

## MEASURING THE STAR CLASS BOAT

The information in this section is provided by the TAB for those owners, builders, and fleet or regatta measurers wishing to understand the principles of ISCYRA measurement. Certified Measurers are provided with additional information, and have developed special measuring techniques, so one of them, or the TAB, can provide more detailed information than is presented here, if needed.

### PRINCIPLES OF MEASUREMENT

Since the construction of a Star must conform to ISCYRA plans and specifications, and certain construction details require prior approval, the measurement procedure is a series of selected dimensional checks to ascertain that the boat actually conforms to the plans and specifications. Thus, measurement is a verification process, not a detailed physical description of the boat. When a new boat is completed, it is measured by a Certified Measurer. If his data indicate that the boat complies with the plans and specifications, the TAB will grant a Measurement Certificate, and the boat becomes eligible to the ISCYRA (STCR 33).

Certain measurements are often required for entry in championship and other series, and non-sanctioned events, such as Olympic Regattas, may have special measurement requirements for eligibility (STCR 32). This type of measurement is conducted by appointed regatta measurers or the TAB. While regatta measurement requirements vary, the types of measurement and techniques used are the same as for certification measurement.

There are four main categories of measurement:  
Measurement of Hull, Keel, Skeg and Rudder  
Measurement of Spars  
Measurement of Sails  
Weighing

In each category, physical data are obtained by the measurer for comparison with allowable maxima and minima.

### MEASUREMENT OF HULL, KEEL, SKEG AND RUDDER

Many of the Measurements in this category are taken on an imaginary three-dimensional grid whose position is specified. A base plane is established either optically or mechanically in an accurate position relative to the hull, roughly parallel to the waterline, and located a few centimeters below the hull bottom. Various height measurements are taken perpendicular to the base plane; most lengths and breadths are taken parallel to it. For example, "Keel Heights" are perpendicular distances from the base plane of specified points on the hull bottom.

The Star is measured in an upright position, with base plane level and the hull supported on the keel (Spec. 14). Some flexion of the hull occurs due to its own weight in this position, but conditions are equalized for all boats measured. Certain critical keel and rudder post measurements are taken parallel to the base plane, so even if only these appendages are to be measured, an accurate base plane must be established. Measurements called for in the ISCYRA Regatta Measurement form, on the other hand, do not require the establishment of a base plane.

Rudders are measured by use of a transparent template available from ISCYRA. Since rudder shape controls are referred to the hull, rudders cannot be properly measured off the boat (Drawing "F"). In addition to shape and height limitations, a minimum radius is specified for any curve of the rudder profile. Skeg measurements are described in Spec. 5.4.

Because virtually every radius in the hull, keel, skeg and rudder is controlled, great care should be taken in fairing a Star that all radii remain in compliance with the controls. Radii can be checked with appropriate radius templates.

Aid of non contact measurement instruments to define the dimensional checks conform to ISCYRA plans are allowed.

### MEASUREMENT OF SPARS

Mast lengths are measured from Point "B", which is a point in the hull, not a point on the mast (Spec. 2). The distance in the hull from the mast step to Point "B" is measured and then transferred to the butt of the mast, and the required heights are checked. In fitting a new mast to a boat, care must be taken that the lower band is not less than the minimum height above Point "B", as well as observing height limits.

Boom length is measured to the forward face, that is, the "bottom" of the luff groove in the mast. It is most convenient to measure this with the boom attached. Care must be taken that the measuring standard reach into the luff groove and touch bottom.

### MEASUREMENT OF SAILS

Sails are measured to determine compliance with Specifications 12. As well as materials and all dimensions, sails are checked for numbers, insignia and honors, royalty labels, batten pockets, "windows", and all other items specified.

When sails are measured for a championship series or other regatta, and found to comply, they are indelibly and distinctively marked by the measurer. Only sails thus marked may be used in the series.

Drawings are provided in this section to assist in laying out measurement triangles and measuring sails.

Several aspects of the Star are subject to weight control. Sails and parts of the hull, keel and skeg are controlled as to unit weight. Keel, hull and complete boat must meet minimum total weight standards, rigged masts must have a minimum "tip weight" (Spec. 5, 10, 13). Weight of the complete boat and mast tip weight are regularly checked at championship and other series. Yachts are weighed for certification in accordance with Spec. 13.3.

The most desirable scales for these uses are the electronic "load cell" type which give accurate readings with excellent replicability. Various spring and lever types are also used. While scales should be calibrated with test weights to ensure accuracy, the most important characteristic for fairness in regatta weighing is replicability of readings. This should be checked by weighing the same boat, or mast tip, several times before, and, if possible, during the measurement procedure. The scales should give very nearly the same reading at each re-weighing. If differences are noted, the scales should be repaired or replaced. If corrector weights are necessary due to non-compliance with specified minima, the measurer must ensure that these are installed properly and permanently, and weight seals per Spec. 13.3 are in place.

#### **CERTIFICATE**

The Measurement Certificate is as much an essential part of a Star as a mast or sails (Spec. 1). Since the Certificate is the boat's proof of eligibility for competition at any level, it must always be current as to ownership information, and be kept readily available. Original copies of the Measurement Certificate are maintained, and duplicates are available for \$10 USD upon application to ISCYRA.

#### **EXPERIMENTS, PECULIARITIES, AND DISCREPANCIES**

Technical improvement in the Star have been made during every period of its long history. Most, if not all, are the result of thoughtful experiments by owners seeking to make their boats safer, stronger, and above all, faster. Often such experiments take place in the area of control systems or rigging not limited by the Specifications, in which case measurement procedures are not involved. On the other hand, modifications to areas which are controlled require re-measurement and re-certification before the boat is eligible to compete again at any level. The assistance of the TAB, the Chief Measurer(s) and the Certification Measurer(s) is available to owners contemplating such modifications, and should always be sought to ensure continued eligibility.

Some modifications or construction errors may be termed peculiarities in a boat. Spec. 1 and 14 make it clear that such deviations from the standard for a Star are not permitted. Measurers, as well as owners, should be alert for any peculiarity in a boat which might not comply with the intent of the Specifications, and seek the assistance of the TAB, the Chief Measurer(s) and the Certification Measurer(s) in determining whether this is the case.

Discrepancies are actual instances of noncompliance with the Plans and Specifications. No boat having a discrepancy is eligible for competition as a Star at any level (Spec 1). Discrepancies should be corrected immediately to avoid any possibility of an ineligible boat being sold as a Star or entered in competition.

In any series the TAB, the Certified Measurers and the Event Measurers are requested to pay attention to possible discrepancies and, in case of evidence, to arrange for adequate correction. In any series, the TAB, the Certified Measurer and the Event Measurer are responsible for the total observance of what is stated in the previous paragraph.

#### **DEFINITIONS**

Certain terms related to measuring the Star Class Yacht are defined below for assistance in understanding measurement principles:

**BASE LINE.** A line in the Center Plane having a perpendicular distance from the hull bottom at Station 10 of 390 and at Station 1 of 486. Hull Stations are located on the Base Line by measuring forward from the intersection with a line perpendicular to it which passes through Point "T".

**BASE PLANE.** A plane perpendicular to the Center Plane, and containing the Base Line.

**CENTER PLANE.** A plane containing the centerlines of the deck and bottom, the axis of the mast, the center plane of the keel fin, etc.

**CHINE POINT.** Any point on the curved line defined by the intersection of the extended surface of the side and the extended surface of the bottom. "Chine Heights" are measured from the Base Plane to specified Chine Points; "Chine Half-Breadths" are measured from the Center Plane to specified Chine Points.

**JIBSTAY INTERSECTION.** The intersection of the line of action of the jibstay in sailing position with the forward surface of the mast.

POINT "B". See Spec. 2. The height of the deck edge is the height of the Sheer Points, and this may be found by supporting a straightedge on the deck at the proper distance from Point "T", measuring from it vertically to the mast step, and subtracting the offset of the straightedge above the Sheer Points.

POINT "T". See Spec. 2.

PROFILE. The shape of a part of the boat, such as rudder or keel, as projected perpendicular to the Center Plane.

SHEER POINT. Any point on the curved line defined by the intersection of the extended surface of the side with the extended surface of the deck. "Side Heights" are measured from the Base Plane to specified Sheer Points; Deck Half-Breadths" are measured from the Center Plane to specified Sheer Points.

TRUE BOTTOM. The actual surface of the hull bottom, or the extended continuation of the arc of the bottom through the keel flange or skeg. "Keel Heights" are taken at specified points on the intersection of the True Bottom with the Center Plane.