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Resilient, textile and laminate floor coverings - Evaluation and requirements of volatile organic compounds (VOC) emissions

Revêtements de sol Résilients, Textiles et Stratifiés - Evaluation et exigences des émissions de composes organiques volatils (COV)

Elastische, textile und Laminat-Bodenbeläge - Bewertung und Anforderungen zu Emissionen von flüchtigen, organischen Verbindungen (VOC)

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (prEN 15052:2004) has been prepared by Technical Committee CEN/TC 134 “Resilient, textile and laminate floor coverings”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document is based on Report 18 (1997) from the European Collaborative Action : Evaluation of VOC emissions from building products (solid flooring materials).

Annexes A, B are normative.

Annex C is informative.

1 Scope

This European Standard specifies an evaluation procedure based on requirements for the emissions of volatile organic compounds of resilient, textile and laminate floorcoverings. These floorcoverings can be supplied in either tile or roll or plank form.

Volatile organic compounds to be considered are defined in ISO DIS 16000-6.2 par. 3.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 13419-1: 2002, *Building products — Determination of the emission of volatile organic compounds — Part 1: emission test chamber method*

prEN 13419-2: 2002, *Building products — Determination of the emission of volatile organic compounds — Part 2: emission test cell method*

prEN 13419-3: 2002, *Building products — Determination of the emission of volatile organic compounds — Part 3 : Procedure for sampling, storage of samples and preparation of test specimens*

ISO/DIS 16000-6: 2002, *Indoor air — Determination of VOCs in indoor air and chamber air by active sampling on Tenax TA, thermal desorption and gas chromatographic MSD/FID*

3 Terms and definitions

For the purposes of this standard, the following definitions apply :

3.1
lowest Concentrations of Interest (LCI_i)
lowest concentration above which, according to best professional judgment, an organic compound might have some adverse effect on people in the indoor environment

3.2
concentration of volatile organic compound C_i
measured concentration of a volatile organic compound in µg/m^3

3.3
R-value
for the evaluation of each compound i the ratio R_i is established as $R_i = C_i / LCI_i$ where C_i is the chamber concentration of compound i.

If R_i falls below 1, it is assumed that there will be no adverse health effects.

If several compounds with a concentration > 5 µg/m^3 are detected, additivity of effects is assumed and it is required that R, the sum of all R_i, shall not exceed the value 1.

R = sum of all R_i = sum of all ratios (C_i / LCI_i)

4 Procedure for sampling and storage of samples and preparation of test specimens

Procedures for sampling and storage of samples and the preparation of test specimens are described in EN 13419-3, Building products-Determination of the emission of volatile organic compounds — Part 3: Procedure for sampling, storage of samples and preparation of test specimens.

5 Experimental conditions and calculation of results

For the purpose of defining the evaluation procedure and the requirements, the following experimental conditions are defined in order to express the results in concentrations:

At a given test condition, C_i (the concentration of the individual compound i in the outlet air of the test chamber or the test cell) depends on the area specific emission rate of the test specimen and the air flow rate through the emission test chamber or test cell.

For solid materials (like floor coverings) the area specific emission rate in a test chamber or a test-cell can be regarded as constant.

In this case the relation between C_i, $SERa_i$ (the area specific emission rate of the individual compound i) and q (the area specific air flow rate) can be expressed as:

$$C_i = SERa_i / q$$

with

q = n/L

n: air exchange rate [1/h]

L: product loading factor [m^2/m^3]

$_{Ci}$ [µg/m³] = $SERa_i$ [µg/m²h] / q [m/h]

For the emission tests on solid floor covering products according to the chamber method as described in EN 13419-1 the following parameters worked satisfactorily and have been proven in practise:

air exchange rate (n): 0.5 [1/h]

product loading factor (L): 0.4 [m^2/m^3] with q being: 1,25 [m/h]

For the test cell method comparable conditions are to be selected

Further Information on the calculation of test results can be found in Report 18 (1997) from the European Collaborative Action: Evaluation of VOC emissions from building products (solid flooring materials) on pages 16-18.

6 Requirements

Resilient, textile and laminate floor coverings shall satisfy the following requirements:

Characteristic	Maximum concentration of VOC in emission test chamber / cell	Test method
after 3 days		
Sum of all carcinogenic compounds as defined in annex A	≤ 10µg/m^3	EN 13419 parts 1-2-3
$TVOC_3$	≤ 10000 µg/m³	ISO 16000-6
Report the toluene equivalent concentration of the sum of all unidentifiable compounds for information purposes.		
Report separately the toluene equivalent according to equations set in ISO 16000-6.2 of VVOC and SVOC compounds as described in ISO 16000-6.2 for information purposes. Report the individual compounds before hexane and after hexadecane at concentrations above 2 µg/m^3 and the number of unknowns with concentrations > 2 µg/m^3.		
Cut off criteria: if the results of the tests after 3 days are lower than the criteria set for the tests after 28 days, the 28 days criteria are considered to be met.		
after 28 days		
$TVOC_{28}$	≤ 1000 µg/m^3	EN 13419-1-2-3
Sum of all carcinogenic compounds as defined in annex A	≤ 2 µg/m³ (*)	ISO 16000-6
Sum of C_i/LCI_i for all assessable compounds defined in annex B	≤ 1	
Report the toluene equivalent concentration of the sum of all non-assessable compounds (with unknown LCI) for information purposes.		
Report separately the toluene equivalent according to equations set in ISO 16000-6.2 of VVOC and SVOC compounds as described in ISO 16000-6.2 for information purposes. Report the individual compounds before hexane and after hexadecane at concentrations above 2 µg/m^3 and the number of unknowns with concentrations > 2 µg/m^3.		

Annex A
(normative)

List of carcinogenic compounds

The list to be considered is the consolidated list of carcinogenic compounds related to point 29 to annex 1 of the European Directive 76/769/EC.

NOTE This list is only to be considered for volatile components as defined in ISO 16000-6.2 par. 3.

CAS-Nr.	Substance	Index-Nr.	EG-Nr.	Category
106-97-8	Butane, (contains >= 0,1 % Butadiene)	601-004-01-8	203-448-7	1
106-99-0	1,3-Butadiene	601-013-00-X	203-450-8	1
107-30-2	Chloromethyl-methylether, Chlorodimethylether,	603-075-00-3	203-480-1	1
505-60-2	2,2´-Dichlordiethylsulfide			MAK/BAT 1
51-75-2	N-Methyl-bis-(2-chloro-ethyl)amine		200-120-5	MAK/BAT 1
542-88-1	Bis(chloromethyl)ether (Dichlorodimethylether)	603-046-00-5	208-832-8	1
71-43-2	Benzene	601-020-00-8	200-753-7	1
75-01-4	Vinylchloride	602-023-00-7	200-831-0	1
75-28-5	Isobutane (contains >= 0,1 % Butadiene)		200-857-2	1
91-59-8	2-Naphthylamine	612-022-00-3	202-080-4	1
92-67-1	4-Aminodiphenyl, 4-Phenylanilin or 1,1´-Biphenyl-4-amino	612-072-00-6	202-177-1	1
92-87-5	Benzidine (Benzidine or 4,4´-Diamino-1,1´-biphenyl)	612-042-002	202-199-1	1
95-69-2	4-Chlor-o-toluidine (4-Chloro-methyl-aniline)		202-441-6	MAK/BAT 1
2425-06-1	Captafol, 1,2,3,6-tetrahydro-N-(1,1,2,2,-tetrachlorethylthio)phthalimide	613-046-00-7	219-363-3	2
6804-07-5	Carbadox	613-050-00-9	229-879-0	2
100-44-7	alpha-Chlorotoluene, Benzylchloride	602-037-00-3	202-853-6	2
100-63-0	Phenylhydrazine	612-023-00-9	202-873-5	2
100-75-4	N-Nitrosopiperidine		202-886-6	MAK/BAT 2
101-14-4	4, 4`-Methylen-bis(-2-chloraniline)	612-078-00-9	202-918-9	2
101-61-1	4,4´-Methylen-bis-(N,N-dimethylaniline)-benzamine		202-959-2	MAK/BAT 2
101-77-9	4, 4`-Diaminodiphenylmethane (4, 4`-Methylendianiline)	612-051-00-1	202-974-4	2
101-80-4	4, 4`-Diaminodiphenylether (4,4´-Oxydianiline)		202-977-0	MAK/BAT 2
103-33-3	Azobenzene	611-001-00-6	203-102-5	2
10595-95-6	N-Nitrosomethylethylamine			MAK/BAT 2
106-47-8	4-Chlor-aniline	612-137-00-9	203-401-0	2
106-87-6	1-Epoxiethyl-3,4-epoxi-cyclohexane, 4-Vinyl-1,2-cyclohexendiepoxide	603-066-00-4	203-437-7	MAK/BAT 2

CAS-Nr.	Substance	Index-Nr.	EG-Nr.	Category
106-89-8	1-Chloro-2,3-epoxypropane, Epichlorhydrine	603-026-00-6	203-439-8	2
106-93-4	1,2-Dibromethane	602-010-006-6	203-444-5	2
107-06-2	1,2-Dichlorethane	602-012-00-7	203-458-1	2
107-13-1	Acrylnitrile	608-003-00-4	203-466-5	2
108225-03-2	(7-(4,6-Bis-(2-ammoniopropylamino)-1,3,5-triazin-2-ylamino)-4-hydroxi-3-3(2-methoxiphenyl)azo)naphthaline-2-sulfonato)monoformiate	611-058-00-7	402-060-7	2
110-00-9	Furane	603-105-00-5	203-727-3	2
1116-54-7	2,2'- (nitrosoimino)-bis-ethanol	612-090-00-4	214-237-4	2
1120-71-4	1,3-Propansultone	016-032-00-3	214-317-9	2
1121-03-5	2,4-Butansultone		214-325-2	MAK/BAT 2
118-74-1	Hexachlorbenzene	602-065-00-6	204-273-9	2
119-90-4	o-Dianisidine (3,3´-Dimethoxibenzidine, 4,4´-Diamino-3,3´-methoxi-1,1´-biphenyl	612-036-00-X	204-355-4	2
119-93-7	o-Tolidine; 3,3-Dimethylbenzidine or 4,4´-3,3´-dimethyl-1,1´-biphenyl	612-041-00-7	204-358-0	2
120-71-8	p-Kresidine; 2-Methoxi-5-methylaniline		204-419-1	MAK/BAT 2
121-14-2	2,4-Dinitrotoluene	609-007-00-9	204-450-0	2
25321-14-6	Dinitrotoluene (Isomerenmix)		246-836-1	2
122-60-1	1,2-Epoxi-3-phenoxipropan,	603-067-00-X	204-557-2	2
122-66-7	Hydrazobenzene	007-021-00-4	204-563-5	2
13360-57-1	Dimethylsulfamoylchloride	016-033-00-9	236-412-4	2
137-17-7	2,4,5-Trimethylaniline		205-282-0	MAK/BAT 2
139-65-1	4,4´-Thiodianiline ((Bis-(4-aminophenyl)-sulfide)		205-370-9	MAK/BAT 2
1464-53-5	1,2,3,4-Diepoxibutane	603-060-00-1	215-979-1	2
151-56-4	Ethylenimine, Aziridine	613-001-00-1	205-793-9	2
16071-86-6	CI Direct Brown	611-005-00-8	240-221-1	2
1836-75-5	Nitrofene, 2,4-Dichlorophenyl-4 nitrophenylether	609-040-00-9	217-406-0	2
192-97-2	Benzo[e]pyrene	601-049-000-6	205-892-7	2
1937-37-7	C.I. Direct Black 38	611-025-00-7	217-710-3	2
205-82-3	Benzo[j]fluoranthene	601-035-00-X	205-910-3	2
205-99-2	Benzo[b]fluoranthene	601-034-00-4	205-911-9	2
207-08-9	Benzo[k]fluoranthene	601-036-00-5	205-916-6	2
218-01-9	Chrysene	601-048-00-0	205-923-4	2
2475-45-8	1,4,5,8-Tetraaminoanthrachinon, CI Disperse Blue 1	611-032-00-5	219-603-7	2
2602-46-2	C.I. Direct Blue 6	611-026-00-2	220-012-1	2
27140-08-5	Phenylhydrazinehydrochloride		248-259-0	2
302-01-2	Hydrazine	007-008-00-3	206-114-9	2
334-88-3	Diazomethane	006-068-00-8	206-382-7	2
399-95-1	4-Amino-3-fluorphenol	604-028-00-X	402-230-0	2
50-32-8	Benzo[a]pyrene	601-032-00-3	200-028-5	2
509-14-8	Tetranitromethane		208-094-7	MAK/BAT 2

CAS-Nr.	Substance	Index-Nr.	EG-Nr.	Category
51594-55-9	(R)-1-Chlor-2,3-epoxypropane	603-166-00-8	424-280-2	2
51-79-6	Urethane (Ethylcarbamate)	607-149-00-6	200-123-1	2
52033-74-6	Phenylhydraziniumsulfate		257-622-2	2
5216-25-1	4-Chlorbenzotrichloride		226-009-1	MAK/BAT 2
53-70-3	Dibenz[a,h]anthracene	601-041-00-2	200-181-8	2
540-73-8	1,2-Dimethylhydrazine	007-013-00-0		2
542-75-6	1,3-Dichlorpropene (cis and trans)	602-030-00-5	208-826-5	MAK/BAT 2
55-18-5	N-Nitorosodiethylamine		200-226-1	MAK/BAT 2
556-52-5	2,3-Epoxi-1-propanol, Glycidol	603-063-00-8	209-128-3	2
56-55-3	Benzo[a]anthracene	601-033-00-9	200-280-6	2
57044-25-4	R-2,3-Epoxipropane-1-ol	603-143-00-2	404-660-4	2
57-14-7	N,N-Dimethylhydrazine	007-012-00-5	200-316-0	2
573-58-0	C.I. Direct Red 28	611-027-00-8	209-358-4	2
57-57-8	3-Propanolid, 1,3- Propiolactone	606-031-00-1	200-340-1	2
581-89-5	2-Nitronaphthaline	609-038-00-8	209-474-5	2
592-62-1	(Methyl-ONN-azoxy)-methylacetate	611-004-00-2	209-765-7	2
593-60-2	Bromethylene	602-024-00-2	209-800-6	2
593-70-4	Chlorfluormethane (R 31)		209-803-2	MAK/BAT 2
59-88-1	Phenylhydraziniumchloride		200-444-7	2
59-89-2	N-Nitrosomorpholine			MAK/BAT 2
60-09-3	o-Aminoazobenzene	611-008-00-4	200-453-6	2
601-77-4	N-Nitrosodi-isopropylamine			MAK/BAT 2
602-01-7	2,3-Dinitrotoluene	609-050-00-3	210-013-5	2
602-87-9	5-Nitroacenaphthaline	609-037-00-2	210-025-0	2
606-20-2	2,6-Dinitrotoluene	609-049-00-8	210-106-0	2
610-39-9	3,4-Dinitrotoluene	609-051-00-9	210-222-1	2
612-64-6	N-Nitrosoethylphenylamine			MAK/BAT 2
614-00-6	N-Nitrosomethylphenylamine		210-366-5	MAK/BAT 2
615-05-4	2, 4-Diamino-anisol		210-406-1	MAK/BAT 2
618-85-9	3,5-Dinitrotoluene	609-052-00-4	210-566-2	2
619-15-8	2,5-Dinitrotoluene	609-055-00-0	210-581-4	2
621-64-7	N-Nitrosodi-n-propylamine	612-098-00-8	210-698-0	2
62-55-5	Thioacetamide	616-026-00-6	200-541-4	2
62-75-9	N-Nitrosodimethylamine, Dimethylnitrosamine	612-077-00-3	200-549-8	2
64-67-5	Diethylsulfate	016-027-00-6	200-589-6	2
65321-67-7	4-Methyl-m-phenylene-diamine-sulfate, Toluene-2,4-diammoniumsulfate	612-126-00-9	265-697-8	2
680-31-9	Hexamethylphosphoramide	015-106-00-2	211-653-8	2
70-25-7	1-Methyl-3-nitro-1-nitrosoguanidine	612-083-00-6	200-730-1	2
75-21-8	Ethylenoxide	603-023-00-X	200-849-9	2
75-55-8	2-Methylaziridine, Propylenimine	613-033-00-6	200-878-7	2
75-56-9	1,2-Propylenoxide	603-055-00-4	200-879-2	2
764-41-0	1,4-Dichloro-2-but-2-ene	602-073-00-X	212-121-8	2
77402-03-0	Methylacrylamido-methoxyacetate	607-190-00-X	401-890-7	2
77402-05-2	Methylacrylamidoglykolate	607-210-00-7	403-230-3	2
77-78-1	Dimethylsulfate	016-023-00-4	201-058-1	2