EU Regulatory framework for NORM and Building materials

European Commission
Radiation Protection

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EC-DG-ENER-D4
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NORM EU REGULATORY FRAMEWORK

**BSS. Art. 24:** Member States shall ensure the identification of practices involving NORM and leading to exposure of workers or members of the public...

*Such identification shall be carried out by means of surveys or by any other appropriate means taking into account industrial sectors listed in Annex V.*
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;
$\text{TiO}_2$ 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.
Practice involving NORM already IDENTIFIED by the national authority? (Art. 24)

Coal-fired Power Plant

No regulatory control 😊

May be NOTIFIED depending on MS
Regulatory decision whether to exempt or to authorise (art.25b.4) +
Human consumption water directive compliance (2011/0170)

are these activities liable to significantly affect drinking water supply quality or any other exposure pathway?

Art 25b.4 irrespective of 25c

Yes

No

Yes

No
Are process residues to be used in Building Materials?

- **No**
  - $^{238}\text{U} \leq 1 \text{ Bq/g}$
  - $^{232}\text{Th} \leq 1 \text{ Bq/g}$
  - $^{40}\text{K} \leq 10 \text{ Bq/g}$
  - **Art. 25b.1 & annex VI**
  - **Table A part 2**
  - **No**
  - Shall be **NOTIFIED**
    - **Art. 24 + 25b.1**
    - + Assessment & regulatory decision whether to **AUTHORISED** or to **EXEMPT** the practice (< 1mSv/y ?)
    - **Art. 25a + Annex VI**

- **Yes**
  - **No regulatory control**
    - 😊
    - **Art. 29.2 & 25c.1**
Are process residues to be used in Building Materials? (e.g. fly ash) art. 25b.3

Yes

Index ≤ 1 or specific national RL?

Yes

No regulatory control

Art. 29.2 & 25c.1

No

Practice to be NOTIFIED With radionuclide concentrations & index art. 25b.3 & 75

+ Assessment & regulatory decision with requirements and/or restrictions

Art. 75.4 & annex VII

\[ \frac{C_{226Ra}}{300} + \frac{C_{232Th}}{200} + \frac{C_{40K}}{3000} \]

C in Bq/kg

art.25b.3 + Annex VII
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\(^{-1}\)

Dose estimate (mSv/year) = \( \frac{C_{226}^{Ra}}{300} + \frac{C_{232}^{Th}}{200} + \frac{C_{40}^{K}}{3000} \)

C in Bq/kg
To provide for guidance

\[ I = \frac{C_{226\text{Ra}}}{300} + \frac{C_{232\text{Th}}}{200} + \frac{C_{40\text{K}}}{3000} \]  

(C in Bq/kg)


WG: CEN-TG 31

SOME DIFFICULTIES

\[ I = \frac{C^{226}_{\text{Ra}}}{300} + \frac{C^{232}_{\text{Th}}}{200} + \frac{C^{40}_{\text{K}}}{3000} \]  
(C in Bq/kg)
DIFFICULTIES?

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

(C in Bq/kg)
DIFFICULTIES?

\[ I = \frac{C_{226}^{\text{Ra}}}{300} + \frac{C_{40K}^{\text{K}}}{3000} \quad (C \text{ in Bq/kg}) \]
Experiment with Building materials

\[ I = \frac{C_{226Ra}}{300} + \frac{C_{232Th}}{200} + \frac{C_{40K}}{3000} \quad (C \text{ in Bq/kg}) \]

\[ \begin{align*}
228Ra + 228Th \\
\text{2}
\end{align*} \]

- Neutronic VS Spectro\n- Factors may vary from 3 to 10 !!!
- Spectrometry (progenies)
- Not representative at all...
- Other appropriate techniques e.g. neutronic
To provide for guidance

CEN is also mandated to work on protocols for the assessment of expected doses from indoor external exposure from specific types of building materials, in excess of prevailing outdoor external exposure

WG: CEN-TG 32
The index much too conservative for thin or superficial building materials

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

<table>
<thead>
<tr>
<th>Use</th>
<th>Categories</th>
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<tbody>
<tr>
<td></td>
<td>A ≤ 1mSv</td>
<td>B &gt; 1mSv</td>
<td></td>
</tr>
<tr>
<td>Bulk materials (1)</td>
<td>I ≤ 1</td>
<td>I &gt; 1</td>
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<tr>
<td></td>
<td>Type A1</td>
<td>Type B1</td>
<td></td>
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<tr>
<td>Superficial materials with restricted</td>
<td>I ≤ 6</td>
<td>I &gt; 6</td>
<td></td>
</tr>
<tr>
<td>uses (2)</td>
<td>Type A2</td>
<td>Type B2</td>
<td></td>
</tr>
</tbody>
</table>
German Federal Office for RP (BfS) to review the index for density aspects

- Model room of 5 m x 4 m x 2.80 m
- Made of one building material with a lower density (d) 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$^{-1}$

Dose estimate (mSv/year) =
\[
\left[ C_{226\text{Ra}} (2.6\ln(d)-13.9) + C_{232\text{Th}} (3.1\ln(d)-16.6) + C_{40\text{K}} (3.1\ln(d)-16.6) \right] \times 7 \times 10^{-4} - 0.245
\]

$C$ in Bq/g
Harmonized dose risk modelling to be established in EU

- Activity concentration measurements (index) CEN-TG31 with additional measurement techniques if necessary

- Dose modelling harmonisation for building materials CEN-TG 32

- Building materials not to give a gamma dose to “a member of the public” exceeding 1 mSv/year to any member of the public

What about Radon exhalation from building materials then?
Other outcome from Oct. & Nov. meetings

**All buildings:**

Max. RL, for all buildings (old or new), shall be 300 Bq/m$^3$

Flexibility was kept to establish different lower limits at national level

**At work, according to the latest ICRP data:**

- **400 Bq/m$^3$$\ (annual\ average)\ and\ 2000\ hours\ of\ exposure:** 10.4 mSv
- **300 Bq/m$^3$$\ (annual\ average)\ and\ 2000\ hours\ of\ exposure:** 8 mSv
- **225 Bq/m$^3$$\ (annual\ average)\ and\ 2000\ hours\ of\ exposure:** 6 mSv
Other outcome from Oct. & Nov. meetings

At work:
RL = 300 Bq/m$^3$ for the workplace (with 2000 hours).
If more, compliance with national radiation protection regulation based on the BSS directive (chapter VI) for the protection of workers.

Building codes:
to incorporate requirements to reduce radon ingress in building...

Radon kept out of the screening tools for gamma radiation
CONCLUSION

- NORM processing and building material radioactivity will be taken on board by the new EU-BSS directive

- Related pieces of guidance are to be drafted:
  - Activity concentration measurements (index) CEN-TG31
  - Dose modelling harmonisation for building materials CEN-TG 32

- Radon:
  - Max RL of 300 Bq/m³ for all buildings or dwellings
  - Max RL = 300 Bq/m³ at work as well, and if not: compliance with specific national radiation protection regulation based on selected parts of the BSS Chapter VI.
Thank you