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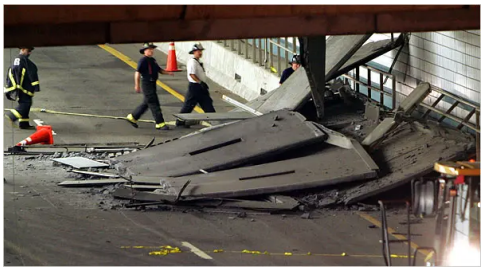
Collapse of Big Dig Ceiling in Boston Is Tied to Glue



A year ago Wednesday, a woman died in the collapse of the ceiling of a Big Dig tunnel in Boston. A report on the collapse was released Tuesday.
Michael Dwyer/Associated Press

By Matthew L. Wald
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WASHINGTON, July 10 — The ceiling collapsed in one of Boston's Big Dig tunnels a year ago, killing one woman, because builders used the wrong epoxy to hold the anchor bolts in place, the National Transportation Safety Board said Tuesday.

"We're talking about the wrong glue here, in effect," said Kitty Higgins, one of the five members of the board, which said that the epoxy selected dried quickly but lost strength weeks later.

A continuing theme of the board's meeting Tuesday was how small a detail led to the accident. "It's kind of ironic in a $14 billion project," said Deborah A. P. Hersman, a board member. "About $1.50 per anchor is what ended up bringing the ceiling down."

During construction, the builders tested the strength of the bolts; when some failed, the problem was attributed to installation errors, not breakdown of the epoxy.

"The knowledge of the engineering community seems to be deficient," said Bruce A. Magladry, director of the board's office of highway safety.

With concrete, steel and asphalt, he said, "once you test them for strength, they essentially keep that strength forever."

"Epoxy is not that way, it's a different material," Mr. Magladry said.

Builders of a variety of other tunnels, some in New York, use epoxy, investigators said, but the panels being supported are much lighter.

Bechtel/Parsons Brinkerhoff, one of the nation's leading construction management firms, was hired by the state to oversee the project, and worked with six subcontractors and suppliers on the ceiling. Gannett Fleming, Inc., a subcontractor, wrote specifications for the epoxy, and Bechtel reviewed the choice but never thought about its long-term strength, according to investigators.

The supplier in Boston, Powers Fasteners, noted that the fast-set epoxy was not for long-term use but that information was "in the fine print," said Mr. Magladry, and no one recognized that the material would weaken.

The failure dumped 26 tons of concrete and hardware on the 15-year-old Buick sedan in which Milena Del Valle was riding, and on the surrounding roadway. Her husband, the driver, escaped with minor injuries.

The board tested both formulations of epoxy available from Powers and found that the "standard set" type worked fine, but within 80 days, all the samples using the "fast set" formulation had failed.

A spokeswoman for Powers, Karen Schwartzman, said the company was asked to supply its “standard set” product, did so, and assumed it had been used. Perhaps the construction companies had the “fast set” product on hand for another part of the job and used that instead, Ms. Schwartzman said.

Powers said the longer-lasting epoxy that it sold the builders for use in the ceilings was a $1,287 order.

Powers and other companies are defendants in civil suits, and the attorney general of Massachusetts is considering whether to bring criminal charges.

The National Transportation Safety Board, which entered the investigation partly because the Massachusetts Congressional delegation asked for its help, said it did not follow its normal practice of asking companies involved to participate in its inquiry because of the other investigations.

Safety board staff members, working with experts from a Federal Highway Administration laboratory and others, found a variety of other problems in how the epoxy was mixed and used, but these did not reduce the strength enough to cause the bolts to pull out of the concrete, they found.

Documents released by the board Tuesday show that during the project’s construction, as bolts continued to slip out of the ceiling, various companies involved in the work raised new theories. These included suggestions that nuts had been attached to the bolts with too much force or that ceiling panels were pulling unevenly on the bolts.

Despite the discovery of numerous damaged anchor bolts in 1999 and again in 2001, project officials did not begin an inspection program.

Investigators said that the companies involved were waiting until a database of parts to be inspected had been completed, and the Federal Highway Administration had approved the inspection plan. There were no regular inspections in the more than three and a half years between the completion of the tunnel and the collapse, the investigators found.

But after the disaster, investigators found that other ceiling panels were in imminent danger of falling.

The safety board said the accident demonstrated that there were no national standards for tunnel “finishes,” and that the Transportation Department did not have jurisdiction to inspect tunnels unless they were built with federal aid. The Big Dig tunnels were, but about half those around the country were not.