

 Office of Structures Guidelines and Procedures Memorandum	DESIGN
	Number: D-18-54(4)
	Date: 07-27-2018
Retaining Walls/ Wing Walls	Approval: 

The following guidelines and procedures relate to the design of retaining/wing walls and shall be used in conjunction with the AASHTO LRFD Bridge Design Specifications.

Geometric Design Criteria

Retaining/Wing Wall geometry shall be established in accordance with the following:

- A. The length of proposed retaining/wing walls shall be set so that the wall extends a minimum of 1'-6" beyond the location where the contours intersect.
- B. Retaining/wing walls on curved horizontal alignments may be constructed on chords, unless otherwise stated, provided the angle of deflection between segments does not exceed 5 degrees.
- C. The horizontal offset of the wall from the baseline shall not change abruptly. All changes in offset shall be accomplished using curves or chorded construction as described above.
- D. The top of retaining/wing walls shall not be stepped or contain sharp breaks in slope to accomplish a change in elevation. The top shall be level or shall vary using a smooth linear or curved transition.
- E. The completed retaining/wing wall, and all associated structural elements, shall be located entirely within the Administration's Right-of-Way. Construction easements shall only be used to facilitate construction efforts.
- F. The ground line behind the retaining/wing wall shall be placed a minimum of 9" below the top of the wall, unless a barrier is required on top of the wall.
- G. The retaining/wing wall footing shall be extended to the end of the wall (we are no longer providing a 5' overhang).

Structural Details for Retaining Walls/Wing Walls

MDOT SHA Structural Details shall be utilized whenever possible. If the Structural Details are modified in any way; the details shall be removed from the Detail section of the plans and included with the wall drawings as a non-standard element.

The following structural details shall be used where appropriate:

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- A. On all projects proposing the use of cantilever CIP retaining/wing walls with either a two-foot surcharge or a maximum 2:1 sloping backfill, the appropriate Retaining Wall Structural Detail (RW-101 through RW-109) shall be evaluated for the design of these retaining walls and wing walls. It is the responsibility of the designer to evaluate the project parameters to determine if the Structural Details are applicable. Parameters that may inhibit the use of the Structural Details include, but are not limited to, geometric restrictions, wall height, soil conditions, right-of-way requirements, traffic impact, and special aesthetics. If the Structural Details are not utilized, documentation as to why they are not being incorporated into the plans must be submitted to the Director of the Office of Structures for concurrence. If no constraints exist, the retaining wall and/or wing wall shall be selected using the appropriate Structural Details.
- B. If the retaining/wing wall is on piles, a pile layout, add all normal pile notes including size, estimated tip, design load, etc., must be included in the Contract Plans for each wall, using Detail No. RW-108 or RW-109 as guidance for the pile spacing. The pile layout must include the layout of the 3 - #6's each way over the piles.
- C. For retaining walls supporting roadways and adjacent to the shoulder, an F-Shape Barrier shall be placed on top of the proposed retaining wall. The height of the proposed barrier shall be 42" in accordance with the roadway design requirements.
- D. For retaining walls adjacent to and supporting sidewalks, a 2'-8" vertical face barrier with a one strand rail resulting in a combined barrier height of 3'-6" shall be utilized. Where fencing is required, the one strand railing shall be eliminated, and a Type II or Ornamental Fence shall be placed on top of the barrier in accordance with the Structural Details.
- E. For barriers placed on top of MSE walls, a moment slab shall be utilized to resist the horizontal loads applied to the barrier. The moment slab and barrier shall be cast-in-place. The moment slab may not be part of the roadway surface.
- F. For retaining walls (excluding wing walls) supporting private property or other facilities that are accessible to pedestrians, fencing shall be provided on top of the wall. The minimum height of the fence shall be 3'-0" and detailed in accordance with the Structural Details. If an ornamental fence is required per the structures aesthetic specifications, the fencing details shall be developed in accordance with those requirements.
- G. All retaining/wing walls shall contain the appropriate details for drainage. The drainage system for cast-in-place cantilever walls shall be in accordance with Detail No. RW(0.01)-80-100.

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Design Alternates for Retaining Walls

The design for permanent retaining walls shall follow one of the following alternates. Only one alternate shall be used per wall location.

Cast-in-Place (CIP) Cantilever Retaining Walls

CIP Walls shall be designed and detailed in accordance with Structural Detail Nos. RW(6.02)-83-133 through RW(6.14)-89-201, when possible. It shall be noted that the Structural Details have been developed without a traffic impact load (or barrier). The Designer must modify the wall design to meet current code for traffic impact when supporting a roadway.

Proprietary Retaining Walls

Proprietary retaining walls shall be designed and detailed in accordance with the manufacturer's approved details. The list of proprietary retaining wall systems that have been approved by the Administration are located on the Administration's website www.marylandroads.com under the section Business with SHA.

- A. Mechanically Stabilized Earth (MSE) retaining walls that are to be placed adjacent to streams, floodplains, SWM ponds, or other water features shall be placed so that no stream flows up to the 100 yr flood elevation or standing water comes in contact with the face of the wall. A solid concrete barrier may be designed to protect the base of the wall and shall contain the appropriate scour countermeasures.
- B. The leveling pads for proprietary retaining walls shall be cast-in-place concrete. They are considered spread footings and shall follow the design requirements for spread footings.
- C. The reinforced zone backfill for Mechanically Stabilized Earth (MSE) walls shall be comprised of No. 57 stone. A phi angle of 34 degrees shall be used for No. 57 stone in the design calculations.

Top-Down Retaining Walls.

Top-down retaining walls shall be designed and detailed in accordance with AASHTO and the following:

- A. All loads shall be resisted by the soldier piles, lagging, or other elements in direct contact with the retained soil.
- B. Only concrete lagging shall be used for permanent retaining walls. The use of type of timber lagging will not be permitted.

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- C. A concrete facing shall be provided that will not be considered structural in nature. The aesthetic finish for the concrete facing shall be as outlined in the contract documents.
- D. Portions of permanent steel elements, which are exposed after excavation, shall be coated in accordance with Section 465.