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Ground Penetrating Radar application in planning structural evaluation of roads – Nordic actions

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Despite the challenging natural environment and scarce resources the Nordic countries have managed to develop expertise that is outstanding and can be utilized across the world. Such an example of cutting edge expertise, knowledge, skills, research, provided services and development of tools is the Ground Penetrating Radar (GPR) method.

Ground Penetrating Radar (GPR) is a non-destructive ground survey method that can be used in assessing roads, railways, bridges, airports, tunnels, environmental objects etc. Its main advantage is the continuous profile it provides over the road structure and sub grade soil. The GPR is becoming an increasingly important tool especially for planning structural evaluation of roads. Another important advantage of GPR in road surveys is that it does not essentially disrupt the flow of traffic during the survey. The method is used for many purposes as well as for the measurement of Ice and Snow that can be exploited in the Nordic areas.
The Nordic countries have reached good quality of skills and accumulated the knowhow of GPR application to road construction services during the last 15 years of developments. Finland, Sweden and Norway have specialized in very different ways in the GPR. Due to the different level of application, level of knowledge and awareness about the equipment and the method for application, it is hard for companies to compete internationally. Also the level of knowledge, awareness and experience regarding the use of GPR in the Road Administrations are different in all three countries. There is a need to share the knowledge and developed procedures to insure better quality of services. To respond to the recognized needs Mara Nord international cooperation project financed by Interreg IV A Nord has been initiated among Finland, Sweden and Norway. Among others, one goal of the project is to produce common guidelines that can be used as a reference in tendering processes in all three countries. The research results have to be updated, information gap evened, and know-how disseminated evenly across the borders and across the businesses.

To respond to that, Mara Nord project organizes education sessions in Norway, Sweden and Finland. The project also carries out the benchmarking of different equipment available on the market. The aim of the benchmarking is to present capability of tested equipment in different types of road measurements.

Finnish Transport Administration purchases the GPR services regularly. The contractors use GPR as a quality assurance method. One important method is to measure the void content of asphalt pavement. This method was introduced in 1997 by Petri Roimela (master thesis, University of Oulu). Nowadays, this method is included in PANK quality assurance guidelines (asphalt quality guidelines in Finland). In his Thesis Roimela introduced a mathematical relationship of dielectric value of an asphalt pavement to its void content. In the method the dielectric values are measured by air-launched GPR antenna. These values are transformed to asphalt void content through the mathematical model and some asphalt drill pieces analyzed in laboratory. During the last 15 years many changes have taken place in asphalt mixtures as well as in GPR equipment system. Therefore there is a need for further research and development. This work is now activated in Mara Nord project by Rovaniemi University of Applied Sciences. The aim is to update the method and increase the reliability of void content measurements. Research includes laboratory and on site measurements and the results will be used to improve the accuracy of mathematical models used in void content measurement. Also few new reference procedures for this method will be investigated.

Although currently a Nordic action, Mara Nord project is aiming to expand and share the knowledge further in Europe. Currently the expert team is planning next steps to further expand the skills and knowledge gained so far.