European Communication Format – B2B

# Environmental Product Declaration

**Polyvinylchloride (PVC-U) pipe system for soil and waste removal in the building**

# 1 DECLARATION OF GENERAL INFORMATION

## Introduction

The European Plastics Pipes and Fittings Association (TEPPFA) deems it important to have an insight into the integral environmental impacts that are encountered during the life-span of particular pipe system applications. With this framework in mind, TEPPFA has set up an LCA/EPD project with the Flemish Institute for Technological Research (VITO). The present EPD outlines the various environmental aspects which accompany the polyvinylchloride (PVC-U) pipe system for soil and waste removal in the building, from the primary extraction of raw materials up to and including the end of life (EoL) treatment after its reference service life time.

## Name and address of manufacturers

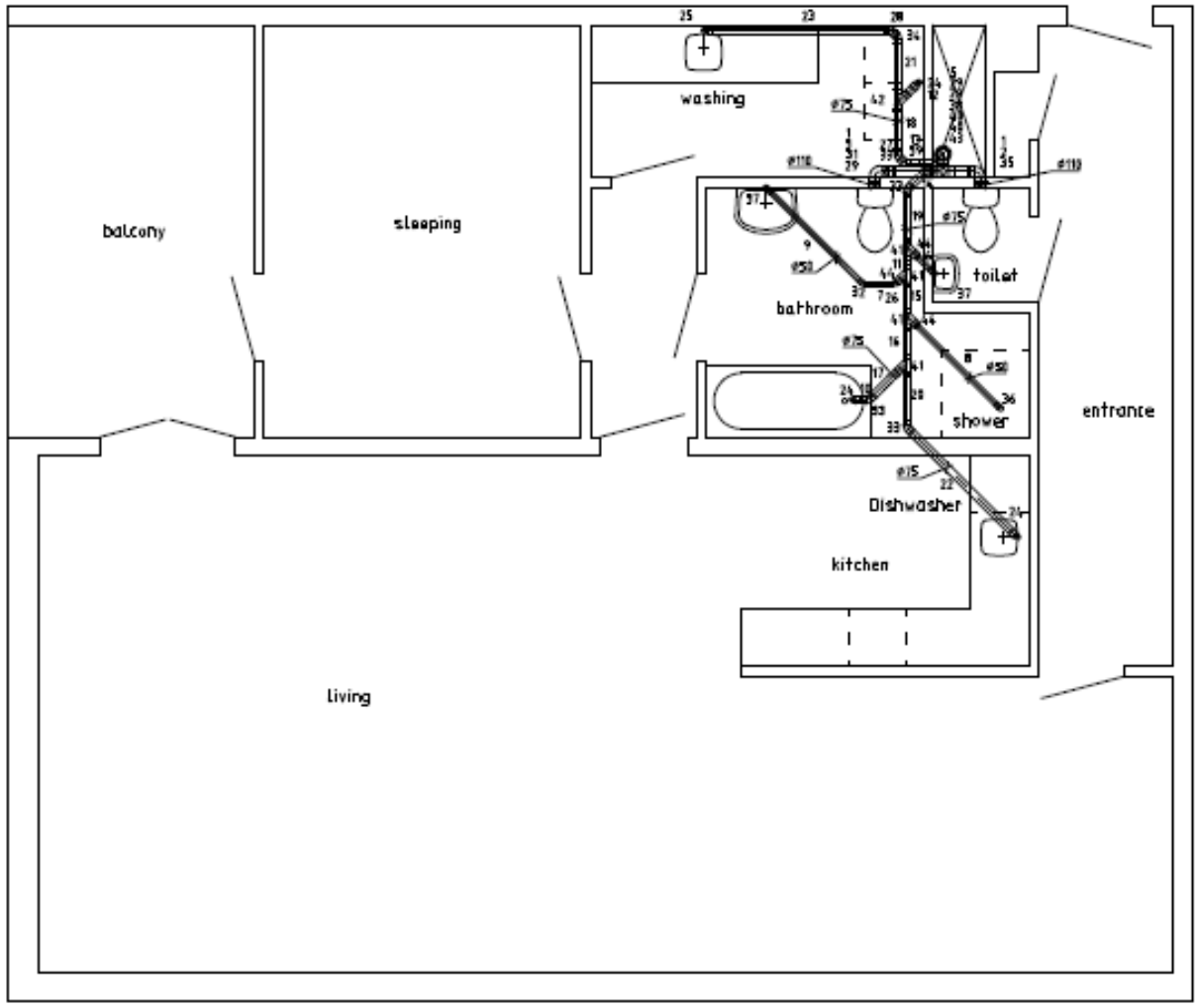
TEPPFA, Avenue de Cortenbergh, 71, B-1000 Brussels, Belgium, Tel: +32-2-736 24 06, Fax: +32-2-736 58 82, E-Mail: info@teppfa.org, Website: www.teppfa.org

## PVC-U pipe system's use and functional unit

The EPD refers to a typical European PVC-U pipe system for soil and waste removal in the building, from the cradle to the grave, including raw material extraction, transportation to converters, converting process, transport to apartment, construction, use and end of life. Environmental indicators are expressed for the complete life cycle, from the cradle to the grave, so for a typcial European PVC-U pipe system. The functional unit is defined as "the gravity discharge and transport of soil and waste, from a well-defined apartment to the entrance of a public sewer system, and this by means of a PVC-U Soil and Waste gravity drainage system installation into the 100 m² apartment, incorporating a bathroom, separate WC, kitchen and washroom (considering the service life time of the pipe system to be aligned with the 50 year life of the apartment), calculated per year".

## Product name & graphic display of product

PVC-U pipe system for soil and waste removal from the building




## Description of the PVC-U pipe system's components

The environmental burdens are calculated in relation to the functional unit, which resulted for the typical European PVC-U pipe system for soil and waste removal in the building in the following basic pipe system components: PVC-U pipes, PVC-U fittings and SBR sealing rings. The PVC-U Soil & Waste system is designed according to EN 12056-2 "Gravity drainage systems inside buildings – part 2: Sanitary pipe work, layout and calculation". The components of the PVC-U-systems, pipes and fittings, are in accordance with EN 1329 "Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticized poly (vinyl chloride) (PVC-U) - Part 1: Specifications for pipes, fittings and the system". The PVC-U Soil & Waste pipe system is designed for application area "B" within the building structure (B-application). The building system represents 100 m² of a typical residential single family apartment in a 5-storeyed building with all the facilities clearly positioned, like bath, shower etc.

The EPD is declared as the average environmental performance for a typical European PVC-U pipe system for soil and waste, over its reference service life cycle of 50 years (being the estimated reference life time of the apartment), calculated per year, in accordance to EN 12056-1, EN 12056-2 and EN 1329.

### EPD programme and programme operator
The present EPD is in line with the ongoing standardization work by CEN TC 350 (prEN15804 and prEN15942). A programme operator related to the CEN TC 350 has not been established yet.

### Date of declaration and validity
Revision 0, 26 January, 2012
The EPD has a 5 year validity period (January, 2017)

### Comparability
Please note that EPDs of construction products may not be comparable if they do not comply with the CEN TC 350 (prEN15804 and prEN15942) standards.

### Typical European PVC-U pipe system EPD
The present EPD outlines various environmental aspects which accompany a representative typical European PVC-U pipe system for soil and waste removal from the building, from the primary extraction of raw materials up to and including the end of life (EoL) treatment after its reference service life time of 50 years (considering the service life time of the pipe system to be aligned with the 50 year service life time of the apartment).

### Group of manufacturers
The EPD for the PVC-U Soil and Waste pipe system is representative for an anticipated European typical PVC-U Soil and Waste pipe system. The TEPPFA member companies represent more than 50% of the European market for extruded plastic pipes. For an overview of all members and national associations within TEPPFA we refer to the last page of this EPD.

### Content of the product system
The product system does not contain materials or substances that can adversely affect human health and the environment in all stages of the life cycle.

### Retrieve information
Explanatory material may be obtained by contacting TEPPFA (http://www.teppfa.org)

# 2 DECLARATION OF THE MATERIAL CONTENT

The European polyvinylchloride (PVC-U) Soil and Waste pipe system does not contain any substances as such or in concentration exceeding legal limits, which can adversely affect human health and the environment in any stages of its entire life cycle.

# 3 DECLARATION OF THE ENVIRONMENTAL PARAMETERS DERIVED FROM LCA

## 3.1 Life cycle flow diagram

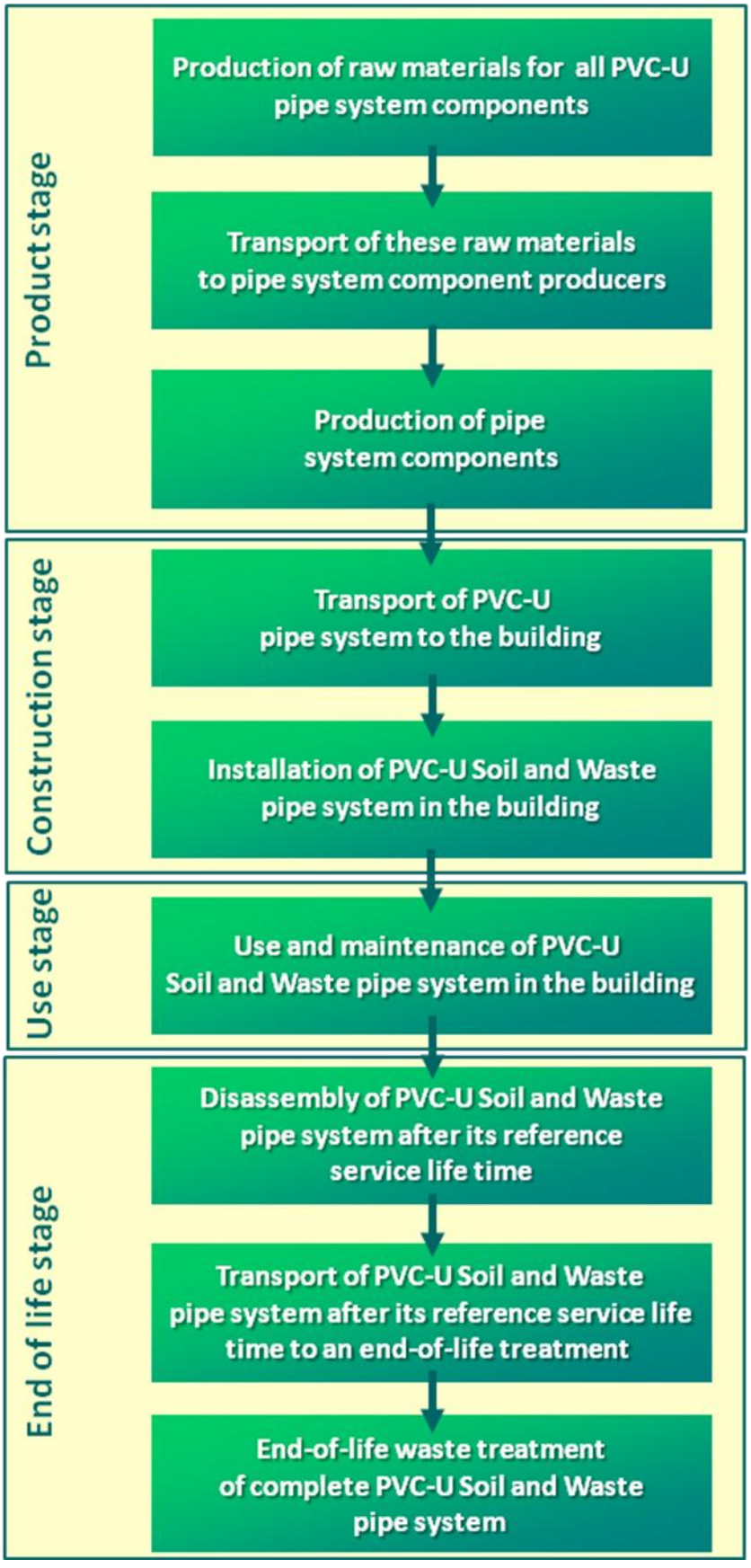
The EPD refers to a typical European PVC-U Soil and Waste pipe system, from the cradle to the grave, including product stage, transport to construction site and construction process stage, use stage and end of life stage.

- **Product stage**: raw material extraction and processing, recycling processes for recycled material input, transport to the manufacturer, manufacturing (including all energy provisions, waste management processes during the product stage up to waste for final disposal):
  - Production of raw materials for PVC-U pipes
  - Transport of PVC-U raw materials to converter
  - Converting process for PVC-U Soil and Waste pipes (extrusion)
  - Production of raw materials for PVC-U fittings
  - Transport of PVC-U fittings raw materials to converter
  - Converting process for PVC-U fittings (injection moulding)
  - Production of SBR sealing rings (raw materials + converting process)
  - Production of solvent cement
  - Production of cleaning agent

- **Construction process stage**: including all energy provisions, waste management processes during the construction stage up to waste for final disposal
  - Transport of PVC-U Soil and Waste pipe system to the building
  - Installation of PVC-U Soil and Waste pipe system to the building

- **Use stage** (maintenance and operational use): including transport and all energy provisions, waste management processes up to waste for final disposal during this use stage
  - Use and maintenance of the complete PVC-U Soil and Waste pipe system during 50 years of reference service life time of the apartment

- **End of life stage**: including all energy provisions during the end of life stage
  - Disassembly of the complete PVC-U Soil and Waste pipe system after 50 years of reference service life time at the building
  - Transport of the complete PVC-U Soil and Waste pipe system after 50 years of reference service life time at the building to an end-of-life treatment
  - End-of-life treatment of complete PVC-U Soil and Waste pipe system


Product stage
Production of raw materials for all PVC-U pipe system components
Transport of these raw materials to pipe system component producers
Production of pipe system components
Construction stage
Transport of PVC-U pipe system to the building
Installation of PVC-U Soil and Waste pipe system in the building
Use stage
Use and maintenance of PVC-U Soil and Waste pipe system in the building
End of life stage
Disassembly of PVC-U Soil and Waste pipe system after its reference service life time
Transport of PVC-U Soil and Waste pipe system after its reference service life time to an end-of-life treatment
End-of-life waste treatment of complete PVC-U Soil and Waste pipe system

## 3.2 Parameters describing environmental impacts

The following environmental parameters are expressed with the impact category parameters of the life cycle impact assessment (LCIA).

| Impact category | Abiotic depletion | Acidification | Eutrophication | Global warming | Ozone layer depletion | Photochemical oxidation |
|---|---|---|---|---|---|---|
| | kg Sb eq | kg SO2 eq | kg PO4--- eq | kg CO2 eq | kg CFC-11 eq | kg C2H4 eq |
| Product stage | 0,01415 | 0,00408 | 0,00127 | 1,31409 | 0,000000026 | 0,00022 |
| Construction process stage | 0,00142 | 0,00072 | 0,00023 | 0,21259 | 0,000000027 | 0,00004 |
| Use stage | 0 | 0 | 0 | 0 | 0 | 0 |
| End of life stage | -0,00005 | -0,00001 | -0,00008 | 0,11157 | 0,000000004 | 0,00000 |
| **Total** | **0,01552** | **0,00479** | **0,00142** | **1,63825** | **0,000000057** | **0,00027** |

## 3.3 Parameters describing resource input

The following environmental parameters apply data based on the life cycle inventory (LCI).

| Environmental parameter | Non-renewable energy indicator | Renewable energy indicator | Non-renewable material resources (other than energy) | Renewable material resources (other than energy) | Crude oil (feedstock and energy) | Natural gas (feedstock and energy) | Input of net fresh water |
|---|---|---|---|---|---|---|---|
| | MJ primary | MJ primary | kg | kg | kg | kg | m³ |
| Product stage | 37,32843 | 1,57967 | 0,00619 | 0,04061 | 0,27085 | 0,26980 | 2,05501 |
| Construction stage | 3,31211 | 0,13052 | 0,01593 | 0,00082 | 0,04911 | 0,00734 | 0,42021 |
| Use stage | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| End of life stage | -0,21843 | -0,05546 | 0,00072 | -0,00097 | 0,00850 | -0,00218 | -0,18319 |
| **Total** | **40,42210** | **1,65473** | **0,02284** | **0,04046** | **0,32846** | **0,27497** | **2,29204** |

## 3.4 Parameters describing different waste categories and further output material flows

The parameters describing waste categories and other material flows are output flows derived from the life cycle inventory (LCI)

### Parameters describing different waste categories

| Environmental parameter | Hazardous waste | Non-hazardous waste | Nuclear waste |
|---|---|---|---|
| | kg | kg | kg |
| Product stage | 0,00661 | 0,04086 | 0,00003 |
| Construction stage | 0,00001 | 0,04478 | 0,000004 |
| Use stage | 0 | 0 | 0 |
| End of life stage | -0,0000004 | 0,58650 | -0,000004 |
| **Total** | **0,00663** | **0,67214** | **0,00003** |

**Parameters describing further output material flows**

| Parameter | Parameter unit expressed per functional unit |
|---|---|
| Components for re-use | 0 kg |
| Materials for recycling | 0,028 kg |
| Materials for energy recovery | 0,085 kg |

# 4 SCENARIOS AND TECHNICAL INFORMATION

## 4.1 Construction process stage

### Transport from the production gate to the construction site (apartment)

| Parameter | Parameter unit expressed per functional unit |
|---|---|
| Fuel type consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat etc. | The PVC-U soil and waste pipe system is transported over an average distance of 480 km with a truck and 30 km by means of a van from the producers of the different pipe system components via customers to the building. Environmental burdens associated with this kind of transport are calculated by means of the Ecoinvent V2.2 datarecords "Transport, lorry 3,5-7,5t, EURO4/tkm/RER" and "Transport, van <3.5t, RER". |
| Capacity utilisation (including empty returns) | |
| Bulk density | |
| Volume capacity utilisation factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaged products) | |

### Construction (installation in building/apartment)

| Parameter | Parameter unit expressed per functional unit |
|---|---|
| Ancillary materials for installation | **0,00125 kg of soap (lubricant)**<br>**0,0094 kg of brackets** (2 for the installation) , considered to be made out of galvanised steel<br>**0,04 kg fast fixing cement** (ratio water/cement 0,3) of which 0,028 kg cement and 0,012 kg water<br>**0,002 kg of plastic fixing materials**, made out of polypropylene (PP)<br>Environmental burdens associated with this kind of input flows are calculated by means of the Ecoinvent V2.2 datarecords "Tap water, at user, RER", "Cement, unspecified at plant, RER", "Soap, at plant, RER", "Polypropylene, |

<table>
<tr><td></td><td>granulate, at plant, RER in combination with Injection moulding, RER" and ""Steel, converter, unalloyed, at plant, RER, in combination with Steel product manufacturing, average metal working, RER"</td></tr>
<tr><td>Other resource consumption</td><td>Not relevant</td></tr>
<tr><td>Quantitative description of energy type (regional mix) and consumption during the installation process</td><td>0,0008 kWh of electrical energy is needed for the installation (screw driver)<br>Environmental burdens associated with this kind of energy are calculated by means of the Ecoinvent V2.2 datarecord "Electricity, low voltage, production RER, at grid (European average mix of production)"</td></tr>
<tr><td>Waste on the building site, generated by the product's installation<br><br>Output materials as result of waste management processes at the building site e.g. of collection for recycling, for energy recovery, final disposal</td><td>0,008 kg of PVC-U pipe left left over during installation: 80% to landfill, 15% to incineration and 5% to mechanical recycling. Transportation of PVC-U pipe left over to waste management treatment facilities is included: 600 km to recycling plant, 150 km to incineration with energy recovery and 50 km to landfill. Environmental burdens are calculated by means of the Ecoinvent v2.2 datarecord "Transport, lorry 3.5-7.5t, EURO4/tkm/RER".<br>0,0672 kg of packaging waste: treated according to European average packaging waste scenarios (EU27, 2006):
<table>
<tr><th></th><th>Recycling</th><th>Energy Recovery</th><th>Landfill</th></tr>
<tr><td>Plastic</td><td>27%</td><td>26%</td><td>47%</td></tr>
<tr><td>Paper and board</td><td>75%</td><td>10%</td><td>15%</td></tr>
<tr><td>Wood</td><td>38%</td><td>23%</td><td>39%</td></tr>
<tr><td>Metals</td><td>66%</td><td></td><td>34%</td></tr>
<tr><td>Total</td><td>57%</td><td>12%</td><td>31%</td></tr>
</table></td></tr>
<tr><td>Emissions to ambient air, soil and water</td><td>No direct emissions at the trench. Emissions are related to the upstream processes (mining of sand, transportation processes and mechanical energy) and downstream processes (waste management and treatment) and are included in the Ecoinvent datarecords that are used for modelling the environmental impacts.</td></tr>
</table>

## 4.2 Use stage: operation and maintenance

### Operation and maintenance:

Operational use is not relevant for the EPD, since it falls outside the system boundaries of the LCA project. Maintenance is not needed for the PVC-U soil and waste pipe system. Moreover the PVC-U soil and waste pipe system is a gravity pipe system.

### 4.3 End of life

The following end of life scenarios have been taken into account:

- Estimated reference service life time of 50 years, being the service life time of the apartment
- EoL approach for landfill, incineration with energy recovery (impacts and credits are assigned to the life cycle that generates the waste flows)
- Recycled content approach for recycling and use of recyclates (= impact of recycling and credits for recyclates, because less virgin materials are needed is assigned to the life cycle that uses the recyclates)

<table>
<tr><th>Processes</th><th>Parameter unit expressed per functional unit</th></tr>
<tr><td>Collection process</td><td>After a reference service life time of 50 years the PVC-U soil and waste pipe system is stripped for recoverable materials and products, and the remaining construction subsequently demolished. The PVC-U soil and waste pipe system is demolished together with the total construction. For the functional unit 0,568 kg of pipe system components are available at the apartment: 5% (0,028 kg) is transported over an average distance of 600 km to a recycling plant, 15% (0,085 kg) is transported over an average distance of 150 km to an incinerator, and the remaining 80% (0,455 kg) is transported over an average distance of 50 km to a landfill.<br><br>
<table>
<tr><th colspan="2">EOL scenario PVC-U pipes</th></tr>
<tr><td>Mechanical recycling</td><td>5%</td></tr>
<tr><td>Incineration</td><td>15%</td></tr>
<tr><td>Left in ground</td><td>80%</td></tr>
</table>
<br>Environmental burdens associated with transportation are calculated by means of the following Ecoinvent v2.2 datarecord “Transport, lorry 3.5-7.5t, EURO4/tkm/RER”</td></tr>
</table>

# 5 ADDITIONAL INFORMATION ON EMISSIONS TO INDOOR AIR, SOIL AND WATER DURING USE STAGE

Emissions to indoor air:
Despite there is no approved European measurement method available, we can confirm that the PVC-U Soil and Waste pipe system does not contain any substances mentioned on the REACH-list.

Emissions to soil and water:
Since the PVC-U Soil and Waste pipe system is installed in the apartment we can confirm that emissions to soil and water are not relevant.

# 6 OTHER ADDITIONAL INFORMATION

## Product certification, conformity, marking

**EN 12056-1**, Gravity drainage systems inside buildings. Part 1: General and performance requirements

**EN 12056-2**, Gravity drainage systems inside buildings. Part 2: Sanitary pipe work, layout and calculation

**EN 1329**, Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticized polyvinylchloride (PVC-U) - Part 1: Specifications for pipes, fittings and the system

In compliance with European Construction Products Directive (89/106/EEC)

## Other technical product performances

For the full overview of the environmental benefits of plastic pipe systems we will refer to the TEPPFA website: http://www.teppfa.org

## TEPPFA member companies

**Aliaxis**

**Alphacan**

**EGEPLAST**

**Geberit International**

**Georg Fischer Piping Systems**

**KWH Pipe**

**Pipelife International**

**Rehau**

**Teraplast**

**Tessenderlo Group**

**Uponor**

**Wavin**

## TEPPFA national member associations

| | | |
|---|---|---|
| **ADPP** | - | Czech Republic plastic pipes association |
| **ASETUB** | - | Asociación Española de Fabricantes de Tubos y Accesorios Plásticos |
| **BPF** | - | Plastic Pipes Group |
| **BPPMA** | - | Bulgarian Plastic Pipes Manufacturers Association |
| **BureauLeiding** | - | Dutch Plastic Pipes Association |
| **DPF** | - | Danish Plastics Federation |
| **FCIO** | - | Fachverband der Chemischen Industrie Österreich |
| **Federplast.be** | - | Belgische Vereniging van Producenten van Kunststof- en Rubberartikelen bij Agoria en Assenscia |
| **FIPIF** | - | Finnish Plastics Industries Federation |
| **IPPMA** | - | Irish Plastic Pipe Manufacturers Association |
| **KRV** | - | Kunstoffrohrverband e.V.- Fachverband der Kunstoffrohr-Industrie |
| **MCsSz** | - | Műanyag Csőgyártók Szövetsége |
| **P&K** | - | Swedish Plastics and Chemical Federation |
| **PRIK** | - | Polish Association of Pipes and Fittings |
| **STR** | - | Syndicat des Tubes et Raccords |
| **VKR** | - | Verband Kunststoffrohre und Rohrleitungstelle |

# REFERENCES


Ecoinvent, 2010. Ecoinvent database v2.2, Swiss Centre for Life Cycle Inventories, Switzerland. From: www.ecoinvent.org

EN 12056-1, Gravity drainage systems inside buildings. Part 1: General and performance requirements

EN 12056-2, Gravity drainage systems inside buildings. Part 2: Sanitary pipe work, layout and calculation

EN 1329, Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticized poly vinyl chloride (PVC-U) - Part 1: Specifications for pipes, fittings and the system

Eurostat, 2006. Packaging waste scenarios (EU27, 2006). From: http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/wastestreams/packaging_waste

ISO 14025: Environmental Labels and Declarations Type III

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

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

prEN 15804: Sustainability of construction works – Environmental product declarations – core rules for the product category of construction products (draft, 2008);

prEN 15942: Sustainability of construction works – Environmental product declarations – Communication format – Business to Business (draft, April 2009)



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