

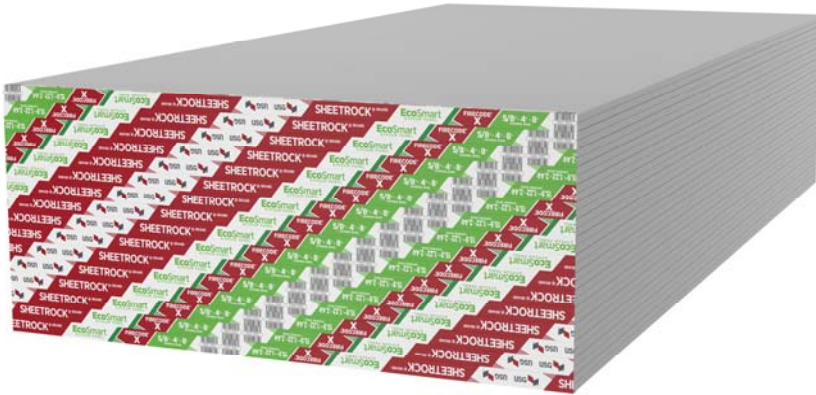
ENVIRONMENTAL PRODUCT DECLARATION

USG Sheetrock® Brand EcoSmart Panels Firecode® X

UNITED STATES GYPSUM COMPANY
ALIQUIPPA, PA



USG Sheetrock® Brand EcoSmart Panels represent a revolutionary approach to the manufacturing of lightweight gypsum wallboard, significantly reducing the need for natural resources and impact on the environment. Through proprietary gypsum core technologies, these panels use 25% less water to manufacture, reducing associated greenhouse gas emissions by over 20%.



These third-generation gypsum panels 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.



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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 | 4787352797.102.1 | |
| DECLARED PRODUCT | USG Sheetrock® Brand EcoSmart Panels Firecode® X | |
| 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 | |
| This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by: |  | |
| | Brad McAllister, WAP Sustainability | |

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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 traditional 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.

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 |

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 including:
 - U419: 1- to 4-hour non-load-bearing steel-framed walls
 - U423: 1- and 2-hour load-bearing steel-framed walls
 - U305: 1-hour load-bearing wood-framed walls
 - U301: 2-hour load-bearing wood-framed walls



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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 | 15 | ASTM E84 |
| Smoke Developed | 0 | 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 (%) | 92.5 | As defined in ISO 14021 |
| Pre-consumer (%) | 1.7 | As defined in ISO 14021 |
| Post-consumer (%) | 90.8 | 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 online at usg.com.

2.6 Product Formulation

| Product Specifications | Measurement | Value |
|------------------------|------------------|---|
| | Thickness | 5/8 in. (15.9 mm) |
| | Lengths | 8-12 ft. (2438-3658 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 | 739 |
| | Vermiculite | 24 |
| | Paper | 34 |
| | Additives | 21 |



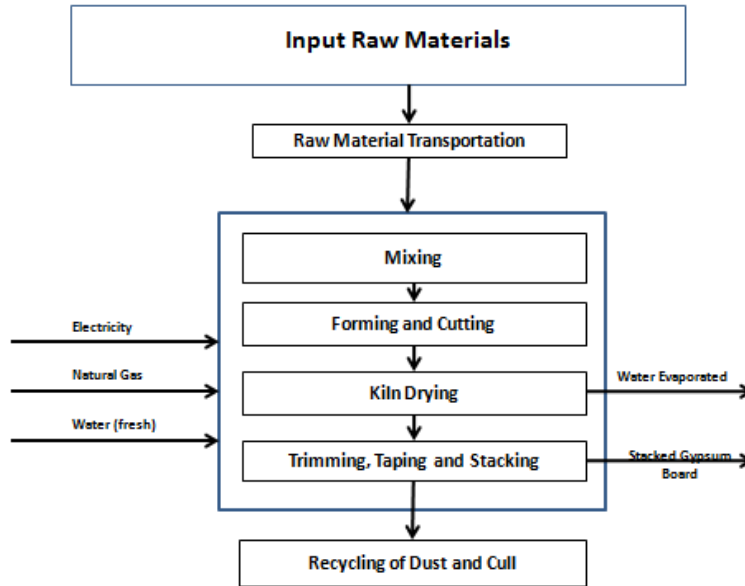
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2.7 Manufacturing



The manufacture of gypsum board at the Aliquippa plant 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, end 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.



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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 building 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

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 |



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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 Aliquippa, PA production facility, paper manufacturing, waste management and transportation.

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 Otsego, MI paper mill. All USG Sheetrock® Brand gypsum board raw material and energy inputs are specific to the specific products produced at the Aliquippa, PA gypsum board plant.

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 plant in Aliquippa, PA.

3.6 Allocation

The LCI data was collected for the Aliquippa gypsum board plant for the 2014 production year. The Aliquippa plant produces only gypsum board. Raw material and energy inputs were allocated to USG Sheetrock® Brand EcoSmart Panels Firecode® X based on the reduced mass of those panels.

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.

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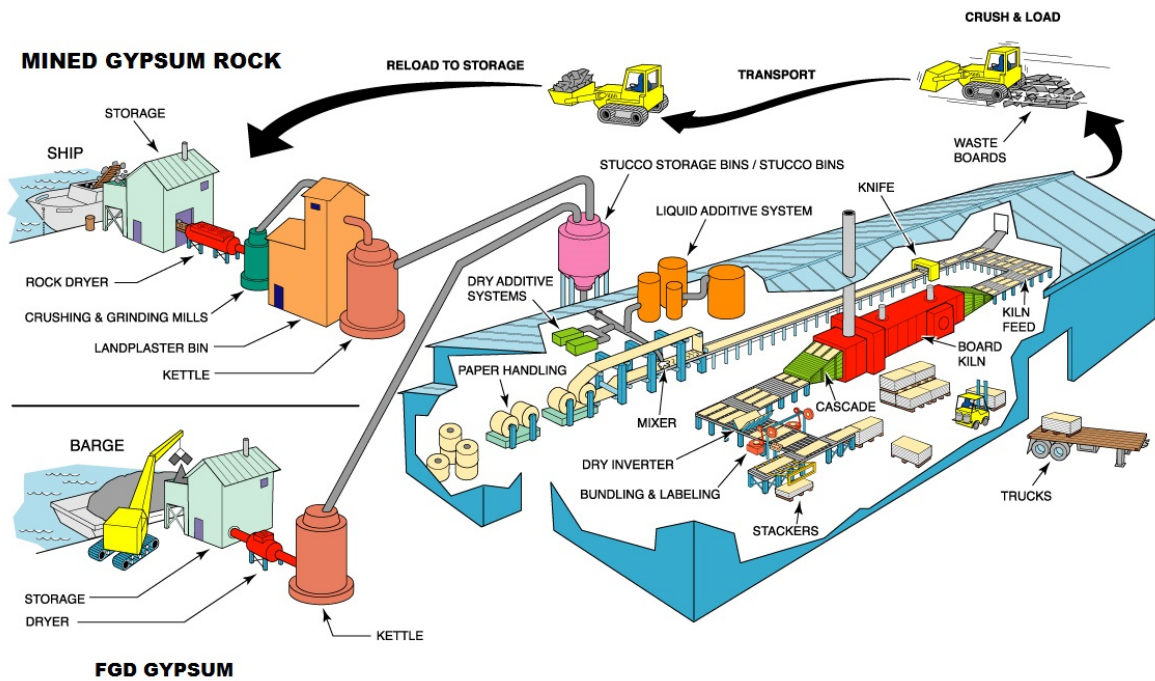
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4.0 LCA Scenarios and Additional Technical Information

Life Cycle Flow Diagram

The SHEETROCK® Brand Gypsum Panels Manufacturing Process



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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 | A2 | 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 |
|--|---------------|--------------------------------|
| | | |
| Global warming potential | kg CO2-Eq. | 202 |
| Depletion potential of the stratospheric ozone layer | kg CFC-11 Eq. | 2.43E-07 |
| Acidification potential | kg SO2 Eq. | 0.310 |
| Eutrophication potential | kg N Eq. | 3.05E-02 |
| Photochemical ozone creation potential | kg O3 Eq. | 4.24 |
| Abiotic Depletion potential-fossil fuels | MJ | 424 |

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 |
|--|---------|--------------------------------|
| | | |
| Use of non-renewable primary energy resources (NRPE)- excluding NRPE used as raw materials | MJ, HHV | 3543 |
| NRPE, fossil | MJ, HHV | 3459 |
| NRPE, nuclear | MJ, HHV | 83.8 |
| Use of NRPE used as raw materials | MJ, HHV | 0.0 |
| Use of non-renewable secondary fuels | MJ, HHV | 0.0 |
| Use of non-renewable material resources | kg | 35.78 |
| Use of renewable primary energy resources (RPE)- excluding RPE used as raw materials | MJ, HHV | 179.7 |
| 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 | 9.27 |
| Use of secondary material | kg | 771.4 |
| Net use of fresh water | m3 | 0.758 |



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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

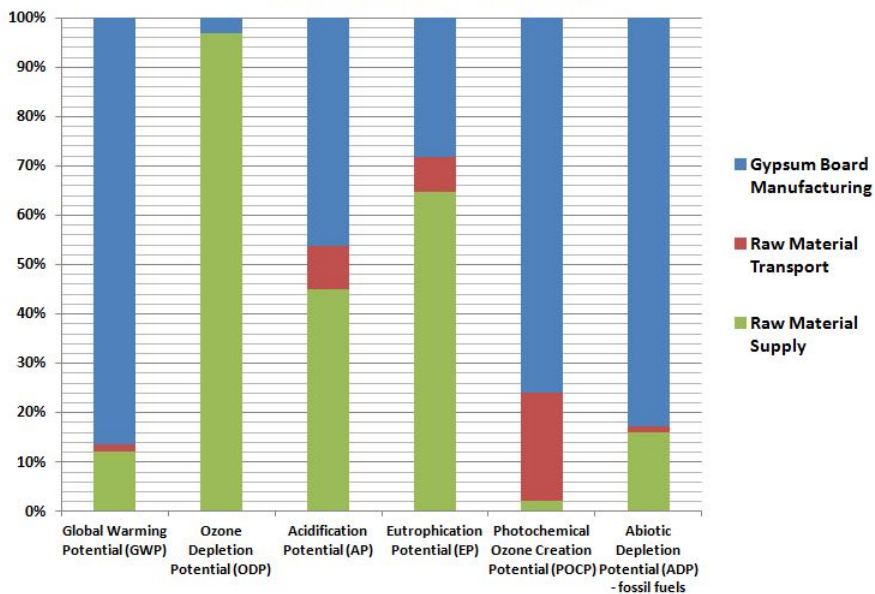
| Parameter | Units | Modules included in LCA: A1-A3 |
|-----------------------------------|-------|--------------------------------|
| | | |
| Hazardous waste disposed | kg | 2.45E-03 |
| Non hazardous waste disposed | kg | 99.0 |
| Radioactive waste disposal | kg | 3.51E-02 |
| Components for re-use | kg | 0.00 |
| Materials recycling | kg | 0.00 |
| Materials for energy recovery | kg | 0.00 |
| Material for disposal to landfill | kg | 99.0 |

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 at the Aliquippa plant 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.

Process Contribution Analysis - 1 MSF of 5/8" USG Sheetrock Brand EcoSmart Panels Firecode X (A1-A3)



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7.0 Additional environmental information

Additional information regarding VOC emissions is pending.

8.0 References

1. International Organization for Standardization (ISO), International Standard ISO 14040, Environmental management – Life cycle assessment – Principles and framework, 2006.
 2. International Organization for Standardization (ISO), International Standard ISO 14044, Environmental management – Life cycle assessment – Requirements and guidelines, 2006.
 3. International Organization for Standardization (ISO), International Standard ISO 21930, Sustainability in building construction -- Environmental declaration of building products, 2007.
 4. European Standards, Sustainability of construction works, Environment product declarations, core rules for the product category of construction products, 2012.
 5. FPIInnovations, "Product Category Rules for North American Gypsum Boards", 2013.
 6. Jane C. Bare, Gregory A. Norris, David W. Pennington, and Thomas McKone, 2003. TRACI-The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts, Journal of Industrial Ecology, Volume 6, Number 3–4, 2003.
 7. Dr. Lindita Bushi and Mr. Jamie Meil, "A Cradle-to-Gate Life Cycle Assessment of 1/2" Regular and 5/8" Type X Gypsum Wallboard" Prepared for the Gypsum Association by the Athena Institute, 2011.
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