



# EKECO

GREEN TECHNOLOGIES

**WATER RECOVERY  
ECOLOGICAL SYSTEMS  
USING 100% PERMEABLE  
PAVEMENTS**



**EKECO**

## INTRODUCTION

### Advantages:

- ALL SURFACES ARE 100% PERMEABLE.
- AVOIDS PUDDLES.
- SIGNIFICANTLY REDUCES THE TEMPERATURE OF THE SURFACE.
- SIGNIFICANTLY REDUCES THE NOISE GENERATED BY VEHICULAR TRAFFIC.
- REDUCES OR ELIMINATES THE NEED FOR RAINWATER DRAINS.
- PREVENTS VEHICULAR HYDROPLANING.
- IS COMPATIBLE WITH MATERIALS USED FOR PAVEMENT TO ACHIEVE PERMEABLE SURFACES.
- NO "PUMPING" NEEDED SINCE SURFACE IS FLAT.
- ACQUIRES ITS CHARACTERISTICS OF RESISTANCE BETWEEN 24 AND 72 HOURS.
- CAN BE MADE IN SEVERAL COLORS AND WITH DIFFERENT KINDS OF STONE.
- PREPARATION OF BASES AND CONSTRUCTION SYSTEMS ARE CHEAPER THAN TRADITIONAL PAVEMENTS; I.E. THE COST PER INSTALLED M<sup>2</sup> IS CHEAPER THAN HYDRAULIC CONCRETE.
- IT CAN BE MIXED ON SITE OR BE PREMIXED AT THE PLANT.
- FRIENDLY TO THE ENVIRONMENT SINCE ITS FORMULA IS 100% WATER BASED.

This concrete, which is entirely permeable, has been developed by a group of Mexican scientists in an effort to solve the problem of the depletion of aquifers with the advantage that it can be used in common applications such as streets, squares, sidewalks, parking, etc.

This system allows rainwater to be recovered and filtered underground, helping to recharge the aquifers of the cities and providing other benefits that common pavements do not have, such as the elimination of pools and bumps.



The material, which is similar to common hydraulic concrete, is manufactured without fine materials such as sand, which is replaced by the ecological additive which reacts with the cement, causing a rapid increase in strength during the first few minutes after setting.

The result is a porous, very malleable, easy-to-use and strain mix with very high resistance to compression (more than 250 kg/cm<sup>2</sup>) and outstanding resistance to bending (up to 60 kg/cm<sup>2</sup>).

This special product is part of a developed system for rainfall control; using permeable pavements and through the implementation of construction systems specially designed for this purpose.

## AWARDS

- PREMIO NACIONAL DE ECOLOGÍA (Awarded at 10th Annual Fair) in 2000.
- RECONOCIMIENTO A LA EXCELENCIA ECOLÓGICA Y AMBIENTAL guaranteed by the Mexican Ecologic movement (July 2000).
- EI SOL DE ORO, 2003 Ecological Merit special award granted by the National Circle of Journalists, A. C.
- RECOGNITION FOR THE CONTRIBUTION TO THE PRESERVATION AND CARE OF THE ENVIROMENT granted by Círculo Teorema (2004).
- THE GREEN BUSINESS AWARD granted by the World Resources Institute (2004).



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**SPECIFICATIONS**

**TECHNICAL CHART PERMEABLE ADDITIVE  
EKECO®**

<b>ADDITIVE BASE:</b>	Different types of polymers.														
<b>CONCRETE AGGREGATES:</b>	Any source stone or metal, with clean heavy-duty and particle size from 6 to 18 mm														
<b>CHARACTERISTICS:</b>	<p>a) Resistance to compression 150 to 300 kg/cm<sup>2</sup></p> <p>b) Resistance to bending 25 to 55 kg/cm<sup>2</sup></p> <p>c) Weight volumetric 1,700 kg/m<sup>3</sup> (average)</p> <p>d) Permeability 100%</p>														
<b>FINISHED PRODUCT:</b>	Prepped on site or precast pieces (the cobblestones can be 6-10 cm thick). The mixture can be made on site or at the plant and it can be "stamped"														
<b>NOT AFFECTED BY:</b>	<table border="0"> <tr> <td>Aliphatic hydrocarbons</td> <td>Alcohols</td> </tr> <tr> <td>Aromatic hydrocarbons</td> <td>Vegetable oils</td> </tr> <tr> <td>Chlorinated solvents</td> <td>Mineral oils</td> </tr> <tr> <td>MIBK (methyl isobutyl ketone)</td> <td>UV rays</td> </tr> <tr> <td>MEK (methyl ethyl ketone))</td> <td>Salinity</td> </tr> <tr> <td>Ethyl acetate</td> <td>Alkali</td> </tr> <tr> <td>Isophorone</td> <td></td> </tr> </table>	Aliphatic hydrocarbons	Alcohols	Aromatic hydrocarbons	Vegetable oils	Chlorinated solvents	Mineral oils	MIBK (methyl isobutyl ketone)	UV rays	MEK (methyl ethyl ketone))	Salinity	Ethyl acetate	Alkali	Isophorone	
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**RESISTANCE IN DIFFERENT APPLICATIONS**



***Pedestrian Sidewalks***  
6cm, con fc = 200 kg/cm<sup>2</sup>

***Parking Lots***  
6cm, con fc = 250 kg/cm<sup>2</sup>

***Low traffic roads***  
8cm con fc = 250 kg/cm<sup>2</sup>

***High traffic roads***  
8 a 10cm con fc = 250 kg/cm<sup>2</sup>

***Cargo Areas***  
12 a 15cm con fc = 250 kg/cm<sup>2</sup>



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LAB TESTS BY ATEC

Report Date: 7-Nov-2009

<b>DATA OF ESPECIMEN</b>	Diameter (cm.)	7.60	7.60
	Section (cm <sup>2</sup> .)	45.36	45.36
	Casting Date	30.10.09	30.10.09
	Breakdown Date	06.11.09	06.11.09
	Days	7	7
	Breakdown load (kgs.)	10,400	10,000
	Resistance (k/cm <sup>2</sup> .)	229.3	220.4

Report Date: 14-Nov-2009

<b>DATA OF ESPECIMEN</b>	Diameter (cm.)	7.60	7.60
	Section (cm <sup>2</sup> .)	45.36	45.36
	Casting Date	30.10.09	30.10.09
	Breakdown Date	13.11.09	13.11.09
	Days	14	14
	Breakdown load (kgs.)	12,800	12,600
	Resistance (k/cm <sup>2</sup> .)	282.2	277.8

Report Date: 29-Nov-2009

<b>DATA OF ESPECIMEN</b>	Diameter (cm.)	7.60	7.60
	Section (cm <sup>2</sup> .)	45.36	45.36
	Casting Date	30.10.09	30.10.09
	Breakdown Date	27.11.09	27.11.09
	Days	28	28
	Breakdown load (kgs.)	13,400	13,200
	Resistance (k/cm <sup>2</sup> .)	295.4	291.0

## TECHNICAL ADVANTAGES

There are several reasons that make permeable floors and pavements better than hydraulic concrete:

- 1.- The absence of fine materials. Concrete without these materials transmits weight evenly unlike conventional concrete made in a homogeneous way. The weight is transmitted through contact points, causing the loads to be distributed randomly and over a larger surface.
- 2.- When the additive reacts with the cement, it creates a super powered concrete. In some lab tests when the additive was added to conventional hydraulic concrete, it achieved an incremental compression resistance of 100%.
- 3.- The pores in permeable concrete result in:
  - Greater elasticity.
  - Better reaction to changes in temperature, decreasing contraction and expansion.
  - Fresher and lighter pavements.
- 4.- The evenly spread workload transmission causes the loads on the surfaces to be distributed better than conventional concrete or asphalt. Coupled with this, a foundation designed with permeable floors is cheaper, more efficient and does not generate bumps.
- 5.- An additional benefit, caused by the evenly distributed loads, is that it is usually unnecessary to do additional work to improve the nature of the terrain.



## FORMULA "BLANK FACTOR"

A formula called "Blank Factor" was developed; it measures the compression resistance of permeable concrete floors using cylinders or hearts. It allows setting a comparison between the two types of concrete.

1. The "blank factor" is obtained by dividing the weight of the conventional concrete (approx. 2,400 kg/m<sup>3</sup>) by the specific permeable one (approx. 1,750 kg/cm<sup>3</sup>).
2. The result is multiplied by the "fc" obtained at simple break point.

Example: *Weight of the concrete conventional 2,400 kg/m<sup>3</sup> = 1.3714 (empty factor)*

*Weight of the concrete permeable 1,750 kg/m<sup>3</sup>*

*Laboratory test results "fc" = 252 kg/cm<sup>2</sup>*

*Permeable concrete fc = 252 \* 1.3714 = 345.60 kg/cm<sup>2</sup>*

This factor applies to both testing compression and tension.

*With this information we can figure the proper design for the different applications*



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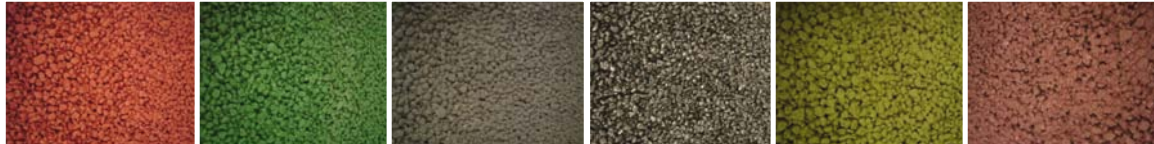


## AESTHETIC ADVANTAGES

This system allows an endless number of aesthetic advantages, while keeping its properties of compression, resistance, flexibility and durability.

### COLORS:

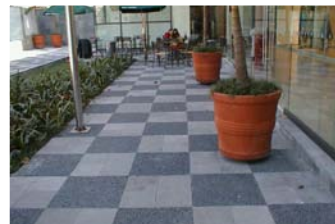
Gray, in its natural form, or can be dyed with any color.



### TEXTURES:

Can work with precast cobblestone pieces (the cobblestones can be 6-10 cm thick).

It also works with other textured aggregates such as: marble, silica, and almost any decorative stone.



IT CAN BE "STAMPED" AS WELL





## CONSTRUCTION SYSTEM

Permeable pavements are built following a procedure different to that of traditional floors; they are built with stone aggregates which must be included in the combined base.

Bases must be free of fine materials such as sand, since these would dissolve and be swept away by the water, which could cause breakage in the finish, possibly forming potholes.

As an example of a typical procedure we present the following example proposed for a high traffic city with a rainfall such as that of a street in Mexico City:

- Open box 40 cm deep.
- Manual compaction of the natural terrain.
- Open absorption wells of 1.0 x 1.0 x 1.0 m. One per each 100 m<sup>2</sup>.
- Filling of ballast (stones 4 "-8"). This filing is applied in wells and throughout the whole area.
- Compacting of the filling by mechanical means. The thickness of the filling after compacting will be 25 cm.
- Gravel filling of 3/4 ".
- Compacting of the filling by mechanical means. This padding thickness will be of 5 cm.

**1-Ecological permeable concrete garrison**

**2-Ecological Permeable concrete carpet**

**3-Gravel base ¾**

**4-Ballast Sub-Base**

**5-Natural terrain**

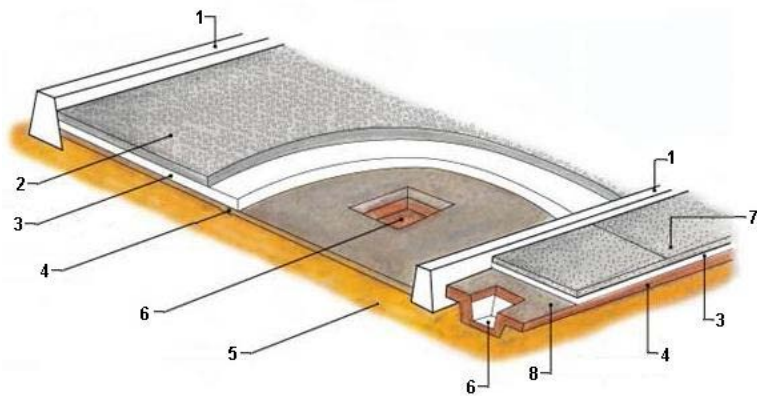
**6-Absorption well**

**7-Ecological permeable concrete sidewalk**

**8-Compacted terrain**

*Regarding wells referred to in the preceding example, we must note the following:*

- *Number of wells depends of the permeability of the floors .*
- *Form is not important. What matters is that the deeper they are, the better they will work.*
- *The purpose of the wells is to create higher hydrostatic loads.*





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COMPARATIVE CHARTS

COSTS

PAVEMENT TYPE	ASPHALT	HYDRAULIC CONCRETE	STAMPED CONCRETE	EKECO®
BASE & SUBBASE	100%	100%	100%	65%
DIGGING OR EXCAVATION	100%	100%	100%	60%
SOAKING IRRIGATION	100%	100%	100%	0%
IRRIGATION TIE OR ATTACH	100%	100%	100%	0%
FORMWORK	0%	100%	100%	100%
REINFORCEMENT BARS	0%	100%	100%	0%
LAYERING	47%	90%	100%	62%
IRRIGATION SEAL	100%	0%	0%	0%
MOLD	0%	0%	100%	0%
PLUVIAL DRAIN	100%	100%	100%	0%
TOTAL	58%	98%	100%	53%

BENEFITS

PAVEMENT TYPE	ASPHALT	HYDARULIC CONCRETE	STAMPED CONCRETE	EKECO®
EXECUTION TIME	60%	100%	115%	60%
USAGE TIME	1 DAY	15 DAYS	15 DAYS	1 DAY
LIFE TIME	2 YEARS	20 YEARS	20 YEARS	20 YEARS
RE APPLICATION	EACH YEAR	EACH 5 YEARS	EACH 3 YEARS	10 TO 20 YEARS
AESTHETIC	NO	NO	YES	YES
ACOUSTIC	YES	NO	YES	YES





**EKECO**

## SERVICE & WARRANTY

EKECO OFFERS A ONE YEAR WARRANTY IN FRACTURES AND DISSOLUTION, AS WELL AS HIDDEN WEAKNESSES.

THIS WARRANTY WILL BE ELABORATED IN DETAIL IN THE PROJECT CONTRACT.

OPTIONAL MAINTENANCE SERVICE AVAILABLE.



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95% of this file is made from recycled and biodegradable materials.



SISTECKOCRETO S. DE RL. DE CV.  
PLAZA DE LA REPÚBLICA 9  
COL. TABACALERA  
C.P. 06030  
MÉXICO D.F.

PHONE #:  
(52)(55) 57030838

Fax:  
(52)(55) 55664136

E-MAIL:  
[manuel@ekeco.org](mailto:manuel@ekeco.org)  
[eustaquio@ekeco.org](mailto:eustaquio@ekeco.org)

Visítenos en:  
[www.ekeco.org](http://www.ekeco.org)