



**European Communication
Format – B2B**

**Environmental
Product Declaration**

**Polypropylene (PP) low
noise 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, in 2010 TEPPFA has set up an LCA/EPD project with the Flemish Institute for Technological Research (VITO) which resulted in an EPD. The present EPD is the update of the EPD issued in 2013 – foreground data remained the same, with only the datasets being updated to the latest available version (Ecoinvent 3.3 and Industry 2.0 replaced Ecoinvent 2 datasets). It outlines the various environmental aspects which accompany the polypropylene (PP) low noise 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

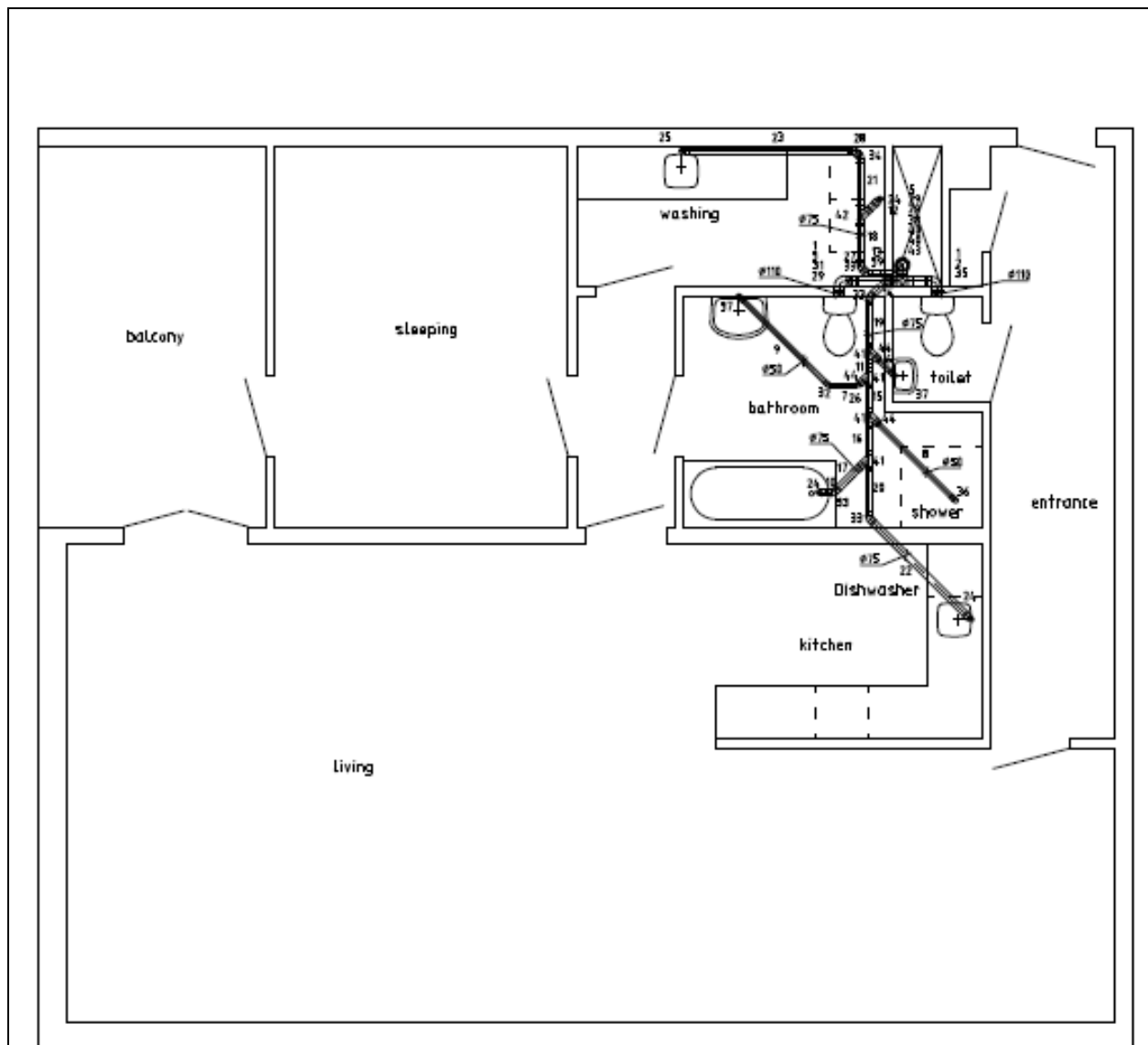
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PP low noise pipe system's use and functional unit

The EPD refers to a typical European PP low noise 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 typical European PP low noise 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 PP low noise 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

PP low noise pipe system for soil and waste removal from the building.



Description of the PP low noise pipe system's components

The environmental burdens are calculated in relation to the functional unit, which resulted for the typical European PP low noise pipe system for soil and waste removal in the building in the following basic pipe system components: PP low noise pipes, PP low noise fittings and SBR sealing rings. The PP low noise 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 PP-system, pipes and fittings, are in accordance with different National or Company specifications. Soil & Waste pipe system are 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 PP low noise 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 and EN 12056-2.

EPD programme and programme operator

The present EPD is in line with the standardization work by CEN TC 350 (EN15804 and EN15942). A programme operator related to the CEN TC 350 has not been established yet.

Date of declaration and validity

August, 2018

The EPD has a 5 year validity period (August, 2023)

Comparability

Please note that EPDs of construction products may not be comparable if they do not comply with the CEN TC 350 (EN15804 and EN15942) standards.

Typical European PP low noise pipe system EPD

The present EPD outlines various environmental aspects which accompany a representative typical European PP low noise 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 PP low noise Soil and Waste pipe system is representative for an anticipated European typical PP low noise 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 pages 13 and 14 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.eu>)

2 DECLARATION OF THE MATERIAL CONTENT

The European polypropylene (PP) low noise 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.

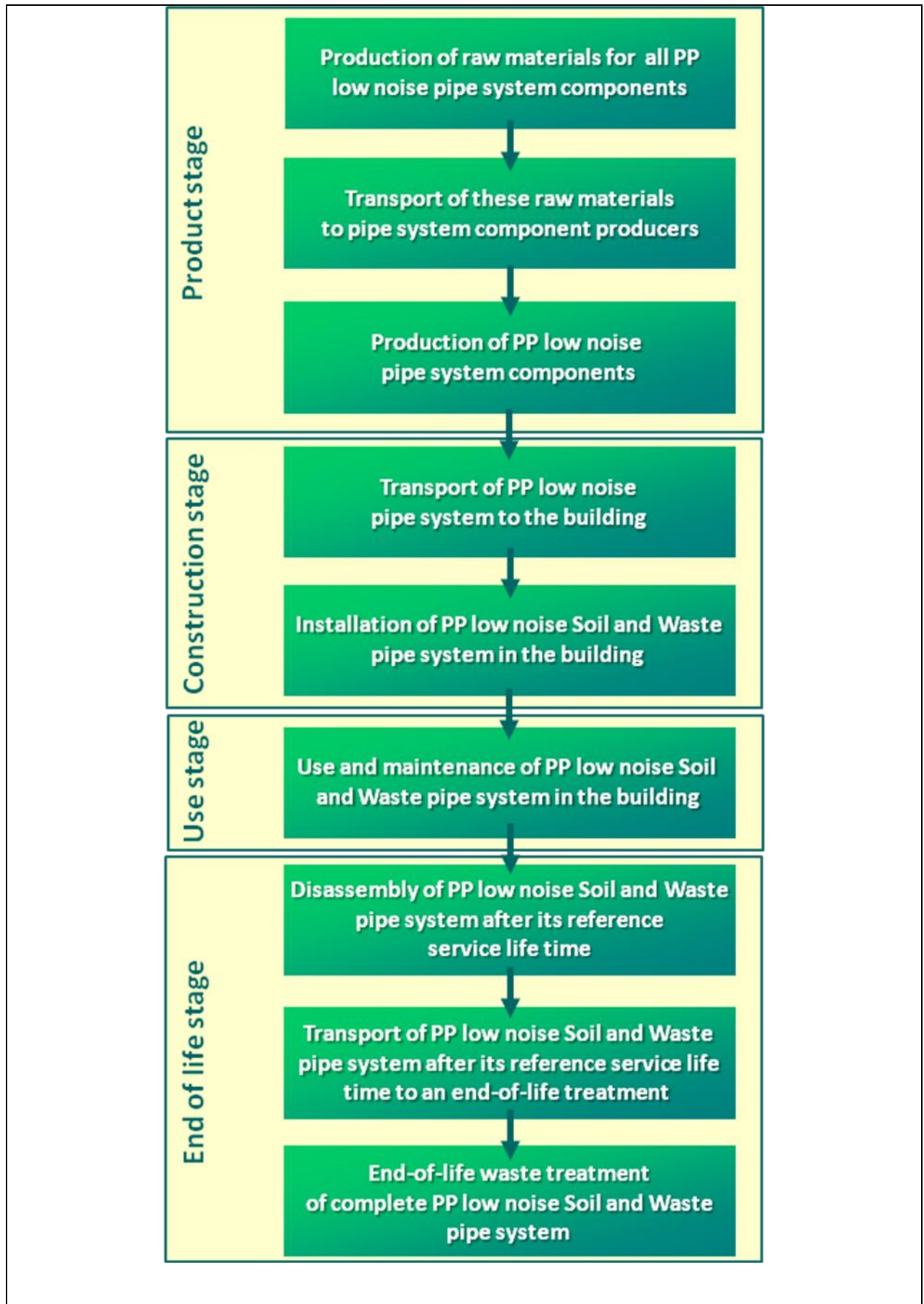
3 DECLARATION OF THE ENVIRONMENTAL PARAMETERS DERIVED FROM LCA

3.1 Life cycle flow diagram

The EPD refers to a typical European PP low noise 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 PP low noise pipes
 - Transport of PP raw materials to converter
 - Converting process for PP low noise Soil and Waste pipes (extrusion)
 - Production of raw materials for PP low noise fittings
 - Transport of PP low noise fittings raw materials to converter
 - Converting process for PP low noise fittings (injection moulding)
 - Production of SBR sealing rings (raw materials + converting process)
- **Construction process stage:** including all energy provisions, waste management processes during the construction stage up to waste for final disposal
 - Transport of PP low noise Soil and Waste pipe system to the building
 - Installation of PP low noise 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 PP low noise 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 PP low noise Soil and Waste pipe system after 50 years of reference service life time at the building
 - Transport of the complete PP low noise 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 PP low noise Soil and Waste pipe system after 50 years of reference service life time at the building



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 (non-fossil)	Abiotic depletion (fossil fuels)	Acidification	Eutrophication	Global warming	Ozone layer depletion	Photochemical oxidation
	kg Sb eq	MJ	kg SO ₂ eq	kg PO ₄ --- eq	kg CO ₂ eq	kg CFC-11 eq	kg C ₂ H ₄ eq
Product stage	1,08E-06	3,04E+01	4,13E-03	7,28E-04	1,00E+00	6,40E-08	2,72E-04
Construction process stage	1,19E-06	3,80E+00	9,97E-04	1,85E-04	2,87E-01	3,87E-08	6,54E-05
Use stage	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
End of life stage	1,35E-08	-5,36E-01	-2,20E-04	-1,37E-05	1,89E-01	-3,50E-09	-1,07E-05
Total	2,28E-06	3,36E+01	4,91E-03	8,99E-04	1,48E+00	9,92E-08	3,27E-04

3.3 Parameters describing resource input

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

Environmental parameter	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	Use of renewable primary energy resources used as raw materials	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials	Use of non renewable primary energy resources used as raw materials	Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)	Use of secondary material	Use of renewable secondary fuels	Use of non renewable secondary fuels	Net use of fresh water
	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	MJ, net calorific value	kg	MJ, net calorific value	MJ, net calorific value	m ³
Product stage	n.a.	n.a.	2,73E+00	n.a.	n.a.	3,39E+01	n.a.	n.a.	n.a.	2,06E-02
Construction process stage	n.a.	n.a.	1,11E-01	n.a.	n.a.	3,83E+00	n.a.	n.a.	n.a.	1,15E-03
Use stage	n.a.	n.a.	0,00E+00	n.a.	n.a.	0,00E+00	n.a.	n.a.	n.a.	0,00E+00
End of life stage	n.a.	n.a.	-2,81E-01	n.a.	n.a.	-1,61E+00	n.a.	n.a.	n.a.	-1,20E-03
Total	n.a.	n.a.	2,55E+00	n.a.	n.a.	3,61E+01	n.a.	n.a.	n.a.	2,05E-02

Only for foreground process from which LCI data are made available by TEPPFA - the number does not include processes and materials modeled by means of background data, e.g. transportation, electricity, ancillary materials.

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	4,48E-03	1,22E-01	5,67E-05
Construction stage	1,15E-05	1,56E-01	2,13E-05
Use stage	0,00E+00	0,00E+00	0,00E+00
End of life stage	-2,05E-06	4,21E-01	-8,91E-06
Total	4,49E-03	6,98E-01	6,91E-05

Parameters describing further output material flows

Parameter	Unit	Total
Components for re-use**	kg	0
Materials for recycling**	kg	0,14320
Materials for energy recovery**	kg	0,04966
Exported energy**	MJ per energy carrier	0

** Only for foreground process from which LCI data are made available by TEPPFA - the number does not include processes and materials modeled by means of background data, e.g. transportation, electricity, ancillary materials.

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 PP low noise soil and waste pipe system is transported over an average distance of 665km with a truck and 30 km by means of a van from the producers of the different pipe system components via wholesalers to the building. Environmental burdens associated with this kind of transport are calculated by means of the Ecoinvent V3.4 datarecords "Transport, freight, lorry 3.5-7.5 metric ton, EURO4 {RER} transport, freight, lorry 3.5-7.5 metric ton, EURO4 Cut-off, U" and "Transport, freight, light commercial vehicle {Europe without Switzerland} processing Cut-off, U".
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	0,00250 kg of soap (lubricant)

	<p>0,0094 kg of brackets (2 for the installation) , considered to be made out of galvanised steel</p> <p>0,04 kg fast fixing cement (ratio water/cement 0,3) of which 0,028 kg cement and 0,012 kg water</p> <p>0,002 kg of plastic fixing materials, made out of polypropylene (PP)</p> <p>Environmental burdens associated with this kind of input flows are calculated by means of the Ecoinvent V3.4 datarecords "Tap water {RER} market group for Cut-off, U", "Cement, unspecified {Europe without Switzerland} production Cut-off, U", "Soap {RER} production Cut-off, U", "Polypropylene, granulate {RER} production Cut-off, U" in combination with Injection moulding {RER} processing Cut-off, U" and ""Steel, unalloyed {RER} steel production, converter, unalloyed Cut-off, U", in combination with Metal working, average for steel product manufacturing {RER} processing Cut-off, U"</p>
Other resource consumption	Not relevant
Quantitative description of energy type (regional mix) and consumption during the installation process	<p>0,0008 kWh of electrical energy is needed for the installation (screw driver)</p> <p>Environmental burdens associated with this kind of energy are calculated by means of the Ecoinvent V3.4 datarecord "Electricity, low voltage {RER} market group for Cut-off, U"</p>
Waste on the building site, generated by the product's installation	<p>0,018 kg of PP low noise pipe left left over during installation: 80% to landfill, 15% to incineration and 5% to mechanical recycling. Transportation of PP low noise 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 v3.4 datarecord "Transport, freight, lorry 3.5-7.5 metric ton, EURO4 {RER} transport, freight, lorry 3.5-7.5 metric ton, EURO4 Cut-off, U".</p>
Output materials as result of waste management processes at the building site e.g. of collection for recycling, for energy recovery, final disposal	<p>0,07385 kg of packaging waste: treated according to European average packaging waste scenarios (EU27, 2006):</p>

	<table border="1"> <thead> <tr> <th></th> <th>Recycling</th> <th>Energy Recovery</th> <th>Landfill</th> </tr> </thead> <tbody> <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> </tbody> </table>		Recycling	Energy Recovery	Landfill	Plastic	27%	26%	47%	Paper and board	75%	10%	15%	Wood	38%	23%	39%	Metals	66%		34%	Total	57%	12%	31%
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Metals	66%		34%																						
Total	57%	12%	31%																						
Emissions to ambient air, soil and water	No direct emissions at the building. Emissions are related to the upstream processes (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.																								

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 PP low noise soil and waste pipe system. Moreover the PP low noise 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)

Processes	Parameter unit expressed per functional unit
Collection process	After a reference service life time of 50 years the PP low noise soil and waste pipe system is stripped for recoverable materials and products, and the remaining construction subsequently demolished. The PP low noise soil and waste pipe system is demolished together with the total construction. For the functional unit 0,5191 kg of pipe system components are available at the apartment: 5% (0,026 kg) is transported over an average distance of 600 km to a recycling plant, 15% (0,078 kg) is transported over an average distance of 150 km to an incinerator, and the remaining 80% (0,415 kg) is transported over an average distance of 50 km to a landfill.

		EOL scenario PP pipes and fittings (soil and waste)	
		Mechanical recycling	5,0%
		Incineration	15,0%
		Landfill	80,0%
	<p>Environmental burdens associated with transportation are calculated by means of the following Ecoinvent v3.4 data record "Transport, freight, lorry 3.5-7.5 metric ton, EURO4 {RER} transport, freight, lorry 3.5-7.5 metric ton, EURO4 Cut-off, U"</p>		

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 PP low noise Soil and Waste pipe system does not contain any substances mentioned on the REACH-list.

Emissions to soil and water:

Since the PP low noise 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

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.eu>

List of names and logos of TEPPFA member companies



Aliaxis



Geberit International



Georg Fischer Piping Systems



Pipelife International



Polypipe



Rehau



Radius Systems



Tessenderlo Group



Uponor



Wavin

List of National Associations of TEPPFA

ADPP

- Czech Republic plastic pipes association

ASETUB	- Asociación Española de Fabricantes de Tubos y Accesorios Plásticos
BPF	- Plastic Pipes Group
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 Essenscia
FIPIF	- Finnish Plastics Industries Federation
KRV	- Kunststoffrohrverband e.V.- Fachverband der Kunststoffrohr-Industrie
MCsSz	- Műanyag Csőgyártók Szövetsége
IKEM	- Swedish Plastics and Chemical Federation
PRIK	- Polish Association of Pipes and Fittings
STR	- Syndicat des Tubes et Raccords
VKR	- Verband Kunststoffrohre und Rohrleitungstelle
Unionplast	- Federazione Gomma Plastica – Pipes Sector Group

List of names and logos of TEPPFA Associated Members



Borealis



LyondellBasell



Vynova



Lubrizol

List of names and logos of TEPPFA Supporting Members



Rollepaal



Molecor

REFERENCES

Ecoinvent, 2016. Ecoinvent database v3.3, 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 15804:2012+A1:2013: Sustainability of construction works – Environmental product declarations – core rules for the product category of construction products (2013);

EN 15942: Sustainability of construction works – Environmental product declarations – Communication format – Business to Business

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

Background LCA report (ISO 14040 and ISO 14044) prepared by

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External critical review of underlying LCA by

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