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Simulation and Experimental Study on Tensile Force Measurement of PS Tendons Using an Embedded EM Sensor

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Abstract : The tensile force estimation PS tendons is in great demand on monitoring the structural health condition of PSC girder bridges. Measuring the tensile force of the PS tendons inside the PSC girder using conventional methods is hard due to its location. In this paper, an embedded EM sensor based tensile force estimation of PS tendon was carried out by measuring the permeability of the PS tendons in PSC girder. The permeability is changed due to the induced tensile force by the magneto-elastic effect and the effect then lead to the gradient change of the B-H curve. An experiment was performed to obtain the signals from the EM sensor using three down-scaled PSC girder models. The permeability of PS tendons was proportionally decreased according to the increase of the tensile forces. To verify the experiment results, a simulation of tensile force estimation will be conducted in further study. Consequently, it is expected that both the experiment results and the simulation results increase the accuracy of the tensile force estimation, and then it could be one of the solutions for evaluating the performance of PSC girder.

Keywords : tensile force estimation, embedded EM sensor, PSC girder, EM sensor simulation, cross section loss
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