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**PROPOSAL FOR REGULATORY IMPROVEMENT ON LOAD ASSUMPTIONS FOR  
ROUTINE CONDITIONS OF TRANSPORT**

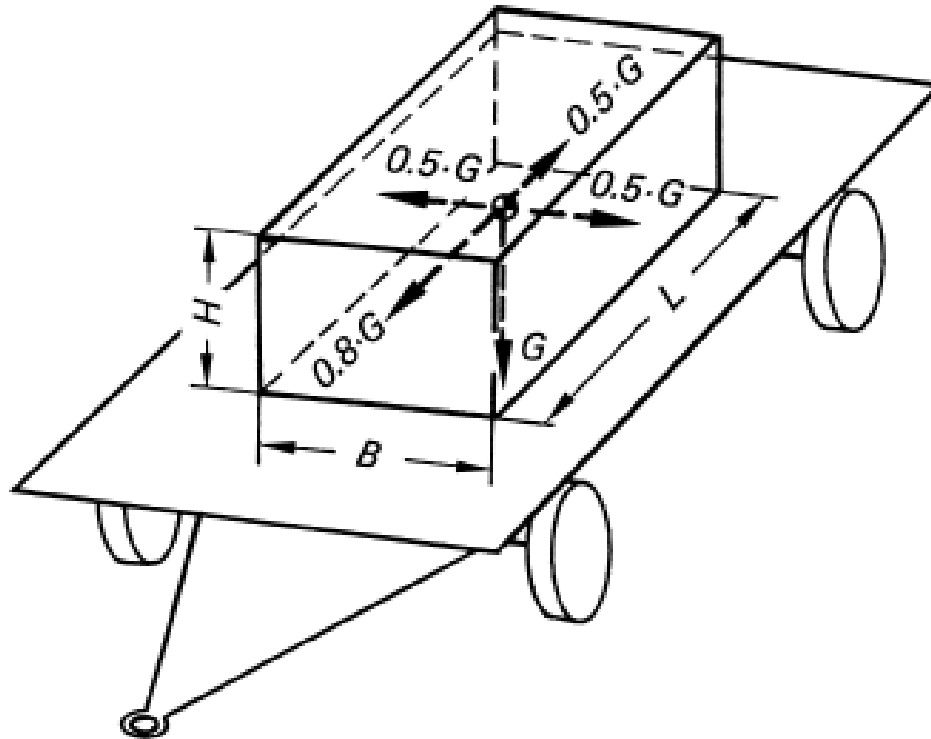
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This paper was withdrawn because of discussions about routine conditions of transport during international meetings at IAEA shortly before PATRAM. Thereafter BAM has revised its opinion on the topic and refrained from publishing the article. The presentation which follows, however, addresses the new developments.

# PROPOSAL FOR REGULATORY IMPROVEMENT ON LOAD ASSUMPTIONS FOR ROUTINE CONDITIONS OF TRANSPORT



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## IAEA Safety Standards

for protecting people and the environment

Advisory Material for the  
IAEA Regulations for the  
Safe Transport of  
Radioactive Material

Safety Guide

No. TS-G-1.1 (Rev. 1)

**Better load case  
information for routine  
conditions of transport by a  
fundamental revision of  
Appendix IV**



TABLE IV.1. ACCELERATION FACTORS FOR PACKAGE RETENTION SYSTEM DESIGN

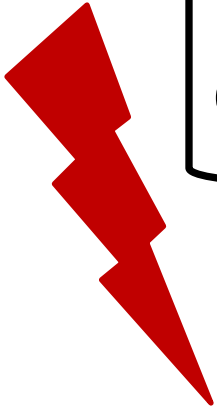
Mode	Acceleration factors		
	Longitudinal	Lateral	Vertical
Road	2g	1g	2g up, 3g down
Rail	5g	2g	2g up, 2g down
Sea/water	2g	2g	2g up, 2g down
Air <sup>a</sup>	1.5g (9g forward)	1.5g	2g up, 6g down

- (1) Introduction**
- (2) Principal Ways of Improvement**
- (3) General Proposal**
- (4) Proposal more detailed**
- (5) Summary & Final Remarks**

(1) **Facilitation of international transport**

(2) **Appendix IV of the IAEA Advisory Material TS-G-1.1 is an important reference for load case information about transport of RAM packages under routine conditions**

(3) **Obvious deficiency of Advisory Material load case data for routine conditions of transport**



**IAEA Technical Meeting-44891, Vienna, July 15-19 2013 decided the establishment of an **international working group on acceleration and stacking****

Para. IV.8 → "These acceleration factors represent the package inertial effects, and are **simultaneously applied** ..."


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**combination** / rail shunting / normal conditions of transport / heavy haulage / dead weight / quasi-static forces or force pulse waveform / speed limits / consistency of Table IV.1 and IV.2 / cyclic load cases ...

**Question must be answered by the international working group on acceleration and stacking.**

### **Some aspects of the Terms of Reference**

- Identify the relevant standards, guides and regulations ...
- Identify the scope and limit conditions for application of the recommended levels of forces ...
- Collect the results of the available acceleration campaign measurements ...
-  ▪ Revisit the text of appendix IV of TS-G- 1.1 ...

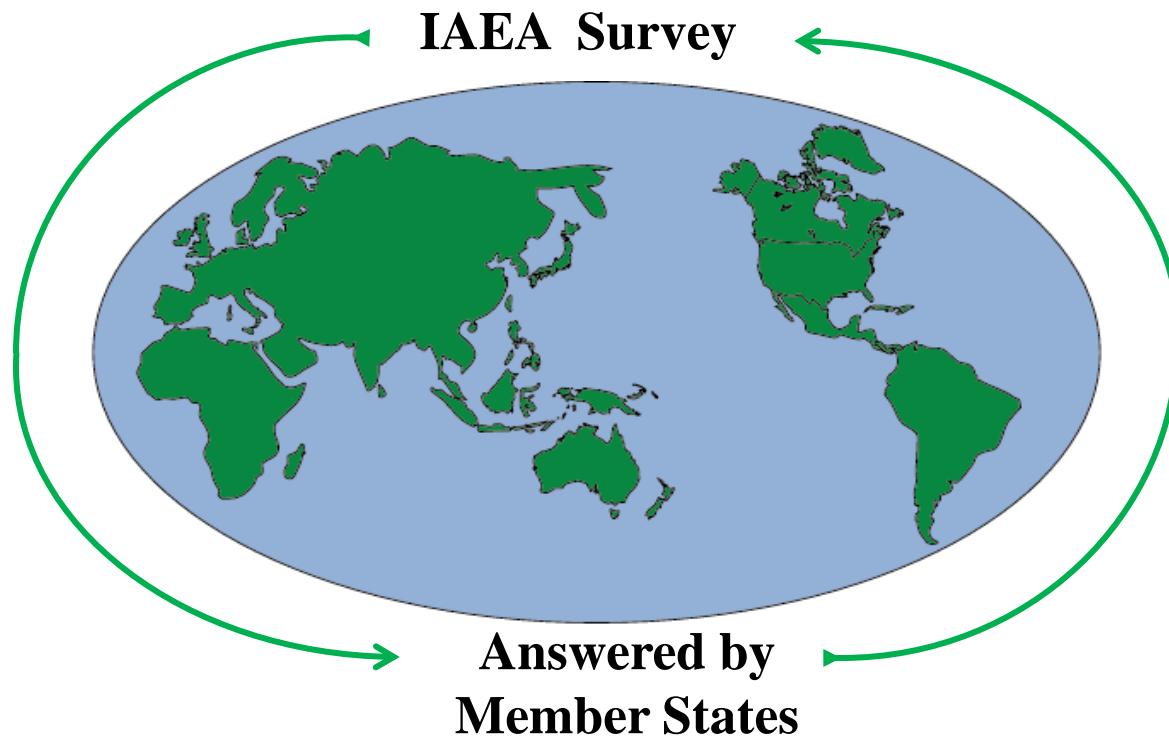
**IAEA TM-44891, Vienna, July 15-19 2013**

- (1) Deletion of data: No load case data better than not reasonable values ?**
- (2) Slight improvements**
- (3) Acceleration values according to different types of packages?**
- (4) Acceleration values according to classes of packages mass, speed limits, inside buffers, with or without of rail shunting ...**
- (5) Most likely more → [Proposal by BAM](#)**



Appendix IV, Advisory Material TS-G-1.1, modified Paragraph IV.9

“The values given for each mode are in accordance with most national and international regulations.”



## *Advantage / Disadvantage*

## *Applicable to*

### **Measurement & Simulation**

*precise* load case  
information  
*restricted* to specific  
situation/condition

*Specific conditions*  
design, vehicle type,  
route, heavy haulage,  
speed limits ...



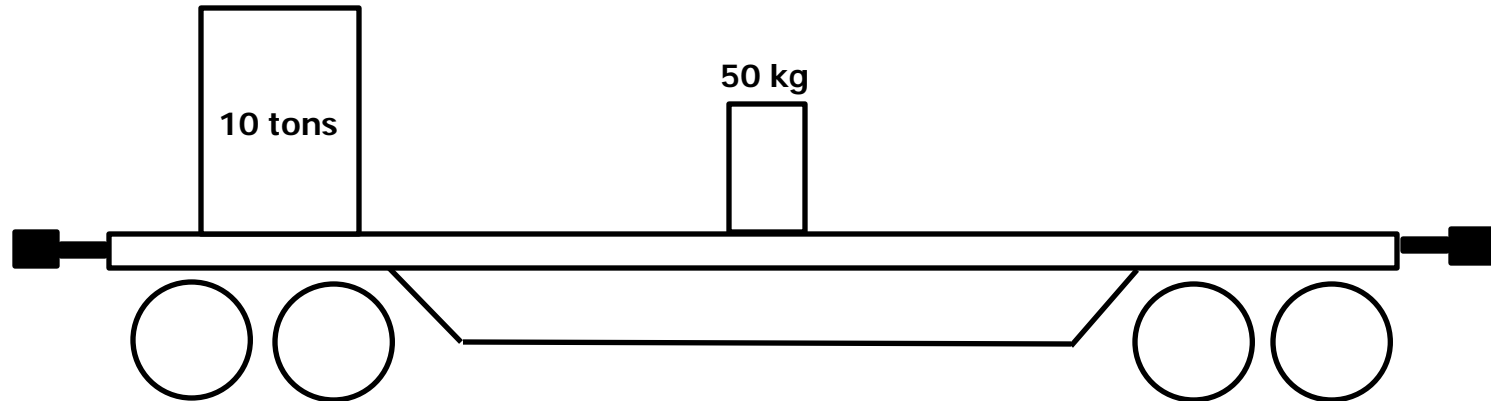
### **Technical Standards**

*established & approved*  
No special reference to  
RCT

*General conditions*  
*all member states,*  
*many types of vehicles,*  
*wide mass range*

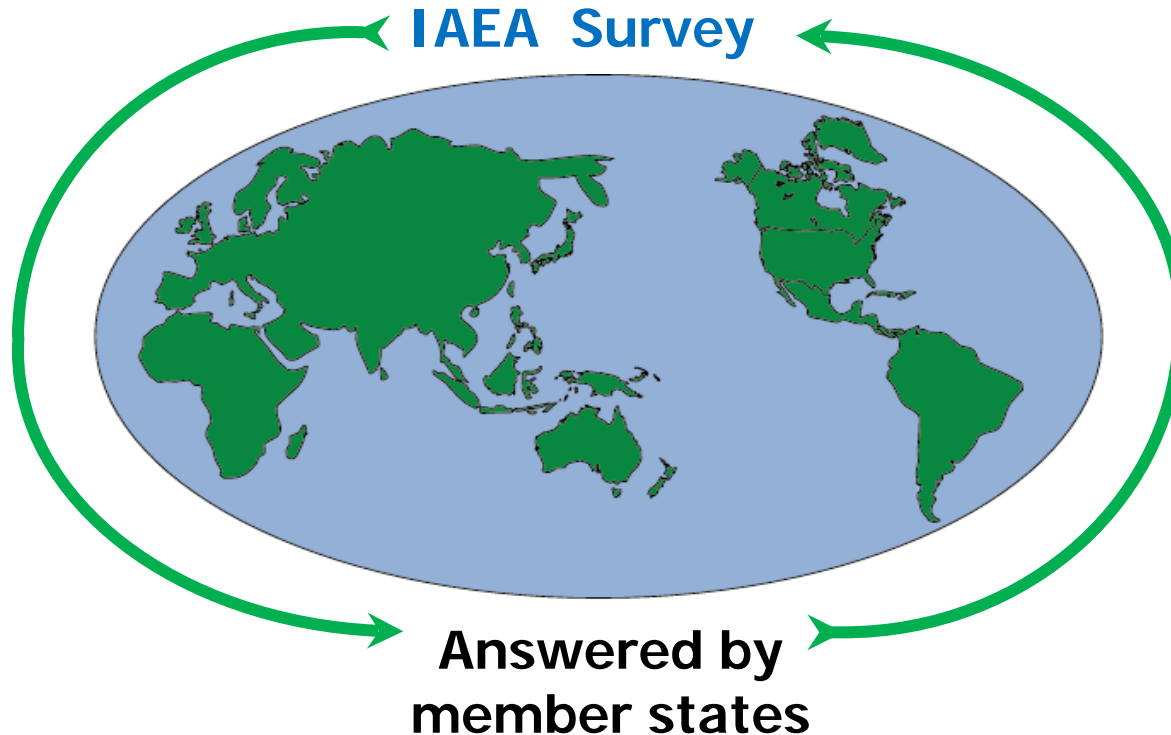
Stage		Description
1	Definition Standard Case	<p><b>General Conditions:</b> Enabling that the comparison of load case data from technical regulations and standards for routine conditions of transport is possible.</p>
2	Improvement of Guidance (e.g. Table IV.1)	<p><b>General Conditions:</b></p> <ul style="list-style-type: none"> <li>➡ survey of guidelines in member states</li> <li>➡ up to date summary of acceleration values and criteria</li> <li>➡ refresh reference list and member state acceptance</li> </ul>
3	Exceptional Case(s)	<p><b>Specific Conditions:</b></p> <ul style="list-style-type: none"> <li>➡ consideration of frequent non-standard situations</li> <li>➡ examples of simulations &amp; measurements</li> </ul>

**Definition of the standard case** (to make regulations comparable)



- Design: two bogies, bogie distance, track gauge, vehicle length and so on
- Mass ratio between the masses of the package and the freight wagon
- No particular routes and vehicles, maybe speed restriction, rail shunting possible
- **Connection to strength criterion?**

**Standard case was clarified**

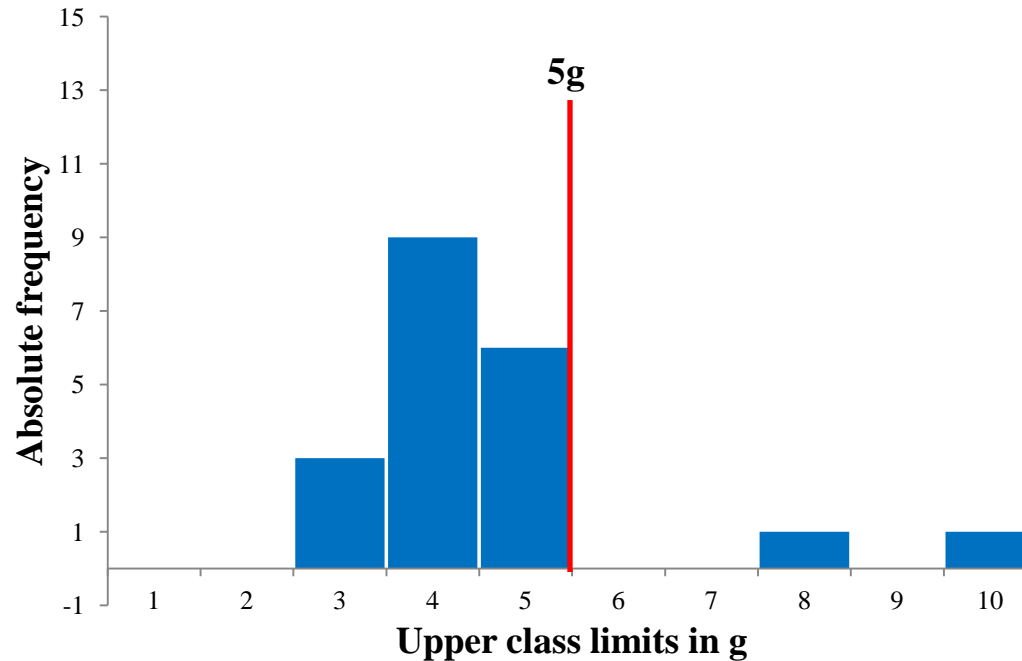


**Which standards/codes incl. acceleration values  
and criteria are accepted?**

**Is there a need of minimal combination of  
acceleration values?**

(Survey results for the standard case)

**Sample of accelerations in one direction**



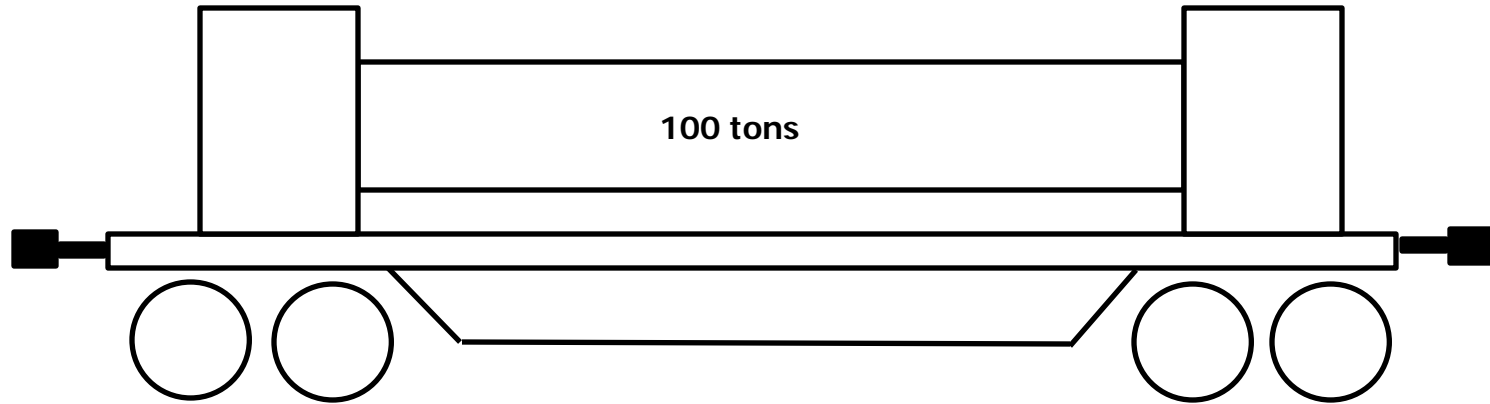
**One not too high value covering the bulk of values taken for Table IV.1**



**Few outliers listed in Table IV.2**

**Substantiation of Table IV.1 and IV.2**

## What is about cases outside the standard case?



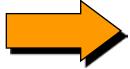
No to deal with every possible constellation of routine transport

- Restriction on exemplary cases for example by a survey of test drive measurements
- Important here: Heavy haulage, acceleration without rail shunting, maybe inner buffers and special designs of freight wagons
- Representation of the survey results possibly in a separate report

- (1) Guidance of Advisory Material is reference No1 for load case data and safety criteria applied internationally**
- (2) Present situation: Load case data *deficient* for a clear international application**
- (3) Because of (1) and (2): IAEA TM-44891 decided to establish an international working group on acceleration and stacking**
- (4) First task of WG is to define the precise goal. What kind of guidance should be given? Several options exists.**



- (5) International survey could clarify different approaches and values for standard and non-standard situations of transport**

 **possible outcome: up-to-date reference list(s)**
- (6) Our proposal focus on a separation between technical guidelines for standard transport situations and mainly measurements for exceptional circumstances like heavy haulage.**
- (7) Improvement / International harmonization of load case data is a challenge.**