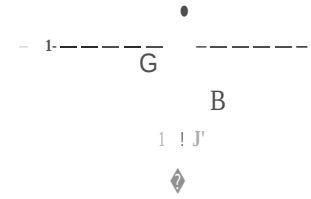
Ship Measurement

Tonnage

The tonnage of a vessel indicates the measurement of her weight, size or capacity.
A very common way of measuring a vessel is by means of a displacement-indication.
Merchant vessels are also measured by their gross tonnage or deadweight tonnage.

Displacement

By *displacement* is understood the amount of water that is "displaced" by the body of the vessel as she is floating in the water.
Displacement is *indicated* by the word "ton" (or "tonne").
According ta Archimedes' Principle a vessel displaces a weight of water that is *equal* ta its own weight. Therefore a vessel will *experience* an *upthrust* that is equal ta the weight of the displaced mass of water.
Sa, by displacement is understood the total weight of the vessel and her *contents*, or the weight of the displaced water mass.
A vessel will float when *buoyancy* (B) is equal ta *gravity* (G).
So, when buoyancy is less than gravity, the vessel will sink.
When buoyancy is greater than gravity, the vessel will fly.
Therefore "G" cannot possibly be less than B.



Weights and volumes

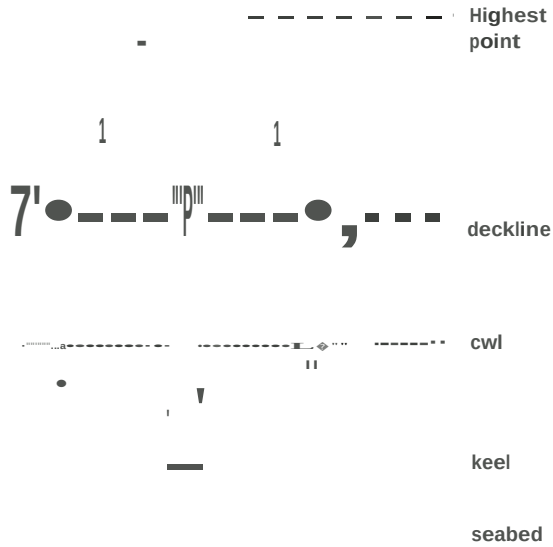
Mariners are often confused as ta the exact meaning of the word "ton", because it may indicate *weight*, but it may also indicate *volume*.
As a weight 1 ton equals 1000 kg. The "long ton" equals 1016 kg. The obsolete "short ton" equals 907 kg.
As a volume 1 ton equals one cubic metre, or, according ta the English avoirdupois-system (avdp), 1 ton equals 2.83 cubic metres, which is equal ta 100 cubic feet.
Since "volume" is a very important aspect in *mercantile* affairs, merchant ships are often measured by volume, *contrary to* warships, which are measured by displacement, which indicates weight.
We *distinguish* several kinds of tonnages.
Gross Register Tonnage = the entire volume of the enclosed spaces of the vessel that can be used for cargo, *stores* and *accommodation.*
Net Tonnage = volume that can be used to carry cargo. It is calculated by d!)ducting the spaces that are not used for cargo !rom the gross tonnage.
Net tonnage is often used ta *calculate* harbour *dues* that must be paid to *municipal* port authorities for the use of ail the port facilities.
Deadweight Tonnage = the weight of ail the contents a vessel is capable of carrying when loaded ta summer mark. The contents of a merchant vessel are cargo, stores, *equipment*, *fresh water*, *potable water*, *lubricating oil* and *fuel*.
By *Cargo Carrying Capacity* is understood the amount of cargo that a vessel is capable of carrying.

Cargo spaces

By *Baie Space* is meant the volume of the cargo holds that can be used ta carry general cargo.
By *Grain Space* is understood the volume of the cargo holds that can be used ta carry dry bulk cargo.
By Oil Space is understood 98% of the total volume of the wet bulk tanks.
The *remaining* 2% are used as *ullage*. This is the empty space on top of the *liquid level* that will prevent a tank !rom overflowing when the oil expands due ta heat.

Dimensions

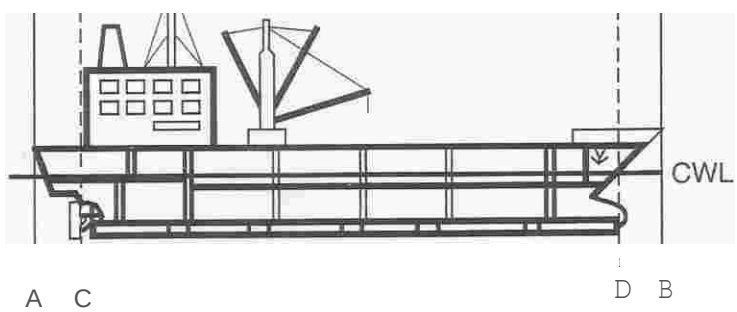
Moulded Breadth
By *moulded breadth* is understood the horizontal *distance* between the insides of the *moulds*. In other words, it is the inside *breadth* (or *width)* of the vessel.
It is used to *determine* the vessel's cargo carrying capacity in relation to her stability.



Moulded Depth
By *moulded depth* is understood the vertical distance between the insides of the moulds (including the double bottom). It indicates the inside *height* of the vessel. It is used to determine the vessel's cargo carrying capacity in relation to her stability.

Bearn
By beam is understood the extreme breadth of the vessel. In *restricted*, narrow fairways (e.g. the Panama Canal) the vessel's beam is an important factor to *obtain* a *clearance* to *proceed*.

Length Over Ali (L.O.A.).
By Length over all (A · B) is understood the distance between the extreme fore-end and the extreme ait-end of the vessel. Before a berth along an embankment is allocated, the port authorities will have to know the total length of the ship.



Length Between Perpendiculars (LPP)
Length Between Perpendiculars (C - D) is measured between the fore-perpendicular (FPP) and the alt• perpendicular (APP). Il is used to determine the vessel's stability.
The Construction Waterline is the line to which the ship may be loaded in summer.
The fore-perpendicular is the vertical line through the point where the Construction Waterline and the stem intersect. The ait perpendicular goes through the rudderstock.

Draft, air draft, freeboard and underkeel clearance
By ***draft*** is understood the distance !rom the bottom of the keel to the surface of the water. A distinction must be made between *loaded draft* and *light draft*, as well as *sait-water* dralt and fresh-water draft. Due to the *salinity* of seawater, the dralt in seawater is less than dralt in fresh- water, because seawater has a higher *specific gravity*.
By ***air draft*** is understood the distance !rom the waterline to the highest point of the vessel. When proceeding through a *channel that* is *spanned* by a bridge, the air dralt should of course be less than the *vertical clearance* of the bridge. When a vessel's air dralt is greater than the vertical clearance will allow, we speak of a *top-hampered* vessel.
By **Freeboard** is understood the distance between deckline and waterline.
By **Underkeel Clearance** (UKC) is understood the distance between keel and seabed.