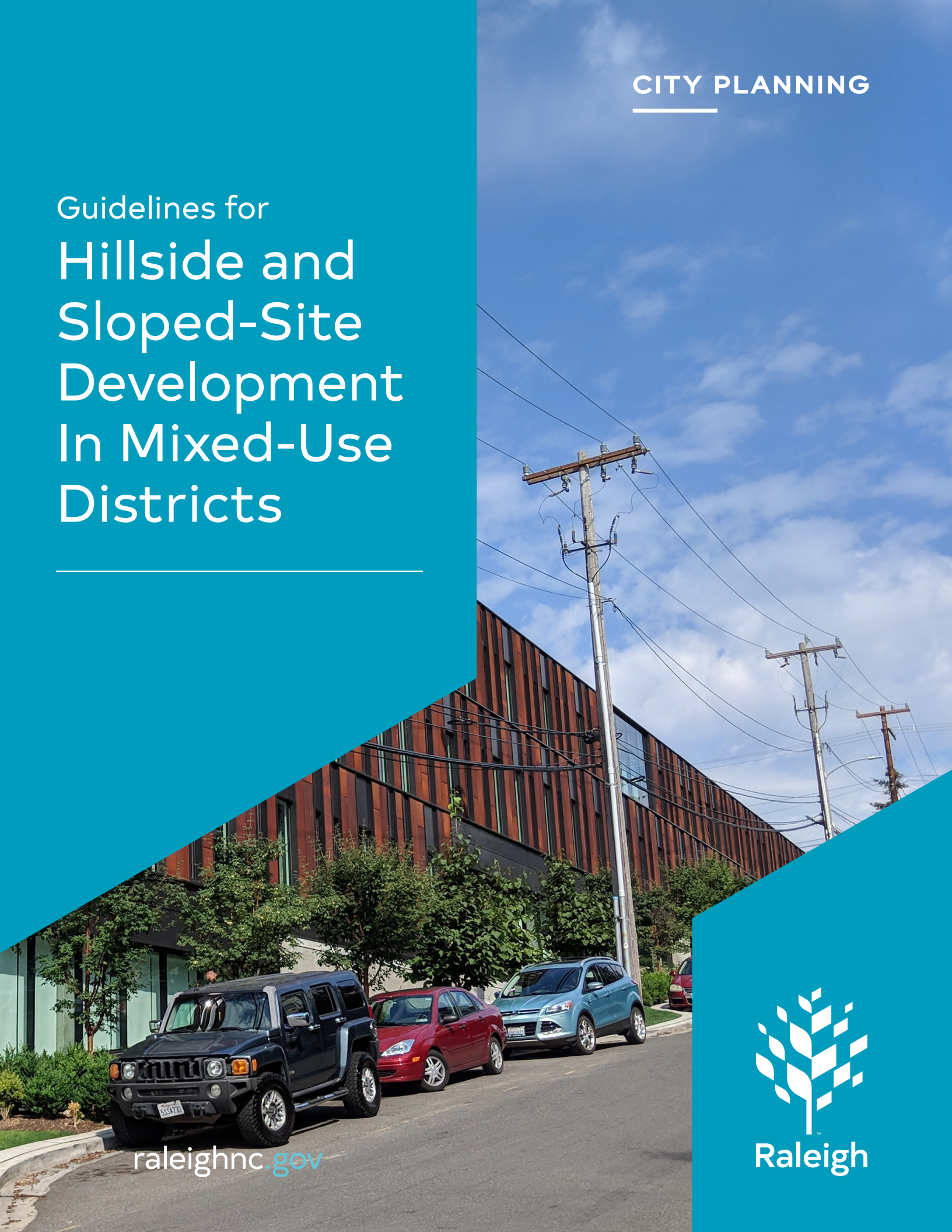
CITY PLANNING

Guidelines for

Hillside and Sloped-Site Development In Mixed-Use Districts



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Raleigh

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Executive Summary

Raleigh's built environment has been undergoing rapid changes for several years, with the city seeing new trends emerging in development. Specifically, Raleigh is seeing larger projects built on sites with significant topography. Many of these projects struggle to simultaneously meet the requirements of the UDO and to interface well with the public realm. As the City receives more development plans for sloping sites, it has become apparent that the UDO currently does not incentivize hillside development that is in line with the goals of the code. To rectify this, a study was undertaken to examine these projects throughout Raleigh.

Phase I of the study commenced in Fall 2017 when the City contracted Code Studio, LLC as a consultant to develop recommendations for policy guidance and regulatory code related to sloped site development. Their recommendations were released in Spring 2019 and offered possible solutions to current problems using the existing UDO structure.

Following a series of stakeholder meetings, staff set about revising the document to address concerns about the first set of recommendations. This report presents a more theoretical and broad approach to sloped site development that marries Code Studio's expertise with community sentiment.

This document addresses the same areas of the code as the previous document with the exception of blank wall: transition zones, pedestrian access, measurement of height, transparency, retaining walls, and blank foundation walls. It offers several options for each issue that require various degrees of oversight and code change. All potential impacts of the proposed changes have been evaluated and the city can choose any or all of these proposed solution to adopt. If adopted, these changes would allow for flexibility in the UDO that would elevate the quality of development, hillside or otherwise, around the city.

Introduction

The Need

Raleigh has seen significant development activity over the past 10 years, particularly for multi-family and student housing projects in mixed-use zoning districts. The Unified Development Ordinance encourages an active pedestrian environment by placing an emphasis on build-to lines, transparency, and active use at street level. The City routinely receives development plans for sloping sites; some of which take a stark approach to the interface between the building façade and the public sidewalk. Meeting the regulations of the UDO may present challenges to projects where significant topography exists across a relatively small area. In other cases however, projects may assemble multiple parcels across seemingly flat sites, where the size of the development reveals an unexpected change in grade.

Based on recent development plan approvals and built projects, the Planning Department has concluded that its existing development regulations do not adequately address the unique conditions of sloping sites. This has created somewhat undesirable conditions related to building height, transitions, retaining walls at property edges, public realm quality and safety, and lack of pedestrian and vehicular connectivity between sites in some circumstances. Staff has had little flexibility in applying existing design guideline standards to development projects on sloping sites during both the site plan review process and Administrative Alternate process. The lack of clarity and flexibility has led to unintended consequences and undesirable development outcomes.

The Process

In the fall of 2017 the City engaged in a contract with Code Studio, LLC, to complete a Best Practices for Hillside and Sloped Site Development Manual. This project will result in recommendations for policy guidance and regulatory code.

The consultant team traveled to Raleigh for three days of field research and stakeholder meetings. The team documented developments throughout Raleigh and evaluated what elements made their relationship to the street and public realm successful or unsuccessful. Meetings were held with members of the Development Management Team, the Appearance Commission, and the Planning Commission. The intent of the meetings was to use the stakeholders' expertise to assist in clarifying the problem, identifying key issues and, if possible, prioritizing areas of needed reform.

The team reviewed the existing policies of the Comprehensive Plan, the regulations of the UDO, and any applicable City guidelines to understand specifically whether the key issues could be resolved using existing policy, regulations and guidelines, and if not, what types of new tools are needed.

Working with City staff, the team identified appropriate peer cities, and then inventoried best practices with regard to the key issues raised during the earlier tasks. The selection of peer cities reflected local urban and suburban conditions in Raleigh.

Based on the information gathered from field research observations, the policy audit,

stakeholder feedback, and peer city research, the team gathered areas of focus to perform 3D-modeling scenarios in order to test potential code changes.

Draft recommendations were completed and an online commenting period of the draft document was made available to the general public. Additionally, staff conducted several work sessions with representatives from the Appearance Commission, Planning Commission, and Development Services Advisory Committee to review the draft proposals. Based on feedback from this public comment period and stakeholder work sessions, staff has re-evaluated the problems originally identified by the consultant, analyzed the comments received, and revised the proposed regulations. The final set of proposals examines the issues from several angles, offers options for solutions, and evaluates impacts of potential code changes.

Issues to Address

Based on field research and staff input, the team identified issues that merited technical study:

1. **Transition Zones**

Mitigate impact between land uses of different intensity by standardizing height measurement where a retaining wall exists in the transition zone.

2. **Pedestrian Access**

Promote pedestrian accessibility by setting forth regulations regarding access both directly and through a retaining wall.

3. **Measurement of Height**

Establish a method for measuring height of a building that accounts for slope changes throughout the site so that all structures conform to the zoned story limit while retaining an active street level.

4. **Transparency**

Determine methods to accurately measure transparency where a slope exists and mitigate the impact of foundation walls on the pedestrian experience.

5. **Retaining Walls**

Create retaining wall regulations to ensure final products are not excessively tall and overbearing on adjacent sidewalks or properties.

6. **Blank Foundation Walls**

Identify ways that the impact of exposed foundation walls on sloped sites can softened.

Transition Zones

The Need

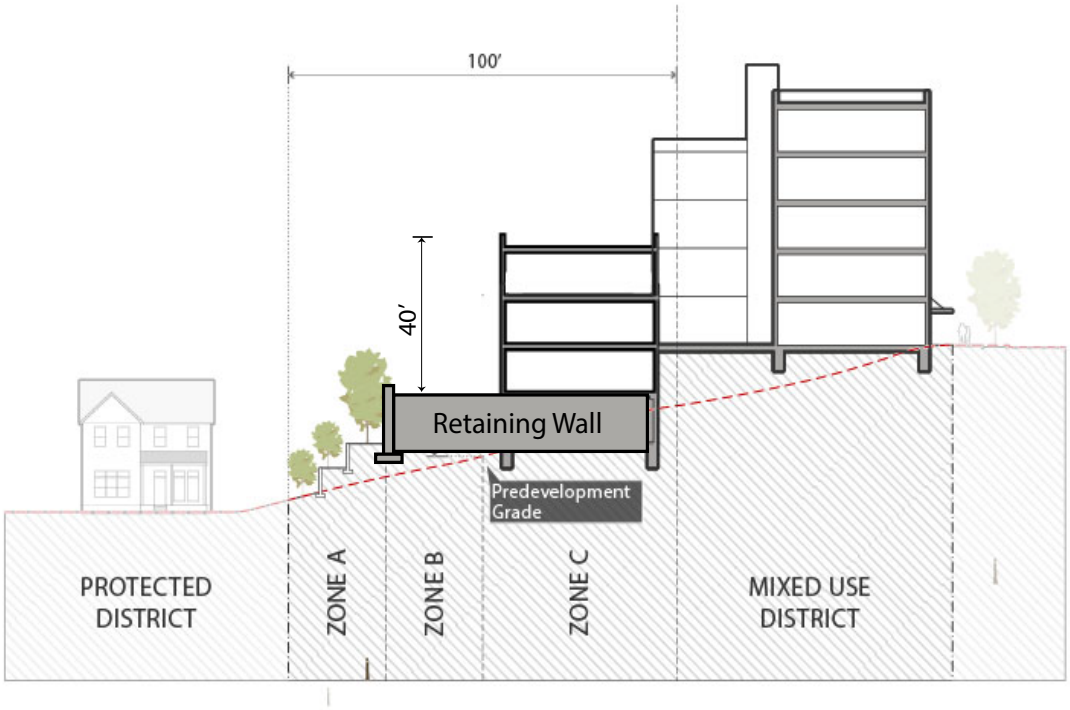
The UDO provides guidance for neighborhood transition areas to mitigate impacts between otherwise incompatible adjacent and nearby land uses. Zone C refers to the parcels immediately abutting a mixed use district. Restrictions in this zone are intended to decrease the impact of new multi-story structures on the neighboring residential district. Currently, the UDO limits height in Zone C to a maximum of 40', but lack of clarity has led to confusion about what is intended to be measured in this zone. The City has received applications for designs that exceed the intended height limit.

The Proposal

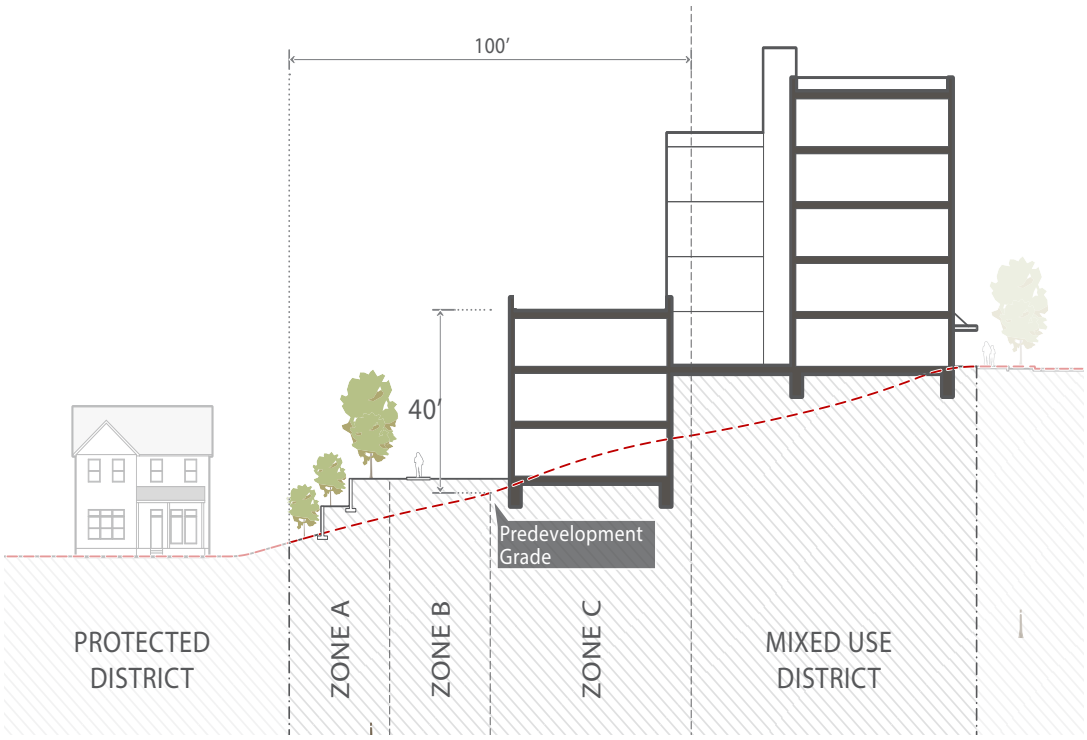
No structure can be more than 40 feet at the Zone C line as measured from pre-development grade. Height can increase subject to a 45 degree height plane measured from a height of 40 feet from pre-development grade at the Zone C line, extending upward one foot for every additional foot of setback into the site.

The Impact

- Lower structures near neighborhoods
- Potential for fewer usable stories within Zone C transition area



1. Example of improper strategy for development in Zone C.



2. Proposed text change clarifies intent of the code

Pedestrian Access

The Need

Raleigh continues to make increased investment in public transit and efforts to promote alternate forms of transit throughout the city. With this in mind, the code must further prioritize adequate pedestrian connectivity to the public sidewalk and confirm the intent of the code. While many would consider pedestrian connectivity a more urban priority, encouraging the development of safe, walkable communities is a City-wide need. Encouraging direct pedestrian access to buildings is also supported by the Comprehensive Plan, including policies T 5.9. T5.10, and UD 6.2.

Pedestrian access can be thought of in terms of access to the site, the building, or both. The most accessible sites facilitate direct pedestrian access from the sidewalk through the site in the most efficient manner, and then to the building's front door. In order to encourage safe, accessible, and walkable neighborhoods, some regulations could be strengthened, such as distances and requirements for pedestrian accessways to a site and building, and requirements to provide access through retaining walls instead of around them. By strengthening these requirements, the code will better align with UDO section 1.5.8.A.2, which states that "Access points should be located or identified in a manner visible to the pedestrian from the street and be accessible via a direct path."

The Proposal

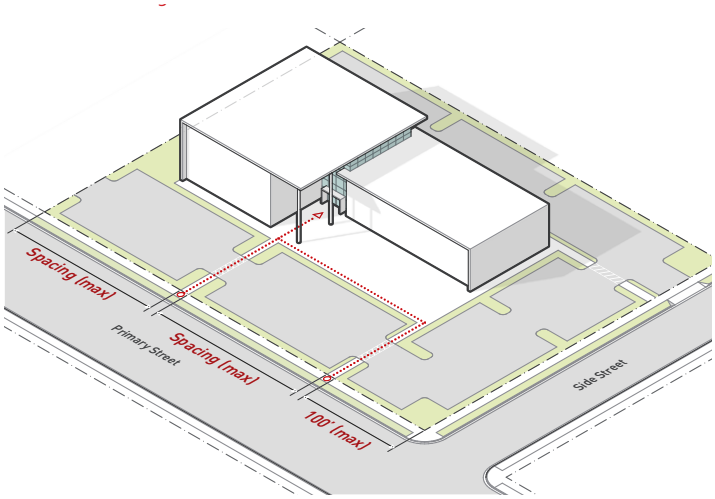
Site Access - Strengthen requirements that govern how the site is accessed. Some frontages have strict standards for pedestrian access, but the baseline standards can be improved. Strengthening this requirement is the first step toward improving pedestrian access.

Access Through Retaining Walls - Current regulation does not require pedestrian access where a retaining wall is located between the sidewalk and the building. Where a retaining wall is allowed between the street-facing entrance and the public sidewalk, the pedestrian accessway must continue through the retaining wall. Stairs must meet standards shown.

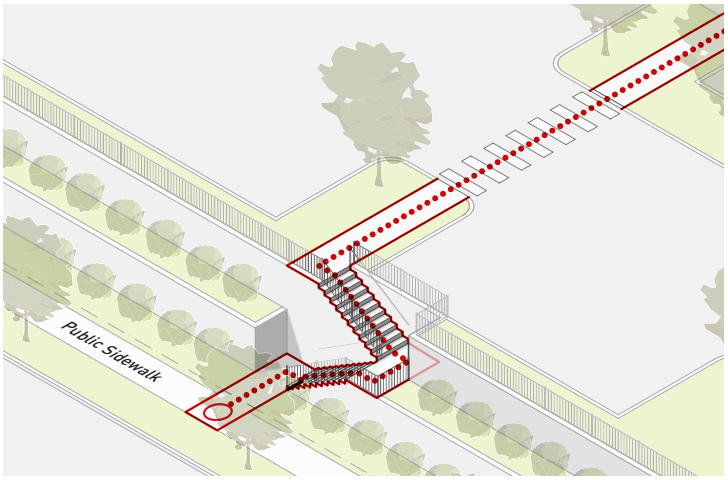
Building Access - A more comprehensive way to ensure pedestrian access is to make pedestrian access from the sidewalk to the building as direct as possible. For example, routes from the sidewalk should not excessively meander. This could be tied to Building Type requirements.

The Impact

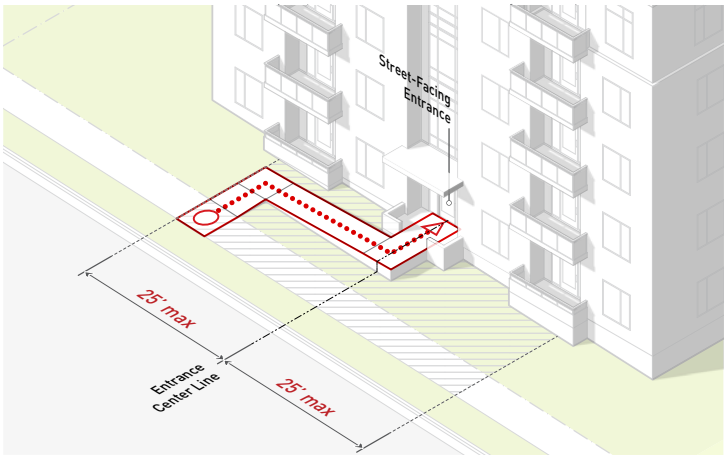
- Improved walkability
- Additional Construction costs
- Added complexities to site layout



3. Access way requirements based on Frontage



4. Required access ways must be provided at retaining walls



5. Direct building access applied to Building Type

Measurement of Height

The Need

The original UDO text determined height by measuring from the average grade to the top of roof. This is regulated through a zoning limit on the number of stories, which also includes limits on the overall height in feet for buildings 7 stories and below. The height in feet is measured from the site's average grade. The original language does not address height limits for a building's side or rear facades. This can create unpredictable height results on secondary streets or for adjacent rear and side lot properties.

Current code incentivizes maximizing the number of floors allowed by zoning. On a sloping condition, it is common practice to flatten the topography of the site as much as possible in order to build all allowable floors. In many cases, this results in retaining or foundation wall conditions at the high and low ends of a site, with ground floor levels being located either well above or below the sidewalk location. This condition does not promote active, safe, and walkable environments.

Some recent developments have activated the low end of a sloped site by adding an additional half-story, which was classified as a basement condition. In an effort to prevent buildings from appearing taller than allowable for their zone, a text change (TC-17-16, see note) was adopted to not allow the additional story gained through grade change.

Without the option to gain an additional half story, developments will continue to flatten sites instead of working with the natural topography. Currently, there is no incentive to step massing up or down with a site as this would result in a loss of buildable area. The proposed solutions seek to rectify Text Change 17-16. TC-17-16 addressed these height conditions in an attempt to keep actual stories in line with zoning districts. This has the unintended consequence of creating increased inactive partial ground floors in order to keep large floorplates and conform with zoning height restrictions.

Text Change 17-16 (Average Grade, Basement Definition):

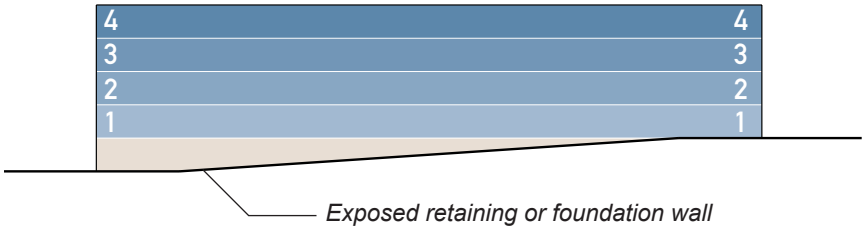
In order to address the creation of additional above ground floor area that is classified as a basement, a text change was adopted in advance of this study. TC-17-16 makes several changes to the code:

- Sets the method for determining average grade by calculating the average of the highest and lowest elevation along each building elevation, and averaging all elevations.
- Gaining an additional story when a site slopes away from the primary street is limited to buildings three stories or lower and any buildings in the Downtown Mixed-Use District. This provision only applies when a building does not contain a basement.

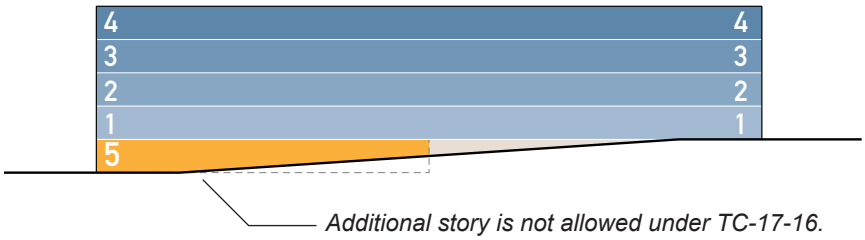
  This text change was adopted July 3, 2018 and went into effect September 1, 2018.

4-Story Zoning Scenario with Current Regulations:

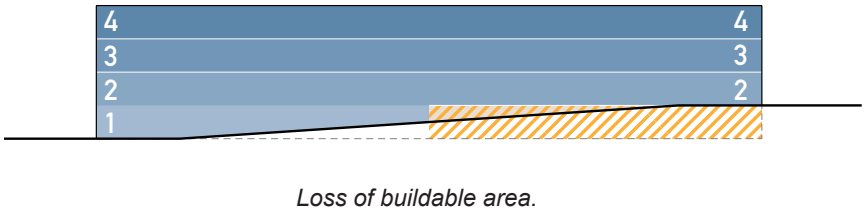
If allowed through existing regulations, a building will **maximize** its developable area.



The portion of the building that steps either up or down is considered an additional story, and **not allowed under TC-17-16.**

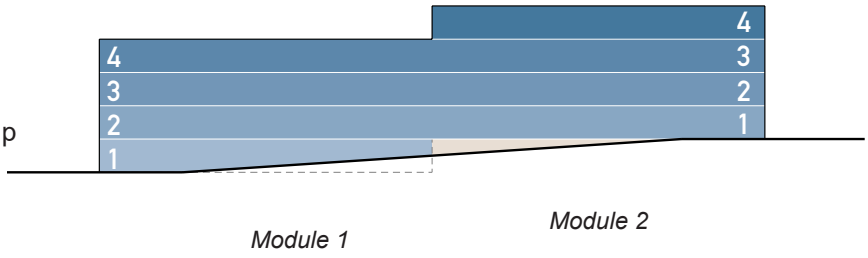


Stepping a building with topography and maintaining the allowable number of stories **reduces buildable area.**



4-Story Zoning Scenario with Proposed Regulations:

Height and stories can be measured in **modules**, which allows a building to step up or down with topography and not lose buildable area.



6. Height scenarios under different regulations

Large foundation walls occur for several reasons related to the scale of modern, sloped development. First, the method of creating multi-family housing today is very different than it was 100 years ago, when many cities were urbanizing like Raleigh is today. At that time, large city blocks would be filled with separate buildings, side by side, lining the streets. These separate buildings would share a wall (known as party wall), but have their own entries and exits, and internal circulation. So in a condition where the street sloped, these individual buildings would simply step down with the topography.

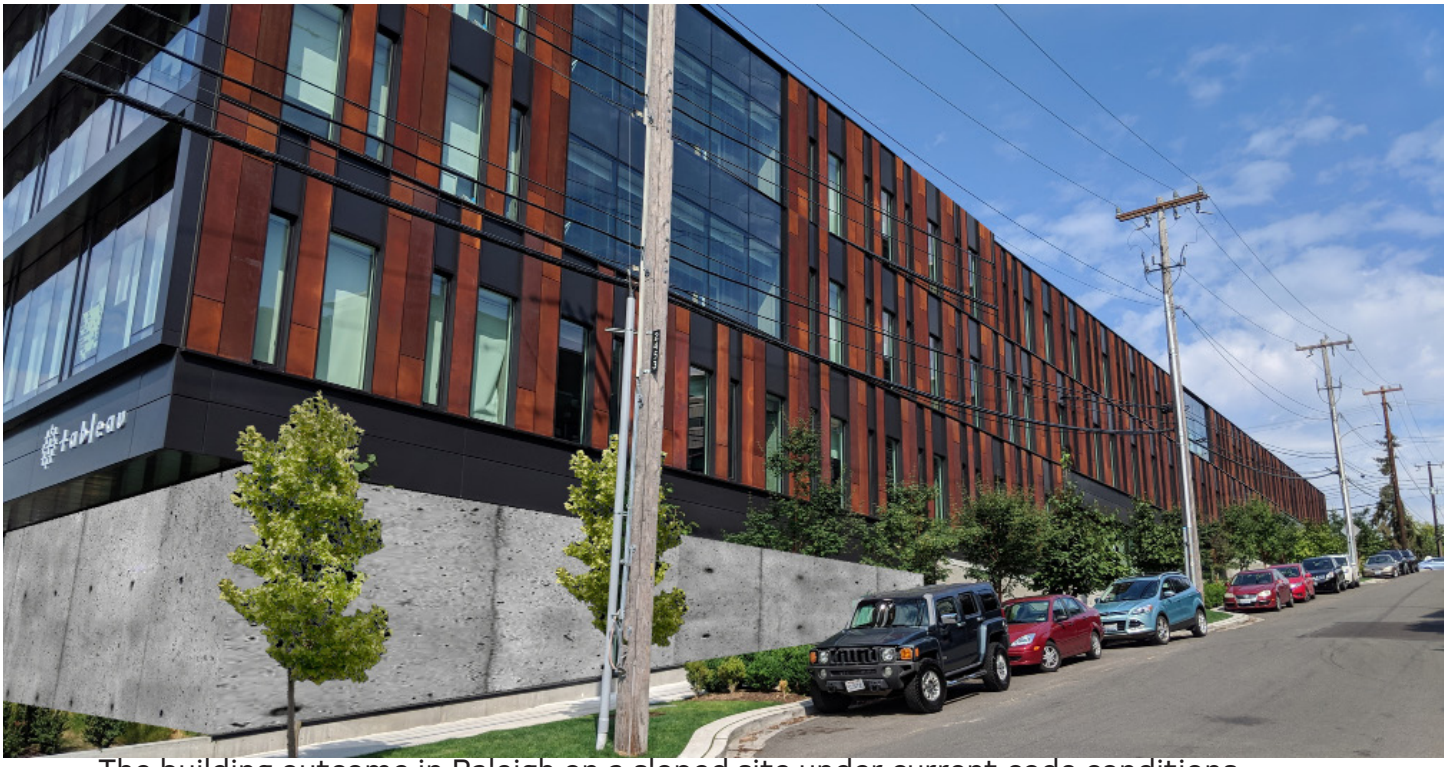
Today's development takes a different form than that historic model. To begin, many buildings today are simply larger in scale and density, and most developers will assemble several parcels of land to make a 4, 5, or 7-story building feasible. Instead of breaking a site up into multiple separate buildings, sites are developed with large buildings containing double and single-loaded corridors. Buildings of this size also require a significant amount of parking, sometimes as surface parking but many times in large, bulky parking decks. Often, these decks are wrapped on the exterior with apartments. Stepping a large building to meet topography becomes challenging when continuous floor levels are desired throughout.

The images on the next page illustrate how the UDO affects sloped site development. The top image shows a 3-story office building with multiple modules in another city. The bottom image shows how a similar building would be built in Raleigh. Note the foundation wall on the ground floor in the Raleigh example.

7. Historic Urban Development

8. Modern Urban Development

9. Sloped site building condition in Seattle



10. The building outcome in Raleigh on a sloped site under current code conditions

The Proposals

The study revealed a need to add flexibility to the code to minimize stark building conditions at the sidewalk by allowing buildings to step up or down with the natural topography. This can be done by introducing a height measuring technique where the building is measured in multiple modules.

The following lists the proposed approaches to the identified issues. The first two options require little to no text changes. The recommended proposal is to add flexibility to our current method of measuring height. That additional method is explained in the following pages.

1. No change to code

Leaving the current code as it is would reduce confusion associated with a change in regulation. However, low-quality urban development would continue.

2. Allow for an addition half-story at ground level

The simplest way of ensuring active sidewalks is to reverse the basement portion of TC-17-16, which would allow an extra half-story at ground level. The attics portion of the text change would not need to be reversed. Within a four story district, for example, a building could transition from four stories on one end to five on the other, essentially allowing more building space than would be permitted on a flat site. While this is the condition TC-17-16 sought to rectify, reversing this portion of the text change would incentivize the development of more active ground floors, creating a more positive condition for the public realm.

3. Introduce an additional method for measuring height

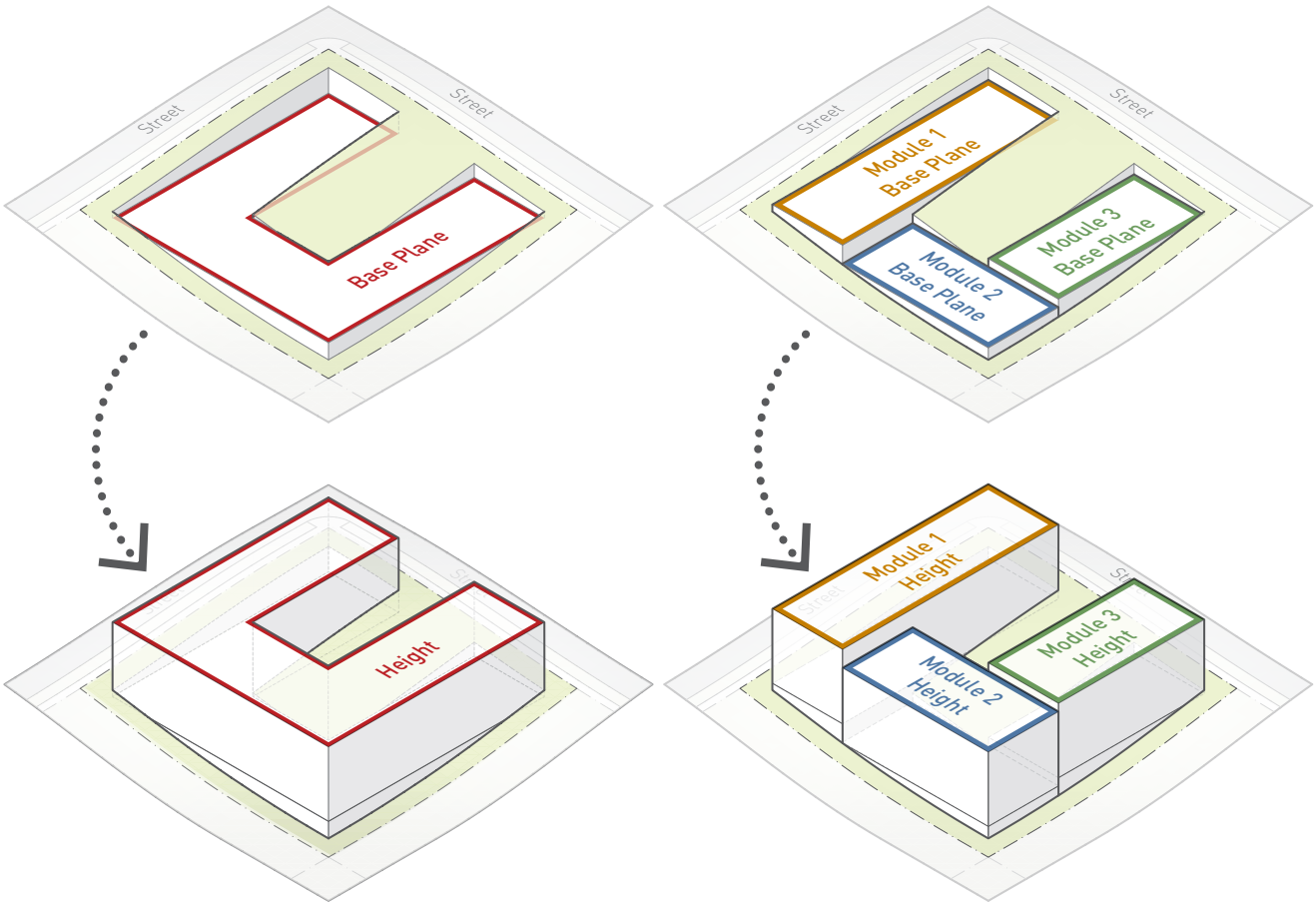
This method would provide needed flexibility and encourage buildings to be designed with the natural topography of the site. The multiple module method would add an additional option to builders for how to measure height, especially for steeply sloped sites, without removing the current method of single module measurement. The benefit of the multiple module method is that the predictability of building height, which is defined by zoning district, would be maintained while allowing for greater flexibility to design for challenging sites.

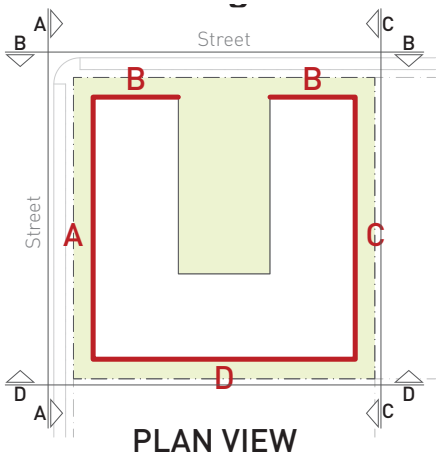
Current Method:

SINGLE MODULE

Added Option:

MULTIPLE MODULES





PLAN VIEW

$$\frac{\left[\text{Avg. Grade Elevation A}\right]+\left[\text{Avg. Grade Elevation B}\right]+\left[\text{Avg. Grade Elevation C}\right]+\left[\text{Avg. Grade Elevation D}\right]}{\left[\text{\# of Elevations}\right]} = \text{Base Plane}$$

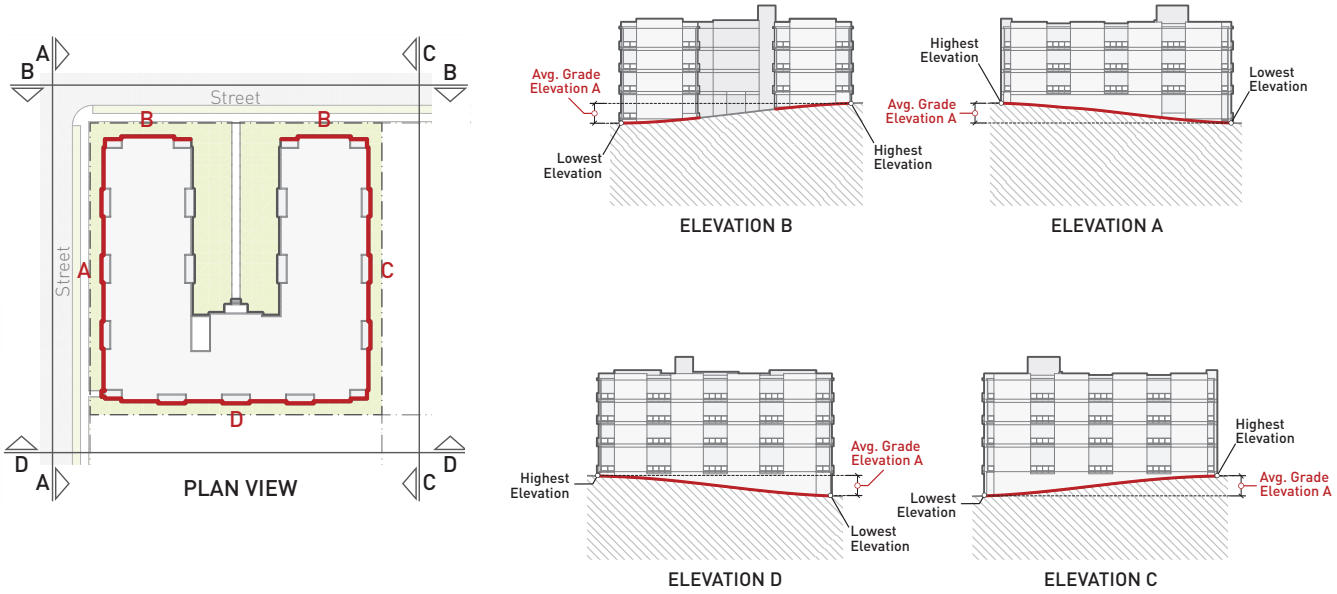
FORMULA

11. Overview of Single vs Multiple Module Method

Single Module Method

Current method for establishing base plane and measuring height. Average grade for the Single Module Method is determined by calculating the average grade for each applicable building façade individually of a single building footprint, then averaging the average grade for all façade elevations.

Measurement of height is be taken from this overall average elevation, or base plane.



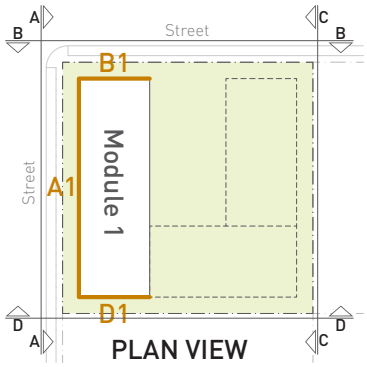
12. Single Module Method

Multiple Module Method

Average grade for the Multiple Module Method is determined by calculating the average grade for each applicable building façade individually for each module of a building footprint, then averaging the average grade for all façade elevations per module.

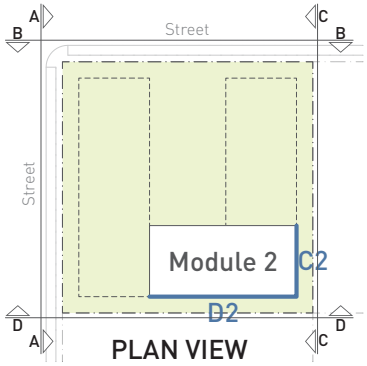
Measurement of height will be taken from each building module's average grade.

There is no determination for how many modules should be established for any given development; that decision is left to the applicant. This method is intended to give flexibility while achieving high quality design results.



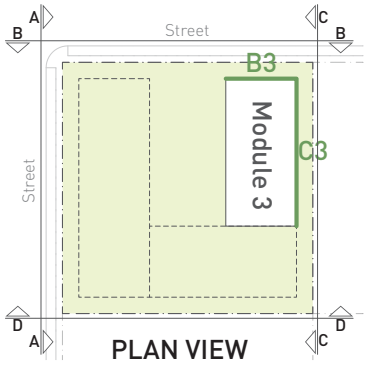
$$\frac{[\text{Avg. Grade Elevation A1}]+[\text{Avg. Grade Elevation B1}]+[\text{Avg. Grade Elevation D1}]}{[\text{\# of Elevations}]} = \text{Module 1 Base Plane}$$

FORMULA



$$\frac{[\text{Avg. Grade Elevation C2}]+[\text{Avg. Grade Elevation D2}]}{[\text{\# of Elevations}]} = \text{Module 2 Base Plane}$$

FORMULA



$$\frac{[\text{Avg. Grade Elevation B3}]+[\text{Avg. Grade Elevation C3}]}{[\text{\# of Elevations}]} = \text{Module 3 Base Plane}$$

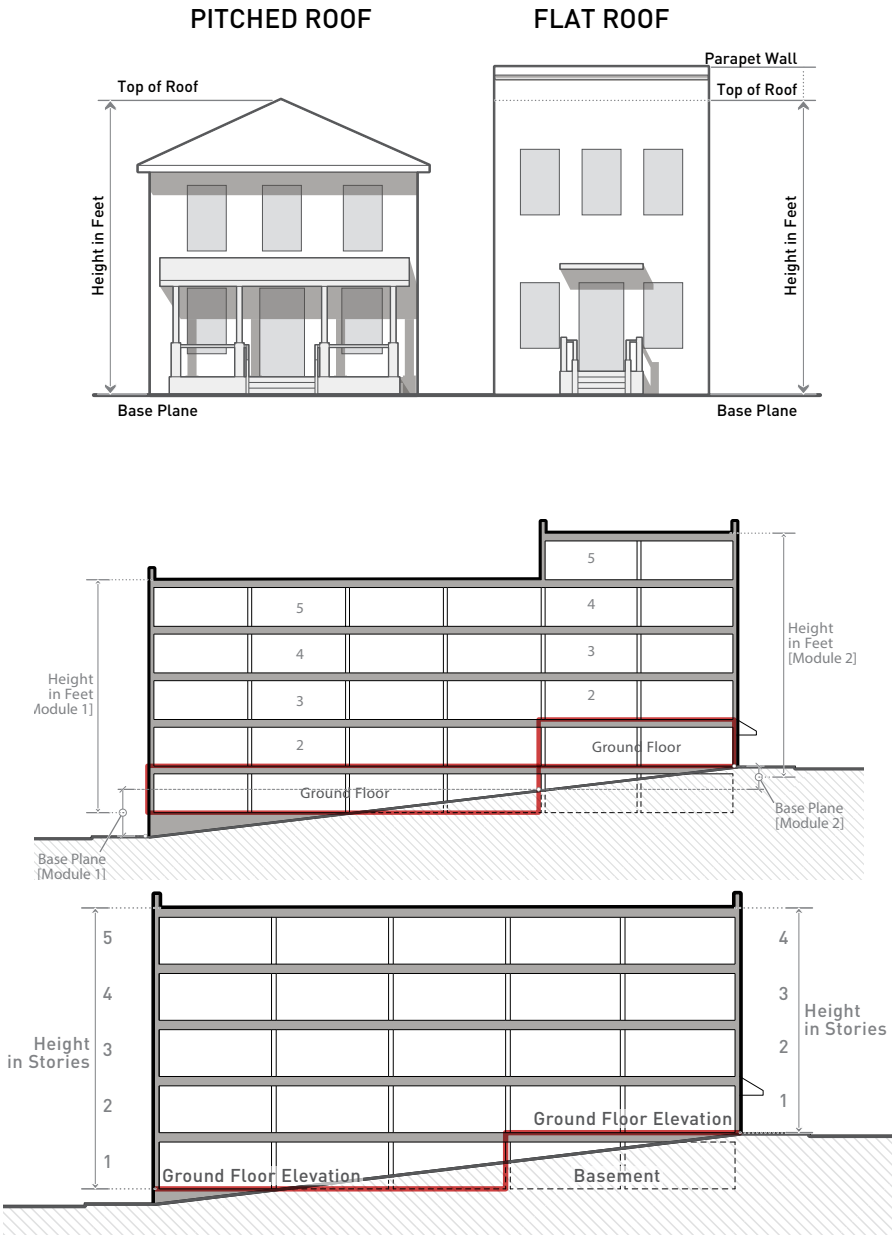
FORMULA

13. Multiple Module Method

Defining Measurement of Height for Building Façade

Building Height in FEET is measured from average grade in feet to the top of the highest point of a pitched or flat roof.

Building Height in STORIES is measured from ground floor elevation to the top of the highest story above ground floor.

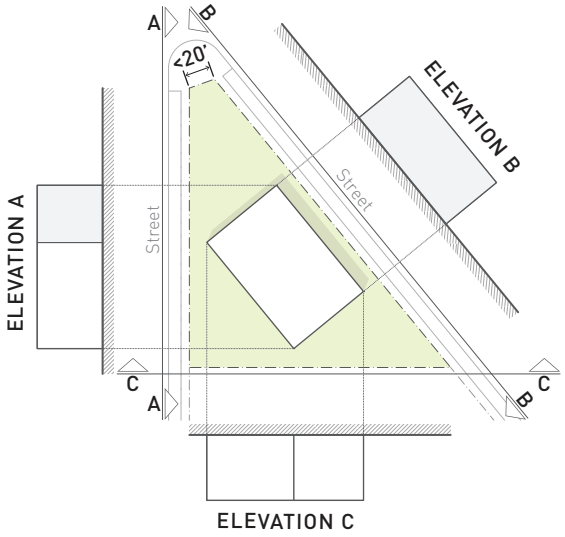


14· Measuring Building Height in Stories

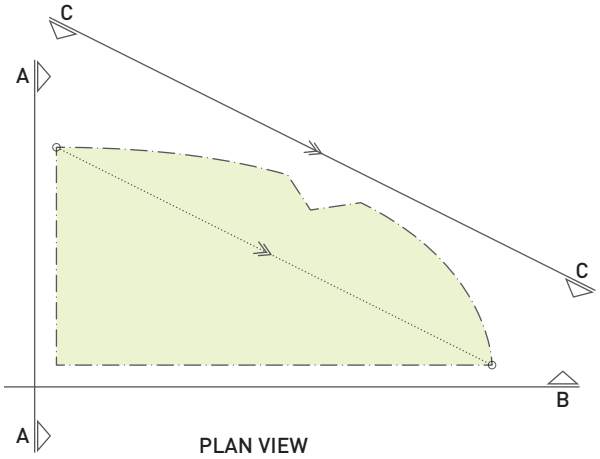
Applicable Building Elevations

Building elevations are projected parallel to each property line greater than 20 feet long. Building elevations along curved or complex property lines are projected parallel to a line connecting the end points of the curved or complex property line.

Projected Elevations



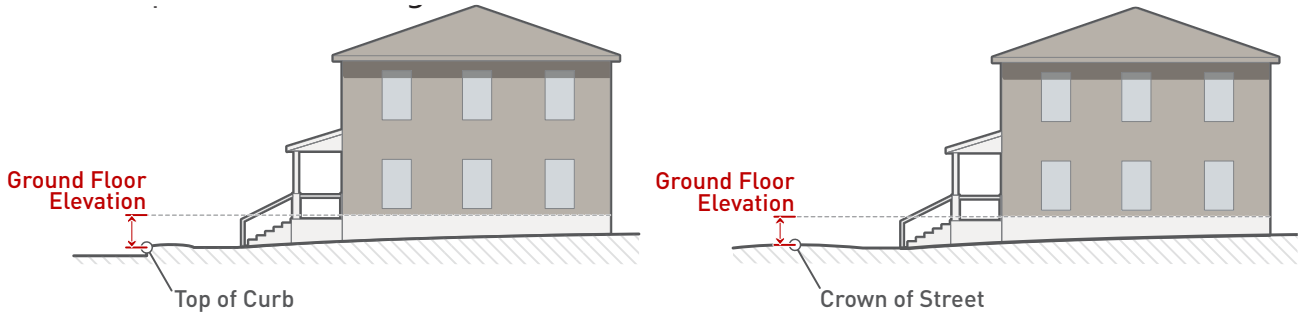
Curved Elevations



Ground Floor Elevation

Changes made to ground floor elevation regulations are intended to encourage ground floors to follow topography along sidewalks.

Ground floor elevation is measured from the average sidewalk level along the adjoining street frontage, or if no sidewalk exists, the average level of the center crown of the street for the adjoining street frontage to the top of the finished ground floor.



15. Determining Ground Floor Elevation

The Impact

Pros

- Greater activation at sidewalk level
- Less flattening of building site
- Building massing more responsive to topography

Cons

- More complicated for staff to review

Transparency

The Need

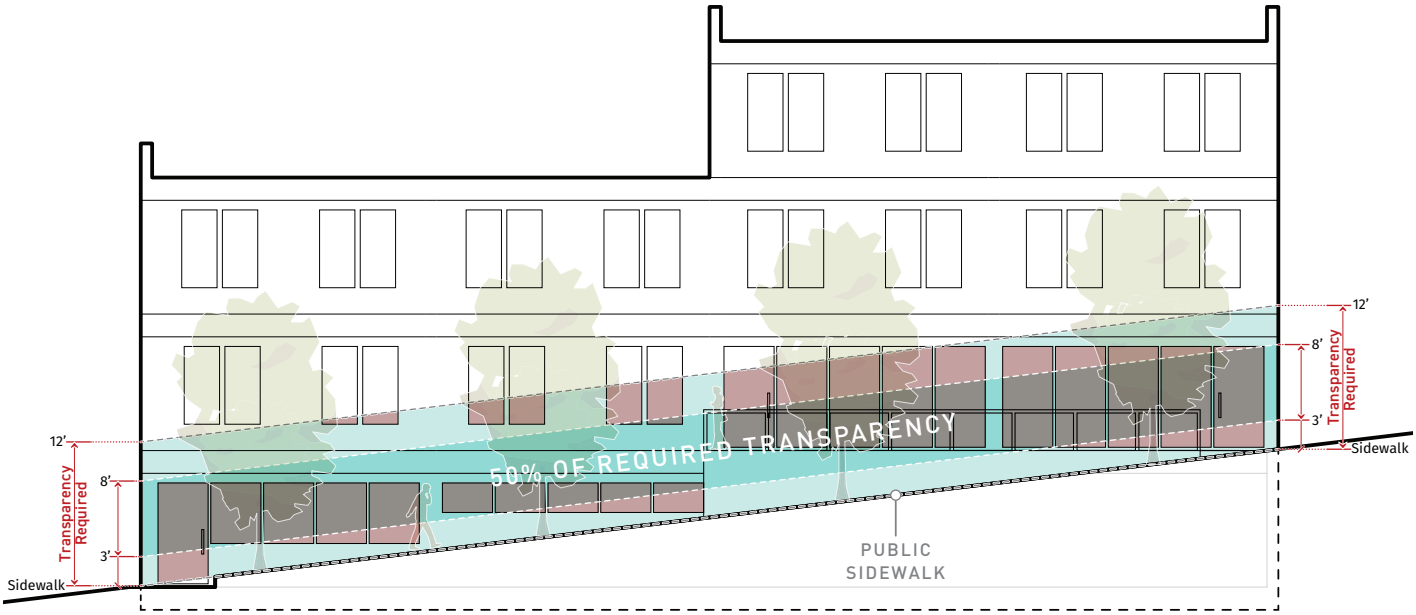
The transparency requirements are intended to lend visual interest to street-facing building facades for both pedestrians and building occupants and minimize blank walls.

In the current text of the UDO, transparency requirements are measured between 0 and 12 feet from the adjacent sidewalk. The intent is to make sure transparency is adequately provided to pedestrians.

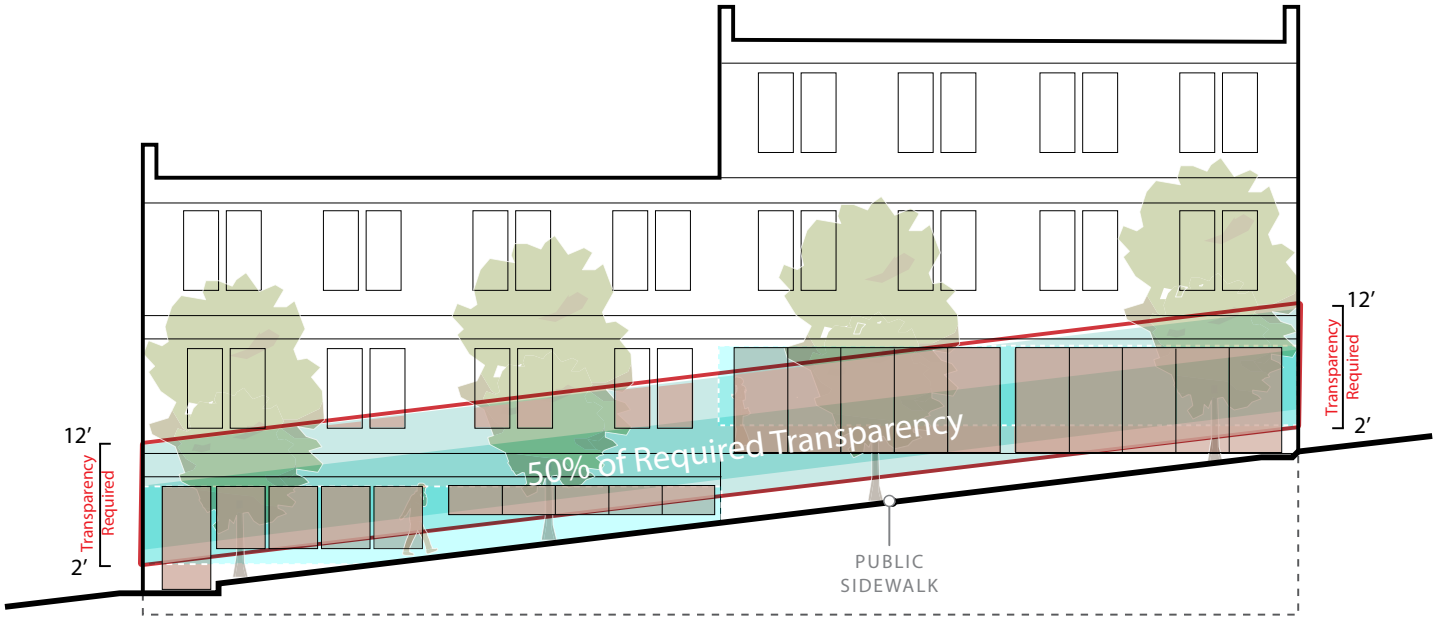
This method is awkward for both designers and staff to evaluate, particularly if the sidewalk slopes. Because the measurement follows topography, arbitrary lines on a building elevation are established to meet the requirements. Too often on sloped sites, designers are forced to apply idiosyncratic strategies to maintain transparency, or opt to seek an Administrative Alternate. Transparency Administrative Alternates are often for gently sloped sites where the first few feet of the facade feature small foundation walls.

The Proposals

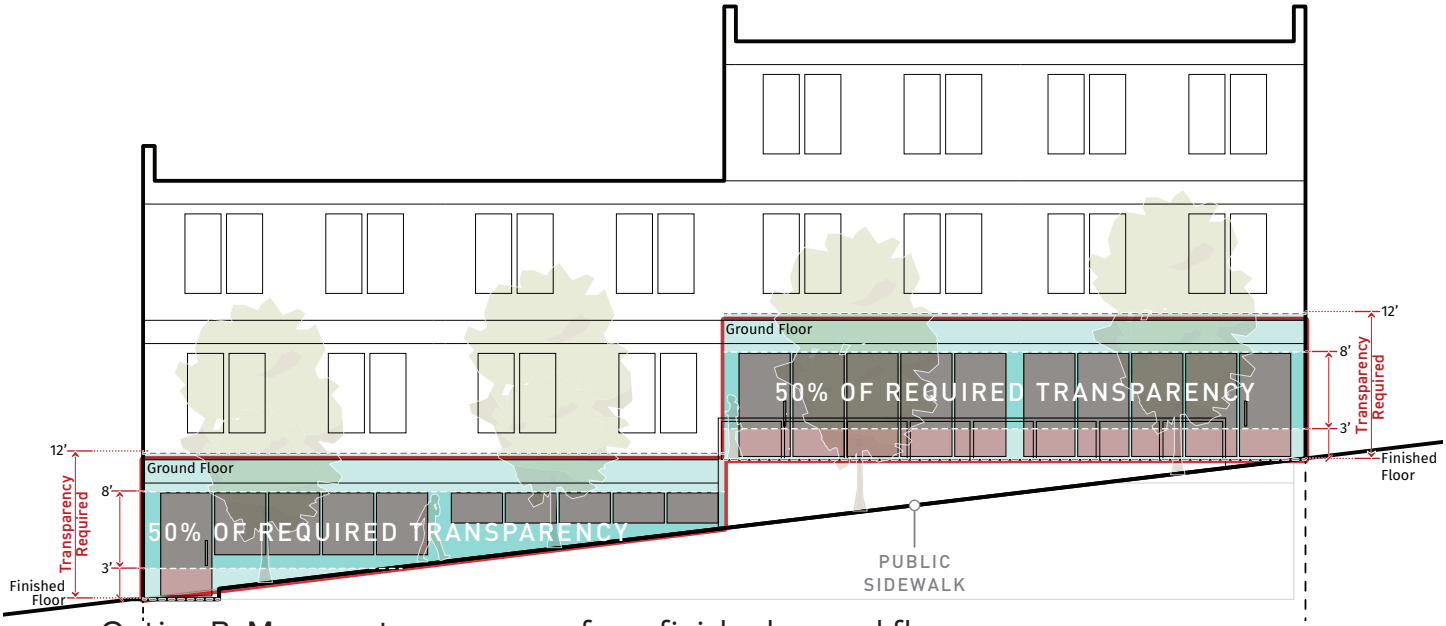
The transparency requirements can be updated to better accommodate real world conditions. Both of these options would address the intent of the transparency requirement while adapting for sloped sites. Option A fits the intent of the current code but accounts for some slope in a site by relieving the applicant from having to provide transparency at the first two feet from the ground. Option B works well for sites with more significant slope, where transparency would be measured from each finished ground floor. While this condition is not seen as often, measuring from the ground floor is a better option as long as ground floor levels are tied to the sidewalk. Otherwise, this could end up in over-prescribed solutions without enough flexibility.



16. Current method of measuring transparency



17. Option A: Measure transparency from 2′-12′;



18. Option B: Measure transparency from finished ground floor.

Option A: Change measurement area from 2'-12' from sidewalk grade

The Impact

Pros

- Fewer Administrative Alternates
- Works for flat and gently sloped sites

Cons

- Area where transparency is required overlaps multiple stories

Option B: Measure transparency from finished ground floor instead of sidewalk. This ground floor could be staggered on a steeply sloped site.

The Impact

- More accurate measurement
- Better for sites with significant slope

Retaining Walls

The Need

Current regulations of retaining walls do not require anything more than height and terracing dimensional maximums. Retaining walls are limited to 10 feet maximum. Additional height is permitted if a 2-foot step back is provided in-between 10-foot high sections. These regulations only apply when a retaining wall is within 30 feet of a public sidewalk.

These regulations do not apply to walls associated with culverts or stream crossing or to transportation improvements.

The current regulations are permissive and have resulted in excessively tall and overbearing retaining walls adjacent to public sidewalks or neighboring property lines.

More guidance should be introduced to encourage design options on retaining walls that help to soften the impact of walls in the pedestrian realm.

The Proposal

Negotiating a moderate or significant slope with thoughtful design strategies is needed to ensure a high quality of public and private spaces is maintained. The height limit for a retaining wall is currently too high, and setback distances between walls is not adequate. This document proposes adding regulations to mitigate undesirable results to areas such as retaining wall height, length, terracing, and / or planting requirements.

Based on feedback on the first draft of this document, staff identified options that can be used when designing retaining walls that will soften their impact on pedestrians and the public realm. The options have been divided into two categories: form & massing options and treatment options. These, combined with better defined retaining wall measurement techniques, will address the issues with current retaining wall standards.

The following page contains form and massing options which can add flexibility to retaining wall requirements to produce great design and variation without being too prescriptive. While not all treatments fit all situations, these options can work as a menu of strategies for designers. Requiring two to three of these options, with one from each group, is a potential regulation option.

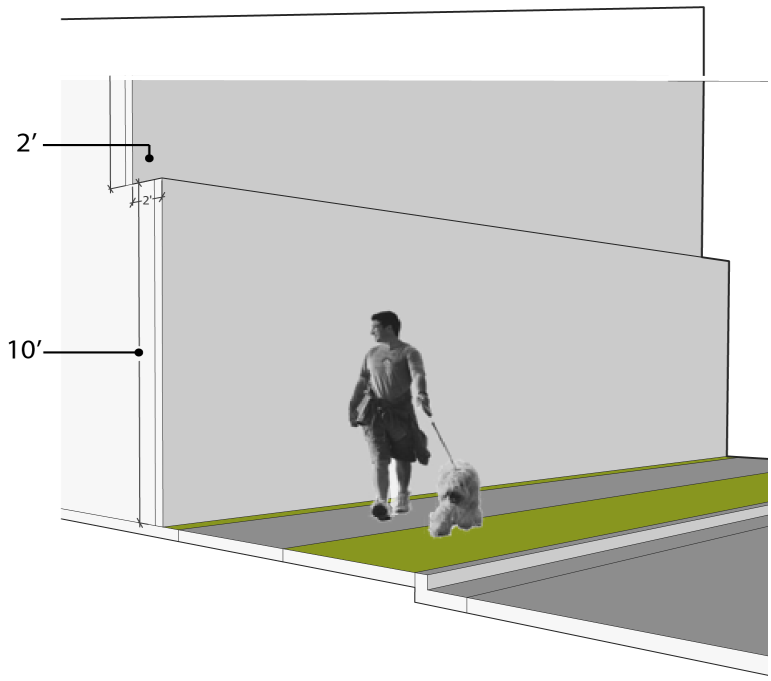
The Impact

Cons

- Additional requirements for form and massing will increase land development costs.
- Increased cost for site layout and design. May create additional challenges on small sites
- Treatment requirements may add to construction and maintenance costs.
- Developable area of the site may be reduced

Pros

- Beautification of the street and pedestrian environment
- Greening and shading of the street and sidewalk
- Sustainability and stormwater opportunities



19. Current retaining wall conditions

20. Proposed use of retaining wall strategies

Form & Massing Options

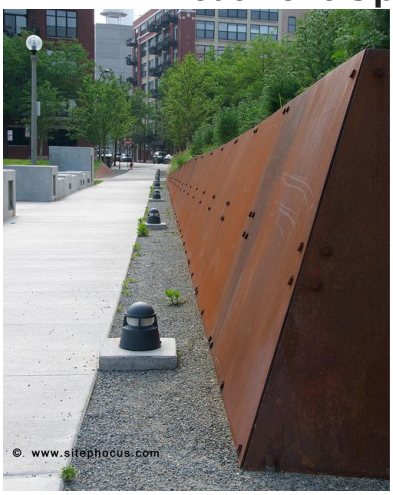
Break up length - Techniques to break up the length of a retaining wall can reduce the visual impact and presence of a longer wall.

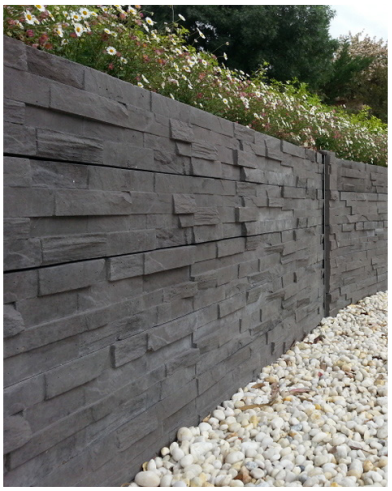
Break Up Height - Terracing a retaining wall adds opportunities for planting and staggers the height of the wall away from the street.

Activating Pedestrian Level - Techniques such as adding seatwalls to retaining walls can benefit pedestrians, or green infrastructure installations between the retaining wall and the sidewalk.

Treatment Options

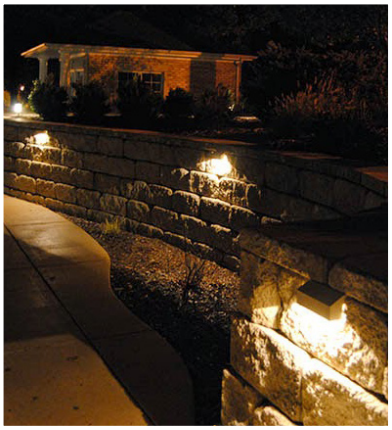
Materials - The use of aesthetically pleasing materials to either construct or cover the retaining wall can improve the appearance of retaining walls.





Plantings - Planting can be incorporated on terracing or throughout the entire wall.

Lighting / Art - Art and lighting can be incorporated into the design of the retaining wall.



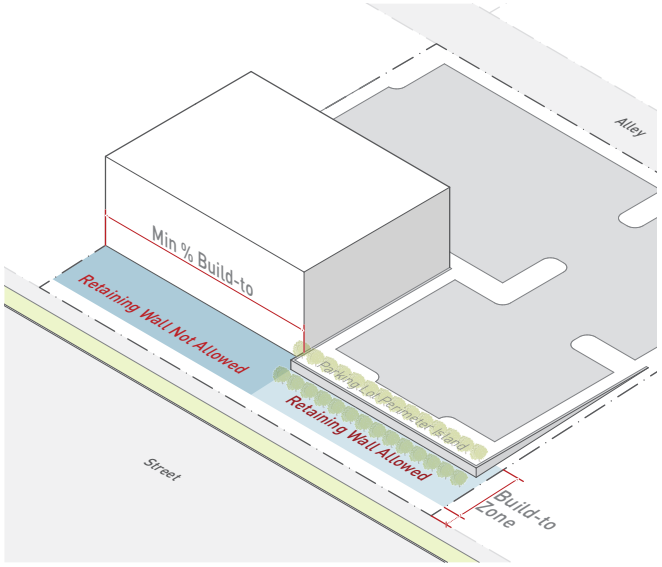
Proposed Retaining Wall Standards

Retaining walls are allowed between the building and the street in all Residential and Special Districts. Where a frontage does not allow retaining walls between the building and the street, retaining walls are always allowed under the following conditions:

1.In the build-to zone once the required minimum percentage build-to has been met (21).

2.Between the building and the street where the building face is not required to meet the minimum percentage build-to.

3.Where no retaining wall is allowed between a building and the street, a planter or garden wall with a wall height of up to 4 feet is allowed.



21. Retaining Wall in the build-to

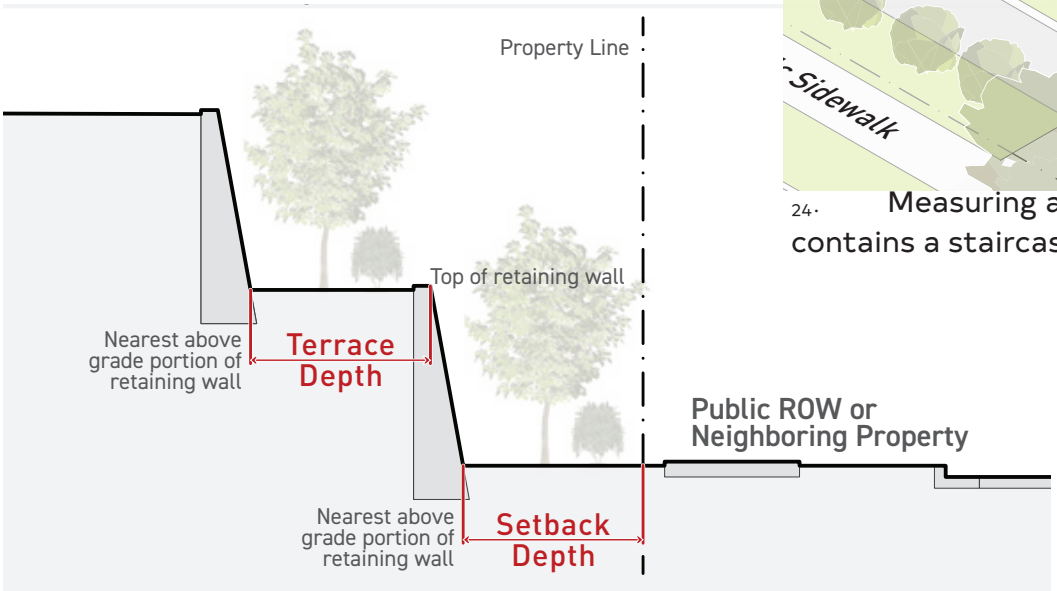
Measurement of Setback and Terrace Depth

Setback depth is measured from the above-grade portion of a retaining wall to the property line, sidewalk or access drive nearest to the retaining wall.

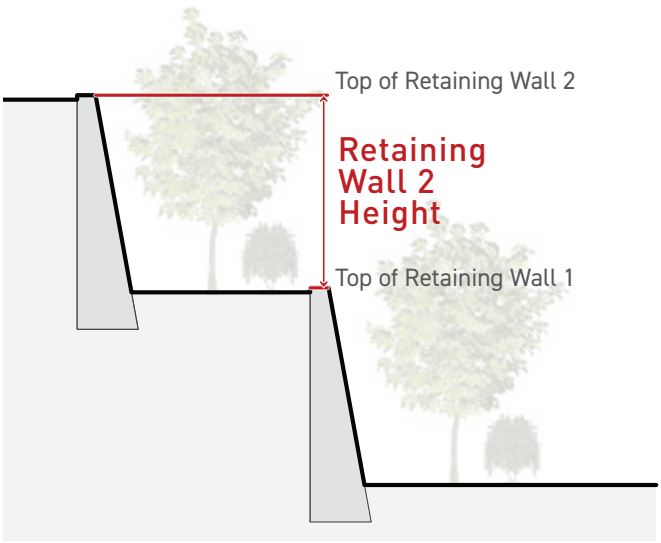
Terrace depth is measured from the top of the outside face of a retaining wall to the nearest above grade portion of the next higher retaining wall (22).

Each next higher retaining wall in a tiered retaining wall system is measured from the top of the lower wall to the top of the higher wall.

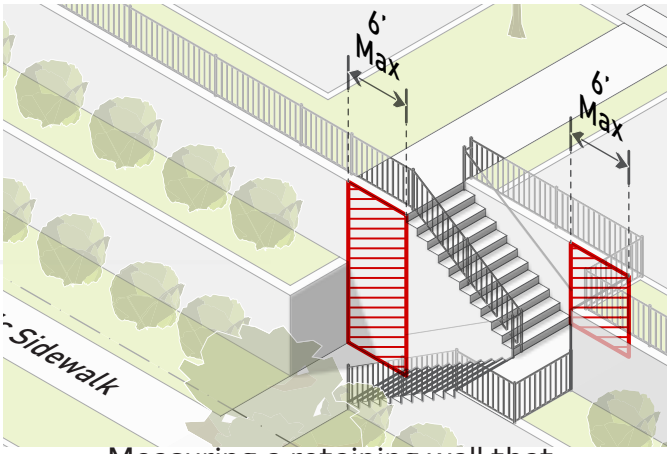
A section of retaining wall up to 6 feet wide may extend to a maximum height of 16 feet in height only in conjunction with a staircase landing or ramp landing providing pedestrian access through a retaining wall.



22. Measuring terrace and setback depth



23. Proposed method of setback and terrace depth



24. Measuring a retaining wall that contains a staircase

Blank Foundation Walls

The Need

Exposed foundation walls are an inevitable byproduct of building on topography. Most sites will have foundation walls to some extent, and they only get larger as the slope of the site increases. Sloped sites very often create conditions where a significant stretch of blank foundation walls are left exposed. This is another byproduct of the large scale of modern buildings on sloped sites.

The UDO recently introduced regulations on blank foundation walls. The code currently states that a foundation wall shall be finished with the same primary materials as the building. When the foundation wall is within 30 feet of any primary street, the foundation wall has a maximum height of 5 feet from grade.

While this regulation is effective in managing exposed foundation walls, it is not flexible and does not encourage other strategies of mitigating the impacts of foundation walls.

Under this proposal, blank foundation walls between 4 and 5 feet high would be required to apply a treatment.

The Proposal

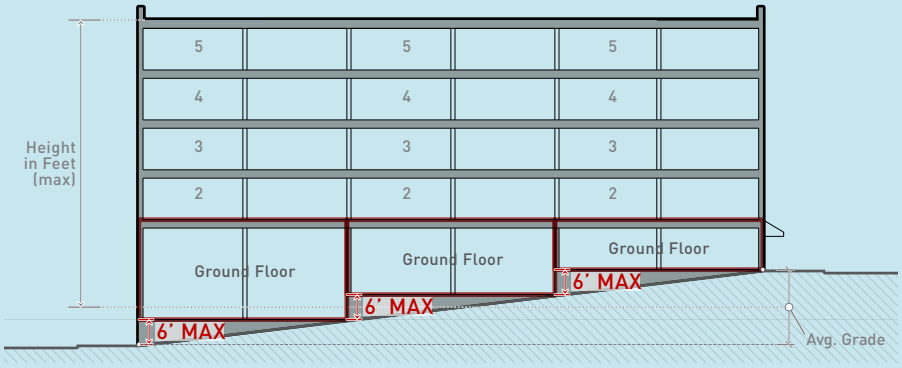
Regulation of blank foundation walls should incorporate both size regulation and treatment options. Blank foundation walls above a certain size will be required to use treatments to improve condition, only when near right-of-way. Size can be determined by:

- Dimensional criteria with set maximum for blank foundation walls OR
- Performance-based criteria, where a building can only leave a maximum percentage of its foundation wall blank.

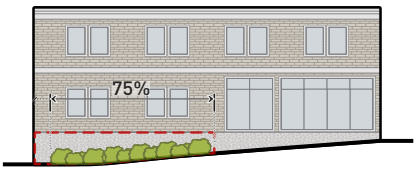
The Impact

- Increased construction costs
- Improved pedestrian realm
- More options for compliance

In order to avoid large exposed foundation walls, a 6-foot height maximum was originally proposed on exposed foundation walls no matter the method of measurement. Staff recieved pushback for this limit from the stakeholder groups. However, it should be noted that TC-17-16 imposes a 5-foot height limit for foundation walls. Further study is needed regarding this regulation.

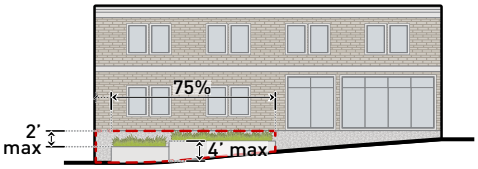


Foundation Planting



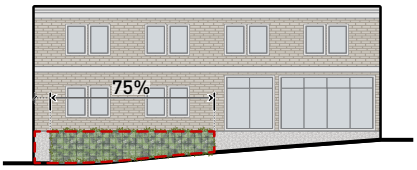
A 3' tall shrub planted at a rate of 3 shrubs per 10 feet of otherwise blank foundation wall.

Planter



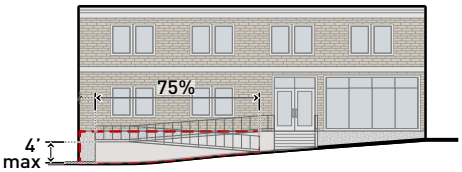
A planter of not more than 4 feet in height above the sidewalk that reveals a maximum of 2 feet of foundation wall.

Green Wall



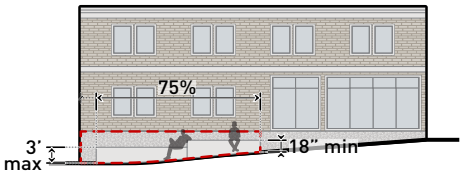
A structure permanently attached to the applicable wall and at least 75% covered in vegetation. Includes both systems providing support for climbing plants and systems supporting vegetation with its own growing medium.

Access



Stairs or ramps providing access to a street-facing entrance. Must be no more than 4 feet in height above the sidewalk.

Seating



A permanent structure intended for public seating between 18 inches and 3 feet in height above the sidewalk, and a minimum of 18 inches deep.

25. Blank Foundation Wall Treatments

CITY PLANNING

Raleigh

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City of Raleigh
City Planning Department
1 Exchange Plaza, Suite 300
919-996-2682
raleighnc.gov/planning