

Container packing and weight distribution

Weight distribution, securing, moisture and the CSC plate: the basic rules of the CTU Code.

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Online interactive version: <https://ozgurkonakci.com/en/guide/container-packing-weight-distribution/>

SHORT ANSWER

Containers should be packed following the CTU Code, published jointly by the IMO, the ILO and UNECE. The cargo's centre of gravity should be close to the middle of the container's length: as a general rule, its offset should not exceed $\pm 5\%$ of the length. The cargo should be secured with no voids, the maximum payload and road weight limits must not be exceeded, and precautions should be taken against moisture and condensation.

Why it matters

Often only the person who packed a container knows what is inside it. A badly packed container endangers not only its own cargo but also the truck, the stow on board and other cargo. Waves at sea, braking and cornering on the road all apply forces to the cargo from every direction. Packing rules aim at a stow that withstands these forces.

The main reference is the **CTU Code** (Code of Practice for Packing of Cargo Transport Units, 2014), published jointly by the IMO, the ILO and UNECE.

Weight distribution

The cargo's **centre of gravity** should be close to the middle of the container's length. The rules in the CTU Code:

- **$\pm 5\%$ rule:** In general, the centre of gravity should not be offset from the middle of the container by more than 5% of its length. The offset is measured from the middle of the dimension concerned: about ± 30 cm for a 20' container (external length about 6.06 m) and about ± 60 cm for a 40' (about 12.19 m).
- **$\pm 10\%$:** In special circumstances an offset of up to 10% may be accepted.
- **60/40 rule of thumb:** No more than 60% of the cargo weight should be concentrated in one half of the container's length.

A container with an off-centre load tilts when lifted and can overload a truck's axle on the road.

Example: 40' container (internal length 12.03 m). Block A 8 t between 0 and 4 m (centre 2 m); block B 6 t between 4 and 9 m (centre 6.5 m). Centre of gravity = $(8 \times 2 + 6 \times 6.5) \div 14 \approx 3.93$ m; container middle 6.02 m; offset ≈ 2.09 m, about 17% of the length. Far outside the limit: the cargo should be redistributed towards the middle.

The calculator is for teaching purposes; measure positions from the inside of the door-end wall to the middle of each block. For real loads, follow the relevant annexes of the CTU Code and the carrier's instructions.

Other basic rules

- **Do not exceed the payload:** Respect both the maximum gross mass on the CSC plate and the carrier's cargo limit. Road weight limits are often more restrictive.
- **Concentrated loads:** Heavy machinery standing on a small area can exceed the floor's strength. Spread the load over a wider area with timber beams or skids.
- **Heavy at the bottom, light on top:** Put heavy cartons at the bottom and light ones on top; do not put liquids on top of solids.
- **No voids:** Fill gaps between cargo with dunnage such as inflatable airbags, timber or pallets.
- **Securing (lashing):** Cargo that can shift must be secured to the container's lashing points with straps or chains.
- **Door end:** Support the door end so the cargo cannot fall out when the doors are opened.

Moisture and condensation

Humid air in a container that warms up during the day condenses on the roof as it cools and drips onto the cargo. The industry calls this **container rain**. To reduce the risk:

- Use dry packaging and dry pallets.
- Do not pack in the rain or load wet cargo.
- Use desiccants on long routes that cross climate zones.

Wood packaging: ISPM 15

Because wooden pallets, crates and dunnage can carry plant pests, many countries require wood packaging that has been treated and marked to the **ISPM 15** standard. Unmarked wood packaging may be refused or destroyed at destination.

The CSC plate and the seal

- **CSC plate:** Shows that the container is approved under the International Convention for Safe Containers (CSC). It carries the maximum gross mass, the allowable stacking load and examination information.
- **Seal:** Fitted to the doors when packing is finished; its number is written on the bill of lading. The seal number is checked at destination; a different or broken seal is important evidence in loss and damage claims.

Test yourself

1. A single 18-tonne machine is being loaded in a 40' container. Where should it go? *(Answer: Positioned so the centre of gravity is in the middle of the container, on skids that spread the load over the floor, and secured.)*
2. 70% of the cargo weight is in one half of the container. Is there a problem? *(Answer: Yes. The 60/40 rule of thumb is exceeded and the centre of gravity is most likely outside the $\pm 5\%$ limit.)*
3. At destination, the seal number differs from the one on the bill of lading. What should be done? *(Answer: Record it in writing before opening the container, inform the carrier and the insurer, and call a surveyor if needed.)*

Frequently asked questions

Where should the centre of gravity be in a container?

Under the CTU Code, the cargo's centre of gravity should be close to the middle of the container's length; in general its offset should not exceed $\pm 5\%$ of the length. In special circumstances up to $\pm 10\%$ may be accepted. As a rule of thumb, no more than 60% of the cargo weight should be concentrated in one half of the container.

What is a CSC plate?

A metal plate showing that the container is approved under the International Convention for Safe Containers (CSC). It shows the maximum gross mass, the allowable stacking load and examination information. A container without a valid CSC plate should not be used in international transport.

Why does condensation form inside a container?

Humid air in a container that warms up during the day cools at night or in colder regions, turns into droplets and drips from the roof onto the cargo ('container rain'). Using dry packaging and pallets, adding desiccants and not packing in wet weather reduce the risk.

SOURCES

IMO/ILO/UNECE — Code of Practice for Packing of Cargo Transport Units (CTU Code, 2014) —

<https://unece.org/transport/intermodal-transport/imoilounece-code-practice-packing-cargo-transport-units-ctu-code>

TIS (Transport Information Service, GDV) — CTU Code Annex 7, 3.1.4: centre of gravity offset generally within $\pm 5\%$ —

https://www.tis-gdv.de/tis_e/foto/2025-2/2025-05/

Rothschenk — Weight distribution according to the CTU Code (60/40 rule of thumb) — <https://rothschenk.de/en/episode-46-weight-distribution-according-to-ctu-code-5-or-10-or-60-40>

TT Club — Is weighing enough? — <https://ttclub.com/news-and-resources/news/article/tt-talk-is-weighing-enough>

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