

## Container matters

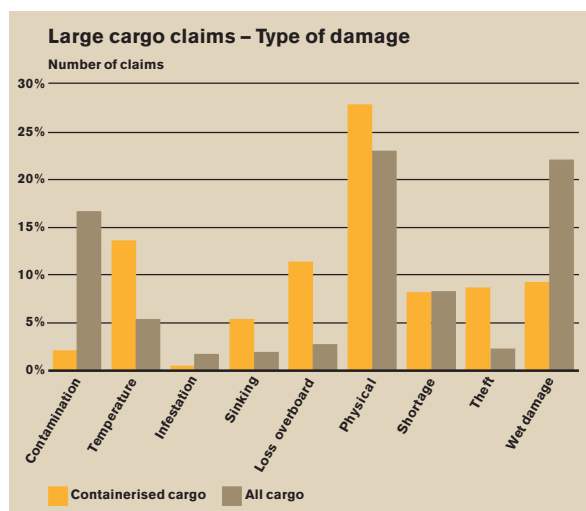
*The container revolution of the 1960s was deemed to be the solution to limiting cargo damage, but has experience proved otherwise?*



# Container cargo damage – the causes

*One of the biggest contributory causes of container cargo damage is bad stowage – it would seem we have merely shifted the cargo problem further back up the transit chain*

A considerable proportion of the Club's time is taken up handling container cargo claims where 25% of the damage is physical, 14% temperature related, 11% containers lost overboard, 9% theft and 8% shortage.\*



The graph shows how these compare to damages of all the Club's large cargo claims and highlights some of the real benefits, or otherwise, of containerisation.

It is worrying that one of the biggest contributory causes of container cargo damage is bad

stowage – causing nearly 20% of the claims. It would seem that we have merely shifted the cargo damage problem further back up the transit chain.

Shore error now accounts for around 27% of large container cargo claims compared with 19% for all types of cargo claim, tie this in with bad stowage statistics and it seems to point to problems originating at the time of stuffing.

We seem to have substituted problems in one large container (the ship) to problems in a lot of smaller containers (the container). With around 12,000,000 containers in circulation and 95,000,000 loaded container movements each year, this seems to be a real problem for the industry.

Although it is a major cause of container cargo damage, it would be wrong to lay the origin of all container cargo claims on bad stowage alone. The table (*right*) lists many other reasons for damage.

As an insurer finding and highlighting the problems and where the money goes is easy. Rectifying those problems unfortunately is not. The Club's two videos *Container matters* and *Any fool can stuff a container* try, in a limited way, to address some of these problems as do the articles in this document.

\*Source: Analysis of Major Claims

- Lack of export packaging
- Increased use of weak retail packaging
- Inadequate ventilation
- Wrong choice of container
- Poor condition of container
- Lack of effective container interchange inspection
- Ineffective sealing arrangements
- Lack of clear carriage instructions
- Ineffective internal cleaning
- Contaminated floors (taint)
- Wrong temperature settings
- Condensation
- Overloading
- Poor distribution of cargo weight
- Wrong air flow settings
- Wrongly declared cargo
- B/I temperature notations misleading/unachievable
- Lack of reefer points
- Organised crime
- Heavy containers stowed on light
- Stack weights exceeded
- Heat sensitive cargoes stowed on/adjacent to heated bunker tanks or in direct sunlight
- Fragile cargoes stowed in areas of high motion
- Damaged, worn, mixed securing equipment
- Poor monitoring of temperatures
- Wrong use of temperature controls





# Containers – stuffing & stacking

## Losses continue

The Club is concerned at the continuing incidence of damage to containers and cargo from within containers, and of damage to containers and contents from the collapse of containers in stack.

This article is a reminder and re-enforcement of earlier advices, and reference should be made to the following *Carefully to Carry* reports:

- Report No.11 - July 1983,
- Report No.12 - December 1986,
- Report No.13 - April 1989.

Reference should also be made to such booklets as *Stuffing & Stowage* by ScanDutch, and to similar publications by Atlantic Container Lines and Hapag Lloyd, for example, with their excellent descriptive line drawings and practical advice, and to the catalogues of container securing components and securing systems available from all reputable manufacturers such as Coubro & Scrutton, Conver and Peck & Hale.

## Stuffing

The stuffing of containers is not just a ship operator's problem. Containers are often packed at places which may be many miles, and sometimes even several days' journey, from the marine loading terminal. It is therefore important that everyone involved with the packing of containers, at whatever stage in transit, should be fully aware of the stresses that can be generated in the structure of the container itself and in and around the cargo within it, during transportation by

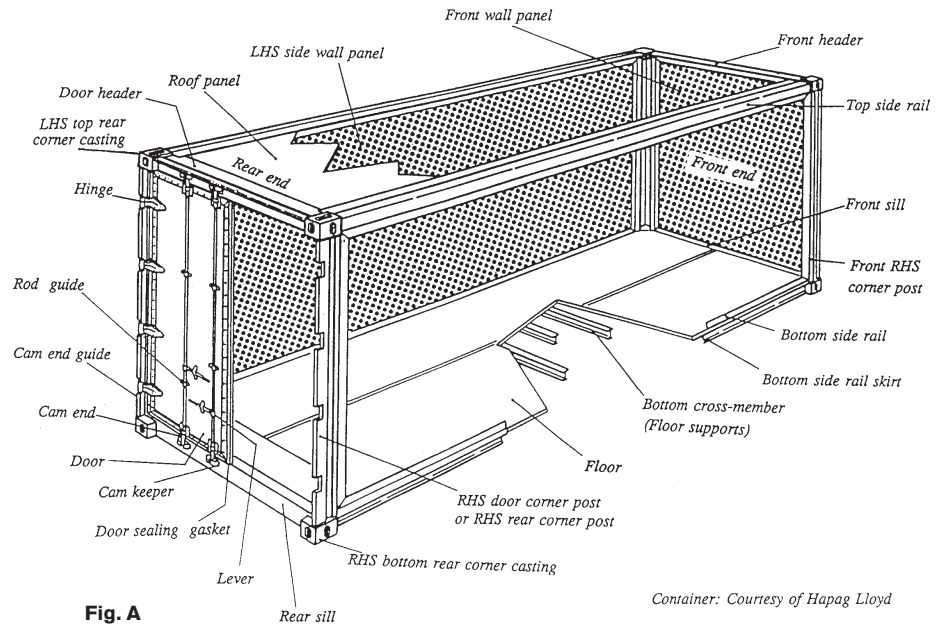


Fig. A

Container: Courtesy of Hapag Lloyd

road, rail or ship. It is also, of course, essential that containers are in sound structural condition each time they are put into service, and that the containers themselves are suitable for the cargo to be carried.

*It should always be borne in mind that the side panels, the end panels, and the roof panels of an ISO container are not normally strength members. Beneath the floor timbers there are metal cross-bearers and it is generally those bearers which provide the floor's strength. Additionally, the corner posts, front and rear headers and front and rear sills provide the internal strength members. (See Fig. A). Whenever bracing is to be used in vertical, horizontal or diagonal form, it must act against those members and the floor bearers, and no others. Bracing and/or end chocking against side, end, and roof panels will surely result in disaster (photos 3 and 4).*

The great problem is that, unlike break-bulk cargo, the ship's master and his officers do not sight, nor do they have any control over, the contents of containers or the methods by which the contents have been packed and secured. Hence, whenever and wherever containers are being packed, management and supervisory personnel should be properly trained and be provided with copies of the many relevant excellent handbooks and leaflets available from shipping companies engaged and specialising in container carriage by sea.

If the contents of just one container are improperly packed or lack adequate securing arrangements or are inappropriate for container carriage and, as a result, break adrift when the ship encounters heavy weather, the safety of many other containers, their contents, and the safety of the ship itself could be at risk. For instance, round steel bars, inadequately secured, broke adrift within a container third in stack on deck, pierced and went through the container's side panels,



Photo 1



shattered a corner post of the next adjacent container creating a domino collapse of other units. A single block of granite lacking securing arrangements within the lower tier of a below decks stack, broke through the container's side panel and fell corner down piercing the double-bottom fuel oil tank

below. The consequential fuel oil flooding of the hold and lower level damage to base containers was a costly business. As has been said elsewhere: Only the foolhardy believe that a heavy cargo unit's inertia, alone, will restrain its movement during a sea voyage!

Of the casualties investigated it is often the case that horizontal spaces – that is fore-and-aft and longitudinally – are more-or-less adequately chocked, but the vertical component is entirely neglected. When a ship is pitching and scending in a seaway, vertical acceleration and deceleration forces acting on cargo components can attain values of 2g. That is, as it goes up and comes down the load upon the securing arrangements will be equal to twice the static weight of the cargo item. If there is no arrangement to *hold down* the cargo securely to the container's floor the cargo will lift, and once it lifts it will start to shift, and once it starts to shift it will go on shifting!

Where relatively lightweight cartons or good timber cases can be afforded tight block stowage, there will be little need for additional securing arrangements. However, where lightweight cartons with frail contents, or plastic jars, bottles and barrels, are to be stowed to the full internal height it may be necessary to provide a mid-height flooring so that the lowermost items do not suffer damaging compression and collapse. (Figs. B & C).

Where bags, cartons or cases do not occupy the full internal space, then chocking and bracing with timbers and/or air bags is necessary. (Fig.D).

And where heavy items are involved, securing with downward-leading wire lashings and/or strapping to 'D'

Fig. C

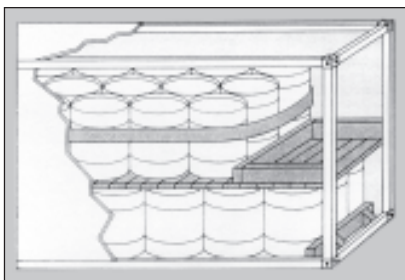


Fig. B

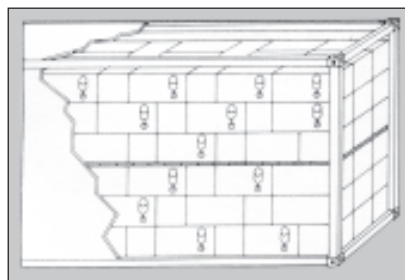


Fig. D

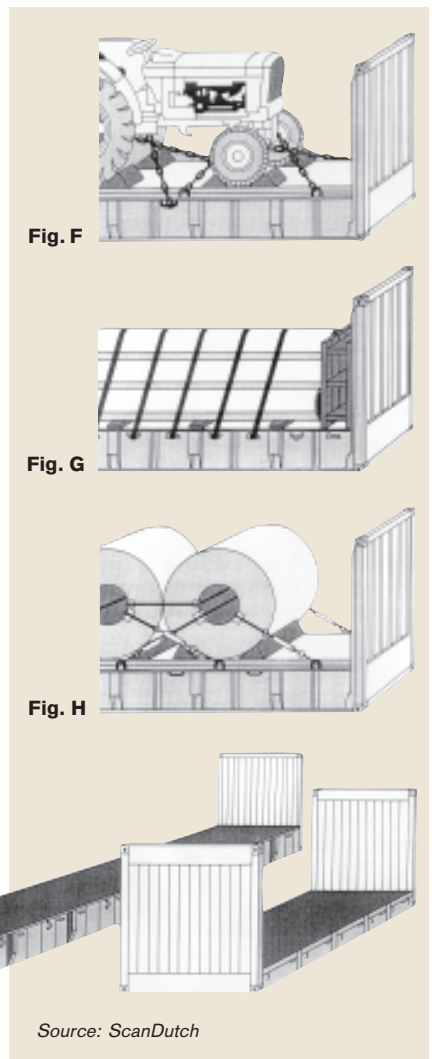
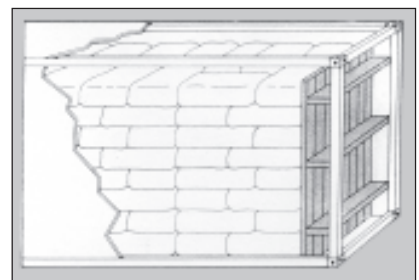


Fig. E



rings attached to the upper parts of the floor bearers will be required.

So it is important that the correct form of container is used, because not all have provision for mid-height flooring to be fitted, and not all are provided with 'D' rings.

Steel coils, steel pipes and bars, and heavy machinery items should be shipped on specially designed 'flat racks', 'flats' or 'sledges'. (Fig. E).

These units are strengthened for such loads, and adequate securing terminal points are provided. (Figs. F, G & H, for instance.)

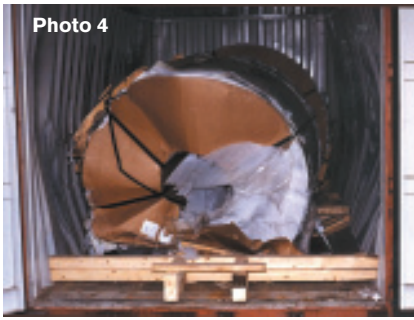


Photo 4

It is when such items are packed into ordinary cargo containers that disasters occur.

As the Atlantic Container Lines booklet says to shippers: *“When you have finally packed your cargo into the container, sealed the doors and dispatched the unit, it is extremely difficult to correct an inadequate stow. If your load has not been properly secured or if the packaging is unsuitable the risks of damage to your cargo will increase during transit.”*

## Containers in stack

Most ISO containers are designed and constructed to allow nine-high stacking *when empty*. They should be placed and must stand on the four lower and four upper corner castings, alone, with the appropriate stacking/locking components between. The bottom and top side rails, the front and rear sills and headers, and the underside floor bearers should remain free of vertical stacking contact at all times if transient wracking stresses are to be avoided.

A variety of securing systems sometimes create problems where ships' officers/charterers' superintendents familiar with one specific system fail to update themselves when faced with something different. It is not possible within the scope of this article to examine the many different fully approved and highly efficient systems in current use, but the Club cannot stress firmly enough the need to comply with, and to fully implement the requirements of, the stowage and securing system formally approved and planned for a particular vessel. All too often, container stack wracking failures occur in non purpose-built vessels because charterers insist on stacking containers in the holds and on the weather-deck in a manner which would not be approved even in a purpose-built ship. Unfortunately, stack collapses within the holds, and within weather-deck stacks, occur just as frequently in purpose-built vessels.

Independent of casualties arising from lack of securing arrangements and use of inappropriate containers as indicated earlier, container stack failures seem to arise from three prime causes, all of which involve unacceptable wracking stresses in one form or another.

Firstly, it is found that container stacks have failed because a fully-approved and fully adequate securing system has become downgraded with time. That is to say, after the casualty all concerned aboard the vessel insist that “we always secure them that way” when what proves to be the case is that, over time, one small recommended aspect after another has been omitted incrementally and successively without casualty until the day that circumstances conspire to subject the stacks to the maximum stress which the system was designed to withstand. Damage and loss result. A chain is only as strong as its weakest link, and a container stack securing system is only as effective as its least efficient component. *Do not omit from a container stack securing system any single component*



Photo 5

*which comprises the full and approved arrangement.*

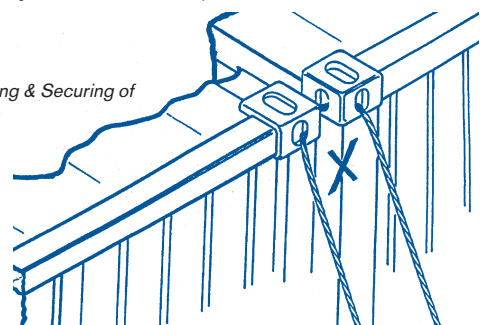
Secondly, and with disturbing frequency, it is found that container structural collapse has occurred due to excessive

superincumbent weight in stack. This occurs mostly in chartered vessels where charterers neglect to consult, or deliberately ignore, the stack weight restrictions set out in the approved stacking plans. *It is most unusual for ships to be approved for on-deck and under-deck stacks of 4, 5 or 6 units high in the absence of very rigorous unit-weight restrictions. In other words, an approved stacking plan for 5 or 6 units high may well specify a sliding decrease in weight per unit up to 4 high, with tiers 5 and 6 required to be empty.* Time and again, casualty investigation reveals a blatant disregard for these restrictions.

A very large, purpose-built, container vessel was slot-chartered on her maiden voyage to a number of

**Fig 1. A recipe for disaster. Adjacent corner castings should never be loop-lashed like this, or similar.**

Source: *Lashing & Securing of Deck Cargoes*





container carrying interests. The Classification-approved plans allowed 6-high stacks in the holds, so 6-high stacks were used throughout. Not a single charterers' superintendent bothered to check the stack plans, so many heavier units were placed in the upper three tiers because of the port discharge rotation. A week before arriving at the first discharge port the base tier containers in Nos. 2 & 6 holds suffered widespread collapse and crushing and tank-tops were pierced. Investigation revealed that the approved stacking plans provided a sliding scale, in which unit height increase should have been traded off against unit weight decrease: 20ft base and second tier units should not have exceeded 20 tonnes; third tier units should not have exceeded 10 tonnes, fourth tier units should not have exceeded 6 tonnes, and the two top tiers should have been empty. Sad to say, anything learnt from that loss appears to have been quickly forgotten bearing in mind that a similar train of events occurred in the same vessel some twelve months later.

The records of all the P&I Clubs combined would reveal the unwelcome frequency with which a similar sequence of events has created widespread damage and loss to containers carried on the weather-decks, and continues to occur. *Don't overload the stack. Consult the stacking plans. A container constructed to accept 8 empty units above it (a total of 20 tonnes) is unlikely to withstand a superincumbent weight of 160 tonnes even when static; when subjected to vertical acceleration/deceleration forces at sea, collapse is almost certain to occur.*

Thirdly, where two 20ft units are stowed on the weather deck in what would otherwise be a 40ft unit position, it is very difficult – in many instances, impossible – to apply wires, chains or bar-lashings to the adjacent end-butting corners. Their absence is not compensated for by using double or four-way inter-layer stackers (spades) or longitudinally positioned screw-bridge fittings, tie-wire, or the like. (Fig. 1).

The problem is that the container stack as a whole, and particularly those units in the base tier, will be subject to excessive wracking stresses should the ship start rolling in heavy seas or pronounced swell conditions. Some compensation can be applied by the use of anti-rac bands (two tensioned metal straps fitted diagonally across the corners of the 'free' ends of the base tier containers) but they suffer from the same inability to secure the 'butting' ends. A full lashing system, properly planned for the dual carriage of 20ft and 40ft units is to be preferred if container losses from this cause are to be prevented

*When all else fails – read the instructions!*

## Substandard components jeopardise cargoworthiness

A vessel's container stowage and securing arrangement can be easily undermined if substandard and/or incorrect components are utilised.

To maintain securing equipment in good order, both fixed and portable, requires considerable time and effort.

Whatever regulations, standards or codes of practice are issued the integrity of a vessel's container stowage and securing arrangement can only be made by regular 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 equipment.

## Portable securing equipment

The human nature of stevedores means that they will often 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 design rating, thereby resulting in a failure of the overall securing system and the possible collapse of the container stow.

The aspects which should be considered during periodic inspection of 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. When left-hand

### Mixed twistlocks



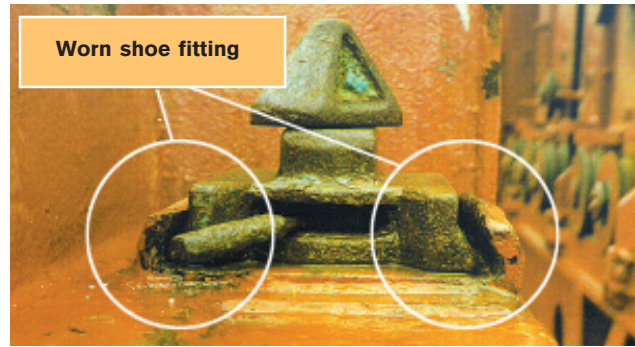


### Uniform twistlocks

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. ISO TC104 has been considering for some time amendments to ISO Standard 3874 that will include the physical and functional requirements for various items of portable securing equipment. For manual twistlocks it is proposed that the unified direction of handling will be clockwise when viewed from above, i.e. left-hand locking.



- Checks to ensure that the spring holding the twistlock in the closed position is in a resilient condition. If a spring loses its resiliency the cone(s) will not be held in position in a positive manner. The moving and flexing of a vessel in a seaway has been found sufficient to allow twistlocks to unlock themselves if their spring action is failing or has failed.
- 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; and
- Seized/buckled turnbuckles, bridge fittings.

### Fixed fittings

Regular inspection of fixed fittings is also 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; and
- Dovetail deck foundations distorted.

If a dovetail type 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 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.

To ensure as far as possible that containers can be safely carried can be summarised as follows:

- Providing and maintaining an adequate supply of container securing equipment;
- 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
- Provision of a comprehensive stowage and securing manual, and ensuring that the ship's staff understand the manual.

# Carriage of refrigerated cargo

*The international transport of temperature controlled raw materials and final products is an essential link in many industries between producers and consumers. Most cargoes have properties that will determine practical storage lives (PSLs), which are a key factor if they can be carried by sea.*



A container operator observes evolving patterns of trade. Examples are:

- More countries exporting by sea – especially fruit, fish, and flower bulbs;
- Some shorter life products spending more than half their PSL in transit;
- Demands from supermarkets for all-year-round supplies reducing seasonality;
- Lower stock holding with demands for just in time deliveries and inventory control;
- Some moves from airfreight – particularly cargoes needing due diligence records such as pharmaceuticals;
- Use of intermodal movements depending on local requirements and facilities.

A prudent carrier has to apply a systematic approach to ensure that the equipment and service provided is 'fit for the purpose intended'.

To achieve the requirements needs:

- Containers of appropriate design that are maintained correctly;
- A process (temperature controlled chain) that is capable of remaining in control;
- A set of detailed procedures;
- A reliable information system;
- Trained staff;

- Shippers that correctly stuff containers with properly prepared cargoes to meet their customers' purchase specifications.

## Claims and incidents

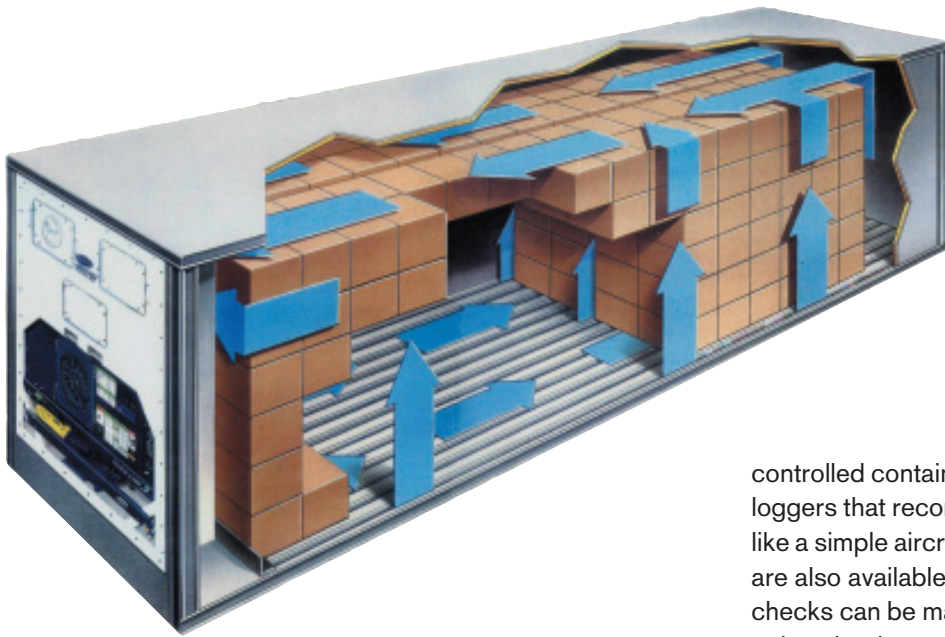
The vast majority of cargoes outturn well and claims represent a fraction of one percent of the containers carried. Temperature controlled container carriage is developing and there are many things that can, and very occasionally do go wrong. The UK Club's video *If you think any fool can stuff a container – think again*, provides a graphic demonstration of how not to get cargo to its destination in good condition.

Experience is a great teacher and even the best-designed systems can be found wanting with 'Murphy's law' and human error ever present. An individual temperature controlled container may suddenly appear to have attracted multiple errors and faults while the many others carried in the same transit having perfect outturns. Cambridge Refrigeration Technology (CRT) runs a training course that uses a real claim as a short case study. Six individual separate faults, and errors, occurred. The cargo had a value of US\$750,000 and unbelievably it was not a total write off!

The following list is not exhaustive but covers a typical list of ten critical areas of occurrence reported to a typical cargo claims or cargo care, department that may result in a confirmed claim:

- Containers off power and therefore off refrigeration for extended times
- Wrong settings caused by incorrect information
- Failure to monitor properly and correct faults or wrong settings
- Poorly pre-cooled or overcooled cargo
- Cargoes with insufficient PSL
- Badly stowed containers impeding air flow – many with low quality packaging
- Excess fresh air ventilation for live cargoes thereby causing evaporators to ice up
- Incorrect defrost interval where this has to be set manually
- Incorrectly booked cargo leading to operational and commercial problems
- Fahrenheit and Celsius temperatures interchanged or wrongly converted





guarantee cargo temperatures. The set point is the temperature of the air passing a sensing probe and is not the temperature of the cargo. Cost and time would be saved if these professional claimants attended an independent training course to understand how a modern integral unit operates.

Fortunately most temperature controlled containers built since 1994 contain data loggers that record a variety of information. They are like a simple aircraft 'black box'. Independent loggers are also available so that a wide variety of audits and checks can be made. When reviewing a claim/incident a download can show:

- Pre trip inspection records;
- Set point plus supply and return air temperatures at preset intervals;
- Defrosts;
- Times off-power;
- Basic faults;
- Relative humidity.

This is a major step improvement from just recorder chart details. It will be some years before containers without digital electronics are replaced. This factor is delaying the full introduction of remote monitoring on vessels and terminals although most new vessels are so equipped. As always the data remains the property of the container operator.

## Ways forward

The future trends are mainly positive and a selection follows:

- Integral containers:
  - More reliable with improved airflow, calibrated air freshening vents, dehumidifiers, and other programmable settings;
  - Improved insulation with lower degradation over time.
- New vessels providing faster transits, new routes, and some relaxation in inland road weights.
- Leading consignees and shippers working with lines to provide good logistics.
- Increasing uniformity of regulations between groups of countries reducing variations.

This list is not in priority order with claims relative to the number of containers carried very low.

There is a long list of minor but important issues that relate to individual incidents. They can include physical damage, broken security seals, air probe temperature sensor failures, and partial or complete loss of refrigerant, generator failure during land transit and many more.

## Patterns of claims and incidents

Because of the small number of claims the statistics are difficult to analyse. It is sometimes possible to observe patterns of claims/incidents by careful systematic review of all the factors. For example – the surprising patterns that continue to involve alleged temperature abuse of frozen fishery products.

Additional points to check include:

- New export locations;
- Pre shipment temperatures and the use of 'glaze (water)' to protect the product;
- Freezing of items individually (IQF) rather than as a block. (A less dense more temperature-sensitive cargo with a lower heat sink in the container);
- Low stuffing and unstuffing times to avoid temperature rises;
- The temperature set point. (The popular -18 degrees Centigrade needs to be colder and -23 degrees Centigrade is acceptable for most containers with many able to be set colder).

A difficult area involves a few subrogated claimants that are unwilling to accept that Lines do not

- Foods standards agencies or equivalent developing in key countries.
- EU/UN inspectors approving meat and fishery product facilities thereby improving standards.
- US Food & Drug Administration moves from inspection to prevention mode.
- Acceptance of hazard analysis by big food companies and many countries as a safety measure.

In the meantime information and training continue as active methods of preventing claims. Examples are:

- The Internet (and Intranet in many companies) provide a systematic method of communication.
- A booklet by the University of California provides good information on stowing containers plus very good photographs on troubleshooting some perishable product problems.
- Modern videos such as *If you think any fool can stuff a container – think again.*
- Training courses run by integral container refrigeration equipment manufacturers and organisations such as Cambridge Refrigeration Technology.
- Support of organisations such as International Cold Chain Technology.

The International Quality Standard ISO9000:2000 requires changes in approach if companies wish to retain, or obtain, assessment.

It requires:

- Customer focus
- Leadership
- Involvement of people
- Process approach
- System approach to management
- Continual improvement
- Factual approach to decision making
- Mutually beneficial supplier relationships.

## Conclusions

The carriage of temperature controlled cargoes in containers is growing with the vast majority of outturns meeting both the shippers' and consignees' requirements. Advances in digital electronics are improving the ability to manage transits.

A systematic approach to analysing the causes of claims and incidents can lead to effective remedial and preventive actions.

## Refrigerated cargoes – recommendations for carriage instructions



*The following is an extract from a on Carriage Instructions for Refrigerated Cargoes produced by the International Cold Chain Technology group (ICCT) – commercial companies interested in the safe transit and storage of refrigerated goods. The Club supports, and is an active member of, ICCT. The origin of the guide is the concern within the industry that insufficient/inadequate instructions are becoming increasingly common making it extremely difficult in some cases for the carrier of the goods to fulfil his duties of care.*

*A complete copy of the recommendations is available from the Club on request.*

## Introduction

Refrigerated cargoes are invariably perishable to a greater or lesser degree, and their safe carriage depends on maintaining suitable storage conditions during transportation. This is true for all modes of transport and all cargoes, though conditions are more critical for longer journey times and for more perishable commodities.

Refrigerated cargoes include both frozen and chilled goods, the latter including fresh fruits and vegetables. Generally, frozen goods do not suffer if over-cooled, whereas chilled goods can be damaged by low temperatures, either by freezing or by chilling injury to fresh produce. Much tropical and sub-tropical produce is liable to chilling injury if subjected to temperatures below those usually experienced in the growing area. Successful transportation is dependent on the carriage instructions, which define the conditions in which the goods are to be carried. If these instructions are incomplete, inadequate, contradictory, or wrong, then problems can be expected. For the shipper, there is the



risk of loss of cargo. For the carrier, there is the risk of a claim even if the goods are undamaged. Many shippers and carriers are prepared to accept inadequate instructions either through ignorance or through unquestioning acceptance of what has been accepted previously by themselves or others. Instructions may be based on goods of different origin, which may have different requirements.

The way in which cargo is stowed into holds or stuffed into containers is important for successful carriage, but is outside the scope of these recommendations.

*These recommendations have been drawn up by ICCT to assist both shippers and carriers to re-assess their carriage instructions in order to improve the operation of refrigerated transport chains.*

First, general requirements are considered. Thereafter, separate sections relate to containerised cargoes and to shipments in reefer vessels. For ease of reference, points which are the same for both types of transport are repeated in the appropriate sections.

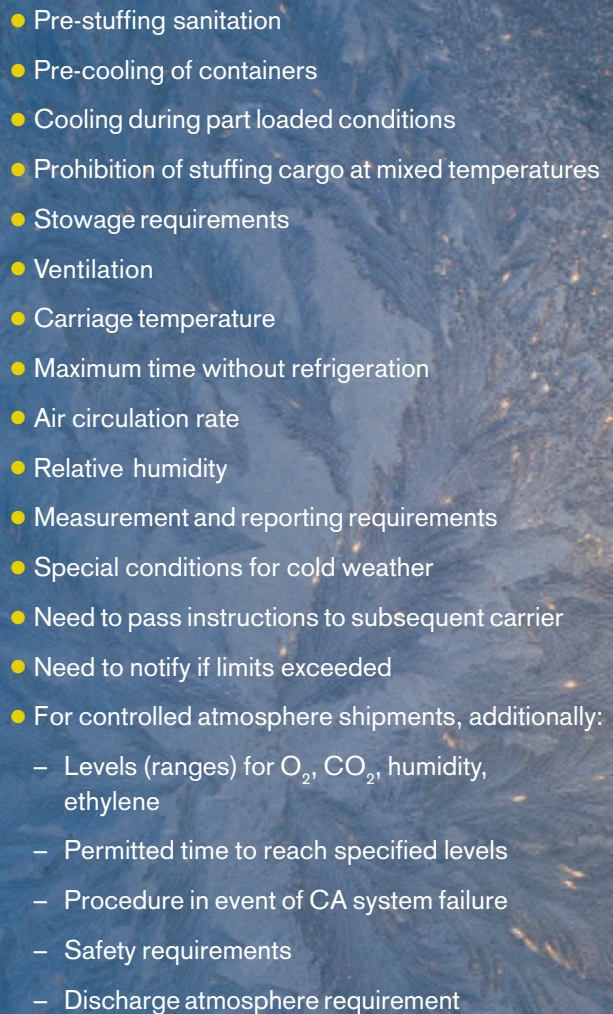
## General requirements

The responsibility for specifying carriage instructions is that of the shipper, the owner of the goods. Only the shipper knows the full nature of the goods and their requirements. Frequently this responsibility is passed to the carrier, but in this case the shipper prior to shipment should agree the acceptability of the specified conditions. In either case, the exact nature of the cargo needs to be known – in the case of fruit, for example, carriage requirements may vary dependent on type, variety, maturity, origin and growing season conditions.

If mixed loads of differing commodities are to be carried in a single cargo space, it is necessary to consider compatibility of temperature, atmosphere (especially ethylene levels) and liability to taint. This will usually require specialist cargo care advice.

It may be necessary to ensure that carriage conditions are specified to all carriers in the transport chain, as frequently an international journey may use different carriers at the start and end of the journey. Items such as relative humidity and maximum time without refrigeration should not be over-specified but should meet the necessary requirements of the goods. Over-specification of requirements is to be avoided as it tends to lead to more, and sometimes spurious, claims regarding technicalities which have not actually affected cargo quality.

Many of the specific items listed below may be taken for granted with regular shipments, but may need to be specified if a new carrier is used.

- 
- Pre-stuffing sanitation
  - Pre-cooling of containers
  - Cooling during part loaded conditions
  - Prohibition of stuffing cargo at mixed temperatures
  - Stowage requirements
  - Ventilation
  - Carriage temperature
  - Maximum time without refrigeration
  - Air circulation rate
  - Relative humidity
  - Measurement and reporting requirements
  - Special conditions for cold weather
  - Need to pass instructions to subsequent carrier
  - Need to notify if limits exceeded
  - For controlled atmosphere shipments, additionally:
    - Levels (ranges) for O<sub>2</sub>, CO<sub>2</sub>, humidity, ethylene
    - Permitted time to reach specified levels
    - Procedure in event of CA system failure
    - Safety requirements
    - Discharge atmosphere requirement

## Specific requirement for containerised cargoes

The parameters that may be included in carriage instructions for containerised refrigerated cargo are shown in the table.

Each of these will be considered below.

### Pre-stuffing sanitation

The proper cleanliness and lack of odour in containers to be used for refrigerated goods should be a matter of normal good practice, but any special or particular needs should be identified.

### Pre-cooling of containers

Pre-cooling is only useful when loading from temperature controlled loading bays; in other conditions, it can result in excessive moisture ingress from the atmosphere and is not recommended.

### Cooling during part loaded conditions

Part loaded containers should be closed and

temperature maintained if there is a delay before completing loading.

### **Prohibition of stuffing cargo at mixed temperatures**

Properly pre-cooled cargo and warmer cargo should not be mixed.

### **Stowage requirements**

Any special stowage requirements, such as a protected or underdeck stow, should be stated.

### **Ventilation**

The rate of fresh air ventilation for fresh produce should be specified. This should be as an absolute figure in cubic metres per hour. The specification of a percentage rate of ventilation only has meaning if related to a specific container size and a specific model of refrigeration unit.

### **Carriage temperature**

It is not physically possible to provide refrigeration in the absence of temperature differences, both between air and goods and within the bulk of the goods. The only temperature which can be controlled is the set point, which corresponds to air delivery temperature for chilled goods and to air return temperature for frozen goods. The term "carriage temperature" therefore has little meaning, and "set point temperature" should be specified. If appropriate, this may be augmented by a maximum allowable temperature during periods without refrigeration.

Although degrees Celsius are the international standard, in the USA degrees Fahrenheit are still commonly used. As zero C is a common chilled goods temperature and zero F is a common frozen goods temperature, great care is needed to avoid possible confusion of units.

For USDA and other cold treatment quarantine requirements, maximum pulp temperature may have to be maintained below a specified temperature throughout a continuous period of days or weeks, and only approved equipment may be used.

### **Maximum time without refrigeration**

Sometimes it may be necessary for statutory or other reasons to specify a maximum duration of time without refrigeration, either per event or in total for the journey. This should not be necessary if temperature limits are well defined.

### **Air circulation**

Many containers have a high air circulation rate for chilled goods and a lower rate for frozen goods. If a

speed change switch is fitted, low speed operation for chilled goods may be possible, but as this inevitably results in a wider range of cargo temperature, it is not recommended.

### **Relative humidity**

When special equipment with humidity control is used, a range must be specified. It is difficult to measure humidity regularly to better than the nearest 2 to 3%, so an acceptable range of at least plus or minus 5% should be specified, albeit with a tighter target.

Special equipment is available to maintain either high (e.g. 90%) or low (e.g. 50%) humidity. Without such equipment, relative humidity is not controllable and should not be specified.

### **Measurement and reporting requirements**

It is normal to record return air temperature in refrigerated containers, and some equipment also records delivery air temperatures. Any specific shipper requirement for reporting temperatures should be stated. When the refrigeration unit is not running, the recorded temperatures do not reflect cargo temperatures. Shippers may choose to put their own recording equipment within cargo, in which case they should inform both carriers and receivers.

### **Special conditions for cold weather**

Sometimes special requirements exist for exceptionally cold conditions. However, it should be noted that most transport refrigeration equipment will control temperature using either cooling or heating as necessary to maintain specified conditions.

### **Need to pass instructions to subsequent carrier**

If there is uncertainty at the start of a voyage as to who will be the final carrier, it may be necessary to request the initial carrier to pass on carriage instructions.

### **Need to notify if limits exceeded**

Procedures for notification of out of specification conditions should be established prior to acceptance of cargo for shipment. This could apply to warm loading, or to equipment failures, for example. Standard procedures and safe limits should be available.

## **Additional requirements for controlled atmosphere shipments**

Controlled atmosphere (CA) systems are designed to maintain an atmosphere different from normal, usually with low oxygen and increased carbon dioxide. They enhance the storage life of some produce when used in



conjunction with refrigeration. There are additional requirements for such shipments, as follows:

### **Levels (ranges) for O<sub>2</sub>, CO<sub>2</sub>, humidity, ethylene**

For each of the atmospheric gases to be controlled, upper and lower concentration limits should be specified.

### **Permitted time to reach specified levels**

The maximum time allowed to reach the specified levels may be laid down.

### **Procedure in event of CA system failure**

The failure of a CA system will not necessarily have a drastic effect on the produce if the refrigeration continues to run. In these circumstances it will be necessary to introduce fresh air ventilation to fruit and vegetable cargoes. This should be specified.

### **Safety requirements**

CA produces an atmosphere which is deadly to humans – breathing an oxygen-depleted atmosphere produces immediate unconsciousness and fairly rapid death. Adequate safety systems must be in place, and these may need to allow for the possibility of stowaways in the cargo.

### **Discharge atmosphere requirements**

The safety requirements extend to those unloading cargoes. Proper ventilation prior to entering containers and training of workers are both necessary.

## **Containerised transport of perishables without refrigeration**

Some perishable commodities are carried without refrigeration, possibly for short-duration journeys, or in ventilated equipment. In these cases it is wise to consider which of the above requirements may still apply.

Products with limited temperature sensitivity may be carried under refrigeration for certain journeys only. The following guidelines suggest when this may be appropriate.

- For any goods requiring close temperature control, refrigeration is essential. If temperatures need to be maintained within a band of 2 deg C or less, refrigeration should be virtually continuous.
- At the other extreme, for less sensitive goods with a maximum temperature tolerance of 30 deg C or above, refrigeration is only necessary for storage on land at high ambient temperatures. For containerised shipments at sea, a protected stow may be requested.

- If the maximum permitted temperature is 25 deg C or lower, refrigeration should be used for any journeys through the tropics and for any journeys anywhere in summer.
- If cargo requirements are marginal, either in terms of temperature tolerance or in terms of possible delays at high ambient temperatures, then the only safe option is to use refrigeration.

Frozen foods may sometimes be carried without refrigeration for short journeys as long as the cargo does not rise above the specified maximum temperature. This should only be done with the consent of the consignee.

Disclaimer: These recommendations are given in good faith after due consideration, but neither CRT nor ICCT or any of its members nor any of the endorsing organisations or individuals accept any liability for the consequences of their use.

## **Carriage of agricultural products in non-refrigerated containers**



A wide variety of agricultural products are carried in non-refrigerated containers, either ventilated or standard dry boxes. These include cocoa, coffee, tea, tobacco, dried fruit, rice, nuts, oilseeds, pulses and spices. Fresh fruit and vegetables are more commonly carried in refrigerated containers, although produce such as melons, oranges, potatoes, sweet potatoes, yams and onions are sometimes carried in ventilated or open containers.

Careful consideration should always be given to ensure that the choice of container, packaging and dunnage is appropriate for both cargo and voyage. Two frequent causes of major cargo damage are condensation and taint.

## Condensation (sweat)

Almost all agricultural products have a considerable intrinsic moisture content. These are hygroscopic cargoes; they are in equilibrium with the air in the container and can emit as well as absorb moisture. The amount of water available within a container of such cargoes is much larger than for manufactured goods. Translocation of a comparatively small proportion of the total moisture available may cause substantial condensation problems.

Hygroscopic cargoes change temperature comparatively slowly. Thus, when a container is shipped across climatic zones, the cargo adjusts to the changing ambient temperatures much more slowly than the container walls and the air. This delay can cause considerable temperature differences within the container; these are a major driving force for moisture translocation and condensation.

### Ventilated containers

Ventilated containers include those with passive ventilation openings, open containers and mechanically-ventilated containers. However, these are all comparatively rare, the vast majority of containers having no effective ventilation provision. Although the small air-expansion holes in the walls of standard dry boxes are sometimes called 'ventilation-holes', the air flow through them is insufficient to provide significant protection against condensation. The International Cocoa Organization recommends using ventilated containers for all containerised cocoa shipments. Some coffee and cocoa shippers only use such containers; however, this is not the standard throughout the trade.

The air inside ventilated containers is largely common with the surrounding air. This may present such additional problems as more ready transmission of taints, and the stowage location onboard requires careful consideration.

### Desiccants

During carriage of hygroscopic cargoes in non-ventilated containers, condensation could in principle be prevented if the relative humidity of the air inside the container was kept sufficiently low that its dew point was always below the ambient temperature. This ideal situation is often unrealistic, but the dew point may be lowered, and the risk of condensation reduced accordingly, by using desiccants.

Desiccants (such as silica gel, Møler clay or certain polymers) are water-absorbent and remove moisture from the surrounding air. They may be supplied in bags,

### Some basic considerations to protect against taint damage are:

- Inspect containers prior to stuffing for odours, previous cargo residues and staining of floorboards. The container should be kept closed for some time until immediately before inspection.
- Containers which have recently been used for the carriage of odorous chemicals should not be used for foodstuffs, even if no detectable odour remains. More generally, operators should consider keeping separate pools of containers designated for chemicals and for foodstuffs.
- Stow containers containing foodstuffs away from strong odours onboard. This is particularly relevant when using ventilated containers, where the air-exchange rate, and thus the potential for transmission of external taints, is much greater than for non-ventilated containers.
- Floorboards, pallets, crates, etc. are often treated with fungicidal wood preservatives containing chlorophenols. These are also contained in mould-inhibitors used on jute bags and the adhesives in some fibreboard cartons. Chlorophenols are themselves a potential source of taint. Although the levels used are usually insufficient to cause commercial problems, they can be converted to chloroanisoles by certain micro-organisms, especially in the presence of excessive moisture such as may result from condensation. Chloroanisoles are an extremely potent source of taint, causing a characteristic musty odour and flavour even in very minute proportions.

specially-lined sheets or as polymer-based paint. Once the maximum absorption capacity of such products is exhausted, they have no further beneficial effect. Thus, when using desiccants, their type and amount must be chosen carefully for the type of cargo and the voyage.

Because of their potential for significant moisture exchange with the air inside the container, hygroscopic cargoes place much greater demands on the capacity and sustained absorption rate of desiccants than do non-hygroscopic cargoes. Desiccants alone are unlikely to prevent condensation in the event of rapid temperature changes of large magnitude.

### Dunnage, sheets and linings

A basic precaution for cargoes sensitive to



condensation damage is to apply suitable dunnage to separate the cargo from the container's walls and floors. This cannot prevent the formation of condensation, but can greatly reduce its commercial implications. It is often recommended to use kraft paper or similar material to line the walls and floors of containers or as protective sheets on top of the cargo. Since these become quickly saturated they cannot afford significant protection against severe sweat, although they can absorb small amounts of condensation and in some circumstances prevent or reduce staining and similar damage. Sheets placed atop the cargo must be readily permeable to air; plastic is unsuitable for this purpose, as condensation could form between sheets and cargo.

## Taint

Many foodstuffs can absorb chemicals and foreign odours from the air. This typically affects their taste and severely affects their commercial value even when there are no significant toxicological implications. Coffee, tea and cocoa are particularly susceptible to taint. They are traded primarily on their delicate flavour balances, with sophisticated tastings of every consignment being carried out at various stages. A comparatively minor off-flavour or odour causes commercial damage to these high-value cargoes.

A short article can give only a general introduction to the potential problems associated with the containerised carriage of agricultural products. Condensation in particular is a complex topic. The above may be of some assistance in identifying key areas of concern. However, if in doubt, specialist advice should be sought.

## Shipping dangerous goods by sea – the hidden dangers

When towards the end of a voyage four seamen were sent to check lashings little did any of them realise what the future held in store. Unbeknown to anybody on the ship, a shipment of cylinders of deadly gas had been placed inside a freight container which had been loaded aboard. Although the gas was properly packaged and the cylinders were properly labelled, they had not been declared to the shipping company,



the container was not placarded and the cylinders were either badly secured or not at all. Furthermore, the ocean had caused the cylinders to roll, damaging the valves and letting the gas escape. A declared shipment would have gone on deck, but nobody knew so there it was underdeck – and this particular gas was much heavier than air.

If only this story were the product of a fevered imagination. However, regrettably, it was a tragic real life case and two lives were eventually lost but it serves to dramatically underline how vulnerable the ship and its crew can be, even with packaged dangerous goods. In fact, despite the millions of man hours spent in discussing, devising, updating, publishing, training and implementing the dangerous goods rules at international, national and company level, *if the cargo originator fails to carry out his part either through ignorance or intent, the whole concept collapses, just like a pack of cards.*

Shipments of packaged dangerous goods are quite substantial – it is estimated to be anything up to 10% of total tonnage carried and this dictates that there is a need to ensure that there is widespread knowledge and understanding of the rules throughout the maritime transportation chain. After all, the rules have been built up over many years and are often the result of accident or incident experience in the past. The fact that there is wide understanding is shown by the millions of shipments made and completed properly, safely and successfully every year.

However, it is also clear, and there can be no doubt, that there is widespread non compliance to one degree or another with the DG rules and that this indicates a certain level of ignorance of the requirements. This does not mean that it has become dangerous to carry dangerous goods, although, if it is not brought under control, it could well become so. The annual surveys carried out by maritime administrations and reported to the Dangerous Goods, Solid Cargoes and Containers Sub Committee (DSC) of IMO has told its own story. Starting with the USA in 1985, a large number of countries have submitted reports over the years. Separate reports have been compiled by Finland, three Western European nations, followed by five Western European nations, Japan, Sweden, then Canada, the UK, the Netherlands, the USA and Norway. The vast bulk of these reports has revealed considerable shortcomings in the situation found.

An analysis of the reports over the past 5 years, for example, shows:

- Over 9000 cargo transport units (CTUs) were checked

- Average number of units found to have a DG deficiency – 27.6% (lowest 17.2%, highest 75%)
- Most common deficiency
  - labelling, marking, placarding
- Second most common deficiency
  - stowage within the CTU
- Followed by
  - documentation
  - packaging.

Also significant was the finding that an average of nearly 10% had damaged, unreadable or out-of-date CSC plates.

What can the shipping company do about this?

Movements with such deficiencies are against the law. However, the transportation chain cannot, and should not, simply rely upon enforcement agencies and preventative action to control the situation. Only Finland has been able to report to IMO a reduction in the deficiency rate to a low level (3%). The rules themselves which are enshrined in the IMDG Code are basically quite clear and, to further aid the shipper, they will be published this year in a new multi modal format. There should, therefore, in theory be no excuse for not knowing what is needed and not implementing it. However, it is an imperfect world and how is the exporter in the middle of, say, a landlocked country or even in the middle of a maritime nation going to know what is required, let alone appreciate the stresses that a ship and its cargo moving across the oceans will undergo.

**“The challenge is not to set and maintain a standard we can live with, but to set a standard that we could not live without.”**

Despite the pressures of the commercial world and the need to minimise turnaround times, the hazards from the carriage of DG are too great and the issue too important to ignore. Each shipping company needs to have a strategy backed by commitment and support if this increasingly important cargo is to continue to be carried safely.

The first requirement must be to ensure that the ships officers and crew are alert and aware of this type of cargo. With major retraining needed with the new Code during 2001, it is an ideal opportunity to raise general awareness at the same time. However, it is very clear that the ship cannot possibly run its own checks as the goods come aboard. It has to rely upon the shoreside to do this and, therefore, the second requirement is to ensure that there are good checking systems in place at the export port. These should cover the basic essentials

such as documentation (declaration and container/ vehicle packing certificate). placarding, marking, signing and labelling. They are the aspects which can readily be checked in the port and they also represent some of the most common deficiencies found (it is amazing how poorly some declarations are completed). A partnership needs to be established between the port and the ship as both benefit from a good standard whereas both are likely to suffer from a poor level of compliance.

That leaves the original customer – the shipper – and this is where the main effort must be made. In its revised *Recommendations on the Safe Transport of Dangerous Goods and related activities in the Port Area* IMO introduced the term “cargo interests” to cover all those who are responsible for the cargo which arrives at the port and the ship and it recommends that they should be given training commensurate with their involvement. New ways need to be found, perhaps in company with the ports industry, to target shippers in a way which will not only reach them but which will influence their activities. Perhaps the use of electronic communications will enable a response to be generated giving essential DG information whenever a freight booking is made. Some shipping companies (and ports) run short information courses, which are free to their customers. Others produce information material – videos, pamphlets, booklets and cards. These are widely distributed and these efforts must be continued.

A missing placard, an imperfect declaration or a less-than-effective securement within a CTU *might* not, by themselves, render a situation dangerous. However, in certain circumstances each on its own could be crucial and there is a need to set a high standard of expectation. The truth is that we will get the standard we set and it could be alleged that we are not setting a high enough level. *The challenge is not to set and maintain a standard we can live with, but to set a standard that we could not live without.*

## Dangerous Goods Guides

This UK Club, Carefully to Carry publication series ‘*Book it right and pack it tight: shipping containerised dangerous goods by sea*’, provides basic safety critical guidance for those engaged in all stages of preparing dangerous goods for carriage by sea; from booking cargo to packing the shipping container.

There are four guidebooks in the series each focused on a key operational stage in the transport chain – shippers and forwarders; shipping lines and freight sales agencies; consolidators and container packers; fork lift operators and cargo handlers.



## Container crime

Current estimates put the annual cost of cargo crime worldwide at between US\$30-50 billion, so how safe is container cargo whilst in transit?

The favourite locations for this type of crime are at ports, terminals or during road or rail transport.

Whilst onboard a vessel container cargo poses less of a risk and yet all too often the vessel operators find that they are the focal point of a claim. The reason for this is due to the fact that the operator:

- Constantly accepts a container onboard without actually checking the seal.
- The contractual terms of their bill of lading provides coverage from door-to-door.
- Their assets are often more easily accessible than that of other parties.

### Question

“What control does the issuer of a bill of lading have as to the safety of a laden container whilst in transit and storage?” or “How reliable are their agents in complying with the release terms of a container’s cargo?”

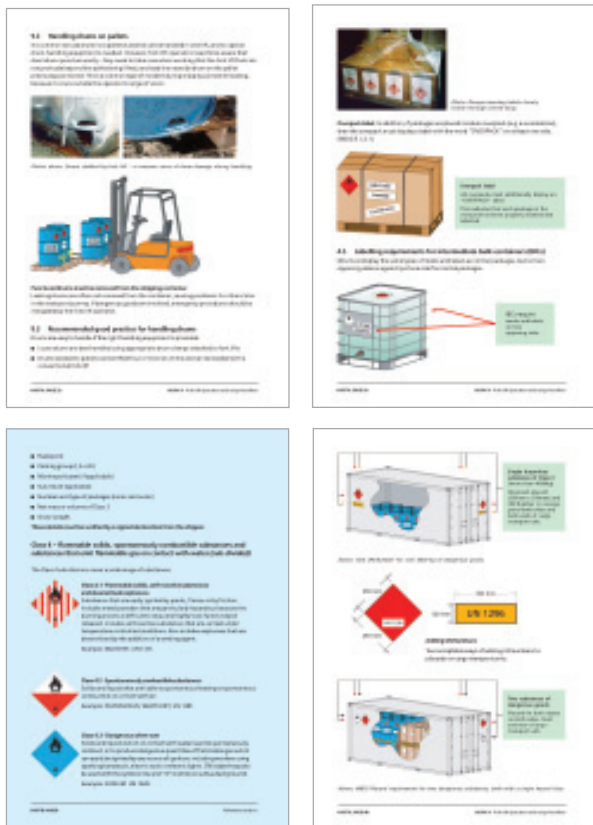
Whatever type of container is used, its safety relies on its own security safeguards and those in place throughout its journey.

The introduction of containers was a technological advancement in the safe movement of cargo that has had a major impact on the reduction of cargo pilferage. However, this type of transport has become the notable asset to the organised criminal, primarily due to the cargo involved, which offers substantial profits with minimal chance of detection.

Cargo in transit has and always will be the subject of crime. The distance involved in this type of movement, combined with the various handling procedures in place during its journey, presents a major obstacle. Without an investigation it is extremely difficult to identify where a loss occurred and who carried it out. This is obviously very important when a bill of lading provides a door-to-door service.

If a container is correctly stuffed and its doors secured, there are only three ways that an unlawful entry can be gained:

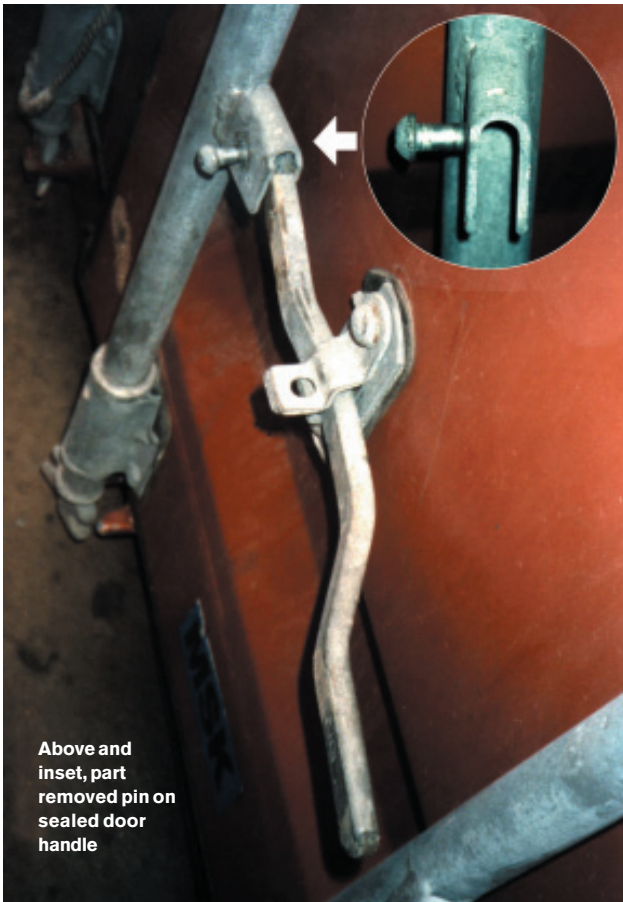
- The removal of a section of the container's body.
- Interference to the seal or seals on the outer container door.



IMDG Code procedures are comprehensive, but frequently mis-understood causing dangerous goods incidents that regularly put ships and lives at risk. These guidebooks assist those preparing dangerous goods consignments to understand and implement the requirements of the IMDG Code by identifying and clarifying their key duties and requirements.

Visit the dangerous goods section of the UK Club website [www.ukpandi.com](http://www.ukpandi.com) for more details.





Above and inset, part removed pin on sealed door handle

- Interference to the container doors. The weakest links tend to be the pivot rivet connecting the door handle to the handle hub, the rivet to the swivel seal bracket and the rivets on the door hinges.

The presence of a seal on a container provides evidence that its cargo has remained secure throughout its journey. It is not an anti-theft device. Fortunately, there have been significant advancements in the design of seals which act as an additional deterrent against the loss of cargo from containers whilst in transit.

These improvements alone will not prevent an attack on a container, because if given the time, situation and the tools, the criminal can remove virtually any seal or section of a container's door. As with a container, the extent to which a seal offers protection is only as good as the system into which it is introduced.

For this reason it is imperative that issuers of bills of lading are satisfied that the procedures in place throughout a container's movement meet their requirements. If it does not, take heed, for resourceful criminals know what containers to attack and the weaknesses in the operational system to enable them to carry out the crime.

In many instances, where improved security procedures have reduced the opportunity of a loss

occurring at a port or terminal, they have not prevented the criminal from identifying a suitable cargo to steal once it has left that location.

There is therefore a need to constantly review procedures. For instance:

- Are you satisfied that a container was correctly secured before departure from the shipper's premises?
- Are you satisfied with the haulier contracted to move a laden container on your behalf?
- Do they use sub-contractors? If so, are they suitable to undertake this work?
- Are transport instructions issued to the haulier?
- How efficient is the checking procedure of a container on its arrival at a port?
- Is there a physical check prior to a container being loaded onto a vessel? Accepting the operational and financial aspects that are involved when discharge and loading takes place, it is this weakness in the system which is constantly exploited by criminals, who remove cargo prior to loading.
- Is the seal physically checked when the container is offloaded at the destination port?
- Is the seal checked when the container leaves the port?
- Is there a procedure in place should there be an alleged irregularity on delivery?

It is important whenever there is a potential loss that:

- The seal sections are retained.
- Special attention is given to the container's doors, in particular as to whether there are any different shaped rivet heads or signs of repainting.

Any irregularity should be noted, with consideration being given to a surveyor's examination.



It is imperative that a carrier's agent complies with the cargo release terms, which generally requires the presentation of the original bill of lading. The case of *Motis Exports v Dampskibsselskabet AF 1912 and Another* emphasised this point.

On occasions agents show a lack of judgement in not complying with the release terms, but take an alternative approach without first obtaining the required authority. Such action usually relates to:

- A consignee's letter of credit.
- A consignee's letter exonerating the agent from their action.
- A bank guarantee confirming that sufficient funds exist in an account on a specific date.
- Agreement between agent and receiving party.
- Shipper's extended credit facility, minus the authority to release the cargo.

## Container top safety

Good practice minimises accidents and can save lives, good intentions do neither.



The subject of container top safety has been discussed in detail by various maritime organisations. The conclusions have brought about

numerous changes in the applicable laws in a number of countries, most notably the United States of America and Japan. Both of these countries require all ships calling at their ports to comply with their legislation relating to the safety of dockworkers in the operation of loading and unloading containers.

Each of these countries has a requirement that dockworkers are able to secure containers without going on to the top of containers that are stacked more than one high, whether on the quayside or on the ship. For ships to comply with the applicable law means that the equipment for fitting and securing containers

onboard the ship is operated from the deck, or possibly a safe walkway, level.

In order that containers can be safely secured, automatic or semi-automatic twistlocks need to be used and lashing rods need to be constructed such that they can be handled easily and safely and secured properly without the dockworkers having to be raised above the deck, or safe walkway, level.

The top tier of a stack of containers needs to be secured at the top of the container and the positioning of bridge-pieces normally does this. Dockworkers do need to be positioned on the top of containers on the top tier to fit these bridge-pieces. The port or terminal normally has specialised cages fitted with fall-arrester systems to facilitate this particular operation.

All of the above arrangements for loading and unloading ships are based on the ship being alongside a pier, quay or wharf and properly secured against unwarranted movement.

These arrangements do not mean that the ships' crew can be ignorant of these operations and the special nature of the equipment as they will need to be able to operate these items of equipment in an emergency whilst the ship is at sea (SOLAS). Training in the safe operation of these pieces of equipment is an essential part of the management and running of the ship. Initial training can be carried out on shore based facilities, providing a sufficient 'mock-up' of the arrangement for stacked containers onboard can be arranged, but training in the ship environment is likely to be more instructive.

All training should be frequently practiced, in a safe environment, and the training should be reviewed after each practice session. This is essential as the requirement for automatic and semi-automatic equipment becomes more widespread in ports and terminals throughout the world.

The fact that the USA and Japan has put such



legislation in place means that any ship operator trading with them must follow their rules and regulations. This does not, however, mean that every port or terminal in the world will have the same requirements. Many countries are examining their specific practices regarding dockworker safety and may not arrive at the same conclusions as the USA or Japan, so ship operators need to be aware of the varying regulations in each port.

Because national legislators are keen to ensure that none of their countrymen are injured during the loading or unloading of a ship, does not mean that the ship's crew should consider doing any part of the job that would normally be done by dockworkers. The correct fixing and lashing of containers, irrespective of whether they are on or under deck, is a specialised job and should always be left for the specialists to do. Ship's personnel, who ultimately have the responsibility for the safe carriage of the cargo, should oversee the fixing and lashing onboard.

Any ship that does not have the particular equipment in use for a specific country's requirements should never consider trying to do releasing or lashing work whilst at sea, in coastal waters or manoeuvring in port limits as this would be very dangerous both for the crew and the cargo.

Despite various countries operating 'safe dockworker' principles, there should still be facilities to handle all ships that call at their ports. There should be other methods of ensuring that their dockworkers operate in a safe way, even if this means going on the tops of containers to release twistlocks (assuming that the ship has not been re-stocked with automatic or semi-automatic units). How they do this work is not the direct concern of the ship, as long as the ship is loaded or unloaded effectively.

As dockworkers are provided with appropriate safety equipment, such as fall-arrester harnesses and ancillary equipment, there is every reason to ensure that similar safety equipment is provided for ships' crews, even though this may only need to be used in an emergency. If it is considered dangerous for a dockworker to go on the top of a container stack whilst the ship is moored against a wharf without safety equipment, then it is far more dangerous for ship's crew to do this whilst at sea, and life threatening to do so without proper safety equipment. Safety equipment is often available onboard but its use, at every opportunity is not always enforced.

*Good practice minimises accidents and can save lives, good intentions do neither.*



## Stowaways and containers

Weekly Loss Prevention Bulletins 118 – 11/99  
*Smuggling of Chinese Citizens* and 123 – 1/00  
*Chinese Stowaways – Canada/USA* highlighted the development of organised smuggling of Chinese citizens into North America. Recent incidents have involved the use of containers and enquiries by the investigative organisation Signum Services Ltd have given the Club an insight into the methods being employed by the criminal organisations responsible. New information is now available on the very real threat of sustained attempts to smuggle stowaways in containers and ships in general. Accordingly, the Club has taken the opportunity to revise its loss prevention advice for all categories of ships. The suggestions made within this bulletin will assist ship operators and their masters to develop their own procedures aimed at reducing the opportunities for stowaways to be smuggled onboard ship or by means of containers. The Club will continue to review the situation and issue further guidance when appropriate.





## Preventative measures

### All trades

- While in port accommodation doors should be locked or guarded
- A crew member must always be on duty on the gangway tallying *all* persons boarding and disembarking.
- Stevedore companies should be asked before operations begin how many stevedores will be working and stevedores should be required to access the ship only by the gangway. Consideration should be given to the easy identification of authorised personnel. One way in which this can be achieved is to issue coloured vests or perhaps arm bands to members of the stevedore team. These should be returned and counted at the end of the shift. Different colours should be used in order to prevent copying. Those not wearing the appropriately coloured article can

be assumed to be an unauthorised visitor.

- Watchmen should be vigilant for boarders climbing the fore and aft mooring ropes and over the rails from the quayside at low water, or by small boat, especially during the night.
- Specific instructions should be given to watchmen to allow onboard only people required for the ship's business, such as stevedores and officials. Sellers of services or goods should not be permitted.
- Before departure the vessel should be searched thoroughly with particular attention to dark and unlikely places, including areas *apparently* locked.

### Container trades

#### Prior to terminal

- Carriers are recommended to make further enquiries and take extra precautions at the time shipments are booked.

Particular attention should be paid to:

- Trade patterns which have been the subject of past problems.
- Previously unknown shippers; company searches may be appropriate.
- New trading areas.
- Requests for empty containers to be delivered to insecure areas.
- Loaded containers collected from insecure areas.
- Open top containers, which should be inspected prior to acceptance.
- Lightweight shipments.
- Shipments in reefer containers set at relatively high temperatures.

### Terminal (prior to loading)

- In appropriate areas co-operation should be sought from local immigration authorities; their experience may be an essential asset.
- Carriers should emphasise to terminal operators the need for dialogue and co-operation in combating the ease with which stowaways are able to access containers due for shipment.
- Any containers presented for loading with no seals, faulty or tampered seals, should be opened and checked before being resealed.
- All reefer containers with settings above, say, 10 deg C should be opened and checked for stowaways.
- All open top containers should be inspected.
- Particular attention should be given to any containers with signs of recent repair, repainting etc.
- Particular attention should be paid to containers that arrive in the terminal late, after the cut-off period and shortly before vessel loading commences. This tactic might be used to reduce the opportunity for detection and would also reduce stowaways' length of confinement.
- Consider the deployment of CO<sub>2</sub> detectors, heat detectors, sniffer dogs and/or heartbeat detectors. Methods of detection will vary from terminal to terminal. Agreements should be sought with each operator.
- Pay particular attention to any containers received from outside locations and especially from insecure or uncontrolled areas.
- Containers for which obvious weight discrepancies exist should be identified and if necessary, searched.

### After loading

- On container ships, searches of empty spaces and deck vigilance prior to departure is necessary as with all other types of vessels. When appropriate, consider building time into the vessel's schedule to enable this to take place.
- Whenever possible it may be prudent to have men in the hatch when hatchcovers are replaced as stowaways have been known to conceal themselves in the hatchcover structure when stowed ashore.
- Routine crew security and safety tours of the vessel should be undertaken and noted regularly in the vessel deck log.

## Steps to be taken after a stowaway has been detected

### All trades

- Many stowaways give themselves up once the vessel is at sea, often by making a loud noise. For a vessel discovering stowaways, the priority is for them to be disembarked at the next port of call. The master should therefore immediately inform the owners and the Club or Club's correspondent so that international formalities can be completed as soon as possible.

A master should, if possible, immediately:

- Search the area where the stowaway was found for concealed documents etc.
- Search the stowaway's clothing.
- Interview the stowaway and immediately advise the Member and the agents at the next port of call of the following:
  - Port of embarkation
  - Details of documents held
  - Name
  - Date and place of birth
  - Address
  - Nationality.
- Photographs should be taken of the stowaway in order to speed the acquisition of travel documents. If digital photography is available it may be possible to e-mail transfer the images to the agent or the Club's correspondent at the ship's next port of call, thereby saving time with the necessary formalities.
- The stowaway should be kept secure at all times, particularly when the ship is in port.
- While the stowaway is onboard, the master should

not provide work for him and the stowaway should not be signed on to the Ship's Articles.

- The Member should immediately advise the Club of the above, together with:
  - Full itinerary
  - Details of agents at future ports of call
  - Details of ship's radio/fax/telex.
- The Club will agree a course of action with the Member and instruct local correspondents where necessary.
- Masters should always bear in mind that stowaways frequently give false details in order to delay their removal from the ship. If the master believes that the stowaway is not telling the truth, he should so report.

### Container trades

- Every situation must be examined in its own right, with major considerations being the safety of the vessel and crew, and the preservation of life.
- On discovering stowaways within containers, review the stow position and accessibility.
- Inform vessel operations of the known facts, with container number, stow position and load port, seeking directions.
- Urgent attempts must be made to communicate with the stowaways (consider tape recorded messages in various languages).
- Assess the situation. How many stowaways? What nationality? Try to determine their health. Do they present a threat to the vessel and crew? Do they require food and water? Consider drilling holes in the container to provide these, if feasible.
- Taking into consideration the safety of the ship and crew, as well as the stowaways, should the vessel divert? (Factors to be considered will include time since departure from load port, estimated time of arrival at destination, time to the nearest suitable port if ship diverts, can that port cater for the vessel and provide fast access to the container?).
- Liaise closely with owners'/carriers' P&I Club. The master should not be expected to carry the entire burden. Each case must be reviewed on its own merits and decisions taken jointly.
- If the stowaways can be released from the container, are there sufficient crew to safely supervise them in a secure area?

*No guidelines issued in advance can hope to cover all situations. In rare instances stowaways could be armed or be capable of violence towards the crew, or even*

*outnumber the crew. The master in close liaison with the shipowner and the P&I Club will need to consider the safety of the ship and crew as well as the health and well-being of the stowaways and achieve a balance of interests.*

## Related UK Club material



The DVDs *Any fool can stuff a container* and *Container matters* provide a useful adjunct to this document, as does the Club's publication *Book it right and pack it tight: shipping dangerous goods by sea* (which includes a copy of *Any fool can stuff a container*). Members may order copies direct from the Club and non-members through Marisec Publications, [www.marisec.org](http://www.marisec.org).

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#### **Containers – stuffing & stacking**

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#### **Carriage of refrigerated cargo**

M Sanderson Walker – P&O Nedlloyd Ltd

#### **Refrigerated cargoes – recommendations for carriage instructions**

R Heap – International Cold Chain Technology

#### **Carriage of agricultural products in non-refrigerated containers**

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#### **Shipping dangerous goods by sea – the hidden dangers**

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Whilst the information given in this document is believed to be correct, the publishers do not guarantee its completeness or accuracy.



