

NEBCBA Sail Measuring Procedure

1. Purpose

The purpose of measuring the sail is to determine the lengths of the four sides of the sail (foot, leach, head and hoist), the length of the two diagonals (clew to throat and tack to peak), the maximum amount which each of the four sides of the sail curves outward beyond a straight line (the "roach" of each side), and several measurements relating to the number and spacing of sail slides, hoop fasteners and reef points, the location of reef cringles and batten pockets, and the length of the battens.

Maximum and/or minimum allowable values for each of these measurements are specified in the NEBCBA Handbook.

2. Equipment

2.a. Measuring surface: A flat floor or other surface suitable for laying out the sail and into which awls or nails may be driven.

It is not necessary to lay out the entire sail at once. However, the measuring surface must be long enough to lay out the longest side (the leach, 17'4") and wide enough to measure the roach curves. A surface at least 18 feet long and two feet wide is the minimum that will meet these requirements.

2.b. Measurers: Two or three persons, at least one of whom is familiar with the measurement procedure.

The optional third measurer will expedite the process by measuring dimensions in the middle of a sail edge (e.g., fastener number and spacing, roach, cringle location and batten pocket locations) while the other two measurers measure the length, and/or by recording the measurements called out by the other measurers.

2.c. Awls: Four or six awls (or nails), two of which will be driven through the corner grommets into the measuring surface when laying out a side of the sail, and two which will be driven into the measurement points just outside of the corner grommets. When using six awls, the two additional awls will allow positioning of the throat grommet and measurement point without borrowing from the other four awls which will be some distance away. (If you use nails instead of awls, you will need at least two hammers.)

2.d. Masking tape: Masking tape (two rolls, one per person) sufficiently stiff to mark a straight line 6" to 12" long on the measuring surface.

2.e. Tape measure: An easily read tape measure, 18 feet or longer, marked in feet and inches.

2.f. String: A String of at least 18 feet in length, which will be stretched between the measurement points at two corners of the sail to represent the straight line of a side of the sail when measuring edge curve (roach).

2.g. Second tape measure (optional): A second tape measure, 5 feet or longer, to measure roach, fastener spacing, reef cringle location and batten pocket location without having to rewind the long tape measure which is used to measure the lengths of the sides and diagonals.

2.h. Ruler (optional): A 12" or 18" ruler may be more convenient than the tape measure to measure the distance from the straight line string to the sail edge when measuring edge curve (roach). A ruler may also be more convenient for measuring fastener spacing. A 12" ruler will be sufficient for measuring roach and head slide spacing. An 18" ruler will allow using the ruler to measure hoop fastener spacing and foot slide spacing.

2.i. Recording sheet: A sheet of paper on which to record the measurements as they are measured, preferably a standardized NEBCBA sail measurement form.

2.j. Pen or pencil: To record the measurements.

2.k. Clipboard (optional): Not required but highly recommended to facilitate the recording of measurements.

2.l. "NEBCBA" sail stamp: To mark an approved sail when performing an official measurement.

2.m. Permanent marker: To date and initial an approved sail when performing an official measurement.

3. Sail Preparation

3.a. Sail ties, tags, etc.

Remove any and all sail ties, etc. at the corners and cringles.

3.b. Battens:

If the battens are in the sail, remove the battens.

If the battens are not in the sail, be certain the you have the set of battens that will be used with the sail, or the sets of battens that may be used if more than one set of battens may be used.

3.c. Sewn in battens:

If the battens are stitched into the sail, cut the stitching and remove the battens. The battens must be removed in order to measure the sail. Measuring the sail with the battens in will result in a leach length measurement which is 1 to 2 inches less than the actual length, and a leach roach measurement which may differ significantly from the actual roach.

3.d. Preparing the recording sheet:

For an official measurement, record the NEBCBA serial number for this sail measurement (typically one more than the previous serial number) in the space marked "number" on the NEBCBA Sail Measurement Recording Sheet. For an unofficial measurement, write the word "unofficial" in the space marked "number" on the recording sheet.

Record the owner's name, phone number, address, and yacht club affiliation, boat name, sailmaker, sailmaker's model name, date of purchase, sail colors, sail number, condition and other comments in the appropriate spaces on the recording sheet.

For condition, enter "new" if the sail has never been used, "used __ times" if the sail has been used a small and known number of times, or "used __ months" or "used __ seasons" if the sail has been used more than a small number of times.

For comments, include any relevant descriptive information or unique features which are not recorded elsewhere on the recording sheet.

Enter the name of the chief measurer, assistant measurer, and additional assistants (if any) in the appropriate spaces on the recording sheet.

3.e. Owner preparation:

When measuring a large number of sails, it will be useful to have each owner prepare his or her own sail and to fill out the owner information on the recording sheet before the sail is accepted for measurement.

In this case it may also be useful to pre-number an appropriate number of measurement sheets and hand these sheets to the owners in the order as they arrive to drop off their sails. The sails may then be measured in order of their measurement sheets to preserve a first-come first serve measurement order, and arranged for pick-up in the same order with the owner's copy of the measurement sheet placed with each sail in the pick-up area.

4. Measurement Points

The following measurement points shall be used:

4.a. Tack, clew and head:

The measurement point at the tack, clew and head shall be the "apex" which is the intersection of the straight line extensions of the two edges of the sail past any rounding or trimming of the corner. The purpose of using the "apex" as the measurement point is to ensure that the measurements are representative of the overall outline of the sail, and are not influenced by details of cutting or finishing at the corners.

For practical purposes the extensions of the edges may be determined as straight lines which are tangent to the edges at a distance of 2 to 3 inches from the corner. The "apex" is at the intersection of these two tangent lines.

In any case where unusual cutting, trimming or rounding of the sail produces a tangent line at 2 to 3 inches from the corner that is not a reasonable extension of the edge, and/or an apex location that is not representative of the overall outline of the sail, the measurer shall use discretion to determine appropriate extensions of the sail edges and the "apex" point which is representative of the overall outline of the sail.

4.b. Throat:

The measurement point for the throat shall be on the sail edge at the point closest to the center of the throat grommet. Because this measurement point is determined by the location of the throat grommet, the measurement point will not necessarily be the same as the "apex" of the throat corner, if any such apex exists.

In case of small deformities of the sail edge near the throat grommet, the measurer shall use discretion to determine the undeformed outline of the sail, and the measurement point shall be the point on this outline closest to the center of the grommet.

4.c. Sail fasteners and reef cringles:

The measurement point for sail fasteners and reef cringles shall be on the sail edge at the point closest to the center of the grommet. For sail fasteners which are attached to the sail by means of a sewn or riveted strap and have no grommet, the measurement point shall be on the sail edge at the center of the strap.

4.d. Batten pocket location:

The measurement point for batten pocket location shall be on the sail edge at the centerline of the batten pocket.

5. Measuring the Sail

5.a. Order of Measurement

The dimensions may be measured in any order, however the following order of measurement is suggested to facilitate the measuring process, particularly in cases where a long narrow measuring surface is used:

1. foot
2. clew to throat diagonal
3. leach
4. tack to peak diagonal
5. head
6. hoist.

Edge curve (roach) should be measured while measuring each side.

Foot slide number and spacing should be measured while measuring the foot. Clew reef cringle and bottom and top batten pocket locations should be measured when measuring the leech. Head slide number and spacing should be measured when measuring the head. Hoop fastener spacing and tack reef cringle locations should be measured while measuring the hoist. Reef point number may be counted when measuring the foot, when measuring either of the reef cringle locations, or after the completion of other sail measurements. Batten lengths may be measured before or after measuring the sail.

5.b. Flaking an edge:

When measuring the length and roach of an edge, the sail must be flaked along a line parallel to the edge and approximately 6" to 12" towards the middle of the sail from the edge.

To flake an edge, first lay the edge to be measured onto the surface (or lay the entire sail out on the surface if the surface is a floor large enough to accommodate the entire sail), with one measurer at each end of the edge to be measured. (e.g., When measuring the foot, there would be one measurer at the tack and one measurer at the clew.) Each measurer grasps the sail with one hand at the corner and one hand at the flake line. (e.g., When measuring the foot,

the measurer at the tack would put one hand at the tack grommet and one hand on the hoist approximately 6" to 12" above the tack. The measurer at the clew would put one hand on the clew grommet and one hand on the leach approximately 6" to 12" above the clew.) It is helpful but not essential that the two measurers place their flake line hand approximately the same distance from the sail corner, e.g., both 6" or both 9" or both 12".

Next the measurers pull the sail taught along the sail edge by pulling with their sail corner hands, and taught along the flake line by pulling with their flake line hands. At this point the sail should be laying approximately flat on the measuring surface within the flake area (the area between the sail edge and the flake line).

Next the measurers maintain the tension between their flake line hands, but let go of the sail corners, and reach with that free hand across their flake line hands to a point 6" to 12" further up the sail and fold the sail along the flake line by lifting the sail with the hand that has reached across and pulling the lifted portion of the sail down over approximately half of the flake area. When folding the flake, the measurers must maintain tension along the flake line or the sail will not fold properly. The measurers must fold the sail far enough onto the flake area to ensure that the sail will remain so folded when not held in place, but not so far as to obscure a straight line between the sail corners.

Once the sail will remain folded without holding the fold over the flake area, the measurers let go with their folding hands, return these hands to the sail corners, pull again with tension along the sail edge and along the flake line until the sail lays as flat as it will, and then let go of the sail. The sail should be laying flat within the flake area and should not have moved or recoiled significantly when let go.

If the sail will not lay flat or moves when released, the measurers should first decrease the distance from the sail edge to the flake line and repeat the flaking procedure to see if the sail will lay flat and not move when released.

If, after the width of the flake area is reduced to the practical minimum (usually about 6"), the sail still does not lay flat, or continues to move or recoil significantly when released, the measurers may try pulling again with slightly reduced or increased tension to see if the sail will then lay flat and not move or recoil when released.

In some cases, particularly with the foot, hoist and head of older sails which have stretched significantly and may have a tight edge tape or bolt rope, it will be difficult or impossible to get the sail to lay entirely flat within the flake area through the method described above. If after the above remedies, the sail is not laying entirely flat, it may be possible to smooth out some or all of the puckers within the flake area by gently patting the sail down onto the measuring surface after releasing the tension on the flake, being careful not to slide the sail across or along the measuring surface while patting it down.

Once the measurers have followed the above flaking procedure to produce a well behaved flake, or have exhausted the above remedies for a poorly behaved flake, they should conclude that the sail is flaked sufficiently for measurement purposes and proceed with the measurement of the edge.

In most cases the flaking procedure (pulling, folding, pulling and releasing) will go smoothly and the entire process should take between ten and twenty seconds. In cases which require reflaking, retensioning or patting, the process

may take from thirty seconds to one minute. The key to achieving a well behaved flake quickly and easily is maintaining tension along the flake line throughout the flaking process, but not applying so much tension as to distort the sail.

5.c. Flaking a diagonal:

The procedure for flaking a diagonal is similar to flaking an edge, except that instead of tensioning the sail along the edge and along one flake line, the sail is tensioned and flaked along two flake lines, one on each side of the diagonal, and each parallel to and approximately 3" to 6" away from the diagonal being measured.

When flaking a diagonal it usually is not possible to fold the flake from both sides of the diagonal over the flake area without completely covering the flake area with several layers of cloth. However, because the diagonal requires only a length measurement and does not require the stretching of a straight line string to measure roach, covering of the diagonal and the surrounding flake area will not cause any problems. As long as the diagonal is properly flaked from both sides, the sail lies flat on the measuring surface within the flake area, and the tape measure lays along the diagonal, on top of the flake surface but beneath the covering folds, the length measurement will be correct.

When measuring the tack to peak diagonal, there may be a temptation to flake only the aft side of the diagonal and to leave the sail unfolded between the diagonal and the throat. This method of flaking the diagonal should never be permitted as it will result in a measurement of diagonal length which is shorter than the actual length. The sail must always be folded between the throat and the diagonal, preferable at a distance of not more the 3" to 6" from the diagonal.

If there is any question as to the suitability of a flake when measuring a diagonal, measure the length as flaked, reduce the width of the flake, and measure again, being careful not to stretch the sail for any of the measurements. As long as the diagonal is not stretched, the greatest length which can be measured is always the correct length. If the first flake was already as narrow as possible, it probably has produced the correct length, but the measurers may check this assumption by increasing the width of the flake or reflaking at the same width and measuring again. The longest length that can be measured without stretching the diagonal is always the correct length.

5.d. Pinning the ends:

Once an edge or diagonal is flaked, the measurer at one end drives an awl through the corner grommet and into the measuring surface. The awl should be placed touching one edge of the inside of the grommet such that the grommet will not move when the measurer at the other end pulls the sail against the awl.

The measurer at the other end pulls the corner grommet at that end lightly to be certain that the sail is fully laid out along the edge or diagonal, but is not stretched. This measurer then releases the grommet and places an awl through the grommet into the measuring surface such that the grommet cannot slide towards the other end of the edge or diagonal.

Note that the NEBCBA sail measuring procedure differs from that of other classes in that the NEBCBA procedure calls for measuring the sail in a fully extended but not tensioned condition,

whereas other classes commonly provide for a fixed amount of tension when measuring. The purpose of the NEBCBA method is not to force any sail to measure outside of the specifications, but rather to identify any sails which do not comply with the specifications.

If the grommet slides more than 1/4" toward the other end of the sail when it is released and before the awl is placed, the measurers should check to be certain that the edge or diagonal is properly flaked, and repeat the flaking and pinning procedures until the situation is remedied.

5.e. Marking an apex:

Once the ends of an edge or diagonal are pinned, the measurer at each end must determine the measurement point at that sail corner. As described in section 4.a., the measurement point at the tack, clew or head is the "apex", which is the intersection of the extensions of the edge lines past the grommet and other trimming or rounding of the corner. Considerations when determining the apex are discussed in section 4.a.

NEBCBA measurers have found that a simple method to determine and mark the apex is to lay a strip of masking tape onto the measuring surface, tangent to one of the sail edges at a point approximately 2" to 3" from the corner and extending past the corner. When a second strip of tape is laid in a similar position relative to the sail edge on the other side of the corner, the intersection of the tape edges marks the apex.

In the absence of masking tape, the extensions of the sail edges and the apex may be determined by laying a ruler or straight edge tangent to the sail edge on each side of the corner and marking the extended edges lines with a pencil.

5.f. Marking the throat measurement point:

As described in section 4.b., the measurement point at the throat is the point on the sail edge closest to the center of the grommet.

The throat measurement point should be relatively easy to determine. However, it is essential to use the same measurement point for all measurements involving the throat. Therefore, the throat measurement point should be marked on the sail the first time it is used, and the marked measurement point should be used for all following throat measurements. A pencil mark should be sufficient to remain discernible throughout the measuring process. However, in the case of an official NEBCBA measurement, use of a permanent marker is recommended to provide a permanent record of exactly how the sail was measured.

5.g. Measuring the length of an edge or diagonal:

Once the measurement points at each end of the edge or diagonal have been determined, the length of the edge or diagonal is measured as the distance between the measurement points and recorded on the measurement sheet.

5.h. Measuring the roach of a sail edge:

Once the length of an edge has been measured, the roach should be measured by the following procedure.

First, the measurer at each end of the edge drives an awl into the measuring surface at the measurement point. Note that the roach is measured from the

measurement points and not from the grommets. Note also that the awls in the grommets must remain in place while the roach is measured. Therefore, four awls are required, two for the grommets and two for the measurement points.

After placing the awls in the measurement points, the measurers stretch a string between these two awls and fasten it to the awls with sufficient tension to ensure that the string runs in a straight line between the measurement points, checking to be certain that the string is not disturbed by the sail fold, stray parts of the sail (e.g., sail fasteners, edge tapes, etc.) or foreign objects.

Once the string is determined to be running along the straight line between the measurement points, the roach at any point along the edge may be measured as the distance from the string to the sail edge.

The required roach measurement is the roach at the point where it is maximum.

When measuring the leach, this maximum typically occurs at one of the batten pockets. Therefore it is only necessary to measure the roach at each of the battens and select the largest value obtained to be recorded on the measurement sheet.

When measuring the foot, head or hoist, it is useful to note that the roach will not vary measurably from the maximum for a small distance either side of the maximum point. Therefore it is only necessary to measure the roach at a point close to where it is maximum, and then to measure the roach a small distance (6" to 12") on either side of the maximum to verify that the roach does not vary measurably near the assumed maximum point.

In some cases, particularly on the foot, head or hoist of an older sail that has stretched significantly and may have a tight edge tape or bolt rope, the roach may be negative. That is, instead of the sail edge bowing out away from the center of the sail, the sail edge sags towards the center of the sail. In some cases, the edge may form an "s curve" that lies on sides of the straight line string. However the sail specifications limit only the maximum positive roach. Negative roach is of no consequence when determining if the sail complies with the specifications.

When measuring an edge with an "s curve", measure and record the roach at the point where the positive roach is maximum. When measuring when measuring an edge that has negative roach over its entire length, measure the roach at the point where the negative roach is maximum, and record this value with a minus sign on the recording sheet.

5.i. Sail fasteners:

When measuring the foot, head or hoist, the number of sail fasteners (slides on the foot or head, hoop fasteners on the hoist) must be counted and recorded, and the maximum distance between any two adjacent fasteners must be determined and recorded.

As described in section 4.c. the measurement point for sail fastener spacing is on the sail edge at the point closest to the center of the grommet, or at the center of the attachment strap if there is an attachment strap and no grommet.

In most cases, it should be possible to determine the maximum inter-fastener spacing with sufficient accuracy simply by measuring a few of the spaces,

visually scanning the sail edge, and measuring any spaces that are noticeably larger than those that were measured.

Because the maximum fastener spacing specification applies to the space between the end fasteners and the sail corners (apex or throat measurement point) as well as to the space between any two adjacent fasteners, it will be necessary to measure the end spaces as the distance from the corner measurement points to the first and last fasteners. Note that the end spaces are measured to the corner measurement points and not to the corner grommets.

If either of the end spaces are larger than the maximum inter-fastener spacing, record the largest end space as the maximum fastener spacing. Otherwise, record the maximum inter-fastener spacing as the maximum spacing.

5.j. Cringle location:

When measuring the leach and the hoist, measure and record reef cringle location.

As described in section 4.c., the measurement point for reef cringle location is on the sail edge at the point closest to the center of the grommet. The height of the tack cringle is the distance from tack apex to the tack cringle measurement point. The height of the clew cringle is the distance from the clew apex to the clew cringle measurement point.

When performing an official measurement, use a permanent marker to mark each reef cringle measurement point with a line perpendicular to the sail edge.

5.k. Reef points:

After measuring and recording reef cringle location, the number of reef points should be counted and recorded, along with a visual observation that the reef point spacing is or is not approximately even.

5.l. Number of battens:

When measuring the leach, count the number of batten pockets and record this number as the number of battens in the sail.

5.m. Bottom and top batten pocket location:

After counting the number of batten pockets, measure and record the bottom and top batten pocket locations.

As described in section 4.d., the measurement point for batten pocket location is on the sail edge at the centerline of the batten pocket. The bottom batten pocket location is the distance from the clew apex to the bottom batten pocket measurement point. The top batten pocket location is the distance from the peak apex to the top batten pocket measurement point.

When performing an official measurement, use a permanent marker to mark each batten pocket measurement point with a line perpendicular to the sail edge.

5.n. Batten length:

Batten lengths are measured from the battens, not from the batten pockets.

For this reason, the owner must provide the complete set of battens to be used with the sail to the measurers for measurement. If there is more than one set of battens that may be used with a sail, each set should be measured.

Record the length of the longest batten in each set as the batten length for that set of battens.

5.o. Cautionary note:

It is essential to flake and measure only one side or diagonal at a time. Upon completion of all the measurements (length, roach, fasteners, reef cringle and or batten pocket location) associated with one side or diagonal, the measurers must remove the awls to release that side or diagonal before proceeding to flake the next side or diagonal.

When following the recommended measurement order, the head and hoist will be measured immediately following the measurement of the tack to peak diagonal. There may be a temptation to lay out both the head and the hoist simultaneously by leaving the tack and the peak pinned and simply adding an awl to pin the throat. This erroneous method should never be used.

6. Reviewing the Results

6.a. Checking the measurements with the specifications:

Once all of the sail dimensions, etc., listed in the sail specifications have been measured and recorded, the "chief" measurer should review each of the measurements to determine if any measurements do not meet the specifications. Any measurement which is not in compliance should be marked with an "x" in the space provided on the recording sheet.

6.b. Approving or rejecting the sail:

If any measurement or measurements do not meet the specifications, the measurer should enter the words "does not comply" in the space marked "result" on the measurement sheet.

If all measurements meet the specifications, the measurer should write the word "complies" in the space marked "result" on the measurement sheet for an unofficial measurement, or the word "approved" in the space marked "result" for an official measurement.

If the measurement is an official measurement, and all measurements meet the specifications, the chief measurer should stamp the approved sail with the "NEBCBA" sail stamp, and mark the sail directly beneath the stamp with the serial number of the recording sheet, the date and his or her initials.

6.c. Filing copies of the recording sheet:

If the sail is approved, the original of the recording sheet should be placed in the NEBCBA sail records, and a copy of the recording sheet shall be provided to the owner.

If the sail does not comply with the specifications, the original of the recording sheet shall be placed in the NEBCBA sail records, a copy of the recording sheet shall be provided to the owner along with a letter suggesting

that the owner should return the sail to the sailmaker and request that the non-compliance(s) should be remedied at no expense to the owner, and a second copy of the recording sheet shall be mailed or otherwise delivered to the sailmaker along with a letter explaining to the sailmaker that NEBCBA has encouraged the owner to return the sail to the sailmaker and that NEBCBA has informed the owner that the non-compliance(s) should be remedied at no expense to the owner.