ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Lindner Group
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-LIN-20250431-IBA1-EN
Issue date	28.10.2025
Valid to	27.10.2030

NORIT fire protection gypsum fibreboard

Lindner Group

Institut Bauen und Umwelt e.V.

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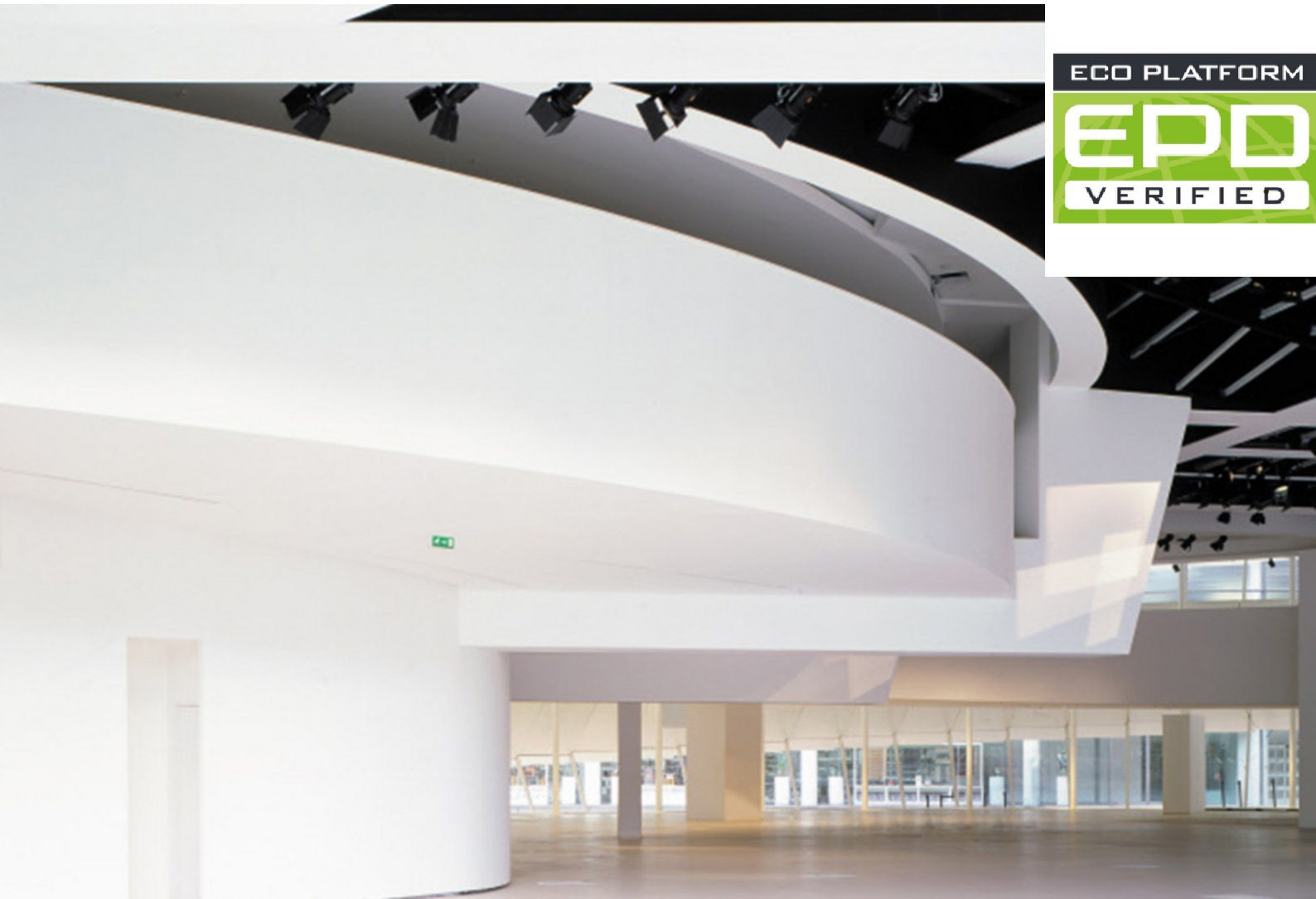


1. General Information

Lindner Group

Programme holder

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

Declaration number

EPD-LIN-20250431-IBA1-EN

This declaration is based on the product category rules:

Plasterboard, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

28.10.2025

Valid to

27.10.2030

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

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

NORIT fire protection gypsum fibreboard

Owner of the declaration

Lindner Group
Bahnhofstraße 29
94424 Arnstorf
Germany

Declared product / declared unit

1 m² of the NORIT fire protection gypsum fibreboard with 18mm thickness.

Scope:

This Environmental Product Declaration (EPD) covers the NORIT gypsum fibreboard, a specific product with a consistent thickness of 18 mm and a specified density of 1277 kg/m³. The boards are manufactured at the Lindner facility in Dettelbach, and the production data used for this EPD was collected during the 2024 calendar year.
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

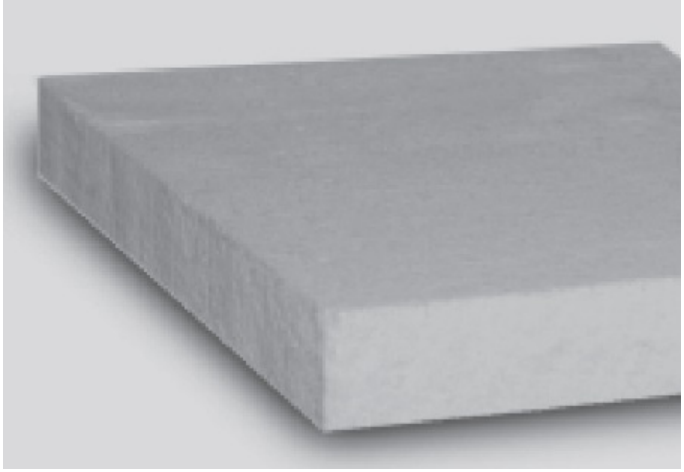
The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Steffen Steier,
(Independent verifier)

2. Product

2.1 Product description/Product definition

The declared product, Lindner's NORIT fire protection gypsum fibreboard, is a fibre-reinforced calcium sulfate panel. This panel has a thickness of 18 mm and a bulk density of 1277 kg/m³. They are produced in sizes of 2600 x 1270 mm and 3030 x 1270 mm. Produced with a robust gypsum core and cellulose fibre in a factory setting, providing the construction of sturdy walls for a variety of building projects. The NORIT fire protection gypsum fibreboard has been developed and tested in accordance with the *EN 15283-2* standard for gypsum fibreboard with enhanced properties and the *EN 13501-1* standard for fire safety compliance.
Regulation (EU) No. 305/2011 (CPR) applies to the placing of the product on the market in the EU/EFTA (with the exception of Switzerland).



2.2 Application

NORIT fire protection gypsum fibreboard is designed for use in interior construction applications, including walls, ceilings, and floors. It provides fire-resistant performance, making it suitable for use as a fire protection board in various building sectors. Additionally, NORIT fire protection gypsum fibreboard is widely used in the construction of prefabricated homes, grandstands, and container buildings. It has strength, sustainability, and ease of installation of the final product.

For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

2.3 Technical Data

The technical specifications of the NORIT fire protection gypsum fibreboard within the scope of the EPD is as follows:

Constructional data

Name	Value	Unit
Gross density	1277	kg/m^3
Bending strength (longitudinal)	~6	N/mm^2
Modulus of elasticity	~6000	N/mm^2
Brinell hardness	~1100	kg/m^3
Swelling (air-dry to water-saturated)	0 - 2	%
Moisture content at 20 °C, 65% humidity	0.8	M.-%
Sound absorption (only with reference to the corresponding component design)	PND	%
Elongation/Vibration when humidity changes by 10%	~0.1-1.5	mm/m

** PND= Performance Not Declared

Product harmonized as well in accordance with the CPR as with other legal provisions of the EU]: Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *DIN EN 15283-2: 2009.* Performance data of the product, based on the harmonised standards, in accordance with the other provisions for harmonization. Voluntary data: Document No. LD-001, NORIT Gipsfaserplatte BSP / TP , acc. to regulation (EU) No. 305/2011 (Construction Products Regulation) (not part of CE-marking)

2.4 Delivery status

NORIT fire protection gypsum fibreboard, available in sizes 2600 x 1270 mm and 3030 x 1270 mm, are efficiently delivered stacked on euro pallets. Other packaging materials are plastic strips, wooden edge protection and Cardboard.

2.5 Base materials/Ancillary materials

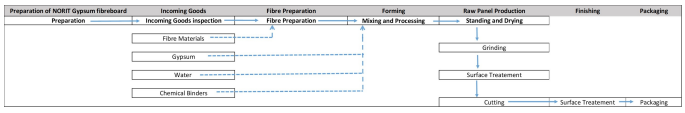
The main constituents of the NORIT fire protection gypsum fibreboard.

Name	Value	Unit
Gypsum Alpha gypsum	4.30	kg
Gypsum Beta gypsum	16.59	kg
Fibre cellulose	1.74	kg
Chemical binders various binders	0.04	kg
Water Water	0.31	kg

1.The product contains substances on the *ECHA* list of Substances of Very High Concern (SVHC) for authorisation (date 31.03.2021) above 0.1 mass %: no.
2.The product contains other carcinogenic, mutagenic, reprotoxic,CMR substances of category 1A or 1B, which are not on *the candidate list*, above 0.1 % weight by weight in at least one sub-product: no.
3.Biocidal products have been added to this construction product or it has been treated with biocidal products (it is therefore a treated product within the meaning of the *Biocidal Products Regulation (EU) No. 528/2012)*: no
The NORIT fire protection gypsum fibreboard consists of 90-96% gypsum and 4-10% cellulose fibres. The gypsum binder used is gypsum and calcined grinding, milling and sawing dust from our own production. The recycled content of both the gypsum binder and the cellulose is 100% preconsumer.

2.6 Manufacture

Manufacturing and processing of gypsum fibreboard involve mixing raw materials like Alpha Hemihydrate, Beta Gypsum, and cellulose fibres. Once water is added, the mixture is pressed into stable panels under high pressure. These gypsum fibreboard are then dried and cut to the desired dimensions. Lindner Group implements a quality management system compliant with *EN ISO 9001* standards.



2.7 Environment and health during manufacturing

The production of fibre-reinforced calcium sulfate panels occurs in environmentally compliant facilities. The process water is recirculated as much as possible within a closed-loop system. Gypsum waste generated is efficiently utilized and reintroduced into the material cycle within the facility. Lindner Group

implements an energy management system aligned with *EN ISO 50001* and an environmental management system conforming to *EN ISO 14001* standards.

2.8 Product processing/Installation

The NORIT fire protection gypsum fibreboard delivered to the construction site are combined with additional individual components, including substructure to create a complete wall system. The substructure is specific for the application and varies based on the place of application and is not part of this EPD. The substructure's design is application-specific and varies depending on the location of installation; as such, it is not included within the scope of this EPD. For further. Instructions, please refer to the installation guidelines. Installation must be carried out by trained personnel.

2.9 Packaging

Gypsum fibreboard are delivered stacked on single euro pallets with three runners, with the dimensions of 1250 x 650 x 150 mm, ensuring optimal stability during final packaging. These panels are wrapped in cardboard, secured with plastic tape. Each pallet can carry a maximum number of 66 panels with 18 mm thickness.

2.10 Condition of use

The service life of gypsum fibreboard is intended to coincide with the full lifespan of the building. Drawing from extensive experience, there are no anticipated significant changes in the material composition of the NORIT Gypsum fibreboard throughout its use.

2.11 Environment and health during use

No health hazards or impairments are expected based on current knowledge when the are used as intended and appropriately. For further details, see Section 7 According to the current state of knowledge, proper use of the described products will not result in exposure to air, water, or soil.

2.12 Reference service life

A reference service life in accordance with *ISO 15686* cannot be determined for this product. Consequently, the technical service life is based on the table "Service Life of Components for Life-Cycle Analysis According to the Rating System for Sustainable Construction (Bewertungssystem Nachhaltiges Bauen – *BNB*) – Code No. 352.911," published by the Federal Office for Construction and Regional Planning (BBSR). The BNB outlines that gypsum fibreboard can expected to have a service life exceeding 50 years, provided they are used, maintained, and cared for appropriately.

Additionally, the document outlines factors influencing the aging of the product when applied following standard technical guidelines.

2.13 Extraordinary effects

Fire

Fibre-reinforced calcium sulphate panels, used as gypsum fibreboard, are classified as "non-flammable" according to *EN 13501-1* and fall into building material class A1.
Furthermore, the system has successfully met the rigorous testing criteria outlined in *DIN 4102-2*, thereby achieving a commendable Fire Resistance Class rating.

Fire protection

Name	Value
Building material class	A1
Burning droplets	0
Smoke gas development	0

Water

NORIT fire protection gypsum fibreboard is commonly used in various interior applications, including as a wall lining for creating smooth, durable surfaces in residential, commercial, and industrial buildings. It's also utilized for ceiling solutions, providing a stable surface for finishing layers, and in partition walls within dry areas, leveraging its high level of fire resistance. Additionally, it might be used as a floor underlayment in dry spaces, and in some cases, as a roof underlayment in fully enclosed, dry areas.

For areas with higher moisture levels, such as bathrooms, kitchens, and laundry rooms, NORIT fire protection gypsum fibreboard can still be used, but with precautions. In these spaces, it's best suited for areas away from direct water spray or high humidity, such as upper walls in bathrooms or kitchens away from sinks. However, it's generally advised to avoid using NORIT fire protection gypsum fibreboard in areas with direct outdoor exposure, swimming pools, wet rooms, or any space prone to continuous high humidity, flooding, or direct water exposure to ensure its longevity and performance.

Mechanical destruction

The durability and functionality of the gypsum fibreboard will be impaired in the event of mechanical damage. Depending on the extent of the damage, affected areas can be repaired or replaced with new gypsum fibreboard without impairing overall functionality.

2.14 Re-use phase

The NORIT fire protection gypsum fibreboard can go to recycling at the end of life cycle as a possible end of life scenario. This scenario involves shredding gypsum panels for recycling, converting them into gypsum dust and secondary cellulose that can be reused in a closed-loop production process.
In this case, both cellulose fibre and the gypsum dust from shredding can replace or compensate for alpha hemihydrate and secondary cellulose in the raw materials, effectively creating an imaginary closed loop. By recycling the material, this scenario contributes to resource conservation and reduces environmental impacts, thus closing the material loop and gaining credit for the material.

For this scenario, it is assumed that:

- 2% of the gypsum panels are being rejected/lost right after dismantling in C1 in the constrction site.
- 98% of the gypsum panels are driven to Dettelbach to undergo the shredding process, of which: 5% will be rejected before shredding, those containing impurities will be taken to landfill. This amount will be recorded under C4 and will never reach the end-of-waste state. The remaining 95%, being considered materials for recycling (MFR), will undergo an internal shredding process in Dettelbach, booked under C3. All relevant processing impacts are taken into account until the shredded panels reach the end-of-waste state, after converting the gypsum panels into gypsum dust and cellulose in C3, which can be reused within the nwxt production processes. Specifically, this gypsum dust can replace or compensate for Alpha hemihydrate. However, it should be taken into account that although 100% of this shredded and recycled gypsum and fibre pass the quality assurance, in the production process of each square meter only 86% of this recycled dust is allowed to be used.
  The amount of recycled gypsum and fibre have been

calculated based on the portion of each in the product as:
Shredded NORIT fire protection gypsum fibreboard× 0.95 (98% of whole panel)= 21.4 kg gypsum panel

2.15 Disposal

Residual NORIT fire protection gypsum fibreboard from construction or demolition that cannot be recycled should be disposed of in line with the *European Waste Index code* 17 08 02, which covers gypsum-based materials not falling under code 17 08 01.

The first end-of-life (EoL) scenario for NORIT fire protection gypsum fibreboard involves landfilling, where all gypsum panels are sent for disposal. In the second scenario, recycling, 6.9% of the gypsum panels were 2% reject from 100% and 5% from 98% loss at Dettelbach are disposed of, as recycling is not possible.

2.16 Further information

For additional product information, please visit: www.Lindner-Group.com

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit for this EPD is 1 m² of the NORIT fire protection gypsum fibreboard. In accordance with PCR Part A, the declared unit is for a specific product with a board thickness of 18 mm, a density of 1,277 kg/m³, and the weight of 22.99 kg/m². This declaration does not include incorporated installation materials.

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	m^2
Grammage	22.99	kg/m^2
Layer thickness	0.018	m
Gross density	1277	kg/m^3

3.2 System boundary

The life cycle analysis for the NORIT fire protection gypsum fibreboard includes the stages "cradle to gate with options".

Specifically, the following processes were included in information module A1–A3 for the production of the NORIT fire protection gypsum fibreboard:
• Raw material provision (A1)
• Transport of raw materials and consumables to the plant (A2)
• Production processes at the plant, including energy costs (electricity, thermal energy), water consumption, production of packaging materials and disposal of residual substances (A3)
• Transport from the factory gate to the construction site (A4)
• Disposal of packaging materials (A5)
• Dismantling of the panels from the building (C1)
• Transportation of discarded panels to facilities for processing, recycling, or disposal (C2)
• Processing dismantled gypsum fibreboards from the deconstruction stage for recycling (C3)
• Disposal of waste materials that cannot be recycled, and landfilling the whole panels in the 1st EoL scenario (C4)
• Reporting on the benefits and loads associated with the recycling of materials beyond the system boundary, including energy recovery from the incineration of packaging materials under A5 and the credits from material recycling under C3 in the 2nd EoL (D)

3.3 Estimates and assumptions

In the EPD, The GWP for the electricity mix in modules A1–A3 is 0.67 kg CO_2e/kWh, while the thermal energy mix accounts for 0.223 kg CO_2e/kWh. With the exception of Modules A1 to A3, which describe the manufacturing process and are therefore based on actual foreground data, all other modules are calculated using assumptions, referred to as scenarios.
• Scenario 1 - Landfilling: Gypsum panels are dismantled and sent directly to a landfill without recycling, remaining as waste and not entering a recovery process.

• Scenario 2 - Shredding for Recycling: The panels are shredded for recycling, with some lost to landfill initially. Most are converted into gypsum dust and cellulose for reuse in production, thus conserving resources.

It is also assumed that all waste incineration plants have an R1 factor greater than 0.6, indicating a high level of efficiency in energy recovery from waste. This assumption is based on statistical data from waste incineration plants in Northern Europe, as detailed in the *CEWEP* Energy Report II (Status 2007-2010).

Apart from End-of-Life scenarios, for all transportation-related modules—including A2 for raw material extraction, A4 for transport from the production site to the construction site, and C2 for waste processing—the "GLO: LKW-Zug/Sattel-Zug, Euro 6 A-C" process is utilised, assuming a scalable distance of 100 km. This reflects the reality that a significant portion of raw materials and NORIT fire protection gypsum fibreboard products are delivered within Germany, covering a substantial delivery radius from Dettelbach, near Würzburg.

3.4 Cut-off criteria

Cut off rules are not applied. Data for the manufacturing process was collected by the life cycle assessor, with the foreground data referencing the year 2024. No mandatory life cycle phases or relevant processes were omitted in the assessment. All known and calculable inputs and outputs were declared, utilising available LCI datasets from the LCA FE databases accessible to the LCA provider.

3.5 Background data

The life cycle of the product was modeled using the *GaBi* software system for life cycle assessment, developed by thinkstep AG. The specific version used was *Sphera MLC* (formerly GaBi), *CUP 2023.02.* Data required for the upstream chain, where specific details were unavailable, were sourced from the *GaBi* database:
http://www.gabisoftware.com/support/gabi/gabidatabase-2016-lcidocumentation/

3.6 Data quality

The data quality of the life cycle inventory (LCI) used in the life cycle assessment (LCA) is rigorously evaluated to meet the standards outlined in *EN 15804+A2* and *EN ISO 14044:2006*. The data sets align with the current ILCD format.

The assessment considers time-related, geographical, and technological coverage, ensuring that primary data gathered from the Dettelbach production facility reflects the latest production conditions as of 2024 and is supplemented by geographically relevant generic data from the *GaBi* database.

Technological Coverage

The data used in the LCA reflects the specific technologies employed at the Dettelbach production facility. Where specific technology data was unavailable, approximations were made using the closest available

Time-Related Coverage
The primary data collected at the Dettelbach production facility reflects the most recent production conditions, specifically from 2024. This ensures that the data accurately represents the current state of the manufacturing processes. The reference years for the generic data used from the *GaBi* database are consistent with the time frame of the project, providing a reliable temporal alignment.

Geographical Coverage
The foreground data was collected from the production facilities in Germany, ensuring that it is geographically relevant. For background data, the *GaBi* database was chosen because it includes datasets that are geographically specific to Germany and Europe, ensuring that the environmental impacts are accurately represented for the region.
Datasets from the *GaBi* database, ensuring that the technological representativeness is maintained.

Completeness
All relevant processes, including material and energy flows involved in the production of the NORIT fire protection gypsum fibreboard, were
thoroughly considered in the life cycle assessment. Data were systematically categorised into specific groups: energy, raw materials, water consumption, wastewater, and waste. This categorization also included materials that remain in a closed loop by reusing their waste, such as the incorporation of gypsum dust back into the material itself. This approach ensured a comprehensive capture of all significant inputs and outputs, allowing for a detailed and accurate assessment of the environmental impacts associated with the product's life cycle.

3.7 Period under review
Production data for this assessment were collected from the Lindner plant in Dettelbach, Germany, for the year 2024.

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: Europe

3.9 Allocation
The Lindner Group's production line manufactures several products, focusing on NORIT fire protection gypsum fibreboard. Thermal, electrical, and photovoltaic energy data, alongside raw material consumption, are collected specifically for this declared product. Since production processes are uniform across products, differences arise only in the panel's density and thickness. Resource allocation, including raw materials and energy, is proportioned based on a representative product. Environmental impacts are allocated using a physical classification method, considering raw material, packaging, energy, and water consumption. This methodology includes end-of-life considerations, ensuring accurate and transparent reporting of consumed resources for NORIT fire protection gypsum fibreboard.
Key areas:
• Allocation of energy, auxiliary, and operating materials used for individual products in a factory.
• Allocation of co-production processes.
• Allocation in the use of recycled and/or secondary raw materials.
• Loads and benefits beyond the system boundary from recycling or energy recovery of packaging materials and production waste.
• Loads and benefits beyond the system boundary from recycling or energy recovery from the end of life of the product.

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 background data were sourced from the *GaBi* database (see Section 8, References).

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon
The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it shall be separately declared for the product and for any accompanying packaging.
If the total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging, the declaration of biogenic carbon content may be omitted. The mass of packaging containing biogenic carbon shall always be declared.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0.77	kg C
Biogenic carbon content in accompanying packaging	0.329	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

The following technical scenario information is required for the declared modules and optional for non-declared modules.

Modules for which no information is declared can be deleted; additional information can also be listed if necessary.

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

A5 is not declared including the disposal of the packaging material on the construction site, the amounts of packaging materials included in the LCA calculations must be declared as technical scenario information for Module A5.

Transport to the building site (A4)

Name	Value	Unit
Fuel Type	Diesel Mix	-
Litres of fuel	0.06	kg
Transport distance	100	km
Capacity utilisation (including empty runs)	61	%
Total weight of the transported good (packed)	23.32	kg

A reference service life in accordance with ISO 15686 cannot be determined for this product. Consequently, the technical service life is based on the table "Service Life of Components

for Life-Cycle Analysis According to the Rating System for Sustainable Construction (Bewertungssystem Nachhaltiges Bauen – *BNB*) – Code No. 352.911," published by the Federal Office for Construction and Regional Planning (*BBSR*). The BNB outlines that gypsum fibreboard are expected to have a service life exceeding 50 years, provided they are used, maintained, and cared for appropriately.

Additionally, the document outlines factors influencing the aging of the product when applied following standard technical guidelines.

Reference service life

A reference service life cannot be calculated for this product. A technical service life of around 50 years is assumed according to the *BNB*.

Name	Value	Unit
Life Span (according to BBSR)	50	a

End of life (C1-C4)

Name	Value	Unit
Collected Waste	22.99	kg
Landfilling Sc 1	22.99	kg
Landfilling Sc 2	1.59	kg
Recycling Sc 2	21.4	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Credit from material Sc 2- gypsum	19.72	kg
Credit from material Sc 2- fiber	0.01342	kg
Electrical Energy Recovery	0.1512	MJ
Thermal Energy Recovery	0.2854	MJ

5. LCA: Results

The table below presents the life cycle assessment (LCA) results for a declared unit of 1 m², based on a material weight of 22.99 kg/m² for NORIT fire protection gypsum fibreboard.
The EPD covers two End of Life scenarios :
• Base Scenario: Landfill
• Scenario 1: Recycle

Base Scenario is represented by C1, C2, C3, C4, D
Scenario 1 is represented by C1, C2/1, C3/1, C4/1, D/1

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 NORIT fire protection gypsum fibreboard

Parameter	Unit	A1-A3	A4	A5	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
GWP-total	kg CO_2 eq	4.01E+00	2E-01	3.8E-01	0	1.87E-01	1.87E-01	0	3.5E+00	3.19E+00	2.2E-01	-3.29E-02	-4.26E+00
GWP-fossil	kg CO_2 eq	7.23E+00	1.94E-01	1.55E-02	0	1.8E-01	1.82E-01	0	8.43E-01	3.4E-01	2.35E-02	-3.27E-02	-4.25E+00
GWP-biogenic	kg CO_2 eq	-3.22E+00	5.08E-03	3.65E-01	0	6.25E-03	4.01E-03	0	2.65E+00	2.85E+00	1.97E-01	-1.47E-04	-1.32E-02
GWP-luluc	kg CO_2 eq	2.44E-03	1.2E-03	1.08E-06	0	1.12E-03	1.12E-03	0	3.38E-05	1.07E-03	7.4E-05	-2.11E-06	-2.57E-04
ODP	kg CFC11 eq	9.59E-12	4.95E-14	2.09E-14	0	4.63E-14	4.63E-14	0	1.48E-12	8.78E-13	6.06E-14	-2.51E-13	-1.14E-11
AP	mol H^+ eq	7.1E-03	2.7E-04	3.54E-05	0	2.5E-04	2.5E-04	0	6.25E-04	2.45E-03	1.69E-04	-4.04E-05	-4.03E-03
EP-freshwater	kg P eq	4.59E-06	4.73E-07	7.4E-09	0	4.42E-07	4.42E-07	0	3.42E-07	6.95E-07	4.8E-08	-5.18E-08	-3.25E-06
EP-marine	kg N eq	2.66E-03	1.01E-04	1.22E-05	0	9.33E-05	9.33E-05	0	2.38E-04	6.33E-04	4.37E-05	-1.19E-05	-1.53E-03
EP-terrestrial	mol N eq	2.92E-02	1.2E-03	1.55E-04	0	1.1E-03	1.1E-03	0	2.61E-03	6.96E-03	4.8E-04	-1.27E-04	-1.68E-02
POCP	kg NMVOC eq	7.41E-03	2.39E-04	3.22E-05	0	2.22E-04	2.22E-04	0	6.92E-04	1.91E-03	1.32E-04	-3.31E-05	-4.43E-03
ADPE	kg Sb eq	1.43E-07	1.45E-08	1.7E-10	0	1.36E-08	1.36E-08	0	2.03E-08	1.6E-08	1.1E-09	-2.3E-09	-1.17E-07
ADPF	MJ	1.11E+02	2.73E+00	4.06E-02	0	2.55E+00	2.55E+00	0	1.43E+01	4.6E+00	3.17E-01	-6.03E-01	-6.23E+01
WDP	m^3 world eq deprived	1.32E-01	1.05E-03	1.45E-02	0	9.85E-04	9.85E-04	0	1.83E-02	3.79E-02	2.62E-03	-3.04E-03	-1.44E-01

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 NORIT fire protection gypsum fibreboard

Parameter	Unit	A1-A3	A4	A5	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
PERE	MJ	-2.75E+01	1.83E-01	4.63E+00	0	1.71E-01	1.71E-01	0	2.86E+01	2.8E+00	2.1E+00	-1.71E-01	-5.71E+00
PERM	MJ	9.78E-01	0	-7.39E-01	0	0	0	0	-2.22E-01	-2.38E-01	-1.64E-02	0	0
PERT	MJ	-2.66E+01	1.83E-01	3.89E+00	0	1.71E-01	1.71E-01	0	2.84E+01	2.56E+00	2.08E+00	-1.71E-01	-5.71E+00
PENRE	MJ	1.11E+02	2.73E+00	3.46E-01	0	2.56E+00	2.56E+00	0	1.43E+01	4.6E+00	3.18E-01	-6.03E-01	-6.23E+01
PENRM	MJ	1.39E-01	0	-1.39E-01	0	0	0	0	0	0	0	0	0
PENRT	MJ	1.11E+02	2.73E+00	2.07E-01	0	2.56E+00	2.56E+00	0	1.43E+01	4.6E+00	3.18E-01	-6.03E-01	-6.23E+01
SM	kg	1.81E+00	0	0	0	0	0	0	0	0	0	0	1.97E+01
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	1.04E-02	1.63E-04	3.43E-04	0	1.52E-04	1.52E-04	0	8.44E-04	1.16E-03	8.02E-05	-1.39E-04	-1.01E-02

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 NORIT fire protection gypsum fibreboard

Parameter	Unit	A1-A3	A4	A5	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
HWD	kg	2.3E-08	4.61E-12	6.91E-13	0	4.31E-12	4.31E-12	0	2.11E-09	1E-10	6.91E-12	-3.38E-11	-9.08E-09
NHWD	kg	1.67E+00	4.09E-04	3.97E-03	0	3.82E-04	3.82E-04	0	1.13E+00	2.3E+01	1.56E-03	-2.94E-04	-2.38E-02
RWD	kg	3.5E-03	3.6E-06	1.89E-06	0	3.36E-06	3.36E-06	0	2.67E-04	5.25E-05	3.62E-06	-4.55E-05	-6.21E-04
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	0	0	2.14E+01	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	1.51E-01	0	0	0	0	0	0	0	0	0
EET	MJ	0	0	2.85E-01	0	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 NORIT fire protection gypsum fibreboard

Parameter	Unit	A1-A3	A4	A5	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
PM	Disease incidence	1.89E-07	2.21E-09	2.36E-10	0	2.05E-09	2.05E-09	0	5.37E-09	3.01E-08	2.08E-09	-3.43E-10	-2.47E-08
IR	kBq U235 eq	2.86E-01	3.85E-04	2.7E-04	0	3.6E-04	3.6E-04	0	4.43E-02	6.06E-03	4.18E-04	-7.56E-03	-6.84E-02
ETP-fw	CTUe	1.86E+01	1.99E+00	1.62E-02	0	1.86E+00	1.86E+00	0	5.76E-01	2.49E+00	1.72E-01	-8.22E-02	-2.39E+01
HTP-c	CTUh	9.68E-10	3.97E-11	1.63E-12	0	3.71E-11	3.71E-11	0	1.21E-10	3.86E-10	2.67E-11	-6.62E-12	-8.54E-10
HTP-nc	CTUh	4.07E-08	1.66E-09	1.03E-10	0	1.56E-09	1.56E-09	0	4.28E-09	4.08E-08	2.81E-09	-1.65E-10	-2.48E-08
SQP	SQP	2.47E+01	9.71E-01	1.29E-02	0	9.08E-01	9.08E-01	0	6.77E-01	1.12E+00	7.71E-02	-1.13E-01	-4.15E+00

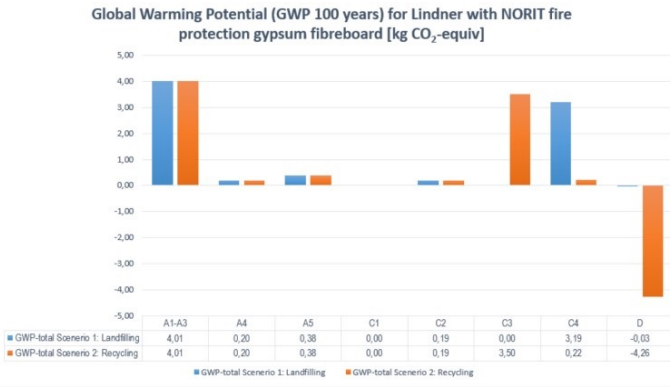
PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic);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

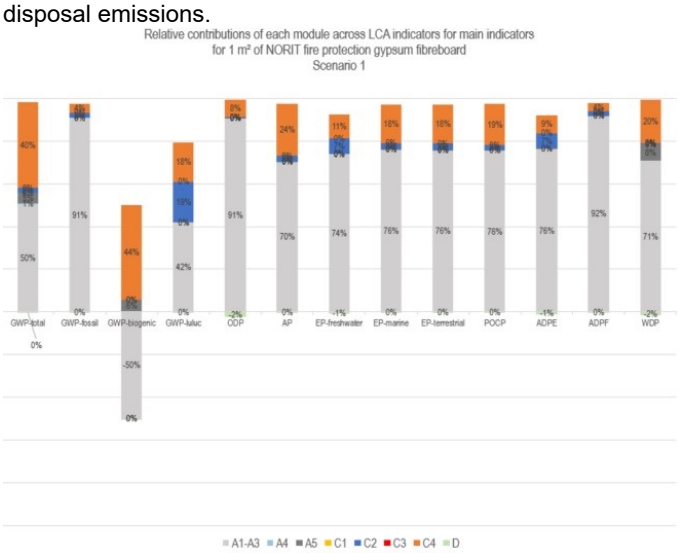
Disclaimer 2 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit 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.

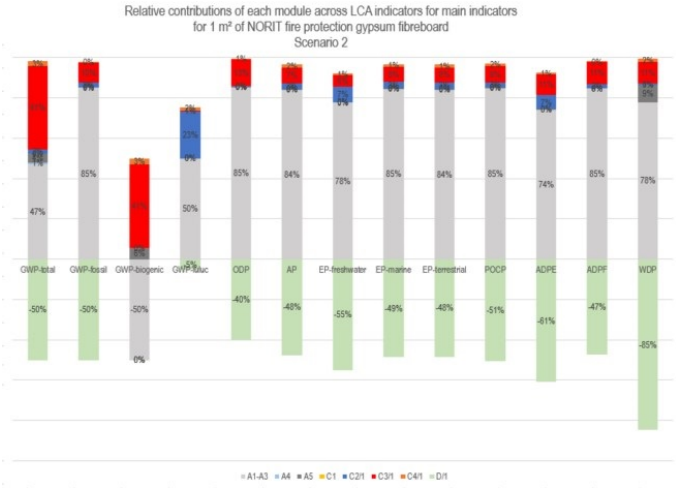
6. LCA: Interpretation

Total Global Warming Potential (GWP)



The chart compares the Global Warming Potential (GWP) over 100 years for NORIT fire protection gypsum fibreboard under two disposal scenarios: landfilling and recycling. Both scenarios show identical emissions during production (A1–A3:4.01 kg CO_2-eq), transport (A4: 0.20 kg CO_2-eq), and construction (A5: 0.38 kg CO_2-eq). End-of-life stages differ: landfilling shows lower emissions in C4 (3.19 kg CO_2-eq) compared to recycling (3.50 kg CO_2-eq), but recycling compensates with significant benefits in module D (–4.26 kg CO_2-eq), unlike landfilling (–0.03 kg CO_2-eq). Overall, recycling results in a lower total GWP due to material recovery and energy recovery, making it the more environmentally sustainable option despite slightly higher disposal emissions.





GWP Fossil & GWP Biogenic
In Scenario 1, fossil emissions from production are much higher than the carbon absorbed by materials. Some stored carbon is released during construction and more during landfill decomposition, increasing biogenic emissions. Transport and construction have low impact. Landfilling offers little environmental benefit beyond the system boundary.
In Scenario 2, Module D/1 significantly reduces environmental impact through material recovery and reuse. It contributes –50% to GWP fossil, indicating a major reduction in fossil-based emissions by avoiding the use of new raw materials. These negative percentages highlight the environmental advantages of recycling, making Module D a key factor in lowering the overall carbon footprint of the NORIT fire protection gypsum fibreboard.

7. Requisite evidence

7.1 Leaching (sulphate + heavy metals)
The measured values cover key metals of concern, including arsenic, lead, cadmium, chromium, copper, nickel, mercury, and zinc. In the eluate for all metals tested fall significantly below their respective upper limits, indicating compliance with these standards and no significant contamination risks according to DIN EN 12457-4. The tested product allows for unrestricted installation concerning arsenic, lead, cadmium, and below-threshold levels for sensitive categories such as chromium, copper, nickel, mercury, and zinc. This compliance is vital for preventing water body contamination when disposed of properly. The data collection also respects TVO (Drinking Water Ordinance) as of 01.01.2008, further reinforcing its environmental safety during various construction and landscaping applications. The IBR report is available with No. 3024 - 1464/ 2024.

7.2 Radioactivity
Measurement of the nuclide content in Bq/kg for Ra- 226, Th-232, K-40. In Germany, there are currently no statutory limit values specified for assessing the radioactivity of building materials. Assessment can be performed on the basis of:
- EU Commission "Radiation Protection 112" document
- OENORM 5200
- Nordic Countries' Recommendation 2000.

7.3 Testing pretreatement of substances
The declared product does not contain "recycled wood" in its basic materials. Therefore, there is no basis for testing according to the Recycled Wood Regulation (AltholzVO).

7.4 Toxicity of Combustion Gases
The product is non-flammable, making the assessment of the toxicity of combustion gases irrelevant. A toxicological investigation has been conducted.

7.5 VOC emissions
Test Report No. 3024-1464, dated October 2024, is available for the NORIT fire protection gypsum fibreboard. The testing was conducted by the Institute for Building Biology Rosenheim GmbH.

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

Name	Value	Unit
TVOC (C6 - C16)	25	µg/m³
Sum SVOC (C16 - C22)	< 5	µg/m³
R (dimensionless)	0.01	
VOC without LCI	< 1	µg/m³
CMR substances	< 1	µg/m³
formaldehyde	< 2	µg/m³

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

Name	Value	Unit
TVOC (C6-C16)	40	µg/m³
Sum SVOC (C6 - C22)	< 1	µg/m³
R (dimensionless)	0.02	
VOC without LCI	< 1	µg/m³
CMR substances	< 1	µg/m³

8. References

Standards

EN 15804
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

EN 13501-1
DIN EN 13501-1:2019-05, Classification of construction products and types into their fire behavior.

DIN EN 12457-4
DIN EN 12457-4:2002, Characterization of waste — Leaching — Compliance test for leaching of granular waste materials and sludges — Part 4: One stage batch test at a liquid to solid ratio of 10 l/kg for materials with particle size below 10 mm (without size reduction).

Further References

LCA software GaBi
Sphera's LCA for Experts (GaBi) 10.7.1.28

LCA database
Sphera's LCA for Experts (GaBi) database 2023

IBU 2021

Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021 www.ibu-epd.com

PCR part A
Calculation Rules for the Life Cycle Assessment andRequirements on the Project Report according to EN15804+A2:2019 /IBU PART A/. Version 1.4.

PCR part B
PCR Guidance-Texts for Building-Related Products and Services From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU)- Requirements on the EPD for Plasterboard, v11, Lastamended: 01.08.2024.

AgBB 2021
Procedure for the health-related evaluation of emissions of volatile organic compounds from construction products.

Biocidal Products Regulation
Regulation (EU) No 528/2012 of the European Parliament andof the Council of 22 May 2012 concerning the making availableon the market and use of biocidal products, Official Journal ofthe European Union, 2012

BBSR
Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR): Service life of construction components. Service life of construction components for Life Cycle Assessments according to the assessment system for sustainable construction (BNB), in: Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (ed.), 2017.

European Chemicals Agency (ECHA)
ECHA, guidance and compliance materials - ensure the safe use of chemicals - scientific and technical advice on EU chemical policies www.echa.europa.eu

European Waste Index
Systematic efforts within the European Union to track and categorize waste generation and management practices across member states. This involves collecting data on waste types, quantities, disposal methods, and recycling rates to promote sustainable waste management and ensure compliance with EU environmental regulations

REGULATION (EU) No. 305/2011
REGULATION (EU) No. 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC; and Council; OJ EU L88/5, 4.4.2011.

CEWEP Energy Report III (Status 2007-2010)
https://www.cewep.eu/wp-content/uploads/2017/10/1069_13_01_15_cewep_energy_report_iii.pdf aufgerufen am 06.05.24, CEWEP Energy Report III, (Status 2007-2010), Results of Specific Data for Energy, R1 Plant Efficiency Factor and NCV of 314 European Waste-to-Energy (WtE) Plants
DIN EN 12457-4

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