

International survey on the classification of areas

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Study for ASN (2011) with the participation of EAN



■ Objectives:

- Establish a **synthesis of the RP rules regarding demarcation and access to controlled and supervised areas**
 - *Belgium, Spain, USA, Finland, UK, Sweden, Switzerland*
- *Test the application of existing rules through ~12 case studies in the nuclear, non-nuclear (e.g. NDT) and medical sectors*

- Analysis of the regulatory frameworks
 - Laws & Decrees
 - Specific Regulatory Guidances
 - Procedures (Technical Guidances)
- Sources :
 - Web
 - EAN survey
 - ISOE survey
 - + Interviews (RP authorities in the UK, Switzerland, Finland)

- Unique regulatory ‘cap-text’, not so much detailed (i.e. establishing general principles as they are stated in the Euratom Directives), valid for all sectors,
- Complementary regulatory guidances for each sector
- The controlled area is not often sub-divided, but in the nuclear sector
 - The sub-division of the controlled areas in the nuclear installations are fixed either by RP authorities (e.g. Spain, Finland, USA) or operators (e.g. Sweden)
 - Operators can opt for stricter rules than those fixed by Law
 - Usually, no subdivision of the controlled area in the medical sector (except. Spain, France)

General objective of the classification of areas

- Rarely explicit
- **Clear link with the dose limitation principle:** the area must be controlled if the dose limits could be exceeded (in specific circumstances)
 - Prevent or limit the probability and magnitude of radiation incidents and accidents (i.e. potential exposures)
 - Identification of areas that necessitate specific access & surveillance procedures
- **Tenuous link with the optimization principle (i.e. ALARA dose reduction in routine circumstances)**
 - UK: *‘to help ensure that the measures provided are effective in preventing or restricting routine and potential exposures’ (...)* *‘the area design requirements and access controls should always aim to keep exposures ALARP’*
 - Switzerland: « Limit and control exposures to radiations »

Preliminary Risk Assessment (PRA)

- Requested everywhere, **the PRA must be done by the licensee**, with the help of internal or external *ad-hoc* RP services or expert(s)
- PRA shall include:
 - Nature, type and levels of radioactivity
 - Contamination risks
 - Potential exposures
- Generally speaking, **the real risk (dose) assessment at workplace is not the criterion which is used to designate the area**: a 'conservative approach' is adopted

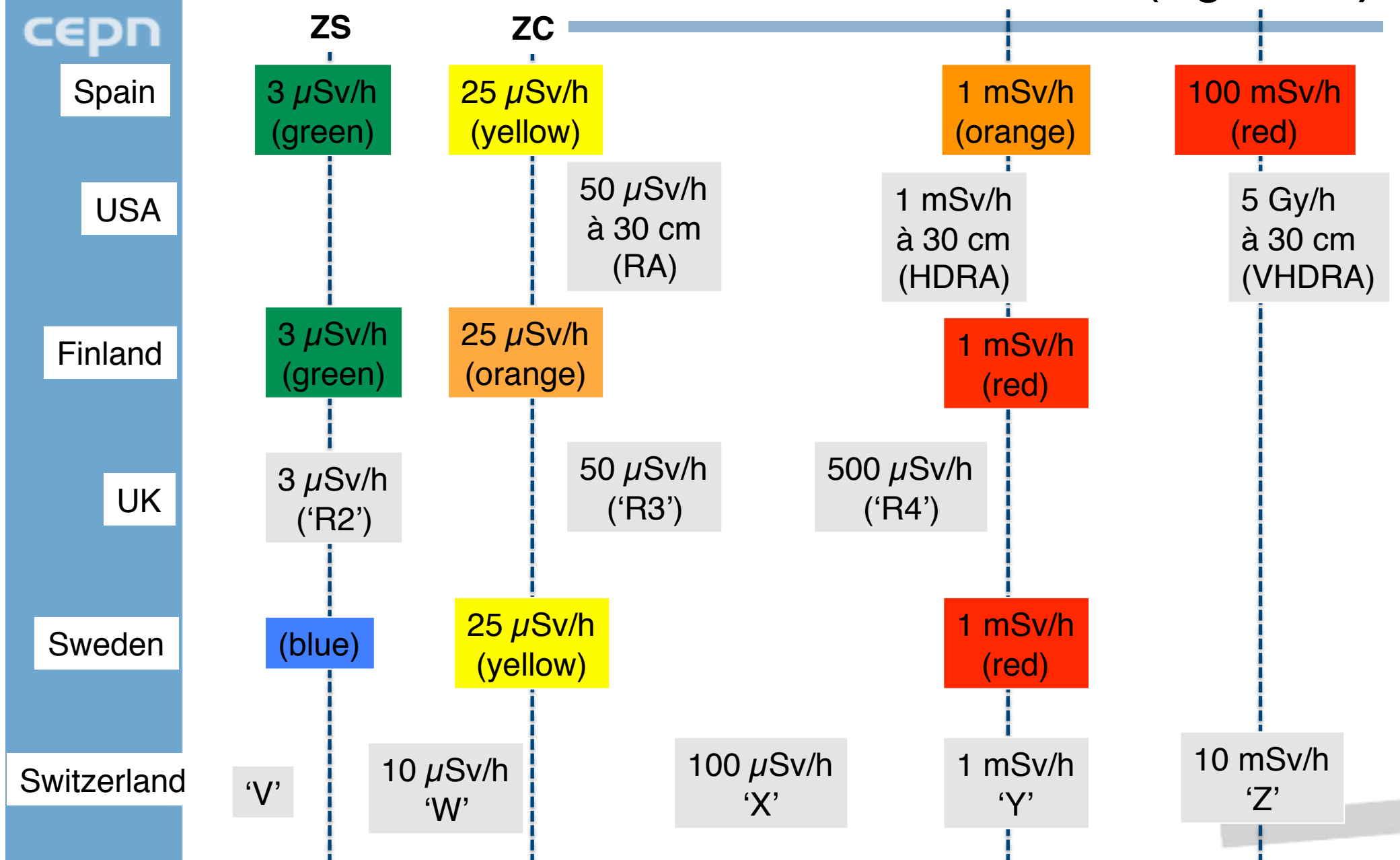
Recommended criteria for the designation of areas

CRITERIA	Belgium	Spain	USA	Finland	UK	Sweden	Switzerland
Potential Effective Dose	✓	✓		✓	✓	✓	✓
Potential Equivalent Dose	✓	✓	✓	✓	✓	✓	
Max. Dose rate	✓				✓		
Potential Absorbed Dose			✓				
Max. Air contamination			✓				✓
Max. Surfacic contamination							✓
Protective suits or equipment (whatever the risk level)		✓		✓	✓		

Conservative exposure scenarios (maximum dose rates, maximum occupancy rates of 250 d/y, 40 h/w., 8 h/d, etc)

Example of non-harmonization

Dose rate criteria used in the nuclear sector (e.g. NPPs)



- Trefoils (4 colours)
- Risk of irradiation indicated with a 'shining' symbol
- Contamination indicated with a dotted background



ZONA DE PERMANENCIA LIMITADA

RIESGO DE IRRADIACIÓN

SERVICIO DE PROTECCIÓN RADIOLÓGICA

INFORMACIÓN RADIOLÓGICA DEL CUBÍCULO

H2-02

(ANTESALA DE CALENTADORES 3 A/B)

■ TASA DE DOSIS EN ÁREA : 0.10s mSv/h

● CONT. SUPERFICIAL EN ÁREA : 0.2 Bq/cm²

● CONT. AMBIENTAL EN ÁREA : 0.00s LOCA

FECHA DE LAS MEDIDAS : 16/10/2009

TASA DE DOSIS EN PUNTOS CALIENTES (mSv/h)

Número	Contacto	± error	Observaciones
1.1	1.25	0.05	112% de pot. el. H ² a 1.0 ppm/s
1.2	1.32	0.08	

OBSERVACIONES : - Vestuario a utilizar en el área (en presencia de riesgo de Contaminación. Vestuario para inspecciones, para trabajos o en convivencia de ambos).
- Nº de Teléfono de contacto del SPR : 87C

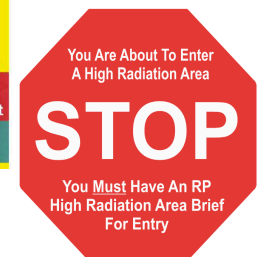
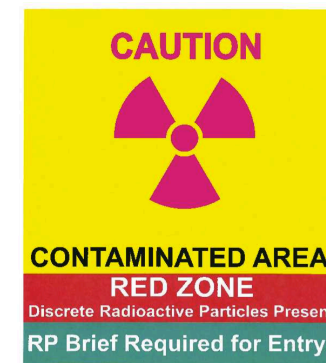


■ 'Read carefully' approach

Purple trefoil

Yellow background + written text

- « Radiation Area »
- « Caution, Radiation Area »
- « Danger, Locked High Radiation Area »
- « Grave Danger, Very High Radioactive Area »
- Contamination atmosphérique : Danger, ou grave danger, zone de radioactivité dans l'air »



Signs in Finland



« Supervised Area »

+ identification of sources

Not mandatory if another sign is sufficiently explicit:

(e.g. « **X-ray room** »)

« Controlled Area »

+ black trefoil

+ Risk description:
radionuclide, activity, dose rate and contamination levels (date)



Signs in the UK

Figure A12.6 Safety signs and notices (in two languages) at the entrance to a radiotherapy bunker; the illuminated interlocked warning signals are shown in use in the lower image

Radiological Safety Rules



Radiation Hotspot!

Do not Linger in this Area!

Contact doserate	
Doserate @ 0.5m	
Hotspot Number	
Monitor Name / Date	/



No Entry

except authorised personnel



Controlled Area

X rays when warning light is on

Radiological Safety Rules



Contamination Controlled Area C

!



- Regulatory framework valid for all sectors
 - Main criterion is, most of the time, the potential effective dose (using a conservative approach)
 - Real dose assessment (ALARA procedure) at workplace is generally disconnected of the principles that steer the classification of area (≠ in France)
 - Other domain-specific criteria
- Non harmonization between countries, in terms of
 - Criteria (type, levels)
 - Designation of areas (colours, VWXYZ, R1/2/3...)
 - Signs, etc.
- The classification of areas mainly aims at identifying where specific controls are needed in terms of surveillance, access restriction, individual protective equipment, etc. to avoid or mitigate incidents/accidents