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PERSPECTIVE

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It's the Engineering, Stupid

When placing blame for the Big Dig accident, one point is too often overlooked: mistakes happen.

Engineering failures - including Paris's Charles de Gaulle airport roof cave-in - can help improve future public and private building projects. (AP File Photo)

By Tom Keane | September 10, 2006

The fiascos of the Big Dig have unleashed a torrent of self-criticism that sometimes seems to verge on self-loathing. More than two months since the death of Milena Del Valle, the fury continues unabated. The project's failures, many argue, epitomize all that is wrong with Massachusetts. We're too liberal, too corrupt, too unionized. We have too many Democrats (or too many Republicans). We're a culture of the mediocre, the mendacious, and the profligate.

True or not, I suspect it's all irrelevant. The problems with the Big Dig are not a result of our politics, our mores, or even (as one commentator claimed) our recognition of same-sex marriage. They are, instead, engineering problems, the kind of engineering problems that happen all the time, all over the country. The Big Dig may be our particular calamity, but we are certainly not alone.

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The most famous engineering failure is the Tower of Pisa - its lean was unintentional, a result of subsidence of the soil underneath. Most such mistakes don't become tourist attractions, however. Instead, they kill people. In 1981, 114

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died when two suspended walkways collapsed at the Kansas City Hyatt Regency. Ten were killed in 1987 when parts of the Schoharie Creek bridge in upstate New York fell into the water. Four lost their lives in 2004 when a roof caved in at the Charles de Gaulle airport in Paris. Failure Watch, a project of the website icivilengineer.com, documents at least 40 significant engineering failures worldwide, many with a horrific loss of life, that have occurred just since 2000.

Failures like these, Duke University civil engineering professor Henry Petroski says, are almost "inevitable." Engineering is as much art as it is science, he argues, subject to human error. Examples are easy to find. In 1940, a moderate but steady wind caused the Tacoma Narrows Bridge in Washington state to sway. The oscillation grew ever more violent until the bridge tore itself apart. In 1967, after almost 40 years of faithful service, the Silver Bridge connecting Ohio and West Virginia fell into the Ohio River, killing 46. And in 1983, the long-standing Mianus River Bridge in Greenwich, Connecticut, suddenly collapsed, killing three.

None of those happened because the wrong political party was in charge. In the case of the Tacoma failure, no one understood the effects of wind. The Silver Bridge collapsed due to a crack in a piece of steel forged four decades earlier. And the flaw with the Mianus River Bridge apparently was its commonly used pin-and-hanger design. Alerted by that tragedy, by the way, officials in Massachusetts checked our own bridges; one of those, the Harvard Bridge over the Charles River, had cracks in its pins and hangers.

Each of these cases underscores a proposition that Petroski says applies to engineering in general and to the Big Dig in particular. Not only is failure inevitable, but it is also the way that we learn - often at enormous cost - about what works and what doesn't. Sometimes the mistakes, in retrospect, are almost blindingly obvious (the L'Ambiance Plaza apartment project in Bridgeport, Connecticut, collapsed and killed 28 in 1987 because, some investigators claimed, no one had accounted for the weight of the construction equipment building it). Other times they're almost undetectable (the Schoharie Creek bridge failed because of hidden erosion of the creek bed). Occasionally they are problems never recognized as hazards (foam had fallen off virtually every space shuttle since the program's inception; it wasn't until the 2003 Columbia calamity that we learned it could be fatal). Often the mistakes result from human error (a last-minute change in supporting rods led to the Hyatt Regency collapse).

In all likelihood, Del Valle's death is part of this long and often sad history. We don't yet know what caused a ceiling panel to fall in the Ted Williams connector - bad design, poor materials, shoddy workmanship, or some combination of the three - but someday we will. And eventually, Petroski argues, "it should become part of the collected memory of design professionals."

Right now, however, we're not thinking that way. Most of us are just angry about the whole thing. Yet, if we want to fix the Big Dig - and prevent similar problems from cropping

up in future projects - we need to stop beating ourselves up. Its failures are problems of science, design, and management; the solutions require reason, not melodramatics.

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