

# Sentinel AI™

## Bridge Impact Structural Monitoring

StructureIQ



### APPLICATION NOTE

Reliably differentiate between minor and major impacts

### StructureIQ's Bridge Impact Application

Modern bridge infrastructure operates under constant and unpredictable loading demands — daily traffic cycles, overweight vehicle crossings, vessel navigation in maritime corridors, seismic activity, and extreme weather events that accumulate stress and fatigue across a structure's service life. From aging highway spans to critical port and waterway crossings, bridges are routinely exposed to high-energy impact events that traditional inspection regimes cannot capture in real time. For bridge owners, transportation agencies, and infrastructure operators, the consequences of undetected impact damage are severe: accelerated structural degradation, unplanned closures, costly emergency inspections, and safety liability that grows with every missed anomaly.

StructureIQ deploys wireless smart sensors near high-vulnerability impact zones, delivering continuous, real-time structural condition intelligence through Sentinel AI, its secure cloud-based SaaS platform.

### Sentinel AI™



### Key Highlights

- **Continuous Bridge Health Monitoring:** 24/7 real-time visibility.
- **AI-Powered Impact & Anomaly Detection:** Sentinel AI automatically flags fatigue accumulation, and anomalous events that visual inspections routinely miss.
- **Instant Impact Alerts:** Automated notifications triggered immediately by vessel strikes, overweight crossings, or seismic events.
- **Avoid Unnecessary Closures:** Objective sensor data replaces guesswork, enabling confident, evidence-based decisions on whether shutdown and inspection are warranted.
- **Accelerated Return-to-Service:** Quantified structural response data supports fast, defensible integrity assessments, reducing time between impact event and safe resumption of full traffic operations.

# APPLICATION NOTE: StructureIQ AI powered SHM Service

## Sentinel AI - SaaS Architecture

### Xnode Wireless Smart Sensors

StructureIQ's wireless smart sensors provide real-time structural health monitoring by precisely measuring vibration and tilt. These ruggedized devices utilize onboard edge AI to filter raw data, identifying critical events. Data is transmitted via low-power protocols to a wireless gateway, eliminating the need for invasive and costly cabling across infrastructure.

### Gateway and Cellular data

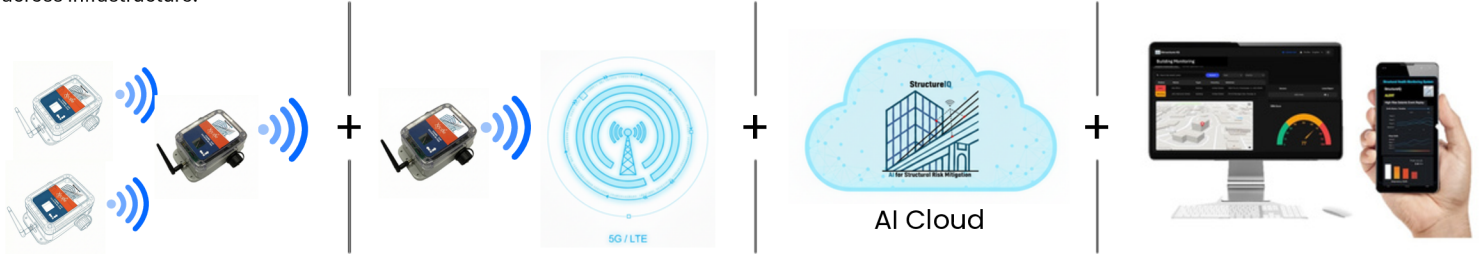
The StructureIQ Gateway acts as a secure bridge, collecting high-precision vibration and tilt data from wireless sensors via low-power protocols. After local verification and edge buffering, the gateway utilizes an encrypted 4G LTE/5G cellular uplink to transmit data through a private APN, ensuring cybersecurity.

### AI Cloud Data Analysis

In the StructureIQ Data Cloud, AI algorithms de-serialize and normalize this time-series data. The engine then performs automated feature extraction to distinguish routine environmental noise from critical structural anomalies.

### SaaS delivery

Insights generate real-time risk profiles and alerts delivered directly to the secure Sentinel AI SaaS dashboard for engineering and insurance assessment. The Structural Condition Index (SCI) score provides a single composite health metric per asset.



## Core Capabilities

- Wireless smart sensor deployment – Rapid installation with minimal disruption
- Automated anomaly detection – Identifies deviations from established baselines
- Post-event structural assessment – Faster safety and occupancy decisions
- Secure cloud-based dashboard – Remote visibility anytime
- Secure SaaS delivery (no client IT infrastructure required)
- Scalable from single building to enterprise portfolio
- Subscription-based SaaS service model

## What Gets Monitored

- Vibration (Acceleration), Temperature
- Tilt – Settlement, drift, structural movement
- Impact Detection – Ship/Vehicle strikes
- Trends – Deterioration and performance shifts

## SaaS Features

- Real-time alerts (SMS, email, dashboard)
- Automated event reports
- Structural health scoring
- Multi-asset portfolio dashboard

## Dashboard



Sensor configurations shown are illustrative of monitored parameters; actual deployment specifications can be different.

