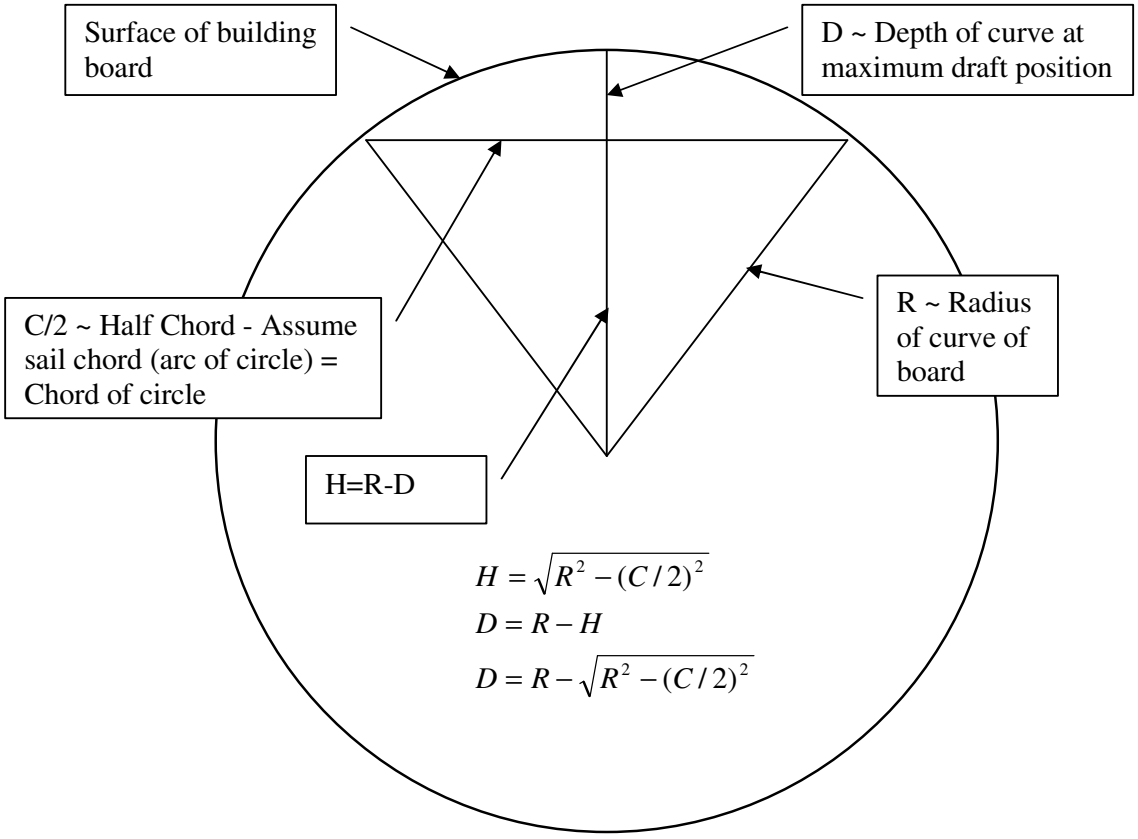
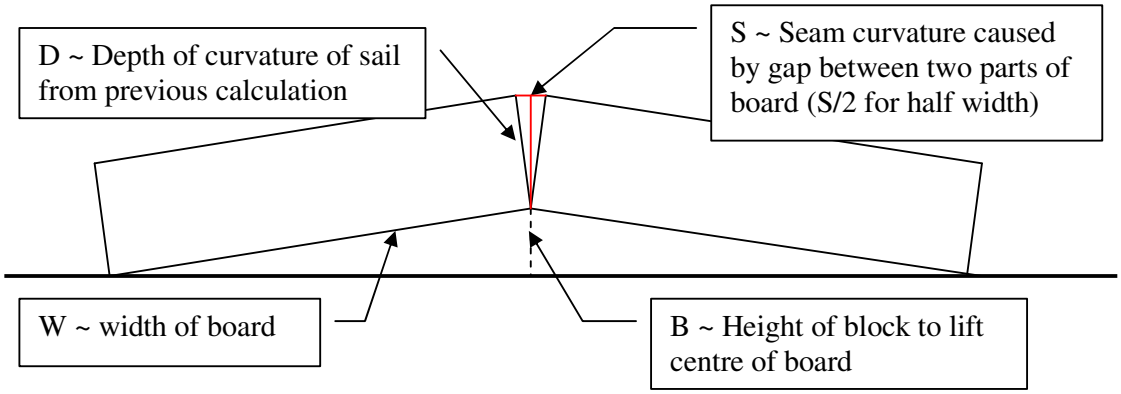
Calculation for the depth of the building board

Consider the cross section of the building board being an arc of a circle. Calculate the depth of the arc which corresponds to the sail seam wrapped over the board.

Assumptions:
1. That the curve of the board is circular. In fact if using an airfoil or parabolic section it will not be quite circular but close enough to calculate the depth of curve for various chord lengths. Alternatively D can be calculated or measured from the parabola or airfoil shape if that is used instead of the arc of a circle.
2. That the chord of the airfoil (the chord of the circle in the diagram) is the length around the circumference of the arc (actual length of the sail cloth).



Calculation of the maximum seam curvature used to produce built-in depth at the sail seam.



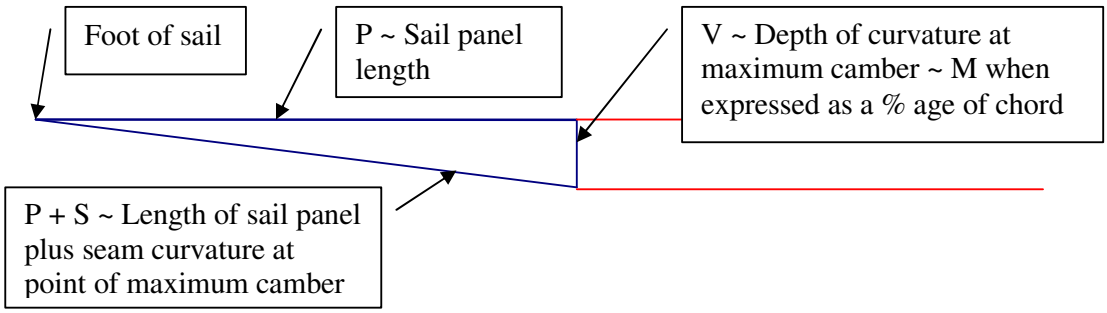
Using Similar Triangles

$B/W = S/2D$

$S = 2BD/W$

Calculation of the curvature of the sail

Consider the side view of the sail from the foot out to the second panel looking at a section through the position of maximum camber. Assume for the calculation that the foot is flat so the calculation determines the built in curve at the first seam.



$$V = \sqrt{(P+S)^2 - P^2}$$

$$M = \frac{V}{C} \times 100\%$$

When these calculations are performed the camber of the seam expressed as a percentage of the sail chord is dependent only on the radius of curvature of the board, the width of the building board, the height of the block lifting the board and the sail panel length.

It is independent on the chord of the sail seam being joined!

See calculations for a variety of chords below

Calculations to show independence on chord of percentage curvature of seam

Radius of curve of board	**750**	mm	Vary the three values in the orange coloured cells to match the values for your board and sail
Width of each side of board	**250**	mm	
Length of sail panel	**400**	mm	

D' is intermediate calculation showing depth of sail when wrapped around board

		Curvature of seam expressed as percentage of chord when lifted by 0.1 to 8 mm										
Chord (mm)	'D'	0.1	0.2	0.5	1	2	3	4	5	6	7	8
450	34.5	1.0%	1.5%	2.3%	3.3%	4.7%	5.7%	6.6%	7.4%	8.1%	8.8%	9.4%
400	27.2	1.0%	1.5%	2.3%	3.3%	4.7%	5.7%	6.6%	7.4%	8.1%	8.7%	9.3%
350	20.7	1.0%	1.5%	2.3%	3.3%	4.7%	5.7%	6.6%	7.4%	8.1%	8.7%	9.3%
300	15.2	1.0%	1.5%	2.3%	3.3%	4.6%	5.7%	6.6%	7.3%	8.0%	8.7%	9.3%
250	10.5	1.0%	1.5%	2.3%	3.3%	4.6%	5.7%	6.6%	7.3%	8.0%	8.7%	9.3%
200	6.7	1.0%	1.5%	2.3%	3.3%	4.6%	5.7%	6.5%	7.3%	8.0%	8.7%	9.3%
150	3.8	1.0%	1.5%	2.3%	3.3%	4.6%	5.7%	6.5%	7.3%	8.0%	8.7%	9.3%

By using the spreadsheet (Sail Board Chord Depth.xls) which generates this information, the radius of curve, width of board and height of the lifting block can be used to calculate the seam draft for your sail.