ECO 60 CLASS: A NEW PROPOSITION FOR OPEN 60 RACING

Definition:

Broadening the reach of shorthanded offshore racing through Economy and Ecology

1. The Eco 60 is a new concept for a shorthanded sailing class to be premiered in the VELUX 5 OCEANS 2010-11
2. The Eco 60 Class will encompass Open 60 yachts built before 1st January 2003
3. The Eco 60 Class will be governed by a number of rules and regulations, designed to limit costs and encourage positive environmental practices
4. The Eco 60 Class is intended to provide a low cost platform for aspiring sailors with limited budgets to break into the world of shorthanded professional sailing
5. The Eco 60 Class will create a competitive sporting arena for a diverse group of skippers, ranging in nationalities, racing experience and motivations

Eco 60 Class Background:

The VELUX 5 OCEANS is seeking to define a new dimension in ocean racing in 2010-11. Not only will the race be open to any IMOCA Open 60 skipper to compete in the Open 60 Class against other leading professional offshore racers, the event will also host a second fleet of yachts under the banner of the 'Eco 60 Class'.

This new class will take advantage of the large market of older generation, second hand Open 60 yachts for sale. As technological developments take the new generation of Open 60s to new levels of performance and speed, with ever increasing budgets, the older generation Open 60s are being left in their wake. These tried and tested racing machines, proven in the toughest oceans around the world with a pedigree of success, are lying unused. Yet their potential remains and can be harnessed...

A new way in...

The VELUX 5 OCEANS, which has over a 25 year history of innovative boat development and discovering new talent, is seeking to remain contemporary, global and accessible in 2010-11. The race has always attracted a diverse fleet of international skippers, from unknown names destined for greatness to skilled sailors from all corners of the planet, simply fulfilling their life's ambition.

For the 2010-11 edition of this classic event, the Eco 60 Class will attract skippers with limited budgets seeking to break into the professional world of shorthanded offshore racing without compromising safety, which will remain a priority for the race management.
The new way will not only be more accessible through the discounted cost of boat purchase, but the rules will set limitations on the number of sails, the size of shore crews and the extent of refit work permitted in order to further reduce budgets.

A social conscience...
The Eco 60 Class will equally be governed by a number of rules and regulation designed to improve the ecological and environmental impact on the planet. The specific rules, to be developed over the coming months, will seek to limit fossil fuel consumption and encourage wind and solar power, taking a message of sustainable living around the world.

Eco 60 Rule Discussion
For open 60's built before 1st January 2003.
Aim for this class is to use the large number of proven Open 60's available on the market, to give an opportunity for skippers to experience first hand the professional shorthanded racing circuit at achievable costs. Although cost savings are embraced there will be no compromise on safety gear.
Although the boats are of the older generation this class will be still be innovators and test pilots to help many long distance sailors in the area of voyage sustainability. They will be required to come up with sustainable methods to assist in power generation while racing. This will require careful analysis of what is available and the opportunity to be aligned with ground breaking innovation.
Fossil fuel will be allowed without penalty up to an agreed amount and then a point penalty will be awarded by the race committee for any use over a certain limit. Boats will be required to carry 3 independent power generating systems to cover all power needs during racing.

Cost restrictions will apply such as limited support team numbers.

During the race teams will be limited to two professional shore crew, including a shore manager or liaison person while the skipper is at sea.
Limited total number of **sails** for the race:

One mainsail, 5 headsails and two spinnakers,

All sails will be measured in and stamped before the race begins. This will equal the total number of sails to be used in the entire race. Not all sails have to be carried on board for all legs.
Repaired sail is under 50% area repaired anything more equals a replacement.
Replacement of sails equal a points penalty.

Weather assistance will be limited to the supplied race package only. No surfing the internet for weather information will be allowed.

Haul outs during the race are banned unless for safety reasons. To comply with this rule skippers will have to apply to the race committee and explain nature of damage. If haul out permission is granted no other bottom work will be allowed while the boat is out of the water

Race History

THE ORIGINAL
The VELUX 5 OCEANS is the original single-handed round the world yacht race. Run every 4 years since 1982, the race is the longest and toughest event for any individual in any sport. Single-handed around the world's oceans in thoroughbred racing yachts represents the ultimate odyssey. The ultimate in human endeavour, only 90 people have so far finished the challenge.

THE CONCEPT
The VELUX 5 OCEANS is a series of high-pressure sprints within a marathon circumnavigation. In the course of the 30,000 mile race, the skippers cross five oceans alone, starting in Europe and then sailing to Australasia and the United States before returning to the finish in Europe. The various stages and stopovers allow the skippers to push their boats harder and faster over long and diverse legs through some of the planet’s most hostile and treacherous waters. Skippers need to set up their boats for the specific challenges of each leg, such as the light and fluky conditions of the Doldrums versus the fierce winds and seas of the roaring 40's and screaming 50's of the Southern Ocean.

THE CHALLENGE
The solo skipper is the central character of the VELUX 5 OCEANS. These unique individuals must demonstrate determination, skill, courage, endurance and competition at the highest level in order to succeed. The skippers must face the mental challenges of being alone, tired, cold and wet thousands of miles from land. They must endure the physical, physiological and psychological challenges of seven months racing around the world. Each skipper must be navigator, weather guru, cook, sailmaker and computer wizard while racing alone at sea. Although they rejoin family and friends ashore at stopovers, they must wrench themselves away to face the vast oceans alone again.

CONTENTS

SECTION A - ESSENTIAL RULES

A.1: TYPE OF CLASS RULES Eco 60' are open, which states that **anything not specifically prohibited, limited or imposed is permitted.**

A.2: ABBREVIATIONS

ISAF	International Sailing Federation
MNA	ISAF Member National Authority
ERS	Equipment Rules of Sailing
RRS	Racing Rules of Sailing
OSR	ISAF Offshore Special Regulations
COLREG	International Regulations for the Prevention of Collision at Sea
ISO	International Organisation for Standardisation
ABS	American Bureau of Shipping
ERC	Eco 60' Rules Committee

A.3: AUTHORITY

A.3.1: The International Authority

The international authority of the Class is **ISAF** which shall cooperate with the **ECO60 RULES COMMITTEE (ERC)** in all matters concerning these Class Rules.

A.3.2 Eco 60' Rules Committee (ERC)

This committee is comprised of 3 people. :

- The Chief Measurer
- A person, member of the organisation VELUX 5 OCEANS 2010-2011
- An ISAF representative, specialising in rules

Decisions made by this committee cannot be appealed, and cannot be contested by an event jury, including an international jury

A.3.3 Mission ERC

Defined in A.7

A.4: IDENTIFICATION

The Class insignia / logo shall be placed on both sides of the mainsail, between the headboard and the sail number.

The size of nationality letters and sail numbers shall be not less than:

Height: 750 mm
Width: 500 mm (with the exception of One and India)
Thickness: 100 mm
Space between letters: 150 mm.

A.5: ISAF ADVERTISING CODE

In accordance with the 2009 ISAF Rules and Regulations. Competitors will comply with part 20 of the ISAF regulations

A.6: LANGUAGE

A.6.1: Official language:
The official language of the class is English

A.6.2: Obligation and permission
The words “shall” and “must” are mandatory, the words “may” and “should” are permissive.

A.7: INTERPRETATION

Any request for interpretation of the Class Rules shall be made in writing and shall be dealt with as defined in the ISAF Rules and the Class Regulations Section C - 5.
In the case of any doubt about the conformity of a new system or about the accordance of an unused process, a request can be lodged to the Chief Measurer, himself, if he thinks necessary for safety reasons, can refer to the ISAF Technical Committee, which is also required to keep the case strictly confidential. The answer to the request shall be made my post mail, as soon as possible.
Measurement or application procedures under these Class Rules may be clarified through amendments issued by the ERC.

A.8: RESPONSIBILITY

The Safety of a yacht and her crew is the sole and inescapable responsibility of the owner, or her skipper, who must ensure that the yacht is fully found, thoroughly seaworthy and manned by an experienced crew who have undergone appropriate training and are physically fit to face bad weather.
He must be satisfied as to the soundness of hull, spars, rigging, sails and all gear.
He must ensure that all safety equipment required is adequate, function properly and properly maintained, regularly checked, cleaned and when not in use be stowed in conditions in which deterioration is minimised and readily accessible.
He must ensure that the crew knows where it is kept and how it is to be used.

A.9: DATE OF APPLICATION / DURATION OF VALIDITY OF TEXT

These Class Rules are applicable **from June 1st, 2009**.
Boats to be awarded a measurement certificate, special provisions are stipulated in appendix to these rules.

SECTION B MESUREMENT PROCEDURES

B.1: MEASURERS

They shall comply with the prescriptions of chapter H-1 of the **ERS**.
Moreover, the data, measurements and information they collect with a view to awarding a measurement certificate shall remain confidential.
The Chief Measurer must make a detailed report about each test done to issue a measurement certificate.

B.1.2: Official software:

The official software used for the stability calculation is the software named MAAT Hydro+ (Systre International).

B.2: RESPONSIBILITY

The presence of the skipper or an official representative of the boat is mandatory during the measurement sessions, and each measurement is carried out under his responsibility.
Additionally, the provision of a complete set of plans and of all technical documentation which may be required for the awarding of a measurement certificate are the responsibility of the skipper or a representative thereof.

B.3: SUBMISSION OF PLANS

The skipper, or his/her representative, shall supply the Class Measurer with the following documentation:

- The relevant Offset File of the hull, deck, roof and appendages.
- Flooding Calculations for each watertight compartment.
- Buoyancy Volumes longitudinal distribution diagram.

Or any of the following that the chief measurer deems necessary:

- 3D surface model of the boat (hull excluding appendages, roof and cockpit, ballasts), IGES, STEP or equivalent.
- Numerical data of fixed or moveable appendages (2D or 3D model, volumes and centre of volumes).
- Drawing relating to the flooding of each watertight compartment.
- Diagram of the volume of the insubmersible materials with a complete table of the elements and characteristics of the foam with closed cells taken into account in the volume of insubmersibility.
- Document confirming the density of the lead used for the bulb.
- Declaration of conformity of AVSwc>= to 108°, signed by the architect.

B.4: MEASUREMENT BOAT TRIM

Light equipment measurement boat trim:
Hull equipped as follow:
Shall remain fixed:

- Mast(s), standing rigging including runners, spanker boom(s), kicking strap, all forward sails furlers, and all mast running rigging (halyards, topping lifts, etc…). A list of all this gear will be recorded by the measurer.

- Fittings permanently fixed to the deck and mast(s), exemption of the standard B spherical antenna for picture transmission, which can be not fitted. The AVS calculation being without this antenna, if it is fitted, an inclusive weight will be deducted for this calculation.
- Fixed layouts.
- Batteries, electric circuits, piping.
- Electronic equipment fixed to fittings.
- Keel (s) and mast (s) positioned along the vertical axis of the boat.
- Centre boards and all movable fittings at their highest position.

Shall not be onboard:
- All sails.
- Portable deckware and running rigging.
- Anchors, lines and chains.
- All safety gear.
- Forward deck gear including any jib or spinnaker pole.
- All movable equipment.
- All supplies, fresh water and fuel containers, navigation equipment, clothes, stores, personal gear, etc…

Shall be emptied:
- All permanently fitted fresh water tanks.
- All permanently fitted fuel tanks.
- All permanently fitted water ballast tanks and associated pipes.

This procedure defines the fore and aft trim of the boat on the water. Measures of fore and aft freeboards would be recorded by the measurer.
In case of modification of the mast, keel, accommodations, rudders, deck, roof, the Chief Measurer shall be immediately informed. If necessary, a new measurement certificate shall be issued**.**

B.4.2: Capsize trim:
As above, but without:
- Mast, standing rigging, boom(s), vangs, foresails furlers and halyards, and electronic deck devices as radar antenna on crossbar.
- Fittings permanently fixed to mast(s).

B.5: MEASUREMENT WEATHER CONDITIONS

B.5.1: Conditions
Measurements taken afloat shall be in calm water; less than 15 mm ripples and less than 10 knots of wind, without current. The salinity of the water would be recorded by the measurer, and computed to 1,025 for the calculation of draught and stability.

B.5.2: Measurement protocol
The measurement protocol which shall apply to Eco 60’ Class is stated in Appendix B to these rules.

SECTION C – HULL AND DECK

C.1: DEFINITION

Under this rule, a monohull is defined as a boat whose flotation plane at rest or under sail remains continuous in its transversal section, and whose hull depth in any transversal section shall not decrease towards the centre-line.

C.2: HULL NUMBER – MODIFICATION

C.2.1: Hull number – ISAF Registration:

In accordance of article 9.4 of agreement ISAF, a hull number shall be moulded or punched into the transom of the boat. This number, delivered as described in Regulations C-4-1, will include the hull date.

C.2.2: Modification:

Any modification to the boat relating to the sections and articles C, D, E, F, G and H, made after the Class Certificate issue date, shall be declared in writing to the Class Chief Measurer, who will decide, according to the importance of the modification, or to the acknowledgement of the weights and the gravity centres of the replaced equipment (in the case of dismasting for example), if new measure, partial or total re-measurement are necessary or not.
Any modification made without following this procedure will invalidate the Certificate.

C.3: LENGTH OVERALL

LOA shall be greater than 59 feet (17,983m) but not exceeding 60 feet (18,288m).

The measurement of overall length includes the whole hull but not spars and fittings.
A spar or appendage (like a rudder for example) cannot have a planned element, out of the length over all, to artificially extend the flotation length.
The combined fore and aft spars length shall not exceed the overall length of the hull by more than 6 feet (1.829m).
A boom, with or without sail, protruding aft, is considered to be a spar which shall be measured in the axis of the boat and in the most disadvantageous position.
A bowsprit protruding beyond the bow is considered to be a spar which shall be measured horizontally from the stem of the boat to the vertical point of its overall extremity when it is extended to its maximum point beyond the bow, in the axis of the boat.

C.4: DRAUGHT

C.4.1: Draught for Eco 60':

In the light equipment measurement trim, the draught is limited to 4,50m.

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C.5: STRUCTURE OF BOAT

C.5.1: Structural Feature

The boat shall be constructed in such a way as to be able to stand, without irreparable damage, the forces of nature which it is intended to have to face in the course of races classified by the **ISAF OSR** in category 0.

On request by the measurer, the architect, together with the builder, shall be in a position to produce boat structural calculations to **ISO 9000 norms** (ISO 12215). Mechanical resistance tests on the most demanding parts of the boat may be requested, particularly when asking for a renewal of the measurement certificate. Architects are advised to apply significant coefficients of safety, at least similar to those stipulated in the **ABS** Guide, particularly as far as the fixings of the keel and strains due to ballast are concerned.
The deck/hull unit shall be capable of being rendered rapidly and completely watertight by a single person acting alone.

C.5.2: Repairs / Modifications

Any significant repairs or modifications to the hull, keel or appendages on a boat shall be done after consultation with the race officials.

To satisfy the Eco 60 spirit unlimited changes above 100mm height above the original static waterline will be allowed. No changes to the hull after 1st January 2003 will be allowed below this height.

C.5.3: Cockpits

Attention is drawn to ISO 11812

ISO norm 11812 applies (Watertight cockpits and quick-draining cockpits, design Category A).
Furthermore, the following shall be respected:
A semi-permanent sill is allowed but it must conform to article 8.2.4 (Other requirements) of ISO 11812, and if it has hinges, it must only open towards the outside.

a) General requirements:

Cockpits shall be:
- structurally strong
- self-draining quickly by gravity at all angles of heel
- permanently incorporated as an integral part of the hull
- essentially watertight (all openings to the hull must be capable of being strongly and rigidly closed).

A bow, lateral, central or stem well shall be considered as a cockpit.

b) Volume and bottom level of cockpits:

Designers are invited to consult articles 3.09.7 and 3.09.4 of the **ISAF OSR**, which shall apply.

c) Draining:

Cockpits shall be self-draining by gravity by using appropriated openings or adequate drains. At 0° of heel, and 0° of longitudinal trim, the cockpit draining time, when filled to the working deck, shall not be greater than 3 minutes. Draining time may be checked in real conditions or calculated by referring to ISO 11812.

Bilge pumps outlet pipes or pipes shall not be connected to cockpit(s) drains.

C.5.4: Watertight Bulkheads

Any required watertight bulkhead shall be strongly built to take a full head of water pressure without allowing any leakage into the adjacent compartment.

a) Watertight bulkheads for Eco 60':

Of several volumes, shall divide the boat from stem to stern, they shall be transverse at least 5 in number and create 6 watertight compartments with an access for a person. They shall be not more than 5 meters apart. The first stem watertight bulkhead shall be located within 15% of overall boat length and abaft the forward end of the waterline. The passage of various cables, pipes or ducts shall not compromise the watertight characteristic of the compartments.

b) Crash box:

A watertight box, filled with closed cell foam, capable of being destroyed in a frontal collision without endangering the integrity of the boat shall be fitted aft of the bow.

C.5.5: Watertight Access Hatches:

In all circumstances, the boat shall be accessible from stem to stern by way of watertight hatches. These hatches shall permit, whatever the position of the boat in the water, upright or capsized, complete access to the boat, from stem to stern and inversely, with any of the compartments flooded and without any of the other compartments becoming so. These hatches shall have their closing mechanism permanently fitted.

C.5.6: Escape Hatches

The boat shall have two exits. One exit shall be located forward of the foremost mast (except where structural features prevent its installation). The second one shall be located astern, on the transom allowing access to, and exit from, the boat, whatever its position in the water.

This hatch shall be situated above the water line, whatever the position of the boat, and be provided with a closing system with interior and exterior controls operating the same locking mechanism.

Grab handles shall be fitted on the outside, above and below the astern escape hatch, close to the skirt and the deck to ease exit from the boat on to the deck, or on to the hull in the event of a capsize, and equally return to the inside.

As substitute of the forward hatch, it is strongly urged to install a floor cockpit hatch whenever possible. This hatch shall be positioned in such a way that when the boat is capsized, it shall remain open without allowing any leakage into the hull when allowing a crew member to get through it.

C.5.7: Companionway Hatch

A companionway hatch shall be fitted with a strong securing arrangement which shall be operable by a sole person from the exterior and the interior including when the yacht is inverted.

C.5.8: Hatches

No hatch forward of the maximum beam station shall open in such a way that the lid or cover moves into the open position towards the inside of the hull (excepting ports having an area of less than 0.071m².

Hatches shall be arranged as to be above the water when the hull is heeled 90 degrees. They shall be permanently attached, and capable of being firmly shut immediately and remaining firmly shut in a 180 degree capsize.

The hatches, closing mechanism and hinges must be capable of resisting water pressure when the boat is inverted.

C.6: LAYOUT / EQUIPMENT

Working deck definition: a working deck is all safely area, where any crew member is obliged to stand, or to cross frequently, or to go frequently in the aim of realising the usual manoeuvers necessary for sailing the boat. It may be several working decks, providing that the passage between two did not exceed 500mm.

C.6.1: Pulpits, Stanchions and Lifelines

a) General requirements:

Attention is drawn to ISO 15085 norms.

Pulpits and stanchions shall be permanently installed. When there are sockets or studs, these shall be through-bolted, bonded or welded. The pulpit(s) and/or stanchions fitted to these shall be mechanically retained without the help of the lifelines. Without sockets or studs, pulpit(s) and/or stanchions shall be through bolted, bonded or welded.

Stanchion bases shall not be situated outboard of a working deck. For the purpose of this rule a stanchion or pulpit base shall be taken to include a sleeve or socket into which a stanchion or pulpit tube is fitted but shall exclude a base plate which carries fixings into the deck or hull.

Pulpits, stanchions and lifelines shall not be made of Carbon fibre.

Lifelines required shall be "taut". As a guide, when a deflecting force of 50 N (5.1 kgf) is applied to a lifeline midway between supports, the lifeline should not deflect more than 50 mm.

b) Pulpits:

Boats shall have bow and stem pulpits. The bow pulpit shall be forward the head stay. Pulpits may be fixed in part to the fore appendages.

The bow pulpit may not cross forward the head stay, providing the gap between the forward upper rail and the head stay is not more than 300mm. In any case, a closing system between the two forward upper rails and crossing ahead the head stay shall be capable of being installed.

Lifelines arranged in accordance to vertical opening may be considered as an adequate substitute of the stem pulpit.
Upper rails of pulpits shall not be at no less height above the working deck than the upper lifelines (minimum 600mm) and essentially the same height above the waterline as is the upper lifeline at the forward part of the cockpit.
No vertical opening shall exceed 380mm height.
Upper rails in bow pulpits may be openable but shall be secured shut whilst racing.

c) Stanchions:

Stanchions shall be straight and vertical.
However, within the first 50 mm from the deck, stanchions may be displaced Horizontally (Cranked) from the point at which they emerge from the deck or stanchion base by not more than 10 mm, and they may be angled to not more than 10 degrees from vertical from any single point above 50 mm from the deck.

d) Lifelines:

Lifelines shall be supported on stanchions, and shall be continuous around a working deck. Lifelines may be substituted by horizontal rails in pulpits.
Lifelines shall be permanently supported at intervals of not more than 2.20m and shall not pass outboard of supporting stanchions
Provided the complete lifeline enclosure is supported by stanchions and pulpit bases effectively within the working deck, lifeline terminals and support struts may be fixed to the hull aft of the working deck.
Lifelines need not be fixed to a bow pulpit if they terminate at, or pass through, adequately braced stanchions set inside and overlapping the bow pulpit, provided that the gap between the upper lifeline and the bow pulpit does not exceed 150 mm.

Number and height: boats shall have no less than taut double lifelines. The upper lifeline shall be at a height of no less than 600 mm above the working deck. The intermediate lifeline shall be not less than 230 mm above the working deck. No vertical opening shall exceed 380 mm.

Diameters, required material: All mandatory Lifelines shall be stranded stainless steel wire of minimum diameter of 5mm. Lifelines shall be uncoated and used without close-fitting sleeving. Grade 316 stainless wire is recommended.
A taut lanyard of synthetic rope may be used to secure lifelines at each end provided the gap it closes does not exceed 100 mm.
All wire, fittings, anchorage points, features and lanyards shall comprise a lifeline enclosure system which has at all points at least the breaking strength of the required lifeline wire.

C.6.2: Jackstays / Clipping Points

a) General requirements:

Jackstays together with clipping points and static safety lines shall enable a sole crew member to clip on himself before coming on deck and unclip after going below.

This whole set also shall allow whilst continuously clipped on, to move readily between the working areas on deck and in the cockpit(s), including being able to cross the deck athwartships, with the minimum of clipping and unclipping operations.

It shall also enable two-thirds of the crew to be simultaneously clipped on without depending on jackstays.

Warning attention must be drawn on U bolts as clipping points, because they can lead to unclipping plain snap shackle.

b) Jackstays:

Jackstays shall be attached to through-bolted or welded deck plates or other suitable and strong anchorage, fitted on deck, port and starboard of the yacht's centre line to provide secure attachments for safety harness.

They shall be made of, stainless steel 1x19 uncoated wire of minimum diameter 5mm without any sleeving, or webbing of equivalent strength (20kN breaking load).

c) Clipping points:

Attached to through-bolted or welded deck plates or other suitable and strong anchorage points adjacent to stations such as the helm, sheet winches and masts, where crew members work for long periods.

C.6.3: Toe Rail / Foot Stop

A toe rail of minimum height 25 mm shall be permanently installed around the working deck, except in way of fittings and at the vertical of the transom. The toe rail shall be fitted as close as practicable to the vertical axis of stanchion bases but not further in board than 1/3 the local half-beam.

C.6.4: Hand Holds / Hand Rail

The following shall be provided:

- **Hand holds:** adequate hand holds shall be fitted in the interior of boat so that crew members may move about safely at sea.
- **Hand rail:** the boat shall be equipped with a fixed handrail along the skirt or at the hull/transom junction, which acts as a grab-rail to facilitate climbing back on to the boat in the event of falling overboard.

C.6.5: Bow Fairlead

A bow fairlead, or equivalent device, closed or closable and a cleat or other securing arrangement, suitable for towing shall be permanently installed**.**

C.6.6: Navigation Lights

Navigation lights shall comply with the 1972 COLREGs **72** (International Regulations for the Prevention of Collision at Sea) covering light requirements for sailing vessels

under sail, motoring and at anchor and shall be mounted so that they will not be masked by sails or the heeling of the yacht. Navigation lights electric power shall be equivalent to 25 W.
Navigation lights shall be mounted above deck level and should be at no less height than immediately under the upper lifeline
Reserve navigation lights shall be carried and comply with COLREG 72. They shall have an alternate wiring separated from the one used for the normal navigation lights.
Spare bulbs for navigation lights shall be carried, or for lights not dependent on bulbs, appropriate spares.
For boats with rotating mast, masthead navigation lights are forbidden, except if they remain in conformity with COLREG 72 whilst rotating.

C.6.7: Emergency Steering

Emergency steering shall be provided as follows:
An emergency tiller capable of being fitted to the rudder stock. These rule apply only in the case of sole rudder**.**
Crews must be aware of alternative methods of steering the yacht in any sea condition in the event of rudder loss. At least one method must have been proven to work on board the yacht. A measurer may require that this method be demonstrated.

C.6.8: Mast Step

The heel of a keel stepped mast shall be securely fastened to the mast step or adjoining structure.

C.6.9: Sea Cocks or Valves

Sea cocks or valves (quarter turn valves or knife valves) shall be permanently installed on all through hull openings below the water line except integral deck scuppers, shaft log, speed indicators, depth finders and the like, however a means of closing such openings shall be provided.

C.6.10: Bunks

Two bunks shall be installed on board**.**

C.6.11: Cooking Facilities

A cooking stove permanently installed or securely fastened with safe accessible fuel shutoff control capable of being safely operated in a seaway.

C.6.12: Drinking Water

When not specified in the Notice of Race the quantity of drinking water on board at the start of a race shall be, in the absence of a water maker, at least 9 litres per person per 1000 miles or, when a water maker is on board at least 3 litres per person per 1000 miles.

C.7: UNSINKABILITY

C.7.1: Essential rule:

In the event of all compartments being completely flooded, the boat shall remain unsinkable.

C.7.2: Unsinkable volume:

The boat shall possess a total volume for unsinkability, expressed in m3 not less than 130% of the boat displacement in m3.

Included in the calculation of this volume are:

- The combined volumes of any fixed elements waterproof to the water.
- 50% of the volume of the water ballast tanks, except central water ballast tanks (ballasts whose centre of gravity is aligned on the longitudinal axis of the boat).
- The combined volumes of structural lockers when they are filled with closed cell foam.
- Additional buoyancy volumes of closed cell foam, non-removable, laminated, or glued directly to any part of the hull structure.

C.7.3: Longitudinal distribution of buoyancy volumes:

These fixed volumes shall be approximately distributed proportionally among each watertight compartment.

The skipper, or his/her representative, shall supply a diagram for the unsinkable volumes.

C.8: BALLAST, KEEL and DAGGERBOARD

The use of any material with a density greater than 11.3 is prohibited (keel and/or bulb)

C.8.1: Canting keel:

Only one axis of mobility is authorized for keels.

When the boat is equipped with a canting keel, this shall be capable of being maneuvered manually from the inside of the boat, whatever her position in the water.

Strong and easily removable keel angle device shall be in place on both sides and at all times to limit the canting of the keel to the value found when performing the initial heel test (10°). (These devices shall be capable to be sealed).

A specific locking device allowing the keel to be restrained along the axis of the boat and independent from the master device shall be permanently installed.

C.8.2: Daggerboard (s):

Centreboard and daggerboard trunks and the like shall not open into the interior of a hull except via a watertight inspection/maintenance hatch of which the opening shall be entirely above the waterline of the yacht floating level in normal trim.

C.9: WATER BALLAST

The boat may be equipped with water tanks and associated permanently fitted plumbing. All ballast tanks shall be integral to and within the hull. This movable ballast shall be of sea-water only, to the exclusion of any other liquid.

It shall be possible to fill, empty and transfer manually the water in the ballast tanks, whatever the position of the boat in the water.

SECTION D – RIGGING / SAILS

D.1: FUNDAMENTAL RULES

The boat must be properly rigged.
Shrouds shall never be disconnected.

D.2: CANTING MAST IN A LATERAL PLANE

Canting masts in lateral plane are forbidden.
The mast must never cant to windward of the boat's centreline.

D.3: HALYARDS

No mast shall have less than two halyards, each capable of hoisting a sail.

D.4: STORM and HEAVY WEATHER SAILS

a) Materials:

Aromatic polyamides, carbon and similar fibres shall not be used in a storm jib but Spectra / Dyneema and similar materials are permitted.

b) The following equipment shall be provided:

- A storm jib of area not greater than 5% height of the fore triangle squared, and luff maximum length 65% height of the fore triangle.
- The storm jib shall have sheeting positions on deck.
- The storm jib shall have a strong securing method, which does not comprise or depend upon a luff groove device, for attachment to a stay. The use of a storm jib with a free luff is authorised.
- The storm jib must be of highly visible coloured material.

D.5: ADDITIONAL RULES

D.5.1: Poles:

When set in their most forward fixing position, they shall not extend beyond the vertical of the overall extremity of the authorised bowsprit.

D.5.2: Fixings of rigging:

The forestays, backstays, runners, lower shrouds, permanent or temporary, shall be connected to the boat within the surface delimited on the sides by the sheer line (as defined by the ISAF OSR), at the bow by the stem and at the stern by a line joining the aftermost points of the sheer line to port and to starboard.

D.5.3: Fixings of tacks and clew-lines:

The fixing points of the tacks and clew lines of hoisted sails shall not be rigged outside and beyond the overall extremity of the authorised spars.

D.5.4: Outriggers:

In a change to rule 50.3 of the RRS, the use of outriggers is allowed.

SECTION E – MINIMUM STABILITY STANDARDS

The first sentence of rule 51 of the **RRS** is replaced as follows: "Any shifting of weight with the aim of altering control or stability is permitted within the limits fixed by the current rules." Inside the boat, batteries excepted, all other heavy items capable of damaging the boat or injuring a crew member must be securely fastened to the boat at all time, except when being moved around.
Food supplies, fuel and water jerry cans, safety and deck gear spares can be packed in boxes and moved around if securely fastened to the boat.
Sails can be moved around freely. Sail bags shall not be watertight.
Rule 52 of the **RRS** is replaced as follows: "With the exception of the maneuvering and trimming of running rigging and spars, an energy source other than manual force may be used to maneuver the movable appendages of the hull, and for the emptying, filling and transferring the water of the ballast tanks."
Boats shall satisfy the following minimum norms:

E.1: SELF-RIGHTING

During the measurement process, the skipper must demonstrate that the boat, once capsized, is capable of self righting without outside help.

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E.2: INITIAL HEEL ANGLE

From the vertical axis, due to the displacement caused by movable ballast: the amplitude on one side shall not exceed 10° off vertical.

E.3: ANGLE OF VANISHING STABILITY (AVS)

This angle shall not be less than 127.5°. This angle is calculated from the theoretical curve of stability, derived from measurements taken during stability test and from information by the designer.
The volume of the mast, which may be watertight wholly or in part, is not taken into account.

E.4: STABILITY CURVE AREA RATIO

The positive area under the stability curve shall be at least 5 times greater than the negative area.

AVS WORST CASE (AVSwc)

The value of the AVS in the worst case (worst configuration of ballast and keel, in light measurement trim) shall be greater or equal to **108°**.

SECTION F - TESTS AND MEASURES RELATING TO STABILITY

F.1: BOAT WEIGHING

Boat trim: like described in B.4.1.
The load cell used by the measurer shall carry a valid certificate of calibration.

Deliberate
Deliberate flooding of compartments is forbidden. As an exception, a boat with a fixed-keel may fill allocated forward ballast tanks providing both the following conditions are met:

- **The allocated forward tanks shall be capable of being filled with the boat inverted and emptied with the boat upright.**
- **When upright with the allocated forward ballast tanks full, the forward freeboard shall be not less than 75% of the forward freeboard (as measured in B.4.1) with the forward ballast tanks empty.**

F.2: INITIAL HEEL ANGLE TEST (10°)

Boat trim: like described in B.4.1.
The configuration of loading inducing the maximum heel on each side shall be required. The total of two measurements shall not exceed 20°.

F.3: STABILITY TESTS (90°)

Boat trim: like described in B.4.1.
With mast(s) and keel held in their vertical axes, the boat is pulled over her side at 90°, and held in this position by a strop around the mast. The measurements taken shall then be repeated by undertaking the same manoeuver on the other side. The averages of the measured data will be recorded.

F.3.1: Inclining Force:

The load on the strop is recorded by use of a load cell. The place of the strop is also measured. These data are used to establish the vertical position of the boat's centre of gravity under this condition.
The load cell used by the measurer shall carry a valid certificate of calibration.

F.3.2: Measurement of Freeboards:

Forward and aft freeboards are recorded with the boat heeled at 90° to establish the longitudinal position of the boat's centre of gravity under this condition.

SECTION G – NAVIGATION EQUIPMENTS

G.1: ENGINE

a) Engine for Open 60':
The boat shall be equipped with a fixed in-board motorized propulsion system, with a minimum power output of 27 HP.

b) Generator:
A separate generator for electricity can be installed. However, when a separate generator is carried it shall be permanently installed, securely covered, have adequate protection from the effects of heavy weather. It shall have permanently installed exhaust and fuel supply systems and fuel tank(s), with shutoff valve(s).
Flexible tank are not permitted.
A portable generator shall never be operated inside the yacht.

.

c) General requirements:
The engine shall be securely covered, and the exhaust, fuel supply systems and fuel tank(s) permanently installed.
The engine shall have adequate protection from the effects of heavy weather.
When an electric starter is the only method for starting the engine, a separate battery, the primary purpose of which is to start the engine, shall be provided.
Each fuel tank shall be provided with a shutoff valve. Flexible tank is not permitted as a fuel tank.

d) Propulsion unit:
It shall be located below the waterline, as close as possible to the axis of the boat, and shall neither retract nor fold away. It shall be permanently in the running along the hull water flow.

G.2: BATTERIES / GENERATOR

a) Batteries:
Shall be of a waterproof type or have electrolyte gel and shall not be moved during navigation. They shall be fixed in such a way as to be held fast, whatever the position of the boat in the water. They may be sealed into their compartments at the start of a race.
All types of battery charger are allowed, except those relying on fissionable materials.

b) Generator:
A separate generator for electricity can be installed. However, when a separate generator is carried it shall be permanently installed, securely covered, have adequate protection from the effects of heavy weather. It shall have permanently installed exhaust and fuel supply systems and fuel tank(s), with shutoff valve(s).
Flexible tanks are not permitted.
A portable generator shall never be operated inside a yacht.

c) Alternative power sources:
If the engine or generator are powered buy fossil fuel two alternative power sources will be carried, such as wind or solar or any other renewable energy source. These will be sufficient to provide at least 30 % of the total power the yacht will use per leg.

G.3: COMPASS
A marine magnetic compass, independent of any power supply, shall be permanently installed and correctly adjusted with deviation card.
A compass in addition to that required above shall be carried on board.

G.4: MARINE RADIO / NAVIGATIONAL POSITION-FIXING DEVICE
The following, in good working state, shall be provided:

a) A VHF marine radio transceiver. It shall have a rated output power of 25W, equipped with a fixed antenna.
An emergency antenna must be carried on board.

b) A Sat Com transceiver.

c) A radio receiver capable of receiving weather bulletins.

d) An automatic position fixing device (e.g. GPS).

e) Active AIS mandatory

f) A standard C terminal interfaced with GPS and equipped with the relevant software for polling and data reporting. This device must be in perfect working order and installed in such a way as to avoid any possible deterioration. The Inmarsat C antenna must be attached at least 55 cm above the deck and in such a way as to be totally unobstructed within a radius of 60 cm around the antenna regardless of the yacht's position.

g) An echo sounder

h) A speedometer

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G.5: NAVIGATION DOCUMENTATION
Navigational charts (not solely electronic), light list and chart plotting equipment shall be provided **relating to the current race**.

G.6: ANCHORS
Two ground tackles, with one of which shall be ready for immediate use, shall be carried on board. The total weight of the two moorings shall be greater than 75 Kg.

G.7: FLASHLIGHTS
The following shall be carried on board:

- A watertight high-powered flashlight or spotlight with spare batteries and bulbs.
- A watertight flashlight, with spare batteries and bulb.

G.8: TOOLS and SPARE PARTS
Tools and spare parts, including effective means to quickly disconnect or sever the standing rigging from the hull shall be provided.

SECTION H – SAFETY EQUIPMENTS

H.1: DURABLE STOWAGE CHART

A durable stowage chart shall be provided and shall be displayed in the main accommodation where it can best be seen, clearly marked with the location of the principal items of safety equipment.

H.2: DRAINING

The boat shall be equipped with a system of two permanently installed manual bilge pumps, one operable from above, the other from below deck, with a minimum capacity per pump of 4,5 litres per cycle and with a system of electric draining with a minimum total capacity of 2600 litres per hour. .Both systems shall allow the emptying of each watertight compartment from the outside, whatever the position of the boat in the water, except the compartment for the batteries, which shall be emptied with a manual system.

No bilge pump may discharge into a cockpit unless that cockpit opens aft to the sea. Bilge pumps shall not be connected to cockpit drains.

Bilge pumps and strum boxes shall be readily accessible for maintenance and for clearing out debris. Unless permanently installed, each bilge pump handle shall be provided with a lanyard or catch or similar device to prevent accidental loss.

Two buckets of stout construction each with at least 9 liters capacity shall be carried onboard. Each bucket to have a lanyard.

H.3: EMERGENCY WATER

At least 9 liters of drinking water for emergency use shall be provided in a dedicated and sealed container or container(s).

H.4: SURVIVAL FIXING POINTS

External solid anchorage points, allowing the attachment of the life raft, the watertight container, individual grab bags and distress beacons, shall be provided in the vicinity of the aft escape hatch.

H.5: LIFERAFTS

a) Life rafts:

Two life rafts shall be carried on board, one outside, built in respect of SOLAS norms, one inside. The two life-rafts must be accessible whatever the position of the boat in the water. The inside one shall be able to pass through all openings in the watertight bulkheads and all escape openings including the transom escape hatch. The inside life raft shall conform at least with OSR category 1, and shall be constructed with an insulated floor and capable to be inflated at a temperature of -15° C. When racing with numerous crew members, the total capacity of the two life-rafts shall permit the evacuation of the entire crew.

b) Stowage:

The SOLAS life raft shall be stowed on the working deck or in a purpose-built rigid compartment, opening into or adjacent to the cockpit or working deck, or through the transom, and containing only this sole life raft. In the case of a

compartment, it must be watertight or self-draining and have a cover capable of being easily opened under water pressure.

c) Recovery time:
Each raft shall be capable of being got to the lifelines or into the water within 15 seconds. The life raft end of painter shall be permanently made fasten to a strong point of the boat.

d) Servicing and inspection:
Every life raft shall have a valid annual certificate, and a certificate (or copy) shall be kept on board. Notwithstanding the specified servicing periods, the life rafts shall be carefully, frequently inspected externally, and taken for servicing if there is any sign of damage or deterioration.

H.6: LIFEBOYS

The following shall be provided within reach of the helmsman and ready for instant use:-

- A lifebuoy with a self-igniting light and a drogue or a Life sling with a self-igniting light and without a drogue.
- A lifebuoy equipped with a whistle, a drogue, a self-igniting light and a pole and flag. The pole shall be carried on board permanently extended, except that automatic extension (e.g. by compressed gas or spring action) is permitted provided the device activates fully in less than 20 seconds. The pole and flag shall be attached to the lifebuoy with 3 m off floating line. It shall be so constructed that the flag flies at least 1.8m off the water.
- At least one of the lifebuoys shall depend entirely on permanent (e.g. foam)buoyancy.
- Each inflatable lifebuoy and any automatic device (e.g. pole and flag extended by compressed gas) shall be tested and serviced at intervals in accordance with its manufacturer's instructions.
- Each lifebuoy (or life sling) shall be fitted with marine grade retro reflective material.

H.7: PYROTECHNIC SIGNALS

Pyrotechnic signals shall be provided conforming to SOLAS LSA Code Chapter III Visual Signals and not older than the stamped expiry date (if any) or if no expiry date stamped, not older than 4 years.
Shall be provided:

- 6 red parachute flares
- 4 red hand flares
- 4 white hand flares
- 2 orange smoke flares

H.8: LIFEJACKETS

Each crew member shall have a life jacket conform to his relevant national regulations, and each life jacket shall be as follow:

- Equipped with a whistle.
- Fitted with marine grade retro-reflective material
- Compatible with the wearer's safety harness

- If inflatable, regularly checked for air retention
- Have one spare air capsule
- Clearly marked with the yacht's name.

H.9: SAFETY HARNESS and SAFETY LINES

Attention is drawn to ISO 12401 norms.

Harnesses and safety lines shall conform to CE EN1095 or ISO 12401 norms.

a) Safety harness:

Each crew member shall have a safety harness.

A crew member's harness and life jacket shall be compatible.

b) Safety lines (tethers):

Each harness shall be equipped with a safety line not more than 2m long with a Snap shackle at each end.

Attention must be drawn on U bolts as clipping points, because they can lead unclipping plain snap shackle. For this reason the use of snap shackles with positive locking devices is strongly recommended.

H.10: SOFT WOOD PLUGS

Soft wood plugs, tapered and of the appropriate size, shall be attached or stowed adjacent to the appropriate fitting for every through-hull opening.

H.11: FIRE EXTINGUISHERS

Fire extinguishers, at least two shall be provided, readily accessible in suitable and different parts of the yacht. One shall be close to the engine.

At least two fire extinguishers shall be provided, (of at least 2 kg each and ABC rated, CE 0029 or SOLAS 0029/03 approved) readily accessible in suitable and different parts of the boat.

H.12: FOGHORN

A foghorn shall be provided.

H.13: RADAR and RADAR REFLECTOR

The following equipment, in good working state, shall be provided:

a) Radar:

Radar fitted with powerful alarm Radar fitted with power of 2KW minimum.

The radar unit shall be fixed at a height of at least 5 metres above the water line.

b) Portable Transponder Radar

A radar transponder beacon (9.2 – 9.5 GHz frequency), portable and self-powered shall be carried on board. This beacon shall be fitted with a line at least 3 meters long of 1000 daN minimum breaking strain.

H.14: EPIRBs

Boat shall be equipped of two SARSAT COSPAS 406 MHz Epirbs portable distress beacons**,** classified as long-life. These beacons shall include a 121.5 MHz

transmitter, be coded and registered with the name and MMSI number of the boat and shall be tested and serviced at intervals in accordance with its manufacturer's instructions. They shall be fitted with a line at least 3 meters long of 1000 daN minimum breaking strain.

H.15: EMERGENCY TRANSMISSION

Boat shall be equipped with an emergency device which, whatever the position of the boat in the water, allows the erection of a VHF aerial and transmissions from the distress beacon and the radar transponder (9.2 – 9.5 GHz frequency).

H.16: WATERTIGHT HAND HELD VHF TRANSCEIVER

A waterproof hand-held VHF transceiver, with spare batteries, shall be carried onboard.

H.17: HAND-HELD RADAR TRANSPONDER BEACON

A radar transponder beacon (9.2 – 9.5 GHz frequency), portable and self-powered shall be carried on board. This beacon shall be fitted with a line at least 3 metres long of 1000 daN minimum breaking strain.

H.18: FIRST AID MANUAL and FIRST AID KIT

a) Manual:

A First Aid manual shall be provided. In the absence of a National Authority's requirement, the latest edition of one of the following is recommended:

- International Medical Guide for Ships, World Health Organisation, Geneva, or
- First Aid at Sea, by Douglas Justins and Colin Berry, published by Adlard Coles Nautical, London, or
- Le Guide de la medecine à distance, by Docteur JY Chauve, published by Distance Assistance BP33 F-La Baule, cedex, France. An English translation is available.

or

- Skipper's Medical Emergency Handbook, First Aid at Sea, by Dr Briggs and Dr Mackenzie published par Adlard Coles Nautical, London

b) First aid kit:

A First Aid Kit shall be carried on board. It shall reflect the likely conditions and duration of the passage, and the number of people aboard the yacht. Before the start of a race, the skipper shall have undertaken at least once in the past five years a medical training reflecting the conditions of race. This training is strongly recommended for crew members.

It is strongly recommended to follow the prescription of Appendix C to the Class rules.

H.19: HEAVING LINE / THOWING SOCK

A heaving line of 15m – 25m length shall be readily accessible to the cockpit, and a Speedline or equivalent style rope launch shall be on board.

H.20: DIVING EQUIPMENT

One diving bottle (e.g. Spare Air bottle) or equivalent shall be on board.

H.21: YACHT's NAME

Yacht's name shall be on miscellaneous buoyant equipment, such as lifejackets, oars, cushions, lifebuoys and life slings etc...
Marine grade retro-reflective material shall be fitted to lifebuoys, life slings and lifejackets.

H.22: PERSONAL EQUIPMENT

The following equipment shall be carried on board for each crew member:

- Two packs of mini flares or two personal location lights (either SOLAS or strobe), one shall be attached to, or carried on, the person when on deck at night.
- A foul weather suit with hood.
- A knife.
- A watertight flashlight.

H.23: PERSONAL SURVIVAL EQUIPMENT

Before the start of a race, the skipper shall have undertaken personal survival training at least once in the past five years.
One set of Survival Equipment shall be provided for each crew member to include:

- An immersion suit in accordance with Solas 74/83 standards and prEN 1913, with thermal insulation without liner shall be greater than 0.75 immersed Clo.
- An immersion suit in accordance with NF EN ISO 15027-1 norms, and whose thermal insulation value without thermal underwear when immersed shall be greater than 0.75 Clo (Category A).

H.24: WATERTIGHT EMERGENCY CONTAINER

A watertight emergency container shall be carried on board.
It shall be fitted with strong handles and with a line of 1000 daN minimum breaking strain. It shall contain at least:

- A watertight hand-held marine VHF transceiver with spare batteries.
- A hand-held watertight transceiver operating on aviation frequencies with spare batteries.
- An Iridium mobile phone with spare batteries
- A waterproof hand-held GPS with spare batteries
- A watertight flashlight with spare bulb and batteries
- A knife
- Cyalume type chemical light sticks
- Fluoresceine seamark
- A watertight strobe light with spare batteries
- 4 distress parachute flares
- 6 hand flares (3 red / 3 white)
- 2 floating orange smoke
- High energy food
- A survival blanket for each crew member

H.25: HULL MARKING

To assist in SAR location, sail number shall be displayed in a highly visible manner, once on the deck and once on each side of the hull. The sizes of the characters shall be not less than:

Height: 900 mm
Width: 600 mm
Thickness: 120 mm
Space between characters: 180 mm.

H.26: FLUORESCENT PAINT

To assist in SAR location:

- Keel (s), rudder (s), blade(s), and at least a minimum of 2 m^2 of the bottom below the waterline shall be entirely covered with special fluorescent paint.
- At least 2 m^2 of the surface of the deck in one place shall be covered with a brightly highly visible colored paint (e.g. day glo pink, orange or yellow).

APPENDIX TO THE CLASS RULES

Appendix A – SPECIAL PROVISIONS:

1°) Notwithstanding article C.5.4, boats launched before the 1st May 2000 may be equipped with only 3 watertight bulkheads, provided that in this case the boat has an unsinkable volume of 145%; or with only 4 watertight bulkheads, provided that in this case the boat has an unsinkable volume of 137,5%.

2°) Notwithstanding article E.4, the positive area of the stability curve of boats launched before 1st January 1999 may be only 4 times greater than the negative area, instead of the 5 times greater as required in the class rules.

3°) Notwithstanding article E.3, the angle of vanishing stability of boats launched before 31st December, 1996 may be less than 127,5°, provided that they have a GZ greater than 1,375 m (GZ :horizontal distance between the centre of gravity and the centre of the hull below the water line, as tested at 90°).

4°) Notwithstanding article C.5.6, astern escape hatch, a different provision may be accepted for boats launched before 31st December, 1994, and on which the installation of such a hatch is physically impossible.

5°) Notwithstanding article C.6.3, for boats built before 1st June, 2004, the toe rail may be installed only around the foredeck from abreast the mast (cf. OSR 3.17.1)

These authorisations are delivered only after request in writing to the Race Director

Appendix B - MEASUREMENT PROTOCOLS FOR ECO 60

PREAMBLE:

The measurement protocol defines all the measurement and calculation procedures which apply for the measurement of the Eco 60 Class.

Each measurement - except when it is amended by this protocol - must be carried out in compliance with the ISAF ERS and/or the existing ISO standards. In the event of conflictual regulations between them, decision on what text prevails will be taken by the Chief Measurer.

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SECTION A - GENERAL PRINCIPLES

A.1 INTRODUCTION

The skippers wishing to have their boat measured will have to contact the Class secretary (Eco60@clipper-ventures.com) who will ensure the coordination of the information exchanges between the Chief Measurer, the measurers, the designers, the engineering consulting firm in charge of measurement calculations.
Official Class Measurers are listed in an appendix to the Protocol. They shall comply with the prescriptions of chapter H-1 of the **ERS** (ISAF).
The data, measurements and information they collect shall remain confidential.
The Chief Measurer will have to establish a detailed report of all the tests carried out for the measurement certificate to be issued. A copy of this document shall be transmitted to the skipper of the concerned boat and to the Class secretary.

A.2 MEASUREMENT AND CALCULATION EQUIPMENT

A.2.1 Official software

The software used for the stability calculations is MAAT.

A.2.2 Equipment for measurements

The following devices are authorized:

1. Spirit level, plumb line, tape measure and ruler
2. Laser rangefinder
3. Electronic level (0.1° and 0.01°)
4. Optical level with automatic setting
5. Dynamometer 12500 or 20000 daN
6. Dynamometer 1000 or 1250 daN
7. Photogrametric measuring and recording device
8. Laser tracking device

The Chief Measurer will ask for a certification of each material used.

A.3 MEASUREMENT UNITS

Results for the measurements carried out during the measurement session:

Distance measurement: Meters with 3 decimals
Mass measurement: Kilograms
Angle measurement:Degree with 1 decimal

A.4 PROCEDURE FOR MEASUREMENTS ASHORE

The objective of the measurement operations for an Eco 60 is:

1. To measure the Length Over All of the hull

2. To set up the **stem measurement mark** and to identify from this point:
   a. The hull stem (end of the stem in the symmetry plane of the hull)
   b. The end of the astern hull in the symmetry plane of the hull
   c. The most forward point of the bowsprit or pole when it is centered with respect to the hull's centerplane

3. To determine the draft
   - ✓ **Configuration 1 : boat with fixed keel :**
     To measure the curve of the bulb bottom in the centerplane
   - ✓ **Configuration 2 : boat with canting keel (keel attached to the boat):**
     Idem case fixed keel.
     The keel is in maximum draft situation (perpendicular to the hull flotation plane).
   - ✓ **Configuration 3 : boat with canting keel (keel laid down flat on the ground):**
     3.1 To measure the fwd and aft position of the axis of rotation, in the centerplane of the keel.
     3.2 To measure the curve of the bulb bottom, in the centerplane of the keel, with respect to the rotation axis of the keel. Measurement carried out with keel laid down flat on the ground.
     3.3 Optional measurement on the keel/bulb:
     - The 3D-dimension of the bulb to determine its volume and check if its filling corresponds to lead.
     - To measure with two load cells the weight at the head of the keel and the bulb, when the bulb is hanged horizontally (trailing edge and axis). In addition, the horizontal distance between the 2 load cells axes shall be measured. These measurements will enable to determine the keel and bulb mass and to calculate its centre of gravity (necessary parameter for the AVSwc calculation).

4. To determine at least 4 sections to the centerplane of the hull: FFS, MPS, AFS, TFS (see bellow)

5. To measure for each above section, the following coordinates points:
   a. Sheer line (1)
   b. Beam of the section (2)
   c. Break at half height of theorical freeboard (3)
   d. Theoretical waterline (4)
   e. Break in the symmetry plane (5)
   f. Break at around 50% between point d and e (6)
   g. Deck in the centerplane of the boat (7)

These points will be named by sections initials followed by number 1…5. Example FFS1, FFS2, FFS3, ….FFS7.

The above measurements will permit to check the model provided by the designer. This model will be used for the calculation of the position of the centre of gravity, AVS, AVSwc and draft. To determine the shape of the coach roof (only the watertight/closed volume) and its longitudinal position:

a. At least 4 points of the intersection between roof and deck
b. The curve of the roof in the centerplane of the boat (4 points minimum)
c. Two roof sections perpendicular to the centerplane of the hull

6. To measure the shape of the cockpit to determine its geometry, its openings and its volume.

A.5 PROCEDURE FOR MEASUREMENTS AFLOAT

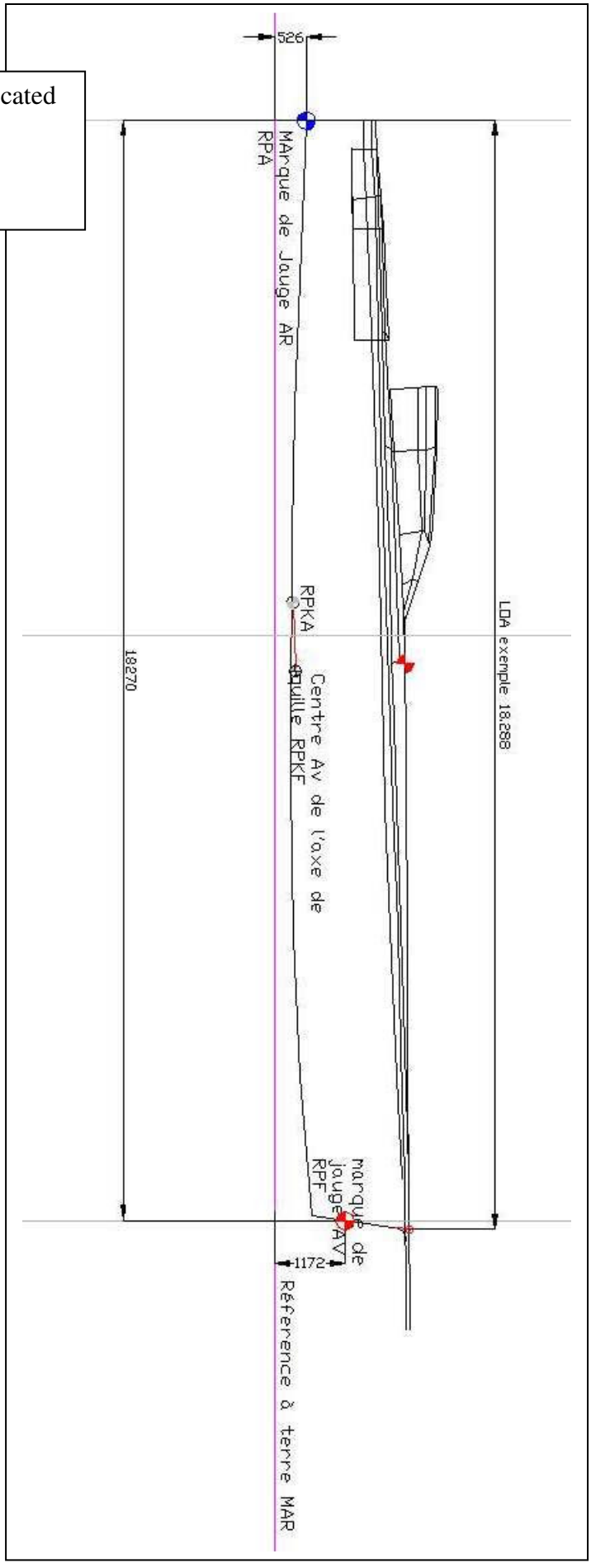
These measurements are carried out in accordance with the measurement protocol.

6 types of measurements or tests afloat:

1. Weighing of the boat with an electronic load-cell.
The measurer will check if the boat is in measurement configuration.
The skipper shall be responsible to check if all compartments, ballasts… etc, are empty.
2. Measurement of freeboards at points RPF and RPA, boat with keel at 0°.
3. Measure of the sea water density.
4. Then boat heeled at "90°", measurement of freeboard at points RPF, FDYNA, ANGLE and of lever arm LDYNA.
5. Measures of the boats inclination under the effect of ballasts and/or canting keel (10°) each side.
6. Self righting test at 180°.

Additional measurements could be carried out upon chief measurer's request (according to the case, these measures could be done ashore or afloat).

The dimensions indicated are given by way of example.



A.6 MEASUREMENT NOMENCLATURE AND DEFINITION OF REFERENCE POINTS

ABREVIATION	DEFINITION
RPF	Reference Point Forward
RPA	Reference Point Aft
RPKF	Reference Point Keel Forward
RPKA	Aft endpoint of the kee's rotation axis or aftpoint of intersection between hull and keel
HULLAV	Forward endpoint of the hull in the centerplane
BSPRIT	Most forward point of the bowsprit
	Sections with reference to MAR (measurement Ashore Reference, see §B.3.1)
FFS	Forward Freeboard Station
MPS	Mast Position Station
AFS	Aft Freeboard Station
TFS	Transom Freeboard Station
	Points measured at each section above (x,y)
XXX 1	Sheer line (1)
XXX 2	Beam of the section (2)
XXX 3	Break at half height of theorical freeboard (3)
XXX 4	Theorical waterline (4)
XXX 5	Break in the centerplane (5)
XXX 6	Break at around 50% between point d and e (6)
XXX 7	Deck in the centerplane of the boat (7)
	Longitudinal positions in MAR (z)
LBSPRIT	Longitudinal position of BSPRIT
LHULLAV	Longitudinal position of HULLAV
LRPF	Longitudinal position of RPF
LFFS	Longitudinal position of FFS
LMPS	Longitudinal position of MPS
LRPKF	Longitudinal position of RPKF
LRPKA	Longitudinal position of RPKA
LAFS	Longitudinal position of AFS
LTFS = LRPA	Longitudinal position of TFS and point RPA
	Freeboards afloat
FRPF	Freeboard at RPF
FRPA	Freeboard at RPA
	Freeboards and measurements at "90°"
FFRPF90	Freeboard at measurement mark RPF
ANGLE	Angle measured at "90°" heel
FDYNA	Measured force at loadcell when at 90°
LDYNA	Shortest distance between loadcell and deck

	Miscellaneous
J	Base of foretriangle
SFJ	Horizontal distance between fwd face of the mast and the bow
SG	Water density
LOA	Length Over All
MAR	Measurement Reference plane ashore
WL	Measurement Reference plane afloat
QT	Mast rake afloat (angle with respect to vertical from mastbase)
DRAFT	Draft
PDYNA	Measured boat weight (en Kg)
	Roof
Roof Line	Points PRF1, PRF2… PRF4
Roof Centerline	Points RC1, RC2, … RC4
Roof Sections	Sections RS1 and RS2
	Cockpit
	The different shape of cockpits does not allow for common parameters. Therefore, the measurer will take the required measurements in order to reproduce the shape and volume of independent cockpits

A.7 RESPONSIBILITY

The presence of the skipper or an official representative of the boat is mandatory during the measurement sessions, and each measurement is carried out under his responsibility.

It is the skipper or a representative of the skipper's responsibility to provide any required documentation for the awarding of a measurement certificate.

During measurement sessions, a checklist has to be co-signed by the measurer and the skipper or his representative. In case of measurement during several sessions, this checklist will have to be ratified again.

A.8 DRAWINGS SUBMISSION

See **B.3: SUBMISSION OF PLANS (Rules ECO 60)**

A.9 MEASUREMENT CONDITIONS

Measurements taken afloat shall be in calm water, less than 15 mm ripples and less than 10 knots of wind at the masthead, without current. The density of the water to be recorded by the measurer, and interpreted to equal 1025 kg/cubic meter for calculations of draft and stability.

A.10 MEASUREMENT CONFIGURATION

A.10.1 Measurement in LIGHT configuration

See **B.4: MEASUREMENT BOAT TRIM (Rules ECO 60)**

A.10.2 Capsize trim (180°)

Identical to LIGHT configuration, but without:

- Mast, standing rigging, boom(s), vanges, headsails furlers and halyards, and electronic deck devices as radar antenna on crossbar.
- Fittings permanently fixed to mast(s).
- Fuel and any other fluid vents shall be obstructed.

A.11 UNSINKABILITY VOLUME

The boat shall possess a total volume for unsinkability, expressed in m3 not less than 130% of the boat displacement (in m3) as recorded during her weighing.

Included in the calculation of this volume are:

- The combined volumes of any fixed watertight elements.
- 50% of the volume of the water ballast tanks, except central water ballast tanks wherever present. (Ballasts whose centre of gravity is aligned on the centerplane of the boat).
- The combined volumes of structural compartments when they are filled with closed cell foam.
- Additional buoyancy volumes of closed cell foam, non-removable, laminated, or glued directly on any part of the hull structure.

SECTION B- MEASUREMENT SESSION

B.1 MEASUREMENT

In order to facilitate the measurement operations, the skipper shall contact the measurer to prepare for all measurement operations so as to limit measurement costs and obtain the best results for the measurement.

- ✓ Operations described in § A.4 and A.5 must be carried out in configuration described in A.9 and A.10.
- ✓ Paragraphs B.2, B.3, B.4, B.5, B.6 describe the measurements procedure

B.2 ASHORE MEASUREMENTS

Measurement conditions:

The boat shall be assembled (deck, hull, bulkheads, structure, and ballasts).
If configuration 1 or 2 of paragraph A.4, the keel must be fixed to the boat.
If configuration 3 of paragraph A.4, **the canting keel is not fixed to the boat for the measurement ashore, but the keel's bearings must be installed on the hull'structure.**

B.2.1 Measurement Trim (MAR: Measurement ashore reference)

The boat shall be in a measurement trim similar to the one (DWL) declared by the designer.

B.2.2 LOA

LOA is measured horizontally between the most forward point of the hull called stem (**HULLAV**), and the most backward point of the hull (**RPA**). These two points are located on the hull centerplane.
It will be referred to the ISO Standard for the particulars related to this measurement.

B.2.3 Sections

4 sections are defined into vertical planes perpendicular to the plane of longitudinal symmetry:

- **FFS**: Forward Freeboard section.
  Located between the boat stem and the MFS[1] section.

- **MFS**: Mast Freeboard Section.
  Through the center of the mast step/base or the middle of the mast front.

- **AFS**: Aft Freeboard Section
  Located between MFS and the boat stern[2].

[1] The measurer will chose the most appropriate position of the section.
[2] The measurer will chose the most appropriate position of the section.

- **TFS**: Transom Freeboard Section:
  Through the most backward point of the hull, or forward if no other section possible.

Each section will be marked by a longitudinal measurement with reference to the point RPF: LFFS, LMFS, LAFS, LTFS.

B.2.4 Reference marks

RPF is marked on the stern, on the longitudinal centerplane of the boat, at about 250mm above the predicted WL given by the designer.
RPA is the point located on the centreline, at the backward end of LOA.

B.2.5 Measurements at each section

7 points defined in A..4.5 shall be measured on each section. In the event of such measurements not being possible, the measurer shall choose an adequate and representative measurement.

Fixed keel boat :

RPKF : Point of intersection between the hull and the keel's leading edge.
RPKA : Point of intersection between the hull and the keel's trailing edge

Canting keel boat :

The above mentioned points RPKF and RPKA become the centerpoints of the keel bearings.
The longitudinal position, RPF, at points RPKF and RPKA will be recorded as LRPKF and LRPKA.

B.2.6 Bulb lower profile (in the longitudinal centerplane of the boat)

Fixed keel boat or canting keel assembled on the boat:

5 points (BDP1, …, 5) are measured on this plane (altitude with respect to the horizontal plane of reference -MAR- and longitudinal position LBDP1, …, longitudinal / RPF).
The measurer will chose the most appropriate points.

Canting keel boat, keel not assembled to the boat:

Measurements allowing to identify in 3D the 5 points of the profile mentioned above and the 2 centres of the keel rotation axis.

B.2.7 Draft

The draft is calculated with the results of ashore measurements and afloat measurements of freeboards at RPF and RPA.

B.2.8 Keel mass and CG (optional)

Canting keel boat: see § A.4 (3.3 b)

B.2.9 Mast mass and CG (optional)

Two methods are possible:

- Search for horizontal balance, weighing and measurement on the mast from the position of the point of balance.
- Weighing of the mast at each end when horizontal. Then calculate the position of the CG.

B.3 AFLOAT MEASUREMENTS

Measurement conditions:

The boat shall be in compliance with the measurements requirements (see § A.9 & A.10).

B.3.1 Water density (SG)

The water density shall be recorded. A sampling shall be made at about 300mm under the surface.

The reference taken into account by the Rule is 1.025 g/cm^3. Any variation to this reference shall be corrected by 0.35mm for a variation of 0.001 of SG and applied to RPF and RPA measured ashore.

B.3.2 Weighing

The boat shall be lifted up by a single point or by any other solution, provided it gathered into one point at the loadcell. The lower attachment of the load-cell shall be fixed to that point. The upper attachment of the load-cell shall be fixed to the crane's hook.

Only load-cells certified by the measurer are authorized.

The skippers or their representative will make any necessary arrangement for emptying every piping, ballasts and valves of any fluid. The only exception concerns the hydraulic system tank(s). Nevertheless, a complete description of these systems and of the tanks capacity shall be provided to the measurer.

The weight noted by the load-cell is expressed in Kg.

B.3.3 Freeboards measurement

Freeboards at the RPF and RPA points shall be measured and recorded FRPF and FRPA.

B.4 TESTS OF STABILITY (90°)

Boat configuration: like described in A.10.1, with mast(s) and keel held in the longitudinal centerplane of the boat..

The boat is pulled over her side at a measured angle. This angle is as close as possible of 90°, and held in this position by a strop around the mast.

The measurements of FFRPF90, FDYNA, LDYNA determine the vertical centre of gravity of the boat by calculation.

Spreaders shall not be made watertight for this test.

The Chief Measurer can ask to carry out the test both side.

✓ **Freeboards measurement at "90°"**:
The forward freeboard –point RPF- will be measured, boat heeled at "90°".

- FFRPF90: Freeboard at RPF, boat heeled at "90°".

B.5 INITIAL HEEL ANGLE TEST (10° each side)

Boat configuration should be as described in A.10.1
(Mast at centerplane of the boat, stays – including removable stays – should remain attached to the mast with their furling systems)

The following measurements will control if :

1. The heel angle achieved by filling ballasts tanks and/or canting keel is not greater than 10° on each tack.
2. The bisectrix of both heeling angles measured on each tack is placed exactly on the centerplane of the hull.

Canting keel boat :

The measurer will install his heeling measurement device on an horizontal plane

a. Keel is totally canted on one tack (with mechanical and structural canting limiting devices or equivalent system). Heeling angle is then measured in that position. Measurer then resets heeling angle measurement device and measures freeboard (lower side) on the previously marked transom point (see above).
b. Keel is then canted totally on the other tack (with mechanical and structural canting limiting devices or equivalent system).). Measurer reads out angle value in that position and measures freeboard (lower side) on the previously marked transom point (see above).
c. In any case, the total angle from one tack to the other shall not be greater than 2x (two times) 10°. The 10° maximum angle will be calculated taking into account any eventual lack of symmetry in the hull that could be revealed from measurements.
d. If boat is equipped with lateral or centreline ballast tanks, maximum heeling will be achieved as a combination of any of those tanks being filled, and this on each tack. The measurer will then verify if the heeling difference from one tack to the other complies to the symmetry obligation defined above.

Comment :
Filling the ballast tanks will be done with seawater (density of 1,025).
If the 10° heeling rule is not respected, structural limiting canting device shall be installed or moved so as to comply with the rule, they will then be sealed and new measurements will be made to make sure the rule compliance is met.

Boats fixed keel and ballast tanks

The measurer will install his heeling measurement device on an horizontal plane

a. Ballasts on one side will be fully filled to achieve maximum heeling angle. In this position, measurer will reset his heeling angle measurement device to

zero and measures freeboard (lower side) at the previously marked transom point (see above).

b. Ballasts will then be emptied, then filled again on the other side. In this position measurer records heeling angle difference and measures freeboard (lower side) on the previously marked transom point (see above).
c. In any case, The angle difference from one tack to the other shall not be greater than 2x (two times) 10°. The 10° maximum angle will be calculated taking into account any eventual lack of symmetry in the hull that could be revealed from measurements

Comments :
Ballast tanks will be filled with seawater (density 1,025)
In case the 10° rule is not respected, ballast tank volumes shall need to be reduced before new measurements will be carried out to ensure rule compliance is met.