
GUIDING PAVING BLOCK POROUS FOR BLIND PEOPLE

Muhammad ISRADI^{1*}
Acep, HIDAYAT²
Joewono, PRASETIJO³

Received: October 2019 | Accepted: February 2020 | Published: April 2020

Please cite this paper as: Isradi, M., et. al. (2020). Guiding paving block porous for blind people, *Holistica Journal of Business and Public Administration*, vol. 11, iss. 1, pp. 79-86

Abstract

Porous concrete is a simple form of lightweight concrete made by eliminating the use of fine aggregates (sand). That is a mixture of cement, water and coarse aggregate. Use of the guiding paving block porous for blind people is one of the efforts that will be made to overcome the inundation due to water spills from sufficiently high rainfall, providing comfort and safety for users so as not to slip easily due to slippery road surfaces, that will be used must have a measurable value of permeability and porosity to optimize the function of using porous concrete. Guiding paving block porous for blind people are very economical and have a great advantage in absorbing water so the surface is always dry, and can reduce accidents due to slippery roads. Another advantage is that the product is environmentally friendly with handmade, designed using a mixture of plastic bottle waste material can be made apart from the manufacturing process in various shapes and various colors. From the test results it has a strength of 10-15 mpa in the precast age of 28 days with a water absorption capability of up to 10L / m².

Keywords: porous; guiding paving; environmentally friendly; economical

1. Introduction

According to the data of SWI (Sustainable Waste Indonesia) year 2017, waste in Indonesia from year to year is increasing in number. There are approximately 1.3 million tonnes per year of existing plastic waste, if it is percentage is about 14% of the total global waste. With that problem, we are from academics wanting to help reduce existing plastic waste to be utilized as a beneficial innovation product.

The idea that we bring up is potentially for new and highly beneficial innovations in the world of infrastructure and construction development. With plastic waste, we make

¹ Faculty of Engineering, University Mercu Buana Jakarta, Indonesia, isradi@mercubuana.ac.id

² Faculty of Engineering, University Mercu Buana Jakarta, Indonesia, acep_hidayat@mercubuana.ac.id

³ Faculty of Engineering, University Tun Hussein onn Malaysia, Malaysia, joewono@uthm.edu.my

* Corresponding author

innovations as an additional material in making the paving block, where the product can be applied as a pedestrian, irrigation cover and others. Porous concrete is a mixture of cement, water and single-sized coarse aggregate, which is combined to produce porous structural materials. Porous concrete has a high pore volume, which results in low strength and is mild. Porous concrete has many different names such as concrete without fine aggregate (zero-fines concrete), non-sand concrete and concrete that can be translucent (pervious concrete) (Ginting, 2015).

Stagnant water at the pedestrian facilities is very uncomfortable, especially since this facility is specifically for blind people, this can cause the road surface to be slippery and can be easily slipping for the user.

Figure 1 Slippery and water-flooded pedestrian facilities



Source: rakyatkaltara.prokal.co, 2016

The use of porous concrete in the guiding paving block is one effort that will be done to avoid a puddle of water on the road surface due to rainfall, beside which the slightly rough surface will make the road surface is not slippery.

One of the advantages of porous concrete is that it is more economical, low shrinkage, low density, and easy to escape water (ASTM 1990). So that it can be used as an alternative design for paving block construction as a guiding for the blind. The guiding paving block is a facility that is installed along the road for conservation with the aim of directing or as a guide to the road so as to provide convenience and safety for users to achieve their travel goals.

This research aims to provide education and innovation about the benefit of guiding paving block and to assess the compressive strength, porosity value in porous concrete by using additional material from the plastic bottle waste LDPE so as to produce a product that environmentally friendly and sustainable, get the ideal proportion of mixtures,

knowing how strong the compressive strength and how large the water absorption for this porous concrete. Porous concrete composition can be seen in the table below.

Table 1 Common mix composition for the manufacture of porous concrete (Vernon 2007)

No	Composition Range	Typical Composition
Cement	270 - 415 kg/m ³	325 – 400 kg/m ³
Coarse Aggregate	1190 - 1600 kg/m ³	1400 - 1550 kg/m ³
Aggregate-cement ratio		4:1 to 4.5:1
Water- cement ratio (w/c)	0.2 - 0.45	0.27 - 0.30
Porosity content	15% - 35%	20% - 30%

Source: Vernon R. et.al, 2007

Porosity is a comparison between the volume of the air cavity to the total volume of the entire porous concrete test object (Neville 2010). The magnitude of the value of porosity produced by porous concrete will largely depend on the small size of the resulting air cavity. The larger the cavity or concrete pores, the value of porosity is also greater, which means that the porous concrete can drain the water rapidly (Ginting, 2015).

Permeability is the ease of liquids or gases to pass through concrete, while absorption is the influx of liquids into concrete through the capillary pipes contained in the concrete itself. Permeability is influenced by concrete porosity (Neville, 1995).

2. Methodology

Making guiding paving block molds by using the yellowing of residual eco-friendly materials in accordance with standard size for pedestrian.

Figure 2 Making paving block guiding molds



Source: Data in research, 2019

Making variations in the mixture of porous concrete proportions

Table 2 Mix design porous concrete

Material	Proportions (kg)
Cemen	1,35
Agregates/Screening	6,7
Water-cement Ratio (w/c)	0,36
Plastic	0,225

Source: Data in research, 2019

Figure 3 Preparation of test objects



Source: Data in research, 2019

The research is conducted from the preparation stage, the testing phase of the material, the mixing phase, test object manufacture stage and test object maintenance and the porous concrete testing phase (porosity testing, compressive strength testing and infiltration rate testing) as well as the analysis stage.

2.1. Research Implementation

The guiding texture tile has a purpose as a guide for blind people to be able to walk independently with a sense of security and comfort. Then preferably a guiding texture tile is installed as effectively as possible to be able to help blind people. The implementation is widely used in open spaces, sidewalks, university areas to public service office rooms.

Table 3 Potential and implementation of product

Sector	Target groups	Implementation
Environment	Living creatures	Reducing pollution caused by disruptive waste
Development	Government Project, Private Project	Providing solutions for construction materials that have an artistic value and advantages that do not exist in the market
Transportation	Public	If applied on a pedestrian then gives comfort to pedestrians when it rains because this product can absorb water

Source: Data in research, 2019

Figure 4 Use of guiding paving block for pedestrian



Source: Data in research, 2019

Figure 5 Function of guiding paving block



2.2. Material Collection

Material composition used in this research are:

- Portland-Pozzolan Cement
- Aggregate screening
- Water
- Admixture
- Low-Density Polyethylene (LDPE) Plastic

Research and testing conducted in the laboratory of Mercu Buana University Civil Engineering Study Program.

Figure 6 Test object samples



Source: Data in research, 2019

3. Results and Analysis

a. Coarse Agregates

The specification of aggregates are based on the test results in the following table:

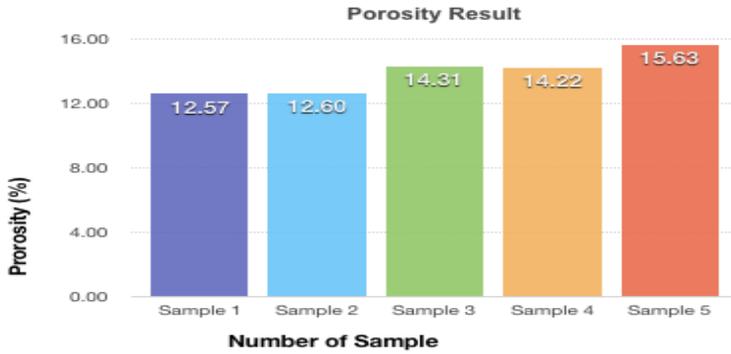
Table 4 Aggregates testing

TYPE OF TESTING	RESULT OF TESTING
Specific gravity (SSD)	2,57
Filter analysis	9,31
Absorption	2,4%
Fine Grain Modulus	8,29
Sludge Level	0%

Source: Data in research, 2019

b. Porosity

Figure 7 Porosity graph result



Source: Data in research, 2019

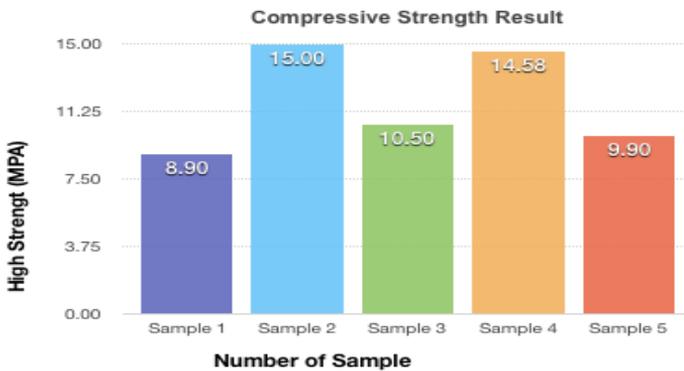
Figure 8 Porosity testing



Source: Data in research, 2019

c. Compressive Strenght

Figure 9 Bar chart of compressive strength result



4. Conclusion

From the results of research and testing obtained the following results:

1. LDPE plastic waste materials can be used as a porous concrete mixture and can be used as a substitute for aggregates and cement.
2. The percentage use of plastic waste in the porous concrete should not exceed 10% of the cement rate to get a compressive strength test result of concrete is 10-15 Mpa.
3. The ability of porosity or water absorption in this innovation product is about 10 L/m²/sec.

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