MEASUREMENT OF THE ELECTRICAL PROPERTIES OF CONCRETE DURING THE CURING PROCESS USING A VARIABLE REFLECTOR WITH GPR

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Measurement of the electrical properties of materials that are heterogeneous require that we use samples that are large compared to the spatial scale of the heterogeneities. GPR can be an effective technology in this application, for samples that are large compared to the GPR antennas. We have developed a variable reflector whose reflectivity can be controlled by a GPR. The GPR is placed on one side of a sample and the variable reflector on the opposite side. GPR traces are then acquired with the reflector in both the on and off state. By differencing these two measurements, we improve our ability to detect the reflection event. This method removes the direct wave and clutter from the trace, improving the quality of the refection event. We have developed a prototype instrument (BP-1000) using this concept to measure large samples. The initial application of the instrument was to measure the moisture content of wood chips. Based on this initial testing, we have used the instrument to measure the electrical properties of concrete. In cooperation with the University of Waterloo, we monitored of a concrete sample during the curing process. Concrete was poured into a 1 cubic foot sample container and monitored continuously with the BP-1000 for a period of 105 days. The results that we will present show the electromagnetic wave velocity increasing rapidly during the first 10 days and then increasing linearly at a much slower rate for the following 95 days. The pulse amplitude increases at a more uniform rate.