

Non contact nonlinear ultrasonic test applied to reinforced concrete beams

JASON MAXIMINO ONGPENG¹, Sohichi Hirose²

¹Civil Engineering Department, De La Salle University, Philippines, ¹Dept. of Civil and Environmental Engineering Major in Civil Engineering, Tokyo Institute of Technology, Japan

Most of the structures that are constructed today are made of concrete. In the recent years, there is a growing need of assessing the structural health of existing buildings and infrastructures that are affected by disasters. It is essential that there is a reliable method for testing the quality of concrete. One way of assessing structure without any contact to the material is the use of non contact nondestructive test. An example of which is the use of air-coupled ultrasonic test. In this paper, non contact nonlinear ultrasonic test using air coupled transducers was used in investigating damage in civil engineering materials. Reinforced concrete beams with water-cement ratio of 40% and 60% and one 8-mm diameter rounded bar were casted and tested using four-point bending test . The air-coupled transducers were placed and focused on the horizontal surface with induced notch of 3mm width at the midpoint where the maximum tension occurred. Nonlinear ultrasonic test was used from frequency domain waveforms. There were four metrics used in measuring the tensile damage according to increasing bending stress, these were: second harmonic amplitude (SHA), second harmonic ratio (SHR), third harmonic amplitude (THA), and third harmonic ratio (THR). The metrics were correlated with water-cement ratio and damage in tension.