

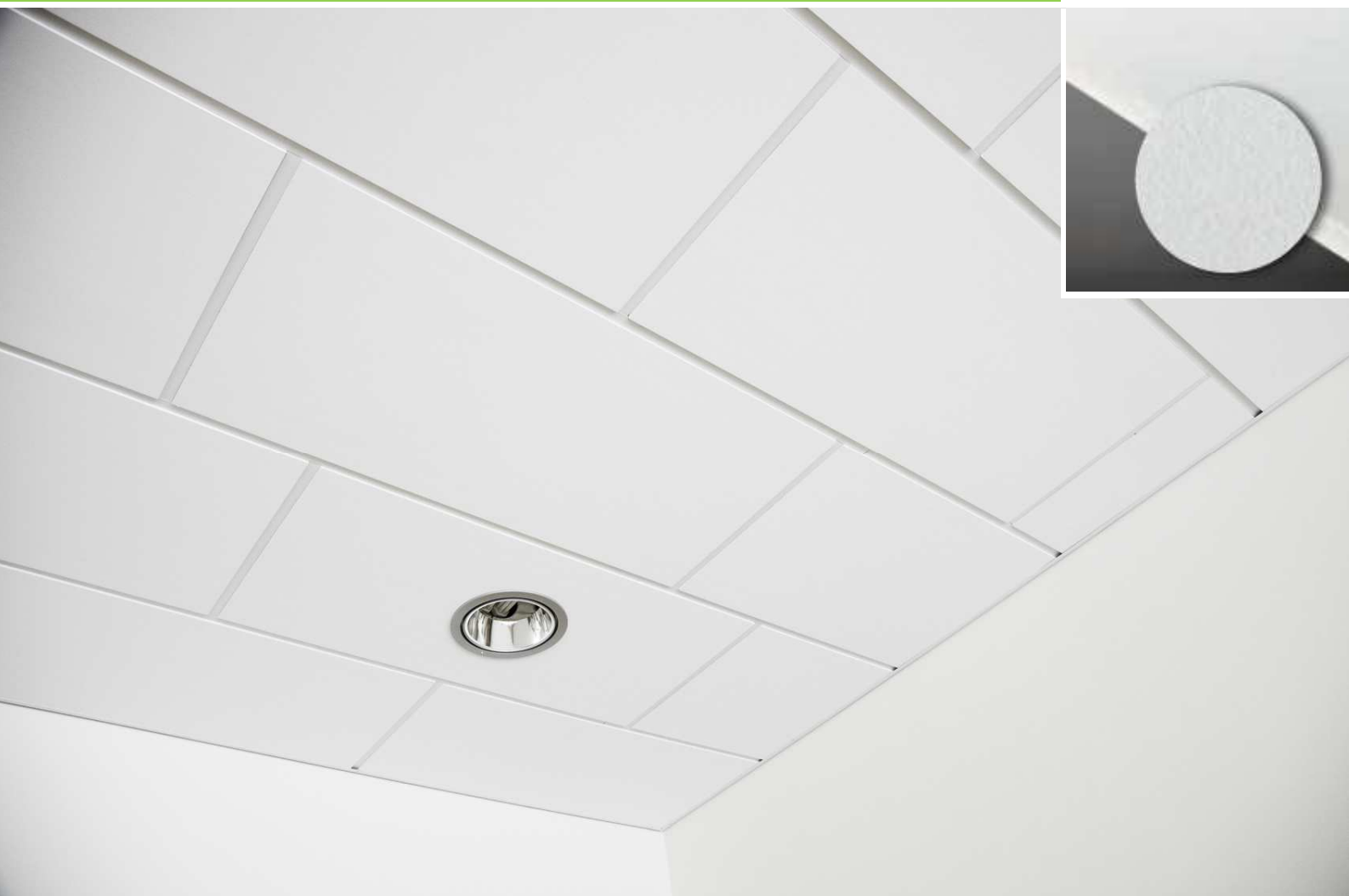
ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	Knauf AMF GmbH & Co. KG
Programme holder	AFNOR
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AMF-THERMATEX Acoustic
Knauf AMF GmbH & Co. KG


www.knauamf.com





1. General Information

<p>Name of the manufacturer</p> <hr/> <p>Programme holder PricewaterhouseCoopers Advisory, SAS 63 Rue de Villiers 92208 Neuilly Sur Seine Cedex France</p> <hr/> <p>Declaration number 20161201-THACMED-468930</p> <hr/> <p>This Declaration is based on the Product Category Rules: Name of PCR, 07.2014 (PCR tested and approved by the SVR)</p> <hr/> <p>Issue date 05 May 2017</p> <hr/> <p>Valid to</p>	<p>Name of the product</p> <hr/> <p>Owner of the Declaration Knauf AMF GmbH & Co. GK Elsenthal 15 94481 Grafenau Germany</p> <hr/> <p>Declared product / Declared unit AMF-THERMATEX Acoustic / 1m²</p> <hr/> <p>Scope: The LCA is based on data from the production year 2016 for 19 mm mineral board AMF-THERMATEX Acoustic, manufactured using the wet-felt process at the production plant of Knauf AMF GbH & Co. KG in Grafenau / Germany. This EPD is a manufacturers self-declaration EPD.</p> <hr/> <p>Verification</p> <table border="1"> <tr> <td colspan="2">The CEN Norm /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Verification of the declaration according to /ISO 14025/</td> </tr> <tr> <td><input checked="" type="checkbox"/> internally</td> <td><input type="checkbox"/> externally</td> </tr> </table>	The CEN Norm /EN 15804/ serves as the core PCR		Verification of the declaration according to /ISO 14025/		<input checked="" type="checkbox"/> internally	<input type="checkbox"/> externally
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2. Product

2.1 Product description

The AMF-THERMATEX Acoustic is a mineral board produced by the wet felt process (raw boards). They meet the requirements of DIN 18177 and the EN 13964 as well as the European legislation on hazardous substances. Mineral boards (wet-felt) consist of mineral wool(s), fillers and binders, etc., mixed with the use of water (auxiliary) to produce a slurry, which is then spread to form a board and dried. The surface finish of AMF-THERMATEX Acoustic is laminated with glass fleece and primed and coated with water soluble dispersion paint. There are different edge configurations available e.g. square, bevelled or grooved. The product range of this EPD comprises of 1 m² AMF-THERMATEX Acoustic mineral board with a thickness of 19 mm. The nominal density typically varies between 230 kg/m³ ± 15%. The results do not correlate to the nominal density.

2.2 Application

AMF-THERMATEX Acoustic is a membrane component for a suspended ceiling used primarily as an aesthetic facing for sound absorption and sound insulation, fire resistance and fire propagation, clean rooms, for high hygiene requirements and low emission applications.

2.3 Technical Data

Fire performance	Result	Standard
Reaction to fire	A2-s1,d0	EN 13501-1
	Class A	ASTM E1264
Release / content	Result	Standard
Release of asbestos (content)	No content	-
Release of formaldehyde	≤ 0.05ppm	ISO 16000
Release and/or content of other dangerous substances	No release	
Thermal performance	Result	Standard
Thermal conductivity	λ _D = 0.70	EN 13964
Acoustic performance	Result	Standard
Sound absorption coefficient	α _w = 0.65 (H)	ISO 354 and ISO 11654
	NRC = 0.70	ASTM C423
Airborne sound insulation (flanking transmission)	D _{n,f,w} = 38 dB	EN 10848-2 and ISO 717-1
Ceiling Attenuation Class	CAC = 39 dB	ASTM E413



Additional performance	Result	Standard
Flexural tensile strength	Class C	EN 13964

2.4 Application rules

DIN 18177, Wet-felt factory-produced mineral panels - Characteristics and test methods;
EN 13964, Suspended ceilings – requirements and test methods.
ASTM E1264, Standard Classification for Acoustical Ceiling Products

2.5 Delivery status

The EPD refers to 19mm thick AMF-THERMATEX Acoustic is a mineral board that can have varying edge details, length and width dimensions.

2.6 Base materials / Ancillary materials

Raw material	Proportion (M - %)
Mineral wool	35 - 50 %
Organic Binding agent (mainly starch)	4 - 12 %
Inorganic Fillers (clay, talcum, limestone, perlite)	30 - 45 %
Glass fleece	2 - 4 %
Other	< 1 %

Dispersion paint and mineral coatings are additionally used for the surface finish as well as water during the production process. Flame retardants are not used. Isothiazolinone based products are used as biocides.

2.7 Manufacture

The described mineral boards are produced using the traditional wet-felt process. The initial materials are mixed with water to a homogenous suspension that is then pumped onto a belt conveyor. The water is removed both mechanically (gravity and vacuum) and by evaporation in a drying oven. The process water is reused as much as possible. It is treated and refed into the process water circuit. The boards are primed, perforated, laminated with glass fleece and painted. Production waste and dust are reused in the production process.

The company is certified ISO 9001, ISO 14001, ISO 50001

2.8 Environment and health during manufacturing

The production plant meets Germany's specific requirements for the production of mineral boards:

- It is prohibited to produce and use biopersistent fibres (Hazardous Substances Act, Annex II, Nr. 5)
- It is prohibited to bring biopersistent fibres onto the market (forbidden chemical regulations Nr.23 appendices to §1)
- Not subject to declaration according to REACH

The production plant is regularly surveilled by the German Authorities for emissions into air, health and safety and fire properties of the product.

2.9 Product processing / Installation

There are safety measures to be noted in accordance

with section 3 of the guideline 'Handling mineral boards based on handling mineral wool (glass wool, rock wool) edition 2008:

Work safety and environmental protection measures are in accordance with the European guidelines for handling man-made mineral fibres. Safety in Use and Material Safety Data Sheet are available see www.knaufamf-dop.com.

2.10 Packaging

The boards are packed in cardboard cartons and sealed with polyethylene film. These cartons are stacked on chemically untreated wooden pallets.

The so formed pallets are wrapped with polyethylene stretch film. Film, paper and wood can be recycled in the usual way.

2.11 Condition of use

When used properly, the mineral boards maintain their mechanical and physical properties for their entire useful life. Direct contact with water should be avoided due to the bio-soluble binder starch. Mineral boards that are exerted to increased temperatures of over 100°C for an extended time period during their useful life can lead to yellowing of the surface finish or coating.

2.12 Environment and health during use

When correctly installed no dust / particles will be released during the period of use.

The limits for formaldehyde, VOC's and TVOC's are in compliance with DIN 18177 and the "Blue Angel" award criteria for suspended ceilings (RAL-UZ 132). Cleaning guidelines are available see www.knaufamf-dop.com and www.knaufamf.com.

2.13 Reference service life

The life span (modules B1-B7) of the wet-felt mineral boards is up to 50 years depending on application, loading and level of maintenance.

2.14 Extraordinary effects

Fire

The declared product has the building material class A2-s1,d0 according to EN 13501-1. They are therefore designated by German building regulations as "non-combustible" with negligible smoke development and no burning droplets in the case of fire.

Name	Value
Building material class	A2
Burning droplets	d0
Smoke gas development	s1

Water

Prolonged contact with water dissolves the binding starch which can lead to a loss of structure. Should the soluble components be carried into the sewage system they are biodegradable, increasing COD and BOD.

Mechanical destruction

The product can be broken by hand and the surface finishes also damaged.

2.15 Re-use / Recycling phase

Correctly demounted boards can be reinstalled. Slightly damaged boards can be used as cut boards or insulation. Mineral boards can be returned to the



production process when material separation and sufficient material quality is available. In the absence of data collection of the recycling rate in the considered market the module D was not integrated.

2.16 Disposal

The European waste code number of production waste for mineral boards is 101103 and the waste code

number for site waste (off-cuts) is 17 06 04. Otherwise, site waste is disposed of as normal construction waste, European waste code number 17 09 04.

2.17 Further information

Additional information is available at www.knaufamf.com & www.knaufamf-dop.com

3. LCA: Calculation rules

3.1 Declared Unit

This declaration refers to 1 m² of AMF-THERMATEX Acoustic mineral board with a thickness of 19 mm and an average nominal density of 230kg/m³±15%.

Declared unit

Name	Value	Unit
Declared unit	1.0	m ²
Grammage	4.4	kg/m ²
Thickness of the panels	19	mm

3.2 System boundary

This LCA addresses the life cycle stages of product manufacturing including pre-product stages (A1 – A3), Transport from the gate to the site (A4), Assembly (A5), Use (B1), De-construction / demolition (C1), Transport from the site (C2), Disposal (C4) according to EN 15804. The stages A1 – A3 were compiled and shown in the tables.

3.3 Estimates and assumptions

The production facilities of the modules A1 to A3 are compiled and presented. No assumptions were necessary as all primary product data were available.

3.4 Cut-off criteria

All inputs that contribute to more than 1% of the total mass, energy or environmental effects of the system were included in the study. It can be assumed that the neglected processes contributed to less than 5% of the considered impact categories.

3.5 Background data

The primary data was provided by Knauf AMF GmbH & Co. KG. The year for the data collection is 2016.

The background data was taken from the DEAM database, software TEAM 5.2 from PricewaterhouseCoopers Advisory, SAS. Electricity mix from Europe (2013) and Germany (2013) and fuel mix disclosure for road transportation in Europe (2012) were used.

3.6 Data quality

To model the Life-cycle of the production of mineral boards, data were used which were collected from the production year 2016. All other relevant background data were taken from DEAM database software TEAM 5.2 and is under 10 years old.

3.7 Period under review

The data is representative for the manufacturing processes of 2016.

3.8 Allocation

For the considered product recycling material from internal material streams (Pre-Consumer) is used as well as secondary materials (Pre- and Post-Consumer) replacing virgin raw materials incorporated in the production stage module (A1). Allocations in respect to in-house electric energy production and reuse of waste heat were not incorporated due to the limits of the software. Electricity Mix of the relevant countries was considered in regards to available data.

3.9 Comparability

EPD's for construction products are potentially not comparable if they are not based on EN 15804. The product-specific characteristics of performance, are taken into account.

4. LCA: Scenarios and additional technical information

The following technical information is the basis for the declared modules or can be used for the development of a specific scenario in the context of building assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel	38	l/100km
Road Transport distance	1500	km
Rail Transport distance	600	km
Sea Transport distance	22000	km
Capacity utilisation (including empty runs)	90	%
Nominal density of product transported	230 (±15%)	kg/m ³

Capacity utilisation volume factor	95	%
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Installation into the building (A5)

Name	Value	Unit
Electricity consumption	0.1	kWh
Material loss	5 - 10	%
TVOC (C ₆ – C ₁₆)	< 100	µg/m ³
TVOC (C ₁₆ – C ₂₂)	< 20	µg/m ³
Total VOC without LIC	< 50	µg/m ³

Reference service life

Name	Value	Unit
Reference service life	50	a



5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	MND	MND	MND	MND	MND	MND	X	X	MND	X	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1m² mineral board (wet-felt) 19mm, 230kg/m³

Parameter	Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C4
GWP	Global warming potential	[kg CO ₂ -Eq.]	5.0	1.0	0	0	0	1.2E-02	0
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.6E-07	7.1E-07	0	0	0	8.7E-09	0
AP	Acidification potential of land and water	[kg SO ₂ -Eq.]	2.3E-02	1.7E-02	0	0	0	5.6E-05	0
EP	Eutrophication potential	[kg (PO ₄) ³⁻ -Eq.]	8.8E-03	1.3E-03	2.9E-07	0	0	1.3E-05	5.5E-06
POCP	Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.5E-03	1.0E-03	0	0	0	8.7E-06	0
ADPE	Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	3.5E-06	1.0E-08	0	0	0	1.1E-11	0
ADPF	Abiotic depletion potential for fossil resources	[MJ]	96	13	0	0	0	1.5E-01	0
PEAU	Air pollution	[m ³]	1 566	112	0	0	0	7.8E-01	0
PAIR	Water pollution	[m ³]	1.8	2.8E-01	3.2E-04	0	0	3.4E-03	6.1E-03

RESULTS OF THE LCA - RESOURCE USE: 1m² mineral board (wet-felt) 19mm, 230kg/m³

Parameter	Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C4
PERE	Renewable primary energy as energy carrier	[MJ]	8.6	9.1E-02	0	0	0	7.6E-05	0
PERM	Renewable primary energy resources as material utilization	[MJ]	0	0	0	0	0	0	0
PERT	Total use of renewable primary energy resources	[MJ]	8.6	9.1E-02	0	0	0	7.6E-05	0
PENRE	Non-renewable primary energy as energy carrier	[MJ]	77	13	0	0	0	1.6E-01	0
PENRM	Non-renewable primary energy as material utilization	[MJ]	9.2	5.4E-03	0	0	0	0	0
PENRT	Total use of non-renewable primary energy resources	[MJ]	86	13	0	0	0	1.6E-01	0
SM	Use of secondary material	[kg]	3.4E-01	2.5E-07	0	0	0	0	0
RSF	Use of renewable secondary fuels	[MJ]	0	0	0	0	0	0	0
NRSF	Use of non-renewable secondary fuels	[MJ]	0	0	0	0	0	0	0
FW	Use of net fresh water	[m ³]	9.8E-03	1.3E-03	0	0	0	7.6E-05	0

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1m² mineral board (wet-felt) 19mm, 230kg/m³

Parameter	Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C4
HWD	Hazardous waste disposed	[kg]	7.9E-01	9.9E-03	0	0	0	1.4E-05	0
NHWD	Non-hazardous waste disposed	[kg]	1.9E-01	4.7E-03	2.2E-01	0	0	3.8E-06	4.2
RWD	Radioactive waste disposed	[kg]	6.6E-05	2.0E-04	0	0	0	2.5E-06	0
CRU	Components for re-use	[kg]	1.9E-06	0	0	0	0	0	0
MFR	Materials for recycling	[kg]	1.4E-02	5.7E-05	7.2E-02	0	0	6.5E-08	0
MER	Materials for energy recovery	[kg]	0	0	0	0	0	0	0
EEE	Exported electrical energy	[MJ]	0	0	0	0	0	0	0
EET	Exported thermal energy	[MJ]	0	0	0	0	0	0	0



6. LCA: Interpretation



Figure 6-1: Relative contributions of different life cycle processes to the environmental effects and primary energy utilisation of 1m² of mineral board (19mm) 230kg/m³ density

In nearly all impact categories, the dominant influence of the production (A1-A3) for mineral board appears with proportions of:

- 83% for global warming potential (GWP)
- 88% for depletion of abiotic resources (ADP fossil)
- 87% for total use of primary energy
- 100% with regard to fresh water use.

construction / demolition (C1), Transport from the construction site (C2) and Disposal (C4) were incorporated with common average values

For disposed waste the major contribution is given by the End of Life Stage (C1-C4) with 78% while the production stage (A1-A3) had only an influence of 18%. It should be noted that only the modules De-



7. Requisite evidence

7.1. Reaction to fire

The product under consideration meets the requirements of European building material Class A2-s1,d0 according to EN 13501-1, as well as the Surface burning characteristic Class A according to ASTM E84. This is proven by the classification report:

- B14189 from Technical University Munich
- 11-002-425(F) from Exova Mississauga

7.1 Formaldehyde and VOC emissions

Details on formaldehyde and VOC emissions as per ISO 16000-6 or ISO 16000-3 or EN 717-1 or DIN 18177.

AgBB Overview (28 Days)

Name	Value	Unit
TVOC (C6 - C16)	<100	µg/m ³
Sum SVOC (C16 - C22)	<20	µg/m ³
R (dimensionless)	<1	-
VOC without NIK	<50	µg/m ³
Carcinogenic Substances	<1	µg/m ³
Formaldehyde	<60	µg/m ³

Test report: Eurofins, DK-8464 Galten

7.3 Acoustic performance

The considered product was tested for sound absorption according to ISO 354. The measured

results were calculated and rated to ISO 11654 for α_w and calculated and rated to ASTM C423 for NRC. Proven by test report:

- C/06/5L/3659 – No 4582 from SRL, Sudbury

The considered product was tested for sound insulation according to EN 10848-2. The measured results were calculated and rated to ISO 717-1 for $D_{n,f,w}$ and calculated and rated to ASTM E413 for CAC. Proven by test report:

- C/22162 – No 7251 & No 8803 from SRL, Sudbury

7.4 Hygiene

The considered product was tested for hygienic performance (bacteria and fungi) according to ISO 846 and ASTM G21. Proven by test report:

- 417.872 from OFI, Vienna

The considered product was tested for clean room performance (particle emission) according to ISO 14644-1. Proven by test report:

- KN1202-589 from IPA Fraunhofer, Stuttgart

8. References

Product Category Rules for construction products

part A: Calculation regulations for LCA and requirements of the background report. 2011-06.

Product Category Rules for construction products

part B: Requirements of the EPD of mineral boards, Institute Construction and Environment, 2011-06

EN 13501-1:2007-05, Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

DIN 18177:2012 Wet-felt factory-produced mineral panels - Characteristics and test methods

EN 13964: 2014, Suspended ceilings - Requirements and test methods;

EN ISO 10848-2:2006. Acoustics. Laboratory measurement of the flanking transmission of airborne and impact sound between adjoining rooms.

EN ISO 717-1:2013. Acoustics. Rating of sound insulation in buildings and of building elements.

ASTM C423 - 09a. Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

ASTM E413 - 16. Classification for Rating Sound Insulation.

ISO 354: 2003-12, Acoustics - Measurement of sound absorption in a reverberation room

ISO 11654: 1997-07, Acoustics - Sound absorbers for use in buildings - Rating of sound absorption

ASTM G21 - 15. Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

ISO 846:1997. Plastics. Evaluation of the action of microorganisms.

ISO 14644-1:2015. Cleanrooms and associated controlled environments. Classification of air cleanliness by particle concentration

ISO 16000-3:2011. Indoor air. Determination of formaldehyde and other carbonyl compounds in indoor air and test chamber air. Active sampling method

ISO 16000-6:2011. Indoor air. Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS-FID

ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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