

Statement of Verification

BREG EN EPD No.: 000646

Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Oriental Yuhong Waterproof Technology Co Ltd

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

1m² of PMH-3040 Plus/3040 Pre-applied Waterproofing Membrane with the weight of 1.3 kg/m²



Company Address

Yueyang Oriental Yuhong Waterproof Technology Co Ltd,
No. 13 Yangfan Avenue,
Yunxi Street, Yunxi District, Yueyang City,
Hunan Province,
China
414000



Signed for BRE Global Ltd

Emma Baker
Operator

19 December 2024
Date of this Issue

19 December 2024
Date of First Issue

18 December 2029
Expiry Date



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Environmental Product Declaration

EPD Number: 000646

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2023 Product Category Rules (PN 514 Rev 3.1) for Type III environmental product declaration of construction products to EN 15804:2012 + A2:2019.
Commissioner of LCA study	LCA consultant/Tool
Yueyang Oriental Yuhong Waterproof Technology Co Ltd, No. 13 Yangfan Avenue, Yunxi Street, Yunxi District, Yueyang City, Hunan Province, China 414000	LCA Consultant: Chi Zhang LCA Tool: BRE LINA A2
Declared Unit	Applicability/Coverage
1m ² of PMH-3040 Plus/3040 Pre-applied Waterproofing Membrane with the weight of 1.3 kg/m ²	Manufacturer-specific product
EPD Type	Background database
Cradle to Gate with Module C and D	Ecoinvent 3.8
Demonstration of Verification	
CEN standard EN 15804 serves as the core PCR ^a	
Independent verification of the declaration and data according to EN ISO 14025:2010 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
(Where appropriate ^b) Third-party verifier: Bala Subramanian	
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)	
Comparability	
Environmental product declarations from different programs may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance.	

Information modules covered

Product			Construction		Use stage							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	Related to the building fabric					Related to the building		C1	C2	C3	C4	D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, Recovery and/or Recycling potential
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				

Note: Ticks indicate the Information Modules declared.

Manufacturing site

Yueyang Oriental Yuhong Waterproof Technology Co Ltd,
 No. 13 Yangfan Avenue,
 Yunxi Street, Yunxi District,
 Yueyang City,
 Hunan Province,
 China
 414000

Construction Product:

Product Description

PMH-3040 Plus and PMH-3040 are high-density polyethylene (HDPE) Waterproofing membranes, both produced using the same advanced manufacturing processes and raw materials. These composite sheets comprise a thick polyethylene film, pressure-sensitive adhesive, and weather-resistant protective coating. The only difference between the two membranes is that PMH-3040 Plus includes an additional yellow PE release film, which enhances its waterproofing performance and durability, especially in extreme weather conditions. Therefore, the two separate LCA analysis has been conducted to ensure more transparency in the results and individual product results are enclosed in this EPD.

Technical Information

Property	Test Methods	Value, Unit	Value, Unit
Product	-	PMH-3040 Plus (High-Density Polyethylene Pre-Applied Waterproofing Membrane)	PMH-3040 (High-Density Polyethylene Pre-Applied Waterproofing Membrane)
Color	-	White	White
Thickness	ASTM D3767	1.2 mm	1.2 mm
Tensile Strength	ASTM D412	28 MPa	28 MPa
Elongation	ASTM D412	500%	500%
Puncture resistance	ASTM E154	1000N	1000N
Peel adhesion to concrete	ASTM D903	1800 N/m	1800 N/m
Resistance to hydrostatic head	ASTM D5385	71m	71m
Peel Strength In lap	ASTM D1876	1800 N/m	1000 N/m
Crack cycling	ASTM C1305	Passed	Passed
Water vapour transmission	ASTM E96 Method B	0.0043 g/ (m ² .h)	0.0043 g/ (m ² .h)
Water Absorption	ASTM 570	0.5%	0.5%
Flexibility at low temperature	ASTM D1970	-29C°	-29C°

*Note: All values are based in test results determined under laboratory conditions and with product samples taken from original stock. Independent laboratory test values available upon request. Product links attached:
PMH3040: <https://www.yuhong.com.cn/Business/building/Synthetic/2021/0426/10862.html>
PMH3040 Plus: <https://www.yuhong.com.cn/Business/building/Synthetic/2021/1201/11346.html>*



PMH-3040 Plus



PMH-3040

Main Product Contents

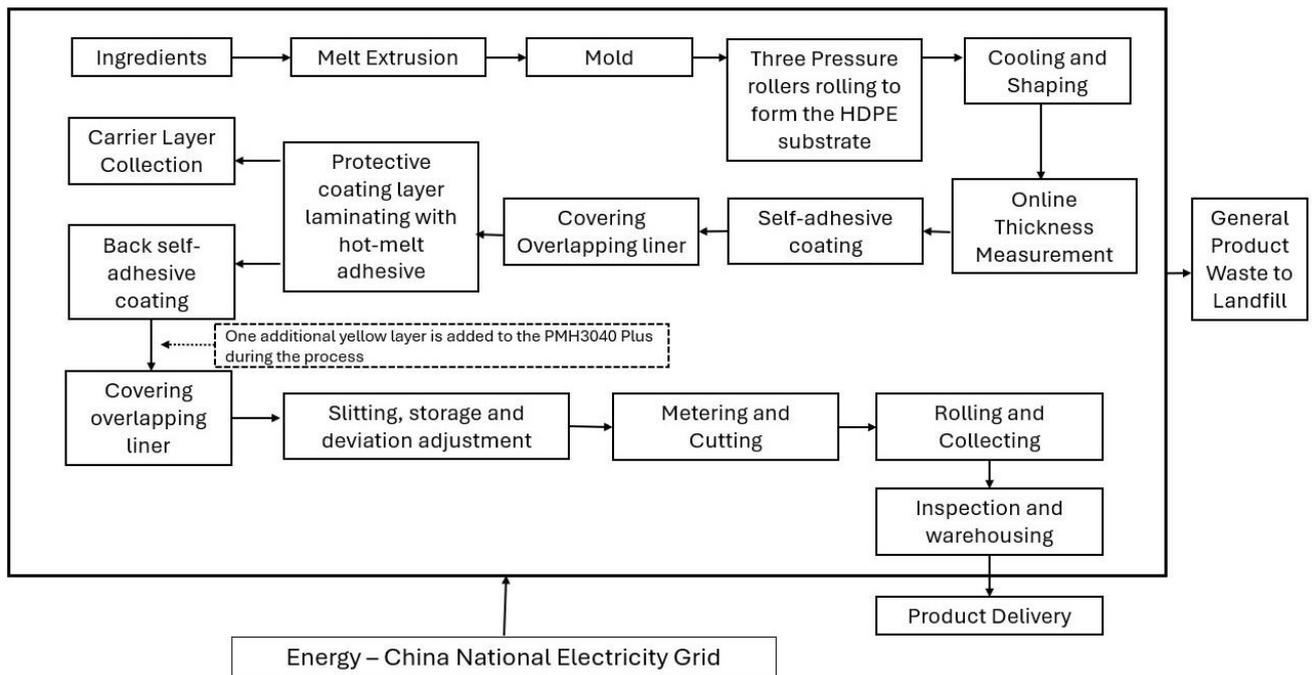
Material/Chemical Input	PMH – 3040 Plus	PMH – 3040
High-Density Polyethylene (HDPE) Resin	45%	45%
Medium-Density Polyethylene (MDPE) Resin	19%	19%
White Master Batch	< 1%	< 1%
Holt Melt Adhesive	33%	33%
Pre-coated Membrane	2%	2%
White PE Film	< 1%	< 1%
Yellow PE Film	< 1%	

Note: For more information about the two products' compositions, please contact Yuhong Ltd Technical Team.

Manufacturing Process

The manufacturing process for PMH3040/PMH3040 Plus begins with the preparation of raw materials, which are then fed into the melt extrusion system to create a continuous polymeric sheet. This material is moulded using three pressure rollers to form the HDPE substrate. Once shaped, the substrate undergoes cooling and online thickness measurement to ensure it meets the required specifications. Simultaneously, the carrier layer is collected, and a protective coating layer is laminated onto it using hot-melt adhesive. A self-adhesive coating is then applied, followed by covering the adhesive with an overlapping liner. The back self-adhesive coating is also applied to enhance bonding (one additional yellow layer is added to the PMH3040 Plus during the process). The product is subsequently slit, stored, and adjusted to correct any deviations. After this, the material is metered and cut to the required lengths, then rolled and collected. Final inspection is conducted before the product is sent to the warehouse, ready for delivery to customers. Throughout this process, the plant utilizes energy from the China National Electricity Grid and any general waste generated during production is sent to landfill.

Process flow diagram



End of Life

In most cases, waterproof membranes remain intact until the building is demolished. During demolition, these membranes are firmly bonded to the reinforced or structural concrete, making separation unfeasible. Yuhong's PMH-3040 Plus and PMH-3040 membranes adhere to concrete blocks and, due to their integration with the main concrete structure, cannot be removed separately. Therefore, 100% landfill disposal is accounted for in this Environmental Product Declaration (EPD).

Life Cycle Assessment Calculation Rules

Declared unit description

1m² of PMH-3040 Plus/3040 Pre-applied Waterproofing Membrane with the weight of 1.3 kg/m²

System boundary

This is a cradle-to-gate with module C and D LCA, reporting production life cycle stages of modules A1 to A3 and end of life stages C1- C4 and D in accordance with EN 15804:2012 + A2:2019 and BRE 2023 Product Category Rules (PN 514 Rev 3.1).

Data sources, quality, and allocation

Specific primary data derived from Yuhong’s production process in the Yuhong factory, have been modelled using the LINA A2 LCA and the ecoinvent 3.8 database. In accordance with the requirements of EN15804:2012 + A2:2019, the most current available data has been used. The manufacturer-specific data from Yuhong covers one year (01/04/2023 – 01/04/2024). Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e., raw material production) from the ecoinvent 3.8 database. All ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804:2012+A2:2019.

PMH3040/PMH3040 Plus both have total input and total output differences within the range of (1±0.05), meeting BRE’s PCR 6.3.5 ‘Criteria for the exclusion of inputs and outputs.

Note:

- The datasets selected for HDPE and MDPE in Ecoinvent 3.8 are HPDE granulate and MDPE granulate, respectively. These proxy datasets were chosen as they are the only available ones in the database. As a result, these 2 datasets do not include the resin processing impacts.
- Both PMH3040 Plus and PMH3040 are manufactured using identical production processes and uses the same raw materials but the only distinction is that PMH3040 Plus includes an additional layer of yellow-printed PE release film, Therefore, the LCA analysis has been conducted separately for each membrane using their individual production data, and the two separate results are enclosed in this EPD. The data for raw materials, ancillary materials, energy, water consumption, other inputs and waste are based on the actual quantities used for each membrane.

Quality Level	Geographical Representativeness	Technical Representativeness	Time Representativeness
Very Good	Data from the area under study	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e. identical technology)	There is approximately 3 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken

Specific generic datasets(rest-of-world) and China based dataset have been selected from the ecoinvent LCI for this LCA. Manufacturer uses the China National Grid electricity for production, so therefore the national grid electricity dataset has been used for the LCA modelling (Ecoinvent 3.8). The GWP carbon footprint for using 1 kWh of electricity is 1.054 kgCO₂e/kWh. The quality level of time representativeness is also Very Good as the background LCI datasets are based on ecoinvent v3.8 which was compiled in 2021. Therefore, there is less than 5 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

All raw materials, energy, water, ancillary materials and waste to the manufacturing process have been included, except for direct emissions to air, water, and soil, which are not measured in this EPD. During the data collection process manufactured has confirmed that there is non-production wastages recorded.

PMH-3040 Plus LCA Results

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq			
Product stage	Raw material supply	A1	4.09E+00	4.07E+00	1.83E-02	1.20E-03	1.22E-07	1.32E-2	4.41E-04
	Transport	A2	1.41E-01	1.41E-01	1.20E-04	5.55E-05	3.27E-08	5.73E-4	9.10E-06
	Manufacturing	A3	5.10E-01	7.14E-01	-2.05E-01	5.37E-04	1.19E-08	3.93E-3	2.54E-04
	Total (of product stage)	A1-3	4.74E+00	4.92E+00	-1.86E-01	1.79E-03	1.67E-07	1.77E-2	7.05E-04
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+0	0.00E+00
	Transport	C2	1.08E-02	1.08E-02	9.21E-06	4.24E-06	2.50E-09	4.39E-5	6.96E-07
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+0	0.00E+00
	Disposal	C4	1.93E-01	1.93E-01	1.38E-04	1.46E-05	4.17E-09	1.19E-4	2.05E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+0	0.00E+00

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 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, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

PMH-3040 Plus LCA Results (continued)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	2.51E-03	2.52E-02	1.16E-02	1.62E-05	1.05E+02	2.11E+00	1.52E-07
	Transport	A2	1.73E-04	1.89E-03	5.78E-04	4.91E-07	2.14E+00	9.61E-03	1.22E-08
	Manufacturing	A3	9.23E-04	9.65E-03	2.58E-03	1.25E-06	6.92E+00	1.20E-01	5.56E-08
	Total (of product stage)	A1-3	3.61E-03	3.68E-02	1.47E-02	1.80E-05	1.15E+02	2.24E+00	2.20E-07
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.32E-05	1.44E-04	4.42E-05	3.76E-08	1.63E-01	7.35E-04	9.32E-10
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	6.22E-04	4.39E-04	1.68E-04	4.61E-08	3.26E-01	1.46E-02	2.37E-09
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

PMH-3040 Plus LCA Results (continued)

			Parameters describing environmental impacts				
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	1.29E-01	4.78E+01	1.13E-09	2.09E-08	3.61E+00
	Transport	A2	1.10E-02	1.67E+00	5.40E-11	1.75E-09	1.47E+00
	Manufacturing	A3	1.92E-02	1.77E+01	3.38E-10	7.74E-09	3.44E+01
	Total (of product stage)	A1-3	1.59E-01	6.72E+01	1.52E-09	3.04E-08	3.94E+01
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	8.40E-04	1.27E-01	4.13E-12	1.34E-10	1.12E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.55E-03	3.39E-01	1.05E-11	2.03E-10	7.71E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

IRP = Potential human exposure efficiency relative to U235;
 ETP-fw = Potential comparative toxic unit for ecosystems;
 HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
 SQP = Potential soil quality index.

PMH-3040 Plus LCA Results (continued)

Parameters describing resource use, primary energy			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.39E+00	0.00E+00	1.39E+00	5.14E+01	5.17E+01	1.03E+02
	Transport	A2	3.01E-02	0.00E+00	3.01E-02	2.10E+00	0.00E+00	2.10E+00
	Manufacturing	A3	3.66E+00	2.62E+00	6.29E+00	6.55E+00	3.15E-01	6.86E+00
	Total (of product stage)	A1-3	5.08E+00	2.62E+00	7.71E+00	6.01E+01	5.20E+01	1.12E+02
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.30E-03	0.00E+00	2.30E-03	1.60E-01	0.00E+00	1.60E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	5.97E-03	0.00E+00	5.97E-03	-5.49E+1	5.52E+01	3.20E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

PMH-3040 Plus LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	3.02E-03	0.00E+00	0.00E+00	4.95E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	2.38E-04
	Manufacturing	A3	3.95E-03	0.00E+00	0.00E+00	3.37E-03
	Total (of product stage)	A1-3	6.97E-03	0.00E+00	0.00E+00	5.31E-02
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	1.82E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	3.42E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

PMH-3040 Plus LCA Results (continued)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	2.39E-01	1.72E+00	3.99E-05
	Transport	A2	2.35E-03	4.18E-02	1.44E-05
	Manufacturing	A3	8.84E-02	7.22E-01	7.39E-06
	Total (of product stage)	A1-3	3.30E-01	2.49E+00	6.17E-05
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.80E-04	3.20E-03	1.11E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	6.54E-04	1.31E+00	1.94E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

PMH-3040 Plus LCA Results (continued)

Other environmental information describing output flows – at end of life									
			CRU	MFR	MER	EEE	EET	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	9.98E-05	8.67E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.22E-02
	Total (of product stage)	A1-3	0.00E+00	9.98E-05	8.67E-02	0.00E+00	0.00E+00	0.00E+00	-8.22E-02
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

PMH-3040 LCA Results

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq			
Product stage	Raw material supply	A1	3.95E+00	3.93E+00	1.78E-02	1.18E-03	1.19E-07	1.29E-02	4.34E-04
	Transport	A2	1.41E-01	1.41E-01	1.20E-04	5.54E-05	3.27E-08	5.73E-04	9.09E-06
	Manufacturing	A3	6.38E-01	8.42E-01	-2.06E-01	5.53E-04	1.26E-08	4.59E-03	2.77E-04
	Total (of product stage)	A1-3	4.73E+00	4.92E+00	-1.88E-01	1.79E-03	1.65E-07	1.81E-02	7.21E-04
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.08E-02	1.08E-02	9.21E-06	4.24E-06	2.50E-09	4.39E-05	6.96E-07
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.93E-01	1.93E-01	1.38E-04	1.46E-05	4.17E-09	1.19E-04	2.05E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 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, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

PMH-3040 LCA Results (continued)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	2.44E-03	2.45E-02	1.13E-02	1.61E-05	1.03E+02	2.04E+00	1.47E-07
	Transport	A2	1.73E-04	1.89E-03	5.78E-04	4.91E-07	2.13E+00	9.60E-03	1.22E-08
	Manufacturing	A3	1.06E-03	1.12E-02	2.97E-03	1.37E-06	8.05E+00	1.28E-01	6.51E-08
	Total (of product stage)	A1-3	3.68E-03	3.76E-02	1.48E-02	1.80E-05	1.13E+02	2.18E+00	2.24E-07
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.32E-05	1.44E-04	4.42E-05	3.76E-08	1.63E-01	7.35E-04	9.32E-10
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	6.22E-04	4.39E-04	1.68E-04	4.61E-08	3.26E-01	1.46E-02	2.37E-09
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

PMH-3040 LCA Results (continued)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	1.28E-01	4.59E+01	1.10E-09	2.05E-08	3.54E+00
	Transport	A2	1.10E-02	1.67E+00	5.39E-11	1.75E-09	1.47E+00
	Manufacturing	A3	2.13E-02	2.09E+01	3.65E-10	9.00E-09	3.46E+01
	Total (of product stage)	A1-3	1.60E-01	6.84E+01	1.52E-09	3.12E-08	3.96E+01
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	8.40E-04	1.27E-01	4.13E-12	1.34E-10	1.12E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	1.55E-03	3.39E-01	1.05E-11	2.03E-10	7.71E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

IRP = Potential human exposure efficiency relative to U235;
 ETP-fw = Potential comparative toxic unit for ecosystems;
 HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
 SQP = Potential soil quality index.

PMH-3040 LCA Results (continued)

Parameters describing resource use, primary energy			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	1.37E+00	0.00E+00	1.37E+00	4.98E+01	5.07E+01	1.01E+02
	Transport	A2	3.01E-02	0.00E+00	3.01E-02	2.10E+00	0.00E+00	2.10E+00
	Manufacturing	A3	3.78E+00	2.62E+00	6.40E+00	7.74E+00	2.43E-01	7.99E+00
	Total (of product stage)	A1-3	5.18E+00	2.62E+00	7.80E+00	5.97E+01	5.09E+01	1.11E+02
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.30E-03	0.00E+00	2.30E-03	1.60E-01	0.00E+00	1.60E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	5.97E-03	0.00E+00	5.97E-03	-5.49E+1	5.52E+01	3.20E-01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

PMH-3040 LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	2.99E-03	0.00E+00	0.00E+00	4.79E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	2.38E-04
	Manufacturing	A3	3.95E-03	0.00E+00	0.00E+00	3.69E-03
	Total (of product stage)	A1-3	6.95E-03	0.00E+00	0.00E+00	5.19E-02
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	1.82E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	3.42E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

PMH-3040 LCA Results (continued)

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	2.28E-01	1.71E+00	3.98E-05
	Transport	A2	2.35E-03	4.18E-02	1.44E-05
	Manufacturing	A3	1.05E-01	8.24E-01	8.02E-06
	Total (of product stage)	A1-3	3.35E-01	2.58E+00	6.22E-05
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.80E-04	3.20E-03	1.11E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	6.54E-04	1.31E+00	1.94E-06
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

PMH-3040 LCA Results (continued)

Other environmental information describing output flows – at end of life									
			CRU	MFR	MER	EEE	EET	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	9.80E-05	8.13E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.22E-02
	Total (of product stage)	A1-3	0.00E+00	9.80E-05	8.13E-02	0.00E+00	0.00E+00	0.00E+00	-8.22E-02
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EEE = Exported Energy Electricity
EET = Exported Energy Thermal

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C1 - Deconstruction	In most cases, the waterproof membrane remains intact until the building is demolished. At building demolition, the membrane stays bonded to the reinforced concrete or structural concrete and cannot be separated, resulting in it becoming part of the construction rubble. Compared to the total energy used for building demolition, the energy associated with the membrane is negligible. As a result, no significant environmental impacts are assigned to module C1.		
C2 – End of Life transport	50km by road has been modelled for module C2 as a typical distance from the demolition site to factory. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required.	Litres per km	0.227
	Distance: Deconstruction unit to pre-processing unit	km	50
C3 – Waste Processing	Based on the Construction Process Document and the academic paper " <i>Experimental Study on Durability of Pre-applied Self-adhesive Waterproofing Membrane</i> " submitted by Yuhong Ltd., the PMH 3040 Plus and PMH 3040 membranes are fully integrated into the building envelope structure and embedded within the concrete. During demolition, these membranes cannot be feasibly separated from the main structural body. As a result, a 100% landfill scenario is applied in this EPD with no impacts allocated to Module C3- Waste Processing.		
C4 - Disposal	As mentioned in C3, the PMH3040 Plus and PMH3040 membrane will be 100% landfill.		
	PMH3040 Plus and PMH3040 membrane to landfill	kg	1.3
Module D - Benefits and loads beyond the system boundary	As these products are entirely disposed of in landfills, therefore no Module D benefits		

Interpretation

Polyethylene constitutes approximately 64% of the total mass of the waterproofing membrane, with HDPE accounting for 45% and MDPE for 19%. Hot-melt adhesive makes up 33%, pre-coated membrane 2%, and the remaining 0.8% is white masterbatch and PE films. As shown in Figure 1, the majority of CO₂ emissions originate from the A1 raw material supply module.

HDPE and Hot melt adhesive cause the global warming impacts. Although hot melt adhesive constitutes only 33% of the mass, it attributed over 50%, followed closely by 30% to HDPE, 16% to MDPE, pre-coated membrane, white masterbatch and PE films contribute the remaining 3%. This nuanced distribution highlights the varying environmental contributions of each material within the composite.

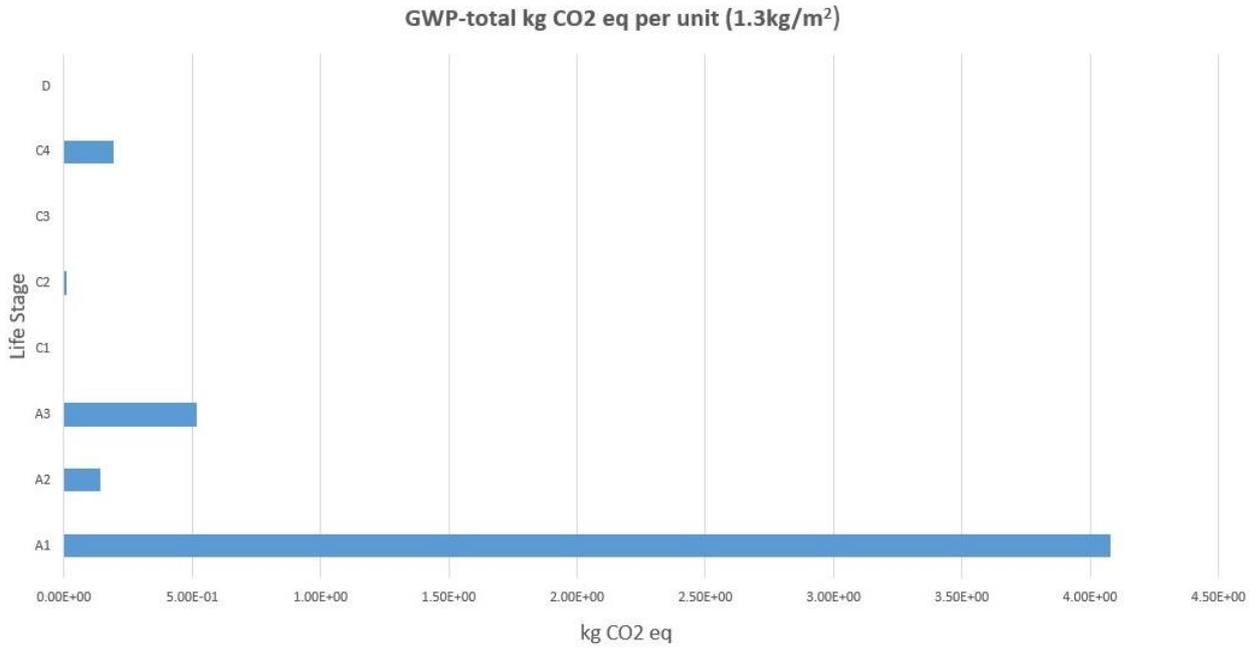


Figure1: GWP-total kg CO₂eq per unit(1.3kg/m²) - PMH3040 Plus

CO₂ Emissions of Raw Materials in Module A1

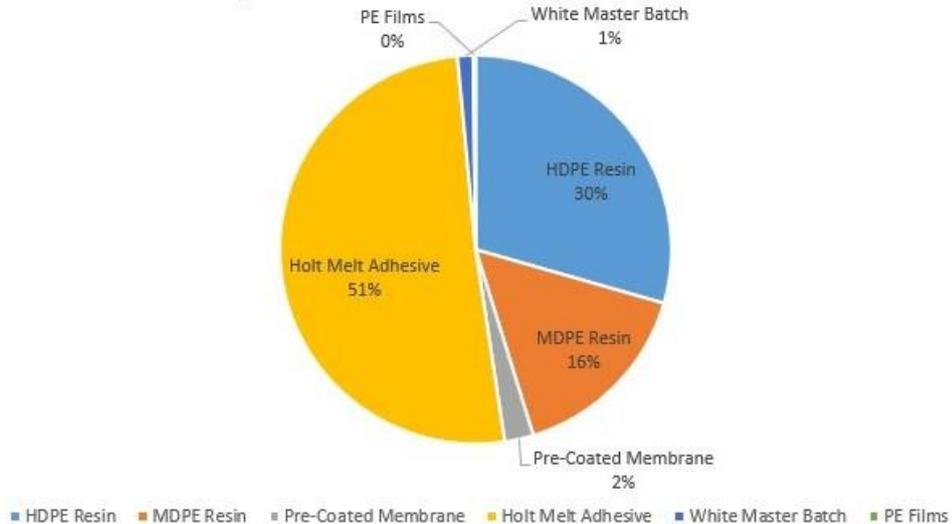


Figure2: CO₂ Emissions of Raw Materials in Module A1- PMH3040 Plus

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