INTERSTATE OVERPASS FAILS

Quick action by engineer prevents injuries

A bridge engineer watching a “tight” crack under the Grand Boulevard bridge noticed it had extended to 20’ on May 6, 2016. He immediately ordered the bridge closed, requiring the rerouting of the more than 9,000 vehicles that use the bridge every day. The state plans to replace the bridge by December, at a cost of $5 million.

“It’s the first time I’ve heard of this happening to a sonovoid bridge, so maybe it’s an isolated case. But could it be something more chronic? The department is going to have to look into that.”

- Andy Hermann, past president of the American Society of Civil Engineers

**1 Problem**

<table>
<thead>
<tr>
<th>What</th>
<th>Problem(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>When</td>
<td>Bridge (overpass) failure</td>
</tr>
<tr>
<td>Where</td>
<td>Grand Boulevard Bridge</td>
</tr>
<tr>
<td>Impact to the Goals</td>
<td>Safety</td>
</tr>
</tbody>
</table>

**2 Analysis**

**Basic Level Cause Map** - Start with simple Why questions.

**Basic Cause-and-Effect**

The failure of any material or object, including all or part of a bridge, results from the stress on that object from all sources overcoming the strength of the object. In this case the stress on the bridge was greater than the strength of the bridge.

**Evidence:**

- Bridge engineer identified "tight" crack in April had spread to 20’ by May 6
- Every day use
- Age of bridge
- Overpass/ sidewalks closed
- Replacement of bridge

**Problem(s)**

- Bridge (overpass) failure
- Overpass/ sidewalks closed
- Replacement of bridge

**Cause Map**

- Safety Goal Impacted
- Production/ Schedule Goal Impacted
- Customer Service Goal Impacted
- Property/ Equipment Goal Impacted
- Labor/ Time Goal Impacted

**More Detailed Cause Map** - Add detail as information becomes available.

**NOTE:** Read the Cause Map from left to right with the phrase “Was Caused By” in place of each arrow.

**Why?**

**Effect**

- Potential for catastrophic collapse while bridge in use
- Stress on bridge > strength of bridge
- Large truck goes over bridge?

**Cause**

- Safety Goal
- Production/ Schedule Goal
- Customer Service Goal
- Property/ Equipment Goal
- Labor/ Time Goal

**Evidence:**

- Engineer identified damage prior to catastrophic collapse
- Evidence: Bridge failed while in use
- Evidence: Bridge engineer identified "tight" crack in April
- Evidence: Bridge was deemed "adequate" in inspection 8 months prior
- Evidence: Bridge began in 1963
- Evidence: One block of Grand Boulevard Bridge closed
- Evidence: Construction on bridge began in 1963
- Evidence: Replacement of bridge
- Evidence: Cost of $5 million

**Solution:**

- Bridge designed with "Sonovoid" design
- Wideest bridge over Interstate
- "Loop"; warning signs of failure
- Rerouting of >9,000 vehicles/day
- 20’ on May 6, 2016
- City plans to replace bridge by December at a cost of $5 million

**Investigate Problems. Prevent Problems.**

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