Perspectives on

Sustainability, “Going Green”
EU Regulation
VOC’s, testing and the implications for adhesives and sealants

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Challenges: Sustainability – VOC – Issues

- Revision of EU Decopaint Directive
- EU Construction Products Directive
  - National rules under CPD
- German speaking countries:
  - EMICODE or Blue Angel often required
- Sustainable building projects:
  - LEED, BREEAM, Démarche HQE, DGNB, …
- Further reading

Legal requirements - VOC

- **Revision of EU Decopaint Directive**
  - EU Commission intends to include adhesives (upper limits for VOC)
- **EU Construction Products Directive – CE marking**
  - "Hygiene and Environment": Volatile organics
  - Next revision of CPD: Sustainability declaration
  - National rules under CPD
    - in Germany (DIBt agency):
      - Plans to include parquet coatings & adhesives into AgBB evaluation (emission test after 3 and 28 days, TVOC, some 180 LCI limit values)
    - In France ("Grenelle"):
      - Restriction of 4 CMR (emission < 1 µg/m3 after 28 days) (benzene, trichloroethylene, DEHP, DBP)
      - Compulsory label of emissions of TVOC and 11 VOCs

VOC emissions and CE marking - EU

- CE mark = basic requirements, declared or certified
  - CE mark is compulsory for many construction products
- Basis is a mandate from European Commission to CEN
  - Product specific Technical Committee then issues a performance standard
- Compliance with that standard allows use of CE Mark
  - VOC emissions shall be included in many such norms
- Present work goes for harmonized testing,

  for use and reference in product specific norms
  - BUT – the accepted limit values will be set by each EU Member State separately

CEN draft standard - Reference

Document N0124 of CEN TC 351 WG 2:

CEN/TC 351/WG 2 "Emissions into indoor air" –

WI 351009 –

Construction products –

Assessment of emissions of regulated dangerous substances from construction products –

Determination of emissions into indoor air

Reference rooms – Comparison

	ISO 16000-9	New CEN standard	CA office	CA classroom
Floor m²	7	12	11.1	89.2
Height m	2.5	2.5	2.7	2.6
Volume m³	17.4	30	30.6	231
Temperature °C	23	23	23	23
Relative Humidity %	50	50	50	50
Effective air change / h	0.5	0.5	0.675	0.81

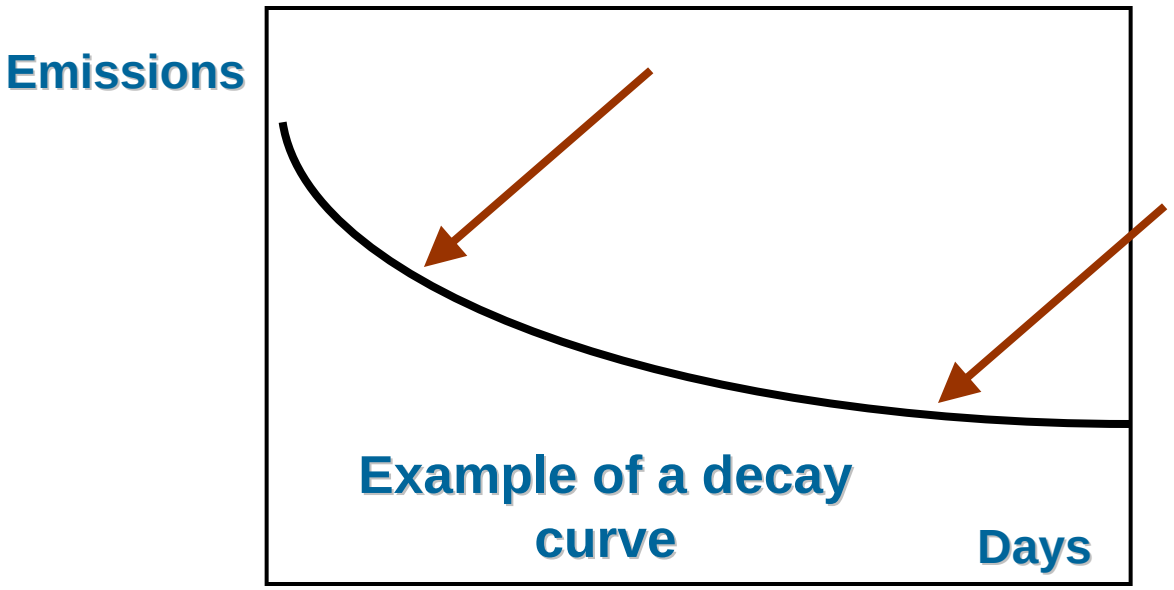
Test chambers – Comparison

	ISO 16000-9	New CEN standard	EN 717-1	CA Section 01350
Size	open	min. 20 l	0.225 – 12 m³	20 – 100 l
Loading floor	(0.4)	0.4	1.0	0.3 – 0.7
Loading wall	(1.4)	1.0	1.0	0.3 – 0.7
Effective air change / h	(0.5)	0.25 – 1.5	1.0	1.0 ± 0.05
Temperature °C	23 ± 2	23 ± 1	23 ± 0.5	23 ± 1
Relative Humidity %	50 ± 5	50 ± 5	45 ± 5	50 ± 5

ISO: The ratio between ventilation and loading is fixed, not absolute values

Emission over Time

- **Evaluation, e.g. by emissions test, standard schedule:**
  - after 3 days (early exposure, renovation) and
  - after 28 days (long-term exposure)
- **Shorter testing accepted**
  - if emissions are low and do not increase



Status and further issues

- Internal draft is written
- Validation is in planning
  - Robustness against change of test parameters
  - Within and between lab repeatability
- Chapter on sampling of product for representative testing is in preparation
- Still an issue of including further emitting substances
  - Now: VOC, some SVOC, some VVOC, volatile aldehydes,
  - What about ammonia?
  - What about other VVOC such as methanol?
- Final publication not realistic before 2011/2012

Elements of the standard already in use

- Final publication not realistic before 2011/2012
- But:
  - German AgBB / DIBt use European reference room
    - Blue Angel, GUT, and others follow
  - New French VOC regulations use European reference room
  - Many test labs adapt their procedures in detail
  - Several CEN product TCs prepare VOC performance criteria in standards on basis of that EU testing method
  - Draft standard, on basis of ISO 16000 standards series, develops into EU state-of-the-art even before publication

Going Green –
BREEAM, LEED®, and more

Going Green – BREEAM, LEED®, and more

- Large variety of sustainability rating systems
- USA: LEED, GBI
- UK: BREEAM
- F: Démarche HQE
- D: DGNB
  - Harmonization approach within Europe:
  - SB Alliance
- Many other initiatives, e.g.
  - Sentinel house
  - EPEA “cradle-to-cradle” approach
  - …

LEED® – what's that? - I

- Sustainable building rating system
- LEED®
  - Leadership in Energy and Environmental Design
  - Latest version as of 2009
  - Created and administered by US Green Building Council US GBC®
- LEED® building projects
  - Project teams – collecting points
  - Audits – checking realization of plans
  - Green Building Certification Institute – assigning sustainability level
- Products can NOT be certified

LEED® – what's that? - II

- LEED® criteria are on:
  - Energy savings
  - Water efficiency
  - CO2 emissions reduction
  - Indoor environmental quality
  - Resources
  - Waste
  - Transport
- LEED® specifications:
  - Commercial Interior
  - New construction
  - Existing buildings
  - Core and Shell
  - Schools
  - Homes
  - Retail (draft)
  - Healthcare (draft)
  - Neighbourhood (draft)

LEED® – where's that?

- Established and administered by US Green Building Council US GBC®
- Copies and modifications in:
  - Italy
  - Dubai
  - Australia
  - China
  - ...
- In most cases copies of 2005 version of LEED
- LEED projects running in many EU countries, too

LEED® – how products fit in

- **Products can NOT be certified**
  - Building projects earn points for achieving high ranking
  - Use of low VOC products can help earning such points by fulfilling specifications, “credits”
  - Product testing may deliver essential documentation for showing compliance with IEQ credits
  - Final decision on acceptance is with the GBCI auditor
- **US GBC® logo on a product means nothing more than:**
  - Manufacturer is member of US GBC®
- **Challenge for European manufacturers:**
  - Have to show compliance with US standards
  - European labels are not accepted (EMICODE, GUT, Blue Angel, M1, …)

California Section 01350

- Developed as purchase criteria in California
  - In conjunction with CHPS for schools
- Based on VOC emission testing
  - After 10 days storage, then 4 days in test chamber
  - Results calculated for class room and office room
- Testing:
  - After (in total) 11, 12 and 14 days
- Evaluation:
  - Limit values: CREL (chronic respiratory exposure levels)
  - 40-50 of VOCs are on CREL list of 2003
  - No TVOC limit value in California
  - Other applications added TVOC 500 µg/m³ (e.g. FloorScore)
- Revision is on-going in 2009 / 2010

LEED® – VOC determination SCAQMD - I

- **SCAQMD: South Coast Air Quality Management District (around and including Los Angeles)**
  - Limitation of VOC content (against ground level ozone)
    - Different limits per US State, and even per county
    - Most stringent: SCAQMD – taken as LEED limit values
  - SCAQMD rules 1113 & 1168 & method 304, EPA method 24:
  - Total volatiles by weight loss after 1h drying at 110 °C
    - Total volatiles may include water:
      Subtraction of water fraction of the product
      - Water-based paints are rated worse than in EU
    - Total volatiles may include non-ozone generating VOC:
      Subtraction of "exempt" compounds

$$\frac{(W_{vm} - W_w - W_e)}{(100 - V_w - V_e)}$$

LEED® – VOC determination SCAQMD - II

- **SCAQMD method – severe drawbacks**
  - Reactive products
    - May stand 1 hour before testing
  - Low VOC products
    - High uncertainty
    - Partial solution: Direct injection method similar as for Decopaint Directive
  - Problems with Karl-Fisher water determination
    - Bad solubility, e.g. with reactive products, and with concrete based products
- **Within LEED:**

  Certain movement away from these content-based VOC specification for next LEED version in 2012

LEED® – different per product group

- **LEED® credits for products and indoor air quality:**
  Indoor Environmental quality IEQ credits 4.1 - 4.6

  - Not all LEED® specifications contain all IEQ credits
  - Content of IEQ credits may vary between specifications

  - IEQ 4.1: Adhesives and sealants
  - IEQ 4.2: Paints and coatings
  - IEQ 4.3: Floorings
  - IEQ 4.4: Composite Wood and Agrifiber products
  - IEQ 4.5: System furniture and seating
  - IEQ 4.6: Ceiling and wall systems

LEED® – Adhesives and sealants IEQ 4.1

- **Mostly:**
  - Limitation of VOC content (against ground level ozone)
    - Even though NO direct correlation between VOC content and VOC long-term emissions
    - Was taken as surrogate for indoor air criteria
  - SCAQMD rule 1168, EPA method 24, SCAQMD method 304:
  - Examples (Total volatiles minus water …):
    - Flooring adhesives 50 g/l
    - Rubber floor adhesives 60 g/l
    - Wood floor adhesives 100 g/l
    - Indoor sealants 250 g/l
- **LEED for schools:**
  - Compliance with California Section 01350

LEED® – Paints and Coatings IEQ 4.2

- **Mostly:**
  - Limitation of VOC content (against ground level ozone)
    - Even though NO direct correlation between VOC content and VOC long-term emissions
    - Was taken as surrogate for indoor air criteria
  - SCAQMD rule 1113, EPA method 24, SCAQMD method 304
  - Higher limits than in EU Decopaint Directive
  - Examples (Total volatiles minus water …):
    - Interior wall and ceiling coatings 50 / 150 g/l
    - Wood coating 350 – 550 g/l
    - Floor coatings 100 g/l
- **LEED for schools:**
  - Compliance with California Section 01350

Global list of some low VOC labels

- **DIBt, Germany** (floorings)
- **VOC regulations and AFSSET, France** (several building products)
- **M1, Finland** (all building products)
- **Blue Angel, Germany** (many different products)
- **Umweltzeichen, Austria** (many different products)
- **Indoor Air Comfort, Europe** (several products)
- **Danish Indoor Climate Label** (many building products)
- **Nordic Ecolabel ("Swan")** (several building products)
- **GuT, Europe** (carpets)
- **EMICODE, Europe** (adhesives, sealants and more)
- **CertiPUR, Europe** (PUR foam)
- **CertiPUR US** (PUR foam)
- **Californian Section 01350 / LEED** (many building products + furniture)
- **FloorScore, USA** (floorings)
- **BIFMA, USA** (office furniture)
- **Indoor Advantage, USA** (several products)
- **CRI, USA** (carpets)
- **Green Label, Hong Kong** (several products)

Global labels – accepted in LEED credits

- *DIBt, Germany (floorings)*
- *VOC regulations and AFSSET, France (several building products)*
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US based VOC Labels – and Rest of World

- **Paints, coatings, adhesives, sealants:**
  - EU Decopaint Directive is more stringent than LEED limits
  - EU labels with VOC emission limitation are more stringent than LEED VOC content requirements
  - EU labels with VOC emission limitation are more stringent than LEED VOC emission requirements
- **Floorings, furniture, wall elements:**
  - EU labels with VOC emission limitation are more stringent than LEED VOC emission requirements
  - Mainly because of lower limits, and limits for more VOC
- **Composite wood products:**
  - LEED is more stringent than European labels

Acceptance of US labels by LEED® ???

- **EMICODE showed to be**
  at least comparable with Section 01350
- **GUT showed to be**
  at least comparable with CRI GLP
- **US limit values seem lower than they are because of higher ventilation in reference room**
  (higher ventilation = more dilution of emissions)
- **Nevertheless, as of today:**
  - **NO European ecolabel is accepted as proof for LEED compliance of products**
  - **Work is ongoing for a change, but when … ?**

UK: BREEAM

- Wooden products and any floorings:
  - E1 formaldehyde class, no regulated wood preservatives
- Suspended ceiling tiles:
  - E1 formaldehyde class applies, and no asbestos is used.
- Flooring adhesives:
  - No carcinogens & no sensitizers emitted as EN 13999-1
- Wall coverings:
  - Low emissions of formaldehyde & vinyl chloride monomer
  - Low migration of heavy metals & other toxic substances
- Adhesive for hanging flexible wall coverings
  - No harmful substances, preservatives of minimum toxicity.
- Decorative paints and varnishes
  - VOC content: Phase 2 EU Decopaint Directive.
  - Fungal and algal resistant.

- Indoor air measurement after completing the building.
- Use of low emitting products - additional points
  - ISO 16000 emissions test by accredited test lab
  - Accepted as proof:
    AFSSET, AgBB, EMICODE, GUT, M1, formaldehyde E1
- Points are granted a.o. for:
  - Knowledge of VOC and formaldehyde emission level for 25%, 50% or 100% of interior surfaces
  - CMR substances within limits of the accepted labels
  - Emissions of all products on floor, wall and ceiling below
    - 1000 or below 250 µg/m³ - TVOC
    - 62.5 or 40 or 20 or 10 µg/m³ - formaldehyde
    - 5 or 2.5 or 1 µg/m³ - class 1 and class 2 carcinogens

- **Indoor air measurement**
  - max. 4 weeks after completing the building

- **Use of low emitting products**
  - no additional points
  - But this may help achieving good result of indoor air measurement

Sustainable Building - future

- Growing movement
- Even surviving well US economic crisis
- Driven by economy:
  - Sustainability certification of a building gives
    - Higher ranking in balance – good for share price
    - Higher rental price
    - Higher sales price
- Regional specifics will gain importance
  - Within LEED – regional credits planned
  - With more different local rating schemes
  - By market and competition driving forces
- Additional push for low VOC products

Further reading

Further reading: www.product-testing.eurofins.com

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Services for Retailers

Tested Products

Certification of Products and Sites

Further reading: www.product-testing.eurofins.com

Home > Testing > Safety - Chemical/Electrical/Fire > Chemical Safety > Emission into Indoor Air > Indoor air limit values (LCI, NIK, CLI, CREL, ...)

Eurofins Product Testing - Indoor air limit values (LCI, NIK, CLI, CREL, ...)

Back to main page on emission testing.

LCI, CLI, NIK, and CREL values are used by several emission rating schemes as limit values for evaluating emissions of VOC into indoor air (

**** Updated by July 20, 2009 ****

Here you can download a **comparison of limit values** for emission into indoor air.

The sources are:

German LCI / NIK values -

- in German: www.umweltbundesamt.de/bauprodukte/aqbb.htm

- in English: www.umweltbundesamt.de/building-products/aqbb.htm

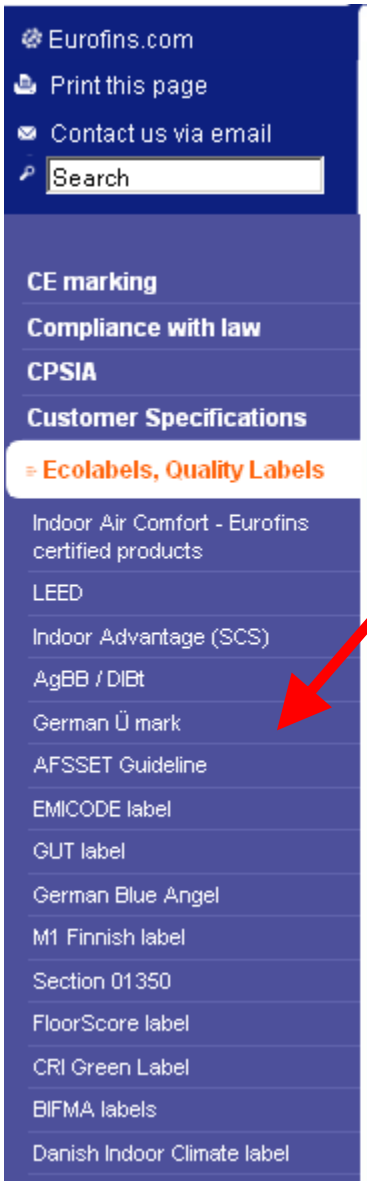
French AFSSET - CLI values:

- in French: www.afsset.fr

Californian CREL values, used for Section 01350, BIFMA, Floor Score, CRI GLP, Indoor Advantage Gold, CHPS, and more programmes: www
note: These programmes require 1/2 CREL shall not be exceeded for any substance, with the exception of formaldehyde and acetaldehyde.

LCI, CLI, NIK, and CREL values will determine partly future product development and technical trends for a number of interior finishing produc
air.

Further reading: www.product-testing.eurofins.com



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AgBB / DIBt
German Ü mark
AFSSET Guideline
EMICODE label
GUT label
German Blue Angel
M1 Finnish label
Section 01350
FloorScore label
CRI Green Label
BIFMA labels
Danish Indoor Climate label

Home > Topics > Ecolabels, Quality Labels

Eurofins Product Testing - Ecolabels, Quality Labels

For more information

- *on legal requirements please click here*
- *on VOC emission testing please click here*
- *on LEED and Green Buildings please click here.*

Quality labels tell you about product performance, and environmental labels (ecolabels) tell you that the product has lower impact on r
these labels are private and voluntary.

Some countries established **compulsory evaluation** of certain properties, such as European CE marking, German GS marking, restric
California, in France and in Germany, and quite some more.

Sustainablity of the product through its life time is the basis for some but not all **ecolabels**.

VOC emissions from construction products relevant for indoor air quality are regulated in Germany (AgBB guidance and DIBt Ü
information in English, in German, in French), in France, and in Japanese regulations. For formaldehyde there is more regulation a
Californian CARB regulation. But in many other countries this issue is subject to voluntary ecolabelling schemes.

Please see also presentations by **different VOC emissions rating schemes** and potential for harmonization (VOC workshop at Health

Some examples for such low VOC emission rating schemes are:

- European Flower
- Blue Angel (Germany)
- Nordic Swan (Scandinavia)
- Umweltzeichen (Austria)
- EMICODE (Adhesives and more, Germany/Europe)
  - Emicode label (information in English, in German, in French)

- GUT (Carpets, Germany/Europe)
- prEN 15052, ISO/DIS 10580 (Resilient (flexible) floor coverings),
  - (information in English, in French)

Further reading: www.product-testing.eurofins.com

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Eurofins Product Testing - Sustainable or "Green" Buildings

For more information

- *on legal requirements please click here*
- *on VOC emission testing please click here*
- *on ecolabels please click here.*

"Green Buildings" is a growing movement in a number of countries, namely in the USA, but other countries are experiencing similar developments towards sustainable buildings.

Sustainable building means that energy consumption, use of resources, impact on environment and on human health are considered and optimised du use and demolition - throughout the whole lifecycle of the building. This is also called sustainable building.

More and more public buildings and large office buildings are built green, but also some residential complexes, schools and hospitals are following the **Motivation** is either to raise quality and the sustainability of a building in general and to support environmental protection, or to contribute to Corporate facilitate marketing of the building with green performance.

There are no uniform **criteria for what is considered to be "Green" or sustainable**. The best known approach is

- LEED by U.S. Green Building Council (USGBC)
- along with
  - Green Building Council Italia
  - Emirates Green Building Council
  - Green Building Council Hongkong

Other criteria have been or are about to be published by

- French HQE
- German DGNB ("Nachhaltiges Bauen")
- British BREEAM
- Estidama, Abu Dhabi
- Green Building Council of Australia's (GBCA)

and more. International initiatives can be monitored on websites of the International Initiative for a Sustainable Built Environment (IISBE), World Green Bu Wikipedia. The SB Alliance is trying to harmonise the Green Building criteria Europe-wide.

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