The US 50 – Blue Mesa Bridge Emergency Repair

Douglas Whittaker, PE, SE of Michael Baker International

In April 2024, while conducting the Federal Highway Administration (FHWA) required non-destructive evaluation of Non-Redundant Steel Tension Member (NSTM) bridges, the Colorado Department of Transportation (CDOT) discovered two partial fractures in the bottom tension flanges of the US-50 Blue Mesa Reservoir Bridge near Gunnison, Colorado. The bridge was immediately closed, and Michael Baker International helped to develop safe loading limits to get inspection equipment back on the bridge. The closure of the bridge to public traffic, however, resulted in a six-hour detour for local motorists. Emergency repair work using the Construction Manager / General Contractor (CMGC) method of contracting with Michael Baker International as the designer and Kiewit Infrastructure Co. as the contractor was undertaken immediately to identify and implement solutions to repair this critical bridge, as well as a second crossing of the reservoir of nearly identical construction.

Thorough non-destructive testing began and ultimately revealed numerous indications throughout many of the structure's 118 tension flange butt welds. Widespread transverse cracking of the girders' web-to-flange welds was also discovered. These defects led to the eventual decision to implement global plating of the bottom tension flanges to provide an alternate load path if any of the defects were to result in a total fracture of the flange. A novel approach to deter the propagation of cracking through the web was also implemented, acting in conjunction with the flange plating to provide a fully redundant system. Repair plates consisted of A514 (100 ksi) material to limit weight added to the bridge during the repair. Critical repairs were completed by July 3, 2024, to allow limited traffic back on the bridge. Additional repairs and full global plating were completed on both bridges by November 15, 2024.

Reengineering Resilience: Real-Time Response to Structural Movement on the WALK Bridge Replacement

Matthew Paradis, PE, CCM and Edward Cofrancesco, PE of HNTB

The WALK Bridge Replacement is a historic and multifaceted infrastructure program on Connecticut DOT's New Haven Line, representing nearly $2 billion in investment. At its core is the replacement of the 1896-built WALK Bridge—a critical swing bridge over the Norwalk River that serves Amtrak, Metro-North, and freight traffic on the Northeast Corridor. The project is not only a feat of structural engineering but also a case study in maintaining essential transportation services during high-stakes construction.

Among the many engineering challenges, the most pressing has been keeping the existing bridge operational for both rail and marine traffic throughout construction. This challenge escalated when the nearly 130-year-old east abutment experienced sudden and unexpected movement—approximately ¾" longitudinally, 1" transversely, and ½" vertically—followed by continued gradual displacement along the same vectors. This movement applied pressure to the approach span and subsequently threatened the operability of the swing span, prompting Metro-North to notify the U.S. Coast Guard that the bridge might not reopen if swung—an alarming scenario for both rail and maritime stakeholders.

Fortunately, a proactive structural monitoring system, installed to manage construction risk, detected the movement in real time. This early warning enabled immediate investigation and the rapid deployment of both high-tech and low-tech mitigation strategies. These included geotechnical and structural analysis, relieving strain in the superstructure, and the installation of temporary structural supports to stabilize the abutment and preserve bridge functionality. The response demonstrates how modern monitoring tools, paired with practical engineering judgment and on-the-ground adaptability, can safeguard critical infrastructure under duress.

The new WALK Bridge, currently under construction, will be a vertical lift bridge with dual 240-foot spans and 150-foot towers supported by 12-foot diameter drilled shafts. Designed for resilience, redundancy, and minimal maintenance, it will significantly improve navigational clearance and operational reliability. The project also includes upgrades to nearby interlockings, catenary systems, and adjacent bridges, forming a comprehensive corridor modernization effort.

This presentation will use the Project's response to the abutment movement as a lens to explore the engineering decisions, risk management strategies, and construction innovations that have defined the WALK Bridge Replacement. Through construction photography and time-lapse visuals, attendees will gain insight into how a legacy structure is being transformed into a 21st-century asset—without ever stopping the trains.

UConn Gampel Pavilion Dome Rehabilitation

Michael F. Hughes, PE, SE of Simpson Gumpertz & Heger

Built in the late 1980s, the Gampel Pavilion is an icon of the University of Connecticut (UConn) campus and its legendary basketball program. The one-of-a-kind geodesic dome roof, supported on a reinforced concrete plinth, acts as the building enclosure, structure, and interior ceiling of the Pavilion. Housed within the building are the basketball court, seating bowl, and ancillary service areas. After decades of use, UConn decided to rehabilitate all 2,016 frayed and deteriorated ceiling tiles and undertook an expedited project that needed to be complete in the very short period between commencement and the start of basketball season. The Pavilion's height and size, unique ceiling system, proprietary "spring-supported" court floor, and seating bowl, made rehabilitating the ceiling tiles and catwalks extremely challenging. The project team developed an innovative repair method that allowed the contractor to nearly simultaneously re-seal the roof, replace the ceiling covering, and repair the catwalk.

In this presentation, we will discuss this exciting real-world study to understand Gampel's original design and discuss the likely cause of the original deterioration. We will also review details of the repair and share the twists and turns (e.g., snow in June!) to rehabilitate this iconic structure in time for the start of basketball season.

Claims and Litigation in the Design & Construction World – Causes and Ways to Avert

Greg Holness, PE, Esq. of FTI Consulting

It is estimated that every year in the US there are between 2,000 and 5,000 lawsuits filed that relate to construction defects, delays, and/or contract issues. But this amount is dwarfed by the total number of construction disputes and claims that arise because it is generally agreed that only a small percentage actually end up in litigation. What causes these disagreements that take time, effort and expense to resolve? Are they inevitable? Or are there ways you, as a structural engineer, can avoid these types of situations?

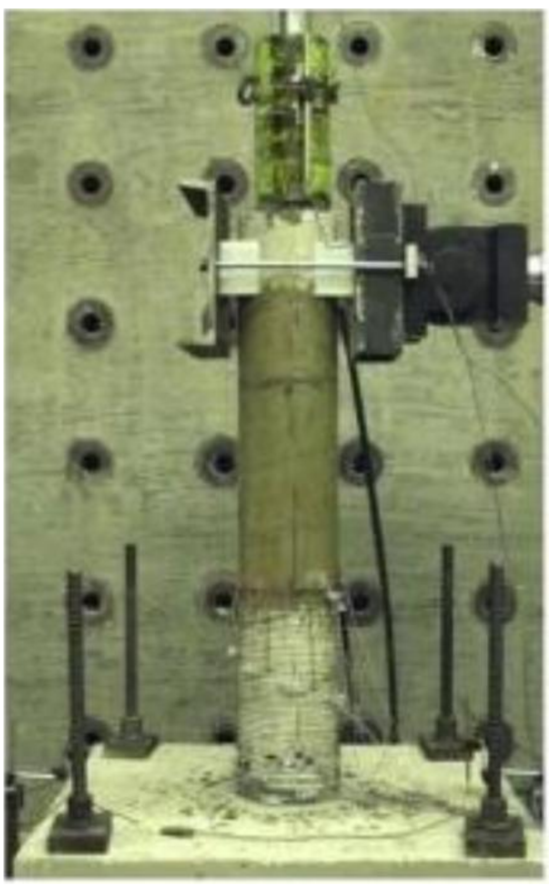
Greg Holness has spent more than three decades in the construction industry addressing problems jobs. He has worked as an engineer and an attorney at different times in his career. He is currently a consultant providing forensic schedule analysis and damages evaluation services, and is often required to provide expert testimony in depositions, court trials, and arbitration hearings.

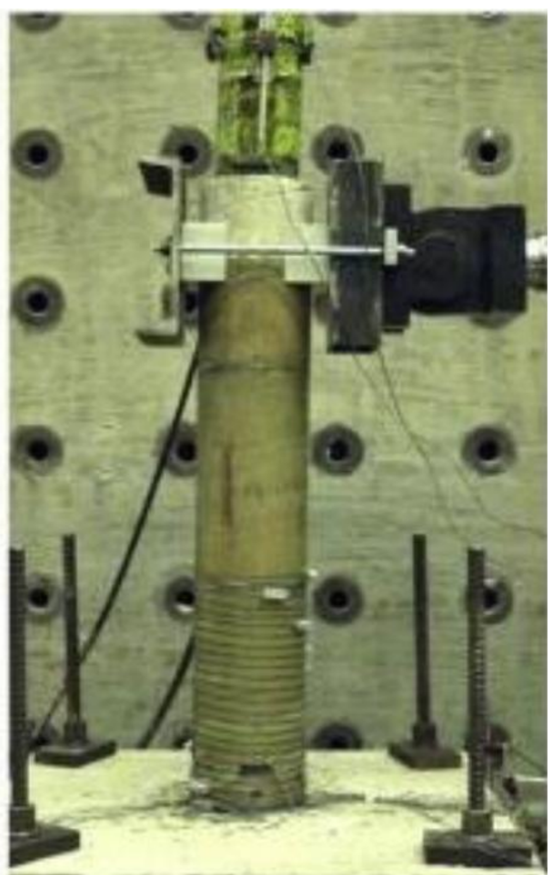
Based upon his unique experience – having been involved from the inception of a project to many years after substantial completion when litigation ends – Greg will discuss some of the geneses of disputes; give an overview of the ways in which they are typically resolved; and present several best practices that can be utilized on any job to prevent them. Along the way, he will provide context by sharing several real world instances he has been involved with, and will offer his thoughts on how claims can affect projects and the people working on those projects, and why developing means to counteract disagreements is well worth the effort.

Development of Sustainable Infrastructure Systems Using Smart/Innovative Materials

Moochul Shin, PhD of Western New England University

The research presentation focuses on the development of sustainable infrastructure systems using smart/innovative materials. This study discusses the feasibility of the use of shape memory alloy (SMA) in lifeline structural components (e.g. reinforced concrete (RC) bridge columns). The thermally triggered recovery stress of prestrained SMA spirals is utilized to apply active confinement pressure at the plastic hinge zone of columns to enhance the flexural ductility and limit their post-earthquake damage. This research focuses on investigating a concrete confinement technique using SMA spirals. The thermo-mechanical behaviors of NiTiNb SMA were experimentally investigated, and concrete cylinders retrofitted with SMA spirals and Glass-Fiber Reinforced Polymer (GFRP) wraps are tested. A large scale column test on RC columns retrofitted with SMA spirals and GFRP wraps are carried out. Furthermore, an emergency repair technique using SMA spirals is suggested for severely damaged RC columns. This study clearly illustrates that using thermally prestressed SMA spirals as a means of active confinements is a simple and robust method to improve the seismic performances of the RC columns.





Smart Solutions for Stronger Spans: Bridge Rehabilitation with UHPC

Jennifer Pixley, PE and Kevin Zmetra, PE, PhD of CHA Consulting, Inc.

Structural engineers are continuously tasked with identifying unique and innovative solutions to address the strength, resiliency and durability of critical structures. Ultra High-Permformance Concrete (UHPC) is a novel cementitious composite engineered to have high strength and durability. Early deployments of UHPC in bridge construction have been focused on prefabricated bridge element connections. More recently, UHPC has been gaining favor in bridge rehabilitation. Its strength and durability properties have been shown to make it an effective solution for steel beam repair through encasement.

The Dexter Coffin Bridge in central Connecticut is a 12-span steel structure carrying four lanes of traffic in each direction. It was originally constructed in 1956 and subsequently widened in 1985. The original structure consisted of 10 riveted plate girders, and a widening addition in the eighties added 6 welded plate girders. The superstructure had a condition rating of 5 (fair) with a load rating less than 1.0. Areas identified that required rehabilitation and strengthening with use of UHPC included advanced pack rust between bottom flange plates; flange local buckling; and negative moment regions.

The rehabilitation of the Dexter Coffin Bridge (completed summer of 2025) is an excellent case study of the practical and real-world applicability of using UHPC in a bridge rehabilitation project and the first use case in CT. This presentation will discuss the innovative rehabilitation techniques used on the Dexter Coffin Bridge, including the use of UHPC to encase the bottom flange to address flange local buckling, negative moment strengthening, and pack rust. The purpose of using UHPC in this rehabilitation effort is twofold. First, the strength of the UHPC will allow the regions of the structure requiring rehabilitation and strengthening, increasing the rating factor as is required as part of the project. Second, the superior durability of UHPC encapsulating the steel will prevent the ingress of water and chlorides to the underlying steel, preventing further section loss. The rehabilitation of this bridge is intended to extend the service life of the structure and increase the load rating capacity.

Structural Failures

Howard Epstein, PhD, PE of University of Connecticut (Emeritus)

This presentation will show dozens of structural failures for structures made of steel, concrete and/or wood.

According to ASCE Technical Council on Forensic Engineering, "Failure is an unacceptable difference between expected and observed performance." While this could include catastrophic collapse, performance and serviceability problems also fit the Council's criteria. Most of the examples presented are collapses, partial or complete.

Structural examples will not only include buildings and bridges (some easily recognized because of the national attention received) but many other specialty structures such as: towers, amusement rides, storage structures, boardwalks, smokestacks, "pre-engineered" metal buildings, parking garages, churches, decks, cladding, etc.

The reasons for each presented failure will be given and will include errors in design or construction, lack of maintenance, improper analyses, overloading, phenomena not known, a priori, and even cover-ups. Changes in procedures and laws and codes that resulted from some of the failures will also be discussed, when applicable. Some research at The University of Connecticut that resulted from Epstein's failure investigations will be shown, along with resulting code changes.

The presentation will conclude with a major building collapse that didn't happen as the result of the courage of the structural engineer, William LeMessurier.