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# EVALUATING THE IMPACT OF FREEZE-THAW CYCLES AND MOISTURE DAMAGE ON PAVEMENT PERFORMANCE IN FINLAND

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**Summary:** This study is to present an update of the research progress and test results through a collaboration between University of Nebraska-Lincoln (UNL) in USA and Tampere University (TAU) in Finland. In Finland, climate change has been a challenge that has worsened the current conditions of the highway pavement due to the intensifying wintertime rainfalls and increasing number of short term freeze-thaw cycles. During daytime, due to the intensive solar radiation typically in March and April, asphalt pavement warms up and therefore the roadside snow melts. Pressure impacts caused by the overpassing vehicle tires are likely to impose the infiltration of water from the road surface into the micro-cracks of the asphalt pavement. At nighttime the temperature may drop down to minus 15 to 20 degrees in Celsius, so the water in the micro-cracks will freeze, thus tending to expand and deteriorate the asphalt pavement. As this mechanism repeatedly takes place, the contact between bitumen and aggregate particles will loosen and particles will start to separate from the asphaltic concrete (AC) pavement and eventually result in the disintegration of asphalt road surface as a form of raveling/pothole issues. In addition, the intensive heat used to warm up top part of existing AC in order to enable in-situ mixing and subsequent re-compaction together with added new asphalt mixtures seemed to have a negative impact on the integrity of overlaid asphalt pavements. Based on field observations, the raveling/pothole distresses are primarily caused by the coupling effect of aforesaid freeze-thaw cycles and moisture damage. A research project has been initiated to cope with the issues through material sampling, material preparation, and material testing conducted at TAU. In addition to asphalt specimen mixing and preparations in the Terra's Materials Laboratory, asphalt specimens sampled from the field will be provided by the Finnish Transport Infrastructure Agency (FTIA) for material testing. A series of freeze-thaw (F-T) cycle tests will be implemented following the ASTM C666 standard, or ASTM D2243 standard to simulate the coupling effect of repeated F-T cycles and moisture infiltration of asphalt specimens. After each desired F-T cycle was completed, the mechanical testing will be performed using indirect tensile test (IDT) and dynamic modulus test (DMT) to evaluate the coupling effect of F-T cycle and moisture damage on the low temperature cracking of asphalt specimens. After each desired F-T cycle was completed, the mechanical testing will be performed using indirect tensile test (IDT) and dynamic modulus test (DMT) to evaluate the coupling effect of F-T cycle and moisture damage on the low temperature cracking of asphalt specimens. All test results will be completed approximately by the end of May. The presentation will focus on the evaluation of mechanical behaviors of asphalt specimens under the coupled effect of F-T cycles and moisture damage, particularly the resistance and integrity of asphalt pavement under the extreme cold temperatures in the Finnish highway network. The goal of presentation is to share the results with practitioners and academics, dedicating to the longer lasting asphalt pavements in Finnish highway network.