



# Construction & Materials Tips

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## Policy Revision for Working Drawings for Bridge Construction

In April, 2001, a set of Special Provisions to Item 5, "Control of the Work," Item 420, "Concrete Structures," and Item 441, "Steel Structures," was approved, changing the approval requirements for bridge construction working drawings. These Special Provisions will be included in all future projects and can be change-ordered into current projects. The new policies will be included in the 2003 Standard Specifications.

Of special importance is the change made regarding working drawings for formwork, falsework, shoring, or steel girder erection. Although the work detailed in these drawings is temporary in nature and does not become part of the completed work, it does affect the safety of the public, TxDOT personnel, and the Contractor's personnel. The current specifications require that working drawings be signed and sealed by a Texas P.E. and then state that the Engineer will review and approve these drawings.

The new special provisions state that "Working Drawings for formwork, falsework, and erection plans shall be designed, signed, and sealed by a Texas P.E. and submitted to the Engineer. These drawings will not be reviewed by the Engineer but the Engineer *may* require that the responsible P.E. certify that the items were built according to the sealed plans." No change was made regarding analysis of construction loads on bridges. TxDOT will still review and approve these details.

An important point is the optional certification by the responsible P.E. that the items were built according to his/her sealed plans. This is at the discretion of the Area Engineer. In many past instances, these P.E.s submitted partially complete or slightly incorrect drawings, secure in the knowledge that TxDOT personnel would correct the drawings for them.

For the Department, the significance is that we will no longer review, correct, or approve working drawings. This change is not a great departure from current practice, since many districts indicated that:

- They weren't always diligent about enforcing the previous procedure
- They didn't review them closely because they were sealed by a P.E.

Therefore, to protect the safety of our employees and the public, we must enforce this new requirement that the Contractor submit signed and seal drawings, and be certain that the forms, falsework, and other elements are built according to them. If questions arise, consult the Engineer responsible for the working drawings, or the Bridge Division's Construction & Maintenance Branch - at 512.416-2232.

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## Preventing Retaining Wall Failure

Mechanically Stabilized Earth (MSE) walls have been the most common types of retaining wall on TxDOT projects for the past two decades. The advantages of MSE walls include their low cost, low design effort, speed of construction, and attractive appearance. However, analysis of recent retaining wall failures have shown the need to address five basic elements of their placement and utility: **System Selection, Design, Site/Soil Analysis, Construction, and Maintenance**. Suggestions include:

*(Continued from page 1)*

**System Selection** - Because MSE wall suppliers are only responsible for the internal stability of their walls, the project engineer must ensure that the retaining wall system selected for a given location will retain its overall (global) stability. Site geometry most often dictates the selection of a retaining wall system. Discourage the placement of MSE walls on slopes steeper than 4:1. If required, perform a detailed slope stability analysis. The Bridge Division Geotechnical Manual (Chapter 6), available in the TxDOT on-line manuals system (<[<http://txdot-manuals/dynaweb/colbridg/geo/@ebt-link:?target=idmatch\(s060001\)>](http://txdot-manuals/dynaweb/colbridg/geo/@ebt-link:?target=idmatch(s060001))>), offers data regarding evaluating geometry and selecting wall types.

**Design** - Sometimes MSE walls are selected because only a geometric layout and a standard sheet are required in the plans (the final detailed drawings are produced as shop drawings). This minimal design effort up front makes MSE walls a popular choice among engineers with limited time/resources, but may make the choice a poor one from a long-term stability standpoint. Consider increasing the minimum embedment from one foot to two feet below finished grade. Also, require Type "A" backfill, which is of higher quality than Type "B", and performs better.

**Site/Soil Analysis** - Evaluate the stability of each proposed retaining wall installation, including a review of the wall height, site geometry, and soil borings. As the wall height increases, if the slope increases, or if the soils prove to be weaker, a more careful assessment of long-term strengths must be made. Engineers in the Geotechnical Branch of the Bridge Division are available to assist with testing and slope stability analysis.

**Construction** - Because soil borings are taken at discrete locations, it is difficult to determine what soils conditions will be experienced over a wider area. During construction of retaining walls, monitor the actual soil conditions along the length of the wall and notify project designers of potential problems.

Typically, cement-stabilized backfill should be avoided. It may compromise the long-term performance of the wall because it reduces its flexibility and does not allow drainage through the wall.

Assure adherence to plans and specifications, especially regarding the width of reinforced volume, length of straps, type of backfill used. Ensure that filter fabric, designed to retain wall backfill while allowing the water to pass, is placed at each panel joint, and that coping joints are sealed to prevent water from entering the wall.

MSE walls require close attention to compaction of select fill.

Backfill the excavated area in the base of retaining walls as quickly as possible.

Be certain each panel is plumb after backfilling.

Observe the retaining wall and backfill after heavy rainfall. Rain can soften or loosen the compacted backfill, increase pressure on the wall panels, and reduce stability.

Check the temporary surface cover for cracks and quickly seal these to prevent seepage into the backfill.

Do not excavate at the base of an existing wall for installation of storm sewer, roadway, or other structure without a determination of wall stability throughout the entire process.

**Maintenance** - Periodically inspect walls for evidence of backfill loss, loss of joint seals, or movement. If indicated, reseal joints. If backfill loss is observed, backfill accessible areas with select fill, and use flowable fill if access is restricted. Treat voids when small and manageable. They will always increase in size over time.

For further information, call Mark McClelland, P.E., at (512) 416-2226, or Ronnie Medlock, P.E., at (512) 416-2518.

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