DECEMBER 2015
www.craneworld.com
A KHL Group publication

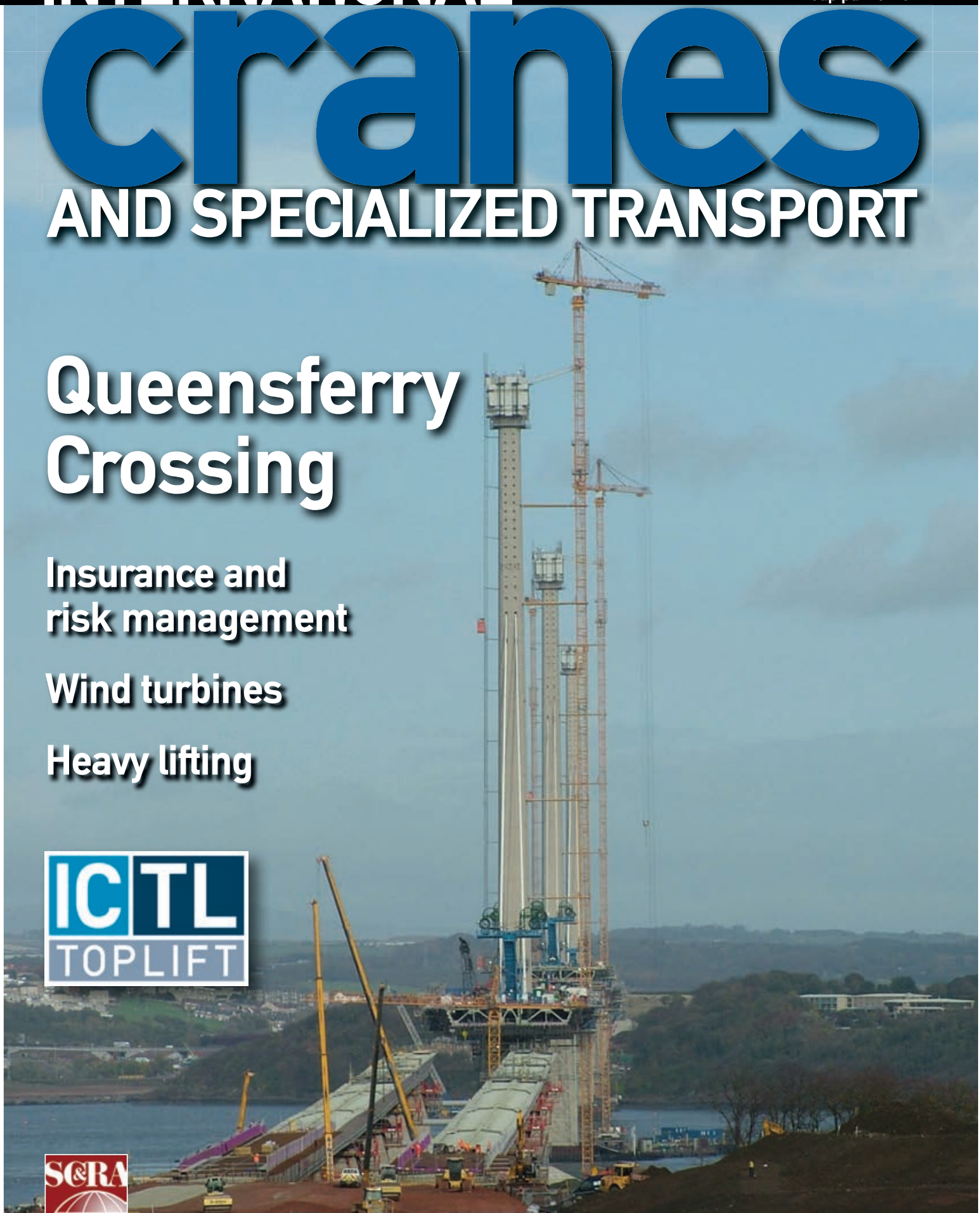
INTERNATIONAL cranes AND SPECIALIZED TRANSPORT

Queensferry Crossing

Insurance and risk management

Wind turbines

Heavy lifting



SC&RA OFFICIAL MAGAZINE

THE MAGAZINE FOR EQUIPMENT USERS AND BUYERS

Nautical terminology

In this, the 30th article in the series, MARCO VAN DAAL introduces nautical terms as used in relation to project cargo vessels and similar specialized transport

FIGURE 1

There is no doubt that nautical terms can be confusing for those who are not exposed to them on a regular basis. Most terms originate from the 1500s and (probably) made perfect sense in that age and language. But as time progressed and ships took various leaps forward in development, some terms have lost their (obvious) meaning. Going back in time helps in understanding the terms, where they came from and why they were used then and are still being used. Understanding these terms will prevent wrong assumptions when preparing and executing roll on roll off (ro-ro) operations.

Bow versus fore

These terms are often interchanged as they both indicate the front of the vessel and in most cases this does not create a problem. Going back in time, however, there is a difference between the terms.

The term "fore" is a direction and means "towards the bow of the vessel". The term "bow" is a location and refers to the actual front of the vessel.

Stern versus aft

These terms are also often interchanged as they both indicate the rear of the vessel and in most cases this does not create a problem. Going back in time, however, there is a difference between the terms.

The term "aft" is a direction and means "towards the stern of the vessel". The term "stern" is a location and refers to the actual rear of the vessel.

ADDITIONAL INFORMATION

In shipping terms one can state "I am going aft", meaning that the person is heading toward the stern of the vessel - a direction. Once he has reached his destination he will state "I am at the stern".

As an example, let's say there are two life boats on board a vessel, one is towards the stern and one towards the bow. These boats would be called the "aft boat" and the "fore boat" as they are located towards (a direction) the bow and stern but not at (location) the bow and stern.

The terms bow and stern are both nouns. The terms fore and aft are both used as adverbs and adjectives.

Starboard versus portside

These terms refer to the left and right side of a vessel when looking towards the bow or the normal direction in which the vessel sails. Starboard indicates the right side of the vessel and portside the left side. Where did these terms come from? Again we have to go back in time for the explanation.

Modern vessels have the rudder on the centreline of the vessel towards the stern. It has not always been like that. Before ship building technology allowed for the rudder to be mounted on the centreline it was on one side. Initially, this could be at either side but over time they were all installed on the same side. This was called the "steerboard" side and for reasons unknown it was the right hand side of the vessel. Navigation was carried out using the position of the stars and over time the term "steerboard" was mixed with "starboard". Eventually the "starboard" term survived.

Knowing the origin of the term starboard makes it easier to understand the term portside. With the rudder on the right side of the vessel, it made that side vulnerable as the rudder protruded beyond the vessel's hull. When the vessel arrived in a port and needed to dock at a berth it would dock with the other side, not the starboard side, facing the berth for the simple reason that otherwise the rudder would be crushed between the hull and the berth. The other side was called "portside". See Figure 1.

Length

The length of a vessel is once again not a straight forward term as there are different definitions describing vessel length for different purposes.

LENGTH OVERALL (LOA): This is the maximum length of the hull measured parallel to the waterline. It is important when docking the vessel as it physically requires this much space at a berth.

LENGTH ON DECK (LOD): This length is more useful when scheduling cargo. It measures the deck space without protrusions and projections, for example, the bow.

REGISTERED LENGTH: This is an old way of measuring the length of a vessel and it appears on the "certificate of registry". It was believed to be a measure of carrying capacity and therefore for the calculation of taxes and fees.

LOAD LINE LENGTH OR WATER LINE LENGTH: This is an important dimension

ABOUT THE AUTHOR

Marco van Daal has been in the heavy lift and transport industry since 1993. He started at Mammoet Transport from the Netherlands and later with Fagioli PSC from Italy, both leading companies in the industry. His 20-year plus experience extends to five continents and more than 55 countries. It resulted in a book *The Art of Heavy Transport*, available at: www.khl-infostore.com/books Van Daal has a real passion for sharing knowledge and experience and holds seminars around the world.

because length at the waterline (summer load line) is a key factor in the complex problem of speed, resistance and friction. It is important when making acceleration calculations.

LENGTH BETWEEN PERPENDICULARS (LBP OR LPP): This length is nowadays the main definition for length. It is the length of the hull measured at the summer load line from the foreside of the stern to the centre of the rudder shaft. Calculations issued as guidelines by various classification societies are based on this length.

NOTE: The various length definitions are the result of the many shapes of ship. Barges are much easier to deal with as they are usually square. Often the overall length (LOA) is equal or near equal to the load line length, registered length, length between perpendiculars and length on deck (LOD). See Figure 2.

Width, breadth or beam

All three terms refer to the width of a vessel and can generally be used interchangeably. There are, as with a vessel's length, various widths for a vessel.

BREADTH EXTREME OR BEAM EXTREME (BE): This is the vessel's width at its widest point measured parallel to the waterline. This dimension is important when entering locks and when passing under bridges.

BEAM: The beam of a vessel is its widest outside width measured at the summer load line.

BEAM MOULDED OR BREADTH MOULDED: This is the same dimension as the beam (see previous term) but measured on the inside of the vessel.

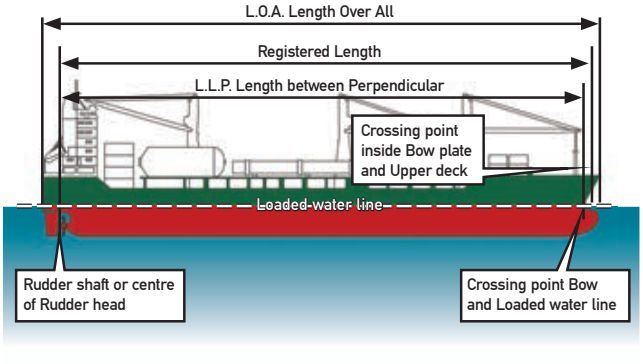
NOTE: Vessels were, and to a certain extend still are, built using a model or mould against which the outside plates (either wood or steel) are shaped. These plates have a certain thickness. Especially on modern vessels and vessels with a double hull, there is a significant difference between "inside" and "outside" width. The former is referred to as the moulded width and the latter as the extreme width.

Some literature mentions the term "mould" (English spelling) and other uses "mold" (American spelling).

For width dimensions of ships it is important to properly differentiate between the moulded and extreme dimensions. The moulded dimensions are of great importance to someone planning and laying out the cargo while the extreme dimensions are important to the person planning the route.

For barges the difference between these dimensions are of little importance, the extreme width of the barge determines if a barge is suitable to carry the cargo in question. As a flat top barge does not have a cargo hold, all cargo is placed on deck, there are few physical limitations. Cargo on barges may even protrude beyond the barge dimensions, although it requires meticulous planning if this occurs.

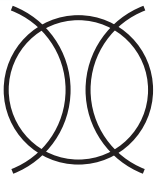
FIGURE 2: SHIP SIZE (SIDE VIEW)



Amidships or midships

Centre between the fore and aft perpendiculars. This is generally the widest part of the vessel. See also length between perpendiculars (LBP or LPP). The midships location is indicated with a symbol. See Figure 3. You will not, however, find this symbol on many vessels. It is used on the architectural and construction drawings. The midships location on the vessel itself is indicated by the load line or Plimsoll line.

FIGURE 3



Keel

There are two types of keels in existence. One type is a keel that protrudes from the bottom of the vessel and is shaped like a fin. This type aids in the hydrodynamics and stability of the vessel and is found on, for example, sailing boats.

The other type is a structural keel. It is the main structural member around which the hull is constructed. When constructing a vessel the keel is laid out first and it is the lowest part of the vessel. The rest of the hull is measured, positioned and constructed based on the measurements of the keel.

Even in modern modular ship construction where sections of the vessel are constructed separately and then lifted into place. The keel of each constructed section is still the basis and is laid out first.

Laying the keel is a milestone in the construction of a vessel and is often celebrated in a "keel laying ceremony".

NOTE: Part of the keel laying ceremony is the coin ceremony. The shipbuilders place one or two coins under one of the keel blocks of the new vessel to bless it and as a sign of good fortune. The coins are normally not fixed and are retrieved when the vessel sails out of the dock. Some shipbuilders weld these coins in place.

Waves & swell

All bodies of (open) water experience waves. Examples include oceans, rivers, lakes, canals. Waves that are long include tides which are caused by the gravitational interaction between the Earth and the Sun and Moon. This type of wave is generally called swell. Waves may also be short, caused by the drag and friction between wind and the water surface. The latter waves are generally called "wind waves".

To understand how waves and swell impact on barges and ships, refer to Figure 4 for the different wave properties.

- CREST: the highest point of a wave
- TROUGH: the lowest point of a wave
- STILL-WATER LINE: water level if there were no waves or swell
- WAVE HEIGHT: the distance between crest and trough
- AMPLITUDE: the distance between a trough and the still-water line or the distance between a crest and the still-water line (note that these distances do not have to be equal)
- WAVE LENGTH: distance between two consecutive crests or troughs
- WAVE PERIOD: time passing between two consecutive crests of troughs.

In the broad spectrum of waves we find wave periods varying from 0.5 seconds to 12 hours. While the longer wave periods may impact on offshore activities, for example, performing ro-ro or offshore lifting operations, it is the short wave periods that interest ship builders and cargo engineers.

The short wave periods have the highest impact on a vessel in terms of mechanical stress and acceleration forces (read: sea fastening). Wave periods between 0.5 and 30

FIGURE 4: ANATOMY OF A WAVE

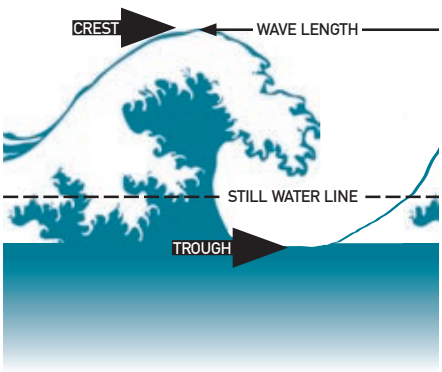
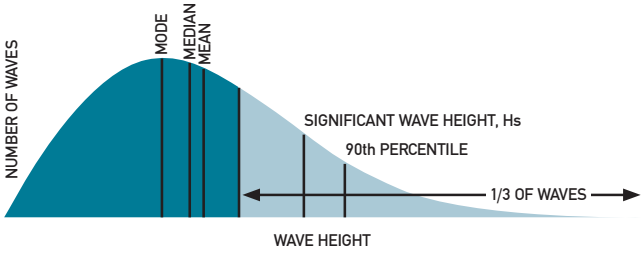


FIGURE 5: STATISTICAL WAVE DISTRIBUTION



seconds have the largest impact on vessels. The size of the vessel plays a significant role in the actual stress and forces but that is beyond the scope of this article.

With swell and wind waves occurring at the same time they end up being superimposed (waves on top of waves on top of waves) and predicting waves and wave heights becomes a cumbersome task. In addition, which wave height should be predicted, the average wave height, the most common wave height or the "once in a life time" freak wave height.

To answer this question, the "statistical wave distribution" graph was developed, see Figure 5. With this graph the term "significant wave height" (Hs or Hsig) was introduced.

The graph shows all recorded waves within a certain time span. Note that the vertical axis indicates the number of waves, not the height of the waves. Wave height is shown on the horizontal axis. As you can see, there are relatively few small waves, left of the graph. There are even fewer large waves, right of the graph. The majority of the waves are found where the graph is the highest, shown as "mode".

The significant wave height is defined as the average of the highest 33.3 % of all recorded waves in the graph. These 33.3 % of all recorded waves is represented by the light blue portion of the graph (on the right side). The significant wave height or Hs is shown in the graph.

So what is the meaning of this significant wave height as there are still higher waves that do occur in the graph? Here is where statistics play a role. Let's assume that the weather is forecast to be 10 foot (3.05 m) seas. This forecast of 10 feet is the significant wave height or Hs and this is the important bit of information. From this Hs and the shape of the Statistical Wave Distribution graph we can retrieve the following information:

Hs = 10 ft
Hmode = 0.6 * Hs = 6 ft
(most probable wave height)
H1/10 = 1.27 * Hs = 12.7 ft
(10% of all waves)
H1/100 = 1.67 * Hs = 16.7 ft
(1% of all waves)
Hmax = 2 * Hs = 20 ft
(less than 1 in 1,000 waves)

With this knowledge the vessel owner or shipping company can make their important decisions as they know for which wave height the vessel was constructed. They also know how much sea fastening has been applied to their cargo. Possible considerations are; to continue voyage as-is, to divert the vessel to an area with a lesser Hs, to apply additional sea fastening and continue the voyage or to wait in a port for more favourable conditions. This list is not complete, it is just a short example of possibilities.

The information and nautical terminology in this article will help to better understand the next article in this series.