Environmental Product Declaration

Tectum® I Roof Deck Panels

Tectum® I
Roof Deck Panels

Armstrong® BUILDING SOLUTIONS

Committed to Sustainability.

Armstrong World Industries is committed to delivering solutions that reduce the environmental impact of the buildings you create; from product design and raw material selection, to how our products are produced and delivered.

Now we provide Environmental Product Declarations (EPDs) to document the sustainability of our products. Inside this UL Environment certified ISO compliant EPD you will find:

- Performance features like acoustics, light reflectance, and durability
- Product application and use
- Product ingredients and their sources
- Information on how a roof deck is produced
- Life Cycle Assessment (LCA) results including global warming potential and primary energy usage
- Total impacts over the life cycle of the product

Tectum® roof deck panels deliver a superior combination of performance attributes – excellent sound absorption, textured aesthetics, and a reduced environmental footprint – making it a great product for commercial applications.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
UL.COM/EPD

1. General Information

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 OPERATOR	Armstrong World Industries
DECLARATION NUMBER	4787863341.101.1
DECLARED PRODUCT	**Tectum®** – I Roof Deck Panels
REFERENCE PCR	PCR Guidance for Building Related Products and Services, From the range of Environmental Product Declarations of UL Environment: “Part B: Non-Metal Ceiling Panel EPD Requirements,” October 2015v1.
DATE OF ISSUE	December 13, 2017
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:	Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ EXTERNAL	 Wade Stout, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Thomas Gloria, Industrial Ecology Consultants

2. Product System Documentation

2.1 Product Description

Armstrong® Tectum® I roof deck panels are cementitious wood fiber (excelsion). The wood fiber comes from a single source that is Forest Stewardship Council certified. Panels are Class A fire-retardant. Tectum roof deck panels are manufactured by Armstrong World Industries in Newark, OH.

2.2 Application

Structural acoustic roof deck panels. The system must be installed in accordance with Armstrong® installation guidelines. For installation instructions visit armstrongbuildingsolutions.com/tectum.

2.3 Technical Data

There are different levels of performance associated with composite Tectum. Performance information is included in this EPD to provide a total understanding of this product and its performance attributes.

Performance of Tectum® I Roof Deck Panels

Items Included in this EPD	Attributes		
Tectum® I Roof Deck		NRC* 	CAC** 
	Tectum I Roof Deck	Up to 0.80* Thickness dependent	NA
	*For information on other Tectum products, visit http://www.armstrongbuildingsolutions.com/tectum.		
	**Maximum NRC is dependent on panel thickness and installation method.		

2. Product System Documentation (continued)

2.4 Placing On the Market/Application Rules

The respective standard is listed in the table in Section 2.3 above for each attribute of the declared product.

EN ISO 14025:2006, Environmental labels and declarations – Type III – Environmental declarations – Principles and procedures

EN 14040 ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework

EN 14044 ISO 14044:2006, Environmental management – Life cycle assessment – Requirements and guidelines

ASTM E1264-08e1 Standard Classification for Acoustic Ceiling Products

ASTM E84-12 Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM C518-10 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

ASTM C423-09a Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

ASTM E1414 / E1414M-11a Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

ASTM E1110-06 (2011) Standard Classification for Determination of Articulation Class

ASTM E1111 (2007) Test Method for Measuring the Interzone Attenuation of Ceiling Systems

2.5 Delivery Status

Tectum® roof deck panels are well packaged in a variety of recyclable corrugated sleeves and box styles. Wooden pallets are used to protect unit loads during shipping.

2. Product System Documentation (continued)

2.6 Material Content

- **Aspen Wood Fiber Core** – a core made of a renewable source – aspen wood fiber.
- **Primary Binder** – a mix of magnesium sulfate and magnesium oxide form a primary binder.
- **Secondary Binder** – sodium silicate and calcium carbonate create a secondary binder.
- **Coating** – applied to the face of the panel.

Figure 1. Composition of Tectum® I Roof Deck Panel

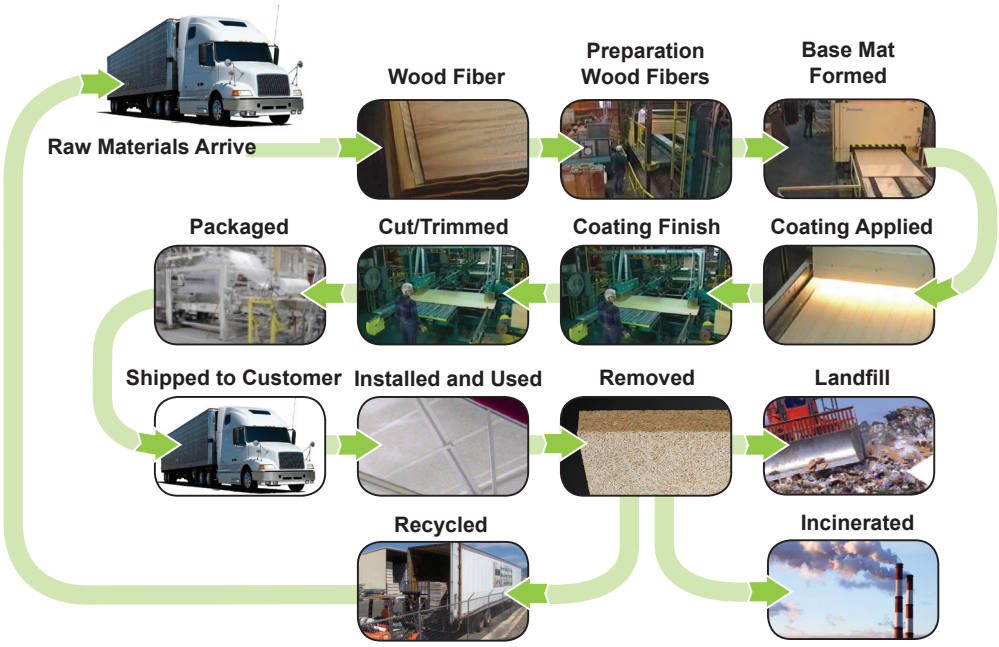
Material Content of Tectum® I Roof Deck Panels

Mineral Fiber	Finished Product	Renewable	Abundant	Origin	Transportation
Aspen Wood Fiber	40-60%	■	■	US	Truck
Magnesium Oxide	20-30%	■	■	US	Truck
Sodium Silicate	10-20%	■	■	US	Rail
Magnesium Sulfate	1-10%	■	■	US	Rail
Calcium Carbonate	1-10%	■	■	US	Truck
Coating	1-5%			US	Truck

2. Product System Documentation (continued)

2.7 Manufacture

Figure 3: Process for Manufacturing Tectum® I Roof Deck



Aspen wood fibers are shipped to the plant in bales (similar to hay bales) and “combed” and separated. The fibers are then coated with a binder solution to form the base mat. The conveyor assists in forming, and creates the outer edges of the base mat. A tenor board then flattens the top of the mat, and once a base is formed, a final coat of binder is applied.

In the finishing process, steam is introduced to the mat and run through a press to create a reaction with the binder that results in the desired panel thickness. The mat is flood-coated with a finishing solution to add filler, strength,and machinability to the panel. The mat flows through numerous dryers; edges are trimmed; and the mat is cut into desired finished panels using carbide-tip saws. The final product is then packaged for shipment.

2.8 Health, Safety, and Environmental Aspects During Manufacturing

Armstrong World Industries has a comprehensive environmental, health, and safety management program. Risk reduction begins in the product design process. All products go through a safety, health, and environmental review prior to sale. Armstrong also has a long standing commitment to the safety and health of all our employees. The company’s safety management program is considered to be World Class. Our OSHA recordable incident rate is below 1.0, meaning that there is less than one injury per 100 employees per year. All employees view safety as a key responsibility of their jobs. In 2010, Armstrong was named one of “America’s Safest Companies” by EHS Today.

Armstrong World Industries is equally committed to reducing our environmental impact. As with safety goals, each manufacturing facility has environmental initiatives focused on responsible use of energy and water, and on waste reduction.

2.9 Installation of Roof Deck Panels

The roof deck must be installed in accordance with Armstrong® installation guidelines. You can reference this document at www.armstrongbuildingsolutions.com/tectum

2. Product System Documentation (continued)

2.10 Packaging

Armstrong® Tectum® I roof deck panels are well packaged in a variety of recyclable corrugated sleeves and box styles. Wooden pallets are used to protect unit loads during shipping.

2.11 Condition of Use

It is very important that Tectum roof deck materials be allowed to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation. The panels should not, however, be installed in spaces where the temperature or humidity conditions vary greatly from the temperatures and conditions that will be normal in the occupied space. Relative humidity shall not fall below 25% or exceed 55%.

2.12 Health, Safety, and Environmental Aspects During Installation

Sawing, sanding, and machining wood products can produce dust. Airborne wood dust can cause respiratory, eye, and skin irritation. The International Agency for Research on Cancer (IARC) has classified wood dust as a nasal carcinogen in humans.

Precautionary Measures: If power tools are used, they should be equipped with a dust collector. If high dust levels are encountered, use an appropriate NIOSH-designed dust mask. Avoid dust contact with eyes and skin.

First Aid Measure in Case of Irritation: Flush eyes or skin with water for at least 15 minutes.

Installers should wear appropriate personal protective equipment, such as gloves and safety glasses, to minimize exposure to dust and the potential for skin irritation.

2.13 Reference Service of Life

The system is warranted for 15 years; however, roof deck panels can last as long as the building's useful life if properly installed and maintained. The useful life indicated in the PCR for roof deck is 75 years. Warranty details can be found on each product page at http://www.armstrongbuildingsolutions.com/tectum

2.14 Extraordinary Effects

- **Fire Performance**

  ASTM E84 surface burning characteristics, HPVA Certified with audit program per ASTM E84. Flame Spread Index 25 or less. Smoke Developed Index 50 or less.

  CAN/ULC S102 surface burning characteristics. Flame Spread Rating 25 or less. Smoke Developed Classification 50 or less.

  ASTM E1264 Classification: Composite – Fire Class A.

2. Product System Documentation (continued)

2.15 Disposal

Disposal in municipal landfill or commercial incineration facilities is permissible and should be done in accordance with local, state, and federal regulations.

3. Life Cycle Assessment

This study provides life cycle inventory and environmental impacts relevant to Armstrong® Tectum® I roof deck panels. This LCA was conducted to 1) better understand the environmental impacts of the life cycle of Tectum I roof deck panels; 2) learn how the impacts of raw material selection, product formulation, and manufacturing process influence the life cycle impacts of Tectum I roof deck panels.

The methods for conducting the life cycle assessments used for this project were consistent with ISO 14040, 14044 and EN15804. This report is intended to fulfill the reporting requirements in Section 5 of ISO 14044 and Product Category Rules Guidance for Building-Related Products and Services Part B: Non-Metal Ceiling Panel EPD Requirements.

3.1 Declared and Functional Unit

The declared unit for this EPD is 1 ft^2 of Tectum I roof deck panels in use over 75 years.

Tectum® 3" Board	
Declared Unit	1 ft^2
Declared Thickness (inches)	3
Surface Weight (lb/ft^2)	6.250
Declared Unit	1 m^2
Declared Thickness (cm)	7.620
Surface Weight (kg/m^2)	30.513

3. Life Cycle Assessment (continued)

3.2 System Boundaries:

The system boundaries studied as part of this life cycle assessment include extraction of primary materials, raw materials manufacture, panel production, installation, and end of life.

The phases below outline a “cradle-to-grave” life cycle assessment for roof deck panels.

Roof Deck Panels:

The Cradle-to-Grave Assessment Includes:

– Raw materials production including substrate, coating, and packaging materials for roof deck panels
– Transportation of raw materials to a Tectum® manufacturing facility
– Manufacturing of the roof deck panels at a Tectum manufacturing facility
– Packaging of finished products including energy to operate packaging equipment
– Transportation from manufacturing facility to distribution centers, retailers, and job site (assumed to be 500 miles by truck)
– Use phase covers a useful life of 75 years as suggested in the PCR and includes the transportation and installation of the system
– End of life includes landfill disposal of roof deck panels with assumed 50 miles truck transport from job site to landfill

The Cradle-to-Grave Assessment Excludes:

– Overhead energy usage (heating, lighting) of manufacturing facilities
– Maintenance and operation of support equipment

3.3 Assumptions:

There are no specific assumptions to list that are not dealt with in the appropriate section. When an assumption is made it will be described within the specific stage of the report. As an example a 7% waste factor was utilized for the waste generated during the installation of the product. This is described in more detail within the installation section of the report.

3.4 Cut-off Criteria:

– Mass – If a flow is less than 1% of the cumulative mass of the model, it is excluded, providing its environmental relevance is not a concern.
– Energy – If a flow is less than 1% of the cumulative energy of the model, it is excluded, providing its environmental relevance is not a concern.
– Environmental relevance – If a flow meets the above criteria for exclusion, yet is believed to potentially have a significant environmental impact, it is included.

3. Life Cycle Assessment (continued)

3.5 Background Data:

All data is reported as a North American weighted average across our roof deck plant locations. All Tectum® panels are manufactured Newark, OH and are shipped all across North America. Shipping data was utilized to determine that the average shipping distance from manufacturing to customer is approximately 2,240 miles. If product is not recycled, disposal transportation at end of life is assumed to be 50 miles.

3.6 Data Quality:

Data for the Tectum panel was provided by our manufacturing location and is believed to be high quality and consistent with industry data.

The LCA model was created using the GaBi Software system for life cycle engineering, developed by Think Step. The GaBi database provides the life cycle inventory data for several of the raw and process materials obtained from the background system. The data quality is considered to be good to high quality. With the exception of supplier specific data, all other relevant background data was taken from the GaBi database software.

All gate-to-gate, primary foreground data was collected for the roof deck manufacturing process. Background data was collected from suppliers or generic data was used. When generic data was used, it was verified and triangulated against several sources.

3.7 Period Under Review

Calendar year 2017 manufacturing data was used to create the LCA model.

3. Life Cycle Assessment (continued)

3.8 Allocation:

No allocation was performed within the modeling of Armstrong World Industries unit processes for Tectum® panels. Credits for electricity and heat gained from thermal recycling of waste and packaging in a solid waste incinerator and/or landfill were not taken in this study.

4. LCA: Scenarios and Additional Technical Information

- **Roof Deck Panel Impacts:**

  The majority of the environmental impacts for this product occur during the extraction and processing of raw materials detailed in the Production Stage. For most roof deck panels, the opportunity for reduction is in the manufacturing process as well as reductions associated with raw materials.

- **Use Stage:**

  Although Armstrong World Industries provides a 15-year roof deck system warranty, the use stage is defined in the PCR at 75 years and this is what was used in the LCA. The assumption is that the roof deck system requires no cleaning or maintenance so the impact is very small.

- **End of Life Impacts:**

  End of Life impacts associated with landfilling and/or incineration of Tectum panels range from 5% to 58% of all impact categories. For example, End of Life represented approximately 30% of the overall Global Warming Potential impacts for a Tectum tile.

Transport To The Building Site (A4)

Name	Unit	Tectum®
Liters of fuel	l/100 km	3.41E+03
Transport distance	km	8.05E+02
Capacity utilization (including empty runs)	%	6.70E+01
Gross density of products transported	kg/m^3	8.50E-01
Capacity utilization volume factor	–	1.00E+00

4. LCA: Scenarios and Additional Technical Information (continued)

Installation Into The Building (A5)

Parameter	Unit	1 m^2	1 ft^2
Auxiliary	kg	0	0
Water Consumption	m^3	0	0
Other Resources	kg	0	0
Electricity Consumption	kWh	0	0
Other Energy Carriers	MJ	0	0
Material Loss	kg	1.65E-01	1.53E-02
Roof Deck Panel Mounting System (RDPMS)	kg	1.12E+00	1.04E-01
Roof Deck Panel Mounting System (RDPMS)	%	4%	4%
Output substances following waste treatment on site	kg	0.0000	0.0000
Dust in air	kg	negligible	negligible
VOC in Air	kg	negligible	negligible

Installation Into the Building

There is no energy or water use required for the roof deck installation. For roof deck systems, a 7% waste factor was assumed on site during construction. This value is based on historic internal studies which have documented the quantity of scrap that are generated at the job site due to needed cuts (to allow for the installation of sprinkler heads, for example) or mistakes. It is assumed that all of the on-site scrap material will be sent to a landfill located within 50 miles of the jobsite.

End of Life

The end of life phase for the roof deck panels was included in the study. End of life impacts include disposal of panels, scrap, and packaging at the end of installation. The study was also conservative in the fact that it did not take credit for any energy that was recovered in the incineration of landfill process.

5. LCA: Results

The Life Cycle Assessment (LCA) was performed according to ISO 14040 and follows the PCR instructions. The cradle-to-grave LCA encompasses raw material production; transport of raw materials to production facility; manufacturing of roof deck panels; packaging; transportation to job site; use phase; and end of life including disposal or recycling.

Table 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				Benefits and Loads Beyond the System Boundaries	
	Raw Material supply	Transport	Manufacturing	Transport from gate site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling potential	RSL
EPD type	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**	
Cradle to grave – m^2																		
	All A – C modules mandatory																	75 Yrs
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Life Cycle Environmental Impact Results: 1 m^2 Tectum® Panel

Declared Unit: 1 m^2 of panels for use over 75 years, impacts based on U.S. EPA TRACI 2.1 Impact Factors

Table 2. North American LCA Environmental Impact Results

Parameter	Parameter	Unit	1 m^2	1 ft^2
GWP	Global warming potential	kg CO^2- Eq.	2.15E+01	1.99E+00
ODP	Stratospheric ozone layer depletion	kf CFC-11 Eq.	3.56E-10	3.31E-11
AP	Acidification potential	kg SO^2- Eq.	6.76E-02	6.28E-03
EP	Eutrophication potential	kg N- Eq.	3.74E-03	3.48E-04
POCP	Photochemical ozone creation potential	kg O_3- Eq.	1.29E+00	1.20E-01
ADP	Abiotic resource depletion potential - fossil fuels	Surplus energy per extracted MJ, kg or m^3 fossil fuel as a result of lower quality resources	2.41E+01	2.24E+00

5. LCA: Results (continued)

Table 3. LCA Results: Resource Use

LCA RESULTS – RESOURCE USE 1 m² TECTUM®				
Parameter	**Parameter**	**Unit**	**1 m²**	**1 ft²**
PERE	Renewable primary energy as energy carrier	MJ, LHV	2.13E+02	1.98E+01
PERM	Renewable primary energy resources as material utilization	MJ, LHV	0	0
PERT	Total use of renewable primary energy resources	MJ, LHV	2.13E+02	1.98E+01
PENRE	Non-renewable primary energy as energy carrier	MJ, LHV	2.21E+02	2.06E+01
PENRM	Non-renewable primary energy as material utilization	MJ, LHV	0	0
PENRT	Total use of non-renewable primary energy resources	MJ, LHV	2.21E+02	2.06E+01
SM	Use of secondary material	MJ, LHV	0	0
RSF	Use of renewable secondary fuels	MJ, LHV	0	0
NRSF	Use of non-renewable secondary fuels	MJ, LHV	0	0
FW	Use of net fresh water	m³	3.04E+01	2.83E+00

Table 4. LCA Results: Output Flows and Waste Categories

LCA RESULTS: OUTPUT FLOWS AND WASTE CATEGORIES 1 m² TECTUM®				
Parameter	**Parameter**	**Unit**	**1 m²**	**1 ft²**
HWD	Hazardous waste disposed	kg	0	0
NHWD	Non-hazardous waste disposed	kg	3.78E-01	3.51E-02
RWD	Radioactive waste disposed	kg	0	0
CRU	Components for re-use	kg	0	0
MFR	Materials for recycling*	kg	0	0
MER	Materials for energy recovery	kg	0	0
EE	Exported energy	MJ, LHV	0	0

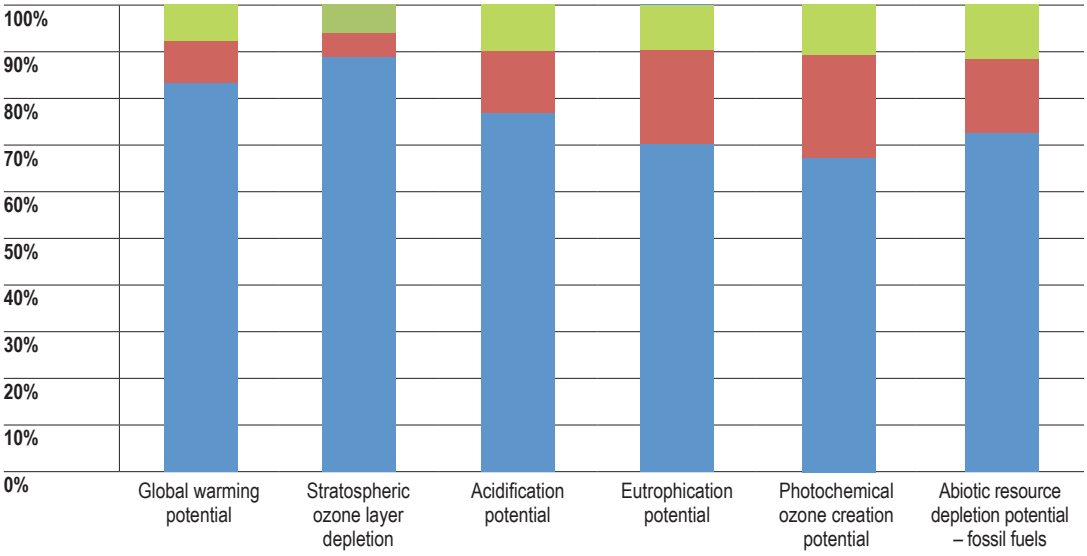
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use;
MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy

6. LCA: Interpretation

From the results of the Tectum® life cycle covered in this study, it was concluded that the panel manufacturing process and raw materials have the greatest impact on Primary Energy Demand (PED) and "carbon footprint" (represented by Global Warming Potential [GWP]).

Life Cycle Impact Assessment of Tectum® I Roof Deck Panels[1] relative importance in percentage terms for the Production, Use, and End of Life stages for the roof deck panel.

[1] Based on U.S. EPA TRACI 2.1 Impact Factors



7. References

PCR

UL Environment

UL Environment General Program Instructions April 2015, version 2

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 – Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006 – 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: 2007 – Sustainability in building construction – Environmental declaration of building products

Testing And Classification References

ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

ASTM C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustic Panel and Lay-in Panels

ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials

ASTM E1110 – Standard Classification for Determination of Articulation Class

ASTM E1111 – Standard Test Method for Measuring the Interzone Attenuation of Open Office Components

ASTM E1264 – Standard Classification for Acoustical Ceiling Products

ASTM E1414 – Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

ASTM E1477 – Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers

ASTM E413 – Classification for Rating Sound Insulation

CA Specification 01350 Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1

7. References (continued)

Relevant Federal Standards and SOPS

Environment Canada, National Pollutant Release Inventory (http://www.ec.gc.ca/inrp-npri/)

EPCRA 313 Toxic Release Inventory Reporting (U.S.) (http://www2.epa.gov/toxics-release-inventory-tri-program)

US EPA, ORD/NRMRL/Sustainable Technology Division, Systems Analysis Branch, SOP No. S-10637- OP-1-0- Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI), Software Name and Version Number: TRACI version 2.1, USER'S MANUAL, 24 July, 2012

US: Resource Conservation and Recovery Act (RCRA), Clause C (http://www.epa.gov/region6/rcra/)

Relevant PCRs

PCR Guidance for Building Related Products and Services, From the range of Environmental Product Declarations of UL Environment: "Part B: Non-Metal Ceiling Panel EPD Requirements", October 2015v1.

UL Environment General Program Instructions April 2015, version 2

PCR Part A: UL Environment and Institute of Construction and Environment e.V., Königswinter (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

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 – Environmental management – Life cycle assessment – Principles and framework

ISO 14044:2006 – Environmental management – Life cycle assessment – Requirements and guidelines

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