Kauffman Fountain Water Spectacular

By Ralph C. Jones and Kirk Matchell

The Kauffman Stadium water spectacular sits at the end of the baseball field, flanking the stadium's scoreboard and bringing a bit of beauty and grace to the stadium. The fountains were a gift from Ewing and Marion Kauffman, the original owners of the Kansas City Royals Baseball team from 1971 to 1985. They gave the fountains to Jackson County as part of a beautification effort for what was then known as Royals Stadium. The stadium was later renamed Kauffman Stadium in honor of the family's contributions to the team.

The first fountain system was completed in 1973 and has two separate pool areas. The first pool, located behind right field, has a pool size of approximately 42 x 72 ft (12.8 x 21.9 m). The second pool is massive and runs from behind center field all the way over to the Royals bullpen, measuring 42 x 200 ft (12.8 x 61 m). Both pools have wall sections over 20 ft (6.1 m) in length.

Removal of existing coatings

Removal of existing coatings at the signage boards

The walls are approximately 1 ft (0.3 m) thick, the elevated slabs are 16 in. (406 mm) thick, and the slab-on-ground is approximately 10 in. (253 mm) thick. All the elevated slabs are located at the rear of the fountain system and house all the electrical and pumping equipment needed to run the two systems. Each fountain area is complete with curvature walls in the front portion that run between the large promotions boxes that cantilever out over the lower return pool systems. The original water-proofing system was a water-submerged membrane system.

Construction on the second fountain began during the late 1980s and was completed in 1990. Its main pool is 129 ft (39.3 m) long by 30 ft (9.1 m) wide. This fountain shares one end wall with the original fountain's west pool and stretches westward to within 15 ft (4.6 m) of the visitors' bullpen in left field. The addition of the second fountain created a more symmetrical look behind the outfield, while staying true to the design of the original in both architectural appearance and structural design.

Two different waterproofing systems were originally used in this fountain. In the main upper pool area, a self-adhering rubberized material was installed; and for the remainder, a water-submerged membrane system was applied.

The Kauffman Fountains hold 500,000 gal. (1,892,705 L) of water and take 2 to 3 days to fill.

Problems that Prompted Repairs

The fountains were showing signs of distress due to existing membrane failures and concrete deteriorations. Large cracks marred the slab-on-ground areas and the existing expansion joints had opened, allowing water to escape. These failures led to a substantial increase in the operational costs of the fountain due to higher water usage.

Prior to the recent repairs, maintenance efforts were limited to keeping the fountain operational, not restoring the entire facility. The restoration of the entire fountain was a master plan item whose turn finally came during 2006.

Inspection/Evaluation Methods

In August 2006, the study and evaluation of the Kauffman Fountains began. All areas were sounded

by chain dragging to determine the location and amounts of partial- and full-depth delaminations of the concrete. Site observations were also conducted throughout the site for determining additional deterioration items.

Causes of Deterioration

Water infiltration behind the waterproofing system caused the concrete surface to be exposed to high moisture conditions. Cracks in the existing concrete allowed further moisture infiltration that eventually caused corrosion to occur on the reinforcing steel bars. As time went by, this corrosion caused the steel to expand and the delamination process started.

Repair Systems and Surface Preparation

Due to the excessive amount of water that infiltrated through the slab-on-ground areas, large amounts of slab-on-ground needed additional stabilization due to voids found under the concrete. This was determined by performing ground-penetrating radar imaging over the entire slab-on-ground areas. The results showed a three-dimensional view of the slabs and the voids underneath. This made grout injection stabilization more productive because the radar imaging showed which voids needed to be filled and which could be overlooked, based on the size found in the images. The precision of the ground-penetrating radar imaging saved money and time on this project because the images gave precise locations for the voids, shortening the time needed to perform grout injection and lessening the loss of material.

Prior to the concrete repairs, the entire surface area needed to be prepped for the new waterproofing system. This led to the complete removal of all the existing membrane systems. The removal process consisted of sandblasting, hand grinding, and chemical removal.

All concrete surface repairs required a nonshrink patching material with corrosion inhibiters built into the patch matrix. In addition, if the delamination was deeper than the patch supplier's recommendations for a single layer, pea gravel was added to increase the depth capabilities.

The existing expansion joints needed a material that mounted just below the surface and could accommodate the expansion and contraction of the joints. This material also had to be compatible with the new waterproofing membrane system. A high-density closed cell foam system was chosen for these joints. After the joint was applied, a series of detail membrane coats or sealant was applied to prep the joint for membrane installation.

All the existing cracks were routed and sealed as directed by the membrane manufacturer. After

Lower pool area: main fountain after coating removal

Secondary fountain: mapped out delamination locations

Concrete slab delamination removal

Completed concrete slab repairs

Secondary fountain: completed concrete slab repairs

Main fountain: completed waterproofing membrane system in the lower pool area

Main fountain: completed waterproofing membrane system and equipment installation in the upper pool area

Kauffman Fountain Repairs

Owner
Jackson County Sports Authority
Kansas City, MO

Project Engineer
Structural Engineering Associates, Inc.
Kansas City, MO

Repair Contractor
S & W Waterproofing
Kansas City, MO

Material Suppliers
Neogard
Dallas, TX

Shield Systems
St. Louis, MO

Kauffman Stadium water spectacular prior to first 2007 season game

all the surface preparation and repairs were completed, the new membrane system was installed. The membrane was installed with rollers, brushes, and special squeegees.

Unforeseen Conditions Found

Poor installation of the cast-in-place expansion joint material led to the failure of the joints. The project team discovered that the existing rubberized expansion joints had areas where the concrete did not bond properly to the material, and voids were found in the areas where consolidation problems occurred. This accelerated the deterioration of the concrete and reinforcement along these joints, causing an increase in repair costs.

The expansion joint problems, coupled with the existing cracks in the slab area, created water infiltration and large voids under the slab-on-ground areas. These issues added additional repairs to the project.

Project Success

This project had a very tight and aggressive schedule. Opening day for the Royals' 2007 baseball season was April 4, so the fountains had to be up and running in time for the first pitch. Missing this deadline was not an option. The repairs began in earnest in October 2006, and the project team battled a harsher-than-usual winter to meet the project deadline. The project was completely finished on March 30, giving the stadium crew just enough time to fill the fountain basins for Opening Day.

Ralph C. Jones *is Senior Vice President and Principal with Structural Engineering Associates, Inc. (SEA) in Kansas City, MO, where he has filled multiple assignments since 1986. He has 28 years of experience and is currently in charge of SEA's Restoration and Field Services Group. Jones has worked on multiple projects involving waterproofing, concrete restoration, masonry restoration, and structural steel restoration. He received his BSCE from the University of Missouri-Rolla and his master's degree from the University of Missouri-Columbia. He is a member of ACI and NACE. Jones is a Past President of the Great Plains Chapter of ICRI and is active on ICRI administrative and technical committees*

Kirk Matchell *is a Senior Restoration Technician and Assistant Project Manager with SEA. Matchell has more than 20 years of experience in the construction industry with 14 years devoted primarily to the restoration of concrete and masonry structures, as well as waterproofing projects. He has obtained several International Code Council Structural Certifications. Matchell is an active member of ICRI and is the current Secretary for the Great Plains Chapter.*