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CONCRETE POLYUREA

Polyurea Crew Makes Big Splash in Vegas

BY **JACK INNIS, CONTRIBUTING EDITOR**
PHOTOS COURTESY **WATER FX**

MGM Resorts International had a huge problem. The massive lagoon in front of their New York-New York Hotel & Casino in Las Vegas, Nev., was leaking like a sieve! The landmark water feature anchors the New York-New York property to the corner of Tropicana Avenue and Las Vegas Boulevard.

On a pedestal inside the water feature stands a 150-foot-tall (45.8 m) replica of the Statue of Liberty that helps visually establish a mock New York City skyline. Each day, thousands of tourists flock to the intersection to marvel at the lagoon, statue, and skyline. This carefully crafted cityscape helps MGM capture its share of Nevada's $10.86 billion annual casino industry revenues.

Now, nothing good ever came from a leaking water feature. At best, precious water is lost. In a worst-case scenario, an unchecked leak might form a hidden sinkhole that could undermine the water feature, anything in it, such as a 150-ton (136.1 metric ton) Statue of Liberty replica, or foundations of adjacent structures. Thankfully, MGM maintenance personnel caught the leak early and avoided any potential catastrophes.

With so much at stake, MGM decided to demo the 9,600-square-foot (891.9 m^2) pond and start over with new plumbing, shotcrete, and an 80-mil (2,032.0 microns) total dry film thickness (DFT) spray-in-place, monolithic polyurea lining system by VersaFlex.

Big Splash in Las Vegas

Water FX was about to make a big splash in Las Vegas. The Henderson, Nev.-based limited liability corporation (LLC) had years of experience creating commercial aquatic structures, such as pools, fountains, and other water features. But Water FX had never tackled a large, high-profile polyurea project such as the New York-New York lagoon. Still, project manager Tim Singleton felt confident. He and his five-man crew were

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Water FX was about to make a big splash in Las Vegas. The Henderson, Nev.-based limited liability corporation (LLC) had years of experience creating commercial aquatic structures, such as pools, fountains, and other water features.

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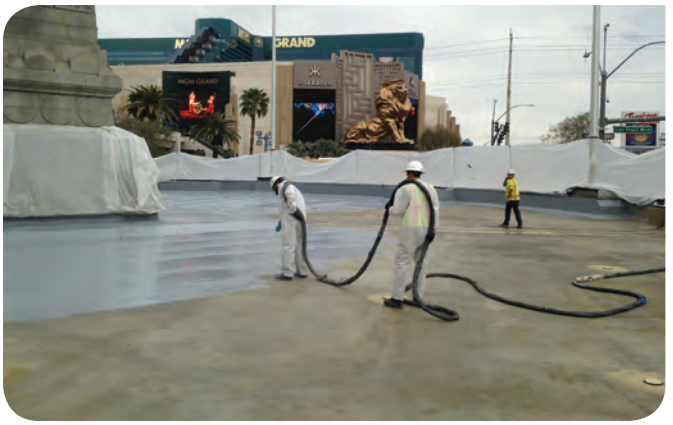

When the lagoon at the New York-New York Hotel & Casino in Las Vegas started leaking, the owners decided to demo it and start over. That included a 9,600-square-foot (891.9 m²) caulk and coating job.

Wielding a Probler P2 spray gun for the first time, the crew from Water FX started the polyurea system with a mist coat of primer. That was VF 20, which was then backrolled.

graduates of VersaFlex's Polyurea University; they had experience with the VersaFlex products specified for this project: FV 20 primer, FSS 45 polyurea, and GelFlex 1115 topcoat. And they had a powerful Graco Reactor 2 HXP3 hydraulic proportioning system on standby. Singleton felt confident — and rightly so. But the project manager had no inkling that factors beyond his control on this project would nearly push the entire Water FX crew right off the deep end!

Tread Water and Wait

Lady luck smiled on Water FX by providing great jobsite access via an empty lot on the north side of the hotel. This allowed them to set up shop in a spray rig trailer that held the HXP3, 400 feet (121.9 m) of heated hose, and other gear. Eager to begin, the crew dove into action and erected overspray barriers along the fountain perimeter and at the base of the Statue of Liberty. No sense getting this lady's toes wet with overspray!

Singleton checked the shotcrete moisture level several times a day with his GE Protimeter moisture meter. Twenty-two days after the pour, the concrete dried to 5 percent moisture content, the maximum specified. The Water FX crew wanted to start prepping immediately, but those hopes were dashed when they learned that the entire polyurea application had to be pushed back three weeks to accommodate changes in the schedule. Despite that the new start date seemed perilously close to their cast-in-stone finish date, there was nothing the crew could do but tread water and wait.

"We're always under pressure to meet a schedule, and this job started out like many," said Singleton. "We'll review designs, attend preproduction coordination meetings, and get initial start dates. Somehow, the start dates always seem to get pushed back — but the finish dates remain the same. It's just part of the business we're in."

The workhorse was the second layer, which was applied in a single layer at approximately 60 mils (1,524.0 microns) dry film thickness (DFT). The crew used coating thickness detectors to confirm the thickness throughout.

Enormous Belly Flop

Three weeks later, the crew returned to the jobsite, freshened up the overspray barriers, and trowel-applied Sikaflex caulking to cover shotcrete imperfections larger than approximately ⅛-inch (0.3 cm). Liquid-applied polyurea covers smaller flaws, said Singleton.

But while the crew made ready for primer application, disturbing weather news began to pour in. A massive storm had just hit the Los Angeles, Calif., coast and was moving their way! Las Vegas forecasters predicted heavy rain within three days. Pushing the start date back again to wait for the storm to pass meant missing the deadline. Could the crew squeeze three-and-a-half days' work into two and a half days? Or would Water FX's first attempt at a large, high-profile polyurea project amount to an enormous belly flop?

Water FX took the plunge and mixed their first 10-gallon (37.9 L) kit of VersaFlex VF 20 primer. The crew could ill afford to waste even one hour for any puddled primer to cure, so they dipped into their bag of tricks. Experience had taught them that rolling or brushing VF 20 tended to leave areas of ponding that cured slowly. To work around this, the crew used a Graco Magnum X7 airless sprayer to apply a thin coat of VF 20 and back rolled the still-wet primer with thin-matte rollers to

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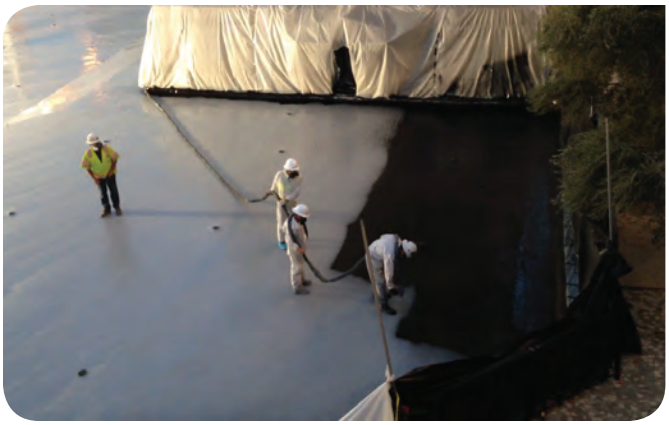

To help keep things moving during the 2.5-day time crunch, the crew took turns on the spray gun. With the 20-mil (508.0 microns) GelFlex 1115 topcoat down, the system was done.

ensure penetration. The technique shaved precious hours off the clock, according to VersaFlex technical sales representative Rudi Rennert.

"Their method allowed the VF 20 primer to cure within 12 hours," said Rennert. "We want VF 20 to achieve a 'transfer free' state, which means that it leaves no residue on your bare hand when you touch it. The primer can still be a bit tacky. As long as it doesn't transfer, it's okay to recoat."

By now, the storm system had left Los Angeles and was heading toward Barstow, Calif., only 150 miles (241.4 km) from Las Vegas. The Water FX crew was ready for some polyurea action, but there was another problem: They were completely unfamiliar with the spray gun they were about to use!

Storm Barreling Down

John Bender, authorized Graco distributor from Santa Fe Springs, Calif., knew the Graco/Glas-Craft Probler P2 gun that they wanted to use was significantly different than the gun they had relied upon in the past. On a fast-paced project like this with a storm barreling toward the jobsite, there was no time for trial and error. Bender dropped what he was doing, hopped in his truck, and drove to Las Vegas.

"It takes experience to know how to set up the gun correctly for each particular application, so instead of just shipping them a P2, I brought them a gun and parts kit," Bender said. "I wanted to show them how to set it up and keep it running. This is an experienced crew, and they picked it up right away."

Now that's a good thing because there was no time to lose. Real-time weather reports indicated the storm had already swept through Barstow and was descending on Baker, Calif., 100 miles (160.9 km) from the jobsite. The Water FX crew knuckled down and began spraying a single 60-mil (1,524.0 microns) DFT pass of VersaFlex FSS 45 polyurea.

"We did the walls first to help get uniform thickness throughout," said Singleton. "The large expanse of shotcrete made it tedious work to make sure every pass was identical to

JOB AT **A GLANCE**

PROJECT:

Apply polyurea system to water feature in front of Las Vegas' New York-New York Hotel & Casino

COATINGS CONTRACTOR:

Water FX LLC
740 N Valle Verde Dr.
Henderson, NV 89014
(702) 233-3200
www.waterfx.net

SIZE OF CONTRACTOR:

Typically 23 full-time employees

SIZE OF CREW:

5 crew members; tapped union workers from Laborers Local #872 when needed

PRIME CLIENT:

MGM Resorts International
3600 Las Vegas Blvd. S
Las Vegas, NV 89109
(702) 693-7120
www.mgmresorts.com

SUBSTRATE:

Concrete

CONDITION OF SUBSTRATE:

New construction

SIZE OF JOB:

~9,600 sq. ft. (891.9 m²)

DURATION:

2½ days

UNUSUAL FACTORS/CHALLENGES:

- This was the contractor's first use of polyurea on a large fountain project and first use of the Probler P2 spray gun.
- A scheduling delay pushed back the start by approximately three weeks.
- An approaching rainstorm forced the crew to gamble on whether they could make the deadline.

MATERIALS/PROCESSES:

- Filled and troweled irregularities larger than approximately ⅛-inch (0.3 cm) with Sikaflex caulk
- Spray-applied a mist coat of VersaFlex VF 20 primer and backrolled
- Spray-applied a single 60-mil (1,524.0 microns) dry film thickness (DFT) pass of VersaFlex FSS 45 polyurea
- Spray-applied a single 20-mil (508.0 microns) DFT pass of VersaFlex GelFlex 1115 topcoat

SAFETY CONSIDERATIONS:

- Used caution due to working with other trades in the area
- Wore hard hats, boots, and reflective safety vests on site
- Wore 3M organic vapor cartridge respirators, goggle-style eye protection, and protective coveralls when spraying

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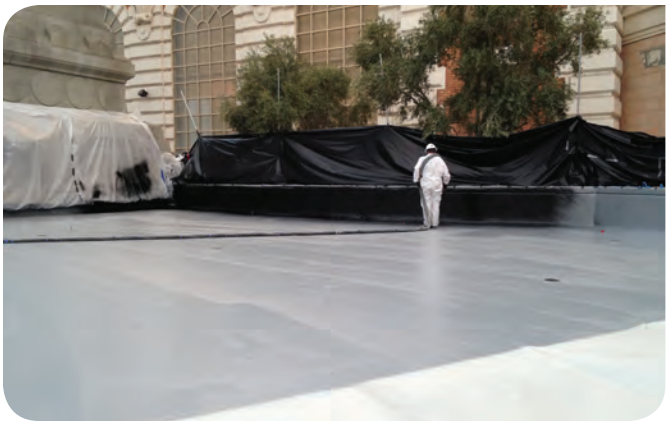

The five-person crew wore proper safety gear throughout the project, including hard hats, boots, and safety vests at all times. They added respirators, goggles, and coveralls when using the spray gun.

The timeline was tight throughout: The start date was delayed about three weeks and a rainstorm loomed at the end. The crew worked through the night to get the coating down before the rain hit.

the previous one. It's easy to get distracted when you come to a wall, but if it's already been coated, it's easier to maintain your focus on consistency."

Smiling Bubbles

The crew relied on teamwork to lay down four sets (approximately 400 gallons, or 1,514.2 L) of VersaFlex FSS 45 polyurea in a single, long day. When one nozzle man grew too tired to shoot, his hose man stepped up, and another crewman grabbed the hose. When the second nozzle man grew tired, the new hose man stepped up. The crew also shaved time by using pliers to flatten outgassing bubbles.

VENDOR **TEAM**

3M
Safety equipment manufacturer
3M Center
St. Paul, MN 55144
(800) 364-3577
www.3m.com

DeFelsko Corp.
Equipment manufacturer
802 Proctor Ave.
Ogdensburg, NY 13669
(800) 448-3835
www.defelsko.com

GE Measurement & Control
Equipment manufacturer
1100 Technology Park Dr.
Billerica, MA 01821
(866) 546-4138
www.gemeasurement.com

Graco Inc.
Equipment manufacturer
88 11th Ave. NE
Minneapolis, MN 55413
(612) 623-6000
www.graco.com

Sika Corp.
Material manufacturer
30800 Stephenson Hwy.
Madison Heights, MI 48071
(248) 577-0020
www.sika.com

VersaFlex Incorporated
Coating manufacturer
686 South Adams St.
Kansas City, KS 66105
(913) 321-9000
www.versaflex.com

"All the guys carry needle-nosed pliers and razor knives," Singleton said. "If you see a bubble smiling up at you, let's say within about 10 seconds or so of shooting, you grab and twist it with your pliers. It will lie back down and you can spray again to cover it — right then and there. If you wait too long and the bubble hardens or if the bubble's too big, you have to cut it out with your knife."

The crew kept tabs on their work by periodically testing the cured polyurea with a PosiTector 200 ultrasonic coating thickness detector. The PosiTector showed that the crew was achieving consistent thickness, which was crucial on this lagoon project.

"We've been doing polyurea water features a long time and know that people like to toss all sorts of things into them," said Singleton. "Pennies are no big deal, but occasionally someone throws in a cocktail glass. It's hard to see glass underwater, so there's the chance that a maintenance worker will step on one and crunch it with his boots. The sharp edge could dig into the membrane. We work hard to apply even coatings with no thin spots to make sure our polyurea systems not only withstand the walking, brushing, and vacuuming associated with maintenance but other kinds of abuse, too."

Rain Hammers Worksite

It was nearly dark by the time Water FX finished applying the polyurea liner. The men were dead tired and looking forward to a hot meal and a good night's rest. But weather-tracking radar showed the storm had just hit the California/Nevada border, a mere 50 miles (80.5 km) from the MGM property. Walking away from this job-in-progress simply wasn't an option.

The crew knew that even if the storm had blown through Las Vegas quickly, it would have taken time to drain the rainwater from the lagoon. The crew would have needed heaters, weed torches, and leaf blowers to try to dry the polyurea lagoon liner. And before they could have been able to apply the GelFlex 1115 topcoat, they'd have to hand-wipe the entire 9,600-square-foot (891.9 m^2) lagoon liner with VersaFlex Tack Coat to promote

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Despite the impending storm, the crew stayed calm and carried on. Graco distributor John Bender said, "The guys stepped up the pace when they had to and finished just in the nick of time."

bonding, as per manufacturer's specifications. All this would have put Water FX well beyond the deadline. The crew had no choice but to tough it out and work into the night.

Singleton called in extra hands from Laborers Local Union #872 and brought in portable light towers. Inside the spray rig trailer, the crew hastened to switch to the GelFlex topcoat. The Water FX crew purged the system with VersaFlex VersaFlush, a solvent used to remove polyurea from application equipment. They fired up the HXP3 and ran a bit of GelFlex through the lines to ensure no contaminants remained. Meanwhile, Bender helped reset the Probler P2 to dish out a consistent 20-mil (508.0 microns) DFT topcoat in a single pass. The stage was set for the crew to make a final assault on the massive New York-New York lagoon.

The Water FX crew finished spraying at daybreak just as the storm's first sprinkles hit. Before they could drag their heated hoses back to the spray trailer, the skies opened up and sheets of rain hammered the worksite. Drenched to the bone, cold, and tired, the men jumped into their pickups and headed back to the shop. They felt miserable, but had beaten the storm!

Bender expressed amazement at how rapidly the crew adapted to changing conditions throughout this project. "Water FX quickly figured out how the Probler P2 functions and how to keep it running," Bender said. "The guys stepped up the pace when they had to and finished just in the nick of time."

Rennert acknowledges all the behind-the-scenes work that helped Water FX pull off this difficult project. "They've taken courses at Polyurea University and have gone so far as hosting classes at their Henderson facility," Rennert said. "That dedication helps bind our relationship, and I'm proud to be part of it."

Singleton praises his crew for the way the New York-New York Hotel & Casino project turned out. The crew made the deadline, the polyurea liner functions perfectly (the topcoat cured instantly, so the rainwater was no worry), and the Statue of Liberty's new lagoon looks amazing. But how does the project manager feel about the storm that put so much pressure on his crew? In retrospect, Singleton doesn't think it was all that bad!

"You know," Singleton said, "it rarely rains in the desert, but when it does, it almost always comes as a surprise. At least this storm gave us advance warning."

With an attitude like that, it's no wonder Water FX is making a big splash in Las Vegas! **CP**

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The Black Magic Science of Polyurea

By ***Dudley J Primeaux II, PCS, CCI, VersaFlex Incorporated***

It is often thought or presented that "polyurea" coating projects are just that: polyurea projects. And not much is given as to why a specific polyurea system was used and the resulting overall performance. So what makes a good polyurea job or project? Well, it is not the polyurea by itself, but the actual system that was used.

The success in this Water FX application is from following the science of proper application and installation work, which come from having proper training and qualifications. Over the past 30 years, I've heard that "urethane chemistry," which incorporates polyureas, is a type of black magic science.

The Illusive Primer Chemistry

In selecting the primer system, the system supplier should consider compatibility issues, environmental issues, and substrate characteristics. For concrete, we know that the surface will be weak (low tensile strength), will be porous, and will have some moisture content. Selection of a primer system should be based upon the chemistry of the application project, including project exposure, environmental issues during installation work, and the recoat window of the primer system.

For this Water FX work, the VersaFlex VF 20 primer was specified. This is a 100 percent solids, urethane-based primer system that remains very flexible after cure. In addition to the 100 percent solids characteristics, the primer is based upon renewable resource polyols, which allows for relative cure insensitivity to residual moisture and high alkalinity of the concrete substrate. This means that the minor residual moisture in the concrete does not interfere or obstruct the reaction or the primer system. Additionally, the high alkalinity of the concrete has no effect on the formed polymer of the primer system. In addition, the VF 20 primer has been shown to significantly reduce the Moisture Vapor Emission (MVE) rate in the concrete, as per ASTM F 1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

The Performance Polyurea Basecoat

The fact that there may be movement, cracks, and the aesthetic nature of the concrete work, the next layer of the polyurea system — VersaFlex FSS 45DC — was chosen. The FSS 45DC is a 100 percent solids, plural-component, aromatic-based polyurea elastomer system. The chemistry of this layer includes matched materials viscosities of the isocyanate and resin sides (the components in the plural-component system) and slightly slower (aka longer) gel.

A little longer gel time (~12 seconds) allows for several chemical aspects to take place between this coat and the previously applied primer: excellent wet out of the system, enhanced adhesion from the mechanical aspect, and increased chemical bonding.

After it has gelled, the basecoat offers several beneficial chemical aspects as well. First, it offers a typical 400–450 percent elongation. It also maintains a Shore D Hardness of 45–50, which means that it is able to withstand 15 seconds of an indenter and maintain its shape. (For reference, a truck tire may have a Shore D of 50 where a hard hat has a Shore D of 75.) The installed cured system also has excellent crack bridging capabilities. Even for the higher tensile strength of the FSS 45DC (about 2,500 psi, or 17.3 MPa), this elastomer passes ASTM C 1305: Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane for crack bridging of an existing crack of >⅛ inch (3.2 mm) at -20° C (-4° F).

The Chemistry Magic of the Topcoat

Given that the basecoat is an aromatic polyurea system, which will show surface degradation and color change when exposed to sunlight over time, the aliphatic polyurea system is then required as a topcoat. For this, Water FX used the VersaFlex GelFlex 1115 system. This is the beauty in the black magic science of polyurea.

The GelFlex 1115 is a plural-component, 100 percent solids aliphatic polyurea. It is a 1:1 by volume product that is designed to process using the same equipment as was used for the basecoat, in this case the FSS 45DC. The topcoat product has good balance between elongation, tensile strength, and hardness, like the basecoat, and it also provides for an 85+ 60° gloss of the surface. This is possible due to the unique chemistry crosslinking that occurs and an even slower gel time (~1 min) of the system.

All of those qualities allow the GelFlex 1115 to chemically interact with the FSS 45DC basecoat, such that excellent chemical bonding occurs, creating a durable system.

Multiple-Step Science

It is not a single-reaction process but a multi-step interaction that provides for this type of success story. By using three coatings that interact together and form a system, Water FX was able to use the black magic of the polyurea technology. CP

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