

(int'l) Transport of NORM

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EAN-NORM 4th WS



IAEA Safety Standards

for protecting people and the environment

Regulations for the Safe Transport of Radioactive Material

2005 Edition

Safety Requirements
No. TS-R-1



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TS-R-1 does not apply to (exclusion)

- (§ 107): Radioactive material moved within an establishment (e.g. mining/processing site) which is subject to appropriate safety regulations in force and where movement does not involve public roads and railway
- (§ 401): Natural material and ores containing naturally occurring radionuclides which are either in their natural state, or have only been processed for purposes other than for extraction of the radionuclides, and which are not intended to be processed for use of these radionuclides, provided the activity concentration of the material **does not** exceed 10 times the values specified in Table 2,



but when it does....

- *Objective of TS-R-1:*
 - *To protect persons, property and the environment from the effects of radiation during transport of radioactive material*
 - Containment of the radioactive contents
 - Control of external radiation levels
 - Prevention of criticality: and
 - Prevention of damage caused by heat



Definitions

- **Consignment** : any *package* or *packages*, or load of *radioactive material*, presented by a *consignor* for transport
- **Consignor**: any person, organization or government which prepares a *consignment* for transport.
- **Carrier**: any person, organization or government undertaking the carriage of *radioactive material* by any means of transport
- **Consignee**: any person, organization or government which is entitled to take delivery of a *consignment*



Definitions (cont' d)

- **Package (Collo)**
 - *Excepted package;*
 - *Industrial package Type 1 (Type IP-1);*
 - *Industrial package Type 2 (Type IP-2);*
 - *Industrial package Type 3 (Type IP-3);*
 - ***Type A package;***
 - *Type B(U) package;*
 - *Type B(M) package;*
 - *Type C package.*

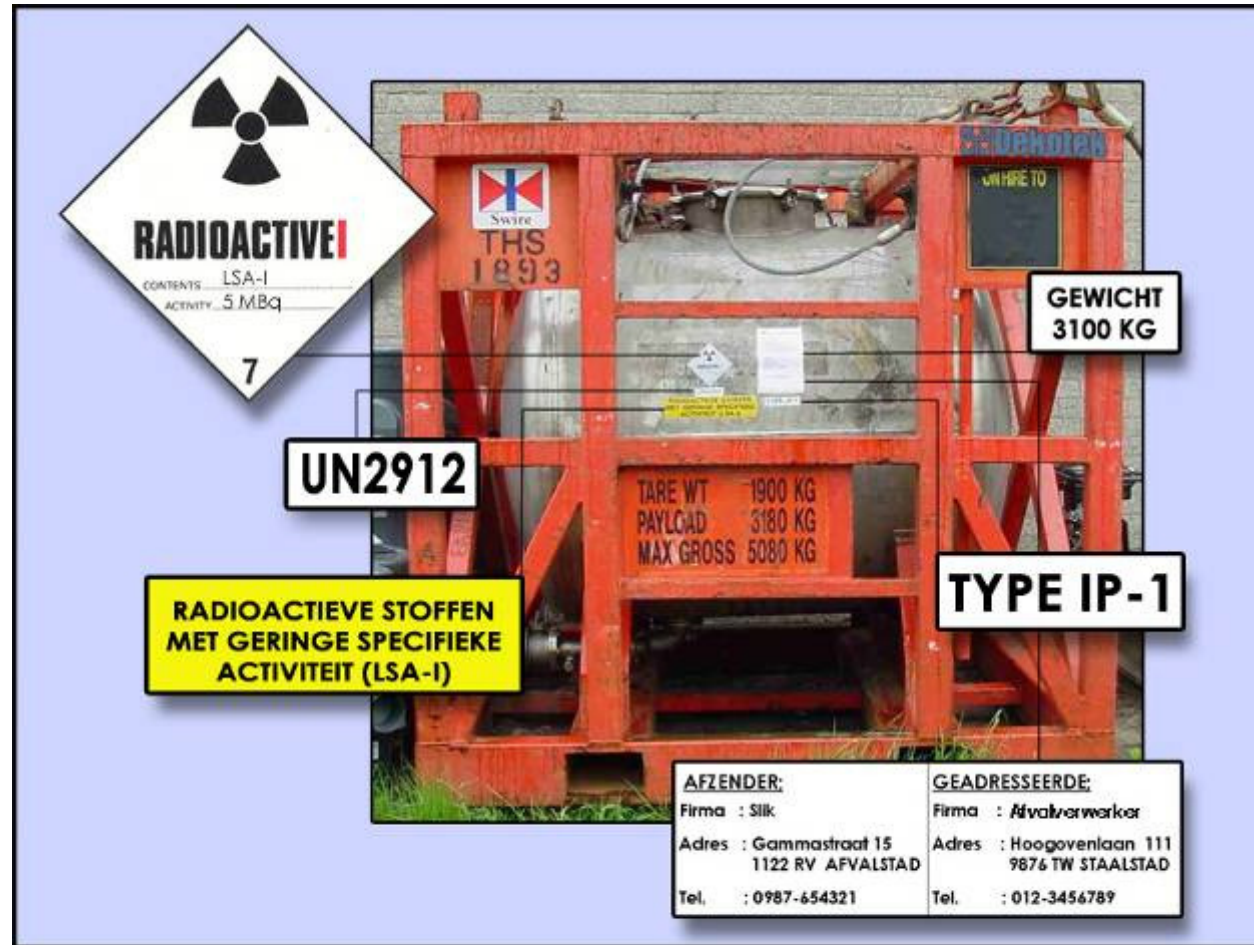


Definition (cont'd)

- *Low specific activity (LSA) material* shall mean *radioactive material* which by its nature has a limited *specific activity*, or *radioactive material* for which limits of estimated average *specific activity* apply. External shielding materials surrounding the *LSA material* shall not be considered in determining the estimated average *specific activity*.



Industriël package (IP-1)



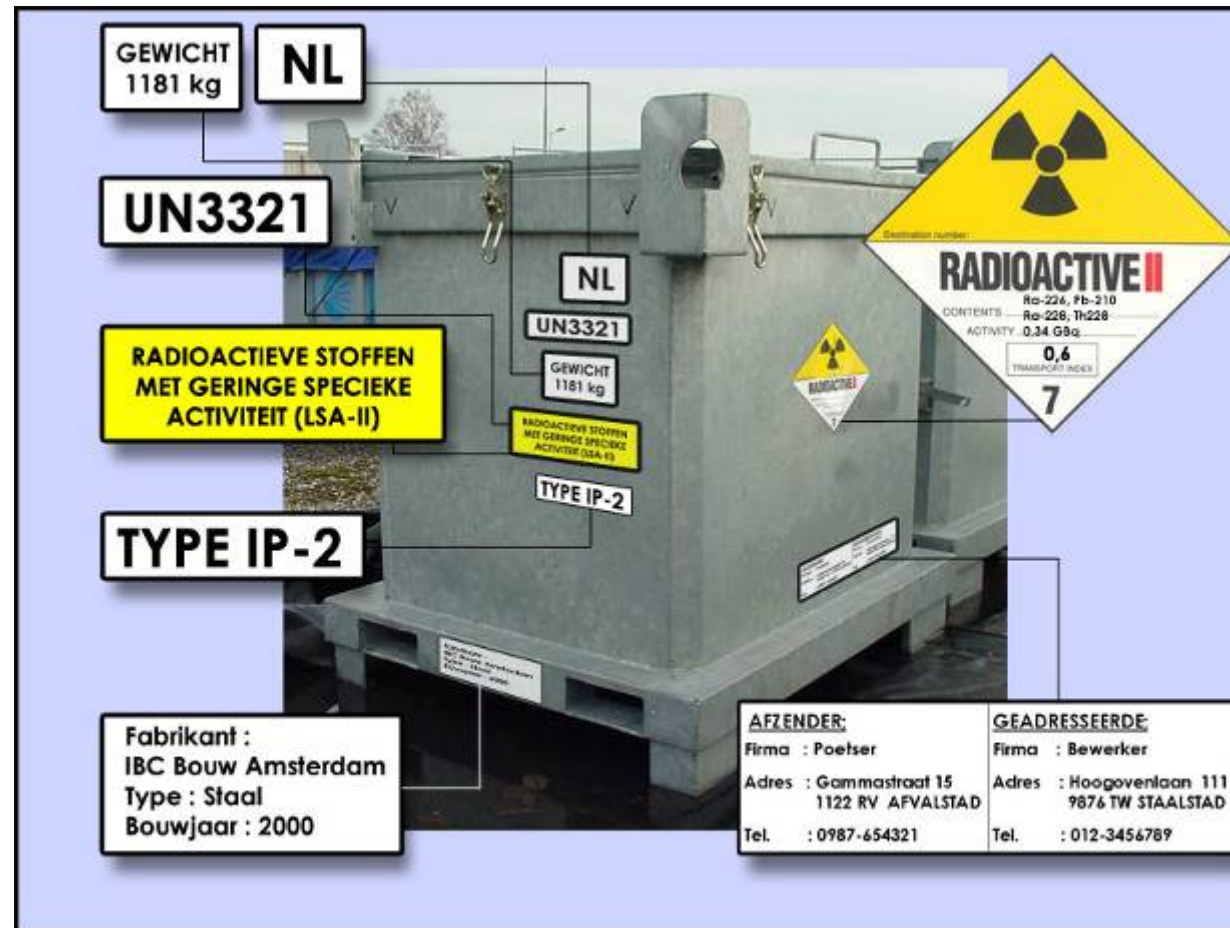
Transport van LSA-I materiaal in verpakking type IP-1: Stoffen met geringe specifieke activiteit.



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Industrial Package (IP-II)



IBC verpakking van het type IP-2 ten behoeve van het transport van stoffen met geringe specifieke activiteit (LSA-II).



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placarding



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Related IAEA publications

- Advisory Material for the IAEA regulations for safe transport of radioactive material (TS-G-1.1)
- Planning and preparing for emergency response to transport accidents involving radioactive material (TS-G-1.2)
- The management System for the transport of Radioactive Material (TS-G-1.4)



Radiation Protection Programme

- TS-G-1.3
 - Systematic and structured way of the framework of controls applied by transport (Consignor, Carrier, Port operator and Consignee)
 - To provide adequate consideration of RP measures
 - To ensure that RP system is adequately applied
 - To enhance Safety Culture
 - To provide practical measures to meet RP objectives



Radiation exposure in the transport of heavy sands (ARPANSA 2008)

- Dose in 16 different scenario's of transport investigated using γ -spec. TLD and PAS.
 - Transport of concentrate to concentrator
 - Transport of HMC from mine to plant
 - Transport of end product from plant to wharf
 - Transport of end product to customer
 - by road, rail and sea
- Highest exposure of worker 0,7 mSv per annum



European Rules

- European agreement about international transport of Dangerous Goods by road (ADR)
- Transport of Dangerous Goods by rail (RID)
- Transport of dangerous Goods by water (ADN and ADN R)



Class

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable liquids
- Class 4: Flammable liquids, self reacting substances
- Class 5: Oxidising substances, Organic peroxides
- Class 6: Toxic substances, infectious substances
- **Class 7: Radioactive material**
- Class 8: Corrosive substances
- Class 9: Misc. Dangerous substances and articles



When using ADR ?

- Above exemption levels and NORM (10 x EL)
- Above exempted contamination levels
 - $> 0.4 \text{ Bq/cm}^2$ for β - and γ -emitters
 - $> 0.04 \text{ Bq/cm}^2$ α -emitters
- Till maximum activity levels
 - A2 ($< A1$)
 - A1 (special arrangement) \rightarrow certificate



Dutch/Belgium Transport Publication

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Dutch regulation for safe transport of radioactive material

- Transport of fissile material, ore and radioactive materials Decree (1969)
- Prescriptions in Regulation about Transport of dangerous goods by land (VLG) are applicable
 - In-, out-, transit and storage during transportation of radioactive materials are arranged
 - De Recommendations of IAEA relating to transport of dangerous goods are implemented



Belgium regulation for safe transport of radioactive material

- In Radiation Protection Decree (ARBIS) chapter IV deals with in-,out- en transit of shipments.
- Permits are issued by Nuclear Agency (FANC).



Australian regulation for safe transport of radioactive material

- Code of Practise for the safe transport of radioactive material (ARPANSA)
 - Adopts TS-R-1
 - Modifying factor (10 x) applies to bulk NORM material or individual items
 - Operator establish a NORM Management plan and discusses this with regulator (ARPANSA)



Different interpretation of LSA

- LSA-I definition in IAEA TS-R-1(2009):
 - exceed 30 times the values for activity concentration specified in paras 402–407
 - NORM: 1 Bq/g “times 10’ OR 1 Bq/g ‘times 30’ OR “times 10 times 30” ?
- Australians interpret it like South Africans
 - 1 x 10 x 30 Bq/g
- Dutch and Belgiums use
 - $\text{Bq/g} < 30 \times \text{EL} \rightarrow \text{LSA I}$
 - $\text{Bq/A2} > 0.001 \rightarrow \text{LSA II}$
 - $\text{Bq/A2} > 0.002 \rightarrow \text{LSA III}$



Why a booklet about NORM transport?

- To avoid different interpretation
- To increase knowledge and awareness of radiological issues
- To combine of Dutch/Belgium booklet and Australian examples of transport of NORM



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Thank you for your attention



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