



EU regulatory framework for NORM and building materials

**European Commission
Radiation Protection**

**EU-NORM
PRAGUE, 17 June 2014**

**EC-DG-ENER-D3
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NORM EU REGULATORY FRAMEWORK

BSS: Proposal for a Council Directive laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation.

*The new BSS directive has been published in early 2014
4 years to transpose it at national level*

CPR: REGULATION (EU) n° 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

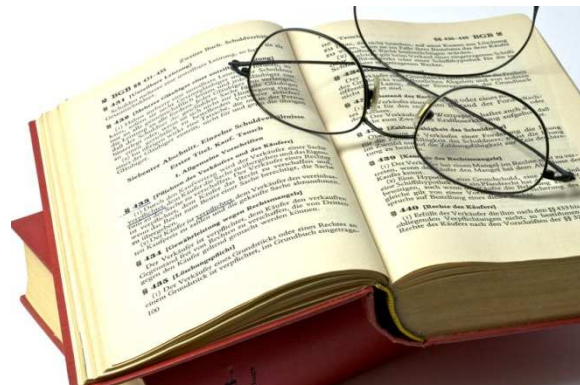




NORM EU REGULATORY FRAMEWORK

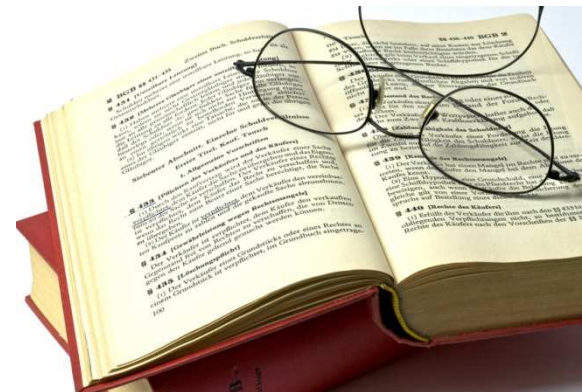
*BSS. Art. 23: Member States shall ensure the **identification** of **classes or types** of practices involving NORM and leading to exposure of workers or members of the public...*

*Such **identification** shall be carried out by **appropriate means** taking into account industrial sectors listed in Annex VI.*



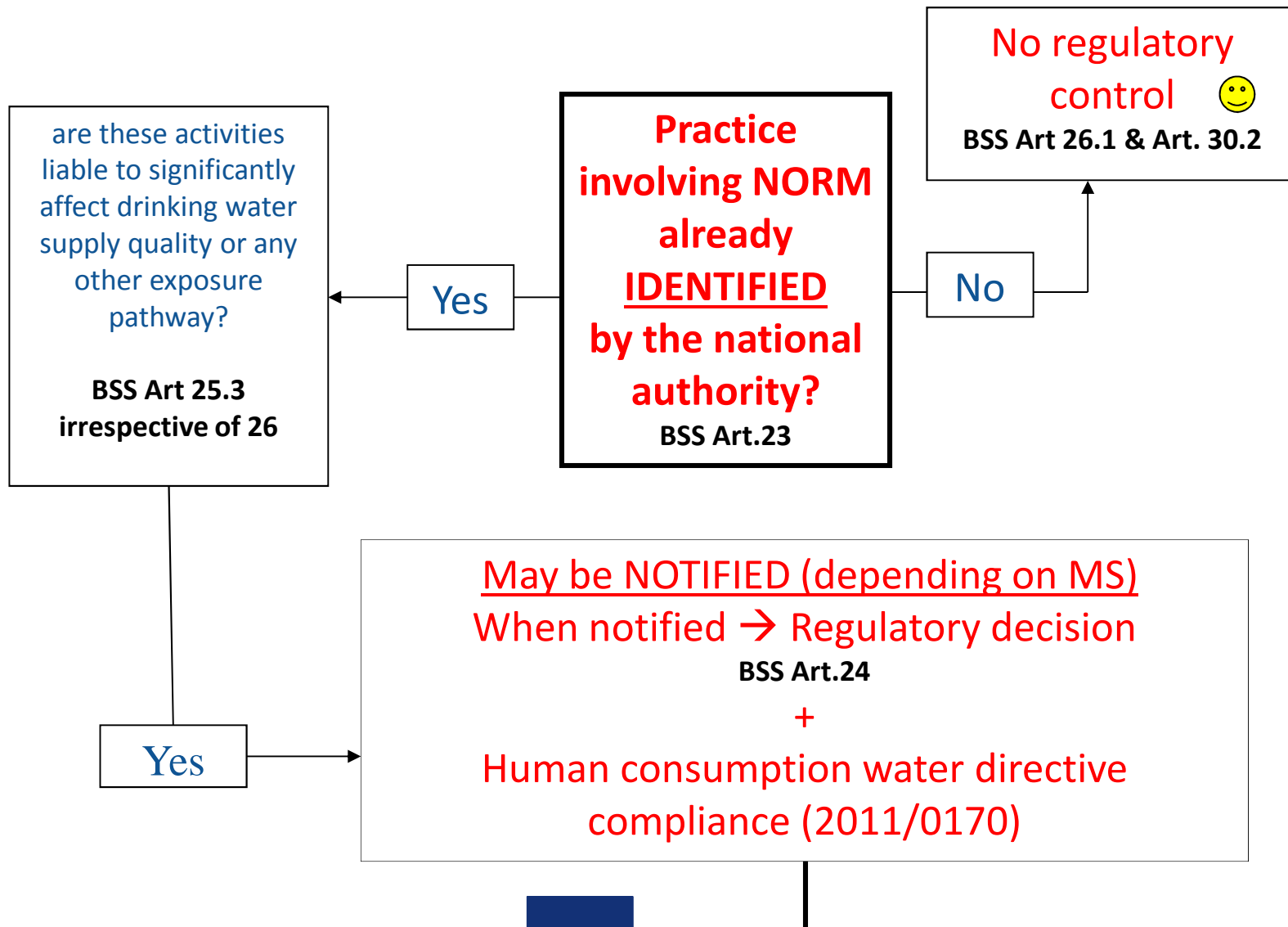
*extraction of rare earths from monazite;
production of thorium compounds and manufacture of thorium-containing products;
processing of niobium/tantalum ore;
oil and gas production;
geothermal energy production;
TiO₂ pigment production;
thermal phosphorus production;
zircon and zirconium industry;
production of phosphate fertilisers;
cement production, maintenance of clinker ovens;
coal-fired power plants, maintenance of boilers;
phosphoric acid production;
primary iron production;
tin/lead/copper smelting;
ground water filtration facilities;
mining of ores other than uranium ore.*

BSS ANNEX V





New BSS





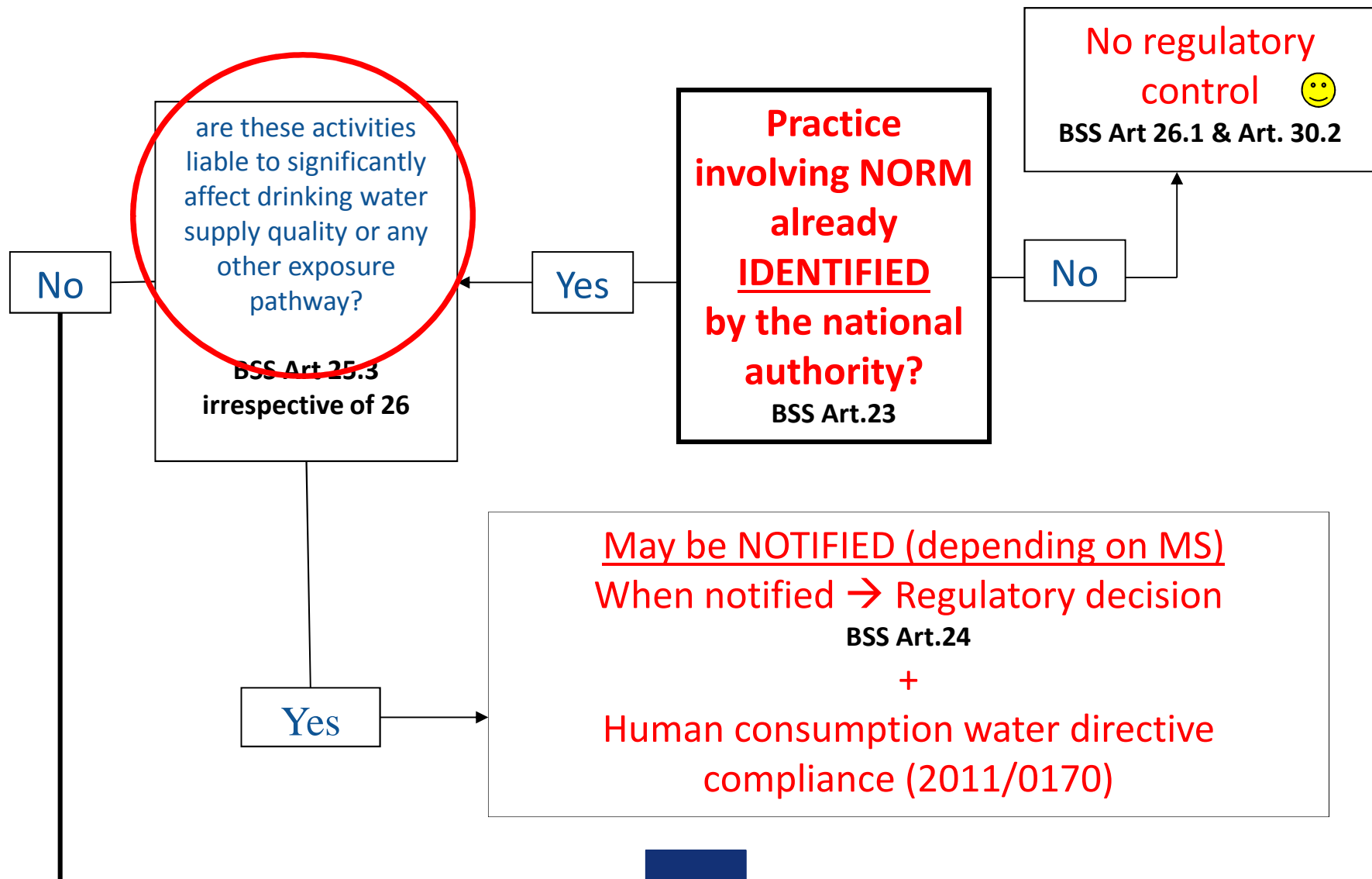
New BSS

EU Water directive

The total indicative dose shall remain **under 0.1 mSv/year** (excluding **Tritium** and Potassium-40 as well as Radon progenies)

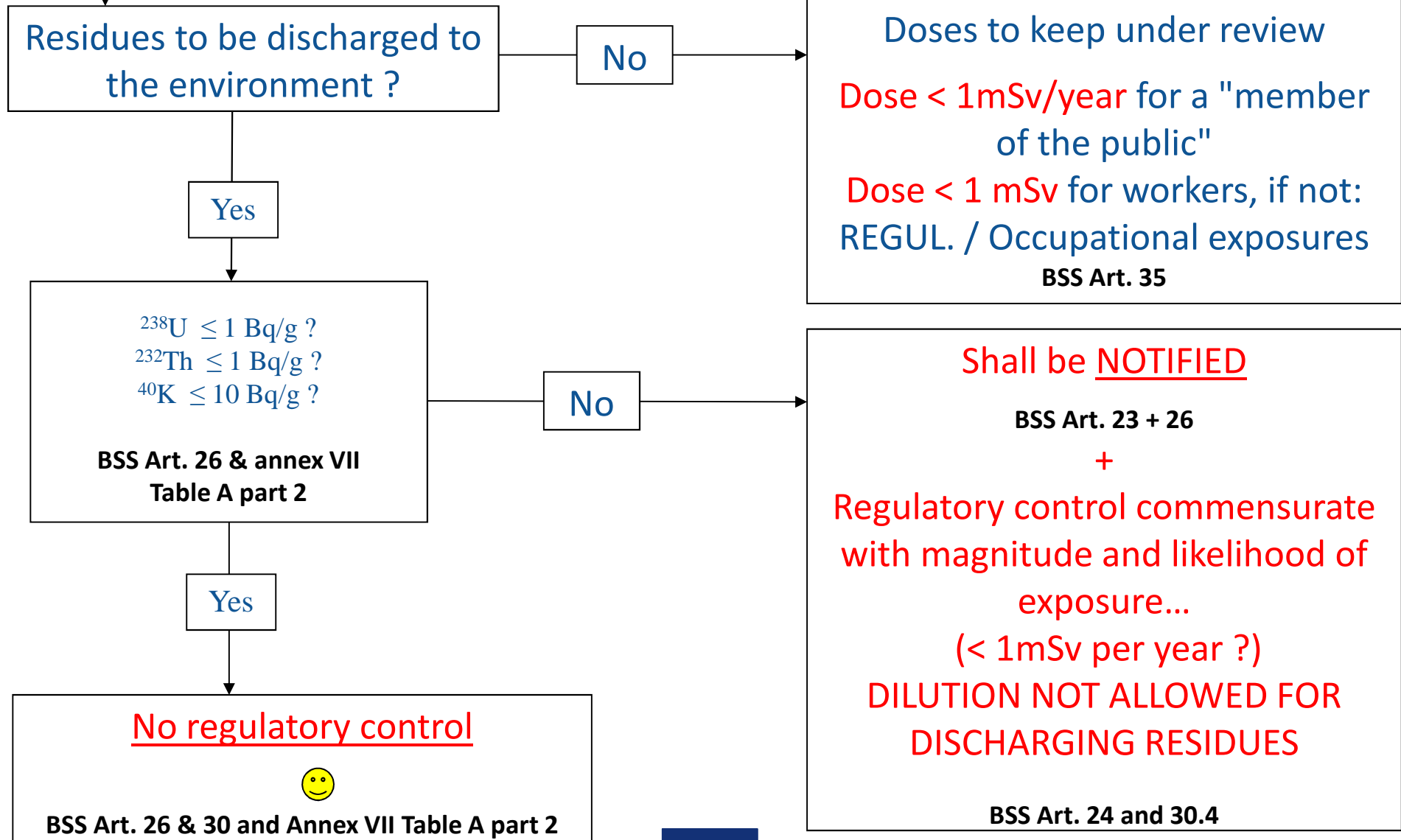
For **Tritium** itself, it is required not to exceed **100 Bq/l**





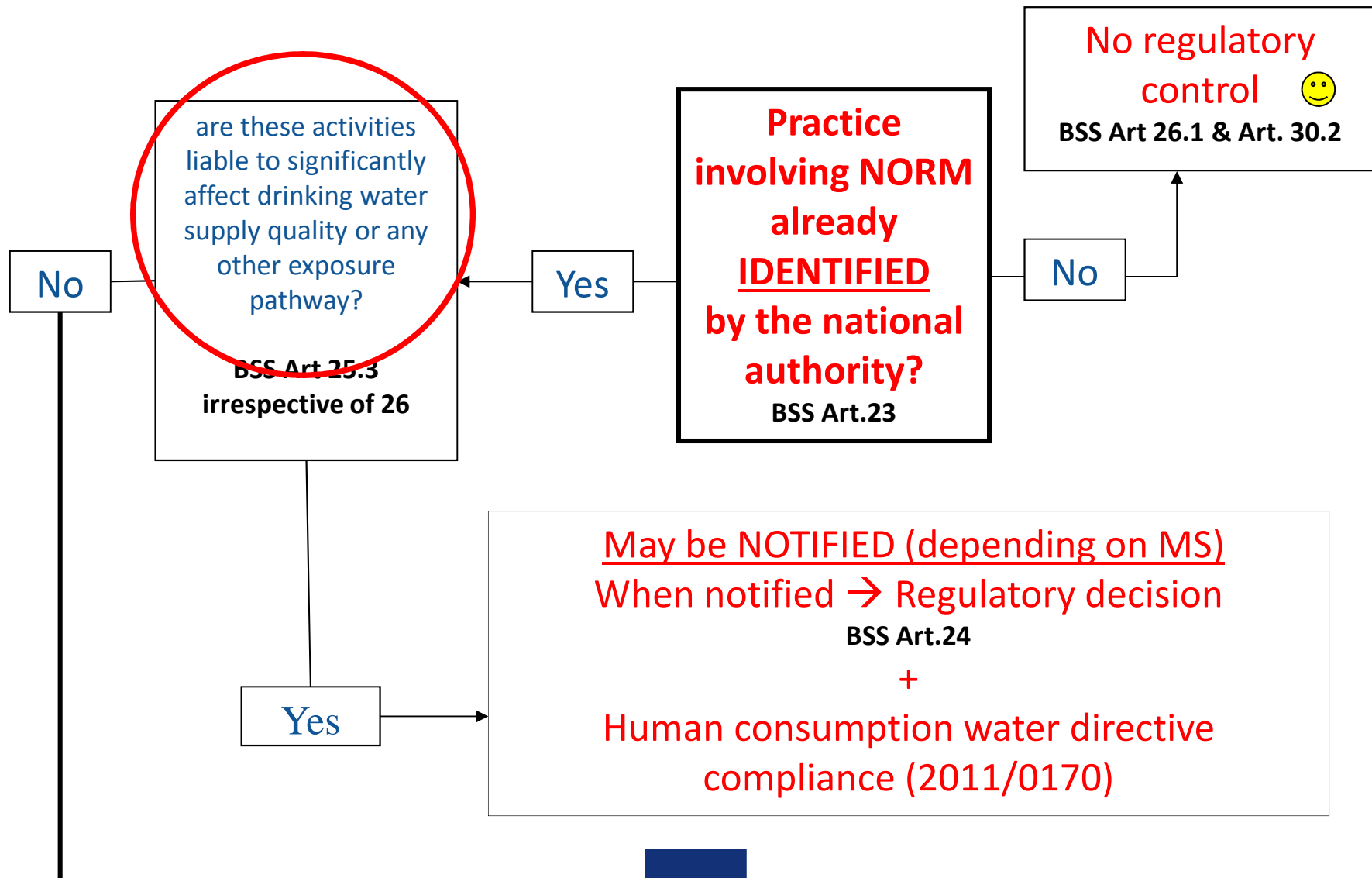


New BSS



QUESTION: TRANSPORT OF NORM?

- Shipment directive 2006/117/Euratom as well as TSR1 (IAEA) do not apply to NORM (except for radionuclide extraction purposes). Nevertheless, radionuclide activity concentrations **shall not exceed 10 times** the exemption values for radiation protection purposes.
- EU-BSS says that doses **shall not exceed 1 mSv/year**.
- In other words, NORM with less than 10Bq/g of ^{232}Th and 100Bq/g of ^{226}Ra can be transported anywhere worldwide if doses are less than 1 mSv/year.





New BSS

NORM residues to be recycled in building materials?

BSS Art. 75.2 + Indicative list in Annex XI + CPR

Yes

$$\frac{C_{226\text{Ra}}}{300} + \frac{C_{232\text{Th}}}{200} + \frac{C_{40\text{K}}}{3000}$$

C in Bq/kg

Index ≤ 1 ?

Results may be requested by the regulatory authority

TS 351014 + CPR art. 18 + BSS Annex VII & VIII

Yes

No regulatory control



BSS Art. 26 & 30 and Annex VII Table A part 2

No

BSS Art. 75

Specific national requirements or restrictions taking into account:

Density; thickness of the material; factors relating to materials and intended use of it (bulk or superficial)

Dose estimate < 1 mSv/year

"Declaration of performance"

CE marking + classification

to be made available to the consumers

CPR Art. 4, 8.2, 8.3, 11, 24

+ EU harmonized standards

CEN-TG 32



IMPORTANCE OF CE marking, decl. of perf. and classification...

*All the "supply chain" would be responsible of the risks: "manufacturers", "importers", "distributors" who need "to take into account health and safety of people and the Environment" (CPR art. 28.2) in the light of the **"declaration of performance"***

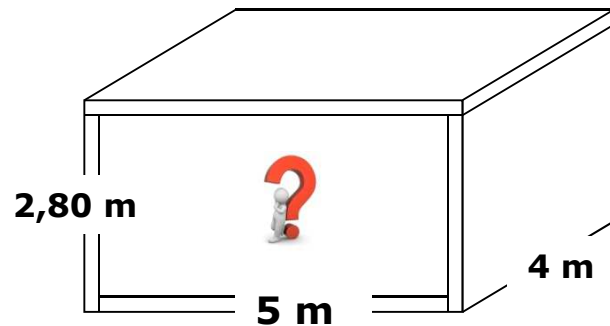
This will be monitored by "Market surveillance authorities" (CPR art.56) with technical support, as appropriate (see CPR from art. 29 to 55)



Conservative Model



Index origin ?



- Model room of 5 m x 4 m x 2.80 m
- Made of one building material with a density of **2350 kg m⁻³**
- Walls, ceiling and floor: 20 cm thick
- Exposure time 7000 hours a year
- Dose conversion of 0.7 Sv Gy⁻¹
- Fixed background activity of 50 nGy h⁻¹

$$\text{Index} = \text{Dose estimate (around 1 mSv/year)} = C_{226\text{Ra}}/300 + C_{232\text{Th}}/200 + C_{40\text{K}}/3000$$

C in Bq/kg

Index < 1 means doses less than 1 mSv/year



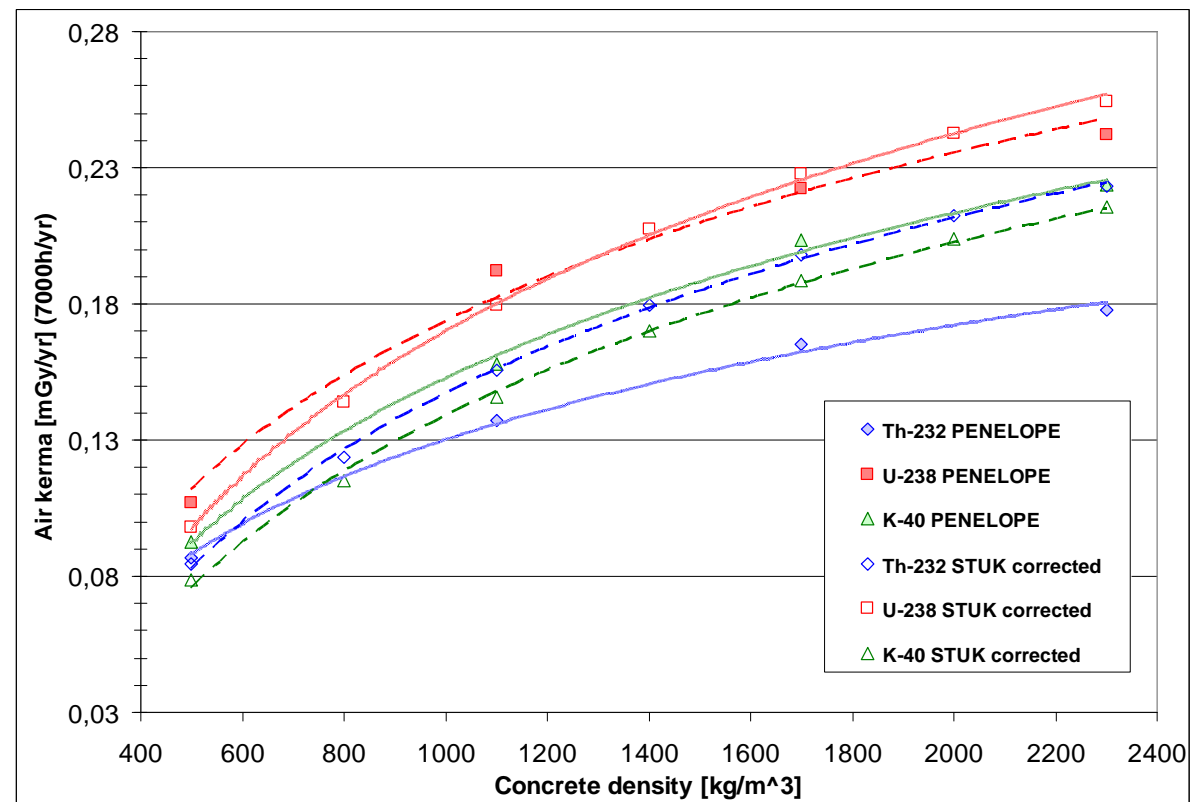
Density issue



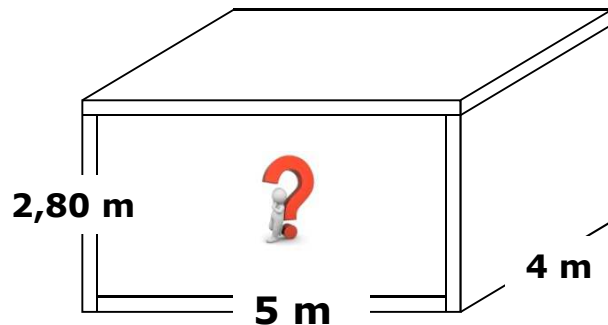
The index is much too conservative for certain **low-density** building materials



**Index > 1 although
doses < 1 mSv/year ???**



German Federal Office for RP (BfS) to review the index for density aspects



- Made of one building material with density (d) lower than 2350 kg m^{-3}
- Walls, ceiling and floor: 20 cm thick
- Exposure time 7000 hours a year
- Dose conversion of 0.7 Sv Gy^{-1}
- Fixed background activity of 50 nGy h^{-1}

$$\text{Real dose estimate (mSv/year)} = \\ [C_{226\text{Ra}} (2.6 \ln(d) - 13.9) + C_{232\text{Th}} (3.1 \ln(d) - 16.6) + C_{40\text{K}} (3.1 \ln(d) - 16.6)] \times 7.10^{-4} - 0.245$$

C in Bq/g



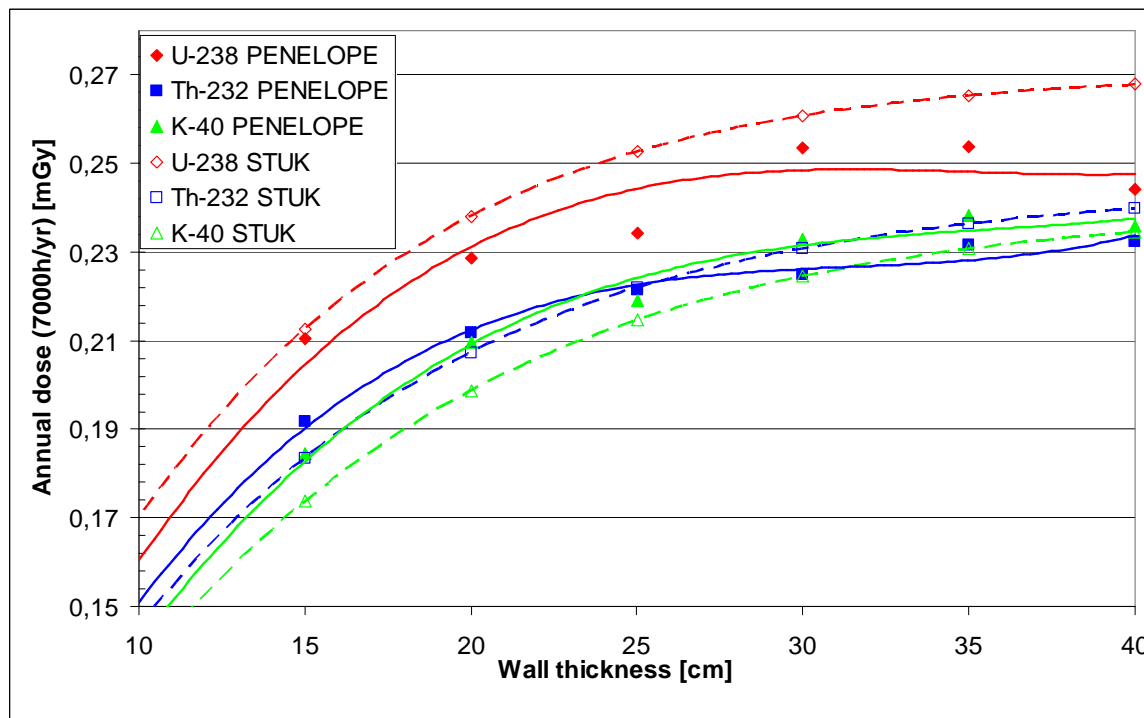


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Thickness issue

The index much too conservative for thinner
walls than 20 cm...

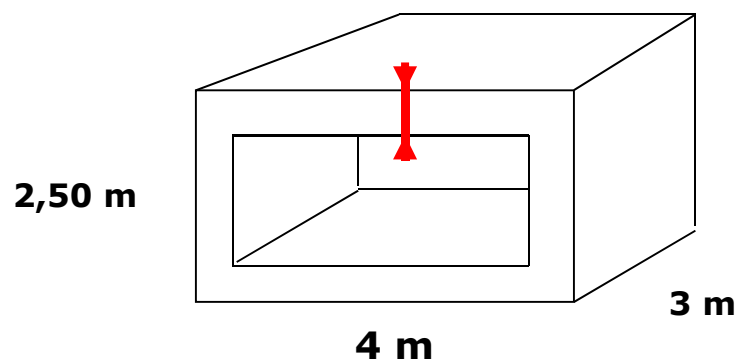
What about thinner bunker ?



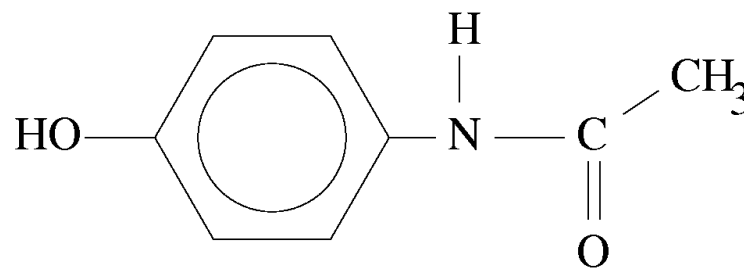
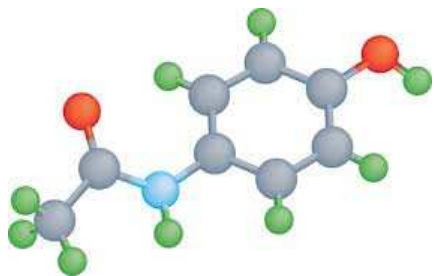
**Index may > 1 although
doses < 1 mSv/year ???**



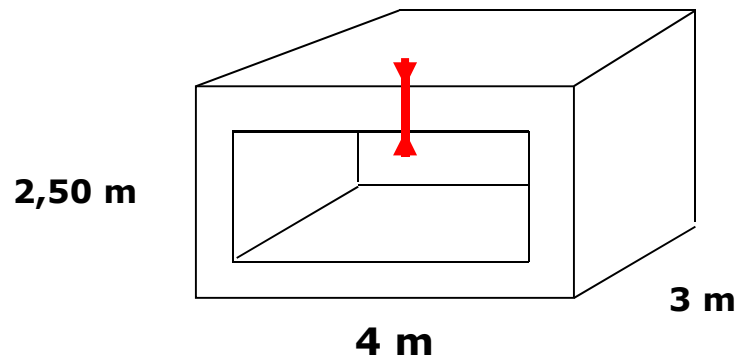
Bunker thickness & density correction



- Made of material with a **density (ρ)**
- Walls, ceiling and floor **thickness (th)**
- Exposure time 7000 hours a year
- No door, no window and dimensions consistent with other CEN TS
- Dose conversion of 0.7 Sv Gy^{-1}
- Fixed background activity of 50 nGy h^{-1}



Bunker thickness & density correction (Cubature code)



(pth) in... kg/m³ x m
"mass per unit area"
Kg/m²

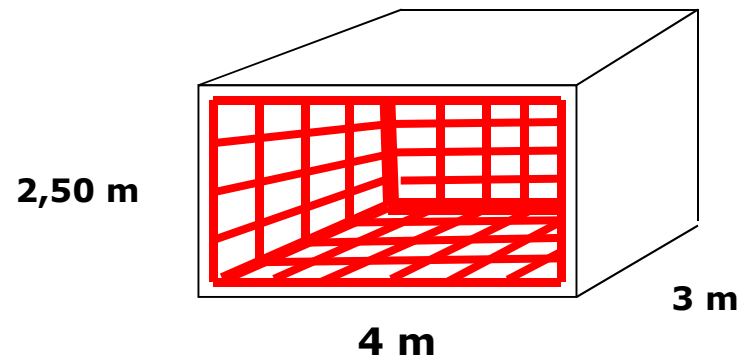
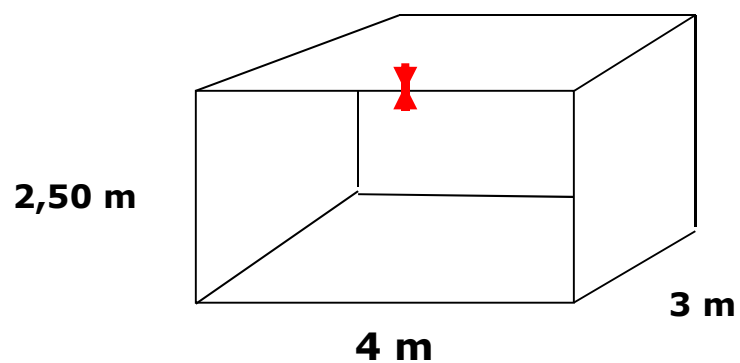
Enhanced dose estimate (mSv/y) =

$$\begin{aligned}
 & [C^{226}\text{Ra} \cdot [281 + 16.3(\text{pth}) - 0.0161(\text{pth})^2] + \\
 & C^{232}\text{Th} \cdot [(319 + 18.5(\text{pth}) - 0.0178(\text{pth})^2] + \\
 & C^{40}\text{K} \cdot [22.3 + 1.28(\text{pth}) - 0.00114(\text{pth})^2]] \cdot 10^{-6} \\
 & - 0.29
 \end{aligned}$$



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Thin building materials such as tiles?





Thickness and density corrections

*The Index remains a **screening tool**, Index < 1 means dose < 1 mSv/y in any scenarios*

*An equation is established to help determine a dose estimate for a (4 x 3 x 2.5) m³ model room taking into account **thickness and density**. The impact of room size is **not significant**...*

*If dose estimate < 1 mSv in the model room, product will be classified "A" for radiation protection. If not, they will be classified B and will be accompanied by instructions in the "declaration of performance" such as: **"to be used for walls only"** or **"not to use for building constructions"** depending on additional specific dose calculations...*



**All of this was for gamma radiations but what
about Radon exhalation
from building materials then?**





Radon in dwellings and public buildings

Art. 74.1

*NRLs shall not exceed:
300 Bq/m³*

Art. 74.2

*MS shall promote action **to identify dwellings** with radon concentration (as an annual average) exceeding the reference level and encourage, where appropriate, by technical or financial means, radon concentration-reducing measures in these dwellings.*

Art. 74.3

...local and national information to be made available...





New BSS: Radon action plan (art. 103)

“...Member States shall establish a national action plan to addressing long-term risks from radon exposures in dwellings, buildings with public access and workplaces for any source of radon ingress, whether from soil, building materials and water. The action plan shall take into account the issues specified set out in Annex XVIII...”





CONCLUSION

Building materials

- 1.** From now on, NORM processing and building material radioactivity are taken on board by the new EU-BSS directive in addition to the existing EU Construction Product Regulation (CPR);

- 2.** Guidance and harmonized standards are being established by the CEN (European Standardization Committee)
 - Activity concentration measurements (index) TS 351 014
 - Dose modelling harmonisation for building materials CEN-TG 32 on-going...





CONCLUSION RADON

- 3. National action plan to be established**
- 4. For all buildings the max national RL is: 300 Bq/m³**

NB: according to the latest ICRP (TG-81 / 2014) data:

Breathing 300 Bq/m³ > 10 mSv/year !!

To be continued...





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Thanks

