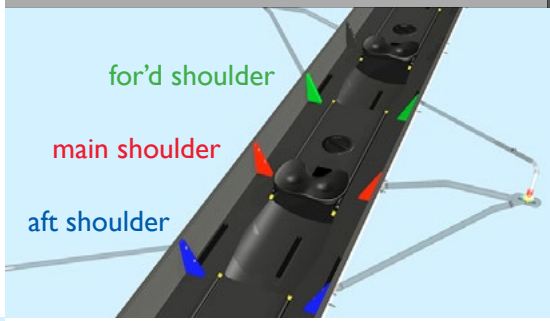
AeRoWing riggers uniquely combine the engineered optimum of lightness, stiffness and strength with durability and extremely low wind–and–water resistance.

AeRoWing™ **riggers can be fitted to any conventionally rigged shell but this requires accurate measurement of that shell.**

Measuring your boat for AeRoWing is not as difficult as you imagine and this document is designed to help you through that process. A comprehensive video is also available on our website or go to YouTube and search "Measure for aerowing"

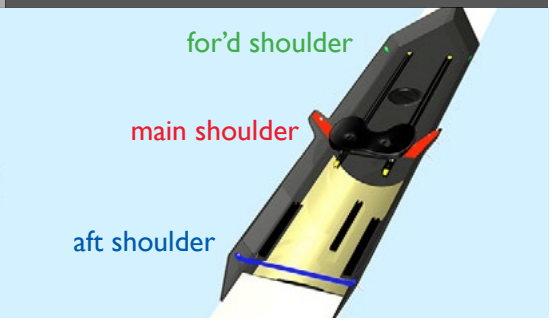
Boats are much less precisely made than you might think. Measurements taken from one side of the boat almost never exactly match those taken from the other side and often change between seating positions. It is therefore important to **never assume anything** and to measure the whole boat accurately.

## SHOULDERS – CREW BOATS

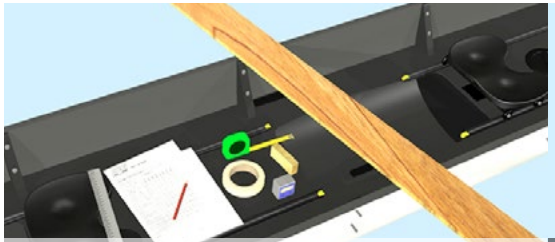



It is important to identify the different shoulders in the boat, the main shoulder in particular. This is the shoulder most in line with the pin when the boat is rigged.

## SHOULDERS – SINGLE SCULLS




Most single sculls only have a main shoulder. The aft shoulder may be part of the boat or a plain stay.
The for'd shoulder may simply be a bolt through the sax board.



## EQUIPMENT REQUIRED

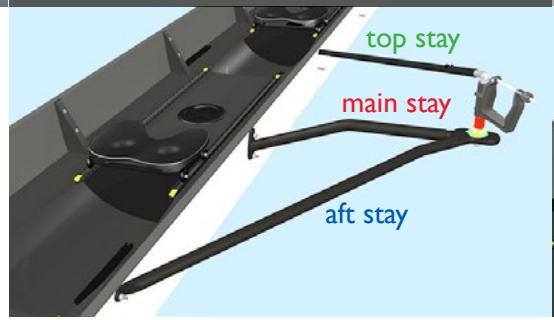
1. AeRowing Specification form – available on this pdf
2. Sharp pencil
3. Tape Measure
4. Ruler
5. Roll of tape
6. Long straight edge
7. Sheets of plain paper
8. Spacer piece
9. Two props
10. Small digital level or bevel box – this is optional, not essential.

## BOAT PREPARATION

Once you start measuring, you want the boat to stay still and level, especially if you're using a Bevel box or similar. For small boats Carl Douglas trestles are ideal for this purpose but even so, it is best to prop the boat before starting:

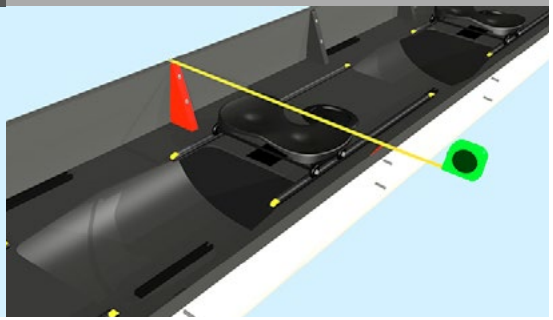
When sitting right-side-up on trestles, place a prop on either side of the boat. The best place is under the bolts or sax lip but avoid the main shoulder area.

## RIGGER COMPONENT NAMES




There are three principle components of a conventional stayed rigger and relate to the descriptions of the shoulders

## DATUM POINT

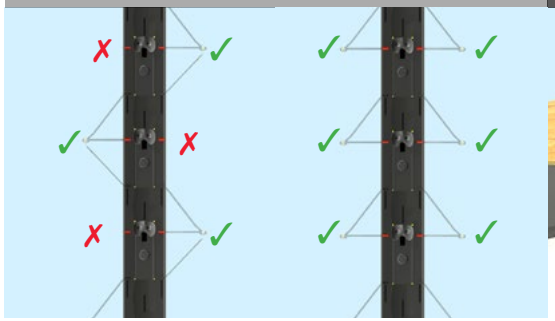


The datum point for measuring the boat is the line running squarely across the top of the main shoulder.

PAPER METHOD

Click **here** if you are using a Bevel Box or other digital level

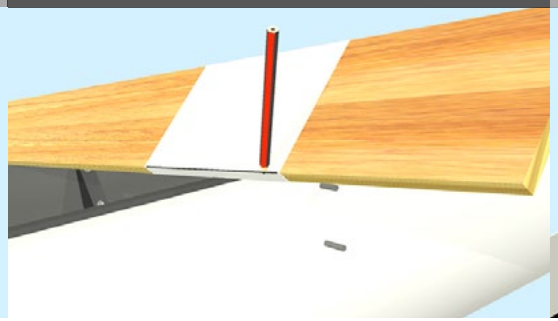
## A SAX BEVEL – WHERE TO MEASURE



On sweep boats you should only measure the positions where you require riggers (unless you need mirror riggers)

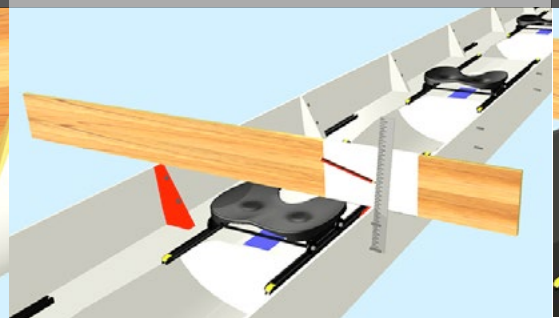
*On sculling boats you should measure every position down both sides of the boat.*

## A SAX BEVEL – PAPER & PENCIL



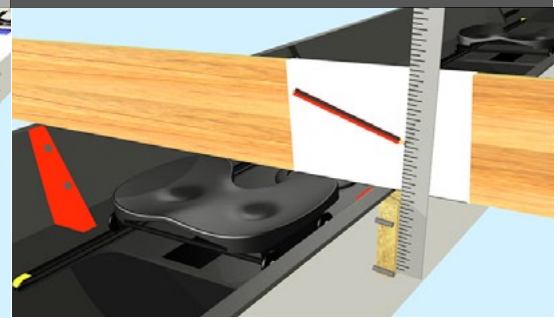
Take your straight edge board and tightly wrap a sheet of paper around it, fixing with some tape. Then clearly mark the bottom edge with a pencil.

## A SAX BEVEL – BOATS WITH NO SAX LIP



At the main shoulder positions, use your ruler to 'extend' the line of the saxboard upwards and mark that line onto the paper. Ensure that the board is both **vertical** and **square** across the boat.

## A SAX BEVEL – BOATS WITH A SAX LIP

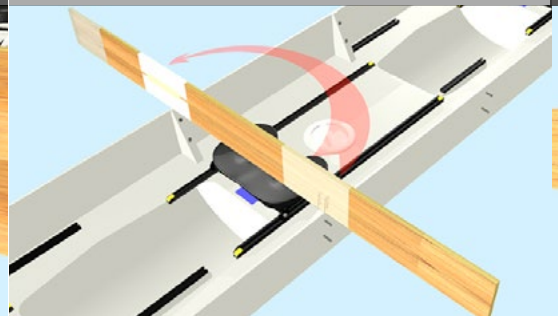


If your boat has a sax lip, you will need to use a **spacer block** to allow the ruler to clear the lip. The spacer should be of even thickness and get the spacer as close to the main shoulder bolts as possible.

## A SAX BEVEL – MARK & ANNOTATE

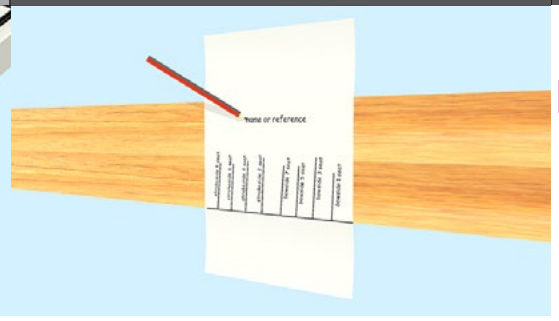
Move the board over a little and repeat at each relevant main shoulder all the way down one side of the boat. It is important to indicate strokeside or bowside so label each position accordingly.

## A SAX BEVEL – ROTATE & REPEAT



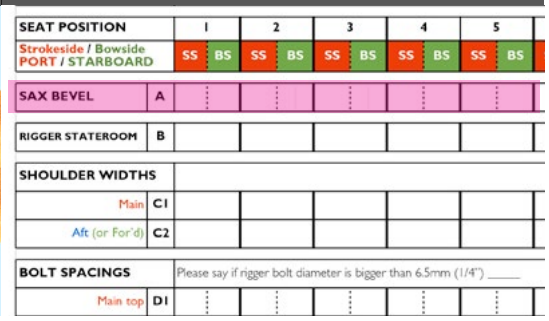
Once you have finished one side, turn the board through 180° and repeat down the other side of the boat. It is important to indicate strokeside or bowside so label each position accordingly.

## A SAX BEVEL – FINAL RESULT



Your paper should end-up looking something like this (for an VIII in this example). Carefully unwrap the paper which can now be faxed to us or scanned and emailed but please **make sure that your name or other reference is on it.**

## RECORD YOUR MEASUREMENTS



| SEAT POSITION | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Strokeside / Bowside PORT / STARBOARD | | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS |
| SAX BEVEL | A | | | | | | | | | | |
| RIGGER STATEROOM | B | | | | | | | | | | |
| SHOULDER WIDTHS | | | | | | | | | | | |
| Main | C1 | | | | | | | | | | |
| Aft (or For'd) | C2 | | | | | | | | | | |
| BOLT SPACINGS | | Please say if rigger bolt diameter is bigger than 6.5mm (1/4") ____ | | | | | | | | | |
| Main top | D1 | | | | | | | | | | |

Send us the marked-up piece of paper

***These measurements record the angle of the saxboard from vertical and are critical, a 1° error will result in a 10mm height error. Never round-up to the nearest whole degree, always record to one decimal place.***

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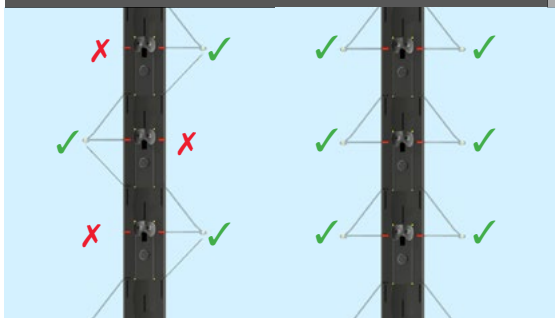
DIGITAL METHOD

Click **here** if you don't have a Bevelbox or other digital level

## A SAX BEVEL – WHERE TO MEASURE



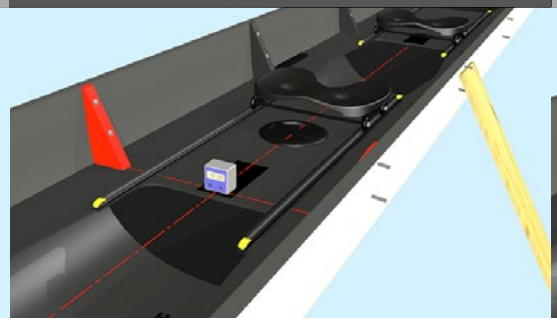
On sweep boats you should only measure the positions where you require riggers (unless you need mirror riggers)

*On sculling boats you should measure every position down both sides of the boat.*

## A SAX BEVEL – PROP THE BOAT

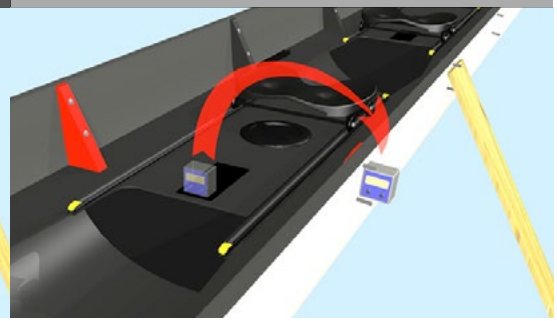
This method uses a small digital level such a Bevelbox and requires the boat to be firmly propped on both sides so that is cannot move. **It is critical that the boat remains still once you start taking measurements.**

## A S AX BEVEL – PLACE & ZERO



Place the Bevelbox **squarely** across middle of the boat on the slide bed at the main shoulder **a**nd zero the device taking care not to move the boat. This only needs to be done once per side

## A SAX BEVEL – MEASURE



Carefully move your Bevelbox to the sax board as close to the main shoulder bolts as possible and take the measurement. Repeat this all the way down the boat. **You do not need to re-zero for every position.**

## A SAX BEVEL – COMMON ERRORS

Make sure that the Bevelbox is placed **squarely** across the boat.

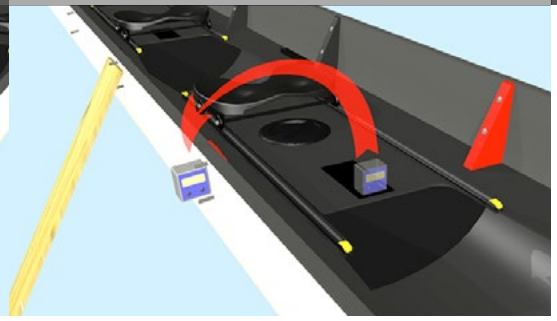
## A SAX BEVEL – COMMON ERRORS

Do not twist the Bevelbox to face away from the direction that it was zeroed-in.

Do not take measurements below the main shoulder bolts.

Do not take measurements away from the main shoulder bolts.

## A SAX BEVEL – ROTATE & REPEAT



Re-zero the Bevelbox for the other side of the boat and repeat the process down that side.

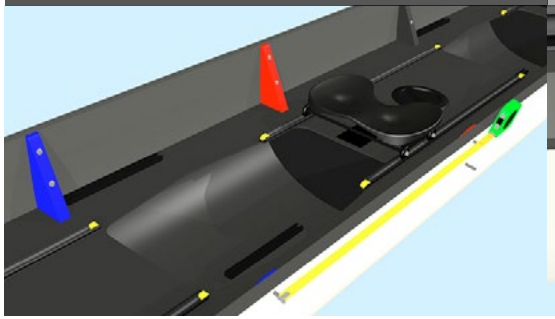
## RECORD YOUR MEASUREMENTS

| SEAT POSITION | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Strokeside / Bowside PORT / STARBOARD | | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS |
| SAX BEVEL | A | | | | | | | | | | |
| RIGGER STATEROOM | B | | | | | | | | | | |
| SHOULDER WIDTHS | | | | | | | | | | | |
| Main | C1 | | | | | | | | | | |
| Aft (or For'd) | C2 | | | | | | | | | | |
| BOLT SPACINGS | | Please say if rigger bolt diameter is bigger than 6.5mm (1/4") ____ | | | | | | | | | |
| Main top | D1 | | | | | | | | | | |

Row A for sax bevel

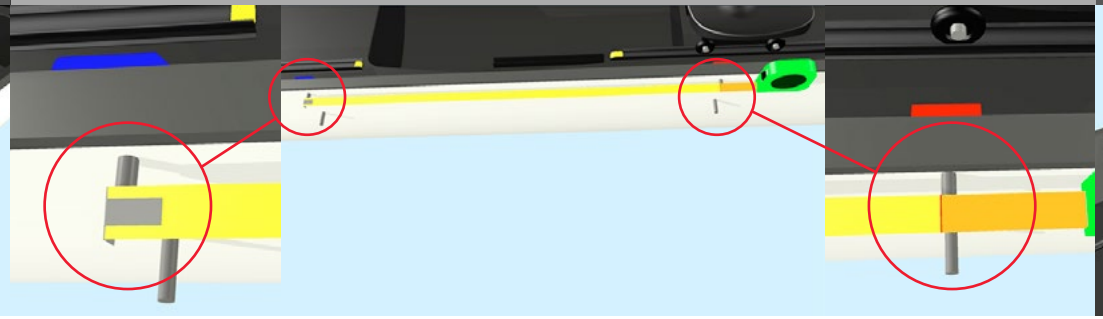
***These measurements record the angle of the saxboard from vertical and are critical, a 1° error will result in a 10mm height error. Never round-up to he nearest whole degree, always record to one decimal place.***

## B RIGGER STATEROOM



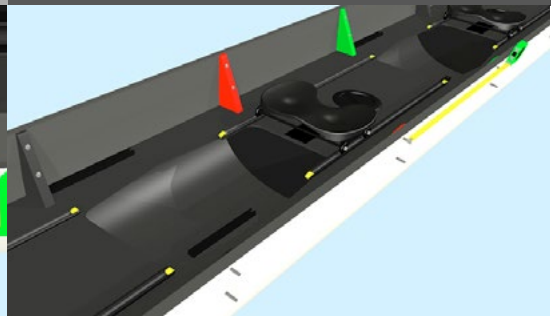
The rigger stateroom (B) is the foot well region between the main shoulder and the aft shoulder.

## B MEASURE BETWEEN BOLTS



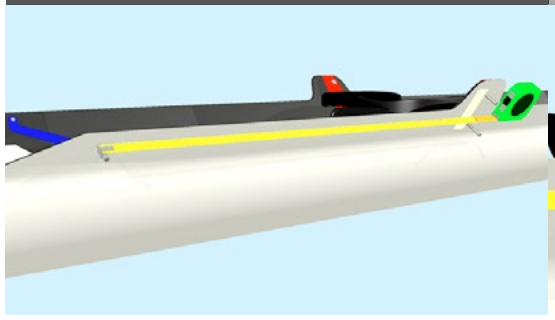
We need the measurement between the bolt centres but measuring between outside edges will give the same result as long as you measure from the **same side** of either bolt

## *b TOPSTAY STATEROOM*



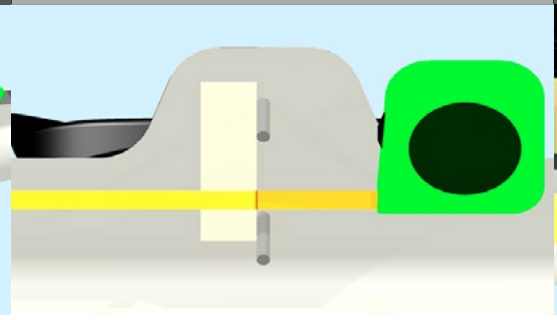
*If you are ordering top stays (for rowing) then you will also need to measure the top stay stateroom as well. This must not be confused with the rigger stateroom. See Topstay page for further instructions.*

## B SAX CUT DOWNS



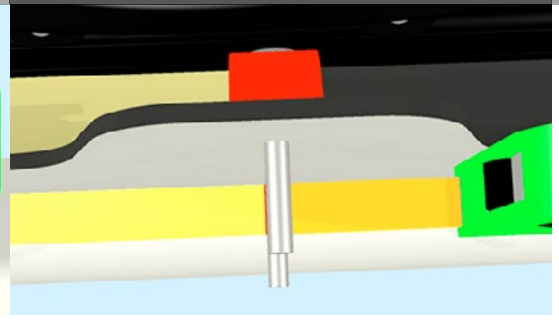
On single sculls (and some crew boats) the rigger bolts are often at different heights on the saxboard but it is important to take a **horizontal** measurement, **parallel** to the edge of the saxboard.

## B SAX CUT DOWNS



In this case you can either put a piece of tape between the two main bolts and measure to the edge of the tape ...

## B SAX CUT DOWNS



... or you can simply sight down the bolts from above and measure where the bolt edges line up. With either method **always measure to the same side of the bolts**

## RECORD YOUR MEASURES

| SEAT POSITION | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Strokeside / Bowside PORT / STARBOARD | | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS |
| SAX BEVEL | A | | | | | | | | | | |
| RIGGER STATEROOM | B | | | | | | | | | | |
| SHOULDER WIDTHS | | | | | | | | | | | |
| Main | C1 | | | | | | | | | | |
| Aft (or For'd) | C2 | | | | | | | | | | |
| BOLT SPACINGS | | Please say if rigger bolt diameter is bigger than 6.5mm (1/4") ____ | | | | | | | | | |
| Main top | D1 | | | | | | | | | | |

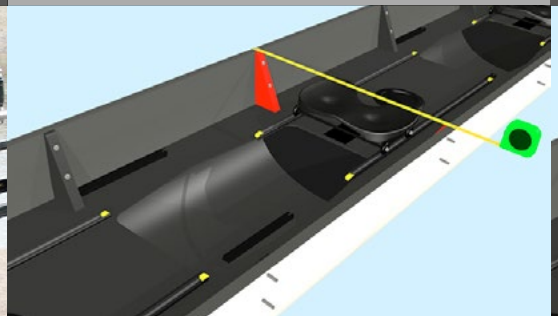
Row B for the Rigger stateroom


+44 (0) 1932 570946 info@carldouglasrowing.com www.carldouglasrowing.com Harris Boatyard, Laleham Reach, Chertsey, Surrey KT16 8RP England

## C SHOULDER WIDTHS

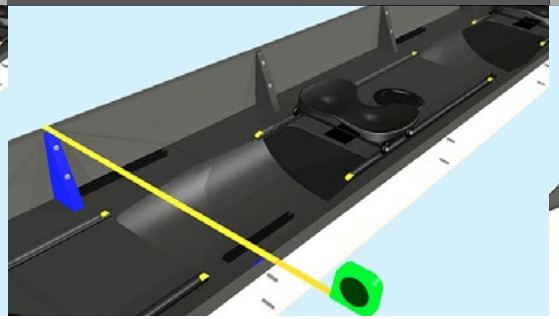
Since boats are curved you must measure the shoulders in all the seating positions as they will differ. We require two different measurements from each seating position (three if there is a sax lip) ...

## C1 MAIN SHOULDER



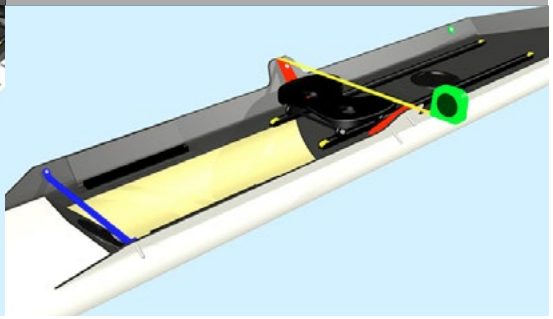
Measure squarely across the top of all the main shoulder positions.

## C2 AFT SHOULDER



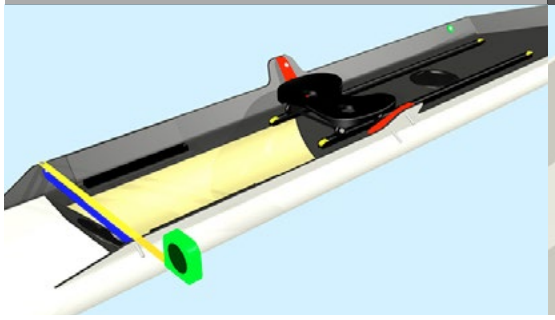
Measure squarely across the top of the aft shoulder positions.

## C1 MAIN SHOULDER SINGLES



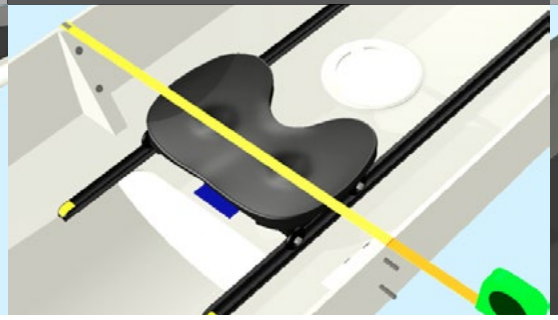
On single sculls measure across the top of the main shoulder, ie. at the highest point.

## C2 AFT SHOULDER SINGLES



On single sculls measure across the top of the sax above the aft shoulder bolt ie. over the aft stay/stretcher

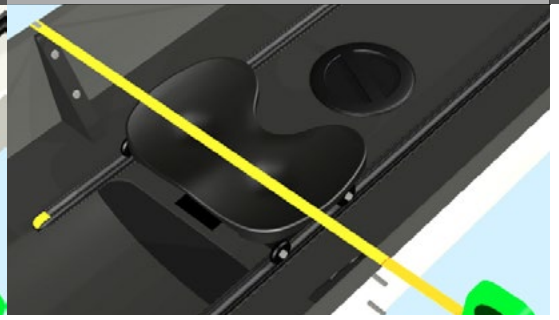
## C BOATS WITHOUT A SAX LIP



**Always measure the full with of the boat.**

For boats without a sax lip, measure to the **outside edge of the sax.**

## C BOATS WITH A SAX LIP



**Always measure the full with of the boat.**

For boats with a sax lip, measure to the **outside edge of the lip**.

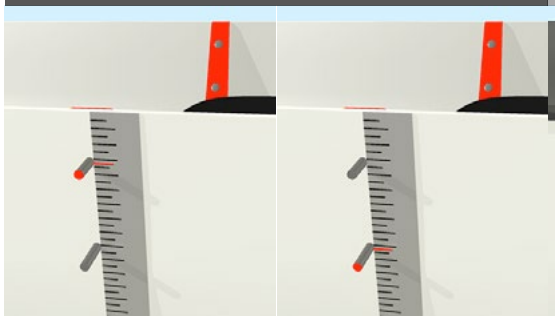
*For boats with a sax lip you will have to take further measurements: see next page.*

## RECORD YOUR MEASUREMENTS

| SEAT POSITION | | 1 | | 2 | | 3 | | 4 | | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Strokeside / Bowside PORT / STARBOARD | | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS |
| SAX BEVEL | A | | | | | | | | | | |
| RIGGER STATEROOM | B | | | | | | | | | | |
| SHOULDER WIDTHS | | | | | | | | | | | |
| Main | C1 | | | | | | | | | | |
| Aft (or For'd) | C2 | | | | | | | | | | |
| BOLT SPACINGS | | Please say if rigger bolt diameter is bigger than 6.5mm (1/4") ____ | | | | | | | | | |
| Main top | D1 | | | | | | | | | | |

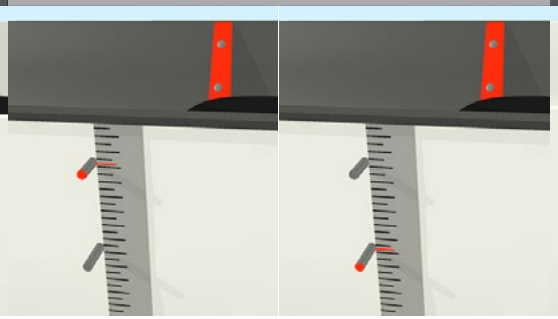
Row C1 for Main shoulders
Row C2 for Aft shoulders

## D1 & D2 MAIN SHOULDER, NO SAX LIP



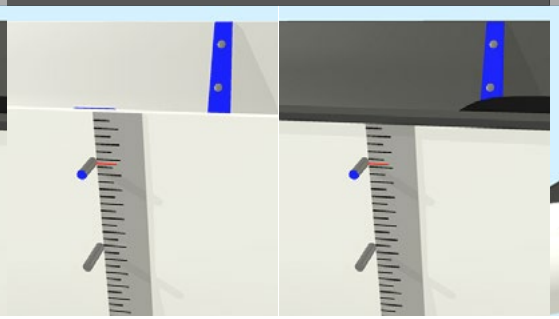
For boats without a sax lip, always measure from the **top of the sax.**
D1 and D2 are the main shoulder bolts. Always measure to the centerline of the bolt.

## D1 & D2 MAIN SHOULDER WITH SAX LIP



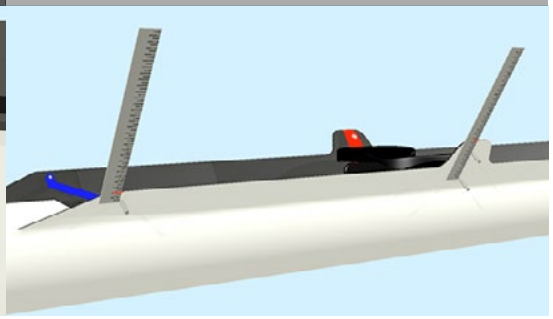
For boats with a sax lip, always measure from the **underside of the sax lip.**
D1 and D2 are the main shoulder bolts. Always measure to the centerline of the bolt.

## D3 AFT SHOULDER



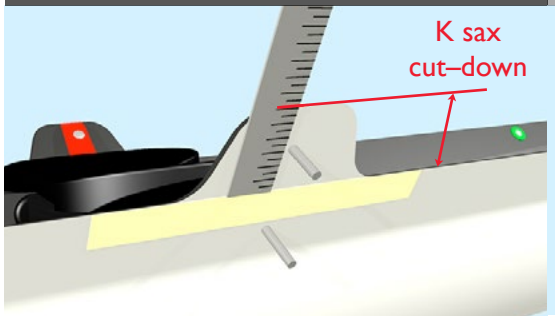
D3 is the aft shoulder bolt. If your boat has two bolts in the aft shoulder you need only measure the top bolt. *However, if you are ordering top stays please see that page for additional instructions.*

## D BOATS WITH SAX CUT DOWN



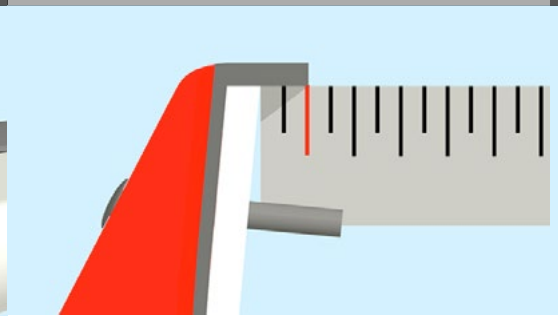
On a single scull with a sax cut-down you should always measure the bolt spacings from the top edge of the saxboard above the bolt(s). Always measure to the centerline of the bolt.

## K SAX CUT DOWN




On a single scull with a sax cut-down you also need to measure the height of that cut-down (K). Some tape, a straight edge or pencil line drawn across the cut-down will help in measuring this.

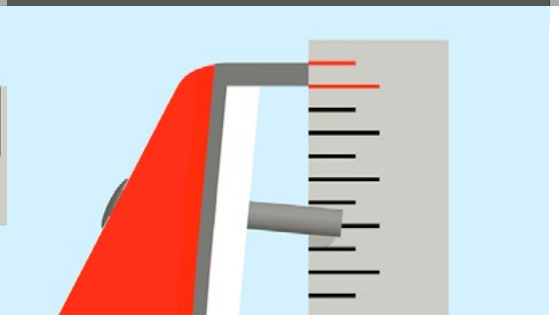
## L SAX LIP DEPTH



If your boat has a sax lip you also need to measure the depth on the **underside** of that sax lip (L).

You must take this measurement at **all** of the main shoulder positions

## T SAX LIP THICKNESS



If your boat has a sax lip you also need to measure the **thickness** of that sax lip (T).

You must take this measurement at **all** of the main shoulder positions

## RECORD YOUR MEASUREMENTS

| BOLT SPACINGS | | Please say if rigger bolt diameter is bigger than 6.5mm (1/4") ____ |
|---|---|---|
| Main top | D1 | |
| Main bottom | D2 | |
| Aft (or For'd) | D3 | |
| SAX CUT DOWN | K | |
| SAX LIP DEPTH | L | |
| SAX LIP THICKNESS | T | |
| MID-RISE | E | |
| WORK HEIGHT | W | |

Row D1 & D2 for main shoulder bolts
Row D3 for aft shoulder bolts
– *Where required* –
Row d for top stay bolts
Row K for sax cutdown
Row T for sax lip thickness

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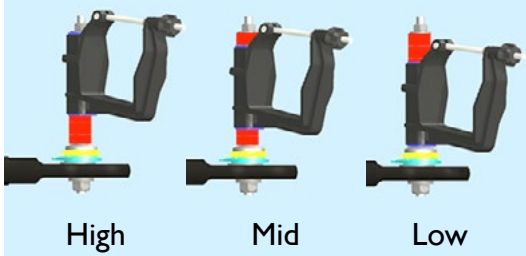
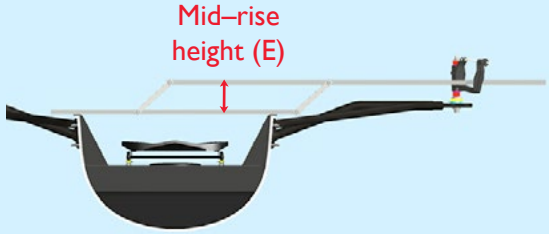
## E MID–RISE



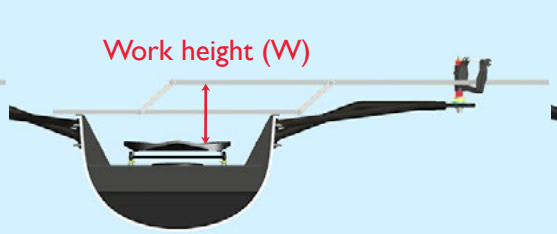

The mid in mid-rise refers to when the gate/oarlock is exactly halfway up the pin ie. with equal numbers of washers above and below to allow for adjustment in both directions.

## E MID RISE



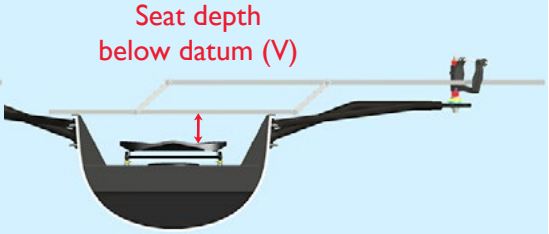

Mid-rise (E) is the height of the gate above datum. If you are replacing riggers you can simply measure this from those existing riggers in each position and fill-in the form with those measurements.

## W WORK HEIGHT



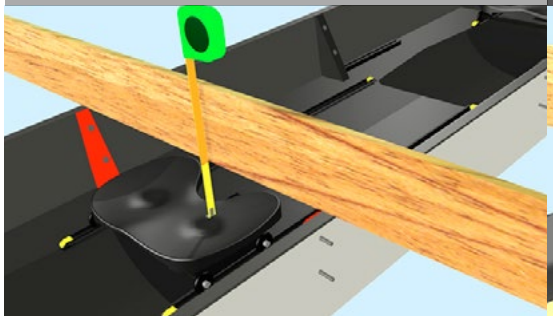

Work height (W) is your choice and is **usually 150mm–190mm above the seat**. If you are replacing existing riggers then it can be measured from the existing riggers with a height stick.

## V SEAT DEPTH BELOW DATUM



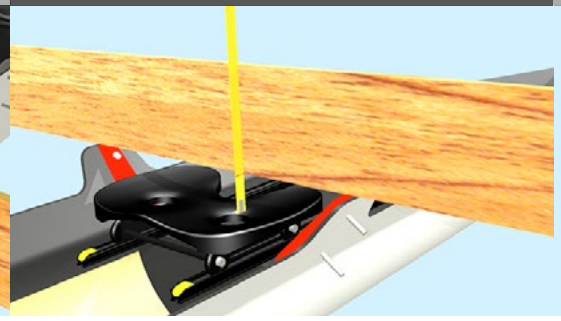

If you don't know the mid-rise height (E) then it needs to be calculated from your chosen work height (W) less the depth of the seat below the main shoulder datum (V).

## V SEAT DEPTH ON CREW BOATS



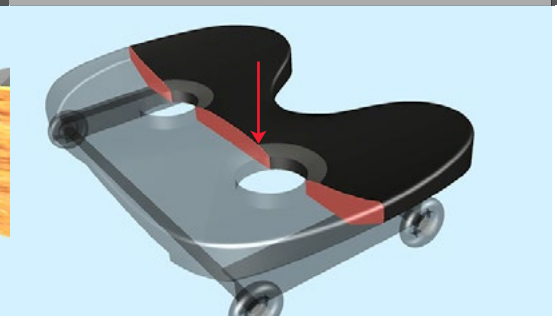
To measure the seat depth (V), place your straight edge squarely across the main shoulder and measure from the bottom edge of the board to the top edge of the seat hole in each position.

## V SEAT DEPTH WITH SAX CUT—DOWN



If you are measuring a single with a sax cut-down, you should use the top of the main shoulder for this measurement.

## V SEAT DEPTH BELOW DATUM



Measure to the top/outside edge of the hole bevel (or dimple) in the seat.

(W) – (V) = (E)

**work height – seat depth = mid–rise**

## RECORD YOUR MEASUREMENTS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SAX CUT DOWN | K | | | | | | |
| SAX LIP DEPTH | L | | | | | | |
| SAX LIP THICKNESS | T | | | | | | |
| MID–RISE | E | | | | | | |
| WORK HEIGHT | W | | | | | | |
| SEAT DEPTH | V | | | | | | |
| WORK POSITION | F | | | | | | |
| | | ahead / level / astern *(delete as appropriate)* | | | | | |
| MID–SPAN/SPREAD | G | | | | | | |

Row E for mid–rise
Row W for work height
Row V for seat depth

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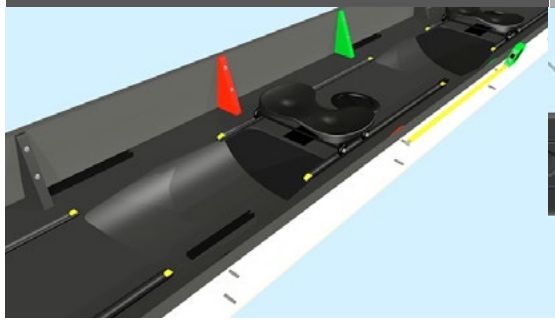
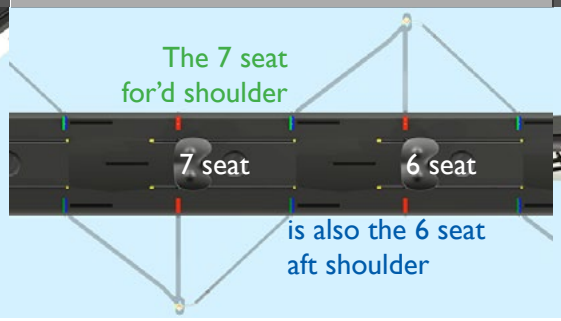
## b TOPSTAY STATEROOM



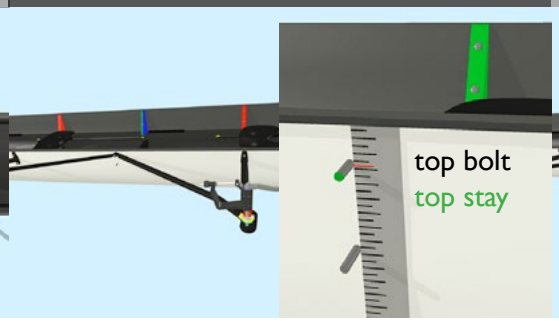
If you are ordering top stays (for rowing) then you will also need to measure the top stay stateroom (b). This is the slide-bed region between the main shoulder and for'd shoulder.

## b TOPSTAY STATEROOM



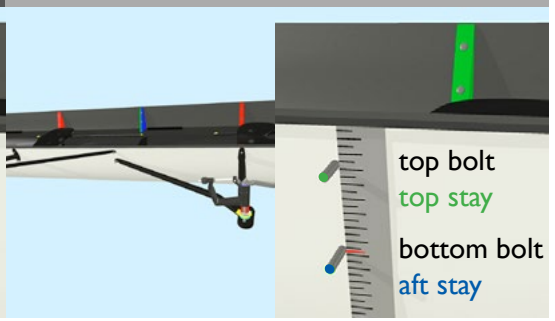

Take care to know which shoulder is which. For example, the for'd shoulder at the 7 seat is also the aft shoulder at the 6 seat so make sure that you're measuring the correct stateroom!

## b TOPSTAY BOLTS



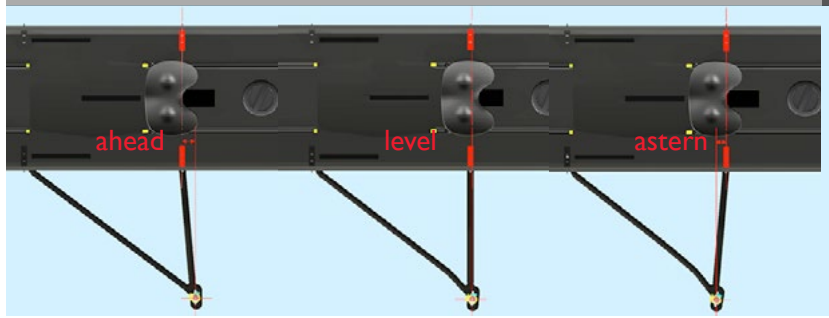

If your top stays and aft stays both use the same bolt, then only measure the top bolt (some boats only have one bolt here).

## d TOP STAY BOLTS



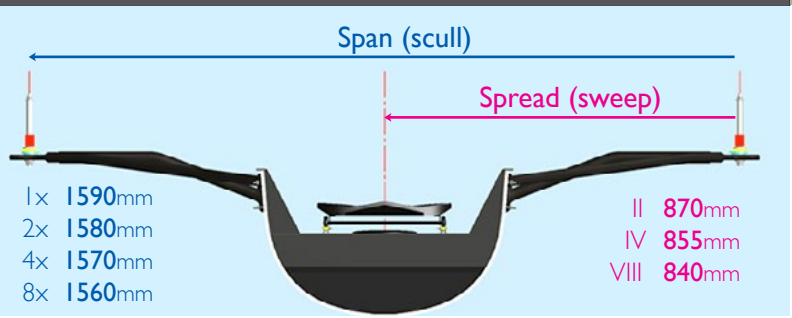

If your boat has two bolts then ideally, the top bolt takes the top stay (d) and the bottom bolt takes the aft stay (D3).

## F WORK POSITION




The work position (F) can be set ahead, level or astern of the main shoulder. Setting the work ahead of the main shoulder will help the set-up for much taller rowers.

## G SPAN (scull) or SPREAD (sweep)

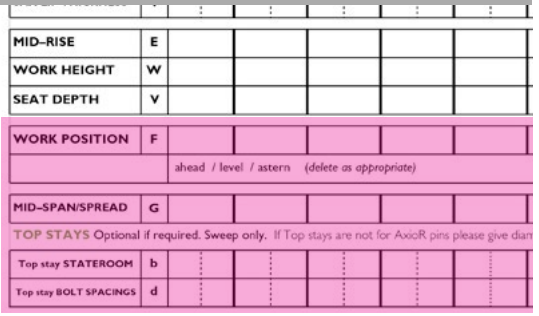



Span or spread are known preferences rather than physical measurements. Typical dimensions are listed above.

Span is the **horizontal** distance across the boat between the middle of the pins on scull-rigged boats.

Spread is the **horizontal** distance from the centre of the boat to the middle of the pin on sweep-rigged boats.

## RECORD YOUR MEASUREMENTS




Row b for top stay stateroom
Row d for top stay bolt(s)
Row F for work position
Row G for spread or span

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| RIGGER TYPE | | Sweep / Scull / Aftstay / Forestay *(delete as appropriate)* | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SEAT POSITION** | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | |
| Strokeside / Bowside<br>PORT / STARBOARD | | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS | SS | BS |
| **SAX BEVEL** | A | | | | | | | | | | | | | | | | |
| **RIGGER STATEROOM** | B | | | | | | | | | | | | | | | | |
| **SHOULDER WIDTHS** | | | | | | | | | | | | | | | | | |
| Main | C1 | | | | | | | | | | | | | | | | |
| Aft (or For'd) | C2 | | | | | | | | | | | | | | | | |
| **BOLT SPACINGS** | | Please say if rigger bolt diameter is bigger than 6.5mm (1/4") _____ | | | | | | | | | | | | | | | |
| Main top | D1 | | | | | | | | | | | | | | | | |
| Main bottom | D2 | | | | | | | | | | | | | | | | |
| Aft (or For'd) | D3 | | | | | | | | | | | | | | | | |
| **SAX CUT DOWN** | K | | | | | | | | | | | | | | | | |
| **SAX LIP DEPTH** | L | | | | | | | | | | | | | | | | |
| **SAX LIP THICKNESS** | T | | | | | | | | | | | | | | | | |
| **MID-RISE** | E | | | | | | | | | | | | | | | | |
| **WORK HEIGHT** | W | | | | | | | | | | | | | | | | |
| **SEAT DEPTH** | V | | | | | | | | | | | | | | | | |
| **WORK POSITION** | F | | | | | | | | | | | | | | | | |
| | | ahead / level / astern *(delete as appropriate)* | | | | | | | | | | | | | | | |
| **MID-SPAN/SPREAD** | G | | | | | | | | | | | | | | | | |
| **TOP STAYS** Optional if required. Sweep only. If Top stays are not for AxioR pins please give diameter of the top stud of your pin _____ | | | | | | | | | | | | | | | | | |
| Top stay STATEROOM | b | | | | | | | | | | | | | | | | |
| Top stay BOLT SPACINGS | d | | | | | | | | | | | | | | | | |

# AeRoWing™

Use this form to fill-in your boat measurements.

Carl Douglas Racing Shells cannot be responsible for incorrectly taken measurements or filled-in forms. **Always double-check your measurements.**

For advice, please refer to this document or to the video "How to measure your boat for AeRoWing" available on our website or on YouTube. You are also welcome to email or call us.

In some cases (and for a fee) we may be able to measure your boat for you, either at your club or at our works in Chertsey. Please contact us to discuss.

NAME

BOAT CLUB

POSITION AT CLUB

ADDRESS

TELEPHONE

EMAIL ADDRESS

DATE