ANALISIS PENGARUH CAMPURAN LIMBAH PLASTIK LDPE DAN SEDIMEN BANJIR HIDROMETEOROLOGI TERHADAP MUTU PAVING BLOCK

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ABSTRAK

Permasalahan sampah plastik yang belum terkelola dan endapan sedimen yang tertinggal setelah banjir hidrometeorologi merupakan dua persoalan lingkungan yang terus berulang di Aceh. Penelitian ini bertujuan untuk mengetahui karakteristik fisik sedimen pasca banjir hidrometeorologi Sungai Peusangan, menganalisis pengaruh variasi komposisi limbah plastik Low-Density Polyethylene (LDPE) dan sedimen terhadap karakteristik mekanik paving block, serta menganalisis pengaruh kondisi termal terhadap kuat tekannya. Penelitian dilakukan secara eksperimental di laboratorium dengan lima variasi komposisi LDPE:sedimen, yaitu 30:70, 40:60, 50:50, 60:40, dan 70:30, menggunakan benda uji kubus berukuran 5 cm × 5 cm × 5 cm. Sedimen diambil dari bagian tepi Sungai Peusangan dan diuji gradasinya berdasarkan SNI 03-1968-1990. Paving block diuji kepadatan, daya serap air setelah perendaman 24 jam, dan kuat tekan pada umur 7, 14, dan 28 hari pada suhu ruang serta pada suhu 35°C melalui pengondisian oven selama 4–5 jam, yang ditetapkan berdasarkan suhu maksimum 34,9°C yang tercatat di Lhokseumawe. Hasil penelitian menunjukkan bahwa sedimen memiliki modulus kehalusan 2,53 dan tergolong pasir bergradasi baik (SW) dengan Cu 7,07 dan Cc 1,13. Peningkatan kadar LDPE menurunkan kepadatan dari 1,76 menjadi 1,08 g/cm³ dan daya serap air dari 3,47% menjadi 0,91%, sedangkan pengaruhnya terhadap kuat tekan bersifat tidak linear. Komposisi optimum diperoleh pada rasio 40:60 dengan kuat tekan 16,46 MPa (Mutu C) dan daya serap air 2,56% (memenuhi batas Mutu A) pada umur 28 hari menurut SNI 03-0691-1996. Pada suhu 35°C, kuat tekan seluruh variasi menurun sekitar 10%, dengan komposisi 40:60 tetap tertinggi sebesar 14,82 MPa (Mutu C). Paving block berbahan LDPE dan sedimen pasca banjir berpotensi digunakan untuk area pejalan kaki dan taman, namun kinerjanya masih perlu diverifikasi pada unit paving block berukuran standar.

Kata kunci: Kuat Tekan, LDPE, Paving Block, Sedimen Pasca Banjir, Suhu

UTILIZATION OF LDPE PLASTIC WASTE AND HYDROMETEOROLOGICAL FLOOD SEDIMENT AS SUSTAINABLE MATERIALS FOR ECO-FRIENDLY PAVING BLOCKS

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ABSTRACT

Unmanaged plastic waste and the sediment deposits left behind after hydrometeorological floods are two recurring environmental problems in Aceh. This study aims to determine the physical characteristics of post-flood sediment from the Peusangan River, to analyze the effect of varying compositions of Low-Density Polyethylene (LDPE) plastic waste and sediment on the mechanical characteristics of paving blocks, and to analyze the effect of thermal conditions on their compressive strength. An experimental laboratory study was conducted with five LDPE:sediment compositions, namely 30:70, 40:60, 50:50, 60:40, and 70:30, using 5 cm × 5 cm × 5 cm cube specimens. The sediment was collected from the banks of the Peusangan River, and its gradation was tested in accordance with SNI 03-1968-1990. The paving blocks were tested for density, water absorption after 24 hours of immersion, and compressive strength at 7, 14, and 28 days, both at room temperature and at 35°C through 4–5 hours of oven conditioning, a temperature set based on the maximum of 34.9°C recorded in Lhokseumawe. The results show that the sediment has a fineness modulus of 2.53 and is classified as well-graded sand (SW), with a Cu of 7.07 and a Cc of 1.13. Increasing the LDPE content reduced the density from 1.76 to 1.08 g/cm³ and the water absorption from 3.47% to 0.91%, whereas its effect on compressive strength was non-linear. The optimum composition was obtained at a 40:60 ratio, with a compressive strength of 16.46 MPa (Grade C) and a water absorption of 2.56% (meeting the Grade A limit) at 28 days according to SNI 03-0691-1996. At 35°C, the compressive strength of all variations decreased by approximately 10%, with the 40:60 composition remaining the highest at 14.82 MPa (Grade C). Paving blocks made from LDPE and post-flood sediment have potential for use in pedestrian areas and gardens, although their performance still needs to be verified on standard-size paving units.

Keywords: Compressive Strength, LDPE, Paving Block, Post-Flood Sediment, Temperature