ENVIRONMENTAL PRODUCT DECLARATION

LOUNA™

ACOUSTICAL CEILING TILE FACTORY OF USG MIDDLE EAST

LOUNA™ Acoustical Ceiling Tiles is designed with soft fiber substrate with monolithic visual reducing installation time.

Sustainable practices have naturally been an inherent part of our business at Factory of USG Middle East. They help shape the innovative products that become the homes where we live, the buildings where we work and the arenas where we play.

From the product formulations we choose, to the processes we employ, Factory of USG Middle East is committed to designing, manufacturing, and distributing products that minimize overall environmental impacts and contribute toward a healthier living space.

We believe that transparency of product information is essential to our stakeholders and EPDs are the next step toward an even more transparent Factory of USG Middle East.

USG ME's ceiling panels listed in this UL Environment Certified Document provides an acoustical ceiling panel's: Life Cycle Assessment (LCA), LCA Impact Measures, Product Composition, Material Definitions, Manufacturing Process, Product Performance Attributes and Product Application.

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

USG

USG ME LOUNA™
ACOUSTICAL CEILING TILE

According to ISO 14025, ISO 21930:2007 & EN 15804

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 Middle East LTD CO
DECLARATION NUMBER	4789313706.103.1
DECLARED PRODUCT	USG ME Louna Acoustical Ceiling Tile
REFERENCE PCR	UL Part B: Non-Metal Ceiling Panel, v.1.0 October 2015 & UL Part A, v.1.3 2014
REFERENCE PCR STANDARD	☒ EN 15804 (2012) ☒ ISO 21930 (2007) ☐ ISO 21930 (2017)
DATE OF ISSUE	October 1, 2020
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:	UL Environment PCR Review Panel epd@ulenvironment.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine James Mellentine, Thrive ESG

ENVIRONMENTAL PRODUCT DECLARATION

USG

USG ME LOUNA™
ACOUSTICAL CEILING TILE

According to ISO 14025, ISO 21930:2007 & EN 15804

1. General Information

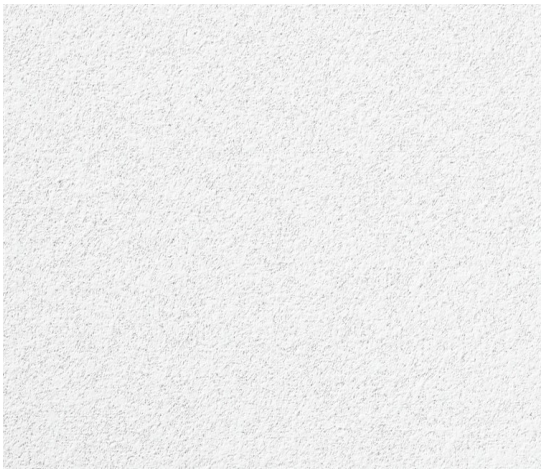
This is the EPD document of LOUNA™ Acoustical Ceiling Tile manufactured by USG ME in the manufacturing plant located in Dammam, Kingdom of Saudi Arabia.

2. Product System Documentation

2.1. Product Description

LOUNA™ Acoustical Ceiling is designed with soft fiber substrate with monolithic visual. LOUNA™ Acoustical Ceiling Panels provide exceptional sound absorption and impact and scratch resistant. Easy to install and clean, their noise reduction properties and high light reflectance values make these tiles perfect for open-plan areas as well as receptions and offices, restaurants, waiting areas and lobbies.

The products covered by this EPD report consists of a Rock Wool base mat laminated with a fiberglass veil. This product fall under ASTME 1264 Section 5.2 designation as Type XII – Glass fiber base with membrane-faced overlay.



LOUNA™ Acoustical Ceiling Tile

2.2. Application

LOUNA™ Acoustical Ceiling is commonly used in open-plan areas, reception & offices, restaurants, waiting areas and lobbies. LOUNA™ Acoustical Ceiling is available in plank sizes compatible with Logix Integrated Ceiling System and baffle sizes. USG ME produces LOUNA™ Acoustical Ceiling in metric and imperial sizes to fit all construction types and to match the contractors lighting fixtures demand.

2.3. Technical Data

Technical information and product standards are given in the table below.

Technical information and product standards	**LOUNA™** thickness: 15mm	**LOUNA™** thickness: 19mm	**LOUNA™** thickness: 25mm	**LOUNA™** thickness: 38mm
Noise Reduction Coefficient (NRC) Test Method C423	0.85	0.90	0.95	0.95
Ceiling Attenuation Class (CAC) Test Method E1414 and Classification E413	24 dB	28 dB	30 dB	35 dB
Surface Burning Characteristics Test Method ASTM E84	Class A, Flame Spread:25, Smoke development:50	Class A, Flame Spread:25, Smoke development:50	Class A, Flame Spread:25, Smoke development:50	Class A, Flame Spread:25, Smoke development:50
Light Reflectance Test Method ASTM E1477	0.88	0.88	0.88	0.88
Thermal Transmission Test Method ASTM C518	0.44 m^2 °K/W	0.60 m^2 °K/W R 3.5	0.74 m^2 °K/W R 4.2	1.12 m^2 °K/W R 6.6
Humidity Resistance Test Method ASTM C367/367M	Max. 99% RH / 40°C	Max. 99% RH / 40°C	Max. 99% RH / 40°C	Max. 99% RH / 40°C

LOUNA™ Acoustical Ceiling is being produced with the most stringent manufacturing facility of its type in the MENA region, the company is ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018 certified.

2.4. Placing on the Market / Application Rules

The respective standard and general technical approval for these products are indicated above. Further detail may be found on www.usgme.com.

2.5. Delivery Status

The products under consideration are typically delivered in bundles of 6-12 pieces per carton surrounded by a cardboard sleeve and wrapped with plastic as indicated below.

Thickness	Quantity
15 mm	12 pieces/carton
19 mm	10 pieces/carton
25 mm	8 pieces/carton
38 mm	6 pieces/carton

2.6. Base Materials / Ancillary Materials

Rock wool base mat, adhesive, fiberglass veil, fiberglass back fleece and coating are the base materials of LOUNA™ Acoustical Ceiling. The mass percentages of the base materials of the product are shown in the table below.

Base Materials Mass Percentage	LOUNA™
Rock Wool Base Mat *	69.6% - 84.3%
Adhesive *	2.6% - 6.0%
Fiberglass Veil *	4.9% - 11.5%
Fiberglass Back Fleece *	1.0% - 2.3%
Coating *	2.9% - 6.8%

** For the thicknesses 15 mm, 19 mm, 25 mm and 38 mm*

2.7. Manufacture

LOUNA™ Acoustical Ceiling Tiles consist of a 3rd party supplied Rock Wool Base Mat laminated in house with a Fiberglass Veil and Fiberglass Back Fleece. Fabrication of the finished product consists of laminating the rock wool base mat with the appropriate laminate, trimming, painting the product and packaging. USG ME produces its own paint coatings and the primary ingredients for these coatings are also included in the analysis. The finishing unit processes are dominated by the use of water-based paint, which contains ingredients such as calcium carbonate, clay, latex, and other chemicals. Shrink-wrap and corrugated strip are used as packing materials.

Manufacturing flow chart of LOUNA™ is given in the figure below.

Manufacturing Flow Chart of LOUNA™

2.8. Environment and Health During Manufacturing

USG ME has a commitment to sustainability. As part of our Product Stewardship Program the environment, health and safety evaluation of raw materials is diligently reviewed. Since the early days of our company, we have made employee health and safety one of our core values by developing and adhering to safety guidelines that exceed industry standards and regulations.

2.9. Product Processing / Installation

The ceiling panels must be installed in accordance with all applicable USG ME installation guidelines. Approved installation procedures are provided in the Ceiling Systems Catalogs must be followed. Installation of USG ME's ceiling and grid products is accomplished by manual labor using mostly hand tools. No material or energy inputs are required on the jobsite.

2.10. Packaging

USG ME ceiling panels are packaged using cardboard sleeves and are then wrapped in plastic shrink wrap. USG ME encourages the proper recycling of these packaging materials. Both the production and disposal of these packaging materials were modeled in this LCA study.

2.11. Condition of Use

To insure the longevity of the product, panels should not be exposed to moisture, high relative humidity or high temperature. Criteria can be found in the USG ME Warranties and Limitations information specific for each product.

2.12. Environment and Health During Use

These products are not expected to produce any unusual hazards during normal use. Exposure to high dust levels may irritate the skin, eyes, nose, throat or upper respiratory tract. Proper personal protective gear should be worn by installer for protection.

2.13. Reference Service Life

A default RSL of 75 years shall be assumed for the product and ceiling panel mounting system. An assumed Estimated Service Life (ESL) of 75 years shall be used for building life.

2.14. Extraordinary Effects

Fire
All ceiling products covered by this study are certified to be Class A (flame spread of 25 or less, smoke developed of 50 or less per ASTM E84).

Water
Moisture must not come in contact with the ceiling panel as a result of a leaking roof, a sweating pipe, a leaking radiator, a flood, condensation on more subtle surfaces where dew points are reached, humidified air from the HVAC system or any other similar causes.

Mechanical Destruction
The product must be installed and maintained in accordance with current USG ME written instructions and best industry practice, including the CISCA Handbook and ASTM C636, ‘’Standard Practice for Installation of metal Ceiling Suspension System for Acoustical Tile and Lay-in Panels.

2.15. Re-use Phase

With proper care, USG ME ceiling panels may be reused at the end of a building’s life.

2.16. Disposal

This EPD covers product stage modules A1, A2, A3 and does not cover end of life stage. In normal practice, most grid components are recycled at end-of-life while all ceiling panel waste generated during installation and at end-of-life is assumed to be disposed of in an appropriate landfill.

2.17. Further Information

For further information, please visit www.usgme.com.

3. LCA Calculation Rules

The LCA study and analysis were conducted according to the PCR "UL - Part B: Non-Metal Ceiling Panel EPD Requirements October 2015 v1" in accordance with ISO 14040 and ISO 14044.

Product stage including the modules A1 (raw material supply), A2 (transport), A3 (manufacturing) is considered as life cycle stage.

3.1. Declared and Functional Unit

The declared unit is 1m^2 for the product USG ME LOUNA™ Acoustical Ceiling Tile. Functional unit is not taken into consideration since the use stage is not assessed.

Please see the table below for declared unit, declared thickness and surface weight per declared unit.

Product	LOUNA™			
Declared unit	1 m^2	1 m^2	1 m^2	1 m^2
Declared thickness	15 mm	19 mm	25 mm	38 mm
Surface weight per declared unit	1.7 kg/m^2	2.1 kg/m^2	2.7 kg/m^2	4.0 kg/m^2

3.2. System Boundary

The scope of study includes the product stage 'cradle to gate'. Product stage includes the modules A1 (raw material supply), A2 (transport), A3 (manufacturing). Production and delivery of the base materials, used packaging materials, delivery to the factory, consumed energy and generated waste during production manufacturing are included in the LCA study. Construction of capital equipment, maintenance and operation of support equipment, human labor and employee commute, overhead of manufacturing facilities and internal transportation are excluded.

3.3. Estimates and Assumptions

The LCA study is conducted in accordance with all methodological considerations such as performance, system boundaries, data quality, allocation procedures and decision rules to evaluate inputs and outputs. Since all the data used in this study are already provided by the manufacturer, there is no data gaps which should be filled by estimates and conservative assumptions with average or generic data.

3.4. Cut-off Criteria

The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes which data are available for are included in the calculation. There is no neglected unit process more than 1% of total mass and energy flows. The total neglected input and output flows do also not exceed 5% of energy usage or mass. The life cycle is covered from cradle to gate, including all industrial processes from raw material acquisition, pre-processing and production. The LCA study includes the provision of all materials, transportation, energy and emission flows.

Water used for cleaning and maintenance of the equipment, transportation and waste streams of the packaging materials used for delivering the raw materials to the factory are omitted since the quantified mass contribution is less than 0.1%.

The production of capital equipment, construction activities, and infrastructure, personnel-related activities, energy and water use related to company management and sales activities are excluded.

3.5. Background Data

The LCA model was created by using ‘One Click EPD Tool’ by the EPD Author ‘Bionova Ltd’.

One Click EPD Tool represents the most recent data available in the form of EN 15804 compliant environmental product declarations (EPDs) as well as complementary data from Ecoinvent 3.6 database. It should be noticed, that Ecoinvent is the only source of environmental data in this study. Ecoinvent was used as a source because producer specific EPDs were not available for this product. Ecoinvent is a widely used database which is commonly referenced in published life cycle studies. The data follows ISO14040/14044 standards. In addition, it must me mentioned that Ecoinvent does not provide year specific data (i.e. the studied 2019), however, as the data already represents the recent period of time it is considered to be relevant.

In this assessment, all modeling calculations are based on the quantities declared by the manufacturer. Also, the most recent version of resources was chosen for calculations.

The primary data collection is accomplished in the form of spreadsheet and questionnaires, and supplemented by manufacturer communication. All relevant background data necessary for the materials used in the model are included in Ecoinvent 3.6 database.

3.6. Data Quality

For consistency and completeness of data, One Click EPD Tool and Ecoinvent 3.6 database which provides the life cycle inventory database in all branches to assess the potential environmental burdens of a product from cradle to gate are used. All input and output flows, type of materials used, energy consumption, transportation and wastes are primary data taken from the manufacturer.

The specific data quality coverages and limitations are also;

- Geographical coverage: The study partially complies with the actual manufacturing situation in Saudi Arabia. While Saudi Arabian data are used for energy consumptions, global environmental data are used for the other flows since there is no specific data for the current situation
- Time period coverage: Inventory data from year 2019 with 12 consecutive months are collected from manufacturing facility and supplied by USG in August, 2020. Generic data from Ecoinvent 3.6 database are not older than 5 years.
- Technology coverage: The objective of the study is to use the data that apply to average technology which represents the actual situation. Even if the data in Ecoinvent 3.6 database which represent the current situations best are used, these data are expected to show limited global variability.

Data quality assessment of inventory and environmental data is handled based on Table 8.2 of WRI Product Standard. Please see the table below for the inventory and environmental data quality points.

Data Category	Inventory Data Quality Point	Environmental Data Quality Point
Raw Material	Very good	Good
Packaging Material	Good	Good
Transportation	Good	Good
Energy Inputs	Very good	Very good
Waste	Good	Good

Different LCA software and background LCI datasets may lead to different results for life cycle stages. Therefore, without understanding the specific variability, the user is not encouraged to compare the LCA results. Even for similar products, data quality may produce incomparable results. Moreover, LCIA results are relative statements and do not anticipate category endpoints, exceeding thresholds, safety margins, or effects on risks.

3.7. Period Under Review

The data used in the LCA model represent the year 2019 which was the latest year with full year data.

3.8. Allocation

The allocation is performed in which the product output fixed to 1 m2 and the corresponding amount of product is used in the calculations.

Average values for 1m2 of the product which is used within this study is calculated by considering the total product weight per annual production. According to this, the total energy consumption, used packaging materials and product-based waste are divided by the total annual production. Since the formulation of each product is certain, base materials do not need to be allocated. The damaged end products which are shredded are calculated by scaling the annual casualties to the annual production.

In the factory, several kinds of non-metal ceiling tiles are produced. Since the production processes of these products are similar, the annual production percentages are taken into consideration to allocate energy consumption. Additionally, since the energy used in dryer is different for each product, the energy consumption of oven is monitored separately and allocated for each product.

3.9. Comparability

A comparison or evaluation of EPD data is only possible if all data sets to be compared are 1) created according to EN 15804 and 2) are considered in a whole building context or utilize identical defined use stage scenarios. Comparisons are only allowable when EPDs report cradle-to-grave information using a functional unit. For further information refer to section 5.3 of EN 15804.

4. LCA: Results

For the results of life cycle assessment according to relevant PCR, the following life cycle stages and information modules are considered;

- **Module A1 / Raw material supply:** This stage covers the extraction/production of the raw materials. The environmental impacts of raw material supply include emissions generated when raw materials are taken from nature, transported to industrial units for processing and processed, along with waste handling from the various production processes.
- **Module A2 / Transport:** This stage covers the delivery of the base materials and the packaging materials. The considered transportation impacts include exhaust emissions resulting from transportation of raw materials from suppliers to manufacturing facilities as well as the environmental impacts of production of the diesel used. The manufacturing, maintenance and disposal of the vehicles as well as tire and road wear during transportation have also been included.
- **Module A3 / Manufacturing:** This stage includes the production processes of the final product in the factory as gate to gate processes. The study considers also energy consumption, packaging materials and waste generation during the manufacturing processes. Also, the transmission losses of energy have been included.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)																
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly / Install	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

4.1. Scaling Factor to Thicknesses

Environmental performance results are presented per declared unit, defined as 1 m^2 of ceiling tile with 15 mm thickness. Environmental impacts per 1 m^2 of ceiling tile with alternative thicknesses can be calculated by multiplying the results (given in the sections 4.2 and 4.3) by the scaling factors presented in the table below.

Thickness	15 mm	19 mm	25 mm	38 mm
Scaling Factor	1.00	1.13	1.35	1.80

4.2. Life Cycle Impact Assessment Results

USG ME 1m² LOUNA™ (thickness: 15 mm)						
North American LCA Environmental Impact Results Method: TRACI 2.1 Impact Assessment, October 2013			PRODUCT STAGE			
Parameter		**Unit**	**A1-A3**	**A1**	**A2**	**A3**
GWP	Global warming potential	[kg CO_2 Eq.]	3.59E+00	3.13E+00	2.07E-01	2.51E-01
ODP	Stratospheric ozone layer depletion potential	[kg CFC-11 Eq.]	3.18E-07	2.48E-07	4.94E-08	2.08E-08
AP	Acidification potential	[kg SO_2 Eq.]	2.17E-02	2.00E-02	1.11E-03	5.75E-04
EP	Eutrophication potentials	[kg N Eq.]	1.04E-02	9.90E-03	2.08E-04	3.40E-04
POCP	Photochemical ozone creation potential	[kg O_3 Eq.]	2.08E-01	1.82E-01	1.76E-02	8.43E-03
ADP	Abiotic resource depletion potential – fossil fuels	[MJ, LHV]	4.47E+00	3.36E+00	4.42E-01	6.69E-01

USG ME 1m² LOUNA™ (thickness: 15 mm)						
EU and ROW Life Cycle Environmental Impact Results Method: CML 4.1 Impact Assessment (EN 15804:2012 + A1:2013)			PRODUCT STAGE			
Parameter		**Unit**	**A1-A3**	**A1**	**A2**	**A3**
GWP	Global warming potential	[kg CO_2 Eq.]	3.72E+00	3.25E+00	2.09E-01	2.58E-01
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC-11 Eq.]	2.54E-07	2.01E-07	3.71E-08	1.57E-08
AP Air	Acidification potentials for air emissions	[kg SO_2 Eq.]	2.30E-02	2.13E-02	1.09E-03	5.72E-04
EP	Eutrophication potentials	[kg $(PO4)^{3-}$ Eq.]	5.43E-03	5.10E-03	1.55E-04	1.79E-04
POCP	Formation potential of tropospheric ozone	[kg ethane Eq.]	1.43E-03	1.33E-03	4.28E-05	5.24E-05
ADP elements	Abiotic depletion potential for non-fossil resources	[kg Sb Eq.]	2.23E-04	2.17E-04	5.09E-06	1.24E-06
ADP fossil fuels	Abiotic depletion potential for fossil resources	[MJ, LHV]	5.29E+01	4.48E+01	3.04E+00	5.03E+00

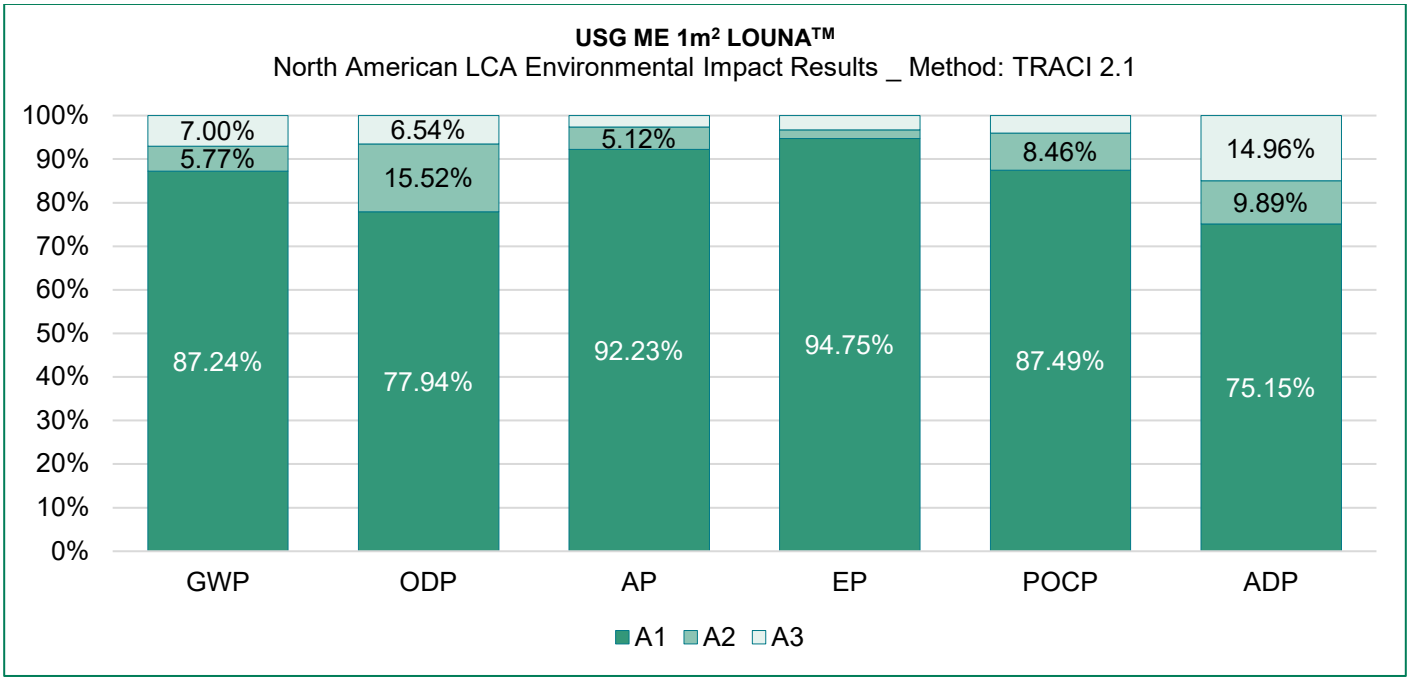
4.3. Life Cycle Inventory Results

USG ME 1m² LOUNA™ (thickness: 15 mm)						
LCA Results: Resource Use			PRODUCT STAGE			
Parameter		**Unit**	**A1-A3**	**A1**	**A2**	**A3**
PERE	Renewable primary energy as energy carrier	[MJ, LHV]	4.10E-02	0.00E+00	4.09E-02	7.09E-05
PERM	Renewable primary energy resources as material utilization	[MJ, LHV]	3.86E+00	3.65E+00	0.00E+00	2.14E-01
PERT	Total use of renewable primary energy resources	[MJ, LHV]	3.90E+00	3.65E+00	4.09E-02	2.14E-01
PENRE	Non-renewable primary energy as energy carrier	[MJ, LHV]	3.11E+00	0.00E+00	3.10E+00	5.06E-03
PENRM	Non-renewable primary energy as material utilization	[MJ, LHV]	5.27E+01	4.75E+01	0.00E+00	5.17E+00
PENRT	Total use of non-renewable primary energy resources	[MJ, LHV]	5.58E+01	4.75E+01	3.10E+00	5.18E+00
SM	Use of secondary material	[MJ, LHV]	2.19E-02	2.00E-02	1.26E-03	6.85E-04
RSF	Use of renewable secondary fuels	[MJ, LHV]	4.67E-02	4.29E-02	1.44E-03	2.37E-03
NRSF	Use of non-renewable secondary fuels	[MJ, LHV]	2.27E-02	1.62E-02	5.73E-03	7.59E-04
FW	Use of net fresh water	[m³]	3.78E+00	3.60E+00	3.82E-02	1.43E-01
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water					

USG ME 1m² LOUNA™ (thickness: 15 mm)						
LCA Results: Resource Use			PRODUCT STAGE			
Parameter		**Unit**	**A1-A3**	**A1**	**A2**	**A3**
HWD	Hazardous waste disposed	[kg]	2.94E-01	2.85E-01	3.18E-03	6.03E-03
NHWD	Non-hazardous waste disposed	[kg]	5.44E+00	5.06E+00	1.95E-01	1.88E-01
RWD	Radioactive waste disposed	[kg]	9.93E-05	7.45E-05	2.13E-05	3.47E-06
CRU	Components for re-use	[kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	Materials for recycling	[kg]	1.43E-02	1.29E-02	1.10E-03	3.29E-04
MER	Materials for energy recovery	[kg]	6.16E-04	5.64E-04	1.59E-05	3.65E-05
EE	Exported energy	[MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy					

5. LCA: Interpretation

When the LCA environmental impact results in the graph below are assessed, it is seen that Module A1 has the biggest share in all of the impact categories because of the raw materials' production and extraction processes. It can be said that the transportation process considered under Module A2 and the manufacturing process such as consumed energy, generated waste which is calculated within Module A3 do not have significant shares while they are compared with the Module A1. Thus, Module A1 is the most important impact category which should be taken into consideration to decrease the product's environmental impacts. Any strategy to decrease GWP will also help decreasing the other environmental impacts as well.



The suggested scenarios below will be helpful to decrease the environmental impacts of the product.

- Module A1: Alternative raw materials or recycled raw materials may be used in the product. In case the quality and the properties of the product for the indicated conditions will not change, the thicknesses may be decreased.
- Module A2: Closer locations to transfer raw materials and sustainable transportation methods may be preferred (if possible) in order to decrease the impact of the transportation even if it will not affect the results much.
- Module A3: Renewable energy sources may be used, and sustainable waste management may be applied during production even if it will not affect the results much.

Sensitivity Analysis: Paint has GWP by 13%-26% from the thickest product to the thinnest product. Preferring to produce unpainted products will decrease the painted products' GWP by 13%-26% in accordance with the thicknesses. Glass wool has GWP by 62%-80% from the thinnest product to the thickest product. Therefore, in case there is an option to use recycled glass wool, it may be also taken into consideration to decrease GWP.

6. References

LCA REPORT

LCA Report for USG ME LOUNA™, August 2020

UL ENVIRONMENT

UL Environment General Program Instructions April 2015, version 2

PCR Part A: UL Environment and Institute of Construction and Environment e.V., Konigswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. July 2014, version 1.3

UL Environment: PCR Guidance for Building-Related Products and Services; Part B: Non-Metal Ceiling Panel EPD Requirements; October 2015, version 1

SUSTAINABILITY REPORTING STANDARDS

EN ISO 14025:2011-10 Environmental labels and declarations: Type 3 Environmental Declarations Principles and Procedures

ISO 21930:2017 Sustainability inbuilding construction - Environmental declaration of building products

EN 15804:2012-04+A1 2013 Sustainability of construction works: Environmental Product Declarations. Core Rules for the Product Category of Construction Products

EN ISO 9001:2015 Quality Management System Requirements

ISO 14001:2004 Environmental Management System Requirements Standard

OHSAS 18001:2007 Occupational Health and Safety Management Systems Standard

One Click LCA Flexible EPD Tool with Ecoinvent v3.6 database

CML 2001. Impact assessment developed by the Institute of Environmental Sciences, Leiden University, The Netherlands, and is published in a handbook with several different authors

TRACI 2.1. Tool for the Reduction and Assessment of Chemical and other environmental Impacts 2.1

ENVIRONMENTAL PRODUCT DECLARATION

USG ME LOUNA™
ACOUSTICAL CEILING TILE

According to ISO 14025, ISO 21930:2007 & EN 15804

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