PITTSBURGH BRIDGE COLLAPSE

5/9/2023

ABSTRACT

In January 2022, a bridge collapsed in Pittsburgh. This commentary discusses two aspects of the incident to help mitigate risks of recurrence.

Ted Corgan

Introduction

In January 2022, a bridge collapsed in Pittsburgh. Constructed things (like bridges) have a designed lifetime but won't last forever, even with repairs.

Infrastructure investments are rarely convenient. Addressing an accident is even more expensive. While the collapsed bridge is down, costs keep piling up. For example, there are disrupted driving routes, debris cleanup, vehicle rescue, environmental containment, DOT and contracted crews, and material and labor for rebuilding. According to the Pittsburgh Post-Gazette's investigation, "taken all together, the repairs that could have been carried out since 1997" would have cost less than $1 million. Now the bridge replacement cost is over $23 million.

If I were contributing to the Pittsburgh bridge team, I would focus on two aspects of the incident.

A. The photos show that snow and vehicle loads were relatively small, probably well within the bridge's weight rating. They also show that major failures appear to have occurred at distinct joints located at key foundational supports. Credit to NYT and Pittsburgh Post-Gazette for photos.
B. To find clues to the root cause(s), forensic investigators should especially look for crumbling concrete and failed fasteners near those locations. Then investigators should inspect similar bridges that could easily have similar risks. Learn from the past to improve the future.

Discussion

The investigation found a history of degradation and recommended repairs to correct some root causes. Those causes included “crumbling concrete” and deterioration of “overlapping joint areas” driven by insufficient corrosion protection[1]. Inspectors said two of the “lower bracing members are completely severed” in a 2018 message. Note that the identified causes are consistent with my estimates. The critical joints shown below[2] (including base material, welding, and fasteners) were failing.

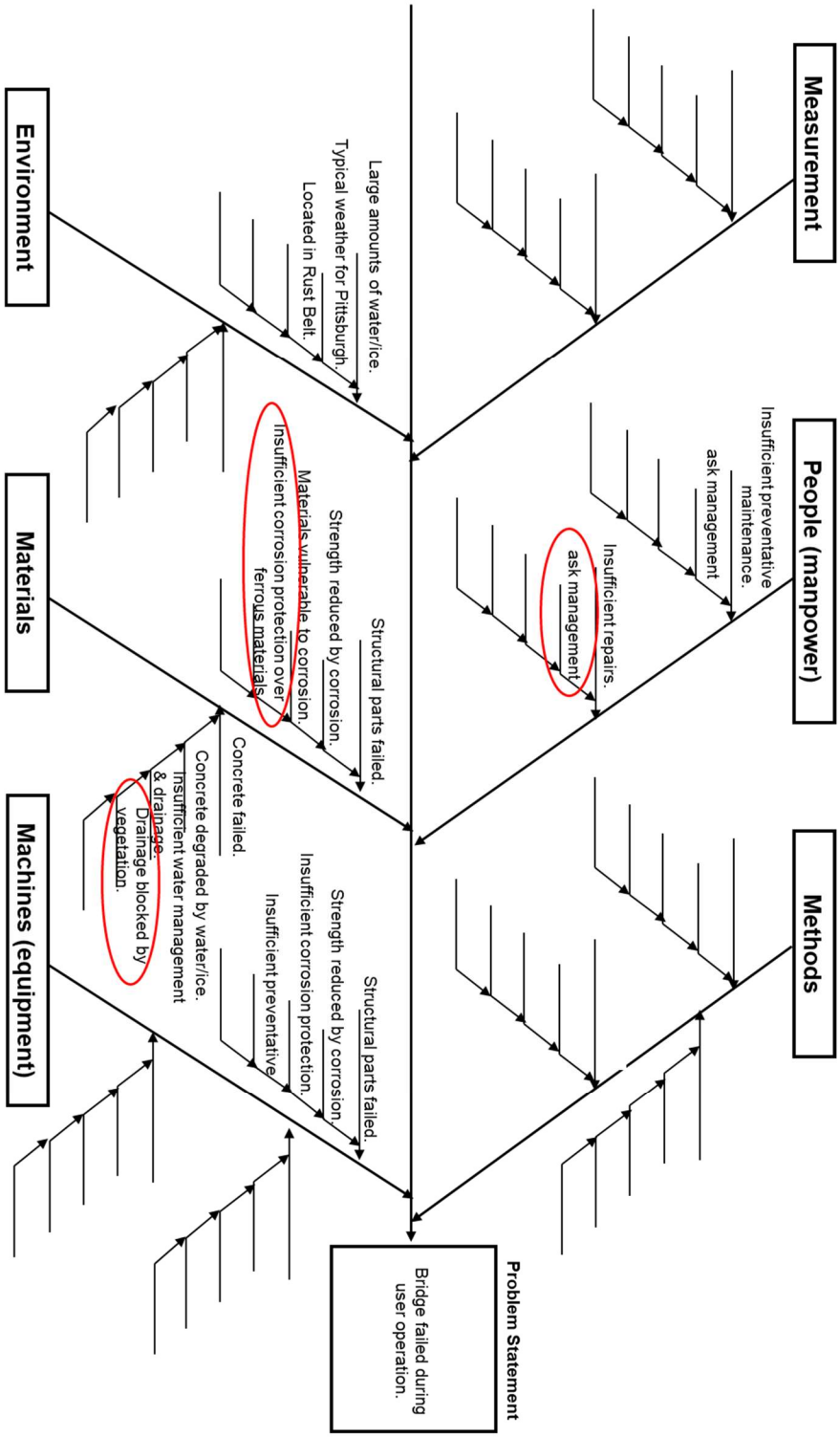
Figure 1. Detached structural joint. Degraded concrete and pavement. Blocked drainage.

Figure 2. Corroded joint with bolts. Corroded joint with various fasteners.

[1] Pittsburgh Post-Gazette. 6/18/2022.
[2] Pittsburgh Post-Gazette. 6/18/2022.

Root Cause Analysis

This chart shows a root cause analysis based on the available information. Key causes are circled in red.



Going Forward

The team planning reconstruction should evaluate building the replacement bridge with modernizing features, such as conduit for electrical cables to boost grid capacity and resilience. The bridge owner should also update operations & maintenance procedures to prevent similar failures in the future.

These methods are great ways to rebuild better and make it a more valuable and resilient community asset.