Environmental Product Declaration

USG Ensemble® Acoustical Drywall Ceiling System

Walworth, WI

The USG Ensemble® Acoustical Drywall Ceiling system represents a revolutionary approach to building design. Installed and finished like traditional wallboard, this system provides a non-directional, monolithic appearance with a fine texture while maximizing sound absorption. The result is a surface that looks like standard finished drywall but absorbs sound like traditional ceiling panels.

Below are presented the cradle-to-gate (A1-A3) lifecycle assessment results for the following USG Ensemble® Acoustical Drywall Ceiling System configurations.

Trace v2.1 Environmental Impacts	A1-A3 GWP (kg CO2e/sf)
Ensemble® Panels, High-NRC Backer Panels plus installation materials	1.54 kg CO2e/sf
Ensemble® RAP Panels, High-NRC Backer Panels plus installation materials	1.49 kg CO2e/sf
Ensemble® RAP Panels plus installation materials	0.707 kg Co2e/sf

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This declaration is an Environmental Product Declaration (EPD) in accordance with ISO 14025 and ISO 21930; 2017. 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.

USG Corporation has sole ownership, liability, and responsibility for this EPD.

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building or construction works level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences in results upstream or downstream of the life cycle stages declared.

DECLARATION NUMBER	EPD 559
PROGRAM OPERATOR	ASTM International – 100 Barr Harbor Drive, West Conshohocken, PA USA www.astm.org
EPD Type	Type III Declaration per ISO 14025:2006
DECLARATION HOLDER	USG Corporation - 550 W. Adams St., Chicago, IL USA
DECLARED PRODUCT	Ensemble® Acoustical Drywall Ceiling System
REFERENCE PCR	UL Environment: PCR Guidance for Building-Related Products and Services; Part B: Non-Metal Ceiling Panel and Interior Wall EPD Requirements; April 13, 2021
DATE OF ISSUE PERIOD OF VALIDITY	10/7/24 5 Years
CONTENTS OF THE DECLARATION	This EPD is complete and contains the following: • Product System Documentation • Life Cycle Calculation Rules • Life Cycle Assessment Results • Further Information • References
This declaration was independently verified in accordance with ISO 14025 and ISO 21930:2017 □ INTERNAL ☒ EXTERNAL	Tim Brooke, ASTM International
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

1. Product System Documentation

1.1 Product Description and Product Identification

The USG Ensemble® Acoustical Drywall Ceiling system consists of perforated 5/8" USG Sheetrock® Brand gypsum board laminated front and back with non-woven scrims. During installation, these panels are screw attached to USG Drywall Suspension Grid where the Sheetrock® Brand Ensemble® Four-Sided Taper™ Panel is finished using USG Sheetrock® Brand Paper Joint Tape, USG Sheetrock® Brand Joint Compound and USG Sheetrock® Brand Ensemble™ Ceiling Compound using traditional drywall installation methods. On the back surface of the panels are optionally installed 1" USG Ensemble® High-NRC Backer panels. Finally, the face of the installed Ensemble® panels is spray coated using USG Ensemble® Spray-Applied Finish resulting in a monolithic drywall ceiling that is acoustically absorptive.

This EPD covers two versions of the Ensemble® panel, the standard 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panel and a modified version named the 5/8" USG Sheetrock® Brand Ensemble® RAP Four-Sided Taper™ Panel.

1.2 Designated Application – Product Features

- Nondirectional, monolithic appearance with fine texture
- Produced using perforated USG Sheetrock® Brand EcoSmart Firecode 30® panels to optimize sound performance
- Installs and finishes similar to traditional wallboard
- NRC 0.80 and CAC 40 when the Ensemble® system is installed according to USG installation instructions*
- High light-reflective finish (LR-0.85) reduces fixture and energy use
- Acoustically transparent spray-applied finish

1.3 Product Technical Data

Base Panel	Backer Panel	NRC	CAC	LR	Fire Performance
USG Ensemble® Panels	1" USG Ensemble® High-NRC Backer Panel	0.80*	40	0.85	Class A

* The reported system NRC of 0.80 requires the use of the standard 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panel and 1" Ensemble® High-NRC Backer Panels.

Table 1: Performance Data

1.4 Placing on the Market/Application Rules

The USG Ensemble® Acoustical Drywall Ceiling system must be installed according to the "USG Ensemble Acoustical Drywall Ceiling" installation overview document and maintained in accordance with current USG written instructions and best industry practice.

1.5 Delivery Status

For the installation of the Ensemble system, USG Drywall Suspension Grid, fasteners, USG Sheetrock® Brand Paper Joint Tape, and USG Sheetrock® Brand Joint Compound are sourced local to the jobsite. 5/8" USG Sheetrock® Brand Ensemble® RAP Four-Sided Taper™ Panels, Ensemble® High-NRC Backer Panels, Ensemble® Ceiling Compound, and Ensemble® Spray-Applied Finish are shipped directly to the jobsite from the Walworth warehouse.

1.6 Product Composition

Product Specifications for 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels	Measurement	Value
	Thickness	5/8 in. (15.9 mm)
	Lengths	8’ and 10’ (2438 and 3048
	Width	4’ (1219 mm)
	Weight (nominal)	1.64 lbs./ ft^2 (8.01 kg/m^2)
	Edges	Tapered on All Sides

Product Formulation for 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels	Additive	Percentage
	Gypsum	87.5%
	Paper	5.1%
	Additives	1.1%
	Scrims + Adhesive	6.3%

Product Specifications for 1” Ensemble® High-NRC Backer Panels	Measurement	Value
	Thickness	1 in. (25.4 mm)
	Lengths	Nominal 4’ (1219 mm)
	Width	2’ (609 mm)
	Weight (nominal)	1.11 lbs./ ft^2 (5.42 kg/m^2)
	Edges	Square Edged

Product Formulation for 1” Ensemble® High-NRC Backer Panels	Additive	Percentage
	Mineral Wool	91.9%
	Binder	6.6%
	Additives	1.5%

1.7 Product Manufacturing

The manufacture of 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels start 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 (Newsline) 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. The resulting product is ready for shipment. Any gypsum board not meeting quality control specifications is recycled at the plant.

The finished gypsum board is then shipped to a separate manufacturing plant wherein the board is cut to its final size, perfed with nominal 3/8” holes and laminates adhesively applied front and back. Two types of back laminates are used to produce the standard 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels and the 5/8" USG Sheetrock® Brand Ensemble® RAP Four-Sided Taper™ Panels. Any gypsum board not meeting quality control specifications is shipped to an appropriate landfill.

1” Ensemble® High-NRC Backer Panels are produced using conventional wet-formed technology. In this process, the tile ingredients are mixed into a dilute slurry, which is then formed onto a wire as a basemat. The base mats are then pressed and dried. The dried tiles are cut to the appropriate sizes and painted.

1.8 Packaging

5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels are shipped as units of 26 finished panels on a wood pallet with cardboard corner protectors and a cardboard shroud.

1" Ensemble® High-NRC backer panels are shipped in bundles and stacked on a wood pallet with cardboard corner protectors.

USG Ensemble® Ceiling Compound is shipped in standard 4.5-gallon cartons. Ensemble® Spray-Applied Finish is shipped in 5-gallon pails.

1.9 Environment and Health During Manufacturing

USG and CGC lead the building sector's effort in developing and supplying sustainable construction materials. Today, sustainability is integrated into the design and manufacture of our wall, ceiling, and flooring products. As both a producer and a buyer of raw materials, we have a responsibility to extensively review and select each material we use. Each decision we make is based on careful consideration of environmental, health, and safety effects over time. Raw materials used in our products are carefully selected and go through a screening procedure. Incoming raw materials are tested for contaminants by an internal lab and third-party labs for consideration of use and worker, environmental, and end-user exposure. This due diligence helps to ensure that our products are safe to handle in our manufacturing plants and on job sites while having minimal impact on occupant health and indoor and outdoor environments.

1.10 Distribution

The default transport distance from the PCR (product transport from the point of manufacture to building site) of 497 miles (800 km) by truck was used in this analysis for all system components that are shipped from the warehouse. Locally obtained installation components are given a transport distance of 25 miles (40 km). Installation and Use

1.11 Product Installation

The USG Ensemble® Acoustical Drywall Ceiling system must be installed according to the procedures demonstrated during the required hands-on training with a USG Contractor Specialty Representative. Once the USG Drywall Suspension Grid is installed, the USG Ensemble® High-NRC Backer Panels are laid into the grid. Then the Ensemble® panels are screwed to USG Drywall Suspension grid and are finished using joint tape and joint compound using traditional drywall installation methods. Finally, the face of the installed Ensemble® panels are spray coated using USG Ensemble® Spray-Applied Finish resulting in a monolithic drywall ceiling that is acoustically absorptive. Installation of USG's Ensemble® system is accomplished by manual labor using mostly hand tools. No material or energy inputs are required on the jobsite. A 7% installation waste factor was included in this study.

1.12 Conditions of Use

To ensure the longevity of the product, 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels and the system in total should not be exposed to moisture, high humidity, or high temperature. Criteria can be found in the USG warranty information specific for this product.

1.13 Environment and Health During Use Stage

This product is not expected to produce any unusual hazards during normal use. Proper personal protective gear should be worn by the installer for protection. The installed system meets the California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017 (Emissions Testing Method for CA Specification 01350) emissions criteria for a high-performance product with respect to harmful VOC emissions.

1.14 Reference Service Life

The reference service life (RSL) and ESL shall be indicated according to Part A, Section 2.8.2. The RSL shall be assumed to be 30 years for this ceiling system. Non-metal ceiling and wall panels shall be assumed to not need repainting, maintenance, or repairing and to last the entire duration of the building ESL with no replacement or refurbishment.

1.15 Re-Use Phase

The USG Ensemble® Acoustical Drywall Ceiling system cannot be reused at the end of the building's life.

1.16 End-of-Life Disposal

USG is helping to meet the needs of a growing world and preserve natural resources by taking back approved USG ceiling panels and recycling them into new building products. While USG encourages recycling of its ceiling panels through its take back program, all USG Ensemble® System waste generated during installation and at end-of-life is assumed to be disposed of in an appropriate landfill.

1.17 Extraordinary Effects

Fire

USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels covered by this EPD are certified to be Class A (flame spread of 25 or less, smoke developed of 50 or less per ASTM C84).

2. LCA Calculation Methodology

2.1 Functional Unit

The functional unit is defined as 1 square meter with optional reporting of one square foot (12"x12") of installed product.

USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels	Value and Units	Value and Units
Functional Unit	0.093 square meters	1 square foot
Conversion to kg	0.744 kg	1.64 lbs.

1" Ensemble® High-NRC Backer Panel	Value and Units	Value and Units
Functional Unit	0.093 square meters	1 square foot
Conversion to kg	0.503 kg	1.11 lbs.

Table 2: Functional unit

3. System Boundary

This EPD represents a "cradle-to-grave" LCA analysis for the USG Ensemble® Acoustical Drywall Ceiling System. It covers all the production steps from raw material extraction (i.e., the cradle) to end of life disposal (grave).

Raw Materials A1	Raw Materials Transport - A2	Production A3	Distribution A4	Installation A5	Use B1–B7	End of Life C1–C4
Synthetic Gypsum	Transport by Truck	Natural Gas	Transport by Truck	7% Installation Waste	Not included in study	Truck Transport to Recycling Center
Starch		Electricity		Packaging Waste		Truck Transport to Landfill
Glass Fiber		Packaging		Suspension System		Recycling
Additives		Waste				Inert Landfill
Face and Back Papers						

Figure 3: Specific processes by life cycle stage covered during the LCA study of USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels

Raw Materials A1	Raw Materials Transport - A2	Production A3	Distribution A4	Installation A5	Use B1–B7	End of Life C1–C4
Mineral Wool	Transport by Truck and Rail	Natural Gas	Transport by Truck	7% Installation Waste	Not included in study	Truck Transport to Landfill
Binder		Electricity				Inert Landfill
Additives		Packaging		Packaging Waste		
Coatings Front and Back		Waste				

Figure 4: Specific processes by life cycle stage covered during the LCA study of 1" Ensemble® High-NRC Backer Panels

3.1 Estimates and Assumptions

The system boundaries are cradle to grave (modules A1-C4) and include the following system processes in the production of USG Ensemble® System components: raw material extraction, raw material production, raw material transportation from suppliers to the production facility, product manufacturing and waste management, distribution, installation, use and end-of-life.

Additional data limitations include the use of proxy processes rather than actual supplier generated primary data. This would include such processes as starch, which is representative of wet-milled corn starch but may not necessarily be representative of USG's particular starch supplier. In addition, the data is limited in that the primary data was collected during the 2022 year and changes in operations may increase/decrease impacts in the future. Other data limitations include the use of secondary data sets instead of primary data for upstream and downstream processes, local impacts vs. global impacts, possible impacts vs. actual impacts, inherent uncertainty in the data sets, accuracy and precision of impact assessment methodology, etc.

3.2 Cut-off Criteria

All inputs and outputs to a (unit) process were included in the calculation for which data is available.

In case of insufficient input data or data gaps for a unit process, the cut-off criteria was 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows did not exceed 5% of energy usage and mass.

3.3 Background Data

All background was sourced from critically reviewed Sphera LCA for Experts databases.

3.4 Data Requirements and Data Sources

The LCA model was created using LCA for Experts software (version 10.8.0.14) from Sphera. Specific comments related to data quality requirements cited in ISO 14025 Section 4.2.3.6.2 include the following.

Temporal: In the case of USG Ensemble® High-NRC Backer Panels and USG Sheetrock® Brand Ensemble® RAP Four-Sided Taper™ Panels, the LCI data was collected from the East Chicago, IN, Cloquet, MN, and Walworth, WI plants for the 2022 production year.

Geographical: Where possible, all processes were chosen as being representative of US manufacturing processes.

Technical: The data selected for this study is specific to the technology used in the preparation of the various raw materials.

Precision: The raw material usage amounts were derived from plant quality data on finished products, coatings usage plant data and product formulas.

Completeness: Virtually all the significant raw material flows (> 99%) that make up the various Ensemble® system components have been modeled.

Representative: Where possible all the data sets were selected to be representative of US-based production, are less than 10 years in age and are representative of the technology being employed.

Consistency: All the manufacturing processes were modeled in a consistent manner throughout this study in accordance with the goal and scope definitions.

Reproducibility: The information contained in this study, including raw material, energy and transportation distance inputs, have been fully documented in the LCA report.

Sources of Data: The sources for the processes used in this study have been fully provided in the LCA report and are representative of the material and energy sources used in actual production.

Uncertainty: The relative uncertainty associated with this study has been minimized. No significant assumptions have been made.

4. LCA: Scenarios and Additional Technical Information

Name	Value for Ensemble® Panels	Value for 1" Ensemble® High-NRC Backer Panels	Unit
Fuel type	Diesel	Diesel	—
Liters of fuel (including packaging)	1.61E-03	1.09E-03	l/100km
Vehicle type	US Truck	US Truck	—
Transport distance	800	800	km
Capacity	0.67	0.67	—
Gross density of products transported (assembly only)	504	212	kg/m3

Table 5: Transport to the building site (A4)

NAME	VALUE	UNIT
Ancillary materials	0	kg
Net freshwater consumption specified by water source and fate	0	m^3
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Material loss	7% of delivered weight	%
Ceiling Panel Mounting System	1.29E-01	kg
Output substances following waste treatment on site	7% of delivered weight	%
Dust in the air	~ 0	kg
VOC content	< 9	$\mu g/m^3$

Table 6: Installation into the building (A5)

Name	Value	Unit
Maintenance process information	No maintenance is required.	
Maintenance cycle	0	Number/ RSL
Maintenance cycle	0	Number/ ESL
Water consumption	0	m3
Auxiliary	0	kg
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Material loss	0	kg

Table 7: Maintenance (B2)

NAME		ENSEMBLE® SYSTEM*	UNIT
Collection process (specified by type)	Collected separately	0	kg
	Collected with mixed construction waste	1.32	kg
Recovery (specified by type)	Reuse	0	kg
	Recycling	0	kg
	Landfill	1.32	kg
	Incineration	0	kg
	Incineration with energy recovery	0	kg
	Energy conversion efficiency rate	0	-
Disposal	Product or material for final deposition	1.32	kg
Removals of biogenic carbon (excluding		0	kg CO_2

Table 8: End of Life (C1-C4)

5. Life Cycle Assessment Results

Product Stage				Construction Process 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

5.1 LCA Results

Life Cycle Environmental Impact Results for 1 Square Foot of 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels, 1"Ensemble® High-NRC Backer Panels, USG Sheetrock® Brand Joint Tape and USG Sheetrock® Brand All Purpose Joint Compound, USG Sheetrock® Brand Ensemble® Ceiling Compound and USG Ensemble® Spray-Applied Finish and Ensemble® Drywall Suspension Grid

Environmental Impact Category	Units	A1-A3	A4	A5	B1-B7	C2	C4	A1-C4	D
Global Warming Potential, excl. biogenic carbon (GWP)	kg CO2 eq.	1.54E+00	1.05E-01	3.06E-01	0.00E+00	4.09E-03	2.62E-02	1.98E+00	-2.91E-03
Ozone Depletion Potential (ODP)	kg CFC 11-eq.	2.71E-07	3.15E-16	2.05E-08	0.00E+00	1.22E-17	1.30E-15	2.91E-07	7.96E-17
Acidification Potential (AP)	kg SO2 eq.	2.86E-03	1.90E-04	4.30E-03	0.00E+00	1.54E-05	1.46E-04	7.51E-03	-5.80E-06
Eutrophication Potential (EP)	kg N eq.	3.03E-04	2.45E-05	6.33E-05	0.00E+00	1.46E-06	6.35E-06	3.99E-04	-3.46E-07
Photochemical Ozone Creation Potential (POCP)	kg O3-Equiv.	4.74E-02	4.24E-03	1.29E-02	0.00E+00	4.59E-04	2.66E-03	6.76E-02	-6.25E-05
Abiotic Depletion Potential (ADP) fossil fuels	MJ surplus energy	2.88E+00	2.01E-01	5.93E-01	0.00E+00	7.79E-03	5.01E-02	3.73E+00	-3.70E-06

Life Cycle Environmental Impact Results for 1 Square Foot of 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ RAP Panels, 1"Ensemble® High-NRC Backer Panels, USG Sheetrock® Brand Joint Tape and USG Sheetrock® Brand All Purpose Joint Compound, USG Sheetrock® Brand Ensemble® Ceiling Compound and USG Ensemble® Spray-Applied Finish and Ensemble® Drywall Suspension Grid

Environmental Impact Category	Units	A1-A3	A4	A5	B1-B7	C2	C4	A1-C4	D
Global Warming Potential, excl. biogenic carbon (GWP)	kg CO2 eq.	1.49E+00	1.04E-01	3.02E-01	0.00E+00	4.04E-03	2.58E-02	1.92E+00	-2.91E-03
Ozone Depletion Potential (ODP)	kg CFC 11-eq.	1.13E-07	3.11E-16	8.62E-09	0.00E+00	1.21E-17	1.28E-15	1.22E-07	7.96E-17
Acidification Potential (AP)	kg SO2 eq.	2.76E-03	1.88E-04	4.29E-03	0.00E+00	1.52E-05	1.44E-04	7.40E-03	-5.80E-06
Eutrophication Potential (EP)	kg N eq.	2.87E-04	2.42E-05	6.20E-05	0.00E+00	1.44E-06	6.27E-06	3.81E-04	-3.46E-07
Photochemical Ozone Creation Potential (POCP)	kg O3-Equiv.	4.54E-02	4.19E-03	1.27E-02	0.00E+00	4.52E-04	2.62E-03	6.53E-02	-6.25E-05
Abiotic Depletion Potential (ADP) fossil fuels	MJ surplus energy	2.33E+00	1.98E-01	5.51E-01	0.00E+00	7.70E-03	4.94E-02	3.13E+00	-3.70E-06

Life Cycle Environmental Impact Results for 1 Square Foot of 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ RAP Panels, USG Sheetrock® Brand Joint Tape and USG Sheetrock® Brand All Purpose Joint Compound, USG Sheetrock® Brand Ensemble® Ceiling Compound and USG Ensemble® Spray-Applied Finish and Ensemble® Drywall Suspension Grid

Environmental Impact Category	Units	A1-A3	A4	A5	B1-B7	C2	C4	A1-C4	D
Global Warming Potential, excl. biogenic carbon (GWP)	kg CO2 eq.	7.07E-01	7.02E-02	2.39E-01	0.00E+00	2.64E-03	1.83E-02	1.04E+00	-2.91E-03
Ozone Depletion Potential (ODP)	kg CFC 11-eq.	1.11E-07	2.07E-16	8.41E-09	0.00E+00	7.88E-18	8.72E-16	1.19E-07	7.96E-17
Acidification Potential (AP)	kg SO2 eq.	2.00E-03	1.37E-04	4.22E-03	0.00E+00	1.11E-05	9.77E-05	6.47E-03	-5.80E-06
Eutrophication Potential (EP)	kg N eq.	1.51E-04	1.68E-05	5.09E-05	0.00E+00	1.01E-06	4.21E-06	2.24E-04	-3.46E-07
Photochemical Ozone Creation Potential (POCP)	kg O3-Equiv.	2.97E-02	3.06E-03	1.13E-02	0.00E+00	3.61E-04	1.75E-03	4.62E-02	-6.25E-05
Abiotic Depletion Potential (ADP) fossil fuels	MJ surplus energy	1.38E+00	1.32E-01	4.73E-01	0.00E+00	5.02E-03	3.66E-02	2.03E+00	-3.70E-06

Resource and Waste Flows for 1 Square Foot of 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels, 1" Ensemble® High-NRC Backer Panels, USG Sheetrock® Brand Joint Tape, USG Sheetrock® Brand All Purpose Joint Compound, USG Sheetrock® Brand Ensemble® Ceiling Compound and USG Ensemble® Spray-Applied Finish and Ensemble® Drywall Suspension Grid

Use of Primary Resources	Units	A1-A3	A4	A5	B1-B7	C2	C4	Total A1-C4	D
Renewable primary resources used as an energy carrier (RPRE)	MJ, NCV	1.76E+00	6.24E-02	4.33E-01	0.00E+00	2.42E-03	5.32E-02	2.32E+00	1.16E-03
Renewable primary resources with energy content used as material (RPRM)	MJ, NCV	1.32E-04	0.00E+00	9.93E-06	0.00E+00	0.00E+00	0.00E+00	1.42E-04	0.00E+00
Non-renewable primary resources used as an energy carrier (NRPRE)	MJ, NCV	1.60E+01	1.41E+00	4.48E+00	0.00E+00	5.47E-02	3.88E-01	2.23E+01	-2.93E+01
Non-renewable primary resources with energy content used as material (NRPRM)	MJ, NCV	4.82E-01	0.00E+00	3.62E-02	0.00E+00	0.00E+00	0.00E+00	5.18E-01	0.00E+00
Secondary material, secondary fuel and recovered energy	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Secondary material (SM)	kg	1.55E+00	0.00E+00	1.17E-01	0.00E+00	0.00E+00	0.00E+00	1.67E+00	0.00E+00
Renewable secondary fuel (RSF)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuel (NRSF)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable energy (RE)	MJ, NCV	1.03E-02	2.07E-04	2.32E-03	0.00E+00	8.05E-06	6.46E-05	1.29E-02	-2.98E-04
Consumption of fresh water	m3	1.55E+00	0.00E+00	1.17E-01	0.00E+00	0.00E+00	0.00E+00	1.67E+00	0.00E+00
Additional inventory parameters for transparency	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Removals and emissions associated with biogenic carbon content of the bio-based product	kg CO2-eq.	-1.02E-01	0.00E+00	-7.64E-03	0.00E+00	0.00E+00	1.09E-01	0.00E+00	0.00E+00
Emission from calcination and uptake from carbonation	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Removals and emissions associated with biogenic carbon content of the bio-based packaging	kg CO2-eq.	-4.20E-03	0.00E+00	-3.16E-04	0.00E+00	0.00E+00	4.52E-03	0.00E+00	0.00E+00
Emissions from land use change	kg CO2-eq.	2.13E-04	5.97E-05	7.16E-05	0.00E+00	2.32E-06	5.55E-05	4.02E-04	-3.92E-07
Emissions from combustion of waste from renewable sources used in production processes	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Emissions from combustion of waste from non-renewable sources used in production processes	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indicators describing waste	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Hazardous waste disposed	kg	9.31E-07	1.90E-10	5.68E-07	0.00E+00	7.38E-12	2.17E-10	1.50E-06	-2.19E-10
Non-hazardous waste disposed	kg	2.03E-01	1.41E-04	3.34E-01	0.00E+00	5.45E-06	1.40E+00	1.94E+00	3.54E-04
High-level radioactive waste	kg	2.33E-04	4.25E-06	1.04E-04	0.00E+00	1.65E-07	4.10E-06	3.45E-04	3.21E-09
Intermediate and low-level waste	kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Assignments of output flows at the end-of-life	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MR)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported (EE)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Resource and Waste Flows for 1 Square Foot of 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ RAP Panels, 1" Ensemble® High-NRC Backer Panels, USG Sheetrock® Brand Joint Tape, USG Sheetrock® Brand All Purpose Joint Compound, USG Sheetrock® Brand Ensemble® Ceiling Compound and USG Ensemble® Spray-Applied Finish and Ensemble® Drywall Suspension Grid

Use of Primary Resources	Units	A1-A3	A4	A5	B1-B7	C2	C4	Total A1-C4	D
Renewable primary resources used as an energy carrier (RPRE)	MJ, NCV	1.72E+00	6.16E-02	4.30E-01	0.00E+00	2.39E-03	5.25E-02	2.27E+00	1.16E-03
Renewable primary resources with energy content used as material (RPRM)	MJ, NCV	4.67E+00	7.93E-01	3.56E+00	0.00E+00	2.95E-02	2.75E-01	9.33E+00	0.00E+00
Non-renewable primary resources used as an energy carrier (NRPRE)	MJ, NCV	1.46E+01	1.39E+00	4.37E+00	0.00E+00	5.41E-02	3.82E-01	2.08E+01	-2.93E+01
Non-renewable primary resources with energy content used as material (NRPRM)	MJ, NCV	4.42E-01	1.17E-04	3.48E-02	0.00E+00	4.33E-06	3.55E-05	4.77E-01	0.00E+00
Secondary material, secondary fuel and recovered energy	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Secondary material (SM)	kg	1.55E+00	0.00E+00	1.17E-01	0.00E+00	0.00E+00	0.00E+00	1.67E+00	0.00E+00
Renewable secondary fuel (RSF)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuel (NRSF)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable energy (RE)	MJ, NCV	9.84E-03	2.05E-04	2.29E-03	0.00E+00	7.96E-06	6.38E-05	1.24E-02	-2.98E-04
Consumption of fresh water	m3	1.55E+00	0.00E+00	1.17E-01	0.00E+00	0.00E+00	0.00E+00	1.67E+00	0.00E+00
Additional inventory parameters for transparency	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Removals and emissions associated with biogenic carbon content of the bio-based product	kg CO2-eq.	-1.02E-01	0.00E+00	-7.64E-03	0.00E+00	0.00E+00	1.09E-01	0.00E+00	0.00E+00
Emission from calcination and uptake from carbonation	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Removals and emissions associated with biogenic carbon content of the bio-based packaging	kg CO2-eq.	-4.20E-03	0.00E+00	-3.16E-04	0.00E+00	0.00E+00	4.52E-03	0.00E+00	0.00E+00
Emissions from land use change	kg CO2-eq.	2.10E-04	5.90E-05	7.12E-05	0.00E+00	2.29E-06	5.54E-05	3.97E-04	-3.92E-07
Emissions from combustion of waste from renewable sources used in production processes	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Emissions from combustion of waste from non-renewable sources used in production processes	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indicators describing waste	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Hazardous waste disposed	kg	9.31E-07	1.88E-10	5.68E-07	0.00E+00	7.29E-12	2.16E-10	1.50E-06	-2.19E-10
Non-hazardous waste disposed	kg	1.98E-01	1.39E-04	3.32E-01	0.00E+00	5.39E-06	1.38E+00	1.91E+00	3.54E-04
High-level radioactive waste	kg	2.21E-04	4.20E-06	1.03E-04	0.00E+00	1.63E-07	4.04E-06	3.32E-04	3.21E-09
Intermediate and low-level waste	kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Assignments of output flows at the end-of-life	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MR)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported (EE)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	.00E+00	0.00E+00

Resource and Waste Flows for 1 Square Foot of 5/8" USG Sheetrock® Brand Ensemble® Four-Sided Taper™ RAP Panels, USG Sheetrock® Brand Joint Tape, USG Sheetrock® Brand All Purpose Joint Compound, USG Sheetrock® Brand Ensemble® Ceiling Compound and USG Ensemble® Spray-Applied Finish and Ensemble® Drywall Suspension Grid

Use of Primary Resources	Units	A1-A3	A4	A5	B1-B7	C2	C4	Total A1-C4	D
Renewable primary resources used as an energy carrier (RPRE)	MJ, NCV	4.11E-01	4.10E-02	3.28E-01	0.00E+00	1.56E-03	3.51E-02	8.17E-01	1.16E-03
Renewable primary resources with energy content used as material (RPRM)	MJ, NCV	4.67E+00	7.93E-01	3.56E+00	0.00E+00	2.95E-02	2.75E-01	9.33E+00	0.00E+00
Non-renewable primary resources used as an energy carrier (NRPRE)	MJ, NCV	5.06E+00	9.28E-01	3.60E+00	0.00E+00	3.53E-02	2.83E-01	9.91E+00	-2.93E+01
Non-renewable primary resources with energy content used as material (NRPRM)	MJ, NCV	4.42E-01	1.17E-04	3.48E-02	0.00E+00	4.33E-06	3.55E-05	4.77E-01	0.00E+00
Secondary material, secondary fuel and recovered energy	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Secondary material (SM)	kg	1.18E+00	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	1.27E+00	0.00E+00
Renewable secondary fuel (RSF)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuel (NRSF)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable energy (RE)	MJ, NCV	6.55E-03	1.36E-04	2.03E-03	0.00E+00	5.19E-06	3.75E-05	8.77E-03	-2.98E-04
Consumption of fresh water	m3	1.18E+00	0.00E+00	8.87E-02	0.00E+00	0.00E+00	0.00E+00	1.27E+00	0.00E+00
Additional inventory parameters for transparency	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Removals and emissions associated with biogenic carbon content of the bio-based product	kg CO2-eq.	-3.44E-02	0.00E+00	-2.59E-03	0.00E+00	0.00E+00	3.70E-02	0.00E+00	0.00E+00
Emission from calcination and uptake from carbonation	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Removals and emissions associated with biogenic carbon content of the bio-based packaging	kg CO2-eq.	-4.20E-03	0.00E+00	-3.16E-04	0.00E+00	0.00E+00	4.52E-03	0.00E+00	0.00E+00
Emissions from land use change	kg CO2-eq.	3.80E-05	3.93E-05	5.26E-05	0.00E+00	1.49E-06	1.02E-05	1.42E-04	-3.92E-07
Emissions from combustion of waste from renewable sources used in production processes	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Emissions from combustion of waste from non-renewable sources used in production processes	kg CO2-eq.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indicators describing waste	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Hazardous waste disposed	kg	9.27E-07	1.25E-10	5.68E-07	0.00E+00	4.76E-12	1.91E-10	1.50E-06	-2.19E-10
Non-hazardous waste disposed	kg	8.50E-02	9.25E-05	2.80E-01	0.00E+00	3.52E-06	8.80E-01	1.25E+00	3.54E-04
High-level radioactive waste	kg	1.42E-04	2.80E-06	9.65E-05	0.00E+00	1.06E-07	3.01E-06	2.45E-04	3.21E-09
Intermediate and low-level waste	kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Assignments of output flows at the end-of-life	**Units**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C2**	**C4**	**Total A1-C4**	**D**
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MR)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported (EE)	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	.00E+00	0.00E+00

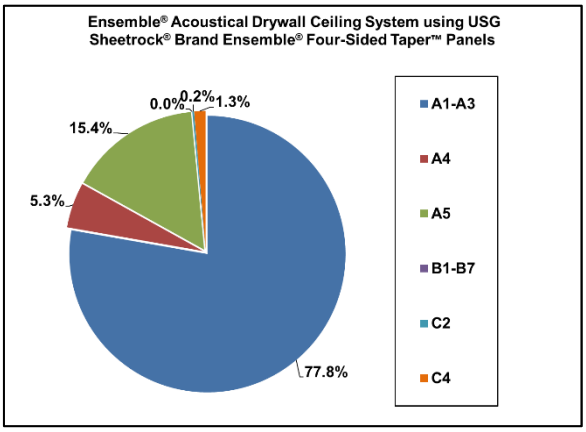
5.2 LCA Results

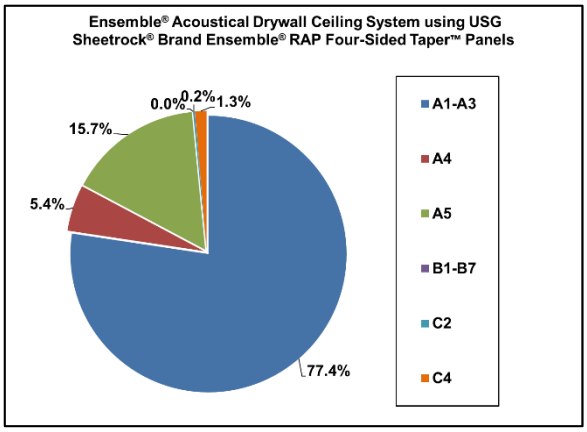
Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building or construction works has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase only when product or construction works performance and specifications have been established and serve as a functional unit for comparison.

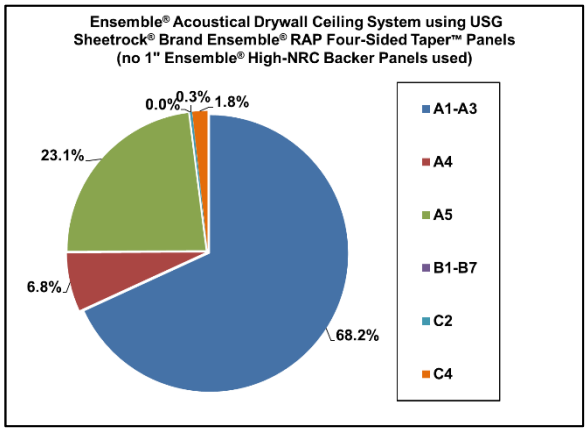
Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparisons can be inaccurate and could lead to erroneous selection of materials or products that are higher impact, at least in some impact categories.

5.3. LCA Interpretation

The cradle-to-grave LCA results for the installed Ensemble® Acoustical Drywall Ceiling System were dominated by product production; primarily gas usage during the drying process for USG Sheetrock® Brand Ensemble® Four-Sided Taper™ Panels and the 1" Ensemble® High-NRC Backer Panel.







6. References

LCA Report

A Cradle-to-Grave (A1-C4) Life Cycle Assessment of the USG Ensemble® Acoustical Drywall Ceiling System, 5/16/24. USG (Confidential)

Product PCR

UL Environment: Product Category Rules for Building-Related Products and Services Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report, UL 10010, v3.2 December 2018.
UL Environment: Product Category Rules for Building-Related Products and Services Part B: Non-Metal Ceiling and Interior Wall Panel EPD Requirements, UL 10010-26, v2.0, April 2021.
ASTM International General Program instructions, v8.0, April 29, 2020.

Sustainability Reporting Standards

EN 15804:2012-04 - Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction product
ISO 14025:2006 - Environmental labels and declarations — Type III environmental declarations — Principles and Procedures
ISO 14040:2006/Amended 1:2020 - Environmental management – Life cycle assessment – Principles and framework
ISO 14044:2006/Amended 2:2020 - Environmental management – Life cycle assessment – Requirements and guidelines
ISO 14046:2013 - Environmental management- Water footprint- Principles, requirements and guidelines
ISO 15392:2008 - Sustainability in building construction- General principles
ISO 15686-1:2011 - Buildings and constructed assets- Service life planning- Part 1: General principles
ISO 15686-2:2008 - Buildings and constructed assets- Service life planning Part 2: Service life prediction procedures
ISO 15686-7:2008 - Buildings and constructed assets- Service life planning Part 7: Performance evaluation for feedback of service life data from practice
ISO 15686-8:2008 - Buildings and constructed assets- Service life planning Part 8: Reference service life and service life estimation
ISO 21930:2017 - Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services