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THE CITY OF
COLUMBUS
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DEPARTMENT OF
PUBLIC SERVICE

DESIGN MEMO 10.02

To: Designers, Contractors, and City Departments

Date: January 1, 2026

Subject: Retaining Walls

Category: Structures

Table of Contents

1 Purpose

The purpose of this design memo is to establish guidelines for earth supporting retaining walls. The information provided in this memo focuses on specific factors that influence the design of retaining wall structures and is tailored to the standards and practices of the City of Columbus.

2 Applicability

Until further notice, this direction will be used for scoping, design, and review within the City of Columbus jurisdiction. All relevant design codes and standards shall supersede the guidance provided in this memo. The guidance provided in this memo is applicable to all permanent retaining wall projects including both capital improvement projects and private development projects.

3 Standards and References

ODOT Bridge Design Manual (BDM)

ODOT Geotechnical Design Manual (GDM)

ODOT Specifications for Geotechnical Explorations (SGE)

ODOT Location & Design (L&D) Manual, Volume 3

ODOT Standard Construction Drawings

ODOT Approved Products List for Prefabricated Modular Block Retaining Wall Systems

City of Columbus Standard Drawings

City of Columbus Construction and Material Specifications (CMSC)

4 Definitions

Definitions of key terms in this memo are provided in City of Columbus Design Memo 1.00: Introduction.

Cast-in-Place Concrete Wall – A retaining wall type consisting of reinforced concrete poured, formed, and cured on location. Cast-in-place concrete walls can be gravity, cantilever, or counterfort wall sub-types.

Curb Wall – A section of concrete curb along the edge of pavement or sidewalk extended vertically to retain earth as a means of grade separation.

Gabion Wall – A retaining wall composed of prefabricated metal baskets of welded or twisted wire mesh, backfilled with stone.

Geogrid – A mesh-like geosynthetic material used for stability and as tensile reinforcement in soils.

Large Block Wall – A retaining wall type consisting of a proprietary system of prefabricated, modular blocks. Large blocks have the smallest dimension of the block's height, width, and depth greater than or equal to 18 inches.

Mechanically Stabilized Earth (MSE) Wall – A retaining wall that uses several layers of backfill and soil reinforcement elements connected to a wall facing.

Sheet Pile Wall – A retaining wall system consisting of interlocking steel sheets driven into the ground to create a continuous wall.

Small Block Wall – A retaining wall type consisting of a proprietary system of prefabricated, modular blocks. Small blocks have the smallest dimension of the block's height, width, and depth less than 18 inches.

Soil Nail Wall – A retaining wall system utilizing large diameter rebar inserted into in-situ soil with a concrete facing.

Soldier Pile & Lagging Wall – A retaining wall system composed of driven, steel, I-shape piles spaced at regular intervals with reinforced concrete or timber lagging members spanning between the piles.

Tangent/Secant Pile Wall – A retaining wall composed of a single row of concrete drilled shafts, which can be reinforced with rebar or a single steel beam. The shafts touch each other tangentially (Tangent Wall) or with a slight overlap (Secant Wall), connecting them into one retaining wall.

5 Design Guidance

5.1 Wall Types

Retaining walls are used to provide lateral resistance for a mass of earth and are used in a variety of applications including grade separation, right-of-way restrictions, transportation system embankments, stabilization of slopes, and protection of environmentally sensitive areas.

Many retaining wall types are available to meet project-specific requirements warranting the wall. Several of the retaining wall systems are proprietary systems, but many are non-proprietary wall systems. The guidance presented in this memo aims to ensure consistency of standards and design criteria used throughout the City of Columbus.

5.1.1 Curb Walls

Curb walls are an effective means of achieving grade separation for cut slopes and should be considered in combination with grades as steep as 3H:1V to avoid right-of-way impacts. Curb walls may also be used for fill slopes.

Curb walls shall be non-reinforced concrete, 6" thick as per Item 609. Exposed height of the curb wall shall not exceed 18". The buried face of the curb wall shall be equal to the exposed height but extend a minimum of 12" into the ground as measured from the lower finished grade. Reference shall be made to Standard Drawing 2001, modified as stated above.

5.1.2 Small Block Walls (Modular Block Wall, Type A)

Small block retaining walls should only be considered when the exposed face of the retaining wall has a height of 4 feet or less. Additionally, no geogrid reinforcement shall be used with small block retaining walls. This wall type should be avoided in locations where structure-mounted railing systems are required for fall protection by the Ohio Building Code, Section 1015.2.

Small block retaining walls shall be designed for external stability (bearing, sliding, overturning) and facial stability failure modes. The proprietary small block system selected shall be on the City of Columbus approved product list. The design of the retaining wall shall follow the manufacturer's instructions, including minimum radius for horizontal alignment if applicable.

5.1.3 Large Block Walls (Modular Block Wall, Type B)

Large block retaining walls should be considered in applications where a modular block type wall is preferred but the criteria to use a small block wall are not met. Large block walls should generally be used when the exposed height of the wall is greater than 4 feet but less than 10 feet. If the exposed face of the wall is greater than 10 feet, the designer shall perform a wall type study to determine the preferred wall type. See ODOT L&D Vol. 3, Section 1407.2 Retaining Wall Justification for wall type study requirements. No geogrid reinforcement shall be used with large block retaining walls. This wall type should be avoided in locations where structure-mounted railing systems are required for fall protection by the Ohio Building Code, Section 1015.2.

Large block retaining walls shall be designed for external stability (bearing, sliding, overturning) and facial stability failure modes. The proprietary large block system selected shall be on the ODOT approved product list for prefabricated modular block retaining wall systems. The design of the retaining wall shall follow the manufacturer's instructions, including minimum radius for horizontal alignment if applicable.

5.1.4 Other Wall Types

The preference of the City is to use the wall types discussed previously in this memo. If the exposed wall height requires a wall type study to be performed, the City will accept the analysis of the following wall types, in no particular order, for comparison to the large block wall system, including but not limited to:

- Cast-in-Place Concrete Wall (Gravity, Cantilever, Counterfort, etc.)
- Soldier Pile & Lagging Wall
- MSE Wall
- Gabion Wall
- Sheet Pile Wall
- Soil Nail Wall
- Tangent or Secant Pile Wall

5.2 Design Information Included in Retaining Wall Plans

Geotechnical exploration shall be performed to explore the soil/rock properties for foundation, retained fill, and backfill soils regardless of wall height for all retaining wall types except curb walls and small block walls. The design and plan information requirements of the ODOT BDM, GDM, and SGE shall apply to all retaining wall projects. Geotechnical information used in the design of the retaining wall shall be listed in the project plans. At a minimum, except for curb walls and small block walls, the following information shall be listed in the plans:

- Factored bearing resistance at the wall foundation elevation per ODOT BDM 606.

- Factored and service design loads applied to the wall.

If applicable to the project, the following information shall be listed in the plans in addition to the requirements above:

- Backfill soil requirements.
- Pile or drilled shaft capacities per ODOT BDM 606.
- For proprietary systems, any additional information such that a contractor could select a proprietary company to design the internal stability of the wall.

5.3 Backfill & Wall Drainage

Backfill and drainage requirements for all retaining wall types shall be in accordance with Item 610 and the manufacturer's instructions if using a proprietary wall system. Consideration shall be given to the details of the drainage outlet locations.

5.4 Sealers & Aesthetic Treatments

The sealing requirements listed in this section apply only to the exposed concrete surfaces of retaining walls, both new and existing walls. New retaining walls shall be sealed using a clear, non-epoxy sealer per Item 512. Existing walls that require concrete patching shall be sealed using an epoxy-urethane sealer per Item 512. Anti-graffiti coatings are not required for small block or large block walls as there is little evidence warranting the additional coating. Anti-graffiti coating shall be applied to the concrete surfaces of all other wall types.

In addition to being functional and economical, retaining walls should be aesthetically pleasing. Colors, textures, finishes, reliefs or other aesthetic features of a retaining wall shall be as directed by the City during the design phase.

5.5 Railing and Guardrail

For safety reasons, retaining walls will often require a protective railing system. Pedestrian railing shall be used on retaining walls meeting the criteria outlined in Ohio Building Code Section 1015.2. Where a protective railing system is required, it should be located behind the wall where the embedment will not interfere with the retaining wall structure. If it is not feasible to locate the protective railing system behind the wall, it is acceptable to mount the railing on top of the wall. It should be noted that protective railing systems mounted to the top of the retaining wall often require a reinforced concrete coping to withstand the required lateral design forces. Guardrail shall not be attached to the retaining wall.

The following protective railing systems should be used for retaining walls:

- For all ground-mounted locations:
  - Chain link fencing per ODOT Standard Drawing F-1.1
- For ground-mounted locations where aesthetic appeal is important to the project:
  - Bikeway railing per ODOT Standard Drawing RM-5.2
  - Steel fencing per Standard Drawing 2325 (modified for ground-mounting)
- For all structure-mounted locations:
  - Chain link fencing per ODOT Standard Drawing VPF-1-24

- For structure-mounted locations where aesthetic appeal is important to the project:
    - Steel fencing per Standard Drawings 2325

The City will consider other properly documented railing systems for acceptance.

5.6 Right-of-Way Considerations

5.6.1 General Guidance

The guidance in this section shall be applicable to situations where proposed retaining walls of any type are to be constructed or existing retaining walls of any type are encountered adjacent to private property owners. For proposed retaining walls, every effort shall be made to locate privately maintained retaining walls outside of the City's right-of-way. For existing retaining walls within the right-of-way, if the retained earth can be graded to a 3:1 or flatter slope, the City is not required to replace existing retaining walls.

The City preference is for walls to be constructed in existing right-of-way or by acquiring a Warranty Deed (WD), but other types of easements (SH or SL with Retaining Wall) will be considered as needed on a case-by-case basis.

5.6.2 Example Scenarios

The following example scenarios are given to provide additional clarification for procedures and maintenance responsibility involving retaining walls adjacent to private property.

Scenario 1: If a proposed wall is being constructed in the City's right-of-way or an existing City maintained wall is being reconstructed within the City's right-of-way, it would be the responsibility of the City to maintain.

Scenario 2: If there is an existing wall previously built by the private property owner in the City's right-of-way and the City needs to reconstruct the wall to comply with slope standards (3:1 max.) or avoid structure conflict, the existing wall shall be reconstructed outside of the City's right-of-way under a temporary construction easement. The reconstructed wall will be the private property owner's responsibility to maintain.

Scenario 3: If there is an existing wall previously built by the private property owner in the City's right-of-way and the City needs to reconstruct the wall within the City's right-of-way to accommodate the project to comply with slope standards or avoid a structure conflict, the City will take ownership, including maintenance, of the wall.

Scenario 4: If there is an existing wall previously built by the private property owner in the City's right-of-way and the existing wall is not needed to comply with slope standards or avoid a structure conflict, design the plan to regrade as necessary with the project. The City will send the private property owner an encroachment letter stating the wall encroachment needs to be removed from the existing City right-of-way. If no action is taken by the property owner to remove the existing wall and place it on their property by the time construction starts, the existing wall will be removed with the project. If site conditions are such that the wall cannot be reasonably removed, then the City will consider granting an encroachment easement to the private property owner.

Scenario 5: If an existing wall on private property is reconstructed on private property by the project in a temporary easement, the reconstructed wall will be the private property owner's responsibility to maintain.