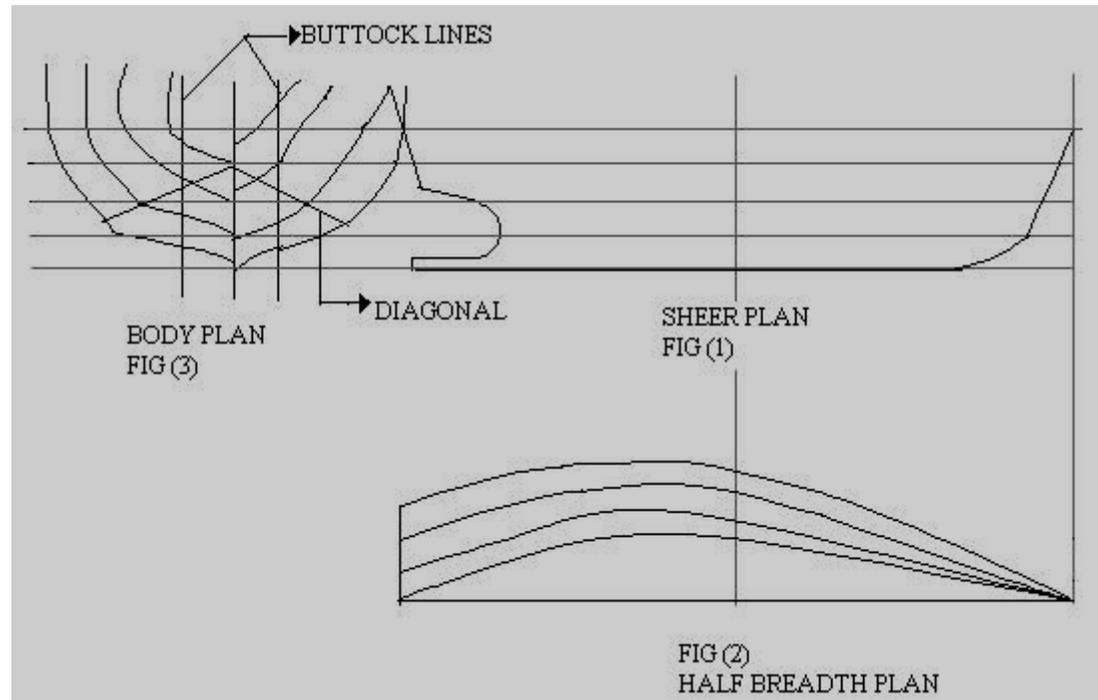


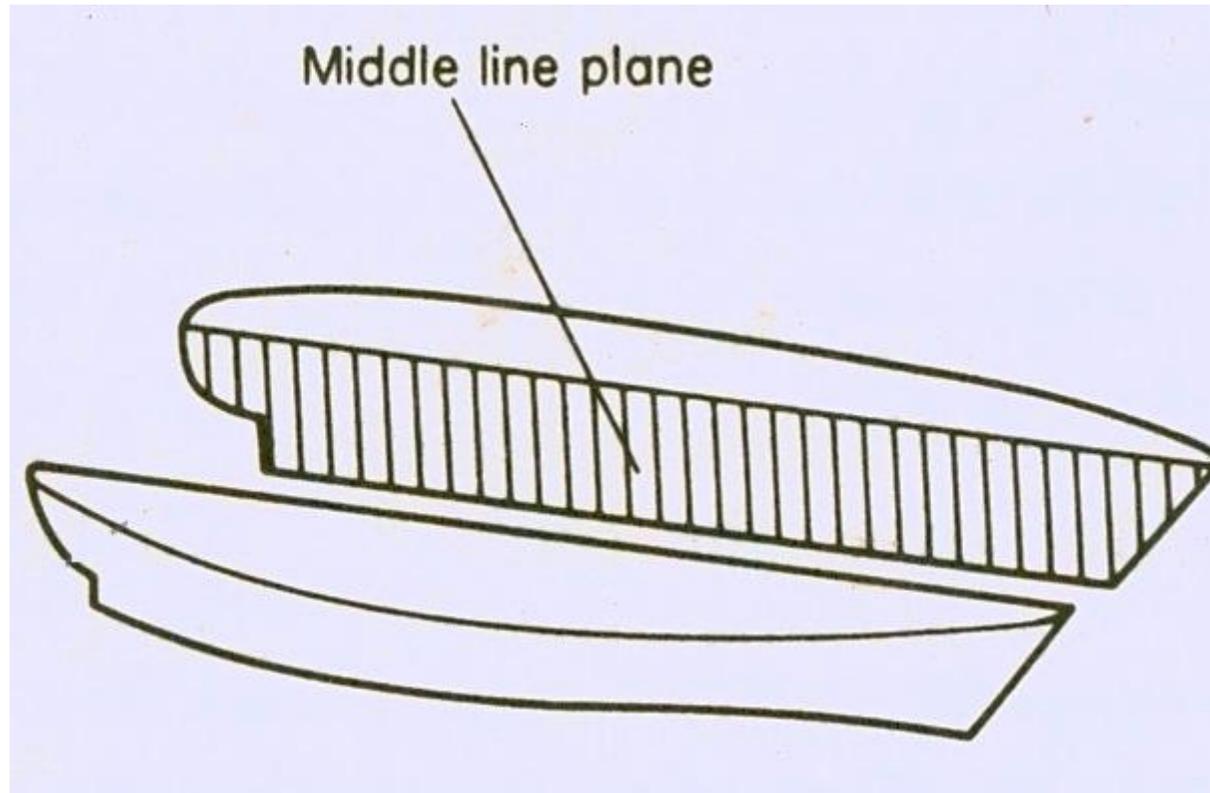
# **Basic geometric concept of the fishing vessel**

## Lines plan

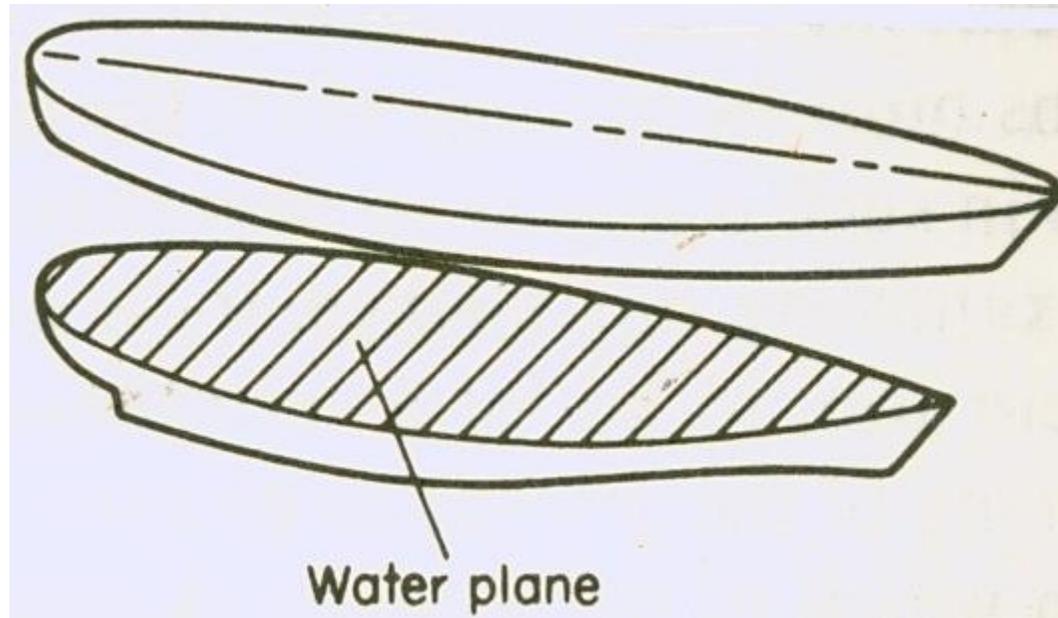
The lines plan is a geometric description of the hull. The hull surface is described by series of longitudinal and transverse sections. It is very essential to learn the main parts of a typical ship together with the terms applied to the principal parts. Because at first they are of little interest or influence, super structure and deck houses are ignored and the hull of the ship is considered as a hollow body curved in all directions surmounted by a water tight deck. Most of the ships have only one plane of symmetry called the middle line plane which becomes the principal plane of reference. The shape of the ship is cut by this plane is known as the sheer plane or profile plane.



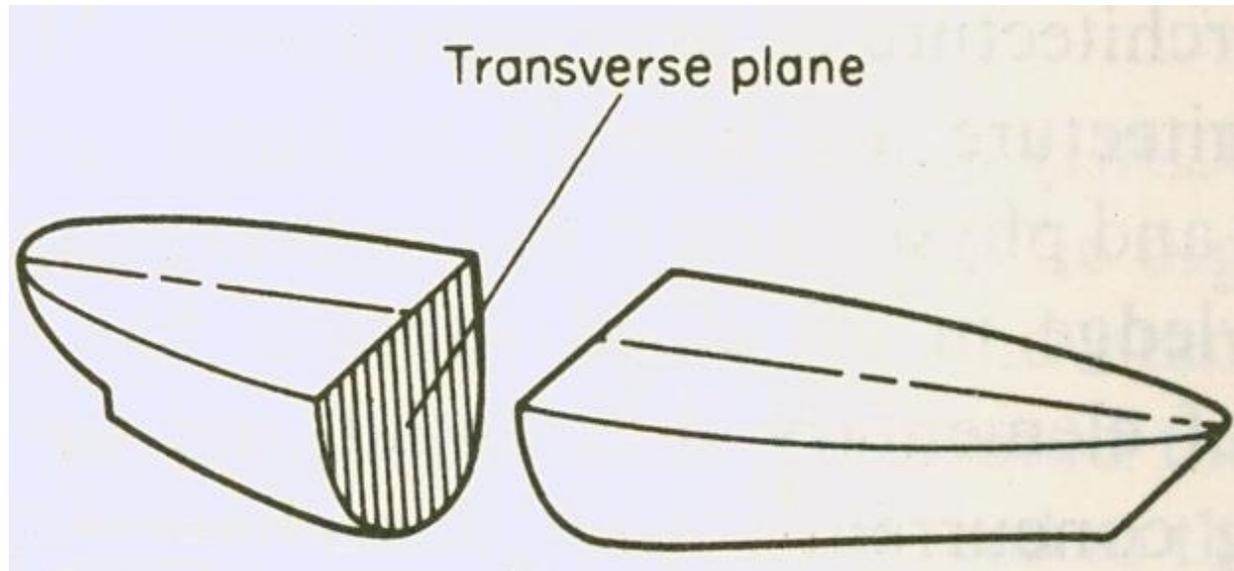
The design water plane is a plane perpendicular to the middle line plane chosen as a plane of reference at design water line. It may or may not be parallel to the keel.



The planes at right angles to the middle line plane and parallel to the design water plane are called as water planes, whether they are in the water or not and they are usually symmetrical about the middle line. Water planes are not necessarily parallel to the keel.



Planes perpendicular to both the middle line and the design water plane are called transverse planes and a transverse section of the ship does normally exhibit symmetry about the middle line.



**a) Sheer plan:**

Most of the ships have only one plane of symmetry, called the middle line plane which becomes the principal plane of reference. The shape of the ship cut by this plane is known as the sheer plan or profile.

**b) Half breadth plan:**

Half water planes are placed one on top of the other, form a half breadth plan. Water planes looked at edge in the sheer are called water lines.

**c) Body plan:**

Transverse sections are laid one on top of the other, form a body plan. Which by convention because the sections are symmetrical shows only half sections the forward half sections on the right hand side of the middle line and the aft or after half sections on the left.

The sheer, body plan and half breadth plan are collectively called the LINES PLAN or SHEER DRAWING .

**d) Buttock line:**

These are another set of intersecting planes parallel to centre lines. Each plane intersects the vessel surface in a curved form in the sheer plan in its true form. They appear as vertical straight line in the body plan and horizontal straight line in the half breadth plan.

**e) Diagonal plane:**

It is an inclined plane; these are inclined to all the above planes. Diagonal planes are usually normal to the surface or nearly so with determining the character of that surface, vicinity more accurately than in a plane sharply inclined to the surface.

**f) Bilge diagonal plane:**

These planes are inclined line to both horizontal and vertical reference planes, but perpendicular to off ward plane. It appears as a straight line in the body plan and as a curve in the sheer plan and different curve in the half breadth plan. Which is its true shape these are often use because its plane is perpendicular, normal to ship surface at the burn of the bilge.

## Form co-efficient

The definition of hull geometry is also specified in the form of certain co-efficient. Which will later prove as the guide values to decide the fatness or slimness of the hull.

### a) Length breadth ratio:

It is defined as the ratio of length between perpendiculars to the breadth mould of the vessel.

$$\frac{LBP}{B}$$

It can be taken as resistance and stability influencing factor.

### b) Breadth depth ratio:

It is defined as the ratio of the breadth to the depth of the vessel. It can be taken as a stability influencing factor.

$$\frac{B}{D}$$

### c) Breadth draft ratio:

It is defined as the ratio of the breadth to the draught of the vessel. Which influence the resistance and stability of the vessel.

$$\frac{B}{d}$$

### d) Length depth ratio:

It is defined as the ratio of the length to the depth of the vessel.

$$\frac{\text{LBP}}{\text{D}}$$

### e) Block co-efficient (CB)

The block co-efficient of a ship at any particular draft is defined as the ratio of the volume of displacement at that draft to the volume of rectangular block whose sides are equal to the breadth, the mean draught and the length between perpendiculars.

$$C_B = \frac{\nabla}{L_{BP} \times B \times d} = \frac{\text{Volume of displacement}}{\text{Volume of the block}}$$

Where,

CB = Block co-efficient

LBP = Length between perpendiculars

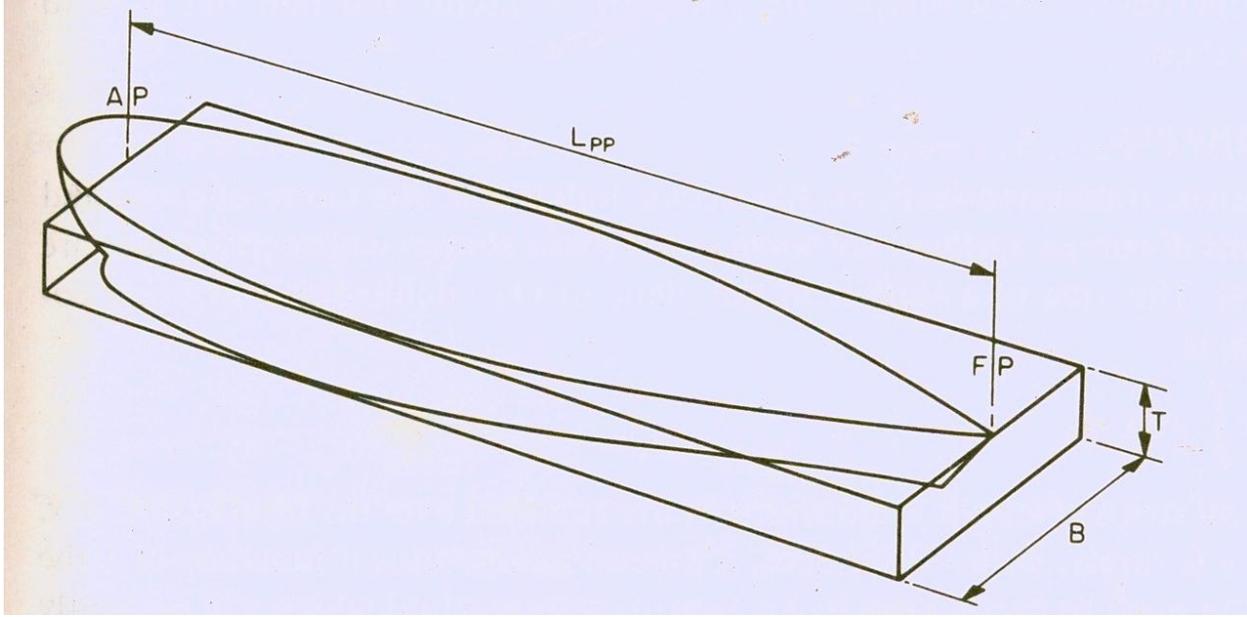
B = Breadth moulded

d = Mean draught

$\nabla$  = Volume of displacement

Mean values of block co-efficient might be 0.88 for a large oil tanker, 0.60 for an air craft carrier and 0.5 for a yacht.

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



### Mid- ship section co-efficient (CM):

Mid ships co-efficient to any draft is defined as the ratio of the mid ship section area to the area of rectangle whose sides are equal to the draught and breadth of the ship.

Its value usually exceeds 0.85 for ships other than yacht.

$$C_M = \frac{A_M}{B \times d} = \frac{\text{Mid ship section area}}{\text{Area of rectangle}}$$

Where,

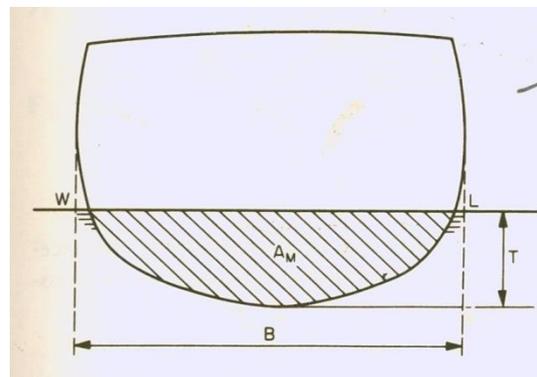
CM = Mid ship section co-efficient

AM = Area of mid ship section

B = Breadth

d = Draught

Area of mid ship section = AM = CM x B x d



### Co-efficient of fineness of water (Cwp):

It is defined as the ratio of the area of water plane to the area of its circumscribing rectangle having the same length and maximum breadth. It varies from 0.7 to 0.9 for ships.

$$C_{wp} = \frac{A_w}{L_{WL} \times B} = \frac{\text{Area of the water plane}}{\text{Area of the rectangle ABCD}}$$

Area of the water plane (AW) = L x B x Cwp

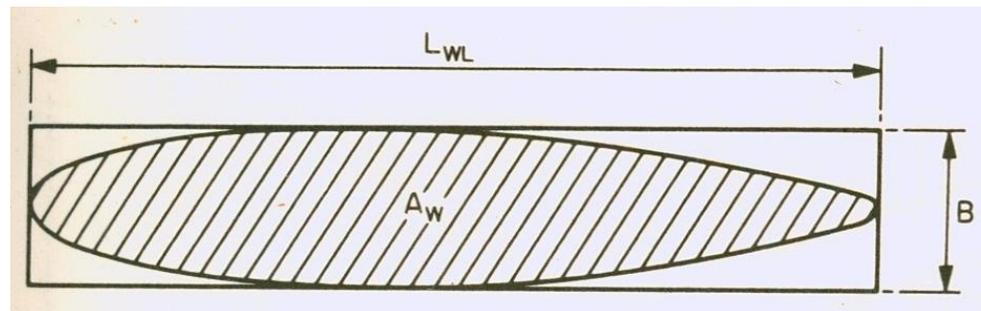
Where,

CWP = Co-efficient of water plane

AW = Area of water plane

LWL or LBP = Length of load water line

B = Breadth extreme or Breadth moulded



**h) The longitudinal prismatic co-efficient or prismatic co-efficient (C<sub>p</sub>):**

The prismatic co-efficient of a ship at any draft is defined as the ratio of the volume of displacement to that draft to the volume of prism having a length equal to the length between perpendiculars and cross sectional area equal to the mid-ship sectional area.

$$C_p = \frac{\nabla}{A_M \times L_{BP}}$$

Where,

C<sub>p</sub> = Prismatic co-efficient

∇ = Volume of Displacement m<sup>3</sup>

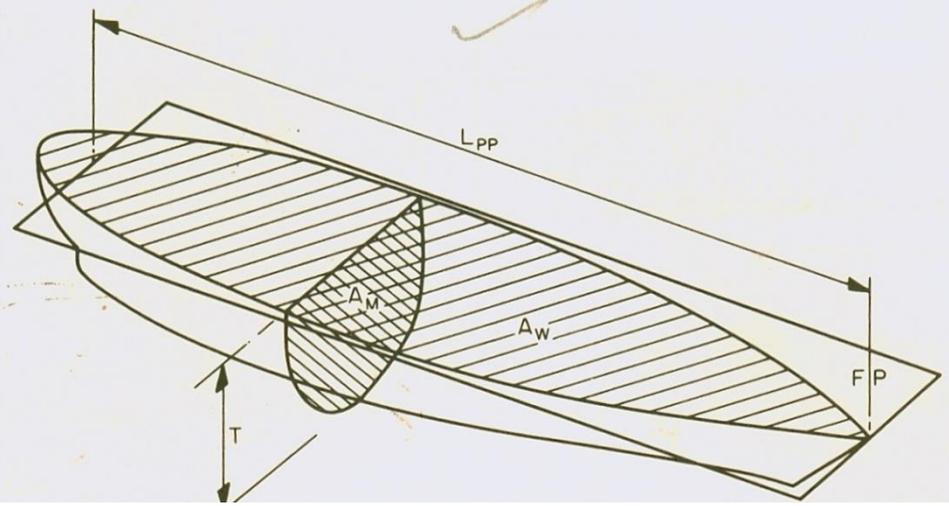
A<sub>M</sub> = Area of mid ship section

L<sub>BP</sub> = Length between perpendiculars

C<sub>B</sub> = Block co-efficient

C<sub>m</sub> = Mid ship sectional co-efficient

Prismatic co-efficient can also defined as the ratio of block co efficient to the mid ship section co- efficient



### **Vertical prismatic co-efficient (CVP):**

It is defined as the ratio of the volume of displacement to the volume of a prism having depth equal to draught and cross-sectional area equal to the water plane area.

$$C_{vp} = \frac{\nabla}{A_w \times d}$$

Where,

$C_{vp}$  = Vertical prismatic co-efficient

$\nabla$  = Volume of displacement

$A_w$  = Water plane area

$D$  = Draught