menard

Ground Improvement for Transportation Structures

WHY SETTLE?™

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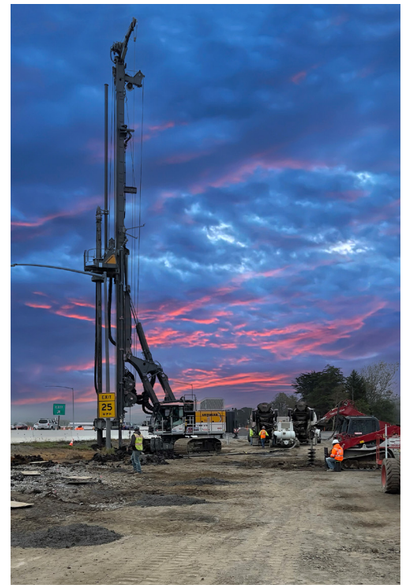
What are the Challenges for Transportation Structure Support?

Transportation structures, such as roadways, highways, railways, embankments, MSE walls, maintenance sheds, salt storage domes, transit stations, and other related structures are critical infrastructures that are heavily relied upon. Consequently, all must perform as expected over time, regardless of the day-to-day demands placed on them.

These structures are frequently built in areas where the ground is highly compressible or otherwise problematic. In these cases, densifying, consolidating, or reinforcing the underlying soils is necessary to prevent failure and minimize long-term settlement.

Transportation structure projects require simultaneous management of multiple sites along the alignment. These projects also pose specific challenges in terms of working near existing traffic in limited access areas and relocating between multiple work areas. They can often involve using multiple techniques to meet the wide-ranging geotechnical conditions or risk/hazards and specific constraints of the terrain.

How Does Menard Support Transportation Structures?



To ensure the long-term integrity of the infrastructures and the safety of the vehicles using them, these areas must be treated to reduce and control primary, secondary and differential settlements. Where significant heights of fill are placed along the alignment the underlying ground can be prone to excessive settlement. Critical areas such as the embankment and bridge interface generally require more extensive treatment and careful management of interfaces between different structures and within areas of differing fill heights.

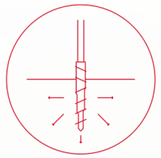
The long-term performance of this infrastructure is vital, so it's important to ensure that the soils that they will be supported by are stable and appropriately reinforced to avoid costly and damaging settlement over time. Ground improvement is a practical, economical, and efficient approach to the unique demands that transportation structures face when situated on poor soils.

Conventional approaches to deal with problematic ground such as removal and replacement have been slow and costly. Menard's techniques improve the soils in place, typically without generating significant volumes of spoils, which is a positive from both a project budget perspective and from an environmental point of view, helping to protect area wildlife and wetlands from being disturbed.

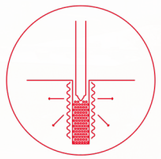
Transportation structures are exposed to significant loads and severe environmental conditions. These structures are susceptible to settlement, instability, and premature failure without adequate ground improvement. Our solutions make it possible to:

- Reduce settlement
- Enhance bearing capacity
- Eliminate piling
- Avoid removal and replacement
- Mitigate the risk of soil liquefaction
- Expedite construction schedules

Menard Solutions for Transportation Structures may include...

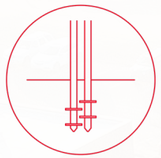


Controlled Modulus Column (CMC)® rigid inclusions are installed to support tall embankments and MSE walls and where extremely soft soils are present. CMCs can be installed to depths over 100 ft.



Stone columns are used in stiff clays or in sands to reduce settlement and enhance stability. Stone columns can also be used to mitigate the risk of liquefaction in areas of potential seismic activity.

Wick drains are used in soft, clayey soils to speed up the consolidation settlement process to reduce the amount of settlement that occurs while the roadway is in service. Wick drains also facilitate strength gain in weak soils to enhance bearing capacity and allow for more rapid placement of embankment fills.



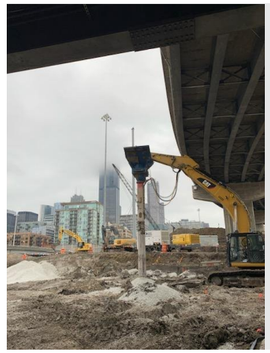
Soil Mixing is an extremely versatile technique that can be used to enhance bearing capacity and slope stability, mitigate the risk or liquefaction, and create safe working platforms.

At Menard, we offer a wide range of ground improvement solutions that are custom designed to meet the needs of your transportation project. **Why Settle?™**

Read more about all of our ground improvement solutions on our website!
https://www.menardusa.com/techniques

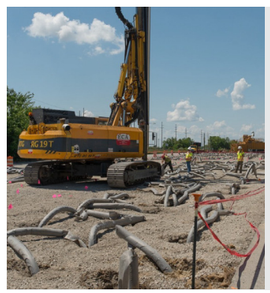
Featured Projects

Menard USA has delivered practical and sustainable ground improvement solutions for hundreds of transportation structures of various sizes across the country, partnering with more than 40 state Departments of Transportation (DOTs). *Here are some highlights from some of our key projects...*



Jane Byrne Interchange | Chicago, IL
As part of a major highway project near downtown Chicago, Menard successfully installed 126 stone columns (42 in diameter) to an average depth of 20 ft to support two, 25-ft tall Mechanically Stabilized Earth (MSE) walls. The design provided for 1 in of post-paving settlement, meeting the performance criteria of the project. In using lightweight fill for the MSE walls, an equivalent maximum bearing pressure of 1,400 psf was applied to the base of the wall. The combination of large diameter stone columns and lightweight fill resulted in an economical ground improvement system that was successfully installed in low overhead conditions beneath the existing ramps.

I-35 Bridge Replacement | Waco, TX
As a value-engineering alternative to stone columns, Menard utilized Controlled Modulus Column (CMC)® rigid inclusions to support 134,000 sq ft of Reinforced Earth Company (RECo) reinforced earth embankments and walls along both sides of I-35 across four distinct work zones. In areas with restricted access beneath high-voltage power lines, low-headroom grouted columns were efficiently installed to meet the project's unique challenges.



Port Access Road | North Charleston, SC
For this multiphase project supporting embankments and MSE walls, three separate techniques were employed, including the installation of 5,000 EQ drains across 12 areas. In two of the areas, EQ drains were installed to enhance the performance of CMCs under seismic conditions. In another area, wick drains were installed to mitigate long-term settlement along the initial approaches. And as embankment heights increased, CMCs were required to accommodate the taller fill requirements.

NJTA 14A Interchange | Bayonne, NJ
Menard successfully installed over 14,000 CMCs through highly variable urban fill and extremely soft organic soils to support numerous RECo MSE walls, embankments, and toll plaza buildings for the $286 million overhaul of the NJ Turnpike's Exit 14A. This ambitious project effectively controlled settlements, provided sufficient global stability and stands as one of the largest single-contract CMC highway support projects ever undertaken in the US.

ODOT I-75 Reconstruction and DiSalle Bridge Replacement | Toledo, OH and Northwood, OH
The DiSalle Bridge Replacement, part of a $350 million major reconstruction project along I-75 in Toledo involved widening roadways, reducing curves, and raising road elevations to meet modern standards. Menard USA was contracted to provide ground improvement for the embankments, walls, and ramps which were to be constructed over soft lacustrine deposits and man-made fills. To mitigate concerns of settlement and stability, Menard installed a combination of wick drains and CMCs for the north and south bridge approaches where MSE walls would retain up to 35 feet of fill. Through close coordination and rigorous testing, the project was completed efficiently, meeting Ohio DOT's strict performance and schedule requirements

TH 169 Nine Mile Creek | Hopkins, MN
The Nine Mile Creek Bridge in Hopkins, Minnesota required rehabilitation due to inadequate drainage and severe wear. The Minnesota Department of Transportation (MNDOT) planned to replace it with a 270,000 sq ft causeway supported by filling between two MSE walls. Menard was contracted to install over 4,800 CMCs to strengthen the underlying soils, meeting the aggressive schedule by mobilizing multiple rigs and coordinating closely with the general contractor. This project became MNDOT's largest CMC installation and was completed ahead of schedule.

CalTrans Route 12 | San Joaquin County, CA
The Bouldin Island rehabilitation project along a 4-mile stretch of State Highway 12 involved replacing the deteriorating two-lane freeway with a new section, featuring wider lanes, shoulders, and a concrete median barrier. To address excessive settlement caused by the site's soft, peaty soils, Menard installed 177,300 linear feet of strip drains and nearly 2.3 million LF of wick drains. Despite challenging swampy conditions, the team successfully completed the project on time, meeting the California Department of Transportation's strict deadlines.

I-29/US 275 Interchange | Council Bluffs, IA
For the I-29 & US 275 Interchange projects, part of a multi-phase highway construction effort, Menard USA installed over 15,000 CMCs and wick drains across seven contract areas to improve soft clayey soils and support embankment construction. With eight load tests, and six drill rigs operating simultaneously, it was one of the largest CMC installations in the U.S. at the time. The project successfully addressed bearing capacity, global stability, and settlement control for this multifaceted, schedule-driven project in a generally congested area.

I-690 Syracuse | Syracuse, NY
Menard installed a design-build ground improvement solution for NYSDOT to support a new double-sided MSE wall to replace the existing viaduct along I-690 over Teall Avenue and Beech Steet. The project was done in two phases: Phase 1 included the installation of 2,000 CMCs on the north side and Phase 2 included the installation of 1,500 CMCs on the south side of the MSW wall embankment. The crew coordinated closely with Menard's design team, thus overcoming NYDOT's strict completion schedule and averting potential coordination issues associated with working near the viaduct.

Rt 1 & 9T New Road | Trenton, NJ
The Route 1&9T/New Road project aimed to alleviate congestion by constructing a new roadway over one mile of unimproved land. Due to unsuitable on-site soils, Menard proposed a value-engineered solution, replacing the original design with a column-supported embankment system incorporating a shallow soil-mixed load transfer platform (LTP) and approximately 3,500 CMCs. The soil-mixed LTP significantly simplified construction by raising the working grade above the groundwater table. The complex design involved finite element models at multiple locations along the length of the roadway. Comprehensive analyses were performed during design that included checks for bearing capacity, settlement, lateral spread and global stability. Overall, this innovative approach improved constructability and performance and reduced costs for the client.

HSR King River Bridge | Central California
The California High-Speed Rail (HSR) project is the nation's first high-speed rail system that will ultimately connect San Francisco to Los Angeles by train. The high-speed rail line will allow trains to travel over 200 mph and make the journey in fewer than 3 hours. Farrell Design-Build was selected to engineer and install a ground improvement solution for the Kings River Bridge; a 445-foot-long structure located in the Central Valley region of the HSR project. The design had to address the performance of the structure under variable groundwater elevations, mitigate soil collapse, and prove resilient during a seismic event. Farrell ultimately designed and installed over 450 stone columns to a depth of 28-feet to meet the project's performance criteria.

WestEdge Infrastructure | Charleston, SC
To support over 1,700 LF of new roadway in a very poor subsurface environment, Menard installed CMCs. To mitigate the risk of flood damage, the new street level was designed 8 ft higher than the surrounding areas with gently sloping roads to accommodate this transition. Menard installed Bi-Modulus columns (BMC)® at the transition zones between the new and existing roads. This combination of Menard ground improvement solutions allowed the embankments to be constructed immediately following the CMC and BMC installation, without any waiting period or surcharging.

PennDOT SR51 & I70 Reconstruction | Belle Vernon, PA
The project consisted of a road widening of I-70, extension of the nearby Cedarbrook Golf Course Tunnel and construction of a new railroad bridge for Wheeling Lake & Erie Railroad. The existing cloverleaf interchange was reconstructed as a Diverging Diamond Interchange. Menard provided ground improvement solutions which included CMCs and Wicks Drains to address predicted embankment settlement under the new fill placed for the ramps, tunnel and railroad. Menard's multi-phase construction took place over 2 years.

Check out the video here.

Find the full case studies for these transportation projects and more on our website.

https://www.menardusa.com/resources-for-ground-improvement/case-studies

Contact Us

Have an upcoming project or questions about ground improvement? **We are here to help!** Call or email today so we can direct you to our representative in your local area.

Menard USA Corporate Office

150 East Main Steet, Suite 500
Carnegie, PA 15106

412-620-6000

Info@menardusa.com

Our offices across the country, including our affiliates, **Farrell Design-Build, Inc.** in the West and **Earth Tech, LLC**, in the Southeast, give you local access to our responsive teams.

Find a Menard USA office near you!

Boston, MA
774-279-2432

Charleston, SC
843-224-8806

Charlotte, NC
704-787-1964

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312-598-9549

Cleveland, OH
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Richmond, VA
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