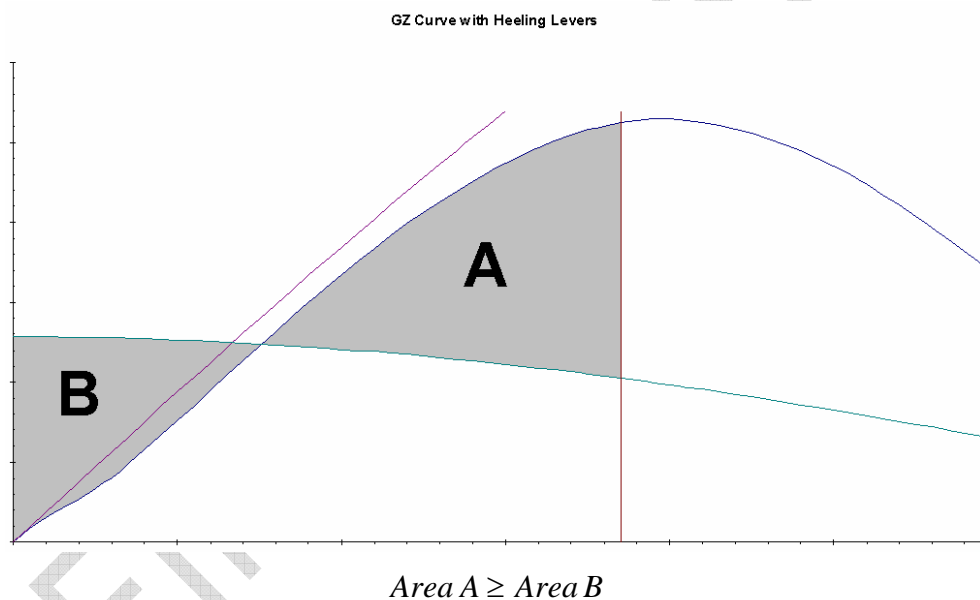


Figure 12 — Typical Balance of Areas

#### 7.6.3.1 Intact Stability Criterion

The stability is considered satisfactory if:

- a) The area under the curve of righting levers (GZ curve) should not be less than 4.01 metre-degrees up to an angle of  $15^\circ$  when the maximum righting lever (GZ) occurs at  $15^\circ$  and 3.15 metre-degrees up to an angle of  $30^\circ$  when the maximum righting lever (GZ) occurs at  $30^\circ$  or above. Where the maximum righting lever (GZ) occurs at angles between  $15^\circ$  and  $30^\circ$ , the corresponding requisite area under the righting lever curve should be determined by use of the formula:

$$Area_{0-\theta_{\max}} \geq 3.15 + 0.057(30^\circ - \theta_{\max}) \text{ metre-degrees}$$

where

$\theta_{max}$  = The angle of heel at which righting lever curve reaches its maximum.

- b) The area under the curve of righting levers (GZ curve) should not be less than 5.16 metre-degrees up to an angle of 40° or the angle of flooding  $\theta_f$  if this angle is less than 40°.
- c) The area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and the angle of flooding  $\theta_f$  if this angle is less than 40°, should be not less than 1.72 metre-degrees.
- d) The righting lever GZ should have a value not less than 0.20 metres at an angle of heel equal to or greater than 30°.
- e) The maximum righting lever (GZ) should occur at an angle of heel not less than 15°.
- f) The initial metacentric height (GM) should be not less than 0.2m
- g) The angle of heel should not exceed 10° when any of the individual heeling moments due to passenger crowding, wind or turn is applied.
- h) The angle of heel should not exceed 15° when the combined effect of the two greatest heeling moments resulting from passenger crowding, the effect of wind or the effect of turn are applied simultaneously.

## 7.7 DRAINAGE

### 7.7.1 Freeing Port Area

All vessels, which are not considered open vessels, should be provided with a minimum freeing port area in the transom of not less than 75cm<sup>2</sup> for every cubic meter of water that may be entrapped within a boundary made up of the vessels collars and transom.

A lesser value may be considered on the basis of a static swamp test showing the vessel will drain in less than 5 minutes.

The freeing ports should be located as to provide drainage when the vessel is at rest.

## 7.8 FREEBOARD

### 7.8.1 Minimum Freeboard

The minimum freeboard of all rigid inflatable boat's should not be less than 300mm measured from the upper surface of the buoyancy collars at their lowest point and not less than 250mm at the lowest part of the transom with the RIB in the following conditions and with the drainage socks (if fitted) tied up in the deepest loaded condition.

### 7.8.2 Class C Vessels

Vessels carrying passengers, operating in class C waters, should have means to drain the vessels deck of water, without assistance of propulsive power and forward motion.

A minimum mean freeboard should be provided to the main watertight deck when the vessel is at rest of not less than the following:

$$F_{bd} = 0.01L_m$$

where:

$F_{bd}$  = The freeboard to the main deck in metres

$L_m$  = The measured length of the vessel in metres

Negative freeboards are permitted at the aft end of the vessel only, provided the following is satisfied:

- a) the maximum negative freeboard at any point does not exceed  $F_{bd} = -0.01L_m$ ,
- b) a drainage sump is provided at the lowest point on the deck and fitted with an acceptable bilge pump, and
- c) it can be demonstrated by means of a practical test, that the vessel can be fully drained, from swamped, through the freeing ports and pump in less than 1.5 minutes.

## 7.9 RESERVE BUOYANCY CRITERION

Class 2 and 3 vessels which are fitted with approved internal foam buoyancy in accordance with this section are not required to carry additional float free lifesaving equipment.

### 7.9.1 Buoyancy Specifications

Foam buoyancy should have the material properties as specified in USL Section 10 Appendix N.

Note:

The use of air chambers inside the hull is not considered as an equivalent to foam buoyancy.

### 7.9.2 Placement of Buoyancy

The buoyancy material should be placed inside the vessels hull, as high as practicable to minimize the risk of capsizing. Suitable access to inspect the buoyancy material should be provided.

### 7.9.3 Quantity of Buoyancy

The required quantity of buoyancy material in cubic metres should be calculated by:

$$V_{Foam} \geq \frac{1.2(MK + F)}{1000 - D}$$

where

$V_{Foam}$  = The minimum quantity of foam in cubic metres

M = The dry mass of hull material in kilograms

K = The relative density of fresh water to the density of the hull r

$$K = \frac{\rho_{Hull} - \rho_{H_2O}}{\rho_{Hull}}$$

where

$\rho_{Hull}$  = The density of the hull material

$\rho_{H_2O}$  = The density of fresh water

The standard K factors may be taken as:

Material	K
Aluminium	0.62
F.R.P	0.375
Steel	0.87

F = The total dry mass of fittings and equipment, 50% of the total mass of persons, and machinery installation if fitted, in kilograms

D = The density of buoyancy material in kg/m<sup>3</sup>

#### 7.9.4 Buoyancy Reduction due to Collars

The buoyancy material may be reduced by a volume not exceeding the total volume of inflated collars with the largest two compartments excluded, however this volume may not be greater than 40% of the volume required in accordance with clause 7.9.3.

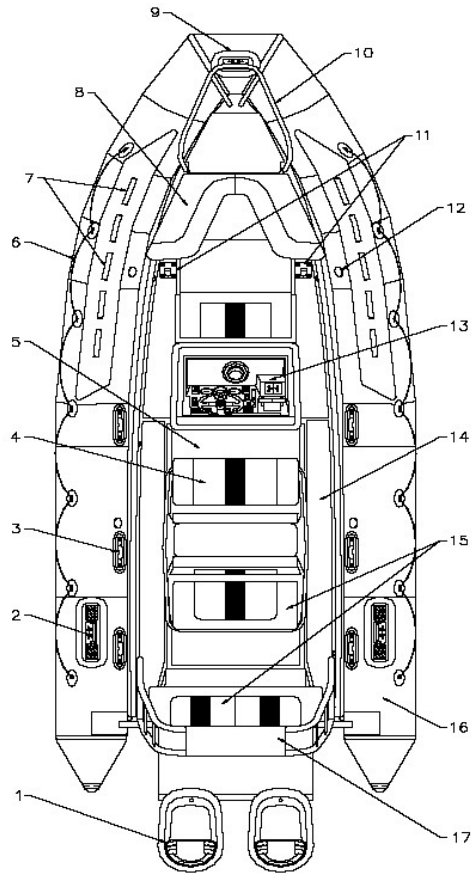
#### 7.10 DAMAGED STABILITY CRITERION

For vessels upon which it is intended to carry greater than 12 passengers, compliance must be shown with the USL Code Section 5.C Appendix III.

Note:

The margin line used in the assessment is as defined in clause 1.9.

ANNEX A EXAMPLE OF TYPICAL RIB



**Key**

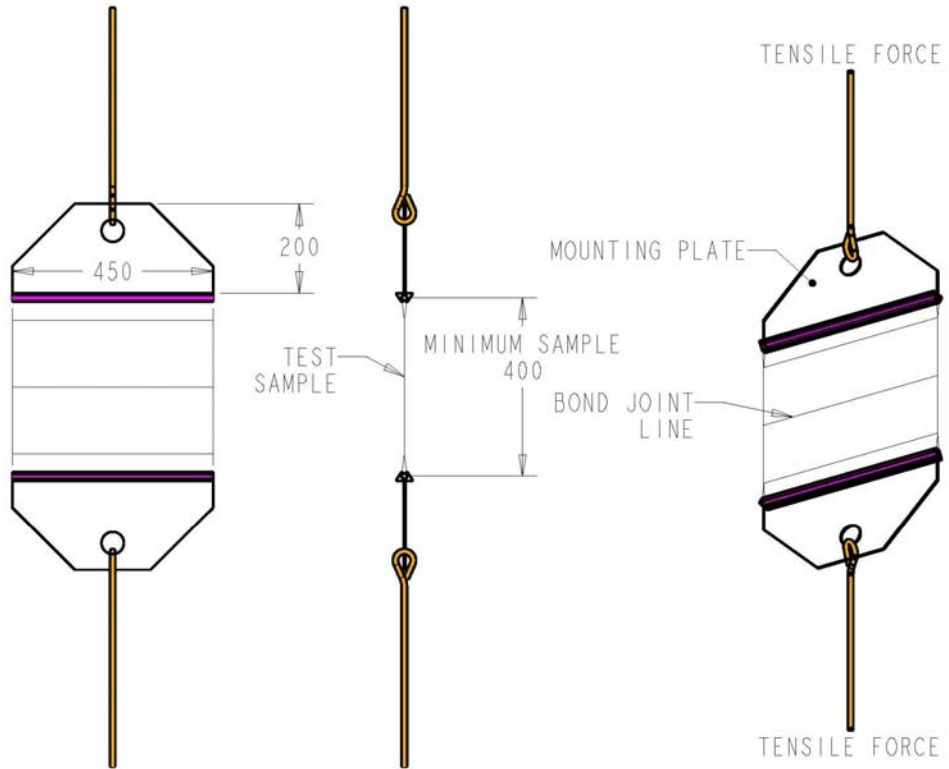
- |  |  |
|--|--|
| 1 Dual Outboard Engines on bracket extension | 10 Bow rail                              |
| 2 Mooring cleat                              | 11 Lifting points                        |
| 3 Passenger grab handle                      | 12 Inflation valve                       |
| 4 Driver and passenger seat                  | 13 Steering console with instrumentation |
| 5 Fuel tank (underdeck)                      | 14 Non-skid deck on rigid hull           |
| 6 Lifelines                                  | 15 Passenger bench/seat                  |
| 7 Passenger handles                          | 16 Inflatable Buoyancy tube              |
| 8 Bow Seats                                  | 17 Stern arch                            |
| 9 Mooring cleat                              |  |

**Figure A.1— Typical RIB Configuration**

**Note:**

Item 16 is also referred to as the vessels collar.

ANNEX B TYPICAL TEST RIGS FOR COLLAR CONNECTIONS



FINAL