

Marking of Load Lines in Ships

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SUMMARY

Sea accidents occur at sea due to ship collisions and overloaded ships. Therefore, in order to reduce maritime accidents, the International Maritime Organization (IMO) has established load lines as a particular mark that must be put on ships in order to indicate the maximum load the ship is capable of carrying as well as to determine the freeboard of the ship, which is crucial to the stability of the ship. There are two different kinds of load line markings, offering distinctive markers for all different kinds of ships, including those that carry cargo. Thus this paper is aimed to provide a comprehensive understanding of the significance of load line markings on ships.

INTRODUCTION

Loadline is a special marking that is positioned in the middle of the ship which depicts the draft of the vessel. It shows the maximum permissible load limit to which the ship can carry while sailing in sea. The IMO has adopted the international convention on Loadlines in 1966 and it entered into force on 21 July 1968. The main objective of the convention is to make provision for freeboards and watertight integrity of ships. Its goal is to reduce the risk of sinking of ships due to overloading of cargos, resulting in instability and breach of the water-tight integrity of ships. These loadlines are made compulsory for all new ships of 24m or more and they are marked on both sides of the hull of ship. Samuel Plimsoll (1824-1898) a member of the British Parliament who was concerned with the loss of ships and crews due to vessel overloading. In 1876, he persuaded Parliament to pass the Unseaworthy Ships Bill, which mandated marking a ship's sides with a line that would disappear below the waterline if the ship was overloaded. The line, also known as the Plimsoll mark, is found midship on both the port and starboard hulls of cargo vessels and is still used worldwide by the shipping industry.



Figure1. Plimsoll line

Importance of maintaining waterline in ships

A vessel should have sufficient freeboard at all times. Any exceptions will result in insufficient stability and excessive stress on the ship's hull. The main purpose of the calculation is to find the freeboard draught (maximum allowable draught). The rule reference is the International Convention of Load Lines, 1966. The first step in freeboard calculation is deciding the type of freeboard. There are two kinds, Type 'A' and Type 'B'. Usually Type 'A' ships are the ones designed to carry liquid cargoes in bulk, where the cargo, tanks have small access openings. High integrity of the exposed deck, and High degree of safety against flooding, resulting from the low permeability of loaded cargo spaces and the degree of subdivision usually provided. Type 'B' ships are all the other ships other than Type 'A', and these have larger freeboard (or lower maximum draught).

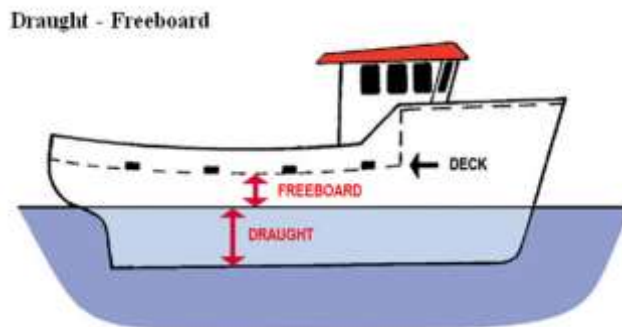


Figure2. Freeboard and draught of ship

Role of Load Lines in maintaining ship’s stability

The Load Line concept emerged in Britain in the 1870s. It is to prevent merchant ships from being overloaded. The fundamental purpose of a Load Line is to allow a maximum legal limit up to which a ship can be loaded by cargo. By prescribing such limits, the risk of having the vessel sailing with inadequate freeboard and buoyancy can be limited. Load lines set the maximum legal limit up to which a ship can be loaded and ensure that the ship has enough freeboard (distance between the waterline to the upper edge of the deck line) so that water cannot enter the vessel. A higher freeboard will increase the distance that the ship is able to roll from side to side before it becomes submerged. Load lines also ensure that there is adequate buoyancy. Buoyancy is the force that enables ships to stay afloat and regulates their stability.

The higher the density of water the stronger is the upward buoyant force. The heavier the ship’s load the greater the draft length as more water is displaced as the ship will lay lower in the water reducing the freeboard. In other words, the lower the density, the lower the buoyancy and the less load the ship will be able to take. If the vessel rides too low in the water its stability may be in danger and it may sink. Both temperature and salinity affect the buoyancy of the ship. Warm water provides less buoyancy, being less dense than cold water. Thus, a ship will sink deeper in the water in warm areas of the tropics than in winter conditions in the North Atlantic. Similarly, fresh water (density 1 tonne per cubic meter) is less dense than salt seawater (density 1.025 tonnes per cubic meter), so a ship will sink deeper in fresh water of a river than in salt seawater. Since the buoyancy and immersion of the ship largely depend on the type of water she is navigating and its density, the LL Convention, as amended, provides for various load lines for different density of water and seasonal weather conditions in particular zones.

Load Line Marks and Types

All vessels of 24 meters and more are required to have this Load line marking at the center position of the length of the summer load waterline. These marks shall be punched on the hull’s surface, making it visible even if the paint on the side of the ship fades out. Load line marks are classified into two types such as (i) Standard Load Line marking applies all fishing vessels and (ii) Timber Load Line marking applies to timber carrying cargo vessels.

Parts of a Load Line mark

The complete Load line markings consist of 3 vital parts.

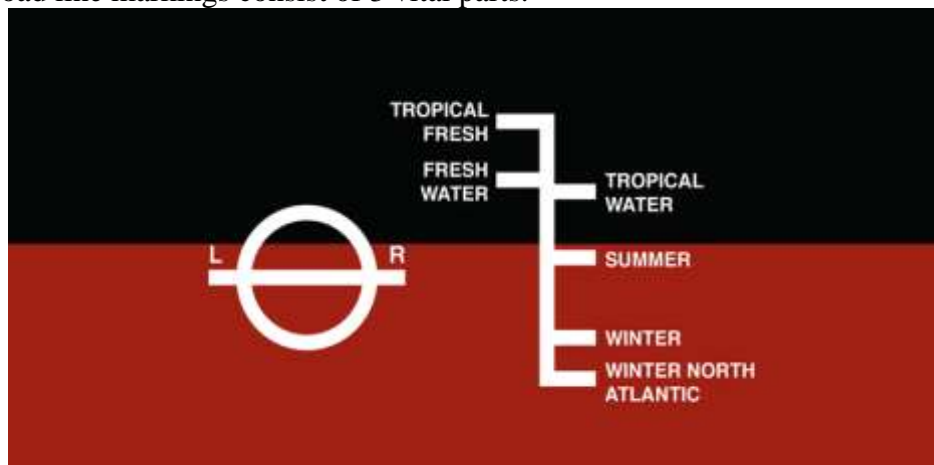


Figure 3. Standard Loadline Marking

Deck Line

- A horizontal line measuring 300mm by 25mm.
- It passes through the upper surface of the freeboard.

Load Line Disc

- A 300mm diameter and 25mm thick round-shaped disc.
- A horizontal line intersects it.
- The upper edge of the horizontal line marks the ‘Summer saltwater line’, also known as the ‘Plimsoll Line.’

Load Lines

- Load lines are horizontal lines extending forward and aft from a vertical line placed at a distance of 540mm from the center of the disc.
- They measure 230mm by 23mm.
- The upper surfaces of the load lines indicate the maximum depths to which the ships may be submerged in different seasons and circumstances

Load line Zones

The seasonal zones, areas and periods that determine the appropriate load line in a particular sea area at a given time of year are by way of the chart. The Tropical, Summer and Winter freeboard zones are based upon the following weather criteria:

Summer Zones - Regions where not more than 10% of wind speeds exceed force 8 Beaufort (34 knots).

Tropical Zones - Regions where not more than 1% of wind speeds exceed force 8 Beaufort (34 knots) and not more than one tropical storm in a ten-year period occurs in an area of 5° latitude/longitude square in any one separate calendar month.

Winter Zones - Are all other regions.

Winter North Atlantic -Vessels bound to enter any part of the North Atlantic Ocean during the winters have an additional load line called the WNA load line. A separate WNA mark is present only on vessels that do not exceed length by 100 m. By default, it is same as the winter mark for other ships

Load line Marks

S – Summer:- It is the primary freeboard line at the same level as the Plimsoll Line. Other load lines are marked based on this summer freeboard line.

T – Tropical:- It is 1/48th of the summer draft marked above the Summer load line.

W – Winter:- It is 1/48th of the summer draft marked below the Summer load line.

WNA – Winter North Atlantic:- It is marked 50mm below the Winter load line. It applies to voyages in North Atlantic (above 36 degrees of latitude) during the winter months.

F – Fresh Water:- It is the summer freshwater load line. The distance between S and F is the Fresh Water Allowance (FWA).

TF – Tropical Fresh Water is the freshwater load line in Tropical. It is marked above the T at an amount equal to FWA.

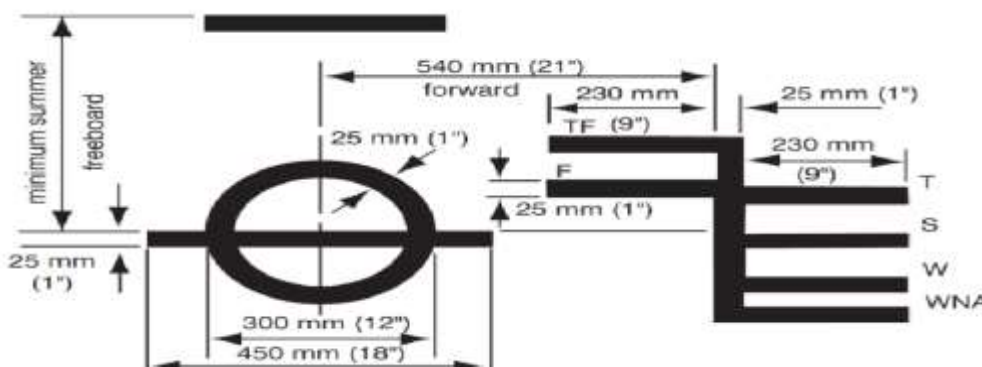


Figure4. Load line markings and its measurements

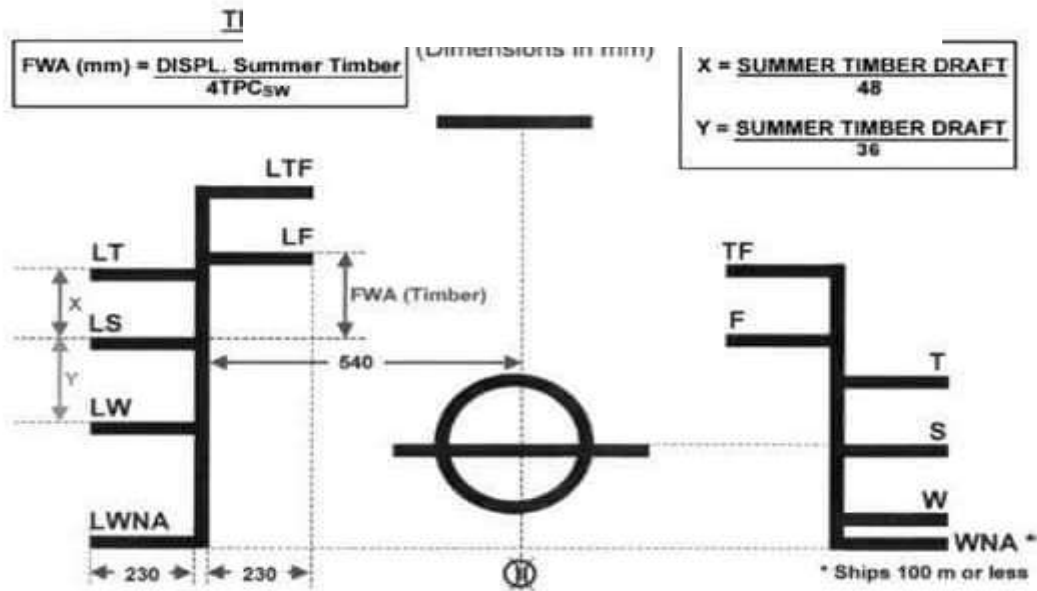


Figure 5a. Timber Load line Marking

Timber Load Line

This applies to vessels carrying timber cargo. These marks shall be punched on the surface of the hull making it visible even if the ship side paint fades out. The marks shall again be painted with white or yellow color on a dark background/black on a light background. Timber cargo vessels will have a second set of Load Lines marked similar to the ordinary load lines positioned 540mm abaft the centre load line ring. The letter marking of the timber load line are different and are prefixed by ‘L’ meaning ‘Lumber’.



Figure 6. Timber Load line Marks in ships

Timber Load Line Markings

LS – Lumber Summer: Its upper edge marks the summer salt water timber load line. It is situated at a specified level above the load line.

LW – Lumber Winter: It is 1/36th of the lumber summer draft below LS.

LT – Lumber Tropical: It is 1/48th of the lumber summer draft above LS.

LWNA – Lumber Winter North Atlantic: It is at the same level as WNA.

LF – Lumber Fresh water: It is situated above the LS by an amount equal FWA.

LTF – Lumber Tropical Fresh Water: It is positioned above LT by an amount equal to FWA.

Load line Certification for ships

Every ship that has been surveyed and marked in accordance with the present Load line convention are issued by the authorized administrator, an International Load Line Certificate. Validity of the certificate is not more than 5 years and will contain all vital information that includes the assigned freeboard and fresh water allowance. It is to be noted that, after completion of a load line survey and issuance of the certificate; no changes shall be made to the superstructure, markings, equipment or arrangements that have been covered under the survey. If such changes need to be made, the authorized authority conducting the survey shall be contacted.

CONCLUSION

Thus by marking the load line on the ship; it helps in preventing it from being overloaded and prevents sea accidents. Further it permits the maximum limit to which the ship can be loaded. This enables in clearing the risk of the vessel related to ship's stability problems. Thus the International Conventions on Load line (1966) main objective is to prevent the ship from sinking due to overloading. Thus the convention enforces every ship to mark the load line markings in the ship.

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