International Measurers Seminar

HANDOUTS v.2015

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Preparing for the International Measurers Seminar

- Experience as **official measurer & equipment inspector**
- Knowledge of the ERS & RRS
- Have read the IM Manual
- Attendance of an IM Clinic highly recommended

Objectives

- Prepare candidates for their International Measurer's appointment
- Educate equipment control inspectors as to their role at major event inspections
- Update on techniques and top level management of equipment inspection at major events

Seminar Outline

DAY 1

The bodies

Int. Measurers' Programme

Int. Measurer's qualities

ERS refresher course

Tools

Hull Prototype measurement

DAY 2

Event inspection
- Role &responsibilities
- Facilities & tools
- Inspection procedures
- interaction with RC & Jury
- Multi-class events

Protests
- Procedures
- Validity
- Evidence

Special topics (Swing tests, Ultrasonic scans, Rating systems etc.)

Seminar Outline

DAY 3

Seminar Review

Preparation for the IM test

International Measurers Examination with written Test

Event inspection templates preparation (Practical session)

"Measurement"

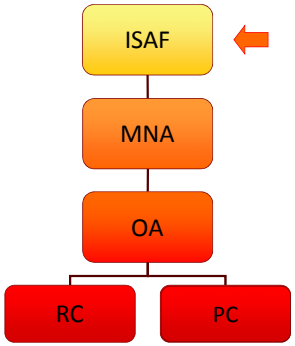
- "Measurement" is the process of sailing equipment control, checking it against the relevant rules.
- "Measurement" of new or modified equipment, to **certify** it (verify its compliance with the rules) is called "certification measurement" or simply "measurement".
- "Measurement" of equipment at sailing events to check use of equipment and verify that "certified" equipment is still in compliance with the "rules" is called "event measurement" or "**equipment inspection**".

"Measurers"

- "Measurers" are specialists whose function is to check sailing equipment against the relevant rules (class or rating rules).
- "Measurers" which perform certification measurement are called "**official measurers**" or simply "measurers". They work for a certification authority (National Authority or a Class).
- "Measurers" which perform event measurement are called "event measurers" or "**equipment inspectors**". They work for the Race Committee.

The Bodies

The Bodies

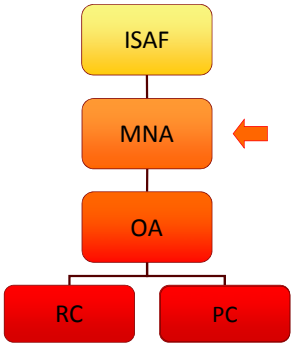


ISAF

– International Sailing Federation

- Racing Rules
- Equipment Rules
- Class Rules & Interpretations
- International Race Officials

The Bodies

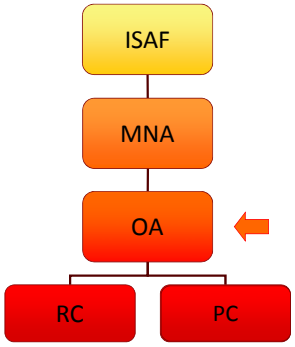


MNA

– National Authority

- Certification Authority
- Prescriptions
- National Measurers (official measurers & inspectors)

The Bodies

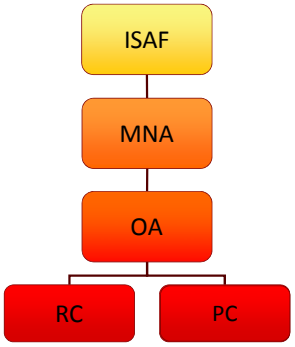


OA

– Organizing Authority

- Publishes the Notice of Race
- Appoints the Race Committee
- Appoints the Jury

The Bodies

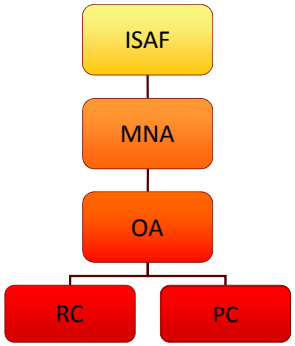


RC

– Race Committee

- Publishes Sailing Instructions
- Conducts races
- Scoring
- Appoints a MC

The Bodies



PC

– Protest Committee
(includes an International Jury)

- Decides protests
- Decides requests for redress
- Other duties

The Bodies

MEASUREMENT COMMITTEE

- Event measurers / equipment inspectors (part of RC)

CLASS

- ICA (International Class Association) See Reg. 10.5 (g)
- NCA (National Class Association)

International Measurers Programme

ISAF "Technical" Committees

- **Equipment Control Sub-Committee**
- **Class Rules Sub-Committee**
- **International Measurers Sub-Committee**

Regulation 6.9.8.3 **The International Measurers Sub-committee shall**:

(a) administer the International Measurers Programme including the review and maintenance of high standards of equipment inspection and uniform application of ISAF standards by International Measurers at events;

(b) recommend to the Race Officials Committee the appointment of International Measurers in accordance with these regulations;

(c) Disseminate information to and communicate with International Measurers and Member National Authorities;

Regulation 6.9.8.3 **The International Measurers Sub-committee shall**:

(d) be responsible with the relevant classes for the instruction and evaluation of International Measurers and candidates to become an International Measurer, which shall include:

(i) the development and conduct of seminars, related manuals and materials to train and qualify International Measurers and candidates to become International Measurers; and

(ii) the formulation of the examinations which applicants must pass to qualify as International Measurers and, if required, the establishment of the criteria for a performance assessment and its administration;

Regulation 6.9.8.3 **The International Measurers Sub-committee shall**:

(e) assist Member National Authorities in training and in developing national measurer / equipment inspector programmes;

(f) recommend policies regarding the conduct of International Measurers;

(i) develop and administer a procedure for the grouping and classification of International Measurers according to their abilities and to place them in groups based on agreed criteria;

(j) update International Measurers Sub-committee documents, such as the Championship Equipment Inspection Report, the International Measurers Manual and the International Measurer application form and comment to the relevant committee on any ISAF document;

(k) address questions from International Measurers;

Int. Measurers Sub-Committee Training Programme

- IM Clinics Train people as potential future IMs:
  - Equipment Rules of Sailing (ERS)
  - Fundamental Measurement
  - Event inspection basics
- IM Seminars Train IM candidates on their expected main role as ISAF Race officials:
  - Event Inspection Management at the top level.
  - ISAF Race officials code of conduct.
  - Specialized training: Prototypes, Protests, Interaction with RC & PC, working within Classes.

What is an IM?

ISAF appoints officials to perform certain functions at the top level of the sport and the IM is one of these officials groups.

Since 1980 the IYRU (now the ISAF) has acknowledged measurers who have a particularly wide experience and knowledge of a class by recognising them as International Measurers. According to the 2009 version of the ERS, they were persons authorized by the ISAF to inspect prototype boats of specific classes and recognised by ISAF as qualified to assist in equipment inspection at international events for those classes.

This ERS definition was dropped in the 2013-2016 Edition.

What is an IM?

IMs are persons: a) authorized to inspect prototype boats and b) highly qualified to lead and manage equipment inspection at the major international events for their classes.

They need to have thorough knowledge and understanding of the ERS –and are tested on that as part of their appointment process- and they are trained by ISAF in both measurement and inspection techniques which are not class-specific.

While they are regarded as Class experts, they are also capable of working outside their Class when needed. Since 2012, ISAF Rating Systems are considered as “Classes” and can have IMs appointed.

An IM is NOT:

- An IM is not an **official measurer** authorized to measure and **certify** equipment worldwide. The “International” part of the title only indicates that he is an ISAF Race Official.
- IMs may also be **official measurers,** but their appointment as such is still done by their MNA or Class or their delegates and is not connected to their IM appointment.
- An IM does not have the authority to appoint or force himself into the MC of an event.
- An IM shall not be employed or act as a consultant to or regular **official measurer** at a builder for that Class or Rating System (ISAF Regulations 31.13.6)

How to Become an International Measurer

- Connection to sailing preferred (racing sailor)
- Basic and General Measurer training (MNA-based)
- Class affiliation & specializing (Class-based training)
- Experience gained by participating at major events as “event measurer” / “equipment inspector”
- Official Training (ISAF Clinics / Seminars & Test)

How to Become an International Measurer

(Reg. 31.5) A candidate for Initial Appointment shall:

- be nominated by the candidate's Member National Authority, an ISAF Class Association or the Race Officials Committee;
- be recommended by the candidate's Member National Authority;
- send the application on the official form so that it is received by the Secretary General by 1 September; and
- meet the general qualifications and the additional qualifications for the discipline concerned.

How to be re-appointed as an International Measurer

Appointments are made for 4-year terms (2 years for people aged over 70)

(Reg.31.6) A candidate for Re-Appointment shall:

- apply directly to ISAF;
- send the application on the official form so that it is received by the Secretary General by 1 September; and
- meet the general qualifications and the additional qualifications for the discipline concerned.

General Qualifications

(ISAF Regulation 31.9)

- Racing experience: **Not for IMs?**
- Rules knowledge
- Judicial temperament
- Physical capability
- Proficiency in English
- Must support policies of ISAF
- Contribute to the IM programme development

Additional Qualifications

(ISAF Regulation 31.13)

- IMs are appointed for a specific Class or Rating system!

A candidate for initial appointment shall:

- have acted as equipment inspector in at least 2 events of the Class he is applying for
- have attended an ISAF IM seminar and passed the IM test
- have an intimate knowledge of the ERS and the relevant Class Rules
- be recommended by the Class and another IM

Additional Qualifications

(ISAF Regulation 31.13)

- IMs are appointed for a specific Class or Rating system!

A candidate for **re-appointment** shall:

- have acted as equipment inspector in at least 2 principal events (at least 1of them in the Class he is applying for), or 1 event and a prototype measurement
- have an intimate knowledge of the ERS and the relevant Class Rules
- be recommended by the Class

How many Classes?

- IMs may be appointed to a maximum of 5 Classes.
- IMs are encouraged to get involved with as many classes as possible.
- Frequently, IMs are also **Official measurers** appointed or recognized by their MNA. And in many cases, this is a multi-class appointment.

DON'T FORGET: TO BE EFFICIENT, YOU NEED MOTIVATION!

Why not all Classes?

- We have Classes ranging from the Optimist to the Open60
- ERS and SCR have helped in sail and rig measurement and inspection, offering a common platform; but not for hulls and appendages!
- Not all Classes follow the ERS/SCR concept!
- **On the top level, specific class experience is needed:** Different classes face different issues! And to be efficient, event inspection procedures might be totally different between a 200-dinghy and a 30-keelboat event.

Additional Classes:

(ISAF Regulation 31.13.4)

An IM applying for appointment to an additional Class shall:

- have acted as equipment inspector in at least 2 events of the Class he is applying for
- have an intimate knowledge of the ERS and the relevant Class Rules
- be recommended by the Class

ISAF Classes Responsibilities:

ISAF Reg. 10.5 (g) v: Classes must:

- have sufficient ISAF recognized class International Measurers to represent the class regionally
- ensure that at least one class International Measurer attends each ISAF Equipment Inspection Symposium
- have at least one class International Measurer present at the class World Championships
- organize regular class Equipment Inspection Seminars to train class Equipment Inspectors with the class International Measurers as instructors
- ensure that only class International Measurers measure prototypes of moulded production boats

See also IM Manual: Section B

Qualities of an International Measurer

- What behaviour is expected?
- What personal abilities are needed?
- What personal character attributes are expected?

Code of Behaviour

- Respectful and polite to competitors, colleagues, coaches, officials, hosts
- Maintain fairness
- Uphold confidentiality
- No conflict of interest
- Social behaviour

Social Behaviour

- Follow dress code (on the water, ashore)
- No drinking until end of duty
- No smoking in the measurement area or on-water
- Absence of greed!
- Be punctual
- Act with dignity and decorum at all times

Personal Abilities

What skills are needed?

- Excellent rules knowledge
- MC experience
- English language proficiency (also technical terms)
- Observation and listening skills
- Concentration
- Physical health
- Experience in protest hearings – procedures
- Find and write facts when needed
- Reasoning abilities
- Management skills
- Communication skills
- Excellent Measurement and other tool handling
- Racing experience (how boats are made and used)
- Measurer's Boat management

Personal Attributes

What personality is needed?

- Integrity, honesty, fairness
- Objectivity
- Able to work within and manage a team (MC)
- Respect for competitors
- Visible, approachable
- Good personal behaviour and appearance
- Aware of conflict of interest
- Can avoid perceived bias
- Can maintain confidentiality
- Able to see other points of view
- Diplomacy
- Aware of cultural differences
- Keeps good relationships with other race officials
- Able to make hard decisions
- Capable of handling pressure
- Able to commit to the entire event
- Willing to support ISAF policy
- Willing to support his Class(es)

In short, IMs should (1):

- Lead the equipment inspections at the major events of their class and measure prototype hulls of their class.
- Follow the ISAF Code of Behaviour for IMs
- Ensure that all equipment is class compliant and teams are competing on equal terms (As event inspectors)
- Maintain a high level of consistency and accuracy in their work
- Keep information from measurement in general and especially prototype inspections confidential within the ISAF and the Class

In short, IMs should (2):

- Train people on the measurement process for their class; Explain the rules to sailors, coaches; Assist Class with Measurement Guides, forms etc. Streamline inspection procedures.
- Take part in the Class Rules development by giving feedback to the Class technical committee, including any new developments in equipment and any shortcomings of the present rules
- Follow developments in tools and techniques. Check what other classes are doing to solve similar problems!

Conflict of Interest

ISAF Regulation 34: Conflict of Interest)

- A conflict of interest exists when an ISAF Race Official has, or reasonably appears to have, a personal or financial interest which could affect the official's ability to be impartial.
- When an ISAF Race Official is aware of a conflict of interest, he/she shall decline an invitation to serve at a regatta at which an International Jury is appointed.
- When the ISAF Race Official has any doubt whether or not there is a conflict of interest, the ISAF Race Official shall promptly consult the ISAF, prior to accepting the invitation and be bound by its decision.
- When, at an event, an ISAF Race Official becomes aware of a conflict of interest, the official shall disclose the potential conflict to the International Jury which shall take appropriate action.

Conflict of Interest

- Measurers don't measure equipment they **own**, **design**, **build**, or **have any personal or financial involvement**.
- IMs don't measure **production hulls of their Class** and ideally should not **certify** equipment that will be used at an event they will officiate in.
- Having accepted an appointment, an IM cannot get involved with any participants as their consultant or measurer.

See also IM Manual: Section C

ERS REFRESHER COURSE

WHAT IS THE ERS?

- Rules about the use of equipment.
- Definitions of equipment, measurement points and measurements for use in **class rules** and other rules and regulations.
- Rules governing **certification control** and **equipment inspection**.

APPLICABILITY

The ERS may be made applicable by:

(a) **Class Rules.**
(b) Adoption by a rating authority for racing under its jurisdiction.
(c) Adoption in the notice of race and sailing instructions for an event.
(d) Prescriptions of an MNA for racing under its jurisdiction.
(e) Other ISAF codes and rules adopted by Council.

The ERS are Revised and Published every **4** years by the ISAF

The ERS may only be changed as follows*:

(a) Prescriptions of an MNA may change a rule in ERS Part 1, for races under its jurisdiction.

(b) **Class rules** may change ERS rules as permitted by rule A.1.

*Not applicable to develop or test proposed rules in local races. MNA approval may be required for such changes.

The Equipment Rules of Sailing consist of three parts:

- Part 1 – Rules for use of the equipment.
  (Section A – During an Event & Section B – While Racing)
- Part 2 – Equipment definitions (Sections C through G)
- Part 3 – Rules governing equipment control and inspection
  (Section H)

Terminology

A term used in its defined sense is printed:

in "**bold**" type if defined in the ERS and
in "*italic*" type if defined in the RRS.

As of November 1997 all classes applying for ISAF status shall have **class rules** in accordance with the ERS and the SCR (ISAF Regulation10.2.1(c)).

Standard Class Rules (SCR)

- A template for ISAF Classes on which to base their class rules, using ERS terms and definitions.
- The SCR give a cohesive structure for use by any type of class but do not imply any standardization of equipment design or its use.
- A collection of rules from which each class may choose to suit its individual needs.
- the SCR divide the manufacturer's and competitor's responsibilities.

ERS CONTENTS	SCR STRUCTURE
Part 1 – Use of Equipment	**Part 1 – Administration**
Section A – During an Event	Section A – General
Section B – When Racing	Section B – Boat Eligibility
Part 2 – Definitions	**Part 2 – Requirements & Limitations**
Section C – General Definitions	Section C – Conditions for Racing
Section D – Hull Definitions	Section D – Hull
Section E – Hull Appendage Definitions	Section E – Hull Appendages
Section F – Rig Definitions	Section F – Rig
Section G – Sail Definitions	Section G – Sails
Part 3 – Rules Governing Equipment Control and Inspection	**Part 3 – Appendices**
Section H – Equipment Control and Inspection	

ERS Section C: General Definitions
Class & Class Rules

- **Class Authority C.1.1**
  The body that governs the class as specified in the **class rules**.

- **Class Rules C.2.1**
  The rules that specify:
  - the **boat** and its use, **certification** and administration.
  - the **personal equipment, portable equipment** and any other equipment and their use, **certification** and administration.
  - the **crew**.
  - Changes to the Racing Rules of Sailing as permitted by RRS 86.1(c).

The term includes rules of handicap and rating systems

ERS Section C: General Definitions

- **Closed Class Rules C.2.2**
  Class rules where anything not specifically permitted by the **class rules** is prohibited.

- **Open Class Rules C.2.3**
  Class rules where anything not specifically prohibited by the **class rules** is permitted.

- **Class Rules Authority C.2.4**
  The Body which gives final approval to **class rule, class rule** changes and **class rule** interpretations.

ERS Section C: General Definitions

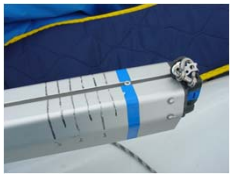
- **Certification C.3** The process of equipment control to verify compliance with class rules. It results in issuing a **certificate** or application of a **certification mark**

- **Certification Authority** C.3.1
  - **Hulls** (ISAF, owner's MNA, delegates)
  - Other equipment (ISAF, MNA of place where control takes place, delegates)

- **Certificate C.3.3** document proof
- **Certification Mark C.3.4**

ERS Section C: General Definitions

- **Limit Mark C.4.8**
  A clearly visible mark of a single color, contrasting to the part(s) on which it is placed, indicating a measurement point.



- **Event Limitation Mark C.4.9**
  A mark placed by a race committee on equipment whose replacement at the event is controlled by the **class rules**.

ERS Section C: General Definitions

- **Fundamental Measurement C.4.1**

  The methods used as the primary means to establish the physical properties of equipment.

- **Certification Control C.4.2**

  The methods used as means of equipment control required by **class rules**, or a **certification authority** for **certification.**

- **Equipment Inspection C.4.3**

  Control carried out at an event as required by the notice of race and the sailing instructions.

ERS Section C: General Definitions

- **Official Measurer C.4.4**

  A person appointed or recognized, by the MNA of the country where the control takes place, to carry out **certification control** and when the **class rules** permit, **certification**.

- **Equipment Inspector C.4.6**

  A person appointed by a race committee to carry out **equipment inspection**.

All IMs are meant to be -above everything else- top level “Equipment Inspectors”

ERS Section C: General Definitions

- **In-House Official Measurer C.4.5**

  An **official measurer** appointed in accordance with the ISAF In-House Certification Programme.

  The ISAF In-House Equipment Certification (IHC) Programme is a scheme whereby satisfactory equipment control is achieved and equipment certified by manufacturers through the application of a Certification Quality Management System under license issued by the ISAF directly or via an ISAF delegate.

ERS Section C: General Definitions

- Personal Definitions:
  - **Crew C.5.1**, **Skipper C.5.2**.
  - **Personal Equipment C.5.3**
  - **Personal Flotation Device C.5.4**

ERS Section C: General Definitions

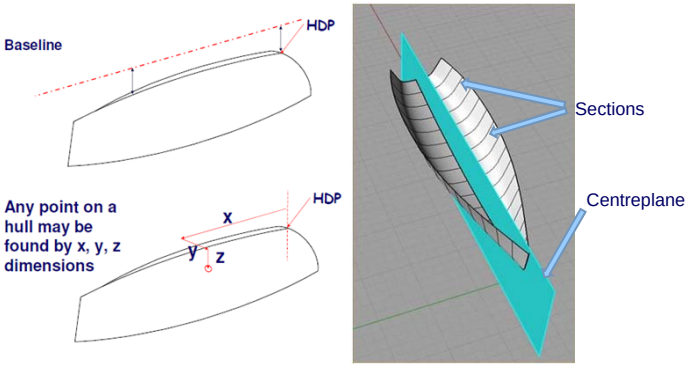
- **Boat C.6.1**

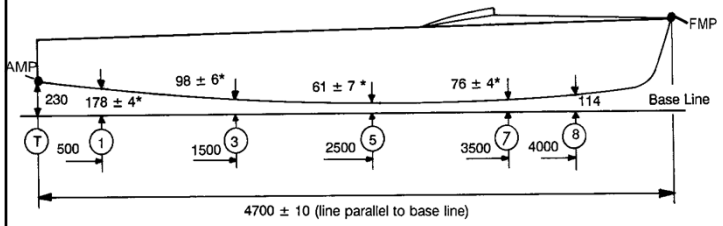
  The equipment used by the **crew** to take part in a race.

  It includes:

  - **Hull(s)** and any connecting structure(s)
  - **Hull appendage(s)**
  - **Ballast** and boat **corrector weights**
  - **Rig**
  - **Sail(s)**
  - fittings
  - all other items of sports equipment used excluding consumables, **personal** & **portable equipment (C.6.5)**.

C.6.3 (a) MAJOR AXES: The three major axes of the boat at 90° to each other – vertical, longitudinal and transverse – shall be related to the baseline and the hull centreplane.





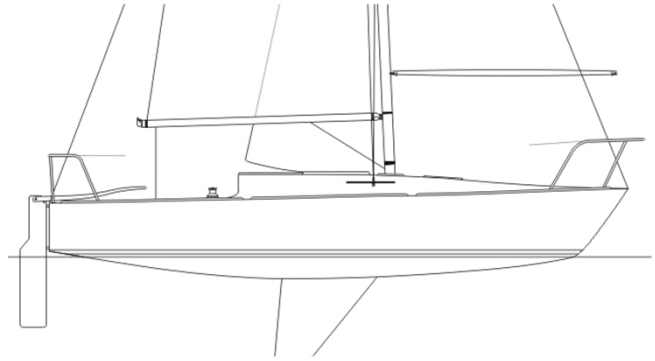
C.6.3 MEASUREMENT TRIM:

Measurement trim is achieved when either, as specified in **class rules**,

(i) two points on the **hull(s)** are at set distances perpendicular to a plane – the plane, the points and distances to be specified in **class rules**, or

C.6.3 MEASUREMENT TRIM:

(ii) as determined by flotation with the **boat** in the condition as specified in **class rules**.



BALLAST C.6.3 (e)

Weight installed to influence the stability, flotation or total weight of the **boat**.

Ballast types:

(i) INTERNAL BALLAST
Ballast positioned inside a **hull**.

(ii) EXTERNAL BALLAST
Ballast positioned outside a **hull**.

(iii) MOVEABLE BALLAST
Internal **ballast** or external **ballast** that may be moved.

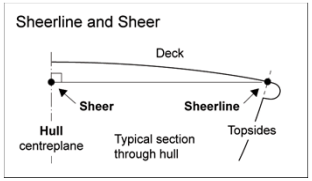
(iv) VARIABLE BALLAST
Water **ballast** the amount of which may be varied.

(v) CORRECTOR WEIGHT
Weight installed in accordance with the **class rules** to correct deficiency in weight and/or its distribution.

ERS Section D: Hull Definitions

Hull D.1.1
The shell including any transom, the deck including any superstructure, the internal structure including any cockpit, the fittings associated with these parts and any **corrector weights**.

Sheerline D.1.2
The line formed by the intersection of the top of the deck and the outside of the **hull** shell, each extended as necessary.



Sheer D.1.3
The projection of the **sheerline** on the centreplane.

Hull Datum Point D.2.1
A point on the **hull** specified in the **class rules** from which **hull** measurements can be taken.

Boat length C.6.4(a)
The longitudinal distance between the aftermost point and the foremost point of the **boat** with sails and spars set as appropriate.

Boat beam C.6.4(b)
The transverse distance between the outermost points of the **boat**.

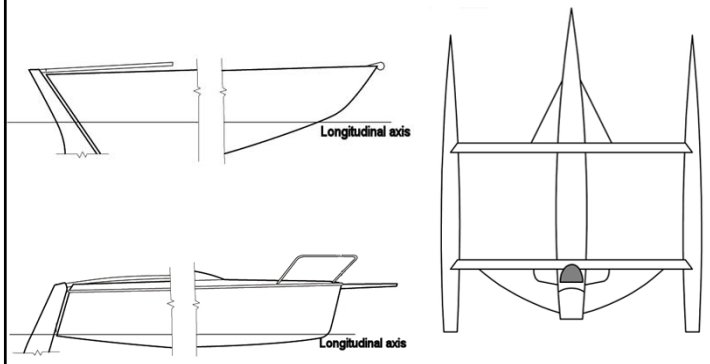
Boat weight C.6.4(h)
The weight of the **boat**.

Hull Length D.3.1
The longitudinal distance between the aftermost point and the foremost point on the **hull**(**s**), excluding fittings.

Hull Beam D.3.2
The maximum transverse distance between the outermost points of the **hull**(**s**) excluding fittings.

Hull Weight D.4.1
The weight of the **hull.**

Boat & Hull Length, Beam, Weight



ERS Section E: Hull Appendage Definitions

Hull Appendage E.1.1

Any item of equipment which is:

- •wholly or partly below the **sheerline or its extension when fixed or when** fully exposed if retractable,
- •attached to the **hull shell or another hull appendage,** and
- •used to affect: stability, leeway, steerage, directional stability, motion damping, trim, displaced volume.

Hull Appendage Types E.1.2

- Keel, Bilge keel, Canting Keel
- Fin
- Skeg
- Bulb
- Centreboard
- Daggerboard
- Bilgeboard
- Rudder
- Trim Tab

ERS Section F: Rig Definitions

Rig F.1.1
The **spars, spreaders, rigging,** fittings and any **corrector weights.**

Spar F.1.3
The main structural part(s) of the **rig**, to, or from which **sails** are attached and/or supported.

Spar Types F.1.4

Rigging F.1.6
Any equipment attached at one or both ends to **spars, sails** or other **rigging** and capable of working in tension only. Includes associated fittings which are not permanently fixed to a **hull, spar or spreader.**

Spreader F.1.5
Equipment used to brace a **spar,** attached at one end to the **spar** and the other end to **rigging** and working in compression when in use.

ERS Section F: Rig Definitions

Rigging Types F.1.7 :

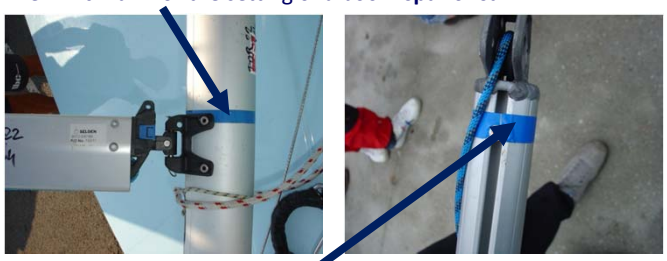
(a) Standing Rigging
Rigging used to support a mast **spar** or hull **spar.** It may be adjustable.
(**Shroud, Stay, Forestay**)

(b) Running Rigging
Rigging primarily used to trim a **spar** and/or a **sail.**
(Halyard, Backstay, Running Backstay, Checkstay, Outhaul, Sheet, Spinnaker Guy)

(c) OTHER RIGGING
(i) TRAPEZE
Rigging attached to a mast **spar** used to support a single **crew** member.

ERS Section F: Mast Measurement Definitions

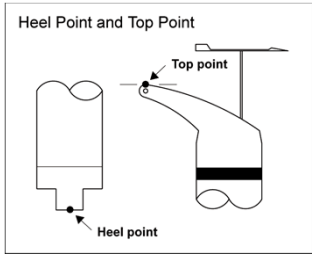
F.2.2 MAST LIMIT MARKS:
(a) LOWER LIMIT MARK
The **limit mark** for the setting of a boom **spar** or **sail**.



(b) UPPER LIMIT MARK
The **limit mark** for the setting of a **sail**.

ERS Section F: F.2 Mast Measurement Definitions

F.2.1 MAST MEASUREMENT POINTS:
MAST DATUM POINT F.2.1 (a)
The point on the **mast** specified in the **class** rules used as a datum for measurement.
HEEL POINT F.2.1 (b)
The lowest point on the **spar** and its fittings.
TOP POINT F.2.1 (c)
The highest point on the **spar** and its fittings.
LOWER POINT F.2.1 (d)
The highest point of the **lower limit mark** at the aft edge of the **spar.**
UPPER POINT F.2.1 (e)
The lowest point of the **upper limit mark** at the aft edge of the **spar.**



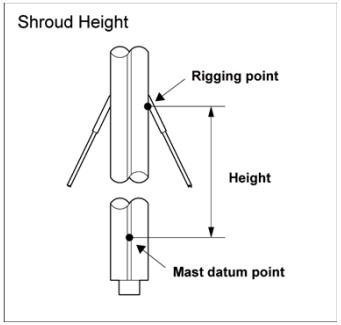
ERS Section F: Mast Measurement Definitions

F.2.3 DIMENSIONS:

(a) MAST LENGTH
The distance between the **heel point** and the **top point**.

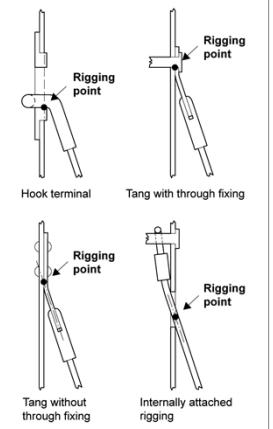
(b) LOWER POINT HEIGHT
The distance between the **mast datum point** and the **lower point**.

(c) UPPER POINT HEIGHT
The distance between the **mast datum point** and the **upper point**.



(e) FORESTAY, (f) SHROUD etc HEIGHT
The distance between the **mast datum point** and the **rigging point**.

Rigging Point



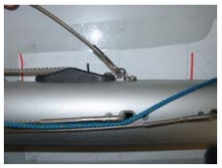
F.2.3 (d) RIGGING POINT:

BY HOOK TERMINAL: The lowest point of the hook where it intersects the **spar,** extended as necessary.

BY TANG WITH THROUGH FIXING: The lowest point of the **spar** through fixing where it intersects the **spar.**

BY EYE WITH BOLT OR OTHER THROUGH FIXING: The lowest point of the **spar** bolt, or through fixing, where it intersects the **spar.**

IN OTHER WAYS:
The intersection of the outside of the **spar, extended as necessary,** and the centreline of the **rigging.**



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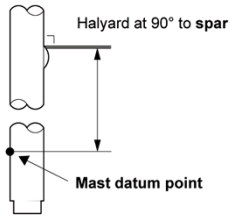
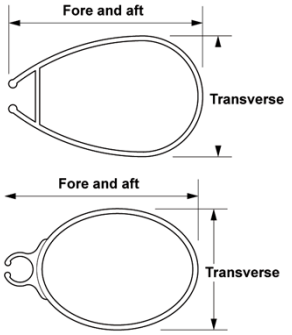
Spinnaker Hoist Height



Mast Spar Cross Section



Also:
F.2.3 (k) MAST SPAR CURVATURE

F.2.3 (l) MAST SPAR DEFLECTION

MAST WEIGHTS & CG

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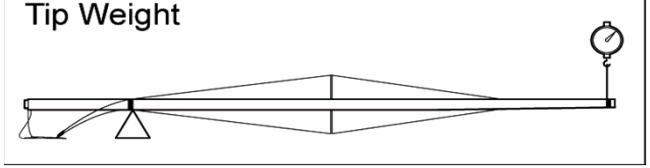
Tip Weight



F.2.3 (p) MAST TIP WEIGHT
The weight of the **mast** measured at the **upper point** when the **spar** is supported at the **lower point**. H.4.6: Any **halyards** shall be fully hoisted and **rigging** tied to the **spar** at the **lower limit mark** with lower ends hanging free or resting on the ground.

F.2.3 (n) MAST SPAR WEIGHT
The weight of the **spar** including fittings and **corrector weights**.

F.2.3 (o) MAST WEIGHT
The weight of the **mast**.

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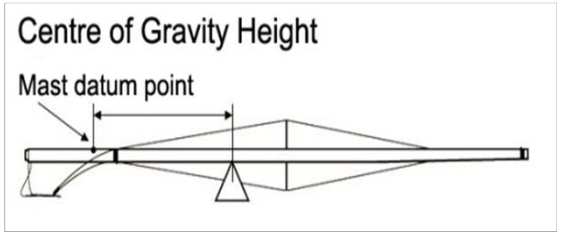
Centre of Gravity Height



F.2.3 (q) MAST CENTRE OF GRAVITY HEIGHT
The distance from the **mast datum point** to the centre of gravity of the **mast**.

H.4.7: **Mast centre of gravity height** shall be checked with any **halyards** fully hoisted and **rigging** pulled taut and tied to the spar as close to the **lower point** as possible.

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ERS Section F: Boom Measurement Definitions

F.3

F.3.1 (a) OUTER POINT

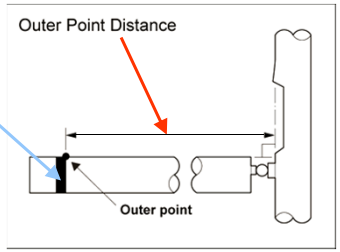
F.3.2 (a) OUTER LIMIT MARK

F.3.3 (a) OUTER POINT DISTANCE

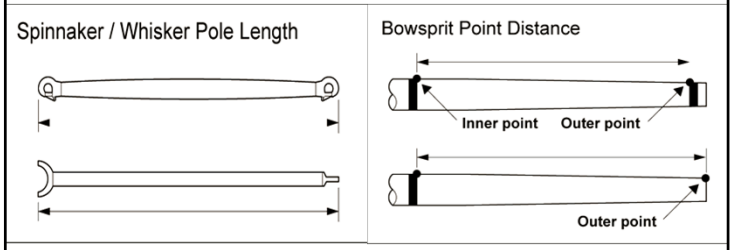
F.3.3 (b) SPAR CURVATURE

F.3.3 (c) SPAR DEFLECTION

F.3.3 (d) CROSS SECTION



ERS Section F: F.4 Poles & F.5 Bowsprits



ERS Section G: Trilateral Sail Definitions

G.1.1 SAIL
An item of equipment used to propel the **boat** including any of the following added parts when they are present:

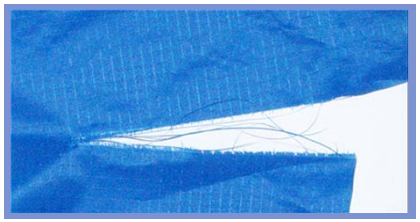
- **sail reinforcements**
- **batten pockets**
- **windows**
- **stiffening**
- **Tabling**
- **sail edge** ropes and wires
- **attachments**
- other parts as permitted by **class rules**.

G.1.4 (a) BODY OF THE SAIL
The **sail** excluding the areas where parts are added as per G.1.1.

G.1.4 (b) PLY
A sheet of sail material which may be made up of a number of layers.

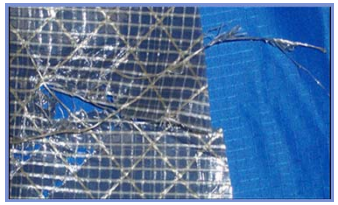
G.1.4 (d) Woven Ply

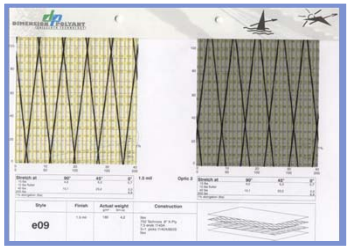
- A **ply** which, when torn, can be separated into fibres without leaving evidence of a film.



G.1.4 (e) Laminated Ply

- A **ply** made up of more than one layer.

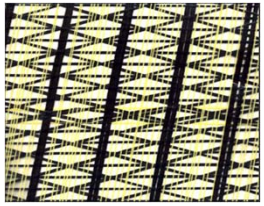




G.1.4 (f) SINGLE-PLY SAIL

A **sail**, except at **seams**, where all parts of the **body of the sail** consist of only one **ply**.

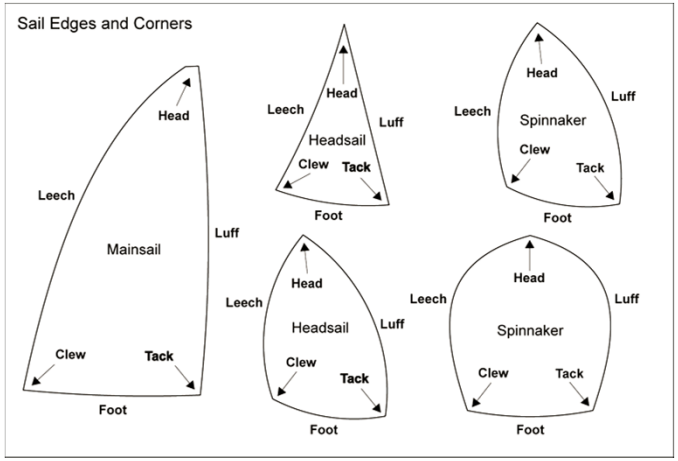
! DO NOT CONFUSE WITH SINGLE-LAYER SAIL MATERIAL !

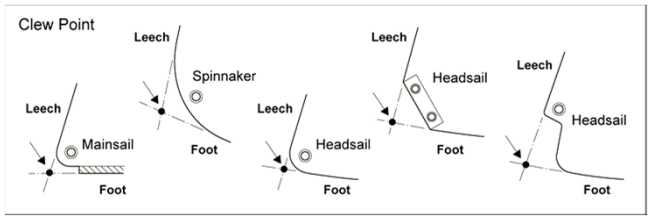


ERS Section G: More Sail Definitions

SEAM	ATTACHMENTS:
DART	* CRINGLES, STRAPS, HANKS, SLIDES
TUCK	* ADJUSTMENT EYES / POINTS
BATTEN POCKET	* REEFING EYES / POINTS
STIFFENING	* BLOCKS & THEIR FASTENINGS
SAIL OPENING	
WINDOW	

BOLT ROPES & THEIR TABLINGS AND LUFF WIRES ARE NOT "ATTACHMENTS" IN THE 2013-2016 ERS





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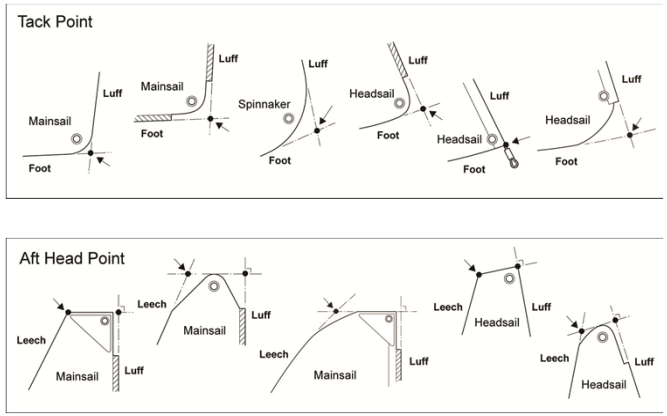

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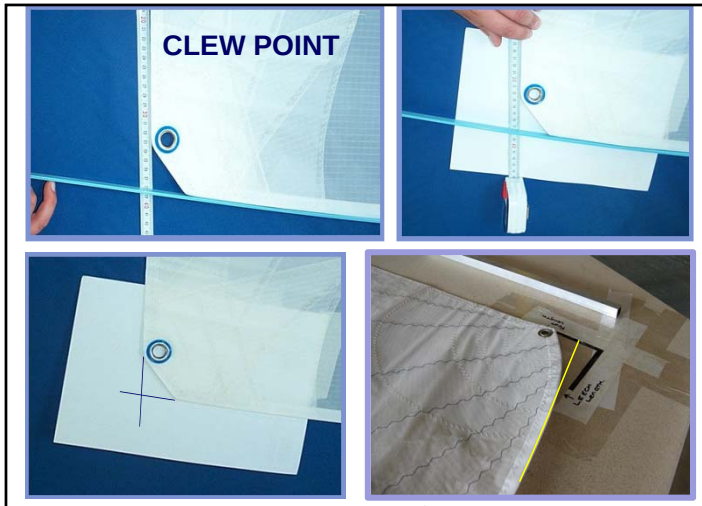

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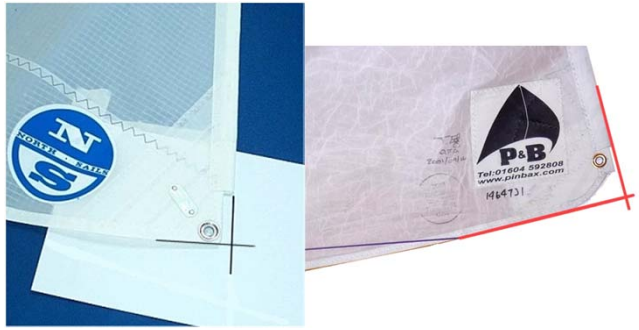
TACK POINT



SAIL EDGES EXTENDED "AS NECESSARY"!

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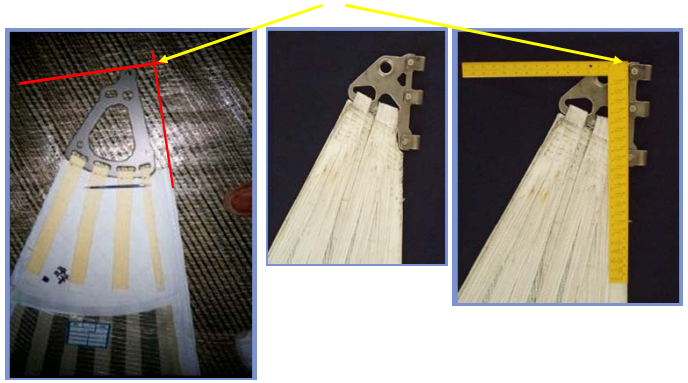
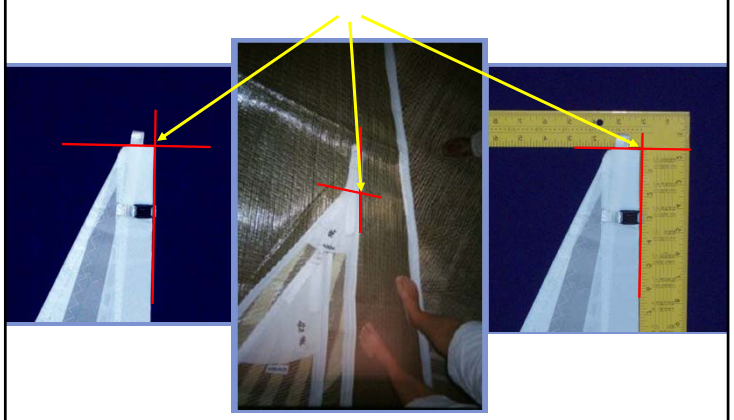
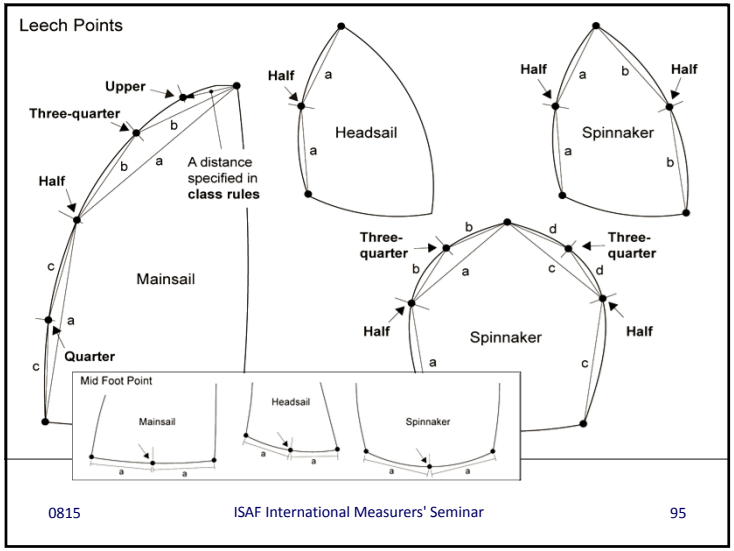
MAINSAIL HEAD POINT (including attachments!)

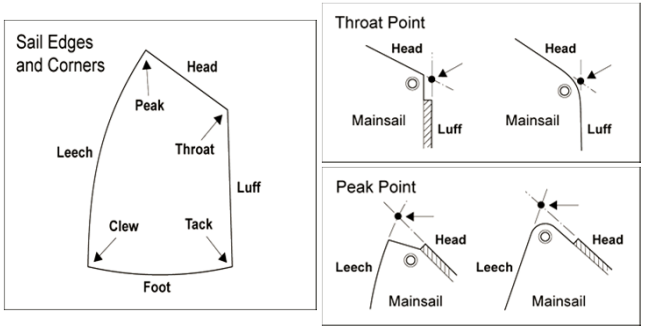


HEADSAIL HEAD POINT (excluding attachments!)





QUADRILATERAL SAILS
MEASUREMENT POINTS



SAIL EDGE SHAPE
The shape of a **sail edge** as a comparison with a straight line between:

•**corner points** or,

•in the case of a **leech** other than of a gennaker or spinnaker, between the **clew point** and the **aft head point**.

Sail Edge Hollow
Concavity in the shape of a **leech** between adjacent **batten pockets**, or a **batten pocket** and the adjacent **corner point**, or in the case of a **mainsail**, **foremast sail**, **mizzen** or a **headsail** other than a spinnaker or a gennaker, between the **aft head point** and the adjacent **batten pocket**.

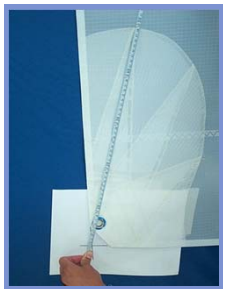
Sail Reinforcement

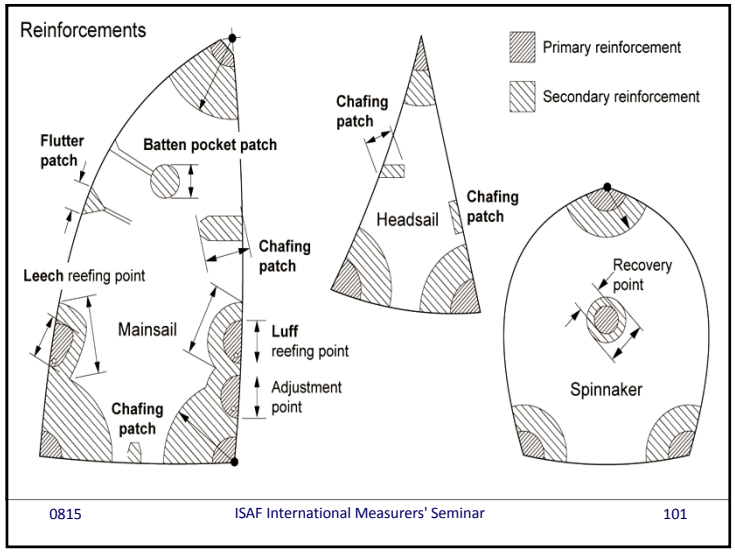
G.6.1 Primary Reinforcement
An unrestricted number of additional **ply** of permitted material:
at a corner
at a adjustment point
at a reefing point adjacent to the **luff**
at a reefing point adjacent to the **leech**
at a **sail** recovery point
where permitted by the **class rules**

Sail Reinforcement

G.6.2 Secondary Reinforcement
Not more than two additional layers of **ply** of permitted material each not thicker than the maximum thickness of the **ply** of the **body of the sail**

at a corner
at an adjustment point
at a reefing point adjacent to the **luff**
at a reefing point adjacent to the **leech**
at a **sail** recovery point
to form a **flutter patch**
to form a **chafing patch**
to form a **batten pocket patch**
where permitted by the **class rules**




Reinforcements
Primary reinforcement
Secondary reinforcement
Flutter patch
Batten pocket patch
Chafing patch
Leech reefing point
Mainsail
Luff reefing point
Adjustment point
Chafing patch
Chafing patch
Headsail
Chafing patch
Recovery point
Spinnaker
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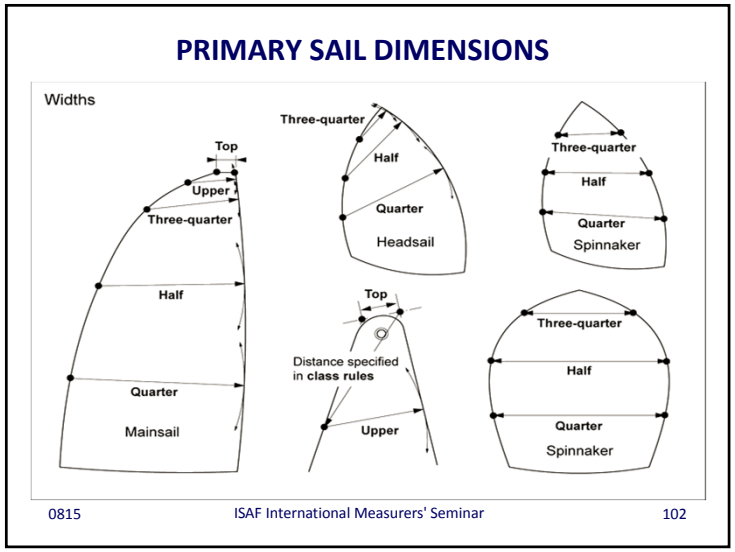
PRIMARY SAIL DIMENSIONS
Widths
Top
Upper
Three-quarter
Half
Quarter
Mainsail
Three-quarter
Half
Quarter
Headsail
Three-quarter
Half
Quarter
Spinnaker
Top
Distance specified in class rules
Upper
Three-quarter
Half
Quarter
Spinnaker
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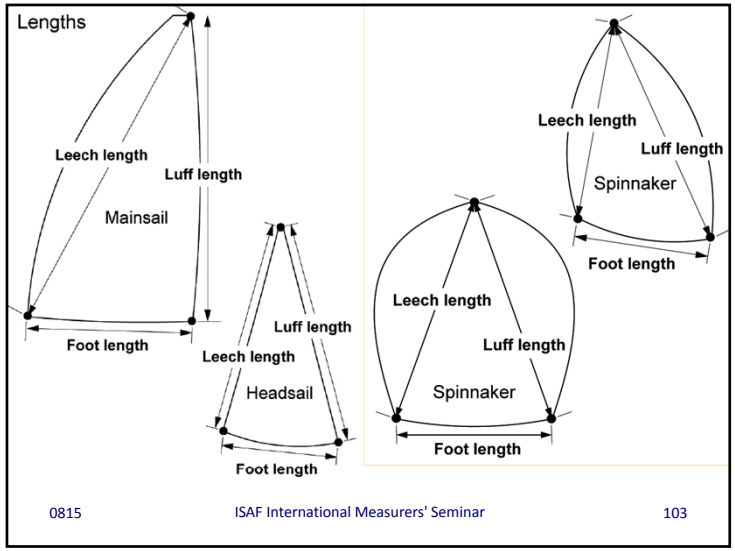
Lengths
Leech length
Luff length
Mainsail
Foot length
Luff length
Leech length
Headsail
Foot length
Leech length
Luff length
Spinnaker
Foot length
Leech length
Luff length
Spinnaker
Foot length
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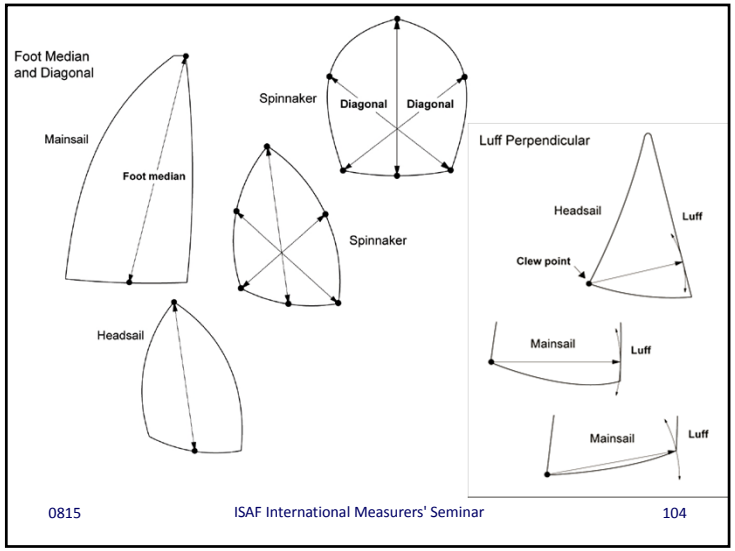
Foot Median and Diagonal
Mainsail
Foot median
Headsail
Spinnaker
Diagonal
Diagonal
Spinnaker
Luff Perpendicular
Headsail
Luff
Clew point
Mainsail
Luff
Mainsail
Luff
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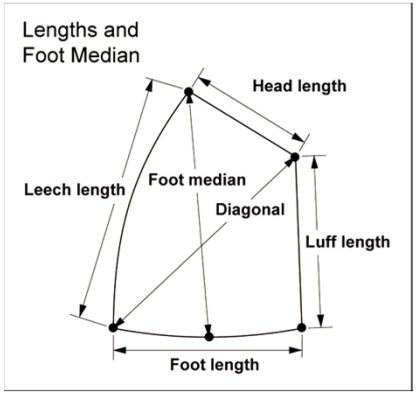
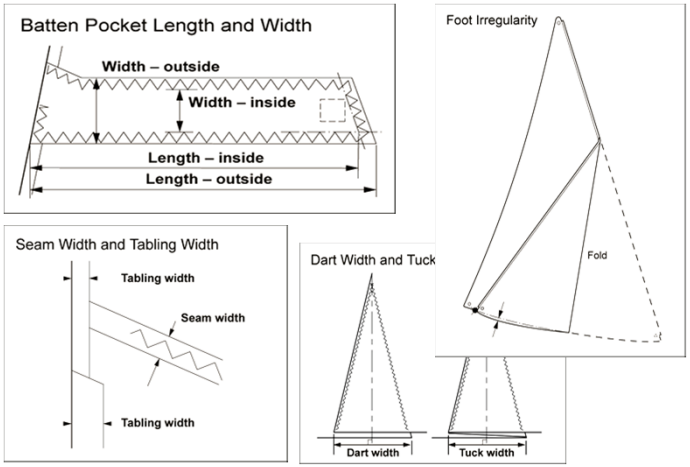
QUADRILATERAL SAILS
PRIMARY DIMENSIONS



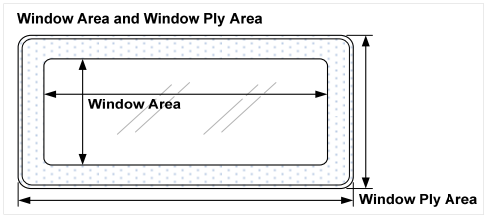


WINDOW

G.1.4 (m) **WINDOW**
A predominantly transparent **ply** in the **body of the sail**.

G.8.9 **Window Ply Area**
The area of the **window ply**.

G.8.10 **Window Area**
The **window ply area** excluding **seams**.



ERS Section A: During an Event

Use of Equipment

- A.1 CLASS RULES

Class rules may change ERS rules B.1 (POSITION OF EQUIPMENT) and B.2 (HEADSAIL BOOM)

- ERS Appendix 1: Racing Rules that govern the use of equipment, for example:
  - Compliance with a Certificate & Equipment Inspection, see RRS 78.
  - Identification on Sails, see RRS 77 and Appendix G.
  - Advertising Code, see Regulation 20.
  - Skin Friction, see RRS 53.

ERS Section B: When Racing

Use of Equipment

B.1 POSITION OF EQUIPMENT

B.1.1 Mast Upper Limit Mark
The **mainsail** shall be below the **mast upper limit mark**.

B.1.2 Mast Lower Limit Mark
When a sail is set on a **main boom**, **foremast boom** or **mizzen boom**, the extension of the upper edge of the **spar** shall intersect the mast **spar** above the **mast lower limit mark**, with the boom **spar** on the mast **spar** centreplane and at 90° to the mast **spar**.

B.1.3 Boom Outer Limit Mark
the **leech** of any sail set on a **boom**, extended as necessary, shall intersect the upper edge of the boom **spar** forward of the **boom outer limit mark**.

* MAY BE CHANGED BY CLASS RULES ! ! !

H.1 CERTIFICATION CONTROL

H.1.1 An **official measurer** shall not carry out **certification control** of any part of a **boat** owned, designed or built by himself, or in which he is an interested party, or has a vested interest, except where permitted by the MNA or ISAF for In-House Certification.

H.1.2 If an **official measurer** is in any doubt as to the application of, or compliance with, the **class rules** he shall consult the **certification authority** before signing a certification control form or applying a **certification mark**.

H.1.3 An **official measurer** shall only carry out **certification control** in another country with the prior agreement of the MNA for that country.

H.2 EQUIPMENT INSPECTION

H.2.1 If an **equipment inspector** is in any doubt as to the application of, or compliance with, the **class rules**, the question should be referred to the authority responsible for interpreting the **class rules**.

H.3 MEASUREMENT AXES

H.3.1 For a **boat**, unless otherwise specified, words such as "fore", "aft", "above", "below", "height", "depth", "length", "beam", "freeboard", "inboard" and "outboard" shall be taken to refer to the **boat** in **measurement trim**. All measurements denoted by these, or similar words, shall be taken parallel to one of the three **major axes.**

H.3.2 For a component, unless otherwise specified, width, thickness, length etc. shall be measured as appropriate for that component, if relevant without reference to the **major axes**.

H.4 RIG MEASUREMENT

- Measurements in the length direction shall be taken along the **spar** at the side relevant for the measurement.
- Fittings, local curvature and local cut away, shall be ignored when measuring a **spar** or dimensions taken to a **spar**.
- No external pressure shall be applied to a **spar** when measuring unless specifically prescribed.

H.7 WEIGHT MEASUREMENT

- The **boat** shall be dry and in compliance with the **class rules**.

H.5 SAIL MEASUREMENT

H.5.1 **Condition of the Sail**

For measurement the **sail** shall:

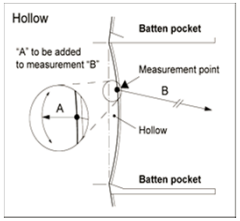
a) be dry
b) not be attached to **spars** or **rigging**
c) unless the **class rules** prescribe otherwise, have all battens removed
d) have pockets of any type flattened out
e) have just sufficient tension applied to remove wrinkles across the line of the measurement being taken,
f) have only one measurement taken at a time and
g) be weighed with all **attachments**.

Attachments at a **sail edge**, other than a bolt rope and **tabling**, shall be excluded when measuring.

H.5.2 **Hollows in Sail Leeches**

Where there is a **sail leech hollow** and a measurement point falls in the hollow:

- between adjacent **batten pockets**
- between the **aft head point** and adjacent **batten pocket**
- between the **clew point** and adjacent **batten pocket**
- at an **attachment**.



SUMMARY

- ERS: NOT Class-specific!
- Class rules may change only certain ERS rules
- A good set of common definitions for sails and rigs
- Hull and appendage definitions, not really helpful for most classes: measurement definitions are needed, to achieve uniformity and commonality in class rule terms as in sails/rigs.

Int. Measurer's Tools & Equipment

Do IMs need different tools than an **official measurer**?

- IMs need the same toolkit as the **official measurers**, PLUS special items (jigs & templates), to make **equipment inspection** easier and to avoid the use of measurement tools like tapes etc.
- Special equipment (e.g. scales) is usually supplied by the organizers of an event or the Class

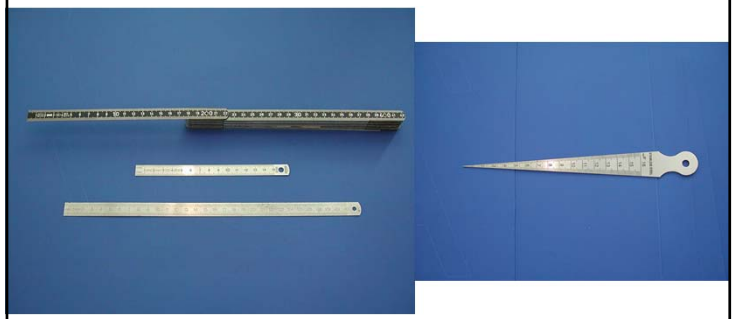
Make sure you have the right tool for each job!

Basic Toolkit

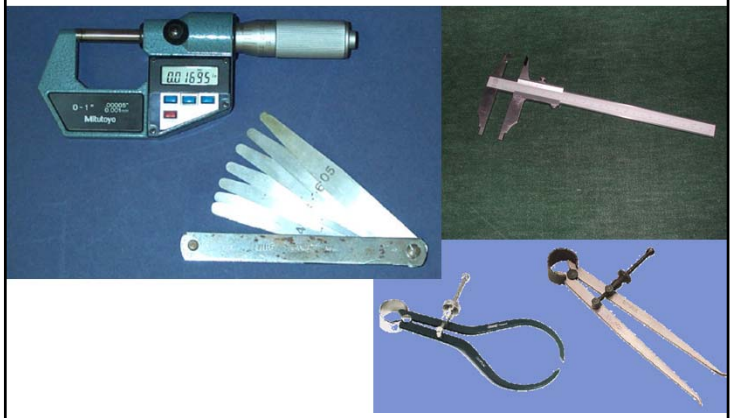
- Permanent Markers – Various colours
- Pens
- Soft Lead pencils with eraser
- Uniform thickness Batten
- Selection of tapes, rulers, squares

Steel tapes, Minimum Class II standard.

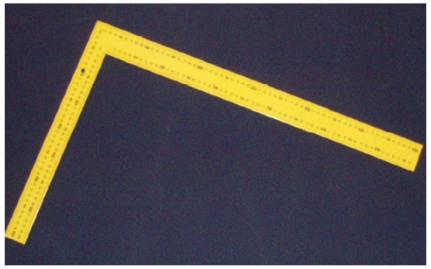
Steel rulers. Don't use articulated ones unless certified!



Micrometer with feelers, vernier & calipers



Carpenter's & Combination squares



Spirit levels

Laser or surveyor's level

Special lasers: straight line, torpedo, 5-line.

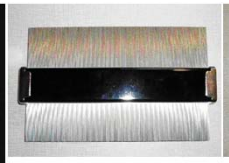
Special lasers: Self-leveling, flat square.

0815 ISAF International Measurers' Seminar 125

Plumb bob, lines and water tube.

0815 ISAF International Measurers' Seminar 126

Special tools: sheerline, radius, inside dimensions.



0815 ISAF International Measurers' Seminar 127

Very Special tools: Metal detector, optical fiberscope, magnetic and ultrasonic thickness gauges.

0815 ISAF International Measurers' Seminar 128

Very Special tools: Swing test equipment, electronic timer linked to photo-cell trigger.

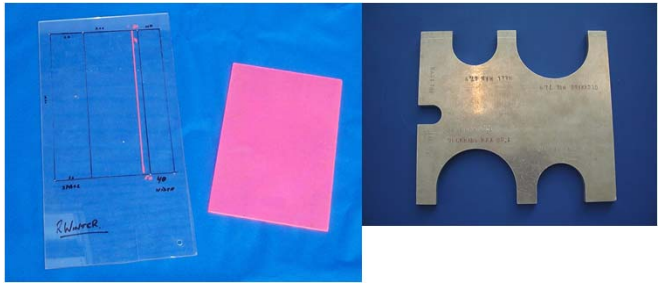
Very Special tools: Laser tracker, digital arm, reflectorless total station.

Scales & jacks

Hull Jigs

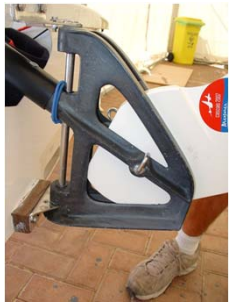
Special hull baseline systems (“Strongback”)

Templates, Go/no go gauges



Digital Cameras, good macro lens!

Event Limitation Stamps or Labels
Event inspection forms



Further reading: Int. Measurer's Manual

- Section F: Accuracy, Precision and Reproducibility

  Detailed description of definitions, units, standards, errors. Measurement techniques

- Section G: Measurement Equipment

And…
Technical Documents

- Racing Rules of Sailing (RRS)
- Equipment Rules of Sailing (ERS)
- Class Rules & Interpretations
- Class measurement forms
- National prescriptions
- ISAF Regulation 20 (Advertising Code)

Technical Manuals & Guides

- IM Manual
- Class specific guides

- **Guide to Sail Measurement**
- **new EQSC Guides**

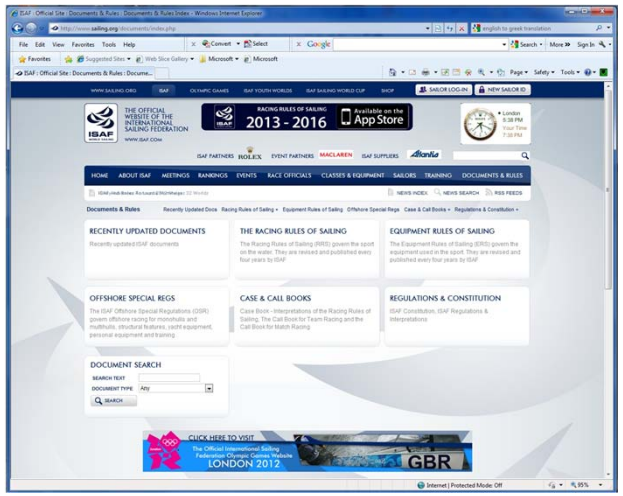
IM Manual v2013 Sections:

A The Basics
B IM Programme
C IM Qualities

E Measurement Fundamentals
F Accuracy, Precision and Reproducibility of Measurement
G Measurement Tools
H Hull Measurement
I Hull Appendages
J Rigs
K Sails
L Equipment Inspection
M Measurement Protests

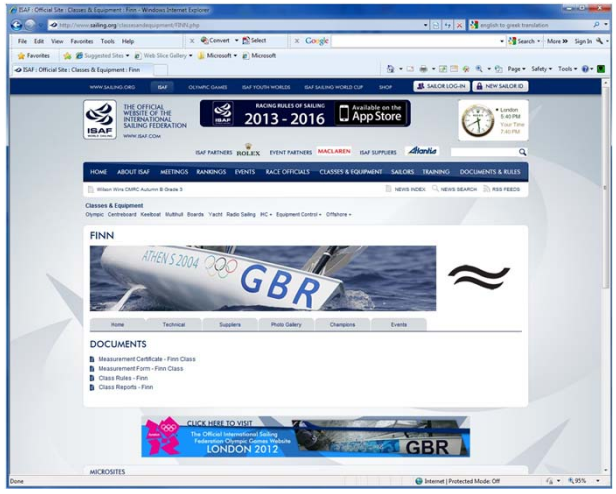
Z Glossary, Conversion Factors & Material Data

Sections 1,2,3,4,5 and 6 form the Race Officials "Common Sections"



0815 ISAF International Measurers' Seminar 141

0815 ISAF International Measurers' Seminar 142



0815 ISAF International Measurers' Seminar 143

ISAF

HULL PROTOTYPE MEASUREMENT

0815 ISAF International Measurers' Seminar 144

Prototype measurement: a procedure for measurement-controlled Classes where builders get licensed for mass production of hulls from moulds they make themselves. It is the actual full measurement of the first hull coming out of a mould, and NOT of the plug used to make the mould.

Who gives the license? Normally the ISAF, in consultation with the Class and MNA of the builder

Who does it? Under the ISAF regulations and ERS, a Class International Measurer. Normally this is agreed between the ISAF and the Class.

Why? To check that a mould has the potential to produce class-legal boats. It doesn't necessarily remove the need to measure each production hull individually!

Hull shape measurement:

a procedure to get certain dimensions of a hull's external surface, and finally compare the hull shape with the original as-designed shape. The latter may require the use of special templates which outline the "standard" shape of a particular "section" of the hull, or –in case the hull shape permits, as in chine hulls- may be accomplished with direct comparison to a set of XYZ offsets

ERS terminology? Incomplete as of the 2013 edition

What do we "measure"?

Hull length, width (beam) measurements between certain points, keel profile shape (rocker), bow and transom profiles and of course the external shape of the hull in certain sections (stations or "frames")

Reference system

a **Hull Datum Point** to start taking measurements from and a Cartesian axis system to define the major axes:
Longitudinal, vertical and transverse.
These are related to a "baseline" defined in the Class Rules (usually an imaginary line parallel to the designed waterline) and the hull center-plane (**hull** in **Measurement trim**).

Once the reference system is defined and in place, **measurement "stations"** can be defined as transverse sections "cut" through the hull at certain longitudinal positions according to class rules.

ERS H.3.1: For a **boat**, unless otherwise specified, words such as "fore", "aft", "above", "below", "height", "depth", "length", "beam", "freeboard", "inboard" and "outboard" shall be taken to refer to the **boat** in **measurement trim**.
All measurements denoted by these, or similar words, shall be taken parallel to one of the three **major axes**.

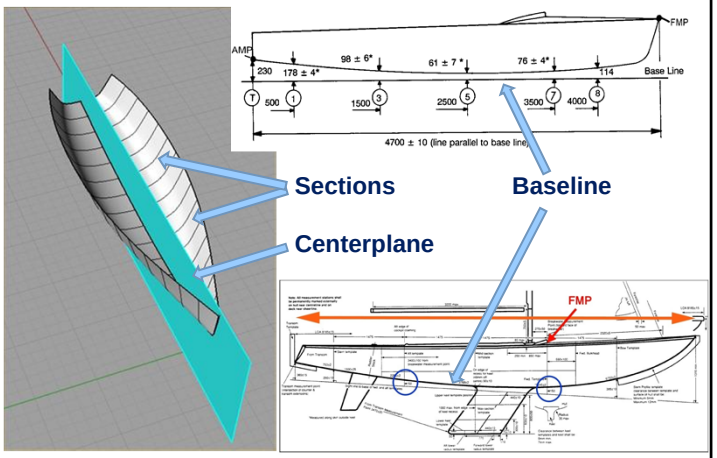
The standard Cartesian axis system may be called a **"Gravitational Coordinate system"**

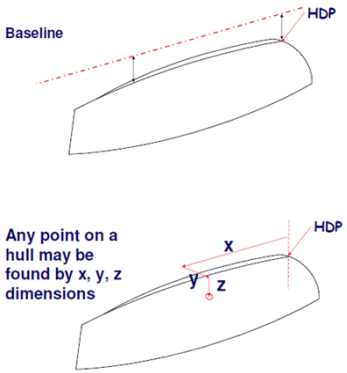
Price to pay? locating the measurement stations at the sheerline and keel needs **special equipment** and **takes time** to set up properly and accurately;

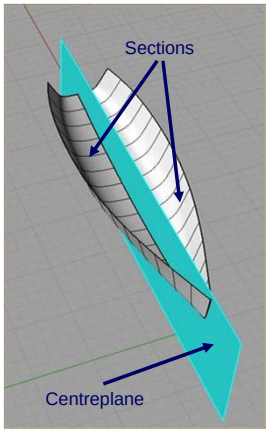
Stations maybe also defined at pre-determined points along the curve of the sheerline and keel, eliminating the need for precise leveling of the hull: this is the **"Hull Coordinate system"**

Easier setup but Measurement sections on a hull may not correspond exactly to the actual design section planes

Tip: when using the latter system, hulls often carry scribed or punched marks to show the section points on keel and sheerline.







How to make a "baseline" for measurement purposes?

Principally it depends on hull size:

Small keelboats and dinghies: light string, or preferably a **stiff** beam may serve adequately as a baseline.
Bigger boats: Dumpy levels

Always try to use tools that you can handle with minimal assistance! And choose the right tool for each job!

Beams bend and lines sag! Beam sag should be measured & taken into account.

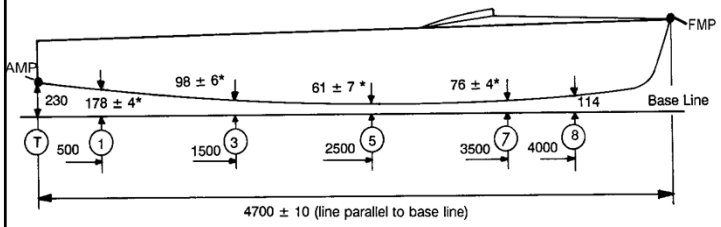
Hulls bend! Sag also depends on the support positions.

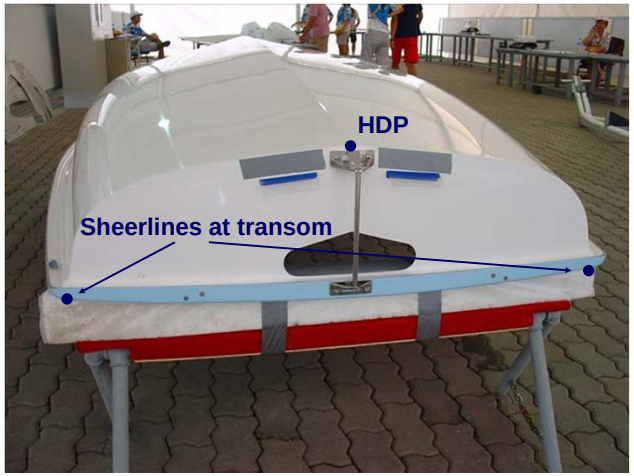
CASE STUDY:
Dinghy measurement using a stiff beam baseline & hull templates

Toolkit

- "Strongback" system: aluminum beam in 3 pieces, special "legs" to set the beam at the proper height from hull, triangle to define transverse sections, suction cup setting arm
- Torpedo Laser level (or big Carpenter's square)
- Self levelling Laser
- Ruler, tape measure, adjustable square
- Plumb bob, plasticine, pencils, masking tape
- Sheerline finder
- Official set of templates
- Car jack
- Trestles, support for the hull

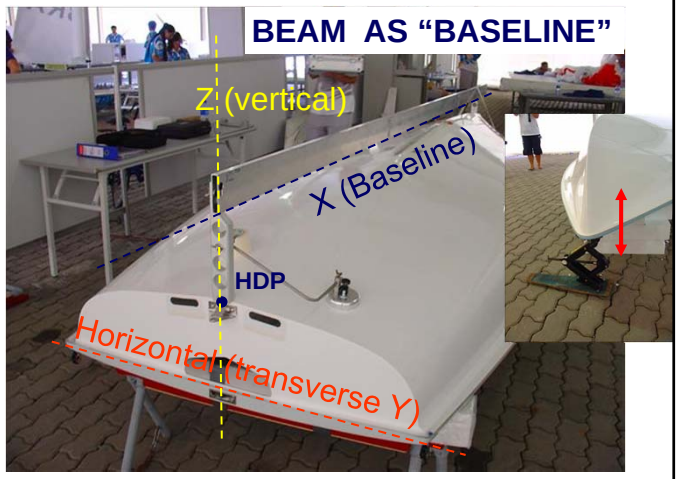
The Rules

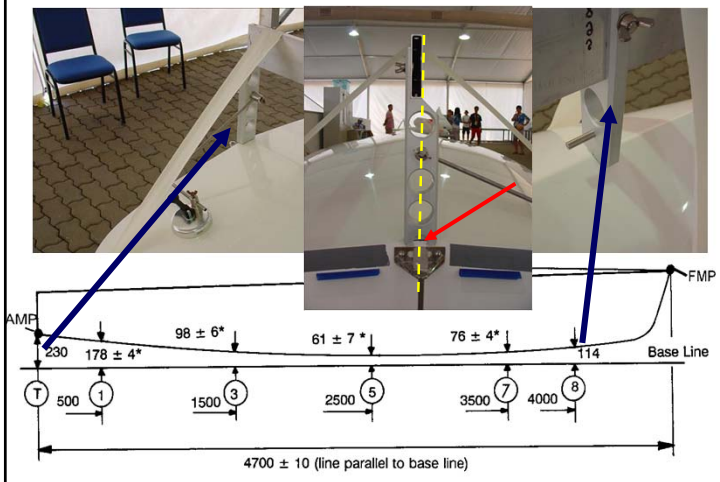




- Verify that the transom support is level
- Find the sheerlines port and starboard
- Mark a set distance from each sheerline on the hull-transom intersection. Find the middle point: this is our HDP
- The bow is placed on a car jack.

Boat is now horizontally levelled on the transverse axis





- Assemble the strongback: legs are 230mm long at transom and 114mm at the front. So the beam will be positioned at the correct height above the hull
- Put the system on the hull (one assistant). Front leg should be touching the highest point of the keel at that section.
- Use a level or plumb bob to set the transom leg exactly vertical. Use the suction cup system to fix the strongback on the hull. Use tape as backup
- Set the self-levelling laser on the side. Adjust the jack to level the beam horizontally using the laser line. Water tube works the same way

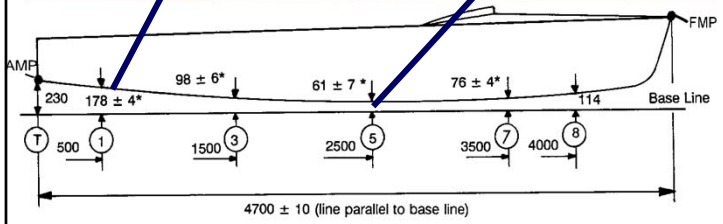
Boat is now horizontally levelled on the longitudinal axis!

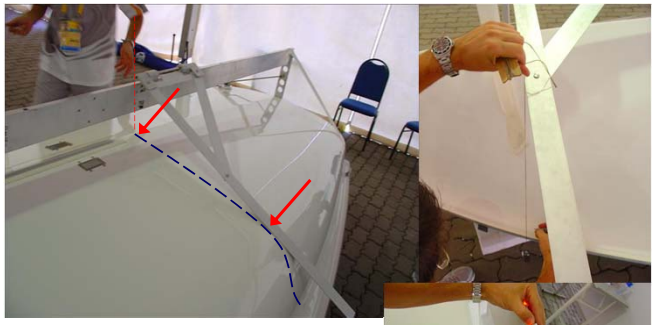
- The strongback beam has scribe lines at the measurement stations. No need for a tape measure to find them (but verify them before you start!)
- Measure the actual sagging of the beam on each station. Use the torpedo level and write on the beam the exact figures in mm

- Use the adjustable square and a ruler to measure the rocker on each station
- Put masking tape on hull and mark the section points along the keel
- Measure items like the case ends and the centreboard pivot

Boat has marked stations on the centerplane

Keel profile





Section marking by triangulation or laser square

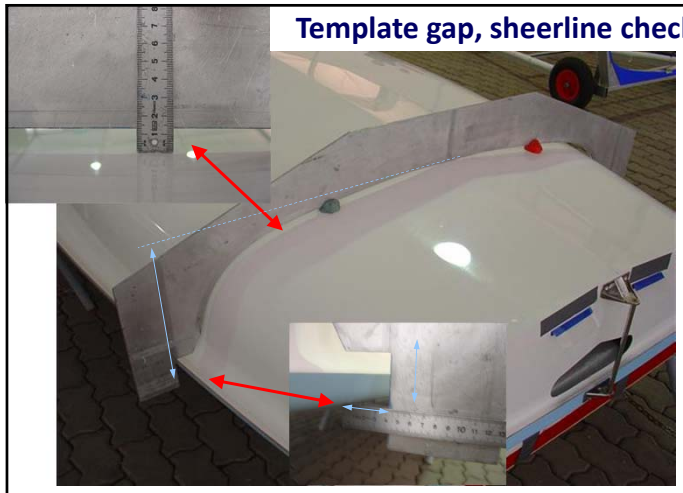
- Use the pivoting square angle of the system to transfer the marks for each station port and starboard. Use masking tape!
- This may be also done with the laser square, or a Carpenter's square
- Use a plumb bob to mark stations at the bow, and to check the position of the chain plates. Use plumb bob or laser to mark a reference point for the hull length. Measure the height of the baseline above the stem

Boat has fully marked stations (port, starboard and keel)

- Remember: 2 points define a line, 3 points define a plane

Template positioning

Template gap, sheerline check



- Remove the strongback beam.
- Start putting the station templates one by one. Use plasticine to fix them on the hull. Place centre scribe line of template over the marked point on keel.
- Rotate the template so that the gaps on both sides of the hull and that the sheerline heights are within the tolerances
- Use a ruler, not a wedge
- Put the stem template on the keel to check profile and sheerline height. Use a level to keep it horizontally aligned.

End of hull surface measurement

Variations of a main theme

Finn
Same procedure but stem template is positioned depending on hull length: Longer hulls have the template more forward and vice versa. Templates cannot be rotated because of their construction and they don't need to touch the hull at the centerplane.

420
It has both stem and transom templates. They may be fixed with clamps on the beam instead of the legs: They have the baseline position inscribed on them

Europe
Fundamental difference: In previous cases, the templates "follow" the rocker shape of each boat up and down. The Europe fixes the templates at the "as designed" position. So they are set at heights depending on the actual difference of each station rocker measurement from the "standard". And their top edge is straight and has to be set so it is horizontal

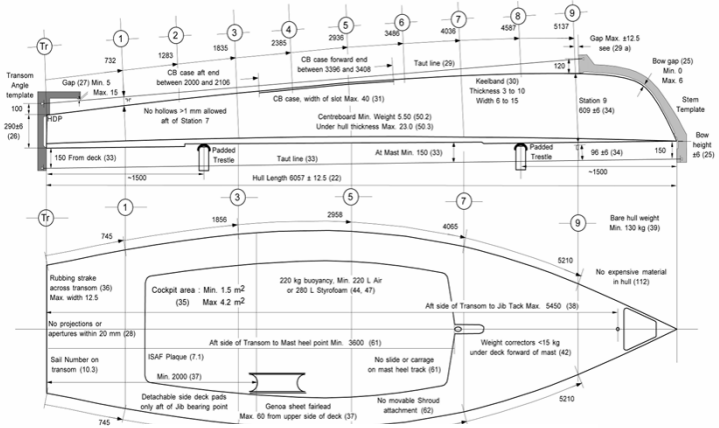
Variations of a main theme

Tornado
The Stem template defines the HDP, in relation with the 5m station template. This requires movement of both templates along the keel and bow centreline.

FD, Yngling & Star
Hull coordinate system for the positioning of templates.

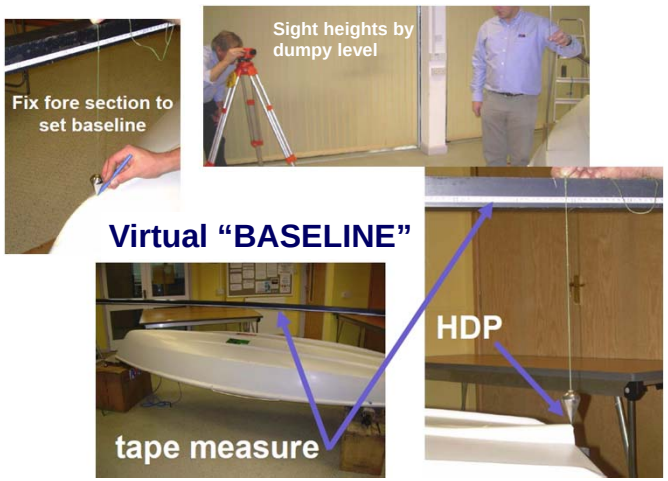
Optimist
Optimists use no templates, because they have a chine hull with a "flat" section bottom. Measure rocker heights and transfer the station positions on the chine in the standard way. Then use the Optimist edge zone finder to mark the measurement points on each section and use a tape or ruler to measure the bottom widths.

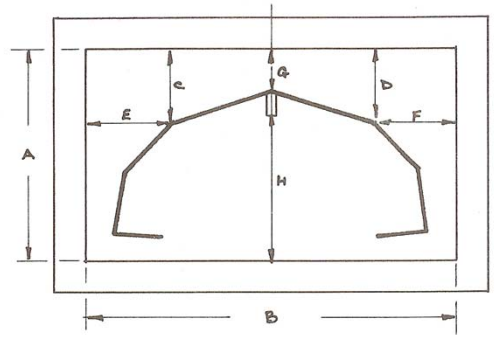
Tip:
Make sure the templates are not warped, and use a mylar pattern or control point distances to check their accuracy.



Hull coordinate system (FD)

Clockwise from top left: Europe, FD, 420, Finn, Finn





Chine hulls, y & z point coordinates using a "Chippendale" frame

See also IM Manual: Section H

Equipment Inspection

What is Equipment Inspection?

Equipment inspection or regatta / event measurement is a formal procedure to check compliance with the class rules, ranging from checking certain items only, like the weight of boats or sail measurements, to almost complete measurement of all competing boats.

In major events like World or Continental Championships and certainly at the Olympic Games, this task should be done by a team led by International Measurers.

Fundamental issues to deal with:

- Number of classes present at the event
  - Single Class events (most common scenario for IMs)
  - Multi Class events (ISAF Grade 1, national events etc.)
- Type of Classes present
  - Manufacturer-controlled
  - Measurement-controlled
- Desired Level of inspections
- Facilities & resources available

- **Single Class events:**

  World or Continental Class Championships
  - Class IM leading the measurement committee
  - Preparations and facilities for higher level inspections
- **Multi Class events**

  ISAF events, Grade 1, major national events etc
  - IM, preferably related to some of the participating classes, leading the measurement committee
  - Preparations and facilities usually for lower level inspections

For inspection purposes, Olympic Games and Combined World Championships should be treated as group of single class events. The "Event Chief Measurer" is an overall manager but for each class, inspection teams should be led by Class IMs.

Levels of Inspection

The following are recommendations: they may be adapted to suit local conditions, event-specific requirements and above all, the nature of each Class.

- LEVEL 1 – (National events)
  - Only Measurement Certificate + Safety equipment
- LEVEL 2 – (National Championships)
  - Measurement Certificate + Sails + Safety equipment + Corrector weights
- LEVEL 3 – (Nat. Championships of Olympic Classes or major International Events)
  - Measurement Certificate + Sails + Weight and C-W + Safety equipment + Limit marks on spars

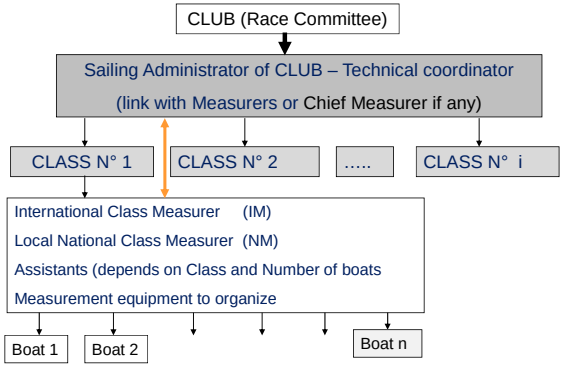
Levels of Inspection

- LEVEL 4 (Olympic Qualifiers, Continental + World Championships)
  - Measurement Certificate + Sails + Weight + CW + Marks on Spars + selected items + Safety equipment
- LEVEL 5 – (Olympic Regatta)
  - Measurement Certificate + (Almost) full Measurement + Safety equipment

Minimum requirements
Levels 4&5

- Facilities required:
  - Under cover, out of the wind, enough space to do everything in one place, with separate entry and exit points when possible.
- Measurement program
  - Production line method (stations)
  - Timetable depending on available time and the required level of inspection
  - Adequate number of Qualified Measurers + assistants

Flowchart



General Guidelines

- Notice of Race and Sailing Instructions to specify in detail the inspection procedures. Any "measurement instructions" to accompany the SI on the notice board
- Equipment that has been inspected should be specially marked. This is very important for equipment that its replacement is restricted by class rules (event limitation marks).
- Inspections should be performed during both the pre-event designated time and during the racing days.
- General plan for the actual inspection process (timetables, decisions on items to be inspected, requirements in area tables and equipment to be provided by the OA) formulated with the assistance of the Class.

General Guidelines

- Special "measurement forms" using the go/no go system.
- Use of jigs, templates, measuring rods wherever possible; avoid the use of measurement tapes etc; use the simplest equipment that can do the job!
- Sail measurement on tables if possible.
- Special equipment brought in by the Class or IM (swing test, hull templates etc). Scales may be provided by the OA.

General Guidelines

- Measurer's boat (when needed)
- General plan for the actual inspection process (timetables, decisions on items to be inspected, requirements in area, tables and equipment to be provided by the OA): TO BE DEVELOPED BY THE CLASS and USED IN A STANDARD WAY.
- If a part does not comply when inspected with templates, the check must be repeated by a qualified person and if it still does not comply, rechecked using measurement tools and fundamental measurement techniques.

General Guidelines

- In addition to the general plan for the inspection process, it is advisable to have in place a policy document about the procedure: How the measurement team will operate, describing for example how the chief measurer will interact with competitors, or how the on-the-water inspection will be performed. In addition, there has to be an agreement with the RC about the protocol for Medal race quarantine and inspection.

At the moment there is an ISAF policy document about the Olympic Games and Combined Worlds: this will be developed in the future as a template for use by classes.

Guidelines for Multi-Class events

In addition to the general guidelines, a person in charge of a multi-class event inspection should consider the following:

"Important" items vary by class, so

- Seek the advice of each Class Chief Measurer, who is a recognized expert and should be able to offer proper guidance on what to look for
- The number of items to inspect depends heavily on available resources: manpower, facilities, current measurement issues of each class and of course time: In case of problems, reduce the total number of items or the number of boats that will be inspected on that level.

Guidelines for Multi-Class events (2)

The person in charge of a multi-class event inspection is the manager of a team of inspectors who will lead each class inspection:

- Allocates resources according to real time needs (e.g. helpers, RIBs)
- Forms a multi-person committee to deal with measurement problems, questions and protests.
- Liaises with RC and Jury on all matters affecting cross-committee coordination (or appoints a delegate)

Morning and afternoon briefings are a good way of managing this kind of teams.

Pre-event Responsibilities

Before accepting a measurement committee appointment:

- Ensure you have no conflict of interest. The ISAF ROC is the body to decide in case of doubt
- Ensure you can commit for the duration of the event
- If this is a Multi-Class event, ensure you feel you can manage it!
- Decline the invitation if there is any problem!

Pre-event Responsibilities

After accepting the appointment:

- Obtain and review the draft versions of the NoR, sailing and measurement instructions. Approve and finalize the parts that affect inspection.
- Contact the Class Chief Measurer. Ensure you have the latest information on the Class inspection procedures, current class rules and all relevant documents. Ensure your toolkit includes all the required tools and equipment! Don't expect to find at the venue what you need: chances are that either the quality will be below standard or many things will be missing.
- Normally the OA has a coordinator appointed. Find his contact details, you must liaise with him and he expects your guidance and instructions for the preparations.

Pre-event Responsibilities of the Event Chief Measurer

Review all documents and send the final versions to the OA, including inspection & equipment replacement/repair forms

Liaise with OA on logistics

- Housing
- Transportation
- Equipment provided by OA and Class
- Measurement facilities (ashore and on-water)
- Manpower requirements
- Measurement team arrangements

When you arrive at the venue, do not expect to get anything that you have not specifically asked for in advance!

Make sure that the available facilities meet the class/your requirements; ask for photos, plans etc.

At the Venue

Always plan to arrive early, having at least one day for preparations before the first day of inspections.

Once there,

- Meet the local measurer/coordinator as soon as possible
- Ensure that the facilities and equipment the OA provides are what you had requested. Finalize the arrangement of the measurement stations as you see best fit
- Unpack your equipment and start preparing the tables, templates etc. Check that the scales are working and that they are certified/calibrated.
- Visit the club office, check that they have printed the required forms and other documents. Check that you do have a measurement notice board; put there all information to competitors, and the inspection timetable

At the Venue (2)

By mid-afternoon, everything should be in place; then,

- the assistants should arrive, to have their station assignments and specific instructions on their job
- To train the team, find a boat to get through the inspection process as your test horse
- Always test the tables, templates etc. before the actual inspection day comes: any errors will be found and rectified before they cause any harm. So, doing the team training in the afternoon before is always a good idea!
- keep training the team for as long as needed. If you must repeat the process in the next morning, you will just delay the whole inspection procedure.

Measurement Team management

Unlike Juries, MC teams almost always include people with little or no measurement /inspection experience. Keep that in mind!

- Try to understand the capabilities of your team, and don't expect them to identify important class rule issues by themselves!
- Be patient, and explain clearly what you want from them.
- Let them understand that you are the authority in the team, and you call the shots.
- Mistakes will happen; keep your temper and behave as an ISAF Race Official.
- Keep notes!

Dealing with Competitors

- Interaction depends on level of the event and age of competitors
- In all cases, friendliness, fairness and impartiality (this includes giving the right appearance)
- With young and inexperienced competitors:
  - Show care and understanding
  - Be willing to answer questions
  - Be willing to explain decisions

"Difficult" Competitors

- Be patient but firm.
- Avoid arguments and personal confrontations.
- Keep calm, keep to your plan.
- Be civil, be prepared, explain as best as you can.
- Show that you know your job and that you only want to provide a level field.

On the Water

- Measurer's boat visibility! Show your flag.
- Before the start, always stay close to the fleet.
- Don't obstruct boats, plan your moves ahead.
- At the finish, pick a spot that will give you easy access to finished boats without obstructing the RC or Media boats.
- Do not interact with competitors unless you are inspecting something in their boat.

Liaising with RC and PC

- RR87 The sailing instructions may change a class rule only when the class rules permit the change, or when written permission of the class association for the change is displayed on the official notice board. See also Class rules for the permitted procedure.
- RR86.1(c) Class rules may change only racing rules 42, 49, 50, 51, 52, 53 and 54. Such changes shall refer specifically to the rule and state the change.
- RR90.2(c) Changes to the sailing instructions shall be in writing and posted on the official notice board before the time stated in the sailing instructions or, on the water, communicated to each boat before her warning signal. Oral changes may be given only on the water, and only if the procedure is stated in the sailing instructions.
- RR89.2 (a) The organizing authority shall publish a notice of race that conforms to rule J1. The notice of race may be changed provided adequate notice is given.

Case Study: 150+ dinghy fleet World Championship (Level 4)

Planning

- How many days for inspection? 3
- How many boats? 150
- How much time needed per boat? 10'
- Total time needed: 1500' or 25 hours , about $8^1/_3$ hours per day.
- So every day from 0930 to around 1900, including one 60 minute lunch break

Planning

- If the combination of number of boats and the prescribed inspection days does not allow for the standard time slots (e.g. 10' per boat):
  - Reduce the number of items to be inspected
  - Reduce the number only on part of the fleet (either by using ranking lists or randomly)
  - Think about running TWO inspection lines in parallel, doubling those stations that are necessary: Maybe one boat weight station is enough, but two separate sail and rig stations are needed. The idea is to minimize idling stations waiting for others to finish first.

Planning

- How many people in the team? Depends on the number of stations!
- How many stations do we need to man? Depends on what we want to do:
  - Hull station, to check the boat weight
  - Rig station, to check mast boom and spinnaker pole
  - Sail station, to check Main, jib and spinnaker
  - Foils station, for centerboard and rudder
  - Secretary desk

Planning

- Hull, rig and sail stations need at least two persons each. Ideally one in each station should have some measurement experience. The foils may be managed by a single person only. Therefore, we need at least 8 persons, including one secretary but EXCLUDING the chief measurer, who is a Class IM.
- Depending on the class, some stations may be combined, saving manpower (e.g. hull and appendage station in case of certain keelboat classes).

Planning

- Normally, the Chief Measurer should NOT be manning a station. He should be in charge of the team, taking final decisions, and checking equipment by himself only when the assistants find problems.
- To speed up the process and to ensure that boats are ready, there has to be a "pre-inspection" of boats as they line up in the queue outside the measurement area.
  - So, a second Class IM may be appointed, to assist the CM in his duties, departing after the end of the last measurement day.
  - If that's not possible, the best of the local team members should help the IM in charge.
  - **Total number of persons in the team: 10 with 8 from the OA side**

Planning

Next step, facilities and equipment requirements:

- Enclosed space (building or well-made tent) to accommodate
  - a sail table large enough to spread a mainsail on top,
  - a spar table to put a mast with the boom attached, and
  - a table to put a centerboard and rudder on top.
  - Enough space in between to move a boat through and a protected place large enough to accommodate a scale with the hull on top.
- This place has to be connected to the boat park, and preferably it must have separate entry and exit points that can be closed to keep wind out.
- In a hot climate venue, it may be necessary to have an air-conditioning system or ensure that the area is adequately ventilated without causing problems with draughts.

Planning

- Tables with good quality surface (ideally melamine) that the CM can cut, write on with markers and fix tape marks etc. These tables must be ready and any joints fixed properly in the morning the CM arrives at the venue. Insist on that!
- Do we need scales? Yes, one for the hull and one each for the rig and foils. Platform scales are better because they are faster to use.
  - Class owned? Need to be transported and re-calibrated
  - OA-provided? Check the specifications, calibrate them
  - Ask for a set of calibration weights for the duration of inspections
- A toolbox with essential basic hand tools and a selection of screws: many hours have been lost for lack of a screwdriver or a couple of screws that were not long enough!

Planning

Is it over? NOT YET!

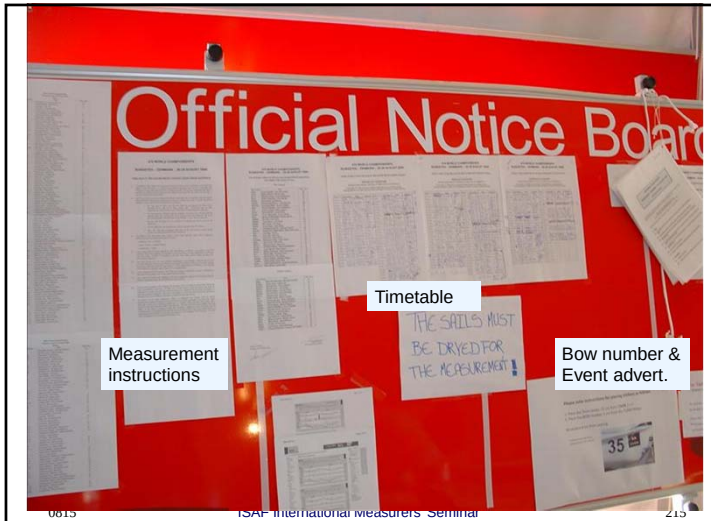
- Event limitation marks for our equipment:
  - A stamp with good quality ink or stickers for sail marking
  - Waterproof stickers for hull, spars and foils. Some extras for corrector weights and replacements for damaged ones
    - Number? 3 per rig set, 2 for foils and 1 per hull X 150 = **at least 900.** Adding enough for losses, replacements and correctors, **minimum 1200**
    - Design? Bright colors are better, round shapes more difficult to peel off, narrow rectangular shapes better suited for foils!
- Not to forget: markers, pens, duct, masking and clear tape, and spray paint (black and white). Other simple things like a straight bar/edge

Guidance:

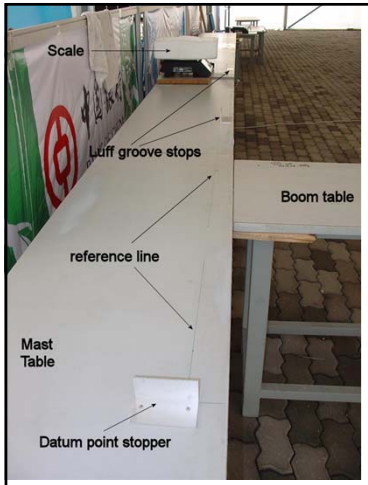
- All information regarding preparations has to be sent to the OA well in advance. Follow up from time to time to keep the pressure on them.
- Don't re-invent the wheel each time: The class –with your help- can develop a standard document that describes in detail what is needed from the OA side. Send it at the time they sign the contract for the event.
- "Spy" on other classes: they may be doing things with better efficiency than you do. Learn and adopt what seems to work better. Grab every opportunity you can get to be in other classes' event MCs.

Fixed Measurement Area, separate entry & exit

Tent Measurement Area, same entry & exit point



See also IM Manual: Section L



Rig table preparation

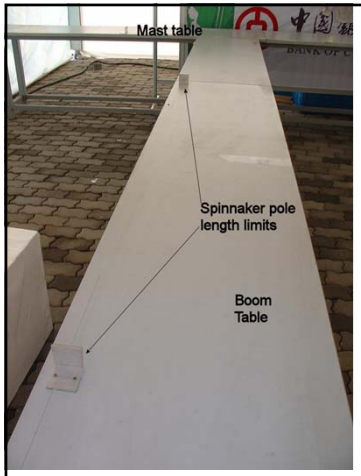
- Table with flat clean surface
- Length to accommodate a mast
- Width: 30-40 cm

Steps:

1. Draw the reference line (string, laser)
2. Mark point zero (datum)
3. Mark on the reference line the points you need: lower & upper points, rigging points etc
4. Fix at least two devices to act as sail track stoppers: above the boom and above the spreader
5. Fix a strong angle on the datum point
6. Draw mark lines at the measurement points and cover them with clear tape

Rig table preparation

- Cut-outs to accommodate the spreaders without the need to remove them
- Mast weight scale near the centre of gravity for the mast. Foam block to raise the mast from the table and to provide a bigger support area
- Rigging point marks color-coded. Pre-printed mylar template also possible. Cover every mark with clear tape for protection.



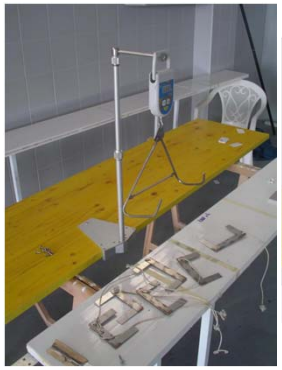
Rig table preparation

- Boom table: same stuff as mast table
- Length to accommodate a boom
- Width: 30-40 cm is enough
- Spinnaker pole also goes here

Steps:

1. Draw the boom reference line (laser square, geometric methods) from the lower point mark
2. Mark outer point
3. Draw another straight line for the pole. Mark a datum point and another point at the maximum pole length
4. Fix a strong angle on each marked point
5. Draw mark line at the outer point and cover with clear tape

More options!

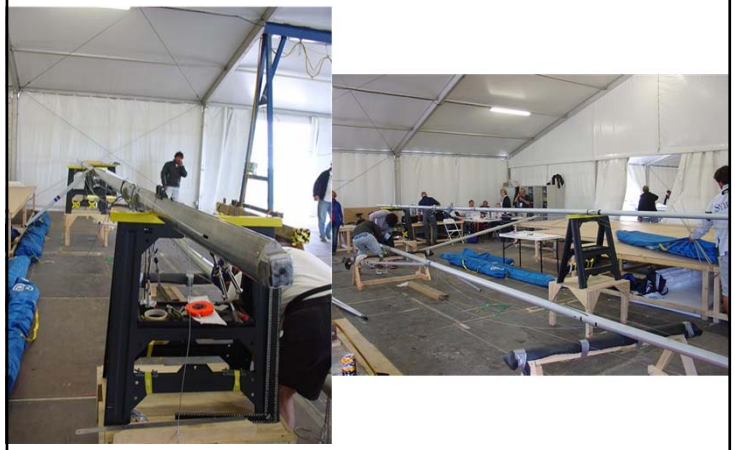


Rig table preparation, final notes

- Bring along all angles/stops needed. It is not easy to find them at the venue. Laser lines and squares minimize the time needed to prepare the reference lines
- Mark the floor around the table supports; if it moves you will notice it
- Cut out parts of the table where it is likely to have a mast fitting on the side or a compass bracket. If you don't, the mast will not rest flat on the side!
- Some classes measure the boom separately from the mast. Then you only need one (wider) table for all.
- Check the marks from time to time, especially if the weather conditions change.

What if?

- We are inspecting a big keelboat?
  - Instead of tables you may use trestles to lay the mast on top. But then you must use measurement tapes, not really recommended for inexperienced assistants. So, a measurer should be doing this control. And of course, there is no automatic inspection process, you must write down all the dimensions the assistant needs to check.
- You arrive and the tables are not in place or fixed?
  - Don't panic! But this is why you must be able to handle tools, and of course use your brains: improvise with what you see lying around.



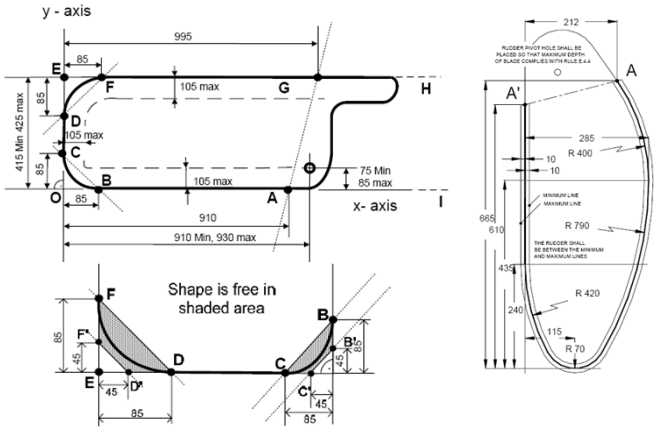
See also IM Manual: Section J

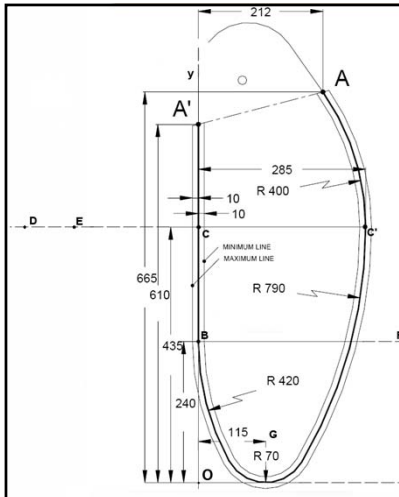
Foil template preparation

Foils with a curved profile or with straight edges?

- If the former, Classes are using a standard template, aluminum or wooden. So, nothing to prepare other than unpacking and putting the template on a flat surface
- If the latter, maybe there is a template, but sometimes it has to be prepared on the spot
- In any case, you must know how to do it if needed! Some curved foil edges are just arcs!

Example: 420 rudder and centreboard





- Table with flat, clean, smooth surface. A panel of melamine is adequate.
- Draw the standard profile, then add min and max profiles in the same way

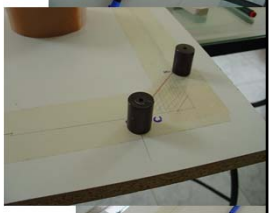
Steps:

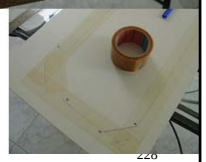
1. Mark point zero (datum)
2. Draw reference lines for the axis system Ox and Oy
3. Measure and mark points B, C, A' on axis Oy
4. Draw parallel lines to Ox from B and C
5. Measure and mark points C' D, E, F and G
6. Draw arcs with the appropriate radii from D, E F and G.

Foil template preparation

General guidelines

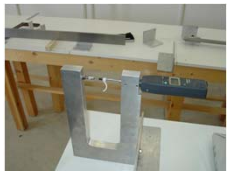
- Check the class rules: there must be an axis system or reference points to start from
- Draw this system on a panel. Decide now which dimensions to check
- Mark all the necessary positions with their tolerances: Mark the inside or outside of their edges
- Fix any devices you need to define the reference points
- Cover marks with clear tape





Other Measurements

Thickness and weight:

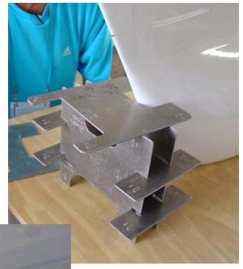


Specially modified micrometer, slot tool, hanging or platform scale. Thickness tools brought by the Class.

What if?

- We are inspecting a big keelboat?
  - You can't lay a keel on a table... But their rules usually define points on the keel profile measured from the hull or transom, and then section templates are applied to check the shape. One less station to have (may be combined with the hull weight one) but the measurement points have to be found by a measurer and marked on the keel before using the templates.






Section marking

See also IM Manual: Section I

Weight Control Station

- Area wide enough to accommodate two hulls side by side: Scale on one side, boat trailed in to the other side
- Platform scale for all boats that can be physically lifted. Faster and easier to use, by one assistant and the 2 crew members
- Have a set of calibration weights nearby, always check the scale at least every morning before you start!

Keelboats again…

- Hanging scale
- Crane system
- Inside a protected space
- NOT the dock launching crane -if you can avoid it!
- Take care when lifting hulls; no people under the boat when it is hanging on the scale!

See also IM Manual: Sections F & H

Sail table preparation

- Table with flat clean surface
- Dimensions: large enough to accommodate a mainsail
- With more assistants and space, a second table for jib and spinnaker

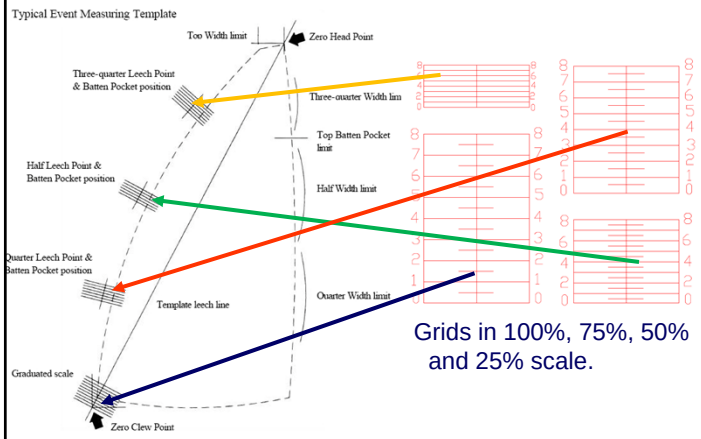
Steps:

1. Use a mainsail to see how it fits on the table. Mark the head and clew areas on the table
2. Do the same with the jib (all corners)
3. All spinnaker measurement marks can be put in one line, near the edge of the table
4. Make sure that the assistants can reach the sails in your designated positions before you start fixing the marks

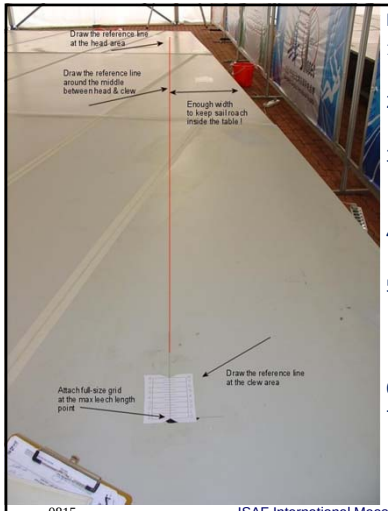
Sail table preparation, considerations

- Make the table in such a way that the sails will be laid down with the side for stamping on top. In our case, all limitation stamps will be put on port tack clews.
- If you are going to measure a lot of sails, a grid system always helps because it saves folding time to find leech points. Laser tools also save a lot of time and effort
- Decide what you want to check: some dimensions are more "dangerous" than others, as sailmakers try to exploit the tolerances. Class experience pays here, to know what is usually safe to ignore –but make sure your data is up to date!
- If using one table for all sails, color-code the marks for each sail
- Try to have around some official measurer who is not member of the MC, to certify any uncertified sails

"Automated" Sail table example

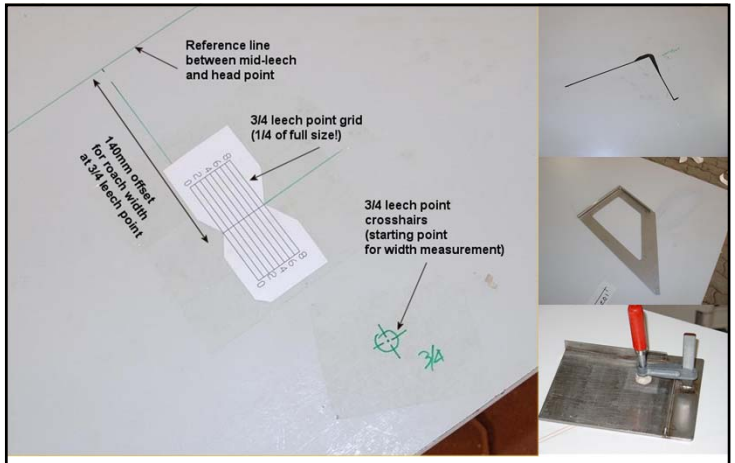


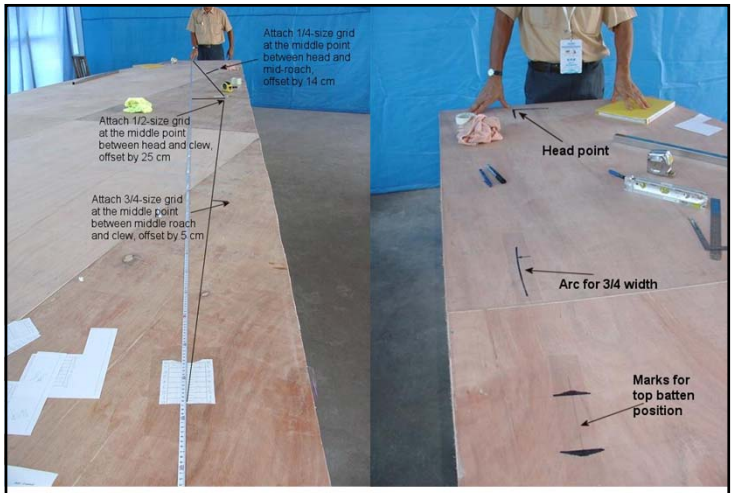
Grids in 100%, 75%, 50% and 25% scale.



Mainsail, Steps:

1. Mark the datum point for leech measurements (head point)
2. Draw the reference line at the head, clew and middle areas
3. Print a set of grids on transparency film. Paper is also Ok if it is covered carefully with clear tape
4. Attach the Full size grid at the maximum leech length point
5. From the middle point (between head and max clew) mark measure an appropriate distance out and mark this line
6. Attach the ½ size grid there
7. Draw reference lines from that offset middle point to head and clew

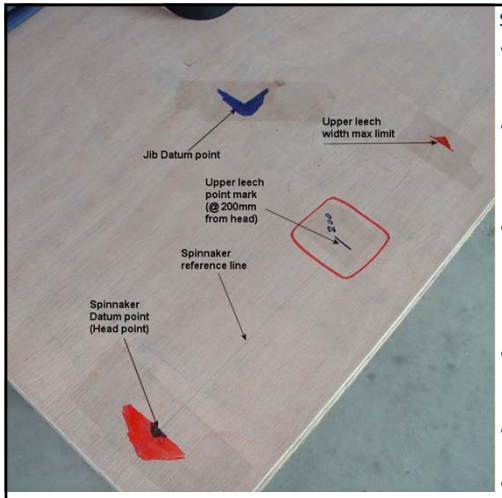




Mainsail, Steps:

- Make datum points near the leech measurement points
- Draw arcs to make the limits for the sail widths
- Mark limits for the top batten inner end

- For quick reference, a copy of Section G rules may be attached on a sail table corner



Spinnaker, Steps:

- Mark the datum point for leech measurements (head point)
- Draw the reference line all the way down to the foot median maximum length
- Print a set of grids on transparency film. Paper is also Ok if it is covered carefully with clear tape
- Attach the Full size grid at the maximum leech length point
- Attach the ½ grid at the half leech point
- Attach the ¾ grid at the ¾ leech length point

Spinnaker, Steps:

- Mark the maximum foot median point
- Mark the upper leech point
- Using the leech datum point, measure from there and mark the foot, ½, ¾ and upper width lengths

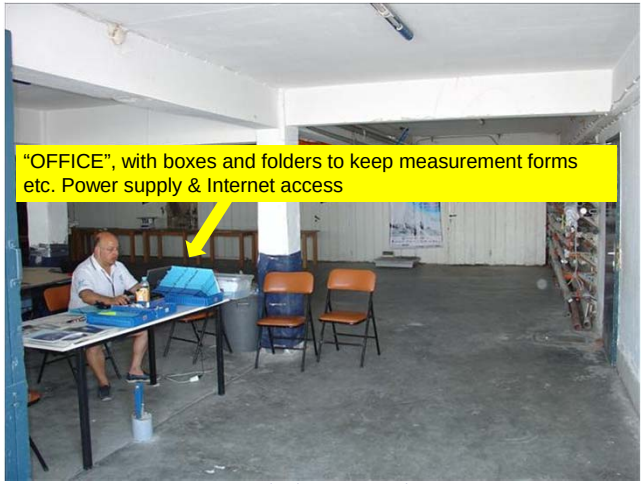
Jib, steps

- Head point is datum for luff, leech and foot median lengths
- Mark also the limits for the foot length.
- No need for grids here, only the foot needs folding

Again, What if?

- Big boat classes have large sails; you may need the club parking lot for proper inspection!
- Usually their rules permit more than the usual 2-3 sails of a dinghy. More time, or more people needed; Spot checks only on partial inventories.
- In smaller-sized classes, it may pay to have a sail template printed in full size on mylar: this only needs to be unrolled and fixed on a flat surface.

See also IM Manual: Section K



Inspection Process

- Who comes first? How to define the order?
  - Full teams by Country. Home team given the option to come first or last. Draw and/or alphabetical order.
  - Individual boats. Timetable with slots for filling up by competitors
- Same level of inspections for all boats or simplified for some? Is there enough time? Is there a method to group boats into full and simple controls?
  - Ranking lists, or random pick from each Country
  - In our example, all boats in the top-30 or the RL and then more in random so that each Country will have at least one boat with full inspection. Thus, the latest RL must be available and the list of the Full inspection boats posted together with the timetable.

Inspection Process

- It may pay to pre-assign slots for full or simple inspection according to the actual ratio of the fleet. Then you won't get 10 full inspection boats in a row!
- Make sure that the timetable is posted at the time prescribed in the measurement instructions, and that the secretary is present to oversee the process
- Check that all relevant documents are posted clearly on the notice board: measurement instructions, timetable, list of full inspection boats. If you have special instructions for the competitors, post them here: it certainly pays to have a clear list of things to prepare in one's boat.

Inspection Process

What to check:

- Full inspection
  - Certificate, measurement form, ISAF and builder plaques
  - Rig: dimensions and mast weight. Stoppers when rigged
  - Illegal equipment –always look for non-standard fittings!
  - Foils: shape and weight
  - Sails: dimensions & identification
  - Boat weight, safety equipment

Inspection Process

What to check:

- Simplified inspection
  - Certificate, measurement form, ISAF and builder plaques
  - Rig: mast weight (?) and limit marks if missing. Stoppers when rigged
  - Illegal equipment –always look for non-standard fittings!
  - Foils: - (look for one-off or new builders!)
  - Sails: identification
  - Boat weight, safety equipment
- **Chief Measurer may request additional checks, on a case by case basis!**

Inspection Process

- Chief measurer shouldn't work at a station. Here we have two Class IMs: one is supervising the whole team, and the other is **Pre-Inspecting** the boats as they line up, 10 minutes or so before their assigned inspection time. To be accepted inside the measurement area,
  - Boats must have a valid measurement certificate and form
  - Boats must be dry and if possible with any correctors removed
  - Extra or illegal equipment has to be identified and set aside
  - Rig and foils have to be ready to be sent to their respective stations
  - Sails have to be dry, certified and with required class buttons & identification
  - Competitors must fill part of the inspection form: names, equipment manufacturers
  - That's the first step, and it SHOULD be performed by a Class expert!

Inspection Process

- If the boat is properly prepared it goes in, but the CM:
  - Makes sure the inspection form is filled and ready to be taken in.
  - instructs the competitors where to pass their equipment depending on their inspection level: simplified inspection boats may get the rig & foil limitation marks at this point
- If there is water in the hull or the boat is not ready (e.g. centerboard in place on a full inspection boat), it should go back in the queue and the next one advances
- If there are other issues as uncertified sails or a missing certificate, boats are taken in but the competitors are notified, details about all problems are taken on the inspection forms and a deadline for rectification is given.
- Uncertified sails are NOT inspected at this stage

Inspection Process

- The second IM oversees the work of the team, keeps order in the area and keeps a steady pace
- If a station goes faster, then he may ask the next boat to bring equipment there. But he must not over do it!
- When an item is close to or just over the limit he should re-check for himself and take the final decision. Assistants should be explicitly told NOT to take risks if something is not clearly out of limits and always ask the IMs for clarification when they see something they don't understand
- Always ensure that no successfully inspected piece of equipment leaves the area without limitation marks and properly filled inspection form
- If there is a delay (usual case on the first day…), then: urge the team to work faster, shorten lunch break, simplified inspections on some boats. Check which team is going slow and try to figure out why!

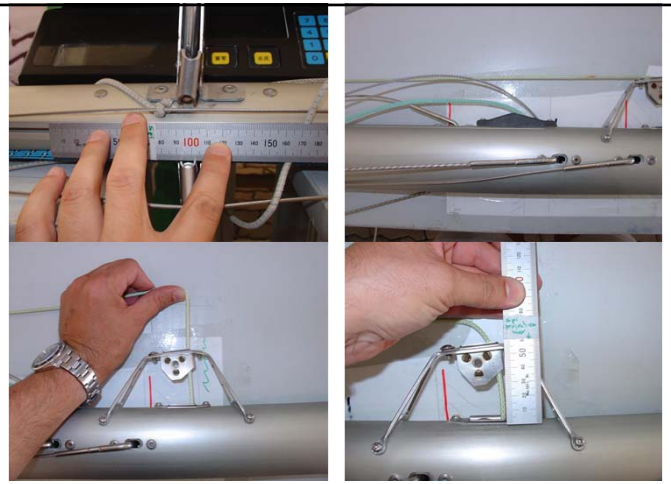
Inspection Process

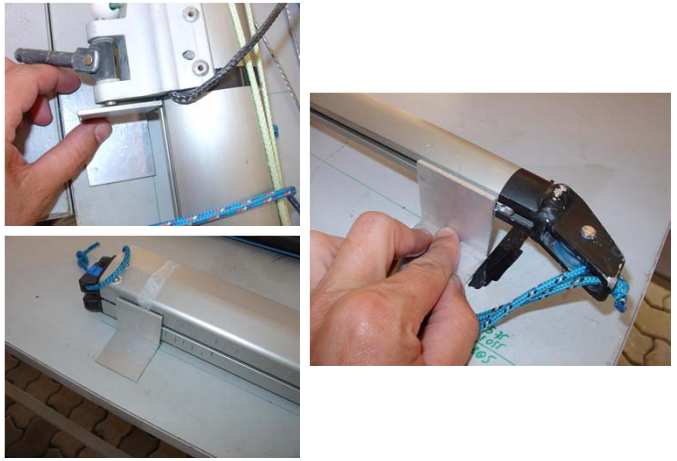
- After the first morning session, boats may have to be inspected in a fully rigged state for things like:
  - Mast and boom stopper efficiency
  - Forestay length / mast rake
  - Extra or illegal equipment not identified before, and
  - Use of equipment (like the way control lines are rigged)
- After this final inspection, IM and competitors sign the inspection form. The competitor's text declaration should give him the responsibility to verify that all equipment required to be event limitation marked has received the necessary marks (stamps, stickers etc.). Proof of successful inspection is taken back to the registration desk, to complete the registration process.

Inspection Process

- Tips:
  - When a hull needs corrector weights, these may be checked on the higher resolution mast or foil scale, and then an IM verifies that they are properly installed. Boats don't need to be brought back in the queue for this check! But foils and masts should be re-checked with the prescribed correctors on the scales.
  - Sail identification may seem to be a trivial item that does not affect boat speed. However it may cause problems to the RC and the PC. Therefore the helpers must understand their job is to check carefully letters and numbers.
  - Bow numbers and event advertisement are also a seemingly trivial item. First of all, their weight sometimes may be substantial, so they have to be installed AFTER the hull weighing process. And their position on the hull should be marked by one of the assistants: sailors usually fail to observe the instructions given
  - A checklist of the inspection items may come handy!

Some examples:
Make sure your team understands the right way to use your templates & gauges!





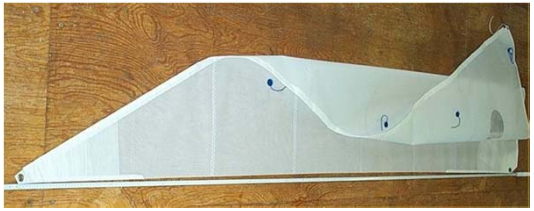
0815 ISAF International Measurers' Seminar 261

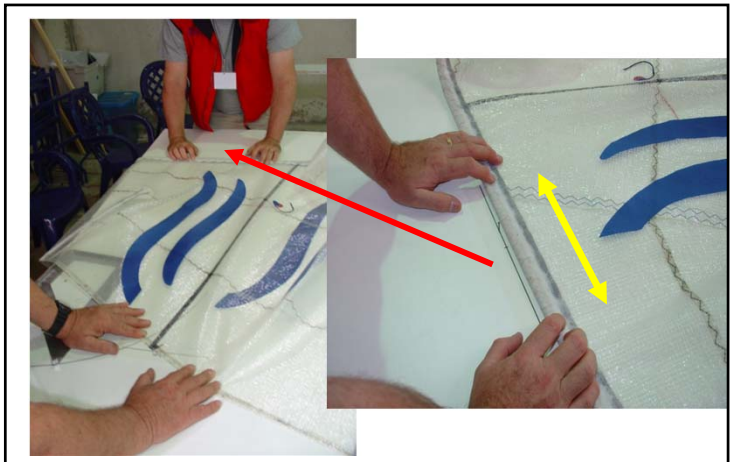
0815 ISAF International Measurers' Seminar 262

0815 ISAF International Measurers' Seminar 263

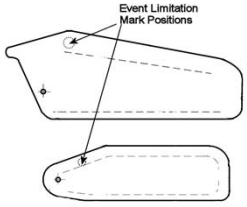
0815 ISAF International Measurers' Seminar 264

SAILS: FLATTEN, FLAKE, DON'T OVER-TENSION!





Event Limitation mark positioning: same place on ALL boats!



SAILS: NEAR CLEW ON PORT SIDE! TACK AREA IS RESERVED FOR CERTIFICATION MARKS.

IDENTIFICATION ON SAILS

HELVETICA!

1234567890

Always check national letters and numbers, class emblem, other identification (like women-only marks) and advertisement (Reg.20)

If in doubt, ask the RC and Jury for their opinion.

Racing Days

- Try to keep the measurement area and tables intact for as long as possible; bad weather might mean equipment replacements that – obviously- need inspection!
- Encourage competitors to check by themselves their spare equipment using the templates, such as:
  - Spare Spinnaker pole length
  - Rudder blade weight
  - Personal equipment weight
- Prepare equipment data sheets, including corrector weight and any other relevant information. Write down the weight of each boat on its transom and use event limitation marks as much as possible: even for equipment that carries serial numbers, this makes checks easier!

Racing Days (2)

- Make yourself visible around the boat park, keeping an eye on the fleet: Checking items that cannot be changed on the water while boats are going out removes the need for post race checks. Being on the ramp as boats come in after the race will help in cases where a team has actually changed equipment: The usual excuse is that they "changed it after they came back ashore", so there is only one way to prove things if there will be a protest.
- Always stay at the venue until at least the end of protest time. It is also recommended that this time limit applies for equipment replacement repair requests, in order to handle them at the same day. Obviously, late requests cannot be rejected but they will be handled the next day.
- Tip: Use your free time to train local measurers

ON THE WATER: POST RACE INSPECTIONS

- Try to have a second measurer aboard: you need a witness, and a driver when you will be checking things inside a boat. Agree beforehand about the positioning plan and make sure you understand the set policies, if any.
- Always have a digital camera and a voice recorder with you.

- Define a clear policy about the selection of boats for post-race inspection. Agree with the PRO about who will be the responsible person to select –ALWAYS before the race start- the boats according to their finishing position.
- Select finishing positions according to the class (“fast” or “slow” boats) and the wind / sea state conditions of the day: You should have enough time to finish the inspection on the first boat and then reach the next boat right after it finishes. Otherwise you will need another RC boat to keep the next boats under control until you are able to inspect them.
- Think carefully and beforehand about what you are going to check! For example, event limitation marks, safety gear, Position/use of equipment.

What if?

- Are we inspecting a builder-controlled Class fleet?
  - For some classes, no more than visual inspection of identification on boats and sails, and equipment serial number collection. Visual verification that equipment has not been modified from original state: sail seams, extra fittings etc
  - For other classes, there are some more items to control as outlined above:
    - Boat or hull weight
    - dimensions of certain items
  - Check the class rules, ask the Class expert!

How to save inspection time?

- Proper certification may help! For example by:
  - Eliminating the need to weigh each boat
  - Reducing the number of fully inspected sails and equipment and doing spot checks only
- “Proper” certification means “traceable” and class-organized: official measurers known by the Class, work done with standard forms and procedures. IHC also helps a lot.
- Class rules may cause trouble or make things easier:
  - Hull or Boat weight?
  - Which items need to be certified?

Pre-Race or Post-Race checks?

- Depends on Class:
  - Measurement controlled classes, better suited to pre-race controls (but not limited to…)
  - Builder controlled classes, well suited to post race controls only
- Some items are very difficult to inspect reliably with post-race checks only (weights, or items that need disassembly)
- Post race checks are well suited to control “use” of equipment. However, a set of pre-race controls helps “teach” your fleet sailors their class rules.

Final Notes:

- Recognize the roles: Sailors want to win and we want a level field
- Listen – understand the issues – be prepared – explain: DON'T tell people how to make their boats faster
  DO advise people on how to make their equipment legal –IF ASKED!
- Keep Calm – Keep to your plan
- Keep notes: experience gained must be shared; let the Class and the ISAF know about any issues!
- **And ALWAYS be on the alert:**

Innocent-looking stopwatch bracket. But flip it over, and…

Hidden weight!

CLASS EXPERIENCE ALWAYS PAYS…

Measurement Protests

Who can protest ?

- Boat vs. boat (rule 60.1)
- Race committee vs. boat (rule 60.2)
- Protest committee vs. boat
  - Under rule 60.3
  - Under rule 61.1(c) – during a hearing
  - Under rule 60.3(a)(1) – serious damage or injury

Measurement Protests

- Measurer cannot protest
- Measurer must report in writing non-compliance to RC if he decides there is non-compliance (RRS 78.3).
- RC must then protest (RRS 60.2 "However when the Race Committee receives a report required by Rule 43.1(c) or 78.3, it shall protest the boat.")

Measurement Protests

- 43.1(c) When an equipment inspector or a measurer in charge of weighing clothing and equipment believes a competitor may have broken rule 43.1(a) or 43.1(b) he shall report the matter in writing to the race committee.
- 78.3 When an equipment inspector or a measurer for an event decides that a boat or personal equipment does not comply with the class rules, he shall report the matter in writing to the race committee.

Measurement Protests

- A protest by RC or a boat must identify the rule alleged broken (usually the measurer prepares the Protest + is the RC representative on an RC protest)
- PC can call event measurer as a witness
- Decision must comply with rule 64.3
  - Sometimes not DSQ
  - Boat may race if intending to appeal
  - Costs paid by unsuccessful party
- RRS 64.1(a) Should the SI's modify it to allow lesser penalties? Under what conditions? DPI systems are coming into force more and more.

Measurement Protests

- PC makes final decision, **BUT**
- When in "*doubt*", (RRS 64.3 (b)) the PC:
  must ask the measurement authority and is bound by its reply

  Who is the measurement authority?
  - Event Measurer?
  - Class?
  - ISAF?

  See ISAF Regulation 10.12

CR Interpretations
Regulation 10.12

International and Recognized Class Associations rule interpretations shall be made in accordance with the following procedures unless otherwise provided for in the agreement defined in Regulation 10.3. Any alternative procedure shall be approved by the ISAF. Such interpretative changes shall not be used to change an existing rule. The Class shall immediately advise ISAF of any interpretations issued.

Regulation 10.12.1

ISAF may only make interpretations in accordance with the following procedures:

(a) requests for an interpretation may be made to ISAF from the following sources only:
Member National Authorities, International and Recognized Class/Owners Associations, **Copyright Owners**, Trade name and Trademark Owners, **Manufacturers of International or Recognized Classes** and International Measurers;

(b) an interpretation shall only clarify an existing class rule and shall not change the class rules;

(c) a request received by ISAF from one of those sources shall be acknowledged and immediately sent to the Class/Owners Association;

Regulation 10.12.1

(d) the validity of the interpretation or any alternative interpretation shall be decided by a panel formed by the Chairman or Vice-Chairman of the Class Rules Subcommittee, the technical representative of the Class/Owners Association and a nominated member of the ISAF Technical Staff;

(e) interpretations of the Class rules made by the Sub-committee shall be distributed by ISAF as provided in Regulation 10.11.6;

Regulation 10.12.1

(f) rule interpretations shall have the status of a class rule and, unless otherwise sanctioned in the Agreement, shall remain valid for a maximum period of 2 years or until superseded by a Class Rule change or modification carried out following the procedures of this Regulation.

Protest Procedure

- Introductions
- Interested party
- Translators
- Validity
- Protestor's story
- Protestee understands?
- Protestee's story
- Protestor understands?
- Protestor's questions
- Protestee's questions
- Protestor's witness' evidence
- Questions to the witness (protestee asks first)
- Protestee's witness' evidence
- Questions to the witness (protestor asks first)
- PC questions
- Final statements (protestor first)
- Facts, conclusions and rules that apply, decision
- Inform parties of decision

Attending the Hearing

- Only one representative from each party
  - If Parts 2, 3 or 4 (usual measurement issues) : Must have been on board unless PC agrees otherwise.
  - Ensure representative is authorized by skipper or owner.
- The Equipment Inspector usually represents the Race Committee in measurement protests
- Witnesses
  - Present only while giving evidence.

Absent Parties

- PC will try to locate an absent party
- If one party elects not to attend:
  - Protest should proceed
- If a party is unable to attend:
  - PC may consider re-scheduling if there is a good reason for non-attendance
- If neither party attends:
  - PC may dismiss the protest
  - PC may proceed using the form as evidence
  - PC could later decide to reopen

Observers (ISAF Policy)

- PC members must be comfortable
- Disallow if a party has a good reason to object
- A witness cannot be an observer
- Observers must leave during PC discussions
- Silent, no recording devices or mobile phones, sit at back, may not leave.

RR64.3 Decisions on Protests Concerning Class Rules

(a) When the protest committee finds that deviations in excess of tolerances specified in the class rules were caused by damage or normal wear and do not improve the performance of the boat, it shall not penalize her. However, the boat shall not *race* again until the deviations have been corrected, except when the protest committee decides there is or has been no reasonable opportunity to do so.

(b) When the protest committee is in doubt about the meaning of a class rule, it shall refer its questions, together with the relevant facts, to an authority responsible for interpreting the rule. In making its decision, the committee shall be bound by the reply of the authority.

RR64.3 Decisions on Protests Concerning Class Rules

(c) When a boat disqualified under a class rule states in writing that she intends to appeal, she may compete in subsequent races without changes to the boat, but shall be disqualified if she fails to appeal or the appeal is decided against her.

(d) Measurement costs arising from a *protest* involving a class rule shall be paid by the unsuccessful *party* unless the protest committee decides otherwise.

Result of the Hearing

- Penalty may be applied to a boat or person
- May dismiss, issue warning or penalize
- Any penalty must be within PC's event jurisdiction
- Report penalty (but not a warning) to NAs of competitor, venue, boat owner
- Discretionary Penalties (Applied in some events but are still under development).

Rules References to Damage and Injury

Witness (measurer as a witness)

Damage

Penalize a boat – rule 14(b)

Injury or serious damage

Taking a penalty – rule 44.1(b)

Injury or physical damage

Giving redress – rule 62.1(b)

Injury or serious damage

PC protest – rule 60.3(a)(1)

Damage
rule 14(b)

Not defined, but ISAF Case 19 suggests:

Market value diminished?

Item or equipment made less functional?

Serious Damage
Rule 44.1(b)

Not defined, but ask:

Was the performance of the boat seriously impaired?

Was the cost of repair high?

Was the market value significantly diminished?

Physical Damage
Rule 62.1(b)

Example of physical damage:

Real damage to the boat or equipment

Examples of what is NOT physical damage:

Capsize with no damage causing loss of places

Rigs or lifelines entangled

Rule 2
Fair Sailing

- A fundamental rule
- Boats, PC and RC can protest a boat under rule 2
- Can be applied alone
- Must be clearly established
- Penalty is DNE

Rule 69
Gross Misconduct

- Addresses behaviour of competitors, not of boats
- Rule 69 is a procedural rule, it cannot be *broken* by a competitor
- Rule 69 cannot be protested, and the action taken is not a protest
- Rule 69 hearings are the only means for a PC to have a hearing for pre-race inspection incidents. That applies in cases of competitors trying to break the rules by e.g. hiding corrector weight at a place that is not permitted. Class Rules apply when *racing*!
- To penalize a competitor for RR69, solid evidence beyond doubt must be presented.

ALWAYS REMEMBER:

When an equipment inspector decides that a boat or personal equipment does not comply with the class rules, he shall report the matter in writing to the race committee.

TIPS:

Always ensure that the rules are actually broken before initiating the procedures (report to the RC)

Always gather solid and clear evidence to present the Jury during the hearing. If you can't, it is better to reconsider making a report!

Try to have a second inspector present as a witness during your controls

Outline clearly the facts found during your inspection, including the rules allegedly broken, in the protest form.

If you represent the RC during the hearing, don't try to "teach" the Jury members the Class rules.

See also IM Manual: Section M

Hull Construction Controls

Hull Construction Rules

Measurement-Controlled Classes:

- Scantlings & Lay-up in Class Rules or Building Specification

or

- Construction details unlimited or partially restricted

Builder-Controlled Classes *

- Construction details covered in building manuals, controlled usually by ISAF. Details not open to public.

* Including "hybrid" Classes, where the hull is builder-controlled and sails etc are measurement controlled

Hull Construction Rules

Special Case:

- Construction in accordance with the scantling rules of a Classification Society / the ISAF Plan review scheme.
- In these cases the boat may have to be built under the supervision of a surveyor from the Classification Society, and a Classification Certificate issued on completion.
- Costly process, normally confined to large yachts.

Measurement-controlled Classes

- Scantlings and/or lay-up specified in rules:
  - Thickness of various parts of hull
  - Permitted or mandatory materials
  - Positions and dimensions of various structural parts
- Direct (non-destructive!) measurements where possible: e.g. Ultrasonic Thickness gauging
- Builder declarations of conformity
- Moulded parts: verification during prototype measurement (e.g. keelsons)
- Visual inspection (using "as approved" laminate samples)

Measurement-controlled Classes

- Unrestricted Scantlings:
- Rules may specify limitations on
  - Center of Gravity position
  - Total Mass and its distribution (through a gyradius limitation)
- If yes, then usually controlled by "swing" testing

Swing Testing

- Radius of Gyration gives a measure of the distribution of the hull mass about its center of gravity.
- Mass distribution affects pitching and yawing response of hull in waves
- Radius of gyration may be established by a pendulum swing test (Lamboley test)

Lamboley test description

- Hull is suspended from a horizontal athwartships axis at a distance α vertically above the CG, so that the hull is free to pitch.
- hull is then displaced, and oscillates under the influence of gravity. The small amplitude period of oscillation T_1 is given by

$$T_1 = 2\pi\sqrt{a^2 + \rho^2 / ag}$$

Where g is the local acceleration due to gravity and ρ is the pitch gyradius about the CG.

Lamboley test description

- For Keelboats, distance ***α*** may be derived by doing a static tilt test.
- For smaller boats like dinghies, distance ***α*** is small and cannot be measured easily and accurately. Therefore, a second oscillation axis is taken at a set distance below the first one, e.g. 200mm in the Finn Class test:

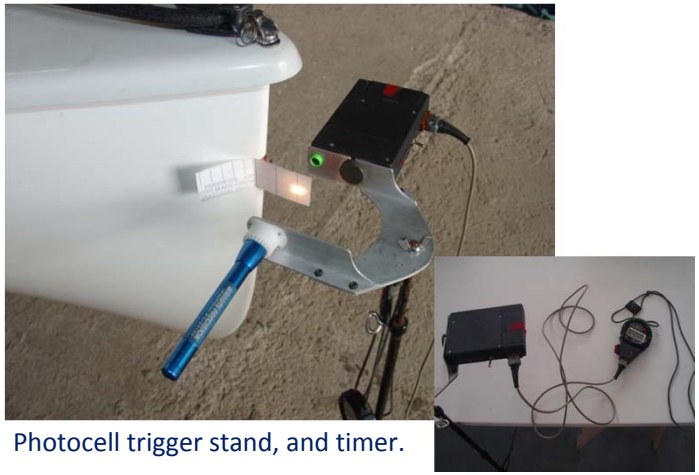
$$T_2 = 2\pi\sqrt{\left(a-0.2_m\right)^2 + \rho^2 \Big/ \left(a-0.2_m\right)g}$$

Hence by measuring T_1 and T_2 we may calculate both " α " and " ρ ".

Setup

- The boat is suspended by using hooks inserted under the sheer guards.
- The boat is set to be level fore aft (the hooks coincide with the fore and aft position of the centre of gravity).
- A pointer - a piece of light plastic is suitable - is attached to the stem by masking tape and a reference point erected adjacent to this when it is in the stationary position.

Lamboley test stand combined with hull weighing scale



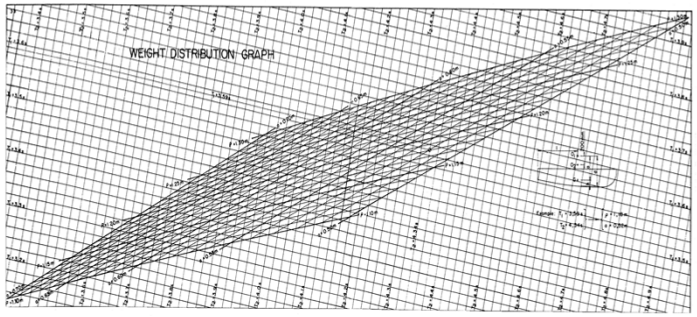
Photocell trigger stand, and timer.

Practice

- The longitudinal position of the center of gravity is to be checked with a plumb bob against marks on the floor (minimum distance marked during stand setup)
- The boat is oscillated through a fairly small angle - say about 200mm total movement of the stem head and the period of oscillation T_1 taken.
- Process repeated with oscillation around the second axis, and the period of oscillation T_2 taken.
- One timed oscillation per axis is enough, but measurement may be repeated for verification purposes.

Practice

- The two periods are then plotted against the special graph that automatically gives the values for ***α*** and ***ρ***



Swing Testing: Common Errors

- Draught: the stand should be in an enclosed space (container, or small room with doors that close)
- Water in boat
- Stand with inadequate rigidity, or flexible floor!
- Normal timer without automatic trigger: more oscillations need to be timed (at least 10) and averaged.

See also IM Manual: Section H.4

Hull skin thickness measurement

- Non-destructive method: ultrasonic gages.
- Thickness measurements may be used to show:
  - Correct lay-up and materials as per class rules
  - Alterations of initial hull construction
- Destructive methods (direct measurement of sample pieces) only in extreme cases and after initial non-destructive methods have shown serious signs of problems.

Ultrasonic thickness measurement

- Ultrasonic testers operate on a pulse-echo principle much like sonar, measuring the round trip travel time of very high frequency sound waves emitted from a piezoelectric transducer held in contact with the hull skin.
- Sound waves emitted from it bounce off the inner wall of the hull and back to the transducer.
- A calibration process determines the speed of travel of the sound waves passage through the hull allowing an accurate measure of the hull thickness to be obtained.

  Thickness = Sound Velocity x (Round Trip Time) / 2

Ultrasonic gages: considerations

- There are upper and lower limits of thickness for ultrasonic gages to work on fibreglass hulls
- Fiberglass and many composites can be much more attenuating than metals and often require high penetration gages with pulsers/receivers optimized for low frequency operation.
- The range of thickness measurement is also a limitation, often necessitating more than one transducer to cover the range needed for hull and deck measurement.

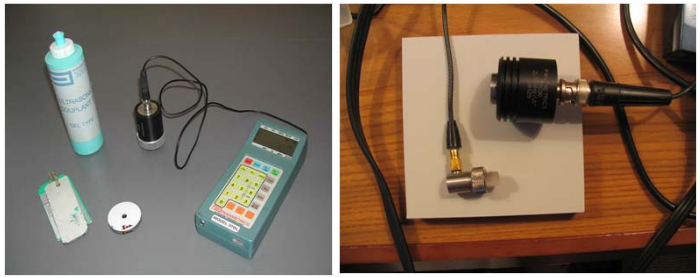
Ultrasonic gages: considerations

- The ultrasonic technique requires coupling of the piezoelectric transducer to the hull or deck using a gel type ultrasonic couplant between the active surface of the transducer and the surface of the hull or deck. The couplant layer thickness is part of the measurement.
- Factors that may adversely affect the accuracy of measurement:
  - Inner surface roughness
  - Presence of voids or de-laminations
  - Inner and outer surfaces not parallel
  - Curvature of skin (especially for larger transducers)

Ultrasonic gages: practice

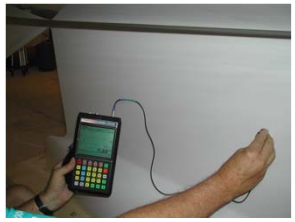
- The gages need to be calibrated before use and samples of known thickness tested for verification
- Testing methods:
  - Spot check: quick and easy examination for obvious defects in construction or for any alterations afterwards, with randomly selected points to check.
  - The grid layout: the hull is marked with the location of expected thickness changes determined from the construction lay-up. A grid system is applied to the hull and the transition lines where the thickness is expected to change are related to a grid location.

– Concentrate on the ends of the boat as there could be an advantage to lighter ends.



Coating thickness measurement

Magnetic based instruments, only for steel keels



Ultrasonic velocity based instruments, they work on any materials

See also IM Manual: Section H.6

Hull weight (mass) measurement

- Measurement using Class III scales (display step: 1/3000 or 1/6000 of their measuring span, 50gr for a 150 kg scale)
- Scales calibrated by authorized body (adjustment for local **g**)
- No measurements taken within the first 50 display steps (<2.5 kg for the 150 kg scale, do not check corrector weights on the hull weighing scale!)

Hull weight (mass) measurement

- "Suitability" test for scales when no documents are available:
  - Place a load in the centre of the platform (20% of max. load) and tare the scales reading. Weigh the load on the corners of the scales and check that the difference with the tarred quantity does not exceed one step.
  - Sensibility test. Put on the scale a load of about 50 display steps. When a weight equalling the value of one step is added, the reading must change by one step.
  - Deviation of readings. Repeatedly place the same load on the scales. The readings should not change. A few occurrences of a one-step change in the same direction are acceptable.

Hull weight (mass) measurement

- Weighing station requirements:
  - Change in the temperature of the environment should be minimum
  - Direct sunlight to the scales must be avoided
  - There should be no vibration or strong draught
  - Scales must be on a stable base and levelled (floor scales)

In practice a good indicator of the conditions is the stabilizing of the scales reading. If the reading of proper class III scales has problems stabilising, there are problems with the conditions, the weighing results are unreliable (due to the conditions) and reading should not be used. (weighing of keelboats in the wind)

- In case of wet boats at an event:
  - If it is hot and sunny, ask the crew to dry the boat and come again.
  - If the weather is wet, you may try to compensate for the extra weight, based on each boat's actual condition.
- In case of consistently bad weather:
  - It is better NOT to check equipment weight at all.

See also IM Manual: Section H.3

Buoyancy tank tests

- Immersion buoyancy test: equipment to be tested by immersing the boat in water to simulate a capsize or swamping. Such a test may be used to establish that
  - there is sufficient buoyancy to prevent the boat from sinking,
  - to check that there are no leaks in the buoyancy equipment,
  - to show that buoyancy is distributed in the boat satisfactorily, so that the boat floats approximately level when waterlogged, and finally
  - to ensure that the buoyancy, if moveable, is strongly fixed in position.

Buoyancy tank tests

- Buoyancy tank air test: the tank is subjected to a small increase in internal air pressure or, in the case of the vacuum test, a small decrease in pressure.
  - The pressure difference between the inside and outside of the tank is indicated on a water manometer fitted to a hatch cover or drain hole. The test will be satisfied if the difference in water levels in the two halves of the manometer does not decrease faster than a certain rate; the rate and initial pressure difference being specified in the class rules.

Caution

Many air tanks have breather holes (on centreline) which need to be blocked before the tank test.

! Do not take on potential liability by checking safety items.

Buoyancy tank air test

See also IM Manual:
Section H.5

Internal structure measurement: special “dark room” and light source placed inside the hull to outline the rib positions. Once marked, their position, number and length can be measured with normal means.

Rating Systems

Important Considerations

Yacht racing under a rating system imposes a different set of problems on the inspector compared to “normal” One-Design Class event inspections:

- Boats are different. So, inspectors don't just need a set of “class” (rating) rules. They also need the rated data for each boat. The simplest way to get that is from a copy of each boat's certificate.
- Limiting sail dimensions for rating systems are not always simply linear dimensions. ORC as well as IRC limits max. areas, not individual dimensions.

Important Considerations

- Certain important measurements in Rating Rules depend on environmental conditions and must be performed with the yacht floating at sea.
- In certain cases where measurements do not correspond to the actual rated values, the yacht’s certificate must be re-issued with the new data. This requires a fast track certificate issuing process, for which the certification authority must be ready.

Inspection Tips

- Using tables with sail templates set out obviously does not work! Sails need to be individually measured, and inspectors may need to check more than one sail to find the largest rated values.
- Rated boats tend to have more sails than smaller one designs. Longer time needs to be allowed.
- The boats (and hence the sails) tend to be bigger, so more space is required. Unfolding and re-packing sails also takes longer which again adds to the time needed.
- Getting big boats into measurement condition takes time because certain gear needs to be removed.

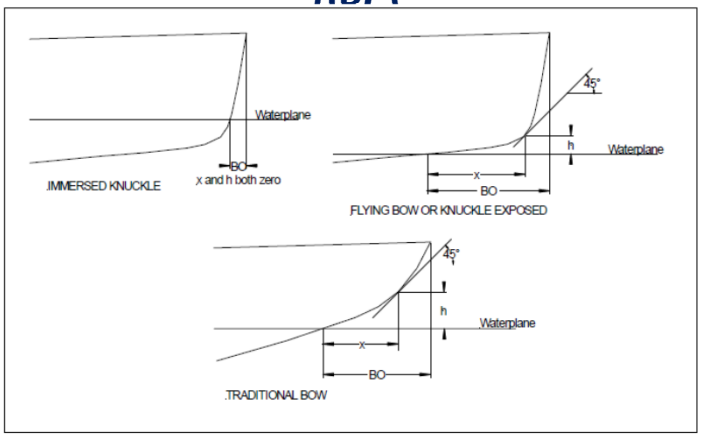
Inspection Tips

- The boats are heavier. Weighing a 40 footer requires a substantial crane and hard standing. Which is both expensive and time consuming.
- Flotation of boats (for measurement of bow/stern overhangs and/or freeboards) and stability tests require good weather conditions and take time. Inspectors must (obviously!) be familiar with what is required. This is an area where practical experience is a pre-requisite. Not all inspectors will have this experience. Asking an otherwise skilled and experienced measurer to do this is a recipe for mistakes.

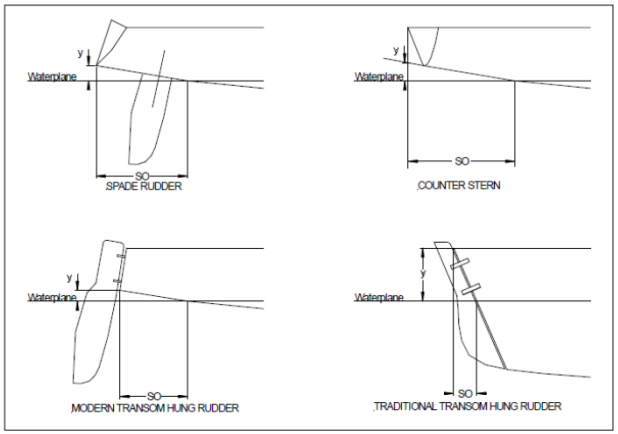
Inspection Tips

- Some measurements are difficult and/or expensive, weighing for example. Unless conditions are very good, checking overhangs and freeboards (which would also require emptying the boats) is both difficult and time consuming. It is suggested therefore that on most occasions the focus should be on rigs and sails, the items most likely to change. Useful and simple issues that can be checked include safety equipment, sail inventory, rig details (number of spreaders etc.), rig material, and internal ballast.

Bow Overhang Measurement (IRC)



Stern Overhang Measurement (IRC)

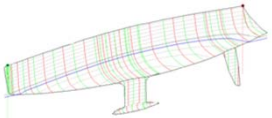


Hull Measurement(ORCi)

- A hull measurement is performed to create an offset (OFF) file describing the body plan of the hull together with appendages, by using an ORC-approved hull measurement machine or any available measurement instrument capable to produce a list of the points in the co-ordinate system defined as follows:
  - X axis – longitudinal with 0 at stem and positive towards the stern
  - Y axis – transverse with 0 at the centerline and positive to outwards
  - Z axis – vertical with 0 at the waterline and positive upwards
- Hull is measured by taking half width (Y) and height (Z) of station points with equal distance from stem (X) from the deepest point to the sheerline as follows:
- Approximately 20 stations up to a maximum of 180 are taken from either side, spaced with maximum distance of 5 % LOA and 2.5 % of LOA within the forward 15% of the hull.

Hull Measurement(ORCi)

- Two stations where freeboard measurements are taken are at the same distance from the stem on port and starboard sides:
  (1) the forward freeboard station is normally placed approximately 0.5 m from the stem, and
  (2) the aft freeboard station shall is normally placed at the intersection of the hull and the transom at the sheerline
- Stations are also taken at the edges of any appendage, at the maximum draft and at any significant change of appendage profile in the longitudinal direction.
- Once a hull is completely measured, an OFF file is generated using ORC-approved software by the Rating Authority or if needed by the ORC Chief Measurer. Such an OFF file can then be used for any boat of the same production model.



Freeboards Measurement(ORCi)

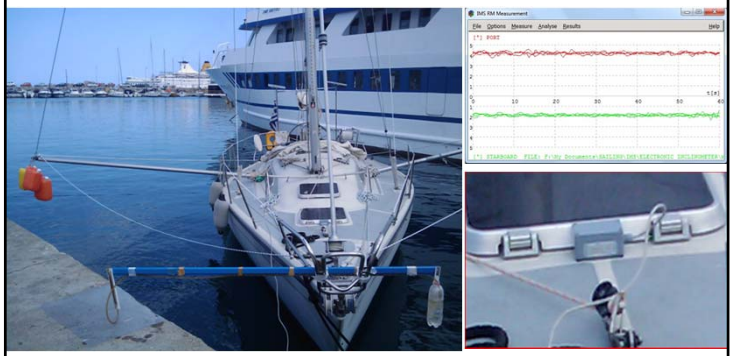
- By measuring freeboards from the pre-defined points to the waterplane it is possible to calculate the volume of the immersed area, which once multiplied by the water density gives the weight, without the need of suspending the boat from a crane.
- The LPP (Lines Processing Program) embedded in the VPP calculates many other items, such as beam, draft, overhangs and other integrated measurements that are considered by the VPP program.
- The measurer must know the exact locations of the freeboard measurement stations and verify the location of the sheer points from the offset file!

Inclining Test (ORCi)

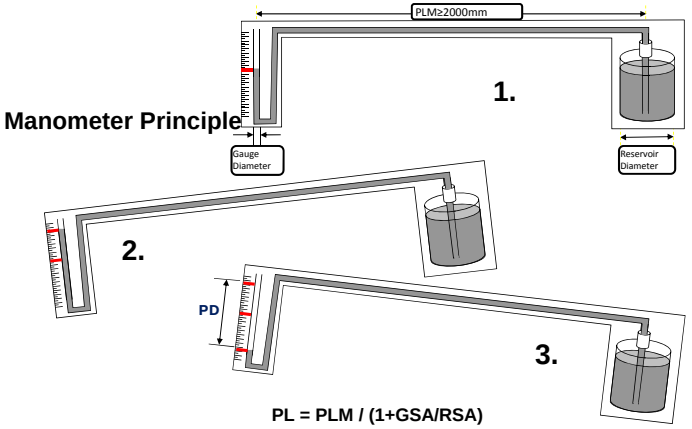
- The inclining test is a static test to determine the vertical position of the yacht's center of gravity.
- A known heeling moment is applied on the yacht in lightship measurement trim, while floating in calm water and not affected on any side by lying to a mooring, and with no one aboard. The corresponding heeling angle is measured. As the yacht generates a righting moment when heeled, the vertical center of gravity is easy to calculate.
- The heeling moment is induced by hanging known weights (usually water containers) outside the hull (to increase the arm length and thus reduce the required weights) using the yacht spinnaker poles.
- The poles are simultaneously positioned, port and starboard, at the Longitudinal Centre of Flotation or at the Maximum Beam station, perpendicular to the boat's centerline and as horizontal as possible.

Inclining Test (ORCi)

- The heeling angle is measured using a gauge manometer or an electronic inclinometer.



Inclining Test (ORCi)



PL = PLM / (1+GSA/RSA)

Standard Class Rules

Standard Class Rules (SCR)

A template for ISAF Classes on which to base their class rules, using ERS terms and definitions in a cohesive structure and standard format.

SCR STRUCTURE

Part I – Administration
Section A – General
Section B – Boat Eligibility

Part II – Requirements & Limitations
Section C – Conditions for Racing
Section D – Hull
Section E – Hull Appendages
Section F – Rig
Section G – Sails

Part III – Appendices

General Notes

- An ERS definition is only invoked if it is used in its defined sense in the **class rules** (by using the word highlighted by **bold** font).
- A class shall not use measurement points and measurement methods other than those defined in the ERS, unless it has justifiable reasons for doing so and then only when these are clearly described in the class rules themselves.
- Diagrams may be used in the class rules to illustrate a particular position, point, placing, measurement or method.
- The ERS contain diagrams of the common **hull**, **rig** and **sail** measurement points. Usually, they are not repeated in SCR **class rules**.

PART I – ADMINISTRATION

Section A – General

Section B – Boat Eligibility

PART I Notes

Section A covers administrative issues like the **Class Authority**, sail numbers and **certificates**.

Section B includes rules that shall be complied with for a boat to be eligible to race.

PART II – REQUIREMENTS AND LIMITATIONS

Section C – Conditions for Racing

Section D– Hull

Section E – Hull Appendages

Section F – Rig

Section G – Sails

PART II Notes

- The **crew** and the **boat** shall comply with the rules in Part II when *racing*.
- "The rules in Part II are **closed class rules"**. This text is to be used in the beginning of Part II if all Sections in this part are closed class rules. Otherwise it should be stated under "Rules" in each section whether the rules in that section are "closed class rules" or "open class rules".
- Measurement shall be carried out in accordance with the current version of ERS except where varied in this Part.
- Section C includes rules that are not part of **equipment certification measurement**, usually because compliance with those rules can only be checked at an event or that checking requires access to one or more parts that are individually certified. RRS rules that are amended, rules about the use of equipment by the crew and rules governing permitted modifications and maintenance are placed in Section C.

PART II Notes

- Sections D, E, F & G include rules about **equipment certification measurement** for hulls, appendages, rig and sails respectively. Manufacturers will find all the necessary information they need here.
- Typically, each section includes rules about
  - Component parts
  - Manufacturers
  - Materials
  - Mandatory and optional fittings / items
  - Dimensions, weights & corrector weights
  - Certification requirements

Examples

C.1.1 RULES

(a) The following RRS 2013-2016 rules shall apply as amended below:

(1) If the average wind speed is clearly over 8 knots across the course the race committee may signal in accordance with RRS Appendix P5 that pumping, rocking and oaching are permitted. This changes rules RRS 42.2(a), RRS 42.2(b), RRS 42.2(c).

(2) RRS 49.1 is changed to: 'A crew member shall use no device designed to position his body outboard other than a **trapeze**, hiking straps and stiffeners worn under the thighs..

(3) See C.3.3 (a) for amendments to RRS 43.1(b) and C.10 for changes to RRS Appendix G.

(b) The ERS Part I – Use of Equipment shall apply.

Examples

C.5 PORTABLE EQUIPMENT

C.5.1 FOR USE

(a) OPTIONAL

(1) One hand bailer or bucket.

(2) Up to two compasses, which may include timing devices. If electronic, only compasses with heading, heading memory and timing functions are permitted.

(3) Electronic or mechanical timing devices which shall be removable. Wrist watches with compass functionality are permitted additionally. No other electrical or electronic devices than those prescribed in C.5.1 and those required by an organizer and the ICA to be carried by boats shall be permitted on board when racing.

(4) Spare parts such as blocks, shackles, ropes, etc.

C.5.2 NOT FOR USE

(a) OPTIONAL

(1) One paddle.

(b) MANDATORY

(1) Towing rope of floating type with a minimum length of 10m and of not less than 8mm in diameter. It shall not be stored inside a buoyancy tank.

Examples

C.8 HULL APPENDAGES

C.8.1 LIMITATIONS

(a) Only one **centreboard** and one **rudder** blade shall be used during an event, except when a **hull appendage** has been lost or damaged beyond repair.

C.8.2 CONDITIONS FOR USE, CENTREBOARD

(a) No part of the **centreboard**, in its raised position, shall project below the **hull**.

C.8.3 CONDITIONS FOR USE, RUDDER

(a) RUDDER

The **rudder** blade shall be in its fully lowered position. However for races sailed in shallow water, the sailing instructions may prescribe that this rule shall not apply.

(b) RUDDER ASSEMBLY

The rudder consists of a rudder blade, a rudder stock and a tiller. The rudder blade shall be able to pivot around its axis. The rudder shall be detachable from the hull.

When mounted on the hull, the rudder blade pivot shall be located at a maximum of 150 mm abaft the transom and its height above the lower corner of the transom shall be a minimum of 120 mm, measured according to the Figure "Rudder Pivot Position".

Examples

E.1 RULES

(a) **Hull appendages** shall comply with the current **class rules**.

E.2 MANUFACTURERS

(a) Manufacturer is optional.

E.3 CENTREBOARD

E.3.1 MATERIALS

The **centreboard** shall be made from one or a combination of the following materials; wood, plywood, polyester reinforced with glass fibre, epoxy reinforced with glass fibre and/or plastic foam which includes micro balloons and may be painted.

E.3.2 FITTINGS

OPTIONAL

(1) Blocks and associated fittings for hoisting/lowering the **centreboard.**

(2) A bushing round the pivot of the centreboard.

Examples

F.3 MAST

F.3.1 DEFINITIONS

(a) MAST DATUM POINT

The **mast datum point** (MDP) is the **heel point**. Unless indicated otherwise, all measurements are from the MDP.

F.3.2 MATERIALS

(a) The mast **spar** shall be of aluminium alloy.

F.3.4 CONSTRUCTION

(a) The **spar** shall include a fixed sail groove or track, which may or may not be integral with the **spar**.

F.3.5 FITTINGS

(a) MANDATORY

(1) A gooseneck
(2) Kicking strap attachment(s)
(3) Spinnaker pole fitting.
(4) Spinnaker pole downhaul system.
(5) Spinnaker pole lift system.
(6) A pair of fixed or adjustable metal **spreaders** with optional attachment systems which may include local reinforcement as per F.3.6
(7) Headsail halyard system.
(8) Attachments for **shrouds**, **forestay** and **trapezes**.
(9) Spinnaker halyard system.
(10) Mainsail halyard system.

(b) OPTIONAL

(1) A heel fitting
(2) Fitting(s) for centreboard system.
(3) Cunningham system.
(4) Reinforcement as per F.3.6.
(5) A removable timing device
(6) Attachment fittings for removable compass.

Examples

G.2 GENERAL

G.2.1 RULES

(a) **Sails** shall comply with the current **class rules**.

(b) Headsails may be measured with battens inside the **batten pockets**.

G.2.2 CERTIFICATION

(a) The **official measurer** shall **certify** mainsails and headsails in the **tack** and spinnakers in the **head** and shall sign and date the **certification mark**. Sails may be certified without identification on them.

(b) Sails shall carry the sail button/sticker issued by the ICA attesting that the class fee has been paid, and located for mainsails and headsails in the tack and spinnakers in the head.

(c) The ISAF or an MNA may appoint one or more **In-House Official Measurers** to measure and **certify sails** produced by that manufacturer.

G.2.3 SAILMAKER

(a) The sailmaker is optional.

Examples

G.3.4 DIMENSIONS

	minimum	maximum
Leech length		6265 mm
Quarter width		2340 mm
Half width		1790 mm
Three-quarter width		1050 mm
Top width		140 mm
Thickness of **ply** of the **body of the sail**	0.165 mm	
Primary reinforcement		325 mm
Secondary reinforcement:		
from **sail corner measurement points**		1000 mm
from the **leech**		300 mm
area above top batten pocket		unlimited
Foot boltrope length	2200 mm	
Total **window(s) area**		0.3 m^2
Window to **sail edge**	150 mm	
Extension of headboard from **head point**		140 mm
Batten pocket inside length: (Intermediate and lowermost pockets)		800 mm

PFDs

ISAF Racing Rules…

RR1.2 Life-Saving Equipment and Personal Flotation Devices – boats must carry life-saving equipment. Each competitor is responsible when to wear a PFD

RR27.1 & 40 Flag "Y" – when flown must wear a PFD

App. J2.2 Notice of Race & Sailing Instructions – shall include applicable PFD requirements

ISAF Equipment Rules…

C.5.3 …A PFD is **Personal Equipment**…

C.5.4 **Personal equipment** as required by the *rules* to assist the user to float in water.

ISAF Offshore Special Regulations

5.01 Promotes an ISO 12402 Part 3 Level 150 PFD for each crew member. Each fitted with crotch strap and harness for Cats 0 to 4 and spray hood and PLB for Cats 0 and 1

App J Promotes PFD requirements for Category 5 inshore races

App L Promotes an ISO 12402 Part 5 Level 50 PFD for each person aboard for Cat 6 races were all boats are in sight of the race committee and supported by safety/rescue boats

Class Rules

Class Rules can never consider the individual requirements of specific venues and the time / season of a race

Nevertheless many ISAF Class Rules give PFDs requirements and the **S**tandard **C**lass **R**ules include minimum standard recommendations for classes to use:

…C.3.1 Mandatory
(a) The boat shall be equipped with a **personal floatation device** for each crew member to the minimum standard ISO 12402-5 (CE 50 Newtons), or USCG Type III, or AUS PFD 1.
Or…
(a) The boat shall be equipped to the minimum standard ISAF Offshore Committee Special Regulations category IV.

Standards

- ISO 12402-3 (Level 150)
- ISO 12402-5 (Level 50)
- USCG Type III (should also specify Type II)
- AUS PFD 1
- equivalents

- (EN 396, predecessor to the ISO 12402-3)
- (EN 393, predecessor to the ISO 12402-5)

ISO 12402-3 & EN 396 Lifejacket

Suitable for swimmers and non-swimmers.

For use in all but the most severe conditions.

They will give reasonable assurance of safety from drowning to persons not fully capable of helping themselves.

May not immediately self-right an unconscious user wearing heavy waterproof clothing.

EN 396

ISO 12402-5 & EN 393 Buoyancy Aid

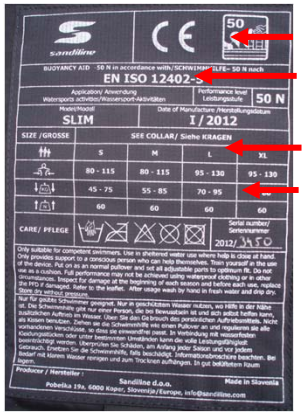
Only suitable for competent swimmers.

Sheltered water use where help is close to hand.

Only provides support to conscious persons who can help themselves

EN 393

ISO 12402-5 & EN 393 Buoyancy Aid



level

standard

size

size range: weight, Newtons chest

EN 393

ISO 12402-5 & EN 393 Buoyancy Aid

size range

size

level

standard

EN 393