PROJECT PROFILE

Seattle Kingdome

Ceiling Tile Failure Investigation | Seattle, WA

On July 19, 1994, just prior to a Seattle Mariners baseball game, several acoustical ceiling panels fell from the underside of the dome to the empty seats below, prompting the closing of the stadium and an immediate, comprehensive investigation. WJE was retained and arrived on site the next day.

CLIENT

King County Stadium

BACKGROUND

The Seattle Kingdome was a 65,000 seat multipurpose sports arena that opened in 1976. The dome of the stadium was the largest thin shell concrete roof in the world, spanning over 660 feet and rising 250 feet above the playing floor. The dome was constructed of cast-in-place concrete with radial concrete ribs spanning from a compression ring at the crown to a post-tensioned concrete tension ring at the base of the dome. Thin concrete shells spanned between the concrete ribs. In 2000, the Kingdome was demolished and replaced by separate football and baseball stadiums.

SOLUTION

The initial on-site investigations revealed widespread problems with the integrity of many of the 40,000 ceiling panels, all of which were subsequently removed. Further assessment revealed areas of poor consolidation and voiding in the concrete dome, as well as performance concerns with the roofing. In response, WJE initiated a massive, round-the-clock assessment and restoration design of the dome.

WJE initially performed close-up inspections and laboratory testing of the ceiling panels. After the concrete shell of the dome was exposed, WJE proceeded with a series of tests and evaluations to determine the extent and nature of voiding and consolidation deficiencies in the concrete shell. WJE performed nondestructive testing of the concrete, such as reflective ultrasonics and infrared thermography to survey the entire dome from the interior. Anomalous areas identified by infrared in the 5- to 18 inch-thick shell were evaluated with further techniques, including impact echo, exploratory openings and core sampling.

WJE designed structural repairs for the dome consisting of shotcrete to restore structural integrity, as well as a corrosion protection system to protect steel reinforcement. Additionally, WJE designed both a new replacement roof and a new acoustical ceiling system. WJE developed a fast-track repair scheme so that the stadium could be reopened in early November for Seahawks football games and other planned events.

WJE | ENGINEERS ARCHITECTS MATERIALS SCIENTISTS