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16. ABSTRACT A concept for harvesting energy from the traffic-induced loadings on a highway bridge using piezoelectric materials to generate electricity was explored through the prototype stage. A total of sixteen lead-zirconate titanate (PZT) Type 5A piezoelectric wafers [0.080 inch (2.0 mm) thick] were attached to the steel shims of a six-layer bridge bearing; 60-durometer rubber sheets separated the shims. The outputs of the piezoelectric wafers were each sent through 480-ohm load resistors, and the voltage drops across the resistors were measured to estimate instantaneous power output and overall energy generation. The prototype energy harvesting bridge bearing was subjected to cyclic force loading (square wave) with mean load, load amplitude, and loading frequency being the experimental parameters. The highest observed energy generation of 1.253×10^{-6} W·hr occurred with a mean load of 10 kip (44.5 kN), a load amplitude of 4 kip (17.8 kN) and a frequency of 1.5 Hz. The concept of generating electric power from a piezoelectric-wafer-equipped bridge bearing was proven, but the energy generated was well below what would be required to operate a modest electrical load.			
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