Special Report: Passenger Rail Trends
PAGE 24

Are You Getting the Most Out of Your **Safety Training**?
PAGE 28

BRT Stations Offer More Than What Meets the Eye
PAGE 32

MASS TRANSIT

BEST PRACTICES FOR INTEGRATED MOBILITY

Mid-Coast Corridor Program Delivered with a Project-First Mentality

UC SAN DIEGO BLUE LINE TROLLEY

Developing a project culture that valued safety and solutions helped Mid-Coast Transit Constructors deliver one of the largest infrastructure programs to the San Diego region. PAGE 12

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Contents JUNE 2022

12
Mid-Coast Corridor Program Delivered with a Project-First Mentality

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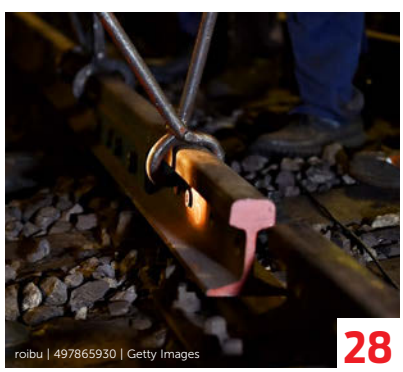
Developing a project culture that valued safety and solutions helped Mid-Coast Transit Constructors deliver one of the largest infrastructure programs to the San Diego region.



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28

32

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FEATURES

DEPARTMENTS

ONLINE EXCLUSIVES

Transportation Technology
Center continues its evolution into innovation hub for rail and ground transportation

▶ The FRA facility, under a new management contract with ENSCO, is maintaining its focus on rail research while expanding its services to more surface transportation modes.
MassTransitmag.com/21267736

85-35193 | Eddie Toro | Dreamstime

Best Practices: How to build
resilience into electric bus plans

▶ Without energy resilience complementing electric fleets, transit agencies risk disrupting service continuity during adverse weather events.
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Drug Use Has No Place on Transit

Of the myriad of societal challenges transit systems must face, this one threatens the prosperity of communities, systems, riders and customers.

Over the past few months, my inbox has received an increasing number of local news stories regarding open drug use on public transit vehicles and property. Headlines asked if buses were becoming the new drug dens and one transit hub was called a "lawless hellhole," a bit salacious, but effective in drawing attention. These stories have been arriving from major urban areas and from across North America. As with homelessness, mental health and human trafficking – many of which have strong links to drug use – another one of society's big, menacing challenges is being spotlighted in the transit industry with the looming question of 'what can be done?'.

The safety concerns directly impact both customers and operators. For customers who may be coming back to hybrid work schedules, trying to save money or make a more climate friendly choice by taking transit, the real or perceived threat of witnessing drug use is enough to tarnish the value a transit system brings to a community. And for transit-dependent customers, is this the travel environment they deserve? As systems work to increase access to marginalized communities, there shouldn't be an asterisk associated with this access, especially when it comes to a feeling of personal safety.

Transit operators, many of whom have worked through the pandemic and are the main interface point between riders and the system, have their own set of safety concerns. The industry is aware of raising assaults on operators over simple things such as paying a fare but add in a variable such as drug use and the situation has greater potential to become volatile. These situations also add a new layer to the recruitment challenges faced by the industry.

If this environment allows a harmful cycle to perpetuate – however unintentional it may be – an obligation exists to change the environment.

And finally, there is a dis-service to those gripped by addiction, as well. This industry believes transit is an environment for all, and the access provided is meant to connect people to what is needed by way of jobs, education, time with friends and family and much more. If this environment allows a harmful cycle to perpetuate – however unintentional it may be – an obligation exists to change the environment.

Solutions will need to be varied and will require support and partnerships from municipal and state leaders. The industry will need the services of trained social workers, addiction experts, as well as intervention from law enforcement. It bears mentioning that on this last element, there seems to be recognition within the industry that this isn't a problem that will be solved with a certain number of arrests. The suite of solutions will also need to empower both riders and operators. This could be through anonymous reporting platforms or a dedicated social media account, if it is monitored and there is a clear path of action for when a report arrives.

The industry needs to find a way to enhance personal safety if it is to reach its full potential post-pandemic and deliver on its goals to better connect people to where they want to go.

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A RENDERING of an aerial view of the future Los Angeles Union Station.

L.A. Metro, CHSRA Board finalize $423.34 million Link Union Station agreement

The California High-Speed Rail Authority (CHSRA) Board of Directors approved a multi-million-dollar project management and funding agreement with Los Angeles Metropolitan Transportation Authority to modernize the historic LA Union Station through the Link Union Station (Link US) project. The Link US project will allow trains to enter and exit from both the north and south ends of the station, which will increase capacity for rail service and reduce train idling times. Additionally, the project will improve connections between Metrolink, Metro Rail and bus services. The project will also accommodate future high-speed rail service and includes a new expanded passageway under the tracks and new platforms, escalators and elevators.

MassTransitmag.com/21265884

APTA honors 2022 Bus Safety & Security Excellence Award winners at Mobility Conference

▶ The American Public Transportation Association (APTA) honored its APTA Bus and Rail Safety & Security Excellence Awards winners on May 3. The awards recognize public transit providers for their innovative and proactive safety and security programs. These awards help to build the industry by benchmarking successful initiatives so other systems can implement and fine-tune their programs based on the findings of their peers. The Safety Excellence awards included Gold Winners Société de Transport de Montreal and Metrolinx (GO Transit); Indianapolis Public Transportation Corporation was recognized with a Certificate of Merit. The Security Excellence awards included Gold Winner OmniTrans and Certificate of Merit Winner Corpus Christi Regional Transportation Authority.

MassTransitmag.com/21266541

Fair Transit South Cook pilot labeled a success in first annual report

▶ Partners in the first year of the Fair Transit South Cook pilot program have called the initiative a success as they look toward two more years of the program. The three-year pilot program began in January 2021 and is designed to improve transit service and reduce costs for riders on the south side of Chicago, south suburban Cook County and north Will County. The program is funded by Cook County with regional partners Metra, Pace and the Regional Transportation Authority. Fair Transit South Cook offers discounted fares of 50 percent on Metra Electric and Rock Island lines and increased service on Pace's 352 Halsted route by 25 percent. The program is targeted to areas where the transportation costs as a percentage of income is considered "very high" and where more than 30 percent of households have an average commute length of more than 60 minutes. Findings during the first year of the program include riders reporting they are taking Metra Electric/Rock Island lines more often because of reduced fares and lower-income neighborhoods are benefitting the most from the fare reductions on Metra Electric, among other results.

MassTransitmag.com/21266728

OCTAVIA SAFFOLD offered a testimonial of the positive impact the Fair Transit South Cook pilot program has had on her life.

USDOT launches $6.4 billion Carbon Reduction Program

▶ The U.S. Department of Transportation's (USDOT) Federal Highway Administration launched the new Carbon Reduction Program (CRP) on April 21 that will provide $6.4 billion in formula funding for states and localities over five years. The funds can be used to expand transportation options and help states develop carbon reduction strategies. Projects eligible for the funds range from traffic monitoring and management, active transportation, public transportation, intelligent transportation systems such as vehicle-to-infrastructure communications equipment, street lighting replacement, congestion pricing support, deployment of alternative fuels, among others. Additionally, any project eligible under the Surface Transportation Block Grant program can use CRP funds if the USDOT secretary has certified that the state has demonstrated a reduction in transportation emissions both on a per capita basis, as well as a per unit of economic output.

MassTransitmag.com/21265178

Continued ▶

People in the News

Charles Stewart

St. Louis Metro Transit

Charles Stewart was appointed by the Bi-State Development to be executive director of St. Louis Metro Transit. Stewart has served as interim executive director since Jan. 26, 2022. He is responsible for overseeing the day-to-day transit operations of MetroLink, MetroBus and the Metro Call-A-Ride paratransit system.

MassTransitmag.com/21265691

Richard W. Andreski

Trinity Metro

Richard W. Andreski has been named president and CEO of Trinity Metro. Andreski is a public transportation veteran with 23 years of experience and more than 10 years of executive leadership. He previously served as the bureau chief for public transportation at the Connecticut Department of Transportation since 2015.

MassTransitmag.com/21265521

Cheri Holsclaw

Morongo Basin Transit Authority

Cheri Holsclaw has been selected to be general manager of the Morongo Basin Transit Authority in Joshua Tree, Calif. The unanimous appointment was made by the authority's board of directors March 24, 2022. She becomes the first female general manager since 1995 to oversee the organization.

MassTransitmag.com/21261865

Michael Tree

Santa Cruz Metropolitan Transit District (Santa Cruz Metro)

Michael Tree was named the new CEO/general manager of Santa Cruz Metro. His start date was April 25, 2022. He has more than 27 years of experience in public transit industry and city management, most recently as executive director of the Livermore Amador Valley Transit Authority.

MassTransitmag.com/21261918

Ben Cole

Southwest Ohio Regional Transit Authority (SORTA)

Ben Cole has joined SORTA as director of training and employee development. He will ensure staff have access to the training programs and tools they need for immediate and future success, including leadership and management training, and operations and specialized training.

MassTransitmag.com/21262946

MARTA places three electric buses into service

▶ The Metropolitan Atlanta Rapid Transit Authority (MARTA) launched its first electric buses May 1 with the support of the Federal Transit Administration (FTA) and partners New Flyer, Siemens and the Center for Transportation and the Environment (CTE). The three new vehicles were placed into service on Routes 2 and 102. MARTA plans to continue transitioning to electric by seeking additional funding made available as part of the Bipartisan Infrastructure Law such as for Clayton Southlake Bus Rapid Transit (BRT). That project will use 10 electric buses to provide high-capacity transit service from College Park Rail Station to key destinations in Clayton County. Electric buses will also be used on Atlanta's first BRT route along Summerhill Road to connect the Beltline, Peoplestown, Summerhill, Capitol Gateway and South Downtown.

➲ MassTransitmag.com/21265341

MARTA LAUNCHED it first three electric buses into service on May 1.

Gov. Hochul waives fares on LaGuardia Airport bus connection year-round

▶ How to improve transit connections to New York's LaGuardia Airport has been a much-debated topic and, as of May 1, New York Gov. Kathy Hochul is betting an offer of a zero-fare transit connection to the airport via the Q70 bus will make the journey a bit easier. The governor directed Metropolitan Transportation Authority (MTA) to suspend fares on the Q70 LaGuardia Link bus as an immediate incentive to encourage transit use to get to the airport. MTA previously offered zero fare on the Q70 route during select holiday weeks. The bus route connects with subway and Long Island Rail Road customers. MTA says the Q70 runs 24 hours a day and operates every 10 minutes during the day. The vehicles operating on the route are equipped with special luggage racks for people traveling to and from the airport.

➲ MassTransitmag.com/21266025

MORE NEWS AT A GLANCE

▶ AECOM was selected by the City of Austin's Transportation Department (ATD) to continue serving as engineering consultant, augmenting ATD's existing workforce.

➲ MassTransitmag.com/21266515

▶ LINXS Constructors – comprised of Fluor, Balfour Beatty, Dragados USA and Flatiron – has completed construction of Los Angeles International Airport's 2.25-mile Automated People Mover train guideway structure for Los Angeles World Airports.

➲ MassTransitmag.com/21266740

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Happy 40th to today's farebox!

Collects a lot more than cash.

Celebrating 40 years of the modern farebox!

In 1982, Genfare completed its first installation of CENTSaBILL® electronic registering fareboxes for the Dallas Transit System, now Dallas Area Rapid Transit. The CENTSaBILL was to fare collection what Henry Ford's Model T was to the automobile – the product that redefined an industry. It became a transit mainstay, with 50,000 units ultimately installed.

The farebox has evolved a lot since 1982. Like many 40-year-olds, it's embarked on a second career. In 1982, the farebox was all about cash. Now, it's mainly about data.

In the early 1980s, cash handling was the big headache. With bus fares approaching $1, riders were cramming dollar bills into fareboxes designed for coins. Equipment jammed constantly. Money rooms filled with a jumbled mess of coins and bills that needed laborious hand sorting.

The CENTSaBILL's elegantly simple solution: Riders dropped coins into a coin slot and pushed bills into a bill slot, which were then conveyed to a cashbox with separate compartments for each – a design still used by all fareboxes.

That was then. Today, transit agencies collect more than cash, and with the wide adoption of electronic media, they collect a lot more data in a lot more ways. To keep up, the farebox has been reinvented multiple times. Genfare's Odyssey® validating farebox was introduced in the late 1990s, followed by the Fast Fare® networking farebox in 2013. In addition to cash, the modern farebox can process smart cards, mobile tickets, magnetic cards, and now contactless bank cards and mobile wallets.

These days the farebox is part of a complex fare processing ecosystem that includes a wide range of field devices and online systems, all monitored and controlled in real time, or close to it, by a centralized fare processing platform – in Genfare's case a cloud-hosted back end called Genfare Link®.

That's huge. Data processing was in its infancy in the early 1980s. Now it's the main event.

Some things haven't changed. The farebox still counts coins and bills and probably always will – cash remains the one fare medium available to everyone, including the essential workers and low-income riders who remain transit's core users.

But its more fundamental task is to provide a single gateway capable of accepting whatever form of payment riders have in their pockets, and a single collection point for the vast trove of data generated by electronic media.

"The data is key," says Genfare president Eric Kaled. "It's equally if not more important than the money. If you're a transit executive, it's how you know who's riding your system and when and how they ride it. With that data, you can understand the communities you serve and how best to meet their needs. Without it you're flying blind."

"Given the many ways of paying a transit fare nowadays, getting the data into one place for analysis isn't easy. To get a complete picture, all the data needs to wind up in a single database on the back end," Kaled says. "That can be challenging but solving that challenge is our specialty."

The modern farebox collects all fare media no matter if agencies keep their legacy systems – mobile ticketing, for example – Genfare provides ways to merge the datastreams in the back office for single reporting and revenue reconciliation. Genfare Links allows integration with whoever the agency wants to work with and provide tools to help them look at the data holistically to see the ways riders are using the system, paying their fare, and how that changes over time.

Today's fareboxes are more complicated than the ones sold 40 years ago. But as the public-facing piece of an integrated solution processing both revenue and data, they're just as indispensable.

Mid-Coast Corridor Program Delivered with a **Project-First Mentality**

Developing a project culture that valued safety and solutions helped Mid-Coast Transit Constructors deliver one of the largest infrastructure programs to the San Diego region.

By **Mischa Wanek-Libman, executive editor**

More than 8,500 people gathered at the University of California San Diego's Warren Field this past November to celebrate the opening of the Mid-Coast Extension of the UC San Diego Blue Line Trolley. The extension provides a one-seat ride from the U.S./Mexico border to University City and carries with it the promise to increase opportunities for the region's residents and help the region achieve its climate action goals.

THE 11-MILE Mid-Coast Extension of the UC San Diego Blue Line Trolley began service in November 2021.

Photos by Under Construction Photography by Tara Garner and www.ucp.photos

The extension was called "a phenomenal addition to [the region's] public transit system" and is the centerpiece to one of the area's largest infrastructure programs that took a dozen years of planning, six years of construction and included enhancements to infrastructure that spanned beyond rail improvements and the 11-mile Trolley extension.

"This project presented many unique technical challenges, including difficult geological conditions, utility conflicts, adjacency to an active railroad and construction in an urbanized environment where impacts to businesses, schools and medical facilities had to be carefully mitigated as part of the design development," said Vladimir Kanevskiy, engineering technical lead for WSP, which served as the lead environmental and engineering consultant for the program.

The San Diego Association of Governments (SANDAG) used the construction manager/general contractor (CM/GC) delivery method to build the Trolley extension, which is now operated by the San Diego Metropolitan Transit System (MTS).

Mid-Coast Transit Constructors (MCTC), a joint venture of Stacy and Witbeck, Herzog and Skanska, was awarded the CM/GC contract. Eric Meisgeier, deputy project manager at MCTC, notes the sheer number of stakeholders involved in the program required a collaborative work environment if the program was to be delivered on time and on budget.

"There was a lot of collaboration," said Meisgeier. "At the end of the day, it all came down to the kind of people and the culture that the job had, and we had people willing to solve problems and move the project forward."

The project-first mentality Meisgeier describes permeated through the program's 1,000-plus team members and helped MCTC and its partners to safely deliver on a complex program.

THE MID-COAST Corridor work included 21 bridges.

By the numbers

25
track-miles of ballast track

7
track-miles of direct fixation track

21
heavy rail, light rail and roadway bridges

9
major aerial and at-grade stations

1
parking garage

MCTC WORKED closely with NCTD to ensure certain construction activities could continue adjacent to active tracks.

Collaboration and Innovation

The scope of the program included 25 track miles of ballasted track, seven track miles of direct fixation track, nine stations, 1.4 million cubic yards of earthwork and 500,000 square feet of walls. Seven of the Trolley extension's 11 miles were constructed within the busy LOSSAN corridor which hosts 60 freight and passenger trains every day.

Initially, the Mid-Coast Corridor project consisted of the Trolley line extension and two heavy rail double tracking projects. However, additional supplemental projects were bid on and incorporated into the work MCTC was performing for SANDAG because these projects had critical interfaces with the original Mid-Coast project.

Meisgeier points to the Gilman Drive Bridge Project and I-5 Auxiliary Lane as one example of how several separate projects all had critical connections. The Trolley extension crosses I-5 at two locations. At one of these locations, California Department of Transportation (Caltrans) required an auxiliary lane on I-5, while SANDAG and UC San Diego needed a new overcrossing at Gilman Drive

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to provide a link between the west and east campuses of UC San Diego that was to be located directly under a viaduct for the rail project.

"There was no way [the I-5 auxiliary lane and Gilman Drive Bridge] could be built until after we finished the light rail. We negotiated it and [these projects] were brought into our program," explained Meisgeier. "At one point, we had three levels of construction going on between the light rail, the Gilman Bridge and then at the I-5 level."

The supplements added complexity to the administrative side of construction with each requiring its own billing, which MCTC managed to support its subcontractors, and each carried different requirements for small and disadvantaged business goals and reporting. Weekly production meetings and monthly cost meetings helped keep this work in line.

Back in the planning phase, SANDAG recognized the corridor improvements would require an immense amount of coordination, which is why the CM/GC delivery method was selected as it inherently brings collaboration to the design, plans and construction of a project.

During preconstruction, MCTC identified a control point that needed to be relocated for work in the LOSSAN corridor to take place. The control point relocation was part of a long-range plan, but not part of the initial scope of the Mid-Coast Corridor project. MCTC worked with SANDAG and North County Transit District (NCTD) to accelerate plans to relocate the control point, which moved train traffic through the corridor and provided space for the Mid-Coast Corridor project to be constructed.

MCTC also worked closely with NCTD on the Joint Right of Entry (JROE) permits required to work adjacent to an active railroad. MCTC says the process was revised to support a large-scale construction effort. MCTC worked with NCTD to provide delineation for certain work activities to proceed uninterrupted. In addition to a refined permitting process, MCTC hired supplemental flaggers to help support safe working conditions throughout the corridor.

Working adjacent to active tracks also required innovation when it came to construction elements outside of the tracks, such as retaining walls. The original design called for cast-in-place walls using a soldier pile shoring system and mechanically stabilized earth (MSE) walls. According to MCTC, "geotechnical investigations determined that the top 15 feet of the existing ground was full of large cobbles and caving soils which presented high schedule and cost risk for soldier pile installation. Compounding the problem was that the railroad would not allow MSE walls."

The solution was a pre-cast retaining wall system, which eliminated the need for shoring through the use of slot cuts where narrow excavations were made along the tracks without compromising the existing embankment. MCTC says the wall system reduced excavation and export of potentially contaminated materials, allowed for rail operations to continue uninterrupted and saved millions of dollars and months of the schedule.

By the numbers

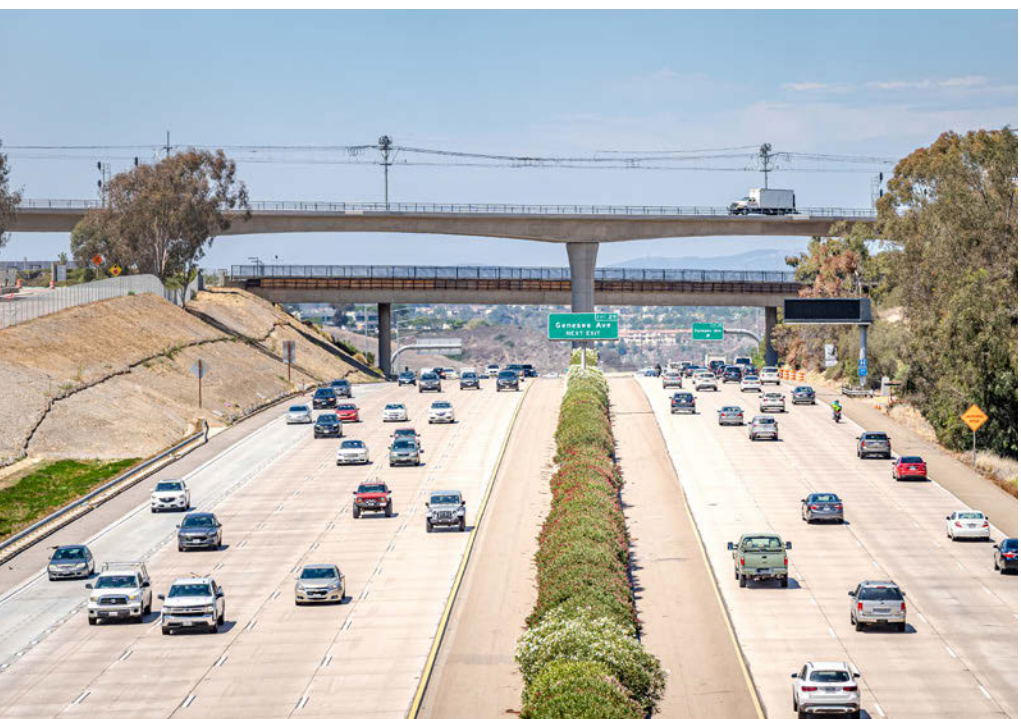
1
arched roadway bridge over I-5

1.4 million
cubic yards of earthwork

500,000
square feet of walls

2-mile
bikeway path

MCTC HANDLED the construction of an auxiliary lane on I-5, built the Gilman Drive Bridge (middle structure) and the light rail bridge (top).



Effective Training

As with all rail projects, safety was paramount, and the project concluded with an admirable safety record. In an industry where the average recordable incident rate is 3.4 and the average lost time incident rate is 1.2, MCTC employees had a 1.28 recordable incident rate and a 0.17 lost time incident rate based on 3.43-million manhours worked. Subcontractors had a 1.27 recordable incident rate and a 0.23 lost time incident rate with 1.73-million manhours worked.

Meisgeier notes the culture of the project was also steeped in safety, which began early in the program with a third-party assessment of the program's safety culture and climate. MCTC says all levels of management brought the focus on safety to the craft level, giving ownership and accountability for safety to all members of the team. Subcontractors were included in every safety meeting and each one was paired with an MCTC employee who provided mentoring and assistance, as well as performed regular audits on safety performance and compliance.

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MCTC provided more than 4,000 Roadway Work Protection training courses for employees in heavy rail and light rail and participated in annual Construction Safety Week activities. MCTC also used "cross-job safety tours" where supervisors from other projects would visit to evaluate safety practices while MCTC employees would do the same. The result was the development of shared best practices.

Meisgeier says one practice gained from these tours was the use of white cones put out by supervisors to indicate where employees could park at the job site. The practice was picked up from a visit to a Seattle, Wash., job site. Meisgeier says it may not seem like a big deal on the surface, but on a transit job site where clearances are tight, it made supervisors think about what and where the work was being performed and brought awareness to the job site.

One of the most unexpected and largest risks to safety was the spread of the COVID-19 pandemic. MCTC worked to get ahead of procuring PPE for its teams, modified the way briefings were conducted, staggered crew start times and tried to minimize the number of high touch items, like taking verbal role call versus using a sign-in clipboard.

MCTC's training efforts extended beyond job safety. The joint venture provided more than 4,500 individual environmental orientation trainings, required anti-harassment training of managers and initiated a program called Working Minds: Suicide Prevention in the Workplace.

"Construction has the highest rate of suicides out of any industry," explained Meisgeier. "There is a stigma and we started looking at what common threads exist: long hours, sometimes working nights, isolation from your family. We had a connection to someone who was doing similar training for the military and who was willing to speak to our team. It evolved and we found the Working Minds Program, which works to build suicide awareness. Our goal was to get rid of the stigma and to let people know there are resources available. We also wanted to bring a comfort level and the training needed to talk to people to try to understand who may need help. And a big part of this is letting someone know in the right moment that someone cares about them."

In addition to the safety, environmental and mental health training that occurred on the project, SANDAG and MCTC were dedicated to the advancement and success of small and disadvantaged firms. These efforts began with procurements and a subcontracting plan MCTC says balanced "custom subcontract packaging, outreach, marketing and mentoring."

SANDAG and MCTC worked together to exceed project goals for utilizing small and disadvantaged firms, enabling several companies to grow their workforces and secure additional contracts. MCTC published a regular *DBE Connection* newsletter that shared participation statistics, construction updates, as well as procurement and mentorship opportunities. MCTC staff mentored four DBE subcontractors through a formal program, in addition to the informal mentoring efforts. Through MCTC's commitment to supporting small and DBE firms, the project was recognized by the Small Business Administration as Minority Small Business Champion of the Year. Additionally, the Federal Highway Administration used the project as an example to develop best practices for DBE programs.

Companies involved in the Mid-Coast Corridor Projects:

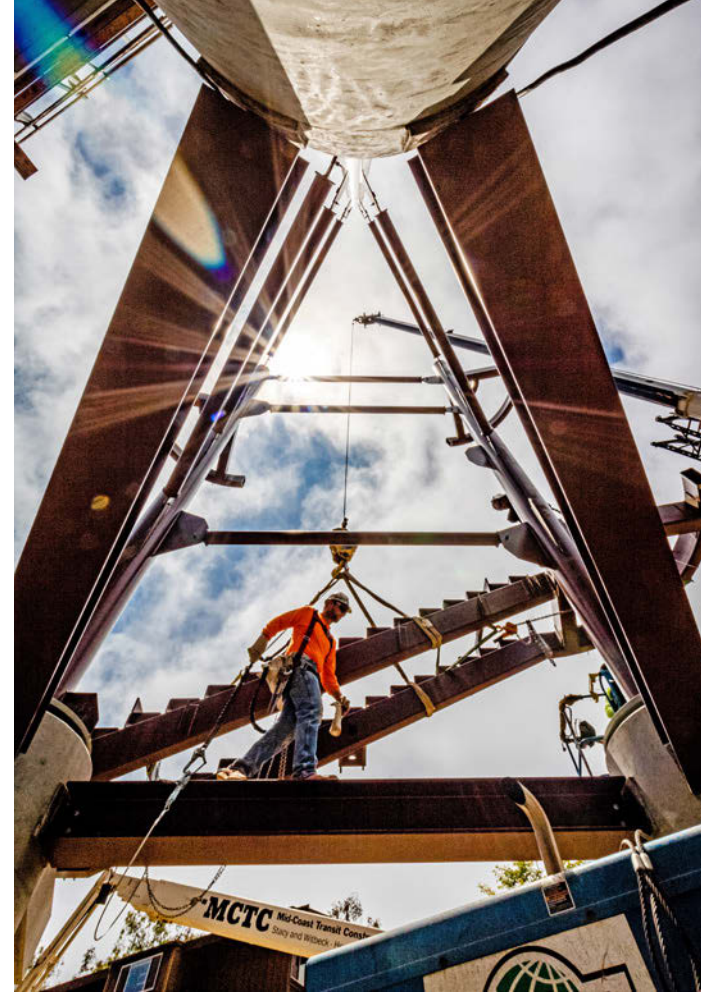
Lead Engineer: WSP; HDR and Kleinfelder/ Simon Wong

Program Management Consultant (PMC): T.Y. Lin International in partnership with HDR

Construction Management: Jacobs Engineering and PGH Wong

Major Subcontractors: Modern Railway Systems; McCarthy Building Companies; Lucas Builders; SRK Engineering

Major Suppliers: Oldcastle Infrastructure; L.B. Foster Company; Voestalpine Nortrak; Roberson's Ready-Mix



MCTC WORKED to develop a culture of safety on the project.

Gauging Success

Measuring how much the Mid-Coast Corridor program accomplished can be done in several ways. The program's central project, the Mid-Coast Extension of the UC San Diego Blue Line Trolley, was one of only three rail tran-

sit projects in the United States to open for service in 2021. Its impact could be seen immediately. San Diego MTS reported ridership on its Trolley system increased 74 percent on the extension's opening day compared to the week prior.

"When we began this project, we knew it would be a game-changer for our region. This line had been under construction for five years, and the excitement and anticipation we all had at MTS was equally matched by the community," said Sharon Cooney, MTS chief executive officer. "The new Trolley extension expanded our system by 20 percent and is already opening opportunities to connect thousands of community members to healthcare, education and new jobs."

MCTC was also recognized by the National Railroad Construction and Maintenance Association with its 2021 Large Project of the Year, which honors "innovation, expertise and quality project management applied towards the successful execution of a rail construction project."

In a letter supporting the MCTC's nomination as Large Project of the Year, Jim Starling, construction program manager at Jacobs and construction manager representative for SANDAG, called the final product "a highly successful project" that exceeded expectations "for partnership, collaboration, performance, schedule achievement and issue resolution."

For Meisgeier, it comes back to a team of people working toward a common goal.

"Everybody who has seen this project says how it went amazingly well, but there were no fewer issues on this job than any other mega project. There were some really tough issues, but the key was the collaboration and the project-first mentality of the team members," said Meisgeier. "I've heard [it] said that this was like a family. You might disagree with them, but you're looking out for them at the end of the day. Everybody [on this project] checked their egos and put the project first and, to me, that's the greatest story out of this project."

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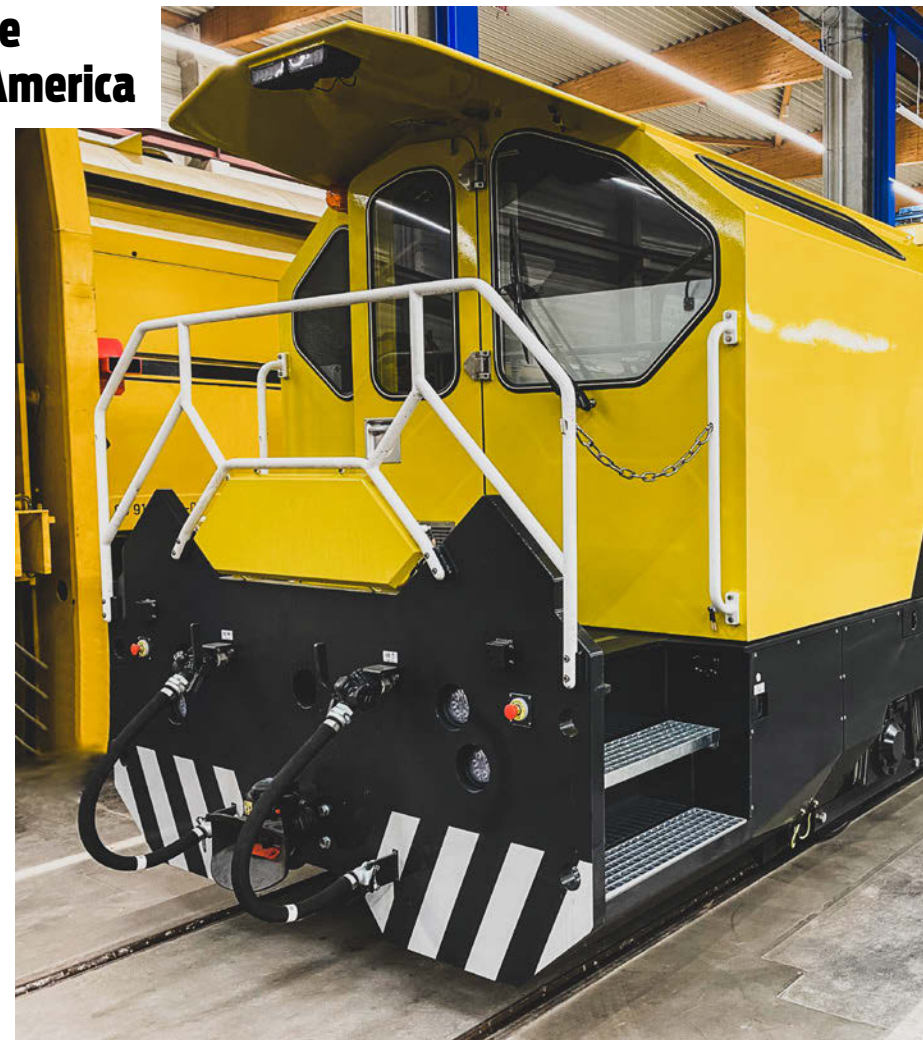


Due to continuously increasing passenger frequencies and train loads over the last years, transit systems in North America face the challenge of accelerated rail degradation combined with less time for doing rail maintenance to counter this degradation. Although rail grinding is a well-established and proven technology, it is often not efficient enough to keep rail degradation under control with these challenging conditions. Furthermore, rail grinding is a process that creates sparks, dust and a lot of heat having detrimental impacts on the environment and the rail surface. To prevent premature rail exchange rail milling has successfully been used in Europa, Asia and Australia in addition to rail grinding or as a stand-alone solution. Plasser American will bring this innovative technology to the American market and will start providing milling services by Q4 2022.

Romill Urban 3 E3 – how does it work?

Rail Milling is a rotational cutting process that removes material from the rail surface in form of milling chips. The chips are collected by a high efficiency vacuum system and are stored in a chip bunker on the machine to be recycled at a later stage. As this dry cutting process does not result in any sparks, rail milling can be used in fire sensitive areas or even fire ban areas without any special fire prevention measures. In urban areas this is especially applicable in tunnels, at street level and on elevated track – all environments where sparks can cause major fire danger. In addition, rail milling does not create any dust. In closed environments like tunnels or stations this has a major health impact on the operator crew and other maintenance crews working in the vicinity, for not being exposed to dangerously high dust concentrations. Due to its adjustable cutting depth of 0.1 mm of up to several mm (dependent on machine size) per pass, rail milling can fully remove any rail damage and can completely restore the rail profile to its targeted shape. Not only the transversal profile is restored within tightest tolerances but also in longitudinal direction, a perfectly smooth rail surface is created (free of singular or periodic defects). Thereby, rail milling is the perfect tool for a regenerative maintenance strategy. The rail surface is restored to an as-new condition (regenerated) almost independent of the initial damage situation. In addition, due to the before mentioned adjustable cutting depth, rail mailing can also be applied for all other maintenance strategies like initial milling (mill scale removal), preventive maintenance and corrective maintenance. Furthermore, rail milling technology can also be used to efficiently process switches, without the need for a dedicated switch mailing machine. With significant changes in workforce availability to impact the rail market in the near future, transit systems have a high demand for technologies that require less "human intervention". Compared to traditional rail grinding, rail milling meets

this requirement as the resultant profile shape is defined by the cutting tools and does not require "human factors" to be involved. Rail milling is a very gentle rail treatment process preventing unwanted material transformation of the rail surface that might have detrimental effects on rail life.

Romill Urban 3 E3 – rail maintenance going green

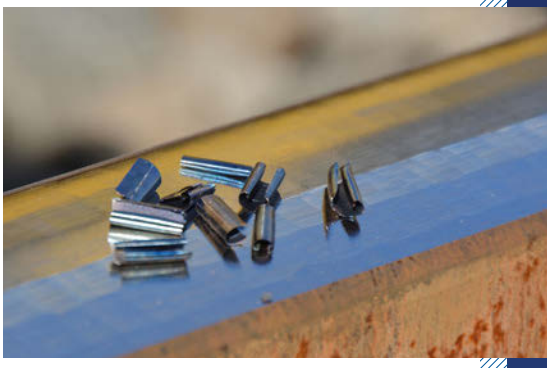
Plasser American will bring the innovative transit rail milling machine Romill Urban 3 E3 to North America. The Romill Urban 3 E3 is the world's first milling machine equipped with a hybrid drive system, allowing for a total of 3 hours of pure electric battery operation. Therefore, this innovative milling machine can operate spark free, dust dree and emission free in tunnels and stations – a world premiere. To operate beyond these 3 hours, the machine is equipped with a Tier 4 final diesel engine range extender, that also provides quick charging capability. Of course, the machine can also be re-charged through an external power source. But the electric drive system also significantly reduces the operational noise emissions of the milling machine. Therefore, the machine can work in densely populated neighborhoods and other similarly noise sensitive areas without any special measures.

The Romill Urban 3 E3 can accurately remove between 0.1mm and 1.5mm in pass at milling speeds of up to 4000 ft/h. The advanced milling technology and cutter head design translate into extended tool lifetime and capability to reliably process also low-quality track conditions that so far could not be treated by rail milling. To create a high quality and low noise surface finish that meets even the tightest European noise standards, the milling train is equipped with a new and innovative post processing technology called HPP – High Performance Polishing. This polishing unit is completely enclosed and equipped with a by-product collection system. The machine is equipped with the three most common rail profiles, ready to work at any North American Transit System. In addition, any required custom target profile can be provided upon customer request.

The Romill Urban 3 E3 is designed to fit into smallest tunnel clearance envelopes and to provide efficient and reliable rail milling technology tailored for the needs of urban networks. Besides urban areas, Plasser American also has application scenarios readily deployable to promote milling technology in class 1 / freight environments and to use this machine to treat bridges, switches and high damage areas (specialty milling applications) in these networks. The milling machine consists of three cars that can be individually transported on floats to and from the work side. No cranes are required for loading and unloading the milling machine (RoRo capability). After unloading the machine can be reassembled and put into operation within 2-3 hours.

Romill Urban 3 E3 – measure the success

As it is only possible to manage what can be quantified and measured, the Romill Urban 3 E3 is equipped with state-of-the-art measurement technology. The machine determines the vertical metal removal, measures the transversal profile to compare it with the target profile and determines the straightness/waviness of the rail surface with the help of a longitudinal profile measurement system. In addition, the machine also measures the presence and depth of any remaining cracks with the help of proven eddy current technology. With this integrated measurement technology, the milling machine can create a "track certificate" considering the fully restored rail profile and damage free rail surface condition.



Plasser American will be a full-service contractor, providing all the required aspects for rail milling operations in US, Canada and Mexico. The ROMILL Urban 3 E3 is expected to start operation in Q4 2022 to provide efficient, sustainable and safe rail maintenance services to the North American rail market.

SPECIAL REPORT:

Passenger Rail Trends

Increasing ridership, new service frequency and significant new investment is ensuring rail modes remain a relevant part of the mobility mix.

By **Mischa Wanek-Libman, executive editor**

Rail modes have typically accounted for half of all transit rides taken in the U.S. However, year-end ridership information collected by the American Public Transportation Association (APTA) shows rail modes accounted for approximately 42 percent of all transit rides in 2021. Year-end 2021 versus 2020 overall transit ridership shows a 3.6 percent increase. This is supported by a 9.7 percent increase in ridership from rail modes, most of which was driven by an increase on heavy rail.

This rebound of rail use isn't unexpected as rail modes suffered the most significant decreases in ridership during 2020. As workers' schedules fluctuate and continue to move toward more hybrid plans, the focus for rail service providers, particularly commuter rail, will be on frequency of service. In Ontario, Canada, Metrolinx's multi-project GO Rail Expansion program aims to provide two-way all-day service on five core lines. The largest element of the program, the On-Corridor Works project, entered the development phase in April. The project will add more than 124 miles of track, electrify more than 372 miles of track and the route will be served with a new electric train fleet. Metrolinx described the contract as a "single, innovative, fully-integrated contract" with construction anticipated to begin in 2023.

Additional rail projects to mark recent milestones include the Los Angeles County Metropolitan Transportation Authority's Regional Connector project, which saw the completion of construction of all track work and guideway systems in April 2022 and the Crenshaw/LAX Line, which reached substantial completion of the first two construction segments of the 8.5-mile line. On the East Coast, the Portal North Bridge project, a critical component of the Gateway Program, received a Notice to Proceed in early April, which will allow heavy construction to begin. In the Midwest, construction started in early April on the 3.5-mile KC Streetcar Main Street Extension.

In 2021, rail projects opened in Seattle with the start of service on the 4.3-mile Northgate Light Rail Extension, the Charlotte Area Transit CityLYNX Gold Line streetcar opened for passenger service Aug. 30 and the Mid-Coast Extension of the UC San Diego Blue Line Trolley opened in November (story on page 12).

More ribbon cuttings are expected in 2022. The first occurred in March when the Massachusetts Bay Transportation Authority opened the Green Line Extension Union Square Branch – the first of two segments – followed by the May opening of the Valley Metro Tempe Streetcar line. The second segment of the MBTA Green Line Extension is expected to open this summer. San Francisco Municipal Transportation Agency anticipates opening the Central Subway this fall and Washington Metropolitan Area Transit Authority could open the second phase of the Silver Line in late summer.

Investment for Fleets and Access

Two new rail programs were created under the Bipartisan Infrastructure Law and with the passage of the Fiscal Year 2022 Omnibus Package in March, FY22 will be the first year these programs will have an impact on passenger rail networks.

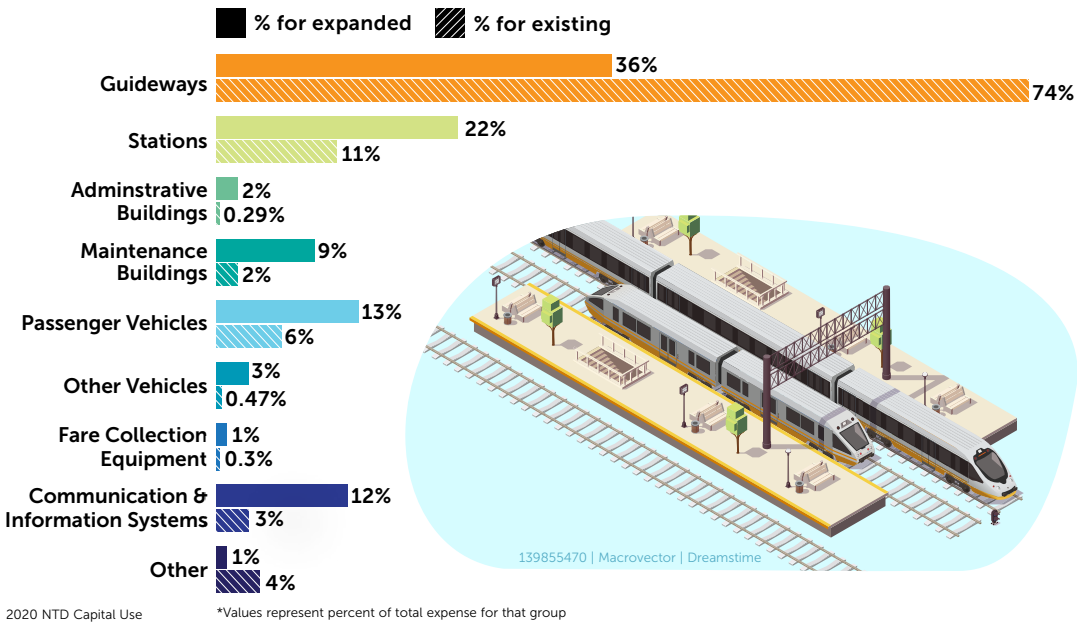
The Rail Vehicle Replacement Grants will award approximately $300 million in each of the next five fiscal years to help agencies replace railcars that are past their useful life and improve reliability, safety and accessibility for transit passengers. According to

By the numbers

2,111
Number of escalators available within rail stations
Source: NTD 2020 Transit Stations

2,947
Number of elevators available within rail stations
Source: NTD 2020 Transit Stations

Capital Expenses: Existing vs. Expanded Services



2020 NTD Capital Use

*Values represent percent of total expense for that group

Terminology

NTD Mode Types

AR: Alaska Railroad

CC: Cable Car

CR: Commuter Rail

HR: Heavy Rail

IP: Inclined Plane

LR: Light Rail

MG/AG: Monorail/ Automated Guideway

SR: Streetcar

YR: Hybrid Rail

the most recent reports from the National Transit Database (NTD), the number of active vehicles at or exceeding their useful life for heavy rail passenger cars, light-rail vehicles and commuter rail passenger coaches all increased.

In January, Valley Metro placed the first of its new S700 light-rail vehicles into service; the agency ordered 11 light-rail vehicles for use on its Phoenix, Tempe and Mesa lines. In April, Sound Transit took delivery of the first of five new light-rail vehicles supporting its future Hilltop Tacoma Link extension. Bay Area Rapid Transit (BART) also began accepting deliveries of its Fleet of the Future cars after a year long suspension to resolve reliability issues with the new vehicles.

The second new rail program created under the Bipartisan Infrastructure Law is the All Station Accessibility Program, which will award approximately $350 million in each of the next five fiscal years to reduce the number of legacy rail transit stations that remain inaccessible to individuals with disabilities.

Information comparing 2019 and 2020 NTD statistics show nearly 75 percent of stations on all rail modes are ADA accessible. Rail modes increased the number of ADA accessible stations by 1.75 percent, while non-ADA accessible stations were reduced by 1.59 percent. However, when the data is isolated to legacy rail systems in New York City, Chicago, Philadelphia, Washington, D.C., Boston and San Francisco, approximately 48 percent of all rail stations are non-ADA accessible.

The All Station Accessibility program's chief architect U.S. Sen. Tammy Duckworth (D-IL) told *Mass Transit* this past November she believes the industry will see rapid compliance with the ADA because the funds included in this program are protected from being used for anything else and prioritizes disability access.

Making sure stations are accessible is one part of the solution, streamlining where access is within a station is another. In February, BART opened a new fare gate at the Embarcadero platform aimed at giving riders the ability to tag out of the station at the platform instead of the concourse. BART explains that for people who rely on elevators, the new platform fare gate improves access to the station by streamlining the path to tag in or out of the station. Before the platform fare gate, riders had to travel up two levels to the concourse, reach around to tag out of BART at the fare gate, travel to the Muni entrance, tag in at their fare gate and travel down one level. MT

By the numbers

13,755 miles

Number of track miles transit authorities operate in the U.S.

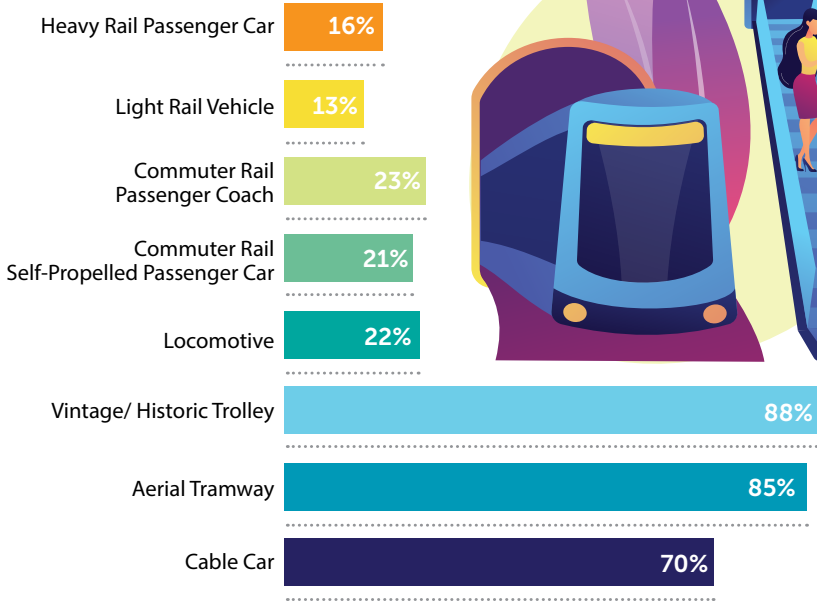
Source: NTD 2020 Track and Roadway

1,254.1 miles

Number of below grade track miles transit authorities operate in the U.S.

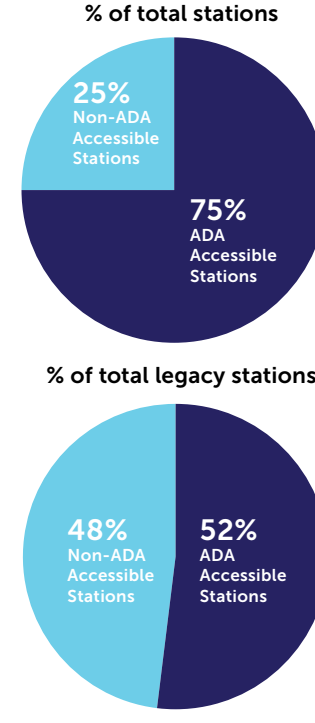
Source: NTD 2020 Track and Roadway

Percent of Active Vehicles Beyond Their Useful Life



NTD Vehicles 2020

U.S. Station Accessibility



NTD 2020 Transit Stations

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Are You Getting the Most Out of Your Rail Safety Training?

EDUCATION and TRAINING COURSES and ACTIVITIES should do more than tick a box; they should add value and adapt as needs change.

By **Megan Perrero, Associate Editor**

A critical step in establishing and maintaining a safe rail organization is to provide education and training to ensure personnel can properly and safely execute their tasks. Up until a couple years ago, a common approach to safety training and education was to present the curriculum, probably with a PowerPoint presentation, provide a written test and, if the trainee passed, they were ready to get to work.

"In my experience, there was no real thorough verification to make sure that learning transfer was taking place," said Rick Bellew, chief safety officer and senior vice president, RailPros.

Instead, to create a safer working environment, organizations should challenge the status quo and execute training for the right reasons—pushing beyond being compliant and promoting a culture of safety.

"Groups are being encouraged to really look internally and analyze themselves for what it is [they] are trying to achieve with [their] training programs and why or why not they are effective," explained Erika Bruhnke, vice president of training services, RailPros.

> "If employers can embrace a complete learning process that ensures the learning transfer has taken place, a safer workforce will be the return on investment worth the efforts."
>
> **RICK BELLEW,** chief safety officer and senior vice president, RailPros

Creating a Complete Safety Training Program

When thinking about a safety program, organizations should embrace the idea that safety training and education isn't a singular, passive event where an employee views a presentation and passes a test. Rather, it starts in a classroom setting and continues to be an ongoing, active process that includes mentoring, safety briefings, toolbox talks and on-the-job demonstrations. While the former establishes the building blocks, the latter ensures knowledge has been transferred and the tasks can be performed correctly and safely.

"There are levels of evaluation that determine the depth of which knowledge transfer has occurred. Level one, simply reacting to something that has been learned. [Then] there are other levels going to two, three, four that actually demonstrate a more proficient and a deeper understanding of what has been learned," said Bruhnke. "We're not just sitting there throwing information at a human and hoping it sticks."

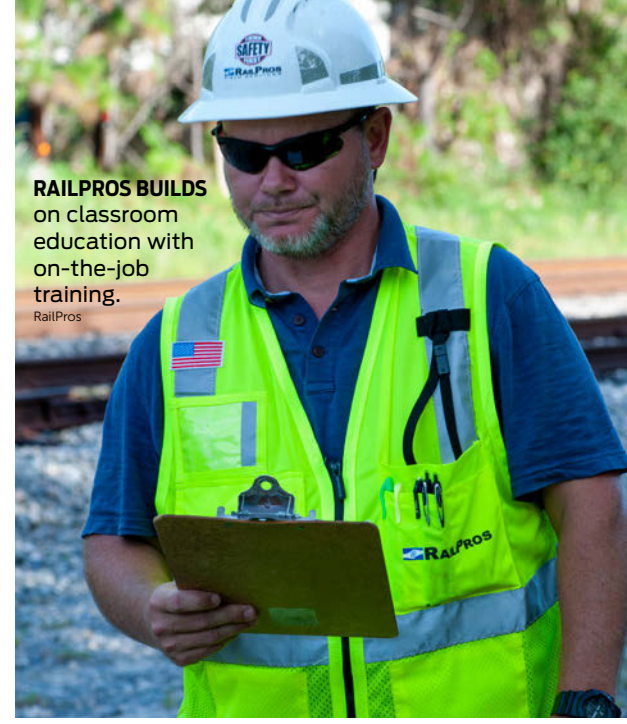
Bobex-73 | 1369620388 | Getty Images

For instance, at RailPros, its on-the-job training component is designed so that trainees don't move to the next level or task until they are masters of the task they're currently being trained in. This creates a strong foundation for "confidence and success," said Bellew.

"We also do the same thing with the trainers. We make sure that the people [giving the training] are not only designated instructors, but are also masters of their craft," added Bellew.

Bruhnke notes that being experts in their skillsets is just one part of becoming trainers, mentors and designated instructors.

"We put [them] through a pretty rigorous process to make sure that not only, yes, we have confirmed they have the experience, they have the knowledge, but also they have the skill sets to actively teach those topics," said Bruhnke. "Just because you have the experience and you have the knowledge of the topic being addressed does not automatically qualify you to be an instructor. It does take a different kind of person to be able to connect and teach a student."



RAILPROS BUILDS on classroom education with on-the-job training.
RailPros

Evaluating the Effectiveness of a Safety Training Program

At RailPros, the designated instructors, trainers and mentors play a major role in auditing the training, another critical component of any safety training and education program. Auditing trained workers' performance allows organizations to look for areas of improvement and determine if training played a role, and if so, adjust the program so the errors are addressed.

However, an audit of skillsets should go deeper than a pass/fail test. It should question why an action is being performed, if it's being performed completely and that it has been done correctly over a period of time—not just the day of the audit. These findings can then inform refresher courses.

"You've got to figure out what your people are struggling with, identify that need through some form of a skill gap assessment and then go out and focus on that piece that your people are struggling with," said Bellew.

By analyzing what a training course is trying to achieve and being proactive with skill gap assessments, organizations can save time and money in the long run.

"By taking that brief moment to be more targeted with what it is we're training, we truly are gaining back quite a bit of effort in the future," explained Bruhnke. "We're making sure [knowledge] transfer has taken place today versus waiting for something to perhaps, unfortunately, find us months down the way."

Justifying the Cost of Training

If organizations have been operating regularly without incidents, it can be difficult to quantify a return on investment when it comes to training. But organizations should be cautious of having the mindset that they have a safe work environment because there haven't been any incidents. In other words, is it safe on accident or on purpose? Instead, consider taking a proactive approach to ensure the program is working and is valuable.

"I can build a PowerPoint for fairly cheap in the comfort of my own home on a computer and it will probably meet the requirements, but am I really providing the value to my team to ensure that they are getting the best product to ensure they can go out there and perform that task to the highest extent possible? Maybe I am, maybe I'm not," said Bellew.

Creating and auditing a valuable safety program uses resources that need to be justified. So, organizations should start with a needs assessment. Step one is to figure out what is needed to be successful. And this might not include training. Maybe the need can be addressed with a one-on-one conversation, explains Bruhnke.

"That needs analysis is very important to recognize that we are training for the right reasons," said Bruhnke.

To continue developing a robust safety program, use the needs assessment to develop concrete learning objectives, which also indicate what needs to be evaluated at the end. Next, select the type of learning best suited to the need (i.e. instructor led, e-learning, blended) and a trainer (if applicable), and then start building meaningful material. Feedback comes next to ensure the training will achieve what the needs assessment revealed. Then the organization and instructors should prepare their audiences for the upcoming training. At the end of training, utilize the evaluation data to monitor the success of the course.

"If employers can embrace a complete learning process that ensures the learning transfer has taken place, a safer workforce will be the return on investment worth the efforts," concluded Bellew. MT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BRT Stations
OFFER MORE THAN WHAT MEETS THE EYE

MARTA's future Summerhill BRT stations are helping redefine the authority's position as an asset and its purpose in the community.

By **Megan Perrero, associate editor**

Bus rapid transit (BRT) stations are unique for several reasons, but at the most basic level they establish a sense of permanence not seen in the traditional fixed-route stops that can be subjected to route changes and discontinued use. Because of this, the Metropolitan Atlanta Rapid Transit Authority (MARTA) is finding more generated interest in its future BRT stations, particularly in the development community.

MARTA's future stations for its Summerhill BRT corridor aim to offer a modern experience with community programming, as well as spur economic development that focuses on affordable housing. And with these goals, MARTA is further enhancing its place as a community asset.

BRT Stations Spur Economic Development

As mentioned, developers and investors are already showing interest in funding projects along the BRT corridor. In March 2022, MARTA and the Goldman Sachs Urban Investment Group within Goldman Sachs Asset Management (Goldman Sachs) broke ground on the Skyline Apartments, a transit-oriented development (TOD) with 250 units of affordable housing located across the street from the southern terminus of the Summerhill BRT line.

This TOD project is made possible through a greater partnership between MARTA and Goldman Sachs that established a $200 million initiative to finance new development at or within a mile of MARTA stations. While MARTA does not have money in this initiative, it did establish the criteria for the program to advance equitable investment and development near transit.

The partnership is part of the Greater Atlanta Affordable Housing TOD Initiative, which is a flexible, multi-product program designed to promote and support the development of ground-up mixed-income, TOD and affordable housing projects that benefit from proximity to MARTA's 38 heavy-rail stations, 12 Atlanta Streetcar light-rail stops and in new transit investment corridors—such as the Summerhill BRT corridor.

MARTA Senior Director of Transit-Oriented Development and Real Estate Jacob Vallo shares he sees this as an encouraging sign from the development and investment communities, adding that MARTA is just now being included in real estate marketing packages for large development projects if it's near heavy rail.

"What my hope is, is that the bus rapid transit does get that same level of respect because it does provide that level of connectivity that's important and it is an amenity for tenants," Vallo said. "I do think it's that evolution of permanence. Bus stops being just as critical, but from a dollar investment or the significance of the capital investment, the development and the investment community certainly sees that permanence and is attracted to it."

On top of increased investment, the initiative with Goldman Sachs and MARTA is also helping address equity by increasing affordable housing and partnering with Black-owned and Black-led, and particularly Black women-led, organizations and developers to construct the TOD projects.

"If we have access to capital that could benefit someone's projects [then] you make those connections because ultimately it lifts up the entire community along that corridor," Vallo said.

Photos by MARTA

THE DEVELOPMENT community is beginning to see how proximity to MARTA service is an amenity.

Modern Amenities for a Modern Service

Brand new TODs won't be the only feature of the Summerhill BRT corridor. The service will feature 16 stops with modern amenities to enhance the customer experience and increase connectivity and safety.

For instance, MARTA created a Pedestrian Connection Inventory to assess the sidewalk infrastructure around several of its future BRT stations. The inventory includes field visit findings that identified deficiencies such as broken sidewalk pavers, necessary ADA ramp improvements, limited pedestrian lighting and other pedestrian connection challenges due to grade crossings. MARTA is working with the Atlanta Department of Transportation, the Georgia Department of Transportation, Norfolk Southern, the Atlanta BeltLine and private property owners to address these issues.

Other features of the service include 85 percent dedicated lanes, transit signal priority, off-board fare collection, real-time information and two pedestrian hybrid beacons. At each station, riders will experience level platform boarding, station signage and screens with route map information, lean rails, station phone with white light, ramps with mesh panels, polycarbonate roof, windows, benches and guardrails with integrated artwork panels.

A Bigger Footprint Opens Opportunities

Typical customer amenities like real-time information and customized shelters are the start of elevating the customer experience. With a permanent and larger footprint, MARTA is thinking outside the box on how else it can capitalize on its BRT stations. One example is expanding the agency's Fresh MARTA Market from its heavy-rail stations to BRT stations.

Vallo explains the agency is focusing on the southern terminus for the fresh markets to conceptualize the idea but will focus on stations with the highest ridership that presumably will have the most customers that can benefit from having better access to fresh produce.

"We want to make sure that, if we pass the first couple of filters, okay, there's great ridership, there's a physical location opportunity for it; we also want to make sure that it's in the food insecurity area as identified [by] the USDA," Vallo said.

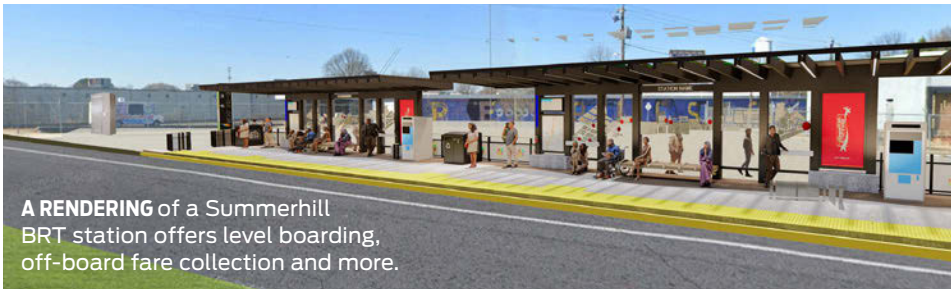
Vallo notes the agency may also consider adding food vending machines at its future transit hubs – which primarily serve bus routes. However, he adds MARTA may reexamine the options available to promote a healthier lifestyle to better position transit as a public health good, as well as align with its contribution to the wellness program StationSoccer.

StationSoccer is a program run by Soccer in the Streets, an Atlanta-based nonprofit organization. The program launched at MARTA's Five Points Station on the plaza level, creating the first soccer field project inside a train station in the world according to the nonprofit. MARTA is hoping to expand StationSoccer to

the terminus locations of Summerhill BRT, but each BRT station can be evaluated on a case by case basis. Vallo shares these types of programs can add value to stations and other transit facilities.

"As we begin to think about early activation, we can talk about the bigger TOD, but how can we be impactful today or tomorrow, because these TODs take a long time," Vallo said. "So, what can we do to help address some of the mayor's concerns about activating some of these surface parking lots? Arts are a great way to do that."

And StationSoccer isn't the only community program offered at MARTA. MARTA also hosts dance, theatre and live music events at its passenger facilities that could potentially expand to the future BRT stations. These live music, dance and theatre events are part of the greater Artbound public art program, which also includes murals and other visual art. MARTA's goal with public art is to "bring joy to the experience," says Vallo, and in working on the Summerhill BRT corridor, project teams are more open to having an art director at the table to enhance the project.



A RENDERING of a Summerhill BRT station offers level boarding, off-board fare collection and more.

"I think functionality is expected, but to go above and beyond, you need to really affect or positively impact the senses visually," Vallo said. "The customer expects that the thing works. You're not getting credit for it just working. You're getting dinged if it's not working, but I think in order to get ridership back, we need to be focusing on some of these soft things."

Future Prosperity

A growing interest in the development and investment communities and the opportunity to educate them on how bus service is an asset to their projects, along with the introduction of a new mode of transit service that offers new amenities and a new approach to bus stations has Vallo excited for the region.

"I think our region has a really exciting opportunity to continue to deliver these projects and benefit the community, but also deliver infrastructure projects that are seen as significant and permanent, and relative to the development and investment community," Vallo added. "I'm optimistic about our region." MT

Achieving Low-Carbon Benefits from Bus Yard Automation

The yard environment offers an ideal place to deploy automated technologies to support economic, operational and safety initiatives.

By **Severin Skolrud, contributor**

Photos by WSP USA

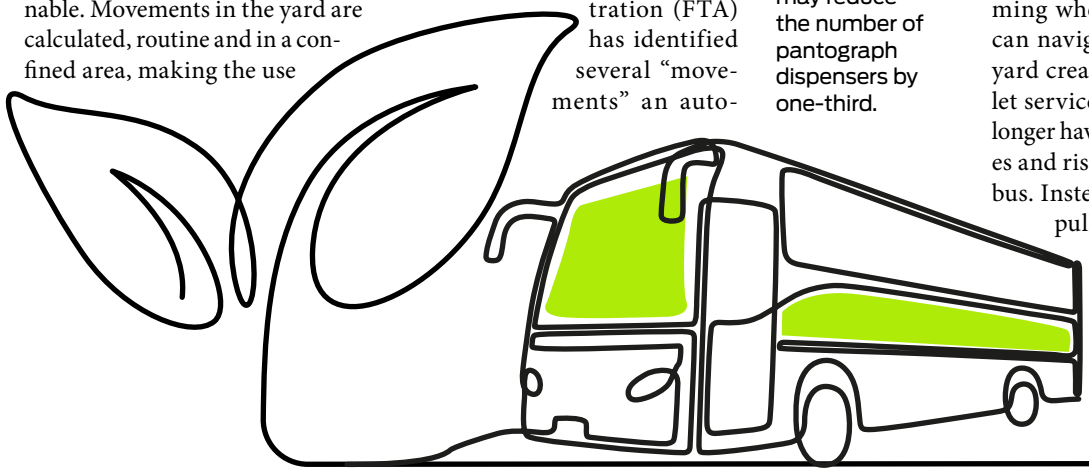
When transit leaders consider capital investments to reduce costs, improve staff safety and prepare for a low-carbon future, automating a bus yard is an option that should receive significant consideration.

Deploying automated vehicles (AVs) in city streets is attempting to plan ("code") for the unplannable. Movements in the yard are calculated, routine and in a confined area, making the use case for automation much more attainable in the near-term and less risky. Automating the bus yard can provide a wide variety of economic, operational and safety benefits from day one while enabling transit agencies to develop experience with automation capabilities and methodically expand their use cases.

The Federal Transit Administration (FTA) has identified several "movements" an automated bus yard (ABY) can streamline including:

- **Parking and recall.** Programming where and when the bus can navigate to within the bus yard creates an "automated valet service" where operators no longer have to walk long distances and risk pullout of the wrong bus. Instead, their assigned bus pulls up to the door and is ready to depart which saves valuable time and space. In a GIS study conducted on a facility at University of Michigan, the FTA

FACILITY EXPERTS estimate bus yard automation may reduce the number of pantograph dispensers by one-third.



estimates transit agencies can more than double the number of buses by parking closer together and in new, previously unused positions. WSP facility design subject matter experts think this number is closer to 25-35 percent capacity savings but are eager to validate in the field.

- **The bus wash.** This is a frequent, monotonous task that should not require an individual to be in the vehicle as it moves through the wash.
- **Service bays.** Depending on the fleet size, where buses park versus where they are maintained can be in different areas on the property. If a bus is scheduled for preventative maintenance or corrective maintenance, that requirement can be pre-programmed for when the operator pulls into the depot. The bus can then autonomously drive to the designated service bay.
- **Fueling/Charging.** Depending on the bus yard movements, once buses enter a designated area in the bus depot and with limited initiation by an operator, the buses can autonomously travel to a designated lane and either await service, park underneath an overhead charging dispenser or begin exiting for the next assigned run.

By making more efficient use of space through tighter parking and queuing, an automated yard can support bus fleets on a land footprint that is smaller than that required for a conventional bus yard. For a bus yard that serves all electric buses, WSP's transit facility design experts estimate that the number of overhead charging dispensers required may be reduced by one-third over what would be required in a non-automated bus yard.

Rapidly Evolving Transit

Automating the bus yard may seem futuristic and speculative for transit agencies struggling daily to meet service demands while recovering from the COVID-19 pandemic and dealing with daunting workforce challenges.

As trends shaping the future of bus transit are monitored, many transit agencies—especially those with mature or emerging bus rapid transit (BRT) systems—would be well advised to begin learning about the several advantages of automating the bus yard.

Implementing an ABY involves retrofitting existing buses or procuring new buses equipped with automation kits that include sensors and onboard computers connecting to the actuators of the vehicle. The ABY can be developed with diesel or compressed natural gas (CNG) vehicles, but the most impactful synergies and benefits will be attained with a battery electric bus (BEB) fleet. This is due to the potential to automate charging operations via overhead pantograph dispensers which does not require personnel to manually plug-in chargers.

Electrification of transport, including transit buses, is proceeding rapidly on a global level. BloombergNEF estimated in its 2021 Electric Vehicle Outlook that electric buses represent 39 percent of new sales and 16 percent of the global bus fleet. Most of those electric buses—or 98 percent—are deployed in China, according to BloombergNEF.

In the U.S., transit agencies are taking widely varying approaches to converting their diesel and CNG buses to battery electric or other zero-emission technology such as hydrogen fuel cells. New York Metropolitan Transit Authority has committed to purchasing 500 new electric buses in its 2022-2024 capital budget and building charging infrastructure at eight of its 28 depots. Los Angeles County Metropolitan Transportation Authority replaced all the 60-foot articulated CNG buses on its San Fernando Valley G line with 40 New Flyer Xcelsior CHARGE NG™all-electric buses. Chicago Transit Authority committed to electrifying all of its 1,900 buses by 2040.

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A Vital Strategy

Many agencies are deploying smaller-scale fleets of BEBs in demonstration projects or investing instead in small-capacity electric shuttles or rideshare vehicles—some of which also serve as test platforms for varying levels of driving automation. Transit agencies pursuing electrification also must engage other stakeholders in making major investments—especially the local electric utilities who will be called upon to upgrade power capacity on the many distribution circuits where agencies hope to locate charging infrastructure.

As trends shaping the future of bus transit are monitored, many transit agencies especially those with mature or emerging bus rapid transit systems would be well advised to begin learning about the several advantages of automating the bus yard.

Still, it appears to WSP and a wide range of analysts that electrification of buses is a long-term trend that will continue to grow in the U.S. and worldwide. Despite their higher purchase costs, electric buses offer long-term return on investment with savings in fuel, maintenance and repairs, as well as eliminating the street-level pollution emitted by internal combustion engine buses. For local governments that have committed to greenhouse gas reduction targets, electrifying public transit is a vital strategy.

While the anticipated shift to automated buses is in a nascent stage, connected and automated vehicle (CAV) initiatives led by transit agencies are becoming

more common. Most readers will be aware of this trend from coverage in these pages of programs such as Arlington, Texas's, Arlington RAPID autonomous shared mobility platform.

At this point, however, even light-duty passenger cars like those operated by Arlington RAPID are operating with Society of Automotive Engineers (SAE) Level 3 or Level 4 technology—driving in automated mode some or most of the time, but always with drivers behind the wheel ready to take over if an unexpected challenge confounds the automated driving system (ADS).

The ADS is an important distinction in transit automation kits. ADS can perform entire dynamic driving tasks at SAE Levels 3, 4, or potentially 5, while advanced driver-assistance systems (ADAS) are associated with lower levels of automation that improve safety such as lane-keeping assist and object detection.

The automated yard is a great use case for ADS equipment. The same equipment required for ADS maneuvers can be programmed for ADAS capabilities that can provide benefits in BRT environments with precision-docking, narrow lanes and platooning buses to increase route capacity while decreasing energy use.

Projects like the CTfastrak – deploying three automated BEBs in 2023 - the KCATA ADAS pilot on the MAX BRT line and the first automated bus yard specification released by Niagara Frontier Transportation Authority as an option for the ground-breaking BEB procurement, prove the market is eager to realize the benefits of ADS and ADAS transit solutions.

Low-Risk Environment

The steepness of the automated bus learning curve is a primary reason that WSP is focusing on the ABY. Compared to public bus routes where unpredictable and unusual hazards can challenge the most skilled human driver—let alone a computer—a bus yard offers a low-risk environment in which to test and gain experience with autonomous driving technology. Bus yards are secured from public access and operations are organized based on schedules and routines that can be automated relatively easily.

Currently, there are no active ABY pilot projects in the U.S., but WSP and its partner RR.AI–which is actively integrating automation kits with OEMs such as New Flyer and Gillig–jointly operate an ABY demonstration program in Clarksburg, Md., that has been visited by several Mid-Atlantic transit agencies. The next opportunity for agency staff to observe ABY operations at that facility will be in summer 2022. Additionally, a European Union-funded demonstration project by Swedish vehicle manufacturer Volvo in Paris in 2018 successfully tested automated bus parking in a multi-story bus depot, the first of its kind at an active bus depot.

ABY is an advanced concept that will require an innovative partner to demonstrate its benefits sufficiently to foster wide adoption. An ABY can offer immediate benefits in terms of improving safety for workers, allowing more dense and efficient operations, and reducing common accidents like broken mirrors that arise when drivers maneuver in tight areas. But the most significant advantages will manifest through serving electric buses.

"The growth of the battery electric bus market requires new solutions to enable efficient charging," said Bryan Brilhart, director of operations at RR.AI. "Capabilities like autonomous precision docking enable driverless smart charging and reduce incidents of damage in bus yards. This is a near-term opportunity for transit agencies to increase service reliability and increase safety within their depots."

Ideal Candidates

WSP and RR.AI are currently in conversations with transit agencies interested in partnering to pilot this technology and are continually meeting with interested parties. A funding opportunity will likely be made available soon by the FTA under the Strategic Transit Automation Research (STAR) Plan, which has identified the importance of an ABY demo. WSP and RR.AI have developed a strategic roadmap and a conceptual plan of operations for how an agency can make a competitive case for an ABY grant submission to FTA.

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One of the most frequently asked questions on the topic is regarding the size and characteristics that would make a transit agency an ideal candidate for an ABY. Capacity-constrained depots are a top criterion and that is a box that many agencies in the country can check.

Beyond that, agencies planning to retrofit an existing bus depot and/or developing a new bus depot would be good candidates and agencies with BRT in operation or at least in planning stages are also favorable because of the benefits that an automated operations can provide to a BRT system.

Battery-electric bus garages typically use a shared charging technique that, while cost-effective, requires staff to move buses in and out of charging positions. In an automated charging scenario, a bus, once fully charged, would move seamlessly to its designated parking area, while the staged bus behind would pull forward simultaneously underneath the pantograph to be charged. This increase in operational efficiency can reduce the number of overhead pantograph chargers by 30-35 percent, providing substantial capital infrastructure cost savings.

Severin Skolrud is the emerging technology lead within the National Fleet & Facilities Division at WSP USA.

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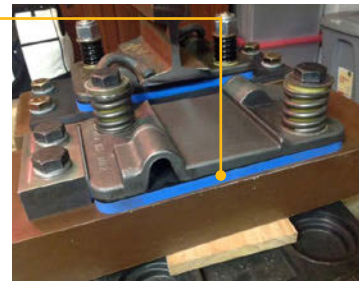

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