REConews

T-WALL® Retaining Wall System Spring 2018

I-476, Montgomery County, PA

# The Reinforced Earth Company Adds T-WALL®

## In this issue



REINFORCED EARTH®

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We're excited to announce that the T-WALL® Retaining Wall System, formerly of The Neel Company, has been added to RECo's proven retaining wall solutions.

The T-WALL modular gravity retaining wall system has been a staple in the highway and railroad construction industries for three decades. An ideal solution for bridge abutments, approach embankments, accelerated bridge construction, and other bridge applications, the system uses modular precast concrete units and select backfill, reducing the backfill quantity as the wall rises.

- There are no mechanical connections needed.
- The simple stacking and compacting procedure allows for fast construction.
- A great retaining wall solution in areas that have a narrow base width.
- Backfill specifications are less restrictive than for MSE walls.

Ongoing projects include work on the Fullerton Road Grade Separation in Industry, California and a sea wall in Monmouth Beach, New Jersey. Several highway projects in Pennsylvania, as well as the Kosciuszko and Goethals Bridges in New York are also using T-WALL.

T-WALL units come in three sizes to accommodate application, wall size and other unique site criteria. The units are cast with varying stem lengths based on the wall height or location on the wall. Extended-height

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and sloped top units are provided for the uppermost wall course. As with all of our precast concrete products, a wide range of standard and custom architectural treatments can be applied.

We're looking forward to continuing the successful delivery of the T-WALL retaining wall system throughout the country.

River Road Bridge Replacement (ABC), Uxbridge, MA

Setting T-WALL units


Union Pacific Railroad Relocation, Chicago O'Hare International Airport

# Specialized MSE Design for Bridge Widening


Bridge Widening with Specialized MSE Wall Design

The Pennsylvania Department of Transportation (PennDOT) is one of the most active agencies in terms of transportation infrastructure improvements. Statewide there are over 1,000 projects under construction as of the middle of spring, 2018, according to the PennDOT website. Of the many types of improvements to be made, road and bridge widening is very common, in which older structures are upgraded to accommodate a growth in traffic volume. Complications often arise during this type of project, when planning how to efficiently use portions of the existing structure with as little demolition as possible.

One such project, in Easton, involved the widening of the Freemansburg Avenue bridge over SR 33. The existing structure was a double-span bridge with abutments on either end. The abutments sat on piles to carry the vertical and lateral loads from the bridge. Each abutment was built with a mechanically stabilized earth (MSE) wall in front, and flared MSE wing walls.

The proposed widening involved extending the bridge abutment seat in one direction by driving new piles to align with the existing, then building a new MSE abutment wall and wing wall to interface with the existing wall.

A design problem arose when determining how to continue the abutment seat across the interface of the existing and proposed MSE wall. The original plan was to “freeze” a corner zone of the existing MSE wall by using a jet grouting procedure, then drive new piles through the existing MSE wall backfill. This was a good idea in theory, as it would ensure that the MSE wall stability was not compromised when driving new piles through it. However, it was later determined that when jet grouting the existing MSE backfill, it would be too difficult to ensure that the necessary volume of fill had been treated.

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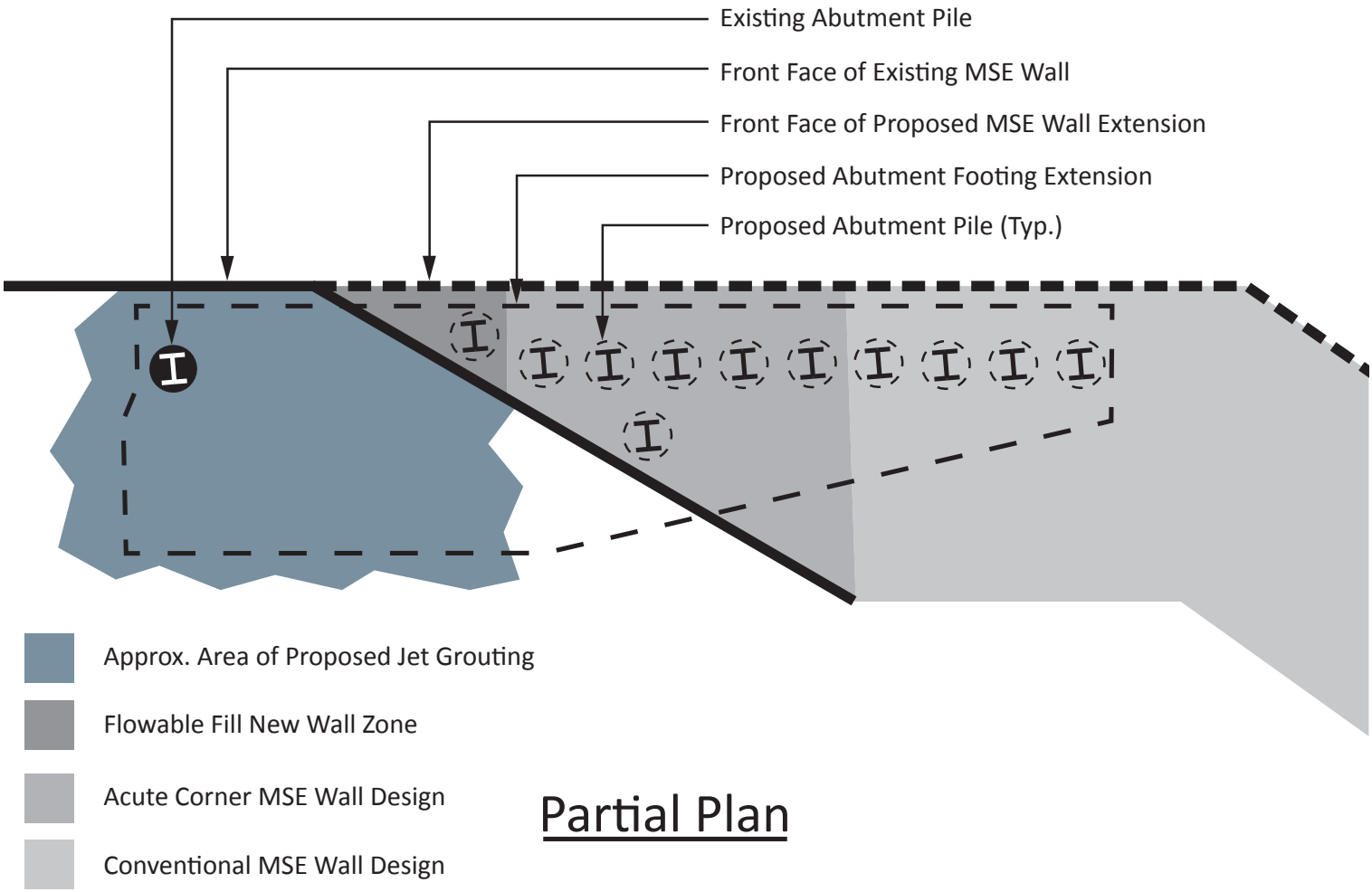
Therefore, the project team (PennDOT, Pennoni Associates, Inc., Borton-Lawson, JD Eckman, Inc., and The Reinforced Earth Company) worked on an alternate solution that would involve leaving the existing MSE wall backfill undisturbed. To avoid driving a new pile through the existing MSE structure, it was proposed to design a length of abutment footing from the last existing pile that would span extra distance to the new piles in the proposed MSE structure. This allowed new pile installation to occur prior to backfilling, which is ideal when constructing an MSE wall.

The interface of the new and existing MSE walls also had to be designed. The two walls formed a roughly 30-degree angle, making it impossible for conventional MSE wall design in the corner, especially when considering the tight spacing of the new piles. A cast-in-place concrete triangular zone was constructed to the full height of the wall, which connected the new MSE wall panels to the existing. This allowed for a stabilized corner over a short length along the face of the new wall, until a more conventional MSE acute corner design was feasible for the remainder of the wall. What resulted was a "shored" MSE wall, which is the general term for building a wall in front of an existing structure, while using the existing structure to stabilize or reduce loads on the new structure.

Shored MSE walls require a specialized bin-wall type design, and are rarely identical in cross section from project to project, due to the variation in geometry of the site and the characteristics of the existing structure. Shored MSE walls are often used to widen roadways and bridge abutments, in which existing structures still retain much of their original service life, but must be improved to carry new loads or an increased traffic volume. It has proven to be an excellent solution for upgrading transportation infrastructure.




Partial Plan

# Improvements to a Major Alaska Corridor



The most direct route from Anchorage to Fairbanks, Alaska begins as Glenn Highway (AK 1). At Wasilla, Alaska, the road becomes Parks Highway (AK 3). While Glenn Highway is the heavily traveled main artery and commuter route between Anchorage and Wasilla, Parks Highway is a key corridor north of Wasilla for local traffic, commuters and tourism, as well as recreation and commercial transportation. Parks Highway has numerous railroad grade crossings, which are always a safety concern.

Parks Highway Grade Separation

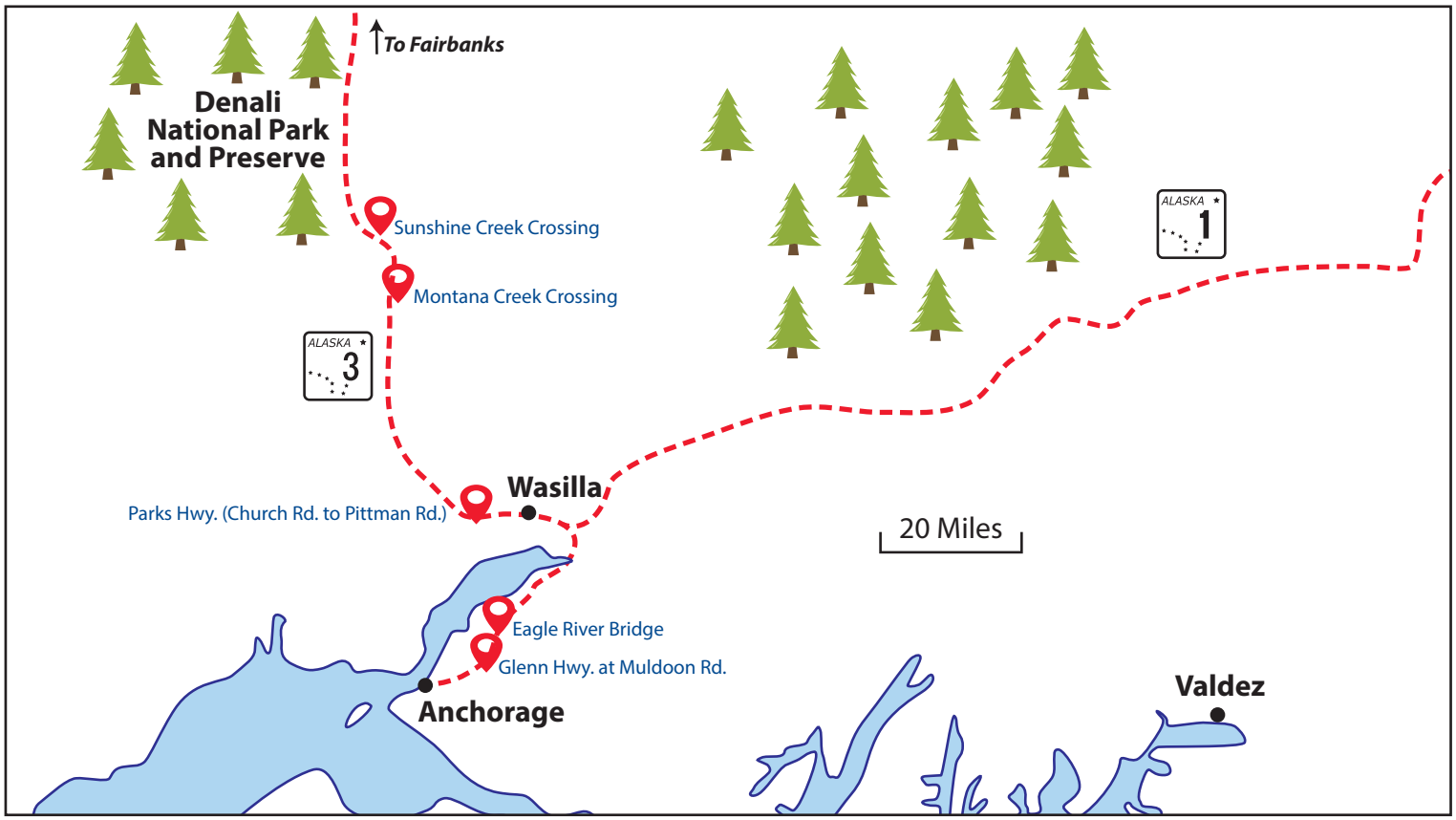
The Alaska Department of Transportation & Public Facilities (DOT&PF) was able to construct grade separations at two accident-prone crossings near the town of Talkeetna. This was made possible by participating in the Federal Highway Administration's Highway Safety Improvement Program (HSIP), which identifies high accident locations, evaluates corrective measures addressing lifesaving and injury reduction, and then funds the most cost-effective solution.

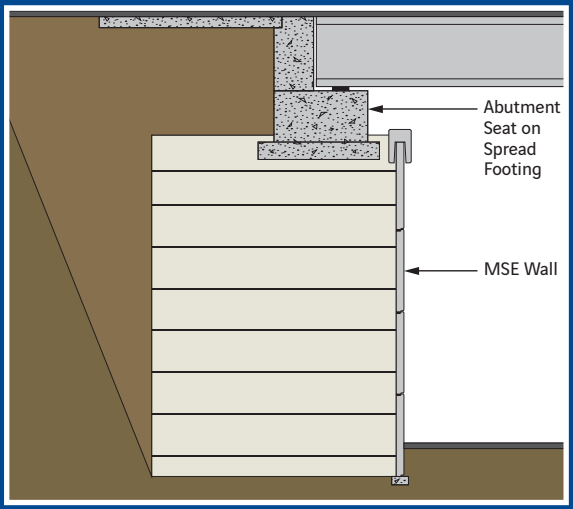
Buses and fuel trucks, when stopping as required by law at all railroad crossings, were creating long traffic backups at Montana Creek crossing and Sunshine crossing, leading to increased accident frequency along with wasted fuel and driver frustration. The new grade separations were constructed with Reinforced Earth® mechanically stabilized earth (MSE) abutments, eliminating both the vehicle-train collisions at these crossings and the resulting traffic backups. Located 8 miles apart, the two crossings had different foundation conditions and required different types of Reinforced Earth bridge abutments.

At the Montana Creek site, little settlement was expected under the weight of the new fill, allowing use of a true MSE abutment (bridge beams supported on a spread footing bearing directly on the MSE structure). More settlement was anticipated at the Sunshine site, however, requiring a mixed MSE abutment (piles passing through the MSE structure support the bridge seat, the MSE walls retain the fill). Both were constructed under a design-build contract with general contractor Kiewit Infrastructure West, partnered with PND Engineers, of Anchorage. PND Engineers performed design management, roadway and geometric design, structural and geotechnical engineering, and design quality control. Reinforced Earth wall panels were fabricated by Precast Concrete Co., a subsidiary of Anchorage Sand & Gravel Co. The project was completed in late 2016.

Parks Highway (Church Road to Pittman Road)

In the western suburbs of Wasilla, before Parks Highway turns northward toward Fairbanks, there are sprawling residential developments, the Wasilla airport,

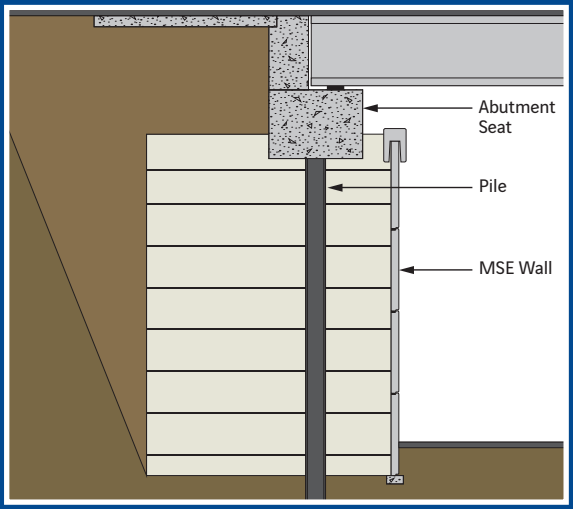





## Abutment Sections:

In a True Abutment:

- Bridge beams are supported on a spread footing bearing directly on the MSE structure.
- The bearing stress of the spread footing on top of the MSE structure is typically held to 4 ksf.
- The bearing stress beneath the spread footing is distributed into the reinforced soil, with the lateral load carried by the upper rows of MSE soil reinforcements.




In a Mixed Abutment:

- Piles support the bridge seat.
- The MSE wall retains the fill beneath and adjacent to the bridge.
- A portion of the lateral load on the pile-supported bridge seat may be transmitted to the MSE fill and can be resisted by MSE reinforcements in the wall or attached to the abutment backwall.

and too much traffic for the available two-lane Parks Highway. This was resulting in congestion and accidents. The DOT&PF contracted with Knik Construction for a reconstruction of a four-mile stretch between Church Road and Pittman Road, upgrading to a four-lane divided highway, which included lengthening the existing MSE true abutment walls to support the new bridge. The contractor selected Reinforced Earth structures for the abutment extensions, requiring some modifications of the existing abutments that used a different MSE system.

The old MSE wingwalls were in line with the abutments and not folded back, so the east wing of each structure had to be partially demolished to make room for the new wall extension. This meant protecting the integrity of the in-service Parks Highway above, accomplished on one abutment by driving sheeting and on the other side by careful staging of embankment removal and prompt replacement using the new Reinforced Earth MSE wall. Clip angles anchored to in-place panels allowed transitioning to Reinforced Earth reinforcing strips, and slip joint panels created the junction between the two MSE systems' dissimilar facing panels. The new MSE precast components were also cast by Precast Concrete Co. of Anchorage.

## Glenn Highway Capacity Improvements

The Eagle River begins in the mountains east of Anchorage and flows generally westward, emptying into Knik Arm just north of Elmendorf Air Force Base. Along the way it passes

Glenn Highway Capacity Improvements
Temporary Wire Wall

under Glenn Highway. As in the lower 48, rush hour congestion is a problem, exacerbated by the highway's steep descent into the Eagle River's valley at the bridge crossing. During winter months, the road becomes especially dangerous with snow and wind.

Capacity improvements to Glenn Highway required reducing the grade on the steep approach to the northbound Eagle River Bridge, adding a third northbound lane and frontage road, and making provision for a future northbound HOV lane. To accomplish the widening, general contractor Kiewit Infrastructure West first installed a Reinforced Earth wire-faced MSE wall to support the new fill and allow traffic relocation. Then the permanent Reinforced Earth precast panel wall was constructed parallel to the wire wall, with panels delivered by barge to Alaska from Wilbert Precast in Yakima, WA. The fill of the permanent wall was placed against the wire face, effectively burying it.

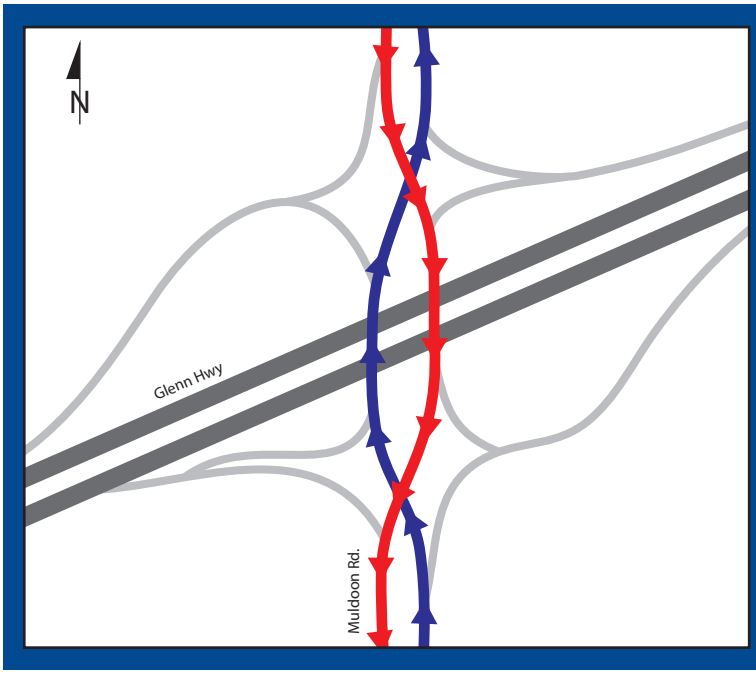
Project completion came one year ahead of schedule, due to an accelerated concurrent design-build process that also decreased lane closures and delays. Using MSE structures contributed to this speedy completion because design and fabrication are done by the MSE vendor in parallel with other work on the project, facilitating delivery accompanied by vendor-supplied on-site wall construction start-up assistance.

Glenn Highway and Muldoon Road Interchange

Closer to Anchorage and south of the Eagle River, Glenn Highway intersects Muldoon Road, an access point to a large residential suburb and the primary bypass for traffic east of Anchorage. General Contractor Neeser Construction, Inc. (Anchorage) reconstructed the accident-prone partial cloverleaf into a safer and higher capacity diverging diamond interchange, requiring two new, 3-lane bridges with Reinforced Earth mixed abutments and retaining walls.

Glenn Highway at Muldoon Road
MSE Ramp Wall

Glenn Highway at Muldoon Road
Abutment MSE Wall




A Diverging Diamond Interchange (DDI) is an interchange in which the two directions of traffic on the non-freeway road cross to the opposite side on both sides of the bridge. A traffic light is typically used at the crossover. It is unusual in that it requires traffic to briefly drive on the opposite side of the road. The purpose is to improve safety and traffic flow on and off the freeway.

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Glenn Highway Capacity Improvements - Mural Art

# OTHER NEWS...

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The Reinforced Earth Company USA

## LUNCH & LEARN

Contact us today to schedule a Lunch & Learn at your office!

## Visit us at these upcoming spring events:

**SAME Joint Engineer Training Conference** *May 23* Kansas City, MO

**Elko Mining Expo** *June 7* Elko, NV

**International Bridge Conference (IBC)** *June 11* National Harbor, MD

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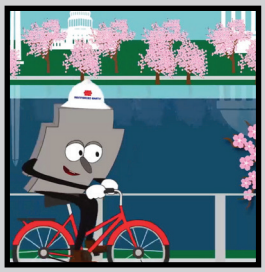

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*New!*