Informal meeting on Code of Practice for Packing of Cargo Transport Units

at the request of the United Nations Economic Commission for Europe Working Party on Intermodal Transport and Logistics

Geneva and virtual, 29-30 March 2023

Comments to changes to new section 4.2 and Chapter 10

Submitted by the secretariat

Background

This document contains comments received from Germany to changes proposed concerning new section 4.2 of Annex 7 and Chapter 10. To facilitate the understanding of comments made, boxes provide the text with the proposals made for changes on which comments were received.

General remark to the new section 4.2

Transport Stability level

Proposal for a new section 4.2 of Annex 7:

4.2 ~~Tightly arranged cargoes~~**Transport Stability Level, TSL**

4.2.1 Importance of package stability

The term "package" is used to refer to any goods that are enclosed within one or more layers of packaging or secured on, or to, a packaging accessory.

Consignors should ensure that formed packages are capable of withstanding the hazards of environmental exposure, storage, handling and transport. Packages in the form of overpacks should retain their integrity during transport, failure to do so increases the risk of the cargo being damaged or the CTU stability being adversely affected.

To assist Packers in their role, the transport stability of the packages may be determined by practical tests, in which the packages capability of withstanding horizontal forces without substantial deformation is verified. Upon completion of such tests, the package may be marked with its corresponding Transport Stability Level (TSL), as given in table 7.8.

Transport Stability Level TSL	Horizontal acceleration a
TSL 1	$a \geq 1{,}0\ g^a$
TSL 2	$0{,}8\ g \leq a < 1{,}0\ g$
TSL 3	$0{,}5\ g \leq a < 0{,}8\ g$
TSL 4	$0{,}35\ g \leq a < 0{,}5\ g$
TSL 5	$0{,}18\ g \leq a < 0{,}35\ g$
[a] g = gravity acceleration 9,81 m/s^2 Note: Below 0.18 g no TSL marking allowed	

Table 7.8 – Transport Stability Level

The TSL when associated with the CTUs boundary strength can indicate the need for additional securing of the cargo and should be determined in each specific case.

The proposed new text applies to the stability of unit loads in intermodal transport. It is very confusing that the proposed text defines such unit loads as packages and provides the definition "The term *package* is used to refer to any goods that are enclosed within one or more layers of packaging or secured on, or to, a packaging accessory". Following this approach, we would have two meanings of the word package in the CTU Code: the normal package, consisting of the goods and their enclosure, and the package of which the stability needs to be determined, which means several layers of packages on a pallet.

Such confusion should be avoided. In section 4.2 which deals with the transport stability of unit loads, the correct word "unit load" instead of "package" should be used. *The text of section 4.2 should be revised accordingly, to ensure consistency of definitions.*

For this purpose, following wording is proposed for the first sentence in 4.2.1:

"The term "unit load" means that a number of packages or articles are placed or stacked on and secured by strapping, shrink wrapping or other suitable means to a load board, such as a pallet."

Remarks to table 7.9

The lowest required TSL for securing the cargo using bottom blocking only			
Mode of transport	**Sideways**	**Forward**	**Backward**
Road	TSL3	TSL2	TSL3
Rail	TSL3	TSL3	TSL3
Sea Area A	TSL3	TSL2	TSL2
Sea Area B	TSL2	TSL1	TSL1
Sea Area C	TSL2	*Not advised*	*Not advised*

Table 7.9 – Required TSL for bottom blocking as the sole cargo securing method

The values for the sea mode need to be reconsidered. The applicable acceleration factors are listed in section 5.3 of the CTU Code. For securing in longitudinal direction, it has to be considered that the vertical acceleration factor is less than 1. For sea area A it is 0.5, for sea area B it is 0.3 and for sea area C it is 0.2. This needs to be considered when determining the TSL level, but there is no justification for a conclusion that no TSL is applicable for sea area C.

The TSL of a unit load can be determined through practical tests by exposing the unit load to the horizontal acceleration corresponding to a certain inclination angle, which is determined by the expected acceleration factor and the internal friction of the goods or packages in this unit load. The relation between these parameters is expressed by following equation:

$$\gamma = \frac{c_{x,y} - \sin\varphi}{c_z - \cos\varphi} \qquad (1)$$

A direct calculation of the inclination angle is possible by following equation:

$$\sin\phi = \frac{r + \gamma \cdot \sqrt{1+\gamma^2 - r^2}}{1+\gamma^2} \qquad (2)$$

$$r = c_x - \gamma \cdot c_z \qquad (3)$$

The first equation permits a cross check of the result obtained by the second equation.
In above equations, γ is equivalent to μ for blocking against sliding, and equivalent to the ration L/H for blocking against tipping. Calculation with γ = 0.45 obtains the following result:

Sea area	Longitudinal (C_x)	Vertical (C_z)	Inclination angle
A	0.3	0.5	28.1°
B	0.3	0.3	32.9°
C	0.4	0.2	40.6°

Above inclination angles are taken to receive the corrected C_x value, which is used to determine the applicable TSL level. By transformation of equation (1), equation (4) is obtained and provides a result for C_x, corrected to the test condition, where C_z is 1.0.

$$C_x = \gamma\,(1 - \cos\varphi) + \sin\varphi \qquad (4)$$

Sea area	Longitudinal (C_x)	Vertical (C_z)	Corrected C_x value
A	0.3	0.5	0.53
B	0.3	0.3	0.62
C	0.4	0.2	0.76

The corrected C_x value has to be applied for the determination of the TSL level, because the inclination test is carried out at a condition where the vertical acceleration C_z is 1.0 g, where however at sea, the vertical acceleration is lower. According to table 7.8, the resulting TSL level would be TSL 3. However, as also securing against longitudinal tipping needs to be considered, the TSL level for sea areas B and C needs to be increased to TSL 2.

As consequence from above considerations, table 7.9 must be corrected and should read as follows:

The lowest required TSL for securing the cargo using bottom blocking only			
Mode of transport	**Sideways**	**Forward**	**Backward**
Road	TSL3	TSL2	TSL3
Rail	TSL3	TSL3	TSL3
Sea Area A	TSL3	TSL3	TSL3
Sea Area B	TSL2	TSL2	TSL2
Sea Area C	TSL2	TSL2	TSL2
The TSL values for the sea areas in longitudinal direction apply to $\mu < 0.5$			

Remarks to figure 7.38

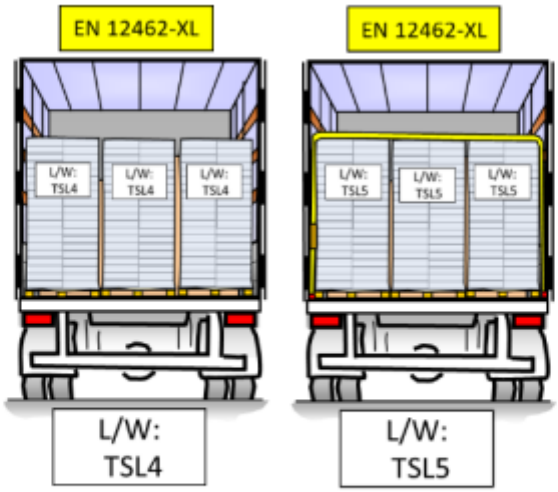

Figure 7.38: During transport in a road vehicle complying with standard EN 12642-XL, packages marked with TSL 4 or better may be secured by blocking against the CTU's sides only, whilst packages marked with TSL 5 needs additional securing measures, e.g. top-over lashings.

Figure 7.38 and accompanying explanation do not match the table 7.10. The title of both trucks in the figure 7.38 needs to be changed to "EN 12642-L" (instead of "EN 12462-XL"). The explanation should be worded as follows:

"Figure 7.38: During transport in a road vehicle (L-vehicle, curtainsider) complying with standard EN 12642:2016, packages marked with TSL 4 or better may be secured by blocking against the CTU's sides only, whilst packages marked with TSL 5 needs additional securing measures, e.g. top-over lashings."

Remarks to 4.2.4.3

4.2.4.3 TSL in combination with the Quick Lashing Guides

The lashing tables in the Quick Lashing Guides (QLG) in Informative material IM5 are based on rigid packages and the assumption that sliding occurs between the bottom of the package or package accessory and the CTU floor. However, this is not the case for packages with low transport stability, which may tip earlier than indicated by their shape and structure indicates due to substantial deformation or sliding may occur within the package.

When using the Quick Lashing Guide (QLG) to identify the number of lashings required to prevent a package, with a given cargo mass, from sliding the maximum friction factor for a declared TSL can be identified in table 7.11 below.

Transport Stability Level TSL	Maximum friction factor for deciding μ
TSL 1	*1.0*
TSL 2	*0.80*
TSL 3	*0.50*
TSL 4	*0.35*
TSL 5	*0.15*

Table 7.11 – Maximum friction factors to use in the QLG for different TSLs

This section applies to IM 5 “Quick Lashing Guide”. As this section is only relevant for the use of IM 5, it should be included in IM 5 and not shown in Annex 7. Therefore, *this section should be deleted here.*

Remarks to the proposal for changes to Appendix 5 of Annex 7.

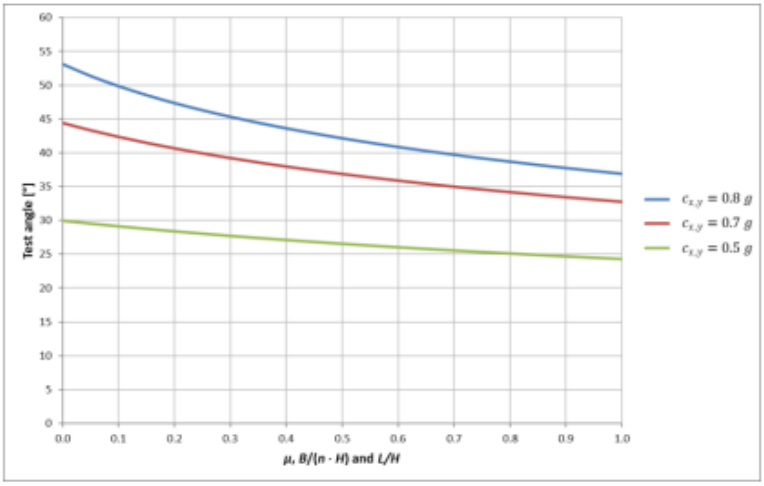

Figure 7.~~6~~398

Example:

If μ and $\frac{B}{n-H}$ is 0.3 ~~at~~ **for sideways** accelerations ~~sideways at~~**in** transport in sea area B (c_y = 0.7g) the cargo securing arrangement should be able to be inclined to approximately 39°, according to ~~the diagram~~**figure 7.98 and table 7.15**

In the table **7.15** below the inclination α is calculated for different γ factors at the horizontal accelerations ($c_{x,y}$ = *0.8* g, *0.7* g and *0.5* g and c_z = *1.0* g).

The γ factor is defined as follows:

μ, $B/(n \cdot H)$ and L/H, as required in section 4 of this appendix.

$c_{x,y}$ / Y factor	0.8g	0.7g	0.5g
	Required test angle α in degrees		
0.00	53.1	44.4	30.0
0.05	51.4	43.3	29.6
0.10	49.9	42.4	29.2
0.15	48.5	41.5	28.8
0.20	47.3	40.7	28.4
0.25	46.3	39.9	28.1
0.30	45.3	39.2	27.7
0.35	44.4	38.6	27.4
0.40	43.6	38.0	27.1
0.45	42.8	37.4	26.8
0.50	42.1	36.9	26.6
0.55	41.5	36.4	26.3
0.60	40.8	35.9	26.0
0.65	40.2	35.4	25.8
0.70	39.7	35.0	25.6
0.75	39.2	34.6	25.3
0.80	38.7	34.2	25.1
0.85	38.2	33.8	24.9

Figure 7.98 and table 7.15 do not contain values for $C_x < 0.5$ and for $C_z < 1.0$. Therefore, this figure and table cannot provide inclination angles for application in longitudinal direction in case of sea transport. As long as no values are provided for inclination angles for application in longitudinal direction at sea, it should be accepted to use the obtained angles from this figure or from this table to carry out the inclination test both in transverse and longitudinal direction.

Therefore, following remark should be included after table 7.15:

*"For sea areas A, B and C, it is acceptable to use the obtained angles for cargo securing in transverse direction to c*arry out the inclination test both in transverse and longitudinal direction."

Remarks on proposed changes to chapter 10

The inclusion of the proposed section 10.4 would contradict the status of the deliberations in the 8th session of the IMO Subcommittee for Carriage of Cargoes and Containers (CCC 8) regarding the International Maritime Dangerous Goods Code (IMDG Code), which is mandatory for the transport of packaged dangerous goods by sea. The IMDG code does not require the specification of the SAPT (self-accelerating polymerization temperature). Therefore, it makes little sense to recommend specifying this temperature in the CTU Code, especially since it is not specified in what form this information is to be transmitted. This information is usually not mentioned in safety data sheets. With respect to dangerous goods, the CTU Code should refer only to the mandatory requirements provided in the IMDG Code and should not create additional provisions. Therefore, the proposed section 10.4 should not be included.