บันทึกข้อความ

ส่วนราชการ ภาควิชาวิศวกรรมโยธา คณะวิศวกรรมศาสตร์ มหาวิทยาลัยอุบลราชธานี โทร.3345
ที่ ศธ 0529.8.2/ 1085 วันที่ [illegible]
เรื่อง ขออนุมัติงบประมาณสนับสนุนการนำเสนอบทความวิชาการในการประชุมวิชาการระดับนานาชาติ

เรียน รองคณบดีฝ่ายวิจัย และบริการวิชาการ ผ่านหัวหน้าภาควิชาวิศวกรรมโยธา

ด้วยนายเกรียงศักดิ์ แก้วกุลชัย ตำแหน่งผู้ช่วยศาสตราจารย์ สังกัดภาควิชาวิศวกรรมโยธา คณะวิศวกรรมศาสตร์ มหาวิทยาลัยอุบลราชธานี ได้รับการตอบรับให้นำเสนอผลงานวิจัย/ผลงานทางวิชาการระดับนานาชาติ เรื่อง "ACF2012 & ACC8 The Joint Conferences The 5th Asian Concrete Federation International Concrete The 8th Annual Concrete Conference" ระหว่างวันที่ 22-26 ตุลาคม 2555 สถานที่ ณ โรงแรมอมารีออร์คิด พัทยา จังหวัดชลบุรี

งบประมาณในการเดินทางทั้งสิ้น 25,690 บาท(สองหมื่นห้าพันหกร้อยเก้าสิบบาทถ้วน) เพื่อเป็นการสร้างชื่อเสียงให้กับคณะวิศวกรรมศาสตร์ ภาควิชาวิศวกรรมโยธา จึงขออนุมัติงบสนับสนุนการนำเสนอผลงานวิชาการในการประชุมวิชาการระดับนานาชาติ สำหรับบุคคลดังกล่าว จำนวน 25,690 บาท (สองหมื่นห้าพันหกร้อยเก้าสิบบาทถ้วน) รายละเอียดดังนี้

1. ค่าลงทะเบียน	จำนวน 13,350 บาท
2. ค่าเบี้ยเลี้ยง	จำนวน 1,440 บาท
3. ค่าที่พัก	จำนวน 7,500 บาท
4. ค่าพาหนะ	จำนวน 3,400 บาท

จึงเรียนมาเพื่อโปรดพิจารณา

(ผู้ช่วยศาสตราจารย์ ดร.เกรียงศักดิ์ แก้วกุลชัย)
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ACF2012 Author Notification: Review Result of Paper No. ACF 2012-0198

ACF 2012 <thaiacf@gmail.com> Sun, Sep 30, 2012 at 11:21 PM
Reply-To: ACF 2012 <thaiacf@gmail.com>
To: griengsak@gmail.com

Dear Griengsak Kaewkulchai

The committee of the 5th international conference of Asian Concrete Federation (ACF2012) has reviewed your submitted manuscript. We would like to inform you that your submitted manuscript as the below information was accepted for ACF2012 after revision as in the attached full-paper evaluation form.

Paper ID: ACF 2012-0198
Title: Fundamental Study on Wearing and Abrasive Resistance of Porous Concrete

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We are looking forward to welcome you in the 5th international conference of Asian Concrete Federation (ACF2012) in Pattaya, Chonburi, Thailand.

Sincerely yours,

Local Organizing Committee the 5th International Conference of Asian Concrete Federation October 24-26, 2012
Pattaya, Chonburi, Thailand

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Fundamental Study on Wearing and Abrasion Resistance of Porous Concrete

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ABSTRACT: This article presents the abrasion resistance of porous concrete after water curing at 7 and 28 days with different aggregate sizes of 1/2", 3/8", and retained on sieve # 4 (4.75 mm) at designed void ratio of 20, 25, and 30% respectively. The testing results revealed that the abrasion loss percentage and cracking percentage were increased as an increasing in void ratio and aggregate size. The porous concrete made with aggregate retained on sieve # 4 with void ratio of 25% provided the best abrasion resistance performance with the smallest abrasion loss percentage of 0.38% and cracking percentage of 1.1% at 28 days curing.

1. INTRODUCTION

Porous or pervious concrete is the special concrete containing continuous void inside which gas or liquid can be penetrated freely. Porous concrete or no-fine concrete usually contain no fine aggregate in the mix proportion, but for some extent, fine aggregate can be used in such a few content in order to reduce the expansion [1]. Porous concrete has been developed and used as environmentally friendly concrete. The main application is for drainage, pavement for pedestrian or lightweight vehicle [2].

Durability of porous concrete is also one property that should be concerned, especially those subjected to wearing and abrasion condition on top surface such as porous concrete as irrigation cannel, porous concrete sidewalk and pavement. Porous concrete, therefore, not only function as bearing materials for vehicle, but also transfer load from surface layer to sub-base layer properly and should take function as resistant materials for wearing and abrasion resistance material. In accordance with TIS 566 defines the wearing and abrasion resistance of coarse aggregate for wearing and abrasion structure at 40%. [3]

This fundamental study is, therefore, focus on the ability of porous concrete at various void ratio and aggregate size to the wearing and abrasion resistance by applying the instrument in accordance with TIS.566

2. MATERIALS

Ordinary Portland cement type I was used in this investigation with superplasticizer (SP) of 1% of cement weight. Four single size aggregate of 3/4, 1/2, 3/8 inch and those retained on sieve no.4 were used in this experiment.

3. TESTING PROCEDURE

3.1 Coefficient of permeability (k)

Figure 1 shows the apparatus for coefficient of permeability measurement in accordance with Darcy's law. The cross sectional areas (A) with height (H) of cylinder samples were measured. Samples were then wrapped with inpermeable materials to protect some error due to leakage of water along the side of samples during test. Stop watch was used to monitor time used (t_1 to t_2) for collecting overflow water (Q) at steady flow state. The equation for calculating the coefficient of permeability (k) is shown as equation (1).

Coefficient of permeability (k) [1]

$$k\ (cm/s) = H/h*[Q/(A*(t_2-t_1))] \quad (1)$$

3.2 Compressive strength of porous concrete

The compressive test of porous concrete were tested for 3 void ratios of porous concrete i.e. 20%, 25% and 30% respectively for those single size aggregates of 3/4, 1/2, 3/8 inch and those retained on sieve #4, respectively. The sample size used for this whole experiment is ø 10x20 cm^3. The samples were casted for 3 samples for each aggregate size and void ratio. The samples were then tested for compression at the curing age of 7, 14, 28 and 90 days. All of coarse aggregate that used in this investigation was in saturated surface dry (SSD) condition.

Ordinary Portland cement, chemical admixture and tap water including superplaticizer (SP) were prepared according to the mix proportion given in table 1. Tap water and chemical admixture should be noted to prepare prior the mixing approximately 5 minutes.

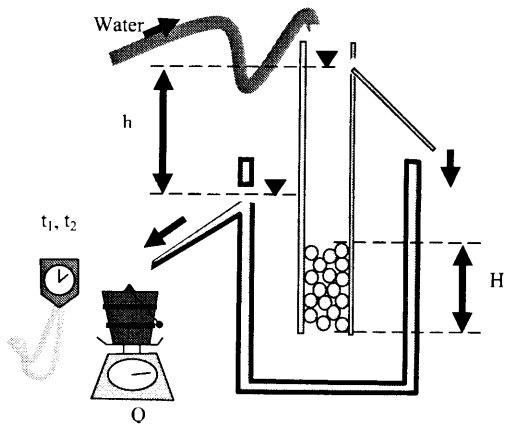


Figure 1 Apparatus for coefficient of permeability measurement

Table 1 Mix proportion of porous concrete

Mix proportion of porous concrete			
Void ratio (%)	P/A (paste/aggregate volume ratio)	w/c (%)	SP (%)
20	0.372	27.5	1
25	0.327	29.5	1
30	0.235	30.2	1

To mix the porous concrete, w/c of at 27.5, 29.5 and 30.2 % were used for those void ratio of 20, 25 and 30%, respectively [4]. Step of mixing procedure, start with cement paste mixing in the tilt mixer size 30 litres, this to make sure that cement, water and superplasticizer can be mixed the most homogeneously. In order to mix cement paste, the frequency of mixer was set at 50 rpm for initial 30 seconds, Afterward the frequency was then adjusted to be 200 rpm for another 270 seconds. Coarse aggregate in saturated surface dry (SSD) condition was then added in the final stage and mixed at 50 rpm for 30 seconds and at 200 rpm for another 90 seconds.

3.3 Wearing and abrasion resistance of porous concrete

Porous concrete of those aggregate sizes of 1/2, 3/8 inch and those retained on sieve #4 with void ratio of 20, 25 and 30% were chosen for wearing and abrasion resistance test. The casting porous concrete block with the size of 20x40x5 cm^3 totally 8 plates per 1 time of abrasion test. Every sample was soaked in water until the testing age of 7 and 28 days. Samples were then set up inside Los Angeles abrasion machine as shown in the Figure 2, with the speed of 30-33 rpm for 500 rounds. Porous concrete made with aggregate size of 1/2 and 3/8 inch was set the steel ball at 11 pieces, while those made with aggregate retained on sieve #4 used the steel ball of 8 balls in accordance with TIS 566.

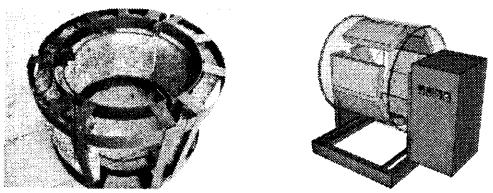


Figure 2 Application of Los Angeles abrasion machine for abrasion resistance test

In order to investigate the percentage of loss and percentage of cracking of porous concrete block, all porous concrete fragments (that was taken out from Los Angeles machine) were examined with respect to the total weight of porous concrete block and judged as "percentage of cracking". The same amount of fragments were then sieved by using mesh #12, those of smaller than mesh #12 were classified and calculated with respect to total weight of porous concrete block and named "percentage of loss".

4. RESULTS

4.1 Coefficient of permeability (k)

It is general accepted that coefficient of permeability (k) of porous concrete depends on void ratio of porous concrete as shown in Figure 3. Porous concrete with void ratio of 30% provided coefficient of permeability more than those void of 25 and 20%, respectively. Porous concrete with larger aggregate size tends to increase coefficient of permeability.

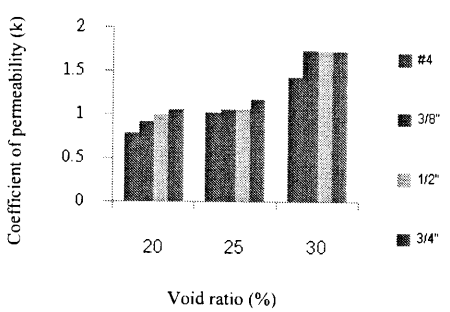
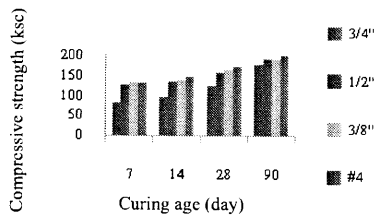


Figure 3 Coefficient of permeability (k) of porous concrete at different void ratio and aggregate size

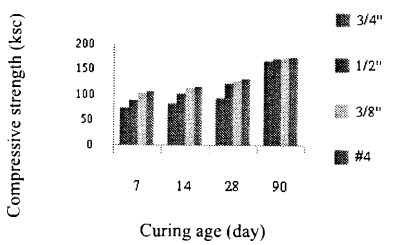
4.2 Compressive strength of porous concrete

As the obtained results, compressive strength of porous concrete at the lowest void ratio provided the highest compressive strength. This mainly owing to porous concrete at 20% void ratio used the lowest w/c at 27.5% and those of 25 and 30% void ratio used the w/c of 29.5 and 30.2%, respectively. It should be advantage to note that paste/aggregate volume ratio of those porous concrete with 20, 25 and 30% void ratio were decreased from 0.372 to 0.327 and to 0.235, respectively, this also influencing to the lower in compressive strength.

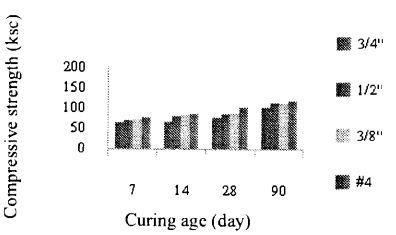
Compressive strength of porous concrete increases with an increasing in curing age, this as of hydration reaction development as same as those conventional concrete. Figure 4 shows the hydration reaction development of porous concrete up to 90 days curing.



a) Void ratio 20%



b) Void ratio 25%



c) Void ratio 30%

Figure 4 Strength development of porous concrete with curing age

In the view point of aggregate size, smaller size porous concrete tends to provide the higher compressive strength. This tendency is relative clear in every testing age. This is due to the higher surface area of small size aggregate, higher in contacted area of cement paste as compared to those of large size aggregate at same amount of cement paste and void ratio. The throughout distribution of contacted area of cement paste contributed the bearing stress from compression test. On the contrary, those of large size aggregate with less contacted area of cement paste, concentration of stress occurred during the compression test and induced the crack formation at the final stage of testing [5]. Furthermore, the use of smaller size aggregate for producing porous concrete provides such better compacted appearance in comparison with those of larger size aggregate and provides higher strength eventually.

4.3 Percentage of loss and percentage of cracking of porous concrete

A study of wearing and abrasion resistance of 20, 25 and 30% void ratio porous concrete, the percentage of loss and percentage of cracking were reported as shown in Figure 5 and 6. The results

revealed that the percentage of loss and percentage of cracking were increased as an increasing in void ratio and aggregate size. This mainly owing to the higher void ratio, the lower in paste/aggregate (P/A) could be obtained (See Table 1) causes lower the wearing and abrasion resistance of porous concrete. However, according to the curing age of porous concrete, it was obviously showed that longer period in water curing, higher abrasion resistance could be obtained. For example, 28 days curing of porous concrete block provided the significant reduction in percentage of loss and percentage of cracking than those of 7 days curing.

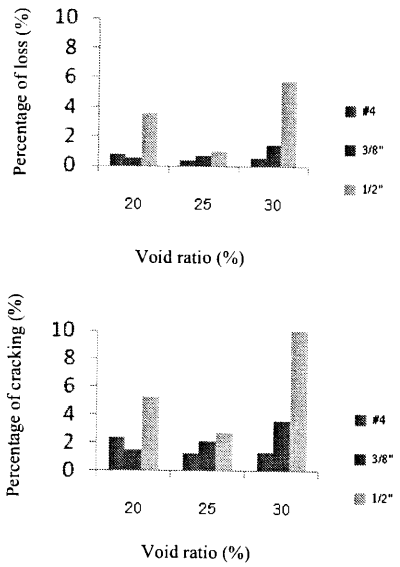


Figure 5 Percentage of loss and percentage of cracking of porous concrete at different void ratio at 7 days curing

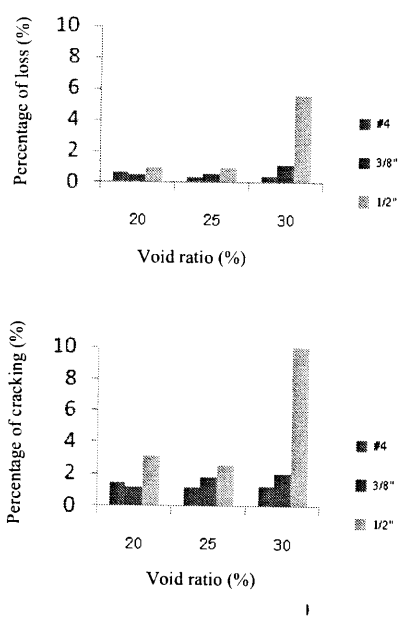


Figure 6 Percentage of loss and percentage of cracking of porous concrete at different void ratio at 28 days curing

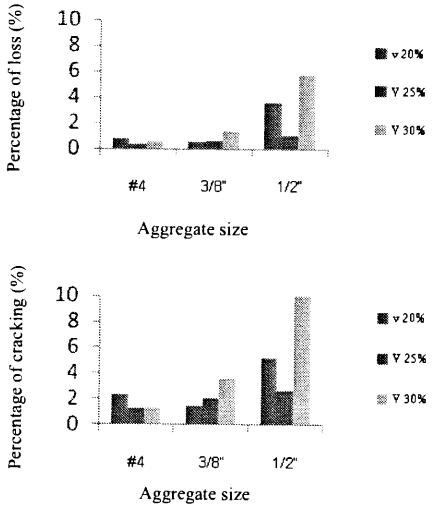


Figure 7 Percentage of loss and percentage of cracking of porous concrete at different aggregate size at 7 days curing

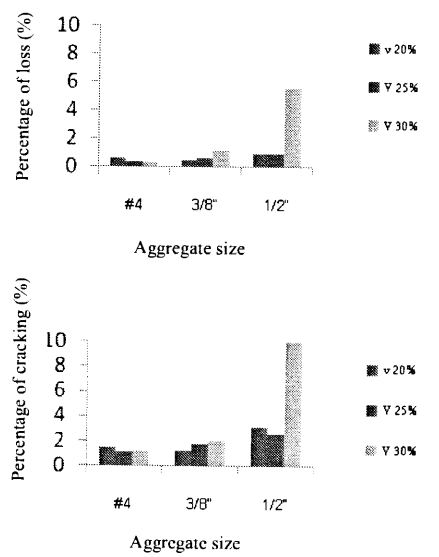
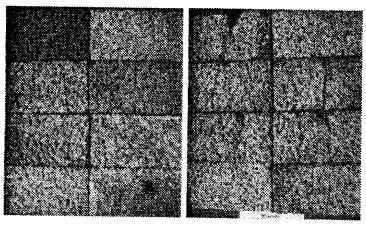


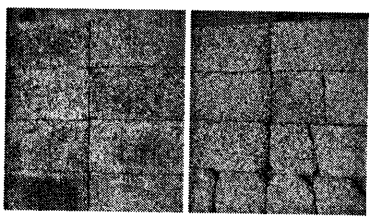
Figure 8 Percentage of loss and percentage of cracking of porous concrete at different aggregate size at 28 days curing

Figure 7 and 8 showed the percentage of loss and percentage of cracking of porous concrete at different aggregate size at 7 and 28 days curing, respectively and figure 9-11 showed the texture of 25 % void ratio porous concrete block using aggregate size of 1/2, 3/8 inch and those retained on sieve #4 before and after Los Angeles test, respectively.



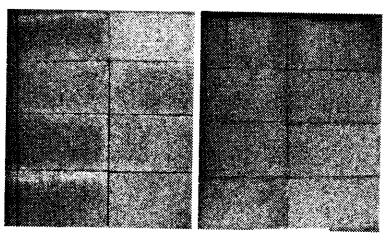
(a) Before (b) After

Figure 9 Porous concrete block with 25% void ratio using aggregate size of 1/2 inch before and after Los Angeles test



(a) Before (b) After

Figure 10 Porous concrete block with 25% void ratio using aggregate size of 3/8 inch before and after Los Angeles test



(a) Before (b) After

Figure 11 Porous concrete block with 25% void ratio using aggregate size of those retained on sieve #4 before and after Los Angeles test

5. CONCLUSION

From the obtained results of coefficient of permeability, compressive strength and wearing and abrasion resistance of porous concrete, significant conclusion can be drawn as the followings:

Coefficient of permeability (k) of porous concrete increased with an increasing in void ratio.

Compressive strength of porous concrete increased as an increasing in curing age and a decreasing in void ratio. The smaller size of aggregate provided higher compressive strength.

Percentage of loss and percentage of cracking of porous concrete tends to increase as an increasing in void ratio. Regards to the aggregate size, smaller size of aggregate tends to decrease percentage of loss and percentage of cracking of porous concrete as compared to larger size aggregate. From this investigation, those retained on sieve #4 at void ratio of 25% revealed the smallest percentage of loss and percentage of cracking.

It should be advantage to note that porous concrete can effectively applied as environmentally friendly concrete materials for light to medium vehicle pavement, walkway for pedestrian or even irrigation canal. From this study indicates the good wearing and abrasion resistance of porous concrete with relative low percentage of loss and percentage of cracking.

6. ACKNOWLEDGEMENT

Authors would like to acknowledge Kasetsart University, CSC campus and Sakon Nakhon Rajabhat University for providing funds, essential facilities and laboratory for this research.

7. REFERENCE

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The 5th ACF International Conference
The 8th ACC Conference

Introduction

Asian Concrete Federation (ACF) was officially established since 2004 along with the recognition of the growth of the Asian Region. It is certain that a tremendous amount of research and practical information as well as new technologies are now spreading within this region. The ACF International Conferences were held every 2 years since 2004 in various countries of Asia and have been well functioned as the venue for information exchange as well as for many other activities such as technical meetings of related committees and social meetings of participants, etc.. With increasing numbers of presented papers and participants, the ACF international conference has become well known among researchers, academicians, professionals and practitioners in the field of concrete and has become one of the major conferences in this field in Asia and other regions.

In 2012, the 5th ACF International Conference is scheduled to be held and attached with the 8th ACC in Pattaya City, Chonburi, Thailand on 22 to 26 October 2012 hosted by the Thailand Concrete Association (TCA) together with Faculty of Engineering, Chulalongkorn University (80th anniversary celebration) and the Sirindhorn International Institute of Technology (SIIT), Thammasat University (20th anniversary celebration), and Burapa University (ACC8 host).

To unite the expanding construction industry of Asia with the environmentalism-conscious design and sustainability, we would like to extend our invitation to all of you to participate in this meaningful conference and to welcome all of you back to the land of smile, Thailand, where ACF was firstly officially established.

For more information

Regarding to any announcements as well as conference venues, details schedule, paper templates, submission procedure, registration method, and other related information to this conference, please visit our website or contact the conference secretariat.

Objectives

The conference seeks to be a venue for the technical information exchange in the filed of concrete as well as for many other activities such as technical meetings of related committees and social meetings of participants, etc.. Main theme of the conference is "Novel Concrete Technology for Environmentalism-conscious Design" and also focuses on the following topics:

- Environmentalism-conscious design of RC structures
- Cement, aggregates, additives and admixtures for Green Concrete
- Advanced concrete technologies for different environmental conditions
- Special concrete such as High performance concrete, Self-compacting Concrete, High-strength concrete, High-durability concrete, Lightweight Concrete, Heavyweight concrete, etc.
- Durability and service life design of concrete structures
- Seismic design and evaluation of concrete structures
- Development of new construction techniques
- Repair, retrofit and maintenance technologies for concrete structures
- Structure maintenance planning and life cycle cost
- Mega Projects and International Cooperation
- Codes and standards
- Etc.

Importance date

Last date of Abstract Submission:	January 31, 2012
Notification of Abstract Acceptance:	February 15, 2012
Deadline for Full Paper Submission:	June 1, 2012
Notification of Full Paper Acceptance:	August 31, 2012
Deadline for Early Bird Registration:	September 15, 2012
Conference Dates:	October 22-26, 2012

Official language

The official language are Thai and English.

Submission procedure

Authors are invited to register and submit abstracts online through the conference website http://acc.thaitca.or.th/pv1/ by January 31, 2012.

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