



International Approach to Legal Control of NORM and of radioactivity in building materials

Revision of the Euratom Basic Safety Standards

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Euratom

Basic Safety Standards (BSS)

- Council Directive 96/29/Euratom sets up a framework for the control of exposure of workers and members of the public to ionising radiation.
- Natural radiation sources are for the first time addressed explicitly (Title VII).
- Exposure to radon in dwellings is not included in the scope.
- No specific requirements on building materials



EC Recommendations

- Commission Recommendation from 1990 on indoor exposure to radon (90/143/Euratom)
- Commission Recommendation from 2001 on radon in drinking water (2001/928/Euratom)



EC Guidance Reports

Radiation Protection Series

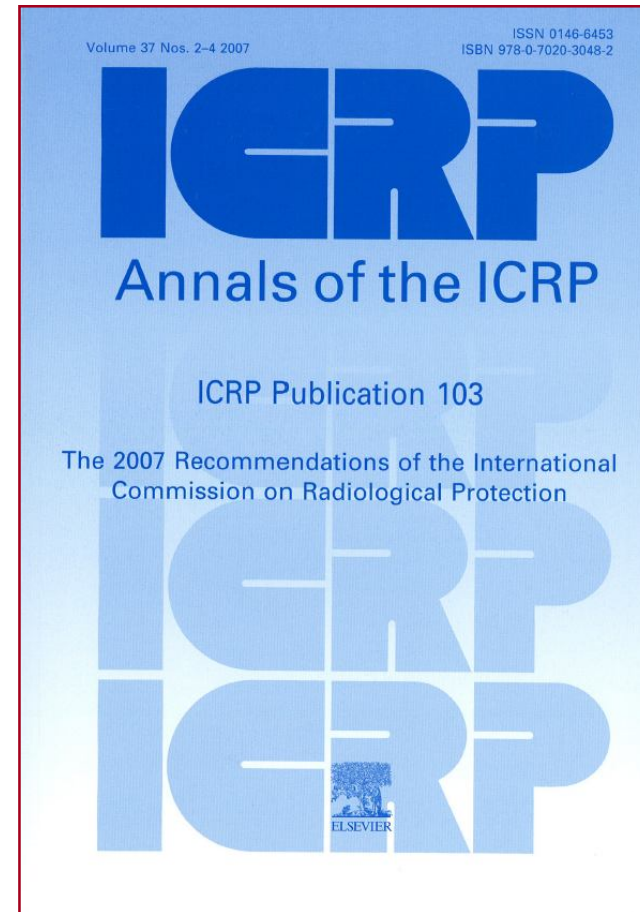
- Implementation of Title VII (RP 88)
- Reference levels for workplaces (RP 95)
- Building materials
 - Radiation Protection principles (RP 112)
 - Enhanced radioactivity of building materials (RP 96)
- Exemption and clearance (RP 122 part II)
- Effluents from NORM industries (RP 135)

http://ec.europa.eu/energy/nuclear/radiation_protection/radiation_protection_en.htm



Revision of EU-BSS

- Allow for ICRP/IAEA
 - Planned, emergency and existing situations
 - Incorporate natural radiation sources
 - Strengthen the requirements
- Review of regulatory control system
 - Graded approach to regulatory control
 - Harmonise exemption and clearance
- Consolidation of current Directives





ICRP Publication 103

(176) ... applied to all sources and all exposed individuals, in the following three exposure situations:

- planned: ... involving the planned operation of sources (practices in operation)
- existing: ... that already exists when a decision on control has to be taken, including natural background radiation ...
- emergency exposure situations

Principle of Justification:

(206) introduction of new activities where radiological protection is planned in advance and the necessary actions can be taken on the source

(207) ... where exposures can be controlled mainly by action to modify the pathways of exposure and not by action on the source

Problems:

- “planned” associated with the applicable regime of regulatory control
 - notification, registration and licensing of practices
- “existing” has been confounded with “practices that already exist”
 - e.g. NORM industries
- any (industrial) activity for which there is a legal responsibility can be stopped
 - its continuation and resulting exposure are therefore planned
 - justification should allow for the fact that the practice already exists



Exposure situations

- Exposure situations:
 - Planned: new source or new pathway of exposure
 - NORM industries
 - Aircrew
 - Existing: resulting from features of the location (not the activity)
 - indoor Radon (ingress from soil)
 - Emergency: urgent situation, which can be planned or prepared for
- Boundaries:
 - Radon at the workplace: existing situation managed as a planned situation
 - Emergency: in the long term becomes an existing exposure situation
 - Delineation through:
 - Identification (threshold)
 - Exemption/clearance
 - ICRP Publication 104
 - Management decision
- Commodities managed together with the exposure situation:
 - building materials
 - foodstuffs
- Radon in new construction in the same way as existing buildings
 - lower reference level on grounds of cost-effectiveness



Euratom Definitions

- Practice: any type of activity that introduces additional radiation sources or alters exposure pathways and which is managed as a *planned exposure situation*
 - involving the introduction of a radiation source or of activities which alter exposure pathways so as to cause the exposure or the potential exposure of people
 - IAEA: ... so as to increase the exposure of people or the number of people exposed
- Undertaking: a natural or legal person which has legal responsibility for carrying out a practice or ... for a radiation source (including the owner or holder of a source)
 - occupational exposure: exposure of workers incurred in the course of their work, with the exception of exposures deemed to be un-amenable to control
 - responsibility of the employer for (out-side) workers and for exposure to radon at work



Topical issues

- Exposure situations
- Natural Radiation
 - NORM industries
 - Building materials
 - Radon
 - Cosmic radiation (exposure to aircrew, space crew?)
- Graded approach to regulatory control
- Exemption and Clearance
 - Education and training
 - Constraints/reference levels
 - Justification
 - (non-) medical exposures
 - Emergency preparedness and response
 - Occupational Exposure (Outside Workers)
 - Protection of the Environment



Revision of EU-BSS

Art. 31 Working Parties

- WP BSS
- WP Exemption and Clearance
- WP Natural Sources
 - NORM, Radon in indoor air, Building materials
 - Commission public consultation
- WP Graded Approach
 - Notification, Registration, Licensing
- WP Recast
 - First consolidated draft text: meeting in June 2009
 - Final text in November 2009
 - Draft and Opinion approved subject to examination of late new Articles
- For approval at extra Article 31 meeting on 23-24 February 2010



RECAST DIRECTIVES

- **Basic Safety Standards (workers, general public): 1959-1996**
- **Patients/Medical Directive: 1984, 1997**
- Informing the public on measures in the event of a radiological emergency: 1989
- Outside Workers: 1990
- High Activity Sealed Sources (HASS): 2003
- (Radon Recommendation 90/143/Euratom)



Options for structure

- Option 1

PLANNED EXPOSURE SITUATIONS	EMERGENCY EXPOSURE SITUATIONS	EXISTING EXPOSURE SITUATIONS
Occupational exposure	Occupational exposure	Occupational exposure
Public exposure	Public exposure	Public exposure
Medical exposure	Medical exposure	

- Option 2

OCCUPATIONAL EXPOSURE	PUBLIC EXPOSURE	MEDICAL EXPOSURE
Planned exposure situations	Planned exposure situations	Planned exposure situations
Emergency exposure situations	Emergency exposure situations	Accidental or unintended exposures
Existing exposure situations	Existing exposure situations	



Radon

- Require MS to establish an action plan for managing long term risks from radon:
 - Assign responsibilities, allocate resources for measurements and remedial actions
 - Criteria for delineation of radon prone areas
 - Criteria for identification of buildings of concern
 - Criteria for accreditation of measurement and remediation services
 - Strategy for increasing public awareness in relation to smoking
 - Long term goals of reducing lung cancer
 - cf WHO Radon Handbook



Radon

- Require national reference levels, not exceeding:

300 Bq/m³ for new building
300 Bq/m³ for existing dwellings
300 Bq/m³ for public buildings with a high occupancy by the public

– 1000 Bq/m³ for existing workplaces and other public buildings

- Establishment of building codes
 - in radon prone areas
 - where appropriate



NORM-industries

- Now managed as a planned exposure situation
- “Positive list” of types of industries
- Activity concentrations above
 - 1 Bq/g (U-238 and Th-232)
 - 10 Bq/g for K-40
 - not applicable to (recycling in) construction materials
- Assessment of doses to workers
 - 1-6 mSv: keep under review /ALARA
 - > 6 mSv: controlled areas
- Assessment of effluents and disposal of waste
 - exemption criterion 0.3 mSv
 - constraint of 0.3 -1 mSv
 - recycling (dilution) / radioactive waste disposal

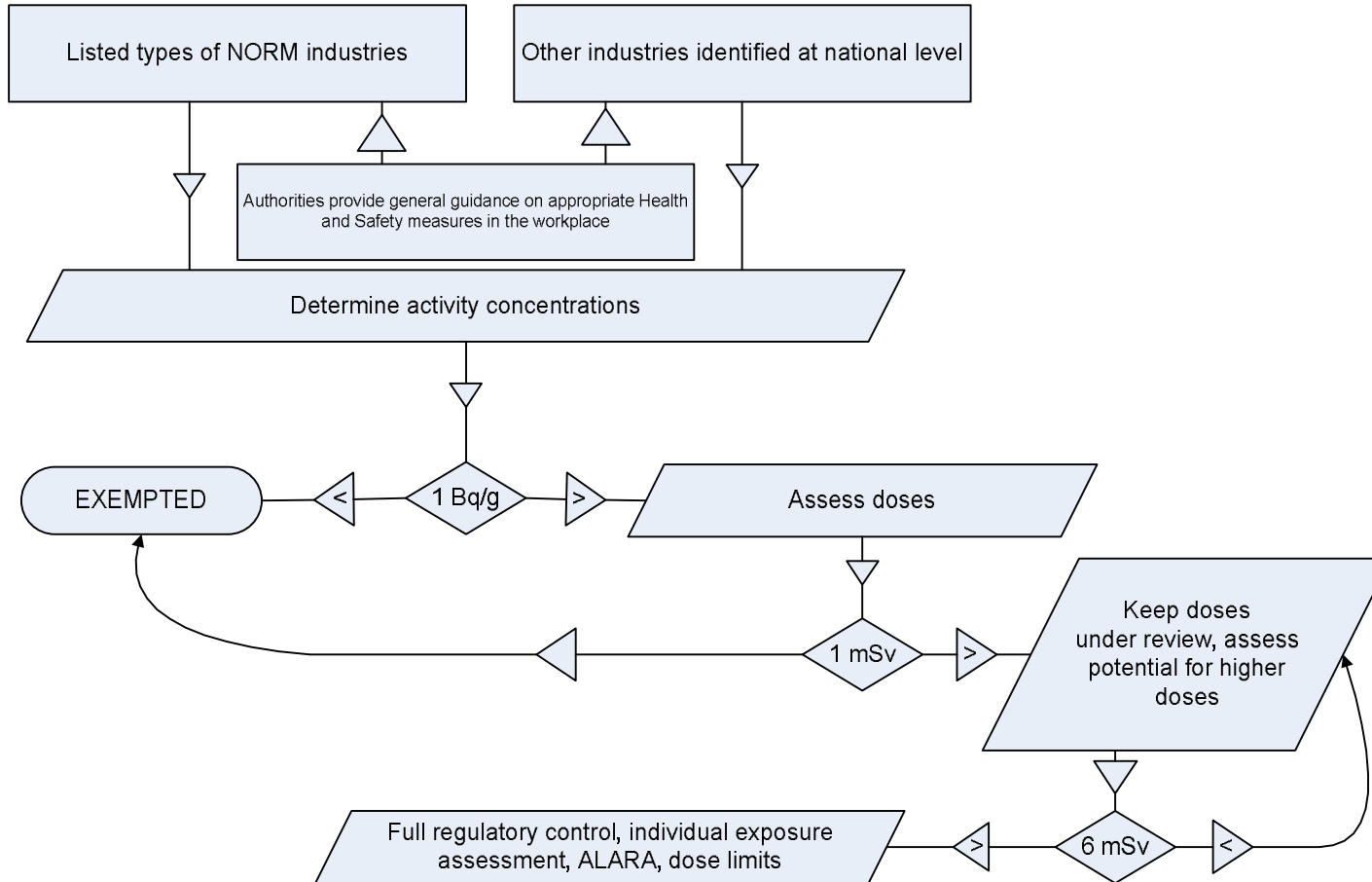


NORM industries

- List of NORM industries which will require regulatory consideration:
 - Extraction of rare earth from monazite
 - Production of thorium compounds and thorium containing products
 - Processing of niobium/tantalum ore
 - Oil and gas production
 - Geothermal energy production
 - TiO₂ pigment production
 - Thermal phosphorus production
 - Zircon and zirconia 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
- including relevant secondary processes
- Member States should be able to add activities which may require regulatory attention



NORM industries





Exemption and clearance

- Artificial radionuclides: 10 μ Sv per year
 - RP-65 for exemption, guidance on clearance levels
- Natural radionuclides:
 - RP 122 part II: 0.3 mSv per year
 - 0.5 Bq/g for U-238 and Th-232 in equilibrium
 - 5 Bq/g for K-40
 - RS-G-1.7
 - 1 Bq/g for U-238 and Th-232 in equilibrium
 - 10 Bq/g for K-40
- Now: RS-G-1.7 values
 - for exemption, subject to dose criterion (1 mSv for workers)
 - for clearance, subject to dose criterion (0.3 mSv for public)



Radiation protection principles for building materials

Radiation Protection 112

- Gamma dose criterion
 - 0.3 – 1 mSv / year
 - in excess of outdoor gamma dose rate
- Building materials should be exempted if the gamma radiation increases the annual dose by < 0.3 mSv
- Higher doses than 1 mSv / year should only be accepted
 - in exceptional cases
 - where materials are used locally.
- Activity concentration index for identifying materials of concern



Categories of building materials

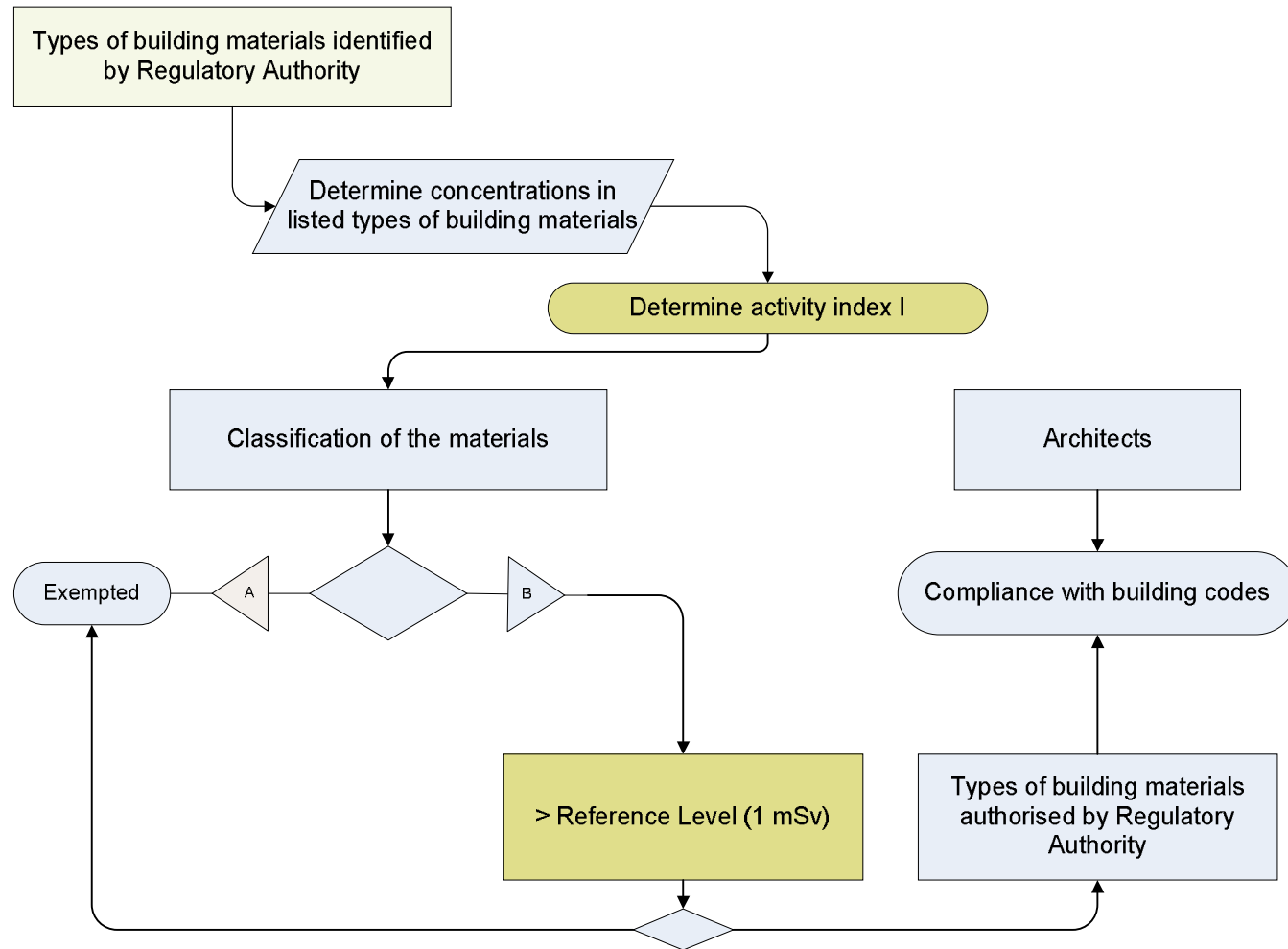
	Category (corresponding default dose)	
Use	A (≤ 1 mSv)	B (> 1 mSv)
(1) materials used in bulk amounts	A1 $I \leq 1$	B1 $I > 1$
(2) superficial and other materials with restricted use.	A2 $I \leq 6$	B2 $I > 6$

The distinction of materials into (1) or (2) according to their use will be based on national building codes.

Where appropriate, actual doses for comparison with the reference level will be assessed using more elaborate models which may also allow for the background outdoor external exposure from local prevailing activity concentrations in the undisturbed earth's crust.

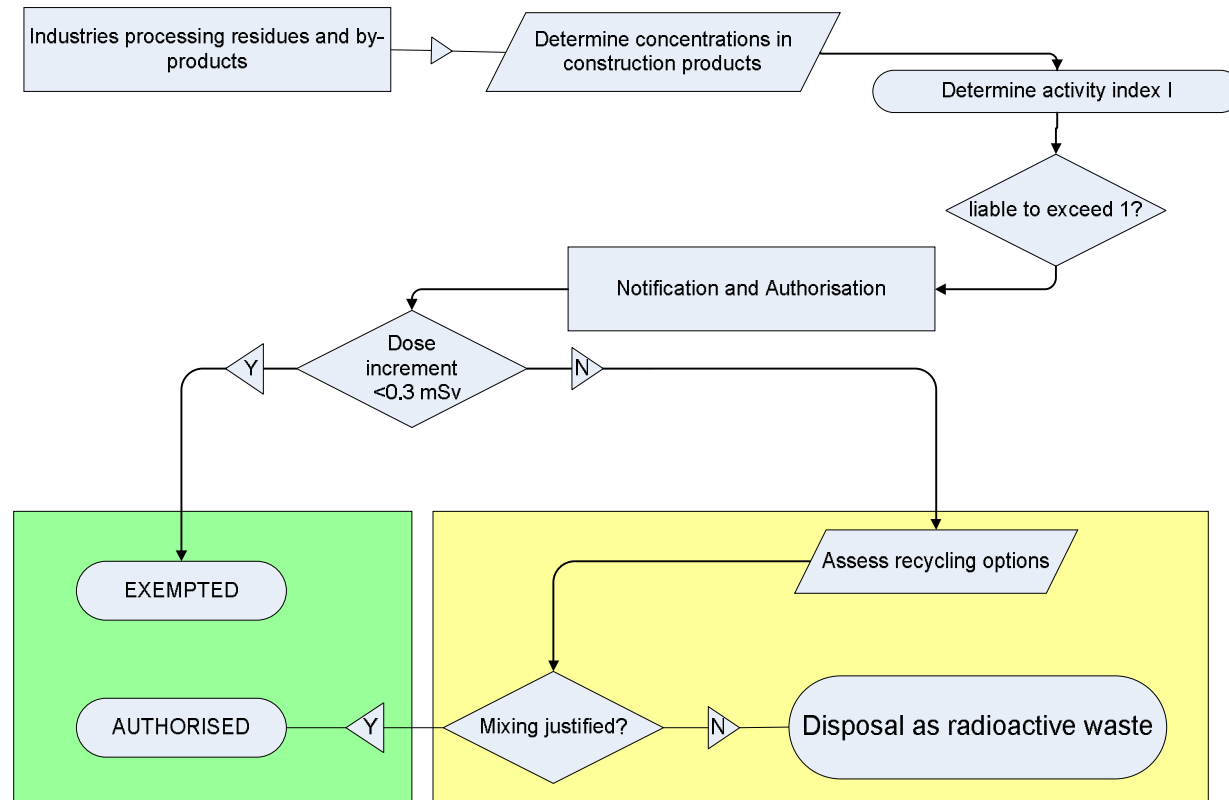


Building Materials





Residues from NORM industries





NORM-industries

- Member States shall ensure the identification, ..., of practices involving NORM and leading to the exposure ... which cannot be disregarded from the radiation protection point of view, ... taking the list of industrial sectors in Annex 8 into account
 - “Positive list” of types of industries
- All practices shall be notified, except:
 - materials containing radioactive substances the concentration of activity per unit mass does not exceed the *exemption values* in ... or Table C to Annex 9
- Practices identified according to ... producing or processing residues which are recycled into building materials, are subject to notification
 - if the activity concentration index in the resulting building materials is liable to exceed 1
- Practices liable to cause the contamination of ground or surface water shall be notified ...



International standards (draft 2.5)

3.4: Exposure to natural sources is normally considered as an existing exposure situation, except that the requirements for planned exposure situations apply to the following exposures to natural sources:

- (occupational) exposure due to material
 - other than food, feed, drinking water, agricultural fertilizer and soil amendments, *construction material* ...
 - where the activity concentration of any radionuclide in the decay chains headed by U-238, -235! or Th-232 is greater than 1 Bq/g (or 10 Bq/g for K-40)
- public exposure from (above) practices
 - discharges of effluent or management of radioactive waste
- occupational exposure to radon ... remains above 1000 Bq/m³
 - irrespective of radon concentration level for practices controlled for U-238-Th-232



Conclusions

- NORM industries are a planned exposure situation
- Recycling of residues from NORM is subject to
 - clearance criteria
 - authorisation of mixing with other materials
 - activity index for building materials
- Building materials now incorporated in BSS
 - as an existing exposure situation