Titanic's Load (Plimsoll) Line

By Bob Read, D.M.D.

Introduction

This article will explain the calculation and application of the load line for *Titanic.* This line was a safety measure required by the British Board of Trade to prevent overloading of the ship. It is not a conspicuous feature but is every bit as important as the other safety measures incorporated into the ship.

History

After the middle of the 19th century the industrial revolution was accelerating in England. The use of iron and steel to build ships along with the incorporation of steam engines to provide power caused these ships to continue to grow in size and speed. The mercantile applications were such that shipowners increasingly overloaded their ships. The ships were also overinsured which made the loss of the ship of no great consequence. However, the safety of the crew was also considered by them to be of minimal consequence.

In 1867 Samuel Plimsoll was elected to Parliament. His primary concern was to pass legislation which would establish statutory load lines on ships to prevent overloading. His early efforts were not fruitful owing in large part to influential members of Parliament who were in the shipping trade. After much resistance his bill dealing with the establishment of compulsory load lines was amended into the Merchant Shipping Act.

The next development had to do with "freeboard". Freeboard is the distance from the waterline to the upper deck level measured at the lowest point of sheer where water could enter the ship. The calculation of freeboard was used in establishing the load line of the ship which was the maximum level that it could be loaded under normal conditions. Much research was done by shipping companies and Lloyds Register to produce tables which could enable the Board of Trade to calculate the freeboard of a ship with reliability. These tables were accepted by the Board of Trade and incorporated into the Merchant Shipping Act of 1890. In 1906 the freeboard tables were revised and these were the tables which were used in calculating *Titanic's* freeboard. Calculating a vessel's freeboard was how the placement of the load line was determined.

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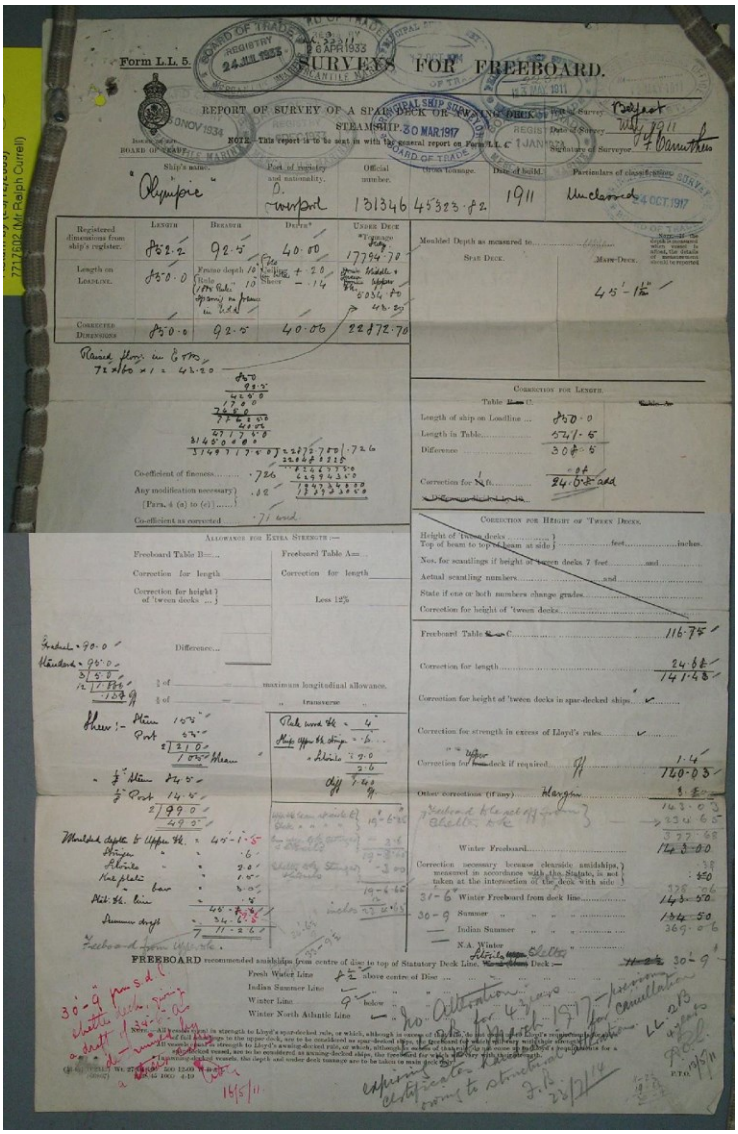
Calculating *Titanic's* Freeboard

The calculation of *Titanic's* freeboard which resulted in the location of placement of her load line was a complex process. It is beyond the scope of this article to explain all the various variables and calculations which went into the calculation of the freeboard. Figure 1 illustrates this complexity. This is a worksheet used by the Board of Trade surveyors to calculate the freeboard of *Olympic.* The calculations and results for *Olympic* were for all intents and purposes the same as for *Titanic.*


Form L.L. 5.

SURVEYS FOR FREEBOARD.

REPORT OF SURVEY OF A SPAR DECK OR SHELTER DECK STEAMSHIP

NOTE.—This report is to be sent in with the general report on Form L.L. 6

Ship's name: Olympic

Port of registry and nationality: Liverpool

Official number: 131346

Gross tonnage: 45323·82

Date of build: 1911

Particulars of classification: Unclassed

Registered dimensions from ship's register: Length 882·9, Breadth 92·5, Depth 40·60, Under Deck Tonnage 17794·70

Length on Loadline: 850·0

Moulded Depth as measured to: Spar Deck ... Main Deck 45' 1½"

Correction for Length: Length of ship on Loadline 850·0; Length in Table 571·5; Difference 30·5; Correction for ½ ft. 24·0·5 add

Correction for Height of 'Tween Decks

Freeboard Table B ... Freeboard Table A ...

Correction for length

Correction for height of 'tween decks

Less 12%

Difference

maximum longitudinal allowance

transverse

Freeboard Table C 116·75

Correction for length 24·6½ 141·25

Correction for height of 'tween decks in spar-decked ships

Correction for strength in excess of Lloyd's rules

Correction for ... deck if required 1·4 160·05

Other corrections (if any) Harpins 1·5

Winter Freeboard 143·00

Correction necessary because sheerside amidships, measured in accordance with the Statute, is not taken at the intersection of the deck with side ·50

31-6 Winter Freeboard from deck line 143·50

30-9 Summer 134·50

— Indian Summer

— N.A. Winter

Moulded Depth & Upper Dk. 40'-1·5

Sheer

Keel plate

Flat of K. line

Summer draft 30-9

FREEBOARD recommended amidships from centre of disc to top of Statutory Deck Line.

Fresh Water Line ... above centre of Disc

Indian Summer Line

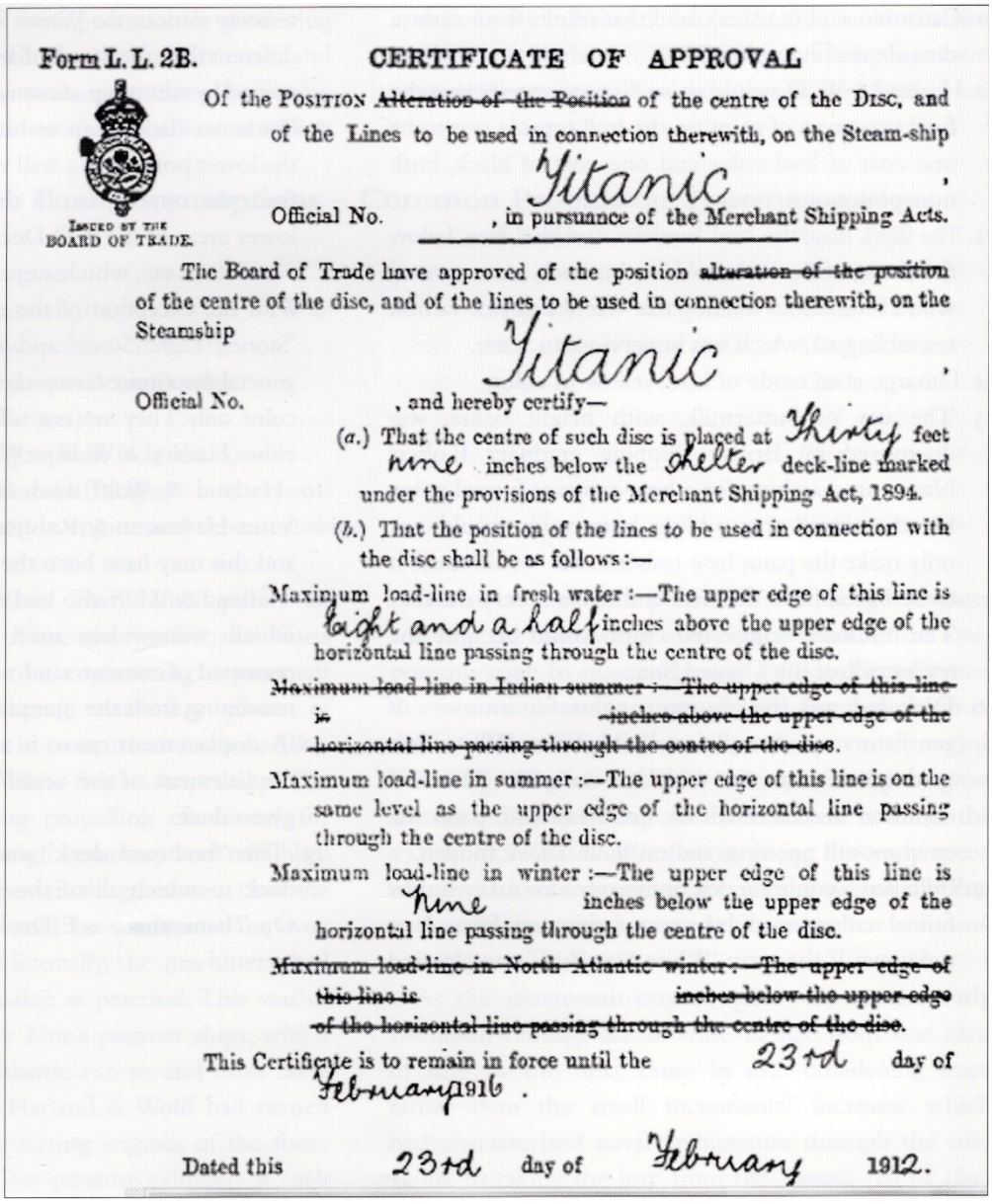
Winter Line ... below

Winter North Atlantic Line

Figure 1

Board of Trade survey for freeboard

At the conclusion of the freeboard survey the Certificate of Approval of the location of the Plimsoll mark or load line mark was issued. This document specified the exact location of the load line and those of other conditions. Figure 2 shows this document for *Titanic.*



Form L. L. 2B.

CERTIFICATE OF APPROVAL

ISSUED BY THE BOARD OF TRADE.

Of the POSITION ~~Alteration of the Position~~ of the centre of the DISC, and of the Lines to be used in connection therewith, on the Steam-ship Titanic, Official No. , in pursuance of the Merchant Shipping Acts.

The Board of Trade have approved of the position ~~alteration of the position~~ of the centre of the disc, and of the lines to be used in connection therewith, on the Steamship Titanic, Official No. , and hereby certify—

(*a.*) That the centre of such disc is placed at Thirty feet nine inches below the Shelter deck-line marked under the provisions of the Merchant Shipping Act, 1894.

(*b.*) That the position of the lines to be used in connection with the disc shall be as follows:—

Maximum load-line in fresh water:—The upper edge of this line is Eight and a half inches above the upper edge of the horizontal line passing through the centre of the disc.

~~Maximum load-line in Indian summer:—The upper edge of this line is inches above the upper edge of the horizontal line passing through the centre of the disc.~~

Maximum load-line in summer:—The upper edge of this line is on the same level as the upper edge of the horizontal line passing through the centre of the disc.

Maximum load-line in winter:—The upper edge of this line is Nine inches below the upper edge of the horizontal line passing through the centre of the disc.

~~Maximum load-line in North Atlantic winter:—The upper edge of this line is inches below the upper edge of the horizontal line passing through the centre of the disc.~~

This Certificate is to remain in force until the 23rd day of February 1916.

Dated this 23rd day of February 1912.

Figure 2

Board of Trade Certificate of Approval for placement of *Titanic's* load line mark

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Figure 3 illustrates the load line mark for the Board of Trade.

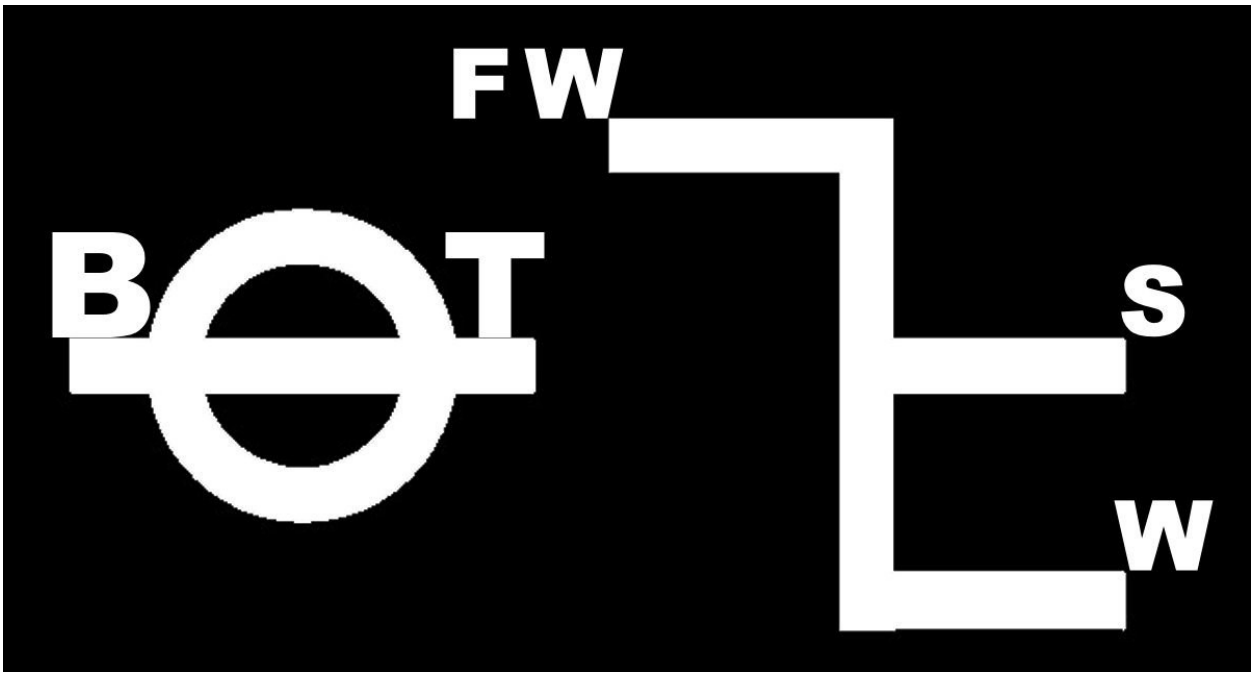

Figure 3

Board of Trade load line (Plimsoll) mark as used on *Titanic*

The top of the line running horizontally through the center of the circular disc is the normal load line mark. The top of the "FW" line is the load line in exclusively fresh water conditions. The top "S" line is the load line for summer in seawater. It is the same as the load line through the center of the disc. The "W" represents the load line for winter in the North Atlantic. The "B" and "T" on either side of the disc represents Board of Trade.

In addition to these load lines, each deck above the load line to the shelter deck or "C" deck is marked with a horizontal line on the side of the hull. According to the freeboard calculations, the top edge of the load line through the disc is 30 feet 9 inches below the shelter deck as measured at the ship's side. This is equivalent to 34 feet 6 inches above the keel baseline. The load line will be applied to the ship at this location centered between frames 1A and 1F.

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Figure 4 shows the load line on *Olympic* and the deck indicator lines above it.

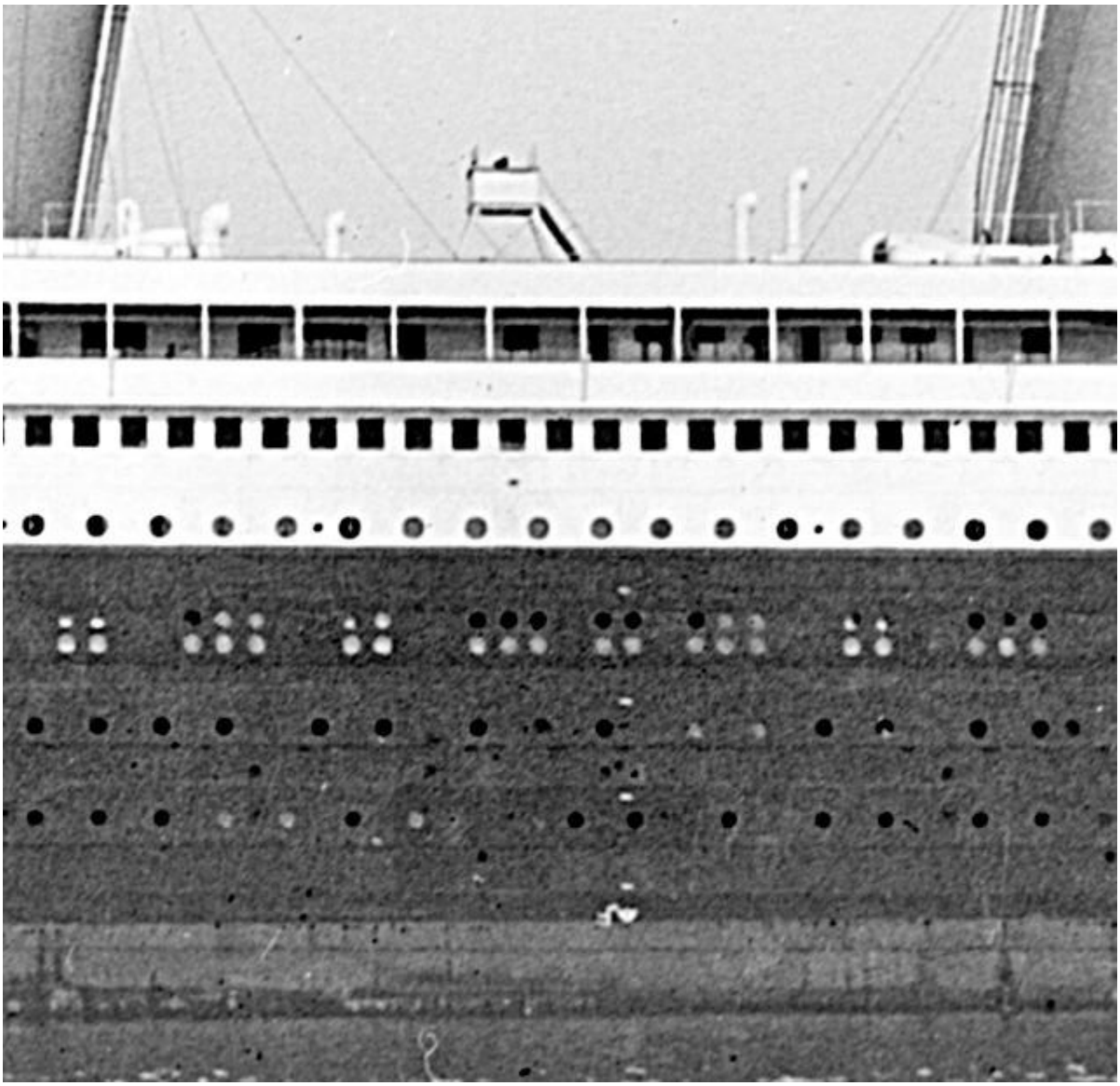

Figure 4

Load line and deck indicator lines on *Olympic*

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Figure 5 shows a clearer image of the load line and horizontal deck indicator lines on *Titanic.*

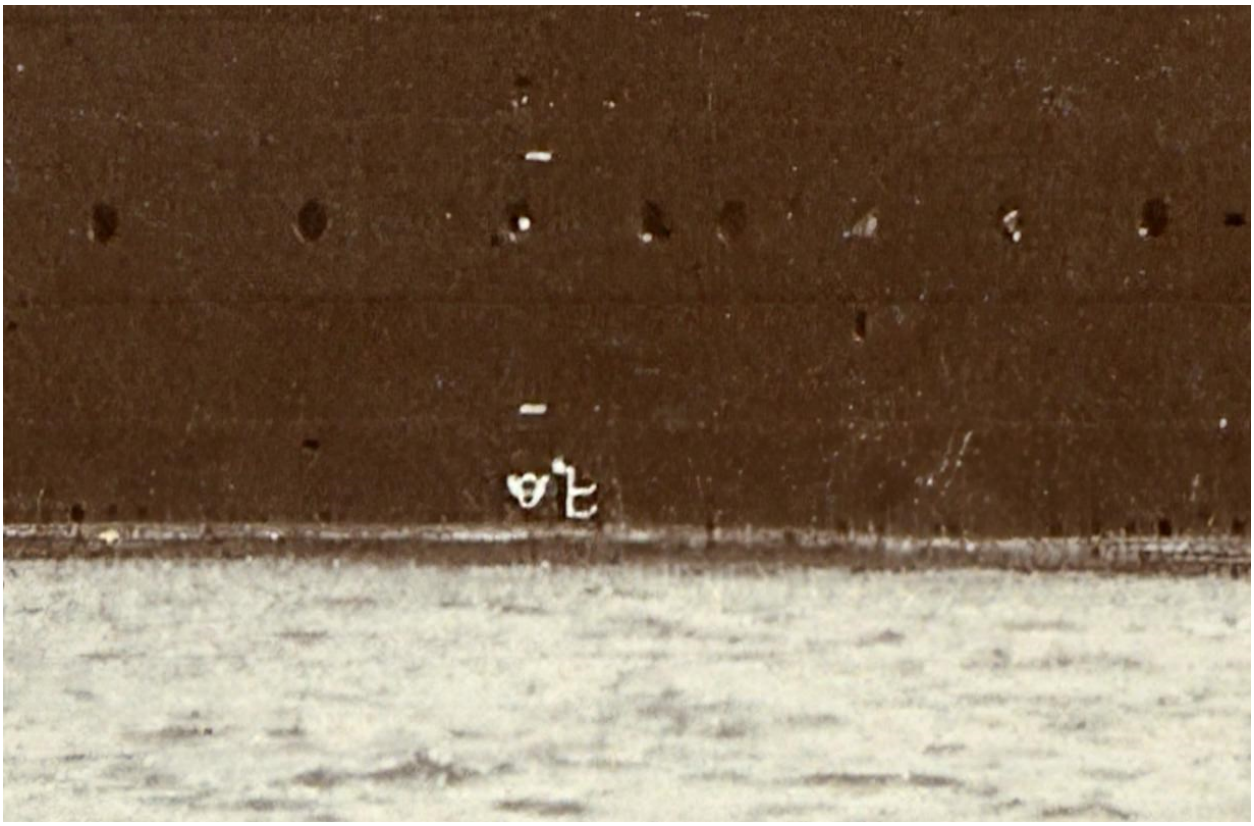

Figure 5

Load line and deck indicator lines on *Titanic*

When the Board of Trade did its final inspection for approval to sail, the water level would have to be at or below the appropriate load line.

Conclusion

This article has provided a brief history of the development of the Plimsoll line. The procedures of determining the freeboard of a vessel by the Board of Trade was illustrated. From the determination of freeboard the Certificate of Approval for placement of the load line, with the specific location of the line was shown. Illustrations of *Olympic* and *Titanic's* actual load lines were included. The terms Plimsoll line and load line used in this article mean the same.