Insight Article

Containers on non-cellular ships

THE SYSTEM - HISTORY
Containerisation developed hugely in the 1960s and 1970s and has continued to evolve. The early operators were large, well-established liner companies and had considerable knowledge of carrying cargo and operating ships. They were therefore well able to develop and control the new industry. They created the terminals, which had not previously existed. They changed the manner in which ships were operated and, in general, increased the involvement of shore planners in ship operations.

Many of those early operators remain with us still. They now operate ships much larger and much more sophisticated than previously. The original aims, which included obtaining economies of scale and reducing dependence upon militant and volatile groups of stevedores, have been achieved.

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These days it appears that almost every dry cargo ship, except for the larger bulkers, carries containers from time to time. This means that containers are carried on general cargo and multi-purpose ships, RoRos and bulk carriers. The multi-purpose and RoRo ships are generally fitted to carry containers, although general cargo and bulk carriers may or may not be. Fitted or not, these ships are no longer specialised yet have merged within the containerised environment.

A cellular container ship is provided with strong metal vertical guides, generally only in the holds but occasionally on decks as well, into which the containers are placed. Damage to containers or cargoes while stowed within these cells, except by incidents such as collision or fire, is unusual.

A non-cellular ship fitted for the carriage of containers is provided with a system other than cells by which the containers are positioned, i.e., stowed and secured.

There is great variety in the types of stowage and securing provided. A well-planned system on a RoRo vessel may be almost as secure as the cells of a container ship. A poor system on an elderly bulk carrier may consist of painted marks on the tank top, to show where to place the containers, together with dunnage and a collection of wires, bulldog grips and turnbuckles. The containers carried on such a vessel would be extremely vulnerable in the event of bad weather conditions being encountered.

Carriage of containers on non-fitted ships should be restricted to small numbers, and is not considered further in this article.

NON-CELLULAR SYSTEMS

Stowing and securing a general cargo ship, when done properly, was a work of art. It was an integrated operation whereby the cargo was placed closely, compatibly and carefully into the hold, thus minimising the need for lashing and additional securing. It required ships to be in port for long periods. It was costly and obtaining quality was uncertain.

Containerisation was intended to make stowage and securing much simpler and quicker, and to replace experience, innovation and skill by a standard system which could hardly be operated improperly. That has not been achieved with non-cellular ships.

STOWAGE AND SECURING SYSTEMS

Non-cellular systems allow for stowage in bays, and securing by fittings such as twistlocks and lashings. Differences from one design to the next, however, are considerable. These are crucial to the security of the cargo and are not always obvious.

Generally, the containers are stowed in the fore and aft line, in bays, rows and tiers. Stowage of the containers in the athwartships direction is common with RoRos.

Positive locking fittings or stacking cones used together with lashings, are employed to fasten the lowermost units to the tank top/deck or to the hatch panels/bulwark pedestals.

Ships are provided with Container Stowage and Securing Plans prepared by the builders. Such a plan should show the maximum permitted GM, i.e., how stiff the ship may be, in terms of transverse stability in the conditions illustrated. This was discussed in Gard News issue 145, on page 14.

Several plans are normally required to describe the system on a single ship. Plans and specifications of equipment such as twistlocks should also be available on board.

Typically, securing systems are complicated and require many different types of fittings. One ship, for example, may be provided with two or three different types of bottom twistlocks, with intermediate twistlocks, two sorts of bridge fitting, pressure adapter pieces, long and short lashing rods, turnbuckles and hooks. Carriage of hundreds of containers will require the provision and maintenance of thousands of securing fittings. Thus on many ships, simplicity has not been achieved. That affects both operation and maintenance.

A feature of container securing is that individual items are of crucial importance. Failure or improper operation of a single item could cause a load to be shed onto a nearby fitting. That fitting in turn could be overloaded, causing local failure. Resultant restraint may be unbalanced and insufficient, extending the problem. The outcome may be a multi-container loss or collapse.

ACCESS TO CONTAINERS IN STOWAGE

The stowage of a ship carrying containers has to be arranged so that twistlocks can be engaged. The ease with which this vital operation may be carried out varies considerably. More space used for access means fewer containers on board.

On some ships, both ends of all containers remain accessible at all times. On other vessels, one end remains accessible at all times; the other end is stowed closely against adjacent containers. The significance is that on some ships the twistlocks, or whatever locking fittings are placed at the base of the stack, may be engaged and lashings rigged at any time after loading. On other vessels, those operations have to be carried out concurrent with loading. If that is not done, the stowage may look in order when inspected by an officer prior to sailing, but twistlocks may be disengaged.

Ships with restricted access to container corners are provided with long poles with a small device at one end by which twistlocks can be operated remotely.

These long poles are used in the same manner as a gas man operates a valve in the ground. They are often used incorrectly as hammers or even as spears to knock the levers. They are poor hammers, being lightweight and headless. They may be used to operate slack twistlocks.

When a proportion of twistlocks on one ship lock to the right, and the others to the left, it is normally impossible to check if the containers have been secured after loading. That is asking for trouble.

OPERATION

It is easy to say the system should be used as shown on the container stowage and securing plan, but normal operation is not so simple as the theoretical situations envisaged by naval architects prior to building.

Stowing and Securing Plans generally show full container loads with idealised individual weights, for example, 23 tonnes on the bottom, 14 tonnes in the middle and 3 tonnes on top giving a stack weight of 40 tonnes. Unfortunately, life is not like that.

Plans provide stack weights which should not be exceeded. Heavy containers must be stowed beneath lighter units. Err on the safe side!

If the GM shown on the Stowage and Securing Plan is exceeded, and can not readily be altered, the solution is probably to reduce the height of the stowage. Although the GM will be marginally increased, that will be more than offset by the reduction of the loads acting on the containers and securing.

When twistlocks are shown on the Stowage and Securing Plan, these should be engaged whenever the ship is at sea or manoeuvring in port. That applies even in regions of the stowages where separation forces (those which cause the base of a unit to move away from the deck or container beneath) seldom develop. Most ships break down from time to time. When that happens during heavy weather the loads on the securing system will become higher and even containers stowed low in the ship may topple.

Some securing plans require stacks to be independently secured. If that is the case, an adjacent stack may be empty without affecting the security of the units remaining. If that is not the case, additional securing may be necessary when the stowage is incomplete.

MAINTENANCE

The first stage in maintaining the system is recognising its parts. The system in place and used on board the ship and that described on the plans must be the same.

TWISTLOCKS AND CONIC GUIDES

It is often thought that one twistlock is much the same as the next. That is wrong.

A browse through one of the catalogues produced by one of the manufacturers of securing fittings will show the great variations of fittings. The catalogue of one manufacturer describes 23 different models of twistlocks.

Base twistlocks generally engage in a conic guide fitting welded to a reinforced part of the hatch panel or to a bulwark pedestal. It is easy to mismatch fittings. The result will be an insecure connection.

Conic guides wear in service and become useless in time. Determining when a worn fitting should be replaced is not easy, even for an objective and experienced person.

Intermediate twistlocks, which are those above the bottom of the stack, look generally similar, and identification of the specific type of lock is necessary as a first step towards determining the strength of the fitting.

Minimum breaking loads of twistlocks vary substantially.

It may be thought to be stating the obvious, but twistlocks must remain locked in order to resist separation forces. They have to stay locked during ship motion. Slack twistlocks may come open during bad weather.

Levers must be reasonably straight to allow operation and if long poles are necessary on board, the levers have to be in particularly good order. Twistlocks with slack or missing levers should be discarded or repaired.

OTHER FITTINGS

Parts of the securing system other than twistlocks also have to be inspected and repaired and replaced when necessary.

GOOD HOUSEKEEPING

Damaged fittings should be withdrawn from the system and either discarded or stored separately prior to being sent ashore for repair.

Phrases such as "worn but OK" have no place within the records of an efficient container operation. That is because they are normally used to denote "worn and not really OK".

MODIFICATIONS

In practice, stowage and particularly securing systems may be modified in the light of experience. Unless that is done to the same standards as were originally applied, i.e., with the design by a naval architect and approval by the Classification Society, such modifications are likely to result in losses. All too often, systems are changed "... because the last chief officer thought it was better that way", with unfortunate consequences.

Sometimes, the twistlocks on board a particular ship are known to be substandard, so additional lashings are used. A twistlock is a very short connection, providing restraint in the directions required. Lashings are much longer and stretch considerably prior to failure, thus allowing movement. A lashing is generally led in a direction oblique to that in which restraint is required. For these reasons, when twistlocks are specified by the system no alternative arrangement should be used.

Maintenance of a container securing system must be a continuous process. Superintendents often complain that twistlocks have legs and simply disappear of their own accord. They are constantly abused by being dropped. The solution involves repeated inspections and replacements.

OLDER TONNAGE

All of the wear and much of the deterioration of a container securing system takes place comparatively slowly. A good maintenance programme, with the application of high standards, can result in an old ship retaining a good container carriage system.

When standards are allowed to slip, and time elapses, the real complexity, size and cost of a container stowage and securing system become obvious.

A SAD STORY

A RoRo ship carrying containers met atrocious weather conditions during a voyage. Containers shifted and others were lost overboard. The Master remained on the bridge and brought the ship safely into a port of refuge. Investigation revealed that many twistlocks were in poor condition and others had not been engaged at the start of the voyage. Stack weights had been exceeded and a number of heavy containers were stowed above lighter units.

Good seamanship involves the routine, correct operation and maintenance of container stowage systems, as well as the skilful navigation of ships at sea.

MANAGEMENT

Many container ships today operate under a succession of charter parties. An individual ship is then required to integrate, as seamlessly as possible, into a charterers' established service.

There is a limit to what officers can do to ensure the safety of their ships. They are likely to have no control over the actual contents and security of the goods within the containers. However, there is much that they can and have to do concerning container operations vital to the well being of the ship. The work includes:

1. Maintaining the stowage plan.
2. Ensuring correct segregation and treatment of IMO hazardous cargo.
3. Keeping below stack weight limits.
4. Ensuring correct dispositions.
5. Ensuring those carrying out the stowage and securing are familiar with and apply the system.
6. Monitoring the stability of the ship.
7. Monitoring the longitudinal strength of the ship.
8. Maintaining the systems in good order.

It is not possible, in practice, for ships' officers to check everything that stevedores and riggers do. They should, however, take action to check whether vital work, such as engaging twistlocks shortly to be covered up in the stowage, is being done in a conscientious manner. This may be achieved by subjecting parts of the stowage to rigorous checks. Where a ship is on a regular trade, observations at the discharge port may be useful in respect of the subsequent voyage.

CONCLUSION

Proper operation of container ships, whether cellular or otherwise, is a difficult task requiring well trained, competent and industrious personnel supported in all respects by high quality management.

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