ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	James Hardie Europe GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-JAM-20240184-IBA1-EN
Issue date	15.08.2024
Valid to	14.08.2029

Aestuver® Tx Fire protection board

James Hardie Europe GmbH

Institut Bauen und Umwelt e.V.

ECO PLATFORM EPD VERIFIED

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1. General Information

James Hardie Europe GmbH

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-JAM-20240184-IBA1-EN

This declaration is based on the product category rules:

Fibre cement / Fibre concrete, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

15.08.2024

Valid to

14.08.2029

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Aestuver® Tx Fire protection board

Owner of the declaration

James Hardie Europe GmbH
Bennigsen-Platz 1
40474 Düsseldorf
Germany

Declared product / declared unit

1 m² Aestuver® Tx Fire protection board

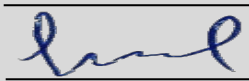
Scope:

This document refers to the manufacture of Aestuver® Tx Fire protection boards by James Hardie Europe GmbH. This product is produced in the manufacturing plant in Calbe/Germany in which the production data for 2022 was recorded. The Life Cycle Assessment therefore fully represents the Aestuver® Tx Fire protection boards produced in Calbe by James Hardie Europe GmbH.
The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally



Dr.-Ing. Nikolay Minkov,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Aestuver® Tx Fire protection boards are cement-bound, fibreglass-reinforced lightweight concrete boards manufactured in thicknesses of 20 to 60 mm. The boards have sandwich structure, i.e. they comprise surface layer and core material components whose mass ratio varies with thickness. Both cover layers, which comprise the top and bottom of the core of the panel, are around 3 mm thick. The material of the top layer and the core are made from the same raw materials, but in different compositions..

Placing on the market / Application rules

The placing on the market of the product in the EU / EFTA (with the exception of Switzerland) is governed by Regulation *(EU) No 305/2011 / CPR*. The product requires a declaration of performance taking into account the / European Technical Assessment No. *ETA-17/0170* and the CE marking. The declaration of performance has been prepared: Aestuver® Tx Fire protection board FC-0010.
For use, the respective national regulations apply.

2.2 Application

Aestuver® Tx Fire protection boards for tunnel use are used in precautionary structural fire protection as concreted or subsequently fastened cladding for the protection of construction concrete in tunnels.
Aestuver® Tx Fire protection boards are also used as building and fire protection boards for partition walls, as fire protection paneling of components and elements, as well as interior and exterior cladding, as plaster base boards for facades and ceilings, and as fire protection products for technical building equipment and as components of fire resistant components.

2.3 Technical Data

Aestuver® Tx Fire protection board (depends on thickness).

Constructional data

Name	Value	Unit
Thermal conductivity DIN EN 12667	0.15 - 0.25	W/(mK)
Water vapour diffusion resistance factor acc. to DIN V 4108-4, EN ISO 12572	10 - 12	-
Swelling (air-dry to water-saturated)	1	mm/m
Gross density DIN EN 12467	800	kg/m^3
Compressive strength DIN EN 789	3.5	N/mm^2
Tensile strength DIN EN 319	0.3	N/mm^2
Flexural strength DIN EN 12467	1.5	N/mm^2
Modulus of elasticity DIN EN 12467	2000	N/mm^2
Moisture content at 23 °C, 80% humidity at 23 °C, 80% humidity at 20°C, 65%	5	M.-%
Coefficient of thermal expansion	0.01	$10^{-6}K^{-1}$
Chemical resistance DIN EN 12467/, category of use acc. ETAG 018-1	X, Y, Z1, Z2	-
Ageing resistance DIN EN 12467/, category of use acc. ETAG 018-1	X, Y, Z1, Z2	-
Permanent temperature resistance	105	°C

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according *ETA-17/0170*.

2.4 Delivery status

The boards are manufactured in a range of thicknesses from 20 mm to 60 mm. The boards can be up to 3000 mm in length and up to 1250 mm wide.

2.5 Base materials/Ancillary materials

Base materials weight as percentage

Name	Value	Unit
cement: binder	50-80	M-%
fly ash: binder/ filler	0-10	M-%
CSH: filler	0-15	M-%
Perlite: leightweight aggregates	5-35	M-%
Alkali-resistant glassfibre: reinforcement	0,5-5	M-%
Plasticisers, stabilising agents, air-entraining agents: Auxiliaries/ Additives	aprox. 1	M-%

Additional additives such as flame retardants, softeners or biocides are not used in the production of Aestuver® Tx Fire protection boards.

This product/article/at least one partial article contains substances listed in the candidate list (date: 18.12.2006) exceeding 0.1 percentage by mass: **no**

This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: **no**

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): **no**

2.6 Manufacture

The production of the Aestuver® Tx Fire protectionn boards takes place in a completely automated production process on a production line in layers "fresh in fresh" in steel moulds. In a first step, the lower cover layer is sprayed into the mould together with glass fibre segments cut from a continuous strand. Immediately afterwards, the core layer is applied onto the fresh lower cover layer from a distributor station. In a final step, the upper, covering cover layer is sprayed onto a carrier film, deposited on the core layer and rolled on.
The finished rough strand is then cut according to the mould size, the filled moulds are stacked separately and linger for several hours in a setting channel. In the demoulding station, the hardened boards are removed from the moulds, placed on stacking grids and dried in the drier to the delivery moisture. After the drying time, the boardss are trimmed by the edges, calibrated in thickness, palletized and packaged. The boards remain in stock until a maturation period has elapsed.

The manufacturing plant has been certified a quality management system according to *DIN EN ISO 9001: 2015* by TÜV Nord since 2010 and operates a system of factory production control oriented to the requirements of the European Technical Assessment and Product Safety Regulations. In addition to the incoming goods inspection and the permanent production monitoring, this includes the final inspection of the finished products.

2.7 Environment and health during manufacturing

During production of Aestuver® Tx Fire protection boards, exclusively low-chromate (< 2ppm) cement is used in accordance with *RL 2003/53/EG* and the REACH Directive

(EC), Annex XVII, No. 1907/2006. Excess process water or cleaning water is mechanically filtered in the process water circuit in order to separate cleaning residue. The cleaned water is added to the manufacturing process as service water.

Noise:

Sound protection analyses have established that all values communicated inside and outside the production facility are far below the requisite technical standards.

Waste:

All types of waste such as scrap metal, waste oil, foils and plastic chips (packaging), wood (pallets) and paper are separated, stored and directed back into the recycling system.

2.8 Product processing/Installation

Aestuver® Tx Fire protection board cuttings are achieved using conventional rail-guided hand-held circular saws with suction, preferably as plunge-cut sawing. For precisely fitting and sharp-edged cuts, the use of carbide-tipped saw blades with alternating teeth is recommended. The dust content is reduced by the use of saw blades with a small number of teeth and at low speeds. The attachment is done by means of drywall screws or by means of commercial staples.

2.9 Packaging

Aestuver® Tx Fire protection boards are packed lying on wooden pallets and supplied with cardboard edge protection and covered with foil. These packaging materials are separated and returned to the recycling circuit. The wooden pallets can be returned to the respective dealers.

2.10 Condition of use

Due to the stable crystalline calcium-silicate hydrate phase binding and achieved after curing solid structure emissions are normal for the intended use of the products described use, extremely low and are considered to be harmless to health. No risks are associated with water, air and soil if the products are used as intended. The natural ionizing radiation of Aestuver® Tx Fire protection boards is extremely low and harmless to health hazards.

2.11 Environment and health during use

The Institut für Baubiologie in Rosenheim has tested Aestuver® Tx Fire protection boards and their manufacturing process with regard to healthy living and environmental protection (xxx).

2.12 Reference service life

A service life of at least 25 years has been confirmed by test scenarios for Aestuver® Tx Fire protection boards. The practical service life can however be much longer. However, the indications given on the working life can not be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means of selecting the right products in relation to the expected economically reasonable working life of the works. The prerequisite for a long service life is that the necessary conditions for packaging, transport, storage, installation, use, maintenance and repair and maintenance have been met (please refer to www.aestuver.com).

2.13 Extraordinary effects

Fire

In accordance with the *96/603/EG* and *2000/605/EG* rulings by the European Commission, uncoated Aestuver® Tx Fire protection boards are classified as Class A1, non-combustible building materials according to *DIN EN 13501-1*. In addition, they are also Class A1 non-combustible building materials according to *DIN 4102*.

Water

Aestuver® Tx Fire protection boards display neutral reaction when exposed to water (e.g. flooding). No substances are washed out which could be hazardous to water.

Mechanical destruction

Not relevant.

2.14 Re-use phase

Cement-bound lightweight concrete boards can be easily deconstructed. They do not need to be treated as special waste when demolished / deconstructed. With regard to an efficient recycling process, care should be exercised in ensuring dismantling whereby waste is sorted into as many different categories as possible.

Reuse and further use

Cement-bound lightweight concrete boards usually outlast the service life of the buildings in which they are used. After deconstructing such buildings, the materials can therefore be prepared, classified, assessed (environmental compatibility, building material characteristic values, consistency) and reused. The waste incurred by these boards and any components manufactured from them can be recovered in building material recycling plants before being used as an aggregate for various applications. Unmixed residual materials can be taken by the manufacturers and re-used or recycled. This material can be used as aggregates in production. Building rubble and production rejects should be prepared mixed to ensure the consistent features of lightweight concrete products made from recycled material. The recycled material should comply with the natural requirements of the material standards for the raw material to be replaced. Furthermore, recycled material made from lightweight concrete can also be used for building roads and paths in construction class V.

2.15 Disposal

If in exceptional cases, materials can not be directed to a building material recycling plant, the Aestuver® Tx Fire protection boards can be disposed of at any building rubble landfill in accordance with the /waste key number 170101/ (concrete).

2.16 Further information

Further information on the products is available in the Download area on www.fermacell.com. Safety data sheets can be requested by calling 0800 5235665.

3. LCA: Calculation rules

3.1 Declared Unit

Declared unit and mass reference

This declaration refers to the manufacture of 1m² Aestuver® Tx Fire protection board by James Hardie Europe GmbH. The boards are manufactured in varying thicknesses. The average grammage of fire-resistant boards produced is 28,6 kg/m² (complies with a board of approx. 35mm thickness). The average was based on the annual production volume 2022 at the Calbe plant.

Name	Value	Unit
Declared unit	1	m²
Grammage	28.6	kg/m²
Layer thickness	0,035	m
Gross density	818	kg/m³
conversion factor to 1 kg	0.035	-

3.2 System boundary

Type of the EPD: cradle to gate with Options

The EPD considers module A1-A3, A4, A5, C1-C4 and D

Module A1 includes provision of all raw materials and pre-products (for example cement) and energy supply, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage.

Module A2 considers the transport of these raw materials to James Hardie's production site located in Germany via truck.

Module A3 considers the manufacturing of the product in James Hardie's production site including the provision of electricity and thermal energy from natural gas. The production of packaging materials is also included.Manufacturing losses are close to zero and thus not considered in the LCA.

Module A4 considers 100 km truck transport to site. The transport distance can be modified project specific if required by linear scaling.

Module A5 considers the treatment and disposal of packaging material. Credits for potential avoided burdens due to energy substitution of electricity and thermal energy generation are declared in module D.

Module C1 considers the dismantling of the product at EoL with an Excavator, 100 kW.

Module C2 accounts for a 50 km transport by truck.

Two scenarios are considered in the End-of-life; recycling (1) and landfilling (2).

Module C3 (Scenario 1) calculates the recycling processing efforts, in which the entire product is processed and a material credit for roadworks (gravel) is applied in module D. For C3/1 the results are '0'.

Module C4/1 (Scenario 2) considers landfilling of the product. For C4 the results are '0'.

Module D includes potential benefits for the thermal and electrical energy generated in module A5 due to packaging treatment and also the material credit due to the product processing in module C3. Avoided burdens have been calculated by the inversion of electricity grid mix and thermal energy from natural gas. The material credit is calculated by using a generic data set for gravel.

Module D/1 accounts for the avoided burdens for electricity grid mix and thermal energy from natural gas due to packaging incineration resulting from A5 only.

3.3 Estimates and assumptions

For electricity production the Residual Grid mix for Germany is accounted for within the LCA.

3.4 Cut-off criteria

All data from the production data collection, i.e. all raw materials used according to the recipe, their transport to the plant, the thermal and electrical energy used, packaging materials, all direct production waste and all available emission measurements were taken into account in the balance. In this way, material and energy flows with a share of less than one percent were also taken into account.
Machinery, equipment and infrastructure required for production were neglected and thus not considered.
The sum of the excluded material flows does not exceed 5% of mass, energy or environmental relevance.

3.5 Background data

The background data are taken from the *Sphera LCA FE* (former GaBi databases).

3.6 Data quality

All primary data are collected for the year 2022. All secondary data come from the *Sphera LCA FE* (GaBi) databases and are representative of the years 2018-2023. As the study intended to compare the product systems for the reference year, temporal representativeness is good.
The overall technological and geographical representativeness is also considered to be good.

3.7 Period under review

Primary production data were collected in James Hardie's production site in Calbe, based on the annual production volume 2022.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Germany

3.9 Allocation

The production process does not deliver any co-products. The data were collected product specific.
Fly ash, like all other power plant by-products, is allocated by market value.

All applied incineration processes (module A5) are displayed via a partial stream consideration for the combustion process, according to the specific composition of the incinerated material. For the waste incineration plant an R1-value of 0.6 is assumed.
Environmental burden of the incineration of packaging are assigned to the system (A5); resulting credits for thermal and electrical energy are declared in module D.
The credits for thermal and electrical energy are calculated via inversion of the life cycle inventory of average data.

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The used background database is *Sphera LCA FE* (former GaBi database), CUP2023.1

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The product itself does not contain any biogenic carbon. Only the packaging (wooden pallets, paper) does contain it.
Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	0.2	kg C

Transport to the building site (A4)

This module considers 100 km truck transport to site (diesel driven). The transport distance can be modified project specific if required by linear scaling.

Name	Value	Unit
Litres of fuel	0.08	l/100km
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%

Installation into the building (A5)

The following packaging materials come with the declared product and are incinerated after installation. Potential benefits due to the energy generation after incineration are assigned to module D.

Name	Value	Unit
wooden pallet	0.48	kg
paper	0.003	kg
plastic foil	0.002	kg

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	28.6	kg
Recycling	28.6	kg
Landfilling	28.6	kg

Module D considers the benefits of packaging treatment (from Module A5) and material credit after waste processing (from Module C3)

Module D/1 considers the benefits of packaging treatment (from Module A5) only

5. LCA: Results

The following table shows the results for 1m² Aestuver® Tx Fire protection board. The recycling scenario (EoL1) shows the corresponding results in C3, for C3/1 the results are '0'.
The landfill scenario (EoL2) shows the results in C4/1, for C4 the results are '0'.
Moreover, only packaging incineration ends up in potential benefits in D/1. Module D includes besides those benefits also the material credit due to recycling.

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

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	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² Aestuver® Tx Fire protection board

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	kg CO_2 eq	3.41E+01	2.46E-01	8.92E-01	1.75E-02	1.23E-01	7.45E-02	0	0	4.33E-01	-3.55E-01	-3.01E-01
GWP-fossil	kg CO_2 eq	3.47E+01	2.16E-01	2.03E-02	1.54E-02	1.08E-01	7.42E-02	0	0	4.3E-01	-3.54E-01	-2.98E-01
GWP-biogenic	kg CO_2 eq	-6.38E-01	2.82E-02	8.72E-01	2.03E-03	1.41E-02	1.13E-05	0	0	1.75E-03	-1.34E-03	-2.69E-03
GWP-luluc	kg CO_2 eq	1.07E-02	1.47E-03	2.23E-06	1.02E-04	7.33E-04	3.58E-04	0	0	1.34E-03	-2.65E-04	-2.72E-05
ODP	kg CFC11 eq	1.85E-11	4.29E-14	1.33E-13	3E-15	2.14E-14	2.23E-13	0	0	1.09E-12	-3.98E-12	-3.62E-12
AP	mol H^+ eq	3.97E-02	1.82E-04	1.61E-04	8.56E-05	9.09E-05	3.71E-04	0	0	3.05E-03	-5.83E-04	-2.99E-04
EP-freshwater	kg P eq	1.01E-05	5.71E-07	3.21E-08	3.99E-08	2.86E-07	1.93E-07	0	0	8.66E-07	-1.08E-06	-8.02E-07
EP-marine	kg N eq	9.76E-03	4.77E-05	4.51E-05	4.07E-05	2.38E-05	1.73E-04	0	0	7.88E-04	-2.11E-04	-1.11E-04
EP-terrestrial	mol N eq	1.08E-01	6.3E-04	7.73E-04	4.5E-04	3.15E-04	1.91E-03	0	0	8.67E-03	-2.28E-03	-1.18E-03
POCP	kg NMVOC eq	2.77E-02	1.47E-04	1.18E-04	1.14E-04	7.35E-05	4.67E-04	0	0	2.38E-03	-5.57E-04	-2.85E-04
ADPE	kg Sb eq	7.11E-07	1.74E-08	9.92E-10	1.21E-09	8.68E-09	7.93E-08	0	0	1.98E-08	-3.16E-08	-2.58E-08
ADPF	MJ	2.95E+02	3.32E+00	2.04E-01	2.32E-01	1.66E+00	1.43E+00	0	0	5.72E+00	-5.51E+00	-4.65E+00
WDP	m^3 world eq deprived	3.84E-01	1.28E-03	9.14E-02	8.91E-05	6.38E-04	1.29E-02	0	0	4.72E-02	-9.8E-03	-3.91E-03

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² Aestuver® Tx Fire protection board

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	MJ	1.19E+01	2.15E-01	8.84E+00	1.5E-02	1.07E-01	1.57E-01	0	0	9.33E-01	-2.04E+00	-1.76E+00
PERM	MJ	8.77E+00	0	-8.77E+00	0	0	0	0	0	0	0	0
PERT	MJ	2.06E+01	2.15E-01	6.49E-02	1.5E-02	1.07E-01	1.57E-01	0	0	9.33E-01	-2.04E+00	-1.76E+00
PENRE	MJ	2.94E+02	3.33E+00	5.53E-01	2.32E-01	1.66E+00	1.43E+00	0	0	5.73E+00	-5.51E+00	-4.65E+00
PENRM	MJ	3.49E-01	0	-3.49E-01	0	0	0	0	0	0	0	0
PENRT	MJ	2.95E+02	3.33E+00	2.05E-01	2.32E-01	1.66E+00	1.43E+00	0	0	5.73E+00	-5.51E+00	-4.65E+00
SM	kg	2.92E+00	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	3.26E-02	1.96E-04	2.15E-03	1.37E-05	9.79E-05	3.77E-04	0	0	1.45E-03	-8.82E-04	-6.26E-04

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² Aestuver® Tx Fire protection board

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	kg	1.58E-08	8.91E-12	2.28E-12	6.23E-13	4.45E-12	0	0	0	1.25E-10	-2.68E-10	-2.89E-10

NHWD	kg	3.83E+00	4.85E-04	6.69E-03	3.39E-05	2.42E-04	4E-04	0	0	2.87E+01	-1.16E+00	-2.49E-03
RWD	kg	4.32E-03	3.48E-06	6.75E-06	2.43E-07	1.74E-06	1.17E-05	0	0	6.52E-05	-2.41E-04	-1.82E-04
CRU	kg	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	2.86E+01	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	1.09E+00	0	0	0	0	0	0	0	0
EET	MJ	0	0	2.55E+00	0	0	0	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 m² Aestuver® Tx Fire protection board

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	Disease incidence	6.62E-07	1.32E-09	8.52E-10	9.79E-10	6.6E-10	7.19E-09	0	0	3.75E-08	-1.88E-08	-2.18E-09
IR	kBq U235 eq	3.72E-01	3.58E-04	7.17E-04	2.5E-05	1.79E-04	1.23E-03	0	0	7.53E-03	-2.9E-02	-1.93E-02
ETP-fw	CTUe	1E+02	2.47E+00	8.2E-02	1.73E-01	1.24E+00	1.02E+00	0	0	3.12E+00	-1.26E+00	-7.85E-01
HTP-c	CTUh	2.3E-09	4.93E-11	6.06E-12	3.45E-12	2.47E-11	2.24E-11	0	0	4.81E-10	-9.33E-11	-5.63E-11
HTP-nc	CTUh	1.43E-07	2.43E-09	1.98E-10	2.01E-10	1.22E-09	1.12E-09	0	0	5.29E-08	-5.37E-09	-1.76E-09
SQP	SQP	1.39E+02	1.18E+00	7.02E-02	8.25E-02	5.9E-01	3.6E-01	0	0	1.39E+00	-1.51E+00	-1.22E+00

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

Life Cycle:
The manufacturing phase dominates the product system. In addition, the packaging treatment in module A5 has relevant environmental impacts where the credits accounted in module D cover the inversion of electricity grid mix and thermal energy from natural gas due to packaging treatment (A5). The impacts from the C4/2 scenario are comparatively higher than the results of the C3/1 scenario.

Product stage:
The main drivers of the manufacturing phase in most impact categories are the raw materials cement, blown perlite and glass fibres. Electrical and thermal energy consumption in the product manufacture is reflected with relevant contributions in most of the indicators. The resource use minerals and metals contribution seem maximum from aerated concrete. The biogenic carbon content in the wooden pallets is reflected by the higher negative contributions in GWP biogenic.

7. Requisite evidence

The Institut für Baubiologie in Rosenheim has tested Aestuver® Tx Fire protection boards and their manufacturing process with regard to healthy living and environmental protection (xxx).

7.1 Radioactivity
Assessment performed on the basis of:
- EU Commission "Radiation Protection 112" document
(MPA NRW, Test report No. 321000741)

Determination of Radioactivity

Name	Value	Unit
Radium-226	120 ± 5	Bq/kg
Radium-228	120 ± 4	Bq/kg
Thorium-228	120 ± 10	Bq/kg
Potassium-40	140 ± 20	Bq/kg

7.2 Leaching
Eluate analysis to DIN 38414, Part 4
(Eurofin Umwelt Ost, Expert Report No. AR-24-KS-001439-01)

Determination of the eluate

Name	Value	Unit
Arsenic (As)	0,001	mg/l
Cadmium (Cd)	0,0003	mg/l
Thalium (Ti)	0,0002	mg/l
Chromium (Cr)	0,001	mg/l
Nickel (Ni)	0,001	mg/l
Copper (Cu)	0,005	mg/l
Mercury (Hg)	0,0002	mg/l
Zinc (Zn)	0,01	mg/l
Lead (Pb)	0,001	mg/l

7.3 VOC emissions
Test procedure in line with the AgBB
(MPA Eberswalde, Report No. 31/24/5372/01)

AgBB overview of results (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	5	µg/m³
Sum SVOC (C16 - C22)	5	µg/m³
R (dimensionless)	0.004	-
VOC without NIK	< 5	µg/m³
Carcinogenic Substances	< 1	µg/m³

Name	Value	Unit
TVOC (C6 - C16)	210	µg/m³
Sum SVOC (C16 - C22)	5	µg/m³
R (dimensionless)	0.18	-
VOC without NIK	126	µg/m³
Carcinogenic Substances	< 1	µg/m³

AgBB overview of results (3 days [µg/m³])

8. References

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