



CONTAINER SECURING

THE BASIC CAUSE of many collapsed container stows and the loss of containers overboard can be attributed to inadequate or incorrect securing, resulting from either lack and/or misunderstanding of instructions/information on-board concerning applicable stowage and securing arrangements. Whilst there has been a requirement for sometime that vessels carrying containers should have a Cargo Securing Manual, which should include a Container Lashing Manual, container stacks continue to collapse due lack of appreciation, as to the required stowage and securing arrangement.

CARGO SECURING MANUAL

The International Convention for the Safety of Life at Sea (SOLAS), 1974, Chapter 6 (Carriage of Cargoes), Regulation 5 and Chapter 7, Regulation 5 (Carriage of Dangerous Goods), requires that cargo units, including containers, shall be loaded, stowed and secured throughout the voyage in accordance with a Cargo Securing Manual approved by the Administration.

The Cargo Securing Manual shall be drawn up to a standard at least equivalent to the guidelines developed by the International Maritime Organisation (IMO 298E-1997). Chapter 4 of these guidelines cover the stowage and securing of containers and other standardised cargo. This chapter requires that there should be comprehensive and understandable plans providing the necessary overview on the applicable stowage and securing arrangements.

Unfortunately, there is an inherent weakness in the approval of a Cargo Securing Manual in that it is only a documentary exercise. There is no verification process to ensure that the actual stowage and securing arrangements (including availability of the necessary fixed and portable equipment) used on board agrees with the requirements detailed in the Cargo Securing Manual.

On the front page of some Cargo Securing Manuals caveats such as the following are given: *“Completeness of securing devices onboard not verified against provisions in the Cargo Securing Manual. Master responsible for completeness and satisfactory condition of respective equipment and for the adequacy of the Cargo Securing Manual concerning the type of cargo carried”*. It is questionable whether a Master would have the necessary knowledge for determining that a container stowage & securing arrangement is adequate. Complex calculations have to be undertaken and specialist knowledge is required to correctly interpret them. It is complicated even further, as there is not a common set of guidelines used by the various Classification Societies.

ISO Standard 3874

This standard was amended in 1997 to include the function, dimensions, strength requirements and testing of twistlocks, latchlocks, stacking fittings and lashing rod systems. However, this

standard was out-of-date shortly after it was published, as it now does not cover some of the more modern types of semi-automatic twistlocks and fully automatic twistlocks.

Maintenance

Whatever regulations, standards or codes of practice are issued the integrity of a ship's container stowage and securing arrangements can only be maintained by regular periodic inspection of the securing equipment. The securing arrangement can amongst other things be undermined by one or more of the following:

- "Rogue" securing equipment
- Improperly maintained securing equipment
- Insufficient supply of correct securing equipment
- Overloading of the securing arrangement

When considering the first two points it should be borne in mind that the stowage and securing of containers is more often than not undertaken by stevedores appointed by either the Ship Operator or the Charterer. The human nature of stevedores means that they will use the first item of equipment which comes to hand, be it "rogue" or damaged, without due consideration to its suitability. If substandard equipment is used it can fail at a lower load than its designed rating, thereby resulting in a failure of the overall securing system and the possible collapse of the container stow. Supervision by ship's officers is therefore essential.

The aspects which should be considered during the periodic inspection of the container securing equipment should include the following:

- Inspection of the twistlock complement to ensure that "rogue" twistlocks, i.e. ones with an opposite locking action to the ship's standard complement, have not made their way onboard. It is unfortunate that the lack of any standard in the early days of containerisation resulted in both left-hand and right-hand locking twistlocks being manufactured. The transfer of lashing cages (which are used to hold and transport portable securing equipment during cargo operations) between ships has been one of the prime sources of the unintentional acquirement of "rogue" twistlocks. When left-hand and right-hand locking twistlocks are fitted with similar shaped handles, which can be the case, it is not always possible to differentiate between them once used in the same stow. Even if the stevedores are aware of the difference, any subsequent checks by other people could allow disengagement if the handles were all actuated in the same direction on the premise that some twistlocks had not been properly locked in the first instance. (Under the ISO Standard 3874 the unified direction of handle locking for manual twistlocks is clockwise when viewed from above, i.e. Lefthand locking)
- Checks to ensure that the spring holding the twistlock cones in a closed position are in a resilient condition. If a spring loses its resiliency the cone(s) will not be held in position in a positive manner. The movement and flexing of a ship in a seaway has been found sufficient to allow twistlocks to unlock themselves if their spring action is failing or has failed. Checking the integrity of semiautomatic and fully automatic twistlocks is especially important to ensure that they will not fall out when fitted to the bottom corner casting of a container. Also, such locking devices are now being used as a lifting device for the vertical tandem lifting of containers.
- No structural defects which would compromise the proper use of the equipment, e.g.
 - Twistlocks with missing handles
 - Twistlocks with fractured housings
 - Double cones with fractured base plates
 - Seized/Buckled turnbuckles, bridge fittings

To maintain a ship's portable container securing equipment in good order requires considerable time and effort.

Fixed Deck Fittings

Regular inspection of fixed deck fittings is essential to establish whether progressive wear has undermined their integrity. Areas requiring particular attention include:

- Reduction in the thickness of securing points where for example a turnbuckle may have chafed,
- Wastage in the way of the key holes of deck foundations,
- Wastage and cracking of the plating to which fittings are welded,
- Dovetail deck foundations distorted.

If a dovetail type deck fitting and its associated part are compatible and in good working order, it should only be possible to slide a dovetail type twistlock or locating cone in a horizontal direction into the deck fitting. However, if the deck fitting is damaged or its associated part is incompatible it may be possible to lift a dovetail type twistlock or locating cone out vertically. In such an event no vertical restraint will be provided to secure a column of containers to the deck. Photograph No. 1 shows a case where the chamfered edge of the deck fitting has been distorted sufficiently to allow the twistlock to be removed vertically. Photograph No.2 shows a case where an incompatible locating cone has been used and which can be removed vertically; the thickness of the cone's base plate is only 13mm thick, whereas a cone with a 24mm thick base plate should have been used.

Ordering Replacement Equipment

If the incorrect equipment is ordered the integrity of a ship's securing arrangement can soon be undermined. To ensure this does not happen the correct description, part number, safe working load and breaking load should be known for each item which makes up the ship's standard complement. For example it is not sufficient to order a dovetail twistlock as there are models with variations in their angle of chamfer (i.e. 45 or 55 degrees) and their breaking load (i.e. 270, 300 or 400 kN).

Stowage Arrangement

A fundamental part of a ship's securing system is also the container stowage arrangement. A securing system is based on a number of parameters which can have a variable value, e.g.

- Total column weight
- Maximum tier weights
- Ship metacentric height (GM)

A change in any of the variable parameters will mean that the resultant forces acting upon the containers and their securing arrangements are altered. Therefore, it is important that the parameters used to design a ship's stowage and securing arrangement are known so that the system is not overloaded.

The maximum column weight achievable will depend upon the type of securing arrangement used. For independent columns a twistlock only securing system will have a lower capability than if lashings are deployed.

The conditions normally assessed when considering the suitability of a securing arrangement are either a homogeneous loading (equal weights) or with the heaviest containers at the bottom of the stack.

Good practice would suggest that containers should be stowed with the heaviest containers at the bottom of the stack and the lightest containers at the top. However, this may not happen in practice for a number of reasons, e.g.

- Loading light containers at the bottom of the stow to reduce the ship's stability (GM)
- Commercial considerations. With the high cost of restowing containers at some terminals, the operators may look to reduce costs by stowing in port of discharge rotation. This can lead to container weights varying throughout the stow

There is no theoretical objection to a heavier container over stowing a lighter one as long as the resultant forces acting upon the containers and their securing arrangement are not exceeded. However, it can be the case that to keep the resultant forces within acceptable limits a reduction in the total column weight may be required to allow heavier containers to be stowed above lighter ones.

The following example for a column of 20ft containers cross-lashed at the base of the second tier shows the order of variance in the theoretical permitted column weights stowed on a deck structurally capable of taking 60 tonnes:

	OPTION 1	OPTION 2
TIER 86	4	28
	TONNES	TONNES
TIER 84	26	4
	TONNES	TONNES
TIER 82	30	5
	TONNES	TONNES
MAX. PERMITTED	60	37
COLUMN WT.	TONNES	TONNES

If the lashing system suitable for Option 1 had been used on an inverted weight stack, which exceeded the weights for either Tier 84 or Tier 86 in Option 2, then a structural failure of the containers and/or the securing equipment could occur.

The above is an extreme example. Unfortunately, rules of thumb are not sufficient for gauging whether a container securing arrangement is suitable for an intended loading. Complex and detailed calculations are required to establish whether a proposed securing arrangement would be suitable. These calculations and their interpretation are outside the normal expertise of either a reasonable competent Master or Supercargo. Therefore, it is important that the given column and tier weights limits as shown in the container lashing manual are strictly followed.

It is sometimes mis-understood as to what is meant by maximum permissible hatch cover load distribution and maximum permissible container stack weight limit. The former is a function of the material strength of the hatch cover, whilst the latter is a function of tier weight distribution within a stack, container type, container stowage location and securing arrangement. It is not always the case for a particular set of circumstances that maximum permissible hatch cover load distribution and maximum permissible container stack weight limit are synonymous, whichever of the two gives the lower figure then that should be the working limit.

Code of Safe Practice for Cargo Stowage & Securing

A new annex for this COP is in the process of being drafted and which will give "*Guidance on providing safe working conditions for securing of containers*".

The proposed aim of this annex is to ensure that persons engaged in carrying out container securing operations have safe working conditions and, in particular safe access, appropriate securing equipment and safe places of work. These requirements should be taken into account at

the design stage when securing systems are devised. These guidelines provide ship-owners, ship builders, classification societies, Administrations and ship designers with guidance on producing or authorizing a Cargo Safe Access Plan (CSAP). The scope of this annex is ships, which are specifically designed and fitted for the purpose of carrying containers. The CSS Code requires ships, which are specifically designed and fitted for the purpose of carrying containers to have an approved Cargo Safe Access Plan (CSAP) on board, for all areas where containers are secured. It is also intended that administrations should ensure that lashing plans contained within the approved Cargo Securing Manual are compatible with the current design of the ship and the intended container securing method is both safe and physically possible.

Lessons that can be learnt

The United Kingdom's Marine Accident Branch has published two reports following incidents involving collapsed container stows (m.v. "P&O Nedlloyd Genoa" and m.v. "Annabella") that have identified some important points that should be considered by all those involved in the operation of container ships. These reports are available on their website www.maib.gov.uk.

Summary

The responsibilities of an Owner for ensuring that containers can be safely carried can be summarised under the following points:

- Providing and maintaining an adequate supply of container fixed and portable securings;
- Ensuring that they are of the required strength;
- Ensuring that they are properly maintained;
- Warranting the adequacy of the design of the securing arrangement; and
- Providing a comprehensive stowage and securing manual, and ensuring that the ship's staff understand and use the manual.



Photo 1 - Chamfered edge of deck fitting distorted sufficiently to allow twistlock to be removed vertically.



Photo 2 - Incompatible locating cone which is too small for deck fitting and can be removed vertically.



Photo 3 - Perennial problem of left-hand & right-hand locking twistlocks, which occurring on the same ship can undermine the integrity of the securing arrangement.

While every care is taken in the preparation of this paper, it is published solely for the purpose of providing information and should not, in any way, be construed as a substitute for legal advice, which should always be sought in respect of any specific legal problems experienced.
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