ABSTRACT

The use of low-quality aggregate for road base course materials necessitates the use of alternative materials like local soil stabilized with cement. This study focuses on utilizing local soil from the Jumantono area to determine the optimal cement content for soil stabilization based on achieving the required unconfined compressive strength (UCS) of 20-35 kg/cm^2 (target 24 kg/cm^2) as the 2018 General Specification of Bina Marga revision 2. Cement content variations of 3%, 5%, 8%, and 10% will be tested. Additionally, the modulus of elasticity will be measured using the Ultrasonic Pulse Velocity (UPV) tool.

The results show that the soil is a non-plastic sand soil (A-2-4) that can be used as a road subgrade but cannot be used directly as a base course. Therefore, the soil needs to be stabilized with a cement content of 9% to transform it into a base course material that meets the target UCS value of 24 kg/cm^2. Subsequently, the modulus of elasticity was measured using the UPV tool, yielding a value of 4.400 MPa. According to the Empirical Mechanical Design (MEPDG) for flexible pavements, utilizing a soil cement base course with an elastic modulus value higher than that of asphalt concrete layer will generate horizontal tensile stress, leading to cracking beneath the soil cement base course. By employing this design approach, potential pavement failure can be identified early in the design phase, allowing for the prevention of cracking in the soil cement base course by introducing a 10 cm thick aggregate interlayer between the 10 cm asphalt concrete layer and the 20 cm soil cement base course. This pavement structure combination enhances pavement performance, making it resistant to permanent deformation and fatigue cracking in the soil cement base course, thereby extending the pavement's lifespan compared to using an aggregate base course. Immersing the soil cement base course in pH water for 4 hours can impact the unconfined compressive strength and modulus of elasticity, leading to reduced bending performance. The stabilization of sand soil with cement can serve as a substitute for natural aggregate as a pavement base course material for traffic loads exceeding 5x10^6 ESAL and a service life of over 20 years.

Keywords: flexible pavement, cement stabilization, unconfined compressive strength, modulus of elasticity, mechanical-empirical design