Abstract: We discuss the development and field application of a statistical process control framework to support health-monitoring and management of transportation infrastructure. The work is motivated by advances in sensing, communications, and power harvesting technologies that allow for continuous, long-term, simultaneous collection of various response measurements, as well as the factors that contribute to their deterioration. The framework consists of two parts: The first, estimation of statistical models, i.e., Box-Jenkins ARIMA-GARCH and structural time series models, to explain, predict, and control for common-cause variation, i.e., changes, including serial dependence that can be attributed to usual operating conditions. In the second part of the framework, we detect and interpret possible special-cause events by using univariate and multivariate control charts to monitor the innovation and auxiliary residual series from the aforementioned models. We illustrate the proposed framework with analysis of strain, displacement, traffic, and weather data from the monitoring system on an in-service highway bridge in Hurley, Wisconsin (Wisconsin Structure B-26-7).

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