

PCR Guidance for Building-Related Products and Services

From the range of Environmental Product Declarations of UL Environment

Part B: Building and Construction Sealant EPD Requirements

September 22, 2016 – September 22, 2021

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Editor's Note:

This PCR is based on revisions made to the Institute of Construction and Environment (Institut Bauen und Umwelt e.V., or IBU) Part B Building Sealants PCR.

The revisions are not modifications to the overall methodology or structure of the IBU PCR, but are intended to reflect practices, methods and requirements that are specific to North America.

This PCR is valid for a period of five (5) years, set to expire in September 22, 2021.

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Scope

This document contains the **Requirements for an Environmental Product Declaration (EPD)** from the range of Environmental Product Declarations published by UL Environment in coordination with the EN 15804 standard. The Requirements on the Project Report used to inform the EPD are contained in UL Environment's Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. This Part B document, coupled with the Part A, conforms to the EN 15804 and ISO 21930 sustainability standards for EPD reporting.

Sealants are materials with adhesive properties that are formulated primarily to fill or seal gaps or joints between two surfaces. The main purpose of sealants is to prevent air, water, and other environmental elements from entering or exiting a structure while permitting limited movement of the substrates. Sealants have a suitable viscosity to extrude through a nozzle and then be tooled to a desired profile, or to flow sufficiently for gravitational self-levelling. Sealants are used for a variety of commercial and residential applications and are a critical component for building design and construction. Common sealants include silicone, acrylic, urethane, butyl and other polymeric types.

The system boundary of this PCR is cradle-to-gate.

The scope of this document applies to:

- Single- or multi-component building sealants based on binding agents such as silicones, silane-modified polymers, polyurethanes, polysulfides, or polymer dispersions, which are formulated as injectable or pourable mixtures for use in building envelopes, building interiors, and building site-related construction. Sealants achieve their final properties by means of:
 - Reactive Chemistry (product types and sub-groups detailed in Table 1)
 - Water-Base & Solvent-Base Evaporative Chemistry (product types and sub-groups detailed in Table 2)
- Although the primary focus of this Part B PCR is building and construction sealants, the LCA calculation rules (Section 3 of this Part B PCR) and the Life Cycle Impact Assessment results (Table 5 to Table 8 in Section 5 of this Part B PCR) are also applicable to other market sectors where sealant is used. This PCR may be used to generate a cradle-to-gate (A1 to A3 in Table 3 of this Part B PCR) LCA for sealant products used in market sectors besides building and construction, such as transportation, consumer products, and assembly.

Pre-formed gaskets, extruded and molded seals, and compression systems are specifically excluded from this PCR. Coatings and sealers are covered separately under the US PCR for Architectural Coatings.

Table 1. Reactive Chemistry Types

Reactive Sealant Chemistry Type	Sub-Group
Oil-Based Caulk	n/a
Polysulfides	n/a
Polyurethanes	n/a
Silicones	n/a
Reactive Polyisobutene (PIB) Sealants	n/a
Silane-Modified Polymers	Silane-modified Polyethers (includes silyl-modified polyethers, known as "MS" polymers)
	Silane-modified Polyisobutylene (SiPiB)
	Silane-modified Polyurethanes (includes silyl-modified polyurethanes, known as "SPUR" polymers)
	Silicone-modified Polyacrylate
	Polyurea backbone
	Mixed polymers
Others	(not included)



Table 2. Water-Base & Solvent-Base Evaporative Chemistry Types

Water-Based & Solvent-Base Evaporative Chemistry Types	Sub-Group
Acrylic/Acrylic Copolymers	Water-based latex
	Solvent
Vinyl Acetate	Copolymer
Butyls (Polyisobutene)	Solvent based PIB sealants
	Gun-dispensable and pumpable sealants
	Hot-applied PIB sealants*
Elastomeric Polymers	Synthetic rubber
	Synthetic block copolymer
Others	(not included)

*Not purely evaporative in chemistry type

The following codes, intended as a non-restrictive guide, cover the scope of this Part B: Construction Specification Institute (CSI) Masterformat:

- 04 28 23 (Concrete Form Masonry Units)
- 07 01 90.71 (Joint Sealant Rehabilitation)
- 07 01 90.81 (Joint Sealant Replacement)
- 07 06 90.13 (Joint Sealant Schedule)
- 07 92 00 (Joint Sealants)
- 07 92 13 (Elastomeric Joint Sealants)
- 07 92 19 (Acoustical Joint Sealants)
- 08 44 23 (Structural Sealant Glazed Curtain Walls)
- 32 12 73 (Asphalt Paving Joint Sealants)
- 32 13 73 (Concrete Paving Joint Sealants)
- 32 13 73.13 (Fuel-Resistant Concrete Paving Joint Sealants)
- 32 13 73.16 (Field-Molded Concrete Paving Joint Sealants)

The following CSI codes are specifically **excluded** from the scope of this PCR:

- 07 910 (Preformed Joint Seals)
- 07 92 16 (Rigid Joint Sealants)
- 32 13 73.19 (Compression Concrete Paving Joint Sealants)

Example applications of sealants include:

- High- and low-rise commercial buildings
- Exterior and interior perimeter of windows and doors
- Roofing and flashing penetrations and terminations
- Building and material expansion joints
- Interior perimeters of doors, baseboards, and moldings
- Plazas and parking deck joints in traffic surfaces
- Joints between tilt-up concrete exterior panels
- Heating, ventilation, and air conditioning (HVAC) ducts
- Air barrier installations
- Sidewalks, parking lots and flat work joints
- Water and wastewater treatment facility joints (including in submerged environments)
- Structural sealant glazing



Other PCRs and Life Cycle Assessments (LCAs) considered in the development of this PCR include:

- PCR Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute of Construction and Environment e.V. (IBU), *Part B: Requirements for the EPD for Building sealants*, v1.6, July 2014.
- PCR Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute of Construction and Environment e.V. (IBU), *Part B: Requirements for the EPD for Reaction resin products*, v1.6, August 2014.
- PCR for Architectural Coatings. NSF Sustainability, June 2015.
- Sika Crade-to-Gate Sealing and Bonding Life Cycle Assessment, http://www.sika.com/en/group/sustainability/corporate_productsustainability/case_studies/sustainability-in-sealing-and-bonding/sealing-sustainability-in-the-building-envelope.html

The EPD requirements include:

- Requirements of the EN 15804 standard as a European core EPD for the purpose of consistency between declarations in Europe and the United States.
- Requirements of the ULE General Program Instructions v 2.0, April 2015 (available upon request)
- The calculation rules for the Life Cycle Assessment and Requirements on the Project Report are specified in a separate document, “Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report,” available at <http://industries.ul.com/environment/transparency/product-category-rules-pcrs>

EPD content, format, and use requirements

The chapters of the EPDs shall be described in a concise form, as well as be factually and technically correct. Judgmental, comparative, or promotional texts are not permitted unless specifically requested in the PCR or if necessary in the context of the EPD. Each document is carefully checked before publication.

Content of EPD. An EPD created using this PCR shall contain the required content specified in UL Environment’s “Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report” in addition to the required content identified in this Part B document, which serves as a reporting template.

Extent of an EPD. An EPD may contain multiple data sets representative of a collection of products, as long as each product is uniquely identified either explicitly in the EPD, by product category or by reference to a document that lists included models. For example, the base model of a sealant available in a variety of colors may be listed by: each individual model number, a model classification that includes all colors, a range of model numbers, or a reference to a catalog of model numbers that include all color variations.

Verification. An EPD created using this PCR shall be independently verified through a Program Operator acting in conformance with ISO 14025. The project report shall also be available for independent verification through a Program Operator as required in “Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report,” Section 3.

Validity. An EPD created using this PCR is valid for a five (5) year period from the date of issue.

Comparability. EPDs shall not contain statements of the superiority of one product over a competitor’s product that performs the same functions, or of one manufacturer against another. EPDs shall not contain direct or indirect comparative assertions.

The following statements indicate limitations on EPD comparability and intend to avoid any market distortions or misinterpretation of EPDs based on this PCR. ISO 14025, Section 7.2.1 requires this statement be included: “Environmental declarations from different programs may not be comparable”.

Per EN 15804 Section 5.3, a statement shall be included that indicates, “comparison of the overall environmental performance of sealants using EPD information shall be based on the product’s use and impacts at the building level, and therefore EPDs based on this PCR may not be used for comparability purposes”.



This statement shall be included: “Many factors affect the comparability of EPDs. End users should be extremely cautious when comparing or evaluating EPD data of different EPD publishers. Such comparison or evaluation is only possible if all conditions for comparability listed in ISO 14025 (Section 6.7.2) are met”. Example of variations: Different LCA software and background LCI datasets may lead to different results for the declared upstream or downstream life cycle stages.

The EPD owner shall transparently indicate any comparability limitations.

Product-group-specific LCA calculation rules from Part A PCR

No product-group-specific LCA calculation rules exist.



1. General Information

PROGRAM OPERATOR	Program Operator Provided	
DECLARATION HOLDER	Program Operator Provided	
DECLARATION NUMBER	Program Operator Provided	
DECLARED PRODUCT		
REFERENCE PCR	Program Operator Provided	
DATE OF ISSUE	Program Operator Provided	
PERIOD OF VALIDITY	Program Operator Provided	
CONTENTS OF THE DECLARATION	Product definition and information about building application Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications	
The PCR review was conducted by:	Program Operator Provided	
	Program Operator Provided	
	Program Operator Provided	
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories. The UL Environment Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report, based on CEN Norm EN 15804, serves as the core PCR. <input type="checkbox"/> INTERNAL <input type="checkbox"/> EXTERNAL		
	Program Operator Provided	
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:		
	Program Operator Provided	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:		
	Program Operator Provided	



2. Product System Documentation

2.1. PRODUCT DESCRIPTION

The declared products shall be described and identified according to Table 1 if a reactive sealant and Table 2 if an evaporative sealant. If averages are declared across various products, the calculation method for determining an average shall be explained and variances shall be reported. Averages may only be provided on the basis of individual sealant chemistry and not application type.

The product description shall include an identification of the product's type, grade, class, and uses according to ASTM C920, ASTM C834, ASTM C1184, and ASTM C1311 where applicable, or later editions of these standards.

Example: Epoxy resin products:

Reactive resins based on epoxy resin, filled and/or aqueous filled, comprise resin and hardening agent components. Aqueous, filled systems can be formulated as aqueous dispersions on the resin or hardening agent side. The reactive resins are manufactured in a two component process using reactively-diluted epoxy resins and polyamines. They comply with multiple, often specific tasks in the construction, fitting and repair of structures. By using reactive resins based on epoxy resin, filled and/or aqueous filled, the fitness for use of structures is decisively improved and their life time significantly extended.

The mixing ratio for resin and hardener is adjusted in accordance with the stoichiometric requirements. Product hardening starts immediately after mixing the components.

2.2. APPLICATION

The designated application(s) for the referenced products shall be specified. ASTM C1193-16, and the National Institute of Building Sciences Whole Building Design Guide, Section 07920 should be referenced, where relevant.

2.3. TECHNICAL DATA

The product specification (i.e., technical data sheets) and test results per applicable standards listed in Testing and Classification References in Section 8, where available, shall be referenced here.

2.4. PLACING ON THE MARKET / APPLICATION RULES

The respective standard, general technical approval, comparable national regulation, or guide shall be indicated. Standards shall be quoted as illustrated in the example.

Examples:

- ASTM C920-14a – Standard Specification for Elastomeric Joint Sealants
- ASTM C834-14 – Standard Specification for Latex Joint Sealants
- ASTM C1184-14 – Standard Specification for Structural Silicone Sealants
- ASTM C1311-14 – Standard Specification for Solvent Release Sealants
- ASTM C1193-14 – Standard Guide for Use of Joint Sealants
- National Institute of Building Sciences Whole Building Design Guide, Section 07920

2.5. PROPERTIES OF DECLARED PRODUCT AS DELIVERED

The dimensions/quantities of the declared product(s) as delivered to the site of installation/application shall be indicated.

2.6. BASE MATERIALS/ANCILLARY MATERIALS

The material composition of sealant products shall be disclosed and will include components as percentages or ranges of percentages of total weight as required by product Safety Data Sheet (SDS) rules. The SDS information shall also support safety and efficiency during installation, use, and disposal of the product.



Statements of material non-inclusion, such as "... is free of ..." shall not be used. Ancillary materials and additives remaining on the product shall also be declared. If additives such as fire retardants, softeners or biocides are used, their functional chemical group shall be indicated.

2.7. MANUFACTURING

The manufacturing process and locations shall be described and illustrated using a simple flow-chart. If the EPD applies to several locations, the production processes for all locations shall be described and reference to quality management systems may be included.

2.8. ENVIRONMENT AND HEALTH DURING MANUFACTURING

Measures relating to environmental and health protection during the manufacturing process extending beyond national guidelines (of the production country) should be described, e.g. description of Environmental Management Systems or similar, programs addressing air emissions, waste water, noise, etc.

2.9. PRODUCT PROCESSING/INSTALLATION

A description of the type of processing, machinery, tools, dust extraction equipment, auxiliary materials, etc. to be used during installation and measures for reducing noise should be included. Information on industrial and environmental protection may be included in this section.

2.10. PACKAGING

Information on product-specific packaging: type, composition and possible reuse of packaging materials (paper, pallets, foils etc.) shall be included in this section.

2.11. USE CONDITIONS (NOT REQUIRED FOR THIS PCR)

Any relevant information may be provided in this section regarding specific product use conditions and/or limitations relevant to each product application and/or use.

2.12. EXTRAORDINARY EFFECTS

FIRE

If relevant, information should be included on fire performance e.g. International Code Council (ICC), National Fire Protection Association (NFPA).

WATER

If relevant, information should be included on product performance following unforeseeable exposure to water, e.g. flooding, including possible impacts on the environment.

MECHANICAL DESTRUCTION

If relevant, information should be included on product performance following unforeseeable mechanical destruction, including possible impacts on the environment.

2.13. RE-USE PHASE

The possibilities of re-use, recycling and energy recovery may be described.

2.14. DISPOSAL

The possible disposal channels may be indicated in accordance with North American waste classification and disposal routes.

2.15. FURTHER INFORMATION

Optional details, indication of reference source for additional information, e.g. homepage, reference source for safety data sheet.



3. LCA: Calculation Rules

3.1. DECLARED UNIT

The declared unit is 1 kg. Other units are optionally admissible in addition to 1 kg if the conversion to 1 kg is shown. For multi-component products, the declared unit refers to 1 kg of the already-mixed product and the corresponding mixing ratio shall be indicated. The yield of the declared unit shall be reported in m/kg using the product's uncured density in a rectangular joint configuration (without concave surfaces) with dimensions 12mm x 6mm.

The declared unit, density, yield and mixing ratio shall be indicated in Table 3 as declared.

Table 3. Declared unit

Name	Value	Unit
Declared unit	1	kg
Density		kg/m ³
Yield in joint of dimensions 12mm x 6mm		m/kg
Mixing ratio		

3.2. SYSTEM BOUNDARY

Indicate type of the EPD here: cradle-to-gate. The modules considered in the Life Cycle Assessment as per "System limits" outlined in Section 5.5 of the Part A PCR ("Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report") shall be described in brief. It should be apparent as to what processes are considered in what modules.

3.3. UNITS

SI units are required for all declared units and LCA results. For declared units, imperial units may optionally be included in addition to the required SI units.

3.4. ESTIMATES AND ASSUMPTIONS

Key assumptions and estimates for interpretation of the Life Cycle Assessment should be referred to here, provided that they are not dealt with in other subsections of this Section 3 ("LCA: Calculation Rules").

3.5. CUT-OFF CRITERIA

Cut-off criteria as specified in Section 6.6 of the Part A PCR shall be used and documented in the EPD and Project Report.

3.6. BACKGROUND DATA

The sources for background data used shall be provided and selection of data shall follow Section 7.3 of the Part A PCR, and collection of data shall follow Section 7.1 of the Part A PCR. Primary life cycle data shall have priority.

3.7. DATA QUALITY

An evaluation shall be provided regarding data quality, including primary and background data age, geographic representativeness, technological coverage, and completeness and shall follow the requirements outlined in Section 7.4 of the Part A PCR.

If the data quality assessment gives sufficient reason to believe that any of the employed generic material or process LCI data is not representative of the product(s) under study and may introduce substantial error to the reported impact category results, then a reasonable effort shall be made by the declaring organization to improve the data quality either by 1) assessing whether more representative LCI data is available from any of the sources listed in Section 7.4 of the Part A PCR, 2) by developing LCI data based on other data sources like scientific literature, equipment specs, or trade publications, or 3) by collecting primary data on the material or process in question from suppliers or process operators. If none of these options is viable within given constraints, the source and nature of



the expected error shall be documented in the Project Report and a disclaimer should be added to the EPD that the reported values are likely an over- or underestimate of potential environmental burdens.

3.8. PERIOD UNDER REVIEW

The period under review and ensuing averages shall be documented.

3.9. ALLOCATION

Section 7.5 of the Part A PCR shall be used as the basis for allocation decisions, and mass should be used as the primary basis for co-product allocation in this Part B. Allocation methods deemed more appropriate than on the basis of mass may be used when justified. The allocations of relevance for calculation (appropriation of impacts across various products) shall be indicated, including at least:

- Allocation in the use of recycled and/or secondary raw materials
- Allocation of energy, auxiliary and operating materials used for individual products in a factory
-

Reference shall be made to the modules in which the allocations are performed.

4. LCA: Scenarios and additional environmental information

Scenarios related to modules beyond the factory gate (i.e., modules A4, A5, B1-B7, C1-C3, and D) are specifically excluded from reporting under the scope of this PCR.

ADDITIONAL ENVIRONMENTAL INFORMATION (REQUIRED)

The following information is required for reporting:

Name	Sealant Category (per Rule 1168 Category)	Calculated Value	Category Limit (per Rule 1168 Category)	Unit
VOC content				g/L

VOC determinations shall be performed by calculations or analytical methods consistent with SCAQMD Rule #1168.

Note: There are other regulatory requirements that are less restrictive than Rule 1168, e.g. CARB; however, they all determine VOCs using the same method.

Note: Reporting of VOC content is required to nominally address VOC emissions during the installation and use phases, which are excluded from the scope of this PCR. The exclusions of VOC emissions from the LCI will lead to underestimation of the Photochemical Oxidation Potential (PCOP) impacts in Section 5 of this Part B PCR.

ADDITIONAL ENVIRONMENTAL INFORMATION (OPTIONAL)

Additional environmental information pertaining to product performance may also be reported here as detailed in ISO 14025, Section 7.2.3. In addition to the examples listed in ISO 14025, this may also include the biogenic carbon content of the final product, provided that the value is substantiated with the appropriate documentation following Section 7 of this Part B PCR.

Product hazard information is captured by the product SDS, which identifies the concentration of any hazardous ingredient (as classified by Globally Harmonized System) present above the cut-off limits and provides a detailed listing of toxicological information related to the product as delivered. The individual SDS for the product of interest should be consulted. Any recommendations concerning cleaning, maintenance, etc. of the declared product may also be listed. Companies manufacturing sealants may provide additional environmental information pertinent to ISO 14025 on a voluntary basis.



5. LCA: Results

In Table 3, "Description of the system boundary," all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND." Indicator values in Table 4 for each module shall be declared with three valid digits using scientific notation (e.g., 1.23E-5 = 0.0000123). Modules not declared may be deleted from the table, indicator abbreviations may be replaced with complete names, ensuring the preservation of readability and clear arrangement; the legends may then be deleted.

Module A1, A2 and A3 may be declared as one aggregated module A1-3.

Per the Part A PCR, TRACI 2.1 Life Cycle Impact Assessment (LCIA) results in Table 4 shall be reported to ensure a North American context. Although not required for NA registered EPDs, LCIA results in Table 5 may optionally be reported to achieve conformance with EN 15804 and the mutual recognition program with UL Environment and the German Institute for Construction & Environment's (IBU) Part A PCR, CML v 4.7.

Results derived from the product Life Cycle Inventory (LCI) shall be reported in Table 7 and Table 8.

Table 4. Description of the system boundary modules

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE					END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D	
Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential	Reference Service Life
					B6 Operational Energy Use of Building Integrated System During Product Use										
					B7 Operational Water Use of Building Integrated System During Product Use										
Cradle to grave	Required		Excluded												Excluded

LIFE CYCLE IMPACT ASSESSMENT RESULTS: [INDICATE DECLARED UNIT AND PRODUCT]

Table 5. North American LCIA Results¹

TRACI 2.1 Impact Assessment Method, October 2013 (with the exception of GWP)			
Parameter	Parameter	Unit	Values for all declared modules
GWP	Global warming potential based on IPCC (2013 AR5), 100 years, excluding biogenic CO ₂	[kg CO ₂ -Eq.]	
ODP	Stratospheric ozone layer depletion potential	[kg CFC-11 Eq.]	
AP	Acidification potential	[kg SO ₂ -Eq.]	

¹ Mandatory EN 15804 impact categories are adapted for the NA geographic context.



EP	Eutrophication potentials	[kg N-Eq.]	
POCP	Photochemical ozone creation potential	[kg O ₃ -Eq.]	
ADP	Abiotic resource depletion potential – fossil fuels	Surplus energy per extracted MJ, kg or m3 fossil fuel, as a result of lower quality resources	

Table 6. European Union and Rest of World LCIA Results

CML 4.1 Impact Assessment Method (per EN 15804:2012 + A1:2013)			
Parameter	Parameter	Unit	Values for all declared modules
GWP	Global warming potential	[kg CO ₂ -Eq.]	
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC-11 Eq.]	
AP Air	Acidification potentials for air emissions	[kg SO ₂ -Eq.]	
EP	Eutrophication potentials	[kg (PO ₄) ³⁻ Eq.]	
POCP	Formation potential of tropospheric ozone	[kg ethene Eq.]	
ADP elements	Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	
ADP fossil fuels	Abiotic depletion potential for fossil resources	[MJ, LHV]	

Table 7. Life Cycle Inventory Results: Resource Use

LCI RESULTS – RESOURCE USE [INDICATE DECLARED UNIT AND PRODUCT]			
Parameter	Parameter	Unit	
PERE	Renewable primary energy as energy carrier	[MJ, LHV]	
PERM	Renewable primary energy resources as material utilization	[MJ, LHV]	
PERT	Total use of renewable primary energy resources	[MJ, LHV]	
PENRE	Non-renewable primary energy as energy carrier	[MJ, LHV]	
PENRM	Non-renewable primary energy as material utilization	[MJ, LHV]	
PENRT	Total use of non-renewable primary energy resources	[MJ, LHV]	
SM	Use of secondary material	[MJ, LHV]	
RSF	Use of renewable secondary fuels	[MJ, LHV]	
NRSF	Use of non-renewable secondary fuels	[MJ, LHV]	
FW	Use of net fresh water	[m ³]	
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water		

Table 8. Life Cycle Inventory Results: Output Flows and Waste Categories

LCI RESULTS: OUTPUT FLOWS AND WASTE CATEGORIES [INDICATE DECLARED UNIT AND PRODUCT]			
Parameter	Parameter	Unit	Values for all declared modules
HWD	Hazardous waste disposed	[kg]	
NHWD	Non-hazardous waste disposed	[kg]	
RWD	Radioactive waste disposed	[kg]	
CRU	Components for re-use	[kg]	
MFR	Materials for recycling	[kg]	
MER	Materials for energy recovery	[kg]	
EE	Exported energy	[kg]	
	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy		



6. LCA: Interpretation

To facilitate comprehension of the Life Cycle Assessment, both the aggregate indicators of the Life Cycle Inventory (LCI) and the Life Cycle Impact Assessment (LCIA) results outlined in Section 5 of this Part B PCR (LCIA results) shall be interpreted in a dominance analysis. A statement shall also be included describing uncertainty estimates in the declared numerical indicator results.

This interpretation shall also include a description of the time frame and/or variance of the LCIA results if the EPD is valid for several products. A visual representation of the results is recommended as appropriate for a reader's understanding of the environmental profile of the declared product (e.g., distribution of impacts across the modules).

7. Supporting Documentation

The project report elements required to support the content declared in an EPD created using this document are specified in "Part A: Calculations for the Life Cycle Assessment and Requirements on the Project Report." These project report elements include general information (Part A, Section 4), study goal (Part A, Section 5), study scope (Part A, Section 6), and the life cycle inventory analysis, impact assessment, and interpretation (Part A, Sections 7, 8, and 9). Additionally, the project report shall include additional required supporting documentation specified in this Part B and according to Part A, Section 10.

If relevant to the scope of the declared product, or due to the product material composition, it is recommended to provide sufficient supporting documentation in the EPD and Project Report. When providing documentation, testing protocols and other relevant information shall be indicated. If supporting documentation is not provided, the reasons shall be indicated in the EPD and Project Report.

As a general rule, all statements shall be documented and supported as established by the Federal Trade Commission's Green Guides, 16 CFR Part 260. For Canadian manufacturers, all statements shall also be documented and supported as established by Competition Bureau Canada's Environmental Claims: A Guide for Industry and Advertisers.

In the case of non-verifiable substances, the limit of detection shall be included in the declaration. Interpreting statements such as "...free of..." or "...are entirely harmless..." are not permissible.

8. References

The literature referenced in the Environmental Product Declaration shall be quoted in full from the following sources. Standards, and standards relating to evidence and/or technical elements already fully quoted in the EPD, do not need to be listed here. This Part B PCR document shall be referenced.

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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UL Environment General Program Instructions, v2, *April 2015*.

PCR Part A: UL Environment and Institute of Construction and Environment e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v1.3, *July 2014*.

SUSTAINABILITY REPORTING STANDARDS

EN 15804: 2012-04 - Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction product.

ISO 14025: 2006 - Environmental labels and declarations — Type III environmental declarations — Principles and procedures

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



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

ISO 14046:2013 - Environmental management- Water footprint- Principles, requirements and guidelines

ISO 15392:2008 - Sustainability in building construction- General principles

ISO 15686-1:2011 - Buildings and constructed assets- Service life planning- Part 1: General principles

ISO 15686-2:2008 - Buildings and constructed assets- Service life planning Part 2: Service life prediction procedures

ISO 15686-7:2008 - Buildings and constructed assets- Service life planning Part 7: Performance evaluation for feedback of service life data from practice

ISO 15686-8:2008 - Buildings and constructed assets- Service life planning Part 8: Reference service life and service life estimation

ISO 21930: 2007 - Sustainability in building construction -- Environmental declaration of building products

TESTING AND CLASSIFICATION REFERENCES

ASTM C834 - Standard Specification for Latex Joint Sealants

ASTM C920 - Standard Specification for Elastomeric Joint Sealants

ASTM C1184 - Standard Specification for Structural Silicone Sealants

ASTM C1311 - Standard Specification for Solvent Release Sealants

ASTM C1193 - Standard Guide for Use of Joint Sealants

National Institute of Building Sciences Whole Building Design Guide, Section 07920

South Coast Air Quality Management District (SCAQMD) Rule #1168. Adhesive and Sealant Applications. January 2005. (<http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1168.pdf?sfvrsn=4>)

RELEVANT FEDERAL STANDARDS AND SOPS

Competition Bureau Canada Environmental Claims: A Guide for Industry and Advertisers

(<http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/02701.html>)

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

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

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

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Federal Trade Commission. Green Guides, 16 CFR Part 260. October 2012. (<https://www.gpo.gov/fdsys/pkg/FR-2012-10-11/pdf/2012-24713.pdf>)

RELEVANT PCRS

Product Category Rules for Building-Related Products and Services, From the range of Environmental Product Declarations of UL Environment and Institute Construction and Environment e.V. (IBU): "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v1.3, June 2014, v1.3

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Product Category Rules Guidance-Texts for Building-Related Products and Services, From the range of Environmental Product Declarations of Institute of Construction and Environment e.V. (IBU), “Part B: Requirements for the EPD for Reaction resin products,” v1.6, *August 2014*.

Product Category Rules for Architectural Coatings. NSF Sustainability, *June 2015*.

9. Glossary

ASTM – A standards development organization formerly known as the American Society for Testing and Materials (ASTM). ASTM serves as an open forum for the development of international technical standards for a wide range of materials, products, systems, and services.

CML – An Institute of Environmental Sciences at Leiden University.

EPD – Environmental Product Declaration. a Type III environmental declaration under ISO 14025, which provides a standardized way of reporting the environmental impacts of a product or system. Life Cycle Assessment is the method used to assess the impacts that are reported in an EPD.

LCA – Life Cycle Assessment. A scientific method to assess the environmental impacts associated with all stages of a product life cycle from cradle to grave (i.e., raw material extraction, pre-processing, transport, manufacturing, distribution, installation, use, and disposal), or a portion of that cycle, such as cradle to gate.

LCIA – Life Cycle Impact Assessment. The phase of a Life Cycle Assessment that evaluates the significance of potential environmental impacts based on the LCI flow results.

LCI – Life Cycle Inventory. The quantified inputs and outputs of a product system to and from nature, i.e. its material, water, and energy inputs and releases to air, land, and water. To develop an inventory, a flow model of the technical system is constructed using data on system inputs and outputs.

Multi-Component Sealant – A user-mixed product consisting of a base component, an activator component, and/or a tinting component. The activator component is typically added to the base component and mixed for a set period of time before application. Multi-component sealants typically require bulk guns and mixing equipment to prepare and apply the sealant, and are typically packaged in separate containers.

Part A PCR – Product Category Rule, Part A. Available for use by any program operator, UL Environment’s “Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report” is the core, general document to be used alongside a product specific PCR Part B. The general Part A document, coupled with a specific Part B, conforms to the EN 15804 and ISO 21930 sustainability standards for EPD reporting.

Part B PCR – Product Category Rule, Part B. Outlines product-specific calculation and reporting requirements when creating an EPD. A Part B document, coupled with the Part A, conforms to the EN 15804 and ISO 21930 sustainability standards for EPD reporting.

Reactive Sealant Chemistry Type – Creates bond through a chemical reaction involving a one-part or two-part reaction. One-part sealants are pre-mixed and typically need UV light, heat or moisture to cure. Two-part sealants require mixing and include a base resin plus a hardener/curing agent that transforms into a thermoset polymer via a cross linking process.

Sealant – Materials with adhesive properties that are formulated primarily to fill or seal gaps or joints between two surfaces. The main purpose of sealants is to prevent air, water, and other environmental elements from entering or exiting a structure while permitting limited movement of the substrates. Sealants have a suitable viscosity to extrude through a nozzle and then be tooled to a desired profile, or to flow sufficiently for gravitational self-levelling. Sealants are used for a variety of commercial and residential applications and are a critical component for building design and construction. Common sealants include silicone, acrylic, urethane, butyl and other polymeric types.

TRACI – Tool for Reduction and Assessment of Chemicals and other environmental Impacts. A tool developed by the US Environmental Protection Agency that includes sustainability metrics, life cycle impact assessment, industrial ecology, and process design impact assessment for developing increasingly sustainable products, processes, facilities, companies, and communities. TRACI allows the quantification of stressors that have potential effects, including ozone



depletion, global warming, acidification, eutrophication, tropospheric ozone (smog) formation, human health criteria-related effects, human health cancer, human health noncancer, ecotoxicity, and fossil fuel depletion.

Water-Based Evaporative Chemistry – Sealant products formulated with polymer particles dispersed in water. When the sealant is applied, the water evaporates and the polymer particles move closer together. As the evaporation of water continues, the polymer particles begin to deform and fuse together, eventually forming a continuous seal.

Single-Component Sealant – A sealant product packaged in a single container. No special equipment is required to mix one-component sealants.

Solvent-Based Evaporative Chemistry – Sealant products formulated with a continuous polymer and solvent solution. When the sealant is applied, the solvent evaporates, and the polymer chains are drawn closer together and eventually entangle.

Yield – The expected sealant output of 1kg (declared unit) expressed as m/kg using the product's uncured density in a rectangular joint configuration (without concave surfaces) of dimensions 12mm x 6mm.