

DESIGN MEMO 5.02

To: Designers, Contractors, and City Departments
Date: January 1, 2025
Subject: Cross Section Design
Category: Streets

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1 Purpose

The purpose of this design memo is to establish guidelines for cross section design and potential deviations. The roadways discussed in this memo include both curbed and uncurbed roadways. This memo is intended to provide guidance for roadways of various design speeds and traffic volumes.

2 Applicability

Until further notice, this direction will be used for scoping, design and review within the City of Columbus jurisdiction. The guidance provided in this memo is applicable to all projects including both capital improvement projects and private development projects, except where noted.

3 Definitions

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

4 Design Guidance

4.1 Roadside Hazards

Designers should strive to provide a roadside which is as forgiving and safe for errant vehicles as practical. However, in urban areas like Columbus, many functionally important fixed objects (e.g. utility poles, cabinets, etc.) are commonly located along City streets, some of which are necessary to provide a safe and effective transportation system, and others which provide non-transportation benefits to area residents and businesses. Furthermore, it is necessary in the City to accommodate various modes of travel along the street, reserving ample space for sidewalks, paths, bike lanes, and transit infrastructure within the right-of-way. The sections below provide roadside design guidance related to hazards and fixed objects on City streets.

4.1.1 *Clear Zone Calculations*

The Clear Zone shall be defined and calculated as described in ODOT Location & Design Manual Volume 1 Section 600. Roadside obstacles shall be placed outside the clear zone except as noted below in 4.1.2 through 4.1.5.

4.1.2 *Urban Lateral Offset / Operational Offset*

Minimum Urban Lateral Offset, as defined in ODOT Location & Design Manual Volume 1 Section 600.2.2, may be applied to the design of all streets (curbed and uncurbed) in the City of Columbus with a posted speed of 45 mph or less.

Minimum Operational Offset, as defined in ODOT Location & Design Manual Volume 1 Section 600.2.3 as 1.5 feet from face of curb to face of obstacle (3 feet at intersections), may be applied to the design of all streets in the City of Columbus which satisfy any of the following criteria:



- All streets with design speeds of 25 mph or less. Where curb is not present, measurement shall be from edge of paved shoulder.
- All curbed streets with design speeds of 35 mph or less, with sidewalk and less than 12 feet⁽¹⁾ of distance from proposed face of curb to right-of-way.
- All curbed streets with design speeds of 35 mph or less, with shared-use path and less than 19 feet⁽²⁾ of distance from proposed face of curb to right-of-way.
- All curbed streets with a design speed of 35 mph or less and located in the downtown central business district.

Note that the likelihood and severity of a potential accident involving a roadside hazard should be analyzed when considering the application of Minimum Urban Lateral Offset and Minimum Operational Offset on City streets. As a result, different roadside hazards might be considered differently on the same street or project. For example, it might be appropriate to apply minimum urban lateral offset to utility poles but not to a steep embankment with a large drop off. The designer should apply sound engineering judgment in determining the applicability of minimum lateral offset criteria to potential roadside hazards.

4.1.3 Utility Pole Placement

Utility poles, and other non-frangible utility infrastructure, shall be located in accordance with 4.1.1 and 4.1.2 as described above. Offsets shall be measured to the road-side face of the obstacle and shall be represented as such on permit plans.

All new facilities and major alternations shall be designed to provide the Clear Zone, Minimum Urban Lateral Offset, or Minimum Operational Offsets, whichever is applicable to the subject street, as described above. A major alteration is defined as a utility project with a length of one City block or 1,000 linear feet, whichever is less.

Minor alternations and/or in-kind replacement of isolated equipment may match existing offsets as long as a) a minimum 4-foot pedestrian accessible route (PAR) is provided where applicable and b) feature does not interfere with intersection sight distance. In no case are duplicate poles permitted as a finished condition at the end of the project.

Where Clear Zone applies, minimum offset requirements shall be as published in [Figure 600-1](#) of the Ohio Department of Transportation [Location and Design Manual Volume 1](#).

4.1.4 Roadside Barriers

When determining the treatment of a roadside hazard, designers should follow the order of preference described in ODOT Location & Design Manual Volume 1, Section 600.2, which is repeated below for convenience:

The preferred order of corrective treatment for fixed objects and non-traversable hazards located within the clear zone is as follows:

1. *Remove the obstacle.*
2. *Redesign the obstacle so that it can be safely traversed.*
3. *Relocate the obstacle to a point where it is less likely to be struck.*
4. *Reduce the impact severity by using an appropriate breakaway device.*
5. *Shield the obstacle with a longitudinal traffic barrier designed for redirection or use a crash cushion.*
6. *Delineate the obstacle if the above alternatives are not appropriate.*



If other more preferred options for treatment are determined to be infeasible, longitudinal barriers should be considered. All roadside barriers should be crash tested and approved by ODOT and/or FHWA for use. For design of longitudinal roadside barriers, refer to ODOT Location & Design Manual Section 603.1 and FHWA standards on aesthetic barriers including, but not limited to, those listed below:

- US Federal Lands Standard Drawings: <https://flh.fhwa.dot.gov/resources/standard/>
- NCHRP Report 554 Aesthetic Concrete Barrier Design

4.1.5 *Street Trees*

Street tree placement shall be as follows:

- Speeds 35 mph or less, trees shall be placed no closer than the minimum operational offset or minimum lateral offset, whichever applies, as described in 4.1.2 above.
- Speeds greater than 35 mph and less than or equal to 45 mph, street trees may be placed no closer to the road than is shown on ODOT Location & Design Manual Volume 1 Figures 904-2 and 904-3. The curb-to-tree offsets shown in Figure 904-2 also apply to the placement of trees in center medians.
- Speeds greater than 45 mph, trees should be placed outside of the Clear Zone.
- Trees shall be coordinated with placement of lighting features and traffic control devices, with lighting and traffic control features given priority. Designers should avoid placement of trees in line of sight to all signs.
- Existing trees may remain at their existing offset from the roadway unless crash history suggests an existing safety issue.
- The road-side face of the tree shall be used to calculate the offsets described above. For the purposes of determining offsets for planting of young trees, assume a 12-inch minimum diameter.

4.2 **Lane Widths**

Minimum striped lane widths shall be per ODOT Location & Design Manual Volume 1 Figure 301-4, except as noted below:

- Lane widths in Figure 301-4 will be applied to both curbed and uncurbed City streets.
- Lane widths may be reduced to 10 feet at the City's discretion. Factors which may justify 10-foot lanes include the following:
 - Facility is low speed (< 50 mph);
 - Existing lane widths are 10 feet or narrower and increasing lane width is beyond the project scope or would place a disproportionately large burden on the project;
 - Narrow lanes help to accommodate bicycle and pedestrian traffic by providing more space in a constrained environment;
 - Wider lane is not necessary to facilitate truck or transit movements.
- Lane widths less than 10 feet will be approved only as a variance.
- To facilitate snow plowing, a minimum clear space of 14 feet shall be provided between a raised median and the adjacent curb on the outside of the street, as per Design Memo 6.5.
- Lane width shall be measured from center of pavement marking to center of pavement marking. In areas of curb and gutter, lane width shall be measured to the edge of gutter. In areas with straight curb lane width shall be measured to the edge line or to a 1-foot offset of the curb face, whichever is greater.



- Typical sections of new residential streets shall still comply with Standard Drawings 2100, 2101, 2110, and 2115.

4.3 Medians

Medians should be designed in accordance with Standard Drawing 2331. Minimum median width, measured from face of curb to face of curb, shall be as follows:

- 4 feet minimum for hard surface medians
- 5 feet minimum for lawn or landscaped medians
- 10 feet minimum for medians with tree plantings

A design variance is required for any median less than 4 feet in width. Medians less than 4 feet in width do not allow for standard signage (keep right, etc.); additional delineator posts may be required.

Hard surface medians are preferred for ease of maintenance. Median trees, or other non-frangible landscape treatments should be designed in accordance with Section 4.1.5 above.

See Design Memo 6.05 and 9.06 for additional information regarding Pedestrian Refuge and Median Islands.

4.4 Roadside Grading

Roadside grading standards are established in several standard drawings. Standard drawings represent an idealized condition which is not practical to achieve in all cases. Therefore, the following designer notes are intended to add context to the roadside grading elements shown on the standard drawings.

4.4.1 Uncurbed Streets

Roadside grading in predominately residential areas shall be per Standard Drawings 2130 and 2135 with the following notes:

- A permitted closed conduit drainage system of pipes and catch basins should be replaced like for like unless otherwise approved by the City. A system of pipes and catch basins should not be removed and replaced with open ditches and driveway culverts.
- Ditch foreslopes shall be no flatter than 12:1 and no steeper than 4:1.
- Ditch backslopes shall be no flatter than 12:1 and no steeper than 3:1.
- Where Clear Zone applies (when minimum Urban Lateral Offset does not apply per 4.1.2 below), ditches within the Clear Zone should be designed as traversable, in accordance with ODOT Location and Design Manual Volume 1 Figures 307-10 & 11.
- Ditch cross sections shall comply with Columbus Stormwater Drainage Manual requirements for open channel conveyance. A minimum longitudinal ditch slope of 0.5% is required to encourage positive drainage.

Deviations from Standard Drawings 2130 and 2135

Standard Drawings 2130 and 2135 show City standards for uncurbed streets. Projects to which these standard drawings apply often face right-of-way constraints and a high degree of variability in cross section. Variations from the Standard Drawings, and associated designer notes in the sections above, may be considered as a design variance by the City on a case-by-case basis. Where the City and



designer agree that right-of-way constraints and/or variability in roadside topography warrant a deviation from the standard drawings, those deviations should be considered in the following order:

1. Increase ditch backslope to 3:1 if doing so does not compromise the Clear Zone, if applicable.
2. Increase ditch foreslope to 3:1 if doing so does not compromise the Clear Zone, if applicable.
3. Reduce graded shoulder from 4 feet to 2 feet (preferred minimum) or 1 foot (absolute minimum).
4. Reduce distance between backslope and SUP from 2 feet to 1 foot, if applicable.
5. Reduce paved shoulder from 4 feet to no less than 2 feet. This may be considered only if a sidewalk or SUP is present and therefore, the shoulder does not need to accommodate pedestrian traffic.

In the case of any deviation, all ditch capacity requirements of the City's Stormwater Drainage Manual must be met.

4.4.2 *Curbed Streets*

Standard Drawings 2100, 2101, 2105, 2110, 2111, 2115, and 2116 show City standards for curbed streets, including tree lawn/utility strip areas between the back of curb and sidewalk. As shown on the standard drawings, the City's standard tree lawn slope is 3.13% (32:1). Variations in tree lawn slope may be considered by the City where such variations would eliminate or substantially reduce the need to acquire right-of-way or easements from private property owners. Tree lawn slopes as flat as 50:1 and as steep as 12:1 are allowable without a design variance. Variation in tree lawn slopes outside of that range may be considered as a design variance by the City on a case-by-case basis.

Variations in tree lawn slope result in variations in sidewalk profile. Where sidewalk profiles vary from the adjacent roadway profile, longitudinal sidewalk grades must be flatter than 20:1 (5%). Steeper tree lawn slopes may also lead to steeper driveway grades. The maximum driveway slopes shown on Standard Drawings 2201 and 2202 apply regardless of tree lawn slope.

4.5 **Connection to Private Property**

At the edges of right-of-way where public space meets private property, designers should strive for a condition in which proposed grades are similar to existing grades so as to avoid substantial changes to the way that property is used and maintained by the property owner. This may be accomplished by obtaining temporary construction easements to gradually transition grades, or it may include construction of a retaining structure to transition more abruptly. To guide the design of roadside grading on and immediately adjacent to private property the following guidelines are established:

- For ease of establishing grass and for long term maintenance, designers should strive to achieve the flattest slopes practical which still promote positive drainage and minimize right-of-way and utility impacts.
- 3:1 is the maximum slope for mowed grass areas.
 - Slopes steeper than 3:1 (but no steeper than 2:1) are acceptable only in the following conditions:
 - Where mowing is not a concern such as bridge embankments or naturalized areas.
 - Where proposed slopes mimic an existing condition of 2:1 or steeper slopes on the property.



- No mow seed mixes, slope erosion protection, and/or other erosion control measures shall be placed on slopes steeper than 3:1 to promote stabilization of the embankment during construction, as well as, long term maintenance.
- Where it is not feasible to achieve maximum slopes without adverse impacts on private property, retaining structures should be considered as described below.
 - Curb walls are an effective alternative to cut slopes with 12 inches or less in grade change. Refer to Standard Drawing 2001. Curb walls should be considered in combination with slopes of up to 3:1 to avoid impacts to private property.
 - Modular block walls, selected from the City's Approved Products List, should be considered as an alternative to cut slopes with 4 feet or less of retained height (as measured from the top of finished grade at the back of wall to top of finished grade at the face of wall). Walls shall be designed and installed per manufacturer's recommendations. Wall types with tie-backs shall be avoided. Modular block walls should also be avoided in locations where guards (railings) are required for fall protection; refer to Ohio Building Code Section 1015.2.
 - For changes in grade which cannot feasibly be managed with curb walls or modular block walls, more robust wall types should be considered. Alternative wall types, cost, maintenance, constructability, crashworthiness, and other factors should be presented to the City in a Retaining Wall Justification Study (see ODOT L&D Manual Volume 3, Section 1407.2 for requirements).
- Refer to AASHTO Guide for the Development of Bicycle Facilities and ODOT Multi-Modal Design Guide for applicability of bike railing between SUP and fill slopes or walls.
- Where private property drains toward the right-of-way, roadside grading shall be designed to direct stormwater to a proper outlet (e.g. ditch, catch basin, culvert, etc.).
- In the existing condition, where the right-of-way area drains directly onto private property without being intercepted by roadside ditches or storm sewers, it is the City's preference to correct this condition with the project; however, doing so is not a requirement if both of the following are true:
 - a) The condition does not contribute to known drainage issues on the property. Designer shall review 311 history. Since not all drainage issues are reported via 311, designer shall also make a visual inspection within 24 hours of a 0.5" minimum rainfall event.
 - b) Designer's analysis, as documented in the project's Stormwater Drainage Report, demonstrates, to the City's satisfaction, that the project is not expected to increase the volume or rate of runoff in such a way as to adversely impact the property. Types of adverse impact include, but are not limited to, flooding, ponding of water, and erosion.
- In any case, the project shall be designed in compliance with the Columbus Stormwater Drainage Manual.
- Deviations from the slope requirements listed above will require a variance and may be considered by the City on a case-by-case basis.

Notes

⁽¹⁾ The 12' referenced above in 4.1.2 is based on the following: Curb + 4' to obstacle + 1' obstacle width + 1' clear to sidewalk + 5' sidewalk + 1' clear to R/W = Curb + 12 feet is the minimum distance need to provide Min Urban Lateral Offset without acquiring additional right-of-way.



(2) The 19' referenced above in 4.1.2 is based on the following: Curb + 4' to obstacle + 1' obstacle width + 2' clear to SUP + 10' SUP + 2' clear to r/w = Curb + 19 feet is the minimum distance need to provide Min Urban Lateral Offset without acquiring additional right-of-way.

