

GUIDELINES FOR THE CARRIAGE OF CARGO IN NON-OPERATING REEFER CONTAINERS



CONTAINER OWNERS ASSOCIATION

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CINS
Cargo Incident Notification System

COA Guidelines

The Container Owners Association publishes Codes of Practice and Guidelines on a range of container-related subjects. Further information on www.containerownersassociation.org

TT Club StopLoss Briefings

StopLoss briefings are developed on a broad range of topics that give rise to recurring problems. They seek to provide a straightforward summary of an issue, essential good practice advice and, where applicable, sources of further information. This document forms the 17th in the series; the complete series and further information is visible at www.ttclub.com/loss-prevention and printed copies are available from the TT Club's Regional Centres.

CINS Guidelines

CINS (the Cargo Incident Notification System) publishes Guidelines on the carriage of certain cargoes in containers. This is the third in the series of CINS Guidelines. Information about other Guidelines is available on www.cinsnet.org

Acknowledgements

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1. INTRODUCTION

Refrigerated containers (known as reefers) are designed to be used to transport temperature controlled cargo. Since there may be insufficient temperature controlled cargo for a 'return' leg, reefers would normally be positioned empty to a demand location.

In order to minimise empty repositioning costs, container operators may use reefer containers in a non-operating mode to carry approved dry cargo on a return leg. Such cargo is described as non-operating reefer cargo (NOR cargo).

NOR cargo is defined as a cargo that is approved for packing into a refrigerated container to be transported **without** operating the refrigeration machinery.

Transporting NOR cargo enables the carriage of additional cargo in busy trade lanes where reefers need to be positioned for their next cargo move, but are competing for slot space with revenue earning dry cargo.

Reefer containers differ from General Purpose (GP) containers in both design and materials. This must be taken into account in relation to the approval of and packing requirements for NOR cargo.

These guidelines are intended to help container operators and shippers in making decisions that appropriately protect both cargo and containers.

2. REEFER CONTAINER CHARACTERISTICS

The design of reefer containers enables cargo that is sensitive to temperature to be transported in an insulated container with its own refrigeration machine that circulates air, controlled at a set temperature.

The characteristics of a reefer container are:

- The provision of accurate control of temperature and air flow, within specified technical parameters
- Satisfying hygiene and similar standards, for example related to food cargo, pharmaceuticals or flowers.

As a result of this:

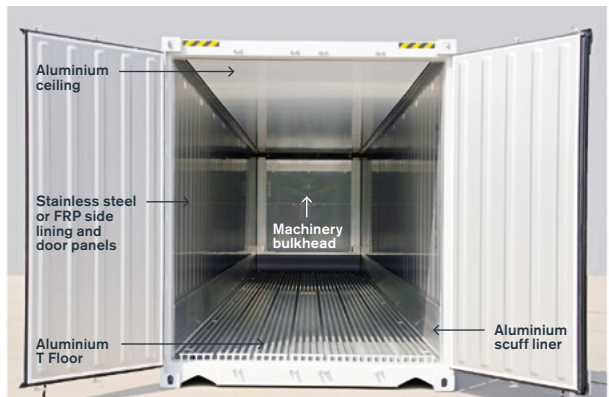
- The design is complex and reefers are seven times more costly than GP containers to purchase
- The internal construction materials used are susceptible to damage if cargo packing techniques are not adjusted
- Repairs to reefers are more difficult and costs are seven times higher than for GP containers.

3. DRY CARGO IN REEFERS: ISSUES TO CONSIDER

There are a number of issues to be considered concerning the characteristics of a reefer container **before** approving it to carry a NOR cargo or commencing packing cargo.

Reefer Interior

- 3.1 Smaller internal dimensions than a GP container require increased awareness and attention when preparing the packing plan
- 3.2 Front-heavy weight distribution from refrigeration machinery should be taking into account in planning cargo distribution
- 3.3 In planning appropriate cargo distribution, the packer should take account of front-heavy weight distribution in the container from the refrigeration machinery
- 3.4 Materials used for construction are less robust and particularly susceptible to piercing or stress
- 3.5 Unpainted metal surfaces are susceptible to corrosion from cargo and improper cleaning processes.



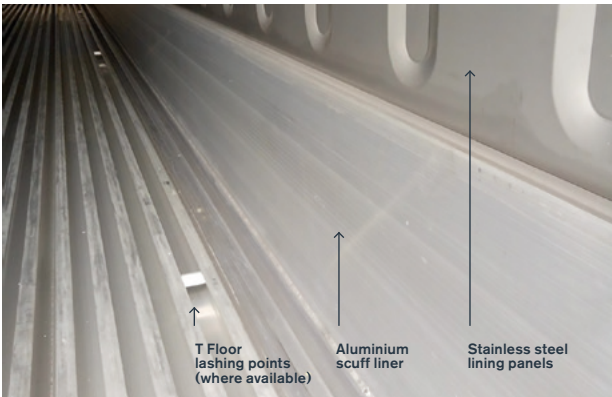
Picture 1

Interior view of a refrigerated container showing aluminium T-Floor and scuff liner, stainless steel or Fibre Reinforced Plastic (FRP) sidewalls, white painted aluminium ceiling, machinery bulkhead at far end.

3. DRY CARGO
IN REEFERS:
ISSUES TO
CONSIDER
(CONTINUED)



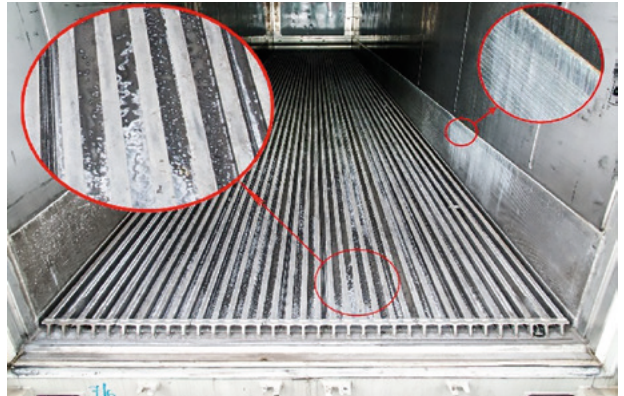
Picture 2
Close up of aluminium T Floor. This is an in-service container with some minor discoloration but otherwise in good condition.



Picture 3
Interior floor/sidewall interface showing lashing points and exposed metal surfaces. Note that there may be no lashing points in the floor.

4. INTERIOR DAMAGE EXAMPLES

There are various causes for the type of corrosion that are presented in Picture 4. Although the most common cause is the cargo itself, including treatments (e.g. residues of fumigation) that might be applied to the cargo, cleaning with caustic materials will also cause corrosion or oxidation to the interior of the unit. Note that fumigation is not allowed in operating reefers; shippers should ensure fumigated cargo is adequately ventilated before packing the container. It is difficult to treat and permanently repair this corrosion as the surface of the aluminium has had its protective oxide layer contaminated.



Picture 4
Corrosion to aluminium T Floor and scuff liner.

In addition to corrosion, the aluminium T Floor sections are susceptible to mechanical damage, such as caused by fork or pallet truck wheels.



Picture 5
Badly damaged aluminium T Floor showing broken T sections, cracks to the welds which will require major and expensive repairs.

4. INTERIOR DAMAGE EXAMPLES (CONTINUED)

Most reefer interior sidewalls are protected by aluminium scuff liners. Aluminium is a softer material than the steel used in GP containers, so can be more easily cut by forklifts used during the packing/unpacking process or by the sharp edges of packaging, such as pallets. Some reefers use Fibre Reinforced Plastic (FRP) as lining material, which is more resistant to damage. Cuts in the scuff liner or sidewall, as shown in Picture 6, allow moisture into the insulating foam that needs to be repaired before the insulation deteriorates.



Picture 6

Forklift or cargo damage to the aluminium scuff liner showing the insulation foam underneath.

While reefer interior sidewalls might be made from high strength stainless steel it is only 0.7mm thick compared to the 1.6mm or 2.0mm Corten steel used for GP containers. Stainless steel sidewalls are therefore more easily damaged, as in Picture 7, and require more complex repair.



Picture 7

Cargo damage to the stainless steel side lining.

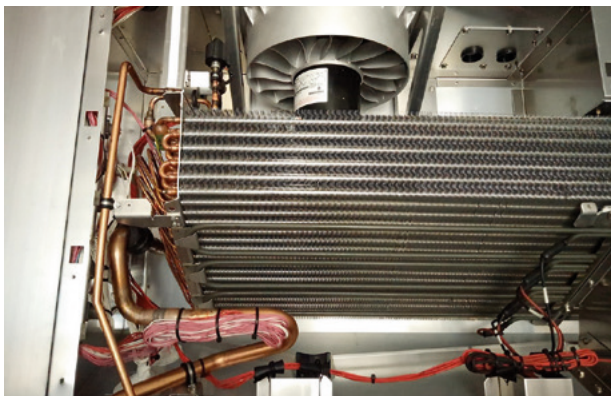
The thin panel aluminium ceilings are significantly easier to damage than the Corten steel used in the roofs of GP containers. Such damage, showcased in Picture 8, exposes the insulation foam and must be repaired to prevent moisture absorption.



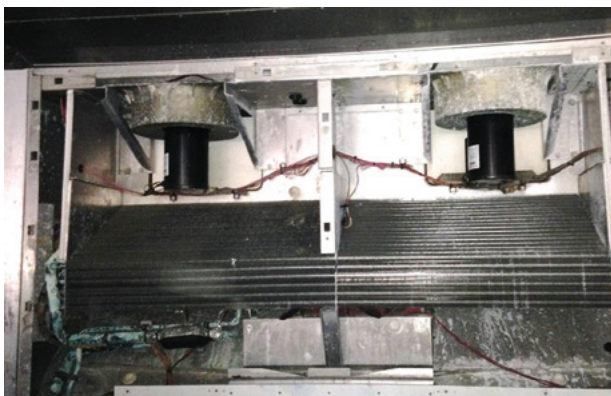
Picture 8

Cargo or forklift truck mast damage to the aluminium ceiling panels.

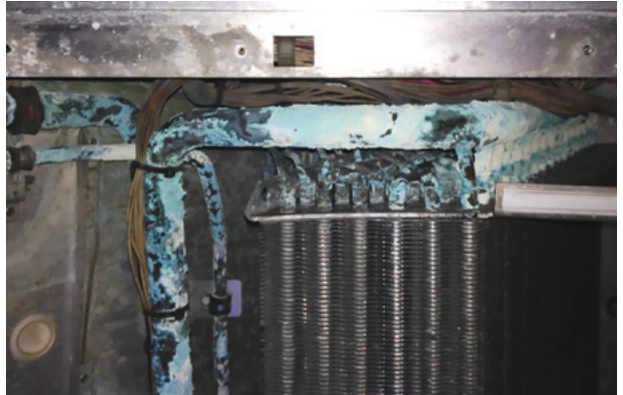
5. REFRIGERATION MACHINERY & CORROSION DAMAGE



Picture 9
View of reefer machinery on a new unit with the bulkhead removed.



Picture 10
View of corroded reefer machinery with the bulkhead removed. Note the white corrosion or oxidation to the aluminium fan housing and the copper corrosion to pipes. The damage is most likely resulting from previous cargo or a cargo treatment, but whatever the actual cause, inadequate operational controls (including excessive cleaning) are likely to lead to costly repairs being required.



Picture 11

Close up view of corroded reefer machinery copper pipes.

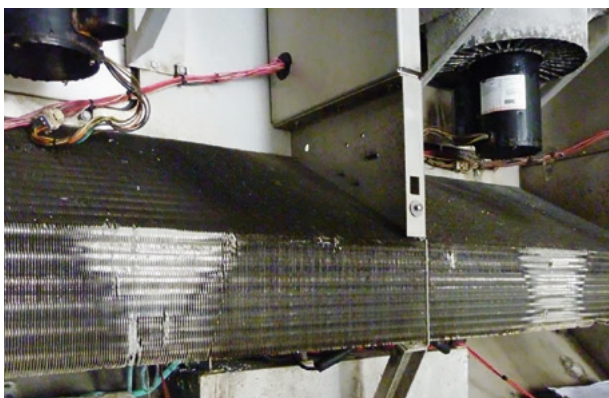
- 5.1 50% of a reefer container's new value is the complex refrigeration machinery at the front of the unit.
Half of this machinery is located inside the container
- 5.2 Even when it is not operating, the refrigeration machine is exposed to the atmosphere inside the container
- 5.3 Gases released from cargo can corrode and contaminate the steel, aluminium, brass, and copper materials used in the machinery
- 5.4 Corrosion to the coil can result in the coil area reducing, air resistance increasing or refrigerant pipes being corroded through. Such damage will affect the cooling performance of the machinery and its ability to maintain temperature settings for future temperature controlled cargoes
- 5.5 In some cases, corrosion and corrosion products may also compromise the quality of certain cargo types, although not generally NOR cargo
- 5.6 There are detailed maintenance guidelines for machinery that need to be followed in order to prolong optimal performance and avoid damage to future temperature controlled cargoes.

6. REFRIGERATION MACHINERY PHYSICAL DAMAGE

Recalling that half the machinery is located inside the container, impact by cargo or handling equipment to the front bulkhead wall may damage the refrigeration machinery.

- 6.1 The reefer front bulkhead is aluminium, behind which is the refrigeration machinery. Impact to the bulkhead may damage this machinery, such as the evaporator coil
- 6.2 At the base of the front panel is the air baffle plate that directs air into the T Floor. Damage to these plates is very common.

A hard impact to the aluminium bulkhead can damage the evaporator coil behind it, crushing the fins or flattening the refrigerant tubes (see Picture 12). Damaged coils will inhibit airflow and the ability to maintain temperature settings for future temperature controlled cargoes.



Picture 12
Damage to the evaporator coils.

Picture 13 shows damage to the machinery airflow baffle. Cargo that is slid along the floor and pushed into the bulkhead can bend back the air baffle plate which will require replacement.



Picture 13
Damage to machinery airflow baffle.

7. CARGO DAMAGE SUMMARY

The viability of permitting NOR cargo to be carried needs to be assessed against the potential for damage to the container structure and the refrigeration machinery.

Accumulation of damage, corrosion, contamination and repairs can degrade the refrigeration machine, as well as the cosmetic and sanitary conditions of the interior.

Poorly maintained and/or cleaned reefers, as shown in Picture 14, are unsuitable for use with refrigerated food products, flowers or pharmaceuticals.



Picture 14

8. GENERAL PRINCIPLES FOR APPROVING 'NOR' CARGO

It is essential that the container operator evaluates the characteristics of all NOR cargo carefully prior to accepting a booking. By way of summary checklist, the following should be taken into account:

In relation to cargo itself:

- whether the cargo is listed in section 10 as specifically not recommended to be packed in reefer containers
- whether a cargo listed in section 11 is adequately and correctly packaged or pre-packed
- if any vapours or gases may be emitted by the cargo that might be corrosive, either alone or in combination with water vapour
- whether any cargo spillage may damage or corrode the interior of the reefer
- whether the cargo will be palletised or packed as individual packages
- the cargo should not have sharp or rough edges that may damage the interior of the reefer container.

In relation to the container:

- that the interior has exposed metal surfaces of copper, aluminium and high grade stainless steel
- that the interior floor, sidewalls, door liners and ceiling are much less strong and impact resistant than a dry container
- the need to avoid any contact by the cargo or any loading vehicle with the container ceiling/roof
- that reefers are not suitable for use with Flexitanks
- that the cargo mass needs to be evenly distributed over the length of the container floor and overall weight distribution should take account of the mass of the reefer machinery (see the IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units - the CTU Code)
- proper consideration is given to the construction of the reefer unit, particularly the strength of the lashing points, when available, in relation to the characteristics of the cargo being presented for shipment
- whether packing can be achieved securely and without damaging the interior.

Best Practice

The use of reefers for NOR cargo in reefers requires careful evaluation, packing and securing to avoid costly damage to the interior or compromise the ability to carry future temperature controlled cargoes.

9. PACKING OF 'NOR' CARGO

9.1 Container Condition

The *Packer* should check that the container is completely dry and make a record of the condition of the interior noting any damage or corrosion including to the refrigeration machinery behind the bulkhead panels (see the IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units – the CTU Code).

9.2 Packing Guidelines

- Clear instructions should be made to avoid the reefer machinery being operated – it is recommended that the plug be taped off and clearly labelled 'NOR cargo – not for connection'
- Cargo can be palletized or in individual packages, and must be positioned so as to distribute the mass uniformly over the floor of the container
- The floor area is slightly smaller than a dry container so pallet configuration may need adapting to enable optimal payload capacity
- When packing, the cargo should be placed gently on the T Floor, against the front bulkhead and floor air-baffle and against the sidewalls and scuff liner
- Forklifts may be used to pack or unpack cargo if used cautiously. Fork trucks must be sized so that they can be accommodated by the lower height and narrower width of a reefer container doorway. Fork truck drivers should also be made aware of the risk of damage to the aluminium T Floor caused by the wheels and to the ceiling/roof by raising the mast inside the reefer
- A reefer door opening is 2290mm, 50mm narrower than a dry container, so cargo should be able to fit through this opening
- A reefer may not have lashing points on the ceiling. Some reefers have lashing points on each side of the T Floor. The packer should refer to the container operator for information on the strength of the container lashing points
- Use of air bags for dunnage against the sidewalls, may cause severe damage to the unit. If air bags are used it is recommended that they should only be placed in the middle of the cargo. Picture 15 shows correctly placed in middle of cargo.



Picture 15

- Blocking/bracing and lashing should be used to ensure the cargo cannot move in transit.
- Dunnage is not suitable for installation against the sidewalls.

9.3 Packaging Suitable for NOR Cargo

- FIBCs/Big Bags: When packing FIBCs the mass of the packed cargo should not exceed the maximum permissible payload or 27 tonnes, whichever is the lesser
- Cargoes that emit fine powders or grains should be packed in sift-proof and sealed FIBCs, an example is shown in picture 16. Packers should also consider stretch/shrink wrapping to prevent fine powders escaping from the FIBCs
- It is recommended to fit a false floor to reduce the risk of bag material tearing.



Picture 16

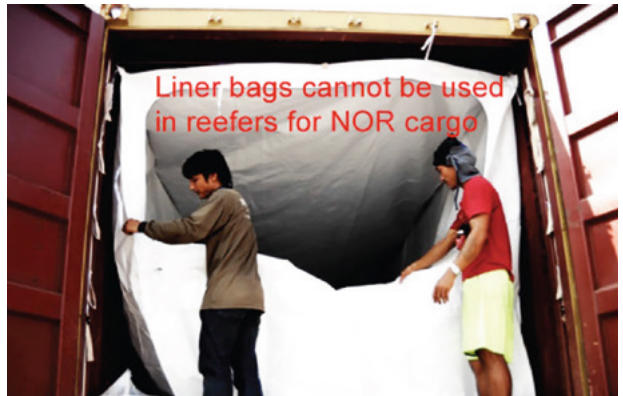
9. PACKING OF 'NOR' CARGO (CONTINUED)

- Cargoes that are (a) inert such as dry plastic scrap, (b) do not emit vapours and (c) not excluded on the list in section 10, can be carried in standard open top or skirted top FIBCs. However, when open top FIBCs (see Picture 17) are used there may be additional costs incurred for cleaning any spillages after the cargo is delivered
- For FIBCs not packed on pallets, it is recommended that a false floor is fitted to reduce the risk of the FIBC fabric tearing.



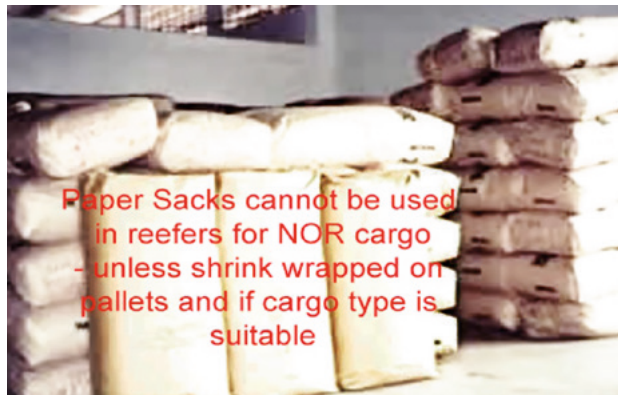
Picture 17

- Liner Bags, as shown in Picture 18, are not suitable for use in reefer containers, whether for temperature controlled or NOR cargo.



Picture 18

- Drums: Closed, sealed drums can be carried if securely mounted on pallets or if the T Floor and part of the sidewall are adequately protected with plywood. Drums should not be placed directly on to the T Floor or against the sidewalls
- Paper Sacks. When packed as non-palletised cargo, as in Picture 19, these are not suitable for use in reefer containers if they contain heavy or powdered products such as cement, fertilizers etc. Paper sacks packed and shrink-wrapped on pallets may be considered if the cargo type is acceptable.



Picture 19

10. CARGOES NOT SUITABLE FOR 'NOR' USE

It is important to check the characteristics of the cargo and how this might affect the materials used in the interior construction of the container and the refrigeration machinery. Also refer to the guidelines in section 8 and 9 of this guide when approving suitable cargo and its packing.

The list below is not comprehensive and provides examples of cargo types that might not be recommended. Some examples mentioned below may be suitable to be transported in NOR, depending on packaging and packing methodology.

Please contact the container owner/operator or responsible carrier's cargo management acceptance function to confirm the suitability of NOR cargo in cases where it is

(a) **NOT** a cargo unsuitable for carriage due to the packing and stowing requirements of section 9, or (b) **NOT** a cargo listed as unsuitable in section 10.

- Potash
- Soda Ash
- Dangerous Goods as classified according to the IMDG Code
- Fertilizer products, both non-Dangerous Goods and Dangerous Goods Classified including Ammonium Nitrate
- Aerosols
- Formaldehyde
- Salt
- Tyres
- Sodium Tripolyphosphate
- Raw Hides
- Steel
- Grain/Wheat (unless packed in FIBCs - see above)
- Powdered products such as flour affected by humidity
- Cement
- Sulphur
- Urea

- Flexitanks
- Used cars
- Used batteries (household and others)
- Lead/Acid (car) batteries
- Machinery parts, generator sets, steel, metal ingots, referenced in Pictures 20 and 21 are **not** suitable for NOR cargo.



Picture 20



Picture 21

11. CARGO SUITABLE FOR 'NOR' USE WITH RESTRICTIONS

In general, palletized and packaged materials are suitable for transport in Non-Operating reefers. Other commodities may also under special conditions be acceptable.

In all cases, when planning to transport NOR cargo that is not listed in section 10 as being unsuitable, please consult the container owner/operator or responsible carrier's cargo management acceptance function for confirmation.



The Container Owners Association (COA) is an international organisation representing the common interests of all owners of freight containers. Full members comprise container shipping lines and container leasing companies, while associate members include suppliers of container equipment and services.

The principle aims of the COA are as follows:

- Development of Industry Standards – with the aim of promoting industry efficiency
- Dissemination of information through Conferences, Training and Education
- Lobbying relevant regulatory authorities and co-operation with industry groups
- Promotion of Safe Operation of Containers
- Promoting Environmental Awareness.



TT Club is the international transport and logistics industry's leading provider of insurance and related risk management services. Established in 1968, the Club's membership comprises ship operators, ports and terminals, road, rail and airfreight operators, logistics companies and container lessors. As a mutual insurer, the Club exists to provide its policyholders with benefits, which include specialist underwriting expertise, a world-wide office network providing claims management services, and first class risk management and loss prevention advice. TT Club is managed by Thomas Miller.



CINS is a shipping line initiative, launched in September 2011, to increase safety in the supply chain, reduce the number of cargo incidents on-board ships and on land, and highlight the risks caused by certain cargoes and/or packing failures. Membership of CINS comprises over 65 percent of the world's container slot capacity. The CINS database permits analysis of operational information on cargo and container incidents which lead to injury or loss of life, loss or serious damage of assets, or environmental concerns. The database includes root cause analysis.

CINS publishes Operational Guidelines on the carriage of certain cargoes in containers.

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