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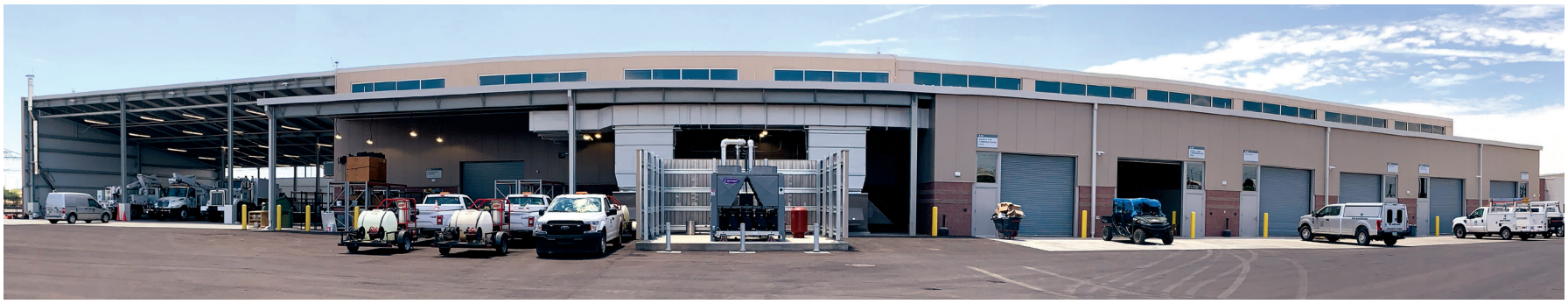
THE SOURCE FOR PUBLIC TRANSPORTATION NEWS AND ANALYSIS

MONDAY, JUNE 6, 2022 | VOLUME 80, NO. 10

2022 Rail Conference

SAN DIEGO, CA



Exterior of the Valley Metro Operations and Maintenance Center.

Taking You There: Helping Valley Metro Complete Two Major Transit Projects

BY ANDREW DITTER
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IN 2015, PHOENIX, AZ, VOTERS opted to fund a 35-year, $31 billion transit plan encompassing new bus service, light rail capacity, and street improvements spanning approximately 42 miles and connecting the major metro areas of Phoenix, Tempe, Mesa, Chandler and Gilbert. Hill International, Inc. is supporting Valley Metro as project manager in delivering this ambitious program, providing program management and construction management services across multiple phases.

Two of the program's most complex and high-profile projects are the Tempe Streetcar project and Valley Metro's Operations and Maintenance Center Expansion. Each of these projects presented a suite of challenges, from coordination with third parties to minimizing operational impacts. But, through close coordination with all stakeholders and a proactive approach to finding solutions, both projects achieved Valley Metro's goals and are ready to further connect the Phoenix metro community. "We are grateful for the partnership with Hill International in delivering these important projects to the Valley," said Valley Metro's Brian Mason, manager, construction and utilities.

Tempe Streetcar

The $200 million Tempe Streetcar project provides a regional commuting solution for the city of Tempe by connecting a residential area at Apache Boulevard, across from the Arizona State University campus in downtown Tempe, with Rio Salado Parkway at a busy commercial / business center terminus. The streetcar also enables intermodal connection with Valley Metro's light rail system at Mill Avenue and Apache Boulevard.

This CM (Construction Manager)-at-Risk project installed a total of 6.3 miles of rail, with 3.8 miles of single and double track segments, seven single turnouts and two crossovers. As streetcar track is shared with local traffic, the project also necessitated 19 grade crossings in downtown Tempe. In addition, the streetcar has 14 stops, each featuring installation artwork from local artists. An overhead catenary system (OCS) provides power for the streetcar, delivered by three traction power substations. These substations are adorned with high-finish architectural wall panels to complement the local urban streetscape. In addition, for a length of track running from Mill Avenue to Tempe Beach Park, the streetcar runs on battery power, temporarily eliminating use of the OCS and preserving downtown Tempe's lush tree canopy.

To help realize the project as planned, the project management team worked in close collaboration with the City of Tempe government and the contractor to solve problems in the field, keep the project on budget and meet schedule requirements. A highlight of the team's work was change management support, as $14 million in contract change orders were made over the three-year construction phase of the project. These modifications included Issued for Bid-to-Issue for Construction adjustments, roundabout construction, and the Dorsey power switches, which were designed during construction to upgrade Valley Metro's light rail system.

The PM team also managed hundreds of conflicts between the OCS with both underground and overhead utilities. Similarly, we helped to identify and resolve conflicts between the streetcar track slab and the existing road geometry and the local drainage system, which encompassed additional grading and paved areas beyond the original design. Additional power connections between local providers and service entry systems were made during construction as well. In each case, the team discussed design and construction methods, with Hill supplying independent cost estimates to provide clarity and increase cost certainly.

Another key area where the PM team directly contributed to project success was through design evaluation support. Reviewing designs during construction, we identified modifications such as simplified traffic signals and streetlight connections, unnecessary catch basins, duct bank changes, and even contract allowance adjustments. Our work resulted in a $4 million credit to the project. The team also contributed to Integration Test Coordination for the project, as well as Safety & Security Certification.

The project also identified several lessons learned for Valley Metro to integrate into future projects applicable to other public transit agencies delivering their own streetscape projects. These included:

- **Detailed surveys:** More detailed and current topographic surveys, including poles, curb, gutters and potential private areas to be built out, can help to control costs and avoid delays.
- **Communications:** Coordinating with local concurrent construction projects during the design phase, including design exchange, helps to keep a more precise and timely record of site conditions.
- **Utility Surveying:** Integrating pot-holing results into the design avoids future obstacles.
- **Risk Allocation:** For any CM-at-Risk project, proper risk allocation is key to success. Discussions with the contractor about shared risks and how to best manage risks helps resolve issues before they can impact project progress. Similarly, making certain the contractor understands the local bureaucracy and is prepared to be flexible about grouping small changes by work type or subcontractor can help resolve changes quickly.
- **Long-Lead Items Scheduling:** Coordinating long-lead items, especially those not directly related to construction, such as vehicle manufacturing, with regular check-ins on progress helps arrive at a "good finish" to the entire project.

Operations and Maintenance Center Expansion

The $92 million, design-build Operations and Maintenance Center Expansion Project (OMCEXP) delivered yard and shop facilities to accommodate a fleet of 40 additional vehicles, along with all associated maintenance and service space requirements, including critical infrastructure upgrades. Now completed, the expansion enables Valley Metro to maintain a fleet of approximately 90 vehicles, compared to the former capacity of 50 vehicles.

The project included adding 35,500 square feet of Maintenance of Equipment (MOE) space and 25,000 square feet of working area to the Maintenance of Way (MOW) building. The yard itself was raised using a mechanically stabilized earth wall and engineered fill to add three new, 1,500 linear feet (LF) of storage tracks, and five new service bays were added in the MOE. In addition, work in the yard included 6,600 LF of new trackwork, and greater flexibility and movement was delivered by adding 16 new turnouts and adjusting three switches to maximize geometry in the yard. Construction of these elements was achieved in an active yard, without disrupting mainline revenue service.

The project also revamped the cooling systems in the MOW and MOE buildings, and especially in the shop spaces for the light rail vehicle (LRV) mechanics. The MOE now cools 174,000 square feet (SF) of shop space to 75 degrees Fahrenheit year-round with a fresh air ERV / ARU cooling tower system. The project also added an additional substation to the yard, replaced train wash equipment, improved system safety by installing a new sanding system for the LRVs and added two new cleaning platforms. Notably, these systems needed to allow for two new dynamic vehicle envelopes: the Siemens LRVs and the Brookville streetcars, as well as accommodate the current Kinkisharyo LRVs for clearance and safety in the shop and yard.

Upgrade and repair elements of the project included correcting the tension of the OCS in the yard, replacing failing components and bringing the overall facility to a state of good repair, all while maintaining operations for vehicles and staff.

VALLEY METRO PROJECTS

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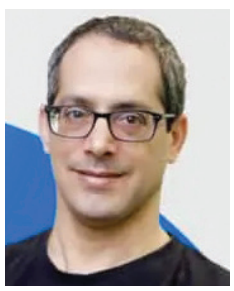
Computer Stacks on Wheels—How the Transportation Sector Is Transforming

BY AMIR LEVINTAL
CEO and Co-founder
Cylus

PUBLIC TRANSPORTATION SYSTEMS have always been synonymous with cutting-edge technology—there's a reason we still gush over reinventing the wheel! It is as true today, with machine learning, IoT, Big Data and other frontline technologies being utilized to make our key transportation systems even smarter.


Amir Levintal

While digital solutions appeared in the transportation sector as early as the late 1990s, never has the road to digitization been as fast tracked as today. Thanks to digital transformation, today's "computers on wheels" have improved the quality, speed, comfort and overall functionality of new and existing transport systems—from roads to rails.

But digitization isn't always a joyride. The interconnectedness that makes digital technology so efficient and convenient also gives rise to greater security risks and vulnerability to cyberattacks.

Striking the right balance between risks and rewards will be key to unlocking transportation technology's full potential. Accordingly, to truly optimize digitalization in the industry, we must also confront the growing security risks and examine how the sector can best grapple with their challenges.

Digitalization in the Transportation Sector & Rising Security Risks

Interconnectivity always widens the attack surface of a transportation system and raises the risk of hacks or data breaches. The digital age has led to a convergence of OT and IT environments—i.e., the integration of systems controlling physical events and processes with back-end hardware and software for conveying and processing information. This poses a major issue in the transportation sector, as both IT and OT systems are directly connected to transportation companies' wider digital ecosystems—opening the door for hackers to leverage vulnerabilities in one system to reach another.

In the auto sector, AI-powered SaaS technologies are being used in more and more vehicles, and not just in electric vehicles (EVs) or increasingly sophisticated, partially autonomous vehicles (AVs). Such amenities as newfangled navigation and entertainment systems and car-sharing capabilities have made even "standard" vehicles more network-reliant. Indeed, the rise in automotive cyber-attacks in recent years only demonstrates that the rate of attacks is proportional to the scale of innovation.

Things are similar in the rail industry. Modern railway systems commonly utilize Automatic Train Control (ATC) and Automatic Train Supervision (ATS) to increase train efficiency and passenger safety by eliminating human error through automated command and control systems. But these increasingly connected systems have also introduced new potential attack vectors for hackers.

What's more, railways rely on a complicated blend of legacy infrastructure, commercial off-the-shelf components and technology from third-party vendors. This creates ample opportunities for cybersecurity gaps, because in the world of cyber, you're only as secure as your weakest link: Any security flaws in supplier systems, new or old, have the potential to compromise the entire rail network.

How Is the Sector Grappling With Evolving Challenges?

Naturally, most transportation systems weren't designed at first with cybersecurity in mind, and to complicate matters, regulators have long struggled to agree on cybersecurity standards for transport companies. Fortunately, transportation companies are working to keep security practices at pace with rapid digitalization, while regulatory bodies also recognize the consequences of cyber-attacks on global trade, supply chain friction, economic

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VALLEY METRO PROJECTS CONTINUED FROM PAGE 14

Specifics of the OMCEXP included:

- 9,300 LF of track replaced and added, requiring 2,700 LF of demolished track.
- 35,500 SF added to the MOE.
- 15,000 SF added to the MOW.
- More than 10,000 SF of new space under canopy. 120 OCS poles were added in the yard.
- Three new cranes and expansion of one crane's ability.
- An LRV wash that can handle 12 vehicles per hour minimum.
- 257 trees added to the facility, representing a 63 percent increase.
- One substation added to the yard.
- Nearly 95,000 contractor man-hours, the equivalent to 45 people working 40 hours a week for a year.
- More than 366,165 craft man-hours, the equivalent to 176 people working 40 hours a week.
- More than 1,000 employees provided with safety orientation.

Resident Engineering support was critical on this project, as Valley Metro was able to leverage its current specifications with Hill's global body of rail program and project best practices and lessons learned. This included specific experience drawn from light rail projects across the U.S. as well as internationally and helped the team to control costs throughout the project lifecycle. Hill worked to ensure compliance with specifications, design and safety concerns during systems integration testing; confirming emergency management plans were in place and updated regularly (this included six separate incidents where the contractor placed equipment within the track's fouling envelope, scratching a train); and implementing a safety call tree early in the project to keep all project parties informed and up to date.

Another area where PM support was critical was in addressing a significant amount of planning and preparation requirement by Valley Metro. This effort was necessitated due to internal concerns between the Operations and the Planning departments, as Operations asked the project to further minimize impacts to operations than had originally been agreed upon.


Interior of the Valley Metro Operations and Maintenance Center

HILL International

ON TRACK: DELIVERING THE INFRASTRUCTURE OF CHANGE

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Hill offers rail and transit clients around the world the lessons learned and best practices of our experience in managing nearly $300 billion in rail construction programs and projects. From Amtrak's Gateway Program along the Northeast Corridor in the U.S. to the world's longest monorail in Egypt, we know how to help your organization deal with the logistical, stakeholder management, and technical challenges inherent in rail construction. And, with Hill's exclusive focus on project and construction management, rail owners and operators know they can always count on Hill to provide timely, accurate, and actionable information needed to make the best decisions for your project.

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