



EUROPEAN ASSESSMENT DOCUMENT

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PREASSEMBLED LINE UNIT FOR  
DRAINAGE OR INFILTRATION

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## Contents

<b>1</b>	<b>Scope of the EAD</b> .....	<b>5</b>
1.1	Description of the construction product.....	5
1.2	Information on the intended use(s) of the construction product .....	5
1.2.1	Intended use(s).....	5
1.2.2	Working life/durability.....	6
1.3	Specific terms used in this EAD .....	6
1.3.1	ND/OD .....	6
1.3.2	$d_i, d_{mean}$ .....	6
1.3.3	$d_{i)ox,ag}, d_{mean)ox,ag}$ .....	6
1.3.4	$\epsilon_{ct}, \epsilon_t$ .....	6
1.3.5	$d_{i)hy,ag}, d_{mean)hy,ag}$ .....	6
1.3.6	$d_{i)bio,ag}, d_{mean)bio,ag}$ .....	6
<b>2</b>	<b>Essential characteristics and relevant assessment methods and criteria</b> .....	<b>7</b>
2.1	Essential characteristics of the product .....	7
2.2	Assessment methods and criteria for the performance of the product in relation to essential characteristics of the product.....	7
2.2.1	Reaction to fire.....	7
2.2.2	Content, emissions and/or release of dangerous substances.....	8
2.2.3	Deformation under load.....	8
2.2.4	Creep in compression.....	8
2.2.5	Water flow capacity under load.....	9
2.2.6	Ring stiffness of the polyethylene pipe .....	9
2.2.7	Static puncture (CBR Test) of the geotextile .....	9
2.2.8	Dynamic perforation test (cone drop test) of the geotextile .....	9
2.2.9	Modulus of compressibility of the EPS aggregate .....	9
2.2.10	Deformation under load after oxidation ageing.....	10
2.2.11	Deformation under load after hydrolysis ageing .....	10
2.2.12	Deformation under load after microbiological ageing .....	11
2.2.13	Resistance to weathering of the geotextile .....	11
2.2.14	Resistance to oxidation of the geotextile .....	11
<b>3</b>	<b>Assessment and verification of constancy of performance</b> .....	<b>12</b>
3.1	Systems of assessment and verification of constancy of performance .....	12
3.2	Tasks of the manufacturer .....	12
3.3	Tasks of the notified body .....	14
3.4	Special methods of control and testing used for the verification of constancy of performance .....	14
3.4.1	Geometrical characteristics of the unit .....	14
3.4.2	Raw materials of the pipe and coupling.....	15
3.4.3	Dimensions and weight of the pipe.....	15
3.4.4	Dimensions of the coupling.....	15
3.4.5	Tensile strength of the geotextile.....	15
3.4.6	Characteristic opening size of the geotextile .....	16
3.4.7	Water permeability normal to the plane of the geotextile .....	16
3.4.8	EPS density .....	16
3.4.9	Bulk density of the EPS aggregate.....	16
3.4.10	Size distribution .....	16
3.4.11	Compression strength.....	16
3.4.12	Grammage.....	16
3.4.13	Tensile strength of the polyethylene netting.....	16
3.4.14	Dimensions of the fixing element.....	16

<b>4</b>	<b>Reference documents .....</b>	<b>17</b>
<b>Annex A</b>	<b>Water flow capacity under load test .....</b>	<b>19</b>
<b>Annex B</b>	<b>Example of dimensions of the EPS aggregate .....</b>	<b>21</b>
<b>Annex C</b>	<b>Example of microbiological ageing .....</b>	<b>22</b>
<b>Annex D</b>	<b>Figures of the preassembled line unit.....</b>	<b>23</b>

## 1 SCOPE OF THE EAD

### 1.1 Description of the construction product

Preassembled line unit used for drainage or infiltration.

Two possibilities are presented:

- The preassembled linear unit comprises a horizontal corrugated slotted or perforated pipe of polyethylene, EPS aggregates that are held surrounding the pipe by means of a netting and a geotextile which covers at least the upper two thirds of the outer surface. The units are set end to end by plastic couplers.
- The preassembled linear unit comprises EPS aggregates that are held by means of a netting and a geotextile which covers at least the upper two thirds of the outer surface. The units are not set end to end.

In both cases the unit length varies between 2 and 12 m. The outer diameter of the plastic pipes is in the range between 70 and 200 mm. The outer diameter of the preassembled line unit is in the range between 225 and 450 mm. An example of dimensions of the EPS aggregate is included in the annex B.

The following table shows the possible product combinations in accordance with the product parameters and intended use possibilities.

**Table 1:** Product combinations.

No of product combination	Product parameters			Intended use	
	Total diameter of the unit	Unit with pipe	Unit without pipe	Drainage	Infiltration
1	X <sup>(1)</sup>	X	---	X	---
2		---	X	X	---
3		X	---	---	X
4		---	X	---	X

<sup>(1)</sup>: Each value of the total diameter of the unit will imply a set of product combinations.

The product is not covered by a harmonised European standard (hEN).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

### 1.2 Information on the intended use(s) of the construction product

#### 1.2.1 Intended use(s)

Underground drainage or infiltration without pressure for water not intended for human consumption.

##### Drainage:

It can be used in, for example: agriculture and gardening, civil works, buildings, bridges, retaining walls, foundation drains, pathways, French drains, sport fields, golf courses, etc.

##### Infiltration:

It can be used, for example, as discharge points of septic tanks, creating nitrification fields, etc.

## 1.2.2 Working life/durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the preassembled line unit for the intended use of 25 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works<sup>2</sup>.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

## 1.3 Specific terms used in this EAD

### 1.3.1 ND/OD

Nominal dimension of the pipe referred to its outer diameter.

### 1.3.2 $d_i$ , $d_{mean}$

$d_i$ : Deformation of each preassembled line unit in the deformation under load without ageing test.

$d_{mean}$ : Mean value of the deformation of the preassembled line units in the deformation under load without ageing test.

### 1.3.3 $d_i)_{ox,ag}$ , $d_{mean})_{ox,ag}$

$d_i)_{ox,ag}$ : Deformation of each preassembled line unit in the deformation under load after oxidation ageing test.

$d_{mean})_{ox,ag}$ : Mean value of the deformation of the preassembled line units in the deformation under load after oxidation ageing test.

### 1.3.4 $\mathcal{E}_{ct}$ , $\mathcal{E}_t$

$\mathcal{E}_{ct}$ : creep in compression (%).

$\mathcal{E}_t$ : total relative reduction of thickness (%).

### 1.3.5 $d_i)_{hy,ag}$ , $d_{mean})_{hy,ag}$

$d_i)_{hy,ag}$ : Deformation of each preassembled line unit in the deformation under load after hydrolysis ageing test.

$d_{mean})_{hy,ag}$ : mean value of the deformation of the preassembled line units in the deformation under load after hydrolysis ageing test.

### 1.3.6 $d_i)_{bio,ag}$ , $d_{mean})_{bio,ag}$

$d_i)_{bio,ag}$ : Deformation of each preassembled line unit in the deformation under load after microbiological ageing test.

$d_{mean})_{bio,ag}$ : Mean value of the deformation of the preassembled line units in the deformation under load after microbiological ageing test.

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<sup>2</sup> The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 2 shows how the performance of the preassembled line unit is assessed in relation to the essential characteristics.

**Table 2:** Essential characteristics of the product and assessment methods and criteria for the performance of the product in relation to those essential characteristics.

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1.	Reaction to fire	2.2.1	Class according to EN 13501-1
Basic Works Requirement 3: Hygiene, health and environment + Basic Works Requirement 4: Safety in use			
2.	Content, emissions and/or release of dangerous substances	2.2.2	Level, class or description
3.	Deformation under load	2.2.3	Level
4.	Water flow capacity under load	2.2.5	Level
5.	Ring stiffness of the polyethylene pipe	2.2.6	Level
6.	Static puncture (CBR Test) of the geotextile	2.2.7	Level
7.	Dynamic perforation test (cone drop test) of the geotextile	2.2.8	Level
8.	Modulus of compressibility of the EPS aggregate	2.2.9	Level
9.	Creep in compression	2.2.4	Level
10.	Deformation under load after oxidation ageing	2.2.10	Level
11.	Deformation under load after hydrolysis ageing	2.2.11	Level
12.	Deformation under load after microbiological ageing	2.2.12	Level
13.	Resistance to weathering of the geotextile	2.2.13	Level
14.	Resistance to oxidation of the geotextile	2.2.14	Level

### 2.2 Assessment methods and criteria for the performance of the product in relation to essential characteristics of the product

#### 2.2.1 Reaction to fire

The preassembled line units with pipe and without pipe shall be tested, using the test method(s) relevant for the corresponding reaction to fire class, and the mounting and fixing provisions in accordance with EOTA TR 042 method B with the following modifications, in order to be classified according to EN 13501-1.

- Two positions of the same type of preassembled line unit shall be tested: one where the EPS granulates are facing the fire, and another where the geotextile is facing the fire. The configuration with the worst performance regarding to the reaction to fire will be used for classification purposes.
- Test procedure: the preassembled line unit with the thicker EPS aggregate layer (with and without pipe) within the range defined by the applicant shall be tested.
- Validity of test results of a product range: The tests performed with the preassembled line units in accordance with the test procedure will cover all range of products.

The products shall be classified according to EN 13501-1 and expressed in the ETA with reference to method B according to EOTA TR 042.

### 2.2.2 Content, emissions and/or release of dangerous substances

The performance of the product related to the emissions and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer using the assessment methods and criteria laid down in EOTA TR 034.

### 2.2.3 Deformation under load

The deformation under load without ageing shall be determined in accordance with EN ISO 604, and the specific following test conditions:

- The sample will lie in a semicircular base of steel of the same diameter as the sample.
- The length of the preassembled line unit shall be equal or greater than the length of the loading plate and of the length of the supporting hemisphere.
- The load will be applied at constant rate through a hardened steel plate whose dimensions will be adjusted to the sample.
- The load shall be applied vertically and perpendicular to the length of the preassembled line unit.
- At least five samples of the same ND/OD of the preassembled line unit with pipe shall be tested.
- Deformation of each sample ( $d_i$ ) and the mean value ( $d_{mean}$ ) at the load compression steps shall be reported.
- The displacement of the loading plate shall be considered the deformation of the preassembled line unit.

The deformation under load without ageing at the load compression steps and the state of the EPS aggregates shall be expressed in the ETA by means of a level.

The state of the EPS aggregates after testing shall be determined in accordance with the existence of the following:

- EPS aggregates crumbled or broken;
- Deformations (appreciable a with the naked eye);
- Other relevant damages;

The approximate rate (percentage) of damaged EPS aggregates shall also be expressed in the ETA by means of a level.

### 2.2.4 Creep in compression

The creep in compression,  $\mathcal{E}_{ct}$  (%), and the total relative reduction of thickness,  $\mathcal{E}_t$  (%), shall be determined in accordance with EN 1606 and the specific following test conditions:



- The sample will lie in a semicircular base of steel of the same diameter as the sample.
- The load will be applied through a hardened steel plate whose dimensions will be adjusted to the sample.
- Temperature:  $(23 \pm 2)$  °C.
- Relative humidity:  $(50 \pm 5)$  % HR.
- Duration: 304 days for a working life of 25 years.
- 2 load compression values will be applied.
- The same equipment and test specimen as used in the deformation under load test will be used (see clause 2.2.3.1).
- 1 specimen of the preassembled line unit without pipe will be tested for each load compression value.
- The indications regarding to the initial deformation in clause 7.3 of EN 1606 will be followed.

$\varepsilon_{ct}$  (%),  $\varepsilon_t$  (%) and the load compression values shall be expressed in the ETA by means of a level.

### **2.2.5 Water flow capacity under load**

The water flow capacity under load shall be determined in accordance with the test method in the annex A.

The water flow capacity in the different load steps shall be expressed in the ETA by means of a level.

### **2.2.6 Ring stiffness of the polyethylene pipe**

The ring stiffness of the pipe shall be taken from the documentation of the manufacturer of the pipe, who has determined it in accordance with EN ISO 9969.

The ring stiffness of the pipe shall be expressed in the ETA by means of a level.

### **2.2.7 Static puncture (CBR Test) of the geotextile**

The CBR static puncture resistance of the geotextile shall be taken from the documents accompanying the CE marking of the geotextile.

The CBR static puncture resistance of the geotextile shall be expressed in the ETA by means of a level.

### **2.2.8 Dynamic perforation test (cone drop test) of the geotextile**

The dynamic perforation resistance of the geotextile shall be taken from the documents accompanying the CE marking of the geotextile.

The dynamic perforation resistance of the geotextile shall be expressed in the ETA by means of a level.

### **2.2.9 Modulus of compressibility of the EPS aggregate**

The modulus of compressibility of the EPS aggregate shall be determined by application of the CBR method (California Bearing Ratio) in accordance with EN 13286-47.

Neither compacting nor curing the sample is necessary.

The modulus of compressibility of the EPS aggregate shall be expressed in the ETA by means of a level.

### 2.2.10 Deformation under load after oxidation ageing

The deformation under load after oxidation ageing shall be determined in accordance with EN ISO 604 and the specific following test conditions:

- The length of the preassembled line unit shall be equal or greater than the length of the loading plate and of the length of the supporting hemisphere.
- The load shall be applied vertically and perpendicular to the length of the preassembled line unit.
- The displacement of the loading plate shall be considered the deformation of the preassembled line unit.
- Oxidation ageing before deformation under load tests will be carried out keeping the samples at a temperature of 70 °C during 14 days.
- At least five samples will be tested.
- Deformation of each sample  $d_{i)ox,ag}$  and the mean value  $d_{mean)ox,ag}$  at the load compression steps shall be reported.

The deformation under load after oxidation ageing at the load compression steps and the state of the EPS aggregates shall be expressed in the ETA by means of a level.

The state of the EPS aggregates after testing shall be determined in accordance with the existence of the following:

- EPS aggregates crumbled or broken;
- Deformations (appreciable with the naked eye);
- Other relevant damages;

The approximate rate (percentage) of damaged EPS aggregates shall also be expressed in the ETA by means of a level.

The rate of damaged EPS aggregates from the deformation under load test after ageing shall be divided by the rate of damaged EPS aggregates from the deformation under load test (clause 2.2.3), and this will be expressed in the ETA by means of a level.

### 2.2.11 Deformation under load after hydrolysis ageing

The deformation under load after hydrolysis ageing shall be determined in accordance with EN ISO 604 and the specific following test conditions:

- The length of the preassembled line unit shall be equal or greater than the length of the loading plate and of the length of the supporting hemisphere.
- The load shall be applied vertically and perpendicular to the length of the preassembled line unit.
- The displacement of the loading plate shall be considered the deformation of the preassembled line unit.
- Hydrolysis ageing before deformation under load tests will be carried out keeping the specimens immersed in hot water during 28 days at temperatures of 60 °C, 70 °C and 80 °C.
- At least one sample with each temperature will be tested.
- Deformation of each sample  $d_{i)hy,ag}$  and the mean value  $d_{mean)hy,ag}$  at the load compression steps shall be reported.

The deformation under load after hydrolysis ageing at the load compression steps and the state of the EPS aggregates shall be expressed in the ETA by means of a level.

The state of the EPS aggregates after testing shall be determined in accordance with the existence of the following:

- EPS aggregates crumbled or broken;
- Deformations (appreciable with the naked eye);
- Other relevant damages;

The approximate rate (percentage) of damaged EPS aggregates shall also be expressed in the ETA by means of a level.

The rate of damaged EPS aggregates from the deformation under load test after ageing shall be divided by the rate of damaged EPS aggregates from the deformation under load test (clause 2.2.3), and this will be expressed in the ETA by means of a level.

### 2.2.12 Deformation under load after microbiological ageing

The deformation under load after microbiological ageing shall be determined in accordance with EN ISO 604 and the specific following test conditions:

- The length of the preassembled line unit shall be equal or greater than the length of the loading plate and of the length of the supporting hemisphere.
- The load shall be applied vertically and perpendicular to the length of the preassembled line unit.
- The displacement of the loading plate shall be considered the deformation of the preassembled line unit.
- Microbiological ageing will be carried out keeping the samples buried in soil during a specific period of time.
- The conditions involved in the microbiological ageing can be different according to the place of use. An example of the microbiological ageing is included in the Annex C of the EAD.
- At least five samples will be tested.
- Deformation of each sample  $d_{bio,ag}$  and the mean value  $d_{mean)_{bio,ag}}$  at the load compression steps shall be reported.

The deformation under load after microbiological ageing, the load compression steps, the state of the EPS aggregates as well as the conditions of the microbiological ageing shall be expressed in the ETA by means of a level.

The state of the EPS aggregates after testing shall be determined in accordance with the existence of the following:

- EPS aggregates crumbled or broken;
- Deformations (appreciable with the naked eye);
- Other relevant damages;

The approximate rate (percentage) of damaged EPS aggregates shall also be expressed in the ETA by means of a level.

The rate of damaged EPS aggregates from the deformation under load test after ageing shall be divided by the rate of damaged EPS aggregates from the deformation under load test (clause 2.2.3), and this will be expressed in the ETA by means of a level.

### 2.2.13 Resistance to weathering of the geotextile

The resistance to weathering of the geotextile shall be taken from the documents accompanying the CE marking of the geotextile.

The resistance to weathering of the geotextile shall be expressed in the ETA by the level corresponding to the maximum period of time the product can remain uncovered after installation.

### 2.2.14 Resistance to oxidation of the geotextile

The resistance to oxidation of the geotextile shall be taken from the documents accompanying the CE marking of the geotextile.

The resistance to oxidation of the geotextile shall be expressed in the ETA by the level corresponding to the period of time of minimum durability and its associated conditions.

### **3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE**

#### **3.1 Systems of assessment and verification of constancy of performance**

For the products covered by this EAD the applicable European legal act is: 1999/472/EC.

The system to be applied is: 4

In addition, with regard to reaction to fire for products covered by this EAD the applicable European legal act is 2001/596/EC.

The systems to be applied are: 1, 3 or 4.

#### **3.2 Tasks of the manufacturer**

The cornerstones of the actions to be undertaken by the manufacturer for the preassembled line unit for drainage or infiltration in the process of assessment and verification of constancy of performance are laid down in Table 3.

**Table 3:** Control plan for the manufacturer; cornerstones.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Factory production control (FPC)</b> [including testing of samples taken at the factory in accordance with a prescribed test plan]					
<b>Polyethylene pipe and coupling</b>					
1.	Raw materials of the pipe and coupling	3.4.2	3.4.2	Testing is not required.	Each delivery
2.	Dimensions and weight of the pipe	3.4.3	3.4.3	Acc. to clause 5 of EN ISO 3126.	Each delivery
3.	Dimensions of the coupling	3.4.4	3.4.4	Acc. to clause 5 of EN ISO 3126.	Each delivery
4.	Ring stiffness	2.2.6	2.2.6	Testing is not required.	Each delivery
<b>EPS aggregate</b>					
5.	EPS density	3.4.8	3.4.8	5 specimens	Once every 3 days of manufacturing (*)
6.	Bulk density of the EPS aggregate	3.4.9	3.4.9	Acc. to 3.4.9	Once every 3 days of manufacturing (*)
7.	Size distribution	3.4.10	3.4.10	Acc. to clause 6 of EN 933-1	Once every 3 months (*)
8.	Compression strength	3.4.11	3.4.11	1 vessel	Once every 3 days of manufacturing (*)
<b>Geotextile</b>					
9.	Tensile strength of the geotextile	3.4.5	3.4.5	Testing is not required	Each delivery
10.	Static puncture (CBR Test)	2.2.7	2.2.7	Testing is not required	Each delivery
11.	Dynamic perforation test (cone drop test) of the geotextile	2.2.8	2.2.8	Testing is not required	Each delivery
12.	Characteristic opening size of the geotextile	3.4.6	3.4.6	Testing is not required	Each delivery
13.	Water permeability normal to the plane of the geotextile	3.4.7	3.4.7	Testing is not required	Each delivery
14.	Resistance to weathering of the geotextile	2.2.13	2.2.13	Testing is not required	Each delivery
15.	Resistance to oxidation of the geotextile	2.2.14	2.2.14	Testing is not required	Each delivery
<b>Polyethylene netting</b>					
16.	Grammage	3.4.12	3.4.12	3 specimens	Each delivery
17.	Tensile strength of the polyethylene netting	3.4.13	3.4.13	2 samples and 2 specimens per sample	Each delivery

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
<b>Fixing element</b>					
18.	Dimensions of the fixing element	3.4.14	3.4.14	3 specimens	Each delivery
<b>Preassembled line unit</b>					
19.	Geometrical characteristics of the unit	3.4.1	3.4.1	3 specimens	Once every day of manufacturing
(*) The minimum frequency of control may vary taking as a reference the annex B of EN 13163 (combined controls).					

### 3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the process of assessment and verification of constancy of performance for the preassembled line unit for drainage or infiltration are laid down in Table 4.

**Table 4:** Control plan for the notified body; cornerstones for system 1.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
1	Reaction to fire	2.2.1	2.2.1	2.2.1	----
<b>Initial inspection of the manufacturing plant and of factory production control</b> <i>(for system 1 only)</i>					
2	The notified body shall ascertain that, in accordance with the control plan, the manufacturing plant of the single product manufacturer, in particular personnel and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of the element according to the European Technical Assessment.				----
<b>Continuous surveillance, assessment and evaluation of factory production control</b> <i>(for system 1 only)</i>					
3	It shall be verified that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan.				Once per year

### 3.4 Special methods of control and testing used for the verification of constancy of performance

#### 3.4.1 Geometrical characteristics of the unit

The geometrical characteristics of the unit shall be determined and expressed by means of a level.

### 3.4.2 Raw materials of the pipe and coupling

The density of the base material, the Melt Flow Ratio (MFR) of the base material at 190 °C of temperature and 5 kg of load, as well as the percentage of unused, internal reprocessed and external reprocessed material in the base material shall be taken from the documentation from the manufacturer of the pipe and coupling.

#### Level of density and Melt Flow Ratio

The use of external reprocessed and recycling material in the manufacturing process of the PE pipes and couplings is subject to the following limitations:

- The minimum content of PE is not less than 80 %;
- It exists a written agreement between the manufacturer and the supplier regarding the requirements to be met by the external reprocessed or recycled material;
- Each delivery includes a certificate showing compliance with the requirements set out in the agreement;
- The manufacturer records the amount of external reprocessed and / or recycled material to be added to blank material;
- The initial type tests of the pipe are done for the specified maximum amount of external reprocessed and / or recycled material;

### 3.4.3 Dimensions and weight of the pipe

The dimensions of the pipe shall be measured in accordance with EN ISO 3126 by means of a level.

In case of dispute the measurements of the dimensions shall be made not less than 24 hours after manufacturing and after being conditioned for at least 4 hours at  $23 \pm 2$  °C.

The following dimensions are measured:

- Minimum inner diameter (mm);
- Length (mm);
- Number of slits in the circumference;
- Slits length (mm);
- Slits width (mm);
- Slits surface ( $\text{cm}^2/\text{m}\cdot\text{l}$ );

The weight of the pipe is measured with a scale by means of a level.

### 3.4.4 Dimensions of the coupling

The dimensions of the coupling shall be measured in accordance with EN ISO 3126 by means of a level.

In case of dispute the measurements of the dimensions shall be made not less than 24 hours after manufacturing and after being conditioned for at least 4 hours at  $23 \pm 2$  °C.

The following dimensions are measured:

- Nominal diameter DN (mm)

### 3.4.5 Tensile strength of the geotextile

The tensile strength shall be taken shall be taken from the documents accompanying the CE marking of the geotextile.

The tensile strength shall be expressed by means of a level.

#### **3.4.6 Characteristic opening size of the geotextile**

The characteristic opening size shall be taken from the documents accompanying the CE marking of the geotextile.

The characteristic opening size shall be expressed by means of a level.

#### **3.4.7 Water permeability normal to the plane of the geotextile**

The water permeability normal to the plane shall be taken from the documents accompanying the CE marking of the geotextile.

The water permeability normal to the plane shall be expressed by means of a level.

#### **3.4.8 EPS density**

The EPS density shall be determined in accordance with EN 1602 and expressed by means of a level.

#### **3.4.9 Bulk density of the EPS aggregate**

The bulk density of the EPS aggregate immediately after leaving the expander and once aggregate has been dried shall be determined in accordance with EN 1097-3. A measuring vessel with a volume of at least 5 litres shall be used. Three measures shall be done, each one with different EPS aggregate.

The bulk density will be the mean value of the three measures and shall be expressed by means of a level.

#### **3.4.10 Size distribution**

The size distribution of the EPS aggregate shall be determined in accordance with EN 933-1 by means of a level.

#### **3.4.11 Compression strength**

The deformation under different compression load steps of a volume of EPS aggregates shall be determined and expressed by means of a level.

#### **3.4.12 Grammage**

The grammage of the polyethylene netting shall be determined and expressed by means of a level.

#### **3.4.13 Tensile strength of the polyethylene netting**

The tensile strength of the polyethylene netting shall be determined by fixing the netting by one edge and hanging a load by the opposite edge, and expressed by means of a level.

#### **3.4.14 Dimensions of the fixing element**

The dimensions of the fixing element shall be determined and expressed by means of a level.



#### 4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EN 933-1	Test for geometrical properties of aggregates. Part 1: determination of particle size distribution. Sieving method.
EN 1097-3	Tests for mechanical and physical properties of aggregates. Part 3: determination of loose bulk density and voids.
EN 1602	Thermal insulating products for building applications. Determination of the apparent density.
EN 1606	Thermal insulating products for building applications. Determination of compressive creep.
EN 12224	Geotextiles and geotextile-related products – Determination of the resistance to weathering.
EN 13286-47	Unbound and hydraulically bound mixtures – Part 47: Test method for the determination of the California Bearing Ratio, Immediate Bearing Index and Linear Swelling.
EN 13501-1	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
prEN 15013:2011	Plastics piping systems –non-pressure drainage and sewerage systems buried in ground – performance characteristics for pipes, fittings and their joints.
EN ISO 604	Plastics - Determination of compressive properties (ISO 604:2002)
EN ISO 1133	Plastics - Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics (ISO 1133:2005)
EN ISO 1183-1	Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2004)
EN ISO 1183-2	Plastics - Methods for determining the density of non-cellular plastics - Part 2: Density gradient column method (ISO 1183-2:2004)
EN ISO 1183-3	Plastics - Methods for determining the density of non-cellular plastics - Part 3: Gas Pycnometer method (ISO 1183-3:1999)
EN ISO 3126	Plastics piping systems - Plastics components - Determination of dimensions (ISO 3126:2005)
EN ISO 9969	Thermoplastics pipes - Determination of ring stiffness (ISO 9969:2007)
EN ISO 10319	Geosynthetics - Wide-width tensile test (ISO 10319:2008)
EN ISO 11058	Geotextiles and geotextile-related products - Determination of water permeability characteristics normal to the plane, without load (ISO 11058:2010)
EN ISO 12236	Geosynthetics - Static puncture test (CBR test) (ISO 12236:2006)
EN ISO 12956	Geotextiles and geotextile-related products - Determination of the characteristic opening size (ISO 12956:2010)
EN ISO 13433	Geosynthetics - Dynamic perforation test (cone drop test) (ISO 13433:2006)

EN ISO 13438	Geotextiles and geotextile-related products - Screening test method for determining the resistance to oxidation (ISO 13438:2004)
EOTA TR 034	General BWR 3 Checklist for EADs/ETAs- Content and/or release of dangerous substances in products/kits
EOTA TR 042	Plastics piping kits for heating systems, consisting of pipes made of PB-R and mechanical and or welded fittings

## **ANNEX A WATER FLOW CAPACITY UNDER LOAD TEST**

### **A1. Equipment**

The specimen will lie on a hemispherical isolated steel box with two lateral water supply valves, which provide transversal water flow through the preassembled line unit. The unit is connected to a single water drainage point (see figure A1).

A 1.000 kN capacity compression testing machine (accuracy 0,1 kN) applied with a 530x280 mm hardened steel platform.

The steel box will be placed between two water tanks of 1.000 litres of capacity each. At the beginning, the water height in one of the tanks will be 140 cm, and 40 cm of water height in the other.

An upper steel plate closes the box, not allowing the water to pour out.

### **A2. Specimens**

Two specimens of the preassembled line unit with pipe of the same dimensions will be tested.

### **A3. Conditioning**

Specimens will be tested to a temperature of  $(23 \pm 2)$  °C and a relative humidity of  $(50 \pm 5)$  % HR.

### **A4. Test procedure**

Water will flow from one tank to the other through the specimen. The gradient is constant.

The specimen #1 will be tested in the following load steps (kPa): 0, 20, 40, 60, 80 and 100;

The specimen #2 will be tested in the following load steps (kPa): 100, 120, 140 and 160.

The applied load will not be modified whilst the test is in progress even if the load measurement by the compression test machine decreases due to the water flow through the specimen.

The load shall be applied vertically and perpendicular to the length of the preassembled line unit.

The displacement of the loading plate shall be considered the deformation of the preassembled line unit.

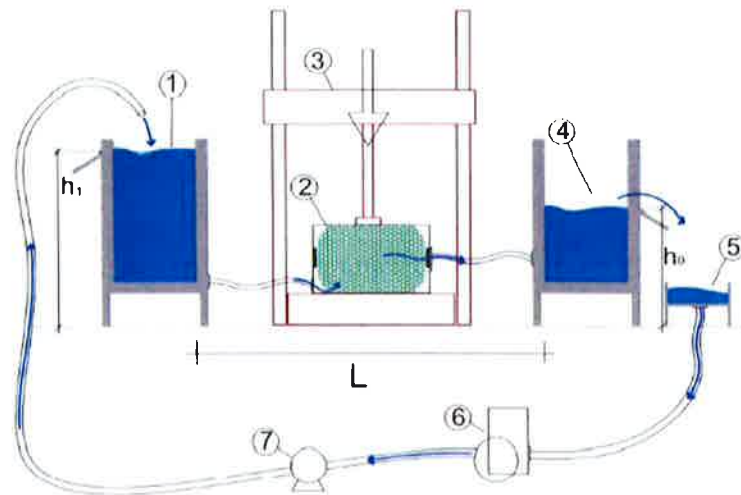
The length of the preassembled line unit shall be equal than the length of the loading plate.

### **A5. Test results**

The time spent for a determined volume of water to pass through the specimen at different loads will provide the water flow (l/s).

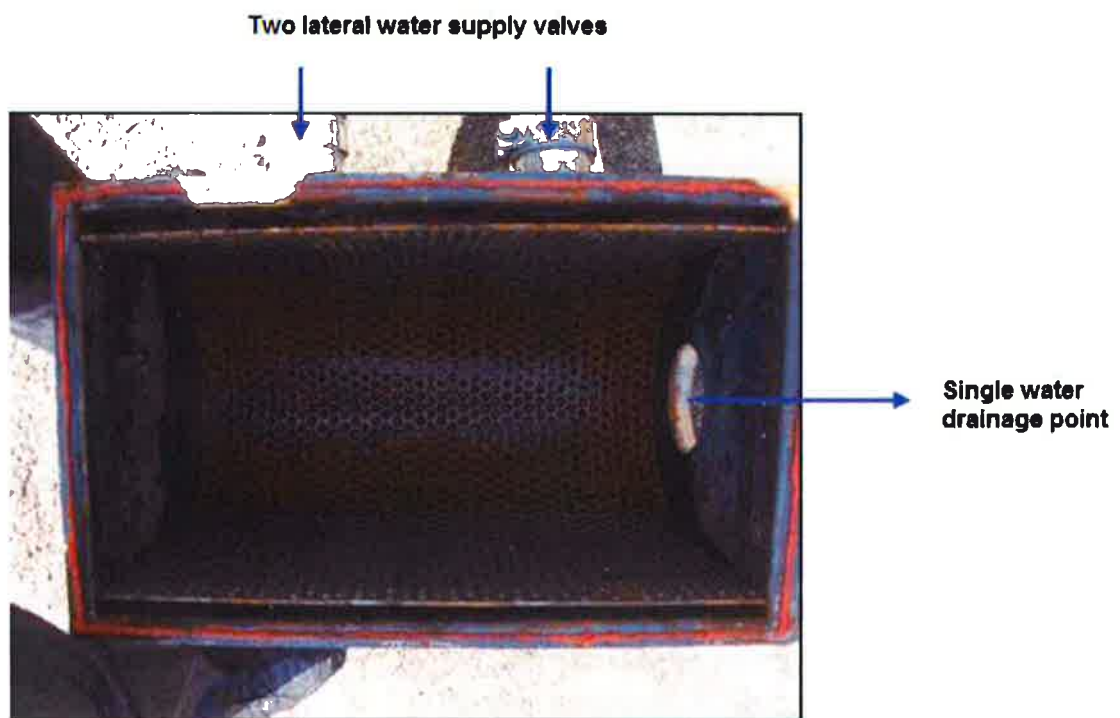
Drainage time and water volume shall be reported.

The theoretical stress value, the starting stress value, the ending stress value and the mean stress value at each load step shall also be reported.



- |                       |                     |
|-----------------------|---------------------|
| 1. Inlet water tank;  | 5. Water collector; |
| 2. Steel box;         | 6. Pump;            |
| 3. Load cell;         | 7. Flowmeter;       |
| 4. Outlet water tank; |                     |

**Figure A1:** General scheme of the water flow capacity under load test.



**Figure A2:** Picture of the plant view of the steel box for the water flow capacity test.

## ANNEX B EXAMPLE OF DIMENSIONS OF THE EPS AGGREGATE

Drawings not to scale. Dimensions in mm.

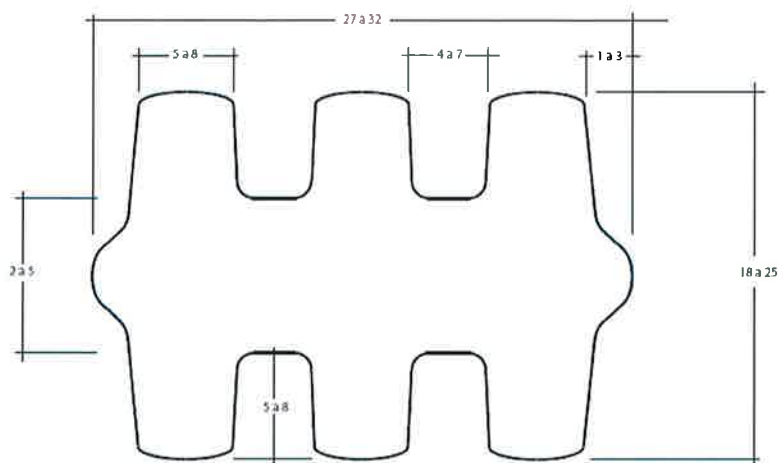


Figure B1: Cross-section.

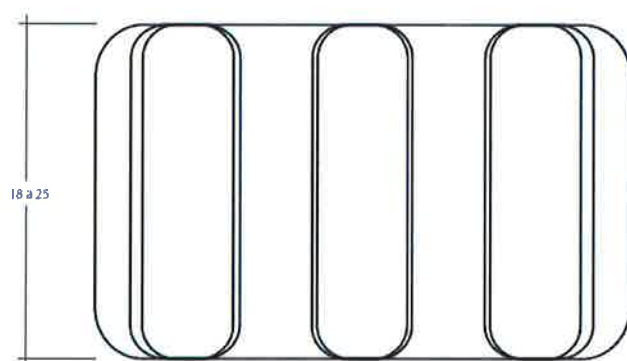


Figure B2: Top view.

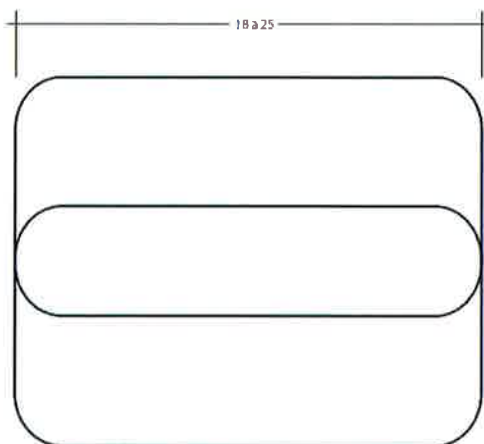


Figure B3: Side view.

## ANNEX C EXAMPLE OF MICROBIOLOGICAL AGEING

This annex contains an example of reference conditions of the microbiological ageing previous to the deformation under load test.

### C1. Exposure conditions of the specimen

- Time: 16 weeks
- Temperature  $26 \pm 1$  °C
- Relative humidity:  $95 \pm 5$  %

### C2. Verification of the optimum properties of the soil

The following standard material or similar can be used

- cotton American type, good middling
- Warp: 18.5 tex Z 886 X 2S 748
- Weft: 30 tex Z 630 X 2S 748
- Weave: plain, 34 ends /cm, 17 picks/cm with brown and green threads at 0.5 cm and 1.0 cm intervals so that strips with identical number of threads can be prepared.
- Mass per unit area:  $230 \text{ g/m}^2$
- Finish: scoured only

### C3. Preparation of the soil

- The soil will be conditioned prior to its use during 4 weeks at 28 °C and  $(97 \pm 2)$  % RH.
- Percentage of fresh soil: 50 %
- Test conditions: Moisture content 60 % of SMC

### C4. Biological activity of soil

After exposure during seven days, the tensile strength of the cotton control fabric will be less than 25 % of its original strength.

### C5. Preparation of the specimens after ageing

After exposure any soil remaining on the specimens will be removed and all specimens, including the control specimens, will be submerged in an ethanol-water solution (70: 30) for 300 seconds.

The specimens will then be cleaned under running water, wiped with absorbent paper and left to dry and condition before carrying out the deformation under load test.

## ANNEX D FIGURES OF THE PREASSEMBLED LINE UNIT



**Figure D1:** Preassembled line unit with pipe and without pipe.



**Figure D2:** Preassembled line unit with pipe.



**Figure D3:** Preassembled line unit without pipe.

