

An Owner's Guide to Tonnage Admeasurement

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I. Introduction to Tonnage Admeasurement

The purpose of tonnage admeasurement is to determine the internal capacity of a vessel. Virtually all seagoing merchant vessels and many vessels operated on lakes, bays, sounds and rivers are measured for individual gross and net register tonnage. The tonnage regulations of various countries detail what spaces are to be measured, which spaces are exempt from measurement, what units are to be used, and how and why certain volumes are measured as a given tonnage.

Unfortunately, many different methods and types of tonnage admeasurement can be applied to determine the tonnage of a vessel. In some cases, these methods result in a wide variance between assigned tonnages. For U.S. flag vessels, the assigned tonnages often force significant regulatory requirements when a certain tonnage threshold is exceeded, and result in many owners attempting to use the tonnage regulations to their best advantage. The number of regulations, and the interpretations of those regulations, often causes great confusion among the marine community.

What is Tonnage Admeasurement?

Tonnage admeasurement has nothing to do with the weight of a vessel. Measured tonnages reflect the internal measured volume of the vessel per the tonnage measurement system employed. The various tonnage admeasurement schemes each have different methods of determining measurable spaces and deducted and exempted spaces. These methods are discussed further in Sections II and III.

Uses of Tonnage Admeasurement

Initially tonnage admeasurement was utilized for determining port duties for vessels of varying sizes. While net tonnage is still generally employed for this purpose, in the United States, and in some cases internationally, gross tonnage is utilized for determining many regulatory requirements for a vessel. Since in many cases it is economically favorable to avoid certain regulatory requirements, owners find it beneficial to reduce their gross and net tonnages. There is no particular pattern to the use of tonnage thresholds within U.S. Law - for example, manning thresholds may be significantly different than lifesaving requirements. In many cases these tonnage thresholds do not accurately reflect the size or type of the vessel.

II. History of Tonnage Admeasurement

The Beginnings

The first recorded data for the carrying capacity of vessels is found in Europe in the thirteenth century in connection with vessels carrying wine. The number of barrels of wine that could be carried, or "tuns", expressed the capacity of vessels. A "tun" was equivalent to a standard wine cask of approximately 250 gallons, occupying a volume of about 57 cubic feet. Port duties were paid as a percentage of the cargo in actual barrels of wine, and vessel capacity became known as "tunnage". By the seventeenth century, these two words had become tons and tonnage, respectively. The tonnage of vessels was initially estimated as the product of the length, breadth and depth of the vessel divided by a factor, which varied from 94 to 100. The lack of a consistent measurement system led to an even wider variety of measurement systems than exists today, and in some cases resulted in "rule-beaters" that were literally unseaworthy.

The Moorsom System

In 1849, a Royal Commission was formed in England to address the problems. The secretary of the commission was George Moorsom, and the resulting tonnage admeasurement system was called the "Moorsom System". The idea of this system is that the fees charged to vessels should be directly proportional to their potential earning capacity, i.e. the space occupied by passengers or cargo. A vessel is measured at a series of sections throughout its length, the transverse area determined at each section, and the areas integrated to determine the volume. The total internal volume was then divided by 100 to determine the vessel's "tonnage", since at that time, 100 cubic feet was determined to be the appropriate factor so that vessels would maintain approximately equal tonnages under the new and old regulations.

There were two tonnages determined under the Moorsom System: "gross" and "net" tonnage. Gross tonnage reflected the entire measured volume of the vessel less certain "exempted" spaces, initially spaces used only for the crew or for navigation of the vessel, and spaces in the superstructure not used for cargo. Net tonnage was equal to gross tonnage less a deduction for the machinery space, reflecting the earning capability of the vessel.

United States Tonnage Regulations

The first tonnage law in the United States was passed in 1789. It was similar to original "length times breadth times depth" systems, but used 95 as the divisor to determine gross tonnage. In 1864 a law was passed essentially adopting the Moorsom System but providing no deductions since charges were at that time based on gross tonnage. In 1865, a special "passenger accommodation exemption" was enacted, which allowed any passenger space above the first deck above the tonnage deck to be exempt from gross tonnage. This exemption remains in current law and is one of the most significant differences between United States regulations and those of other countries. In 1914, with the opening of the Panama Canal, a separate set of tonnage regulations specifically for the Canal was put into effect. The Moorsom System was essentially followed but exemptions were significantly limited. Consequently, Panama Canal tonnage is normally higher than that calculated by United States tonnage regulations.

International Tonnage Convention

In June 1959 the International Maritime Organization (IMO) began discussions on the development of an international standard tonnage measurement system to replace the numerous and often widely different measurement systems in place throughout the globe. The new regulations were intended to reflect an accurate measurement of the volume of a vessel's hull and superstructure, and provide a more accurate assessment of a vessel's size. The International Convention on the Tonnage Measurement of Ships was held in London in 1969, at which the current tonnage measurement regulations were developed. The Convention came into force in July 1982 for new vessels, with a 12-year phase-in period for existing vessels. As of July 14, 1994, any U.S. flag vessel over 79' overall must be measured under the Convention system.

III. Types of Measurement Systems

Four types of measurement systems are utilized in United States Law:

Convention Measurement System (46 CFR 69, Subpart B)

This system is the measurement of a vessel in accordance with the IMO International Convention on Tonnage Measurement of Ships, 1969. Any vessel over 79 feet in overall length now must be measured under this system. Convention tonnage is based on the actual molded volume of the vessel, without any of the exemptions from historical tonnage measurement systems.

However, since our existing regulations for licensing, manning, and vessel inspection are based on the standard tonnage calculation methods developed a century ago, U.S. vessels can optionally be measured under a second system for regulatory purposes. A vessel is assigned two tonnages under this scheme: a required "Convention" tonnage and an optional "regulatory" tonnage. The regulatory tonnage is based on either the "Standard" or "Dual" methods of measurement, further described below.

Standard Measurement System (46 CFR 69, Subpart C)

This system is the original method of measurement based on the Moorsom System. Since underdeck tonnage is measured to the inside of shell framing, "deep-framing" of underdeck spaces, along with water ballast exemptions, can substantially reduce measured volumes. In addition, exemptions are available for above-deck machinery spaces, galley, companions, and open superstructure ("tonnage openings"). All of these design features allow a clever naval architect to reduce tonnage to well below Convention measurement. Vessels measuring nearly 4000 gross tons under the Convention system have been cleverly designed to measure below 100 gross tons under the standard system! Many fishing vessels, small passenger vessels and other workboats take advantage of the regulations to maintain their regulatory tonnage below certain thresholds.

Dual Measurement System (46 CFR 69, Subpart D)

This system is very similar to the Standard System, with the exception that the use of tonnage openings for the reduction of above deck tonnage is eliminated, but spaces used for the carriage of cargo and dry stores on or above the tonnage deck are exempt from measurement. The vessel is in most cases assigned a tonnage mark, which may not be immersed under any condition.

Simplified Measurement System (46 CFR 69, Subpart E)

This system is often utilized for vessels less than 79 feet, and for non-propelled vessels of any length. The gross tonnage is the multiple of the length, breadth and depth of the vessel, multiplied by an appropriate factor (0.5 for sailing vessels, 0.67 for non-sailing vessels, or 0.84 for barge-shaped vessels) and divided by 100.

IV. Frequently Asked Questions about Tonnage Admeasurement

The following are some frequently asked questions about tonnage admeasurement:

Who issues tonnage certificates?

Since 1982, the U.S. Coast Guard has required that all measurement services are performed, and tonnage certificates issued by classification societies. Five classification societies are authorized by the Coast Guard to be admeasurement agencies: the American Bureau of Shipping (Houston, Texas), Det Norske Veritas (River Edge, New Jersey), Lloyds Register (London, England), Germanischer Lloyd (Tarrytown, NY), and Bureau Veritas (Fort Lauderdale, FL) . The classification societies charge a nominal fee for their services. The Coast Guard no longer provides measurement services, but does retain the authority to interpret the tonnage regulations.

How do I get a tonnage certificate for my boat?

Typically, you would contact JMC or another naval architect to ask for assistance. The naval architect calculates the tonnage of the vessel under the required measurement systems previously described, and submits the calculations to the selected admeasurement agency for review. After a cursory review, the admeasurement agency sends the package out to one of their field surveyors in your area, who visits and surveys the vessel to verify that the vessel indeed matches the calculations. The surveyor then submits a report to the admeasurement agency, and the tonnage certificate is issued. At that time your documentation papers need to be updated for the changes to gross and net tonnage.

To recalculate tonnage, JMC typically will need hull lines and/or offsets, an outboard profile and general arrangement, and structural plans for your vessel. In some cases we can do calculations without plans but would generally need to do a detailed shipcheck of your vessel in order to determine hull structure and arrangements.

For vessels measured under the Simplified System, for a small fee JMC can calculate your tonnage and issue a document noting the gross and net tonnages which can then be used to update your documentation papers. Simplified tonnage can also be calculated directly by the Coast Guard from principal dimensions provided by you.

Why should I choose JMC to do my tonnage calculations?

We have considerable knowledge of what can and cannot be done within the scope of the tonnage regulations due to our 39 years of involvement in the small workboat, fishing vessel and passenger vessel market. Our staff has more knowledge of tonnage rules and regulations than virtually any other firm in the country. We also have very cordial working relationships with the classification societies, which helps keep us on the cutting edge of tonnage regulations.

What tonnage system do I need to measure my boat under?

Any new vessel over 79' overall, and many existing vessels over 79' overall must be measured under the Convention System. However, owners may also opt to have their vessel measured under either the Standard or Dual Systems in order to establish a lower "regulatory" tonnage, used for application of U.S. Laws and Regulations. Vessels under 79' can also be measured under the Simplified System.

When do I need to update my tonnage calculations?

Any time you are making a change to your vessel that changes the enclosed volume or modifies the existing tonnage openings or deep framing, you should contact JMC or your naval architect for a review. Small changes to the tonnage of the vessel may not necessarily require readmeasurement, but any change should be reviewed to determine if new tonnage calculations are required.

What's a tonnage opening?

A tonnage opening is a specially constructed "door" in a bulkhead on or above the tonnage deck that allows the enclosed space beyond the tonnage opening to be exempt from tonnage measurement. Typically, the tonnage opening is closed with a closure plate secured with J-bolts spaced no less than 12" apart, and has clear access 30" on either side of the opening with no permanent obstructions. The closure plate cannot be made watertight with gaskets or sealant. There are also significant limitations on interior bulkheads and passageways within the structure exempted by the tonnage opening.

What's deep framing?

Deep framing is a technique used below the tonnage deck to eliminate portions of the vessel from measurement. Since underdeck tonnage is measured to the face of the hull framing, plate frames are installed in the vessel that narrow the measured transverse areas and therefore reduce the underdeck tonnage. Transverse deep frames cannot be spaced more than 8' apart and have severe limitations on the type and number of lightening holes allowed in the frames. There are also limitations on mixing longitudinal framing and transverse framing, plating thickness, and the extent of framing schemes.

I want to convert a sea water ballast tank to a fuel tank. I don't need to check tonnage, do I?

Yes, you do. In many cases, sea water ballast tanks are exempted from tonnage, and therefore changing the tank to a fuel tank may well increase your tonnage. Contact JMC for a review of your existing tonnage calculations to determine if the modification is allowable without an increase in tonnage.

How do you keep all these rules and regulations straight?

With great difficulty. The tonnage rules and regulations established in the Code of Federal Regulations (CFR) Part 69 are only a small part of the information needed to perform tonnage calculations. In addition to the CFR, there are numerous documented (and in some cases undocumented) historical interpretations that need to be considered when calculating tonnage, particularly under the Standard System. At JMC we have access to hundreds of interpretations obtained over the years from USCG, ABS, DNV, Lloyds, and GL, which we maintain in a historical record for office use. In addition, we often use our good relationships with the classification societies and their field surveyors to determine if what we intend to do meets the requirements of the regulations.

Why doesn't somebody fix this mess?

Well, the Coast Guard is trying. In December 1997, the Coast Guard began to simplify things by establishing alternative Convention tonnage for offshore supply vessels (OSVs) as part of a rulemaking process. The rules now allow an OSV under 6000 gross tons under the Convention System to be treated as if it had a regulatory (Standard System) tonnage of under 500 gross tons. At this time, alternative Convention tonnage only applies to OSVs, however further rulemaking is in its early stages that will apply alternative Convention tonnage to other vessels as well. The initial comment period ended in October 1998, in which the Coast Guard requested industry input into the various potential problems. Our experience with past regulatory reform indicates that alternative Convention tonnage may not be a reality for a very long period of time.

I think I might need a review of my tonnage. What should I do?

Give us a call, or send an email. We can then request a copy of your existing tonnage calculations from ABS, DNV, Lloyds, Moorsom Consulting, or BV and begin a review.

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