



# **Stowage As A Profit Centre**

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Stowage Coordination (or stowage planning) is probably one of the least understood aspects of container shipping operations. To put it simply, it is the department of a shipping company that decides where containers are to be stowed on a vessel during at each port call.

The reality, is much more complex, but, in this article, I want to focus on both the technical aspects, the knowledge required to successfully stow a container vessel and money – profit and loss, and how the Stowage Centre can be a key influencer in the profitability of a carrier.

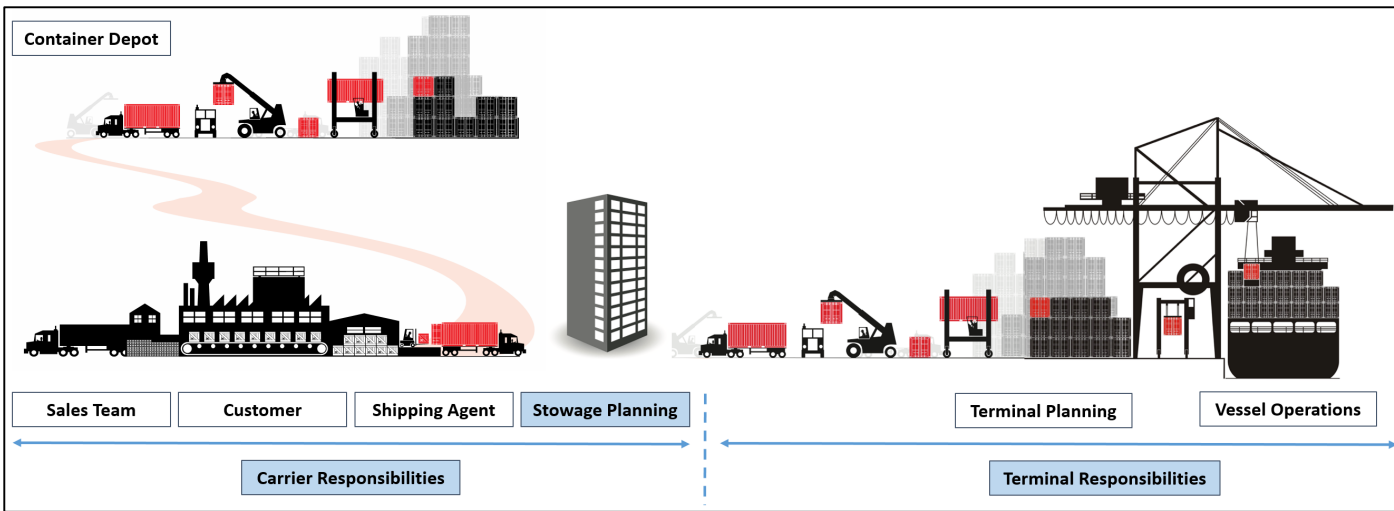


Fig.1

Stowage departments across the container shipping world are relatively small in size, considering what they are responsible for. For example, Maersk Line has approximately 23,000 staff worldwide and, of those, only about 80 are involved in stowing the vessels. That is only 0.3% of the entire workforce that is responsible for the operation of 600+ vessels and millions of container moves per year. At 0.3%, it’s no surprise that those outside the world of stowage are unable to see why this is such a crucial part of the business.

Stowage (if it is known about by anyone in a company at all), tends to be seen as something of a black box. Information goes in, stowage plans come out, but very few people know what happens in between.

Traditionally, stowage has been viewed as purely a “cost centre” (i.e. a department that can only spend money or save money). I would counter that with the argument that stowage is the place where a company ultimately makes a profit or a loss and, in this series of articles, I will explain why I believe this is so.

As can be seen in Fig. 1, the stowage team is the last department in the shipping process, that is under the carriers control, before the vessel is handed over to the terminal for operations. This means that they have the final say in how the vessel will be loaded. This is where money can be made or lost, depending on the skill and experience of the stowage coordinator.



Example of an actual stowage plan

Fig.2

At a very basic level, stowage coordination is the practice of determining, where on a vessel, containers should be loaded to allow for the optimal load and discharge of that vessel. It should take into account considerations for the ports in the rotation, the number of ports in the rotation, the correct segregation of the cargo, the number of cranes required and the overall vessel stability. Of course, the reality of stowage coordination is much more complex than this implies.

Stowage is a giant puzzle that needs to be solved. The difference between stowage and an actual puzzle is that there is no one single end result to stowage planning. There are almost infinite combinations that can be applied to solve the puzzle and none of them can be described as truly correct or incorrect. Every scenario will have positive and negative aspects to it, often depending on what the stowage coordinator is trying to achieve with this particular stow.

The other aspect is that this is a never ending puzzle, in that it does not even really have an end result, just steps along the way. Very rarely do container ships completely discharge and then re-load. Container ships usually operate in a never ending loop of port calls. At every port, some containers will be discharged, some more will be loaded. The puzzle has many different solutions but rarely does it have an end goal.

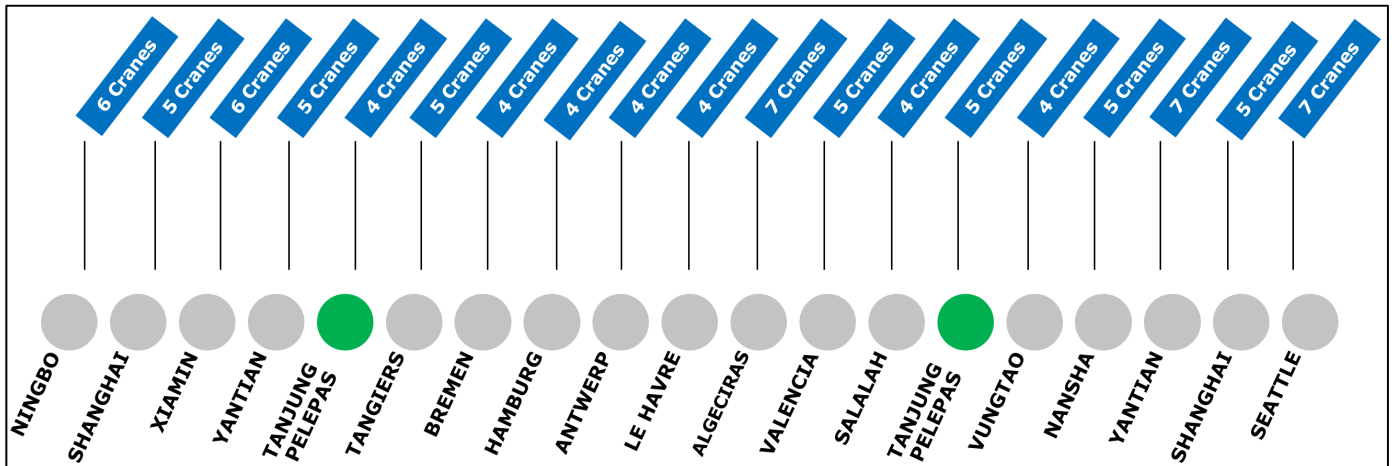


Fig. 3 – Example Service, 19 port calls, 96 cranes required

Due to the dynamic nature of container shipping operations, there is no ‘one size fits all’ solution to stowage. Every service, often every port and/or vessel, will have differing requirements and restrictions that affect the stowage. What works well for one particular stow may not work at all for another. What makes stowage coordination particularly challenging to teach is that it is unusual to have one single or definitive answer to any question. More often than not, the answer to a particular stowage question will be ‘it depends’. Accurate, but unhelpful.

The best way to look at stowage is to break it down into its individual components. There are quite clear rules for each specific aspect of stowage, such as hazardous cargo segregation, reefer loadings, out of gauge pieces etc, it is then up to the stowage coordinator to look at the stowage he or she is currently trying to solve and then apply the solutions that work this time. It’s rather like having a ‘stowage toolbox’. Not every tool will fit every problem but there is a solution to everything. Ultimately, if nothing in the toolbox will work then restowing containers will solve everything. It’s not an elegant solution and it comes at a cost but it is always there as a backup.

What should be remembered about stowage is that virtually every decision that the stowage coordinator makes comes down to a trade off or compromise. If I make ‘this’ decision, what effect will ‘that’ have elsewhere? Often, a good stowage is about coming up with the solution that has the least negative effect on something else.

What makes stowage even more complex is that the coordinator is often having to work with a combination of actual information, forecast information and experience. This is the main reason that stowage is still quite a manual ‘thought based’ process. Container shipping is simply too dynamic to have 100% (or even close to) accurate forecasts which means that the even the best “automated” stowage system in the world is currently still no match for the human brain.

Whenever a stowage is being created, the planner should be keeping an eye on both operational and commercial concerns. If the vessel cannot be filled because of wasted space or unnecessary restows, then the vessel will not be profitable. If the port stay is longer than anticipated, the vessel will have to burn additional fuel to reach the next port on schedule. All this costs money in an industry where the profit margins are very small to begin with.

Fig. 4 – Some of the considerations a planner takes into account

Stowage Considerations					
General	Terminal	Vessel	Cargo	Cargo	Stability
Crane Intensity Restows Restow Costs Per Port Overstows Port of Loading Port(s) of Discharge Change of Destinations Reefer Allocation	Crane Height Limits Crane Reach Limits Crane Lift Capacity Twinlift Capability Dual Cycle Capability Tandem Hoisting Dual Hoisting Capability Crane Gantry Movements Crane Breakdowns Boom Up/Down Past Bridge Crane Productivities Hatchcover Movements Low Movecount Bays	Reefer Bays Russian Stowage Document of Compliance Vessel Restrictions Vessel Repairs Stack Weight Limits Stack Height Limits Onboard Cranes Underdeck Space Available	IMO (Hazardous) 9 UN Classes: <b>Class 1</b> - Explosives <b>Class 2</b> - Gases <b>Class 3</b> - Flammable Liquids <b>Class 4</b> - Flammable Solids <b>Class 5</b> - Oxidizing Substances <b>Class 6</b> - Toxic & Infectious <b>Class 7</b> - Radioactive Substances <b>Class 8</b> - Corrosive Substances <b>Class 9</b> - Miscellaneous Substances Specific Segregation Requirements Company Specific Requirements	<b>OOG (Out of Gauge)</b> Over Height Over Width Over Length Weight Lifting Requirements Protection Required Minimal Lost Slots Stowage restrictions  <b>BBLK (BreakBulk)</b> Vessel Restrictions Gantry or Floating Crane Size/Weight Restrictions Load Port Restrictions Discharge Port Restrictions Floating Crane Costs Impact on crane split BBLK should never be restowed BBLK never over Reefers	GM (Vessel Stability) Shear Force Bending Moment Torsion Draft Air Draft Visibility Rules (Panama) Line of Sight Rules (IMO) Windstacks Lashing Forces

The two main challenges within the industry are getting the carriers to understand that stowage is an asset, rather than a risk and, secondly, giving the planners the financial information needed in order to change from a Cost Centre to a Profit Centre.

**So, what are the costs involved in stowing and operating a vessel?**

Firstly, you have the daily operational cost of running the vessel, pilotage fees, port dues, tug fees, agency fees and container move costs to name but a few. Of these, the main items that a stowage planner can influence are the vessel running costs and container move costs.

Ideally, an 18,000+ TEU vessel would call at perhaps 3 ports in Europe and 3 ports in Asia, with the cargo being loaded onto feeder vessels to the final destinations. Unfortunately, for most carriers, this is not the case. It is not uncommon for these vessels to call at 15-20 ports during the entire port rotation. This is extremely costly and inefficient since the fixed costs of pilotage, tugs and port dues will apply at every one of the 15-20 port calls. There is not a lot a stowage planner can do about these.

However, there are a number of things that a planner can do to keep costs to a minimum. Each port will have a pre-determined container movecount. From this, the planner can derive an appropriate “crane split” (the number of cranes that will work on the vessel during the port call) for each port. So long as the vessel is able to sail from each port on schedule, no additional fuel will need to be used to arrive at the next port on schedule. This is particularly crucial in the last port in the region, often before the vessel sails for the Suez Canal and when there is an allocated time for arrival. Being late out of the last port means burning more fuel for a higher number of days in order to hit the next scheduled window.

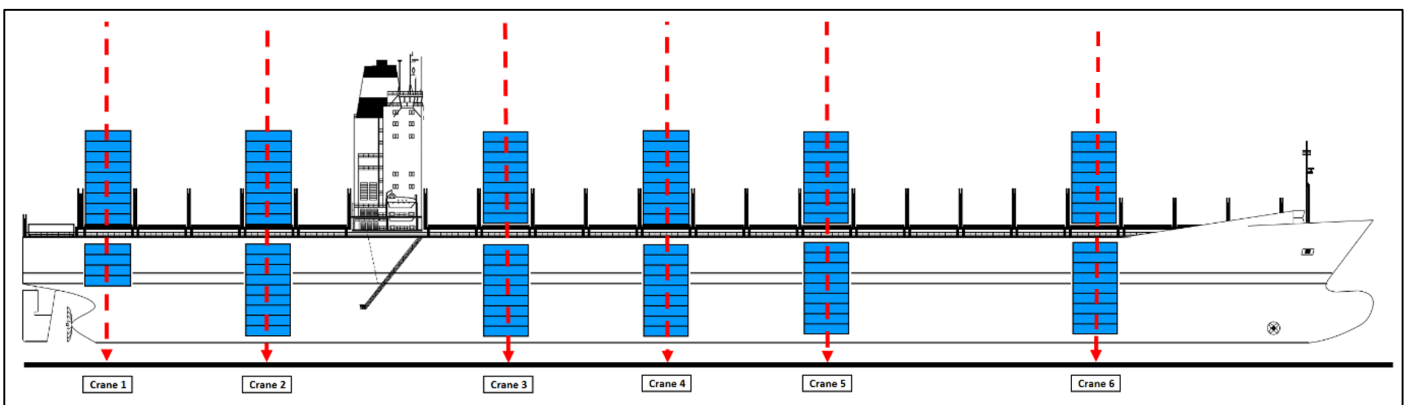
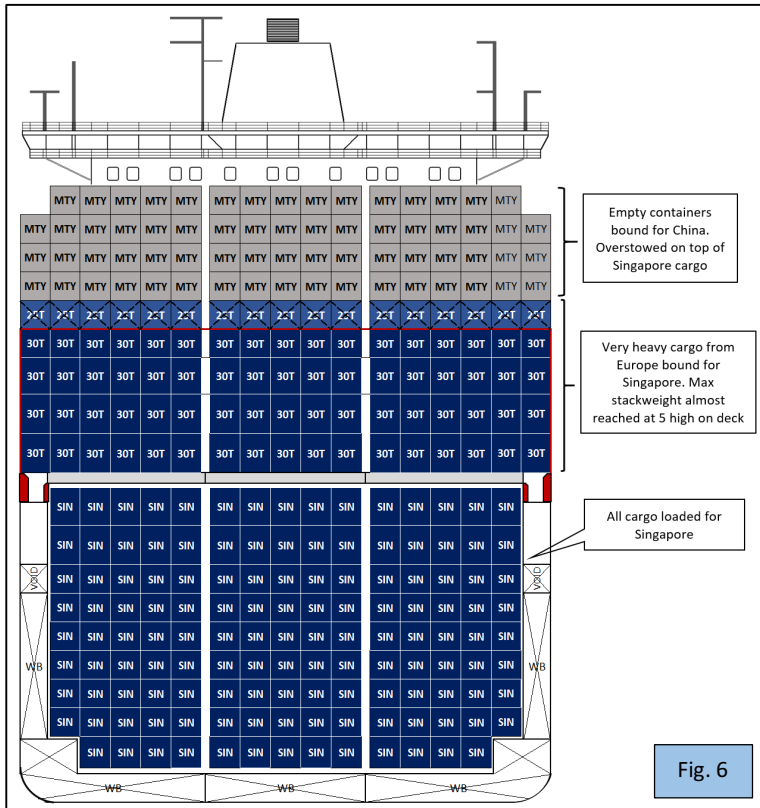


Fig. 5 – Example of a “6 Crane Split”

The second biggest cost of stowage is restows. Restows are containers that are loaded onboard the vessel and are then moved to another position, in another port, before being discharged at the final destination.



Restows can occur for a number of reasons. The highest contributing factor of all is empty container repositioning. Loaded containers come from Asia but, since there is a trade imbalance, empty containers have to be evacuated out of Europe or the US and sent back to Asia.

If a vessel were to go directly from Europe to China, then these empties would probably not have to be restowed. The problem is that most services have a call in somewhere in between (i.e. Port Klang, Singapore, Tanjung Pelepas etc).

As these regions do not require empties and the laden containers from Europe/US to these ports tend to be very heavy, it is not possible to load full containers up to the top tiers as this would exceed the stackweight limits.

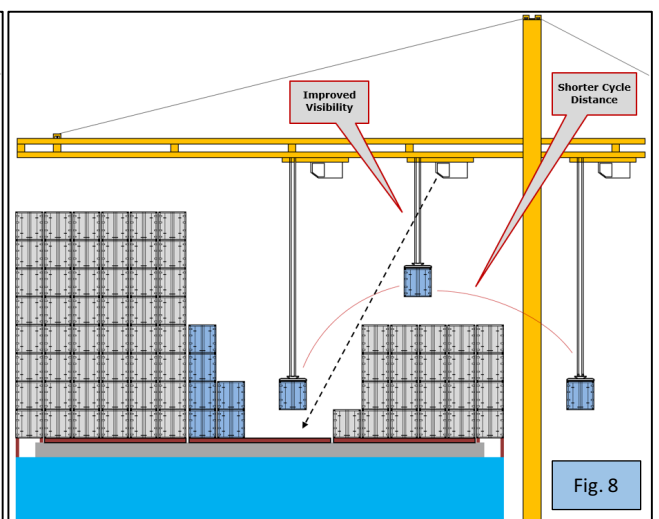
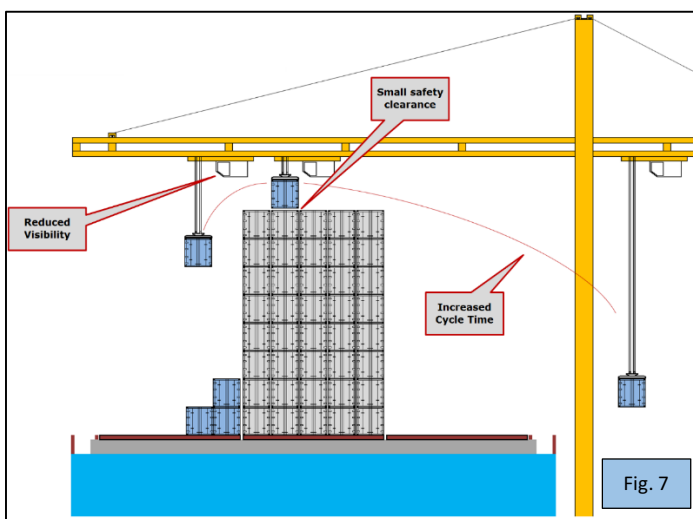
Instead, the heavy containers are loaded 5 or 6 high on deck and the remaining 4 or 5 tiers are loaded with empties for China.

Consequently, when the vessel arrives in Singapore (or other terminal before China), all of these empties have to be taken off the vessel and then reloaded. Again, this would not be such an issue if services with the large vessels were restricted to 3 or 4 ports at either end.

The latest vessels of 18,000 TEU and above almost always incur what are known as Terminal Convenience Restows. Given the height of the containers on the decks of these vessels, terminals sometimes need to move onboard containers out of the way in order to reach the stacks they are loading and/or discharging. As per Fig.7, below, the crane will operate at a much slower rate if it has to work over the high tower in the centre of the bay.

Fig.8, below, shows a bay where there is no need for Terminal Convenience Restows because the onboard containers are only loaded 5 tiers high on deck.

Terminal Restows may or may not be charged to the carrier, but they do cost time due to the loss of productivity or additional restow moves and the ship is likely to be alongside for a longer period than planned, thus prompting the vessel to speed up to arrive at the next port on time. More speed equals more fuel.



One option to get around this is to use ballast to make the vessel deeper in the water. This may speed up the port operations but the vessel can be carrying upwards of 50,000 tons of water and, again, more fuel is required to move the vessel.

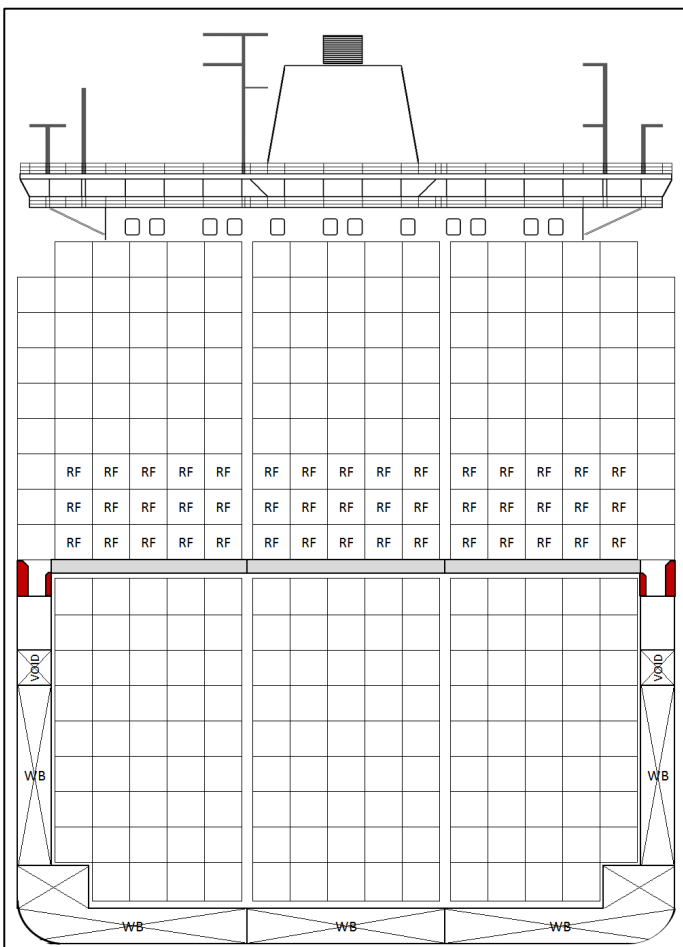
Other reasons for restows can range from customers requesting a change of destination, a small number of containers that cannot be stowed in a final location, hazardous cargoes that have limited locations available to vessel stability requirements. Restow costs range enormously, depending on the port in which they are carried out. In China they can be as cheap as \$33 per container up to \$250 per container in some US ports. Convenience restows can be avoided if the onshore side of the vessel is not loaded up to the maximum tiers.

When considered individually, the cost of restows seems minimal, but when seen in the context of an entire port rotation, the money can soon add up.

If you only look at the costs involved in operating a vessel and a service, it is easy to make the assumption that the stowage centre is a cost centre that can, at best, only reduce the costs. This is, however, where the misconception comes into play, mainly due to the lack of overall knowledge about how stowing a ship works.

When is a ship considered to be fully utilized? How close can the actual loading get to the nominal TEU of the vessel? At what percentage of utilization does the shipping line start to make a profit on a particular vessel?

The easiest way to explain this is to look at a single bay on the vessel, rather than the vessel as a whole. Each bay can be considered to have a nominal TEU capacity, and it is up to the stowage coordinator to make the best use of the space, with the cargo they have available on the loadlist for the current port.



**This bay can load the following:**

- Nominal Capacity of 568 TEU
- Two tiers of high cubes underdeck without slot loss.
- 45 Reefer Containers on deck (marked "RF")
- 9 Tiers On Deck if loading standard height units
- 8 Tiers On Deck if loading all High Cube units

STD	Standard 40 Foot Container
HC	High Cube Container
20FT	20 Foot container
45FT	45 Foot Container
*RF	Reefer Container
DG	Hazardous Container
OOG	Out Of Gauge Unit
MTY	Empty Container

Fig. 9

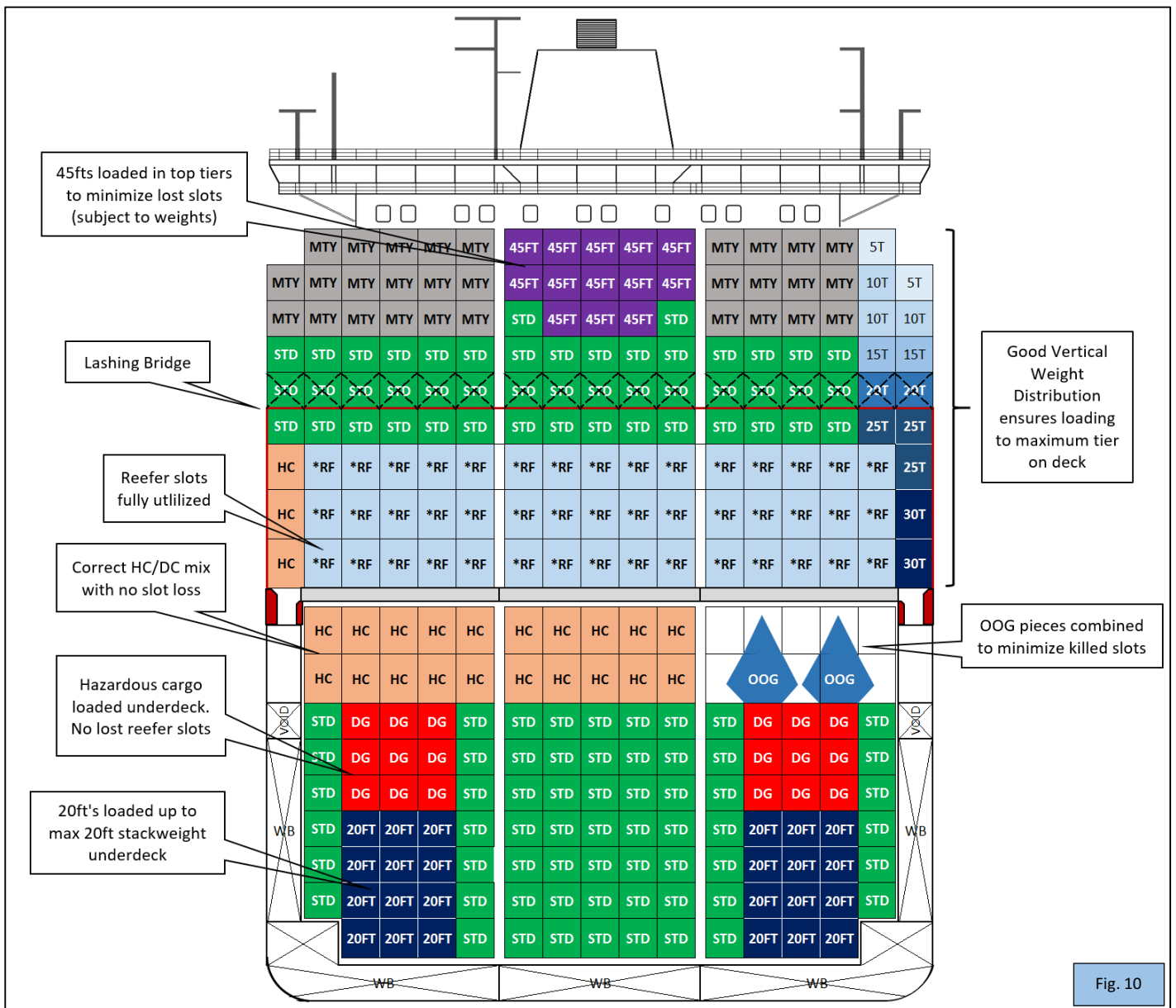


Fig. 10

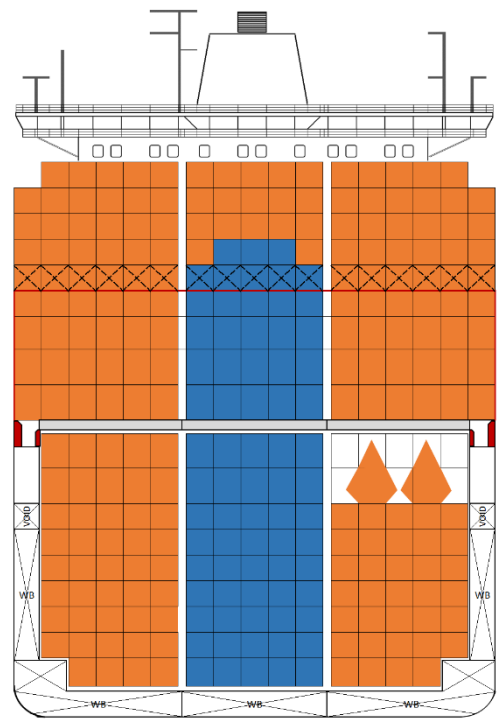


Fig. 11

This would be a bay that is considered to be fully utilized:

Of the nominal capacity of **568 TEU** it is comprised of the following:

- 45 fully utilized reefer slots
- Two tiers of high cubes underdeck without slot loss
- 9 Tiers on deck with good vertical weight distribution
- Hazardous cargo is grouped together underdeck
- 45ft units grouped together to minimize lost slots
- Empties only in the highest 3 tiers (reduced overstows)
- OOG pieces loaded together to minimize slots killed
- OOG killed slots charged to shipper is 20 TEU in total
- Actual OOG slots killed is only 16 TEU in total
- Reduced height tower in the centre for better productivity
  - See diagram fig.11 (Orange is first Port of Discharge, Blue is the second Port of Discharge)
- **Actual TEU's charged for = 572 (due to OOG combining)**

Therefore, this stow **actually exceeds** the nominal TEU for the bay by ensuring that every slot is properly utilized.

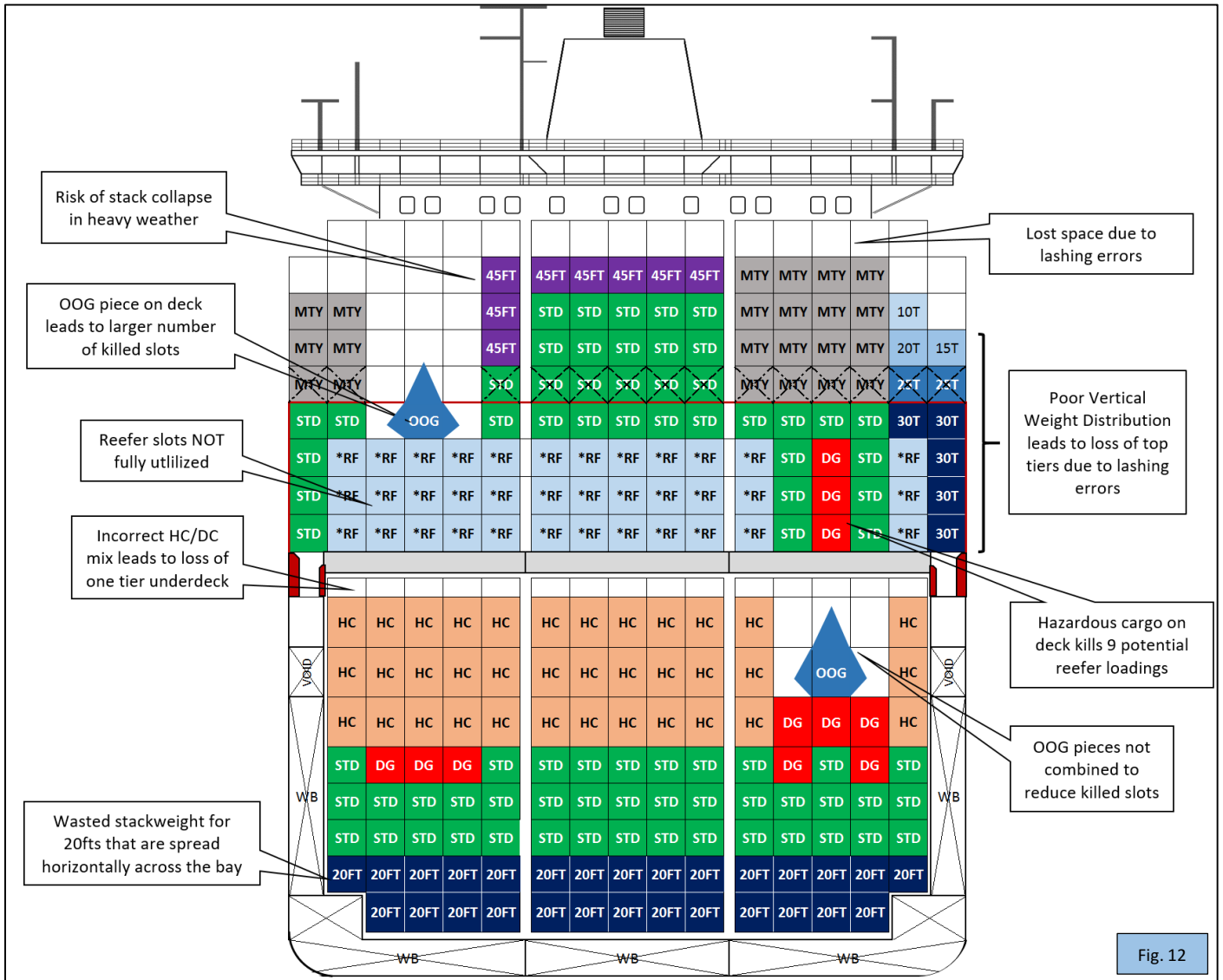


Fig. 12

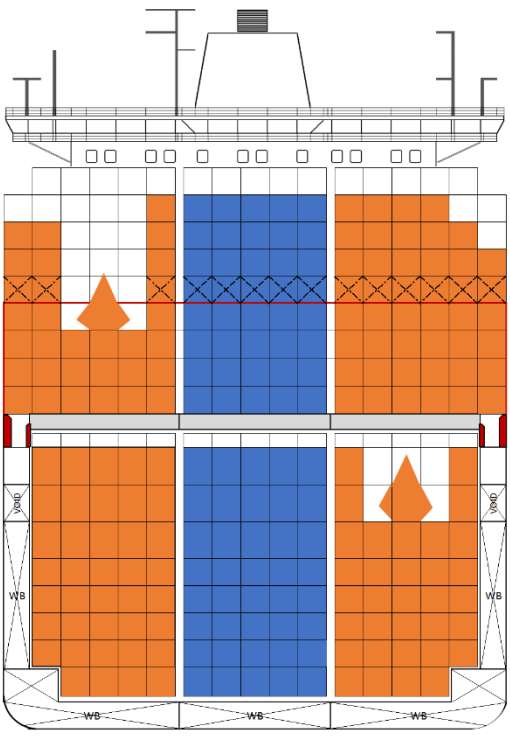


Fig. 13

**This would be a bay that is NOT considered to be fully utilized:**

Of the nominal capacity of **568 TEU** it is comprised of the following:

- Only 36 reefer slots used
- 9 reefer slots lost due to hazardous container on deck
- Three tiers of high cubes underdeck that voids one whole tier
- 8 Tiers on deck due to poor vertical weight distribution
- Hazardous cargo is scattered underdeck and on deck
- 45ft stowed horizontally prevent loading 40ft on top
- 20fts stowed horizontally are not making full use of stackweight
- OOG pieces not loaded together to kill excessive number of slots
- OOG killed slots charged to shipper is **10 TEU** per piece
- Actual OOG slots killed are **44 TEU** in total
- Full height tower in the centre will reduce productivity
  - See fig.13 (Orange is first Port of Discharge, Blue is the second Port of Discharge)

Therefore, this stow has **480 TEU** that are chargeable and so is well below the nominal TEU for the bay by ensuring that every slot is properly utilized. **88 TEU** on this single bay is wasted space.



## Summary

Stowage is not a department that can function independently of the rest of a carrier's processes and departments. It has to work with cargoflow teams, marine and operational teams in order to be successful. That said, it doesn't matter how many slots a sales team can sell if the company does not have the right people with the skills and abilities to load all the containers onto the vessel.

Using my example bays, if you scale that up to a ship that has 22+ bays, you can easily see how much money can be made or lost. Now scale that up to a service which might have 10 vessels on it and the numbers start to get serious.

If carriers truly want to utilize their very expensive vessels and recoup the operational costs in order to be making a profit then the stowage coordinators need to have the ability to load to 96-97% of the vessel capacity. It's only in the last few percentage points where the profit is made or lost.

For companies working within alliances and Vessel Sharing Agreements, the stowage team should know the VSA agreements inside out. What is NOT written in the VSA is just as important as what is written in the agreement.

To really exploit the potential of a stowage department it is far better to have Ship Managers rather than Ship Planners. What is the difference? A Ship Manager is responsible for ALL aspects of the vessel operation from capacity management, berth and crane planning, bunkering requests and, of course, stowing the vessel. A Ship Planner merely takes the loadlist they are given and stows it on the ship.

Yes, Ship Managers are more expensive from a headcount point of view but when headcount is put into the context of the operational stowage costs, it is miniscule by comparison. A planner can spend or lose more money in a single port call than their annual salary. Now realise that the top carriers are each sending over 40,000 stowage plans to terminals per year, with just 80 or so people, and you start to see why headcount shouldn't even be a consideration.

Some carriers are very good at this, some are extremely poor, and you'd likely be very surprised by which carriers are which. Even if the vessel isn't full in the last port, according to the loadlist, the Ship Manager should be reaching out to find more cargo in the terminal. Anything to get to the 97% and above. Since last port calls are often Hub Ports for the carriers, it is highly unlikely that there isn't more cargo available, but if no one asks, the vessel won't break even, let alone be profitable.

It's also equally important that carriers recognize that finance has as much to do with stowage as the stowage team. If the financial data for every vessel is provided to the stowage team, they can start to look at whether a service is profitable or not. Armed with that information, they are the experts who can identify where improvements can be made, whether a particular type of cargo could be prioritized for a service (for example, more reefer loadings).

Sales teams can start targeting particular types of cargo, cargoflow teams can be steering the right cargo towards the right vessels, ship managers can ensure everything gets loaded.

When decisions are being made about what class of vessel should be deployed on a service, the stowage team are the only ones that can give an accurate assessment of whether the vessel class is suitable and, more importantly, be profitable.

When over-capacity in the market is leaving vessels only loaded up to 60 or 70% full, then it is entirely possible on a service of say, 10 vessels, to completely utilize 9 of those vessels and free one up to either be deployed to another service or just taken out of service for a while.

For some stowage centres, irrelevant KPI's have become the driving force. **Profitability** should be the driving force because, in the end, companies don't stay in business because employees hit their personal KPI's. They stay in business because they are more profitable than anyone else.