

# What Makes A Great Wall?

If ever there existed a testimonial about the integrity of a wall, it would have come from the builders of the Great Wall of China. Even though some original sections have surrendered to natural and manmade forces, it is still standing more than 2,300 years after construction began. While the construction material of choice for today's retaining structures is conceptually similar to that of the Great Wall, applying technology gives modern walls a higher measure of strength, durability and safety.

Recognized as one of the most important civil engineering innovations of the 20th century, mechanically stabilized earth (MSE) technology allows retaining structures to be designed and built higher, stronger and more economically than ever before.

Thirty years after its introduction in the United States, the most popular MSE configuration uses steel strips embedded in granular fills and faced with precast concrete panels.

Their safety and reliability features have made these MSE structures the retention system of choice for many state departments of transportation (DOT) that are responsible for public safety along roadways. More than half of DOT-deployed retaining structures are MSE-based, which amounts to roughly 10 million square feet a year. Their success here is grounded in the design-build concept where structure performance, rather than end product or materials, is specified in contracts.

DOT contractors have the flexibility to use whatever materials and construction methods give the best value for the required level of performance. For commercial developers, a similar approach also makes sense when they adopt MSE technology to re-grade and make sub-prime sites economically viable.

Here are a few MSE performance specifications to consider:

- **Design responsibility:** Developers can lower risk when their specification requires the general contractor to subcontract MSE design and construction to a specialist with relevant experience and appropriate levels of insurance. When consulting with the engineer of record, the developer must specify which party will be responsible for the structure's internal and global stability.
- **Design code:** The most rigorous design code comes from the American Association of State Highway and Transportation Officials. Compliance with this code has an added benefit if supporting site roads will be

adopted by state or local governments.

- **Surcharges and external loading conditions:** External conditions generally determine the required size of the structure, so it is critical to specify these in clear terms.
- **Structural envelope:** Specify the structural envelope to ensure the necessary amount of right of way, and any minimum or maximum batter (the back-leaning angle that's built into the front face of a structure). Keep in mind that a 70-degree stepped wall is less expensive

to build than one with a vertical face, but takes up more land.

- **Settlement:** Depending on the geometry and ground conditions, make sure the specifications include reasonable settlement criteria—both for foundation design and bearing capacity—that are compatible with other aspects of the project. Specify if staged construction is necessary.
- **Aesthetics:** Stipulate the desired look, such as concrete for top-class facing or gabion for lesser requirements.

By specifying performance, rather than materials or end-products, developers can take advantage of several innovations in MSE construction that save time and money.

For example, MSE walls incorporating geosynthetic straps—developed for the chloride-rich soils of the Middle East—are becoming more common as a substitute for steel. The polymer-based construction of the geosynthetic straps provides a higher level of durability so they can be used with recycled concrete, which costs significantly less in areas where quarried backfills are expensive. (This also may help qualify a project for credits under the Leadership in Energy and Environmental Design rating system of the U.S. Green Building Council.)

Also, developers increasingly use welded wire facings and “green” walls that accommodate high settlements and cost less than concrete or stone-faced structures.

With their recent refinements, MSE structures are an increasingly important part of today's commercial development environment. Written in the context of a design-build contract, their performance specifications give developers appropriate tradeoffs and the best value, so they, too, can build a great wall.

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