While a vaccine development facility constructed at a warehouse site in an industrial park near the nation’s capital sounds like the perfect location for a Hollywood mystery/thriller film, this laboratory actually exists. The lab helps the National Institute of Allergy and Infectious Diseases (NIAID) study and improve prevention for a number of diseases and viruses including Avian Flu, HIV, and Ebola. In addition to developing vaccines for the myriad known and unknown viruses and illnesses, the facility includes areas for sterile fill/lyophilization (freeze-drying), filling and packaging, process utilities, and warehousing. The quality control labs and offices will eventually employ about 100 people.

The vaccine manufacturing area and corridors leading to these “clean rooms” encompass approximately 60,000 square feet, so careful consideration of a flooring choice was needed to provide the safe, clean environment required for successful production of these medicines.

Coatings on pharmaceutical plant floors must be thick enough to withstand the impact and subsequent abrasion of foot traffic and heavy lab equipment. NIAID has its share of lab gear — including 200- to 500-liter wheeled tanks with a weight of up to 2,000 pounds. The coatings crew from Maryland-based Durex Coverings had a cure for the clean room flooring.

Just what the doctor ordered? 85,000 sq. ft. of new concrete flooring in a pharmaceutical plant’s vaccine development facility was in need of a coating tough enough to withstand harsh conditions including heavy foot and equipment traffic, as well as corrosive spills and aggressive cleaning. The floor coating also needed to be colorful to help combat lab worker boredom. Fortunately, the coatings crew from Maryland-based Durex Coverings had a cure for the clean room flooring.

A coatings crew installs a pharmaceutical floor with a newer technology water-based urethane flooring system that allows for flexibility with construction schedules and guards against moisture vapor emission failure — and is available in a colorful alternative to drab lab grey.
range of a few hundred plus pounds — that move from lab to lab within the production sector of the facility.

Floor coatings must withstand a wide variety of harsh and corrosive spills since vaccine production involves a variety of media, including acids, oils, and solvents. Aggressive cleaning chemicals are used on these floors to keep them clean for safety as well as for periodic inspections. This means that the frequently cleaned floors must be slip-resistant.

Although this vaccine plant needs as sterile an environment as possible, the human element exists as well. In addition to durability and slip-resistance, the floors need to

Because there was no vapor barrier installed below the concrete slab-on-grade, there was a risk of moisture vapor emissions damaging the concrete as well as the coatings. In fact, the originally specified troweled epoxy mortar wouldn’t withstand the anticipated emissions. As a result, the owners went in search of a flooring system that could withstand high vapor pressures, ultimately deciding to use a decorative urethane slurry: General Polymers’ Bio-Flake Decorative Flooring System.

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**JOB at a GLANCE**

**VACCINE PILOT PLANT – FREDERICK, MD**

**PROJECT DETAILS:**
Provide seamless decorative pharmaceutical flooring using urethane slurry flooring system for 85,000 sq. ft. during construction of a vaccine pilot plant.

**FLOORING SERVICE CONTRACTOR:**
Durex Coverings
7381 Washington Blvd., Ste. 104
Elkridge, MD 21075
(410) 579-8770
www.durexcoverings.com

**PRIME CLIENT:**
National Institute of Allergy and Infectious Diseases (NIAID)
Office of Communications and Public Liaison
6610 Rockledge Dr., MSC 6612
Bethesda, MD 20892
(301) 496-5717
www3.niaid.nih.gov

**SIZE OF FLOORING/COATINGS CREW:**
6- to 8-man crew. Three or four were always present on the job during workdays.

**SUBSTRATE:**
New concrete deck

**SIZE:**
85,000 sq. ft.

**DURATION:**
Approximately one year. Flooring team had a few months of downtime while waiting for other trades to complete various tasks with the new construction.

**MATERIALS/PROJECT PROCESS:**
- Shot blast with a Blastrac walk-behind shot blaster to an aggressive profile similar to 40- to 60-grit sandpaper
- Rout and fill any cracks with a semi-rigid epoxy that is spackled down with a putty knife
- Hand-trowel the first coat with a urethane slurry system to 3/16” with a finish trowel and 9” spiked roller frame on a roller pole
- Hand-trowel down second coat to 12 to 14 mils with a pigmented epoxy
- Hand-broadcast the vinyl flake into the 3589 epoxy. Cure overnight
- Hand-trowel down seal coat with a 100% solids, two-component epoxy coating and binder resin. First lift of seal coat goes to 8 to 10 mils. A second lift of the seal coat is done the next day at 5 to 7 mils
- Mix with a low-speed standard electric drill a clear aggregate for slip resistance into a 100% solids aliphatic polyurethane enamel
- Hand-trowel and back roll mixture to 4 to 5 mils. Wait 24 hours to cure

**SAFETY CONSIDERATIONS:**
- Safety glasses, Moldex dust masks, steel-toed boots, hard hats, spiked shoes, and cloth gloves required
- Working with other trades required vigilance

**UNUSUAL FACTORS:**
- Floor had to withstand building environment “shock” that took place after the construction was closed in and HVAC in place. Initial layer on floors was put down prior to building being enclosed and finished after building was enclosed
- Newer technology flooring product recommended for project
- Crew did not have lighting or temperature control in the building in the early stages of construction project
be aesthetically pleasing. Studies have shown that adding color to sterile surroundings can help reduce mishaps and accidents by preventing employees from succumbing to “lab grey lethargy.”

Senior architect Peter Mehltretter of CH2M HILL/Lockwood Greene in Somerset, New Jersey, was the project architect, and he explains that when the original construction site for the vaccine plant became unavailable, the client found a spec developer who was beginning construction of a warehouse in an industrial park in Frederick, Maryland.

“The tenant fit-out was always going to be for vaccine manufacturing,” says Mehltretter. “Since the building wasn’t built yet, we were able to influence the original warehouse design to accommodate most of our special requirements.”

**Battling Moisture Vapor Emissions Failure**

Mehltretter and client, however, were not able to convince the building developer to install a vapor barrier below the concrete slab-on-grade. Without a vapor barrier, the originally specified troweled epoxy mortar could not withstand the anticipated vapor pressure.

“We had a choice to add a compatible vapor resistant subfloor system on top of the slab and then install the troweled epoxy,” Mehltretter says, “or find a new flooring system that achieved our design requirements while withstanding the higher vapor pressure. The most economical solution was to use a decorative urethane slurry.”

After meeting with the general contractor representatives from Rhode Island-based Gilbane Building Co., the Bio-Flake Decorative Flooring system from General Polymers, a Sherwin-Williams brand was recommended. The Bio-Flake system is comparable in price to a troweled decorative epoxy and has been around for about four years. According to Jim Hendley, Health Care Market manager for Sherwin-Williams in Cincinnati, Ohio, the well-known General Polymers’ FasTop S, a water-based urethane modified cementitious slurry mortar system, is a component of the Bio-Flake decorative system.

Hendley explains that Bio-Flake was developed in response to healthcare project schedules that were being compressed. He offers that in the past, contractors had been pressured to install resinous floors when moisture vapor emission readings were at higher than acceptable levels. In these instances, a separate moisture vapor emission remediation system had to be used.

“This created unanticipated project costs and delays,” Hendley says. “The Bio-Flake System is inherently moisture-vapor-emission tolerant and can be installed earlier in the construction cycle. Sherwin-Williams warrants against moisture vapor emission failure for this system.”

According to Hendley, other objectives in developing the Bio-Flake System were quick installation, very low odor during installation, and excellent aesthetics. The Bio-Flake System can also be installed over “green” concrete.

He adds, “The system is made up of 100 percent solids and water-based components, resulting in minimal disruption of the other trades on new construction or operations during retrofit projects. Utilization of ultraviolet (UV) stable finishes helps the system maintain its good looks for a long time.”

The Bio-Flake Decorative Flooring system specified for this project involved a multi-step installation process: General Polymers FasTop S Urethane Slurry System, a low odor, self-leveling slurry; General Polymers 3589 Smooth Epoxy Floor Coating, a pigmented epoxy that is packaged in two liquid components (A and B) as well as vinyl flake (Bio-Flake) hand broadcast into the 3589 epoxy; two coats of General Polymers 3744 High Performance CR Epoxy, a 100 percent solids, two-component epoxy coating and binder resin, which is a chemical-resistant epoxy; and a final coat of General Polymers 4685 (Poly-Cote), a 100 percent solids aliphatic polyurethane enamel along with the addition of General Polymers 5190 Non-Skid Additive, a clear aggregate for slip resistance.

**Function With Flair**

Gilbane Building Co. and Sherwin-Williams called on Durex Coverings in Elkridge, Maryland, for its expertise in decorative flooring.
Kevin DeCarlo, division manager of the Maryland branch, explains that Durex Coverings has been involved with decorative flooring since 1970.

“The FasTop system is a stand-alone industrial system, and we’ve been doing FasTop for quite a while,” he says. “But, it’s a completely different animal with this new product. What General Polymers has done is taken a functional floor to a decorative floor.”

Given the busy construction schedule and the presence of other trades, the Durex crew would have to suspend their work once they had installed the flooring system’s base lift. According to the work schedule, after the base coat had cured, another trade would install metal tracks on top of the floor, inserting white PVC modular wall panels into the tracks to create the clean room walls. When the walls were in place, the coating crew could return and finish the floor.

“Normally, the flooring contractor puts a floor down and has to protect it from the other trades and work being done,” says Hendley. “With the Bio-Flake System, the surface prep and primary layer can be installed and left until the other trades are finished with their work. Later, the decorative layer and finish coats can be completed.”

He adds, “That’s a big deal because we didn’t have to worry about protection of the floor. There won’t be any problem with damage to the primary coat – it’s a tough floor.”

With the walls installed, the Durex crew returned to continue installing the floor system. A four-inch contiguous cove base integral with the flooring had to be installed as part of the urethane slurry as there could be no cracks or crevices for bacteria to collect and grow. This step called for caution because the clean room PVC panels had to remain clean of any coatings products. So, before they could resume the flooring installation, the coatings crew carefully shrouded the panels with plastic sheeting and painter’s tape.

The next steps in the floor’s installation process were designed to combat “drab lab grey,” which can lull even the most dedicated scientists into a stupor. Architect Mehltretter explains that he and the facility’s owners were looking for ways to infuse some color in the expanse of whites and grays.

“We were unable to get a non-standard color in the metal trim around the doors because of the tight construction schedule,” he says. “At this point, we had 40,000 square feet of snow-white walls, ceilings, and doors, grey painted door trim, and grey stainless steel equipment. The flooring was the only remaining opportunity to provide color. Luckily, the owner selected Tropical Blue, the most colorful recommendation. They liked it so much they even upgraded all of the utility rooms from water-based epoxy paint to the more expensive decorative urethane slurry.”

Project Details

The project, which for the three- or four-man floor crew led by 25-year Durex Coverings veteran, Dwayne Wilson, began in late 2004. Ultimately, the project increased to a total of 85,000 square feet of seamless, decorative pharmaceutical and warehouse flooring using the Bio-Flake system. Workdays were Monday to Friday from 7 a.m. to 3:30 p.m. The crew worked some weekends when necessary but also had a few months of downtime while waiting for other trades to complete various tasks with the new construction.

“We were contracted for 60,000 square feet by Gilbane to use General Polymers’ Bio-Flake,” says DeCarlo. “Once that was installed, the owner liked it so much, he contracted us directly for another 25,000 square feet.”

According to DeCarlo, a total of 2,450 units of the Bio-Flake product system was needed for the 85,000-square-foot project, which consisted mainly of 800 to 1,000 square foot rooms as well as long corridors about eight feet wide.

He explains one of the main benefits of the system. “For the generic epoxy flooring industry, moisture vapor transmission is a major problem. Because our floors are seamless, depending on atmospheric conditions and moisture from the ground, if hydrostatic pressure pushes up from the ground, it disbands or blisters the epoxy floors — there’s nowhere for the moisture to go.”
DeCarlo adds, “There are a number of moisture vapor mitigation systems, but these are used in addition to the epoxy systems installers put down, which means basically, they have two systems now. More time, money, and labor are involved.”

**Getting Started…**

**And Started, Again**

One of the challenges for the Durex Coverings crew was working around other trades, but DeCarlo credits Gilbane Building’s Wayne Bishop for keeping him updated on the progress of other trades and on working hard to accommodate the Durex Coverings crew.

Because of the amount of square footage to be completed in various areas of the building and around the different trades, the flooring schedule was a sporadic one. According to DeCarlo, about 25 percent of the year-long project was spent on installing the base coat, which went on (and off) for a couple months.

“If we worked north to south, we went back to north to finish,” he says. “We finished the original 60,000 square feet completely and then began the additional 25,000.”

This is not to say the Durex Coverings crew was standing around waiting. Actually, with a five-phase coating system and surface prep to boot, the crew’s chore chart was always full. Lead foreman Wilson must have needed a scorecard to keep track of his players in the various zones.

“We were always working on some area,” says DeCarlo. “If Step Two was finished and waiting to cure, we had another step of the process in another area to work on.”

**Hand Crafted**

The only aspect of this project that was not completed by human hands occurred prior to the installation when the Durex crew used two Blastrac walk-behind Shot Blasters on the concrete to achieve an aggressive profile similar to 40 to 60-grit sandpaper. They then routed and filled cracks with General Polymers 3552 EPO-FLEX Flexible Epoxy Membrane, a semi-rigid epoxy that was spackled down with a putty knife.

While the Bio-Flake system can be sprayed down, the Durex Coverings crew chose to install the five steps by hand for what they felt offered better control of the result. The first coat of General Polymers FasTop S Urethane Slurry System was hand-troweled to three-sixteenths-inch with a Bon Tool Co. 12-inch hand trowel and Duron nine-inch spiked roller frame mounted on a roller pole.

A four-inch cove base using the General Polymers 3589 Smooth Epoxy Floor coating and hand-broadcasted vinyl flake was installed in the rooms and corridors after the FasTop S was put down.

A second coat using the same product as the cove base was hand-troweled down on the floors to 12 to 14 mils, and then vinyl flake was broadcast by hand into the 3589 epoxy and allowed to cure overnight. Again, this phase went as sporadically as the primary layer — on and off for a few months — but the Durex Coverings crew still had plenty to do.

The next step involved General Polymers 3744 High Performance CR Epoxy, a 100 percent solids, two-component epoxy coating and binder resin, which is a chemical-resistant epoxy and is considered the seal coat. The first lift of seal coat is hand-troweled down to eight to 10 mils and a second lift of the seal coat is done the next day at five to seven mils.

With respect to the slip resistance feature, the client was given a number of physical samples showing the variety of textures available, and they chose a medium texture. General Polymers 5190 Non Skid Additive, a clear aggregate for slip resistance, was mixed into the General Polymers 4685 (Poly-Cote), a 100 percent solids aliphatic polyurethane enamel using a low-speed standard electric drill attached to a Jiffy Mixer.

The final step was to hand-trowel, then back roll with a loop roller to assist leveling to four to five mils with General Polymers 4685 (Poly-Cote) and General Polymers 5190 mixture. The surface was then allowed to cure for 24 hours.

**Safe Handling**

Eye protection and dust masks were the most critical pieces of personal protective equipment for this project, according to DeCarlo. The crew donned Moldex-type dust masks when sanding or blasting. They also wore steel-toed boots, hard hats, spiked shoes when working the decorative portion of the floor, and cloth gloves for mixing.

The technical bulletin for the FasTop calls for clean-up with xylene, a clear, light-colored or colorless, flammable liquid that evaporates quickly. Xylene is also called “xylol,” “dimethylben-
“zene,” or “mixed xylenes.” The experienced Durex Coverings crew wore fresh gloves and respirators when working with the xylene. They also used denatured alcohol for clean-up.

**Conditioned Response**

The flooring went through a somewhat unexpected test of its properties during construction. When the flooring crew started in the fall of 2004, the general contractor had yet to “close in” the building. When the GC did finish the building in the spring of 2005, the change in atmosphere and environment “shocked” the building and changed the approach for the remainder of the floor installation.

“We began the project early, and we didn’t have temperature control or lighting,” says DeCarlo. “We went through the fall and winter of 2004 and spring of 2005 with outside temperatures, but once the building was closed in, it shocked the building.”

Shocking indeed, as the Durex Coverings crew was curious to see if the Bio-Flake system would stand up to the drastic change in environmental conditions. De Carlo explains that if it was a true epoxy floor and the building went through a shock like this, a true epoxy might disbond.

“This urethane floor acts more like concrete and didn’t have bond issues. The Bio-Flake product has a similar coefficient of expansion to concrete,” he says. “It went through its condition cycle and came through with flying colors.”

Hendley adds, “What we’ve found is that these floors typically lose their aesthetics before they lose functionality. When it becomes necessary to restore the original look, it can be re-broadcast with minimal disruption to operations and it’s ready to go again.”

A year later, the colorful Tropical Blue Bio-Flake floor continues to provide a safe and bold stage for the scientists and staff at the vaccine pilot plant. And, while they aren’t actually developing the vaccines necessary to combat and cure the serious and scary viruses threatening the world today, the coatings crew from Durex played a large role in the protective process — literally from the ground up. CP

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**Although the Bio-Flake System can be spray-applied, the Durex crew installed the system by hand in order to better control the results. The first coat, General Polymers’ FasTop S Urethane Slurry System was applied at \( \frac{3}{16} \)” thick. Next, the crew installed a 4” base cove of General Polymers’ 3598 Smooth Epoxy Floor coating, followed by a hand-broadcast of vinyl flake.**

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**Studies have shown that adding color to the sterile surrounding can help reduce mishaps and accidents by preventing employees from succumbing to “lab grey lethargy.”**

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**VENDOR TEAM**

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www.blastrac.com

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Gibsonia, PA 15044
(800) 444-7060
www.bontool.com

**DURON PAINTS & WALLCOVERINGS**
9” spiked roller frame and roller pole
10406 Tucker Street
Beltville, MD 20705
(800) 723-8766
www.duron.com

**GENERAL POLYMERS**
Urethane slurry flooring system
145 Caldwell Drive
Cincinnati, OH 45216
(800) 543-7694
www.generalpolymers.com

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Warsaw, IN 46580
(800) 815-7253
www.midwestrake.com

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Frankfort, NY 13340
(800) 631-1246
www.northernsafety.com