Practical cases of NORM transport

Problems and solutions

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2016 Rio norm VIII

INTRODUCTION

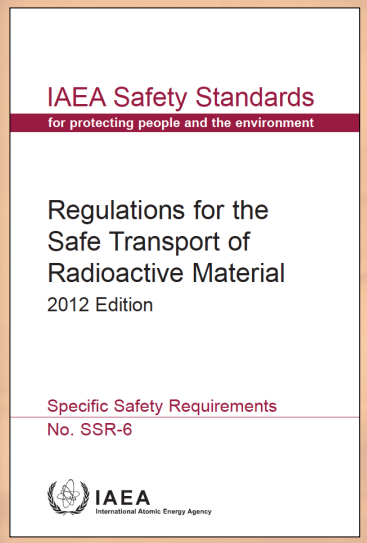
Problems with NORM transport

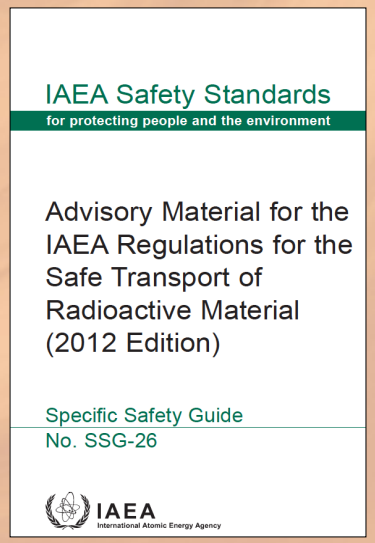
- Mixed dangerous goods – confusion
- General ignorance of applicable regulations – both by industry and regulators
- Denial of shipment and/or return to the country of origin
- Legal claims – unknown exposure and loss of property values

Solutions

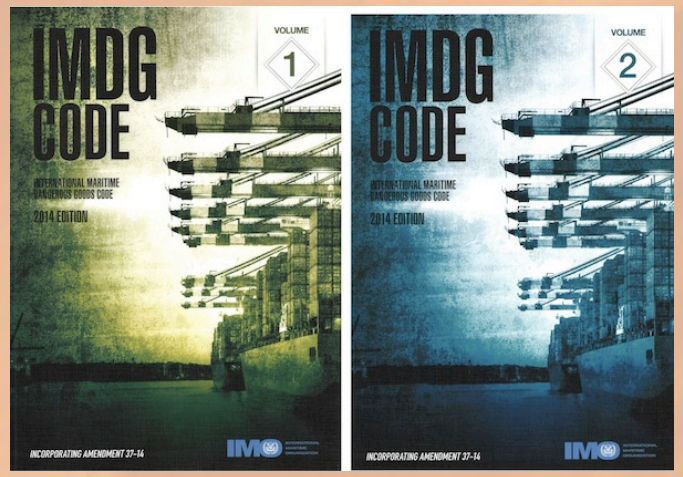
1. Education
2. Communication
3. Cooperation
4. Specialist advice

TRANSPORT OF MIXED DANGEROUS GOODS – issues





Not enough



5.1.4 Mixed packing

When two or more dangerous goods are packed within the same outer packaging, *the package shall be labelled and marked as required for each substance*.

TRANSPORT OF MIXED DANGEROUS GOODS – solutions

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NORM NOT IN SECULAR EQUILIBRIUM

The analysis of minerals and other materials only for uranium and thorium is no longer sufficient. *"For natural materials and ores containing naturally occurring radionuclides that are not in secular equilibrium the calculation of the activity concentration shall be performed in accordance with para.405."*

The analysis for ^{238}U, ^{230}Th, ^{226}Ra, ^{210}Pb, ^{210}Po, ^{232}Th, ^{228}Ra, and ^{228}Th would be required in these cases:

- Any chemical processing of the material, such as leaching or adding flotation agents to the process,
- Any thermal processing of the material (the value of 250-300^{o}C is suggested as a general guide),
- Any combination of chemical and thermal treatment of ores and minerals.

NORM IN TRANSIT SITUATIONS

A certain volume of NORM is almost always present at a transit location

- From one side, the material could be considered to be “in transport”,
- From the other side, the almost permanent storage of material in a certain location may need to be regulated.

Example:

There is a provision in the Western Australian Radiation Safety Regulations that puts a 24-hour limit for an exemption from registration for the material in transport.

A NORM is not classified as ‘radioactive’ in accordance with *transport* regulations, but concentrations of radionuclides are above the limits in *safety* regulations.

Then –

If this material is stored at any location for more than 24 hours, the transit yard/warehouse/etc must be registered for storage of radioactive substances with the Appropriate Authority.

DETECTION OF RADIOACTIVITY AT BORDER CROSSINGS

Relevant to the transport of all NORM, whether it is exempted from the Transport Regulations or not.

Issue:

The concentrations of radionuclides may cause gamma radiation levels outside the packages (e.g. sea containers) that are easily detectable by the equipment that is commonly used at border crossings and in ports worldwide.

DETECTION OF RADIOACTIVITY AT BORDER CROSSINGS

Relevant to the transport of all NORM, whether it is exempted from the Transport Regulations or not.

Solution:

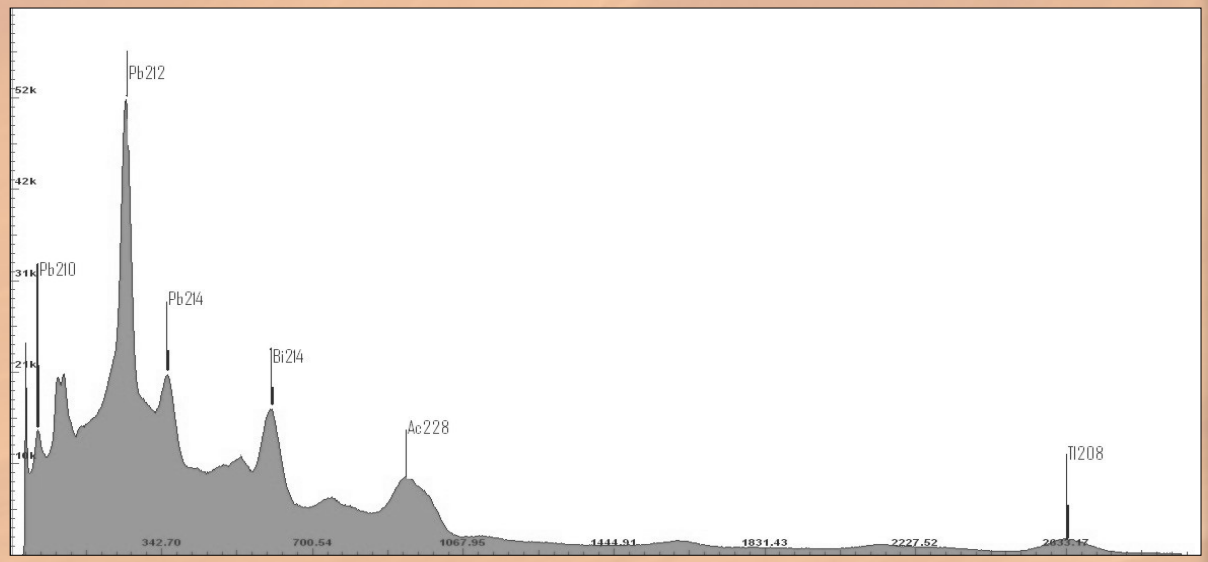
The transport documentation for a particular material must contain detailed information about the concentrations of naturally occurring radionuclides in this material, irrespective of its classification.

MATERIAL SAFETY DATA SHEET
Monazite concentrate

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identification
Product names : Monazite

Company Identification
Company :
Address :
Telephone Number :
Fax Number :
E-mail address :

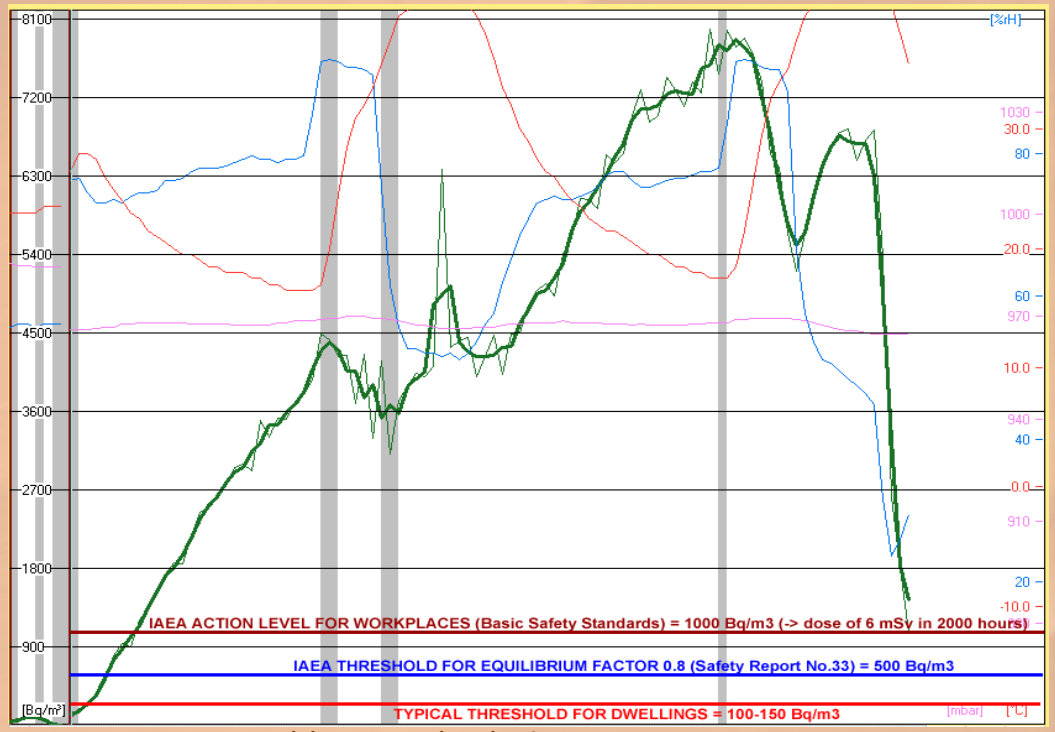


RADON IN CONTAINERS AND HULLS OF SHIPS

Relevant to the transport of all NORM, whether it is exempted from the Transport Regulations or not.

Issue:

The concentrations of radionuclides may cause significant concentrations of radon inside the sealed shipping containers and hulls of ships used to transport minerals in bulk.



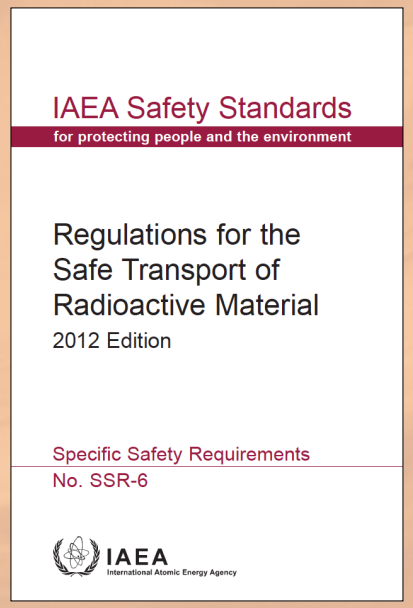
RADON IN CONTAINERS AND HULLS OF SHIPS

Relevant to the transport of all NORM, whether it is exempted from the Transport Regulations or not.

Solution:

Instruct workers opening containers and ship hulls at the destination to stay away from the material for a certain time (typically one hour) to allow for radon concentrations to decrease through natural ventilation.

CORRECT SURFACE CONTAMINATION LIMITS



214. Contamination shall mean the presence of a radioactive substance on a surface in quantities in excess of 0.4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters, or 0.04 Bq/cm^2 for all other alpha emitters.

The fact that ^{226}Ra is not classified as a 'low toxicity' alpha emitter is typically not known or is ignored.

The limit of 0.04 Bq/cm^2 is applicable for the classification of objects which surfaces are contaminated with ^{226}Ra.

THE LACK OF COMMUNICATIONS IN THE INTERNATIONAL TRADE IN NORM – 1

Containers held in a port due to lack of documentation

Case A:

Alarm triggered, no information, argument… Illicit trafficking of radioactive materials? → containers held + shipping agent in prison

Case B:

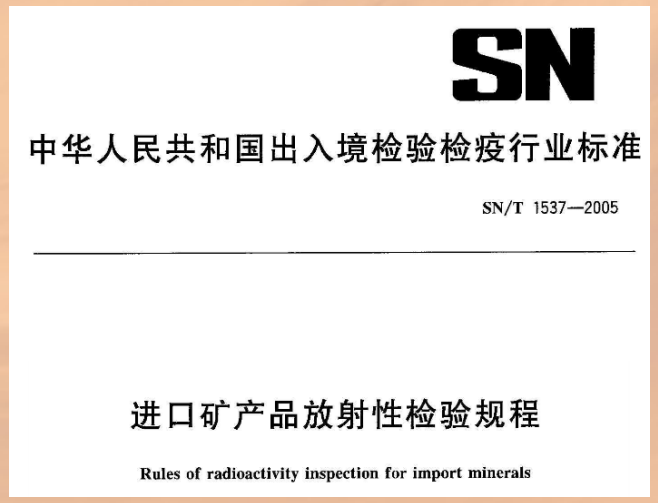
Packed as per 2005 Regulations, received in jurisdiction with 2012 Regulations in force → containers held until analysis for all radionuclides done

Case C:

Packed as per 2005 Regulations, received in jurisdiction with 1987 Regulations in force → containers with material exempt from current international regulations held until signposted as 'radioactive' in an importing country

THE LACK OF COMMUNICATIONS IN THE INTERNATIONAL TRADE IN NORM – 2

Country- and port-specific guidelines and standards


SN

中华人民共和国出入境检验检疫行业标准

SN/T 1537—2005

进口矿产品放射性检验规程

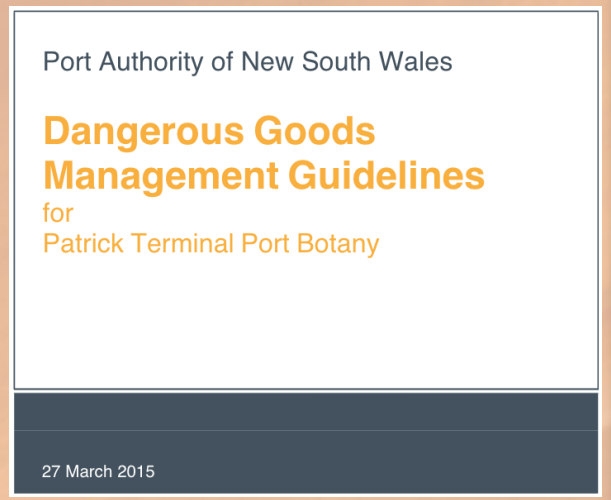
Rules of radioactivity inspection for import minerals

If the highest dose rate detected is 5 to 10 times of the local background – additional regular inspections.

If at any time the highest dose rate detected is 10 times higher than the local background – unloading must be stopped immediately.

UN2912 Class 7 Category III Yellow, Low Specific Activity (LSA-I) non fissile.

These dangerous goods are only permitted to be on the terminal for a maximum time period of 12 hours. …in the event an exemption is granted… to exceed the permitted time period (12 hours) the following conditions apply… [two pages of those]


Port Authority of New South Wales

Dangerous Goods Management Guidelines

for

Patrick Terminal Port Botany

27 March 2015

THE LACK OF COMMUNICATIONS IN THE INTERNATIONAL TRADE IN NORM – 2

Industry-specific standards

ICS 77.150.99
H 63

YS

中华人民共和国有色金属行业标准

YS/T 858—2013

锆 精 矿

Zircon concentrate

ICS 77.150.99
H 63

YS

Non-ferrous Metal Industry Standard
of the People's Republic of China

YS/T 858—2013

Zircon concentrate

If the dose rate from the product is not more than 5 μSv/h, it shall be regarded as passing the regulations.

If the dose rate is more than 5 μSv/h, the specific activity concentrations should be within the limits in Table 4:

Table 4

Items	^{238}U	^{232}Th	^{226}Ra	^{40}K	Total
Specific activity (1×10^{3}Bq/kg) no more than	10	10	10	5	15

THE LACK OF COMMUNICATIONS IN THE INTERNATIONAL TRADE IN NORM – 3

Transit of shipments through international ports

Issue:

The 'radiological screening' of containers would still take place

Solution:

Visit the port, explain the character of the material and present the samples of the material to the Port Chemist.

Issue:

Both import and export license may be required, even if a container with a mineral concentrate only stays in a port for a day or two.

Solution:

Involve a locally registered shipping agent to obtain all necessary import and export permits.

THREE COMMON MISTAKES

Transport of exploration samples:

May be transported as an 'excepted package' if *"the radiation level at any point on the external surface of an excepted package shall not exceed 5 microSv/h."*

ThO_2 and U_3O_8 vs. Th and U:

A typical site laboratory would provide the data in parts per million (ppm – microg/kg) for ThO_2 and U_3O_8, not for Th and U. It is important to remember that 1 ppm of ThO_2 is equal to 0.879 ppm of Th, and 1 ppm of U_3O_8 is equal to 0.848 ppm of U

Multiplication factor for containers and bulk shipments:

The measured Transport Index must be multiplied by a factor between 2 and 10, depending on the *"largest cross sectional area of the load being measured"*.

ASSOCIATED LEGAL ISSUES

The companies and government departments may become involved in legal challenges without actually transporting radioactive material or exposing workers and/or general public to any levels of radiation.

Case 1 – Reduction in property values:

"If people will not purchase property because they fear living or working on or near a …[radioactive material transport] *route, or if a buyer can be found, but only at a reduced price, a loss of value exists. If this loss can be proven to the jury, the landowner should be compensated."*

ASSOCIATED LEGAL ISSUES

Case 2 – Compensable injury from fear of radiation:

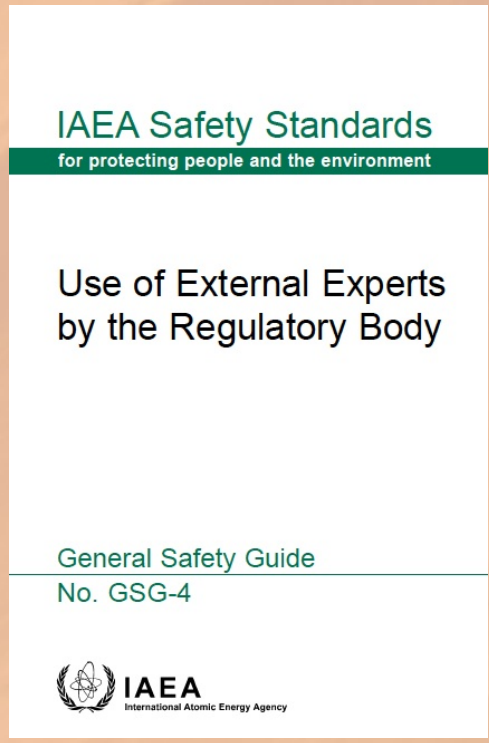
A truck driver's contact with a leaking container that was mistakenly labeled as radioactive waste.

Although the driver suffered no physical injuries and was not actually exposed to radiation, the court determined that the driver's post traumatic stress disorder, depression, fatigue and anxiety were rationally connected to his contact with the hazardous material; and are, therefore, compensable under Tennessee's Law.

CONCLUSIONS

- The transport of NORM and mixed dangerous goods is, almost always, a very complex issue. It is hoped that the examples provided will be useful both for the companies involved in this process, and for the relevant government departments administering transport safety regulations.

- It is expected that the specialist advice will be required in many cases to ensure compliance with all relevant regulations and guidelines.




Thank you for your attention!