EL245. Water-Permeable Concrete Pavements

[EL245-2003/3/2010-13]

1. Scope

The criteria shall apply to the water-permeable concrete paving materials used for road pavement that is not heavy-loaded, the water-permeable concrete molding products, the porous ecological concrete paving materials used for packing construction that allow the growth of plants on the slope and incision surface, and the porous ecological concrete molding products with a porous ecological paving material.

2. Definition

2.1

"Permeable concrete" refers to the concrete by which raindrops can be permeated directly beneath the road surface through aperture inside of concrete structure or can be let out from inside of the structure.

2.2

"Porous ecological concrete" refers to the concrete by which raindrops can be permeated through the aperture inside the structure so that plants can grow.

2.3

"Coefficient of permeability" refers to the average speed of water passing through a test sample with a certain height under a certain level of water position.

3. Certification Criteria

3.1 Environmental Criteria

3.1.1

With respect to the consumption of resources in the manufacturing process, the use rate of waste materials of the product shall be not less than 40 weight%.

3.1.2

With regard to the discharge of pollutants during the manufacturing process or in the

disposal phase, lead or cadmium compounds shall not be used as raw materials for admixture and pigment.

3.1.3

With respect to environmental soil in the use stage, the product shall comply with the following requirements.

Item	Permeable Concrete Paving Materials and/or Permeable Molding Products	Permeable Concrete Porous Ecological Paving Material and/or Permeable Concrete Porous Ecological Molding Products
Coefficient of Permeability [cm/sec]	$\geq 1.0\times10^{-2}$	$\geq 1.0\times10^{-1}$
Total Void Ratio [%]	-	≥ 25

3.2 Quality Criteria

3.2.1

Aggregates used for the products shall satisfy the following requirements.

Items	Coarse Aggregate	Fine Aggregate
Absolute dry density [g/cm^3]	≥ 2.5	≥ 2.2
Absorption Rate [%]	≤ 3	≤ 5
abrasion loss [%]	≤ 40	-
Salt Contents [%]	-	≤ 0.04
Safety	≤ Na_2SO_4 12%	≤ Na_2SO_4 10%

3.2.2

The compressive strength of the product shall satisfy the following requirements.

Item	Permeable Concrete Paving Materials, Permeable Molding Products	Permeable Concrete Porous Ecological Paving Material, Permeable Concrete Porous Ecological Molding Products
Compressive Strength [N/㎟]	≥14.70	≥ 11.76
The rate of	≤ 20	

change in Compressive Strength after 100 cycles of freezing and thawing [%]	

3.3 Information for Consumers

Information on reduced environmental impact displayed in the product's promotional items, such as catalogs, in terms of the use rate of waste materials, and permeability in the product consumption phase.

4. Test Methods

Certification Criteria		Test and Verification Methods
Environmental Criteria	3.1.1~3.1.2	Verification of submitted documents
	3.1.3	Test report by an accredited testing laboratory in accordance with the test methods 4.1 and 4.3
Quality Criteria	3.2.1	Test report by an accredited testing laboratory in accordance with the following test methods ▪ Absolute dry density, absorption rate: KS F 2503 (test methods of density and absorption rate of heavy aggregate) or KS F 2504 (test methods of density and absorption rate of fine aggregate) ▪ Abrasion loss: KS F 2508 (test methods of coarse aggregate abrasion by the Los Angeles tester) ▪ salt content: KS F 2515 (test methods of chloride content in aggregate) ▪ Safety: KS F 2507 (test methods of aggregate safety)

	3.2.2	Test report by an accredited testing laboratory in accordance with the following test methods ▪ Compression intensity: Test report by an accredited testing laboratory in accordance with KS F 2405 (Standard test method for compressive strength of concrete) ▪ Compression intensity after freezing and thawing: KS F 2405 (Standard test method for compressive strength of concrete) in accordance with KS F 2456 (Testing method for resistance of concrete to rapid freezing and thawing) after 100 cycles of freezing and thawing.
Consumer Information		Verification of submitted documents

4.1 General Matters

4.1.1

One test sample shall be required for each applied product. Only if more than one test sample is needed, the former requirement may not be met.

4.1.2

Test samples shall be collected at random by eco-label certification body from products in market or those in storage at the production site.

4.1.3

Test result shall be numerically set according to KS Q 5002 (Statistical interpretation method of the data – Part 1: Statistical description of the data).

4.2 Test Methods of coefficient of permeability

4.2.1

It is a principle that a test sample be made as a test frame after cutting so that the test sample maintains its thickness and cross section characteristics. ‘Water-permeable packaging materials’ and ‘vegetation packaging materials,’ excluding ‘water-permeable molding products’ and ‘vegetation molding products’ shall have test samples produced in accordance with the proportions and molding method established by the

manufacturer.

Note) In case of ‘water-permeable paving material’ and ‘porous ecological paving materials,’ the product constructed on the spot can be used as test sample instead of producing a test sample separately.

4.2.2

Water-permeability test shall be in accordance with the constant-head permeability test. If it is difficult to test in accordance with constant-head permeability test, permeability test method can be applied.

4.2.2.1

Constant-head permeability tester is like the picture (a) below, the calculation of Coefficient of permeability (K_p) is as follows.

$$K_p = \frac{L}{h} \times \frac{Q}{A(t_2 - t_1)}$$

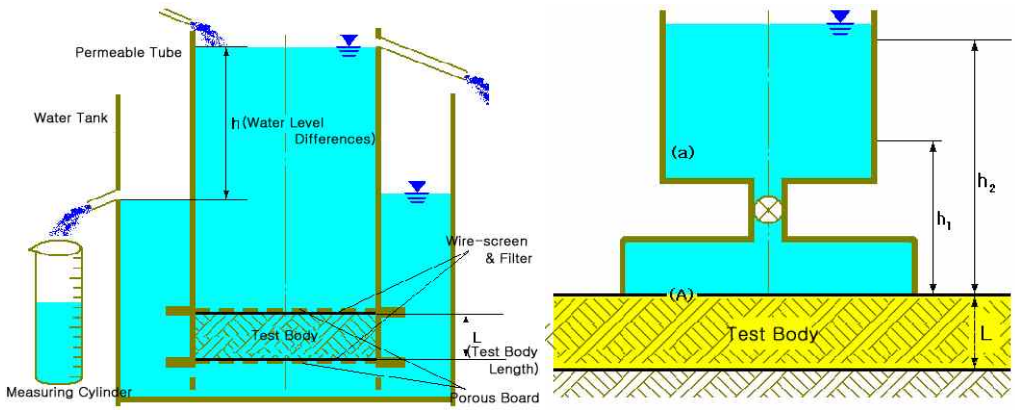
L : Test body length [cm]

h : Water level differences [cm]

Q : Amount of outflow [mL]

A : Water-permeable dimension of test body [cm^2]

$t_2 - t_1$: Permeation time [s]



(a) Constant-head permeability tester (b) in-situ permeability tester water-permeability tester

<Figure. Coefficient of permeability Tester>

4.2.2.2

In-situ permeability tester is like the figure (b) below, and the calculation of Coefficient of permeability (K_p) is as follows.

$$K_p = \frac{L \times a}{A(t_2 - t_1)} \log e \frac{h_1}{h_2}$$

L : Test body length [cm]

a : Dimension of vessel [cm^2]

A : Water-permeable dimension [cm^2]

$t_2 - t_1$: Permeation time [s]

h_1 : Water level when starting the test [mm]

h_2 : Water level when finishing the test [mm]

4.3 Test Methods of total void rate

4.3.1

Cut a test sample to a certain thickness and a certain cross section to use a test body in principle. Test samples of 'porous ecological paving materials' excluding 'porous ecological molding products' shall be produced in accordance with the mixing ratio and the molding method which the producer suggests.

Note) In case of 'porous ecological paving materials,' the product constructed on the spot can be used as test sample instead of producing a test sample separately

4.3.2

Measure the volume of test bodies and harden them in the test apparatus.

4.3.3

Demold the hardened test bodies and measure the underwater weight (W1) after 24 hours underwater curving. At this time remove the residual air in test bodies by rolling them several times.

4.3.4

Let the underwater curved test bodies stand 24 hours and measure the weight in the air (W2) at a dry surface state of test sample.

4.3.5

Total void rate is calculated as follows.

$$A = [\frac{(1 - (W_2 - W_1)}{V}] \times 100$$

W1: Underwater weight of a test sample (g)

W2: Weight in the air after letting stand 24 hours (g)

V: Volume of a test sample (cm^3)

5. Reasons for Certification

"Use of recycled materials, high water permeability"

Common Criteria, Notice No. 2012-36, the Ministry of Environment

1. Eco-label products must follow the following provisions with regard to the proper treatment of environmental pollution substances, such as air and water wastes and noxious chemical substances emitted in the process of manufacturing or service operation.

A. When first applying for certification, the product manufacturer should observe the environment related laws and agreements pertaining to the region where the production factory or the place of service operation is located for a period of one year prior to the date of application. Any case of violation of the penalty clause will be verified by confirming documents involved during a period of one year to the date of application. Regarding any violation not related to the penalty clause, confirmation will be made on the completion of appropriate measures.

B. A person who has received a certification of eco-labeling shall observe the environment related laws and agreements pertaining to the region where the production factory or the place of service operation is located during the period of certification. However, regarding any violation besides a penalty, confirmation will be made on the completion of appropriate measures.

2. As a general rule, information for consumers shall be indicated on the surface of the product in such a way not to be easily erased. However, in case that indication on the surface of the product is impossible or undesirable, it can be indicated on the appropriate part such as product packaging, product guidebook and user's manual that consumers can recognize. However, the service information should be indicated inside and outside of the place of service operation. In case that indication inside and outside of the place of service operation is impossible or undesirable, it can be indicated on the appropriate part such as an agreement, letter of delivery, letter of guarantee, and PR materials that consumers can recognize.

3. In order to establish fair trade and to protect consumer, the applicant for eco-label and the holder of eco-label license shall observe the Act on the Fairness of

Indication and Advertisement with respect to the environmental aspects of the product.

4. For Various standards referred in the certification criteria by target product, the latest revised edition applies at the date of application, if not specified otherwise.

5. In applying the quality related criteria for each target product, if no standard is available that can be applied as the quality criteria, the president of Korea Environmental Industry & Technology Institute (KEITI) (hereafter referred to as "president of KEITI") may establish and operate the quality criteria for the product involved after review by a competent committee.