

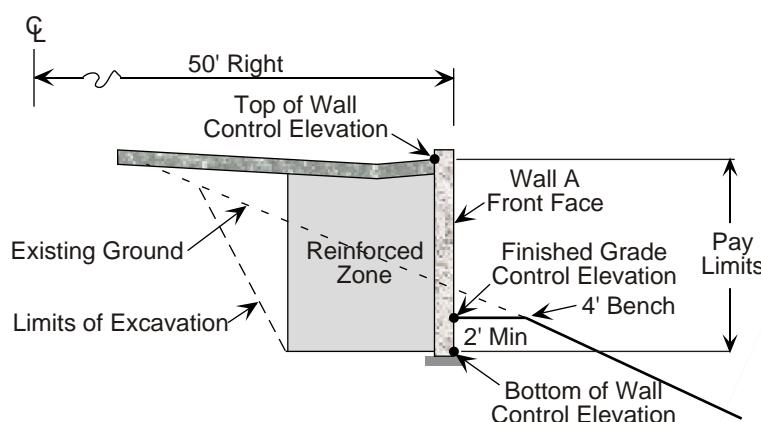
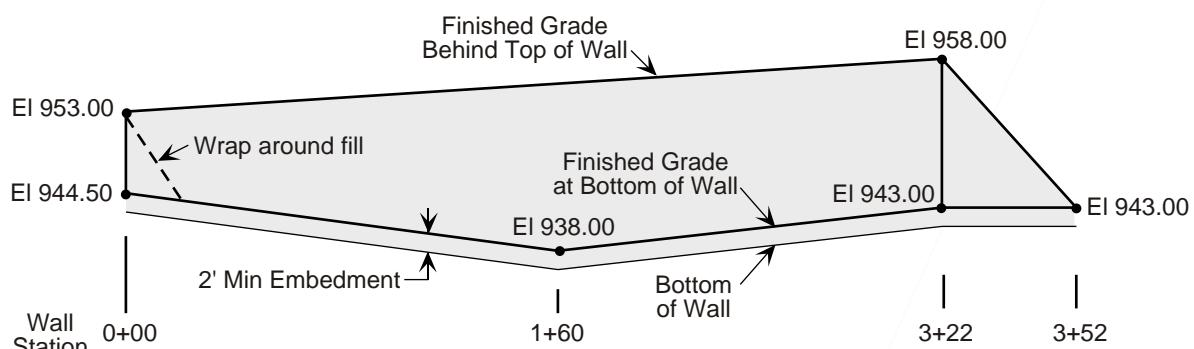
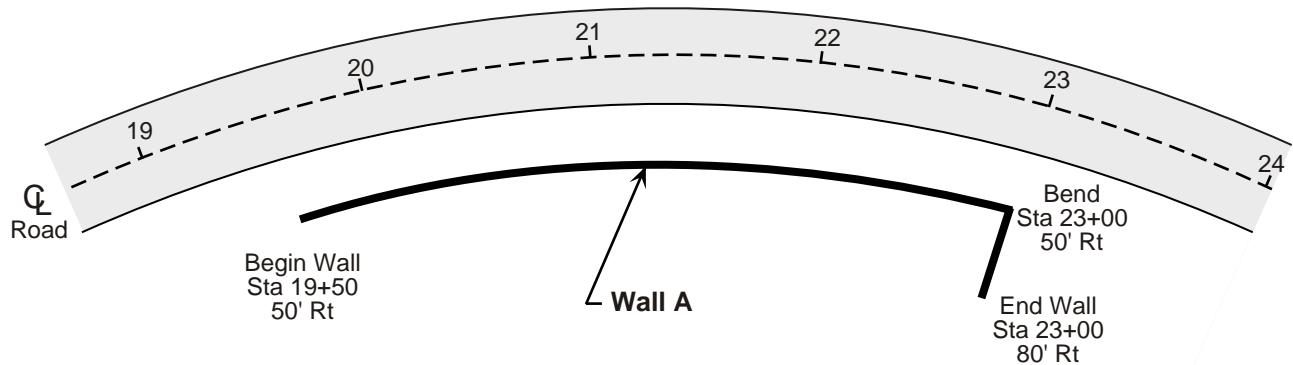
Preparation of Line and Grade Plans for MSE Retaining Wall Bidding

Preparation of bid plans that clearly convey the engineer's intent for the geometry, detailing and design are crucial to minimize confusion during bidding and potential conflicts during construction. The items listed below, in conjunction with a specification that addresses project design criteria, submittal requirements, material requirements, and construction requirements, will eliminate many of these problems.

1. A plan view should be provided for each retaining wall showing the name, beginning and ending stations and relationships to the roadway or structures.
2. Each retaining wall should have its own unique designation and stationing. Many times the retaining walls are in horizontal curves where the centerline station distances are either longer or shorter than the wall length depending on whether the wall is on the inside or outside of the curve. Many walls do not run parallel to the roadway. Additionally, retaining walls on ramps or at intersections could end up with several station references from mainline to ramp to the crossing road. To avoid confusion and clearly show the required retaining wall geometry, each wall should be stationed separately with the beginning and end tied into the appropriate roadway station.
3. A profile or elevation view of each retaining wall should be provided. (Spot elevations can also be provided in tabular form.) Spot elevations along the top and base of the wall should be provided at:
 - The beginning and end of the wall
 - On 50' centers on tangents and 10' to 20' centers on vertical curves
 - Changes in grade along the top or bottom
 - Where pipes or culverts cross the wall face
4. The top of retaining wall spot elevation furnished should be either the top of coping or the ground line at the top of the wall as clearly defined in a cross section.
5. The base of wall spot elevations should be either the finished ground line or the line (elevation) at which the base of the wall system (top of leveling pad) should be at or below. This latter option is preferred as it more clearly defines the engineer's intent for minimum embedment. Simply referring to AASHTO is not sufficient since the minimum embedment criteria is no longer in the current code. For sloping toe conditions, the minimum embedment line should be 2 feet below an imaginary horizontal bench intersecting the ground four feet in front of the wall. The minimum embedment line should not try to anticipate the wall system's stepping pattern.
6. Provide typical cross sections for each condition at each retaining wall indicating:
 - Maximum allowable face batter, typically less than 2° for DOT walls
 - Pay limits
 - Excavation limits
 - Location of top and bottom elevations furnished on the profile
 - Other unusual features

7. Detail the top of wall to show:
 - The relationship between the defined top of wall, the top of coping (if required) and the ground surface
 - Overall coping dimensions, if any
 - Ditch detailing, if any
 - Traffic barrier detailing with dimensions, if any
 - Detailing of the relationship between the top of wall and the bridge abutment seat with dimensions, if any.
8. Detail the base of the wall clearly dimensioning the relationship between the elevations furnished and the maximum top of leveling pad elevation, particularly if the finished ground line is only provided and not the maximum elevation of the base of the retaining wall.
9. Extend the retaining wall until the ground line at the top of the wall intersects the ground line at the base of the wall or indicate wall returns and/or wrap around fill slopes. Many times retaining walls are shown to end where these grades are several feet apart with no provision to accommodate the remaining change in elevation.
10. Define how to measure the design height of the wall for the purpose of complying with the AASHTO minimum length criteria. The pre-1996 AASHTO bridge code more clearly defined how to measure the effective wall height for determining the minimum reinforcement length. The current code (1996 with interims) does not. The main areas of potential misunderstanding are the cases for bridge abutments or sloping backfills. The defined height of the wall for determining the minimum length of reinforcement should be the height measured from the intersection of the internal failure plane with the ground surface down to the top of the leveling pad.
11. Soil strength parameters should be defined for the reinforced and retained backfill and the foundation soils. In addition, if there are bearing capacity concerns then the allowable bearing capacity of the foundation soils for each wall should be provided on the plans. It is important to keep in mind that for level backslope conditions the applied bearing pressure from an MSE wall is approximately 150% of the weight of the reinforced mass ($r \times H$) when accounting for overturning.
12. For situations where differential settlement is expected we offer the following guidance
 - If differential H is $< 1/100$, slip joints probably not needed
 - If differential H is $< 1/50$, specify slip joints on a spacing $< 50'$ centers
 - If differential H is $> 1/50$, ground improvement should be considered
13. Define the pay items and limits to cover all items integral and unique to the wall system, but no more. The pay quantity should be the minimum envelope necessary to cover the retained area with wall facing and any coping required. Any wall face area below the required embedment at the base or above the defined top of wall line needed by a particular wall system to meet the minimum envelope should not be part of the pay area. In addition, the vertical "Jersey" portion of a traffic barrier should be a separate pay item, but the moment slab should be part of the wall system since the moment slab detailing will be different for each MSE wall system.

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Notes:

- Top of wall shall be no lower than 4" above top of wall control elevations.
- Bottom of wall shall be no higher than the bottom of wall control elevations less minimum embedment.
- Four foot bench shall be constructed in front of wall as indicated.
- Wall shall be constructed with minimal batter ($<2^\circ$) due to toe slope.

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