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GPR in Nondestructive Quality Assurance of New Asphalt Pavements

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Mara Nord is an international cooperation project financed by Interreg IVA Nord funding program with partners from Finland, Sweden and Norway. One of the objectives in Mara Nord project has been to research the quality assurance of new asphalt pavement. Ground penetrating radar (GPR) survey is used as an alternative method for coring in quality assurance. There exist numerous advantages for the use of GPR. For example, the fluent measuring arrangements without closing the traffic on the road and the extensive continuous profile that can be constructed from the measuring data.

Within the framework of Mara Nord Project field tests were organized in Seinäjoki region in Finland on August 2011. The tests were done by four consulting companies from Finland and Rovaniemi University of Applied Sciences. The aim of these tests was to compare the measured dielectric value profiles and the calculated void content profiles of the equipment. The tested equipment was GSSI manufactured SIR-20 and 1 GHz horn antennas. Void content values were calculated using the model presented by Mr. Roimela (1997). All core samples were taken from the right wheel path. The same reference core samples were used when analyzing the data of each GPR equipment. Some samples were taken right after the pavement work was completed with the rest three weeks after during the test measurements.

The tests indicated that GPRs have very good repeatability in measuring dielectric changes on top surface layers of asphalt pavements. Furthermore, different GPRs locate the same detectable longitudinal dielectric changes with high accuracy. Some differences were found in the dielectric value levels, yet reproducibility of the calculated void content values was quite good.

The test data was also used to evaluate the reliability of the regression model between the dielectric values measured through GPR and the void content of the pavement determined from reference cores. Test data indicated that accurate regression model could not be validated by using test data because of too wide variation. The variation of void content in core sample results was not always registered by GPR with corresponding variation in dielectric value. There was some moisture present in test conditions and this might have influenced the GPR results. There are some reference data from dry conditions which will be used later on for analyzing the influence of moisture.

There was also quite wide variation in void content determined from core samples taken close to each other during field tests. However, wide variation was not seen in core samples taken right after the pavement work. It is possible that traffic load had its effect on the asphalt pavement compaction. The results indicate that when using only one survey line it should be located between wheel paths. Another option is GPR void content measurements should be done right after the pavement work.

References

[1] P. Roimela, Using GPR and dielectric probe in pavement quality control, Thesis,
University of Oulu, 1997.