Horizontal Evaluation Method for the Implementation of the Construction Products Directive (HEMICPD)

Dr. Marc Lor

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Programme to stimulate knowledge transfer in areas of strategic importance
Wetenschapsstraat 8 Rue de la Science 1000 Brussels

February 2007 – January 2010
Overview

- Introduction: BBRI - problematic - context
- Objectives
- Research program
- Follow-up Committee - website - contacts
The Belgian Building Research Institute is a private research institute founded in 1960 under impulse of the National Federation of Belgian Building Contractors in application of the so-called "De Groote" decreelaw of 1947.

**BBRI**

BBRI Offices
Lozenberg 7, B-1932 Sint-Stevens-Woluwe

Research Centre BBRI
Avenue P. Holoffe 21, B-1324 Limelette
BBRI

The three Departments of the Directorat Research & Innovation are heavily involved in sustainable construction and environmental & health protection via:

- Research projects on European level: PRESCO, IRMA...
- Participation in European Technical Committees: CEN TC 350, CEN TC 351,...
- National research projects and development for regional authorities and companies:
  * ...

Three laboratories of BBRI are working in the context of dangerous substances and construction materials: laboratories Building Chemistry, Microbiology and laboratory Mineralogy & Microstructure
• Phase out **barriers to trade** by harmonized technical specifications ER3 of CPD (89/106/EC: aimed at removing trade barriers for construction products in the common market of the European Union and permitting the free movement of goods) not yet implemented in the first generation harmonised technical specifications due to the lack of knowledge in the field of health and environment. It is planned to harmonize the health and environmental requirements in the second generation of harmonized technical specifications.

Annex I: essential requirements for the works

1. Mechanical resistance and stability
2. Safety in case of fire
3. **Hygiene, health and the environment**
4. Safety in use
5. Protection against noise
6. Energy economy and heat retention

Necessary to obtain **CE marking**
Introduction – Objectives – Research program – Follow-up Committee

- Guidance Paper H “A harmonized approach relating to dangerous substances under the CPD”: link between requirements for the works and the relevant properties of the construction materials

- Construction materials may not pose a threat to the hygiene or health of the occupants or neighbours as well as protection of the immediate environment. Practical guidance to deal with these issues is missing.

- Need for transparent schemes to assess the performance of the product: evaluation method and standardised determination method. Current situation: proliferation of labels and emission test methods

- ER3 not yet harmonized due to the different construction traditions in the Member States of the European Union, the lack of – or differing – regulations for health and environmental protection, the lack of knowledge on the environment and health by the experts in the technical committees and working groups concerned with European standardisation and approvals, and the lack of harmonised test methods

- So far there are no sufficient data available to allow an overview of the quality and quantity of releases from building materials into the environment
Approach for the implementation of the essential requirement N° 3 "Hygiene, health and the environment" in Belgium which complies with current harmonisation efforts at European level:

- Release of dangerous substances into soil and ground water
- Release of dangerous substances into indoor air

A construction product is relevant for emission into indoor air under CPD if it can release dangerous substances during its intended conditions of use phase when consumer is present (« occupancy »)

Safety during installation of the product is handled under different legislation

Scope of research project "HEMICPD":

Emission from construction products into indoor air
Emergence of Interest in Indoor Pollutants

Source: Seifert, B. 2002
Introduction – Objectives – Research program – Follow-up Committee

European standard (EN)
BBRI active in CEN/TC 351

"dangerous substances"

CPD

CE-marking

European Technical Approval (ETA)
BBRI active in EOTA PT9
Introduction – Objectives – Research program – Follow-up Committee

Scope of CEN/TC 351

- Development of horizontal standardised assessment methods for harmonised approaches relating to the release (and/or the content when this is the only practicable or legally required solution) of regulated dangerous substances under the Construction Products Directive (CPD) taking into account the intended conditions of use of the product. It adresses emission to **indoor air**, and release to soil, surface water and ground water.

- On basis of mandate M366/EN (April 2005)

- Implementation of ER3 of CPD
Introduction – Objectives – Research program – Follow-up Committee

Structure of CEN/TC 351

- WG1 Release into Soil & Ground-/Surface water
- WG2 Emissions into indoor air
- BBRI

5 TG’S: 6 TR’s
Scope WG2 (Emission from construction products into indoor air)

- WI 9: Methods for generation of emission of dangerous substances from construction products into indoor air in standardized testing facilities
- WI 10: The measurement of regulated dangerous substances in indoor air samples as generated from construction products in standardized testing facilities
- WI 11: The measurement of radiation and radioactive emissions from construction products
- WI 12: The assessment for potential growth of relevant micro-organisms on construction products in the indoor environment
- During the in use phase
Planning CEN/TC 351

- 1st TC meeting: 19-21 April 2006:
  - Business Plan finished (work programme, title, scope, structure)
  - WG’s established
  - TG’s 1-3 established

- 2nd TC meeting: 14-16 November 2006
  - progress TG’s 1-3 and WG’s

Coming:

- 3rd TC meeting: 9-10 May 2007
  - concepts TR1, TR2 & TR3
  - start of WG’s
  - workshop with productTC’s (24 May 2007)

- 4th TC meeting: October 2007
  - TR1, TR2 & TR3 finished
  - conference with productTC’s (29 November 2007)
**Input & planning CEN/TC 351 WG2**

**INPUT**
- List with standards & existing legislation
- List of ‘Dangerous Substances’ that have to be tested (EG EC /Fuchs)
- List with construction products (list of productTC’s)
- Technical reports 1-6 van TGs 1-5

**PLANNING**
- 1st WG2 meeting: 30 June 2006
- 2nd WG2 meeting: 13-14 November 2006: - compiling list of existing standards

**Coming:**
- 3rd WG2 meeting: 20 April 2007: - approach for common understanding & action plan proposals
- April 2008: State of the Art WI 12 (go/no go) & Start WI 11 en WI 12
EOTA PT9

- EOTA also implementing ER3 of CPD
- Checklist for substances: draft ETAG IPK
- Current situation: “Introduction to guidance on assessment in relation to ER3 for ETAGs and CUAPs and ETAs”

PLANNING

- Next meeting: 22 May 2007
  - how to handle ER 3 in ETAGs/CUAPS and ETAs
  - model clauses
European projects in context of building materials and emissions & indoor air

- BUMA PROJECT
- INDEX PROJECT
- EnVIE PROJECT
- THADE PROJECT
- COSI project

New calls in FP7 regarding indoor air
Prioritzation of BUilding MAterials
as indoor pollution sources (BUMA)

--- Call for the end-user community ---

Project Description

Indoor organic compounds are released from a variety of building materials including vinyl tiles and covings, carpets, particleboards, wood products, paints, adhesives etc. VOCs associated with paints, varnishes, sealing cains, adhesives, carpets and other materials are likely to be a major cause of health complaints associated with indoor air in new buildings. Certain parts of the population may be at greater risk, for example the infants and the elderly, those already suffering from respiratory diseases, hyper-responders and people exercising.

The BUMA project aims to thoroughly assess the human exposure to air hazards emitted by building materials commonly used in Europe. The project aspires to gain a better understanding of the sources of hazardous compounds existing in the indoor environment and play a key role in the determination of the well-being and comfortable living of the occupants. The outputs of the BUMA project will be subsequently used by policy makers, health professionals and building material producers in the enlarged European Union.

The project main objectives are

I. The formation of a comprehensive database containing up-to-date quantified emitted compounds by construction products and other building materials.

II. The classification and prioritization of building materials from the developed database with respect to hazardous compounds emission factors and the relevant exposure levels.

III. The creation of an indoor exposure expert modeling system linked to the above mentioned data base.

IV. The production of relevant guidelines for policy-making actions.

The main activities of the BUMA project include:

1. The collection and review of the existing emission factors from construction products covered by the CPD and other building materials used in Europe.
2. The creation of a database giving quantified building material emissions and exposure data.
3. The classification of the major emissions, from building materials, in the indoor environment according to their potential risk and health consequences.
4. The refinement of the present database by executing selected laboratory experiments in a high volume environmental chamber to characterize individual material emissions, focused on aromatics (benzene and its homologues) and carbonyl compounds (aldehydes and ketones e.g. Formaldehyde, acetaldehyde, aceton). Create an expert modeling system to estimate exposure based on the abovementioned database.
5. The performance of carefully designed indoor environment campaigns at selected sites (houses, schools and public buildings) to assess the exposure and health risk.
6. The Production of relevant guidelines.

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Final Report

The INDEX project

Critical Appraisal of the Setting and Implementation of Indoor Exposure Limits in the EU

Dimitris Kotzias, Kimmo Kostinen, Stylianos Kaphaleponios, Christian Schlüt, Paolo Carrer, Marco Maroni, Matti Jonsson, Christian Cochet, Séverine Kirchner, Thomas Lindvall, James McLaughlin, Lars Mikkelsen, Eduardo de Oliveira Fernandes and Bernd Seifert

Towards Healthy Air in Dwellings in Europe.
The THADE Report

Mariadelaide Franchi, Co-ordinator
Paolo Carrer
Dimitris Kotzias
Edith M.A.L. Ramekers
Olli Seppänen
Johanna E.M.H. van Bronswijk
Giovanni Viegli
Characterization Of Indoor Sources (COSI)

Emissions of chemical substances from materials and products

Yuri Brunewe de Bruijn, Dimitrios Kotzias and Stelios Kephalopoulos

COSI project focused on the 5 priority compounds of INDEX project.
§4.1.1 Emissions from building materials
The overall objective of the proposed research is to propose/develop normalized methods and an evaluation scheme for the implementation of the essential requirement N°3 of the CPD regarding emissions to indoor air which comply with the current European efforts in this field (CEN/TC 351 and EOTA PT9)

In order to reach the overall objective, the following partial objectives are defined:

• The realisation of an inventory of all available information on standards, dangerous substances, evaluation methods, test protocols, and labels relevant for implementation of the essential requirement N°3 of the CPD regarding emissions to indoor air

• Developing test methods for emissions of dangerous substances and odour from construction products into indoor air for use in laboratory and on (construction) site

• Comparative study of results obtained by experiments performed in test chambers of different sizes – ranging from “μ”-test chamber to “real size” test chamber – which will allow to develop a fast screening method
Introduction – Objectives – Research program – Follow-up Committee

- To study the influence of climatic conditions (T, humidity, ozone,...) and general test conditions (substrate,...) on emissions to indoor air for implementation in the test procedures
- Creation of website/database for construction products which comprises up to date information on emissions to indoor air and emission profiles of different classes of building materials
- Promotional activities and sensitisation of all the actors in the construction sector by the organization of workshop(s) and participation in national and international conferences and workshops
- To establish a Belgian test protocol for emissions of dangerous substances of construction products into indoor air
- To suggest a voluntary Belgian building product information system/label that could support Belgian legislation in the field of indoor air
4 work packages

WP1: ORIENTATION PHASE  
*BBRI-VITO-ULG*

WP2: MEASURING PHASE  
*BBRI-VITO-ULG*

WP3: VALIDATION PHASE  
*BBRI-VITO-ULG*

WP4: VALORISATION PHASE  
*BBRI-VITO-ULG*
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**WP1**

- **Inventory**
  - standards
  - available test methods
  - test protocols
  - labels
  - dangerous substances
  - available emission data

- **Selection of relevant building materials**

- **Selection & development of test methods & test protocols**

- **Study of**
  - influence of climatic (T, ozone...) and general test conditions (substrate,...)
  - influence of "upstream the test chamber"

- **Comparison of results obtained with different test methods**

- **Evaluation model for Belgium**

**WP2**

**WP3**

**WP4**
Introduction – Objectives – Research program – Follow-up Committee

Research program

- Sampling of the material
- Transport of the sample
- Storage of the sample before testing
- Test specimen preparation
- Testing age and conditioning of the test specimen
- Measuring technique
- Analyses
- Evaluation procedure
- Reporting, labelling

WP2 + WP3

- « upstream » the test chamber or other measuring technique

- 1. VOCs
- 2. Odour
- 3. PM
- 4. Microbial resistance

- SVOCs

WP3 + WP4

Primary and secondary emission

Test (single product)

climatic parameters
humidity
oxidants

Floor Covering
Adhesive
Concrete
Belgian Building Research Institute

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Abb. 1: SCHEMA ZUR GESUNDHEITLICHEN BEWERTUNG VON VOC- UND SVOC-EMISSIONEN AUS BAUPRODUKTEN

1. Messung nach 3 Tagen
   Prüfung auf:
   TVOC ≤ 10 mg/m³?
   Ja
   Ist die Summe aller detektierten Kanzerogene ≤ 0,01 mg/m³?
   Ja
   Ablehnung
   Nein
   TVOC ≤ 1,0 mg/m³?
   Ja
   Ist die Summe aller detektierten Kanzerogene ≤ 0,001 mg/m³?
   Ja
   Ablehnung
   Nein
   TVOC ≤ 0,1 mg/m³?
   Ja
   Ist die Summe aller detektierten Kanzerogene ≤ 0,001 mg/m³?
   Ja
   Ablehnung
   Nein
   Bewertbare Stoffe:
   Gilt bei Betrachtung aller VOC mit NIK**
   R = \( \sum \frac{C_i}{NIK_i} \) ≤ 1?
   Ja
   Ablehnung
   Nein
   Nicht Bewertbare Stoffe:
   Ist die Summe aller VOC ohne NIK** ≤ 0,1 mg/m³?
   Ja
   Ablehnung
   Nein
   Das Produkt ist für die Verwendung im Innenraum geeignet

Für die zu diesen Zeitpunkten ebenfalls vorgesehenen sensorischen Prüfungen stehen derzeit noch keine abgestimmten und allgemein anerkannten Verfahren zur Verfügung.

* VOC, TVOC: Retentionsbereich C₅ – Cₓ, SVOC: Retentionsbereich > Cₓ – Cₓ₁
** NIK: Niedrigste Interessierende Konzentration, engl. LCI

Emissionskammerprüfung nach prEN ISO 16000-9 bis 11
UBA II 1.2 – AgBB
Sept. 2005
# Belgian Building Research Institute

**Introduction – Objectives – Research program – Follow-up Committee**

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<td>- Analysis method for more difficult compounds (SVOC)</td>
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**Research program**

- WP1: ORIENTATION PHASE
  - State of art report on standards, test methods/protocols, labels, DS, available emission data,...
  - Selection of building materials, test methods and test protocols

- WP2: MEASURING PHASE
  - Results of experiments performed with complementary methods
  - Results of different test conditions on emission profiles
  - Datasets with emission profiles (single materials, combined tests,...)
  - Analysis method for more difficult compounds (SVOC)
  - Results of "upstream the test chamber"
  - Methodology for microbial resistance

- WP3: VALIDATION PHASE
  - Developed fast screening method for VOC
  - Developed test method for PM/dust measurements
  - Developed horizontal method for VOCs for use in laboratory and in situ
  - Developed quantitative and qualitative odour test for use in laboratory and in situ
  - Correlation between laboratory and in situ methods

- WP4: VALORISATION PHASE
  - Website/database test method/protocol for implementation in Belgium
  - Evaluation/impact of different test methods/protocols
Introduction – Objectives – **Research program** – Follow-up Committee

**Work in progress**

**WP1: ORIENTATION PHASE**

**WP2: MEASURING PHASE**

**WP3: VALIDATION PHASE**

**WP4: VALORISATION PHASE**

**CEN/TC 351 + CEN/TC 351 WG2**

Technical Reports, questionnaire to productTC’s

- TR1 – Barriers to trade
- TR2 – Concept of horizontal methods
- TR3 – Without testing (WT)/ Without Further Testing (WFT)
- TR4 – Use of horizontal methods
- TR5 – (Complement to) Sampling procedures
- TR6 – Content Determination

Linked with current European efforts

EOTA PT9 & (ETAGs & CUAPs)

- April 2007: Start WI 9 and WI 10 & TR1-3 first drafts
- April 2008: State of the Art WI 12 (go/no go) & Start WI 11 and WI 12
Work in progress

1. Gathering information for state of art report on:
   - testmethods/standards/analysis methods for VOCs and PM
   - methods for microbial resistance
   - labels & testprotocols
   - odour methods: quantitave and qualitative (intensity, hedonic note, acceptance)
   - dangerous substances
   - available emission data

2. Selection of building materials (for the different tests)
Dangerous substances:

* [http://ec.europa.eu/enterprise/construction/internal/dangsub/dangmain_en.htm](http://ec.europa.eu/enterprise/construction/internal/dangsub/dangmain_en.htm): bestaande regelgeving
* List of substances from EGDS

Selection building materials:

* CEN technical committees for product standardization
* EOTA mandates
* literature

Current methods and standards for VOC emissions + PM + odour + microbial resistance

* CEN, EPA, ISO, ASTM,...
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**BBRI**
- Volume test chamber: 45 cm³

**VITO**
- Volume test chamber: 0.72 m³

**ULg**
- Volume test chamber: 60 m³

**GC sniffing**
- 35 cm³
- 1 m³
**Procedure** (example taken from working document TR2)

1. Taking a sample (1)

2. Wrap the sample in Aluminum foil

3. Wrap the sample in polyethylene foil

4. Send the airtight package to the testing laboratory

5. Cut the test specimen out of the sample roll

6. Mount the specimen on an inert support, seal the edges with aluminium tape

7. Place the test specimen in the chamber

8. The conditions are accurately controlled and monitored

9. Or, alternatively: use the (FLEC) Cell method

10. The analytical equipment: thermal desorption-gas chromatography-mass spectrometer

11. The separation process of the complex mixture takes place in the (brown) gas chromatography column

12. Each peak in the gas chromatogram is identified by mass spectrometry
Contact

BBRI/WTCB/CSTC
Dr. Marc Lor, Coordinator
Construction Chemistry Laboratory
TEL: 02 655 77 11
FAX: 02 653 07 29
E-mail: marc.lor@bbri.be

VITO (Vlaams Instituut voor Technologisch Onderzoek)
Msc. Eddy Goelen
Environmental Measurements
TEL: 014 33 69 62
FAX: 014 33 69 88
E-mail: eddy.goelen@vito.be

ULg (Université de Liège)
Professor Jacques Nicolas
Unité “Surveillance de l’Environnement”
Place du 20 Août, 7
B-4000 Liège
E-mail: j.nicolas@ulg.ac.be
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Introduction – Objectives – Research program – Follow-up Committee

http://admin.wtcb.be
Introduction

As part of the implementation of the European Construction products Directive (CPD), a diverse range of harmonised European standards and technical approvals for construction products are currently being drawn up by the respective bodies, which will continue for the next years. In addition to traditional requirements such as stability and resistance to fire, the provisions of the CPD also require that equal consideration is given to hygiene, health and environmental protection as essential requirements. After the transitional period has expired, construction products may only be placed on the market in the European Union if they accord with the harmonised technical specifications and bear the CE mark.

Construction products could emit or contain substances that have been defined as dangerous substances under Commission directives and national regulations. Manufacturers and authorities need transparent schemes in place to assess the performance of the product. In the first generation harmonised technical specifications only limited references are made to release or emission of dangerous substances.

The second generation of harmonised technical specifications under the Construction Products Directive (CPD) require harmonised test methods for the release or emission of dangerous substances to satisfy the requirements of Essential Requirement No. 3 (HE3) “Hygiene, health and the environment” of the CPD. So far there are no data available to allow an overview of the quality and quantity of releases of dangerous substances from building materials into the environment.

The goal of this research project (HEMICPD) is to improve the flow of knowledge and information vis-à-vis normalisation activities in the domain of indoor air measurements, indoor product emission testing, labelling and certification by proposing an evaluation method and standardised assessment methods for a harmonised approach relating to emissions from building materials into indoor air for implementation in Belgium. This approach will comply with current harmonising efforts ongoing on European level.

To achieve this goal following methodological approach will be used:

1. Preparation and follow up of the current evolutions in European standardisation processes and dangerous substances by participation in the new technical committee TC 351 established in November 2005 by the European Committee for Standardization (CEN) and in EOTA working group P19 "regulated substances"
2. Phase 1: Document all available information regarding CPD, construction products, dangerous substances and indoor air by means of state of the art reviews which serve as the backbone for phase 2.