

Environmental Product Declaration



In accordance with ISO 14025, ISO 21930, and EN 15804+A2 for:

Flex MSE Vegetated Wall System



from

Trexiana Wholesale & Distribution Limited

| | |
|--------------------------|--------------------|
| Program operator: | ASTM International |
| EPD registration number: | S-P-05184 |
| Publication date: | 2021-11-26 |
| Valid until: | 2026-11-26 |

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.astm.org



General Information

| | |
|---------------------|--|
| EPD Program: | ASTM International |
| Address: | ASTM International Environmental Product Declarations 100 Barr Harbor Drive P.O. Box C700 West Conshohocken, PA 19428-2959, USA |
| Website: | www.astm.org |
| Phone: | +1.610.823.9500 |

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| Owner of the EPD: | Trexiana Wholesale and Distribution Ltd |
| Website: | www.flexmse.com |

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| LCA and EPD Developer: | Rob Sianchuk Consulting |
| Website: | www.robsianchukconsulting.ca |

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|---|
| ISO standard ISO 21930:2017 serves as the Core Product Category Rules (PCR) |
| Product category rules (PCR): <i>International EPD® System, 2021. PCR 2019:14 Construction products, version 1.11</i> |
| PCR review was conducted by: <i>Martin Erlandsson, IVL Swedish Environmental Research Institute, martin.erlandsson@ivl.se</i> |
| Independent third-party verification of the declaration and data, according to ISO 14025:2006: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification |
| Third party verifier: <i>Thomas Gloria, Industrial Ecology Consultants</i> |
| Approved by: ASTM International |
| Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with ISO 21930. For further information about comparability, see ISO 21930 and ISO 14025.

Company Information

Owner of the EPD: Trexiana Wholesale and Distribution Ltd

Contact: Dylan Armour, Director of Sustainability and Innovation, dylan@flexmse.com

Description of the organisation: Trexiana is the world-wide marketer and distribution management company for the patented Flex MSE Vegetated Wall System. Founded in 2007, Trexiana is headquartered in Surrey, BC / the traditional territory of the Coast Salish people.

Trexiana's mission is to implement sustainable building solutions for all project owners, designers, stakeholders and builders. Trexiana prides itself as a Triple Bottom Line company - continually working to give back to communities and the planet. This includes, but is not limited to, donating product and design services to local greening initiatives (like community gardens) and supporting our partners' charities of choice.

Name and location of production site(s): Trexiana Wholesale & Distribution Ltd., British Columbia, Canada and Georgia, USA.



Product Information

Product name: Flex MSE Vegetated Wall System (Flex MSE)

Product identification: Non-woven polypropylene geotextile bag and 100% recycled polypropylene spiked plate.

UN CPC code: 369

Product description: The Flex MSE product considered in this study is used for soil erosion control and reinforcement in the residential, commercial, heavy civil, industrial, and environmental construction sectors.

Flex MSE is a cost-effective product that is easy to use, thus appealing to a broad range of users – from local homeowners with backyard ventures, to large, sophisticated engineering projects requiring robust environmental, infrastructural and site development solutions. The system fits any site, working seamlessly with utilities, landforms and other building materials, and can be furnished with greenery of choice, from native grasses to flowers, edibles, trees to shrubs. Flex MSE weathers events that would ruin other walls systems; and as vegetation establishes, the more robust it becomes.

- Environmental
 - Erosion and sediment control
 - Steep slope stabilization
 - Shallow slip repairs
 - Culvert headwalls
 - Retention and detention ponds
 - Bank or shoreline protection
 - In stream, shoreline and estuary structures
 - Industrial restoration and remediation

- Infrastructural
 - Highway walls
 - Bridge abutments
 - Levees/dikes
 - Sea walls
 - Green ways and bike paths
 - Noise barriers

- Site Development
 - Site leveling/optimization
 - Terraced garden walls
 - Landscaping and landforms
 - Sensitive sites



LCA Information

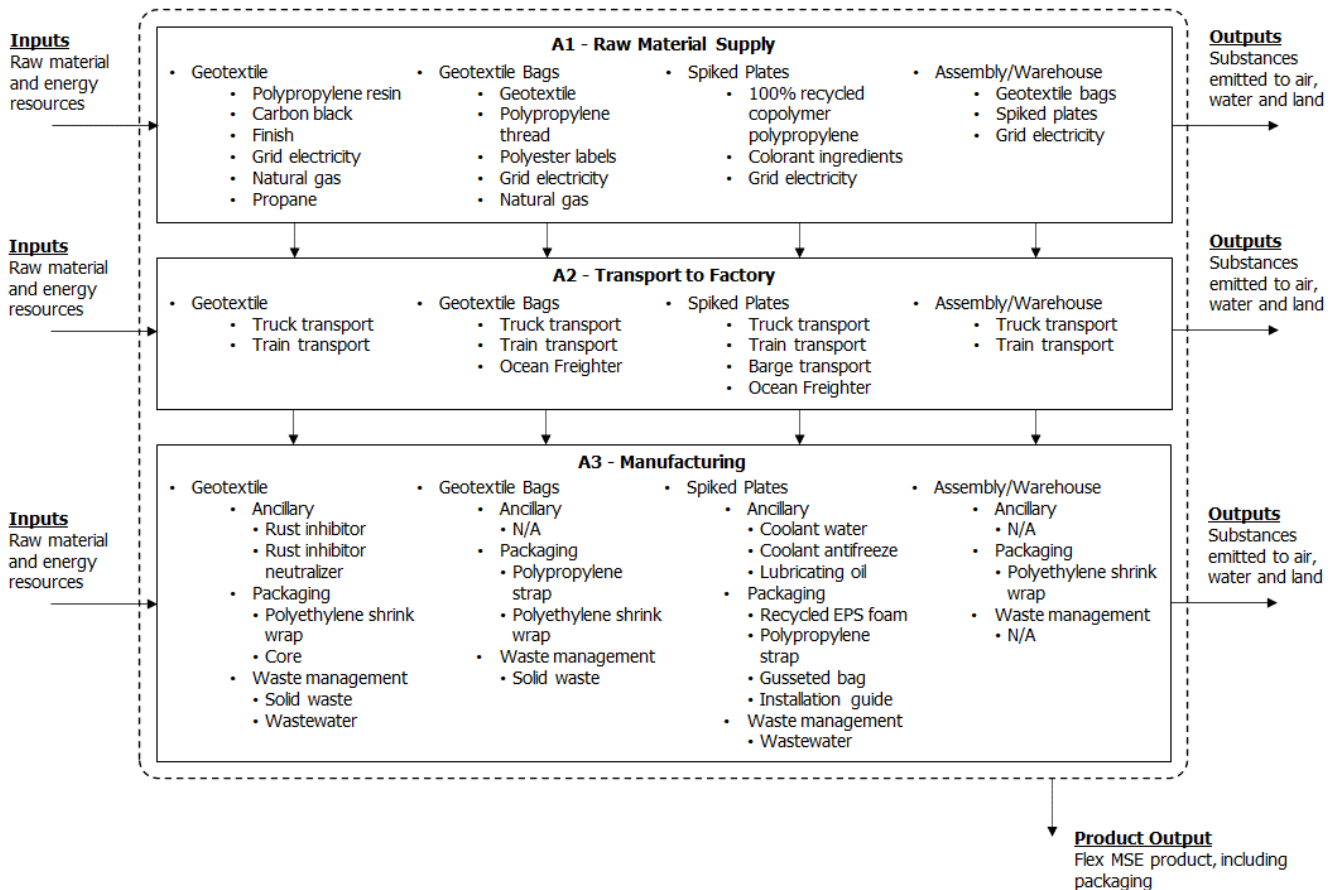
Declared unit: 1 unit of Flex MSE product (1 spiked plate and 1 geotextile bag), including packaging.

Time representativeness: 12-month manufacturing period spanning 2020 to 2021.

Database(s) and LCA software used: ecoinvent 3.6 and openLCA.

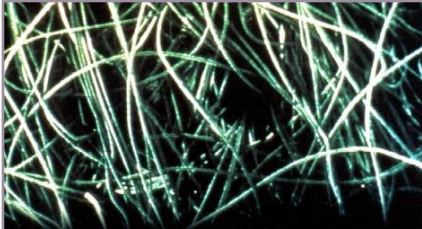
Description of system boundaries: Cradle to gate (A1–A3). This system boundary was selected as the product is physically integrated with other products during installation, no longer identifiable at end of life due to physical transformation (has a 100+ year service life when installed, and is intended for permanent use), and contains no biogenic carbon. Stages beyond A3 are also very dependent on particular scenarios and are better developed for specific construction works.

System diagram: The processes that were included within the system boundary of this study are summarized below with a flow diagram by information module and product component showing foreground product and waste flows (below), followed by a description of manufacturing processes.

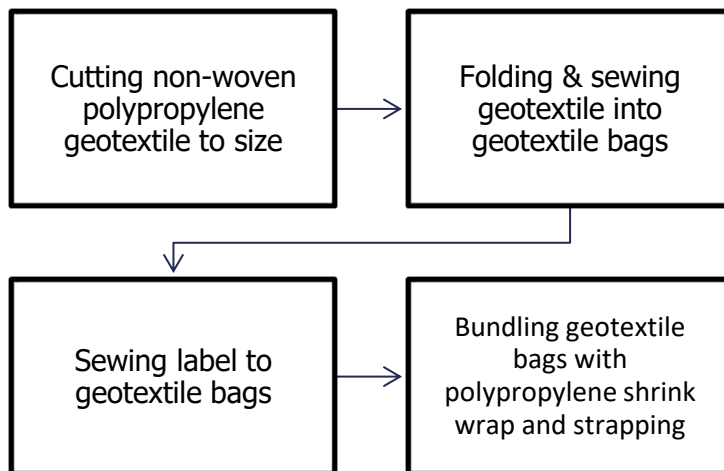


Description of Manufacturing Processes

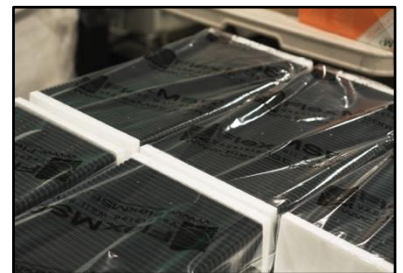
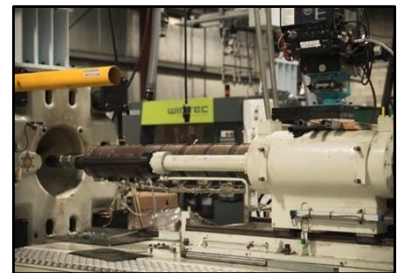
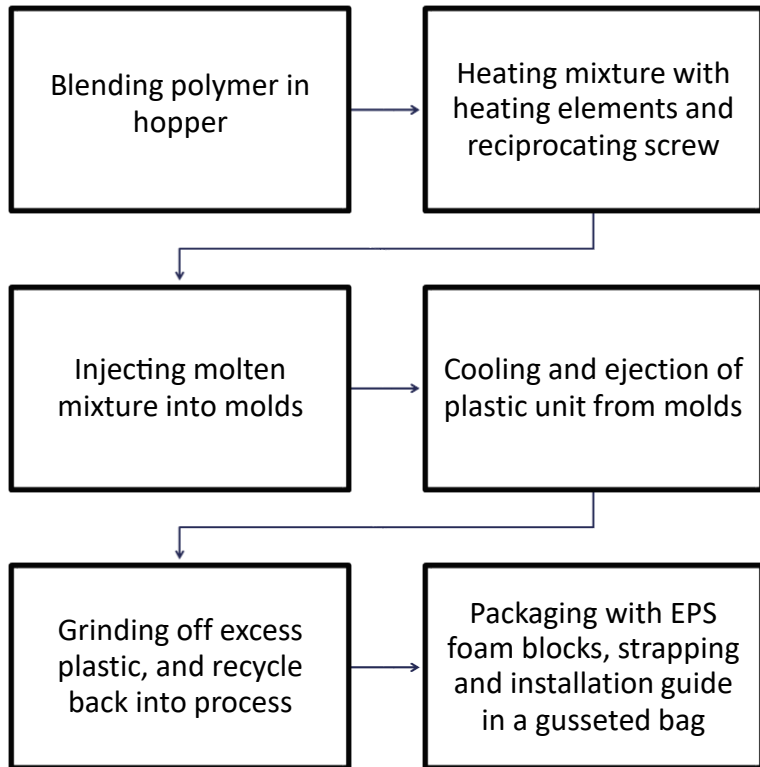
- Geotextile Production
 - Staple fiber production
 - Nonwoven fabric production



- Geotextile Bag Production
 - Sewing geotextile into bags
 - Sewing on polyester label



- Spiked Plates Production
 - Injection moulding of spiked plates



- Assembly/Warehouse Process
 - Packaging bundled geotextile bags with packaged spiked plates into Flex MSE product unit
 - Storage of Flex MSE product units

Additional information: Life Cycle Inventory (LCI) data was completed for the 12-month manufacturing period spanning 2020 to 2021. Specific data was surveyed on manufacturing at the facility-level for the consumption of energy, water and resources, and emission of substances to air, water and as solid waste. Generic data was collected from ecoinvent 3.6.

All impacts are allocated to the production of the Flex MSE product.

All foreground and background activity datasets have been prepared in accordance with ISO 14044:2006 physical allocation rules and attributional Life Cycle Assessment (LCA).

Modules declared, geographical scope, share of specific data (in GWP-GHG indicator) and data variation:

| | Product stage | | | Construction process stage | | Use stage | | | | | | | End of life stage | | | Resource recovery stage | |
|-----------------------------|---------------------|-----------|---------------------|----------------------------|---------------------------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|-------------------------|----------|
| | Raw material supply | Transport | Manufacturing | Transport | Construction installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | | Disposal |
| Module | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Modules declared | X | X | X | ND* | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Geography | Canada, USA, Global | Global | Canada, USA, Global | | | | | | | | | | | | | | |
| Specific data used | >90% | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – products | Not relevant | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Variation – sites | Not relevant | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

*Not Declared

Content Information

| Content per declared unit | | | |
|--|------------|----------------------------------|------------------------------|
| Product components | Weight, kg | Post-consumer material, weight-% | Renewable material, weight-% |
| Spiked plate/100% recycled polypropylene | 0.063 | 100% | 0% |
| Geotextile bag/Geotextile fabric | 0.08978 | 0% | 0% |
| Geotextile bag/Polypropylene thread | 0.00025 | 0% | 0% |
| Geotextile bag/Label | 0.00068 | 0% | 0% |
| TOTAL | 0.15371 | 41% | 0% |
| Packaging materials | Weight, kg | Weight-% (versus the product) | |
| Polyethylene shrink wrap | 0.00012 | 0.08% | |
| Polypropylene strapping | 0.00002 | 0.01% | |
| 100% recycled EPS | 0.00031 | 0.20% | |
| Installation guide | 0.00009 | 0.06% | |
| Polyethylene gusseted bag | 0.00007 | 0.05% | |
| TOTAL | 0.00061 | 0.40% | |

| Dangerous substances from the candidate list of SVHC for Authorisation | EC No. | CAS No. | Weight-% per functional or declared unit |
|--|--------|---------|--|
| No substances included | | | |



Environmental Information

Potential Environmental Impact – Mandatory indicators according to ISO 21930, characterized with TRACI 2.1

| Results per declared unit | | | | | |
|---------------------------|---|----------|----------|----------|-----------|
| Indicator | Unit | A1 | A2 | A3 | Tot.A1-A3 |
| GWP | kg CO ₂ eq | 2.43E-01 | 3.14E-02 | 6.68E-02 | 3.41E-01 |
| ODP | kg CFC-11 eq | 1.69E-08 | 6.32E-09 | 7.96E-10 | 2.41E-08 |
| EP | kg N eq | 4.70E-04 | 4.33E-05 | 1.30E-04 | 6.43E-04 |
| AP | kg SO ₂ eq | 8.80E-04 | 9.49E-05 | 7.11E-05 | 1.05E-03 |
| POCP | kg O ₃ eq | 1.06E-02 | 1.61E-03 | 1.00E-03 | 1.32E-02 |
| Acronyms | GWP = Global warming potential, ODP = Depletion potential of the stratospheric ozone layer, EP = Eutrophication potential, AP = Acidification potential, POCP = Photochemical oxidant creation potential. | | | | |

Potential Environmental Impact – Additional voluntary indicators according to EN 15804+A2

| Results per declared unit | | | | | |
|---------------------------|---|----------|----------|----------|-----------|
| Indicator | Unit | A1 | A2 | A3 | Tot.A1-A3 |
| GWP-fossil | kg CO ₂ eq. | 2.51E-01 | 3.15E-02 | 6.35E-02 | 3.46E-01 |
| GWP-biogenic | kg CO ₂ eq. | 0.00E+00 | 0.00E+00 | 4.60E-03 | 4.60E-03 |
| GWP-luluc | kg CO ₂ eq. | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| GWP-total | kg CO ₂ eq. | 2.51E-01 | 3.15E-02 | 6.81E-02 | 3.51E-01 |
| ODP | kg CFC 11 eq. | 1.32E-08 | 4.76E-09 | 6.21E-10 | 1.86E-08 |
| AP | kg SO ₂ eq | 8.93E-04 | 9.56E-05 | 7.21E-05 | 1.06E-03 |
| EP-freshwater | kg PO ₄ ³⁻ eq. | 1.69E-04 | 1.26E-05 | 1.65E-05 | 1.98E-04 |
| EP-marine | kg N eq. | 4.27E-06 | 3.04E-07 | 2.06E-06 | 6.64E-06 |
| EP-terrestrial | mol N eq. | 1.85E-03 | 2.82E-04 | 1.81E-04 | 2.31E-03 |
| POCP | kg NMVOC eq. | 8.08E-04 | 1.17E-04 | 8.32E-05 | 1.01E-03 |
| ADP-minerals&metals* | kg Sb eq. | 1.48E-09 | 3.18E-11 | 6.27E-11 | 1.58E-09 |
| ADP-fossil* | MJ | 8.19E+00 | 4.18E-01 | 2.30E-01 | 8.84E+00 |
| WDP* | m ³ | 2.39E+01 | 8.93E-01 | 7.11E-01 | 2.55E+01 |
| Acronyms | GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption | | | | |

* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

Potential Environmental Impact – Additional mandatory indicators according to Construction Products PCR

| Results per declared unit | | | | | |
|---------------------------|---|----------|----------|----------|-----------|
| Indicator | Unit | A1 | A2 | A3 | Tot.A1-A3 |
| GWP-GHG | kg CO ₂ eq. | 2.51E-01 | 3.15E-02 | 6.81E-02 | 3.51E-01 |
| EP-freshwater | kg P eq. | 5.56E-05 | 4.12E-06 | 4.77E-06 | 6.45E-05 |
| Acronyms | GWP-GHG = Global warming potential – Greenhouse gas, EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment. | | | | |

Use of Resources

| Results per declared unit | | | | | |
|---------------------------|--|----------|----------|----------|-----------|
| Indicator | Unit | A1 | A2 | A3 | Tot.A1-A3 |
| PERE | MJ | 4.61E-01 | 9.72E-03 | 2.96E-02 | 5.00E-01 |
| PERM | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PERT | MJ | 4.61E-01 | 9.72E-03 | 2.96E-02 | 5.00E-01 |
| PENRE | MJ | 4.44E+00 | 4.28E-01 | 2.42E-01 | 5.11E+00 |
| PENRM | MJ | 4.02E+00 | 0.00E+00 | 0.00E+00 | 4.02E+00 |
| PENRT | MJ | 8.46E+00 | 4.28E-01 | 2.42E-01 | 9.13E+00 |
| SM | kg | 6.11E-02 | 0.00E+00 | 0.00E+00 | 6.11E-02 |
| RSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW | m ³ | 0.00E+00 | 0.00E+00 | 1.58E-06 | 1.58E-06 |
| Acronyms | 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water | | | | |

Waste Production and Output Flows

Waste production

| Results per declared unit | | | | | |
|------------------------------|------|----------|----------|----------|-----------|
| Indicator | Unit | A1 | A2 | A3 | Tot.A1-A3 |
| Hazardous waste disposed | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Non-hazardous waste disposed | kg | 0.00E+00 | 0.00E+00 | 7.93E-03 | 7.93E-03 |
| Radioactive waste disposed | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

Output flows

| Results per declared unit | | | | | |
|-------------------------------|------|----------|----------|----------|-----------|
| Indicator | Unit | A1 | A2 | A3 | Tot.A1-A3 |
| Components for re-use | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Material for recycling | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Materials for energy recovery | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Exported energy | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

Additional Information

Visit <https://www.flexmse.com/flex-mse-estimation-sheet/> for help using this EPD on your next project, and contact Flex MSE (info@flexmse.com) for further interpretation of results.

Differences Versus Previous Versions

This is the third version of the Flex MSE EPD.

References

ASTM 2020. General Program Instructions. V8.0, April 29.

EN 15804:2012+A2:2019 E “Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products”

International EPD® System, 2021. PCR 2019:14 Construction products, version 1.11

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

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

ISO 14025:2006 “Environmental labels and declarations – Type III environmental declarations – Principles and procedures”

ISO 21930:2017. Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.

Rob Sianchuk Consulting, 2021. Project report: Life cycle assessment of Flex MSE version 1.5



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