EVALUATION OF ASPHALT CONCRETE PAVEMENT DENSITY USING NON-NUCLEAR DENSITY GAUGE

Abstract
The changes of density in AC surface layer affect the pavement service life. Each 1% increasing of air-void content over 8% will reduce 10% of pavement service life. In this study, a non-nuclear density gauge, PQI380, was used to measure the AC surface layer density and its air-void content in dry and wet condition. Three core samples were extracted from the pavement, and tested in the laboratory to obtain its density and air-void content. The density and air-void content of three core samples then used as a calibration to the density and air-void content obtained from PQI380. The calibration method used in this experiment was offset calibration method. The result of AC surface layer in wet condition had bigger density and air-void content than in dry condition. The error percentage of uncalibrated PQI380 density was reduced to 0.3%. While the error of air-void content was reduced to 5.6%.

Density Measurement Configuration

Density Measurement Using Non-Nuclear Density Gauge

1. Standardize the PQI380 Gauge
2. PQI380 Core Calibration
3. Measurement in Dry Condition
4. Measurement in Wet Condition

Laboratory Density and AV%

Density (Gmb) of Core Sample = \frac{A}{C-B}

AV% of Core Sample = 1 - \frac{Gmb}{Gmm}

Where
- Gmb = Density of core sample
- Gmm = Maximum Specific Gravity of core sample
- A = Weight of core sample in Dry
- B = Weight of core sample in Submerged
- C = Weight of core sample in SSD

Offset Calibration Method

PQI380 Data Input:
- Stone Size: 16mm - 23mm
- Depth: 56mm
- MTD: 2540 kg/m³

Comparison Between The Density in Dry and Wet Condition

Measurement Results

Comparison Between The AV% of Uncalibrated PQI, Calibrated PQI, and Core sample

Conclusions
- The presence of water on the AC Surface layer shows that the density of the AC surface layer was increases and the measurement becomes less accurate since the difference of dielectric constant value between the AC surface layer and water big. Moreover, the void on the surface layer is covered by the presence of water.
- The increases of AC surface layer density measured in wet condition was affect the value of air-void content of AC surface. Increasing the density of Surface layer made the air-void content of Surface layer lower.
- The Offset calibration method was able to calibrate the density and air-void content of the uncalibrated data. The error percentage of uncalibrated PQI380 density was reduced to 0.3%. While the error of air-void content was reduced to 5.6%.