

ENVIRONMENTAL PRODUCT DECLARATION

CERTAINTEED TYPE X GYPSUM BOARD

FOR CERTAINTEED GYPSUM MANUFACTURING FACILITIES BASED AT:
CARROLLTON, KENTUCKY
MOUNDSVILLE, WEST VIRGINIA
ROXBORO, NORTH CAROLINA



The CertainTeed Type X Advantage:

- Fire ratings up to four hours
- Consistently high quality
- Uniformly flat, attractive appearance; no shadows
- High edge hardness
- No wavy edges, warps, bows or deformities
- Uniform high-strength cores eliminate crumbling and cracking
- Edge tapers consistent to form perfect joints
- Excellent thermal barrier and sound attenuation qualities

CertainTeed
SAINT-GOBAIN
Gypsum

Architects, contractors and manufacturers continue to look for ways to reduce our industry's impact on the environment while meeting customer demand for products that deliver beauty, comfort and performance. CertainTeed Gypsum, the leader in innovative drywall and performance wallboards, has the products to make your property healthier, quieter and more comfortable. For ceiling and wallboard, we offer products that contribute to indoor air quality, acoustics, fire resistance, moisture and mold resistance, recycled content, regional materials and innovation in design needs, as well as overall durability, aesthetics and sustainability of a building.

CertainTeed Gypsum operates its manufacturing facilities with a responsible and environmentally conscious ethic that includes reclamation, preservation of natural resources, recycling and waste management. As part of Saint-Gobain, CertainTeed Gypsum has access to unparalleled research and innovation capabilities to manufacture wall products that can greatly affect our physical and mental well-being. Find out how we can help you create a stronger, healthier interior at www.certainteed.com/gypsum



This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle.



Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g., Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.

PROGRAM OPERATOR	UL Environment	
DECLARATION HOLDER	CertainTeed Gypsum, Inc. • 20 Moores Road • Malvern, PA 19355 • USA	
DECLARATION NUMBER	4786663719.104.1	
DECLARED PRODUCT	Type X Gypsum Board, Carrolton, KY, Moundsville, WV, and Roxborro, NC	
REFERENCE PCR	Product Category Rules for North American Gypsum Boards FP innovations – Gypsum PCR 2013 – V1	
DATE OF ISSUE	November 17, 2015	
PERIOD OF VALIDITY	5 Years	
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications	
The PCR review was conducted by:	PCR Review Panel	
	Chair: Thomas P. Gloria	
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories: <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL		
	Wade Stout, UL Environment	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:		
	Tad Radzinski, Sustainable Solutions Corp	



ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

Date: May 2015 | Version:1
Date: May 2015 | Version:1

CERTAINTEED TYPE X GYPSUM BOARD



The environmental impacts of this product have been assessed over its whole life cycle. Its Environmental Product Declaration has been verified by an independent third party.

N° Verification: XXXXXXXX

CertainTeed
SAINT-GOBAIN

1. General Information

Type III Environmental Product Declaration Developed According to ISO 14025, ISO 21930 and EN15804
Prepared by: Central SHEAR, Saint-Gobain Gypsum

Name and Address of the Manufacturer: CertainTeed Gypsum, Inc. • 20 Moores Road • Malvern, PA 19355 • USA • 800-233-8990

Name and Address of the EPD Program Operator: UL Environment .• 2211 Newmarket Parkway • Suite 106 • Marietta, GA 30067 • USA

PCR: Product Category Rules for North American Gypsum Boards FP innovations – Gypsum PCR 2013 – V1

EPD Owner: Douglas C. Gehring, P.E., Director, Marketing Technical Services, doug.gehring@saint-gobain.com
20 Moores Road
Malvern, PA 19355
United States of America

The owner of this EPD is the sole owner and has liability and responsibility for the published EPD.

Declared Product: CertainTeed 5/8 inch Type X Gypsum Board

Explanatory information about this EPD may be obtained from the PCR, EPD Program Operator and EPD owner, or by contacting this address: acagen-epd.gypsum@saint-gobain.com

The Functional Unit is 1000 square feet (92.9 square meters) of gypsum board with a weight of 2.2 – 2.3 psf (10.98 – 11.28 kg/m²) and a thickness of 5/8 inch (15.8 mm).

Scope of this Declaration: This EPD represents an average performance of Type X board produced at the Carrollton, Moundsville and Roxboro plants.

Declaration of Hazardous Substances: (Candidate List of Substances of Very High Concern): None

Primary Audience: Business to business.

Scope:

PCR review was conducted by:
Independent verification of the declaration, according to EN ISO 14025:2010: <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External
Third party verifier: Wade Stout, UL Environment

The study's scope was to develop an ISO14040/44 and EN 15804 compliant cradle-to-grave life cycle assessment for Type X gypsum wallboard for the 2013 reference year. This specific gypsum board EPD covers the Carrollton, Moundsville and Roxboro facilities, with a weighted average based on annual production used as the basis to calculate the average.

As defined in ASTM C11, gypsum board is the generic name for a family of board products consisting of a non-combustible core primarily of gypsum with a paper facing.

2. Product Section

2.1 Product Description

CertainTeed Type X Gypsum Board is an interior gypsum board consisting of a solid set, fire-resistive, Type X gypsum core enclosed in ivory-colored face paper and a strong liner back paper. CertainTeed Type X board features a specially formulated core providing fire resistance ratings when used in tested assemblies. Long edges are slightly tapered, allowing joints to be reinforced and concealed with joint tape and joint compound. CertainTeed Type X Gypsum Board is available in a variety of lengths and widths.



The CertainTeed Type X Advantage:

- Fire ratings up to four hours
- Consistently high quality
- Uniformly flat, attractive appearance; no shadows
- High edge hardness
- No wavy edges, warps, bows or deformities
- Uniform high-strength cores eliminate crumbling and cracking
- Edge tapers consistent to form perfect joints
- Excellent thermal barrier and sound attenuation qualities

2.2 Designated Application

Gypsum board products provide multiple functions including wall covering, creating a barrier that controls noise, air, water and thermal transmission between the external environment and the interior space of a building, as well as other functions such as load carrying capacity, thermal mass and aesthetics

2.3 Product Data

PRODUCT DATA: Sizes and Types	THICKNESS inch (mm)	SPECIFIC DENSITY lb/ft ² (kg/m ²)	CORE TYPE	ASTM STANDARD
Gypsum Board	5/8" (15.9 mm)	2.2 – 2.3 psf (10.98 – 11.28 kg/m ²)	Type X	C1396 (CAN/CSA-A82.27)

2.4 Technical Data

TECHNICAL DATA	VALUE AND UNITS/TEST RESULTS/ STATEMENT	REFERENCED DOCUMENTS AND LINKS
"R" Factor — Thermal Resistance in U.S. Unit (SI unit)	ASHRAE Handbook of Fundamentals R - 0.48 °F ft ² hr / BTU (R – 0.085 K m ² / W)	ASTM C177 "R" factor — thermal resistance in U.S. unit (SI unit)
Safety Data Sheet — Yes/No	Yes	Available at: http://www.certainteed.com/resources/CTG_5-16_Gypsum_Board_MSDS_Eng.pdf
Mold Resistance (if applicable)	N/A	ASTM D3273 Mold Resistance (if applicable)

Water Absorption (if applicable)	N/A	ASTM C473, ASTM C1396 Water Absorption (if applicable)
Total Water Absorption (if applicable)	N/A	ASTM C473, ASTM C1396 Total Water Absorption (if applicable)
Surface Burning Characteristics (if applicable):		ASTM E 84 (CAN/ULC-S102) Surface Burning Characteristics:
Flame Spread	15	ASTM E84 (CAN/ULC-S102)
Smoke Developed	0	ASTM E84 (CAN/ULC-S102)
Fire Resistance Rated (if applicable)	Yes, UL Classified / ULC Listed	ASTM E119 (CAN/ULC-S101)
Foil Application 1): (if applicable), Desiccant Method Test	N/A	ASTM C1396 Foil Application 1): (if applicable), Desiccant Method Test
Abuse/Impact Resistance Test (if applicable)	N/A	ASTM C1629 Abuse/Impact Resistance Test (if applicable)
Total Recycled Content (%)	Carrollton, KY, USA: 99% Moundsville, WV, USA: 99% Roxboro, NC, USA: 99%	As defined in ISO 14021
Pre-consumer (%)	Carrollton, KY, USA: 99% Moundsville, WV, USA: 99% Roxboro, NC, USA: 99%	
Post-consumer (%)	Carrollton, KY, USA: 0.3% Moundsville, WV, USA: 0.3% Roxboro, NC, USA: 0.3%	

2.5 Placing on the Market / Application Rules

ASTM C1396/C1396M:2014a, Standard Specification for Gypsum Board
CAN/CSA-A82.27, Gypsum Board

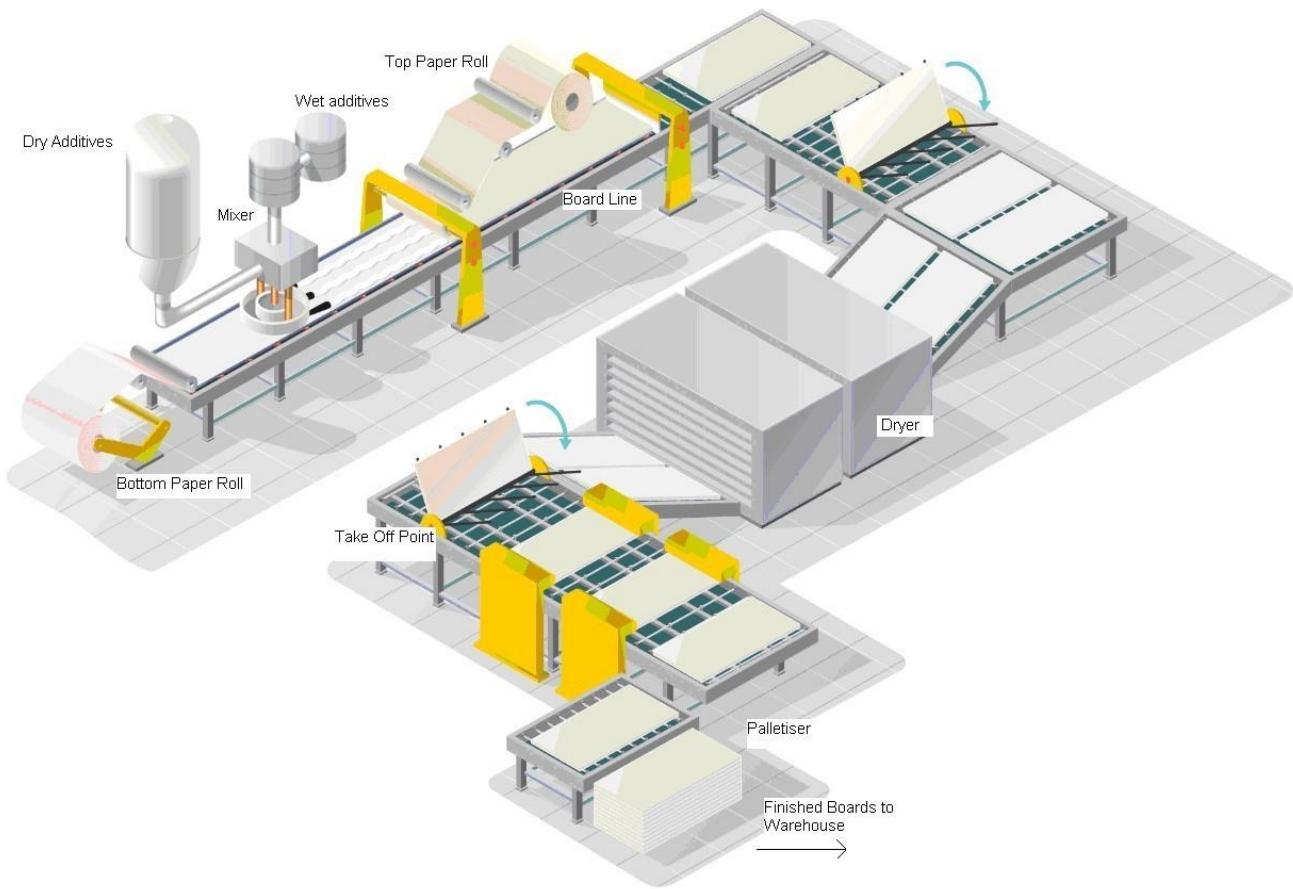
2.6 Product Formulation

TYPE OF MANUFACTURE	GYPSUM WALL BOARD
Product Specification	Thickness: 5/8" (15.9 mm) Weight: 2.2 – 2.3 psf (10.98 – 11.28 kg/m ²) Widths: 4' (1220 mm) standard, 54" (1375 mm) Lengths: 8' to 12' (2440 to 3660 mm) Edges: Tapered
Core Type	Type X gypsum core with additives, encased in a paper liner

Plant	Product	Product weight (kg/1000 sq ft)	Natural Gypsum Ore (kg/1000 sq ft)	DSG (kg/1000 sq ft)	C&D (kg / 1000 sq ft)	Internally Recycled Gypsum Scrap (kg/1000 sq ft)	Paper Bottom Liner (kg/1000 sq ft)	Paper Top Liner (kg / 1000 sq ft)	Additives (kg / 1000 sq ft)
Carrolton	Type X	1029	0	844	0	0	17	18	168
Moundsville	Type X	1021	0	796	0	58	18	17	71
Roxboro	Type X	1039	0	810	0	0	18	16	81

FGD Gypsum is a by – product derived from FGD waste. This is created by the flue gas desulfurization process, commonly known as "scrubbing." As the FGD Gypsum is 100% recycled it is considered a burden free material, and modeled as such. All transport impacts from the Power Station to the Certaineed site have been included, along with any energy use associated with the FGD processing once it enters the manufacturing site.

2.7 Manufacturing



Gypsum, the main raw material, comes from one of four sources: DSG is transported from power stations, natural gypsum is extracted from mines and quarries, process scrap is reformed into new product and construction/demolition waste is collected from jobsites and returned to the plant for reprocessing. This material is calcined before use to produce the hemihydrate of calcium sulphate — stucco ($\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$). This stucco is stored in silos.

The second main raw material is water. Stucco, water and additives are combined in a mixer, forming slurry. Slurry flows between the two papers, comes through an extruder and is formed into gypsum board. After the slurry is set, the gypsum board is cut to smaller pieces. The cut gypsum board then comes through the dryer, evaporating the added extra water. Dried boards are trimmed in a saw station to exact diameters and placed on pallets.

2.8 Environment and Health During Manufacturing

The following environmental abatement pollution equipment was installed at the plant to control particulate matter (PM) emissions:

Moundsville:

- Fabric Filter
- Bin Vents

Carrollton:

- Fabric Filter
- Bin Vents

Roxboro:

- Fabric Filter Dust Collectors

2.9 Packaging

Gypsum dunnage (reject plasterboard), polythene wrap and end tape.

2.10 Product Installation

The finishing process requires patience! You should apply up to three coats of joint compound, CertainTeed® finishing products, Easi-Fil®, or equivalent ready-mix or setting-type, through the process and allow 24 hours of drying time between applications. Drying time for ready-mix joint compound is dependent on temperature and humidity conditions. The first coat is used to embed the tape, while the two finishing coats feather out the compound, resulting in a uniform, smooth finished surface.

A few pointers for easy and safe application:

- Installation and finishing in accordance with ASTM C840, GA-214, GA-216, CAN/CSA-A82.31 and the manufacturer's application instructions.
- Always wear a dust mask when sanding.
- Use only a 150 - 180 grit sandpaper, designed especially for joint compound.
- Keep your knife clean by drawing it over the edge of the mudpan or hawk.
- Throw out any dried bits of joint compound ... they will leave scratches.
- Don't worry about a smooth finish on the first coat; the finishing coats will take care of that.
- Stir joint compound well before use. Add clear water for desired consistency.
- Joint compound should never be frozen. In cold weather compound should be at room temperature 24 hours before using.

2.11 Environment and Health During Use Stage

CertainTeed Type X Gypsum Board is not a hazardous material as defined by 29 CFR1910.100, OSHA Hazard Communication Standard. This product meets the definition of an "article." This is a Not Controlled product under WHMIS (Canada).

2.12 Reference Service Life

The RSL of gypsum board manufactured and installed in residential and non-residential buildings in North America is greater than or equal to 60 years.

2.13 End-of-life

All gypsum boards are disposed of in building and construction landfill. Though not considered during the preparation of this EPD, CertainTeed Gypsum has agreements with third-party gypsum waste recyclers (i.e. New West Gypsum: www.nwgyypsum.com) who collect gypsum construction waste for processing and then transport this post-consumer gypsum raw material to specific manufacturing plants in North America for the production of new gypsum board products. Plants

currently receiving this post-consumer recycled content gypsum material include Calgary, AB; Toronto, ON; Vancouver, BC; and Seattle, WA. Any recycling benefits are not accounted for in this EPD, nor any benefits of avoided landfill.

3. LCA Calculation Rules

3.1 Functional Unit

FUNCTIONAL UNIT	1000 sq. ft (92.9 sq m) of gypsum board with a specified thickness of 5/8" (15.9 mm)
CONVERSION FACTOR TO KG	10.98 - 11.28 kg

Gypsum board products provide multiple functions including wall covering, creating a barrier that controls noise, air, water and thermal transmission between the external environment and the interior space of a building, as well as other functions such as load carrying capacity, thermal mass and aesthetics. According to EN 15804, EPDs of construction products may not be comparable if they do not comply with this standard. According to ISO 21930, EPDs might not be comparable if they are from different programs.

3.2 System Boundary

Cradle to grave. Modules included are modules A1-A5, B1-B7 and C1-C4. The purpose of this EPD is for business-to-business communication.

Included:

- Input raw materials
- Input process ancillary materials
- Input energy supply
- Operation of primary production equipment
- Input water for process and cooling
- Recycling of post-consumer gypsum board waste
- Packaging of product
- Inbound transportation of raw materials and ancillary materials
- Heating and lighting of manufacturing facilities
- Outbound transportation of board to site
- Installation at site
- Treatment and disposal of installation waste
- Use
- End-of-life recycling, treatment and disposal of waste

Excluded:

- Fixed capital equipment
- Hygiene-related water use (where metered separately)
- Transportation of employees
- Office heating, ventilation and lighting (where metered separately)

3.3 Estimates and Assumptions

Distance to waste processing and landfill site has been modelled at 80 km. Return transport during the construction phase (A5) is modelled as a 24 ton truck, 100% empty return.

3.4 Cut-off Criteria

Life Cycle Inventory data for a minimum of 99% of total inflows to the upstream and core module shall be included.

3.5 Data Requirements and Data Sources

Data included is collected from three production sites.

3.6 Allocation

Production data, recycling, energy and waste data have been calculated on a mass basis.

3.7 Comparability of EPDs

In accordance with ISO 14024, clause 7.2.1, environmental declarations from different programs may not be comparable. The comparison of the environmental performance of gypsum boards using the EPD information shall be based on the product's use in and its impacts on or within the building, and shall consider the complete life cycle (all information modules). Use stage impacts of the whole building integrated technical system are modelled for a specific scenario and are only comparable with products developed using the exact same use stage scenarios. Full conformance with the PCR for North American Gypsum Boards ensures EPD comparability when all stages of a product's life cycle have been duly considered; however, variations and deviations are possible.

4. LCA Scenarios and Additional Technical Information

Flow diagram of the Life Cycle



Product stage, A1-A3

Description of the stage:

A1: raw material extraction and processing, processing of secondary material input (e.g., recycling processes). This includes the extraction and processing of all raw materials and energy that occur upstream from the manufacturing process.

A2: transport to the manufacturer. The raw materials are transported to the manufacturing site. The modelling includes road, boat and/or train transportation of each raw material.

A3: manufacturing, including provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the product stage. This module includes the manufacture of products and the manufacture of packaging. The production of packaging material is taken into account at this stage. The processing of any waste arising from this stage is also included.

Manufacture:

The initial materials are homogeneously mixed to form a gypsum slurry that is spread via multiple hose outlets onto a paper liner on a moving conveyor belt. A second paper liner is fed onto the production line from above to form the gypsum board. The gypsum board continues along the production line where it is finished, dried and cut to size.

Recycled gypsum waste is reintegrated back into the manufacturing process wherever possible.

Construction process stage, A4-A5

Description of the stage:

A4: transport to the building site;

A5: installation into the building, including provision of all materials, products and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the construction process stage. These information modules also include all impacts and aspects related to any losses during this construction process stage (i.e., production, transport, and waste processing and disposal of the lost products and materials).

Transport to the building site:

TECHNICAL FACTORS	VALUE	UNITS (PER FUNCTIONAL UNIT)
Liters of fuel	Carrollton: 32 Moundsville: 32 Roxboro: 32	l/100 km
Truck transport distance	Carrollton: 524 Moundsville: 454 Roxboro: 357	km
Rail transport distance	Carrollton: 1487 Moundsville: 1024 Roxboro: 650	
Capacity utilization (including empty returns)	80	%
Bulk density of transported products	692.1 kg/m ³	(kg/m ³)
Volume capacity utilization factor	Carrollton: 83 Moundsville: 83 Roxboro: 83	%

Installation in the building:

PARAMETER	VALUE (EXPRESSED PER FUNCTIONAL/FUNCTIONAL UNIT) / DESCRIPTION	UNITS (PER FUNCTIONAL UNIT)
Ancillary materials for installation (specified by materials)	68.87 kg of gypsum-based jointing compound (0.7414 kg per sq m)	kg
	100.14 m of jointing tape weighing 0.0123 kg/m (1.078 m per sq m)	m
	1115 screws (12 steel screws per sq m)	Number of screws
Water use	15.32 (0.165 per m2)	Liters
Other resource use	None	
Electricity consumption	None modelled	kWh
Other energy carriers	None modelled	MJ
Waste materials resulting from installation	10.01 m of jointing tape to landfill 6.887 kg of jointing compound to landfill 635.44 kg of board to landfill	kg
Dust in the air	None modelled	

Use stage (excluding potential savings), B1-B7

Description of the stage:

The use stage, related to the building fabric includes:

B1: use or application of the installed product;

B2: maintenance;

B3: repair;

B4: replacement;

B5: refurbishment, including provision and transport of all materials, products and related energy and water use, as well as waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage. These information modules also include all impacts and aspects related to the losses during this part of the use stage (i.e., production, transport, and waste processing and disposal of the lost products and materials).

Maintenance:

PARAMETER	VALUE (EXPRESSED PER FUNCTIONAL/FUNCTIONAL UNIT) / DESCRIPTION	UNITS (PER FUNCTIONAL UNIT)
Information on maintenance (description or source where description can be found)	None required during gypsum board lifetime	—
Maintenance cycle	None required during gypsum board lifetime	Number/RSL

Water consumption	None required during gypsum board lifetime	m ³
Ancillary inputs for maintenance	None required during gypsum board lifetime	kg
Other resources	None required during gypsum board lifetime	kg
Electricity consumption	None required during gypsum board lifetime	kWh
Other energy carriers	None required during gypsum board lifetime	MJ
Waste materials resulting from maintenance (specify materials)	None required during gypsum board lifetime	kg

Repair:

PARAMETER	VALUE (EXPRESSED PER FUNCTIONAL/FUNCTIONAL UNIT) / DESCRIPTION	UNITS (PER FUNCTIONAL UNIT)
Information for the repair process	None required during gypsum board lifetime	—
Information for the inspection process	None required during gypsum board lifetime	—
Repair cycle	None required during gypsum board lifetime	Number/RSL
Water consumption	None required during gypsum board lifetime	m ³
Ancillary inputs for repair	None required during gypsum board lifetime	kg
Other resources	None required during gypsum board lifetime	kg
Electricity consumption	None required during gypsum board lifetime	kWh
Other energy carriers	None required during gypsum board lifetime	MJ
Waste materials resulting from repair	None required during gypsum board lifetime	kg

Replacement & refurbishment:

PARAMETER	VALUE (EXPRESSED PER FUNCTIONAL/FUNCTIONAL UNIT) / DESCRIPTION	UNITS (PER FUNCTIONAL UNIT)
Replacement cycle	None required during gypsum board lifetime	Number/RSL
Electricity consumption	None required during gypsum board lifetime	kWh
Liters of fuel	None required during gypsum board lifetime	l/100 km
Replacement of worn parts or refurbishment materials	None required during gypsum board lifetime	kg
Reference service life	60	Years

Operational energy use & operational water use:

PARAMETER	VALUE	UNITS (PER FUNCTIONAL UNIT)
Water consumption	None required during gypsum board lifetime	m ³
Electricity consumption	None required during gypsum board lifetime	kWh
Other energy carriers	None required during gypsum board lifetime	MJ
Equipment output	None required during gypsum board lifetime	kW

End-of-life stage C1-C4

Description of the stage

The end-of-life stage includes:

C1: de-construction, demolition;

C2: transport to waste processing;

C3: waste processing for reuse, recovery and/or recycling;

C4: disposal, including provision and all transport, provision of all materials, products and related energy and water use.

End-of-life:

PARAMETER	VALUE	UNITS (PER FUNCTIONAL UNIT)
Product waste collected separately	0	kg
Product waste collected as mixed construction waste	635.44	kg
Components for reuse (CRU)	None	kg
Materials recycling (MR)	None	kg
Materials for energy recovery (MER)	None	kg
Materials for disposal to landfill (MDL)	None	kg

5. LCA Results

Description of the system boundary (X = Included in LCA, MND = Module Not Declared)

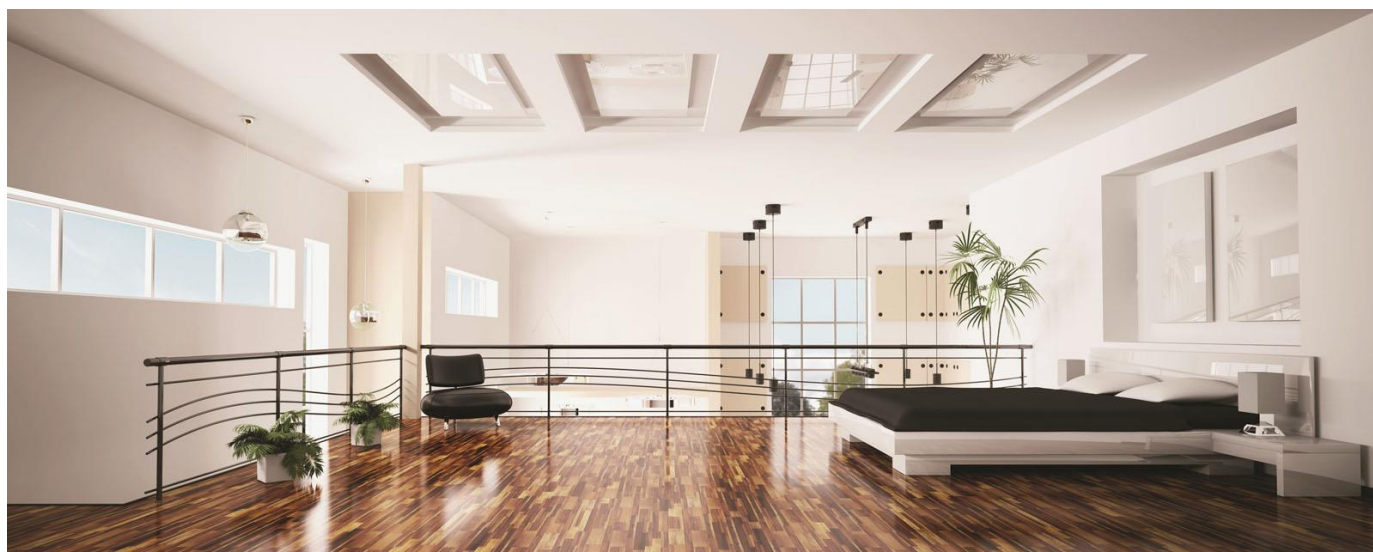
CML 2001 has been used as the impact model. Specific data has been supplied by the plant, and generic data came from the DEAM and Ecoinvent databases.

All emissions to air, water and soil, and all materials and energy used have been included.

PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END-OF-LIFE STAGE			
Raw material supply	Transport	Manufacturing	Transport	Construction-Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

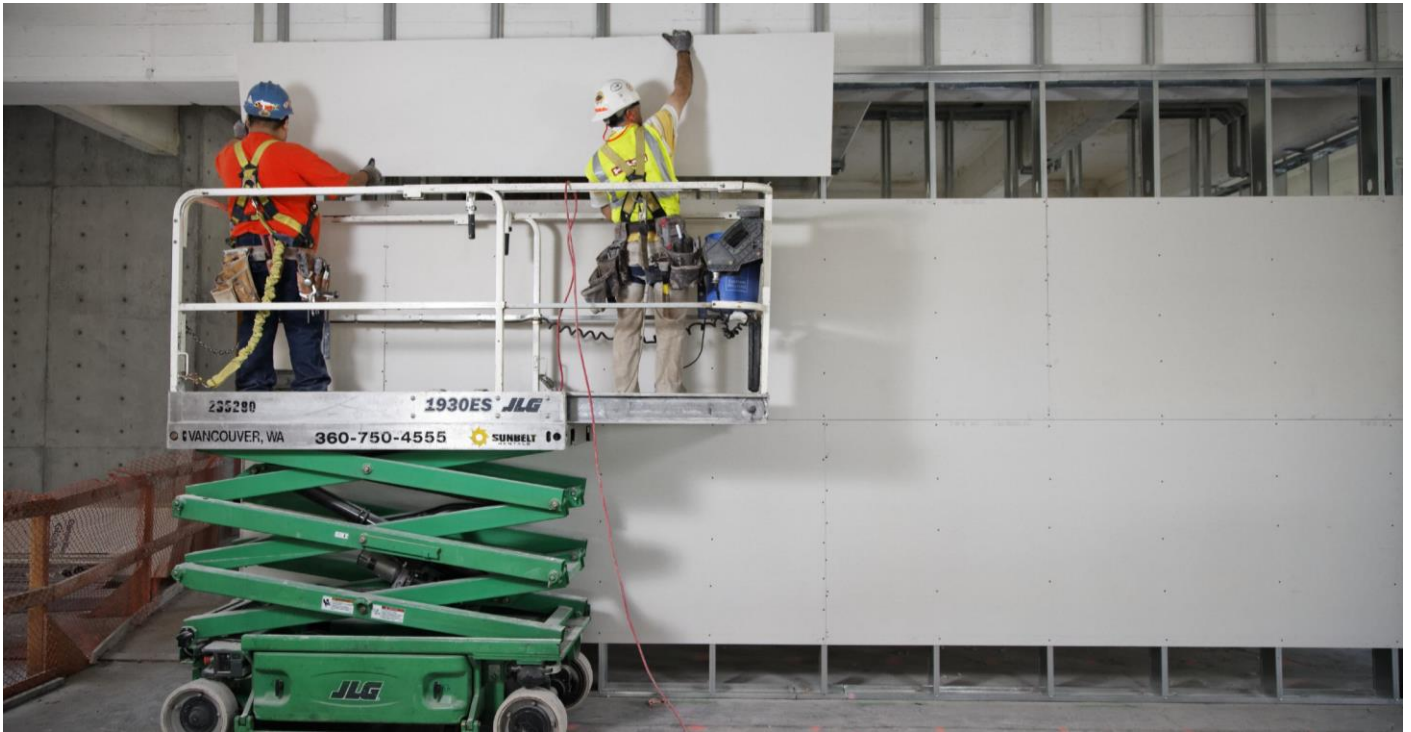
The U.S. Environmental Protection Agency’s TRACI (Tool for the Reduction and Assessment of Chemical and Other Impacts) life cycle impact assessment methodology (version 2.1) is applied to calculate environmental performance of gypsum board.

Per Functional Unit impact indicator results, energy and material resource consumption, and waste are presented in the following tables.



Parameters Weighted Average	Units	Modules Included in LCA							
		A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
Global Warming Potential (GWP)	kg CO2 eq	2.97E+02	6.03E+01	4.4E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ozone depletion (ODP)	kg CFC 11 eq	8.23E-06	1.49E-05	4.8E-06	0.00E+00	4.25E-07	3.67E-06	2.17E-07	0.00E+00
Acidification potential (AP)	kg SO2 eq	1.18E+00	1.58E-01	1.7E-01	0.00E+00	2.62E-02	3.17E-02	2.22E-03	0.00E+00
Eutrophication potential (EP)	kg N - eq	1.57E-01	3.32E-02	3.0E-02	0.00E+00	6.11E-03	7.80E-03	4.78E-04	2.87E-02
Photochemical ozone creation (POCP) -	kg O3 - eq	1.12E-01	1.14E-02	1.7E-02	0.00E+00	7.62E-03	2.33E-03	1.69E-04	0.00E+00
Abiotic depletion potential for fossil resources (ADP-fossil fuels)	MJ	6.24E+03	3.56E+02	8.7E+02	0.00E+00	4.74E+01	6.53E+01	3.86E+00	0.00E+00

Parameters Range	Units	Modules Included in LCA							
		A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
Global Warming Potential (GWP)	kg CO2 eq	2.91 – 3.10 E+02	1.88 – 7.69 E+01	4.4E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ozone depletion (ODP)	kg CFC 11 eq	7.51 – 8.57 E-06	4.21 – 7.54 E-06	4.8E-06	0.00E+00	4.22 – 4.29 E-07	3.65 – 3.71 E-07	1.88 – 2.49 E-07	0.00E+00
Acidification potential (AP)	kg SO2 eq	8.10 E-01 – 1.55 E+00	9.45 E-02 – 3.97 E-01	1.7E-01	0.00E+00	2.60 – 2.65E-02	3.15 – 3.20 E-02	1.93 – 2.56 E-03	0.00E+00
Eutrophication potential (EP)	kg N - eq	1.12 – 1.88 E-01	1.04 – 9.12 E-02	3.0E-02	0.00E+00	6.07 – 6.17 E-0	7.74 – 7.88 E-03	4.15 – 5.50 E-04	2.24 – 3.38 E-02
Photochemical ozone creation (POCP) -	kg O3 - eq	9.1 E-02 – 1.33 E-01	2.90 E-02 – 6.79 E-03	1.7E-02	0.00E+00	7.57 – 7.7- E-03	2.31 – 2.35 E-03	1.47 – 1.94 E-04	0.00E+00
Abiotic depletion potential for fossil resources (ADP-fossil fuels)	MJ	4.90 – 7.47 E+03	1.57 – 8.56 E+02	8.7E+02	0.00E+00	4.71 – 4.79 E+01	6.53 – 6.60 E+01	3.35 - 4.44 E+00	0.00E+00



Parameters Weighted Average	Units	Modules Included in LCA							
		A1 – A3	A4	A5	B1 – B7	C1	C2	C3	C4
Use of NRPE excluding NRPE resources used as raw materials	MJ, HHV	5.14E+03	3.31E+02	7.8E+02	0.00E+00	4.75E+01	6.55E+01	3.87E+00	0.00E+00
Use of NRPE used as raw materials	MJ, HHV	–	–	–	–	–	–	–	–
Use of non-renewable secondary fuels	MJ, HHV	–	–	–	–	–	–	–	–
Use of RPE excluding RPE resources used as raw materials – MJ /FU	MJ, HHV	1.54E+02	6.96E+00	8.0E+01	0.00E+00	1.95E-01	4.39E-02	3.18E-03	0.00E+00
Use of RPE used as raw materials – MJ / FU	MJ, HHV	–	–	–	–	–	–	–	–
Use of renewable secondary fuels MJ / FU	MJ, HHV	–	–	–	–	–	–	–	–
Use of renewable material resources	kg	–	–	–	–	–	–	–	–
Use of secondary material kg / FU	kg	1.14E+03	0.00E+00	7.9E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water m ³ / FU	m ³	1.37E+00	2.67E-02	2.4E-01	0.00E+00	6.40E-03	6.17E-03	3.64E-04	0.00E+00



Parameters Range	Units	Modules Included in LCA							
		A1 – A3	A4	A5	B1 – B7	C1	C2	C3	C4
Use of NRPE excluding NRPE resources used as raw materials	MJ, HHV	4.3 – 5.9 E+03	1.3 – 8.3 E+02	7.8E+02	0.00E+00	4.7 – 4.8 E+01	6.5 – 6.5 E+01	3.4 – 4.5 E+00	0.00E+00
Use of NRPE used as raw materials	MJ, HHV	-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels	MJ, HHV	-	-	-	-	-	-	-	-
Use of RPE excluding RPE resources used as raw materials – MJ /FU	MJ, HHV	1.3 – 1.8 E+02	6.1 – 8.5E+00	8.0E+01	0.00E+00	1.9 – 2.0 E-01	4.4 E-02	2.8 – 3.7 E-03	0.00E+00
Use of RPE used as raw materials – MJ / FU	MJ, HHV	-	-	-	-	-	-	-	-
Use of renewable secondary	MJ, HHV	-	-	-	-	-	-	-	-

fuels MJ / FU									
Use of renewable material resources	kg	-	-	-	-	-	-	-	-
Use of secondary material kg / FU	kg	8.2 E+02 – 1.8 E+03	0	7.9E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water m ³ / FU	m ³	1.1 – 1.5 E+00	8.5 E-03 – 7.3E-02	2.4E-01	0.00E+00	6.4- 6.4 E-03	6.1 – 6.2 E-03	3.2 – 4.2 E-04	0.00E+00

Parameters Weighted Average	Units	Modules Included in LCA							
		A1 – A3	A4	A5	B1 - B7	C1	C2	C3	C4
Hazardous waste disposed	kg	4.83E+00	6.00E-03	4.2E-01	0.00E+00	0.00E+00	1.47E-03	8.69E-05	0.00E+00
Non-hazardous waste disposed	kg	4.20E+01	5.27E-01	2.3E+02	0.00E+00	0.00E+00	6.94E-03	4.40E+02	4.40E+02
Radioactive waste disposed	kg	3.67E-03	4.24E-03	1.6E-03	0.00E+00	0.00E+00	1.04E-03	6.17E-05	0.00E+00
Components for re-use	kg	-	-	-	-	-	-	-	-
Materials for recycling	kg	-	-	-	-	-	-	-	-
Materials for energy recovery	kg	-	-	-	-	-	-	-	-
Materials for disposal to landfill	kg	4.69E+01	5.38E-01	2.27E+02	0.00E+00	0.00E+00	9.46E-03	0	1.08E+03

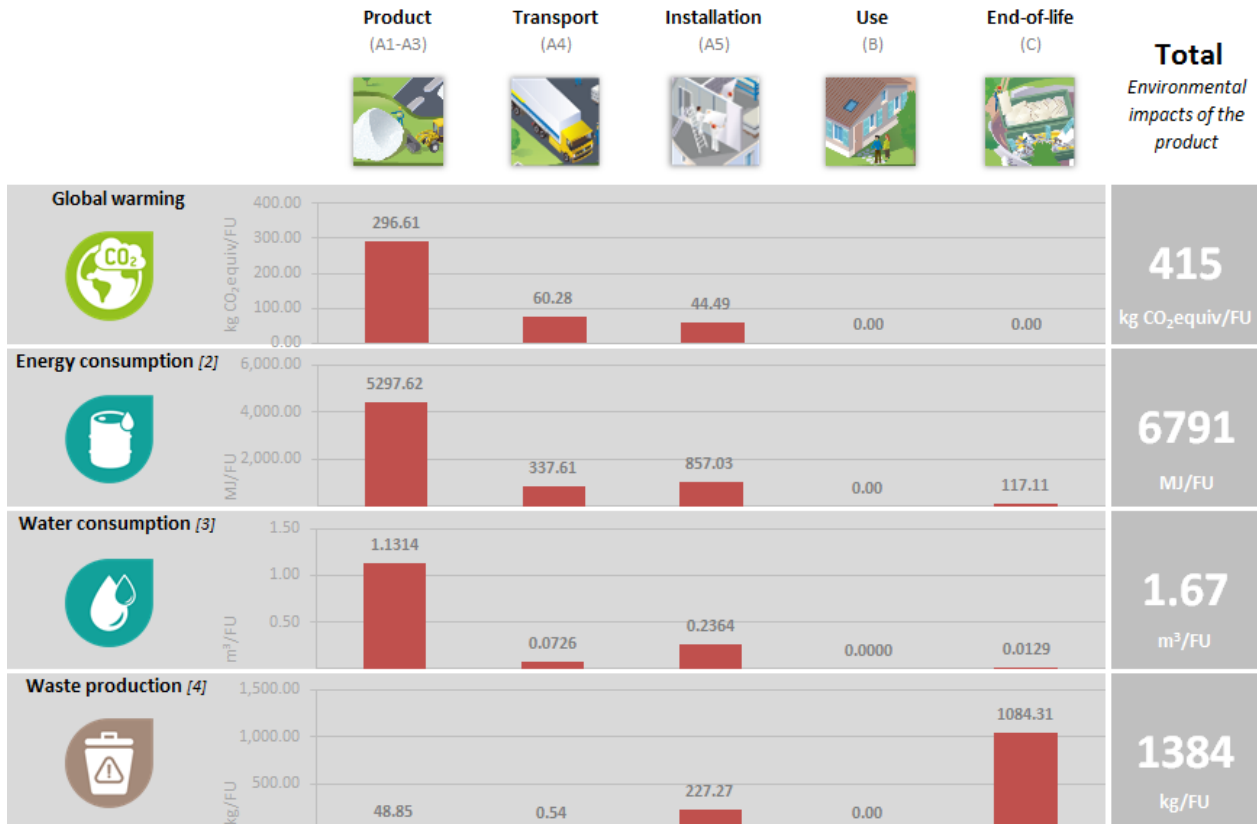
Parameters Range	Units	Modules Included in LCA							
		A1 – A3	A4	A5	B1 - B7	C1	C2	C3	C4
Hazardous waste disposed	kg	3.16 – 8.04 E+00	1.69 E-02 – 3.04 E-03	4.2E-01	0.00E+00	0.00E+00	1.46 – 1.49 E-03	1.00 E-04 – 7.62 E-05	0.00E+00

Non-hazardous waste disposed	kg	1.20 – 7.50 E+01	4.56 – 6.66 E-01	2.3E+02	0.00E+00	0.00E+00	6.90 – 7.02 E-03	3.43 – 5.23 E+02	3.43 – 5.23 E+02
Radioactive waste disposed	kg	2.70 – 4.06 E-03	1.20 – 2.15 E-02	1.6E-03	0.00E+00	0.00E+00	1.04 – 1.06 E-03	5.36 – 7.09 E-05	0.00E+00
Components for re-use	kg	-	-	-	-	-	-	-	-
Materials for recycling	kg	-	-	-	-	-	-	-	-
Materials for energy recovery	kg	-	-	-	-	-	-	-	-
Materials for disposal to landfill	kg	1.99 – 7.88 E+01	4.58 – 6.95 E-01	2.27E+02	0.00E+00	0.00E+00	9.40 – 9.56E-03	0	9.33E+02 – 1.35E+03



6. LCA Results Interpretation

Weighted Average



[1] This indicator corresponds to the total use of primary energy.

[2] This indicator corresponds to the use of net fresh water.

[3] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive waste disposed.

Declarations based on this PCR are not comparative assertion; that is, no claim of environmental superiority can be inferred or implied.

Conclusion

Plasterboard production is energy intensive process as water has to be driven from the Gypsum in a process known as calcination. Water is then added to form slurry, which is then added to paper liner before being dried into boards. Therefore the main impact of CertainTeed Easilite plasterboard production is the Natural Gas used to dry the board in life cycle phase A3. Gypsum is sourced locally to the plant, and plants are located close to their customer base, reducing associated transport impacts.

Impacts at the A5 installation phase include the manufacture of the Jointing Compounds, Tape and screws required to install the board at the construction site. Plasterboard has no impact during its use as it does not require any maintenance, repair or replacement during its expected service lifetime. At End of life plasterboard is commonly landfilled, although CertainTeed now collects Gypsum Waste from demolition sites and it is return to the production process at some sites.

The manufacture of Type X board has an additional embodied impact from the production of the glass mat, which gives the board its rigidity, impact resistance and hard wearing properties.
For Carrolton, Moundsville and Roxboro Natural Gas use make up between 32 – 60 % of the total Type X Board energy use.

7. Additional Environmental Information

CertainTeed Gypsum operates its manufacturing facilities with a responsible and environmentally conscious ethic that includes reclamation, preservation of natural resources, recycling and waste management.

Multiple plants have implemented construction waste management programs that incorporate clean, post-consumer gypsum board back into the production process. Gypsum board product innovation is also carried out with a focus on environmental responsibility; research and development emphasize minimizing environmental impacts to the greatest extent possible.

Visit www.certainteed.com/sustainable for technical information, project and application case studies, free continuing education (CEU) courses, CAD drawings and BIM objects, our corporate sustainability report, product data sheets and other information.

For green building design, material selection and documentation, CertainTeed Gypsum online tools include ecoScorecard™: certainteedgypsum.ecoscorecard.com

CertainTeed Gypsum is committed to resource conservation:

- The face and back paper used for our wall and ceiling board consists of up to 100% recycled paper.
- Synthetic gypsum, specifically FGD (flue-gas desulfurization) gypsum, is used at plants where sources are available. Using synthetic gypsum to make board enables beneficial use of a material that would otherwise be landfilled and enables total recycled content of up to 99%.

8. References

Product Category Rules for North American Gypsum Boards FP innovations – Gypsum PCR 2013 – V1

Athena Sustainable Materials Institute. Life Cycle Analysis of Gypsum Board and Associated Finishing Products. Prepared by George Venta, Venta, Glaser and Associates. Ottawa, Canada. March 1997.

Appendix A. Lower and Higher Heating Values of Gas, Liquid and Solid Fuels. Biomass Energy Data Book. Centre for Transportation Analysis. cta.ornl.gov/bedb. 2011

ISO 14025

ISO 21930

EN 15804

9. Glossary

NRPE: Non-renewable Primary Energy

RPE: Renewable Primary Energy

FU: Functional Unit

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10. Material Content

Plant	Product	Product weight (kg/1000 sq ft)	Natural Gypsum Ore (kg/1000 sq ft)	DSG (kg/1000 sq ft)	C&D (kg / 1000 sq ft)	Internally Recycled Gypsum Scrap (kg/1000 sq ft)	Paper Bottom Liner (kg/1000 sq ft)	Paper Top Liner (kg / 1000 sq ft)	Additives (kg / 1000 sq ft)
Carrolton	Type X	1029	0	844	0	0	17	18	168
Moundsville	Type X	1021	0	796	0	58	18	17	71
Roxboro	Type X	1039	0	810	0	0	18	16	81

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