Action® FLOOR SYSTEMS

VERIFIED by SCS GLOBAL SERVICES
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner:
Action Floor Systems, LLC
4781 N. U.S. Highway 51
Mercer, WI 54547-9708 U.S.A.

Product

Maple Sports Flooring
(25/32" and 33/32" thicknesses)

Functional Unit

1 m^2 of floor covering for sports flooring systems, maintained for 60 years.

EPD Number and Period of Validity

SCS-EPD-04591
Beginning Date: July 31, 2017 – End Date: July 30, 2022.

Product Category Rule

Product Category Rule (PCR) for preparing an Environmental Product Declaration (EPD) for Flooring: Carpet, Resilient, Laminate, Ceramic, Wood. NSF International. Version 2. 2014.

Program Operator

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Disclaimers: *This EPD conforms to ISO 14025, 14040, ISO 14044, and 21930.*

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*

Comparability: *The PCR 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.*

PCR review, was conducted by	Jack Geibig, EcoForm. jgeibig@ecoform.com
Approved July 31, 2017, Valid until July 30, 2022	
Independent verification of the declaration and data, according to ISO 14025:2006 and ISO 21930:2007.	☐ internal ☑ external
Third party verifier	Tom Gloria, PhD, Industrial

PRODUCT DESCRIPTION

Maple sports flooring is manufactured at the Action Floor Systems' facility in Mercer, Wisconsin. The hardwood flooring product is available in thicknesses of 25/32" or 33/32" and widths of 1-1/2", 2-1/4", and 3-1/4". The maple sports flooring is used as floor covering in Action Floor Systems' anchored resilient and floating floor systems. For additional information regarding these maple sports floor systems, please visit: http://www.actionfloors.com/flooring-systems/maple-sports-floors.

The maple sports flooring provides uniform playability, durability, resiliency, and shock absorption for athletes' safety. The reference service lives for the 25/32" and 33/32" thick flooring products is 60 years.

PRODUCT APPLICATION

Action Floor Systems' maple sports flooring provide sports floor options for college and universities, K-12 gyms, field houses, professional arenas, multipurpose community centers, squash and racquetball courts, aerobic and dance rooms, and more.

MATERIAL CONTENT

Table 1. *Origin and availability of main materials contained in maple sports flooring in delivery condition.*

Component	Materials	Origin of Raw Materials	Availability			Pre- and Post-Consumer Recycled Content	Percent of Total
			Renewable	Non-Renewable	Recycled		
Unfinished Solid Wood	Acer saccharum (sugar maple)	United States	Abundant			0%	100%

The product is manufactured without chemical treatments or resins/additives. Wood dust may be present while being transported or when being handled by downstream users. Furthermore, wood dust may be generated as a result of downstream activities (e.g., cutting, sanding), which creates small particles. Wood, including wood dust, does not have a CAS #. Exposure limits and guidelines for hardwood and wood dust are presented below:

- OSHA -TWA 15 mg/m^3 (total dust).
- OSHA -TWA 5 mg/m^3 (respirable dust fraction).
- ACGIH -TLV 1mg/m^3 (inhalable fraction).

PRODUCTION OF MAIN MATERIALS

Acer saccharum (sugar maple): A species of maple native to hardwood forests of eastern Canada and the northern parts of central and eastern United States.

PRODUCT CHARACTERISTICS

Product characteristics of the hardwood flooring product in this study are provided in Table 2 and the specification of wood flooring properties declared are in accordance with the MFMA Performance and Uniformity Rating (PUR) standards and Grading Rules.

Table 2. *Product characteristics for Action Floor Systems maple sports flooring.*

Characteristics	Nominal Value	Unit
Thickness	25/32", 33/32"	inch
Width	1-1/2", 2-1/4", 3-1/4"	inch
Product Weight	45.6	oz/ft^2
Side Hardness	970 – 1450	lb
Relative Hardness	1450	Janka hardness
Moisture Content	7-9%	Percentage
Finish Thickness (factory finished)	Unfinished	mils (thousandths of an inch)
VOC emissions test method	FloorScore® (SCS-FS-04219)	-
Sustainable Certifications	FSC® (FSC-C023843)	-

ADDITIONAL ENVIRONMENTAL INFORMATION

Action Floor Systems is certified for FSC® chain of custody (FSC-C023843). To view the certification, please visit: http://www.actionfloors.com/wp-content/uploads/2016/11/certificate-fsc.jpg

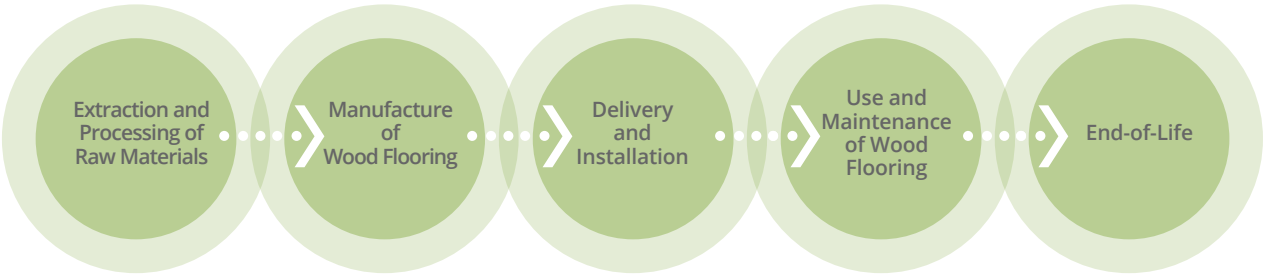
Action Floor Systems' 25/32" x 2-1/4" unfinished maple sports flooring is certified FloorScore® (SCS-FS-04219). To view the certification, please visit: https://www.scscertified.com/products/cert_pdfs/ActionFloorSystems_2016_SCS-FS-04219_s.pdf

A Life Cycle Inventory conducted by the University of Wisconsin has demonstrated that more carbon is stored in Action Floor Systems' solid strip hardwood flooring than is released during its manufacturing process. To view the certification, please visit: http://www.actionfloors.com/wp-content/uploads/2016/11/carbon-negative.pdf

The Action Floor Systems facility in Mercer, Wisconsin uses a wood-fired boiler system that runs on wood waste generated via the manufacturing process. For more information, please visit: http://www.actionfloors.com/sustainability/scores

100% of raw maple material is utilized at the Mercer, WI facility. What is not used for flooring is used to create steam for kiln drying and building heat, and any excess is sold to companies that manufacture other products from chips and dust. Ultimately, 90% of the waste generated at the Mercer, WI facility is diverted from landfill.

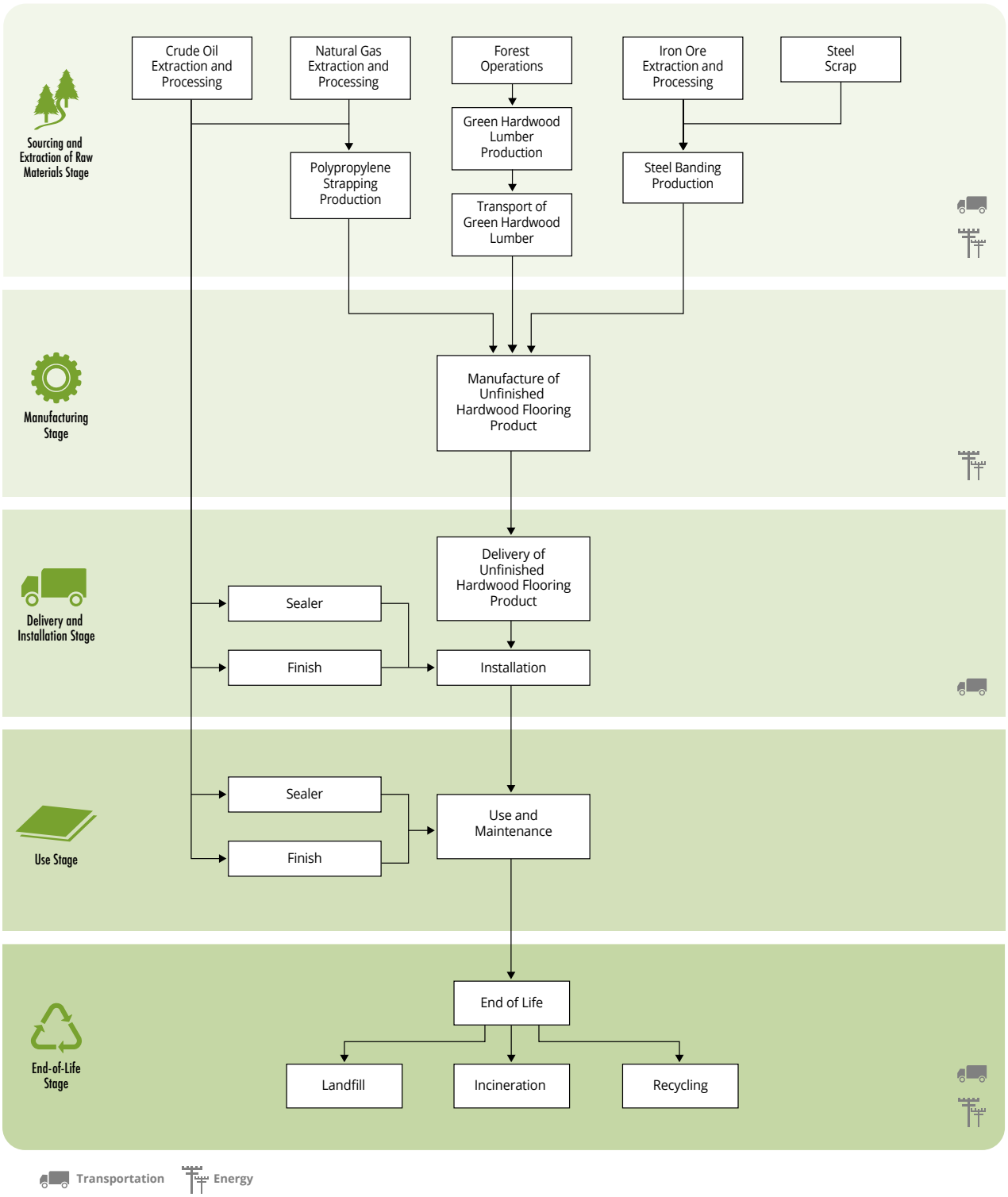
LIFE CYCLE ASSESSMENT



A cradle to grave life cycle assessment (LCA) was completed for this product group in accordance with ISO 14040, ISO 14044, ISO 21930, and Product Category Rule for Environmental Product Declarations Flooring: Carpet, Resilient, Laminate, Ceramic, Wood (Version 2).

PRODUCT LIFE CYCLE FLOW DIAGRAM

The diagram below is a representation of the most significant contributions to the life cycle of Action Floor Systems maple sports flooring. This includes resource extraction and processing, product manufacture, delivery and installation, use and maintenance, and end-of-life.



LIFE CYCLE ASSESSMENT STAGES AND REPORTED EPD INFORMATION

Sourcing/extraction (raw material acquisition) Stage

This stage includes extraction and processing of raw materials, including delivery to the production site. Packaging materials are included.

Manufacturing Stage

This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions at the facility. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are not included.

Sugar maple green lumber from the forests of Wisconsin and upper Michigan are delivered to the Mercer, WI facility, where they are fed into a stacking machine prior to kiln drying. Once the lumber is dried, they are stored before being sent to the flooring mill where the lumber is processed and all defects are removed. The dried lumber is planned, ripped, and trimmed so each piece is at a uniform thickness, width, and random length. Tongue and grooves are subsequently formed via a molding process along the length of the boards. The hardwood flooring product is sorted by grade, packaged, and then stored prior to the shipment of the final product. The facility is not ISO 9001 or ISO 14001 certified.

Delivery and Installation Stage

Delivery

This stage includes the delivery of maple sports flooring to the point of installation. Modeling used in the life cycle assessment assumed an estimated distribution distance to point of sale of 951 miles via diesel truck.

Installation

For anchored resilient floor systems, the first row of maple sports flooring is nailed to the sleepers and the rest are installed using flooring cleats. Similarly, for floating floor systems, the first row of maple sports flooring is nailed to the subfloor and the rest is installed using flooring cleats. For both hard maple sports flooring systems, industry standard practices, specified by MFMA, are recommended for sanding, sealing, and finishing. Installation in this study is based on a "2-2" specification, or two coats of seal and two coats of finish (4 coat system).

In this EPD, sealer and finish for the installation of maple sports flooring are included, while nails, cleats, and court lining are excluded. Furthermore, electricity use is included for sanding, buffing, and vacuuming. Installation of subfloor substrate or underlayment is excluded.

Appropriate personal protective equipment (PPE) guidance shall be followed regarding the need for protection against saw dust when cutting, working, or manipulating flooring. Proper PPE should be worn when installing, sanding, and finishing wood products including ear, eye, and respiratory protection to avoid excess exposure to wood dust. Other suggested protection includes knee pads and rubber globes. Finish and adhesives, if applicable, should meet low VOC requirements.

Sanding will typically remove no more than 1/32" of maple sports floor covering thickness. Wood dust generated from each sanding event is approximately 4% of maple sports floor covering for 25/32" thickness and 3% of maple sports floor covering for 33/32" thickness. Wood flooring is considered nonhazardous waste and should be disposed of in accordance with local requirements.

Packaging

Table 3. *Packaging material for maple sports flooring. Shown per 1 m^2 flooring.*

25/33"		
Material	**Amount (kg)**	**Percent of Total**
Steel banding	$2.75x10^{-2}$	82.1%
Polypropylene strap	$5.99x10^{-3}$	17.9%

33/32"		
Material	**Amount (kg)**	**Percent of Total**
Steel banding	$3.71x10^{-2}$	86.1%
Polypropylene strap	$5.99x10^{-3}$	13.9%

Use Stage

Cleaning and maintenance.

The use stage includes cleaning and resurfacing (sanding, sealing, buffing, vacuuming, and finishing) of the hardwood flooring over the 60 year time period. The resurfacing process follows the same general procedures used during installation and the same PPE guidance shall be followed.

Both thicknesses of maple sports flooring (25/32" and 33/32") require six additional sandings or resurfacing after initial installation over the 60 year time period.

Daily sweeping with a broom or dust mop is recommended, while hardwood floor cleaners can be used to clean more difficult to remove contaminants (e.g., marking from rubber shoes). Hardwood floor cleaners are available with varying compositions, recommended application rates, and maintenance schedules. Due to this uncertainty, the use of hardwood floor cleaners are excluded.

Table 4. *Cleaning and maintenance parameters used for the EPD.*

Cleaning Process	Frequency	Energy & Resource Use
Sweeping	Once daily	None
Refinishing*	Every 10 years	Electricity; Sealer; Finish

*Sanding and vacuuming, sealing, buffing and vacuuming, and finishing

End-of-Life Stage

Recycling, reuse or repurpose

Product and packaging disposal at end of life is based on statistics in the US Environmental Protection Agency's "Advancing Sustainable Materials Management: Facts and Figures Fact Sheet" for 2014. Based on this data, the amount of flooring recycled as a percent of generation for wooden durable goods is negligible, or approximately 0%. The relevant recycling rates from this data were applied to the product's packaging materials, which include low carbon steel and polypropyleneand are 72.8% and 14.8%, respectively.

Disposal

For disposal of product and packaging materials that are not recycled, it is assumed that 20% are incinerated and 80% go to a landfill.

Transport

Transportation of materials at end of life assumes a 20 mile average distance to disposal, which is based on the default value provided in the US Environmental Protection Agency's WARM model.

LIFE CYCLE INVENTORY

Life cycle inventory parameters from ISO 21930 are calculated for the LCA. All results are calculated using SimaPro, version 8.3, using primary and secondary inventory data.

Table 5. *Key life cycle inventory parameters shown per 1 m^2 of 25/32" maple sports flooring maintained for 60 years.*

Parameter	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Total Primary Energy Consumption							
Non-renewable energy resources	MJ	46	110	86	170	6.3	420
Renewable primary energy	MJ	0.27	200	1.5	4.9	0.13	210
Material Resources Consumption							
Non-renewable material resources	kg	$2.1x10^{-2}$	0.0	0.25	1.5	0.0	1.8
Renewable material resources	kg	19	$8.9x10^{-2}$	$1.8x10^{-2}$	$2.7x10^{-2}$	$1.5x10^{-3}$	19
Freshwater	m^3	0.0	0.28	0.0	0.0	0.0	0.28
Waste Generated							
Hazardous waste	kg	$8.8x10^{-5}$	$4.1x10^{-4}$	$5.3x10^{-4}$	$7.7x10^{-4}$	$4.3x10^{-5}$	$1.8x10^{-3}$
Non-hazardous waste	kg	0.53	0.38	3.1	3.6	16	24

Table 6. *Key life cycle inventory parameters shown per 1 m² of 33/32" maple sports flooring maintained for 60 years.*

Parameter	Units	Sourcing and Extraction	Manufacturing	Delivery and Installation	Use	End of Life	Total
Total Primary Energy Consumption							
Non-renewable energy resources	MJ	51	150	110	170	7.0	480
Renewable primary energy	MJ	0.33	270	1.8	4.9	0.15	280
Material Resources Consumption							
Non-renewable material resources	kg	$2.7x10^{-2}$	0.0	0.25	1.5	0.0	1.8
Renewable material resources	kg	21	0.12	$2.2x10^{-2}$	$2.7x10^{-2}$	$1.6x10^{-3}$	22
Freshwater	m^3	0.0	0.38	0.0	0.0	0.0	0.38
Waste Generated							
Hazardous waste	kg	$1.0x10^{-4}$	$5.6x10^{-4}$	$6.7x10^{-4}$	$7.7x10^{-4}$	$4.8x10^{-5}$	$2.1x10^{-3}$
Non-hazardous waste	kg	0.60	0.52	4.0	3.6	18	27

LIFE CYCLE IMPACT ASSESSMENT

Category impact indicator results using CML-IA are presented in accordance with the tables specified in Section 6.10 of the PCR. Specifically, the LCIA potential impacts are declared in the following ways:

- **Table A –** The potential impacts for 1 m² of floor covering for each of the following life cycle stages: sourcing/ extraction, manufacturing, delivery and installation, and end of life. The impacts are not normalized to the 60-year reference service life of the building.
- **Table B –** The impacts for the use stage for 1 m² of floor covering for an average one year use. Tables 9 and 13 list the assumptions for use and maintenance activities.
- **Table C –** The total impacts of all life cycle stages based on the estimated replacement schedule for 1 m² of floor covering over a 60-year reference service life of a building.

25/32"

Table 7. *Cradle to install and end of life LCIA results for 1 m^2 of 25/32" maple sports flooring. Values are shown with two significant figures (Table A of the PCR).*

Impact Category	Units	Sourcing and Extraction	Manu-facturing	Delivery and Installation	End of Life	Total
Abiotic Depletion Potential (Fossil Fuels)	MJ	45	91	82	5.9	220
		20%	40%	37%	2.6%	100%
Abiotic Depletion Potential (Elements)	kg Sb eq	$3.0x10^{-6}$	$5.0x10^{-6}$	$1.2x10^{-5}$	$5.9x10^{-7}$	$2.0x10^{-5}$
		15%	25%	58%	2.9%	100%
Acidification Potential	kg SO_2 eq	$2.4x10^{-2}$	$7.4x10^{-2}$	$1.9x10^{-2}$	$2.2x10^{-3}$	0.12
		20%	62%	16%	1.8%	100%
Eutrophication Potential	kg PO_4^{3-} eq	$3.5x10^{-3}$	$2.3x10^{-2}$	$5.4x10^{-3}$	$4.3x10^{-2}$	$7.5x10^{-2}$
		4.6%	31%	7.2%	57%	100%
Global Warming Potential	kg CO_2 eq	3.2	8.6	4.6	1.3	18
		18%	49%	26%	7.4%	100%
Global Warming Potential, Biogenic	kg CO_2 eq	-37	36	4.6	7.3	11
		-350%	340%	43%	70%	100%
Ozone Depletion Potential	kg CFC-11 eq	$2.1x10^{-7}$	$1.5x10^{-7}$	$8.4x10^{-7}$	$6.7x10^{-8}$	$1.3x10^{-6}$
		17%	12%	66%	5.3%	100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	$1.5x10^{-3}$	$5.8x10^{-3}$	$8.5x10^{-4}$	$3.1x10^{-4}$	$8.5x10^{-3}$
		18%	68%	10%	3.7%	100%
Primary Energy, Non-Renewable	MJ	46	110	86	6.3	250
		19%	44%	35%	2.5%	100%
Primary Energy, Renewable	MJ	0.27	200	1.5	0.13	200
		0.13%	99%	0.74%	0.066%	100%

Table 8. *Average 1 year use stage impacts for 1 m^2 of 25/32" maple sports flooring (Table B of the PCR).*

Impact Category	Units	Average 1 year Use and Maintenance Impacts
Abiotic Depletion Potential (Fossil Fuels)	MJ	150
Abiotic Depletion Potential (Elements)	kg Sb eq	$7.3x10^{-6}$
Acidification Potential	kg SO_2 eq	$3.0x10^{-2}$
Eutrophication Potential	kg PO_4^{3-} eq	$1.3x10^{-2}$
Global Warming Potential	kg CO_2 eq	6.1
Global Warming Potential, Biogenic	kg CO_2 eq	6.2
Ozone Depletion Potential	kg CFC-11 eq	$1.1x10^{-6}$
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	$1.5x10^{-3}$
Primary Energy, Non-Renewable	MJ	170
Primary Energy, Renewable	MJ	4.9

Table 9. *List of use and maintenance activities for 1 m^2 of 25/32" maple sports flooring.*

Maintenance Activity	Frequency
Sweep	Daily (21,900 times over 60 years)
Refinishing*	Every 10 years (6 times over 60 years)

*Sanding and vacuuming, sealing, buffing and vacuuming, and finishing

Table 10. *Cradle to grave impacts over 60 year building service life for 1 m^2 of 25/32" maple sports flooring. Values are shown with two significant figures (Table C of the PCR).*

Impact Category	Units	Sourcing and Extraction	Manu-facturing	Delivery and Installation	Use	End of Life	Total
Abiotic Depletion Potential (Fossil Fuels)	MJ	45	91	82	150	5.9	380
		12%	24%	22%	40%	1.6%	100%
Abiotic Depletion Potential (Elements)	kg Sb eq	$3.0x10^{-6}$	$5.0x10^{-6}$	$1.2x10^{-5}$	$7.3x10^{-6}$	$5.9x10^{-7}$	$2.8x10^{-5}$
		11%	18%	43%	26%	2.1%	100%
Acidification Potential	kg SO_2 eq	$2.4x10^{-2}$	$7.4x10^{-2}$	$1.9x10^{-2}$	$3.0x10^{-2}$	$2.2x10^{-3}$	0.15
		16%	50%	13%	20%	1.5%	100%
Eutrophication Potential	kg $PO4^{3-}$ eq	$3.5x10^{-3}$	$2.3x10^{-2}$	$5.4x10^{-3}$	$1.3x10^{-2}$	$4.3x10^{-2}$	$8.8x10^{-2}$
		3.9%	26%	6.1%	15%	48%	100%
Global Warming Potential	kg CO_2 eq	3.2	8.6	4.6	6.1	1.3	24
		13%	36%	19%	26%	5.5%	100%
Global Warming Potential, Biogenic	kg CO_2 eq	-37	36	4.6	6.2	7.3	17
		-220%	210%	27%	37%	44%	100%
Ozone Depletion Potential	kg CFC-11 eq	$2.1x10^{-7}$	$1.5x10^{-7}$	$8.4x10^{-7}$	$1.1x10^{-6}$	$6.7x10^{-8}$	$2.4x10^{-6}$
		9.0%	6.4%	35%	46%	2.8%	100%
Photo-chemical Oxidant Formation Potential	kg C_2H_4 eq	$1.5x10^{-3}$	$5.8x10^{-3}$	$8.5x10^{-4}$	$1.5x10^{-3}$	$3.1x10^{-4}$	$1.0x10^{-2}$
		15%	58%	8.5%	15%	3.1%	100%
Primary Energy, Non-Renewable	MJ	46	110	86	170	6.3	420
		11%	26%	21%	41%	1.5%	100%
Primary Energy, Renewable	MJ	0.27	200	1.5	4.9	0.13	210
		0.13%	97%	0.73%	2.4%	0.064%	100%

33/32"

Table 11. *Cradle to install and end of life LCIA results for 1 m² of 33/32" maple sports flooring. Values are shown with two significant figures (Table A of the PCR).*

Impact Category	Units	Sourcing and Extraction	Manu-facturing	Delivery and Installation	End of Life	Total
Abiotic Depletion Potential (Fossil Fuels)	MJ	51	120	100	6.6	280
		18%	43%	36%	2.3%	100%
Abiotic Depletion Potential (Elements)	kg Sb eq	$3.5x10^{-6}$	$6.8x10^{-6}$	$1.5x10^{-5}$	$6.6x10^{-7}$	$2.6x10^{-5}$
		13%	26%	59%	2.5%	100%
Acidification Potential	kg SO_2 eq	$2.7x10^{-2}$	0.10	$2.4x10^{-2}$	$2.4x10^{-3}$	0.15
		17%	65%	16%	1.6%	100%
Eutrophication Potential	kg PO_4^{3-} eq	$3.9x10^{-3}$	$3.1x10^{-2}$	$6.5x10^{-3}$	$4.8x10^{-2}$	$8.9x10^{-2}$
		4.4%	35%	7.3%	53%	100%
Global Warming Potential	kg CO_2 eq	3.5	12	5.8	1.4	22
		16%	52%	26%	6.4%	100%
Global Warming Potential, Biogenic	kg CO_2 eq	-41	48	5.8	8.2	21
		-120%	230%	28%	39%	100%
Ozone Depletion Potential	kg CFC-11 eq	$2.4x10^{-7}$	$2.1x10^{-7}$	$1.1x10^{-6}$	$7.5x10^{-8}$	$1.6x10^{-6}$
		15%	13%	67%	4.7%	100%
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	$1.7x10^{-3}$	$7.8x10^{-3}$	$1.1x10^{-3}$	$3.5x10^{-4}$	$1.1x10^{-2}$
		16%	71%	9.7%	3.2%	100%
Primary Energy, Non-Renewable	MJ	51	150	110	7.0	310
		16%	47%	34%	2.2%	100%
Primary Energy, Renewable	MJ	0.33	270	1.8	0.15	270
		0.12%	99%	0.64%	0.055%	100%

Table 12. *Average 1 year use stage impacts for 1 m^2 of 33/32" maple sports flooring (Table B of the PCR).*

Impact Category	Units	Average 1 year Use and Maintenance Impacts
Abiotic Depletion Potential (Fossil Fuels)	MJ	150
Abiotic Depletion Potential (Elements)	kg Sb eq	$7.3x10^{-6}$
Acidification Potential	kg SO_2 eq	$3.0x10^{-2}$
Eutrophication Potential	kg PO_4 eq	$1.3x10^{-2}$
Global Warming Potential	kg CO_2 eq	6.1
Global Warming Potential, Biogenic	kg CO_2 eq	6.2
Ozone Depletion Potential	kg CFC-11 eq	$1.1x10^{-6}$
Photochemical Oxidant Formation Potential	kg C_2H_4 eq	$1.5x10^{-3}$
Primary Energy, Non-Renewable	MJ	170
Primary Energy, Renewable	MJ	4.9

Table 13. *List of use and maintenance activities for 1 m^2 of 33/32" maple sports flooring.*

Maintenance Activity	Frequency
Sweep	Daily (21,900 times over 60 years)
Refinishing*	Every 10 years (6 times over 60 years)

*Sanding and vacuuming, sealing, buffing and vacuuming, and finishing

Table 14. *Cradle to grave impacts over 60 year building service life for 1 m^2 of 33/32" maple sports flooring. Values are shown with two significant figures (Table C of the PCR).*

Impact Category	Units	Sourcing and Extraction	Manu-facturing	Delivery and Installation	Use	End of Life	Total
Abiotic Depletion Potential (Fossil Fuels)	MJ	51	120	100	150	6.6	430
		12%	28%	23%	35%	1.5%	100%
Abiotic Depletion Potential (Elements)	kg Sb eq	$3.5x10^{-6}$	$6.8x10^{-6}$	$1.5x10^{-5}$	$7.3x10^{-6}$	$6.6x10^{-7}$	$3.4x10^{-5}$
		10%	20%	46%	22%	2.0%	100%
Acidification Potential	kg SO_2 eq	$2.7x10^{-2}$	0.10	$2.4x10^{-2}$	$3.0x10^{-2}$	$2.4x10^{-3}$	0.18
		15%	55%	13%	16%	1.3%	100%
Eutro-phication Potential	kg PO_4 eq	$3.9x10^{-3}$	$3.1x10^{-2}$	$6.5x10^{-3}$	$1.3x10^{-2}$	$4.8x10^{-2}$	0.10
		3.8%	30%	6.4%	13%	46%	100%
Global Warming Potential	kg CO_2 eq	3.5	12	5.8	6.1	1.4	29
		12%	41%	20%	21%	5.1%	100%
Global Warming Potential, Biogenic	kg CO_2 eq	-41	48	5.8	6.2	8.2	27
		-150%	180%	21%	23%	30%	100%
Ozone Depletion Potential	kg CFC-11 eq	$2.4x10^{-7}$	$2.1x10^{-7}$	$1.1x10^{-6}$	$1.1x10^{-6}$	$7.5x10^{-8}$	$2.7x10^{-6}$
		8.9%	7.7%	40%	41%	2.8%	100%
Photo-chemical Oxidant Formation Potential	kg C_2H_4 eq	$1.7x10^{-7}$	$7.8x10^{-3}$	$1.1x10^{-3}$	$1.5x10^{-3}$	$3.5x10^{-4}$	$1.2x10^{-2}$
		14%	63%	8.5%	12%	2.8%	100%
Primary Energy, Non-Renewable	MJ eq	51	150	110	170	7.0	480
		11%	31%	22%	35%	1.5%	100%
Primary Energy, Renewable	MJ eq	0.33	270	1.8	4.9	0.15	280
		0.12%	97%	0.63%	1.8%	0.054%	100%

SUPPORTING TECHNICAL INFORMATION

Data Sources

Unit processes were developed within SimaPro 8.3. Where primary upstream data were unavailable, secondary data sources were used. The principal sources of secondary data are from the Ecoinvent and USLCI databases. Secondary datasets with the greatest degree of representativeness were chosen

Table 15. *Data sources used for the LCA.*

Flow	Dataset	Data Source(s)	Publication Date
Product Materials			
Sugar maple (Acer saccharum)	Sawn lumber, hardwood, rough, green, at sawmill, NE-NC/kg/RNA	USLCI	2011
Installation			
Sealer for wood sport floors	White spirit {GLO}| market for | Alloc Rec, U; Toluene diisocyanate {GLO}| market for | Alloc Rec, U; Polyol {GLO}| market for | Alloc Rec, U	Ecoinvent	2016
Finish for wood sport floors	White spirit {GLO}| market for | Alloc Rec, U; Toluene diisocyanate {GLO}| market for | Alloc Rec, U; Polyol {GLO}| market for | Alloc Rec, U	Ecoinvent	2016
Electricity	Electricity, low voltage {US}| market group for | Alloc Rec, U	Ecoinvent	2016
Maintenance / Use / Refinishing			
Sealer for wood sport floors	White spirit {GLO}| market for | Alloc Rec, U; Toluene diisocyanate {GLO}| market for | Alloc Rec, U; Polyol {GLO}| market for | Alloc Rec, U	Ecoinvent	2016
Finish for wood sport floors	White spirit {GLO}| market for | Alloc Rec, U; Toluene diisocyanate {GLO}| market for | Alloc Rec, U; Polyol {GLO}| market for | Alloc Rec, U	Ecoinvent	2016
Electricity	Electricity, low voltage {US}| market group for | Alloc Rec, U	Ecoinvent	2016
Electricity / Heat			
Electricity	Electricity, medium voltage, at grid/MROW 2015 U	Ecoinvent/eGRID/ SCS	2015
Natural gas	Heat, district or industrial, natural gas {GLO}| market group for | Alloc Rec, U	Ecoinvent	2015
Wood waste	Heat, Action Floor Systems, wood waste, boiler 300kW | Alloc Rec, U	Ecoinvent/SCS	2015/2016
Propane	Propane, burned in building machine {GLO}| propane, burned in building machine | Alloc Rec, U	Ecoinvent	2015
Diesel	Diesel, burned in building machine {GLO}| processing | Alloc Rec, U	Ecoinvent	2015
Packaging			
Steel banding	Steel, low-alloyed {GLO}| market for | Alloc Rec, U; Metal working, average for steel product manufacturing {GLO}| market for | Alloc Rec, U	Ecoinvent	2015
Poly strap	Polypropylene, granulate {GLO}| market for | Alloc Rec, U; Extrusion, plastic film {GLO}| mar-ket for | Alloc Rec, U	Ecoinvent	2015
Transportation			
Truck	Transport, freight, lorry 16-32 metric ton, EU-RO4 {GLO}| market for | Alloc Rec, U	Ecoinvent	2016
Truck (disposal)	Transport, freight, lorry 16-32 metric ton, EU-RO4 {GLO}| market for | Alloc Rec, U	Ecoinvent	2016

Data Quality

Table 16. *Data quality assessment of Life Cycle Inventory.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 10 years old. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data are based on annual production for 2015.
Geographical Coverage: 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. Actual processes for upstream operations are primarily North American. Surrogate data used in the assessment are representative of North American or Global operations. Datasets used are considered sufficiently similar to actual processes.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative datasets, specific to the type of material, are used to represent the actual processes, where primary data were not available.
Precision: Measure of the variability of the data values for each data expressed.	Precision of results are not quantified due to a lack of data. Manufacturer data, and representative data used for upstream processes were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the flooring products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded. In total, these missing data represent less than 5% of the mass or energy flows.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	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. 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.
Consistency: 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. Secondary data sources of similar quality and age are used; with a bias towards Ecoinvent for secondary data, with the exception for raw material extraction of hardwood, which was represented by the USLCI dataset, "Sawn lumber, hardwood, rough, green, at sawmill, NE-NC/kg/RNA". Different portions of the cradle-to-gate product life cycle are equally considered.
Reproducibility: 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.
Sources of the data: Description of all primary and secondary data sources	Data representing energy use at the Mercer, WI facility represent an annual average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. A mass and energy balance check was completed during the data collection period. For secondary LCI datasets, both USLCI and Ecoinvent are used, with a bias towards Ecoinvent data.
Uncertainty of the information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the maple sports flooring and packaging is low. Actual supplier data for upstream operations was sought but not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years), but lacked specific geographical representativeness. Uncertainty related to the impact assessment methods used in the study are relatively high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

Allocation

This LCA follows the allocation guidelines of ISO 14044 and allocation rules specified in the PCR, and sought to minimize the use of allocation wherever possible.

Primary data for facility resource use (i.e., wood residue, electricity, natural gas, water, etc.), waste generated, and emissions released at the Mercer, WI facility are allocated on a mass-basis to each product as a fraction of total annual facility production. The secondary datasets used in this LCA apply allocation based on physical relationships.

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

The manufacture of maple sports flooring generates wood shaving which is sold and contributes approximately 2% of total annual sales. Due to the small contribution to the facility revenue, all potential environmental impacts are allocated to the solid hardwood flooring product.

System boundaries

The system under study includes the extraction of raw materials and processing, manufacturing, delivery and installation, use, and disposal (end of life). The cradle-to-grave system boundary includes all unit processes contributing measurably to the category indicator results and the life cycle stages are described relative to the LCA below.

- **Raw material Extraction and Processing Stage –** This stage includes extraction and processing of raw materials, including delivery to the production site. Packaging materials are included.
- **Manufacturing stage –** This stage includes all the relevant manufacturing processes and flows, including the impacts from energy use and emissions at the facility. Production of capital goods, infrastructure, manufacturing equipment, and personnel-related activities are not included.
- **Delivery and installation stage –** This stage includes delivery of packaged unfinished hardwood flooring to the point of installation (downstream transportation) and installation. Installation in this study is based on a "2-2" specification, or two coats of seal and two coats of finish (4 coat system). Sanding, buffing, and vacuuming is included while court lining is excluded. Installation of subfloor substrate or underlayment and its ancillary materials are excluded.
- **Use and Maintenance Stage –** The use stage includes the cleaning and resurfacing (sanding, sealing, buffing, vacuuming, and finishing) of the hardwood flooring over the 60 year time period. The resurfacing process follows the same general procedures used during the initial installation.
- **Disposal Stage –** The end of life stage includes transport of disposed product and packaging for recycling and to waste treatment facilities, and the associated emissions landfill and incineration.

Cut-off criteria

No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No single flow that represents more than 1% of the total mass or energy flows were excluded. However, due to the uncertainty regarding actual use of hardwood floor cleaners, it was excluded from the system boundary.

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July 1, 2022

To Whom It May Concern:

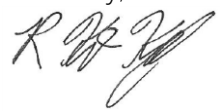
SCS Global Services is currently in the process of completing an Environmental Product Declaration (EPD) for Action Floor Systems maple sports flooring.

SCS is an ISO 14025 Program Operator and the EPD is being prepared following the ISO 14044 and the UL Part A and Part B PCR for Flooring. The EPD will be externally verified, providing assurance of its credibility and accuracy as well as conformance to applicable international standards (ISO 14025, ISO 14044, ISO 21930).

Based on current estimates, the completion date of the EPDs is expected to be *December 31, 2022*.

The EPD will be available for download from the SCS website upon completion of verification: http://www.scsglobalservices.com/certified-green-products-guide.

Sincerely,



Keith Killpack
Technical Director
SCS Global Services