Combined traffic

Loading guide applicable to Intermodal Traffic Units

Belgian National **Railways** (**SNCB/NMBS**)

Contents

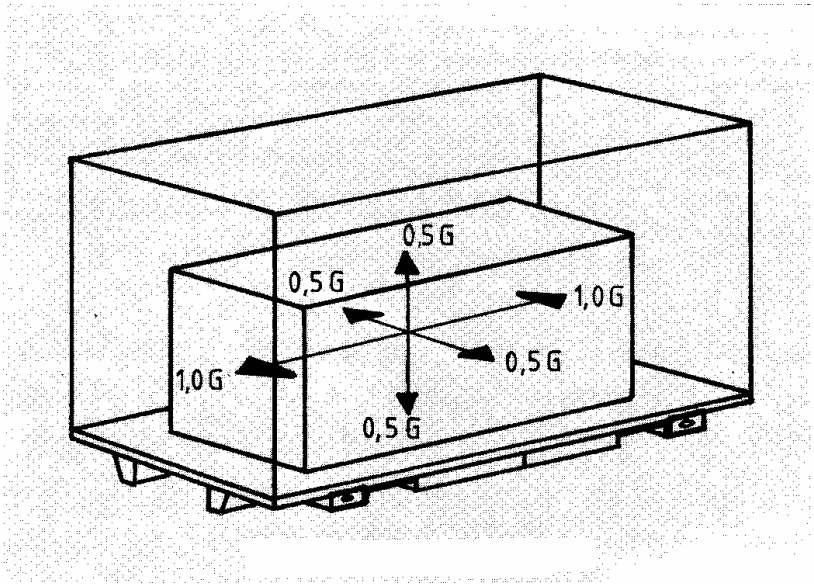
1. Reminder: stresses on ITU's and their contents

During transport ITUs and their load are subjected to the following rail or road stresses:

- Longitudinally (frontward and rearward) up to 1 g;
- Transversally, up to 0.5 g;
- Vertically, up to 0.5 g.

(g: gravitational acceleration: 9.81 m/s²)

Upwards vertical accelerations make goods move during transport.

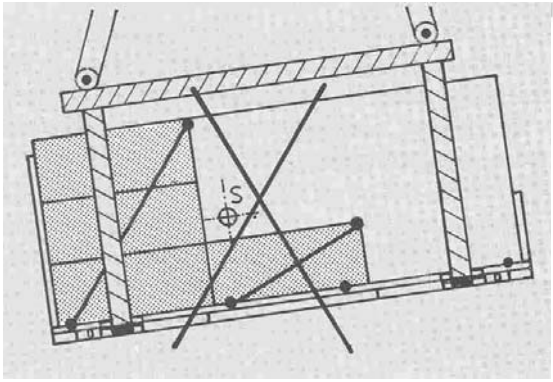


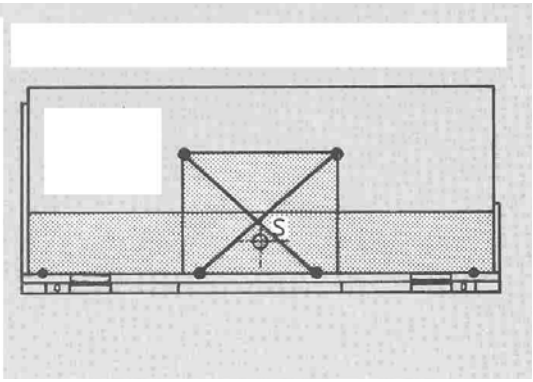
G= gravitational acceleration

2. Fundamental principles

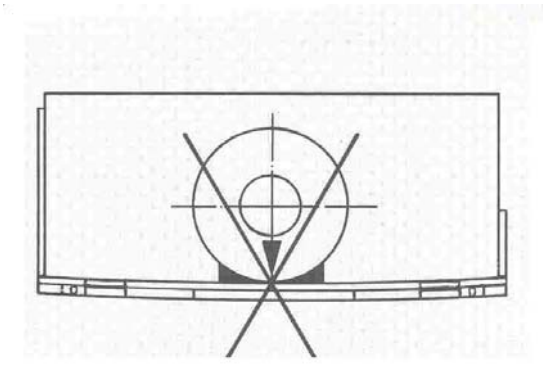
Whatever the kind of ITU, i.e. trailer, swap body, container, flat, etc. and no matter whether it is conveyed by road or rail, it shall be loaded in compliance with the following fundamental rules:

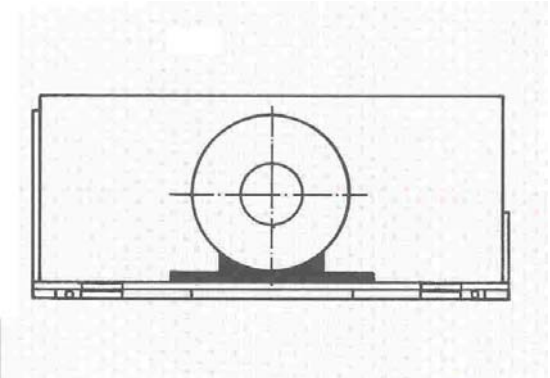
2.1 Particular attention shall be paid to an even distribution of the load over the loading surface of the ITU as a whole, both transversally and longitudinally. The load shall not exceed the outside dimensions of the ITU, unless special securing provisions are applied (loading onto flat wagons).





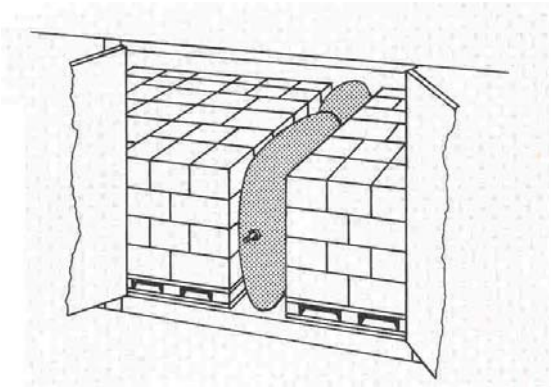
2.2 If it is a large concentrated load, wood or steel pieces of appropriate section and dimensions shall, if necessary, be used so that the load presses down on a sufficient floor surface (and therefore on the frame of the ITU).

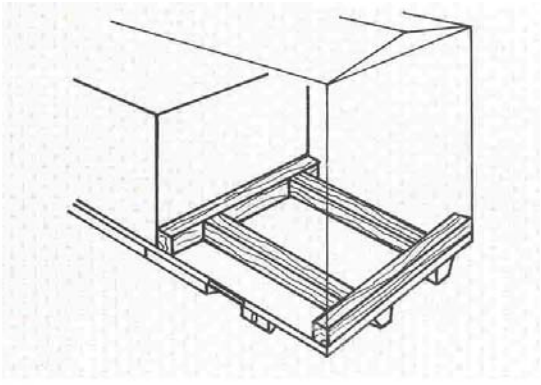




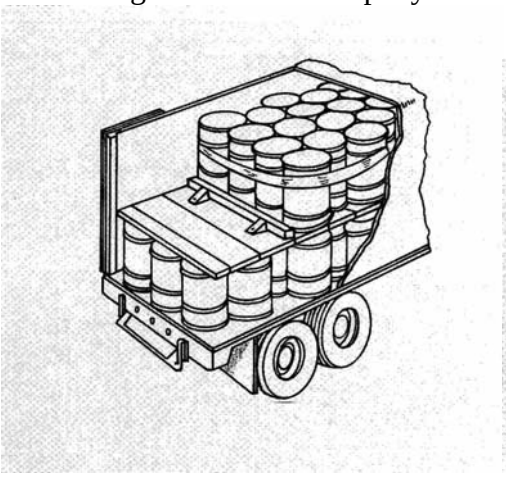
2.3

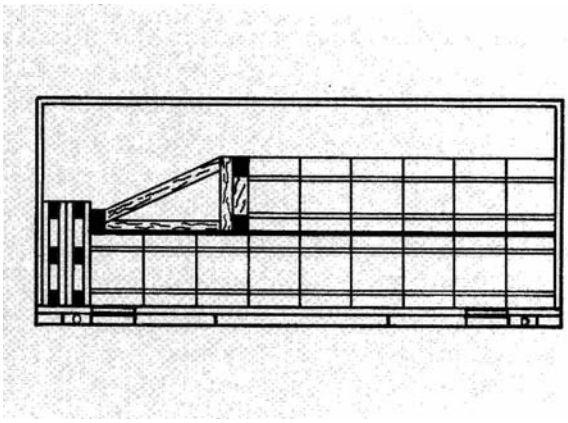
a) Empty spaces within the load shall be avoided in inserting either a loading key or cushions where necessary.



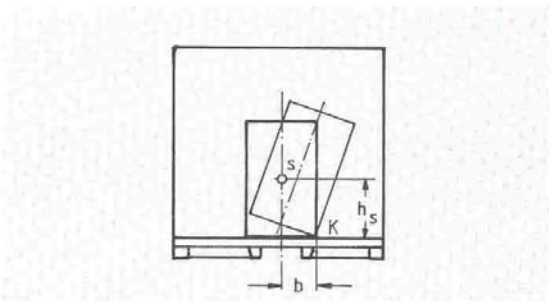


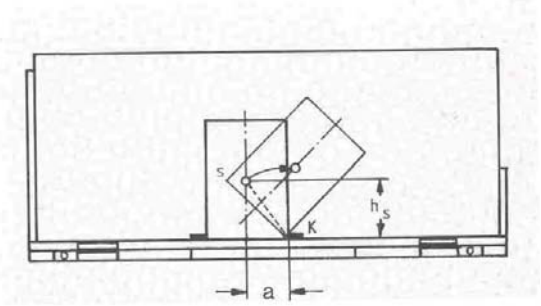
b) Stacking shall only be allowed on condition that the bottom layer covers the whole loading surface. If the top layer is incomplete, it shall be secured.





2.4 Particular attention shall be paid to the stability of the goods, in both the transversal and longitudinal transport direction.

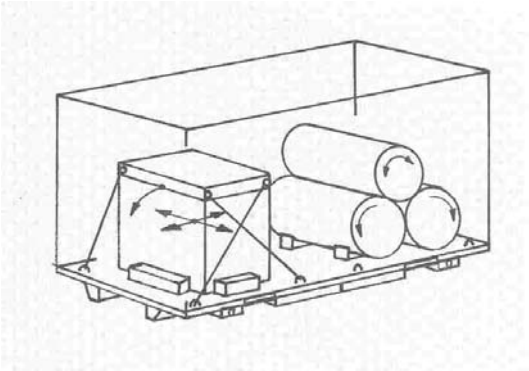




The ratio a/h_s, whether the unit has been scotched or not, shall be equal to or higher than 0.6 longitudinally and the ratio b/h_s shall be equal to or higher than 0.5 transversely.
If the load is subjected to wind (loading on a flat), the ratio b/h_s shall be equal to or higher than 0,7.

2.5

a) Goods shall be correctly secured (both scotching and securing), all the more so, if they are likely, due to vibrations, to roll, tip over, bend over through flattening of their base, etc.



b) To achieve load stability, identical elements or stacks, for instance, shall be held together by means of ligatures or plastic sheets.
c) If there are no side or end walls to hold the goods together, they shall be secured by:
    - strong ligatures;
    - props;
    - air cushions;
    - pallets or boards, vertically placed;
    - inserts that increase the coefficient of friction, etc.

2.5 The door and sliding wall closing device shall be in good condition. The floor shall be clean. If the ITU is sheeted, it is important to only hand over for carriage those units that are in good condition and complete, with all accessories making up their top structure (bows, link-bars, thin sidewall boards, T.I.R. cord in good condition, sheet fixing rings and eyelets, etc.).

2.6 The precautions to take shall be all the greater that the unit weight of goods is big, especially if the load consists in coils; packs of sheets, stone blocks, etc. or the dimensions of the good are so large that it exceeds those of the ITUs and, therefore, those of the transport vehicle (lorry, wagon, trailer, etc.).

2.7 Wooden stands or inserts, with a rectangular profile, shall be laid on their widest face, placed vertically in relation with each other, put where ligatures are to come and shall be approximately as long as the width of the load, without exceeding it.

2.8 As concerns the transport of metal sheets: the thickest, widest or longest sheets shall be put at the bottom of the stack.

3. Loading rules for the transport of:

- **metal sheet or strip coils;**
- **heavy unit loads (slabs, mill rolls, etc.) inside Intermodal Transport Units (ITUs, trailers, containers, swap bodies, etc.).**

a) ITU types

In combined transport, metal sheet coils may only be transported in ITUs designed for that purpose, i.e. those whose frame and floor, where present, have been designed to take the huge concentrated load of that type of goods.

There are:

- ITUs with **longitudinal-axis cradles** (coils being loaded with their axis turned lengthwise), built in the frame, with or without the possibility to shut the cradle room, by means of hinged floor panels, so as to have a floor that covers the entire surface of the ITU,
- ITUs with several **transversal-axis cradles**, built in the frame and distributed over the length of the ITU (coils being loaded with their axis turned transversally),
- ITUs with floor and no cradle built in the frame.

Since it is of the utmost importance for loads to be correctly distributed, a loading diagram (with maximum coil diameters and weights, compulsory locations, etc.) shall on principle be displayed either in or on the ITU fitted with one or several cradles.

Reminder: Any metal sheet coil or units grouped together, of 10 t or more, shall be transported on a (several) **metal springer(s) or cradle(s)**. A coil weighing 10 tons or more mustn't therefore be transported making use of **wooden** pieces and scotches only.

b) As far as the transport of metal sheet coils is concerned, two principles should be born in mind:

- coils shall be **centred both longitudinally and transversally** in the ITU, so as to correctly distribute the loads between the wheels, wheelsets or bogies of the wagon used for carriage;

- metal sheet coils **shall always be scotched laterally** using appropriate tackle (metal bars through the notches of a scotching plate, spring scotching arms, wooden pieces to appropriate dimensions, etc.) that do not normally undergo longitudinal forces such as, for instance, wagon coupling-reactions or shunting-generated stresses.

c) Rules for the transport of metal sheet coils

- In/on the **ITUs with transversal cradles**, inserts increasing the friction (such as a rubber lining covering the sidewalls of the cradle) cannot, on their own, prevent coils from falling off the ITU, as soon as the weight of the coil reaches 2 tons. And transversal securing straps alone are not sufficient either. It is recommended to make up transverse scotching with a sufficient number of straps. The latter shall be protected against possible tearing by special protections, if they are, as is usually the case, in contact with the sharp edge of the coil.

  Reminder: efficient scotching height: 1/8 of the diameter, with a minimum of 20 cm for coils up to 10 tons and, over: 1/8 of the diameter.

- In/on the **ITUs with longitudinal cradle**:

  - transversal scotching is, quite normally, that of the cradle itself (depth: min. 1/12th of the coil diameter but shall be at least 12 cm).
  - longitudinal scotching may, if necessary, be that of floor panels, hinged down, flush with the floor of the sections of cradle left unused. Whether this last possibility exists or not, two indirect-securing straps (straps with a tensioner) shall be thrown and tightened over each separate stable coil or unit (see below).

  As soon as the width of a coil is shorter than $5/10^{th}$ of its diameter and it is therefore likely to fall over longitudinally, it shall be gathered together with other coils of an approaching diameter, by means of metal strips of an appropriate strength, run through the eye of the coils.

- In/on ITUs with no cradle built in the frame (**not advisable**):

  - Metal sheet coils likely to damage the floor because of the narrowness of their supporting surface, of their weight shall be put onto beds.
  - Coils or groups of coils whose unit weight is under or equal to 10 tons shall be placed transversally:
    Each separate unit shall be locked by means of 2 scotches placed so as to take the form of a springer and connected with each other by means of a steel sheet. A steel sheet, minimum 4mm thick, shall be crimped over the three faces of each scotch and screwed to the above surface.
  - Coils over 10 tons and loaded transversally shall not be transported in/on this type of ITU!
  - Coils or groups of coils loaded longitudinally (coil axis turned in the longitudinal direction of the ITU) of a weight under or equal to 10 tons shall be put on sturdy wooden beds.
    Beds shall be used together with side scotches and lashes.

d) Instructions applicable to the transportation of coils on pallets

Reels and coils, because of their shape, are likely to move during transport.
For reasons of weight and safety they shall be kept stationary all the time.
They shall stand upright on the pallet and be tied down to it.
Wrap-ups reducing the coefficient of friction between pallet and coil should not be used.

Securing the coil to the pallet

- Four scotches shall be fitted tightly to the coil to check any movement. Their effective height must be 50 mm.
- To improve support, scotches shall be screwed to the crossbeams of the pallet. Loading staff shall put at least three screws per scotch.
- The coil shall be tightened by means of two metal straps: one in transversal and the other longitudinal direction. Steel straps shall have preference over plastic ones.
- Protective means shall be put where the strap is touching a sharp edge.

If possible, loading staff shall put the coil on the special circular pallet, with an edge to prevent it from sliding off.

Lashing the payload made up of coil and pallet

The payload made up of coil and pallet shall be secured by means of 2 straps (strap minimum strength: 2500 daN). Tied down laterally, the strap around the coil shall assume the shape of a U. The second strap shall be put on the coil in the same way but on the other side of it.
Straps shall be put at the top of the coil, so that they do not slide off to its base or slacken.

e) Rules for the transport of metal strip coils

These coils shall be transported with their axis turned vertically.

Coils shall be distributed as evenly as possible over the surface of the floor and making sure they are centred both transversally and longitudinally.

If several coils have to be stacked on top of each other, making use of wooden inserts, for instance, the stack shall be made dimensionally stable and stable without support (coils with identical or decreasing diameter coming at the top).
Coils and inserts (of appropriate dimensions) of a same stack shall be held together by means of 4 metal strips or straps whose minimum strength shall be 2000 daN.
Those metal strips or straps shall also prevent coils from sliding, however slightly.
To use transversal straps only, as indirect securing, is utterly insufficient.
Transverse scotches shall, if possible, be put at the foot of each stack (wooden pieces nailed to the floor). In such an instance, the securing described below may be dispensed with.
If it is forbidden to nail to the floor, each separate unit thus formed shall be indirectly secured by means of minimum 2 transversal straps (straps with tensioner).
Protection shall be used to prevent straps from getting torn where they come in contact with the sharp edge of coils.

e) Rules for the transport of heavy unit loads (slabs, blooms, mill rolls, etc.)

The fundamental principles under point 2 shall apply: correct distribution of the load, both transversally and longitudinally but also in such a way that it covers most of the floor surface and/or frame, transversal and longitudinal scotching, addition of indirect-securing lashes, etc.

4. Rules for the transport of metal sheets

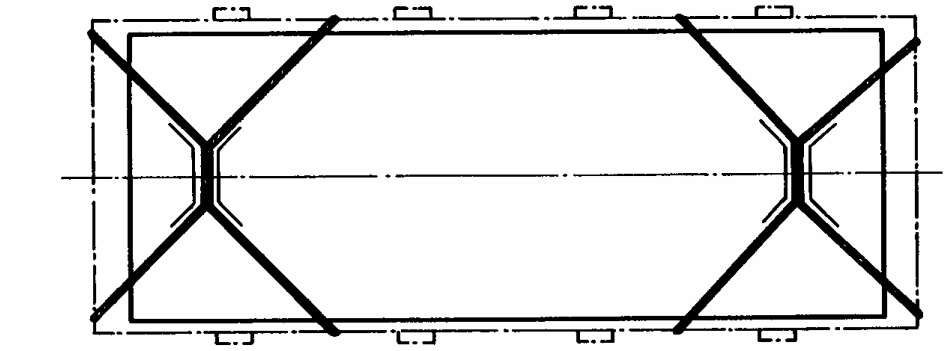
For such transport cases, the recommended loading method shall be that as described under 1.2.4 or 1.2.5 of annex 2, volume 2 of the RIV.

Sheets shall either be stacked one on top of the other or overlap each other and rest directly on the floor of the ITU or on inserts (for the type of insert, it should be referred to point 2).
Individual stacks shall be tightened at least twice. If sheets overlap each other, they shall be tightened at least three times transversally, one ligature securing each overlapping sheet.

Sheets shall exceed the inserts by at least 50 cm.
If the load is standing on top of wooden pieces, its ends shall rest, at the same height, on nailed wooden pieces.

Nature of the lash: steel strip of minimum 14 kN rupture strength or straps and protection or doubled steel wire of at least 5 mm diameter.

The ITU shall be secured longitudinally by the end walls.
If there aren't any end walls or if the distance between these and the load is too big, securing shall be made as shown on the following figure:



The ligatures shown on this diagram are comprised of 4 annealed steel wires whose diameter shall be at least 5 mm.

Sheets shall be held by means of at least 2 ligatures and exceed these by at least 50 cm.
Sheets shall be secured by a ligature every 3 meters.

Securing (ligature) in transversal direction shall be comprised of:

- steel plates with ligatures (rupture strength of at least 20 kN) held to the wagon floor by spikes or nails (leaflet 1.2.4)
  For lengths up to 6 m, the number of steel plates shall be at least 3; for lengths over 6 m, at least 4;

- or 4 annealed steel wires with a diameter of at least 5 mm (leaflet 1.2.5). Ligatures run over the load, pass through the fixing devices on both sides, run then over the load again and are finally twisted on each side. In this way the lateral part of the load is secured by eight twisted wires.

Transversal and longitudinal lashes, made up of 4 annealed steel wires may be replaced (either partly or completely) by an equivalent number of straps with tensioner (minimum strength of the strap: 2500 daN).
Straps shall be located correctly and fitted with adequate protection where they come in contact with the load.

5. Bibliography

- RIV, Annex 2, Loading Rules, Volume 1, Principles;
- RIV, Annex 2, Loading Rules, Volume 2, Goods;
- Emplfehlung für die Ladungssicherung im Hüchepackverkher, Deutsche Bundesbahn – Kombiverkher, 1989.