DPD

Director's Rule 4-2012

Applicant:	Page	Supersedes:
City of Seattle Department of Planning and Development	1 of 7	NA
	Publication:	**Effective:**
Subject: HEIGHT MEASUREMENT: CALCULATING AVERAGE GRADE LEVEL	**Code and Section Reference:** SMC 23.86.006.A	
	Type of Rule: Code Interpretation and procedural rule	
	Ordinance Authority: SMC 3.06.040	
Index: Zoning/Land Use Procedural Requirements	**Approved** _____ Diane M. Sugimura, Director, DPD	**Date**

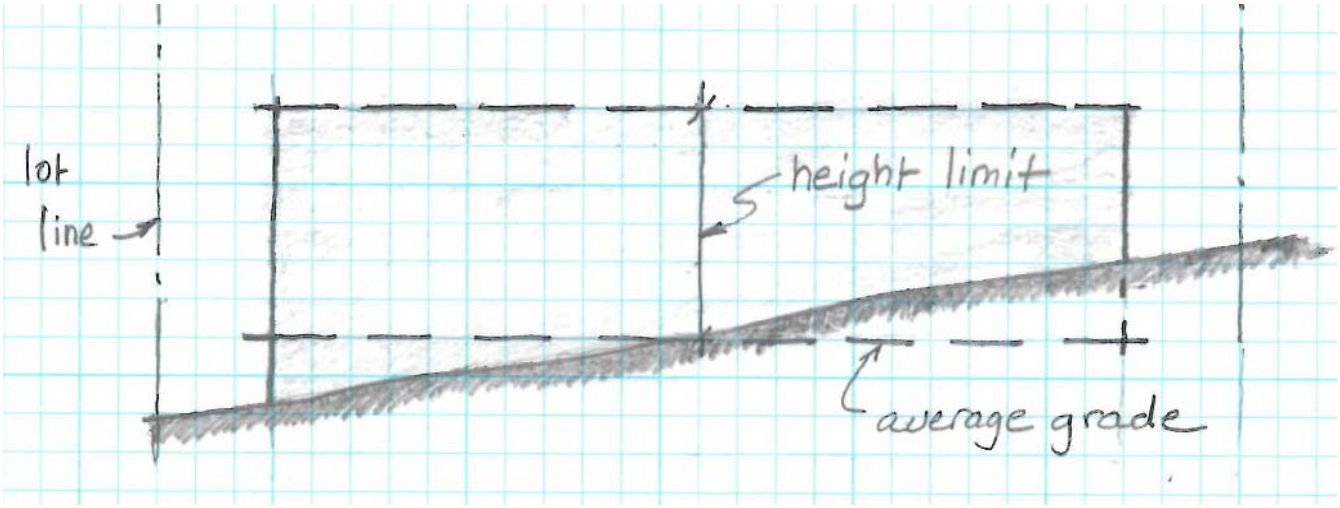
BACKGROUND:

Pursuant to City of Seattle Municipal Code (SMC) Section 23.86.006, structure height is measured from average grade in all zones except Downtown zones and zones in the South Lake Union Urban Center, and except for the Living Building Pilot Program authorized by Section 23.40.060. The Code allows for a general measurement technique (23.86.006.A.1) to determine average grade level, and an option for the applicant (23.86.006.A.2) that allows the average grade level to be calculated for multiple sections of a structure to encourage buildings to better follow the topography. There are two formulas that may be used at the applicant's option within the general technique.

General Rule - Calculating Average Grade Level for Height Measurement

Pursuant to 23.86.006.A.1, the general rule allows two formulas for calculating the average grade level from which the height of a structure is measured. Formula 1 calculates the average elevation of the topography, prior to any development activity, based on the elevations of finished grade at the center of each exterior wall. Formula 2 uses the average elevations at the midpoints of the sides of the smallest rectangle that can be drawn to enclose the structure. Exterior walls for height measurement purposes shall be those walls that form the footprint of the structure that include cantilevered portions of the structure.

If there are multiple structures on a lot, the average grade elevation is calculated separately for each structure. To better address topographic conditions on a lot, an alternative method can be used to divide a larger structure into smaller sections, and the average grade level can be calculated for each of those sections of the structure.



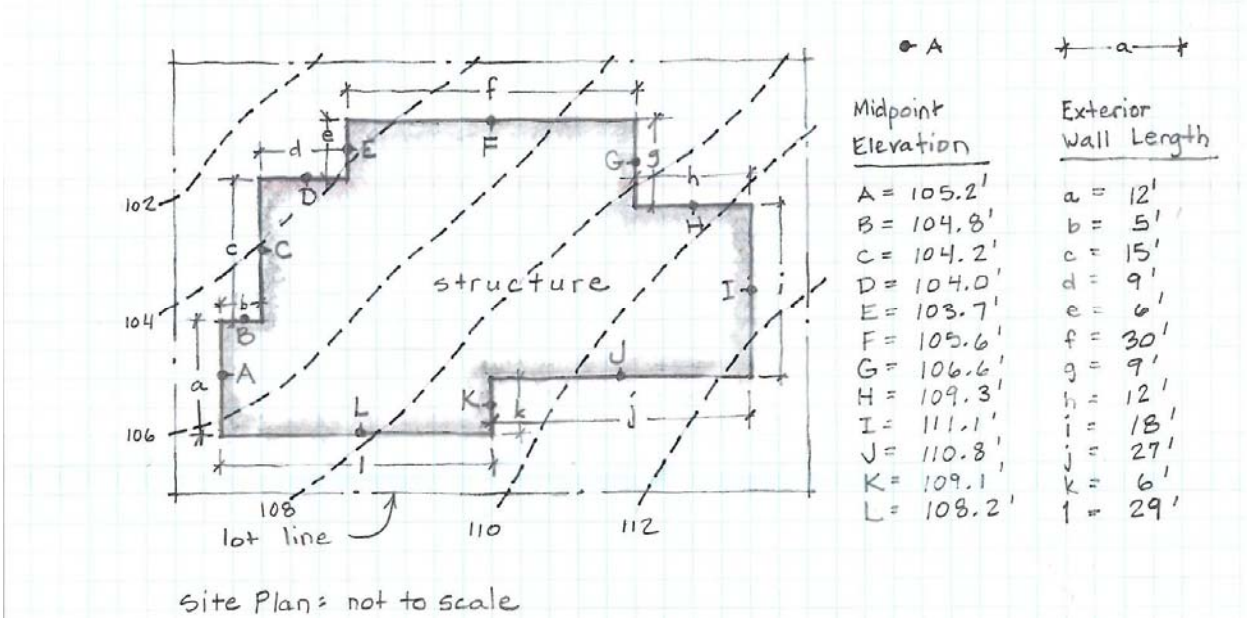
Formula 1: Exterior Walls. Under this formula, the average grade level is calculated as the average of the elevation of existing lot grades at the midpoints, measured horizontally, of each exterior wall of the structure enclosing occupied floor area.

Formula 1: $\frac{\text{(midpoint grade elevations) x (exterior wall length)}}{\text{(total length of each exterior wall)}}$

Example applying Formula 1 to calculate average grade level

A, B, C, D….Existing ground elevation at midpoint of exterior wall
a, b, c, d…..Horizontal length of exterior wall*

*include the perimeter of a deck, unless the deck has no walls at or below the deck level and no covering above the deck



Formula: $\frac{(A \times a)+(B \times b)+(C \times c)+(D \times d)+(E \times e)+(F \times f)+(G \times g)+(H \times h)+(J \times j)+(K \times k)+(L \times l)+\ldots}{a + b + c + d + e + f + g + h + i + j + k + l + \ldots}$

Example:

$$\frac{(105.2 \times 12)+(104.8 \times 5)+(104.2 \times 15)+(104.0 \times 9)+(103.7 \times 6)+(105.6 \times 30)+(106.6 \times 9)+(109.3 \times 12)+(111.1 \times 18)+(110.8 \times 27)+(109.1 \times 6)+(108.2 \times 29)}{12 + 5 + 15 + 9 + 6 + 30 + 9 + 12 + 18 + 27 + 6 + 29} =$$

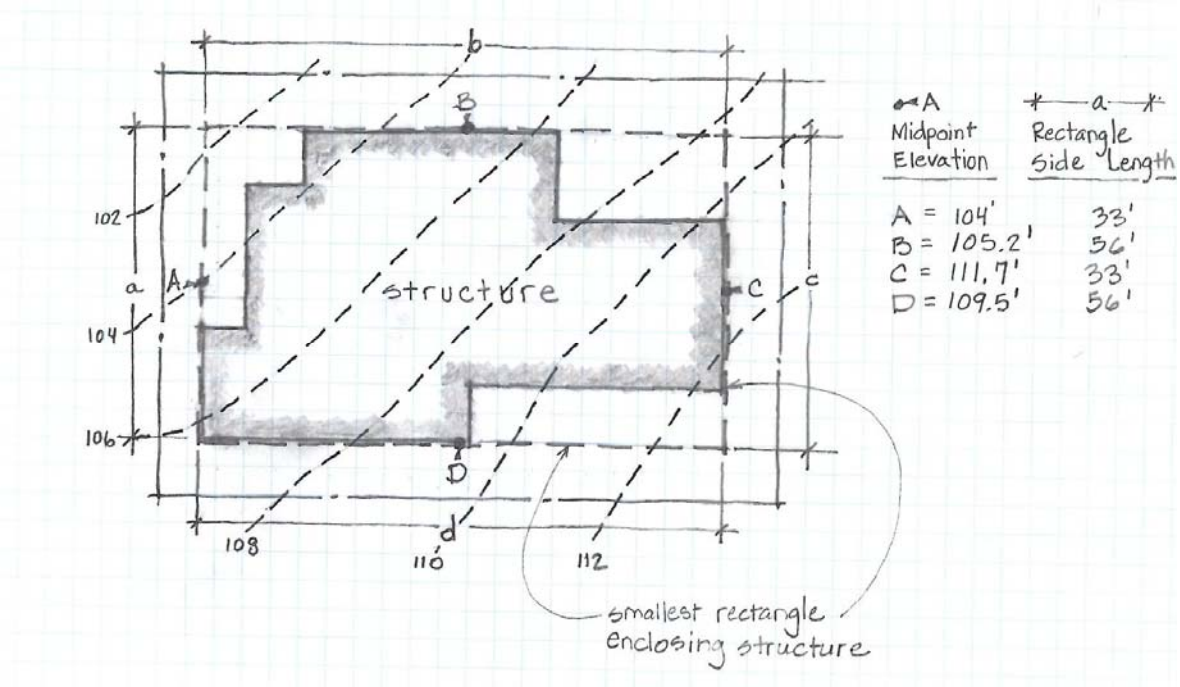
$\frac{19{,}130.4}{178}$ = **107.47' average grade level**

The height of the structure is then measured from this average grade level of 107.47 feet.

Formula 2: Enclosing Rectangle. Under this formula, the average grade level is calculated by first drawing the smallest rectangle that encloses the entire structure, including all occupied floor area. The average grade level is calculated as the average of the elevation of existing lot grades at the midpoints, measured horizontally, of each side of this rectangle. For irregular lots, if the rectangle enclosing the proposed structure would extend beyond the lot property lines, the Director will determine how to treat the irregularity to most closely approximate the smallest enclosing rectangle.

Formula 2: $\frac{\text{(midpoint grade elevations) x (rectangle side lengths)}}{\text{(total length of rectangle sides)}}$

Example applying Formula 2 to calculate average grade level



Formula: $\frac{(A \times a) + (B \times b) + (C \times c) + (D \times d)}{a + b + c + d}$

Example: $\frac{(104 \times 33) + (105.2 \times 56) + (111.7 \times 33) + (109.5 \times 56)}{33 + 56 + 33 + 56} =$

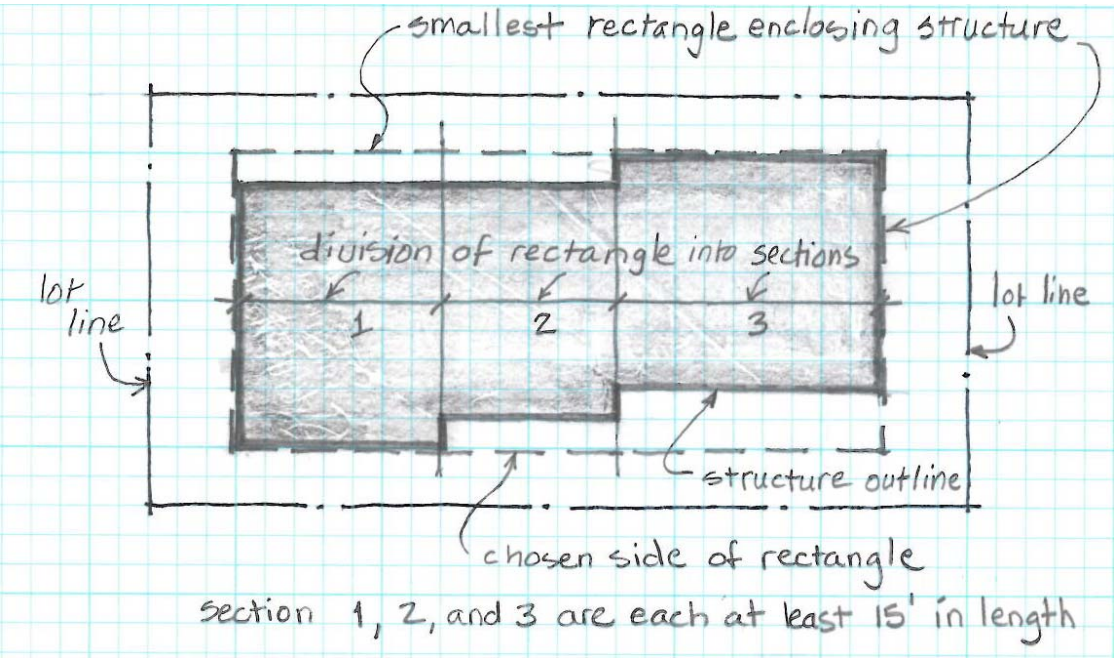
$\frac{3{,}432 + 5891.2 + 3{,}686.1 + 6{,}132}{178} = \frac{19{,}141.3}{178} =$ **107.53 average grade level**

The height of the structure is then measured from this average grade level of 107.53 feet.

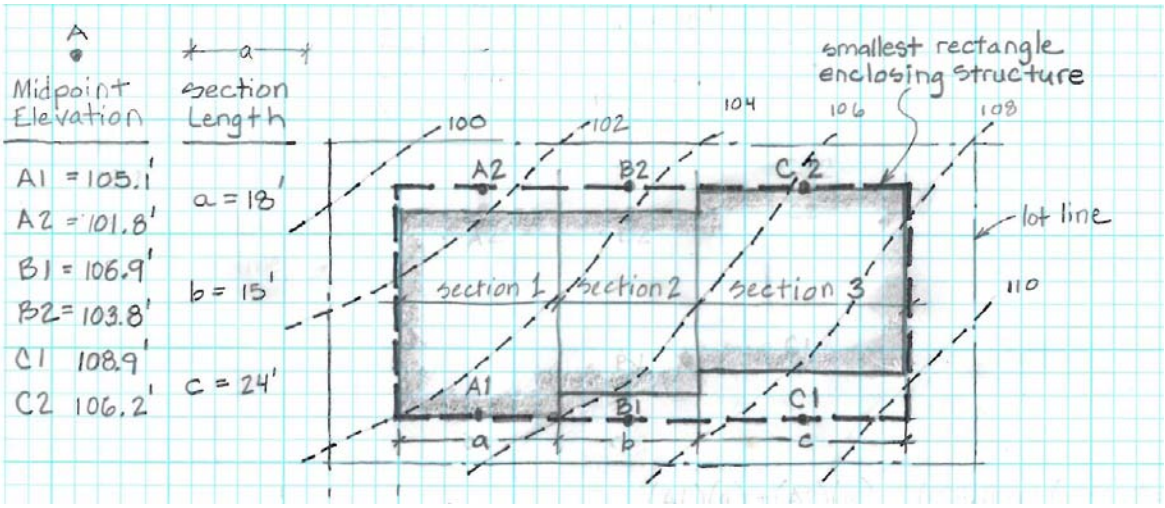
Option to the General Rule

Subsection 23.86.006.A.2 provides an acceptable option for determining average grade level to allow structures to better respond to the topography of sloping sites. In general, the intent is to allow a large structure to adjust the points at which height is measured so that portions of the structure can "step up" with the slope. The technique basically allows the structure to be divided into sections that are treated similar to separate structures for the purposes of calculating the average grade level used to measure height.

Similar to the approach in Formula 2 under the General Rule, the first step is to draw the smallest rectangle that encloses the entire structure, including all occupied floor area. Next, choose one side of the rectangle (usually a side that is generally parallel to the direction of the slope). Along this side of the rectangle, divide the rectangle into sections that are at least 15 feet wide. The lines dividing the rectangle into sections are to be perpendicular to the chosen side, and shall extend across the width of the structure, parallel to each other and to the opposing ends of the rectangle.



The average grade level for each section of the structure is calculated as the average elevation of existing lot grades at the midpoints of the two opposing sides of each section of the rectangle enclosing the structure, as shown below:



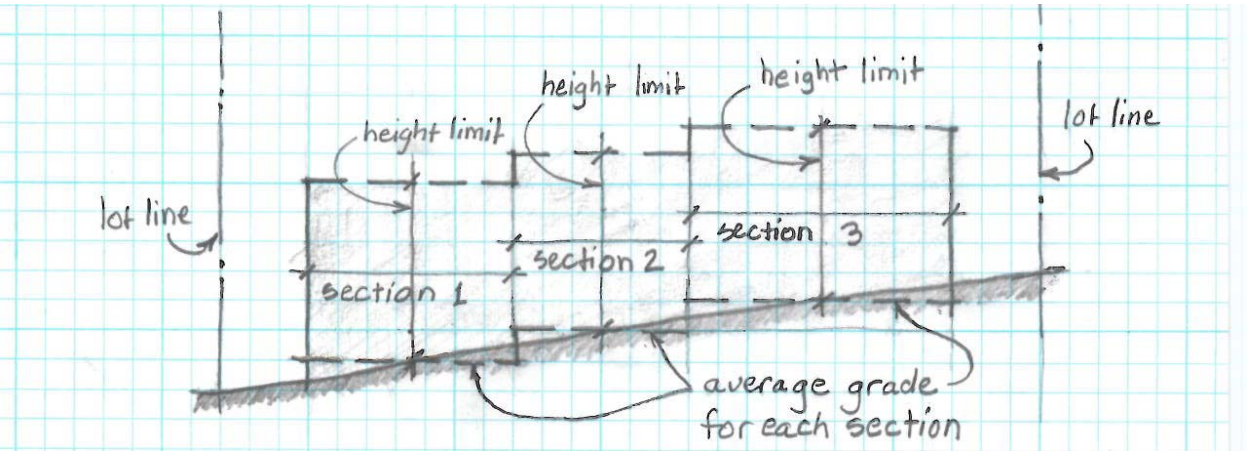
Average grade level

Section 1: $\frac{(A1 \times a)+(A2 \times a)}{a + a} = \frac{(105.1 \times 18)+(101.8 \times 18)}{18 + 18} = \frac{1{,}891.8 + 1{,}832.4}{36} = \frac{3724.2}{36} =$ **103.45**

Section 2: $\frac{(B1 \times b)+(B2 \times b)}{b + b} = \frac{(106.9 \times 15) + (103.8 \times 15)}{15 + 15} = \frac{1{,}603.5 + 1{,}557}{30} = \frac{3160.5}{30} =$ **105.35**

Section 3: $\frac{(C1 \times c)+(C2 \times c)}{c + c} = \frac{(108.9 \times 24)+(106.2 \times 24)}{24 + 24} = \frac{2{,}613.6 + 2{,}548.8}{48} = \frac{5{,}162.4}{48} =$ **107.55**

Once the average grade level has been calculated for each portion of the structure, the height for that portion can be measured up from that average grade level (see exhibit below).



Required topographic survey

For all measurement options, a topographic survey from a licensed land surveyor is required when existing grade will be disturbed to accomplish construction of the structure and when any exterior wall of the new structure, in the area where grade is being disturbed, is within 2' of the allowed height limit for the structure as measured above existing grade. The Director may also require a topographic survey if the information presented by the applicant is not consistent with information available from common DPD geographic resources.

Topographic information may be provided by either:

- Showing 2 foot contours across the entire site; or,
- Specifying the existing grade elevations at each building corner, and at the midpoint elevations that are used by the applicant in the average grade height calculation.

Interpolated grade

On a lot where the surface contour has been altered as a result of past excavation, the Code allows the average grade level to be calculated by using an interpolated grade, so that future development on the excavated lot relates to the topography in a manner that is more consistent with development on abutting lots.

To determine the interpolated grade, the existing grade elevations, measured along a lot line, are extended across the subject lot in a straight line to connect with the matching grade elevation along the nearest opposite lot line(s). The average grade level is then calculated using the interpolated grade as the natural existing surface contour.

Interpolated Grade