

ENVIRONMENTAL PRODUCT DECLARATION

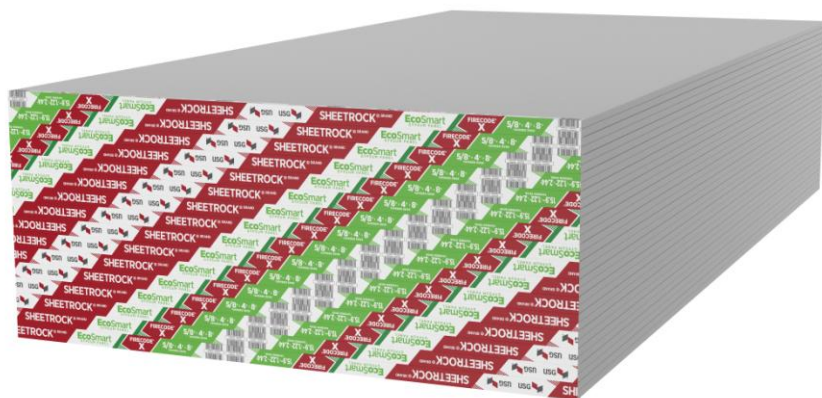
USG Sheetrock® Brand EcoSmart Panels Firecode® X

UNITED STATES GYPSUM COMPANY

EASTERN US: ALIQUIPPA, PA; BRIDGEPORT, AL; JACKSONVILLE, FL; NORFOLK, VA; WASHINGTONVILLE, PA



USG Sheetrock® Brand EcoSmart Panels represent a revolutionary approach to the manufacturing of lightweight gypsum wallboard, significantly reducing the need for natural resources. These panels have been formulated to achieve all of the strength and performance characteristics of standard 5/8 inch USG Sheetrock® Brand Firecode® X panels at a significantly lower environmental impact and reduced weight.



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5/8" Wallboard Panel

According to ISO 14025

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	USG
DECLARATION NUMBER	4787352797.104.1
DECLARED PRODUCT	USG Sheetrock® Brand EcoSmart Panels Firecode® X, Eastern US
REFERENCE PCR	FPInnovations, "Product Category Rules for North American Gypsum Boards", 2013
DATE OF ISSUE	May 20, 2016
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 Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	PCR Review Panel
	Thomas Gloria, Chair
	222.FPinnovations.ca
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
	 Thomas Gloria, Industrial Ecology Consultants
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	

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2.0 Product Information

2.1 Product Description

USG Sheetrock® Brand EcoSmart Panels Firecode® X have been formulated to achieve all of the strength and performance characteristics of standard 5/8 in. USG Sheetrock® Brand Firecode® X Panels at a significantly lower environmental impact and reduced weight. They feature an innovative noncombustible gypsum core encased in 100% recycled face and back papers that form a high strength-to-weight ratio composite design. The natural finish face paper is folded around the long edges to reinforce and protect the core, and the ends are cut square and even. The long edges of the panels are tapered, allowing joints to be reinforced and concealed with USG Sheetrock® Brand joint treatment systems. The panels are UL classified for fire resistance and can be used in any UL Design where Type ULIX panels are listed. On the face along the long edge of each panel, the UL Type Designation is printed with nonbleeding ink for easy identification after installation.

2.2 Designated Application

These gypsum board products are intended primarily for interior applications in both residential and commercial buildings. They are used in both ceiling and wall applications as an interior finish. Upon installation, the joints are typically treated with joint tape and joint compound and the smooth gypsum board wall or ceiling is then finished with the desired aesthetic treatment.

Intended for:

- Commercial or residential applications where 5/8 in. Type X panels are required
- New or repair and remodel construction
- Load-bearing and non-load-bearing wood- or steel-framed fire-rated walls

Compliance:

- Meet or exceed ASTM C1396 Section 5 for 5/8 in. gypsum wallboard, Type X
- Classified as a Class A Interior Finish Material per Section 803.1 of the International Building Code® (IBC®)
- UL Classified as to fire resistance, surface-burning characteristics and core combustibility
- UL Type Designations ULIX panels are listed for use in more than 90 fire-rated designs.

2.3 Product Data

Table #1: Summary of the general data for Gypsum boards

Product Data: Sizes and Types	Thickness Inch (mm)	Specific Density In lb/ft ² (kg/m ²)	Core Type	ASTM Standard
Gypsum Board, Type X	5/8" (15.9mm)	1.8 lb/ft ² (8.80 kg/m ²)	gypsum	C473



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2.4 Technical Data

Table #2: Summary of the technical data for 5/8" gypsum boards

Technical Data	Value and Units/Test Results /Statement	Referenced documents and links
"R" factor-thermal resistance in US unit (SI unit)	0.45 °F x ft ² x h/Btu [0.08 K x m ² /W]	ASTM C518
Material Safety Data Sheet – Yes/No	Yes	Available at usg.com
Mold Resistance	Not Applicable	ASTM C1396
Water absorption	Not Applicable	ASTM C473
Total water absorption	Not Applicable	ASTM C473
Surface burning characteristics		
Flame Spread	5	ASTM E84
Smoke Developed	5	ASTM E84
Foil Application: (if applicable), Desiccant Method Test	Not Applicable	ASTM C1396
Abuse/impact resistance test (if applicable)	Not Applicable	ASTM C1629
Total Recycled Content (%)	Aliquippa, PA: 94.4% Bridgeport, AL: 94.6% Jacksonville, FL: 94.4% Norfolk, VA: 94.5% Washingtonville, PA: 94.4%	As defined in ISO 14021
Pre-consumer (%)	Aliquippa, PA: 89.0% Bridgeport, AL: 89.2% Jacksonville, FL: 89.0% Norfolk, VA: 89.2% Washingtonville, PA: 90.4%	As defined in ISO 14021
Post-consumer (%)	Aliquippa, PA: 5.4% Bridgeport, AL: 5.4% Jacksonville, FL: 5.4% Norfolk, VA: 5.3% Washingtonville, PA: 4.0%	As defined in ISO 14021

2.5 Placing on the Market/Application Rules

Standard application rules for gypsum board are presented in the *USG Gypsum Construction Handbook* available on-line at usg.com.



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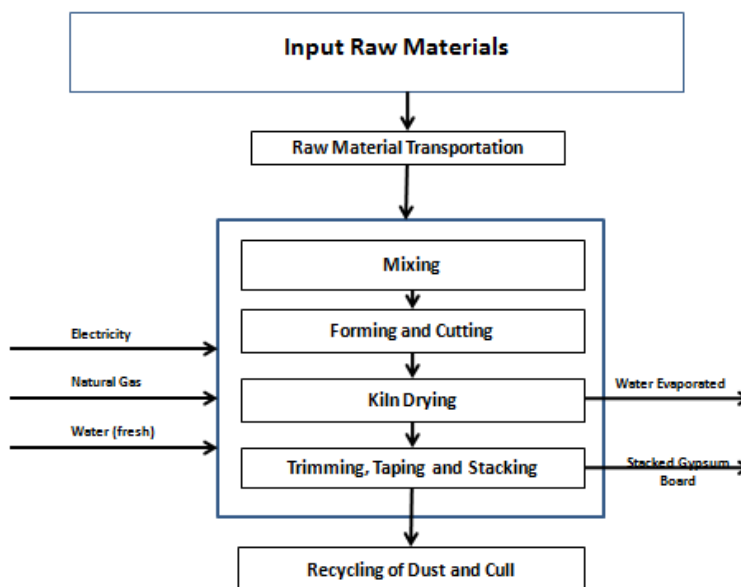
2.6 Product Formulation

Product Specifications	Measurement	Value
	Thickness	5/8 in. (15.9 mm)
	Lengths	8-14 ft. (2438-4267 mm)
	Width	4 ft. (1218 mm)
	Weight (nominal)	1.8 lbs/ ft ² (8.8 kg/m ²)
	Edges	Tapered

Product Formulation	Additive	Amount (kg/1000 sq. ft.)
	Gypsum	722
	Vermiculite	24
	Paper	49
	Additives	21

Product formulation values are averages taken from plants that produce USG Sheetrock® Brand EcoSmart Panels Firecode® X. Some variance may occur from plant to plant.

2.7 Manufacturing



The manufacture of gypsum board starts with the combining of the dry ingredients in a screw conveyor, feeding of this dry ingredient mixture into a pin mixer where these dry ingredients are mixed with water and wet additives. The resulting slurry is fed between two sheets of paper; facing paper (Manila) on the bottom and backing paper (Newslined) on the top. The wet gypsum board is allowed to hydrate after which the hard board is cut and transferred into a kiln for evaporation of excess water. After removal of the evaporative water, the board is cut to its final size, and

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tapes are applied and the resulting product is ready for shipment. Any gypsum board not meeting quality control specifications is recycled on-site.

2.8 Environment and Health during Manufacturing

All appropriate equipment required by federal, state and local regulations are in place at all USG manufacturing facilities.

2.9 Packaging

End tape is applied to every two pieces to form a unit for shipment. A quantity of units are collected and placed on sleutters (i.e., spacers) for easy pick-up by fork lift trucks.

2.10 Product Installation

Standard rules and practices for installing and finishing gypsum board are presented in the *USG Gypsum Construction Handbook* available online at usg.com.

2.11 Environment and Health during Use Stage

USG gypsum board is not a controlled product under WHMIS (Workplace Hazardous Materials Information System).

2.12 Reference Service Life

The reference service life is not relevant for a cradle-to-gate (A1-A3) analysis as dictated by the gypsum board PCR. However, the reference life for USG Sheetrock® Brand gypsum board is assumed to be equal to the buildings' useful life if properly installed and maintained.

2.13 End-of-Life

All gypsum boards are disposed of in a demolition and construction landfill. In certain areas, USG has agreements with third-party gypsum waste recyclers who collect gypsum construction waste at jobsites for recycling and then transport this post-consumer gypsum raw material to specific USG manufacturing plants for use in the manufacturing of new wallboard. There are several alternative options to landfilling such as the use of reground gypsum wallboard for soil amendment applications. Contact your local EPA for reuse rules and regulations.

2.14 Further Information

Additional information can be found at usg.com

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3.0 LCA: Calculation Rules

3.1 Declared or Functional Unit

Gypsum board with a specified thickness of 5/8 in (15.9mm)	Value and Units
Declared Unit	1000 sq. ft.
Conversion to kg	815 kg

3.2 System Boundary

The system boundaries are cradle to shipping gate (modules A1-A3) and include the following system processes in the production of 5/8" USG Sheetrock® Brand gypsum board: materials production, materials transportation from suppliers to the plant production facility, paper manufacturing, waste management, transportation and board manufacturing.

3.3 Estimates and Assumptions

All paper raw material and energy data is specific to the manufacture of USG Manila and Newslined papers at the USG paper mills located in Galena Park, TX, North Kansas City, MO, Oakfield, NY, and Otsego, MI. All USG Sheetrock® Brand gypsum board raw material and energy inputs are specific to the specific products produced at Aliquippa,PA; Bridgeport, AL; Jacksonville, FL; Norfolk, VA and Washingtonville, PA gypsum board plants.

3.4 Cut-off Criteria

The cut-off criteria for input flows to be considered within each system boundary were as follows:

- Mass – if a flow is less than 1% of the cumulative mass of the model flows it may be excluded, providing its environmental relevance is minor.
- Energy – if a flow is less than 1% of the cumulative energy of the system model it may be excluded, providing its environmental relevance is minor.

The sum of the excluded material flows must not exceed 5% of mass, energy or environmental relevance.

3.5 Data Requirements and Data Sources

Manufacturer specific data was obtained from the United States Gypsum plants in Galena Park, TX; Aliquippa,PA; Bridgeport, AL; Jacksonville, FL; Norfolk, VA and Washingtonville, PA; North Kansas City, MO; Oakfield, NY and Otsego, MI.

3.6 Allocation

The LCI data was collected for the 2015 production year. Raw material and energy inputs were allocated to USG Sheetrock® Brand EcoSmart Panels Firecode® X based on the mass of those panels.



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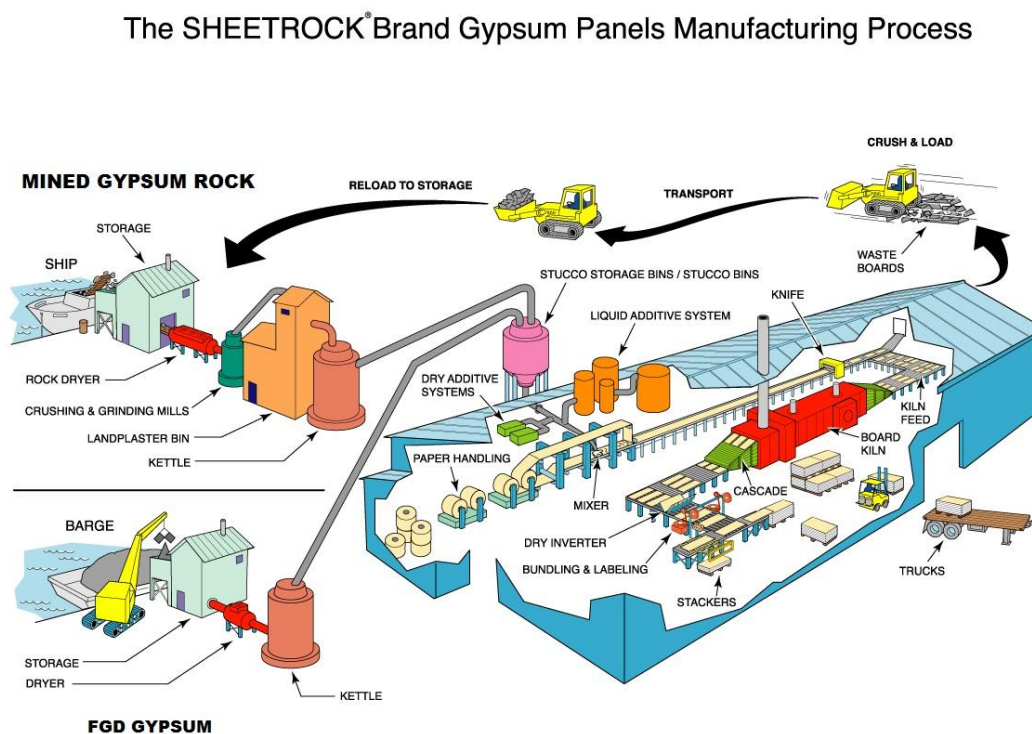
3.7 Comparability of EPDs

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).

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.

4.0 LCA Scenarios and Additional Technical Information

Life Cycle Flow Diagram



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5.0 LCA Results

Part 1- Description of the system boundary (X: included in LCA; MND- module not declared)															
Product stage				Construction process 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	A 2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND
Part 2- Results of the LCA- ENVIRONMENTAL IMPACT: 1000 sq. ft of gypsum board, with thickness of 5/8 inches															
Parameter								Units		Modules included in LCA: A1-A3					
										() range					
Global warming potential								kg CO2-Eq.		214 (205 – 265)					
Depletion potential of the stratospheric ozone layer								kg CFC-11 Eq.		2.38E-07 (2.35E-07 – 2.55E-07)					
Acidification potential								kg SO2 Eq.		0.451 (0.293 – 0.661)					
Eutrophication potential								kg N Eq.		1.83E-02 (1.72E-02 – 2.47E-02)					
Photochemical ozone creation potential								kg O3 Eq.		4.02 (3.51 – 6.96)					
Abiotic Depletion potential-fossil fuels								MJ		422 (392 – 549)					
Part 3- Results of the LCA- RESOURCE USE: 1000 sq. ft of gypsum board, with thickness of 5/8 inches															
Parameter								Units		Modules included in LCA: A1-A3					
										() range					
Use of non-renewable primary energy resources (NRPE)- excluding NRPE used as raw materials								MJ, HHV		3695 (3556 – 4554)					
NRPE, fossil								MJ, HHV		3584 (3466 – 4448)					
NRPE, nuclear								MJ, HHV		111 (81 – 249)					
Use of NRPE used as raw materials								MJ, HHV		0.00					
Use of non-renewable secondary fuels								MJ, HHV		0.00					
Use of non-renewable material resources								kg		36 (36 – 36)					
Use of renewable primary energy resources (RPE)- excluding RPE used as raw materials								MJ, HHV)		196 (178 – 216)					
Use of RPE used as raw materials								MJ, HHV		0.00					
Use of renewable secondary fuels								MJ, HHV		0.00					
Use of renewable material resources								kg		9.76 (9.75 – 9.76)					
Use of secondary material								kg		771 (771 – 780)					
Net use of fresh water								m3		0.78 (0.718 – 0.845)					



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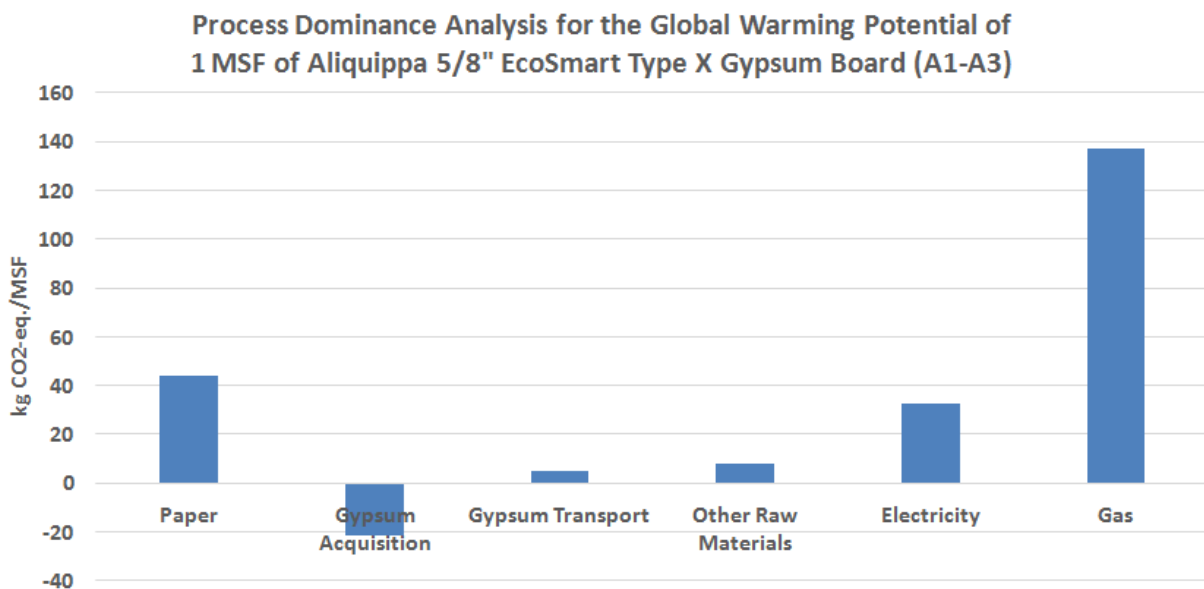
Part 4- Results of the LCA- OUTPUT FLOWS and WASTE CATEGORIES: 1000 sq. ft of gypsum board, with thickness of 5/8 inches

Parameter	Units	Modules included in LCA: A1-A3
		() range
Hazardous waste disposed	kg	2.33E-03 (2.32E-03 – 2.33E-03)
Non hazardous waste disposed	kg	121 (91 – 138)
Radioactive waste disposal	kg	4.54E-02 (3.36E-02 – 9.95E-02)
Components for re-use	kg	0.00
Materials recycling	kg	0.00
Materials for energy recovery	kg	0.00
Material for disposal to landfill	kg	121 (91 – 138)

6.0 LCA Interpretation

The figure below graphically depicts relative contributions for the cradle-to gate production of 1 MSF of Aliquippa, 5/8" USG Sheetrock® Brand EcoSmart Panels Firecode X (ULIX). The significant sources of greenhouse gases for all plants are generated during the combustion of natural gas and indirectly the consumption of electricity at the generating plant.

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



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7.0 Additional environmental information

USG Sheetrock® Brand EcoSmart Panels Firecode X (ULIX) qualifies as a low emitting material (meets CA 01350) and has achieved Greenguard Gold certification from UL Environment. More information can be found at usg.com/eco

8.0 References

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TRACI-The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts, Journal of Industrial Ecology, Volume 6, Number 3–4, 2003.
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9. Dr. Mark Englert, "A Cradle to Gate (A1-A3) and Cradle to Grave (A1-C4) Life Cycle Assessment of USG Sheetrock® Brand EcoSmart Panels Firecode ULIX All Plants, 2017 (Confidential)
10. ASTM C11-16, Standard Terminology Relating to Gypsum and Related Building Materials and Systems
11. ASTM C473-15, Standard Test Methods for Physical Testing of Gypsum Panel Products
12. ASTM C518-15, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
13. ASTM C1396/C1396M-14a, Standard Specification for Gypsum Board



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 15. ASTM E119-16a, Standard Test Methods for Fire Tests of Building Construction and Materials
 16. USG (2014), THE GYPSUM CONSTRUCTION HANDBOOK, 7th Edition, Hoboken, NJ, Wiley
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