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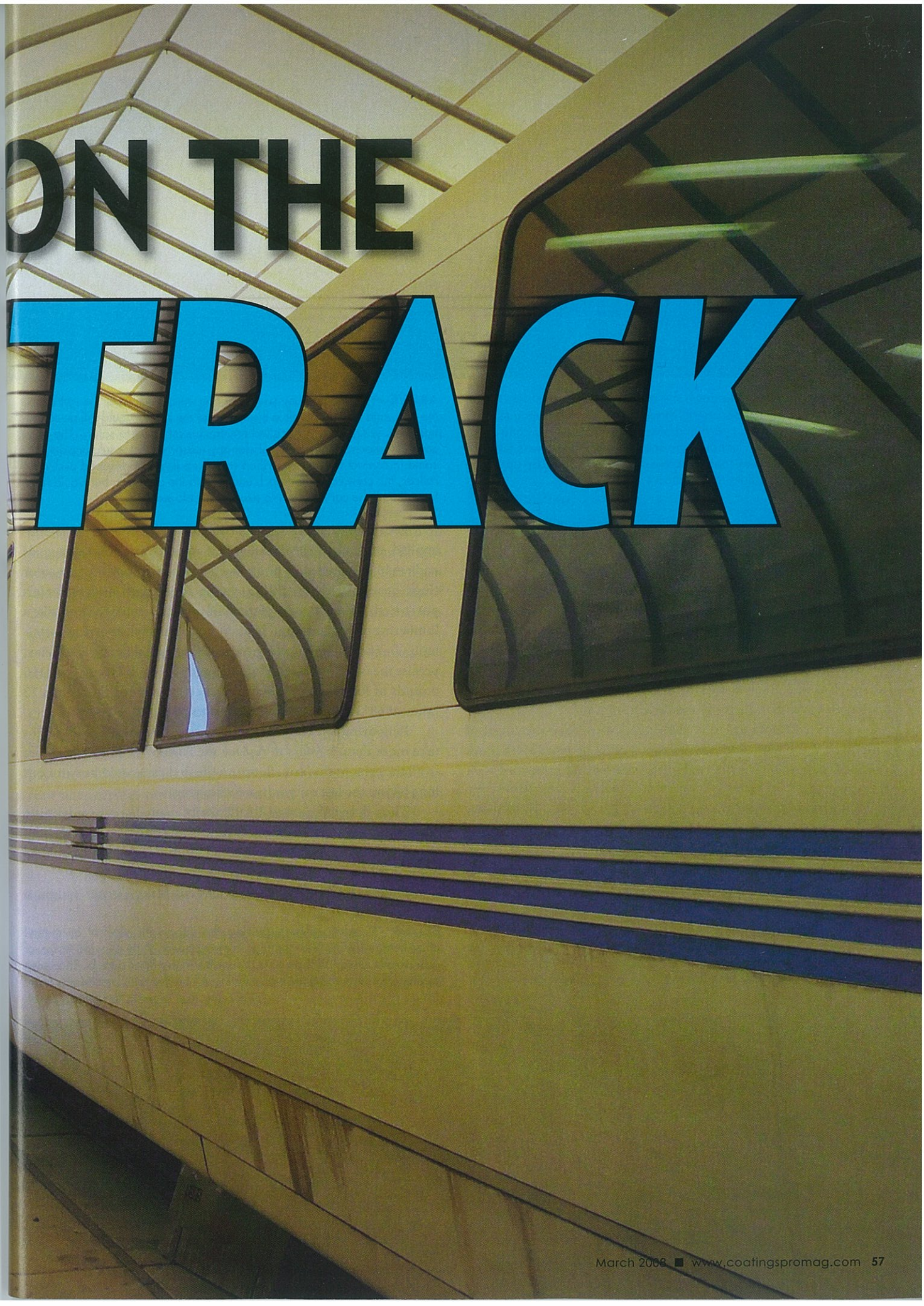
INTUMESCENTS FAST

BY JACK INNIS

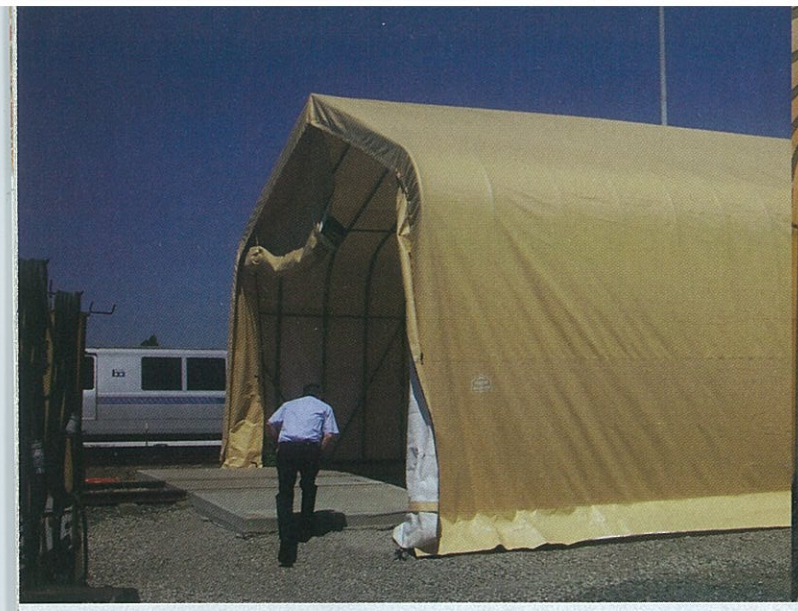
For more than 30 years, the Bay Area Rapid Transit (BART) rail system has provided San Francisco residents and visitors with fast, reliable connections between downtown, Oakland, Berkeley, Fremont, and outlying cities.

The 104-mile-long electric rail system generally makes full use of nearly 850 cars that snake upon the surface, along aerial tracks, and through more than 35 miles of subways, tunnels, and underwater tubes.

To the 100,000,000 riders who head to downtown offices, shopping centers, and tourist attractions every year, timeliness is everything. But few riders know that the trains run safely and on time, largely because of an extraordinary effort from a polyurea manufacturer and a coatings company who are providing timely application of a 100-mil, intumescent polyurea flooring system!



ON THE TRACK



ABOVE ▲ Since shutting down the BART system was not an option, the transit authority temporarily diverted a pair of rail spurs into a far corner of the bustling rail yard and blacktopped the surrounding area. Next, they built a 150' tent over the spurs. Diverting two cars onto the side spurs at a time, the coatings crew could begin to spray-apply the intumescent coatings onto the car floors.

NEXT STOP: COATINGS INSTEAD OF CARPETING

BART trains, ranging from three to 10 cars, typically whisk into one of the system's 43 stations without much time to spare. Doors open automatically. Up to 150 passengers jostle to find standing room in each car. Doors close and the trains depart at 15-minute intervals.

Passengers hate missed connections almost as much as BART system operators hate to be late. But BART operators recently found themselves in a pinch and didn't know where to turn. Luckily, the polyurea coatings industry found them a solution.

Carpeted floors in BART passenger car were in dire need of attention. Local television news transportation reporter Mark Jones derided them to viewers as "old, dirty, stained and imbedded with chewing gum."

However, due to stringent legislation enacted as the result of a fatal fire in one of the tubes several years ago, the worn out carpet could not be easily replaced. Operators would have to find a fire-resistant flooring system that could stand up to water, dirt, and the constant grinding and shuffling of feet.

ABOVE ▲ Although they were working on a side track, the rail spurs, the cars, and the third track in the middle of the spurs, would still be electrified with 1,000 volts. This called for precise attention to safety. The crew could not reach under the railcars for any reason as they could accidentally come in contact with an electrified rail. Even if a tool dropped under the railcar, the crew could not reach underneath the car for it, but would have to wait until the car moved. No exceptions. No excuses.

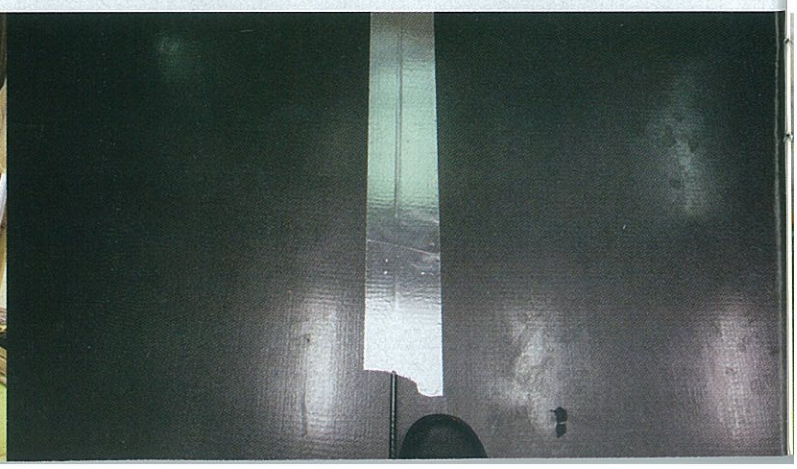
BART management thought they found a solution in a glue-applied, rubberized sheet system that achieved fire resistance goals and could be installed in-house by maintenance crews. A two-color floor design, with speckles, was decided upon and materials purchased. But the floor replacement project seemed to crawl like a lumbering old freight train. In addition to painstakingly slow installation — including unrolling the sheeting and allowing it to relax, precise measuring and cutting, and hand rolling the seams with 100 pounds of force — the rubberized sheeting needed more than 72 hours at 68° F (plus or minus 5°) just to cure.

Reflooring one car every week or two, officials feared it might take more than 15 years to replace the 70-foot by nine-foot floors in all the cars. At this rate, floors on the first cars could be worn out long before the last car got its new flooring.

Time dragged on and BART maintenance crews, sidelining several cars at a time, managed to replace the floors on 80 cars — all the while looking for a better flooring solution -- one that could be applied at Mach 10 speed.

Finally, BART shop superintendent Mike Turner caught a

BELOW ▼ Before the coatings crew arrived on the scene, BART maintenance workers removed the seats and old carpet from the railcars. Then the coatings prep crew took over. First, they vacuumed and solvent-washed the car's floor to remove any carpet glue residue.



BELOW ▼ After solvent-washing the floor with alcohol or methyl ethyl ketone (MEK), the coatings crew applied 2" to 4" wide strips of adhesive-backed foil tape over the seams in the floor panels. They also applied the tape onto copings running 6" up the cars' walls.

ABOVE ▲ It's not surprising that a coatings project on a rail system known for efficiency had to run like clock-work. It took a 10-man crew to coat an average of six cars a week. For each car, the crew cleaned the floor, sprayed the coatings, unmasked the car, and returned it to BART — all within 36 hours.

break. While discussing another project's roofing needs with an independent coatings representative, Kyle Flannigan of San Diego-based Flannigan Corp., the subject of flooring came up. Flannigan told Turner he ought to contact Canada-based Quantum Group of Companies, which recently merged their fire protection coatings and polyurea divisions.

"We have the highest standards in the nation for smoke, fire, and toxicity," Turner told Quantum. "Can you help?"

RAILROAD CROSSING: PUBLIC SAFETY & COATINGS

Back in 2005, Quantum Group combined their polyurea and fire-resistant coatings businesses and ramped up efforts to integrate their two technologies. They had already supplied fire-resistant polyurea for a petroleum company pumping station containment system when Turner called.

"By late 2005 we finally got to a point where, using ASTM E84 standard test methods, we could get a flame spread classification of

BELOW ▼ Once the floors were cleaned and taped, the crew used 3" disposable brushes and 9" synthetic rollers with ½" nap, to apply one coat of Quantum's Precidium System P-180, a two-component urethane primer. The project specifications called for the primer to be applied at three to four mils (WFT).

JOB AT A GLANCE

PROJECT:

Install intumescent coatings on floors in California's Bay Area Rapid Transit (BART) Cars

COATINGS CONTRACTOR:

A team of coatings professionals assembled by
Quantum Technical Services Ltd.
14601 - 134 Avenue
Edmonton, AB, Canada T5L 4S9
(780) 454-9166
www.quantumcoatings.com, and

Innovative Painting and Waterproofing Inc.
250 N. Orange Ave.
Brea, CA 92821
(714) 257-0200
www.waterproofingcontractor.com

SIZE OF CONTRACTOR:

A 10-man crew worked this project

PRIME CLIENT:

Bay Area Rapid Transit (BART) District
P.O. Box 12688
Oakland, CA 94604-2688
(510) 465-2278
www.bart.gov

SUBSTRATE:

Steel or fiberglass over balsa or honeycomb floors

SUBSTRATE CONDITION:

Good

SIZE:

About 120,000 sq. ft.

DURATION:

10 months

UNUSUAL FACTORS:

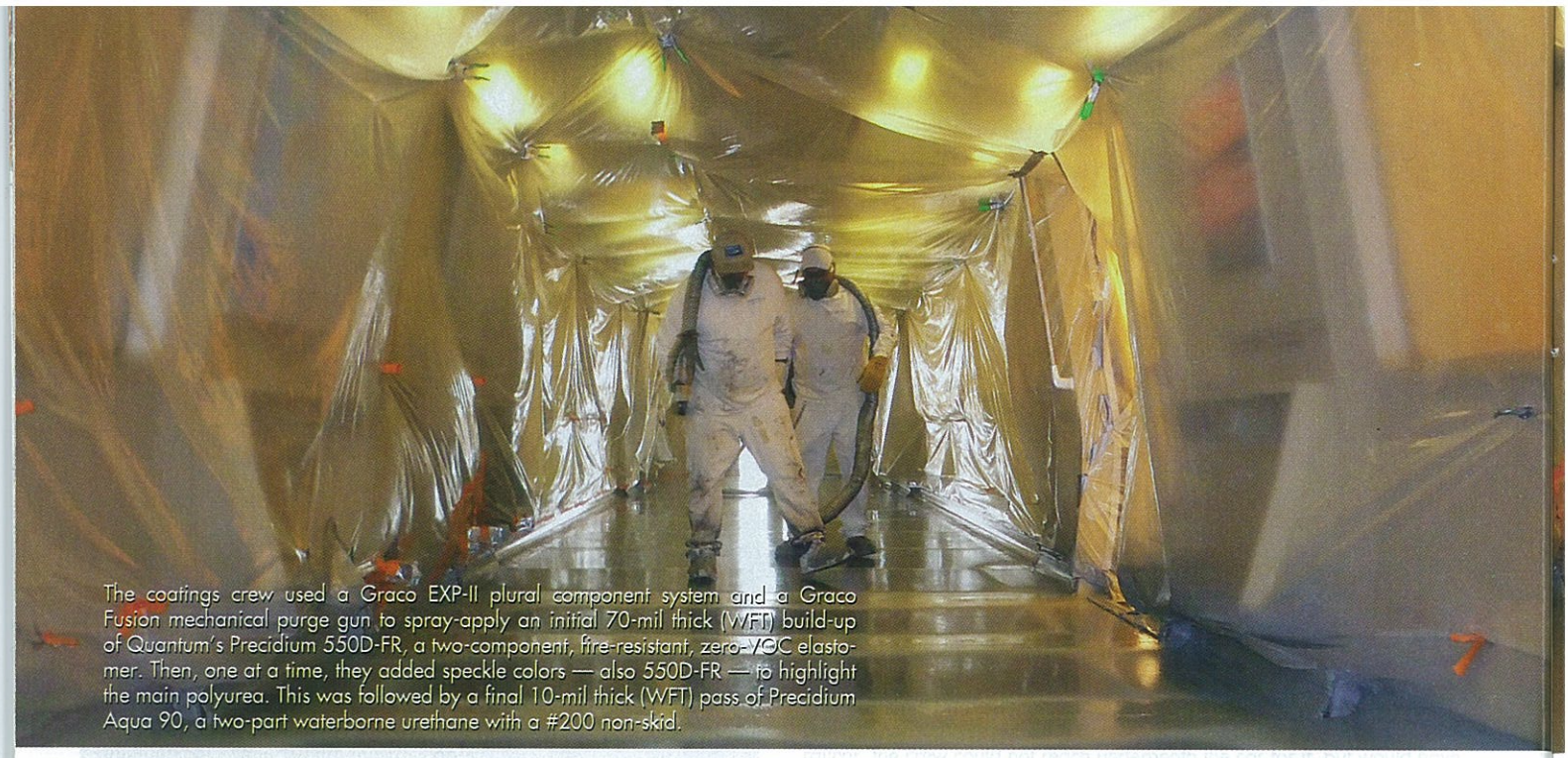
- Coatings contractor and supplier performed a great deal of work on spec in hope of landing contract
- Coatings contractor and supplier supplied coatings crew
- Coatings contractor had to develop method to apply speckled paint
- Coatings system has to be able to wear without losing speckles

MATERIALS/PROCESS:

- Remove carpet adhesive
- Apply metal fabric-backed tape to cover seams in floor panels
- Spray-apply a single coat of Quantum Precidium System P-180 primer to 3-4 mils (WFT)
- Spray-apply 70-mil base coat of Precidium 550D-FR fire-resistant elastomer in two passes
- Build up an additional 25 mils of 550D-FR in varying colors using a proprietary application apparatus and procedure
- Spray-apply 10 mils (WFT) of Precidium Aqua 90 urethane with non-skid in one pass

SAFETY CONSIDERATIONS:

- Working in busy rail yard required safety meetings and diligence
- Working near 1,000 volts of electricity required knowledge and precaution



The coatings crew used a Graco EXP-II plural component system and a Graco Fusion mechanical purge gun to spray-apply an initial 70-mil thick (WFT) build-up of Quantum's Precidium 550D-FR, a two-component, fire-resistant, zero-VOC elastomer. Then, one at a time, they added speckle colors — also 550D-FR — to highlight the main polyurea. This was followed by a final 10-mil thick (WFT) pass of Precidium Aqua 90, a two-part waterborne urethane with a #200 non-skid.

25 or less and a smoke developed classification of 115 on a straight polyurea panel," says Quantum Group of Companies President Tony La Grange. By way of comparison, some polyurea coatings have flame spread rates between 150 and 200 and smoke developed classifications between 300 and 500. Lower is definitely better for these numbers.

"We had done some marketing and a few installations when we heard BART was looking at ways to minimize the turnaround time for re-flooring their cars," La Grange says.

La Grange knew his company could formulate a highly durable intumescent coating and prove its durability to BART management. But he also knew he needed an alliance with someone who could perform significant work up front — in hope of landing a fairly large contract down the road. He called upon California-based Innovative Painting and Waterproofing, Inc., known for work on high-profile projects such as Dodger Stadium and Universal Studios.

Together, Quantum and Innovative performed a series of tests, including installing the intumescent polyurea system in several cars on a trial basis, and ultimately satisfied BART on fire, wear, and — most importantly — installation performance.

But as anyone in the rail industry will tell you, trains do not always run in a straight line.

COLOR MATCHING DETOUR

Moments before inking a contract to install fire-resistant polyurea coating systems on 192 cars, BART dropped the "A" word — "A" as in aesthetics.

Prior to embarking on their rubberized floor detour, BART had commissioned a somewhat pricey study to come up with a color scheme. The two-color floors (a medium gray field, 38-inch tan stripe down the center, and color-coordinated speckles) were specifically designed to subliminally entice riders toward the center of the cars, which would facilitate loading and unloading of passengers. Now, with 80 cars already sporting the colors, BART wanted to know if Quantum and Innovative could tweak their high-tech formula to match the decidedly old-school rubber floor colors.

Innovative President Don Dancey knew the request was not as benign as it seemed.

"You have to think about the surface you're trying to duplicate and how they manufacture it," Dancey says about the rubber flooring. "Imagine dry bags of 1/8-inch round pebbles of rubber: 92 percent one color and the rest varying percentages of colors that will become speckles. You run them all through a hydraulic press to mash and fuse them together. The speckles go all the way through the rubber. As the floor wears down, the speckles remain."

While Quantum tackled color matching, Innovative needed to come up with a technique to deep-seat the speckles so they would last the life of the floor.

A couple months later, they had what they wanted. Armed with the appropriate colors and procedures, it was time to set the wheels in motion.

JOBSITE SIDETRACKED!

Sometimes being on a sidetrack is a good thing. Such was the case when the coatings crew first saw their job site.

At a far corner of a very busy rail yard, BART temporarily ceded a pair of rail spurs to the coatings project. They erected a 150-foot tent — long enough to cover a pair of cars — and even blacktopped the adjacent area to provide better access. The first order of business was a series of safety meetings.

"There are specific safety issues at an active train yard," says Dancey. "Here they have, on average, 75 cars moving around on different lines for maintenance such as brake and axle repair. It's like an airport with a 10-story building with a control tower on top. We're in constant radio contact with the tower to make sure they know where we are, and that if they're moving something, we're not in the wrong place."

In addition, BART cars run on 1,000 volts of electricity fed

This unique application called for a unique approach. Innovative's president Dancey explains, "We use mechanical purge guns because they have a different tip assembly that gives you a nice fan, instead of a cone, like an airless tip. The fan tip really double slams the material together to get a good mix. Normally the components slam in the mix chamber and go into a little cavity. But when forced into a fan pattern, it mixes a second time."

through a third rail. The spurs and cars slated for flooring would be hot, as would the third track. Since access to the cars is through doors on the opposite side of the third rail, there was only one rule to obey: Do not reach under the car for any reason!

"If you drop a tool at the foot of the door, leave it until the car moves," says Dancey. "By reaching underneath, you could accidentally grab an electrical control bus and turn into a French fry."

FINDING TRACTION: SPRAY GUNS AT THE READY

Using a 10-man crew comprised of trained polyurea coatings professionals provided chiefly by Quantum, the BART flooring replacement project finally found traction.

"In a nutshell, we do the prep and spray coating, unmask the car completely, and return the car to BART 36 hours later," says Dancey, who hopes the current 192-car contract will someday be expanded to cover the rest of the fleet. "We're doing six cars a week." That's much better than the previous rate of one car every few weeks.

As with most coatings projects, the process is more complicated than can be conveyed in a brief description.

The polyurea crew is divided into two five-man units. The prep crew works five eight-hour shifts. The spray crew works four 10-hour shifts so they overlap.

"The prep crew gets in on Monday, preps two cars, masks them, and then primes them," Dancey says. "The second day, typically Tuesday, the spray crew lays down the polyurea and the speckle coats in multiple colors. At the same time, the prep crew is doing two more cars. We're there five days a week."

After BART maintenance workers remove seats and old carpet, the prep crew vacuums and solvent washes to remove traces of carpet glue. Depending upon the type of carpet adhesive used — and there have been many over the decades — the crew uses MEK, alcohol, or other solvent.

ABOVE ▲ Creating a speckled polyurea formula is quite a feat. And in this case, it is a proprietary application process and procedure. We can report, however, that the stripe in the center of the floor was created by masking off the gray center of the floor, building up the non-masked areas, and then reversing the mask to fill in the beige.

ABOVE ▲ The BART car floors feature a two-color scheme — a medium gray field with a 38" tan stripe down the center, and color-coordinated speckles — that was specifically designed to subliminally draw passengers in toward the center of the cars. This helps to facilitate loading and unloading, especially during rush hour.

To create a monolithic floor, the crew applies two- or four-inch adhesive-backed foil tape to cover seams in floor panels and copings that run six inches up the cars' walls. Using disposable three-inch brushes and nine-inch synthetic rollers with ½-inch nap, the prep crew applies a single coat of Quantum Precidium System P-180 two-component urethane primer at three to four mils (WFT).

Then, the 100-mil polyurea coating system — Quantum's Precidium 550D-FR two-component, fire-resistant, zero-VOC elastomer — is applied with a Graco EXP-II plural component system feeding a Graco Fusion mechanical purge gun.

"We use mechanical purge guns because they have a different tip assembly that gives you a nice fan, instead of a cone, like an airless tip," says Dancey. "The fan tip really double slams the material together to get a good mix. Normally the components slam in the mix chamber and go into a little cavity. But when forced into a fan pattern, it mixes a second time."

The BART polyurea flooring system application is all about multiple passes.

After an initial 70-mil polyurea course build up in two passes, they add three speckle colors (also 550D-FR), one at a time, using a proprietary application apparatus and procedure. Blue, cream, and charcoal speckles accent the gray field. Brick red, light gray, and cream-colored speckles provide highlights on the beige. The 38-inch wide stripe in the center of the car is kept level (after the initial 70-mil application) by masking off the gray center of the floor, building up the non-masked areas, and reversing the mask to fill in the beige.

Finally, the floors receive 10 mils (WFT) of Precidium Aqua 90, a two-part waterborne urethane with # 200 non-skid added in the coating by Quantum. The Aqua 90 is applied with one pass of a Graco 1595 Airless applied with a 5-17 tip.

Now with the project clipping along at a much-improved rate of six cars per week, Quantum and Innovative hope to stay involved as BART addresses the rest of the cars in its fleet.

"It's a minimum 10 month project and if we're lucky, it's a four and a half year project," says Dancey.

La Grange and Dancey both know that the polyurea flooring will stay adhered, wear well, look great, and — in case of an emergency — provide excellent resistance to flame spread and smoke development.

Thanks to great local media coverage, BART passengers are aware that the new flooring is a critical safety upgrade.

"This new flooring could save your life," transportation reporter Jones told viewers. "It won't burn, smoke, or let loose toxic fumes."

Just the ticket for busy San Francisco commuters and tourists! **CP**

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