M E M O R A N D U M

TO: Ordinance Revisions Committee

FROM: Brett Lenart, Planning Manager

DATE: March 24, 2023

SUBJECT: **Building Height Calculation**

Over the past years at the City, I have participated in varying consultations and conversations with property owners, designers, and colleagues regarding the measurement of building height per the Unified Development Code (UDC). This conversation is not intended to amend any building height requirements across the UDC, but to work toward a clear, illustrated definition of building height that is appropriate, clear, and easy for all users to understand and apply consistently.

Examples of questions that have been raised/discussed over time include:

- How all sides of a building should be considered/compared.
- Whether 5 feet away from the building is the appropriate point of reference for grade
- Defining Average vs. Midpoint of Finished Grade

Background/Current Definitions

Within the adopted UDC today, there are several definitions that are utilized to define and/or calculate the height of a building.

Building Height
The vertical distance of a Building measured from the Finished Grade to the highest point of the Roof surface of a flat Roof; to the deck line of a mansard Roof; and to the average height between the eaves and the ridge of the highest Roof section for a gable, hip and gambrel Roof.

Finished Grade
The level of the ground adjacent to the Structure if the ground is level. If the ground is not level, the Finished Grade shall be determined by averaging the elevation of the ground for each side of the Structure using the highest and lowest point of each side, as measured five feet from the exterior walls of the Structure.

Examples from other communities:

Examples of building height definitions from ten communities are provided below, along with the illustrations from an additional five communities.

Ypsilanti, MI - Building height means the vertical distance from the established grade of the center of the front of the building to the highest point of the roof surface of a flat roof; to the deck line of mansard roof; to the mean height level between the eaves and ridge for a hip, gambrel or gabled roof; and 75 percent of the height of "A" frame. Chimneys, spires, antenna, and similar projections other than signs shall not be included in calculating building height.

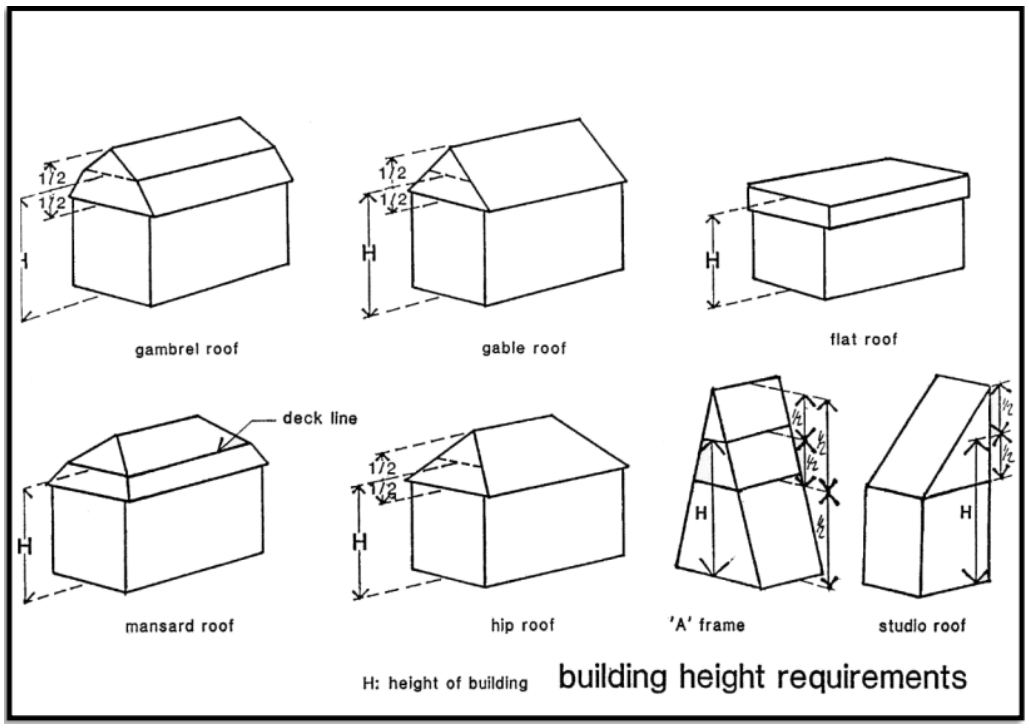


Figure 1 City of Ypsilanti, MI

Detroit, MI - Height (of buildings) The vertical distance from the grade plane at the center of the front of the building to the highest point of the roof surface if a flat roof, to the deck line for mansard roofs, and to the mean height level between eaves and ridge for gabled, hip, and gambrel roofs.

Gainesville, FL - Building height means the vertical distance measured from the average elevation of the proposed finished grade to the top plate of the highest story.

Boulder, CO - Height means the vertical distance from the lowest point within twenty-five horizontal feet of the tallest side of the structure to the uppermost point of the roof or structure.

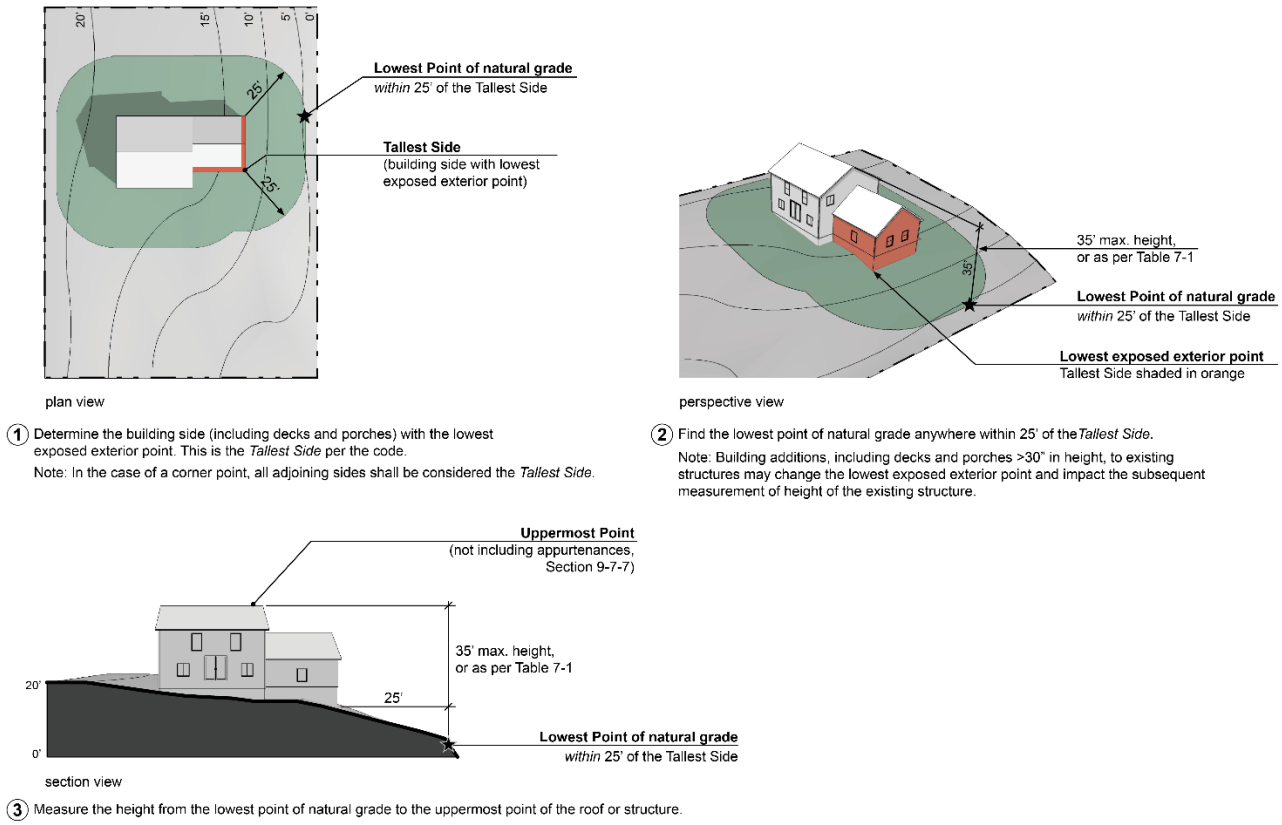


Figure 2 City of Boulder, CO

Grand Rapids, MI - Building Height The maximum permitted vertical height of a building, as measured in feet or stories.

Grade A reference plane representing the ground level adjoining a building or structure used for the purpose of regulating the height of a structure measured at the level of the ground adjacent to the structure if the finished grade is level.

1. Grade, Average. If the ground is not entirely level, the elevation using the ground elevation on each side of the structure, measured at six (6) feet from the exterior walls of the structure.
2. Grade, Existing. The elevation or surface of the ground or pavement as it exists prior to disturbance.
3. Grade, Finished. The elevation or surface of the ground after all earthwork has been completed, without a berm, measured at six (6) feet from the exterior walls of the structure.

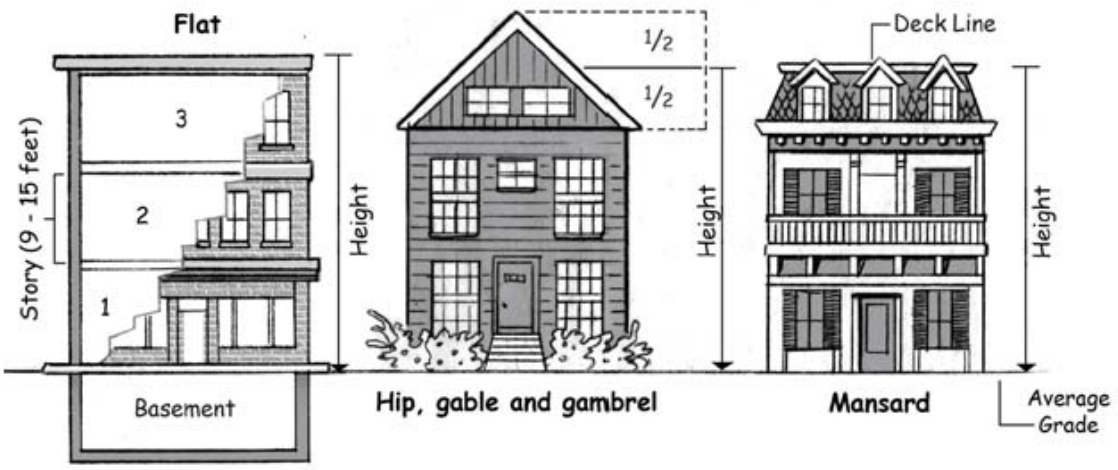


Figure 3 Grand Rapids, MI

Evanston, IL - Building Height, Absolute: The perpendicular distance above the established grade to the highest point of the building, including parapet walls, but excluding chimneys, spires, and mechanical penthouses, provided the penthouses cannot be seen from the street. The highest point of turrets, towers, belfries, cupolas, lanterns, window's walks, and similar structures or features are used as the highest point of the structure when said structure or structure feature is: a) the highest point of the structure, and b) has an outer perimeter enclosing an area of sixteen (16) square feet or more regardless of the presence of floors. Said structure or feature is a spire when it has an outer perimeter enclosing an area of less than sixteen (16) square feet. Said structures or structure features include: turrets, towers, belfries, cupolas, lanterns, widow's walks or similar structures.

Building Height, Mean:
(A) The perpendicular distance measured from the established grade to the high point of the roof for a flat roof, the deck line of a mansard roof, and to the mean height level for gable, hip or gambrel roofs. Mean height level is computed as the average of the height of the high point of the roof and the highest level where the plane of the main roof, excluding dormers, intersects the plane of an outside wall below the main roof. Chimneys and spires shall not be included in calculating the height nor shall mechanical penthouses or solar collectors, provided the penthouses and collectors cannot be seen from the street. The highest point of the following structures or structure features is used as the high point of the roof in computing mean height level when said structure or feature is: 1) the highest point of the structure and 2) has an outer perimeter enclosing an area of sixteen (16) square feet or more regardless of the presence of floor. Said structure or feature is treated as a spire when having an outer perimeter enclosing an area of less than sixteen (16) square feet. Said structures or features include: turrets, towers, belfries, cupolas, lanterns, window's walks or similar structures.

(B) The height of any story of a structure shall be excluded from the calculation of its height when seventy-five percent (75%) or more of the gross floor area of such story consists of parking required for the structure (excluding mechanical penthouse or solar collector). This exclusion of required parking from the calculation of building height shall

be applicable to all permitted and special uses in the B3, D2, D3, and D4 zoning districts including planned developments. Where the required parking exclusion is applicable, it shall in no case be greater than four (4) stories or forty (40) feet, whichever is less.

(C) Anywhere in this zoning ordinance where the words building height are indicated without designation of mean building height or absolute building height the reference is to mean building height.

Madison, WI - (1) Height Measurements.

(a)For accessory buildings and structures, height is measured from the average elevation of the approved grade at the front of the building to the highest point of the roof in the case of a flat roof, to the deck line of a mansard roof, and to the midpoint of the ridge of a gable, hip, or gambrel roof. The average height shall be calculated by using the highest ridge and its attendant eave. The eave point used shall be where the roof line crosses the side wall.

(b)For principal buildings and structures, height is the average of the height of all building facades. For each facade, height is measured from the midpoint of the existing grade to the highest point on the roof of the building or structure. No individual facade shall be more than fifteen percent (15%) higher than the maximum height of the zoning district.

(c)For new buildings, alterations, additions, or replacement of existing buildings, height shall be measured from the natural grade prior to redevelopment. Natural grade shall be determined by reference to a survey or other information as determined by the Zoning Administrator.

(d)Height in the DC, UOR, UMX, DR1 and DR2 districts shall be measured from the highest ground elevation point at the building base adjacent to any street facing facade to the highest point on the roof of the building or structure, including all parapets. In these districts accessible roofs, including the minimum structure necessary to provide access, shall not be counted as a story. However, this provision shall not be applied in violation of the Capitol View Preservation Section 28.134(3).

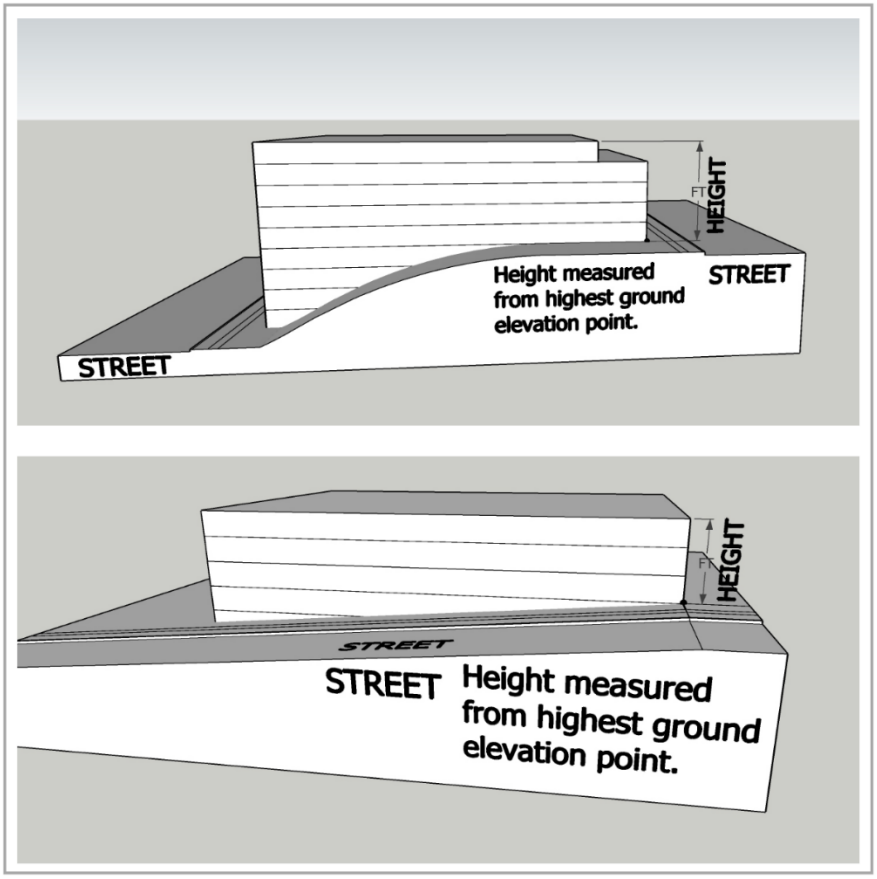


Figure 4 Madison, WI

East Lansing, MI - Building height means the vertical distance from the average elevation of the street curb paralleling the front, or if on a street corner, the front and exposed side of the building, to the highest point of the building's roof surface if the roof is flat; to the deck line, if the roof is of the mansard type; or to the average height between the eaves and the ridge if the roof is gable, hip, or gambrel type. For buildings set back from the street line, this vertical distance shall be taken above the average elevation of the finished grade along the facade of the building which faces the nearest public street, provided the building's distance from the street line is more than the average height of such finished grade above the established curb elevation. Building height shall not include mechanical equipment, antennas, chimneys or similar devices which are placed on or extend above the roof, nor elevator shaft enclosures, nor solid screen walls or enclosed penthouses constructed on the roof to contain and enclose mechanical equipment or rooftop gardens and recreational facilities provided for residents or employees of the building which are designed and sufficiently set back from the outer edge of the roof to be inconspicuous.

Snohomish County, WA - <u>Measuring Building Height</u>

Snohomish County measures building height by drawing the smallest rectangle possible that encompasses the entire building area and averaging the elevations at the midpoint of each side of the rectangle.

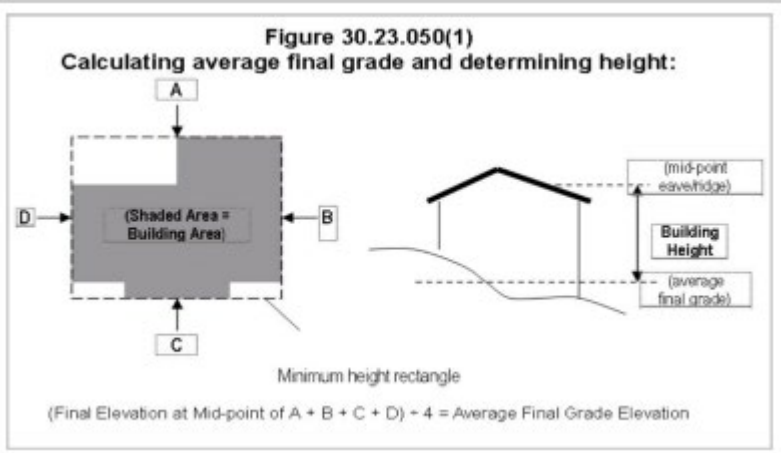


Figure 5 Snohomish County, WA

Building height shall be measured as the vertical distance from the average final grade to the highest point of the coping of a flat roof, or the deck line of a mansard roof, or to the average height of the highest gable of a pitch or hip roof.

Arlington County, VA – <u>Building Height</u>

Building height is the vertical distance from existing grade to the highest point of the roof surface, if a flat roof, to the deck line of mansard roof, and to the mean height level (midpoint) between eaves and highest ridge point for gable, hip or gambrel roof. When a dormer exceeds 50 percent of the horizontal width of the roof, the dormer roof then becomes the main roof on that side of the building, and the building height is the vertical distance from existing grade to the mean height level (midpoint) between the eaves and ridge of the dormer roof.

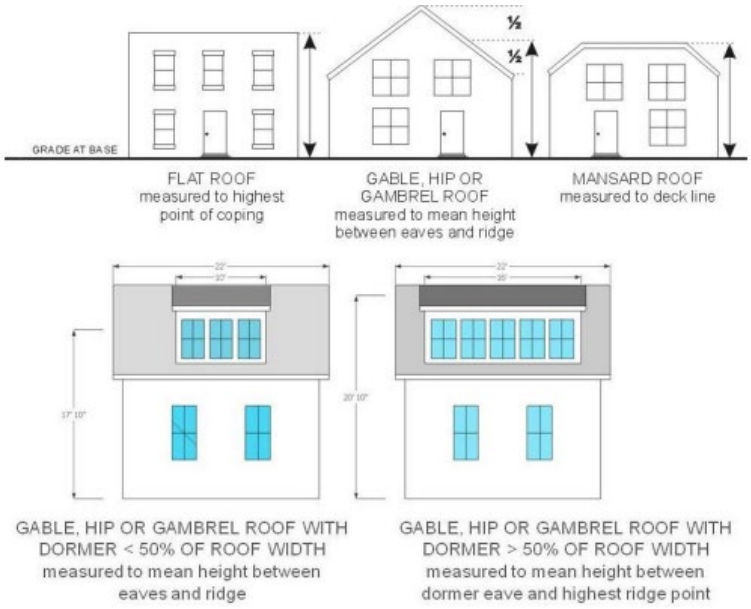


Figure 6 Arlington County, VA

Measurement in R districts, except RA districts The average existing grade is calculated by averaging the existing grade at four points at the perimeter of the building, that include two points each on the front and rear of the building, at the points closest to the applicable side lot lines. The vertical distance is the difference between the average existing grade and a single building height determined as described in §3.1.6.A above (or two building heights, in the case where there is a dormer that exceeds 50 percent of the horizontal width of the roof).

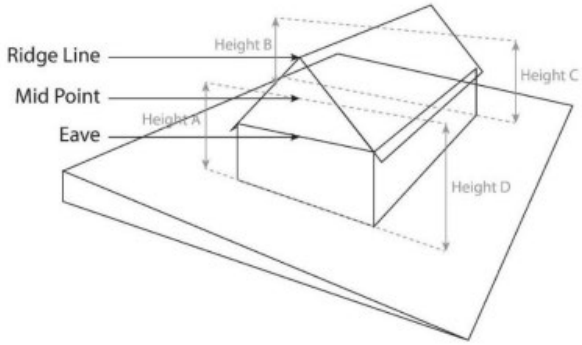


Figure 7 Arlington County, VA

Measurement in all other districts (including RA districts) Vertical distance is measured from a calculated average elevation of the existing or officially approved grade of the site at the perimeter of the site. However, no wall or any structure in any district shall be exposed more than two stories more than the number permitted for that district.

Other Community Building Height Illustrations:

Here are some other community illustration examples for consideration/ideas on how the City could better illustrate our own height regulations.

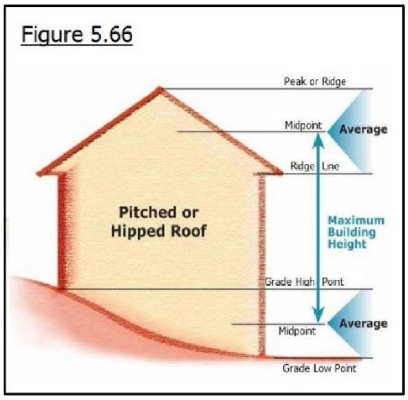


Figure 8 Charlevoix, MI

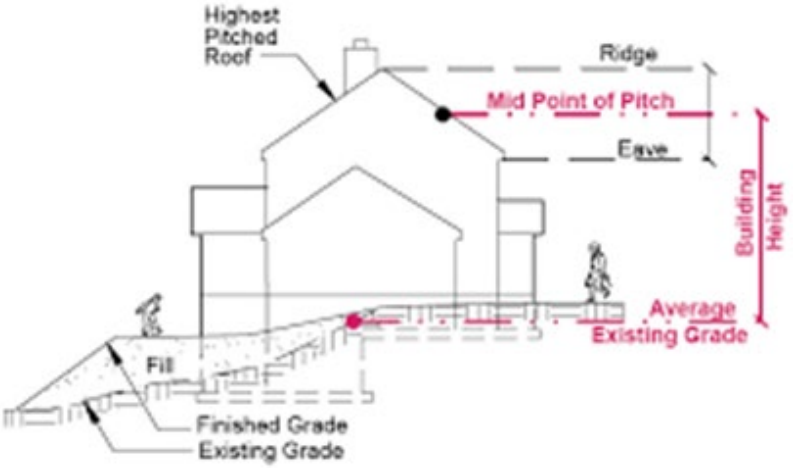


Figure 9 City of Bellevue, WA

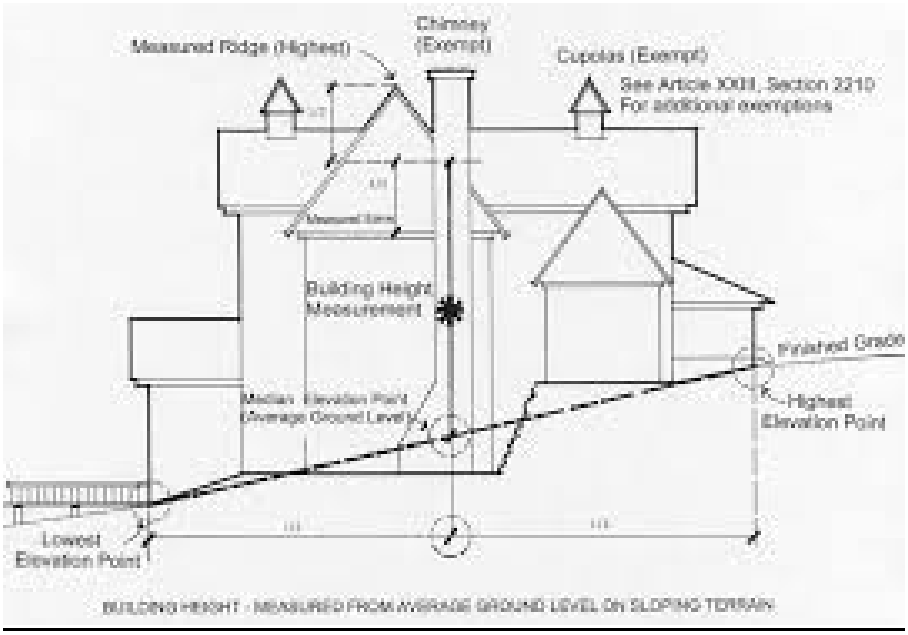


Figure 10 Emmet County, MI

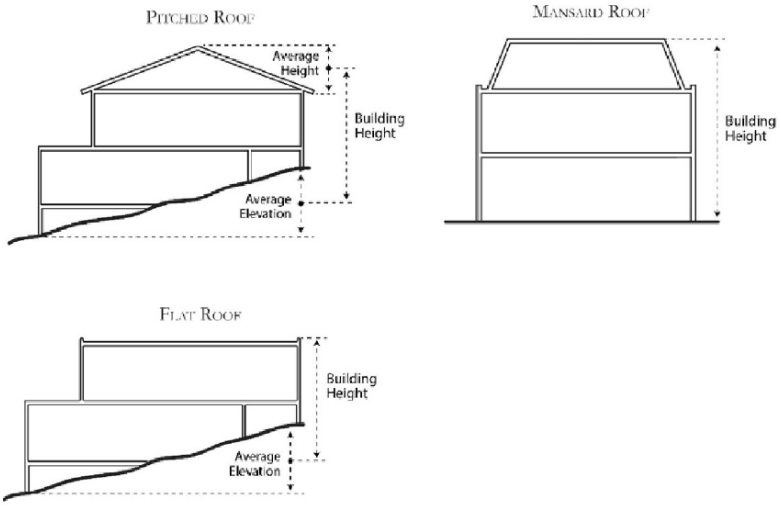


Figure 11 Eureka, CA

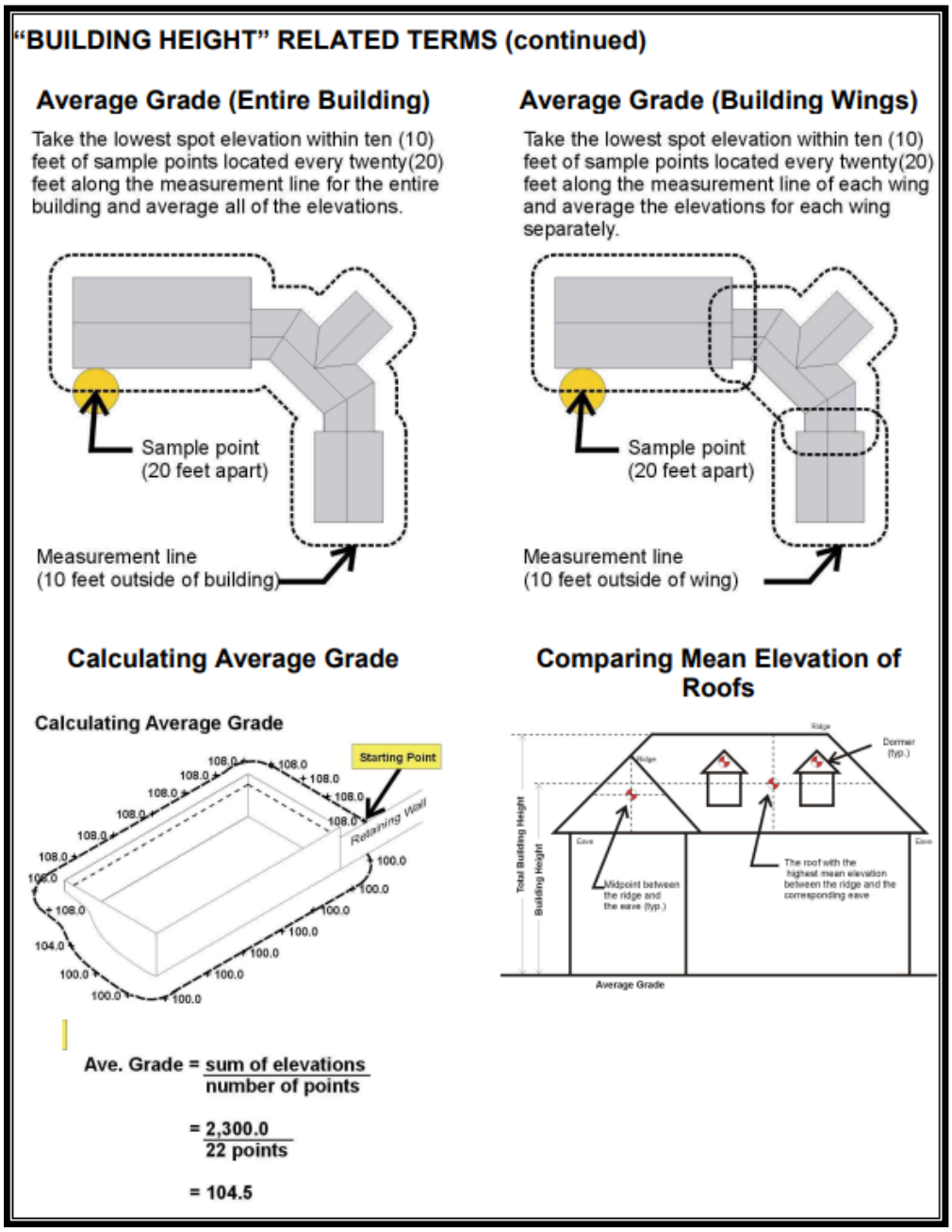


Figure 12 Ridgefield, CT

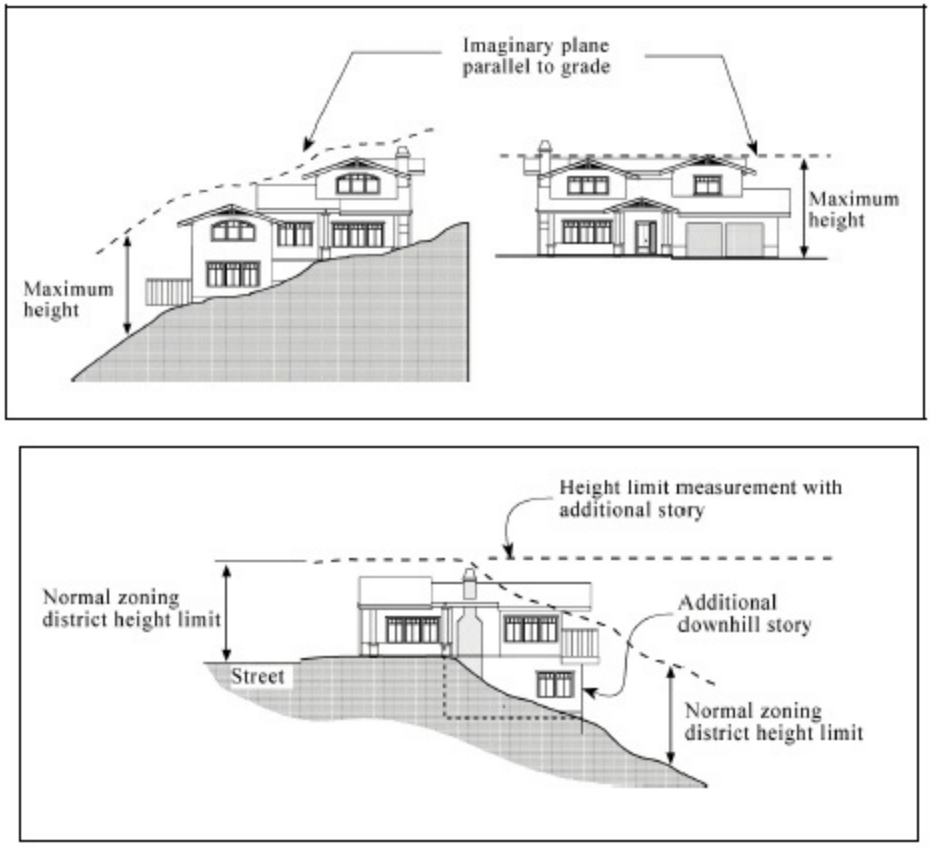


Figure 13 Chico, CA

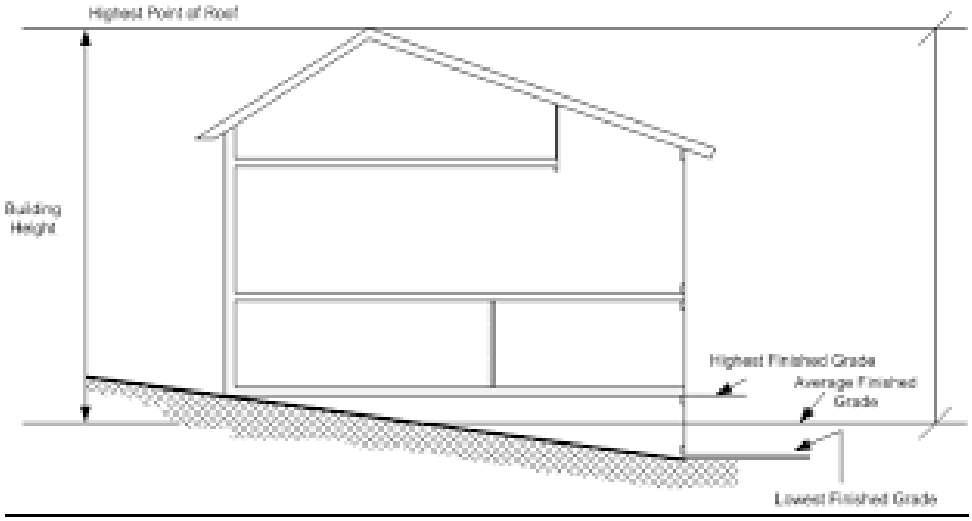


Figure 14 Spokane County, WA

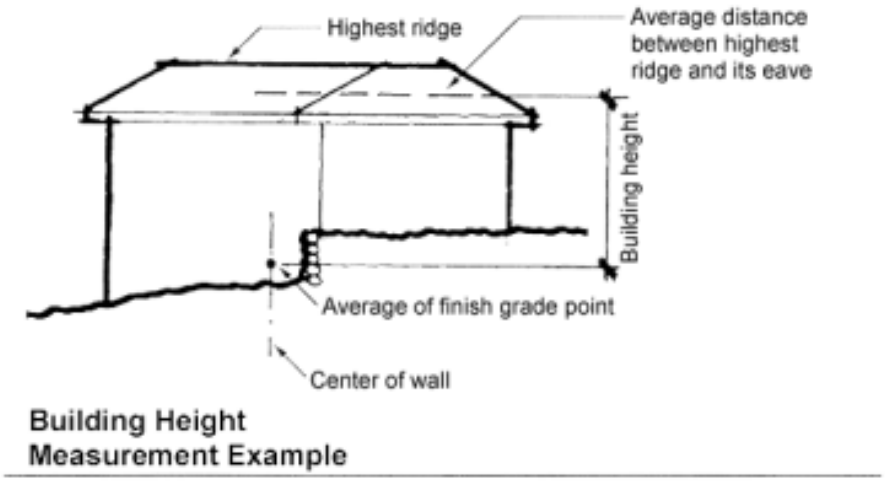


Figure 15 Archuleta County, CO

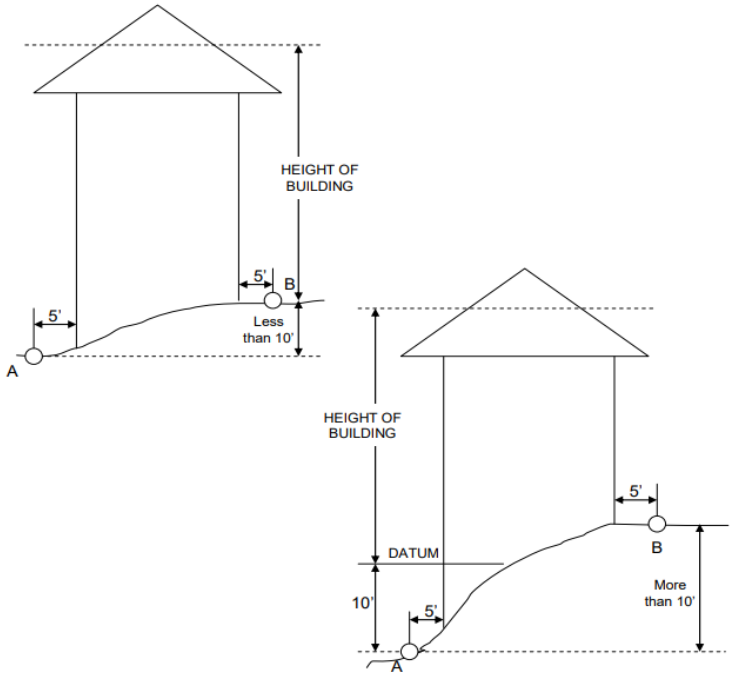


Figure 16 San Diego County, CA

Analysis

The City of Ann Arbor's definition of building height and finished grade is similar to several communities, but as noted above, there are numerous approaches to building height measurement.

Single elevation:

The Ypsilanti, Boulder, and Detroit examples measure building height largely from a single elevation, either the highest, or front. These approaches are perhaps the easiest to apply/understand, but don't consider sloping or other complexly graded sites to other elevations of a building.

Multiple elevations/averaging approaches:

The majority of these examples use some approach to average or otherwise take into account how the building height is considered along changing elevations. Ann Arbor's definition currently follows a similar approach, but is perhaps more restrictive than other examples that more explicitly articulate how changing elevations are to be considered.

The City's current definition repeated:

Finished Grade
The level of the ground adjacent to the Structure if the ground is level. If the ground is not level, *the Finished Grade shall be determined by averaging the elevation of the ground for each side of the Structure using the highest and lowest point of each side,* as measured five feet from the exterior walls of the Structure.

The italicized emphasis of the City's current definition specifies a clear method of measuring the finished grade for the "highest and lowest point of each side." This could be interpreted as a finished elevation is established for "each side" of a structure, or that the highest and lowest point of each side of a building (e.g. eight points for a four-sided structure) are aggregated and averaged to identify a single finished grade. The latter read of this language takes a more holistic approach to a site.

The City's definition also provides a measurement 5 feet away from the structure. A few of the example communities follow some version of this approach (Boulder, Grand Rapids). Staff is exploring language that would shift this to the base of an elevation. This aspect of finished grade definition warrants discussion with the Committee.

<u>Proposed Modifications to the UDC</u>

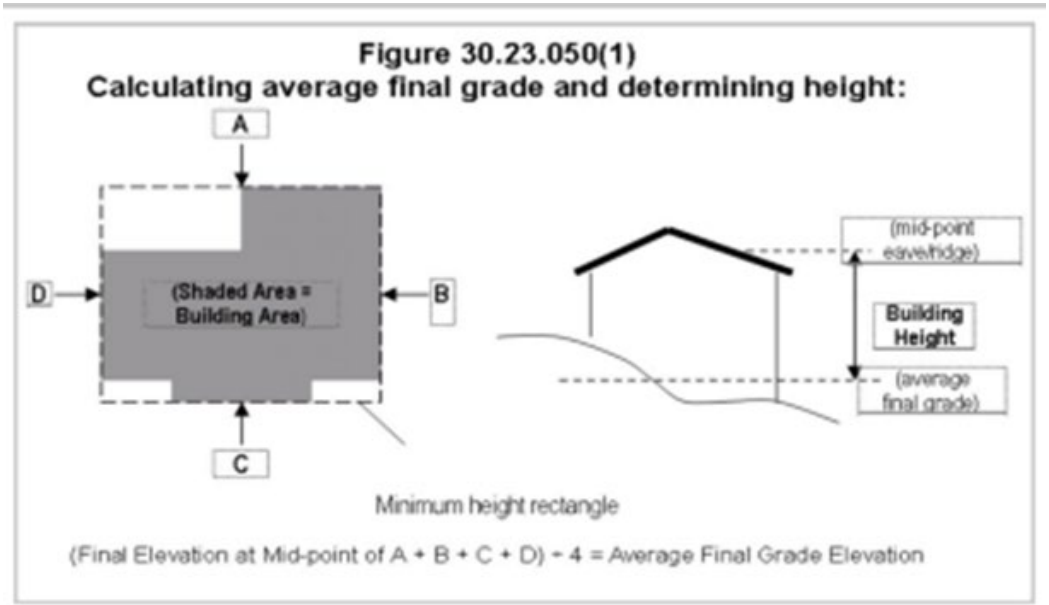
Based on the exploration of other examples, the City's definition appears in intent to be consistent with numerous other communities, but could benefit from clarity in definition and/or illustration for users. To this end, no change is proposed to the definition of Building Height, however the definition of Finished Grade is presented here with proposed modifications.

> **Building Height**
> The vertical distance of a Building measured from the Finished Grade to the highest point of the Roof surface of a flat Roof; to the deck line of a mansard Roof; and to the average height between the eaves and the ridge of the highest Roof section for a gable, hip and gambrel Roof.

Finished Grade
The level of the ground adjacent to the Structure if the ground is level. If the ground is not level, the Finished Grade shall be a single elevation, determined by first averaging the elevation of the ground for each side of the Structure using the highest and lowest point of each side, as measured where the Structure meets the grade, and second averaging this elevation for each side of the Structure. ~~five feet from the exterior walls of the Structure~~.

Additionally, the development of an illustration would be helpful to incorporated into the UDC to help clarify the City's language. As a starting point, the Snohomish County, Washington Ordinance incorporates both plan and elevation renderings to help define the interaction of finished grade and building height. Developing a version of this that perhaps includes a plan view/point definition, a elevation sketch that helps define the application to this to a structure, and potentially a formula, that further helps describe the requirements could be established (e.g. Building Height = [Highest elevation of building] – [Finished Grade (point A, point B, point C, point D, etc./No. of sides calculated].

Alternatively, the City could seek to establish a box/rectangle application as Snohomish County, but clarity on the existing definition may make more sense.



If there is any additional information I can provide in advance of our discussion, please contact me at blenart@a2gov.org.