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Code of Practice for Packing of Cargo Transport Units

Code of Practice for Packing Cargo Transport Units – text prioritized in updates: transport of bulk cargo in CTUs, liquids in flexitanks

Note by the secretariat

I. Introduction

1. The United Nations Economic Commission for Europe (ECE) Working Party on Intermodal Transport and Logistics (WP.24) at its sixty-fourth session (Geneva, 20–22 October 2021) prolonged the informal pre-work on the Code of Practice for Packing Cargo Transport Units (CTU Code) for one more year to continue: (i) assess which areas of the CTU Code need to be prioritized in the updates, and (ii) consider text usage of the CTU Code in the mobile application.

2. Experts participating in the informal pre-work in the process of the assessment of the areas of the CTU Code where updates would be needed, among others, discussed issues such as: transporting solid bulk cargo in CTUs and liquids in flexitanks and considered possible new text developed on these issues to supplement the existing information in the Code.

3. This document presents changes for prioritization in updates on the issues referred above. In particular:

- Annex I presents changes to clause 5.3 of Annex 7 on transporting solid bulk cargo in CTUs, and
- Annex II shows proposed changes to clause 5.2 of Annex 7 on transport of liquids in flexitanks. It is noted that these changes have been elaborated further to the work commissioned by TT Club in compiling risk management guidance for flexitank operations. TT Club retains the right to use this material.

4. Proposed additions to the exiting text of the CTU Code are marked as bold text, while text proposed for deletion is marked as strikethrough.

5. WP.24 is invited to review the proposals presented in annexes I to II and provide its feedback and guidance.

Annex I

Solid bulk cargo

The following changes are proposed to clause 5.3:

5.3 ~~Non-regulated~~ ~~s~~**S**olid **dry** bulk cargoes

5.3.1 **General**

5.3.1.1~~(5.3.1)~~ **Regulated and** non-regulated solid bulk cargoes may be packed into ~~CTUs~~ **a CTU** provided the boundaries of the cargo space~~s~~ are ~~able~~ **capable** to withstand the static and dynamic forces of the bulk material under the foreseeable transport conditions (see Chapter 5 of this Code).

5.3.1.2 Wherever possible, bulk solids should be packed into bulk CTUs and evenly distributed in a manner that minimises movements that could result in damage to the CTU or leakage of the cargo. However, general purpose CTUs are also permitted for use to carry bulk solids (see 5.3.4.1).

5.3.1.3 The density of bulk solids often means that smaller cargo spaces are normally required, such as the 20ft general purpose dry freight container or 30ft bulk container. However, the design requirements of the 20ft freight containers are not always fully suitable for such cargoes, especially free flowing powders and granules. For instance, extremely free flowing materials can damage the side (see figure 7.70) and end walls due to stresses induced during intermodal transport where there is high sideway acceleration, such as turning a sharp corner on a road vehicle.

Figure 7.70 Bulging wall

5.3.1.4 Additionally, freight containers, like many other types of CTU, are normally fitted with full width, full height rear doors which is the only means by which the cargo can be packed and unpacked. When transporting free flowing materials, opening the rear doors may result in the cargo falling from the container with the associated injury to cargo handlers and loss of cargo. Therefore, in order to transport powders and granules in general purpose containers, false walls, known as bulkheads, should be erected at the rear end to retain the cargo when one or both doors are opened.

5.3.1.5 Freight containers are not designed or tested for packing with the container positioned at an angle greater than [45] degrees and under no circumstances should it be stood on its endwall. When unpacking by tipping the container the unpacker must satisfy themselves that the operation is safe, and that the container is not damaged during the operation.

5.3.1.5 Substances which may become liquid at temperatures likely to be encountered during transport are not permitted in either bulk or general purpose CTUs.

5.3.2 **Regulated solid dry bulk cargoes**

5.3.2.1 Dangerous goods regulations include general provisions for the use of containers for the transport of solid substances in bulk. Substances shall be transported in bulk containers to the applicable bulk container instruction identified by the letters "BK" in column 13 of the Dangerous Goods List, with the following meaning:

1. BK1: the transport in sheeted bulk containers is permitted;

2. BK2: the transport in closed bulk containers is permitted;

3. BK3: the transport in flexible bulk containers is permitted.

5.3.2.2 Bulk containers shall be siftproof and shall be so closed that none of the contents shall escape under normal conditions of transport, including the effect of vibration, or changes of temperature, humidity or pressure. If the design of the container or any CTU is such that it cannot be made siftproof then it should be fitted with a liner to achieve this.

5.3.2.3 Before being filled and offered for transport each bulk CTU shall be:

5.3.2.3.1 checked externally in accordance with Chapter 8 clause 8.2.2 including any damage to service or operational equipment

5.3.2.3.2 checked internally in accordance with Chapter 8 clause 8.2.3

5.3.2.3.3 cleaned in accordance with Chapter 8 clause 8.2.4

5.3.2.4 In the case of specialist bulk CTUs, service or operational equipment shall mean any equipment or fittings applied or attached to the CTU that facilitates the packing and / or unpacking of the cargo while fully containing, and preventing any escape of, the cargo.

5.3.3 Use of Bulkheads

5.3.3.1 Cargoes categorised as a dangerous good in the IMDG Code (or similar) are required to be carried in accordance with packing instruction BK2 which states that bulk containers are designed and tested in accordance with ISO 1496 -4:1991 "Series 1 Freight containers- Specification and testing - Part 4: Non pressurized containers for dry bulk". Unfortunately, there are a very limited supply of containers built to this standard, so the IMDG Code states "*Freight containers designed and tested in accordance with ISO 1496-1:1990 "Series 1 Freight containers - Specification and testing - Part 1: General cargo containers for general purposes" shall be equipped with operational equipment which is, including its connection to the freight container, designed to strengthen the end walls and to improve the longitudinal restraint as necessary to comply with the test requirements of ISO 1496-4:1991, as relevant.*" This can normally be fulfilled by fitting a partial height false bulkhead against the front wall (see figure 7.71).

Figure 7.71 False bulkhead

5.3.3.2 The front false bulkhead consists of two full-width panels with horizontal softwood timber cross beams extending the whole width of the CTU and resting against the strong corner posts. The panels should be birch plywood (internal grade) and have a minimum thickness of 12mm. The height of the panels should be at least 200mm above the height of the cargo when packed but

at least 1,800mm high with the lower panels as high as possible (preferably 1,200mm high). Panels with a height less 600mm should have one full width 150 x 50 mm softwood timber cross beams and all other panel heights at least two full width beams.

5.3.3.3 At the door end, the IMDG Code requires that "*operational equipment of bulk containers designed to be emptied by tilting shall be capable of withstanding the total filling mass in the tilted orientation.*" This means that the rear bulkhead should be sufficiently strong so as the retain the cargo with the door open.

5.3.3.4~~(5.3.1)~~ **Many ISO box** ~~freight~~ containers are equipped with shoring slots in the door corner posts which are suitable to accommodate transverse steel bars of 60 mm square cross section. This arrangement is particularly designed to strengthen the container door end for taking a load of 0.6 P, as required for solid bulk cargoes. These bars should be properly inserted. The relevant transport capability of the CTU should be demonstrated by a case-related certificate issued by a recognised consultative body or by an independent cargo surveyor. This requirement applies ~~in particular~~to ~~general-purpose freight~~ **multi-purpose ISO box** containers and to similar closed CTUs on road vehicles, which are not explicitly designed to carry bulk cargoes. ~~It may be necessary to reinforce side and front walls of the CTU by plywood or chipboard facing in order to protect them from bulging or scratching (see figure 7.53)~~

~~Figure 7.53 Lining a 40-foot container with chipboard panels~~

5.3.3.5 Timber beams may be used so long as they satisfy the strength requirements, however, the length of the beams should be long enough so that they are not able to slide out when moved horizontally (see figure 7.72 and figure 7.73).

Figure 7.72 Beam too short

Figure 7.73 Beams too short

5.3.4 Preparation of CTUs for the carriage of bulk cargoes

5.3.4.1~~(5.3.2)~~ The CTU intended to carry a bulk cargo should be cleaned and prepared adequately as described ~~in subsection 5.2.5~~ **under clause 5.3.2.3,** in particular if a cargo-specific liner ~~will~~ **shall** be used for accommodating bulk cargoes like grain, coffee beans or similar sensible materials ~~(see figure 7.54)~~**.**

~~Figure 7.54 CTU with liner bag for accommodating a sensitive bulk cargo~~

5.3.4.2 When using box type CTUs, it should be recognised that it will have been used to transport a variety of cargoes, some of which may constitute a contaminate to powder or granule cargoes carried subsequently. While CTU operator will endeavour to ensure that CTUs are clean before delivery to a shipper, it is the shippers' responsibility to ensure that the CTU is fit for use before loading. Likewise, after the shipment has been made, it is the unpacker's responsibility to ensure that the interior is clean, and all traces of the cargo carried removed. Siftproof liners make the cleaning process easier, but they do not totally eliminate the need for pre and post laden cleaning.

5.3.4.3 Small and fine powders and grains if not contained within a liner may fall out through the doors during transport due to vibration. It is therefore recommended that all dry bulk cargoes are only carried within a suitable liner.

Figure 7.55**74 Lined container** ~~CTU with liners and door barrier loaded~~ **packed** with scrap

5.3.4.4~~(5.3.3)~~ If crude or dirty material shall be transported, the CTU boundaries should be lined with plywood or chipboard for avoiding mechanical wastage of the CTU **(see figure 7.74).** In all cases an appropriate door protection should be installed consisting of battens fitted into suitable recesses and complemented by a strong plywood liner ~~(see figure 7.55).~~

5.3.4.5(5.3.4) Scrap and similar waste material to be carried in bulk in a CTU should be sufficiently dry to avoid leakage and subsequent contamination of the environment or other CTUs, if stacked ashore or transported in a vessel.

5.3.5 **Packing bulk cargoes**

5.3.5.1 Informative Material 3 – *Cargo Transport Units (CTU) types*, section 1.5 Non pressurised bulk container types – describes the various designs of bulk containers. These containers have an outward appearance of a general-purpose container but are fitted with loading and discharge hatches to the roof, front end or rear doors. Bulk containers designed just to carry solid bulk cargoes will generally have loading hatches in the roof which would allow gravity filling (see figure 7.75) or from ground level by means of an elevator (see figure 7.76). Bulk containers with a top loading hatch at the front of the container (see figure 7.77) can be packed using a gravity chute or a screw loader (see figure 7.78).

Note: 5.3.6.1 describes dry bulk containers, however, bulk CTU for other modes are available and their designs are generally similar and present the same packing and unpacking solutions.

Figure 7.75: Top loading

Figure 7.76: Elevator

Figure 7.77: Front chute

5.3.5.2 Box type CTUs can only be loaded and discharged through the rear doors so typical processes can include a screw loading elevator (see figure 7.78), a belt thrower (see figure 7.79), a retractable belt (see figure 7.80) or a pneumatic blowing system (see figures 7.81 and 7.82).

Figure 7.78: Screw loading

Figure 7.79: Belt thrower

Figure 7.80: Retractable belt

Note: When packing bulk CTUs through a front chute and or using a screw loading device, packers are reminded that inclining the CTU during the packing process may cause damage to the CTU's structure (see 5.3.1.4).

Figure 7.81: Pneumatic

Figure 7.82: Pneumatic blower

5.3.5.3 Abrasive cargoes, such as sugar and some grains, can cause damage to the liner if the flow of the material is directed directly at the liner, particularly during gravity loading through the top hatches (floor) or thrown or pneumatic loading through the rear doors (roof or front wall).

5.3.5.4 These loading methods do have restrictions, and it requires the loading operators to understand the "flowability" of the product being loaded so that it is evenly distributed across the entire container by gradually withdrawing the conveyor / blow pipe. Powders and grains which have a high angle of repose may settle unevenly and cause the eccentricity of the bulk material in the CTU which could result in handling difficulties.

5.3.5.5~~(5.3.5)~~ Depending on the internal friction and the angle of repose of the solid bulk cargo, the CTU may be inclined to a certain degree, to facilitate the loading or unloading operation. However, it should always be ensured that the walls of the CTU are not overstressed by the filling operation. It is not acceptable to turn a CTU by 90° to an upright position for filling, unless the CTU is designed and tested for this method of handling.

5.3.6 Packing problems

5.3.6.1 It is frequently seen that the packing method used may cause damage to the CTU's interior surfaces even when a liner has been fitted. Damage can be caused by a number of ways:

- **abrasion**
- **wear**
- **tearing**

resulting in additional costs for cleaning and remedial work on the CTU's interior. Damage to a liner used to render a CTU siftproof may result in substantial cleaning costs onboard ship and in terminals. Therefore, correct supervision and spot checking of packing operations should be performed regularly.

5.3.7 Weighing

5.3.7.1 All packed CTUs should comply with international and national regulations concerning the gross mass of the CTU and transport vehicle. However, containers carried by sea are covered by specific requirements.

5.3.7.2 The international convention for Safety Of Life At Sea (SOLAS) requires that all packed containers are weighed prior to loading on board a ship, and that a verified gross mass certificate (VGM) is presented to the carrier and the marine terminal.

5.3.7.3 Under the current terms of SOLAS, dry bulk cargoes can only have a VGM produced by method 1, therefore, on completion of packing and after the container has been sealed, the packer should weigh the packed and sealed container on a calibrated weighing device.

5.3.8 OPRC-HNS Protocol

The 2000 OPRC-HNS Protocol[1], designed for preparedness and response, describes HNS as a substance identified in one or more lists in the International Maritime Organization's Conventions and Codes. When transporting these noxious substances, it is essential that the consignor provides the shipper with full details including the appropriate measures required to respond to a pollution incident. This information should be forwarded to the carrier to minimise the risk of a major ecological event should multiple substances combine.

5.3.9 Temporary storage

5.3.9.1 CTUs, particularly freight containers, are frequently used as temporary, or long-term storage for bulk cargoes, and care must be taken that the cargo does not deteriorate during the storage or, in the case of dangerous goods, become unstable. The Warehousing White Paper[2] provides advice on storing Dangerous Goods in Warehouses. It should be noted that multiple CTUs carrying one or more dangerous goods and stored in close proximity to each other presents similar risks to those described in the White Paper.

5.3.9.2 Where concentrations of CTUs carrying different dangerous goods are found, the following guidance should be consulted:

- **Operations, particularly relating to good housekeeping and the prevention of combustion or explosion.**
- **Dangerous Goods Storage, particularly relating to documentation, chemical inhibitors and marking.**
- **Fire and explosion prevention, particularly relating to fire alarms, water supply and hot operations being carried out in the area.**
- **Security, specifically relating to policies and procedures to allow quick response to incidents.**
- **Emergency Response plans, particularly relating the hazard, nature and extent of possible emergencies.**

5.3.10 Unpacking dry bulk cargoes

5.3.10.1 Unpacking regulated dry bulk cargoes may require specialist discharge equipment to ensure that there is no escape of the cargo during the process. Fine powder if it becomes airborne may present a risk of explosion.

[1] Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol).

[2] arehousing White Paper – Storage and handling of Dangerous Goods in preparation for, or after, sea-transport, 2021, jointly published by ICBCA International, IVODGA, National Cargo Bureau and the World Shipping Council.

5.3.10.2 Unpacking CTUs is generally far easier than loading as gravity can greatly assist the process. All box type CTUs apart from the vertical hopper type CTU may be tipped either on specialist tipping equipment or, as is becoming more popular, using tipping chassis / trailers. During the tipping operation, extra care should be taken to ensure that:

1 the CTU is not overstressed during the unpacking operation.

2 the rear doors or wall are not over stressed and, for CTUs with rear doors and wherever possible, the rear false bulkhead should take all of the load caused by the tipped load.

3 the tipping device is stable and that the risk of it falling is minimised.

Note: Freight containers are not designed or tested for tipping discharge, therefore, the unpacker must satisfy themselves that the operation is safe, and that the container is not damaged during the operation.

5.3.10.3 Specialist bulk containers, such as shown in figure 7.83 are designed with discharge hatches and a front or rear structure that can withstand the forces associated with a tipped load.

5.3.10.4 Discharging a CTU generally is undertaken using a tundish system attached to the rear of the container, a piped discharge or a general discharge into a receiving hopper. As the following three pictures show the CTU will need to be tipped to a lesser or greater degree.

Figure 7.83 Tundish discharge

Figure 7.84 Grid discharge

Figure 7.85 Piped discharge

5.3.10.5 CTUs can be tipped in one of three ways, using the trailer tipping chassis (figure 7.83 and 7.86), a tipping platform (figure 7.87) or a tipping frame (figures 7.84, 7.85 and 7.88). Using the tipping chassis or platform means that CTU does not need to be lifted off the road vehicle, which in the case of some specialist bulk CTU with a gross mass of 38 tonnes would require special handling equipment. A tipping frame may be able to lift the CTU directly off the trailer as shown in figure 7.88 or may require handling equipment that positions the CTU within the frame (see figure 7.84).

Figure 7.86 40ft Tipping trailer

Figure 7.87 100t Tipping platform

Figure 7.88: 40ft Tipping frame

5.3.10.6 When handling CTUs, especially longer than 20ft, extra care is required to ensure that the stability of the CTU is maintained during the whole unpacking process. As the cargoes moves within the CTU during the operation, the centre of gravity will change, and if associated with potentially uneven ground or side winds, the stability may be compromised, resulting in the CTU falling.

Figure 7.89: locking twistlock

Figure 7.90: Backstop

5.3.10.7 When tipping a freight container on a trailer, it is important to ensure that the container is properly attached and there is no risk of the unit moving during the unpack process. Sudden movement of the cargo can place extraordinary loads on the twistlocks, therefore, it is essential that the correct attachment devices are used and properly tightened. Figure 7.89 shows a tightened screw-down twistlock which should be used at all four corners and figure 7.90 shows a backstop, which prevents the container from slipping.

(The following figures will need to be renumbered).

Annex II

Liquids in flexitanks

The following changes are proposed to clause 5.2:

5.2 Liquids in flexitanks

5.2.1 **The term flexitank has been used to describe the bag in which the cargo is carried, but for the safe transport of bulk liquids in CTU the whole system needs to be considered. A new term, a flexitank system has been developed specifically for freight containers and is defined as a "system used for the transport of a liquid commodity which comprises a flexitank, a restraining system, a constraining system and a general purpose freight container". Packers of all CTU types carrying bulk liquids in flexitanks should be aware that proper securing of the flexitank is essential for safe transport and should follow the installation advice provided by the flexitank supplier.**

5.2.2~~(5.2.1)~~ Flexitanks used for the transport of bulk liquids by road, rail or sea should carry a label that confirms the type approval by a recognized consultative body. The flexitank manufacturer's fitting instructions should always be followed, and the cargo intended to be carried should be checked for compatibility with the material of the flexitank. The transport of dangerous goods in flexitanks is prohibited.

5.2.3~~(5.2.2)~~ During transport the contents of a flexitank will be subject to dynamic forces without significant retention from friction. These forces will act upon the boundaries of the CTU and may cause damage or complete failure.

5.2.4~~(5.2.3)~~ Therefore the payload of a CTU should be appropriately reduced, when it is used for carrying a ~~loaded~~ **filled** flexitank. The reduction depends on the type of CTU and on the mode of transport. When a flexitank is ~~loaded into~~ **used in** a general purpose CTU, the mass of the liquid in the flexitank should not exceed a value agreed with the CTU operator, to prevent the CTU from suffering bulging damages (see figure 7.~~50~~**66**).

Figure 7.~~50~~**66** Damaged CTU side wall

5.2.5(5.2.4) Road vehicles intended to carry packed flexitanks should have boundaries of a certified strength that is sufficient to confine the weight of the cargo under the accepted load assumptions. The certification of fitness of the vehicle should explicitly address the bulk transport of liquid under the assumption of zero-friction. Nevertheless, the lining of the bottom of the loading area with friction increasing material and the application of over-the-top fibre lashings every two metres is recommended for stabilizing the position and the strength of the flexitank.

~~Before being fitted with a flexitank, the CTU should be carefully inspected for structural integrity and fully functional locking bars for each door panel. The CTU should then be prepared by thorough cleaning, removing of all obstacles like protruding nails and by lining the bottom and walls with cardboard. In 40-foot containers plywood should be used for lining of the side walls in order to avoid bulging damage. The door end of the CTU should be~~

~~reinforced by battens, fitted into suitable recesses, and by a strong lining of cardboard or plywood. If the flexitank is equipped with a bottom connection tube, this lining should have an aperture matching with the position of the tube in way of the right hand door. The empty flexitank should be unfolded and laid out accurately to facilitate a smooth filling process.~~

5.2.6 During intermodal transport the forces experienced by the CTU will be magnified by the potential sloshing of the liquid in the flexitank. Therefore, the correct handling of the CTU during transfers and on the various modal vehicles is essential. Improper handling or storage can cause a failure of the flexitanks and the partial or total loss of the cargo. Therefore, specific requirements for each transport mode are discussed in clause 5.2.8

5.2.7 Flexitank operation

5.2.7.1 Commodity considerations

1 General:

- **Flexitanks shall only be offered to transport non-regulated (non-dangerous) substances when the flexitank is suitable and the materials of construction are resistant and compatible with the substance temperatures likely to be encountered at the time of filling and during transport.**
- **All parties are required to undertake an appropriate risk assessment before accepting any cargo for transport in a flexitank container system.**
- **All parties are required to exercise responsible care and ensure safe and reliable flexitank systems conforming to all relevant regulations.**

2 Dangerous Goods:

- **Cargoes regulated as Dangerous Goods shall not be transported in flexitanks, therefore cargo included in IMDG Code (International Maritime Dangerous Goods Code) Dangerous Goods List, Chapter 3.2 which provides the UN Number, Proper Shipping Name and Class of Dangerous Goods together with provisions for transport of substances classified as Dangerous Goods is not allowed to be transported in a flexitank.**
- **Regional and National Regulations may also apply when the CTU passes through the state or region. Substances (cargo) classified as Dangerous Goods by Regional or National Regulations and statutory legislation, are not permitted to be transported in flexitanks.**

3 Non-regulated goods:

- **Non-regulated cargo is allowed for carriage in flexitanks, provided it is suitable for flexitank transport and the flexitank materials of construction are resistant and compatible with temperatures likely to be encountered during transport.**
- **The carriage needs to comply with the maritime and national legislation for governing maximum gross mass of the flexitank system.**
- **The carriage needs to comply with national, or modal transport legislation or directives, and an authorisation for the transport of flexitanks may be required.**

Note: Although the cargo might be classified as non-regulated by the criteria of the regulatory process, the cargo might contain hazards and risk. Therefore the Safety Data Sheet (SDS) should be referred to and the required safety provisions should be implemented.

5.2.7.2 Flexitank application

Shipper must be aware of their responsibilities and liabilities when transporting bulk liquids in flexitanks. In addition to the chemical compatibility of the flexitank with the cargo, shippers should be aware of any potential changes that may occur during transport or the potential effect of a catastrophic failure, such as:

- **Certain cargoes, such as wine, may be subject to fermentation during transport and the selection of the flexitank must be appropriate for the cargo carried. Improper selection may result in the flexitank expanding and damaging the container structure.**
- **Many of the cargoes carried in flexitanks (such as foodstuffs, wines and spirits) present little risk to the infrastructure should there be a serious leak, while others (such as oils and latex) may severely impact the operation of a facility (ship, terminal, roadway etc.) should a similar leak occur.**
- **Environmental controls may require that a leak of some easily disposed cargoes, such as wine, beer and fruit juices, require containment, dilution or cleaning before it enters the wastewater system.**

5.2.7.3 Flexitank selection

When selecting a flexitank shipper and / or packers should:

- **carry out appropriate risk assessments of the flexitank system and the cargo to ensure safe and reliable processes.**
- **select a flexitank manufacturer who has had their flexitank tested, certified and listed in the Container Owners Association (COA) Flexitank Quality Management List (FQML) with the status COA Member Certificate of Compliance[3].**

5.2.7.4 CTU checks

On arrival the CTU should be checked in accordance with Chapter 8, clauses 8.1 and 8.2 and annex 4 of this Code. Deficiencies should be notified to the CTU operator and returned for replacement.

CTUs supplied for transporting a flexitank should be checked to ensure that there are no deficiencies that may puncture the flexitank such as:

- **nails and screws**
- **splinters and broken flooring**
- **gouges in the flooring**
- **miss-aligned flooring or walls**
- **sharp edges at welds and repairs**

Where such deficiencies are found the CTU operator should be notified and a replacement CTU be provided or temporary repair be done and agreed with the CTU operator, such as covering the with a suitable protective lining.

5.2.7.5 Fitting, filling & securing

Note: Always operate the flexitank system in accordance with the manufacturer's instructions and best practice to ensure safe and reliable outcome.

1 Fitting:

- **The CTU should be prepared and the flexitank should be installed according to the manufacturer's installation instructions using trained personnel.**
- **If the cargo has a thick consistency and requires heating to improve unpacking then the heating pads (water or electric) should be installed underneath or to the sides of the flexitank**

Before filling starts, the installation should be checked to ensure the system has been fitted in accordance with the manufacturer's instructions and that there are no signs of damage to any constituent part of the flexitank system.

[3] Using a flexitank that has not been certified and listed in the COA FQML does not mean that it is not suitable for the cargo, however, the risk of an incident or damage to the CTU may be increased.

2 Filling:

• ~~(5.2.6)~~ For filling an empty flexitank the left-hand door of the CTU should be firmly closed so that the inserted barrier is appropriately supported (see figure 7.~~51~~**67**). The flexitank should be filled at a controlled rate. The use of spill protection devices like collecting bag or drip tray is recommended. ~~After filling and sealing the tank the door of the CTU should be closed and a warning label should be attached on the left hand door panel (see figure 7.52).~~

Figure 7.~~51~~**67** Container fitted with flexitank

~~Figure 7.52 Flexitank warning label~~

• **Overfilling a flexitank can result in damage to the CTU and loss of cargo. Stop filling:**

- **once the target volume has been reached,**
- **if the flexitank or any constituent parts becomes trapped,**
- **if there are signs of the flexitank or the valve leaking.**

Do not restart filling until the deficiency has been rectified.

3 Closing:

On completion of filling the flexitank:

• **the CTU should be closed ensuring that the valve does not obstruct the door operation or be forced out of position when closing the door,**

•~~(5.2.6)~~ No part of the flexitank, ~~or retaining battens~~ **shoring bars** or bulkhead should touch either door when fully ~~loaded~~**filled**.

• **Where required the Shipper should also provide a VGM for the CTU (container). Under the current terms of SOLAS, bulk liquid cargoes can only have a VGM produced by method 1, therefore, on completion of packing and after the container has been sealed, the packer should weigh the packed and sealed container on a calibrated weighing device.**

5.2.7.6 Container CTU Markings

After filling and sealing the flexitank, the door of the CTU should be closed and a marking(s) applied to indicate that the CTU is carrying a flexitank.

5.2.8 Transport of Flexitanks

5.2.8.1 Road transport

The driver should be made aware that the container is carrying a filled flexitank as the handling characteristics for the container may be different.

Caution! – Wherever possible the driver should avoid sudden alteration of direction or breaking as the contents of the flexitank are unhampered, and the flexitank material is flexible. Therefore, the load moves heavily and unpredictably.

The driver should inspect the container for signs of leakage prior to starting and periodically during the journey to the destination. If there are signs of leakage, then the driver should ensure that the vehicle is parked in a position that will not cause a hazard or undue traffic congestion and away from any drains, rivers or waterways and does not require returning to the public highways and notify the shipper / consignee.

Uneven surfaces and twisting roads can cause the cargo to move within the flexitank. Abrupt movements could cause an internal wave that could result in the end, or side walls being damaged (see figure 7.68). If the driver notices such damage, it should be reported when the load is delivered to its destination.

Figure 7.68 - Damaged side wall following road transport

5.2.8.2 Rail transport

Flexitanks should only be transported on block trains while shunting wagons with CTUs carrying loaded flexitanks should be avoided.

5.2.8.3 Terminal handling

Any CTU packed with a flexitank should not be lifted using a forklift truck and should be only lifted from all four top corner fittings or using a balanced lifting apparatus.

When handling a CTU carrying a flexitank:

- **the CTU doors should be closed, and the lock rod handles secured in their retainers.**
- **Lifting and lowering it should be done with recognition that the liquid within the CTU will continue to move even though the CTU has stopped.**
- **Lifting and lowering speeds should be restricted so that the static / accelerated liquid can make a smooth transition without damaging the CTU or the lifting equipment.**
- **When swinging or moving a CTU carrying a flexitank transversely, care should be taken when attempting to position the unit within a slot or on a chassis / trailer as the free surface effect of the liquid may affect the CTU's placement.**

5.2.8.4 Marine transport

CTUs (containers) packed with a flexitank can be loaded on ships and ship planners should consider the following when positioning these CTUs:

- **Temperature sensitive cargoes[4] should not be placed on or near heated bunker tanks, the elevated temperature required to keep the fuel viscosity low may heat or otherwise damage the cargo (red slots below deck in figure 7.69).**

Note: the height up the side will depend on the ship's design and may be higher or lower than shown in the figure. CTUs (containers) carrying flexitanks should not be stowed adjacent to the engine room bulkhead.

- **Above deck, CTUs (containers) with flexitanks should not be stowed in the outer and upper most slots as or at the edges of deck covers (red slots above deck in figure 7.54 as:**

  - **CTUs (containers) in the top slot can be subjected to high temperatures from the sun's radiation.**
  - **CTUs (containers) in the outer slots can be subjected to high acceleration loads.**
  - **CTUs (containers) placed at the edge of the deck covers may have slightly wider separation and there is an increase in the risk of the side walls being bowed outwards.**

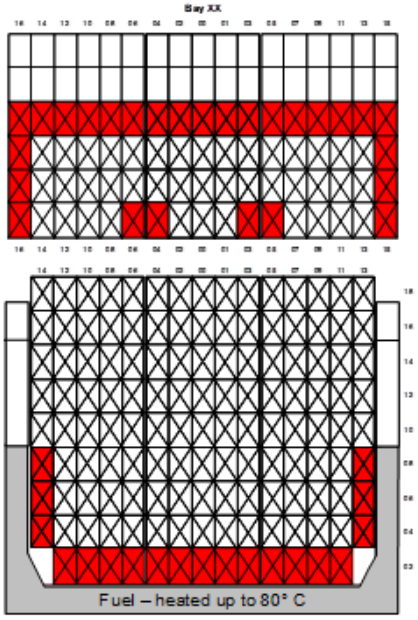

Figure 7.69 - Positioning flexitanks

When planning the location of the CTU (containers) on board a ship, planners should consider the consequences of a leak from the CTU especially for:

- **Flexitanks carrying products that are viscous or that solidify, or which become more viscous when released from the containment of the flexitank, or**
- **Water polluting and oily products.**

5.2.9 Discharging cargo

~~(5.2.7)~~**Only** the right-hand door of the CTU should be opened **until the majority of the cargo has been emptied from the flexitank.** ~~carefully for getting access to the top or bottom connection tube of the flexitank. The left hand door should be kept closed until the flexitank is substantially empty. The use of spill protection devices like collecting bag or drip tray is recommended. The empty flexitank should be disposed according to applicable regulations.~~

If heating pads have been requested and fitted, then these should be activated before the emptying process starts and only trained and competent personnel should conduct the heating,

The internal pressure of the flexitank will force the majority of the cargo out of the flexitank, but additional procedures may be required to fully empty the flexitank.

5.2.10 Environment: disposal and recycling

After discharge of the flexitank cargo, the flexitank, linings and all equipment should be completely removed from the CTU and safely disposed of or recycled for other use as agreed between the Shipper and the Consignee.

It is probable that a small amount of ullage will remain in the flexitank once the emptying process has been completed. This may affect the recycling of the flexitank after use.

[4] It is the responsibility of the shipper to inform the carrier of any temperature constraints or limits before the CTU is loaded.

The CTU should be cleaned, and any marks fitted to the exterior removed. The empty CTU should then be returned to the CTU Operator notifying them of any deficiencies or damage that occurred during the flexitank transport process.