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Standardization of Radon Measurement Procedures for Building Materials - QUESTIONNAIRE

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Deliverables for Topic Building Materials

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- **D4** : Common measurement and quality control protocols.
- **D5** : Develop measurement standards, models.
- **D6** : Develop common guidance for the testing of radon barrier materials. Develop common rating system for describing radon barrier materials, their capabilities and practical use.

Conclusions from the London meeting

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- Need to investigate which standardized procedures exist today.
- What National/International standards exist.
- Need to decide which procedures need standardization (develop one-two protocols).
- Need to have an idea of what accreditation means and what could be done towards that direction.
- Investigate what kind of measurements and procedures need accreditation.
- Investigation of interest on thoron measurements.

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Useful conclusions from another EU Concerted Action

EU CONCERTED ACTION

"Concerted Action for a survey on radon exhalation measurements for building materials and soils"

By order of the European commission,
DGXII, contractnr, ERB F14P-CT98-0072

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Aim of the Concerted Action

- The aim of this Concerted Action was to explore the available knowledge on all aspects of radon exhalation measurements, by means of questionnaires, discussions and a closed workshop for specialists from EU countries.
- Specific objectives: Inventory of basic measurement principals, results, demands of the building industry, inventory of thoron measurements.

Conclusions (I)

- The variety of methods and the variety in used quantities lead to the conclusion that ***each measurement has its own approach***. Furthermore, even within one institute several variants of the same method are used. This makes the interpretation and the comparison of the methods difficult if not impossible.
- There is a huge number of measuring instruments, methods and labs within EU available for radon exhalation measurements. For every type of sample (bricks, soil etc) measurement methods are available. Most methods may be applied on more that one type of sample.

Conclusions (II)

- The fact that several institutes have several variants and ***in many cases the measurements have to be carried out by a scientist, implies that the measurements are not yet well established.*** It can be expected that those methods are in a process of on going development.
- It can be questioned whether institutes have a full insight in the influencing aspects on their own method. ***One of the reasons for this situation is the lack of standards on radon exhalation measurement methods.***
- According to the building industry : ***major aspects are cost and reliability.***

Conclusions (III)

- The practical value of measuring radon exhalation rate of standard building materials was discussed during several meetings. No consensus on this item could be achieved. However, it must be stated that in several EU members, regulation on radon exhalation rates is, or will be established.
- Regarding the institutes responses, the industry concludes that "*the institutes seem to have no specific knowledge on the demands of sample size, sample preparation and storage conditions of building products*". No specific knowledge exists on absolute reliability of measurements (reproducibility and repeatability).

Conclusions (IV)

- ***Sample preparation, sample size, storage conditions should correspond to applicable European standards for building materials, as far as available.*** Otherwise, national standards for the duration of the coexistence should be used.
- Testing methods should be appropriate to the level of activity to be expected and hence may depend on specific building products under consideration.
- If the reliability of the method is high enough, ***a certificate for each test-result with respect to the building product under consideration should be available.***

Conclusions (V)

- ***The aim of standardization is to obtain a method with sufficient precision, repeatability and reproducibility.*** These aspects are seen to be more important than other aspects such as the overall measuring time and cost. There was no agreement on the importance of the overall measuring time and costs.
- ***The participants expressed the outmost importance of conducting a round robin test involving both several methods and different kind of samples. This could apply the basis for a standardized measuring method.***

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QUESTIONNAIRE

On the standardization of radon measurement procedures for building materials

Aim of the questionnaire:

- To record the existing standard procedures regarding radon related measurements for building materials, over Europe.
- To investigate the priorities which ERRICCA-2 partners believe that should be set due to further standardization, relevant to the radon related procedures.
- To assist ERRICCA-2 partners benefit from the experience of Laboratories ahead in the field of standardization.
- To collect information on the existing National and International Standards.

Questionnaire structure (I)

As standardized procedures should be considered:

- Procedures, which are described in a National or International Standard.
- Procedures that are used in a Laboratory for a number of years unchanged, and are described in reports (including internal reports) or publications in National or International Journals.

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Questionnaire structure (II)

Measurement procedures

- Radon exhalation rate from raw building materials
- Radon exhalation rate from building structures
- Radon Emanation Power of building materials
- Thoron exhalation rate from raw building materials
- Thoron exhalation rate from building structures
- Thoron Emanation Power of building materials
- Natural Radioactivity of building materials
- In-situ measurements indoors
- Radon Barrier materials testing
- Other(s)

Questionnaire structure (III)

Questions asked

- Radon related measurements conducted in your Laboratory.
- Procedures that are standardized in your country.
- Procedures that are accredited in your laboratory.
- Procedures that to your opinion need standardization.
- Procedures that to your opinion need to be accredited.
- Questions on the used standards (if any).

Questionnaire structure (IV)

For each National/International standard

- Do you think that the above Standard is:
  - Sufficient
  - Needs to be changed (yes/no)
  - Easy to be applied
  - Fulfills your requirements
  - Other comments
- Does your Laboratory follow the National Standard (Yes/No)?
- If yes since when
- If not what is the reason (Please describe)
- Do you know any other Laboratories in your country that follow any National Standard

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Questionnaire structure (V)

Radon barrier materials testing questionnaire part:

- **What should be tested** *(radon transmission, air permeability, material strength, aging, other)*
- **How should the test be performed** : *(individual components, combined system, other)*
- **Where should be tested :** *(laboratory, field trials, other)*

Questionnaire Response so far (I)

- 12 out of 38 partners have responded so far (~30%)
- Most replies where received within the last week (last received on Saturday)
- Two partners sent a common questionnaire (Czech Technical University and Radon vos)
- For the time being, only preliminary conclusions may be drawn

Questionnaire Response so far (II)

Laboratories that use International Standards for:

- Natural Radioactivity of Building Materials : *FANC (A.Poffijn), HERO (I.Mocsy)*
- Radon emanation Power determination : *(STUK) H.Arvela*
- Radon Exhalation Rate of raw building materials : *HERO (I.Mocsy)*
- In-situ measurements indoors : *HERO (I.Mocsy)*

Questionnaire Response so far (III)

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Laboratories that use National Standards for:

- Natural Radioactivity Measurements of building materials : *(NGD-KVI, Central Mining Institute, ARC Seibersdorf)*
- In-situ measurements indoors : *(NGD-KVI, Radon vos, Central Mining Institute)*
- Radon exhalation from raw building materials : *(NGD-KVI)*
- Radon Barrier Materials : *(Czech Technical University)*

Questionnaire Response so far (IV)

International Standards Used:

- Natural radioactivity of building materials : *EN45001 ISO/IEC 1725, ISO/IEC1725 modified Finland,*
- In-situ measurements indoors : *ISO/IEC1725*

Questionnaire Response so far (V)

National Standards, Guides, regulations used:

- Natural radioactivity of building materials : *GUIDE ITB/234/95 Poland, OENORM S5200 Austria*
- In-situ measurements indoors : *GUIDE ITB/352/98 Poland, DIN 25706 Germany*
- Radon Barrier materials testing : *K124/02/95 Czech Republic*

(Some relevant standards)

- **ISO 11929-1:2000, ISO 11929-2:2000, ISO 11929-3:2000, ISO 11929-4:2001:** Determination of the Detection Limit and the Decision Threshold for Ionizing Radiation Measurements ….
- **ISO/CD 18589-1,2,3,4,5,6** : Measurements of radioactivity in the environment– Soil -- *(drafts)*.
- **ISO 5725-1,2,3,4,5,6:94** : Accuracy of measurement methods and results …. (parts 1- 6)

Questionnaire Response so far (VI)

Procedures that need standardization (first priority or already standardized):

- Natural Radioactivity of Building Materials **(8)**
- In-situ measurements **(5)**
- Radon Barrier Materials testing **(3)**
- Radon exhalation from building structures **(2)**

Questionnaire Response so far (VII)

Accredited procedures:

- Natural Radioactivity of building materials : Central Mining Institute Poland, ARC-Seibersdorf Austria, STUK Finland
- In-situ measurements indoors : Central Mining Institute Poland, ARC-Seibersdorf Austria, BfS Germany
- Radon Barriers materials Testing : Czech Technical University Czech republic

Questionnaire Response so far (VIII)

Regarding radon barriers materials testing:

- **What should be tested:**
  - » Radon transmission **(8)**
  - » Air permeability **(2)**
  - » Material strength **(1)**
  - » Aging **(1)**
- **How should be tested:**
  - » Individual Components **(7)**
  - » Combined System **(6)**
- **Where should be tested:**
  - » Laboratory **(9)**
  - » Field trials **(1)**
  - » Other, laboratory with samples taken in the field **(1)**

Future steps (I)

- Continue the feeding of the questionnaire (maybe with some chances, if necessary).
- Probably some colleagues would like to see it again in more detail.
- We need to further analyse the results of the Questionnaire to come to conclusions
- Collection and study of the standards mentioned
- Decision to go ahead with the development of common measurement and quality control protocols for one-two procedures (D4, D5)
  - are we ready to decide which procedures?
  - what about procedures for which standards are already used?

Future steps (II)

- Form one-two small groups (4-5 persons) to work on the development of the protocols (Literature, existing standards, questionnaire feedback, contacts etc)
- Form a small group (4-5 persons) to work on radon barrier materials (literature, own experience, questionnaire feedback). Develop common guidance for the testing of radon barrier materials. Develop common rating system for describing radon barrier materials, their capabilities and practical use (D6).

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Future steps (III)

- If we intend to produce a standard(s), we should form a small group (4-5 persons) to investigate what should be our next steps towards standardization .

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Initial Proposals for ERRICCA-2

- Building Materials Data Base (BMDB)
- Standardization of radon related measurements
- Accreditation of laboratories conducting building materials measurements.
- Intercomparisons of radon measurements for building materials
- Radon papers Data Base

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Other possible fields

- Thoron measurement techniques.
- Deposition-Recycling of materials from demolition of buildings and industries.
- TENORM materials (recycled iron, mineral wools etc)
- Correlation between Ra content and Rn exhalation from building materials.
- Building materials contaminated with artificial radionuclides
- Occupational exposure of building materials industry workers.