



Insight Article

Tonnage measurement of ships

A vessel's particulars will list a number of different tonnages, which may seem confusing to anyone not familiar with the various measurement terms. So next in Gard News' non-mariners' guide to ship construction and operation is a basic guide to tonnage measurement.

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The tonnage of ships forms the basis for manning regulations, safety rules, registration fees, calculation of port dues, etc. Most merchant ships are required to hold an International Tonnage Certificate, issued by flag states, in accordance with the IMO International Convention on Tonnage Measurement of Ships 1969 (ITC). The calculations are carried out before delivery by the vessel's classification society, which issues the certificate on behalf of the flag state. The certificate has no expiry date, but will have to be amended in case of any conversion to the vessel.

For centuries different nations used different rules to measure vessels' tonnage. In 1854 a ship measurement system devised by George Moorsom, based on the idea that size would be best indicated by the volume of a ship and that charging of service fees should be based on the earning ability of a ship, was adopted and became law in Britain. For volume, the system used the enclosed volume of a ship, measured in cubic feet. The unit of measurement of ships had always been called "tons", so the gross volume, which was to be entered in the Certificate of Registry, was called "gross registered tonnage". For earning capacity, the system deducted from the gross registered tonnage the non-cargo-carrying spaces, and the resulting figure was called "net registered tonnage". Because the numbers involved were very large, the system divided them by 100 for simplification, so that one registered ton was equal to a volume of 100 cubic feet (2.83m³).

The Moorsom system was followed by most maritime nations, and tonnages determined according to it were influential in deriving the formula for the international tonnage standard in the ITC.

Gross and net tonnage

"Gross tonnage" (GT) and "net tonnage" (NT) replaced "gross registered tonnage" and "net registered tonnage", respectively, when the IMO adopted the ITC, which entered in force for all new ships in 1982, with existing vessels at the time having been given a migration period of 12 years. So since 1994 the GT and NT indices have been the only official measures of ships' tonnage.

GT, the magic measurement based on which various dues will be levied and some statutory requirements imposed, is a factor of the internal volume of the permanently enclosed spaces of a ship from keel to funnel, while NT is the measure of the volume capacity of the permanently enclosed spaces of the vessel from keel to funnel, less the volume of certain non-cargo carrying spaces. GT and NT are calculated according to formulas described in the ITC. ¹

Panama Canal and Suez Canal tonnage

Since 1st October 1994 Panama Canal tolls have been based on the Panama Canal Universal Measurement System (PC/UMS), which in turn is based on the international standard of vessel measurement established by the ITC (except for container vessels, which pay in accordance with container-carrying capacity). The tonnages stated on the Panama Canal Tonnage Certificate are therefore identical to those in ITC certificates.

The Suez Canal, however, has a system with a multiplying factor applied to the NRT, thus producing a figure called Suez Canal Net Registered Tonnage (SCNRT), which

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forms the basis for passage dues. It is different from all other tonnage, continuing to be based on the old Moorsom system of measurement. The tonnages stated on the Suez Canal Special Tonnage Certificate are therefore different from those in ITC certificates.

Classification societies issue separate PC/UMS and SCNRT certificates for vessels on behalf of flag states.

Weight measurement of ships

The following methods of ship measurement are based on the ship's weight.

A ship's *displacement* is the volume of water it displaces when it is floating, and is measured in cubic metres (m³), while its *displacement tonnage* is the weight of the water that it displaces when it is floating with its fuel tanks full and all stores on board, and is measured in metric tons (MT, equivalent to 1,000 Kg). The displacement tonnage is the actual weight of the ship, since a floating object displaces its own weight in water. 2

A ship's *lightweight* or *light displacement* is the actual weight of the ship with no passengers, cargo, bunkers, lube oil, ballast, fresh water, stores, etc., on board.

The *loaded displacement* is the weight of the ship loaded down to its load line marks, that is, loaded to its maximum capacity with passengers, cargo, bunkers, lube oil, ballast, fresh water, stores, etc., on board.

A ship's *deadweight* is the difference in metric tons between the loaded displacement tonnage of the ship and the lightweight of the ship. Therefore, the deadweight can be a tool to express in metric tons the actual cargo capacity of the vessel. However, the difference between the loaded displacement tonnage and the lightweight does not reflect the cargo carrying capacity only, as deadweight also includes bunkers, stores, freshwater, etc. These factors will have to be deducted from the deadweight in order to come to the actual cargo carrying capacity in metric tons. 3

Footnotes

1. The word "tons" is no longer in use in reference to ships' tonnage. Gross and net tonnages are unitless indices; for instance, a ship will have a "gross tonnage of 50,000".

2. See article "[Why do ships float?](#)" in Gard News issue No. 207.

3. It obviously does not make much sense to describe the cargo capacity of a car carrier or a container vessel in deadweight. In those cases capacity is described by volume, quantity of cars (car equivalent units, or CEU) or containers (twenty-foot equivalent units, or TEU).

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