

Cut Project Costs and Meet Sustainability Goals

Why Engineers Should Specify Vegetated MSE Walls



TITAN

BUILD YOUR LEGEND

From Cost Savings to Carbon Reduction

Vegetated Mechanically Stabilized Earth (MSE) walls represent a significant shift in sustainable infrastructure design, offering key advantages over conventional retaining solutions.

Vegetated MSE walls deliver measurable environmental benefits, substantial cost savings, effective stormwater management, reduced carbon footprint, and enhanced biodiversity - making them an optimal choice for modern engineering projects.

KEY BENEFITS:

- Significant cost savings compared to conventional concrete retaining structures
- 50-85% stormwater runoff reduction compared to unplanted controls
- Contribution to 10 of 17 UN Sustainable Development Goals
- Design life of 75-100+ years with minimal maintenance requirements



EROSION CONTROL & SOIL STABILIZATION

Vegetated MSE walls provide superior erosion control:

- Integrated vegetation creates extensive root systems that bind soil particles,
- While the mechanically stabilized earth structure provides long-term stability.

This approach effectively prevents erosion by stabilizing soil and stopping sediment from washing into waterways.

Benefits of effective erosion control:

- Promotion of groundwater recharge
- Retains stormwater
- Promotes biodiversity and local wildlife habitat
- Carbon sequestration
- Air quality improvement

TEMPERATURE REGULATION

Research from Utrecht University found that green walls create daytime cooling effects of 0.6-0.7 degrees Celsius between front and back wall surfaces.

This temperature buffering occurs through evapotranspiration cooling, shade provision, insulation effects, and urban heat island mitigation at the community scale.

PACIFIC RIM NATIONAL PARK CASE STUDY

The **ʔapsčiiik ʔašii project** in Pacific Rim National Park demonstrates erosion and soil stabilization benefits at scale, where the flexible design approach reduced environmental impact from an estimated 25,000 trees to approximately 1,200 trees in the final alignment while maintaining structural integrity.



INITIAL COST SAVINGS

According to Federal Highway Administration guidelines, MSE walls are typically more cost-effective than conventional reinforced-concrete retaining structures by 50 percent or more. Current industry data indicates final installed costs are significantly below comparable concrete gravity or cantilever wall systems.

REDUCE CONSTRUCTION & INSTALLATION TIME

The modular nature of vegetated MSE systems enables rapid deployment with installation time reduced by 50% compared to traditional concrete wall construction.

Key efficiency factors include prefabricated facing components eliminating forming and curing delays, hand-placeable materials reducing heavy equipment requirements, simplified construction methods requiring minimal specialized skills, and weather-independent installation for most system components.

LONG-TERM ECONOMIC BENEFITS

Beyond initial cost advantages, vegetated MSE walls provide superior long-term economic value through:

Extended Design Life:

Most systems achieve design lives of 75-100+ years, significantly exceeding many conventional alternatives. Some geogrid-reinforced systems offer design lives up to 120 years.

Reduced Maintenance:

The inherent flexibility of MSE systems accommodates differential settlement without structural damage, minimizing long-term maintenance needs compared to rigid concrete structures.



STORMWATER RUNOFF MANAGEMENT

Significant Volume and Peak Flow Reduction

Research from Southern Illinois University demonstrated that planted retaining wall systems substantially reduce stormwater discharge compared to unplanted controls, with control walls discharging 39.2 litres during study periods while vegetated walls discharged less than 5 litres - representing an 85-90% reduction in peak discharge volumes.

Beyond volume reduction, the systems create delayed runoff response following precipitation events, helping to reduce downstream flooding risks, protect receiving water bodies from erosive peak flows, improve groundwater recharge, and minimize combined sewer overflow events in urban areas.

Water Quality Enhancement

Vegetated MSE walls function as effective water filtration systems, removing pollutants through biological and physical processes. The filtration mechanisms include nutrient uptake by plant root systems, heavy metal sequestration in soil substrates, sediment capture through reduced flow velocities, and pollutant biodegradation in rhizosphere zones.



REDUCED CARBON FOOTPRINT

Material and Transportation Benefits

Comprehensive life cycle assessment research published in the Journal of Cleaner Production found that MSE walls are the most sustainable retaining wall option when compared to conventional alternatives including plain concrete gravity walls, reinforced concrete cantilever walls, masonry brick walls, and gabion limestone cage walls. The sustainability advantage increases with wall height, as MSE systems use soil backfill as the chief structural component rather than carbon-intensive concrete.

Vegetated MSE systems minimize transportation-related emissions through locally sourced materials reducing hauling distances, lightweight components enabling hand placement without heavy equipment, reduced freight shipping requirements, and simplified logistics with fewer specialized material deliveries.

Active Carbon Sequestration

The vegetation component provides ongoing carbon sequestration benefits that improve over time. Research from the Journal of Cleaner Production shows carbon sequestration rates comparable to high forest and coppice ecosystems.

*The comprehensive environmental benefits of vegetated MSE walls support **10 of the 17 United Nations Sustainable Development Goals (SDGs)**, including Clean Water and Sanitation (SDG 6), Sustainable Cities and Communities (SDG 11), Climate Action (SDG 13), and Life on Land (SDG 15).*

STRUCTURAL PERFORMANCE

Vegetated MSE walls maintain excellent structural performance while providing environmental benefits. Key engineering advantages include superior differential settlement tolerance compared to rigid wall systems, seismic resilience demonstrated in major earthquake events, adaptability to variable ground conditions, and accommodation of complex geometries, including curves and varying heights.

The 2015 case study demonstrates these capabilities, achieving a 30% increase in Factor of Safety for global stability while protecting sensitive environmental features.

LEED CERTIFICATION

Vegetated MSE walls support multiple Leadership in Energy and Environmental Design (**LEED**) credit categories, including **Materials and Resources** through use of locally sourced materials, **Energy and Atmosphere** through thermal performance benefits, and **Sustainable Sites** through stormwater management and habitat provision.

These systems increasingly drive market competitiveness by meeting government sustainability mandates for public projects, increasing long-term asset value through environmental performance, and reducing operational costs through natural temperature regulation.



About Titan Environmental

DESIGN WITH CONFIDENCE BY WORKING WITH AN EXPERIENCED PARTNER.

Titan offers professional value-engineered MSE system solutions backed by our in-house MSE engineering team focused on MSE applications. We provide engineering support, drafting, engineered stamped drawings, and site assistance to ensure your project and investments are protected.



System Supply

We offer competitive, turnkey MSE Wall and Slope solutions at all Titan locations.



Design Assistance

Our MSE technical team provides preliminary layout designs. This includes preliminary designs, CAD drawings, and specifications to ensure that your project meets performance criteria and regulatory standards.



Installation Support

Our technical expertise extends to supporting contractors on proper installation of MSE Wall and Slope systems. This helps ensure performance and longevity of a system, and overall project success.



About Titan's MSE System Solutions

TITAN'S MSE SOLUTIONS ARE CATEGORIZED INTO TWO MAIN SYSTEMS:

Titan Earth Wall® MSE Systems

Titan Earth Wall® MSE systems provide solutions for everyday challenges faced during grade separation construction, both permanent and temporary. Suitable for up to a 90-degree batter, Titan Earth Wall® MSE systems are custom designed to suit site geometry, the aesthetic needs of a project, natural habitat limitations, and longevity requirements.

[More information on Titan Earth Wall® MSE systems.](#)



Titan Earth Slope® MSE Systems

Titan Earth Slope® MSE systems are flexible and durable, providing a cost-effective solution for constructing slopes with a batter up to 70 degrees. Each Titan Earth Slope® MSE system is designed with lightweight and easy-to-manage components, making the construction process quick and hassle-free. All applications, once constructed, produce a vegetated green face that is both environmentally friendly and designed to meet the highest performance and quality standards.

Titan Earth Slope® MSE systems are custom-designed to suit site geometry, project aesthetic needs, natural habitat limitations, and design-life requirements.

[More information on Titan Earth Slope® MSE systems.](#)



Depending on the specific project needs, these systems offer various benefits and design options. Factors such as application, aesthetics, natural environment, and service life will influence the choice of the mechanically stabilized earth system required.

References

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More on MSE System Solutions

Get in touch with the MSE Technical Team to inquire about a current or future project. Titan works closely with engineers, contractors, and project owners on MSE applications in Canada and the USA.

- ✓ Technical talks on MSE wall and slope systems
- ✓ Site specific consultation on system selection
- ✓ Design support
- ✓ Installation support

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