External Document

PREPARATION TO TRANSPORT PAPER ROLLS IN **NOR (Non-Operational Reefer),** CARGO

Purpose: Maersk is committed to ensuring overall safety during maritime transportation. Therefore, we have created this easy reference document as a step-by-step guide to book paper rolls as a commodity in Non-Operational Reefers, which is intended to support the safety of our crew at sea and shoreside, as well as safety of the container cargo, environment, and assets.

Commodity:
Paper rolls, Paper coils

Cargo Description-Definition:
Large industrial rolls of kraft linerboard paper, used for making cardboard boxes or corrugated packaging.
Paper is a flat material often made from fibers vegetable origin by dewatering a fiber pulp to produce a fiber felt, which is then compressed and dried. The most important fibrous raw materials used are wood and wastepaper. The following are types of paper applications: Printing and publication paper, office paper/stationery, paper, cardboard for packaging purposes, sanitary paper, and paperboard for industrial / special purposes. Paper products have an approximate water content of between 6 and 10%.

Synonyms:
Boxboard, Corrugated liner, Cardboard roll, Paper roll for packaging, Industrial paper roll

Risk: If the cargo exceeds a reefer container´s safe working load of the floor of **1100kg per square meter**, it risks breaching the reefer´s structural design limits. Overloading can cause long-term damage to the reefer container and create unsafe operating conditions. This may include Top Side Rail (TSR) damage, side panel deformation, and potential collapse of the reefer container.

- Critical example: Paper Rolls with a diameter of 120cm and a weight between 1700-1900 kg exert pressure beyond the safety margins of our reefer equipment. This concentrated load adds a serious risk to the operation and the container integrity, where G-forces of up to 3-4 g can be experienced during container handling, which in turn applies greater forces, more than the reefer is designed to withstand.

Packing & Stuffing Remarks: Paper rolls in NOR containers are allowed only when **loaded eyes to the sky**. Any gap's between the rolls shall be tightly packed with material to prevent movement. There are **2 approved loading methods**:

1- Where the maximum cargo **limit of 1100kg per m2 is <u>not</u> exceeded**, i.e., the cargo is below the reefers safe design limit; it can be loaded directly to the floor, always eye up to the sky **(vertically)**. Use packing such as air bags in the center to limit any lateral rolling. Consider the cargo can shift during transit, use the appropriate lashing points to secure the cargo where required. Care shall be taken when opening the reefer doors during unpacking. It is suggested as best practice to secure a strap to the rear doors and slowly release this when opening the doors, in case the cargo has shifted against the doors during transit.
2- **If one or all paper coils exceed 1100kg per m2**, the reefer floor shall be fully lined with 10mm OSB (Oriented Strand Board), to ensure the cargo load is spread across the entire reefer floor.

Handling mixed roll sizes in the same reefer.

Where roll sizes and weights may vary, alternate these throughout the load as required to prevent concentrated dead weight areas, to reduce the risk of **TSR** failure. Avoid placing all taller, wider, or heavier rolls all at one end or all in the center, as this may cause uneven weight distribution. The reefer unit end is approx. 1000kgs heavier than the door end, and this may need to be taken into consideration for any counterbalance measures during cargo distribution.

Example illustration

In the left image, the larger paper roll exceeds weight limits and requires a wooden OSB floor installed across the whole floor to spread the load, (marked by the red line and the below image on the right). The smaller paper roll in the background falls within acceptable limits and demonstrates a more balanced distribution of mixed cargo across the reefer container. The below image on the right demonstrates Paper roll/s that exceeds 1100kg per m^2 where 10mm OSB boarding has been installed to spread the cargo contact loading point with the floor.

To determine the surface area of a roll in contact with the floor (eye to sky), use the following steps:

1- Find the radius: With the known diameter of the roll 

. Divide the diameter by 2. This will give the radius of the roll. 

2- Square the radius: Multiply the radius by itself. Radius X Radius. 

3- Multiply by Pi number: Squared^2 radius answer by pi  or approx. 3.14159. This result is the contact surface area in square meters. (roll eye up). 

4- Next, divide the roll´s total weight by the contact area to calculate the pressure per square meter. This **must not exceed 1100kg/m^2.**

Example:

Roll diameter = **1.2m** / 2 = 0.6 {radius}.

0.6 x 0.6 = 0.36^2

0.36^2 x 3.14159 = 1.1309724m^2

If the weight of the paper roll is 1000kg it would be on the limits of the permissible design and operation of a reefer.

If the roll weighed 2000kg it would exceed the safety threshold and requires additional support. In such cases, lashing points and floor pressure must be carefully evaluated.

If the cargo exceeds safe pressure limits, consider below corrective actions:

1- Line the entire floor where individual rolls exceed the contact weight threshold.

If neither option is feasible, a different container type – designed for heavy or concentrates loads - should be considered.

Maersk.com Commodity Description:

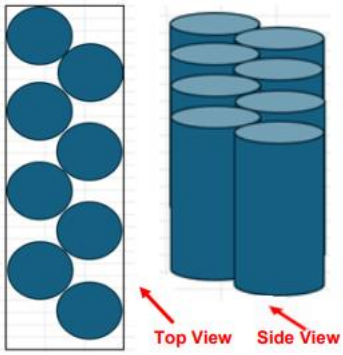
Paper, paperboard, packing material
Paperboard, KLB, Kraft Liner board, linerboard, newsprint, mail

If booking via any other channel:
002802 Paper, paperboard, packing material
002804 Paperboard, KLB, Kraft Liner board, linerboard, newsprint, mail

Circumstances under which we accept this commodity for NOR:
If paper rolls **do not** exceed 1100kg/m² positioned **vertically** eye to the sky. If one or more coils exceed **1100kg/m², ** 10mm OSB is applied to the whole reefer floor before loading.

Circumstances under which we DO NOT accept this commodity for NOR:
If paper rolls are placed horizontally or placed vertically with space between each paper coil, leading to potential risk of rolling. If paper roll/s weight exceeds 1100kg/m² **without above mentioned OSB boarding in place. Any insecure loads.**

Figure 1



Above: Appropriate stuffing

Figure 2

Above: Inappropriate stuffing

How to Book NOR with Maersk:

Main Website: www.maersk.com

Links to Additional Information & Industry Standards:
Code of Practice for Packing of Cargo Transport Units (CTU Code)

Last revision date:

Revision History

Version	Date	Changes	UID
1.0	October 2025	MHJ025 PCL023	POR012
1.1	3rd November 2025	Final Tech update to text and photos.	PCL023/GLBREFTEC

Customer Compliance Acknowledgement

Maersk has issued the above guidance to ensure the safe and compliant transportation of paper rolls in Non-Operational Reefer (NOR) containers. This guidance is designed to protect crew, cargo, equipment, and the environment.

By signing below, the customer acknowledges and agrees to:

- Follow the stuffing and packing requirements outlined in the guidance, including:
  - Loading paper rolls vertically ("eye to the sky") only.
  - Ensuring no paper roll exceeds the reefer floor safe working load of **1100 kg/m²** without the required OSB flooring.
  - Using approved methods to secure and balance mixed roll sizes to prevent concentrated loads.
  - Applying appropriate lashing, packing, and safety measures to prevent cargo movement during transit.
- Accept that Maersk may refuse loading if the above requirements are not met.
- Recognize that this document is a **formal compliance acknowledgement** and not a legal contract. Its purpose is to confirm understanding and agreement to follow the current guidance as a condition for continued acceptance of paper roll cargo in NOR containers.

Customer Confirmation

Company Name: _____

Authorized Representative: _____

Title: _____

Date: _____

Signature: _____