

RISK ENGINEERING // MARINE // ASIA PACIFIC

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MAKING SENSE OF RISK

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## Safe shipment of goods in Cargo Transport Units (CTU)

Recently there has been much negative marine industry press regarding the issues of container ship fires and the loss of multiple containers overboard from container ships.

In this marine risk engineering guide, we highlight how shippers and cargo owners can do their part to minimise losses through more efficient and safe packing, container stuffing and correctly declaring cargo type and weight.

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# Introduction

**1,382**

CONTAINERS

were lost at sea in 2020

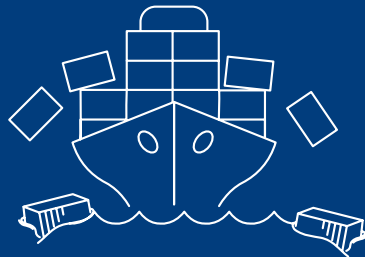


Within the first months of 2021,  
two large containerships had

LOST ABOUT

**2,500**

CONTAINERS



Container design has changed very little since they were introduced more than 60 years ago to carry cargo and speed up the loading and unloading process. Yet the vessels which carry them are regularly evolving, particularly in terms of displacement and numbers of boxes carried.

Many cargo losses can be avoided by adopting good industry practice. In this technical paper we explore factors that shippers and cargo owners can deploy to reduce container loss through fires and loss of cargo overboard.





# Code of Practice for Packing of Cargo Transport Units (CTU Code)

The International Maritime Organisation (IMO), the International Labour Organization (ILO), and the United Nations Economic Commission for Europe (UNECE), with industry support, have produced a [Code of Practice for the packing of CTU](#), including containers.

This Code outlines specific procedures and techniques to improve safety, including:

- ▶ how to ensure correct distribution of the weight inside the container
- ▶ proper positioning
- ▶ blocking and bracing according to the type of cargo, and other safety considerations.

This detailed publication should be referred to when planning container packing and shipments of any kind.

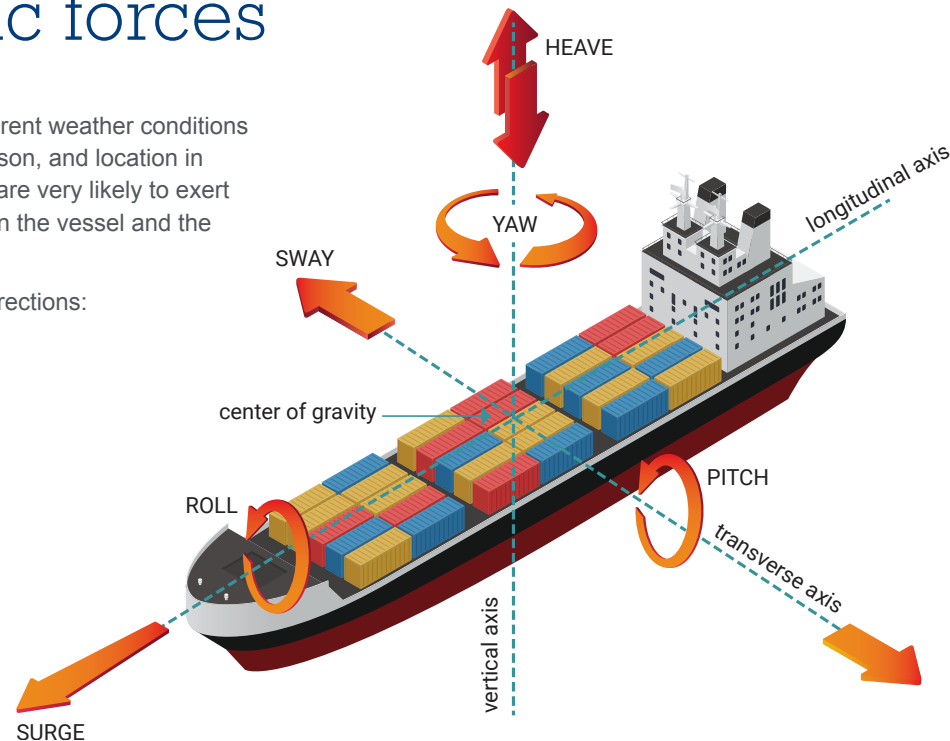


# Pack and stow cargo with consideration of the six dynamic forces

Ship voyages are made in many different weather conditions depending on the time of year or season, and location in the world. These differing conditions are very likely to exert a combination of dynamic forces upon the vessel and the cargo it is carrying.

Ships in a seaway can move in six directions:

1. pitching
2. rolling
3. heaving
4. surging
5. swaying
6. yawing



Forces on cargo are exerted in any of those directions and may be a combination of directions at once.

Cargo should always be packed and stowed to take into consideration these dynamic forces during the voyage.

A lot of goods intended for shipping in containers will be involved in multi modal transportation – that is by road or rail to the port, then sea transportation to the discharge port and then road or rail to the final consignee.

Packing of any cargo should, basically, protect the goods against all forms of damage, and protect the environment against any possible damaging effects of the cargo.







# Stuff and secure containers with consideration

Container stuffing is an art, and requires specialist, experienced stuffers with the experience to do it correctly.

Let's go through some basics. Firstly, the CTU itself should have a solid exterior and be in good condition without any significant damage. The strong points of the container are the casting corners, not the walls of the container, these should also be checked. Likewise, internally the container should be free of signs of water ingress, stains or smells which may damage the cargo after stuffing.

Cargo shipped in containers varies considerably from large single heavy machinery items, to steel pipes, or containers can be used as a frame for a flexi tank to carry oil. The latter comes with its own challenges and is addressed in other Liberty Risk Engineering publications.

Containers are also used to ship regular cargo such as boxed clothing, bagged agricultural commodities and canned goods. All these items are unique in their requirements for handling, loading and stowage within a CTU.

Cargo with high centres of gravity will be more susceptible to tipping, so when packing the CTU, consideration should be given to adequate space for lashings, or additional compatible cargo added for a tighter stow.

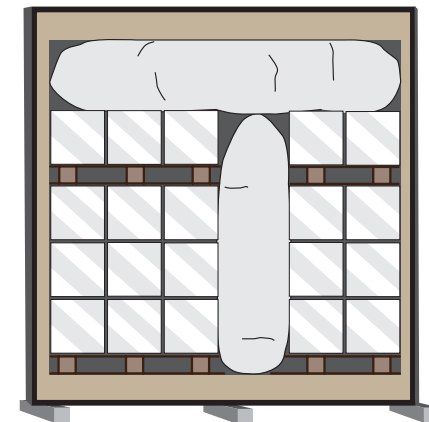
## Correct packing techniques

Cargo items which are heavy, such as machinery or other dense cargo will have to be loaded to ensure their weight is evenly distributed throughout the floor of the CTU strong points to avoid overloading.

For more regular cargo, in general, the CTU should be loaded to ensure the centre of gravity of the cargo is as near as practical to the centre of the CTU.

Always plan the loading process to avoid loading heavy goods on top of light goods and use locking or blocking techniques to secure the cargo without the need for specific lashings.

Stuffing, if done successfully, should result in a tight stow and if this cannot be achieved, then lashings, blocking or bracings used to make the stow secure. In a tight stow, smaller cargo can be used to fill in any significant gaps as well as dunnage bags or cargo nets.



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# Declare the correct weight and contents

It is now a requirement under Safety of Life at Sea (SOLAS) convention that no container should be loaded to a vessel without having its Verified Gross Mass (VGM) declared.

The VGM is basically the combined weight of the container weight, the cargo and its packing inside. This can be compared with the Maximum Operating Gross Weight, which should be marked on the outside of the container.

Incorrect, or inaccurate declarations have resulted in accidents during loading and offloading and is a significant hazard which could compromise the safe stowage and proper securing of containers on board.

As container ships get larger, it's imperative that weights are declared accurately to ensure correct stowage locations and that adequate lashings are provided to prevent loss overboard. This helps ensure accurate stability calculations

are derived for the vessel for the intended voyage.

It's also important that the contents of the container are properly declared to ensure proper stowage on board, particularly when shipping any dangerous goods.

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## Dangerous goods

Dangerous goods as identified in the International Maritime Dangerous Goods (IMDG) code require special consideration for several reasons. Primarily, it's imperative that dangerous goods are carried in accordance with the code.

There are nine classes of dangerous goods, all of which have unique characteristics which need to be considered when packing, stuffing to containers and planning safe stowage on board container ships.

According to an International Cargo Handling Coordination Association (ICHCA) submission to the IMO in 2017, approximately 5.4 million units annually are packed with dangerous goods. Of course, what is more difficult to assess, is how many more units are mis-declared or undeclared as dangerous goods.

Container shipping lines have generally implemented a risk management procedure which highlights the higher risk areas when stowing dangerous goods on board. The main criteria is for the preservation of life, then preservation of shipboard services, such as propulsion and the ability for the crew to successfully fight any fire.

For example, dangerous goods loaded in containers should not be stowed in a lower hold and next to the cargo hold/engine room bulkhead to avoid overheating. Dangerous goods might also be stowed above deck in the forward part of the vessel, away from the accommodation, bridge and engine room and more easily accessible for firefighting.

It's not necessarily the dangerous goods being shipped which might cause a problem, but more likely non-compliance with the IMDG code.

In 2019, the National Cargo Bureau (Bureau, 2019), conducted 32,390 dangerous goods container inspections in the United States, and found almost 8% of these to be noncompliant either due to poor stowage and securing or mis-declared cargo.

We must realise that mis-declaration of dangerous goods by a shipper, might very well be a deliberate attempt to deceive in order to avoid higher freight rates or stricter requirements for the carriage of the goods which might result in the cargo being removed from the vessel.

Clearly, any mis-declaration of dangerous goods must be avoided to reduce the risk of any incidents on the sea voyage which could potentially put the entire vessel, cargo, crew and the environment in jeopardy.







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## In conclusion

Before commencing any cargo shipment in a CTU, please refer to the Code of Practice for Packing of Cargo Transport Units (CTU code) for guidance.

Ensuring that the CTU is stuffed properly, by professionals, will help in mitigating the risk to the cargo carried, as well as the potential for loss of the cargo either on board or in extreme cases, overboard.

Declaring goods accurately in the cargo manifest will allow stowage planners to ensure the cargo is loaded and stowed in the safest place on board the vessel.





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### References

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