



**Declaration Owner**

Tate Access Floors, Inc.  
7510 Montevideo Rd.  
Jessup, Maryland 20794  
Phone: 410-799-4200  
<https://www.tateinc.com>

**Products:**

STONEWORKS™ Concrete Access Floor Panel

**Functional Unit**

The functional unit is one square meter of installed floor panel with a reference service life (RSL) of 50 years

**EPD Number and Period of Validity**

SCS-EPD-10330  
EPD Valid March 12, 2025 through March 11, 2030

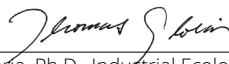
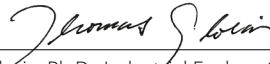
**Product Category Rule**

IBU Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019. Version 1.4. 2024.  
IBU Part B: Requirements on the EPD for System floors. Version 1.1, 2024.  
Addendum for Adapting the IBU PCR Part B for use in North America: Guidance to the IBU Part B: Requirements on the EPD for System Floors. 2025.

**Program Operator**

SCS Global Services  
2000 Powell Street, Ste. 600, Emeryville, CA 94608  
+1.510.452.8000 | [www.SCSglobalServices.com](http://www.SCSglobalServices.com)



|                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Declaration owner:                                                                                  | Tate Access Floors, Inc.                                                                                                                                                                                                                                                                                                                                                                 |
| Address:                                                                                            | 7510 Montevideo Rd. Jessup, MD 20794                                                                                                                                                                                                                                                                                                                                                     |
| Declaration Number:                                                                                 | SCS-EPD-10330                                                                                                                                                                                                                                                                                                                                                                            |
| Declaration Validity Period:                                                                        | EPD Valid March 12, 2025 through March 11, 2030                                                                                                                                                                                                                                                                                                                                          |
| Program Operator:                                                                                   | SCS Global Services                                                                                                                                                                                                                                                                                                                                                                      |
| Declaration URL Link:                                                                               | <a href="https://www.scsglobalservices.com/certified-green-products-guide">https://www.scsglobalservices.com/certified-green-products-guide</a>                                                                                                                                                                                                                                          |
| LCA Practitioner:                                                                                   | Riley Tesman, SCS Global Services                                                                                                                                                                                                                                                                                                                                                        |
| LCA Software and LCI database:                                                                      | OpenLCA 2.1.1 software and the Ecoinvent v3.10 database                                                                                                                                                                                                                                                                                                                                  |
| Product's Intended Application:                                                                     | Raised floor panel                                                                                                                                                                                                                                                                                                                                                                       |
| Product RSL:                                                                                        | 50 years                                                                                                                                                                                                                                                                                                                                                                                 |
| Markets of Applicability:                                                                           | US (Domestic)                                                                                                                                                                                                                                                                                                                                                                            |
| EPD Type:                                                                                           | Product-Specific                                                                                                                                                                                                                                                                                                                                                                         |
| EPD Scope:                                                                                          | Cradle-to-Grave                                                                                                                                                                                                                                                                                                                                                                          |
| LCIA Method and Version:                                                                            | EN 15804+A2, TRACI 2.1                                                                                                                                                                                                                                                                                                                                                                   |
| Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071               | <input type="checkbox"/> internal <input checked="" type="checkbox"/> external                                                                                                                                                                                                                                                                                                           |
| LCA Reviewer:                                                                                       | <br>Thomas Gloria, Ph.D., Industrial Ecology Consultants                                                                                                                                                                                                                                               |
| Product Category Rule:                                                                              | IBU Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019. Version 1.4. 2024.<br>IBU Part B: Requirements on the EPD for System floors. Version 1.1, 2024.<br>SCS Addendum for Adapting the IBU PCR Part B for use in North America: Guidance to the IBU Part B: Requirements on the EPD for System Floors. 2025. |
| PCR Review conducted by:                                                                            | Institut Bauen und Umwelt e.V., (IBU).                                                                                                                                                                                                                                                                                                                                                   |
| Independent verification of the declaration and data, according to ISO 21930, ISO 14025 and the PCR | <input type="checkbox"/> internal <input checked="" type="checkbox"/> external                                                                                                                                                                                                                                                                                                           |
| EPD Verifier:                                                                                       | <br>Thomas Gloria, Ph.D., Industrial Ecology Consultants                                                                                                                                                                                                                                             |
| Declaration Contents:                                                                               | 1. Declaration Owner and Product Description..... 2<br>2. Scope of the Study ..... 4<br>3. Technical Information and Scenarios..... 7<br>4. LCA Results..... 16<br>5. LCI Results ..... 19<br>6. Additional Environmental Information..... 21<br>7. References..... 22                                                                                                                   |

**Disclaimers:** This EPD conforms to ISO 14025, 14040, 14044, and EN 15804+A2.

**Scope of Results Reported:** The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.

**Accuracy of Results:** Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.

**Limitations:** Environmental declarations from different programs (ISO 14025) may not be comparable.

Comparison of the environmental performance of floor system Products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the use phase as instructed under this PCR.

Full conformance with the PCR allows EPD comparability only 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 results for upstream or downstream of the life cycle stages declared.

The owner of the declaration shall be liable for the underlying information and evidence; SCS shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence supplied or made available to SCS.

## 1. Declaration Owner and Product Description

### 1.1 Tate Access Floors, Inc.

Tate Access Floors, Inc. referred to here on out as Tate, provides high-performance and sustainable solutions for commercial buildings, offering a wide range of products to improve efficiency and indoor environmental quality through the use of underfloor service distribution. The products include access floors and a wide range of integrated high-end architectural finishes.

### 1.2 Product Description

The STONEWORKS™ Concrete panel access floor system includes a panel and a supporting understructure. The Concrete panel is a concrete slab with a steel reinforcing bottom sheet with an Electrophoretic Painting Process (E-coat) and features a brushed surface texture. The cement and aggregate provide the panel with structural stability for everyday use. The Concrete panel eliminates the need for laminated finishes and as such, the structure of the panel is combined into a single integrated product. The panel is available in 2' x 2' (0.6 m x 0.6 m) module sizes and is installed in a heavy-duty bolted stringer system without the use of corner lock screws.



**Figure 1.** Example image of STONEWORKS™: Classic Concrete panel

### 1.3 Technical Data

System performance criteria for the STONEWORKS™ Concrete panel access floor system are presented below in **Table 1**. The system design load is based on a permanent set  $\leq 0.010''$  and is verified by loading the panel in accordance with the Ceilings & Interior Systems Construction Association (CISCA) Standards and Procedures for concentrated load methods but with panels installed on actual understructure instead of steel blocks. Ultimate, rolling, and impact load tests are performed using CISCA test procedures.

**Table 1.** System performance criteria for each STONEWORKS™ Concrete panel access floor system.

| Panel       | Understructure             | Static Loads         |                       |                | Rolling Loads          |                      | Impact Loads        |
|-------------|----------------------------|----------------------|-----------------------|----------------|------------------------|----------------------|---------------------|
|             |                            | Design Loads         | Ultimate Loads        | Safety Factor* | 10 Passes              | 10,000 Passes        |                     |
| STONEWORKS™ | Heavy-Duty Bolted Stronger | 1250 lbs<br>(567 kg) | 1800 lbs.<br>(817 kg) | 1.44           | 1,000 lbs.<br>(454 kg) | 800 lbs.<br>(363 kg) | 100 lbs.<br>(45 kg) |

Classic Concrete systems are non-combustible and meet a Class A flame spread rating in accordance with the ASTM E-84 test methods. A document for the testing of the panel was provided by Tate [19]. Additionally, The STONEWORKS™ Classic Concrete panel floor system have been tested for Volatile Organic Compounds (VOC) and conform to the CDPH/EHLB Standard Method (CA 01350) v1.2-2017. A document of the VOC emission test certificate was provided by Tate [22].

## 1.4 Product Material Composition

**Table 2.** Material composition of STONEWORKS™ concrete panel and its packaging, including percentage of pre- and post-consumer material.

| Material                                            | Amount<br>(kg/m <sup>2</sup> ) | Percent of Total<br>Weight | Percent Pre-<br>consumer<br>Recycled Content | Percent Post-<br>consumer<br>Recycled Content |
|-----------------------------------------------------|--------------------------------|----------------------------|----------------------------------------------|-----------------------------------------------|
| <b>STONEWORKS™ Classic Concrete Panel</b>           |                                |                            |                                              |                                               |
| Calcium Carbonate                                   | 1.18                           | 2%                         | 0%                                           | 0%                                            |
| Portland Cement                                     | 15.8                           | 21%                        | 20%                                          | 0%                                            |
| Epoxy Resin                                         | 6.59x10 <sup>-3</sup>          | 0%                         | 0%                                           | 0%                                            |
| Expanded Shale                                      | 18.3                           | 25%                        | 100%                                         | 0%                                            |
| Limestone                                           | 17.8                           | 24%                        | 0%                                           | 0%                                            |
| Epoxy Paste                                         | 2.32x10 <sup>-3</sup>          | 0%                         | 0%                                           | 0%                                            |
| Sand                                                | 15.2                           | 21%                        | 0%                                           | 0%                                            |
| Steel                                               | 5.50                           | 7%                         | 8%                                           | 81%                                           |
| Adhesive                                            | 0.12                           | 0%                         | 0%                                           | 0%                                            |
| <b>Total</b>                                        | <b>73.8</b>                    | <b>100%</b>                | -                                            | -                                             |
| <b>STONEWORKS™ Classic Concrete Panel Packaging</b> |                                |                            |                                              |                                               |
| Corrugated box                                      | 0.11                           | 78%                        | 12%                                          | 57%                                           |
| Polyester strap                                     | 0.03                           | 22%                        | 0%                                           | 0%                                            |
| <b>Total</b>                                        | <b>0.358</b>                   | <b>100%</b>                | -                                            | -                                             |

**Table 3.** Material composition of STONEWORKS™ bolted stringer and its packaging, including percentage of pre- and post-consumer material.

| Material                                        | Amount<br>(kg/m <sup>2</sup> ) | Percent of Total<br>Weight | Percent Pre-<br>consumer<br>Recycled Content | Percent Post-<br>consumer<br>Recycled Content |
|-------------------------------------------------|--------------------------------|----------------------------|----------------------------------------------|-----------------------------------------------|
| <b>Bolted Stringer Understructure</b>           |                                |                            |                                              |                                               |
| Galvanized Steel                                | 3.63                           | 60%                        | 18%                                          | 59%                                           |
| Non-Galvanized Steel                            | 2.34                           | 1%                         | 18%                                          | 59%                                           |
| Grey Phosphate Steel                            | 0.11                           | 39%                        | 18%                                          | 59%                                           |
| <b>Total</b>                                    | <b>6.08</b>                    | <b>100%</b>                | -                                            | -                                             |
| <b>Bolted Stringer Understructure Packaging</b> |                                |                            |                                              |                                               |
| Corrugated box                                  | 2.97x10 <sup>-2</sup>          | 12%                        | 0%                                           | 0%                                            |
| Pallet                                          | 0.22                           | 88%                        | 12%                                          | 57%                                           |
| <b>Total</b>                                    | <b>0.25</b>                    | <b>100%</b>                | -                                            | -                                             |

Wood materials are not included in the product system. Therefore, as per the SCS Part B Addendum, measurement methods for the adhesive have been excluded from the report and EPD.

## 2.5 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website at <https://www.tateinc.com>.

## 2. Scope of the Study

### 2.1 FUNCTIONS OF THE PRODUCT SYSTEM

STONEWORKS™ access floor systems provide the primary function of an elevated floor system, allowing access to building services such as wiring and HVAC. The functional unit used in this study, in accordance with the PCR [3], is 1 m<sup>2</sup> of access floor system over a 75-year period. The access floor system includes the panel and its supporting understructure. The expected lifespan, referred to as the reference service life (RSL), of the concrete panel is 50 years. The functional unit and model include product replacement to satisfy a building's expected service life of 75 years. The reference flows for each STONEWORKS™ access floor system is provided below in Table 4

**Table 4.** Declared unit and mass reference of the STONEWORKS™ classic concrete system.

| Name            | Value | Unit              |
|-----------------|-------|-------------------|
| Declared unit   | 1     | m <sup>2</sup>    |
| Grammage        | 79.6  | kg/m <sup>2</sup> |
| Gross density   | 1769  | kg/m <sup>3</sup> |
| Layer thickness | 0.045 | m                 |

## 2.2 SYSTEM BOUNDARY

The system boundary includes the cradle-to-grave life cycle of the floor panel product, including all inputs required and outputs generated from each life cycle module. The modules are described in **Table 5** and a flow diagram illustrating the processes involved within each life cycle module is shown below in **Figure 2**.

**Table 5.** A description of the life cycle phases included in the floor panel product system boundary.

| Module  | Module description from the PCR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Included in System Boundary |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| A1      | <u>Raw Material extraction and upstream production:</u> Includes raw material extraction and processing, as well as processing of secondary material inputs (e.g., recycled or reused materials).                                                                                                                                                                                                                                                                                                                           | x                           |
| A2      | <u>Transport to factory:</u> Covers transport of raw materials and other inputs to the factory and internal transport.                                                                                                                                                                                                                                                                                                                                                                                                      | x                           |
| A3      | <u>Manufacturing:</u> Includes all fuels, electricity, and water used in manufacturing the product; the extraction and upstream production, transport to the factory, and manufacturing of product packaging; transport and treatment of all waste generated at the manufacturing facility.                                                                                                                                                                                                                                 | x                           |
| A4      | <u>Transport to the building site:</u> Includes transport from the manufacturing facility to the building.                                                                                                                                                                                                                                                                                                                                                                                                                  | x                           |
| A5      | <u>Installation:</u> This stage includes the installation of the STONEWORKS™ floor panel.                                                                                                                                                                                                                                                                                                                                                                                                                                   | x                           |
| B1      | <u>Use stage:</u> The use stage includes environmental aspects and impacts arising from normal product use over the 50-year reference service life. There is no release of substances to indoor air, soil, and water from product use and results for this stage are zero.                                                                                                                                                                                                                                                  | X                           |
| B2      | <u>Maintenance:</u> The maintenance stage includes cleaning, planned technical servicing, and the replacement of worn and damaged parts. The STONEWORKS™ panels require cleaning modeled using a moderate traffic level assumption.                                                                                                                                                                                                                                                                                         | X                           |
| B3 – B5 | <u>Repair, Replacement, &amp; Refurbishment:</u> Neither the panel nor the understructure is expected to need any replacement or refurbishing during normal use over the 50-year reference service life, however, replacement is expected 0.5 times over the 75-year expected building life. Repairing of the STONEWORKS™ access floor system is assumed to be irregular and is assumed to have a negligible contribution to environmental impacts arising from normal product use over the 50-year reference service life. | X                           |
| B6 – B7 | <u>Operational energy and water use:</u> There is no operational energy or water use associated with the use of the product and the results for these modules are zero.                                                                                                                                                                                                                                                                                                                                                     | X                           |
| C1      | <u>Deconstruction/demolition:</u> Includes dismantling or demolition, of the construction product from the construction works and the energy use for this, including initial on-site sorting of the materials. There are no additional inputs required to deconstruct this product, so the impact associated with this module is zero.                                                                                                                                                                                      | X                           |
| C2      | <u>Transport to waste processing or disposal:</u> Includes the transportation of the discarded construction product as part of the waste processing, for example to a recycling site and transportation of waste, to final disposal.                                                                                                                                                                                                                                                                                        | x                           |
| C3      | <u>Waste processing for generation of secondary materials (i.e. recycling):</u> Includes the inputs required for recycling impacts from recycling.                                                                                                                                                                                                                                                                                                                                                                          | x                           |
| C4      | <u>Disposal of waste:</u> Includes physical pre-treatment and management of the disposal site, including provision and transport of all materials, products, and related energy and water use                                                                                                                                                                                                                                                                                                                               | x                           |
| D       | Optional supplementary information about the potential net benefits from reuse, recycling and energy recovery beyond the system boundary of the studied product system.                                                                                                                                                                                                                                                                                                                                                     | x                           |

x = Module Included | MND = Module Not Declared

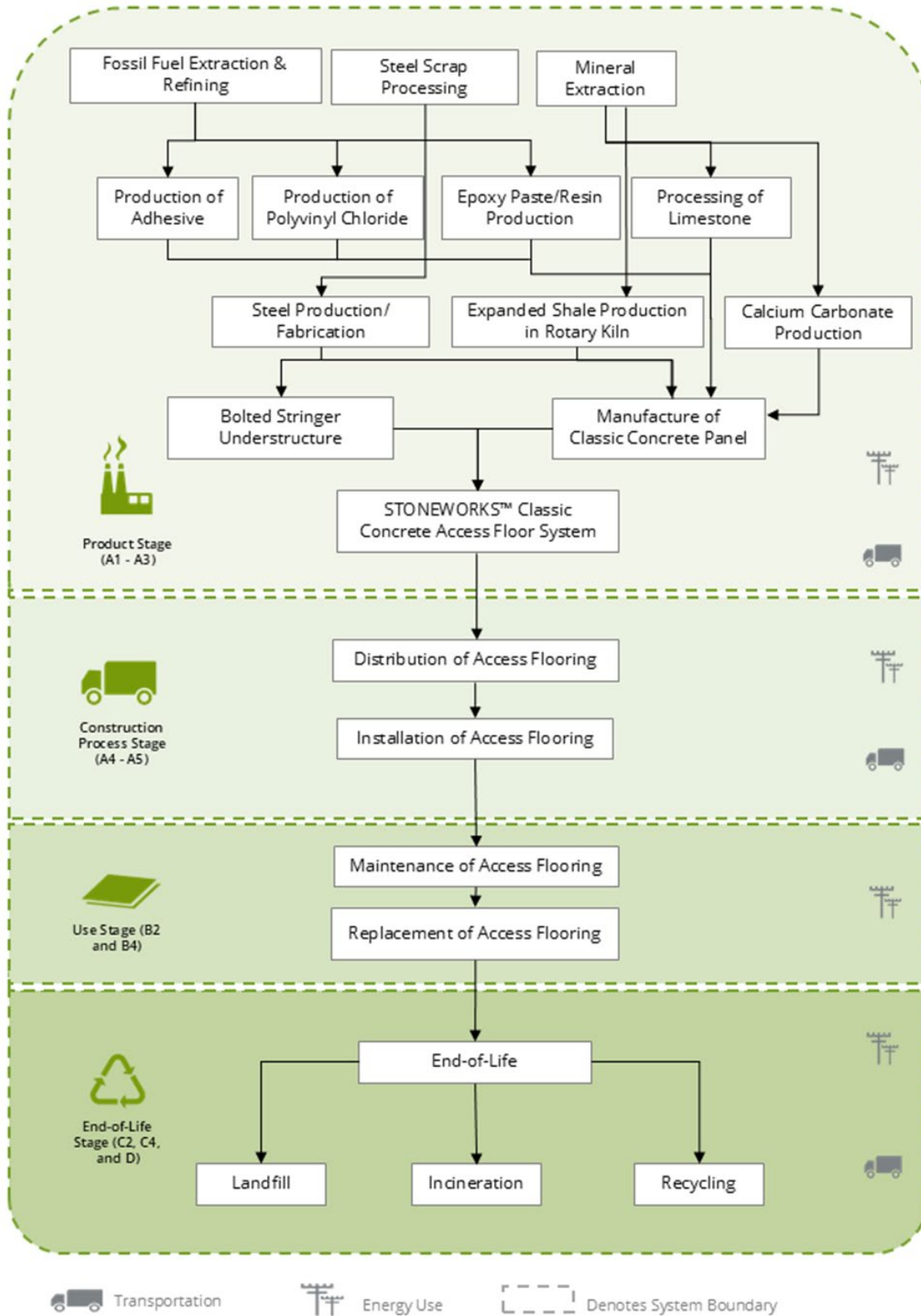


Figure 2. Flow diagram representing the major processes in the life cycle of the STONEWORKS™ access floor systems.

### 3. Technical Information and Scenarios

#### 3.1 LIFE CYCLE MODULES

##### (A1- A3) Raw Material Extraction, Transport, & Manufacturing

These three modules include all of the inputs and outputs necessary to produce the raw materials (A1 module) of the STONEWORKS™ concrete panel (**Table 2**) and the bolted stringer understructure support (**Table 3**), transport these raw materials to the Jessup, Maryland, and Red Lion, Pennsylvania manufacturing facilities (A2 module), and then process the raw materials into the floor panel product (A3 module). The manufacturing module also includes the production of the product packaging.

To manufacture the STONEWORKS™ panel, first, the concrete ingredients are conveyed and dispensed into a mixer where cement and water are added and the ingredients are blended. The mix is then poured into a mold where it is pressed, demolded, and allowed to cure. After the cure time, the raw slabs are processed through bottom grinders to remove material and size the product. They are then sent through side grinders to introduce a taper into the slab and size for a 24" system. The grinding system is a wet operation that uses recycled and filtered water from the process. After the sizing is complete, the STONEWORKS™ panel is sent through a brushing line to give it a smooth, brushed finish. A steel sheet is then laminated to the bottom of the panel and edge banding is glued to the sidewalls of the panel to give the final touch. The panel is put into a corrugated board sleeve before being shipped for customer use.

STONEWORKS™ panels and understructures are manufactured in ISO 9001 and ISO 14001-compliant facilities. Tate has provided certifications for both standards [20 & 21].

These processing steps require electricity, water, and natural gas. The corrugated cardboard used to package the concrete panel and the supporting understructure contains biogenic carbon, which is shown in **Table 6**. Electricity is modeled using the RFCE eGRID subregion mix. Manufacturing also generates a small amount of waste for recycling, non-hazardous waste, incinerated waste, and small amounts of air emissions. Transport of waste is based on the EPA WARM model [6], which assumes a distance of 20 miles (~32km) from the point of generation of waste to a disposal facility (e.g., landfill, recycling, or incineration); transport is assumed to be done by diesel. No substances required to be reported as hazardous are associated with the production of this product.

The type, mass, mode of transport, and distance raw materials were transported were provided by Tate. The quantity of manufacturing facility inputs and outputs were also provided by Tate.

**Table 6.** *The biogenic carbon content per square meter of the floor panel product packaging.*

| Material                          | Biogenic Carbon Content (kg CO <sub>2</sub> eq) |
|-----------------------------------|-------------------------------------------------|
| STONEWORKS™ Floor Panel Packaging | 3.71                                            |
| Bolted Stringer Packaging         | 0.821                                           |

\* The corrugated cardboard is estimated to be composed of 52% cellulose, 10% lignin, and 7% hemicellulose, which is based on Xu et al. (2020) [7]. The carbon content of these materials is based on Chatterjee & Saito (2015) [8] and is 42%, 59%, and 38%, respectively.

##### (A4) Transport to Installation Site

This module includes all transport from the manufacturing facility to the site of installation. Tate distributes nearly all of its floor system products domestically within the U.S. by truck. Tate provided the total distance by type of transport for each floor panel and an average transit distance of 2,147 km was determined to calculate the metric ton-kilometer transport (mass of transported product multiplied by the distance). The capacity and fuel utilization of the truck and the metric ton-kilometer of transport are shown in **Table 7**.

**Table 7.** Distribution information of transported floor panel product to the site of installation.

| Name                                        | Value | Unit              |
|---------------------------------------------|-------|-------------------|
| Liters of Fuel                              | 18.7  | l/100 km          |
| Transport Distance                          | 2,147 | km                |
| Capacity utilization (including empty runs) | 76    | %                 |
| Gross density of products transported       | 1769  | kg/m <sup>3</sup> |
| Capacity utilization volume factor          | -     | -                 |

**(A5) Installation**

The installation of the STONEWORKS™ Classic Concrete panel access floor system is modeled based on the STONEWORKS™ Panels Access Floor Installation Manual (henceforth referred to as the “installation manual”) [13]. Apart from the cutting of the panel, installation is generally performed using manual labor and pedestals are typically leveled using laser levelers. When cutting the panels, it is recommended that HEPA filters are utilized to ensure worker safety. Additional proper protection is listed in the installation manual and includes protective equipment such as safety gloves, safety glasses, and steel toe boots.

Packaging materials and any disposed materials from the installation are assumed to be transported 20 miles (32 km) to a landfill/incinerator or recycling facility. Table 8 summarizes the installation materials and resource requirements to install 1 m<sup>2</sup> of STONEWORKS™ concrete panel.

**Table 1.** Installation information for STONEWORKS™ panel.

| Name                                                | Value                 | Unit           |
|-----------------------------------------------------|-----------------------|----------------|
| Cleaner                                             | 0.312                 | kg             |
| Sealant                                             | 0.445                 | kg             |
| Plastic Sheet                                       | 0.125                 | kg             |
| Water Consumption                                   | 0                     | m <sup>3</sup> |
| Electricity Consumption                             | 1.34x10 <sup>-3</sup> | kWh            |
| Other Energy Carriers                               |                       |                |
| Material Loss                                       | -                     | kg             |
| Output substances following waste treatment on site | 0                     | kg             |
| Dust                                                | 0                     | kg             |
| Volatile Organic Compounds (VOCs)                   | 0                     | kg             |

**(B1) Product Use**

This module includes any impacts from product use, which include volatile organic compound emissions (VOCs) from the product, however, the STONEWORKS™ access floor systems are not exposed during their use and do not produce any emissions.

**(B2 & B3) Maintenance & Repair**

Based on the owner's and installation manuals, a non-abrasive floor cleaner is recommended. A coverage of 360 square feet per gallon of cleaning solution with a dilution amount of 2 oz. floor cleaner per gallon of water is assumed. Routine cleaning is performed with a mop. For heavily soiled floors, where mopping is unable to clean the surface, the owner's manual recommends cleaning with an auto floor scrubber. The same amount of cleaning solution coverage and dilution is assumed for heavily soiled floor cleaning. Assumed cleaning processes and their frequency based on traffic level are presented in Table 9 and cleaning parameters based on traffic level is presented in Table 10. For this study, a moderate traffic level is assumed in order to estimate cleaning impacts over the 75 year building service life.

**Table 9.** Cleaning processes and frequency based on traffic level for the STONEWORKS™ Classic Concrete panel access floor system.

| Cleaning Process         | Cleaning Frequency/Traffic Level |                                      |                                 |
|--------------------------|----------------------------------|--------------------------------------|---------------------------------|
|                          | Light                            | Moderate                             | Heavy                           |
| Routine Maintenance      | Weekly<br>(52 times per year)    | Twice Weekly<br>(104 times per year) | Daily<br>(260 times per year)   |
| Heavy Soiled Floors (kg) | Annually<br>(1 time per year)    | Semi-annually<br>(2 times per year)  | Quarterly<br>(4 times per year) |

**Table 10.** Cleaning parameters based on traffic level for the STONEWORKS™ Classic Concrete panel access floor system.

| Cleaning Process                                               | Cleaning Frequency/Traffic Level |                       |       |
|----------------------------------------------------------------|----------------------------------|-----------------------|-------|
|                                                                | Light                            | Moderate              | Heavy |
| Routine Maintenance (kg cleaning solution per 1 m2 over RSL)   | 302                              | 603                   | 1508  |
| Routine Maintenance (kg cleaning solution per 1 m2 over ESL)   | 453                              | 903                   | 2258  |
| Heavily Soiled Floors (kg cleaning solution per 1 m2 over RSL) | 5.79                             | 11.6                  | 23.2  |
| Heavily Soiled Floors (kg cleaning solution per 1 m2 over ESL) | 8.68                             | 17.4                  | 34.8  |
| Heavily Soiled Floors (kWh electricity per 1 m2 over RSL)      | $3.79 \times 10^{-2}$            | $7.57 \times 10^{-2}$ | 0.151 |
| Heavily Soiled Floors (kWh electricity per 1 m2 over eSL)      | $5.68 \times 10^{-2}$            | 0.113                 | 0.227 |

In addition to cleaning over the 50 years, it is assumed that the sealer is reapplied every 5 to 10 years. An average of this range is assumed and it is estimated that 3.3 kg of sealer is needed per 1 m<sup>2</sup> over 50 years and 5 kg over the 75-year ESL.

Repairing of the access floor system is assumed to be irregular and to have a negligible contribution to environmental impacts arising from normal product use over the 50-year reference service life.

#### **(B4 & B5) Replacement & Refurbishment**

This module accounts for any product replacement (B4 module) or refurbishment (B5 module) required over the 75-year building estimated service life (ESL). The product is replaced (B4 module) 0.50 times over the 75-year building life due to the product's 50-year reference service life (RSL). Ultimately, neither the panel nor the understructure is expected to need any refurbishing (Module B5).

#### **B6 & B7. Operational Energy & Water**

No operational energy (Module B6) or water (Module B7) is needed for the use of the access floor systems.

#### **C1. Deconstruction/Demolition**

This module includes dismantling or demolition, of the floor panel from the building in which they're installed and the energy use for this, including initial on-site sorting of the materials. Dismantling of the floor system is conducted using manual labor and does not require any energy or water.

#### **C2. Waste Transport**

This module accounts for the transport of the product at its end-of-life to a waste treatment facility. Transport for disposal of all product waste is based on the EPA WARM model [6], which assumes a distance of 20 miles (~32km) from the point of generation of waste to a disposal facility (e.g., landfill, recycling, or incineration). Waste is assumed to be transported by the same truck transport shown in **Table 7**.

### C3. Waste Processing

This module includes the processing (e.g., collecting and sorting) of materials and secondary fuels for reuse, as well as recovered energy from waste. As all recycling materials are sorted in the C1 module, no impacts associated are with the C3 module.

### C4. Waste Treatment

This module accounts for the impact of the treatment of the materials within the product that are non-recyclable or reusable waste. Primary data on actual end-of-life treatment for the access floor systems were not available. Concrete and packaging recycling rate are modeled at end-of-life based on US EPA waste statistics [14] and steel recycling rates are modeled utilizing US Geological Survey material data sheets [15]. All other materials within the product are assumed to be landfilled. The percentage of waste landfilled and recycled is shown in Table 11 and the mass of treated waste is shown in Table 12.

**Table 11.** US EPA and USGS construction waste treatment statistics.

| Material           | Percent Landfilled | Percent Recycled |
|--------------------|--------------------|------------------|
| Concrete           | 26%                | 74%              |
| Construction Steel | 2%                 | 98%              |

**Table 12.** Mass of treated waste shown for each STONEWORKS™ panel.

| Treatment Type & Type of Waste | Concrete Panel | Bolted Stringer Understructure |
|--------------------------------|----------------|--------------------------------|
| Landfilled Concrete            | 18.0           | -                              |
| Concrete for Recycling         | 50.5           | -                              |
| Landfilled Steel               | 5.39           | 5.96                           |
| Steel for Recycling            | 0.110          | 0.122                          |
| Landfilled Packaging Materials | 1.08           | 0.241                          |
| Packaging for Recycling        | 0.0633         | 0.00944                        |

### D. Module D

A portion of the STONEWORKS™ Classic Concrete panel access floors are assumed to be recycled based on US Environmental Production Agency and the US Geological Survey statistics. Concrete is assumed to be recycled into aggregate and steel is assumed to undergo scrap collection. Furthermore, product packaging is additionally assumed to undergo materials collection for reuse. The benefits and impacts of these recycled materials are considered in this module. The scrap exiting the system is shown above in Table 12. The datasets used to model the recycling or recovery of material have been shown in Tables 13 and 14. The recycling rates necessary for the Module D calculations are, as described above, based on EPA and USGS waste statistics. Resource use and emissions associated with the processing of the recycled materials are included and modeled using Ecoinvent data. Energy recovery from incineration of waste steel materials is assumed negligible.

The modeling of module D follows the equation for each material as

$$:E_{module\ D1} = (M_{MR\ out} - M_{MR\ in}) (E_{MR\ after\ EoW\ out} - E_{VM\ sub\ out})$$

where:

$(M_{MR\ out} - M_{MR\ in})$  is the net amount of scrap produced from the system:

$M_{MR\ out}$  is the amount of scrap exiting the system

$M_{MR\ in}$  is the recycled content considered in the raw materials

$(E_{MR\ after\ EoW\ out} - E_{VM\ sub\ out})$

$E_{MR\ after\ EoW\ out}$  represents the amount of emissions, resources, and waste from material made from recycled materials.

$E_{VM \text{ sub out}}$  represents the amount of emissions, resources, and waste from material made from virgin materials.

Following the approach given by the World Steel Association [16], the net burden, or credit, for steel components of the product is estimated as

$$e_{module D1} = (RR - S) Y(X_{pr} - X_{re})$$

where:

$(RR - S)$  is the net amount of scrap produced from the system:

RR is the end-of-life recycling rate of the steel product

S is the scrap input to the steelmaking process

$Y(X_{pr} - X_{re})$  is the LCI value of steel scrap:

Y is the process yield of the electric arc furnace.

$X_{pr}$  is the LCI for 100% primary metal production. This is a theoretical value for steel slab made in the basic oxygen furnace route, assuming 0% scrap input.

$X_{re}$  is the LCI for 100% secondary metal production from scrap in the electric arc furnace (assuming 100% scrap input).

**Table 13.** Modeling parameters for Module D.

| Material                | Recycled Content | EOL Recycling Rate | Secondary Material ( $X_{pr}$ or $E_{MR}$ after $EoW$ out)                                                                                       | Primary Material ( $X_{re}$ or $E_{VM \text{ sub out}}$ )                                                     |
|-------------------------|------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Adhesive                | 0%               | 74%                | market for rock crushing<br>  rock crushing  <br>EN15804GD, U - GLO                                                                              | Custom dataset shown in Table 21                                                                              |
| Calcium Carbonate       | 0%               | 74%                |                                                                                                                                                  | market for calcium carbonate, precipitated   calcium carbonate, precipitated   EN15804GD, U - RoW             |
| Portland Cement         | 20%              | 74%                |                                                                                                                                                  | market for cement, Portland   cement, Portland   EN15804GD, U - US                                            |
| Epoxy Resin             | 0%               | 74%                |                                                                                                                                                  | Custom dataset shown in Table 21                                                                              |
| Expanded Shale          | 100%             | 74%                |                                                                                                                                                  | expanded clay production   expanded clay   EN15804GD, U - RoW                                                 |
| Limestone               | 0%               | 74%                |                                                                                                                                                  | market for limestone, crushed, for mill   limestone, crushed, for mill   EN15804GD, U - RoW                   |
| Epoxy Paste             | 0%               | 74%                |                                                                                                                                                  | Custom dataset shown in Table 21                                                                              |
| Sand                    | 0%               | 74%                |                                                                                                                                                  | gravel and sand quarry operation   sand   EN15804GD, U - RoW                                                  |
| Steel (Concrete Panel)  | 89%              | 98%                | steel production, electric, 100% scrap, low-alloyed   steel, low-alloyed   EN15804GD, S/RoW                                                      | steel production, converter, low-alloyed, 0% scrap   steel, low-alloyed   EN15804GD, S/RoW                    |
| Steel (Bolted Stringer) | 77%              | 98%                | steel production, electric, 100% scrap, low-alloyed   steel, low-alloyed   EN15804GD, S/RoW                                                      | steel production, converter, low-alloyed, 0% scrap   steel, low-alloyed   EN15804GD, S/RoW                    |
| Cardboard               | 69%              | 68%                | market for waste paperboard, sorted   waste paperboard, sorted   EN15804GD, U - GLO                                                              | market for corrugated board box   corrugated board box   EN15804GD, U - US                                    |
| Polyethylene            | 0%               | 9%                 | market for waste polyethylene terephthalate, for recycling, sorted   waste polyethylene terephthalate, for recycling, sorted   EN15804GD, U - US | market for polyethylene, high density, granulate   polyethylene, high density, granulate   EN15804GD, U - GLO |

### 3.2 DATA SOURCES

Modeling of this LCA was conducted in openLCA v2.1.1 [7] and all datasets used were from the Ecoinvent 3.10 database with EN 15804+A2 add-on [8]. Detailed descriptions of unit processes can be found in the accompanying documentation. For the manufacturing and packaging of the access floor systems, primary data were provided by Tate. Similarly, the upstream transport of materials used for manufacturing, packaging, distribution, installation, and maintenance were based on primary data provided by Tate. **Table 14** below lists the individual datasets used.

**Table 2.** The LCI datasets from the Ecoinvent v3.10 (2023) database used to model the product system.

| Flow                            | Dataset                                                                                                                                               | Data Source | Publication Date |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|
| <b>Panel Materials</b>          |                                                                                                                                                       |             |                  |
| Calcium Carbonate               | market for calcium carbonate, precipitated   calcium carbonate, precipitated   EN15804GD, U - RoW                                                     | Ecoinvent   | 2023             |
| Portland cement                 | market for cement, Portland   cement, Portland   EN15804GD, U - US                                                                                    | Ecoinvent   | 2023             |
| Epoxy Resin                     | market for epoxy resin, liquid   epoxy resin, liquid   EN15804GD, U - RoW                                                                             | Ecoinvent   | 2023             |
| Expanded Shale                  | expanded clay production, no clay input   expanded clay   EN15804GD, U - RoW                                                                          | Ecoinvent   | 2023             |
|                                 | shale quarry operation   shale   EN15804GD, U - RoW                                                                                                   | Ecoinvent   | 2023             |
| Limestone                       | market for limestone, crushed, for mill   limestone, crushed, for mill   EN15804GD, U - RoW                                                           | Ecoinvent   | 2023             |
| Epoxy Paste <sup>+</sup>        | market for aluminium oxide, non-metallurgical   aluminium oxide, non-metallurgical   EN15804GD, U - RoW                                               | Ecoinvent   | 2023             |
|                                 | market for carbon black   carbon black   EN15804GD, U - GLO                                                                                           | Ecoinvent   | 2023             |
|                                 | market for epoxy resin, liquid   epoxy resin, liquid   EN15804GD, U - RoW                                                                             | Ecoinvent   | 2023             |
|                                 | market for ethylene glycol monoethyl ether   ethylene glycol monoethyl ether   EN15804GD, U - RoW                                                     | Ecoinvent   | 2023             |
|                                 | market for indium tin oxide powder, nanoscale, for sputtering target   indium tin oxide powder, nanoscale, for sputtering target   EN15804GD, U - RoW | Ecoinvent   | 2023             |
|                                 | market for plaster mixing   plaster mixing   EN15804GD, U - GLO                                                                                       | Ecoinvent   | 2023             |
|                                 | market for silicone product   silicone product   EN15804GD, U - RoW                                                                                   | Ecoinvent   | 2023             |
|                                 | market for titanium dioxide   titanium dioxide   EN15804GD, U - RoW                                                                                   | Ecoinvent   | 2023             |
| Sand                            | gravel and sand quarry operation   sand   EN15804GD, U - RoW                                                                                          | Ecoinvent   | 2023             |
| Steel                           | market for sheet rolling, steel   sheet rolling, steel   EN15804GD, U - GLO                                                                           | Ecoinvent   | 2023             |
|                                 | steel production, electric, low-alloyed   steel, low-alloyed   EN15804GD, U - RoW                                                                     | Ecoinvent   | 2023             |
| Adhesive                        | market for chemical, organic   chemical, organic   EN15804GD, U - GLO                                                                                 | Ecoinvent   | 2023             |
|                                 | market for ethylene vinyl acetate copolymer   ethylene vinyl acetate copolymer   EN15804GD, U - RoW                                                   | Ecoinvent   | 2023             |
|                                 | market for polyethylene, low density, granulate   polyethylene, low density, granulate   EN15804GD, U - GLO                                           | Ecoinvent   | 2023             |
|                                 | market for white spirit   white spirit   EN15804GD, U - GLO                                                                                           | Ecoinvent   | 2023             |
| <b>Understructure Materials</b> |                                                                                                                                                       |             |                  |
| Steel                           | steel production, converter, low-alloyed   steel, low-alloyed   EN15804GD, U - RoW                                                                    | Ecoinvent   | 2023             |
|                                 | steel production, electric, low-alloyed   steel, low-alloyed   EN15804GD, U - RoW                                                                     | Ecoinvent   | 2023             |
|                                 | drawing of pipe, steel   drawing of pipe, steel   EN15804GD, U - RoW                                                                                  | Ecoinvent   | 2023             |
|                                 | zinc coating, coils   zinc coat, coils   EN15804GD, U - RoW                                                                                           | Ecoinvent   | 2023             |
| Galvanized Steel Coil           | steel production, converter, low-alloyed   steel, low-alloyed   EN15804GD, U - RoW                                                                    | Ecoinvent   | 2023             |
|                                 | steel production, electric, low-alloyed   steel, low-alloyed   EN15804GD, U - RoW                                                                     | Ecoinvent   | 2023             |
|                                 | sheet rolling, steel   sheet rolling, steel   EN15804GD, U - RoW                                                                                      | Ecoinvent   | 2023             |
|                                 | zinc coating, coils   zinc coat, coils   EN15804GD, U - RoW                                                                                           | Ecoinvent   | 2023             |
| Grey Phosphate Steel            | steel production, converter, low-alloyed   steel, low-alloyed   EN15804GD, U - RoW                                                                    | Ecoinvent   | 2023             |
|                                 | steel production, electric, low-alloyed   steel, low-alloyed   EN15804GD, U - RoW                                                                     | Ecoinvent   | 2023             |

| Flow                                                | Dataset                                                                                                                                                   | Data Source      | Publication Date |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
|                                                     | wire drawing, steel   wire drawing, steel   EN15804GD, U - RoW                                                                                            | Ecoinvent        | 2023             |
|                                                     | zinc coating, coils   zinc coat, coils   EN15804GD, U - RoW                                                                                               | Ecoinvent        | 2023             |
| <b>Packaging</b>                                    |                                                                                                                                                           |                  |                  |
| Corrugated board                                    | market for corrugated board box   corrugated board box   EN15804GD, U - US                                                                                | Ecoinvent        | 2023             |
| Polyethylene Strapping                              | market for extrusion, plastic film   extrusion, plastic film   EN15804GD, U - GLO                                                                         | Ecoinvent        | 2023             |
|                                                     | market for polyethylene, high density, granulate   polyethylene, high density, granulate   EN15804GD, U - GLO                                             | Ecoinvent        | 2023             |
| Wood Pallet                                         | EUR-flat pallet production   EUR-flat pallet   EN15804GD, U - RoW                                                                                         | Ecoinvent        | 2023             |
| <b>Electricity/Heat/Resources for Manufacturing</b> |                                                                                                                                                           |                  |                  |
| Electricity*                                        | electricity voltage transformation from high to medium voltage   electricity, medium voltage   EN15804GD, U Stoneworks - US-RFC                           | Ecoinvent, eGRID | 2023             |
| Natural Gas                                         | heat and power co-generation, natural gas, conventional power plant, 100MW electrical   heat, district or industrial, natural gas   EN15804GD, U - US-RFC | Ecoinvent        | 2023             |
| Tap Water                                           | market for tap water   tap water   EN15804GD, U - RoW                                                                                                     | Ecoinvent        | 2023             |
| Propane                                             | market for propane, burned in building machine   propane, burned in building machine   EN15804GD, U - GLO                                                 | Ecoinvent        | 2023             |
| <b>Transportation</b>                               |                                                                                                                                                           |                  |                  |
| Road                                                | market for transport, freight, lorry 16-32 metric ton, EURO4   transport, freight, lorry 16-32 metric ton, EURO4   EN15804GD, U - RoW                     | Ecoinvent        | 2023             |
| Rail                                                | market for transport, freight train   transport, freight train   EN15804GD, U - US                                                                        | Ecoinvent        | 2023             |
| Ship                                                | market for transport, freight, sea, container ship   transport, freight, sea, container ship   EN15804GD, U - GLO                                         | Ecoinvent        | 2023             |
| <b>Installation and Maintenance</b>                 |                                                                                                                                                           |                  |                  |
| Acrylic Adhesive                                    | market for chemical, organic   chemical, organic   EN15804GD, U - GLO                                                                                     | Ecoinvent        | 2023             |
|                                                     | market for methyl methacrylate   methyl methacrylate   EN15804GD, U - RoW                                                                                 | Ecoinvent        | 2023             |
|                                                     | market for polymethyl methacrylate, beads   polymethyl methacrylate, beads   EN15804GD, U - GLO                                                           | Ecoinvent        | 2023             |
| Concrete Cleaner                                    | market for ethoxylated alcohol (AE7)   ethoxylated alcohol (AE7)   EN15804GD, U - RoW                                                                     | Ecoinvent        | 2023             |
|                                                     | market for sodium hydroxide, without water, in 50% solution state   sodium hydroxide, without water, in 50% solution state   EN15804GD, U - RoW           | Ecoinvent        | 2023             |
|                                                     | market for water, deionised   water, deionised   EN15804GD, U - RoW                                                                                       | Ecoinvent        | 2023             |
| Concrete Sealer                                     | market for chemical, organic   chemical, organic   EN15804GD, U - GLO                                                                                     | Ecoinvent        | 2023             |
|                                                     | market for dipropylene glycol monomethyl ether   dipropylene glycol monomethyl ether   EN15804GD, U - RoW                                                 | Ecoinvent        | 2023             |
|                                                     | market for water, deionised   water, deionised   EN15804GD, U - RoW                                                                                       | Ecoinvent        | 2023             |
| Electricity                                         | market for electricity, low voltage   electricity, low voltage   EN15804GD, U - US-RFC                                                                    | Ecoinvent        | 2023             |
| Film                                                | market for packaging film, low density polyethylene   packaging film, low density polyethylene   EN15804GD, U - GLO                                       | Ecoinvent        | 2023             |
| <b>Module D Processing and Recycling Activities</b> |                                                                                                                                                           |                  |                  |
| Steel Processing                                    | steel production, electric, 100% scrap, low-alloyed   steel, low-alloyed   EN15804GD, S/RoW                                                               | Ecoinvent        | 2023             |
| Concrete Crushing                                   | market for rock crushing   rock crushing   EN15804GD, U - GLO                                                                                             | Ecoinvent        | 2023             |
| Paperboard Recycling                                | market for waste paperboard, sorted   waste paperboard, sorted   EN15804GD, U - GLO                                                                       | Ecoinvent        | 2023             |
| Polyethylene Recycling                              | market for waste polyethylene terephthalate, for recycling, sorted   waste polyethylene terephthalate, for recycling, sorted   EN15804GD, U - US          | Ecoinvent        | 2023             |

+ Based on MSDS for "Powercron gray paste" produced by PPG Industries, Inc. Documentation provided by Tate.

\* This Ecoinvent electricity dataset has been modified to represent the 2022 RFCE eGRID subregion grid mix.

### 3.3 DATA QUALITY

The data quality assessment is discussed in the table below for each of the data quality parameters.

**Table 15.** Data quality discussion of the STONEWORKS™ concrete panel.

| Data Quality Parameter                                                                                                                                                                                           | Data Quality Discussion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Time-Related Coverage</b><br>Age of data and the minimum length of time over which data is collected                                                                                                          | Jessup manufacturer data (primary data) is based on 2018 annual production, during which the Jessup facility only produced the STONEWORKS™ panel. While 2022 manufacturing data was available, the Jessup facility was then manufacturing a variety of highly energy intensive steel products in addition to the STONEWORKS™ panel, and allocating facility energy and water use between these products was not possible. As the machinery used to manufacture the STONEWORKS™ and the manufacturing process itself hasn't changed since 2018, it was decided that 2018 manufacturing data was suitable for this model. The use of 2022 data collected has been tested in the sensitivity analysis. All other primary data used represented one year's worth of data collection. Representative Ecoinvent datasets (secondary data) used for upstream and background processes are generally less than 5 years old. |
| <b>Geographical Coverage</b><br>Geographical area from which data for unit processes is collected to satisfy the goal of the study                                                                               | The data used in the analysis provide the best possible representation available with current data. All data was representative of US or North America and all secondary datasets from Ecoinvent are representative of US, EU, Global, or "Rest-of-World" (average for all countries in the world with uncertainty adjusted). Ecoinvent datasets chosen are considered sufficiently similar to actual processes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Technology Coverage</b><br>Specific technology or technology mix                                                                                                                                              | For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations; the exception is secondary data used for the collection of steel scrap which is modeled with an iron scrap collection process as this was the closest recovery available.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Precision</b><br>Measure of the variability of the data values for each data expressed (e.g. variance)                                                                                                        | Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one year and over multiple operations, which is expected to reduce the variability of results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Completeness</b><br>Percentage of flow that is measured or estimated                                                                                                                                          | Except where noted, the LCA model included all known mass and energy flows. In some instances, surrogate data used to represent upstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 10% of the total environmental impact for each indicator are excluded; in total, these missing data represent less than 5% of the cumulative omitted mass or energy flows.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Representativeness</b><br>Qualitative assessment of the degree to which the data set reflects the true population of interest (i.e. geographical coverage, time period and technology coverage)               | Data used in the assessment represent typical or average processes as currently reported from multiple data sources, and are therefore generally representative of the range of actual processes and technologies for production of these materials.<br><br>Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction. Some proxy datasets are used to represent materials due to the lack of data available.                                                                                                                                                                                                                                                                                                                                                  |
| <b>Consistency</b><br>Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis                                                                     | The consistency of the assessment is considered to be high. Primary data was used to represent Tate's manufacturing, distribution, product material composition, packaging, and upstream transport. In general, secondary data was also of high quality secondary data.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Reproducibility</b><br>Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study | Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Data Quality Parameter                                                                        | Data Quality Discussion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sources of the Data</b><br>Description of all primary and secondary data sources           | For manufacturing and packaging, primary data were provided by Tate. Similarly, the upstream transport of materials is based on primary data provided by Tate. For the distribution of product from manufacturing facility to customer, a weighted average was calculated based on primary shipment data provided by Tate. Where primary upstream data were unavailable, secondary data were used. The principal source of secondary LCI data is Ecoinvent.                                                     |
| <b>Uncertainty of the Information</b><br>Uncertainty related to data, models, and assumptions | Uncertainty related to the product materials and packaging is low. Data for upstream operations relied upon use of existing representative datasets. These datasets contained relatively recent data (<5 years), but lacked specific geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact methods required by the PCR include impact potentials, which lack characterization of providing and receiving environments or tipping points. |

### 3.4 ALLOCATION

This study follows the allocation guidelines of ISO 14044 [1] and allocation rules specified in the PCR and minimizes the use of allocation wherever possible.

Mass allocation was deemed the most accurate and reproducible way of calculating the energy and material requirements for the manufacture of the bolted stringer understructure used with the STONEWORKS™ panel. Primary data for resource use (e.g., electricity, natural gas, water, etc.), waste, and emissions released, are allocated on a mass basis as a fraction of total annual production at the Red Lion facility; allocation was not required for the Jessup 2018 facility data as the facility only produced the STONEWORKS™ panel during that time. The material composition and amounts for each STONEWORKS™ panel and understructure are calculated using the product weights provided in Table 2 and Table 3.

Each panel and supporting understructure include recycled content. The recycled content allocation method was used to allocate the impact of recycled materials between the first life of the material (which produces the material for recycling) and the second life of the product, in which the material is used. This allocation method is also known as the 100-0 cut-off method. Using the recycled content allocation approach, system inputs with recycled content do not receive any burden from the previous life cycle other than the reprocessing of the waste material. At the end of life, materials that are recycled leave the system boundaries with no additional burden.

Impacts from transportation were allocated based on the mass and distance transported.

### 3.5 CUT-OFF RULES

The cut-off criteria for including or excluding materials, energy, and emissions data from the study are in accordance with the PCR and are listed below.

- All inputs and outputs to a unit process are included in the LCA calculation for which data are available. Any data gaps are filled with representative data. Assumptions used for filling data gaps are documented in the LCA report.
- Where there is a data gap or insufficient data, the criteria for exclusion of inputs and outputs are 1% of primary energy usage (renewable and non-renewable energy) and 1% on a mass basis for the specific unit process. The maximum criteria for the exclusion of inputs and outputs are 5% of primary energy usage and mass across all modules included in the LCA.
- If a flow meets the above criteria for exclusion but is considered to have a significant potential environmental impact, it is included.
- No excluded processes were thought to have any significant impact on the total life cycle impact of this product.

No known flows are deliberately excluded from this EPD.

### 3.6 SUMMARY OF ASSUMPTIONS

The assessment relied on several assumptions, described below:

- Representative inventory data are used to reflect the energy mix for electricity use. The Red Lion, Pennsylvania facility and Jessup, Maryland facility are located in the RFCE EPA subregion. An Ecoinvent inventory dataset was modified to reflect the 2022 eGRID energy mix for RFCE to estimate resource use and emissions from electricity use at the Tate manufacturing facility.
- Repairing of the floor systems is assumed to be irregular and to have a negligible contribution to environmental impacts arising from normal product use over the 75-year building ESL.
- For some materials used in manufacturing, a proxy material dataset was used. Datasets are provided in Table 14.
- Inventory data for raw materials, packaging, and ancillary materials were modeled with unit process data taken from Ecoinvent.
- Recycled steel components were assumed to be electric arc furnace (EAF) steel given the range in percent recycled content based on primary data received from Tate, while virgin steel components were assumed to be produced by a basic oxygen furnace (BOF). The model used both production processes to obtain the desired recycled steel content for each steel material. In actual practice, steel is made by one or the other steel methods.
- Concrete and packaging recycling rates are modeled at end-of-life based on US EPA waste statistics [14] and steel recycling rates are modeled utilizing US Geological Survey material data sheets [15]. All other materials within the product are assumed to be landfilled.

### 3.7 PERIOD UNDER REVIEW

The period of review is January 1, 2022, through December 31, 2022, for the Red Lion facility and January 1, 2018, through December 31, 2018, for the Jessup facility.

### 3.8 COMPARABILITY

The PCR [3] this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to, and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

## 4. LCA Results

The LCIA results are presented in **Table 16** and **Table 17** below using EN 15804+A2 [3] and TRACI 2.1 [12] characterization methodologies. Global warming potential, acidification, eutrophication, ozone depletion, smog formation, resource depletion of fossil fuels, and water use are reported. These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes. It should be noted that the indicators prescribed by the PCR do not represent all categories of potential environmental and human health impact associated with the life cycle of the product, and this represents a general limitation of the LCA study. Additionally, these indicators have no "environmental relevance," as defined in the ISO-14044 §4.4.2.2.2, 4.4.2.2.4, and 4.4.5, except the "Global Warming Potential" indicator, which has low

environmental relevance. That is, these “potential” results may or may not have any relationship to actual impacts occurring.

Any comparison of EPDs shall be subject to the requirements of the PCR guidance [3]. 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 comparison can be inaccurate and could lead to erroneous selection of materials or products that have a higher impact, at least in some impact categories.

Note that the impact from modules B1, B3, B5-B7, C1, and C3 are zero and are therefore not displayed in the tables below.

**Table 3.** EN 15804+A2 impact category results reported by life cycle stage for 1 m<sup>2</sup> of STONEWORKS™ concrete panel maintained for a period of 75 years.

| Impact Category                                              | Total                 | A1                    | A2                    | A3                    | A4                    | A5                    | B2                     | B4                    | C2                    | C4                    | D                      |
|--------------------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|------------------------|
| GWP-total<br>(kg CO <sub>2</sub> eq.)                        | 173                   | 48.0                  | 6.12                  | 20.6                  | 33.9                  | 1.40                  | 6.89                   | 55.7                  | 0.496                 | 0.352                 | -18.5                  |
|                                                              | 100%                  | 27.7%                 | 3.53%                 | 11.89%                | 19.5%                 | 0.80%                 | 3.97%                  | 32.1%                 | 0.29%                 | 0.20%                 | -                      |
| GWP-fossil<br>(kg CO <sub>2</sub> eq.)                       | 175                   | 47.5                  | 6.12                  | 23.0                  | 33.9                  | 1.29                  | 6.92                   | 55.4                  | 0.496                 | 0.351                 | -20.5                  |
|                                                              | 100%                  | 27.2%                 | 3.50%                 | 13.2%                 | 19.4%                 | 0.74%                 | 3.95%                  | 31.6%                 | 0.28%                 | 0.20%                 | -                      |
| GWP-biogenic<br>(kg CO <sub>2</sub> eq.)                     | 0.900                 | 0.481                 | 3.70x10 <sup>-4</sup> | -2.38                 | 1.00x10 <sup>-3</sup> | 0.106                 | -8.41x10 <sup>-2</sup> | 0.311                 | 1.46x10 <sup>-5</sup> | 3.10x10 <sup>-4</sup> | 2.01                   |
|                                                              | 100%                  | 30.7%                 | 0.02%                 | N/A                   | 0.06%                 | 6.8%                  | N/A                    | 19.8%                 | 0.00%                 | 0.02%                 | -                      |
| GWP-luluc<br>(kg CO <sub>2</sub> eq.)                        | 0.146                 | 3.90x10 <sup>-2</sup> | 2.58x10 <sup>-3</sup> | 4.39x10 <sup>-3</sup> | 1.36x10 <sup>-2</sup> | 1.65x10 <sup>-3</sup> | 5.43x10 <sup>-2</sup>  | 2.98x10 <sup>-2</sup> | 2.00x10 <sup>-4</sup> | 8.90x10 <sup>-4</sup> | -2.28x10 <sup>-3</sup> |
|                                                              | 100%                  | 26.6%                 | 1.76%                 | 3.00%                 | 9.32%                 | 1.13%                 | 37.1%                  | 20.3%                 | 0.14%                 | 0.61%                 | -                      |
| ODP<br>(kg CFC-11 eq)                                        | 2.00x10 <sup>-6</sup> | 2.39x10 <sup>-7</sup> | 9.00x10 <sup>-8</sup> | 2.04x10 <sup>-7</sup> | 5.04x10 <sup>-7</sup> | 2.69x10 <sup>-8</sup> | 3.92x10 <sup>-7</sup>  | 5.25x10 <sup>-7</sup> | 7.38x10 <sup>-9</sup> | 7.32x10 <sup>-9</sup> | -8.65x10 <sup>-8</sup> |
|                                                              | 100%                  | 12.0%                 | 4.51%                 | 10.2%                 | 25.3%                 | 1.35%                 | 19.6%                  | 26.3%                 | 0.37%                 | 0.37%                 | -                      |
| AP<br>(mol H <sup>+</sup> eq)                                | 0.818                 | 0.303                 | 2.70x10 <sup>-2</sup> | 4.49x10 <sup>-2</sup> | 0.142                 | 6.07x10 <sup>-3</sup> | 3.14x10 <sup>-2</sup>  | 0.260                 | 2.07x10 <sup>-3</sup> | 1.92x10 <sup>-3</sup> | -5.35x10 <sup>-2</sup> |
|                                                              | 100%                  | 37.1%                 | 3.30%                 | 5.49%                 | 17.3%                 | 0.74%                 | 3.8%                   | 31.7%                 | 0.25%                 | 0.23%                 | -                      |
| EP-freshwater<br>(kg PO <sub>4</sub> eq)                     | 3.36x10 <sup>-2</sup> | 1.40x10 <sup>-2</sup> | 5.10x10 <sup>-4</sup> | 3.72x10 <sup>-3</sup> | 2.66x10 <sup>-3</sup> | 2.40x10 <sup>-4</sup> | 2.07x10 <sup>-3</sup>  | 1.04x10 <sup>-2</sup> | 3.90x10 <sup>-5</sup> | 2.91x10 <sup>-5</sup> | -7.07x10 <sup>-3</sup> |
|                                                              | 100%                  | 41.6%                 | 1.52%                 | 11.06%                | 7.91%                 | 0.71%                 | 6.16%                  | 30.9%                 | 0.12%                 | 0.09%                 | -                      |
| EP-aquatic<br>marine<br>(kg SO <sub>2</sub> <sup>-</sup> eq) | 0.189                 | 4.69x10 <sup>-2</sup> | 9.93x10 <sup>-3</sup> | 1.11x10 <sup>-2</sup> | 5.16x10 <sup>-2</sup> | 1.26x10 <sup>-3</sup> | 6.59x10 <sup>-3</sup>  | 6.01x10 <sup>-2</sup> | 7.60x10 <sup>-4</sup> | 7.30x10 <sup>-4</sup> | -1.27x10 <sup>-2</sup> |
|                                                              | 100%                  | 24.8%                 | 5.26%                 | 5.86%                 | 27.3%                 | 0.67%                 | 3.49%                  | 31.8%                 | 0.40%                 | 0.39%                 | -                      |
| EP-terrestrial<br>(mol N eq)                                 | 2.61                  | 0.896                 | 0.108                 | 0.109                 | 0.562                 | 1.08x10 <sup>-2</sup> | 6.45x10 <sup>-2</sup>  | 0.841                 | 8.24x10 <sup>-3</sup> | 7.89x10 <sup>-3</sup> | -0.176                 |
|                                                              | 100%                  | 34.4%                 | 4.15%                 | 4.16%                 | 21.6%                 | 0.42%                 | 2.47%                  | 32.2%                 | 0.32%                 | 0.30%                 | -                      |
| POCP<br>(kg NMVOC<br>eq)                                     | 0.688                 | 0.143                 | 3.70x10 <sup>-2</sup> | 5.42x10 <sup>-2</sup> | 0.196                 | 5.73x10 <sup>-3</sup> | 2.95x10 <sup>-2</sup>  | 0.217                 | 2.87x10 <sup>-3</sup> | 2.77x10 <sup>-3</sup> | -5.54x10 <sup>-2</sup> |
|                                                              | 100%                  | 20.8%                 | 5.38%                 | 7.89%                 | 28.5%                 | 0.83%                 | 4.3%                   | 31.5%                 | 0.42%                 | 0.40%                 | -                      |
| ADPE<br>(kg Sb eq)                                           | 1.13x10 <sup>-3</sup> | 5.50x10 <sup>-4</sup> | 2.00x10 <sup>-5</sup> | 1.92x10 <sup>-5</sup> | 1.10x10 <sup>-4</sup> | 6.74x10 <sup>-6</sup> | 7.06x10 <sup>-5</sup>  | 3.50x10 <sup>-4</sup> | 1.64x10 <sup>-6</sup> | 9.35x10 <sup>-7</sup> | -2.10x10 <sup>-4</sup> |
|                                                              | 100%                  | 48.7%                 | 1.77%                 | 1.70%                 | 9.74%                 | 0.60%                 | 6.25%                  | 31.0%                 | 0.15%                 | 0.08%                 | -                      |
| ADPF<br>(MJ, Net<br>Calorific<br>Value)                      | 2437                  | 410                   | 85.9                  | 543                   | 478                   | 25.2                  | 123                    | 759                   | 7.01                  | 6.27                  | -163                   |
|                                                              | 100%                  | 16.8%                 | 3.52%                 | 22.3%                 | 19.6%                 | 1.03%                 | 5.03%                  | 31.1%                 | 0.29%                 | 0.26%                 | -                      |
| WDP (m3<br>wood eq<br>deprived)                              | 37.4                  | 15.7                  | 0.408                 | 4.51                  | 2.15                  | 0.447                 | 2.80                   | 11.3                  | 3.15x10 <sup>-2</sup> | 2.43x10 <sup>-2</sup> | -3.08x10 <sup>-2</sup> |
|                                                              | 100%                  | 42.0%                 | 1.09%                 | 12.1%                 | 5.8%                  | 1.19%                 | 7.49%                  | 30.3%                 | 0.08%                 | 0.07%                 | -                      |

**Table 17.** TRACI 2.1 impact category results reported by life cycle stage for 1 m<sup>2</sup> of STONEWORKS™ Concrete Panel maintained for a period of 75 years

| Impact Category                                  | Total                 | A1                    | A2                    | A3                    | A4                    | A5                    | B2                    | B4    | C2                    | C4                    | D                      |
|--------------------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------|-----------------------|-----------------------|------------------------|
| Climate Change<br>(kg CO <sub>2</sub> eq.)       | 176                   | 47.6                  | 6.13                  | 23.1                  | 34.0                  | 1.38                  | 7.00                  | 55.5  | 0.497                 | 0.353                 | -20.5                  |
|                                                  | 100%                  | 27.1%                 | 3.49%                 | 13.1%                 | 19.3%                 | 0.79%                 | 3.98%                 | 31.6% | 0.28%                 | 0.20%                 | -                      |
| Acidification<br>(kg SO <sub>2</sub> eq.)        | 0.698                 | 0.249                 | 2.43x10 <sup>-2</sup> | 3.89x10 <sup>-2</sup> | 0.127                 | 5.40x10 <sup>-3</sup> | 2.86x10 <sup>-2</sup> | 0.221 | 1.86x10 <sup>-3</sup> | 1.73x10 <sup>-3</sup> | -4.60x10 <sup>-2</sup> |
|                                                  | 100%                  | 35.7%                 | 3.48%                 | 5.57%                 | 18.2%                 | 0.77%                 | 4.10%                 | 31.6% | 0.27%                 | 0.25%                 | -                      |
| Eutrophication<br>(kg N eq.)                     | 0.453                 | 0.168                 | 7.05x10 <sup>-3</sup> | 4.26x10 <sup>-2</sup> | 3.72x10 <sup>-2</sup> | 9.26x10 <sup>-3</sup> | 6.05x10 <sup>-2</sup> | 0.127 | 5.40x10 <sup>-4</sup> | 4.70x10 <sup>-4</sup> | -3.51x10 <sup>-2</sup> |
|                                                  | 100%                  | 37.2%                 | 1.56%                 | 9.42%                 | 8.22%                 | 2.05%                 | 13.35%                | 28.0% | 0.12%                 | 0.10%                 | -                      |
| Ozone<br>Depletion<br>(kg CFC-11 eq.)            | 2.38x10 <sup>-6</sup> | 3.12x10 <sup>-7</sup> | 9.79x10 <sup>-8</sup> | 3.01x10 <sup>-7</sup> | 5.47x10 <sup>-7</sup> | 2.97x10 <sup>-8</sup> | 4.46x10 <sup>-7</sup> | 0.000 | 8.01x10 <sup>-9</sup> | 7.89x10 <sup>-9</sup> | -8.98x10 <sup>-8</sup> |
|                                                  | 100%                  | 13.1%                 | 4.11%                 | 12.7%                 | 23.0%                 | 1.25%                 | 18.7%                 | 26.5% | 0.34%                 | 0.33%                 | -                      |
| Smog<br>(kg O <sub>3</sub> )                     | 10.9                  | 2.45                  | 0.624                 | 0.602                 | 3.24                  | 6.42x10 <sup>-2</sup> | 0.371                 | 3.48  | 4.75x10 <sup>-2</sup> | 4.56x10 <sup>-2</sup> | -0.914                 |
|                                                  | 100%                  | 22.4%                 | 5.71%                 | 5.51%                 | 29.7%                 | 0.59%                 | 3.40%                 | 31.9% | 0.43%                 | 0.42%                 | -                      |
| Fossil Fuel<br>Depletion<br>(MJ surplus,<br>LHV) | 245                   | 27.8                  | 11.8                  | 44.7                  | 66.4                  | 3.19                  | 13.12                 | 76.1  | 0.972                 | 0.883                 | -6.53                  |
|                                                  | 100%                  | 11.3%                 | 4.83%                 | 18.2%                 | 27.1%                 | 1.30%                 | 5.35%                 | 31.1% | 0.40%                 | 0.36%                 | -                      |

## 5. LCI Results

The following life cycle inventory (LCI) resource and waste indicators were specified by the PCR. The indicator name, abbreviation, and units are shown in **Table 18** below while the results are reported in **Table 19**. These resource and waste indicators were calculated based on the PCR guidance in accordance with EN 15804+A2 [3]. Note that there is no impact from modules A5, B1-B7, and C3 which are therefore not displayed in the following tables.

**Table 18.** *The full name, abbreviation, and unit of additional LCI indicators required by the PCR.*

| Indicator Category                                                                                         | Abbreviation | Units          |
|------------------------------------------------------------------------------------------------------------|--------------|----------------|
| <b>Resource use</b>                                                                                        |              |                |
| Use of renewable primary energy excluding the renewable primary energy sources used as raw materials       | PERE         | MJ             |
| Use of renewable primary energy resources used as raw materials                                            | PERM         | MJ             |
| Total use of renewable primary energy resources used as raw materials                                      | PERT         | MJ             |
| Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | PENRM        | MJ             |
| Non-renewable primary resources with energy content used as a material                                     | PENRE        | MJ             |
| Total use of non-renewable primary energy resources                                                        | PENRT        | MJ             |
| Secondary materials                                                                                        | SM           | kg             |
| Renewable secondary fuels                                                                                  | RSF          | MJ, NCV        |
| Non-renewable secondary fuels                                                                              | NRSF         | MJ, LHV        |
| Recovered energy                                                                                           | RE           | MJ, LHV        |
| Consumption of fresh water                                                                                 | FW           | m <sup>3</sup> |
| <b>Waste and outflows</b>                                                                                  |              |                |
| Non-hazardous waste disposed                                                                               | NHWD         | kg             |
| Hazardous waste disposed                                                                                   | HWD          | kg             |
| Radioactive waste disposed                                                                                 | RWD          | kg             |
| Components for re-use                                                                                      | CRU          | kg             |
| Materials for recycling                                                                                    | MR           | kg             |
| Materials for energy recovery                                                                              | MER          | MJ, LHV        |
| Exported Electrical Energy                                                                                 | EEE          | MJ, LHV        |
| Exported Thermal Energy                                                                                    | EET          | MJ, LHV        |

**Table 19.** Resource use results for the STONEWORKS™ panel over a 75 year time horizon. All values are rounded to three significant figures. Results reported in MJ are calculated using lower heating values. N/A indicates modules that are not applicable to the indicator being assessed.

| Impact Category      | Total                 | A1                    | A2                    | A3                    | A4                    | A5                    | B2                    | B4                    | C2                    | C4                    | D                      |
|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| PERE (MJ)            | 133                   | 34.8                  | 1.26                  | 54.3                  | 6.29                  | 0.918                 | 8.52                  | 27.2                  | 9.21x10 <sup>-2</sup> | 7.47x10 <sup>-2</sup> | -50.2                  |
|                      | 100%                  | 26.1%                 | 0.94%                 | 40.7%                 | 4.71%                 | 0.69%                 | 6.39%                 | 20.4%                 | 0.07%                 | 0.06%                 | -                      |
| PERM (MJ)            | 248                   | 97.8                  | 0.00                  | 26.0                  | 0.00                  | 0.00                  | 0.00                  | 124                   | 0.00                  | 0.00                  | 0.00                   |
|                      | 100%                  | 39.5%                 | 0.00%                 | 10.5%                 | 0.00%                 | 0.00%                 | 0.00%                 | 50.0%                 | 0.00%                 | 0.00%                 | -                      |
| PERT (MJ)            | 381                   | 133                   | 1.26                  | 80.3                  | 6.29                  | 0.92                  | 8.52                  | 151                   | 9.21x10 <sup>-2</sup> | 7.47x10 <sup>-2</sup> | -50.2                  |
|                      | 100%                  | 34.8%                 | 0.33%                 | 21.1%                 | 1.65%                 | 0.24%                 | 2.24%                 | 39.6%                 | 0.02%                 | 0.02%                 | -                      |
| PENRE (MJ)           | 2,300                 | 396                   | 78.0                  | 524                   | 434                   | 24.0                  | 116                   | 716                   | 6.36                  | 5.69                  | -160                   |
|                      | 100%                  | 17.2%                 | 3.39%                 | 22.8%                 | 18.9%                 | 1.04%                 | 5.04%                 | 31.1%                 | 0.28%                 | 0.25%                 | -                      |
| PENRM (MJ)           | 137                   | 14.1                  | 7.87                  | 18.9                  | 44.2                  | 1.18                  | 6.68                  | 42.9                  | 0.647                 | 0.589                 | -2.90                  |
|                      | 100%                  | 10.32%                | 5.74%                 | 13.77%                | 32.3%                 | 0.86%                 | 4.88%                 | 31.3%                 | 0.47%                 | 0.43%                 | -                      |
| PENRT (MJ)           | 2,437                 | 410                   | 85.9                  | 543                   | 478                   | 25.2                  | 123                   | 759                   | 7.01                  | 6.28                  | -163                   |
|                      | 100%                  | 16.8%                 | 3.52%                 | 22.3%                 | 19.6%                 | 1.03%                 | 5.03%                 | 31.1%                 | 0.29%                 | 0.26%                 | -                      |
| SM (kg)              | 24.6                  | 8.96                  | 6.98x10 <sup>-2</sup> | 0.692                 | 0.355                 | 2.36x10 <sup>-2</sup> | 0.192                 | 4.92                  | 5.20x10 <sup>-3</sup> | 4.00x10 <sup>-3</sup> | 9.42                   |
|                      | 100%                  | 36.4%                 | 0.28%                 | 2.81%                 | 1.44%                 | 0.10%                 | 0.78%                 | 20.0%                 | 0.02%                 | 0.02%                 | -                      |
| RSF (MJ, NCV)        | 0.728                 | 0.156                 | 9.05x10 <sup>-3</sup> | 0.236                 | 4.52x10 <sup>-2</sup> | 8.50x10 <sup>-3</sup> | 5.18x10 <sup>-2</sup> | 0.220                 | 6.60x10 <sup>-4</sup> | 6.20x10 <sup>-4</sup> | -0.155                 |
|                      | 100%                  | 21.4%                 | 1.24%                 | 32.4%                 | 6.20%                 | 1.17%                 | 7.12%                 | 30.3%                 | 0.09%                 | 0.09%                 | -                      |
| NRSF (MJ, NCV)       | 0                     | 0                     | 0                     | 0                     | 0                     | 0                     | 0                     | 0                     | 0                     | 0                     | 0                      |
|                      | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                      |
| FW (m <sup>3</sup> ) | 1.47                  | 9.15x10 <sup>-2</sup> | 1.18x10 <sup>-2</sup> | 0.133                 | 6.32x10 <sup>-2</sup> | 1.17x10 <sup>-2</sup> | 1.01                  | 0.150                 | 9.30x10 <sup>-4</sup> | 3.61x10 <sup>-3</sup> | -0.363                 |
|                      | 100%                  | 6.22%                 | 0.80%                 | 9.04%                 | 4.30%                 | 0.79%                 | 68.3%                 | 10.2%                 | 0.06%                 | 0.25%                 | -                      |
| HWD (kg)             | 12.1                  | 6.70                  | 0.111                 | 0.408                 | 0.571                 | 3.63x10 <sup>-2</sup> | 0.349                 | 3.88                  | 8.37x10 <sup>-3</sup> | 6.37x10 <sup>-3</sup> | -5.64                  |
|                      | 100%                  | 55.5%                 | 0.92%                 | 3.38%                 | 4.74%                 | 0.30%                 | 2.90%                 | 32.1%                 | 0.07%                 | 0.05%                 | -                      |
| NWHD (kg)            | 268                   | 155                   | 0.852                 | 2.99                  | 4.51                  | 2.61                  | 19.2                  | 82.6                  | 6.60x10 <sup>-2</sup> | 6.31x10 <sup>-2</sup> | 151                    |
|                      | 100%                  | 57.9%                 | 0.32%                 | 1.12%                 | 1.68%                 | 0.98%                 | 7.17%                 | 30.8%                 | 0.02%                 | 0.02%                 | -                      |
| RWD (kg)             | 1.00x10 <sup>-2</sup> | 4.00x10 <sup>-4</sup> | 1.94x10 <sup>-5</sup> | 3.14x10 <sup>-3</sup> | 9.61x10 <sup>-5</sup> | 1.30x10 <sup>-5</sup> | 1.20x10 <sup>-4</sup> | 1.77x10 <sup>-3</sup> | 4.58x10 <sup>-3</sup> | 1.17x10 <sup>-6</sup> | -1.10x10 <sup>-4</sup> |
|                      | 100%                  | 3.99%                 | 0.19%                 | 31.3%                 | 0.96%                 | 0.13%                 | 1.20%                 | 17.6%                 | 45.7%                 | 0.01%                 | -                      |
| CRU (kg)             | 0                     | 0.00                  | 0.00                  | 0.00                  | 0.00                  | 0.00                  | 0.00                  | 0.00                  | 0.00                  | 0.00                  | 0.00                   |
|                      | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                     | -                      |
| MFR (kg)             | 4.40                  | 1.99                  | 6.03x10 <sup>-2</sup> | 0.466                 | 0.313                 | 1.82x10 <sup>-2</sup> | 0.146                 | 1.40                  | 4.58x10 <sup>-3</sup> | 3.29x10 <sup>-3</sup> | -3.67                  |
|                      | 100%                  | 45.2%                 | 1.37%                 | 10.6%                 | 7.11%                 | 0.41%                 | 3.33%                 | 31.8%                 | 0.10%                 | 0.07%                 | -                      |
| MER (kg)             | 3.31x10 <sup>-4</sup> | 7.01x10 <sup>-5</sup> | 4.06x10 <sup>-6</sup> | 1.10x10 <sup>-4</sup> | 2.03x10 <sup>-5</sup> | 3.82x10 <sup>-6</sup> | 2.33x10 <sup>-5</sup> | 9.90x10 <sup>-5</sup> | 2.97x10 <sup>-7</sup> | 2.80x10 <sup>-7</sup> | -6.97x10 <sup>-5</sup> |
|                      | 100%                  | 21.2%                 | 1.23%                 | 33.2%                 | 6.13%                 | 1.15%                 | 7.03%                 | 29.9%                 | 0.09%                 | 0.08%                 | -                      |
| EEE (MJ)             | 0.347                 | 0.146                 | 6.76x10 <sup>-3</sup> | 1.22x10 <sup>-2</sup> | 3.41x10 <sup>-2</sup> | 5.61x10 <sup>-3</sup> | 4.06x10 <sup>-2</sup> | 0.100                 | 5.00x10 <sup>-4</sup> | 4.30x10 <sup>-4</sup> | -0.05                  |
|                      | 100%                  | 42.2%                 | 1.95%                 | 3.51%                 | 9.81%                 | 1.62%                 | 11.7%                 | 28.9%                 | 0.14%                 | 0.12%                 | -                      |
| EET (MJ)             | 0.79                  | 0.386                 | 1.69x10 <sup>-2</sup> | 1.51x10 <sup>-2</sup> | 6.86x10 <sup>-2</sup> | 5.28x10 <sup>-3</sup> | 4.98x10 <sup>-2</sup> | 0.244                 | 1.01x10 <sup>-3</sup> | 5.00x10 <sup>-4</sup> | -0.124                 |
|                      | 100%                  | 49.0%                 | 2.15%                 | 1.92%                 | 8.72%                 | 0.67%                 | 6.32%                 | 31.0%                 | 0.13%                 | 0.06%                 | -                      |

## 6. Additional Environmental Information

Tate is part of the Kingspan group. Kingspan understands its impact on the environment, both in terms of the role its products can play in optimizing energy efficiency, and the responsibility the company has with a global footprint of over 159 manufacturing facilities and over 15,000 employees. Kingspan seeks to operate as sustainably as possible throughout its supply chain.

Planet Passionate is Kingspan's ambitious 10-year global sustainability strategy that will impact on three big global issues: climate change, circularity, and protection of our natural world. Through Planet Passionate Kingspan will contribute to the world's renewable energy mix, reduce carbon emissions, divert waste from landfill, conserve water, provide upcycling solutions for plastic waste and help clean the world's oceans and protect biodiversity.

The strategy is made up of 12 ambitious targets, addressing the impact of Kingspan's business operations and manufacturing on the four key areas of energy, carbon, circularity and water, with commitments by 2030 to include:

- Energy: powering 60% of all Kingspan operations directly from renewable energy with a minimum of 20% of this energy generated on manufacturing sites (up from 5.3% today). This will include install solar PV on all wholly owned facilities.
- Carbon: achieving net zero carbon manufacturing and a 50% reduction in product CO2 intensity from primary supply partners.
- Circularity: upcycling of 1 billion PET bottles per annum into insulation products plus zero company waste to landfill across all sites.
- Water: harvesting 100 million liters of Kingspan's water usage from rainwater with a goal of five active ocean clean-up projects by 2025.
- Waste: target of zero company waste sent to landfill.

## 7. References

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For more information, contact:



**Tate Access Floors, Inc.**

7510 Montevideo Rd.  
Jessup, Maryland 20794  
Phone: 410-799-4200  
<https://www.tateinc.com>



**SCS Global Services**

2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA  
Main +1.510.452.8000 | fax +1.510.452.8001