

Title	IMDG Code 2016 / SUPPLEMENT / IMO/ILO/UNECE Guidelines for Packing Cargo Transport Units / 1
Effective Date	1-1-2012
Invalid from	1-1-2014
Note	Incorporating Amendment 35-10

1 GENERAL CONDITIONS

1.1 Sea voyages are made in a variety of weather conditions which are likely to exert a combination of forces upon the ship and its cargo over a prolonged period. Such forces may arise from pitching, rolling, heaving, surging, yawing or swaying or a combination of any two or more.

1.2 Packing and securing of cargo into/onto a CTU should be carried out with this in mind. It should never be assumed that the weather will be calm and the sea smooth or that securing methods used for land transport will always be adequate at sea.

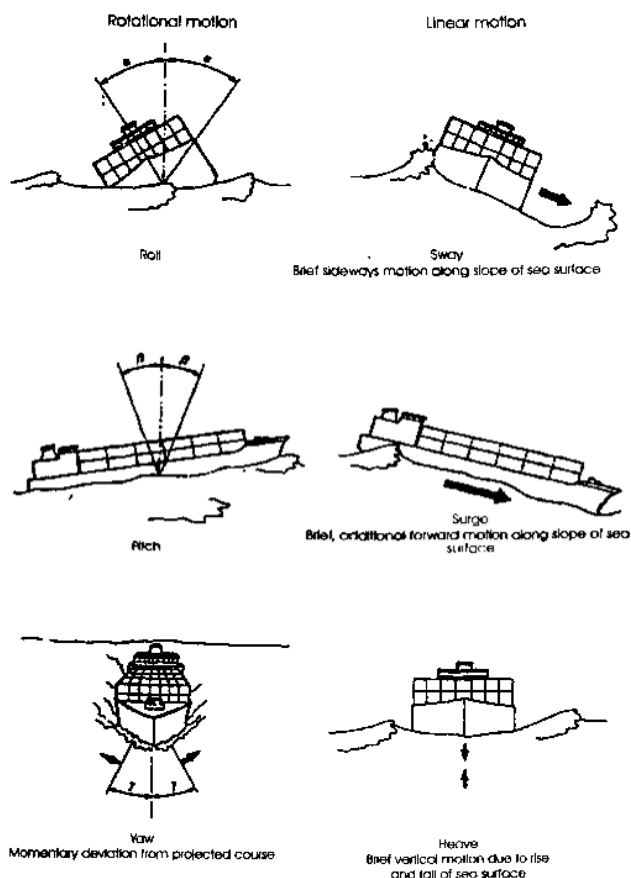


Figure 1 - Examples of ship movement at sea

1.3 During longer voyages, climatic conditions (temperature, humidity, etc.) are likely to vary considerably. These may affect the internal conditions in a CTU which may give rise to condensation (sweating)* on cargo or internal surfaces. Where cargo is liable to damage from condensation, expert advice should be sought.

* See annex 1.

1.4 Road transport operations may generate short-term longitudinal forces upon the cargo and the CTU. They may also cause vibrations that may vary considerably due to different suspension systems, different road surface conditions and different driving habits.

1.5 Rail transport, in addition to subjecting cargo to vibrations (16 Hz), may also lead to shocks as a result of shunting operations. Many railways have organised their operations in such a way as to avoid shunting of railway wagons incurring high forces (e.g. by operating dedicated block trains) or by moving CTUs on wagons with high-performance shock absorbers that are normally able to reduce shunting shock forces. It may be advisable to ensure that such operational features have been established for the rail journey.

1.6 Inland river and waterway transport is generally smooth. It will not normally exert any forces higher than those of road transport on the cargo and the CTU. Diesel engines of inland river and waterway vessels may create some low-frequency vibrations which under normal conditions should not give reason for any concern.

1.7 The following table** provides an example of the accelerations in g's which could arise during transport operations; however, national legislation or recommendations may require the use of other values.

** References:

- Swedish, Finnish and Norwegian national road regulations.
- Code of Practice
- Safety of Loads on Vehicles, United Kingdom Department of Transport.
- UIC prescription - Regolamento Internazionale Veicoli (RIV)
- Loading of Wagons.
- Swedish national regulations on securing of cargo in CTUs for sea transportation.
- The Safety of Passenger Ro-Ro Vessels
- Results of the North West European Research and Development Project.
- IMO Code of Safe Practice for Cargo Stowage and Securing (CSS Code).

Mode of transport	Forwards	Backwards	Sideways
ROAD	1.0g	0.5g	0.5g

RAILWAY			
Wagons subject to shunting ¹	4.0g	4.0g	0.5g (a)
Combined transport ²	1.0g	1.0g	0.5g (a)
SEA			
Baltic Sea	0.3g (b)	0.3g (b)	0.5g
North Sea	0.3g (c)	0.3g (c)	0.7g
Unrestricted	0.4g (d)	0.4g (d)	0.8g

¹ The use of specifically equipped rolling stock is advisable (e.g. long shock absorbers, instructions for shunting restrictions).

² Combined transport means wagons with containers, swap-bodies, semi-trailers and trucks, and also 'block trains' (UIC and RIV).

$$1g = 9.81 \text{ m/s}^2$$

(a) $\pm 0.3 \text{ g}$

(b) $\pm 0.5 \text{ g}$

(c) $\pm 0.7 \text{ g}$

(d) $\pm 0.8 \text{ g}$

1.8 Container movements by terminal tractors may be subject to differing forces as terminal trailers are not equipped with suspension. Additionally, ramps can be very steep, causing badly stowed cargo inside CTUs to be thrown forward or backward.

1.9 Considerable forces may also be exerted on CTUs and their cargoes during terminal transfer. Especially in sea-ports, containers are transferred by shore-side gantry cranes that lift and lower them, applying considerable acceleration forces and creating pressure on the packages in containers. Lift trucks and straddle carriers may take containers, lift them, tip them and move them across the terminal ground.

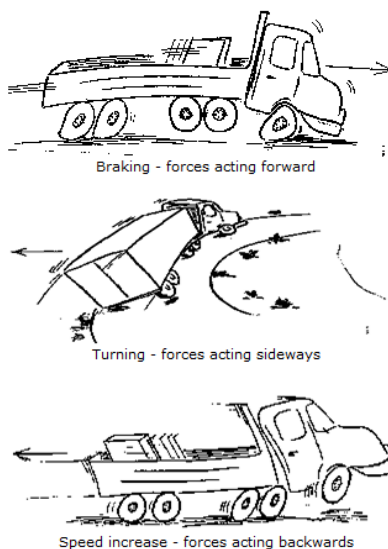


Figure 2 - Forces acting on the cargo during road transport

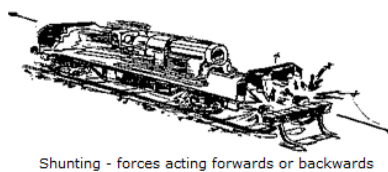


Figure 3 - Forces acting on the cargo during rail transport



The sideways forces are normally the most troublesome

Figure 4 - Forces acting on the cargo during sea transport