Kharuddin, F.S.\textsuperscript{a}, Wan Azahar, W.N.A.\textsuperscript{a}, Ramadhansyah, P.J.\textsuperscript{b}, Hainin, M.R.\textsuperscript{b}, Mohamed Jaafar, Z.F.\textsuperscript{c}

Performance of asphaltic concrete modified with recycled crushed bricks

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\textsuperscript{a} Department of Civil Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, 50728, Malaysia
\textsuperscript{b} Department of Civil Engineering, College of Engineering, Universiti Malaysia Pahang, Gambang, Pahang, 26300, Malaysia
\textsuperscript{c} School of Civil Engineering, Universiti Sains Malaysia, Engineering Campus, Nibong Tebal, Pulau Pinang, 14300, Malaysia

Abstract

The pavement industry relies greatly on this conventional material in constructing the road. However, the shortage of the mined material has led to the need of finding alternative with local materials to partially substitute the asphalt components. The conventional pavement industry also contributed to thermal and greenhouse emission resulting from the mining activities. In addition, throughout the year, the amount of construction and demolition (C&D) waste generated from civil construction activities particularly in Malaysia is increasing in alarming rate. Recycling the C&D waste specifically in bricks is viewed as reasonable potential as aggregate modifier in the impulse for greener and sustainable asphalt pavement production. In this paper, recycled crushed bricks (RCB) is introduced to bituminous wearing course as partial replacement for coarse aggregates. The coarse aggregate is partially replaced with RCB in proportions of 0%, 10%, 20%, 30% and 40% by weight. This study summarizes the results of laboratory evaluation of Los Angeles Abrasion Value, Aggregate Crushing Value and Marshall Test. Results show that asphaltic concrete modified with 10% RCB has the lowest abrasion and crushing values which were 20.2% and 30% respectively. Similarly, the mix has the highest Marshall Stability and lowest flow which 15.61 kN and 3.37 mm respectively. Thus, partial replacement of coarse aggregates with 10% RCB in bituminous mix is suitable to be used in wearing course and can be used as alternative material in bituminous mix to reduce the dependency on natural aggregates and utilize the C&D waste efficiently. © Published under licence by IOP Publishing Ltd.

Index Keywords

Abrasion, Aggregates, Asphalt concrete, Brick, Construction industry, Crushing, Earthquake engineering, Engineering geology, Erosion, Geophysics, Recycling; Alternative materials, Civil constructions, Construction and demolition, Conventional materials, Greenhouse emissions, Laboratory evaluation, Los Angeles abrasion, Partial replacement; Concretes

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References

- Victoria, WorkSafe
(2006) Recycling construction and demolition material, guidance on complying with the occupational health and safety (asbestos) regulations 2003,

- Haji, Kabit Ahmad
  (2010) Strategic Solid Waste Management: The Malaysian Approach, Keynote Address from Secretary General of Ministry of Housing and Local Government Malaysia, at the Second Meeting of the Regional 3R forum 4th October 2010 at Sunway Hotel Resort & Spa, (Kuala Lumpur)

- Eusoff, M.A., Ibrahim, M., Islam, R.
  The construction and demolition waste in Klang (Malaysia)

- Mihai, F. C.
  Construction and demolition waste in Romania: The route from illegal dumping to building materials

- Argenio, A. L.

- Rahman, I.A., Hamdan, H., Zaidi, A.M.A.
  (2009) Modern applied science Assessment of Recycled concrete aggregate 3,

- Aatheeasan, T. B. M. W. J. A., Arulrajah, A., Bo, M. W., Vuong, B., Wilson, J.
  (2010) Crushed brick blends with crushed rock for pavement systems proceedings of the institution of civil engineers-waste and resource management,
  163 29-35 February Thomas Telford Ltd

- Pandey, B., Agrawal, M., Singh, S.
  Assessment of air pollution around coal mining area: emphasizing on spatial distributions, seasonal variations and heavy metals, using cluster and principal component analysis

- Zoorob, S. E., Suparma, L. B.
  Laboratory design and investigation of the properties of continuously graded Asphaltic concrete containing recycled plastics aggregate replacement (Plastiphalt)

- Poon, C. S., Chan, D.
  (2006) Feasible use of recycled concrete aggregates and crushed clay brick as unbound road sub-base Construction

- Poon, C. S., Yu, A. T., Jaillon, L.  
  **Reducing building waste at construction sites in Hong Kong**  

- Sarkar, D., Pal, M., Sarkar, A. K., Mishra, U.  
  (2016) *Evaluation of the properties of bituminous concrete prepared from brick-stone mix aggregate Advances in Materials Science and Engineering* 2016,

- Rahman, I.A., Hamdan, H., Zaidi, A.M.A.  
  (2009) *Modern applied science. Assessment of recycled concrete aggregate* 3,

- Hainin, M. R., Ismail, C. R, Yaacob, H.  

- Haque, A.M.  
  (1976) *Dhaka: Civil Engineering Department, BUET) Behavior of Brick Aggregate Asphaltic Concrete for Road Pavement,*  
  (M.Sc. Engineering Thesis)

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