

## **Informal meeting on Code of Practice for Packing of Cargo Transport Units**

### **at the request of the United Nations Economic Commission for Europe Working Party on Intermodal Transport and Logistics**

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## **Liquids in flexitanks**

### **Submitted by ETS Consulting**

This document is developed substantially from work commissioned by TT Club in compiling risk management guidance for flexitank operations. TT Club retains the right to use this material.

There have been several developments in the transport of bulk liquids in flexitanks since the CTU Code was published. Publications by the Container Owners Association (COA), ICHCA International and the TT Club have explored how the transport of bulk liquids can be made safer and with less waste.

To this end, this document proposes expansion of section 5.2 of Annex 7 to accommodate new developments in transport of bulk liquids. The document also suggests, as consequential changes, to add new definitions to Chapter 2 of the CTU Code.

#### 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 and included in the Publicly Available Specification 1008<sup>1</sup>, 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 GP freight container”. Packers of CTUs 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 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 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 Therefore the payload of a CTU should be appropriately reduced, when it is used for carrying a filled flexitank. The reduction depends on the type of CTU and on the mode of transport. When a flexitank is packed into 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).

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<sup>1</sup> PAS 1008:2016 Specification for the performance and testing of a single use flexitank published by the BSI. A PAS is a fast-track standardization document – the result of an expert consulting service from BSI. It defines good practice for a product, service or process.



**Figure 7.50 Damaged CTU side wall**

- 5.2.5 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.
- 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 5.2.7.
- 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 at the filling and transport temperature.
    - 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.
    - Refer to 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. These substances are not allowed to be transported in a flexitank.
    - Regional and National Regulations applicable in the location of carriage may also apply. 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, providing it is suitable for flexitank transport and the flexitank materials of construction are resistant and compatible at the cargo transport temperature.

- Maritime and National Legislation for governing maximum gross mass of the flexitank system also applies.
- National, or Modal Transport legislation or directives, may require authorisation for the transport of flexitanks.

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

#### 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.
- However, environmental controls may also mean that a leak of some easily disposed of 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:

- transport only cargoes that are classified as non-regulated (non-dangerous) and are compatible with the flexitank system.
- 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<sup>2</sup>.
- operate the flexitank system in accordance with the manufacturer's instructions and best practice to ensure safe and reliable outcome.

#### 5.2.7.4 CTU Selection & checks

On arrival the CTU should be checked in accordance with Chapter 8, sections 1 & 2 and annex 4 of this Code. Deficiencies should be notified to the CTU operator and returned for replacement.

While containers should be supplied that comply with industry repair standards, those to be used 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 they should be rectified by repair or covering with a suitable protective lining.

<sup>2</sup> 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

5.2.7.5 Fitting, filling & securing

.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.

.2 Filling

- 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). The flexitank should be filled at a controlled rate. The use of spill protection devices like collecting bag or drip tray is recommended.



Figure 7.51 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,
- No part of the flexitank, shoring bars or bulkhead should touch either door when fully loaded.
- the CTU should be weighed after the doors have been closed so that an accurate gross mass can be determined.

5.2.7.6 Container Markings

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).

## 5.2.7 Transport of Flexitanks

### 5.2.7.1 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 7.53). If the driver notices such damage, it should be reported when the load is delivered to its destination.



**Figure 7.53 - Damaged side wall following road transport**

### 5.2.7.2 Rail transport

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

### 5.2.7.3 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 container 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 container has stopped.
- Lifting and lowering speeds should be restricted so that the static / accelerated liquid can make a smooth transition without damaging the container 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.

### 5.2.7.4 Marine transport

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

- Temperature sensitive cargoes 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 17.54). Note the height up the side will depend on the ship’s design and may be higher or lower than shown in the figure. Containers carrying flexitanks should not be stowed adjacent to the engine room bulkhead.
- Above deck, 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.
  - Containers in the top slot can be subjected to high temperatures from the sun’s radiation.
  - Containers in the outer slots can be subjected to high acceleration loads.
  - 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.

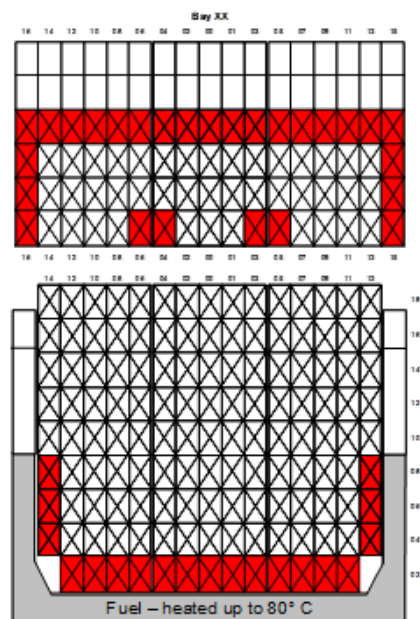


Figure 7.54 - Positioning flexitanks

Planners should consider the consequences of a leak from a CTU carrying products that are viscous or that solidify, or which become more viscous when released from the containment of the flexitank. They should balance the environmental effect of the cargo being lost overboard against the potential safety risk of clogging the bilge pumps.

Water polluting and oily products on the other hand should be stowed below decks where any leakage can be captured within the ship’s bilge.

5.2.8 Discharging cargo

Only the right-hand door should be opened until the majority of the cargo has been emptied from the flexitank.

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.

5.2.9 Environment: disposal & 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.

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.

**Consequential changes**

1. Add new definitions

Flexitank	Bladder with a loading/discharging valve which is installed inside a general purpose CTU and is used for the transport and / or storage of a non-regulated liquid.
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2. The figure references in subsequent sections of annex 7 will need to be renumbered