Outcome 1
LESSON 3
Form Coefficients

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FORM COEFFICIENTS

Form coefficients are ***ratios*** which numerically compare the ship's underwater form to that of a regular shape (such as a rectangle or box-shape).

They are primarily used at the design stage, prior to construction, to determine factors such as resistance to forward motion that the ship will experience during operation, this then being used to determine the ship's power requirements/engine(s) size.

Design coefficients of primary concern are:

Coefficient of fineness of the water-plane area (C_W)

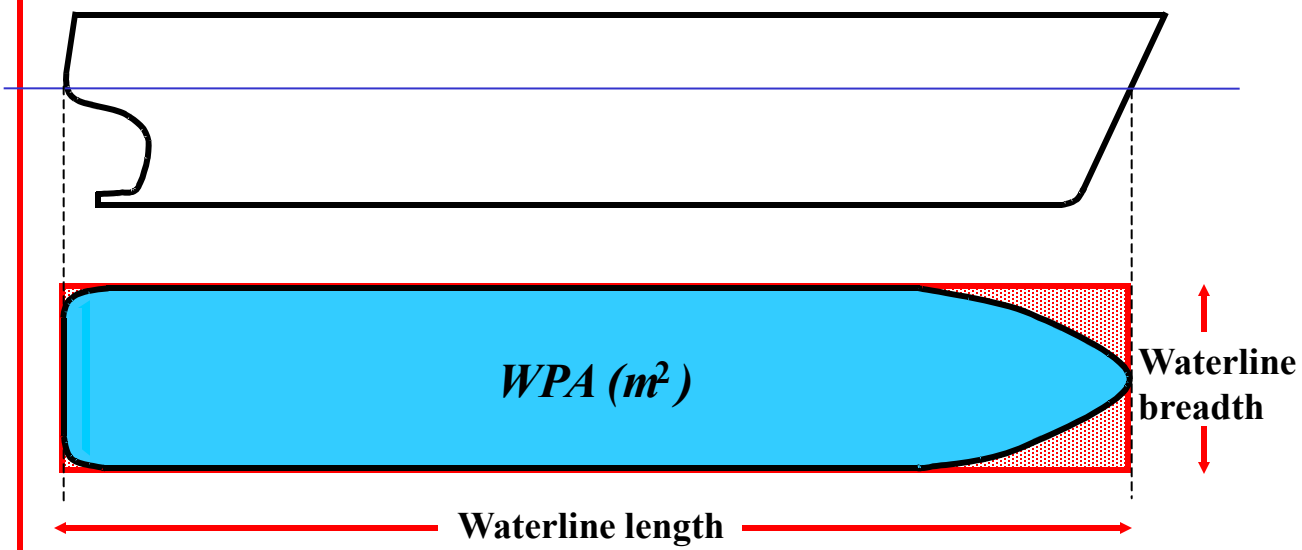
Block coefficient (C_B)

Midships coefficient (C_M)

Longitudinal prismatic coefficient (C_P)

Coefficient of fineness of the water-plane area (C_W)

Is defined as the ***ratio*** of the ship's water-plane area to the area of a rectangle having the same length and breadth of the ship at the waterline in question.

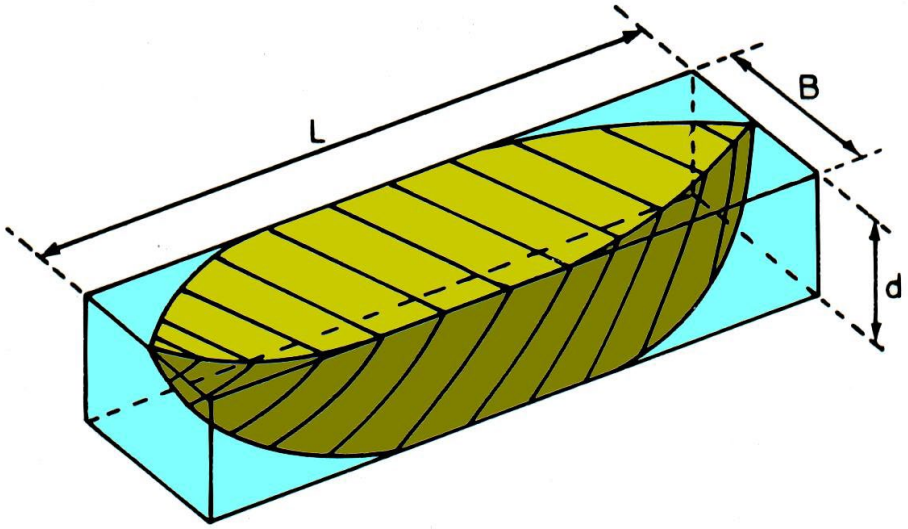


$$Cw = \frac{WPA}{L \times B}$$

Since the ship's WPA is less in area than the rectangle formed around it , ***the value of C_W must always be less than 1.00.***

Block coefficient (C_B)

The block coefficient (C_B) of a ship is the ***ratio*** of the underwater volume of a ship to the volume of the circumscribing block.



$$C_B = \frac{\text{Volume of displacement}}{L \times B \times d}$$

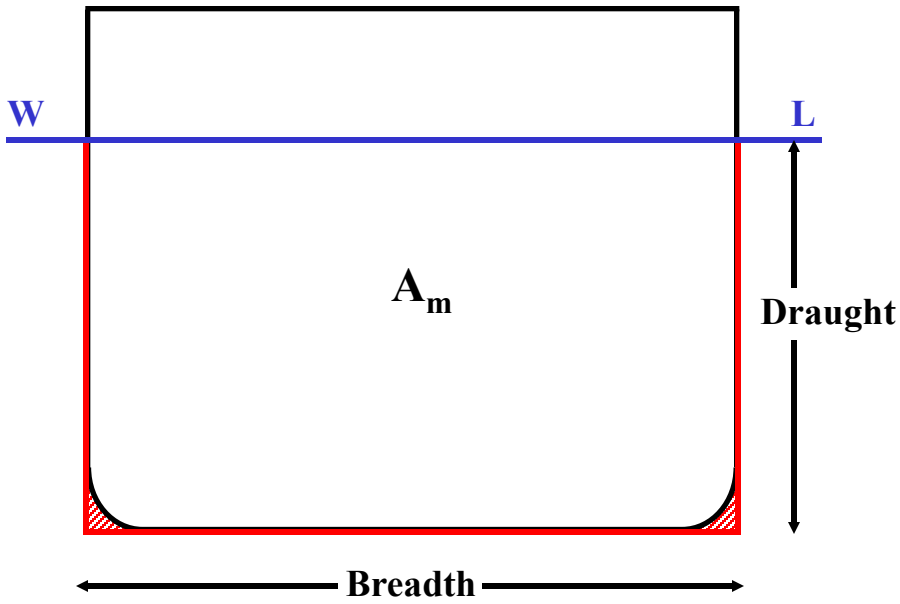
Therefore: $\text{Displacement}_{SHIP} = (L \times B \times d \times C_B) \times \rho$

Since the ship's volume of displacement is less than the volume of displacement of the surrounding block, ***the value of C_B must always be less than 1.00.***

Block coefficient is an important factor when the assigned freeboard of a ship is being calculated (see *'Calculation and Assignment of Freeboard'* notes.)

Midships coefficient (C_M)

The midships coefficient (C_M) of a ship at any draught is the ***ratio*** of the underwater transverse area of the midships section to the product of the breadth and draught (the surrounding rectangle.

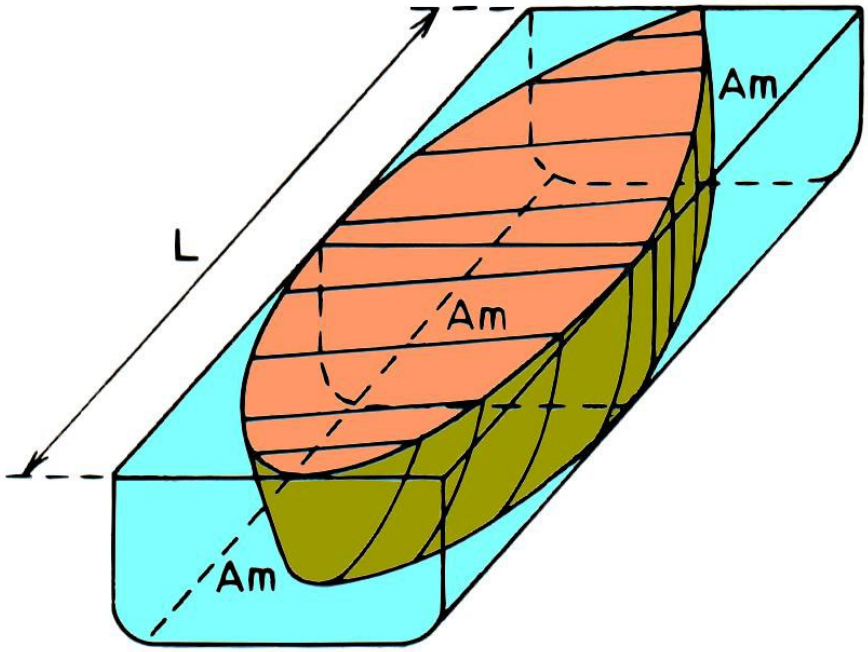


$$C_M = \frac{\text{Underwater transverse area of midships section } (A_m)}{\text{Breadth} \times \text{Draught}}$$

Similarly, ***the value of C_M must always be less than 1.00.***

Longitudinal prismatic coefficient (C_P)

The longitudinal prismatic coefficient (C_P) of a ship at any draught is the ***ratio*** of the underwater volume of the ship to the volume of the prism formed by the product of the transverse area of the midships section and the waterline length.



$$C_P = \frac{\text{Volume of displacement of ship}}{\text{Volume of prism}}$$

$$C_P = \frac{\text{Volume of displacement of ship}}{\text{Waterline length} \times \text{Area of midship section (Am)}}$$

This coefficient gives an indication of how much the ship's form changes at the ends. Similarly, ***the value of C_P must always be less than 1.00.***