

Tensile Force Estimation for Real-Size Pre-Stressed Concrete Girder using Embedded Elasto-Magnetic Sensor

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Abstract : The tensile force of Pre-Stressed Concrete (PSC) girder is the most important factor for evaluating the performance of PSC girder bridges. To measure the tensile force of PSC girder, several NDT methods were studied. However, conventional NDT method cannot be applied to the real-size PSC girder because the PS tendons could not be approached. To measure the tensile force of real-size PSC girder, this study proposed embedded EM sensor based tensile force estimation method. The embedded EM sensor could be installed inside of PSC girder as a sheath joint before the concrete casting. After curing process, the PS tendons were installed, and the tensile force was induced step by step using hydraulic jacking machine. The B-H loop was measured using embedded EM sensor at each tensile force steps and to compare with actual tensile force, the load cell was installed at each end of girder. The magnetization energy loss, that is the closed area of B-H loop, was decreased according to the increase of tensile force with regular pattern. Thus, the tensile force could be estimated by the tracking the change of magnetization energy loss of PS tendons. Through the experimental result, the proposed method can be used to estimate the tensile force of the in-situ real-size PSC girder bridge.

Keywords : tensile force estimation, embedded EM sensor, magnetization energy loss, PSC girder

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