CITY OF MEDINA

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MEMORANDUM

DATE: February 22, 2022

TO: Medina Planning Commission

FROM: Stephanie Keyser, AICP, Planning Manager

RE: Alternatives to Original Grade

Original grade has been used as the starting point for measuring structure height in Medina for decades. Defined as the natural ground elevation that existed prior to any lot development or manmade modifications in the first instance (MMC 16.12.080), determining original grade is not as simple as looking at a site with your naked eye or reviewing a topographic map. As prescribed in the code, the determination requires a soils investigation by a geotechnical engineer along the parameters of the proposed exterior walls/sides (MMC 16.23.080(B)). Test pits are dug and based on those samples, the geotechnical engineer determines original grade underneath the entire structure. A written report is submitted with the building permit and is reviewed for completeness against the requirements in MMC 16.23.080(D).

The process of determining original grade is an imperfect science. Different firms can and have reached contrasting conclusions for the same site. There are sites where original grade is actually in the air, at a point above the existing ground because the site was graded at some point in its history. There are sites that have been amended with soil to create a lawn on a slope and the original grade is now 4-6 feet beneath the visual ground. Original grade is not an infallible process and there is a simpler alternative available.

Most cities use average grade (average building elevation) as a means of determining the starting point to measure structure height. This is calculated by averaging the length of the proposed building's walls with the existing elevation at the center of all exterior walls. Moving to an average grade method will not only make the City consistent with other jurisdictions, and as a result there will be faster cognition from applicants/residents/realtors when they ask how tall of a structure they can build on a site, but it will simplify the development code. Code simplification continues to be on Council's work plan and moving to average grade would align with that directive.

Nothing Planning Commission looks at ends up being an insulated *quick fix*. It should therefore not be surprising to any of the Commissioners that moving to average grade will be no exception. As the code is today, how height is measured depends on the zoning district the lot is in. When measuring in the R-16 zoning district or when utilizing the bonus height for R-20 and R-30, one must look at both the high and low points of original and finished grade, and whichever point has the *lower upper elevation* is what is used. In all other zoning districts and the Medina Heights overlay, height is measured from only the low point of either original or finished grade and whichever point has the lower upper elevation is what is used. The diagrams in the code that demonstrate this process are listed below:

Figure 16.23.060(B): R-16 Height Measurements

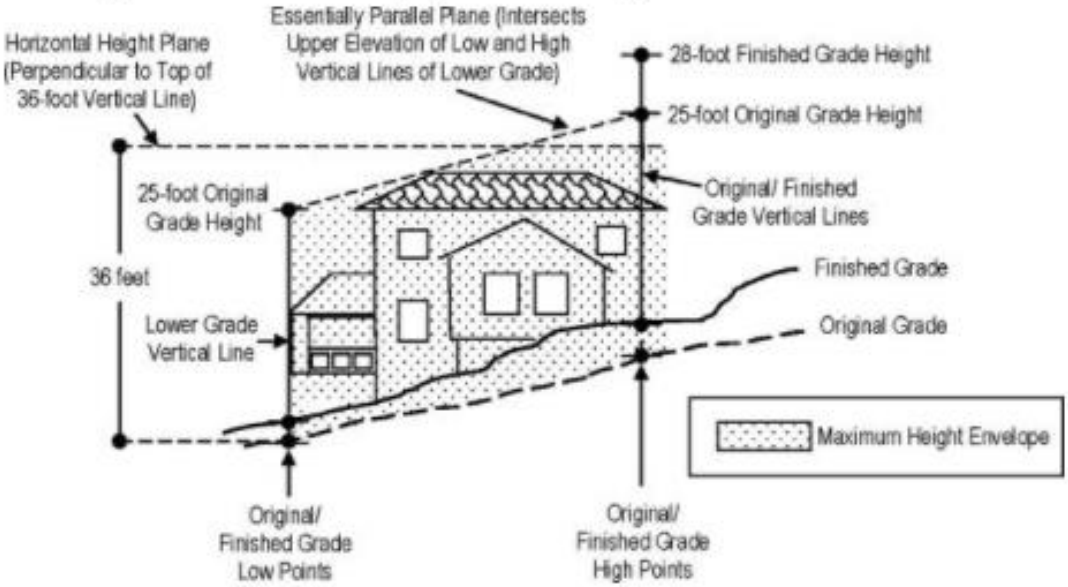
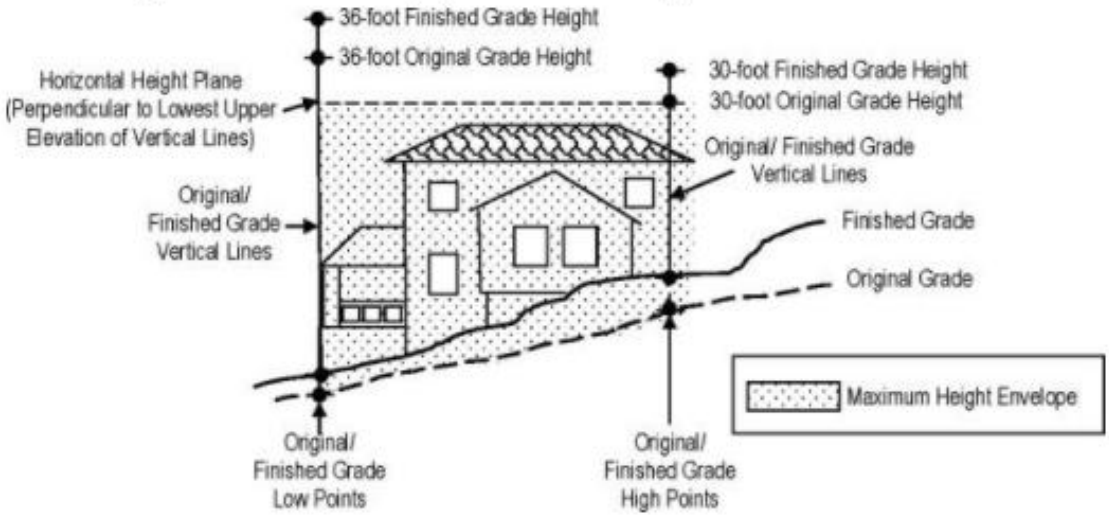
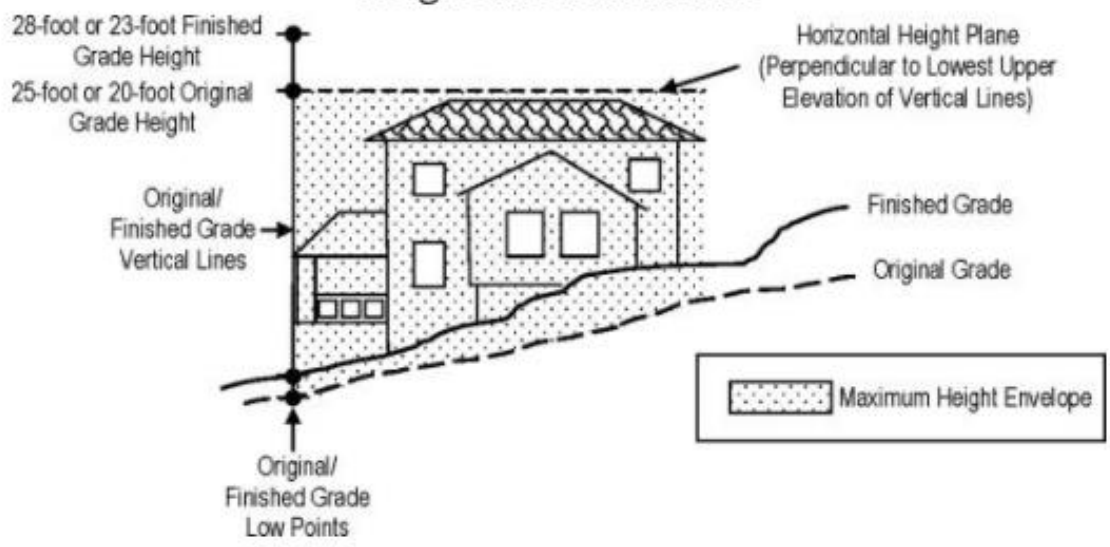


Figure 16.23.060(D): Bonus Height Measurements



In the R-16 zoning district and when using the height bonus for R-20 and R-30, moving to an average grade will result in buildings having a slightly shorter maximum building elevation. The maximum height of 25-feet (or 30-feet in the instance of the height bonus) will remain the same, but because where measuring starts is now an average, that number will never be equal to the high point of original or finished grade. Please refer to Example 1 for a study of a lot in the R-16 zoning district.

Figure 16.23.060(C): R-20, R-30, SR-30, and Medina Heights, Height Measurements



In the other zoning districts and the Medina Heights overlay, moving to an average grade will result in a slightly higher building elevation (again, the maximum height remains the same). This is because the starting point of measuring will be from the average elevation and not the low point of original or finished grade (Example 2).

Please note that Staff used the smallest rectangle around the structure option to determine average grade in the example (See Seattle, below) and the same structure is being used for both examples. Example 3 is the study that Commissioner Nelson shared during the bulk development code discussion.

The definitions used in Kirkland and Mercer Island are provided below to help the discussion as well as two methods to determine average grade from Seattle.

Kirkland

Average Bulding Elevation

The weighted average elevation of the topography, prior to any development activity, either (1) under the fooprint of a building as measured by delineating the smallest rectangle which can enclose the buildng footprint and then average the elevations taken at the midpoint of each side of the rectangle, or (2) at the center of all exterior walls of a buildng or structure.

Mercer Island

Average building elevation: The reference point on the surface topography of a lot from which building height is measured. The elevation in the R-8.4, R-9.6, R-12, and R-15 zoning designations is established by averaging the elevation at existing grade or finished grade, whichever is lower (MICC 19.02.020(E)(4)). The elevation in the PI zoning designation is established by averaging the elevation at existing grade. The elevation points to be averaged shall be located at the center of all exterior walls of the completed building; provided:

1.Roof overhangs and eaves, chimneys and fireplaces, unenclosed projecting wall elements (columns and fin walls), unenclosed and unroofed stairs, and porches, decks and terraces may project outside exterior walls and are not to be considered as walls.

2.If the building is circular in shape, four points, 90 degrees apart, at the exterior walls, shall be used to calculate the average building elevation.

Formula:	Average Building Elevation = (Weighted Sum of the Mid-point Elevations) ÷ (Total Length of Wall Segments)
Where:	Weighted Sum of the Mid-point Elevations = The sum of: ((Mid-point Elevation of Each Individual Wall Segment) × (Length of Each Individual Wall Segment))

For example, for a house with ten wall segments:

(A×a) + (B×b) + (C×c) + (D×d) + (E×e) + (F×f) + (G×g) + (H×h) + (I×i) + (J×j)
a + b + c + d + e + f + g + h + i + j

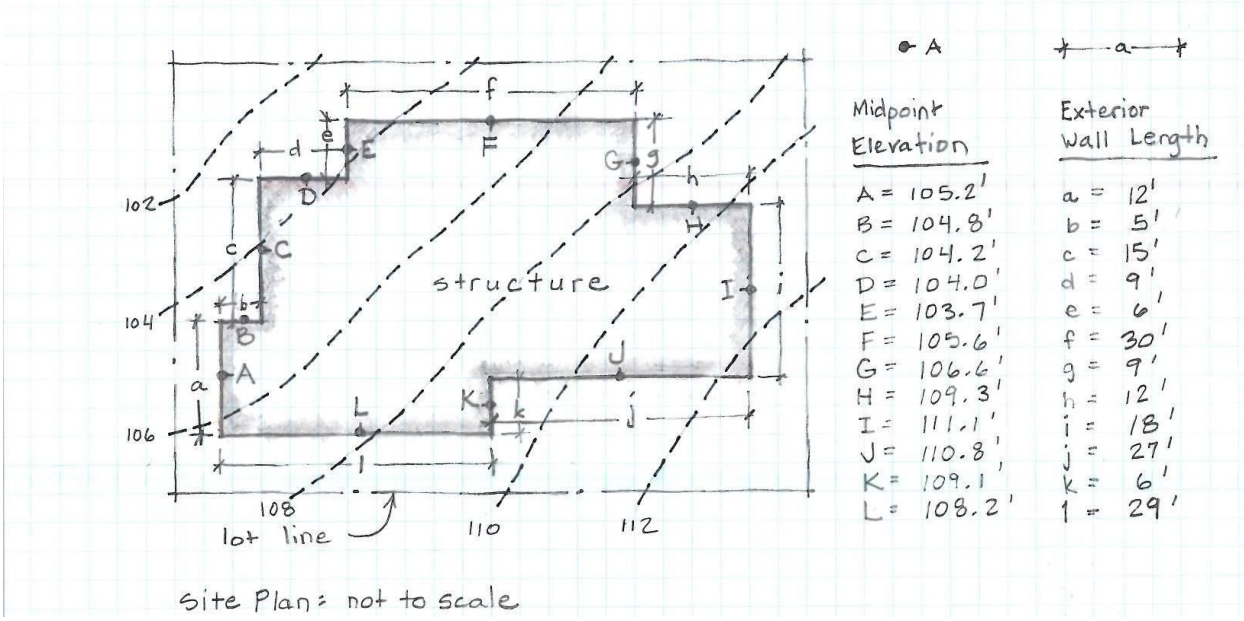
Where:	A, B, C, D… = The existing or finished ground elevation, whichever is lower, at midpoint of wall segment.
And:	a, b, c, d… = The length of wall segment measured on outside of wall.

Seattle

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:

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

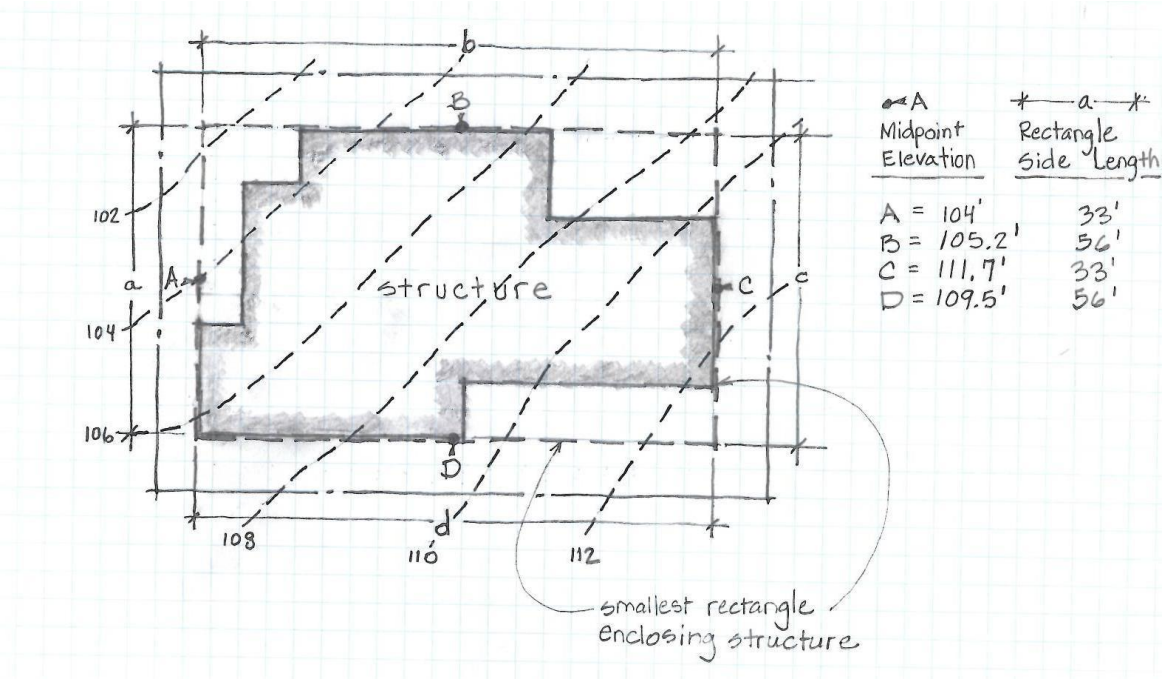
$\frac{19{,}130.4}{178}$ = **107.47' average grade level**

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

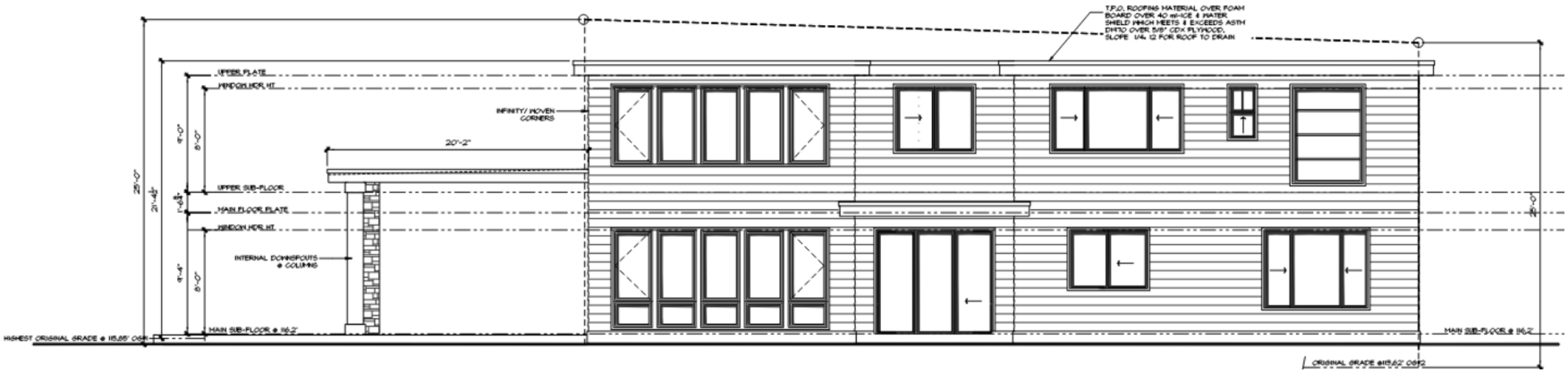
$\frac{3{,}432 + 5891.2 + 3{,}686.1 + 6{,}132}{178} = \frac{19{,}141.3}{178} =$ **107.53 average grade level**

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

Example 1

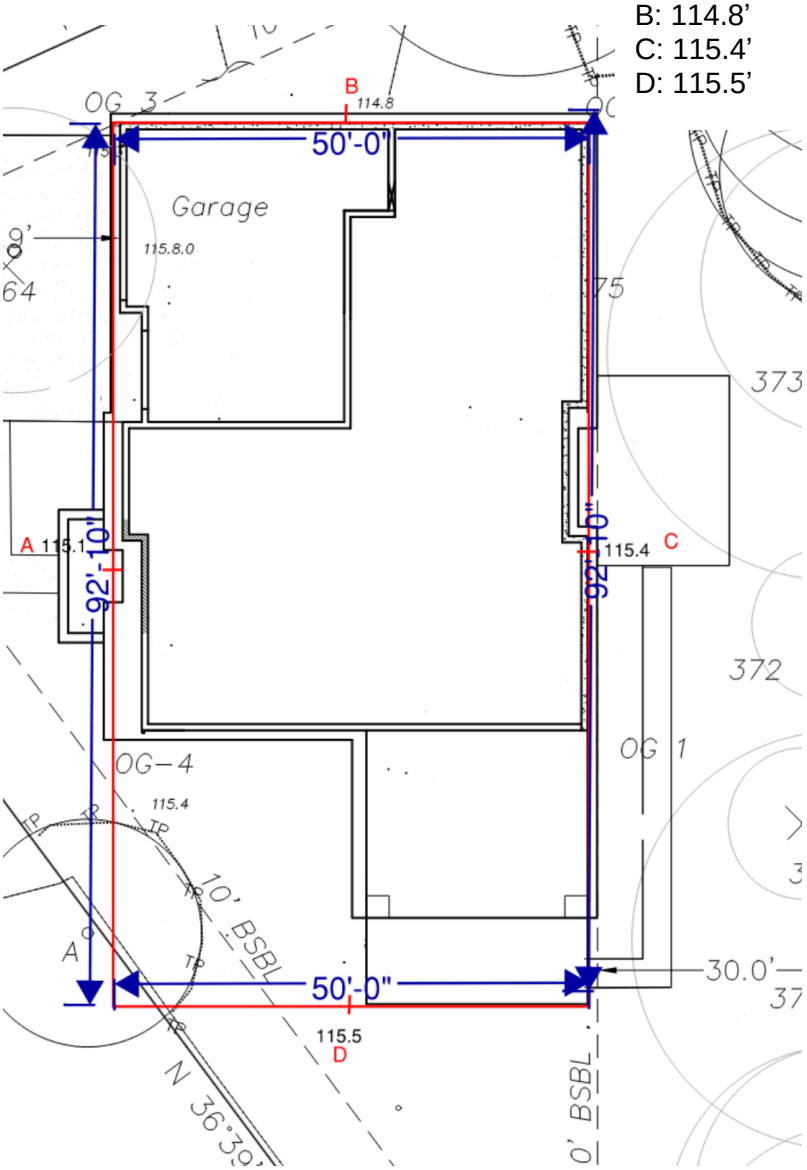
Current Code

R-16 Height – Constraints are high and low points
Highest point of Original Grade – 115.85’
Lowest point of Original Grade – 113.62’
Maximum elevations: 140.85’ from the high point and 138.62’ from the low point



Average Grade Example

Midpoint Elevation	Rectangle Side Length
A: 115.1’	92’-10”
B: 114.8’	50’
C: 115.4’	92’-10”
D: 115.5’	50’



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

Example: $\frac{(115.1 \times 92.1) + (114.8 \times 50) + (115.4 \times 92.1) + (115.5 \times 50)}{92.1 + 50 + 92.1 + 50} =$

$\frac{10{,}600.71 + 5{,}740 + 10{,}628.34 + 5{,}775}{284.2} = \frac{32{,}744.05}{284.2} =$ **115.21 average grade level**

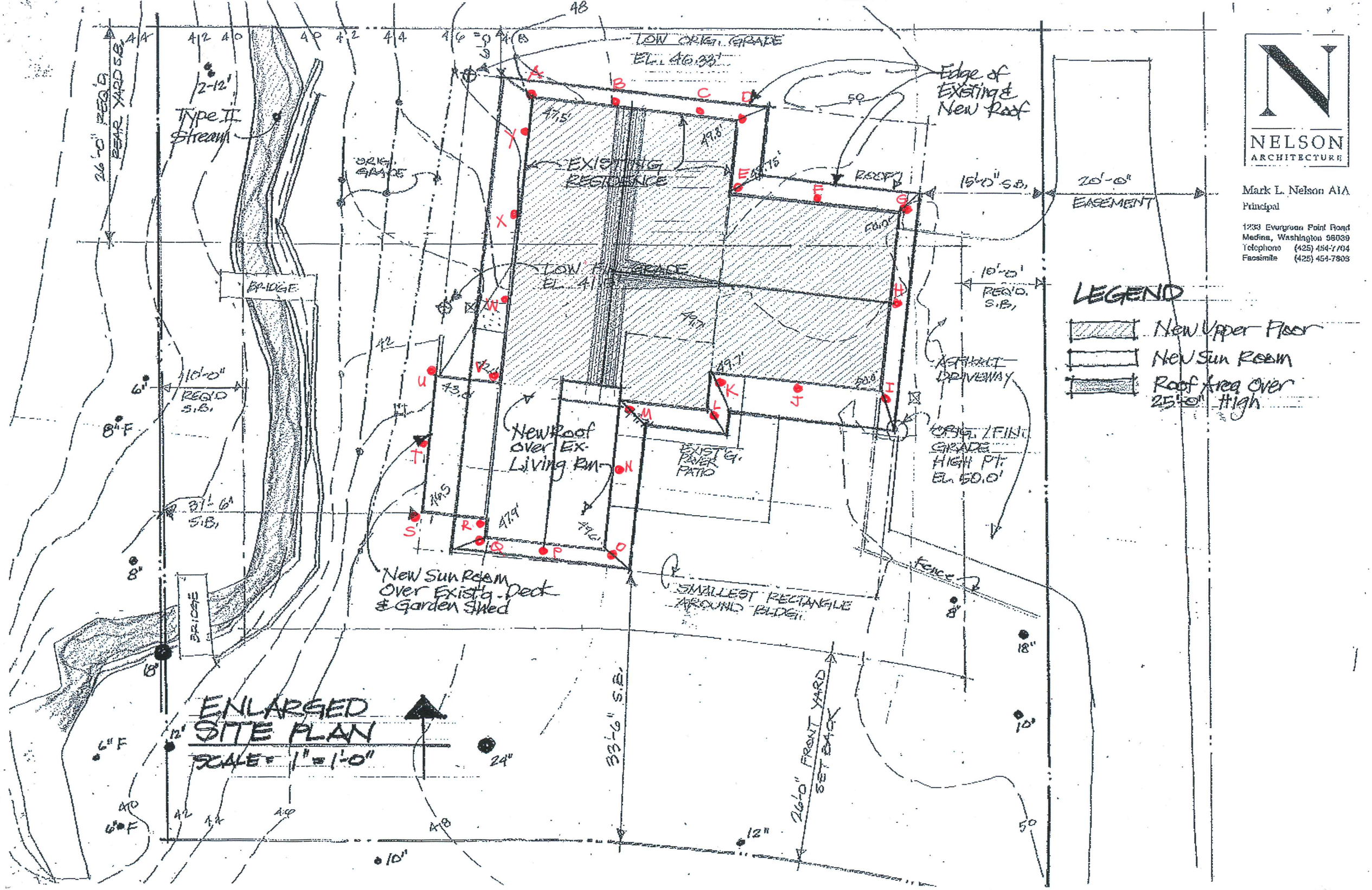
Maximum elevation: 140.21’

Example 2

Current Code

R-20/R-30/SR-30 Height – Constraints are low points
Lowest point of Original Grade – 113.62’
Maximum elevation: 138.62’ from the low point

The same method for determining average grade as shown in Example 1 would be used, so the average grade would still be 115.21’, for a maximum elevation of 140.21’



NELSON ARCHITECTURE

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Principal

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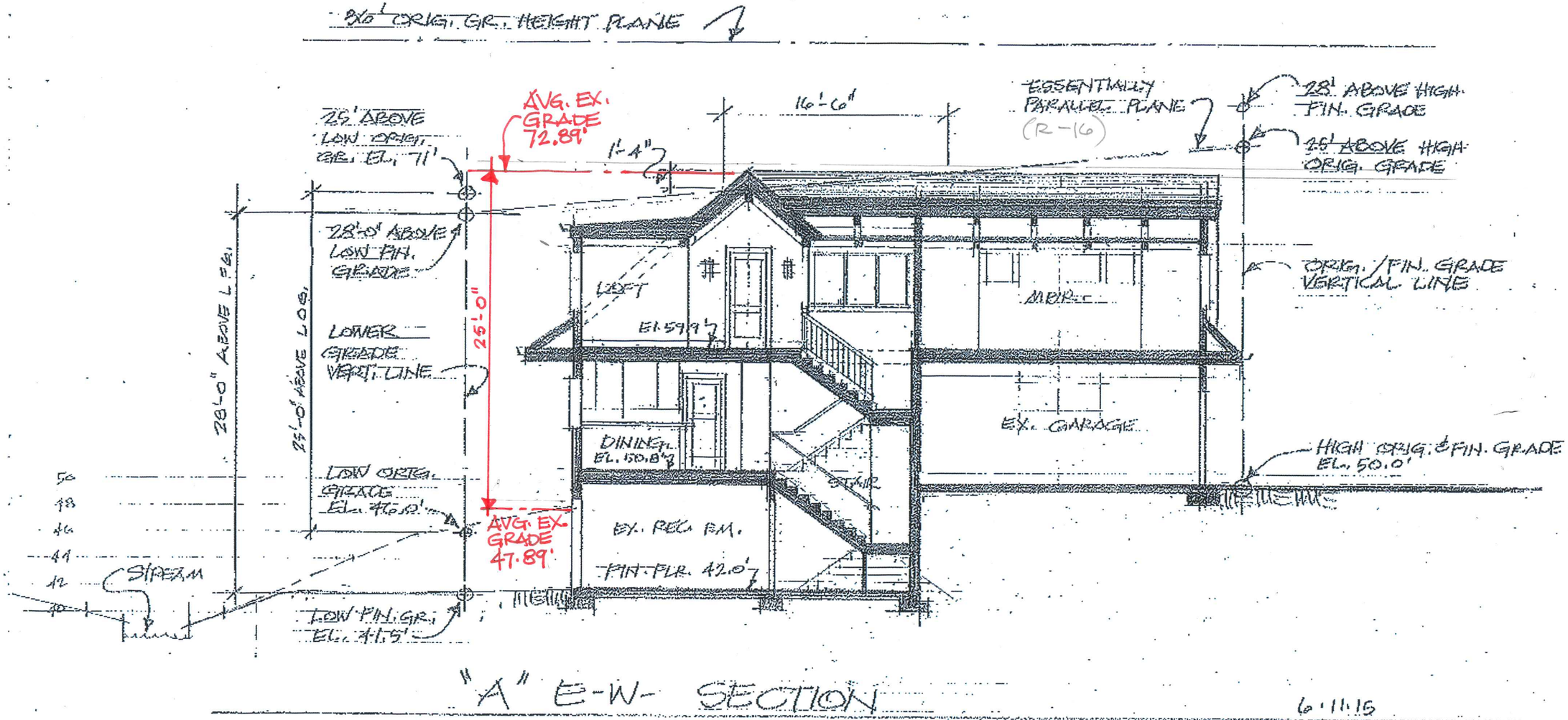
	AVERAGE BRG. GRADE	AVERAGE EX. GRADE	
A	47.5'	47.5'	
B	48.2'	48.2'	
C	49.0'	49.0'	
D	49.3'	49.3	
E	49.75'	49.75'	
F	50.5'	50.5'	
G	50.0'	50.0	
H	50.0'	50.0	
I	50.8'	50.8	
J	49.9'	49.9'	
K	49.7'	49.7'	
L	49.7'	49.7'	
M	49.5'	49.5'	
N	49.5'	49.5'	
O	49.6'	49.6'	
P	48.5'	48.5'	
Q	47.9'	47.9'	
R	47.9' ? =887.25	47.9'	887.25
S	47.0'	46.5'	
T	46.9'	45.0'	
U	46.8'	43.0'	
V	47.8'	41.25'	
W	47.9'	41.25'	
X	47.9'	46.00'	
Y	48.0'	47.00	
	1219.55' ÷25= 48.78	1197.25' ÷ 25 = 47.89	



"A" E-W- SECTION

6.11.15

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