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Learning Outcomes for E&T Programs for RPOs for open sources

A German-Dutch Comparison

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Introduction / contents

- › New learning outcomes for E&T Programs (NL)
 - Old and Adapted Dutch model for E&T in Radiation Protection
 - Qualification Descriptors for RPOs responsible for dispersive RA material ('open sources')
- › Towards German-Dutch comparison
 - Why and why now?
 - Preliminary results



Old Dutch system

| Level of Expertise | Purpose | Variants |
|--------------------|------------------------------------|----------|
| 5 | Low risk & few sources (RPO) | A / B |
| 4 | Moderate risk (RPO) | A / B |
| 3 | Significant risk (RPE/RPO) | - |
| 2 | High risk / complex licenses (RPE) | - |

- › ‘problem’: RPO is not application specific as required by EU-BSS



Adapted Model Dutch educational system RPO

| Sector | Medical | | | Nucl | Industry & Research | | | | |
|---|------------|-----------|------------|------------|---------------------|-----------|------------|-----------|-----------|
| Type of specialisation → | Rad | De | Vet | NFC | Os | No | Acc | IR | GT |
| EQF level | 4/5 | 4/5 | 4/5 | 6/7 | 6 | 4/6 | 4 | 4 | 4 |
| ↓ Topics | | | | | | | | | |
| Technical | B5 | B5 | B5 | B7 | B6 | B6 | B4 | B5 | B4 |
| • Radiation physics and interaction with matter, dosimetry and detection, risks and effects | | | | | | | | | |
| Supervisory | B5 | B5 | B5 | B7 | B6 | B6 | B4 | B5 | B4 |
| • General role and duties RPO, legislation, dose limits, O.P.A, safety assessment, ALARA, environment etc | | | | | | | | | |
| Technical | Rad | De | Vet | NFC | Os | No | Acc | IR | GT |
| • Technical knowledge, operation and maintenance, specific risks, shielding, measurement, storage, packing and transport, waste and discharges. | | | | | | | | | |
| Supervisory | Rad | De | Vet | NFC | Os | No | Acc | IR | GT |
| • Specific tasks RPO, specific legislation, licences/reports incidents, supervising | | | | | | | | | |



RPO-DRM

- › RPO Dispersive Radioactive Material (RPO-DRM)
 - Three levels (depending on amount of activity)
 - RPO-DRM B: E&T Program for RPE
 - RPO-DRM C: EQF Level 5 (modest activity)
 - **RPO-DRM D: EQF Level 4 (low activity)**
- › Qualification Descriptors RPO-DRM C/D
 - 3 Core Competences for all RPO's ('Basic')
 - 1 Core Competence for RPO-DRM ('Specific')



RPO-DRM

- › Qualification Descriptors → Learning Outcomes
 - Table with keywords/subjects ranked according to Knowledge, Skills and Competences $K < S < C$
- › Concluding remarks RPO-DRM
 - RPO-DRM C: similar to old level 4B
 - **RPO-DRM D: similar to old level 5B**
 - **RPO-DRM D also recommended for Radiation Workers**



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Towards a German-Dutch comparison

- › Why and why now?
 - Opportunity to harmonize learning outcomes for a dedicated group of RPOs (D-NL) → mutual recognition?
 - Facilitate employers in mutually ‘recognizing’ instruction programs
 - NL is (a little) ahead of Germany in implementing EU-BSS
 - Comparison of new Dutch learning outcomes with old German ones feasible
 - Recommendations to ANVS (NL) and BfS (D)



The German-Dutch comparison

5B course

RPO-DRM D

S 4.1 module

Handling of open sources with low activity

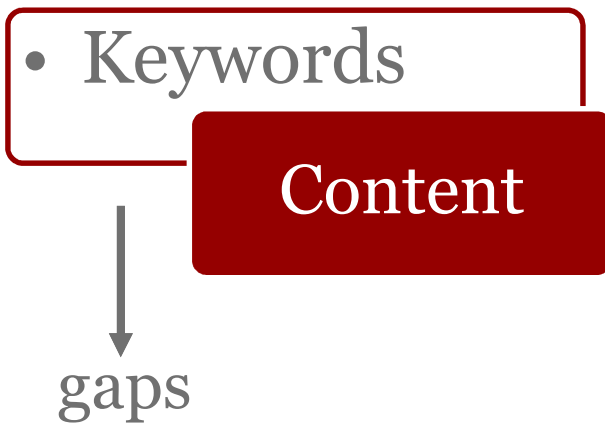
Module **GH**: Handling of sealed radioactive sources with low activity

+ Module **OG**:
Handling of unsealed radioactive sources with low activity

-> Comparison of the learning subjects



Analysis: Scheme



conformity

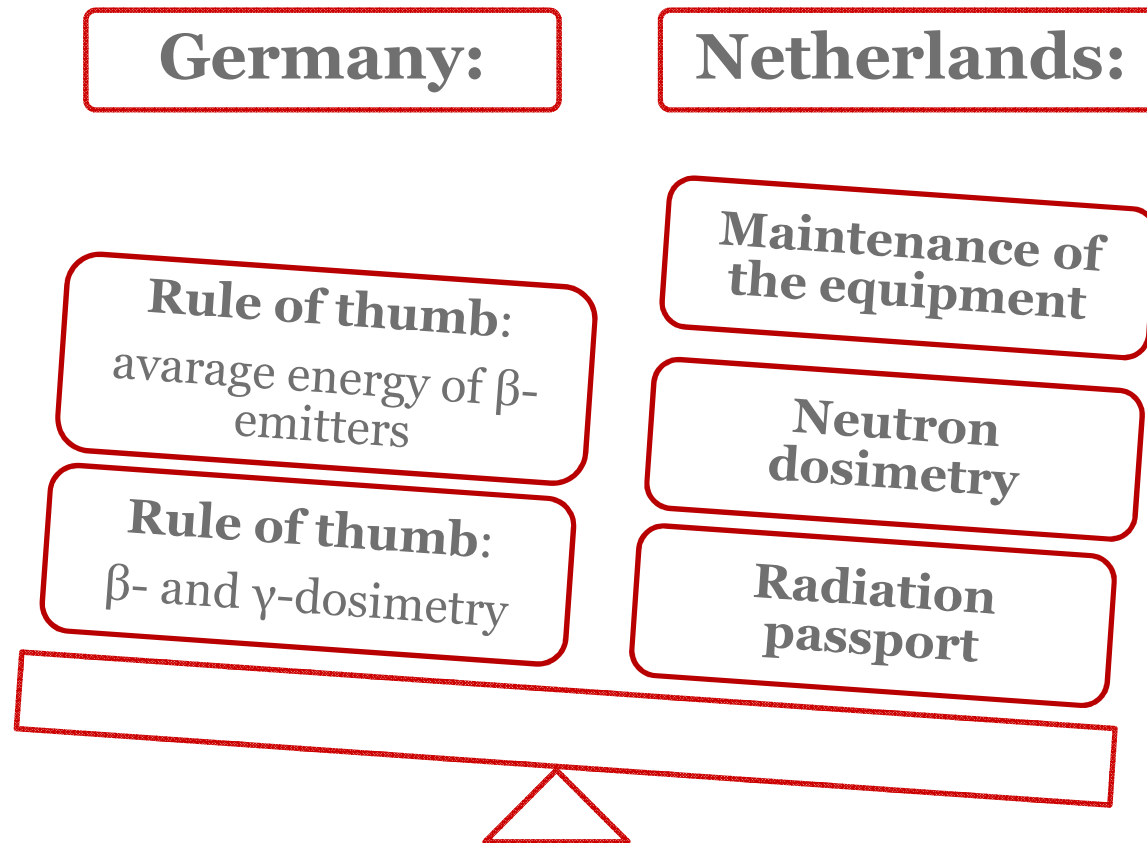
1.

2.

3.



1. Analysis: Content





2. Analysis: Equivalence

-> *The contrast between content wise identical subjects*

“Practical skills in release of contaminated people” **K** < S < C

- › No. 368 OG (2) mention
- › No. 371 OG (2) execute
- › No. 372 OG (2) estimate
- › No. 369 OG (2) evaluate
- › No. 370 OG (2) mention

Extent: Netherlands < Germany

Extent: Germany < Netherlands

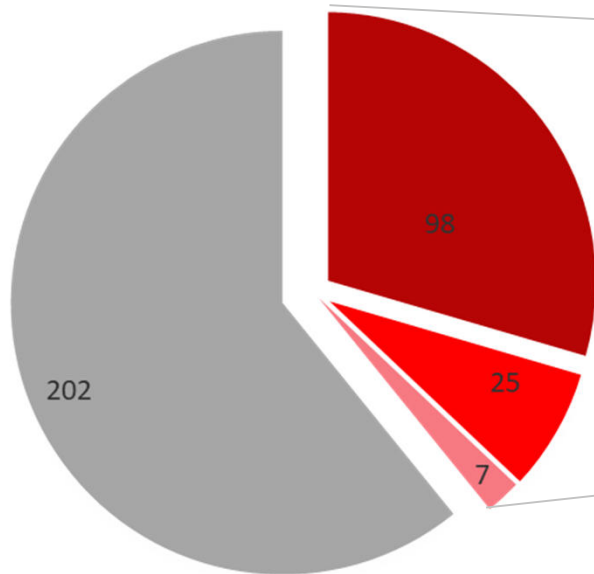
The various lecture times might falsify this analysis slightly!



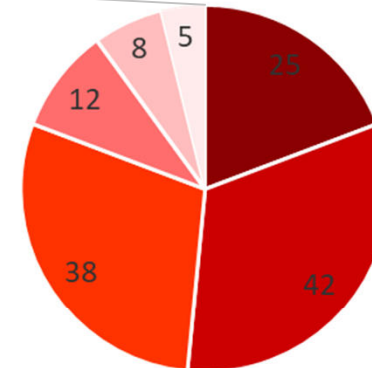
3. Analysis: Legislation reference

German learning objectives

Legislation related topics



- German RP ordinance reference
- Other German legislation references
- Subjects: Regulation knowledge
- No legislation reference



- Legislation
- Organization
- Practical aspects
- Waste handling
- Knowledge and practical skills of different cordoning off levels
- Dose terms and units





Experiments:



- Practical skills in release of contaminated work areas



- Interaction mechanisms for β emitters
- Ionization chambers
- Proportional counters
- Geiger-Müller counters
- Inverse square law
- Half-thickness
- NaI-detector
- Rules of thumb: penetration of beta-emitters
- γ -dosimetry
- Principle protection regulations
- Interpretation of measurements
- Choice of material for shielding as a function of photon energy
- Calculation of radiation scattering by objects
- Practical skills in contamination measuring



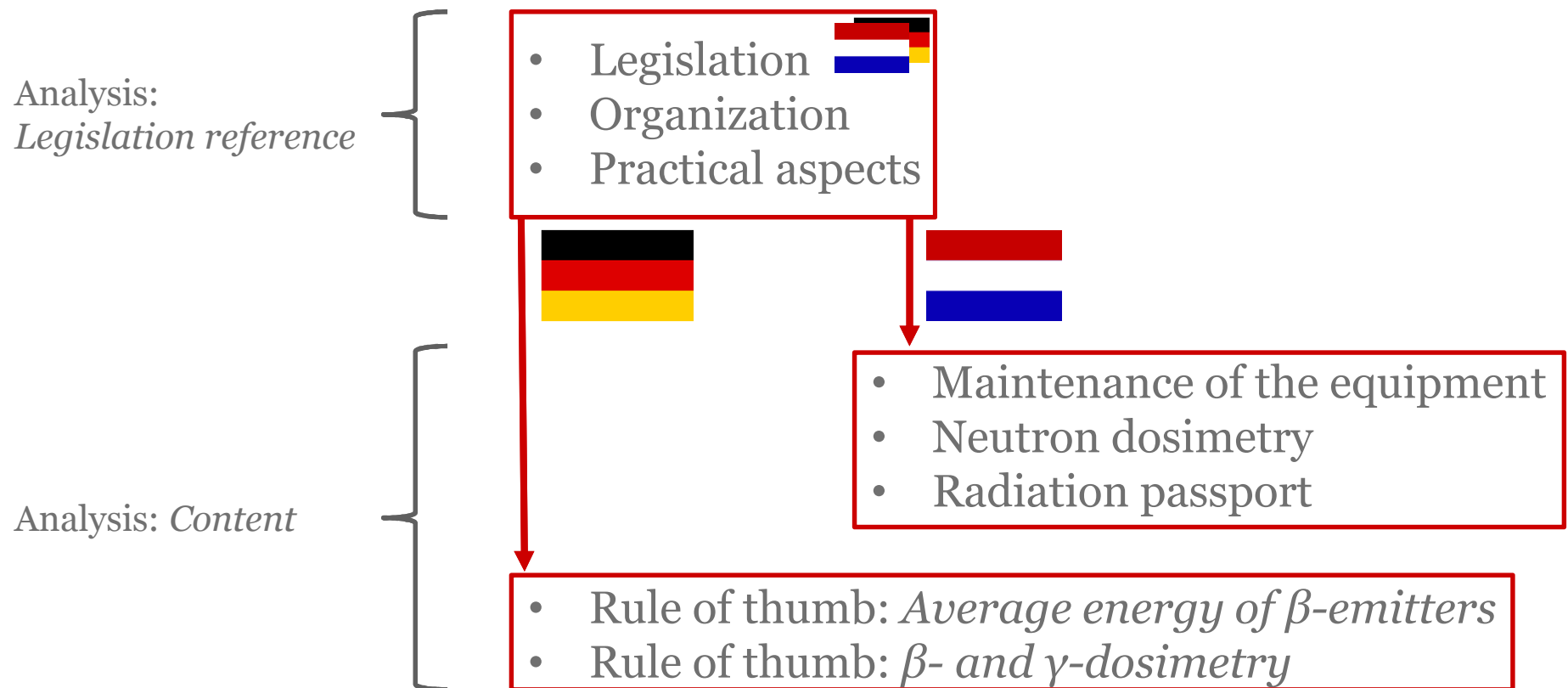
- Energy spectra β -, γ -emitters
- Interaction mechanisms for γ -emitters
- Bremsstrahlung
- Liquid scintillation counters
- Dead time
- Counting efficiency
- Minimal detectable activity / counting rate
- Spectrometry, pulse height analysis
- Source constant
- Build-up factor for non-composite materials

Keep in mind that:

Sufficient practical experience is required to become an RPO in Germany!



Conclusions: Additional training



The equivalence analysis accounts no noticeable gaps.



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Thank you for your attention