SPECIALIZED VOCABULARY FOR MARINE ENGINEERING

船舶工程专业英语词汇

主　编　姜　波　孙卓敏　孙淑娟

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内 容 提 要

本书旨在提高学生船舶工程英语的词汇量，并教会学生如何应用这些词汇，从而提升学生的学术交流水平。本书分为四大部分，第1部分是船舶工程简介，其中包括什么是船舶工程、船舶设计、船舶的主要规格概念和商务船只的类别。第2部分是船舶的专有名词图文详解，其中包括单壳船体结构名称、双层油船结构、单壳散货轮船体结构和船舶集装箱结构。第3部分是船舶工程专业所涉及的专业词汇。第4部分是船舶工程领域的合同模版的中英文对照详解。

本书的目标对象为工科院校的船舶海洋工程专业的学生和教师，本科生和研究生通用，同时也适用于相关专业的研究人员。

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前　言

近几年,船舶海洋专业在我国高等教育中占据越来越重要的位置。本书旨在提高学生船舶工程英语的词汇量,并教会学生如何应用这些词汇,从而提升学生的国际学术交流水平。本书的目标对象为工科院校的船舶海洋工程专业的学生和教师,本科生和研究生通用,同时也适用于相关专业的研究人员。建议课时数为 28 ~ 32,授课内容可以根据教学大纲的设置,从教材中选择合适的内容。

本书分为四大部分,第 1 部分是船舶工程简介,其中包括 4 节内容:什么是船舶工程、船舶设计、船舶的主要规格概念和商务船只的类别。第 2 部分是船舶的专有名词图文详解,其中包括单壳船体结构名称、双层油船结构、单壳散货轮船体结构和船舶集装箱结构。第 3 部分是按照字母顺序介绍船舶工程专业所涉及的专业词汇,并对个别词汇进行详解。第 4 部分是船舶工程领域的合同模版的中英文对照详解。

本书是以下项目的阶段性研究成果:黑龙江省教育科学规划重点课题“翻转课堂模式在英语专业教学中的应用与实践”(GJB1316018);哈尔滨工程大学 2016 年本科教学改革研究项目“翻转课堂模式在跨文化交际课程中的应用研究”(JG2016BZD30);中央高校基本科研业务费专项资金项目“语料库的转译与翻译研究”(HEUCF161206);黑龙江经济社会发展重点研究课题(外语学科专项)“翻转课堂模式下英语听力教学模式与评价研究”(WY2016078 - C);黑龙江省高等教育学会高等教育科学研究课题“大学英语跨文化教学中双向文化的导入策略研究”(16G034);哈尔滨工程大学教学改革研究项目“培养综合应用能力背景下翻转课堂在视听英语课程中的模式与研究实践”(JG2016BZD33)。

本书融入了所有编者的辛勤劳动,其中主编姜波对教材编写进行了统筹规划,并完成了 23 万字的编写。孙卓敏和孙淑娟主要对教材的第三和第四部分进行了部分编写,其中孙卓敏参编字数约为 20 万字,孙淑娟参编字数约为 13 万字。

最后,向所有付出努力与汗水的编写人员表示感谢。如果书中还有任何疏漏与不足之处,敬请专家和学者批评指正。

编　者

2016 年 10 月

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Introduction to Marine Engineering

1.1 What is Marine Engineering?

Marine engineering often refers to the engineering of boats, ships, oil rigs and any other marine vessel or structure, but also encompasses oceanographic engineering. Specifically, marine engineering is the discipline of applying engineering sciences, and can include mechanical engineering, electrical engineering, electronic engineering, and computer science, to the development, design, operation and maintenance of watercraft propulsion and also on-board systems and oceanographic technology, not limited to just power and propulsion plants, machinery, piping, automation and control systems etc. for marine vehicles of any kind like surface ships, submarines etc.

The purely mechanical ship operation aspect of marine engineering has some relationship with naval architects. However, whereas naval architects are concerned with the overall design of the ship and its propulsion through the water, marine engineers are focused towards the main propulsion plant, the powering and mechanization aspects of the ship functions such as steering, anchoring, cargo handling, heating, ventilation, air conditioning, electrical power generation and electrical power distribution, interior and exterior communication, and other related requirements. In some cases, the responsibilities of each industry collide and is not specific to either field. Propellers are examples of one of these types of responsibilities. For naval architects a propeller is a hydrodynamic device. For marine engineers a propeller acts similarly to a pump. Hull vibration, excited by the propeller, is another such area. Noise control and shock hardening must be the joint responsibility of both the naval architect and the marine engineer. In fact, most issues caused by machinery are responsibilities in general. Not all marine engineering is concerned with moving vessels. Offshore construction, also called offshore engineering, maritime engineering, is concerned with the technical design of fixed and floating marine structures, such as oil platforms and offshore wind farms. Oceanographic engineering is concerned with mechanical, electrical, and electronic, and computing technology deployed to support oceanography, and also falls under the umbrella of marine engineering, especially in Britain, where it is covered by the same professional organisation, the IMarEST.

(From Kane, J. R. (1971). Marine Engineering. New York: SNAME)

1.2 Ship Design

The design of a ship involves a selection of the features of form, size, proportions, and other factors which are open to choice, in combination with those features which are imposed by circumstances beyond the control of the design naval architect. Each new ship should do some things better than any other ship. This superiority must be developed in the evolution of the design, in the use of the most suitable materials, to the application of the best workmanship, and in the application of the basic fundamentals of naval architecture and marine engineering.

As sips have increased in size and complexity, plans for building them have became mare detailed and more varied. The intensive research since the period just prior to World War Ⅱ has brought about many technical advances in the design of ships. These changes have been brought about principally by the development of new welding techniques, developments in main propulsion plants, advances in electronics, and changes in materials and methods of construction.

All ships have many requirements which are common to all types, whether they are naval, merchant, or special-purpose ships. The first of such requirements is that the ship must be capable of floating when carrying the load for which it was designed. A ship floats because as it sinks into the water it displaces an equal weight of water, and the pressure of the water produces an upward force, which is called the buoyancy force is equal to the weight of the water displaced by the ship and is called the displacement. Displacement is equal to the underwater volume of the ship multiplied by the density of the water in which it is gloating. When floating in still water, the weight of the ship, including everything it carries, is equal to the buoyancy or displacement. The weight of the ship itself is called the light weight. This weight includes the weight of the hull structure, fittings, equipment, propulsion machinery, piping and ventilation, cargo-handling equipment and other items required for the efficient operation of the ship. The load which the ship carries in addition to its own weight is called the deadweight. This includes cargo, passengers, crew and effects, stores, fresh water, feed water for the boilers incase of steam propelling machinery, and other weights which may be part of the ships international load. The sum of all these weights plus the lightweight of the ship gives the total displacement; that is

$$\text{Displacement} = \text{lightweight} + \text{deadweight}$$

One of the first things which a designer must do is to determine the weight and size of the ship and decide upon a suitable hull form to provide the necessary buoyancy to support the weight that has been chosen.

Owner's requirements

Ships are designed, built, and operated to fulfill, the requirements and limitations specified by the operator and owner. These owner's requirements denote the essential considerations which are to form the basis for the design. They may be generally stated as (1) a specified minimum deadweight carrying capacity, (2) a specified measurement tonnage limit, (3) a selected speed at sea, or a maximum speed on trial, and (4) maximum draft combined with other draft limitations.

In addition to these general requirements, there may be a specified distance of travel without refueling and maximum fuel consumption per shaft horsepower hour limitation, as well as other items which will influence the basic design. Apart from these requirements, the ship owner expects the designer to provide a thoroughly efficient ship. Such expectations include (1) minimum displacement on a specified deadweight carrying capacity, (2) maximum cargo capacity on a minimum gross tonnage, (3) appropriate strength of construction, (4) the most efficient type of propelling machinery with due consideration to weight, initial cast, and cost of operation, (5) stability and general seaworthiness, and (6) the best loading and unloading facilities and ample accommodations for stowage.

Design procedure

From the specified requirements, an approach is made to the selection of the dimensions, weight, and displacement of the new design. This is a detailed operation, but some rather direct approximations can be made to start the design process. This is usually done by analyzing data available from an existing ship which is closely similar. For example, the design displacement can be approximated from the similar ship's known deadweight of, say, 11,790 tons and the known design displacement of 17,600 tons. From these figures, a deadweight-displacement ratio of 0.67 is obtained. Thus, if the deadweight for the new design is, for example, 10,000 tons, then the approximate design displacement will 10,000/0.67 or 15,000 tons. This provides a starting point for the first set of length, beam, and draft dimensions, after due consideration to other requirements such as speed, stability, and strength. Beam is defined as the extreme breath of a ship at its widest part, while draft is the depth of the lowest part of the ship below the waterline.

Length and speed

These factors are related to the hull form, the propulsion machinery, and the propeller design. The hull form is the direct concern of the naval architect, which the propulsion machinery and propeller design are concerned. The naval architect has considerable influence on the final decisions regarding the efficiency, weight, and size of the propeller, as both greatly influence the design of the hull form.

Speed has an important influence on the length selected for the ship. The speed of the ship is related to the length in term of the ratio $V/\sqrt{L}$, where V is the speed in knots and L is the effective waterline length of the ship. As the speed-length ratio increases, the resistance of the ship increases. Therefore, in order to obtain an efficient hull form from a resistance standpoint, a suitable length must be selected for minimum resistance. Length in relation to the cross-sectional area of the underwater form (the prismatic coefficient), is also very important insofar as resistance is concerned. Fast ships require fine (slender) forms or relatively low fullness coefficients as compared with relatively slow ships which may be designed with fuller hull forms.

Beam and stability

A ship must be stable under all normal conditions of loading and performance at sea. This means that when the ship is inclined from the vertical by some external force, it must return to the vertical when the external force is removed. Stability may be considered in the transverse or in the longitudinal direction. In surface ship, longitudinal stability is much less concern than transverse stability. Submarines, however, are concerned with longitudinal stability in the submerged condition.

The transverse stability of a surface ship must be considered in two ways, first at all small angles of inclination, called initial stability, and second at large angles of inclination. Initial stability depends upon two factors, (1) the height of the center gravity of the ship above the base line and (2) the underwater form of the ship . The center of gravity is the point at which the total weight of the ship may be considered to be concentrated. The hull form factor governing stability depends on the beam B, draft T, and the proportions of the underwater and waterline shape. For a given location of the center of gravity, the initial stability of the ship is proportional to B^2/T. Beam, therefore, is a primary factor in transverse stability.

At large angles of heel (transverse inclination) freeboard is also an important factor. Freeboard is the amount the ship projects above the waterline of the ship to certain specified decks (in this case, to the weatherdeck to which the watertight sides extend). Freeboard affects both the size of the maximum righting arm and the range of the stability, that is the angle of inclination at which the ship would capsize if it were inclined beyond that angle.

Depth an strength

A ship at sea is subjected to many forces because of the action of the waves, the motion of the ship, and the cargo and other weights, which are distributed throughout the length of the ship. These forces produces stresses in the structure, and the structure must be of suitable strength to withstand the action. The determination of the minimum amount of material required for adequate strength is essential to attaining the minimum weight of the hull. The types of structural stress experienced by a ship riding waves at sea are caused by the unequal distribution of the weight and buoyancy throughout the length of ship. The structure as a whole bends in a longitudinal plane, with the maximum bending stresses being found in the bottom and top of the hull girder.

Therefore, depth is important because as it is increased, less material is required in the deck and bottom shell. However, there are limits which control the maximum depth in terms of practical arrangement and efficiency of design.

(From "McGraw-Hill Encyclopedia of Science and Technology", Vol. 12, 1982)

Vocabulary

1. form 船型,形状,格式
2. proportion 尺度比,比例
3. workmanship 工艺质量
4. basic fundamentals 基本原理
5. marine engineering 轮机工程
6. intensive 精致的
7. propulsion plants 推进装置
8. naval ship 军舰
9. special-purpose ship 特殊用途船
10. buoyancy 浮力
11. fittings 配/附件
12. piping 管路
13. ventilation 通风
14. cargo-handing equipment 货物装卸装置
15. crew and effects 船员及自身物品
16. stores 储藏物
17. fresh water 淡水
18. feed water 给水
19. boiler 锅炉
20. measurement (吨位)丈量,测量
21. trial 试航,试验
22. distance of travel 航行距离
23. refueling 添加燃料
24. consumption 消耗
25. initial cost 造价
26. cost of operation 营运成本
27. unloading facility 卸货设备
28. cross sectional area 横剖面面积
29. fineness 纤瘦度
30. prismatic coefficient 菱形系数
31. slender 瘦长(型)
32. beam 船宽
33. inclined 倾斜的
34. external force 外力

35. surface ship 水面船舶
36. submarine 潜水艇
37. submerged condition 潜水状态
38. initial stability 初稳性
39. weather deck 露天甲板
40. righting arm 复原力臂
41. capsize 倾覆
42. stress 应力
43. unequal distribution 分布不相等
44. longitudinal plane 纵向平面
45. hull girder 船体梁

1.3 Principal Dimensions of a Ship

In the first place the dimensions by which the size of a ship is measured will be considered; they are referred to as "principal dimensions". The ship, like any solid body, requires three dimensions to define its size, and these are a length, a breadth and a depth. Each of these will be considered in turn.

Principal dimensions

Length

There are various ways of defining the length of a ship, but first the length between perpendiculars will be considered. The length between perpendiculars is the distance measured parallel to the base at the level of the summer load waterline from the after perpendicular to the forward perpendicular. The after perpendicular is taken as the after side of the rudder post where there is such a post, and the forward perpendicular is the vertical line drawn through the intersection of the stem with summer load waterline. In ships where there is no rudder post the after perpendicular is taken as the line passing through the centre line of the rudder pintals. The perpendiculars and the length between perpendiculars are shown in Fig. 1.

The length between perpendiculars (L_{BP}) is used for calculation purposes as will be seen later, but it will be obvious from Fig. 1 that this does not represent the greatest length of the ship. For many purposes, such as the docking of a ship, it is necessary to know what the greatest length of the ship is. This length is known as the length of the extreme point at the after end to a similar point at the forward end. This can be clearly seen by referring again to Fig. 1. In most ships the length overall will exceed by a considerable amount the length between perpendiculars. The excess will include the overhang of the stern and also that of the stem where the stem is raked forward. In modern ships having large bulbous bows the length overall L_{OA} may have to be measured to the extreme point of the bulb.

A third length which is often used, particularly when dealing with ship resistance, is the length on the waterline L_{WL}. This is the distance measured on the waterline at which the ship is floating from the intersection of the stern with the waterline to the length is not a fixed quantity for a particular ship, as it will depend upon the waterline at which the ship is floating and upon the trim of the ship. This length is also shown in Fig. 1.

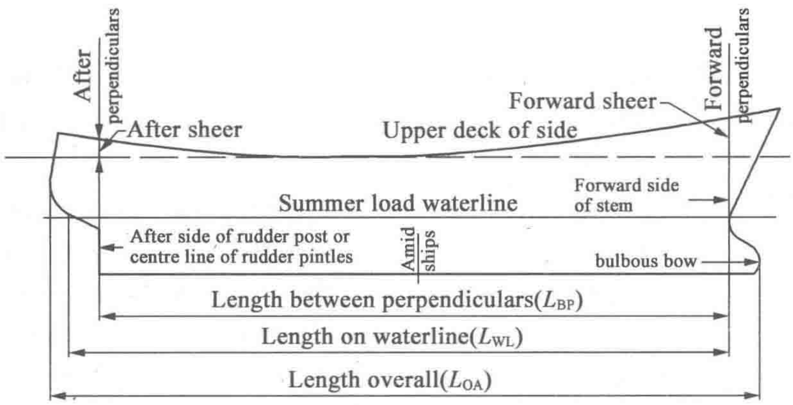

Fig. 1

Breadth

The mid point of the length between perpendiculars is called "amidships" and the ship is usually broadest at this point. The breadth is measured at this position and the breadth most commonly used is called the "breadth moulded". It may be defined simply as the distance from the inside of plating on one side to a similar point on the other side measured at the broadest part of the ship.

As is the case in the length between perpendiculars, the breadth moulded dose not represent the greatest breadth the breadth extreme is required (see Fig. 2). In many ships the breadth extreme is the breadth moulded plus the thickness of the shell plating where the strakes of shell plating were overlapped the breadth extreme was equal to the breadth moulded plus four thicknesses of shell plating, but in the case of modern welded ships the extra breadth consists of two thicknesses of shell plating only.

The breadth extreme may be much greater than this in some ships, since it is the distance from the extreme overhang on one side of the ship to a similar point on the other side. This distance would include the overhang of decks, a feature which is sometimes found in passenger ships in order to provide additional deck area. It would be measured over fenders, which are sometimes fitted to ships such as cross channel vessels which have to operate in and out of port under their own power and have fenders provided to protect the sides of the ships when coming alongside quays.

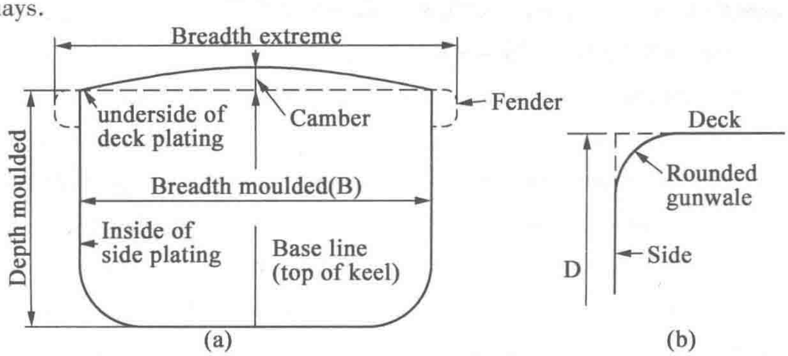

Fig. 2

Depth

The third principal dimension is depth, which varies along the length of the ship but is usually measured ant amidships. This depth is known as the "depth moulded" and is measured from the underside of the plating of the deck at side amidships to the base line. It is shown in Fig. 2(a). It is sometimes quoted as a "depth moulded to upper deck" or "depth moulded to second deck", etc. Where no deck is specified it can be taken the depth is measured to the uppermost continuous deck. In some modern ships there is a rounded gunwale as shown in Fig. 2(b). In such cases the depth moulded is measured from the intersection of the deck line continued with the breadth moulded line.

Other features

The three principal dimensions give a general idea of the size of a ship but there are several other features which have to be considered and which could be different in two ships having the same length, breadth and depth. The more important of these will now be defined.

Sheer

Sheer is the height of the deck at side above a line drawn parallel to the base and tangent to the length of the ship and is usually greatest at the ends. In modern ships the deck line at side often has a variety of shapes: it may be flat with zero sheer over some distance on either side of amidships and then rise as a straight line towards the ends; on the other hand there may be no sheer at all on the deck, which will then be parallel to the base over the entire length. In older ships the deck at side line was parabolic in profile and the sheer was quoted as its value on the forward and after perpendiculars as shown in Fig. 1. So called "standard" sheer was given by the formulae:

Sheer forward (in) $=0.2L_{ft}+20$

Sheer aft (in) $=0.1L_{ft}+10$

These two formulae in terms of metric units would give:

Sheer forward (cm) $=1.666L_{m}+50.8$

Sheer aft (cm) $=0.833L_{m}+25.4$

It will be seen that the sheer forward is twice as much as the sheer aft in these standard formulae. It was often the case, however, that considerable variation was made from these standard values. Sometimes the sheer forward was increased while the sheer after was reduced. Occasionally the lowest point of the upper deck was some distance aft of amidships and sometimes departures were made from the parabolic sheer profile. The value of sheer and particularly the sheer forward was to increase the height of the deck above water (the "height of platform" as it was called) and this helped to prevent water being shipped when the vessel was moving through rough sea. The reason for the abolition of sheer in some modern ships is that their depths are so great that additional height of the deck above water at the fore end is unnecessary from a seakeeping point of view.

Deletion of sheer also tends to make the ship easier to construct, but on the other hand it could be said that the appearance of the ship suffers in consequence.

Camber

Camber or round of beam is beam is defined as the rise of the deck of the ship in going from the side to the centre as shown in Fig. 3(a). The camber curve used to be parabolic but here again often nowadays straight line camber curves are used or there may be no camber at all on decks. Camber is useful on the weather deck of a ship from a drainage point of view, but this may not be very important since the ship is very rarely upright and at rest. Often, if the weather deck of a ship is cambered, the lower decks particularly in passenger ships may have no camber at all, as this makes for horizontal decks in accommodation which is an advantage.

Camber is usually stated as its value on the moulded breadth of the ship and standard camber was taken as one-fiftieth of the breadth. The camber on the deck diminishes towards the ends of the ship as the deck breadths become smaller.

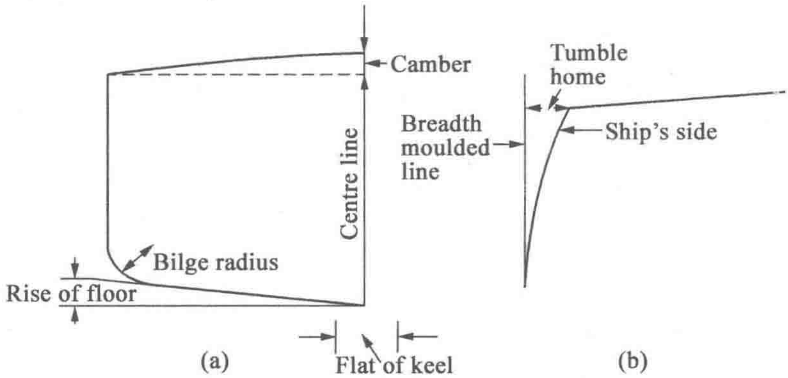

Fig. 3

Bilge radius

An outline of the midship section of a ship is shown in Fig. 3(a). In many "full" cargo ships the section is virtually a rectangle with the lower corners rounded off. This part of the section is referred to as the "bilge" and the shape is often circular at this position. The radius of the circular arc forming the bilge is called the "bilge radius". Some designers prefer to make the section some curve other than a circle in way of the bilge. The curve would have a radius of curvature which increases as it approaches the straight parts of the section with which it has to link up.

Rise of floor

The bottom of a ship at amidships is usually flat but is not necessarily horizontal. If the line of the flat bottom is continued outwards it will intersect the breadth moulded line as shown in Fig. 3(a). The height of this intersection above base is called the "rise of floor". The rise of floor is very much dependent on the ship form. In ships of full form such as cargo ships the rise of floor may only be a few centimeters or may be eliminated altogether. In fine form ships much bigger rise of floor would be adopted in association with a larger bilge radius.

Flat of keel

A feature which was common in the days of riveted ships what was known as "flat of keel" or "flat of bottom". Where there is no rise of floor, of course, the bottom is flat from the centre line to the point where the curve of the bilge starts. If there was a rise of floor it was customary for the line of the bottom to intersect the base line some distance from the centre line so that on either side of the centre line there was a small portion of the bottom which was horizontal, as shown in Fig. 3(a). this was known as the "flat of bottom" and its value lay in the fact that a rightangle connection could be made between the flat plate keel and the vertical centre girder and this connection could be accomplished without having to bevel the connecting angle bars.

Tumble home

Another feature of the midship section of a ship which was at one time quite common but has now almost completely disappeared is what was called "tumble home". This is the amount which the side of the ship falls in from the breadth moulded line, as shown in Fig. 3(b). Tumble home was a usual feature in sailing ships and often appeared in steel merchant ships before World War Ⅱ. Ships of the present day rarely employ this feature since its elimination makes for ease of production and it is of doubtful value.

Rake of stem

In ships which have straight stems formed by a stem bar or a plate the inclination of the stem to the vertical is called the "rake". It may be defined either by the angle to the vertical or the distance between the intersection of the stem produced with the base line and the forward perpendicular. When ships have curved stems in profile, and especially where they also have bulbous bows, stem rake cannot be simply defined and it would be necessary to define the stem profile by a number of ordinates at different waterlines.

In the case of a simple straight stem the stem line is usually joined up with the base line by a circular are, but sometimes a curve of some other form is used, in which case several ordinates are required to define its shape.

Draught and trim

The draught at which a ship floats is simply the distance from the bottom of the ship to the waterline. If the waterline is parallel to the keel the ship is said to be floating on an even keel, but if the waterline is not parallel then the ship is said to be trimmed. If the draught at the after end is greater than that at the fore end the ship is trimmed by the stern and if the converse is the case it is trimmed by the bow or by the head. The draught can be measured in two ways, either as a moulded draught which is the distance from the base line to the waterline, or as an extreme draught which is the distance from the bottom of the ship to the waterline. In the modern welded merchant ship to the waterline. In the modern welded merchant ship these two draughts differ only by one thickness of plating, but in certain types of ships where, say, a bar keel is fitted the extreme draught would be measured to the underside of the keel and may exceed the moulded draught of by 15-23 cm (6-9 in). It is important to know the draught of a ship, or how much water the ship is "drawing", and so that the draught may be readily obtained draught marks are cut in the stem and the stern. These are 6 in high with a space of 6 in between the top of one figure and the bottom of the next one. When the water level is up to the bottom of a particular figure the draught in feet has the value of that figure. If metric units are used then the figures would probably be 10 cm high with a 10 cm spacing.

In many large vessels the structure bends in the longitudinal vertical plane even in still water, with the result that the base line or the keel does not remain a straight line. The mean draught at which the vessel is floating is not then simply obtained by taking half the sum of the forward and after draughts. To ascertain how much the vessel is hogging or sagging a set of draught marks is placed amidships so that if d_a, $d_{\otimes}$ and d_f are the draughts at the after end amidships and the forward end respectively then

$$\text{Hog or sag} = \frac{d_a + d_f}{2} - d_{\otimes}$$

When use is made of amidship draughts it is necessary to measure the draught on both sides of the ship and take the mean of the two readings in case the ship should be heeled one side or the other.

The difference between the forward and after draughts of s ship is called the "trim", so that trim $T = d_a - d_f$, and as previously stated the ship will the said to be trimming by the stern or the bow according as the draught aft or the draught forward is in excess. For a given total load on the ship the draught will have its least value when the ship is on an even keel. This is an important point when a ship is navigating in restricted depth of water or when entering a dry dock. Usually a ship should be designed to float on an even keel in the fully loaded condition, and if this is not attainable a small trim by the stern is aimed at. Trim by the bow is not considered desirable and should be avoided as it reduces the "height of platform" forward and increases the liability to take water on board in rough seas.

Freeboard

Freeboard may be defined as the distance which the ship projects above the surface of the water or the distance measured downwards from the deck to the waterline. The freeboard to the weather deck, for example, will vary along the length of the ship because of the sheer of the deck and will also be affected by the trim, if any. Usually the freeboard will be a minimum at amidships and will increase towards the ends.

Freeboard has an important influence on the seaworthiness of a ship. The greater the freeboard the greater is the above water volume, and this volume provides reserve buoyancy, assisting the ship to rise when it goes through waves. The above water volume can also help the ship to remain afloat in the event of damage. It will be seen later that freeboard has an important influence on the range of stability. Minimum freeboard are laid down for ships under International Law in the form of Load Line Regulations.

(From "Naval Architecture for Marine Engineers" by W. Muckle, 1975)

Vocabulary

1. principal dimension 主要尺寸
2. naval architecture 造船(工程)学
3. architect 造船工程(设计)师
4. length between perpendiculars (L_{BP}) 垂线间长
5. summer load waterline 夏季载重水线
6. forward/after perpendicular 首/尾垂线
7. rudder post 尾柱
8. stem 首柱
9. rudder pintle 舵销
10. length over all (L_{OA}) 总长
11. overhang (水线以上)悬伸部分
12. bulbous bow 球鼻艏
13. length on the waterline (L_{WL}) 水线长
14. amidship 船中
15. breath moulded 型宽
16. breath extreme 最大船宽
17. shell plating 船壳板
18. rivet 铆接
19. weld 焊接
20. strake (船壳板)列板
21. fender 护舷木
22. deck area 甲板面积(区域)
23. cross channel vessel 海峡船
24. port 港口,船的左舷
25. side 舷侧(边)
26. quay 码头
27. depth moulded 型深
28. plating of deck 甲板
29. base line 基线
30. upper deck 上甲板
31. second deck 第二甲板
32. the uppermost continuous deck 最上层连续甲板