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Masjuki, S.A.^a, Gheni, N.I.M.^a, Nadimalla, A.^a, Saad, S.A.^a, Husain, N.M.^a, Deraman, S.N.C.^a, Ibrahim, S.L.^a, Basri, N.K.^a, Norhisham, S.^b

The Relation Between Destructive and Non-destructive Test of Concrete Incorporated with Dredged Sediment as Fine Aggregate Replacement

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^a Department of Civil Engineering, International Islamic University Malaysia (IIUM), Kuala Lumpur, Malaysia

^b Department of Civil Engineering, Universiti Tenaga Nasional (UNITEN), Selangor, Malaysia

Abstract

Accumulation of dredged sediment due to uncontrolled land clearing, construction works, agricultural activities, river control works, soil mining and dam construction at the upstream has led to an environmental issue in Malaysia. Sungai Pusu and its tributaries which is located at Gombak, Selangor Darul Ehsan, has been identified as the affected river that transports the excessive sediment to the stream. Part of Sungai Pusu area is situated within the International Islamic University Malaysia (IIUM) boundary. Due to the construction work at the upstream of the river have contributed to the accumulation of dredged sediments resulting in the disturbance of the river ecosystem. This study has been conducted to analyze the properties of dredged sediment as a replacement for fine aggregate in concrete. The dredged sediment that was used was taken near IIUM Gombak. Basically, the quality and strength of the dredged sediments were investigated using destructive and non-destructive test analysis. For destructive test, compressive strength test was carried out, meanwhile for non-destructive test, we conducted rebound hammer and ultrasonic pulse velocity test followed by the analysis. The compression test reveals that all of the samples have achieved strength greater than 30 MPa which is the minimum strength specified in this test. At the same time, the rebound hammer test result showed that the estimated compressive strength for all samples has also achieved the specified strength with the difference of all estimated and actual compressive strength which is less than 10%. The result followed by UPV test yields a fast pulse velocity indicating a good quality concrete for the samples. All of the results showed that the replacement of 25% of dredged sediment produced the best result on the 28th day of curing compared to other mixture. Overall, all of the tests that were done on this project show that the fine aggregate can potentially be replaced by the dredged sediment in the production of the concrete. © The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd 2024.

Author Keywords

Destructive test; Dredged sediment; Fine aggregate replacement; Non-destructive test

Index Keywords

Concrete aggregates, Dredging, Ecosystems, Mining, Nondestructive examination, Quality control, River control, Sediments, Soil testing, Ultrasonic testing; Agricultural activities, Construction works, Destructive tests, Dredged sediments, Fine aggregate replacement, Fine aggregates, Land clearing, Malaysia, Nondestructive tests, Rebound hammers; Compressive strength

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Correspondence Address

Masjuki S.A.; Department of Civil Engineering, Malaysia; email: aliyyah@iiium.edu.my

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