

INTISARI

Mutu material dan kepadatan lapis fondasi menjadi permasalahan umum dalam keawetan perkerasan. Oleh karena itu diperlukan usaha agar memenuhi standar spesifikasi material dan kepadatan lapisan perkerasan dapat tercapai. Geopolimer dapat menjadi alternatif bahan pengikat yang digunakan dalam konstruksi lapis pekerasan. Kegiatan konstruksi juga dapat memiliki dampak pada lingkungan diantaranya akibat limpasan air hujan. Penelitian ini bermaksud untuk melakukan perancangan lapis fondasi dengan agregat kelas A yang dicampur bahan geopolimer berbasis fly ash. Selain itu melihat pengaruhnya terhadap nilai modulus elastisitas lapis perkerasan serta pengaruhnya terhadap kualitas air.

Metode-metode pengujian merujuk pada Standar Nasional Indonesia. Pengujian yang dilakukan terkait dengan karakteristik bahan, kepadatan campuran lapis fondasi agregat, CBR rendaman, modulus elastisitas, dan kualitas air sisa rendaman benda uji CBR. Variasi bahan lapis fondasi pada penelitian ini adalah agregat kelas A yang dicampur dengan beberapa variasi bahan reagen alkali, yakni variasi tanpa bahan reagen alkali, 3 mol NaOH, 6 mol NaOH, 9 mol NaOH, dan 12 mol NaOH.

Nilai kepadatan kering maksimum pada metode kepadatan ringan dan kepadatan berat tidak didapatkan suatu pola tertentu, namun nilainya antara 2,10 sd 2,12 gr/cm³ pada kepadatan ringan dan 2,23 sd 2,25 gr/cm³ pada kepadatan berat. Peningkatan konsentrasi larutan reagen alkali pada kedua metode kepadatan membuat kadar air optimum semakin berkurang sebaliknya pada nilai CBR rendaman semakin bertambah. Pengujian pengaruh terhadap modulus hanya dilakukan terhadap campuran yang cukup stabil, sehingga dapat dilakukan pengukuran. Modulus elastisitas mengalami peningkatan dengan kondisi curing tanpa perendaman. Pengaruh reagen alkali terhadap baku mutu air meningkatkan nilai keasaman (pH), sedangkan parameter lain seperti *Biochemical Oxygen Demand (BOD)*, *Chemical Oxygen Demand (COD)*, dan *Total Suspended Solid (TSS)* masih memenuhi baku mutu. Penelitian ini dapat menjadi referensi penggunaan geopolimer berbasis fly ash pada lapisan fondasi agregat kelas A dengan metode kepadatan ringan dan berat.

Kata kunci: lapis fondasi, geopolimer, CBR, modulus elastisitas, kualitas air

ABSTRACT

The material's quality and the foundation layer's density are common problems in the durability of the pavement. Therefore, efforts are needed to meet the standard material specifications, and the density of the pavement layer can be achieved. Geopolymers can be an alternative to binders used in pavement layer construction. Construction activities can also impact the environment, including rainwater runoff. This study intends to design a foundation layer with class A aggregates mixed with fly ash-based geopolymers materials. In addition, the effect on the modulus of elasticity of the pavement and water quality was examined.

The testing methods refer to the Indonesian National Standard. The tests carried out are related to the characteristics of the material, the density of the aggregate foundation layer mixture, the CBR-soaked, the modulus of elasticity, and the quality of the residual water of the CBR-soaked test object. The variations in the foundation layer material in this study are class A aggregates mixed with several variations of alkaline reagent materials, namely variations without alkaline reagent materials, 3 moles of NaOH, 6 moles of NaOH, 9 moles of NaOH, and 12 moles of NaOH.

The maximum dry density values in the light and heavy-density methods did not have a specific pattern. However, the values were between 2.10 to 2.12 gr/cm³ at the light density method and 2.23 to 2.25 gr/cm³ at the heavy density method. The increased concentration of alkaline reagent solutions in both density methods decreases the optimum water content further. On the contrary, the CBR values are increasing. Influence testing on the modulus is carried out only against sufficiently stable mixtures so that measurements can be taken. Modulus elasticity is improved by curing conditions without immersion. The effect of alkaline reagents on water quality standards increases the acidity value (pH), while other parameters such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Total Suspended Solid (TSS) still meet quality standards. This research can be a reference for using fly ash-based geopolymers in class A aggregate foundation layers with light and heavy-density methods.

Keywords: foundation layer, geopolymers, CBR, modulus of elasticity, water quality