# Environmental Product Declaration

*according to ISO 14025 and EN 15804*

MRPI
milieu relevante product informatie

This declaration is for:

**Dulux Trade Mouldshield Fungicidal Matt**

Provided by:

**AkzoNobel Decorative Paints**

Dulux TRADE



program operator
**Stichting MRPI®**
publisher
**Stichting MRPI®**
**www.mrpi.nl**

MRPI® registration
**1.1.00104.2020**
EPD registration
**00001126**
date of first issue
**10-02-2020**
date of this issue
**10-02-2020**
expiry date
**10-02-2025**


ECO PLATFORM EPD EN 15804 VERIFIED

## PROGRAM OPERATOR

Stichting MRPI®
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Amsterdam

## COMPANY INFORMATION

*AkzoNobel Decorative Paints*
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## PRODUCT

Dulux Trade Mouldshield Fungicidal Matt

## MRPI® REGISTRATION

1.1.00104.2020

## EPD REGISTRATION

00001126

## DATE OF ISSUE

10-02-2020

## EXPIRY DATE

10-02-2025

## DECLARED UNIT/FUNCTIONAL UNIT

All impacts are calculated using the declared unit “decoration of 1 m2 of surface”

## SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **ing. Kamiel Jansen, Primum.**
The LCA study has been done by **Susana Tecante & Joanna Zhuravlova, Ecomatters.**
The certificate is based on an LCA-dossier according to ISO14025 and NEN-EN15804+A1. It is verified according to the 'EPD-MRPI® verification protocol May 2017.v3.1'. EPD's of construction products may not be comparable if they do not comply with NEN-EN15804+A1. Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

## VISUAL PRODUCT


## DESCRIPTION OF PRODUCT

Dulux Trade Mouldshield Fungicidal Matt contains a special fungicide which inhibits the growth of fungi and mould inside buildings.

## MORE INFORMATION

*https://www.duluxdecoratorcentre.co.uk/dulux-trade-mouldshield-fungicidal-matt*

| *DEMONSTRATION OF VERIFICATION* |
|---|
| CEN standard EN15804 serves as the core PCR[a] |
| Independent verification of the declaration and data, according to EN ISO 14025:2010:<br>internal:  external: X |
| (where appropriate[b]) Third party verifier:<br>Jansen<br>Kamiel Jansen, Primum |
| [a] Product Category Rules [b] Optional for B-to-B communication, mandatory for B-to-C communication (see EN ISO 14025:2010, 9.4). |

## DETAILED PRODUCT DESCRIPTION

This EPD is representative for the 3 product paints belonging to the Dulux Trade Mouldshield Fungicidal :

1. Dulux Trade Mouldshield Fungicidal Matt White (PBW);
2. Dulux Trade Mouldshield Fungicidal Matt Light Base;
3. Dulux Trade Mouldshield Fungicidal Matt Medium Base.

Dulux Trade Mouldshield Fungicidal Matt contains a special fungicide which inhibits the growth of fungi and mould inside buildings. Its broad spectrum of antifungal activity makes it ideal for most interior walls and ceilings likely be disfigured by mould. Tested to BS 3900 Part G6.

*Dulux Trade Mouldshield Fungicidal Matt*
Density (kg/l) 1.43
Coverage (m2/l) 16
Number of Layers 2
Total product used (kg/m2) 0.178

*Typical Use*
Suitable for use on interior walls and ceilings likely to be disfigured by mould. DO NOT use on external surfaces.

*Application Method*
Brush or roller only. For Health & Safety reasons relating to all fungicidal paints, spray application is not recommended. As with other water-based paints, do not use when the temperature is below 8ºC (as recommended by British Standard BS6150).

*Pack size*
The products are packed in a packaging with a capacity of 5 litres.

*Production process and conditions of delivery*
During paint production, the raw materials are pre-weighed according to the percentage of each in the formulation. The pigment is then dispersed in a mixture of binder and solvent using a variety of machines. The amount and type of dispersion is product specific and depends on the type of finish required. Finally, tinter is added to correct the colour, the paint is thinned to viscosity, filtered and filled into the appropriate packaging container. All paint containers are transported from the production sites to a distribution center and finally to the customers in the UK.

| COMPONENT (*) | [kg/%] |
|---|---|
| Pigment: Lightfast Pigments | Confidential |
| Binder: Styrene-acrylic copolymer | Confidential |
| Solvent: Water | Confidential |

**(*) > 1% of total mass**

## SCOPE AND TYPE

The type of this EPD is Cradle-to-Gate with options. All major steps from the extraction of natural resources to the final disposal of the product are included in the environmental performance of the manufacturing phase, except those that are not relevant to the environmental performance of the product. This declaration does not imply an indicator result of zero. This EPD is representative for products produced and sold in the UK. The paint is produced in Torr, UK and the application market is for customers within the UK. Likewise, for the end-of-life, the fate of the paint product is described within a UK context.

The software GaBi 9.2 Professional is used to perform the LCA. The latest version of the AkzoNobel database for decorative paints was used, this includes the background datasets:

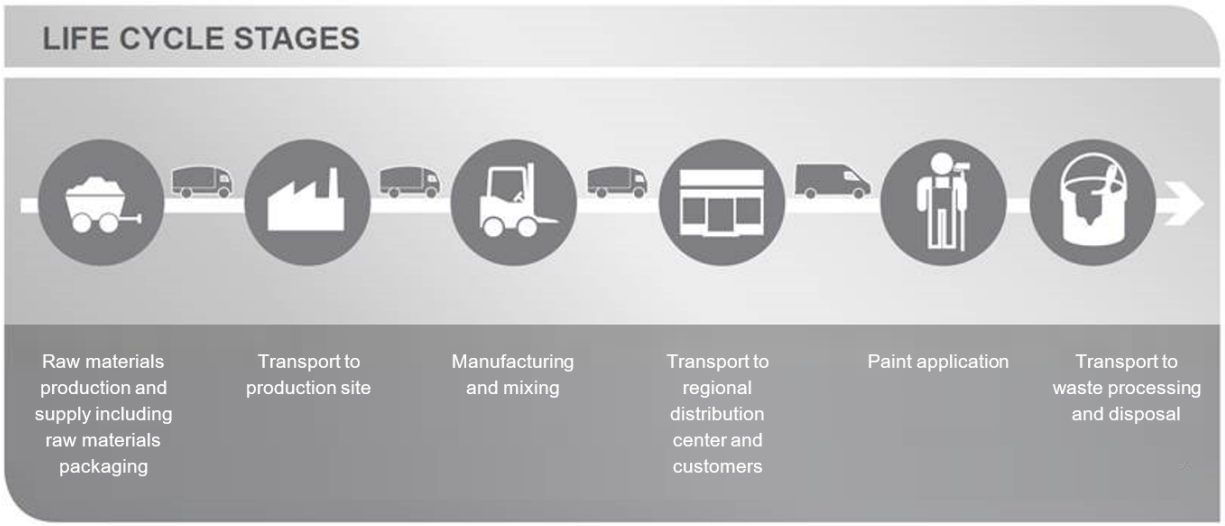
- Ecoinvent (2008).
- GaBi Professional Database
- Plastics Europe.

The validity of this EPD is in correspondence with the specifications of the LCA project report.

| PRODUCT STAGE | | | CONSTRUCTION PROCESS STAGE | | USE STAGE | | | | | | | END OF LIFE STAGE | | | | BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw material supply | Transport | Manufacturing | Transport gate to site | Assembly | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse- Recovery- Recycling- potential |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | MNA |

X = Module assessed

All impacts associated with the upstream production of materials and energy are included in the system boundaries. Mining activities and controlled landfills are included in the product systems. Similarly, wastewater treatment activities are also considered within the technological systems. The emissions and resource extractions derived from these processes are considered elementary exchanges between the product systems and the environment.




## REPRESENTATIVENESS

The representative product consists of a weighted average based on annual production volumes of the formulation and characteristics (i.e. packaging format) of the 3 products within the Dulux Trade Mouldshield Fungicidal:

1. Dulux Trade Mouldshield Fungicidal Matt White (PBW);
2. Dulux Trade Mouldshield Fungicidal Matt Light Base;
3. Dulux Trade Mouldshield Fungicidal Matt Medium Base.

This EPD is representative for products produced and sold in the UK. The paint is produced at one production site: Torr, UK.

A sensitivity analysis is performed to assess the representativeness of the representative product. The environmental impact results for the individual Dulux Trade Mouldshield Fungicidal products have maximum positive difference of 135% (Mouldshield Fungicidal Matt Medium Base) when compared with the representative product, in the photochemical ozone creation potential (POCP) impact category.

## ENVIRONMENTAL IMPACT per functional unit or declared unit

| | UNIT | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADPE | kg Sb-eq. | 3.64 E -6 | 2.42 E -10 | 8.45 E -8 | 3.73 E -6 | 8.37 E -10 | 3.86 E -9 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.20 E -10 | 0.00 | 2.08 E -7 | INA |
| ADPF | MJ | 5.32 E +0 | 3.97 E -2 | 2.34 E -1 | 5.59 E +0 | 1.37 E -1 | 5.10 E -3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.98 E -2 | 0.00 | 2.66 E -1 | INA |
| GWP | kg CO2-eq. | 3.47 E -1 | 2.89 E -3 | 5.58 E -2 | 4.06 E -1 | 1.00 E -2 | 1.04 E -3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.44 E -3 | 0.00 | 4.84 E -2 | INA |
| ODP | kg CFC11-eq. | 2.91 E -8 | 7.98 E -17 | 2.11 E -9 | 3.12 E -8 | 2.76 E -16 | 3.18 E -11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.97 E -17 | 0.00 | 2.83 E -9 | INA |
| POCP | kg ethene-eq. | 1.60 E -4 | 1.18 E -6 | 1.22 E -4 | 2.84 E -4 | 4.07 E -6 | 3.07 E -3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.85 E -7 | 0.00 | 1.18 E -5 | INA |
| AP | kg SO2-eq. | 1.66 E -3 | 1.28 E -5 | 6.14 E -5 | 1.74 E -3 | 4.44 E -5 | 2.08 E -6 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.39 E -6 | 0.00 | 1.21 E -4 | INA |
| EP | kg (PO4)3--eq. | 2.62 E -4 | 3.24 E -6 | 1.49 E -4 | 4.14 E -4 | 1.12 E -5 | 9.37 E -6 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.61 E -6 | 0.00 | 2.24 E -4 | INA |

ADPE = Abiotic depletion potential for non-fossil resources;
ADPF = Abiotic depletion potential for fossil resources;
GWP = Global warming potential;
ODP = Depletion potential of the stratospheric ozone layer;
POCP = Formation potential of tropospheric ozone photochemical oxidants;
AP = Acidification potential of land and water;
EP = Eutrophication potential.

## RESOURCE USE per functional unit or declared unit

| | UNIT | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ | 2.61 E -1 | 2.20 E -3 | 8.06 E -3 | 2.71 E -1 | 7.61 E -3 | 3.62 E -4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.09 E -3 | 0.00 | 1.85 E -2 | INA |
| PERM | MJ | 5.95 E -6 | 0.00 | 2.46 E -9 | 5.96 E -6 | 0.00 | 1.02 E -10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.35 E -9 | INA |
| PERT | MJ | 2.61 E -1 | 2.20 E -3 | 8.06 E -3 | 2.71 E -1 | 7.61 E -3 | 3.62 E -4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.09 E -3 | 0.00 | 1.85 E -2 | INA |
| PENRE | MJ | 5.87 E +0 | 3.99 E -2 | 2.75 E -1 | 6.19 E +0 | 1.38 E -1 | 6.90 E -3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.98 E -2 | 0.00 | 3.62 E -1 | INA |
| PENRM | MJ | 1.50 E -5 | 3.17 E -10 | 6.31 E -7 | 1.56 E -5 | 1.10 E -9 | 4.56 E -8 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.20 E -6 | INA |
| PENRT | MJ | 5.87 E +0 | 3.99 E -2 | 2.75 E -1 | 6.19 E +0 | 1.38 E -1 | 6.90 E -3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.98 E -2 | 0.00 | 3.62 E -1 | INA |
| SM | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| RSF | MJ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| NRSF | MJ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| FW | m3 | 3.80 E -1 | 4.05 E -6 | 4.46 E -2 | 4.24 E -1 | 1.40 E -5 | 6.06 E -5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.02 E -6 | 0.00 | 2.05 E -3 | INA |

INA = Indicator Not Assessed
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 resources excluding non renewable primary energy resources used as materials;
PENRM = Use of non-renewable primary energy used as raw materials; PENRT = Total use of non-renewable primary energy resources;
SM = Use of secondary materials; RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water.

## OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit

| | UNIT | A1 | A2 | A3 | A1-A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HWD | kg | 0.00 | 0.00 | 1.96 E -2 | 1.96 E -2 | 0.00 | 3.56 E -3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.78 E -1 | 0.00 | 0.00 | 0.00 | INA |
| NHWD | kg | 0.00 | 0.00 | 1.06 E -2 | 1.06 E -2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| RWD | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| CRU | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| MFR | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.67 E -3 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| MER | kg | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| EEE | MJ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |
| ETE | MJ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | INA |

INA = Indicator Not Assessed
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;
EEE = Exported electrical energy;
ETE = Exported thermal energy.

## CALCULATION RULES

*Cut off criteria*

The cut-off is considered in the raw material supply and installation stage (A5). Cut-off of inputs comprises of the raw materials, for which no appropriate proxies were found. Total cut-off from all paint product input mass is 0.012 %. The energy consumed during application, used for instance in spray applicators, has not been included due to its insignificance.

*Data quality and data collection period*

Specific data was collected from AkzoNobel though a questionnaire, including inquiries about paint characteristics and packaging, logistics data (e.g. transport), production information and end-of-life. The data collection period for specific data was the year 2018.

Data gaps (i.e. transport data, end of life scenarios) were covered with data from previous internal AkzoNobel LCA studies, concerning the same type of products (paints and coatings) and by using the assumptions for the life cycle stages as described in the Product Environmental Footprint Category Rules Decorative paints version 1.0 developed by the Technical Secretariat Decorative Paints from the European Council of the Paint, Printing Ink and Artists' Colours Industry. Generic data (i.e. upstream acquisition and production of raw materials, energy generation, transport, waste treatment processes) was selected from different publicly available databases, such as Ecoinvent, ThinkStep and Plastics Europe. In the case of missing data, a relevant proxy was searched and adjusted to the corresponding unit process.

*Allocation procedure*

To allocate the emissions and inputs to the manufactured products, the decision-hierarchy in ISO 14044 is used (ISO 2006). It is not possible to sub-divide the site data into a more detailed level or

find physical causalities between inputs and outputs, thus allocation is done based on mass, considering the annual production of paint product for each site. The paint production is basically a process of mixing ingredients and, therefore, the environmental impact is fairly to be related to the mass of the products.

## SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

*A1. Raw materials supply*

This module considers the extraction and processing of all raw materials and energy which occur upstream to the Dulux Trade Mouldshield Fungicidal manufacturing process, as well as waste processing up to the end-of waste state.

*A2. Transport of raw materials to manufacturer*

This includes the transport distance of the raw materials to the manufacturing facility via road.

| Raw materials transport type | Truck 1 |
|---|---|
| Distance (km) | 460 |
| Capacity | 34-40 t ,60% payload |
| Bulk density of transported products | 1426 kg/m3 |

*A3. Manufacturing*

This module covers the manufacturing of the Dulux Trade Mouldshield Fungicidal paint and includes all processes linked to production such as storing, mixing, packing and internal transportation. Use of electricity, fuels and auxiliary materials in paint production is taken into account as well.

Data regarding paint production was provided for the manufacturing sites where the Dulux Trade Mouldshield Fungicidal paints are produced: Torr, UK. Furthermore, the specific transportation distances and transportation modes for raw materials, paint packaging and transportation to customer were collected from the AkzoNobel logistics department. Primary data and site-specific data were retrieved. For nuclear power used at the Torr site, the AkzoNobel electricity mix country models for 2017 was used. For upstream (raw material processes) and downstream processes (application, use, and waste processing) generic data is used when no specific data is obtained.

The construction site data includes lighting, heating, offices, etc. The manufacture of production equipment and infrastructure is not included in the system boundary.

Packaging-related flows in the production process and all up-stream packaging are included in the manufacturing module. For the end-of-life packing of the paints a landfill scenario is assumed.

*A4. Transport to Regional Distribution Centre and customer*

All paint containers are transported from the Torr facility into a distribution centre and then finally to the customer.

| Coatings transport type | Transport from factory to RDC | Transport from RDC to customer |
|---|---|---|
| Transport Type | Truck 1 | Truck 2 |
| Distance (km) | 350 | 370 |
| Capacity | 34-40 t ,60% payload | 40-60 t, 60% payload |
| Bulk density of transported products | 1426 kg/m3 | 1426 kg/m3 |

*A5. Application and use*

This module includes the environmental aspects and impacts associated with the application and of the paint. It is assumed that no energy is required during the application of this paint. The use of paintbrushes and other appliances used during application are not included. There are some raw materials added in the paint formulations which contain small amounts of solvents. The VOC emissions during application of paint are included in this module.

*C2. Transport to incineration or landfill*

This module includes one-way transportation distance of the demolition or sorting site to the dump site.

| End-of-life transport type | Transport to waste processing |
|---|---|
| Vehicle type | Truck 34t-40t payload average fleet |
| Distance | 100 km |
| Capacity utilisation | 60% |
| Bulk density of transported products | 1426 kg/m3 |

*C3. Waste processing and C4. Disposal*

The end of life stage is encompassed in these modules. It is assumed that paint is used as interior paint and exterior paint. In both cases, it is assumed that part of the paint is lost during application and the rest is applied.

The main difference between interior and exterior paint is that for interior paints it is assumed that a percentage (20%) of the applied paint stays for more than 100 years. This is not valid for exterior paint because it is assumed that the polymer in exterior conditions will be flaking and finally disposed away.

| Classification of paint, based on function | % Sold paint in walls > 100 years | % of sold paint to landfill | % of sold paint to incineration |
|---|---|---|---|
| Interior Masonry Wall | 20.00% | 70.40% | 9.60% |
| Exterior, Trim and other paints | 0.00% | 88.00% | 12.00% |

*ADDITIONAL INFORMATION ON ENVIRONMENTAL IMPACTS*

The CML-IA methods do not have characterization factors for the “unspecified VOC” emission flow in the Global Warming Potential environmental impact category. However, VOCs are known to have influence in this category. In order to include the impacts of the VOCs and align with current practice of AkzoNobel, it was decided to calculate the VOC impact on Global Warming Potential separately. The Global Warming Potential impact category has been modified, adding a generic factor of 8 kg CO2-eq/kg VOC, which is in line with AkzoNobel characterisation factors for carbon reporting.

| Environmental Impact | UNIT | A1 | A2 | A3 | TOTAL A1-A3 | A4 | A5 | C2 | C4 |
|---|---|---|---|---|---|---|---|---|---|
| Global Warming potential (GWP 100 years) | [kg CO2-Eq.] | 3.47E-1 | 2.89E-3 | 5.58E-2 | 4.06E-1 | 1.00E-2 | 1.04E-3 | 1.44E-3 | 4.84E-2 |
| Global Warming Potential (GWP 100 years) incl. VOC char. fact. | [kg CO2-Eq.] | 3.47E-1 | 2.89E-3 | 5.93E-2 | 4.09E-1 | 1.00E-2 | 9.38E-2 | 1.44E-3 | 4.84E-2 |

## DECLARATION OF SVHC

None of the substances contained in the product are listed in the “Candidate List of Substances of Very High Concern for authorisation”, or they do not exceed the threshold with the European Chemicals Agency.

## REFERENCES


• EN 15804:2012+A1:2013 Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products, of 11/2013.

• ISO 14040/14044 on Life Cycle Assessments

• Willener Y., 2019. Personal communication with Yasmine Willener, Quality & Regulations Manager AkzoNobel Decorative Paints, UK (2019).

• CEPE: European Council of the Paint, Printing Ink and Artists' Colours Industry. Product Environmental Footprint Category Rules (PEFCR) - Decorative Paints. 04/2018.

• Thinkstep GaBi Software-System and Database for Life Cycle Engineering. Copyright 1992-2018 ThinkStep AG.


## REMARKS

none