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BEHAVIOUR OF GROUND PENETRATING RADAR WITH CHANGING MATERIAL PROPERTIES IN CONCRETE

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Use of Ground Penetrating Radar (GPR) technology as a non-destructive testing method has become a new trend in Civil Engineering because of rapid data acquisition capabilities and processing capabilities with relatively high accuracy.

Better knowledge and understanding of GPR behavior under complex field situations is very important for effective field application of the method. GPR wave simulations can be carried out using GPRMAX 2D (V2.0) computer simulation software for a conceptual model. In this study, a 0.6 m wide and 0.3 m high conceptual model consisting of a rebar (16 mm) located at x = 0.3 m, y = 0.175 m from the edge of the model was prepared. To identify the behaviour of GPR waves under different dielectric constants of the hosting material, the dielectric constant values were changed from 2 to 20. In the same model configurations, rebar values of 20 mm, 25 mm and 32 mm were used in wave simulation. In total 40 model runs were carried out and results were viewed using the EKKO View software.

Results revealed good accuracy between the simulated model and the theoretical value. The effect of the dielectric constant variation and therefore changes in reflected waves from rebar was very clear in the results. When increasing the dielectric constant, time taken to detect rebar was increased as expected. The velocity calibration done using the EKKO View was compared with the theoretical velocity based on dielectric and it showed a difference of around 5.7% between the two. Change of the rebar diameter did not affect the velocity variation.

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