

## Structural Health Monitoring Method Using Stresses Occurring on Bridge Bearings Under Temperature

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**Abstract :** The functions of movable bearings decline due to corrosion and sediments. As the result, they cannot move or rotate according to the behaviors of girders. Because of the constraints, the bending moments are generated by the horizontal reaction forces and the heights of girders. Under these conditions, the authors obtained the following results by analysis and experiment. Tensile stresses due to the moments occurred at temperature fluctuations. The large tensile stresses on concrete slabs around the bearings caused cracks. Even if concrete slabs are newly replaced, cracks will come out again with function declined bearings. The functional declines of bearings are generally found by using displacement gauges. However the method is not suitable for long-term measurements. We focused on the change in the strains at the bearings and the lower flanges near them at temperature fluctuations. It was found that their strains were particularly large when the movements of the bearings were constrained. Therefore, we developed a long-term health monitoring wireless system with FBG (Fiber Bragg Grating) sensors which were attached to bearings and lower flanges. The FBG sensors have the characteristics such as non-electrical influence, resistance to weather, and high strain sensitivity. Such characteristics are suitable for long-term measurements. The monitoring system was inexpensive because it was limited to the purpose of measuring strains and temperature. Engineers can monitor the behaviors of bearings in real time with the wireless system. If an office is away from bridge sites, the system will save traveling time and cost.

**Keywords :** bridge bearing, concrete slab, FBG sensor, health monitoring

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