Chapter 4
Bridge Program Drawings

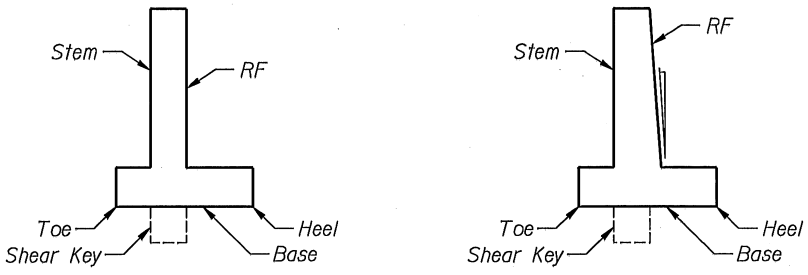
Section 4.21-Earth Retaining Structures

Introduction

Earth retaining structures are built to hold fill materials in place. These structures may be required when the toe of the soils slope encroaches on the channel bottom, roadway, or right-of-way, or if there is extensive fill to be retained. The most common types of retaining structures used by the Bridge Program are reinforced concrete cantilever walls, reinforced concrete counterforted walls, gabion walls, mechanically stabilized earth walls, and embankment reinforcement systems. The type of structure used depends upon the height of the wall, soil conditions, and the aesthetics of the area.

Earth Retaining Structure Types

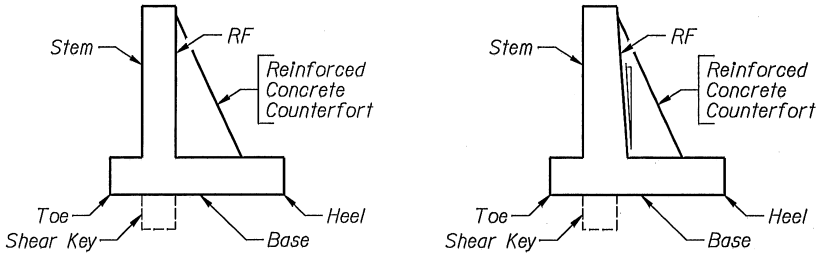
REINFORCED CONCRETE CANTILEVER WALLS consist of a base and a stem which are tied together by extending the main reinforcing steel of the stem into the base. Longitudinal reinforcing steel in the stem and base is tied to this main reinforcing steel for the length of the wall. If soil conditions are inadequate for sliding, a shear key may be added to the base to prevent the sliding.



CANTILEVER WALLS

REINFORCED CONCRETE COUNTERFORTED WALLS have the same configuration as the cantilever wall with the exception of the counterforts tying the stem and base together. Counterforts are placed on the earth side of the stem at regular intervals along the length of the wall. This type of wall is used

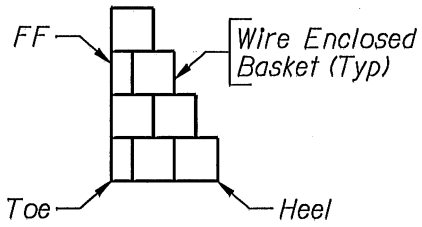
where a high wall is required and footing size for a cantilever wall would be excessive.



COUNTERFORTED WALLS

EXPANSION JOINTS and **CONTRACTION JOINTS** may be required for cantilever and counterforted walls. Expansion joints shall be provided if the wall length exceeds 90'-0". Contraction joints shall be provided at spacings of 20'-0" minimum to 30'-0" maximum.

GABION WALLS are another type that is used to retain earthen materials and for erosion protection. Gabion walls are constructed with wire enclosed baskets filled with stone and placed together to form a wall. Gabion walls are used to provide a more natural appearance to an area.

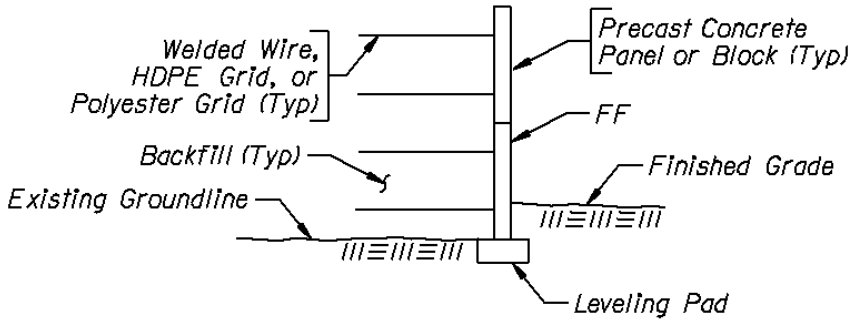


GABION WALL

MECHANICALLY STABILIZED EARTH WALLS consist of welded wire, high density polyethylene (HDPE) grid, or polyester grid soil reinforcing attached to precast concrete blocks or panels. The welded wire, HDPE grid, or polyester grid are placed within compacted soil lifts on the earth side of the wall as the wall is built upward.

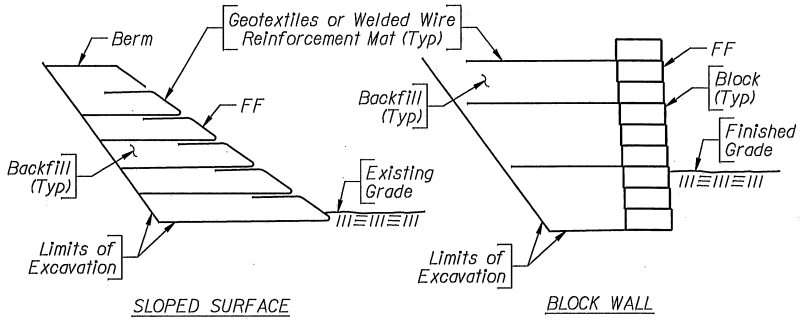
The Bridge Program limits this wall type to a maximum height of 25'-0". The Bridge Program determines the wall height and required welded wire, HDPE grid, or polyester grid length based

on external stability. The details show a plan and profile of the wall. The wall supplier designs the welded wire, HDPE grid, or polyester grid based on internal stability and submits drawing and specifications for approval before construction.



MECHANICALLY STABILIZED EARTH WALL

EMBANKMENT REINFORCEMENT SYSTEMS are geotextiles or welded wire reinforcement mats placed in single layers that mechanically interlock with the material being reinforced. The layers can be wrapped to the next layer of backfill at the face of the embankment to form a sloped surface or the layers can be attached to blocks to form a wall.



EMBANKMENT REINFORCEMENT SYSTEMS

Cells

Name	Description
RETWALLEXPJT	Section thru Retaining Wall Exp Jt

MSE Retaining Wall Checklist

Plan

- ❑ Detail to Scale
- ❑ Centerline Survey w/Stationing and Bearing
- ❑ Begin/End Retaining Wall w/Stationing
- ❑ Longitudinal Dimensions
- ❑ Offset Dimension
- ❑ Soil Reinforcement Dimensions/Call-out
- ❑ Underdrain Pipe Dimensions/Call-outs
- ❑ Radius
- ❑ North Arrow
- ❑ Utilities w/Name of Owner (if available)
- ❑ FF Wall Call-out
- ❑ Modular Block Components Call-out
- ❑ Fill Slope Transition Call-out
- ❑ Wall No. (if multiple walls)
- ❑ Match Line (add stationing if multiple match lines are used)
- ❑ Line Styles

Elevation
(Not required when walls do not step)

- ❑ Detail to Scale/Projected from Plan
- ❑ Longitudinal Dimensions
- ❑ Elevations
- ❑ Finished Grade Call-out
- ❑ Top of Fill Slope Call-out w/Symbols
- ❑ Top/Bottom of Wall Call-out
- ❑ Underdrain Pipe Call-outs/Slope To Drain
- ❑ Wall No. (if multiple walls)
- ❑ Elevation Scale
- ❑ Match Line (add stationing if multiple match lines are used)
- ❑ Line Styles

Horizontal Curve Data

- ❑ Stationing
- ❑ Bearings
- ❑ Structure Located on Curve
- ❑ Curve Information

Typical Section

- ❑ Dimensions
- ❑ Bottom Limits Slope Call-out (if drain system present)
- ❑ Bench Bevel Call-out
- ❑ Elevations (if no Elevation detail)
- ❑ Wall Batter Call-out
- ❑ Top/Bottom of Wall/FF Wall Call-out
- ❑ Modular Block Component Call-out
- ❑ Capstone Call-out
- ❑ Underdrain Pipe Call-outs/Slope To Drain
- ❑ Finished Grade Call-out
- ❑ Existing Ground Line Call-out
- ❑ Fill Slope Call-out w/Symbols
- ❑ Typical Layer of Soil Reinforcement Call-out
- ❑ Bottom Limits of Excavation Call-out
- ❑ Back Limits of Excavation/Bench Call-out
- ❑ Backfill Material Call-out
- ❑ Landscaping Rock/Weed Barrier Call-out
- ❑ Line Styles/Patterning

Fill Slope Transition Detail

- ❑ Embedment Dimension
- ❑ Top/Bottom of Wall/End of Wall Call-out
- ❑ Modular Block Component Call-out
- ❑ Capstone Call-out
- ❑ Fill Slope Call-out
- ❑ Line Styles/Patterning

Underdrain Pipe Detail

- ❑ Dimensions
- ❑ Geotextile Call-out
- ❑ Underdrain Pipe Call-out
- ❑ Gravel For Drains Call-out
- ❑ Backfill Material Call-out
- ❑ Patterning

Step Details

- ❑ Dimensions
- ❑ Top/Bottom of Wall Call-out
- ❑ Modular Block Component Call-out
- ❑ Capstone Call-out
- ❑ Backfill Material Call-out
- ❑ Patterning

Notes

- ❑ Offset and Longitudinal Dimensions
- ❑ Top of Wall Elevations Do Not Include Correction

MSE Retaining Wall Under Bridge Checklist

Plan

- ❑ Detail to Scale
- ❑ Centerline Survey w/Stationing and Bearing
- ❑ Centerline Survey at Cross Road w/Stationing
- ❑ Station Call-outs at FF Walls/Cross Road Intersected
- ❑ Begin/End Retaining Wall w/Stationing
- ❑ Longitudinal Dimensions
- ❑ Offset Dimension
- ❑ Horizontal Dimensions Between Centerline Survey at Cross Road and Walls
- ❑ Berm Dimension
- ❑ Soil Reinforcement Dimensions/Call-out
- ❑ Underdrain Pipe Dimensions/Call-outs
- ❑ Radius
- ❑ North Arrow
- ❑ Utilities w/Name of Owner (if available)
- ❑ FF Wall Call-out
- ❑ Modular Block Components Call-out
- ❑ Fill Slope Transition Call-out
- ❑ Wall No. (if multiple walls)
- ❑ RF Abutment
- ❑ Complement of Skew at RF Abutment/Cross Road (if different)
- ❑ Bent/Pier Component
- ❑ Match Line
- ❑ Line Styles

Elevation
(Not required when walls do not step)

- ❑ Detail to Scale/Projected from Plan
- ❑ Longitudinal Dimensions
- ❑ Elevations
- ❑ Finished Grade Call-out
- ❑ Top of Fill Slope Call-out w/Symbols
- ❑ Top/Bottom of Wall Call-out
- ❑ Underdrain Pipe Call-outs/Slope To Drain
- ❑ Wall No. (if multiple walls)
- ❑ Bent/Pier Component Call-out
- ❑ Begin/End Straight Section

Elevation (Cont'd)

- ❑ Elevation Scale
- ❑ Match Line
- ❑ Line Styles

Typical Section

- ❑ Centerline Survey
- ❑ RF Abutment
- ❑ Dimensions
- ❑ Bottom Limits Slope Call-out (if drain system present)
- ❑ Bench Bevel Call-out
- ❑ Elevations (if no Elevation detail)
- ❑ Wall Batter Call-out
- ❑ Top/Bottom of Wall/FF Wall Call-out
- ❑ Modular Block Component Call-out
- ❑ Capstone Call-out
- ❑ Underdrain Pipe Call-outs/Slope To Drain
- ❑ Finished Grade Call-out
- ❑ Existing Ground Line Call-out
- ❑ Fill Slope Call-out w/Symbols
- ❑ Typical Layer of Soil Reinforcement Call-out
- ❑ Bottom Limits of Excavation Call-out
- ❑ Back Limits of Excavation/Bench Call-out
- ❑ Backfill Material Call-out
- ❑ Landscaping Rock/Weed Barrier Call-out
- ❑ Bent/Pier Component Call-out
- ❑ Line Styles/Patterning

Fill Slope Transition Detail

- ❑ Embedment Dimension
- ❑ Top/Bottom of Wall/End of Wall Call-out
- ❑ Modular Block Component Call-out
- ❑ Capstone Call-out
- ❑ Fill Slope Call-out
- ❑ Line Styles/Patterning

Underdrain Pipe Detail

- ❑ Dimensions
- ❑ Geotextile Call-out
- ❑ Underdrain Pipe Call-out
- ❑ Gravel For Drains Call-out
- ❑ Backfill Material Call-out
- ❑ Patterning

Step Details

- ❑ Dimensions
- ❑ Top/Bottom of Wall Call-out
- ❑ Modular Block Component Call-out
- ❑ Capstone Call-out
- ❑ Backfill Material Call-out
- ❑ Patterning

Notes

- ❑ Offset and Longitudinal Dimensions
- ❑ Top of Wall Elevations Do Not Include Correction

Concrete Retaining Wall Checklist

Plan

- ❑ Detail to Scale
- ❑ Centerline Survey w/Stationing and Bearing
- ❑ Begin/End Retaining Wall w/Stationing
- ❑ Longitudinal Dimensions
- ❑ Offset Dimension
- ❑ Footing Dimensions
- ❑ North Arrow
- ❑ Utilities w/Name of Owner (if available)
- ❑ FF Wall Call-out
- ❑ Footing Call-out
- ❑ Contraction/Expansion Joint Call-outs
- ❑ Fill Slope Transition Call-out
- ❑ Wall No. (if multiple walls)
- ❑ Match Line (add stationing if multiple match lines are used)
- ❑ Line Styles

Elevation

- ❑ Detail to Scale/Projected from Plan
- ❑ Longitudinal Dimensions
- ❑ Elevations
- ❑ Existing Ground Line Call-out w/Symbols
- ❑ Top/Bottom of Wall Call-out
- ❑ Contraction/Expansion Joint Call-outs
- ❑ Elevation Scale
- ❑ Match Line (add stationing if multiple match lines are used)
- ❑ Line Styles

Horizontal Curve Data

- ❑ Stationing
- ❑ Bearings
- ❑ Structure Located on Curve
- ❑ Curve Information

Footing Plan

- ❑ Dimensions
- ❑ Transverse Reinforcing Size/Spacing/Location
- ❑ Longitudinal Reinforcing Size/Spacing/Location/Lap
- ❑ FF Wall Call-out

Footing Plan (Cont'd)

- ❑ Construction Joint/Keyway Call-out
- ❑ Match Line
- ❑ Line Styles

Wall Elevation

- ❑ Dimensions
- ❑ Vertical Reinforcing Size/Spacing/Location
- ❑ Longitudinal Reinforcing Size/Spacing/Location/Lap
- ❑ Contraction/Expansion Joint Call-outs
- ❑ Footing Call-out
- ❑ Adjacent Wall Segment Call-outs
- ❑ Line Styles

Wall Section

- ❑ Dimensions
- ❑ Reinforcing Clearance/Call-outs
- ❑ Optional/Longitudinal Construction Joint/Keyway Call-outs
- ❑ FF Wall Call-out
- ❑ Line Styles/Patterning

Typical Section

- ❑ Centerline Survey
- ❑ Dimensions
- ❑ Bottom Limits Slope Call-out (if drain system present)
- ❑ Bench Bevel Call-out
- ❑ FF Wall Call-out
- ❑ Finished Grade Call-out
- ❑ Existing Ground Line Call-out
- ❑ Bottom Limits of Excavation Call-out
- ❑ Back Limits of Excavation/Bench Call-out
- ❑ Backfill Material Call-out
- ❑ Line Styles/Patterning

Notes

- ❑ Place Short Leg
- ❑ Place Reinforcing Steel to Maintain 2" Clearance
- ❑ Trim Contraction Joints
- ❑ Quantity of Class B Concrete