Average Building Elevation Examples 1-4 – March 29, 2022

Examples 1 and 2 are on the same lot in Medina—the plans are for a detached garage with an accessory dwelling unit (Example 1) and a new single-family residence (Example 2). The site is not a steep slope, however there is a slope. When you look at the elevations, you can see that there has been significant fill placed on the lot at some point—you know this because the original grade (pink line) is so much lower than existing grade (green line). The original house was built in 1920 and the only building record the city has is a roofing permit from 1999. This lot is zoned R-20 and in this zoning district the maximum height is 25-feet from the low point of original grade or 28-feet from the low point of finished, with whichever produces the *lower upper elevation* is what is used. For the garage (Example 1), finished grade ends up producing the lower upper elevation, so the maximum height is 28-feet (original grade + 25 = 54.75 + 25 = 79.75; finished grade + 28 = 50.00 + 28 = 78.00 = maximum elevation 78.00). Original grade produces the lower upper elevation for the single-family residence so the maximum height is 25-feet (original grade + 25 = 48.10 = 25 = 73.1; finished + 28 = 50.00 + 28 = 78.00; maximum elevation 73.10).

The average building elevation for the garage is approximately 59.61, for a maximum elevation of 84.61, or an increase of 6.61. The average building elevation for the single-family residence is approximately 53.06, for a maximum elevation of 78.06, or an increase of 4.96. The differences between the average elevations are due to the degree to which the lot slopes at the site where the buildings will be placed, with the main residence in an area that's flatter than the garage.

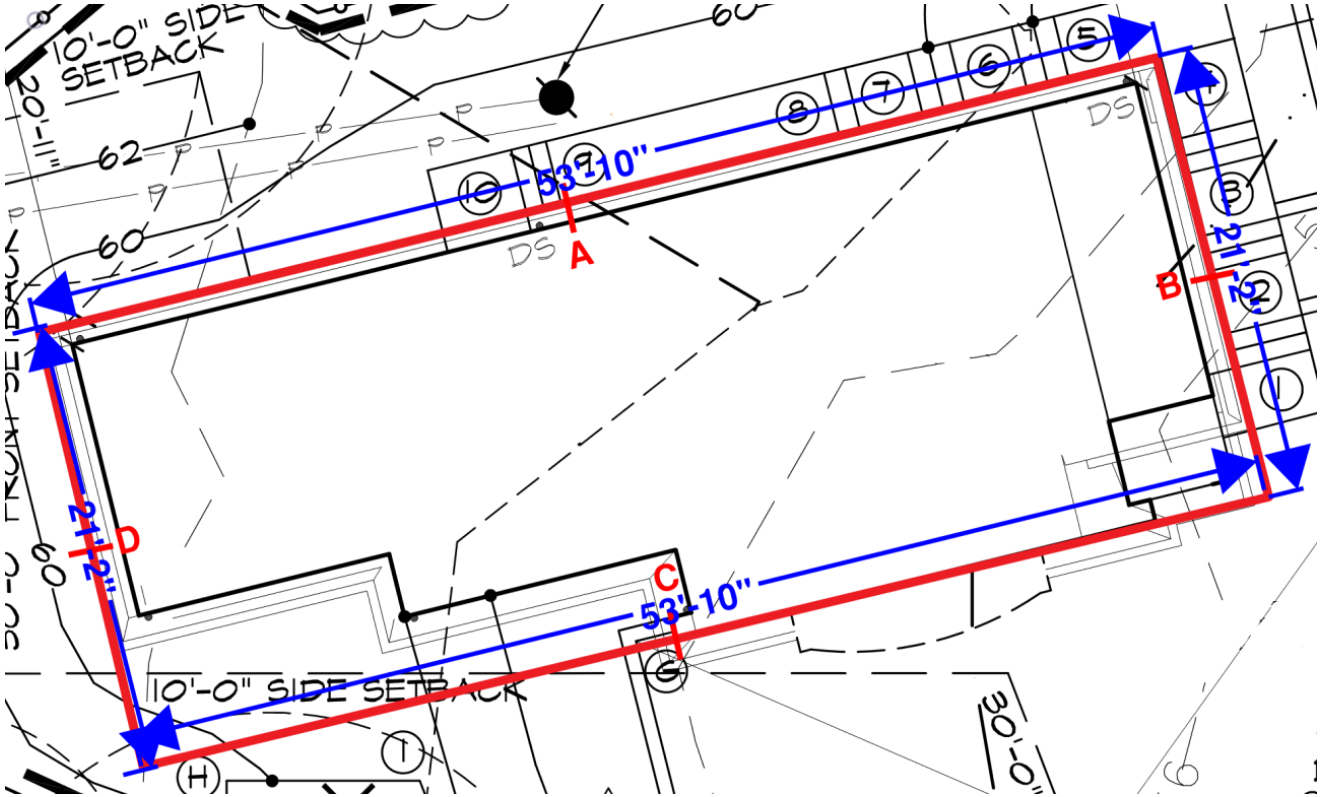
The code in the packet does not differentiate between sloped lots and flat lots. As in previous discussions (e.g., bulk, trees), Medina seems to be a city where a more nuanced code is better suited to meet the needs of the various lot sizes and topographies. Mercer Island calculates average building elevation by averaging the elevation at existing or finished and whichever is lower is what is used (Examples 3 and 4). Although this would be similar to what we currently have, minus the need to get the Geotech report to determine original grade, perhaps including a provision like this would provide better consistency and less *height jumps* under a new code.

Example 3 is from Mercer Island and is on a steep slope. Two pages from the plans are included: the first page shows the table of how average building elevation was calculated and notes that the points are taken from existing grade because final was at the same grade or higher, and the second page shows an elevation section. While Mercer Island has a higher maximum height, we can generalize this example as if it were utilizing the height bonus that's offered for R-20 and R-30 lots. One of the concerns brought up during the February meeting was not allowing buildings to create a massive 50-foot façade on a downhill slope. To address this, the code includes language to limit the façade on a downhill slope to the maximum height otherwise allowed. Mercer Island's code is solely concerned with the façade and only measures to the roof framing, rafters, trusses, etc. (Example 3).

Example 4 is also located in Mercer Island on a steep slope. Two pages from the plans are included: the first page shows the table of how average building elevation was calculated, and the second page shows an elevation section. Again, the maximum height is 30-feet, however this project does not come anywhere near that. We can generalize this example as if it were a sloped lot in R-16, R-20, or R-30. Measuring the downhill façade for this example gives a maximum height of 25-feet (Example 4).

Average Grade Example #1
Maximum Height – 25 ft.

Midpoint Elevation	**Rectangle Side Length**
A: 61.2’	a. 53’-10”
B: 57’	b. 21’-2”
C: 58.1’	c. 53’-10”
D: 62.1’	d. 21’-2”



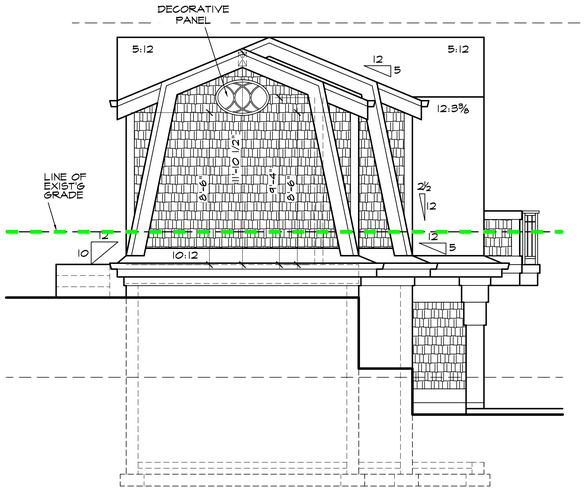
Formula: $\frac{(A \times a) + (B \times b) + (C \times c) + (D \times d)}{a + b + c + d}$

Example: $\frac{(61.2 \times 53.1) + (57 \times 21.2) + (58.1 \times 53.1) + (62.1 \times 21.2)}{53.1 + 21.2 + 53.1 + 21.2} =$

$\frac{3{,}249.72 + 1{,}208.04 + 3{,}085.11 + 1{,}316.52}{148.6} = \frac{8{,}859.39}{148.6}$ = **59.61 average grade elevation**

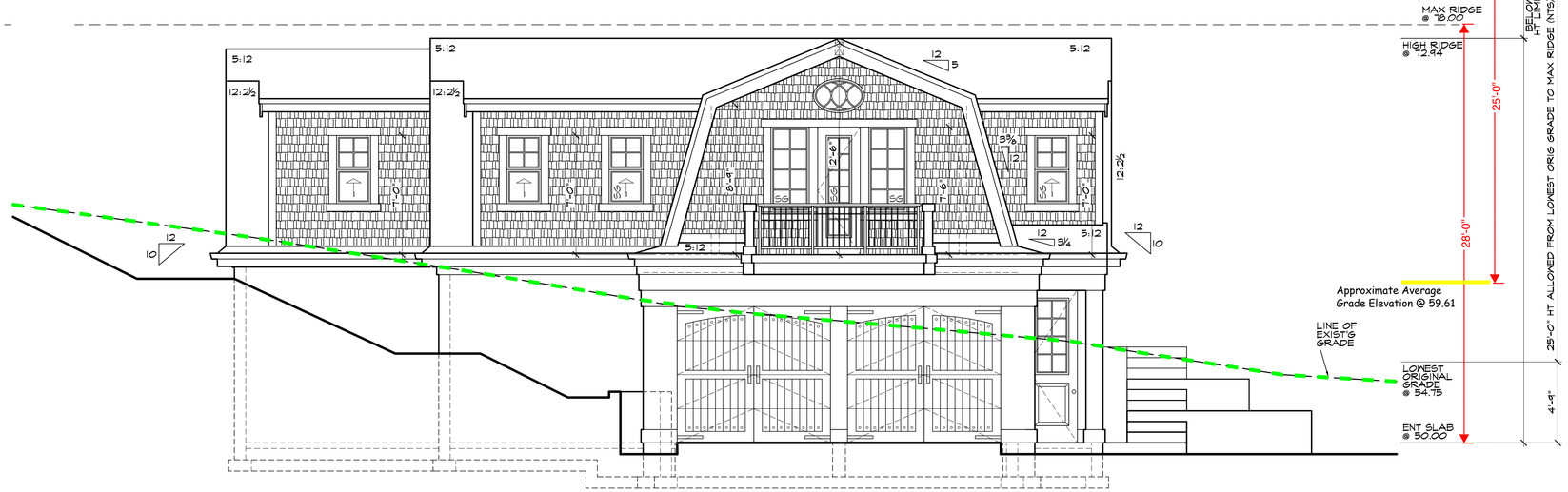
Maximum elevation: 84.62’

Example 1



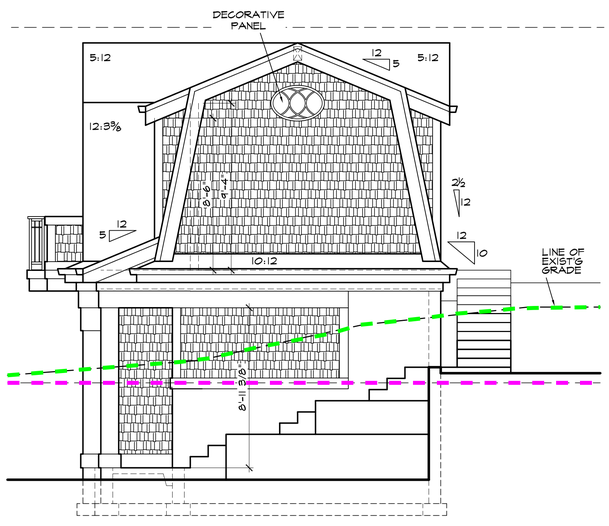
DADU LEFT ELEVATION

SCALE: 1/4" = 1'-0"



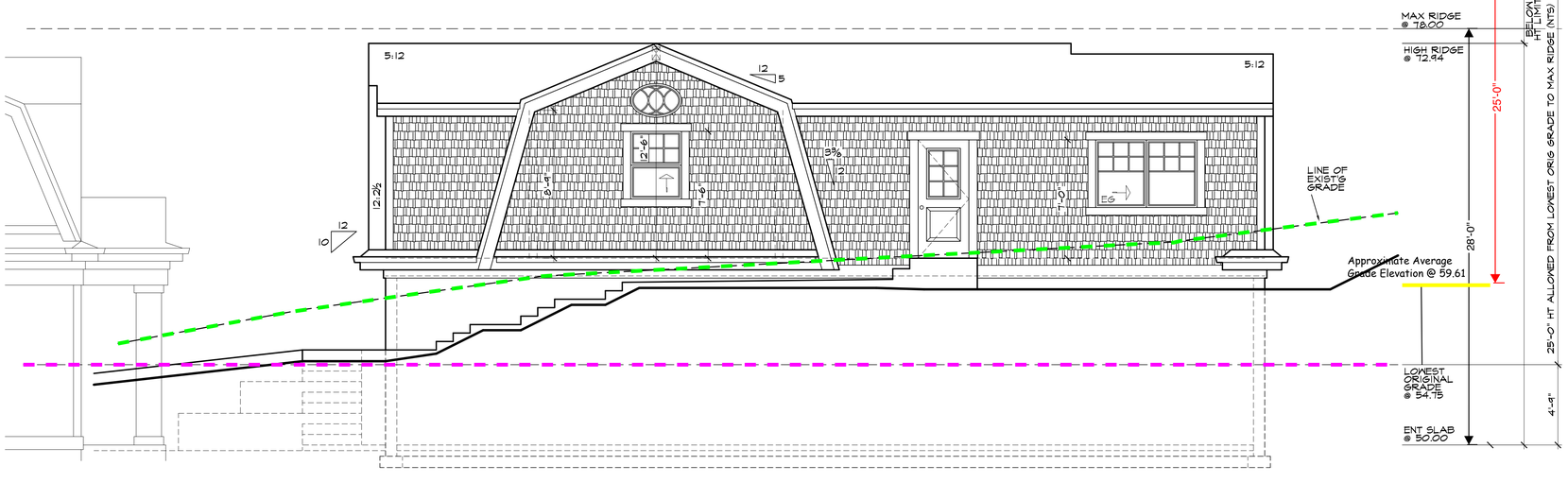
DADU FRONT ELEVATION

SCALE: 1/4" = 1'-0"



DADU RIGHT ELEVATION

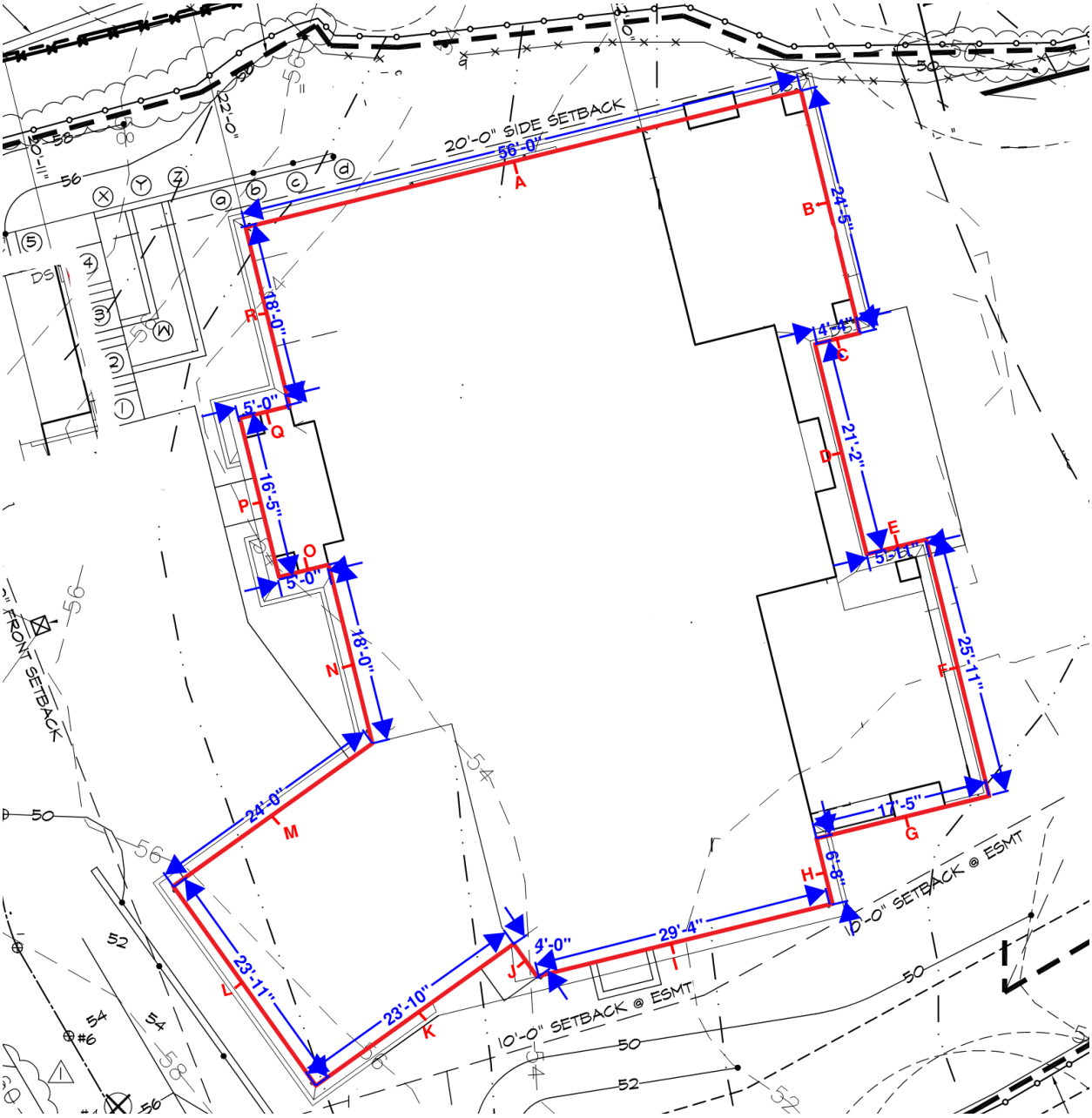
SCALE: 1/4" = 1'-0"



DADU REAR ELEVATION

SCALE: 1/4" = 1'-0"

Average Grade Example #2
Maximum Height – 25 ft.



Midpoint Elevation	**Rectangle Side Length**
A: 52.2’	a. 56’
B: 51.6	b. 24’-5”
C: 51.7	c. 4’-4”
D: 51.9	d. 21’-2”
E. 51.8	e. 5’-11”
F. 52’	f. 25’-11”
G. 51.4	g. 17’-5”
H. 51.7	h. 6’-8”
I. 52.2	i. 29’-4”
J. 54’	j. 4’
K. 55’	k. 23’-10”
L.55.8	l. 23’-11”
M. 55’	m. 24’
N. 54.1	n. 18’
O. 53.8	o. 5’
P. 53.9	p. 16’-5”
Q. 53.5	q. 5’
R. 53.9	r. 18’

Formula: $\frac{(A*a) + (B*b) + (C*c) + (D*d) + (E*e) + (F*f)\ (G*g) + (H*h) + (I*i) + (Jj) + (K*k) + (L*l) + (M*m) + (N*n) + (O*o) + (P*p) + (Q*q) + (R*r)}{a + b + c + d + e + f + g + h + I + j + k + l + m + n + o + p + q + r}$

Example: $\frac{(52.2 * 56') + (51.6 * 24'\text{-}5'') + (51.7 * 4'\text{-}4'') + (51.9 * 21'\text{-}2'') + (51.8 * 5'\text{-}11'') + (52' * 25'\text{-}11'') + (51.4 * 17'\text{-}5'') + (51.7 * 6'\text{-}8'') + (52.2 * 29'\text{-}4'') + (54' * 4') + (55' * 23'\text{-}10'') + (55.8 * 23'\text{-}11'') + (55' * 24') + (54.1 * 18') + (53.8 * 5') + (53.9 * 16'\text{-}5'') + (53.5 * 5') + (53.9 * 18')}{56 + 24.5 + 4.4 + 21.2 + 5.11 + 25.11 + 17.5 + 6.8 + 29.4 + 4 + 23.1 + 23.11 + 24 + 18 + 5 + 16.5 + 5 + 18}$

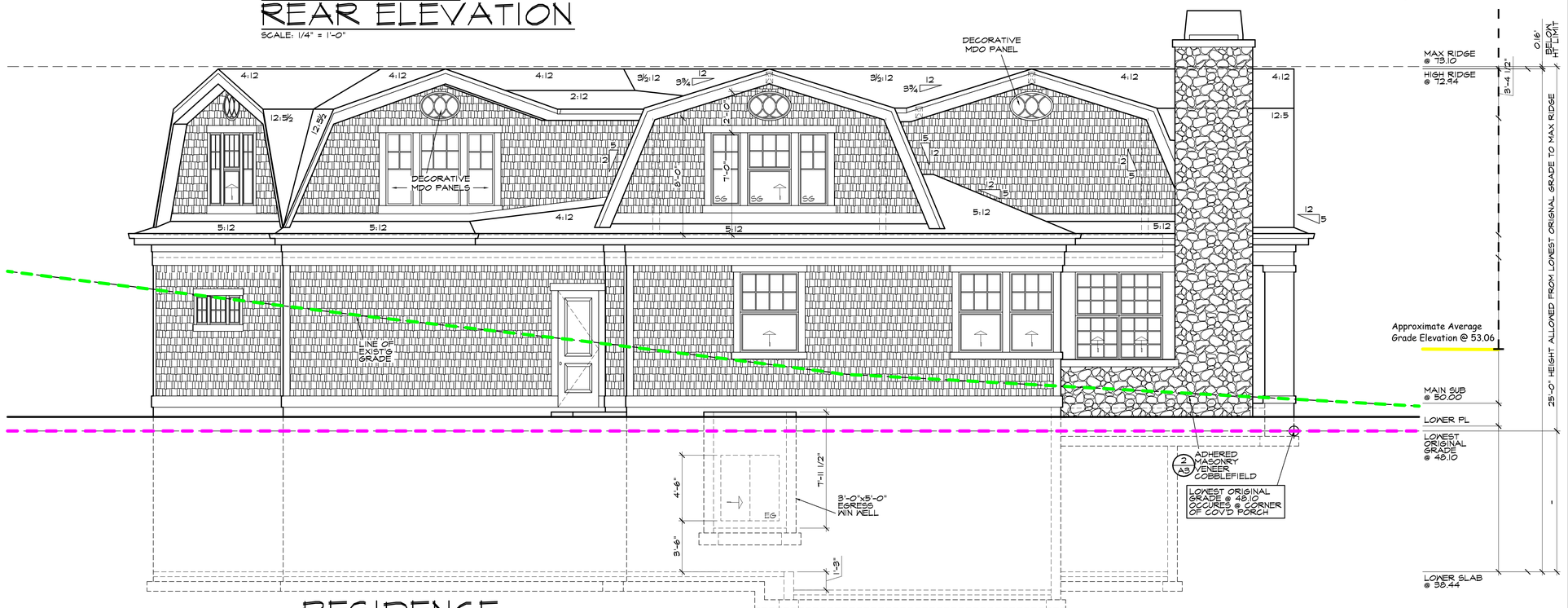
= $\frac{17337.21}{326.73}$ = **53.06’ average grade elevation**

Maximum elevation: 78.06’ (25 + 53.06 = 78.06)

Example 2

RESIDENCE
REAR ELEVATION

SCALE: 1/4" = 1'-0"



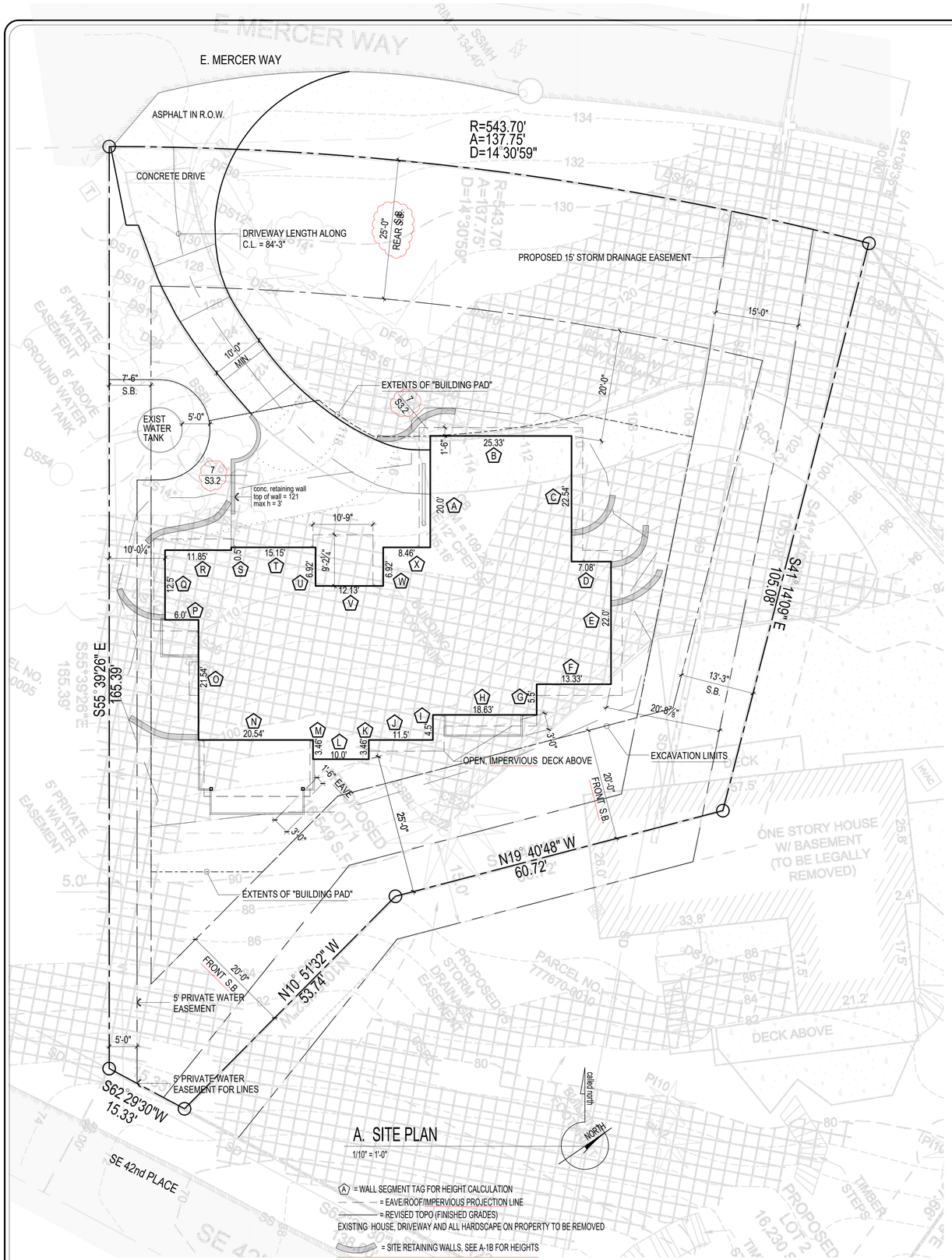
RESIDENCE
RIGHT ELEVATION

SCALE: 1/4" = 1'-0"

Example 3

Owner

Civil Engineer



A. SITE PLAN

1/10" = 1'-0"

A = WALL SEGMENT TAG FOR HEIGHT CALCULATION

= EAVE/ROOF/IMPERVIOUS PROJECTION LINE

= REVISED TOPO (FINISHED GRADES)

EXISTING HOUSE, DRIVEWAY AND ALL HARDSCAPE ON PROPERTY TO BE REMOVED

= SITE RETAINING WALLS, SEE A-1B FOR HEIGHTS

= EXISTING TOPOGRAPHY

CONTINUOUS GEOTECHNICAL INSPECTION IS REQUIRED DURING EXCAVATION.

All Japanese knotweed (Polygonum cuspidatum) and Regulated Class A, Regulated Class B, and Regulated Class C weeds identified on the King County Noxious Weed list, as amended, shall be removed from the property.

development proposals for a new single-family home shall remove japanese knotweed (polygonum cuspidatum) and regulated class a, regulated class b, and regulated class c weeds identified on the king county noxious weed list, as amended, from required landscaping areas established pursuant to subsection 19.02.020(f)(3)(a). new landscaping associated with new single-family home shall not incorporate any weeds identified on the king county noxious weed list, as amended. provided, that removal shall not be required if the removal will result in increased slope instability or risk of landslide or erosion.

ABE CALCULATION

	EL @ MIDPOINT	segment	wtd sgmnt
A	115	20	2300.00
B	113	25.33	2862.29
C	108	22.54	2434.32
D	101.9	7.08	721.45
E	95	22	2090.00
F	92.5	13.33	1233.03
G	94	5.5	517.00
H	97	18.63	1807.11
I	98.1	4.5	441.45
J	97.2	11.5	1117.80
K	96.8	3.46	334.93
L	96.7	10	967.00
M	97.8	3.46	338.39
N	99	20.54	2033.46
O	105	21.54	2261.70
P	110.6	6	663.60
Q	112.7	12.5	1408.75
R	115.4	11.85	1367.49
S	114.8	0.5	57.40
T	114	15.15	1727.10
U	111.9	6.92	774.35
V	110.3	12.13	1337.94
W	112	6.92	775.04
X	113.3	8.46	958.52
Y			
		289.84	30530.11

AVG. EL = 105.3343

all midpoints are existing grade

all final grades same or higher than existing

Parcel Number/Legal

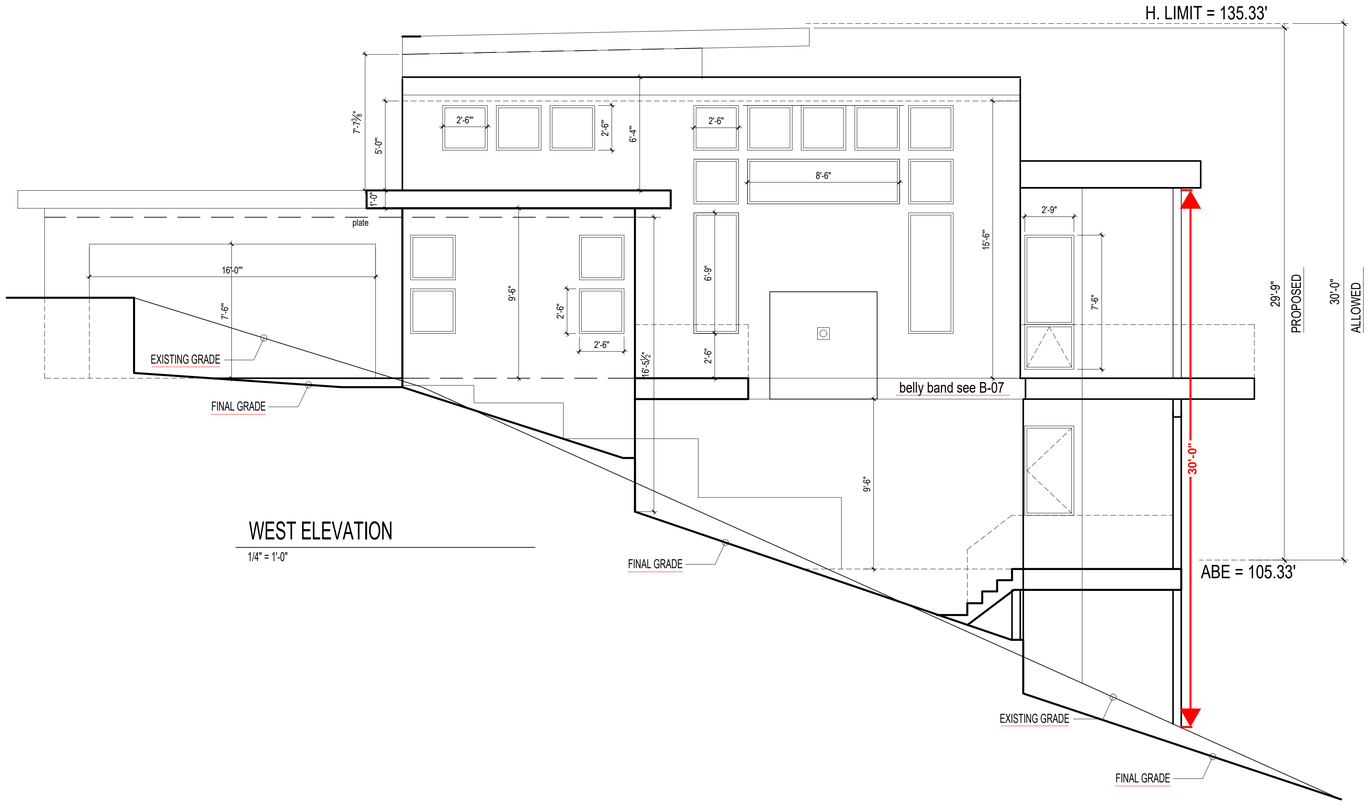
FAR CALCULATION

Main Floor = 2280.5 sf
Lower Floor = 1893.8 sf
Upper Floor = 414 sf
Garage = 570 sf
12'16" clg = 301 sf
covered decks = 220 sf
stairs = (-88)

TOTAL = 5591.3 sf

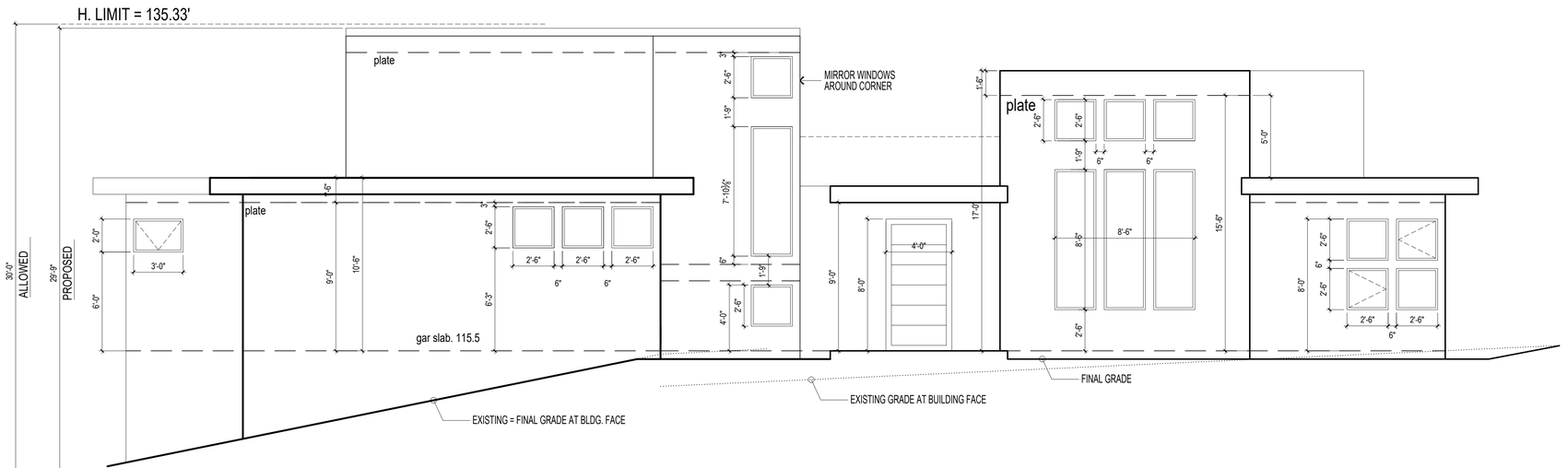
allowable = 16,549 x .4 = 6619.6 sf

Example 3



WEST ELEVATION

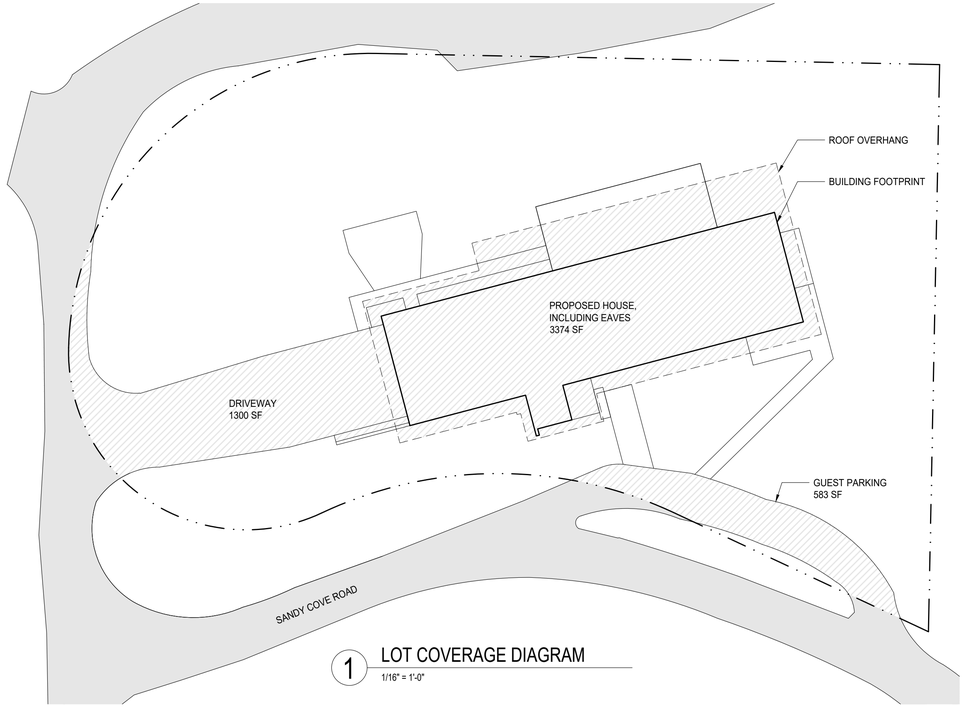
1/4" = 1'-0"



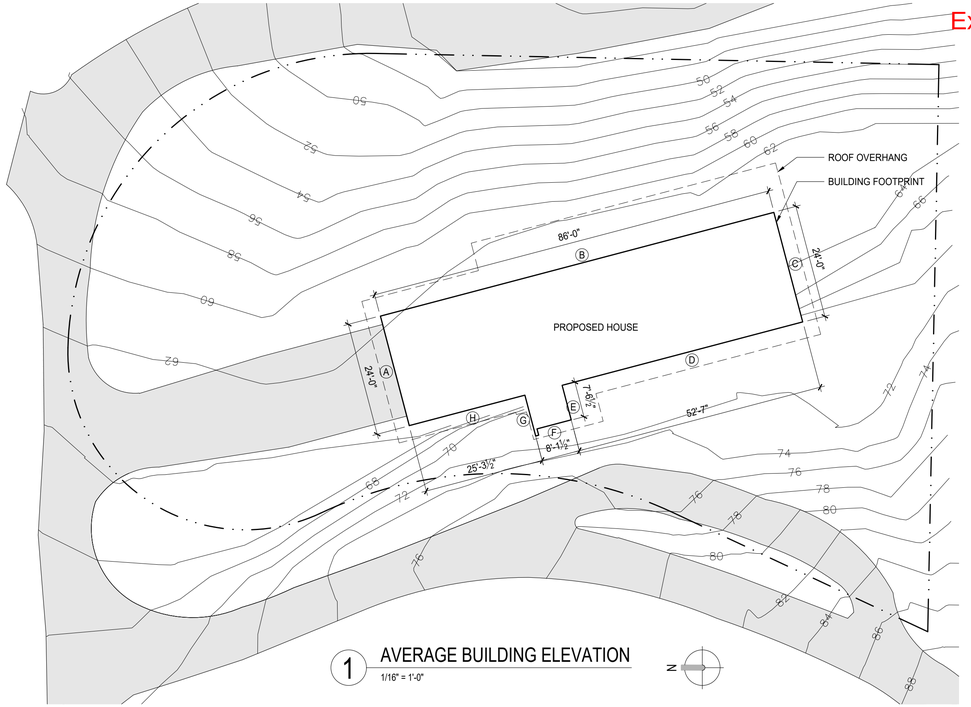
NORTH ELEVATION

1/4" = 1'-0"

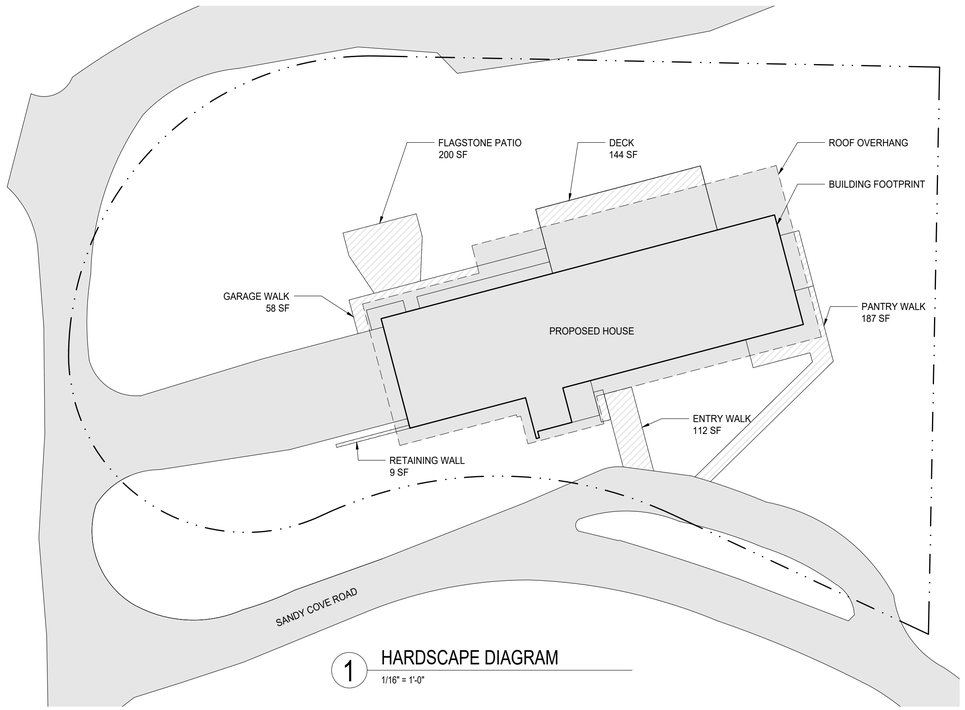
Example 4



1 LOT COVERAGE DIAGRAM
1/16" = 1'-0"



1 AVERAGE BUILDING ELEVATION
1/16" = 1'-0"



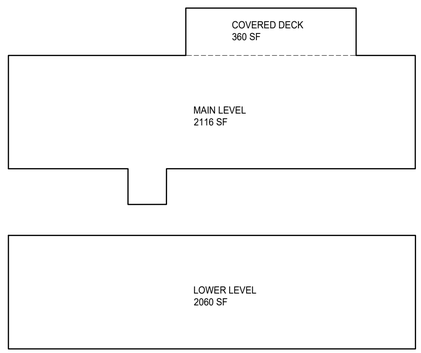
1 HARDSCAPE DIAGRAM
1/16" = 1'-0"

Zoning Calculations

Lot Area 16,878 SF

Gross Floor Area			
Main Level Floor Area	2,116.0 SF		
Main Level Covered Deck	360.0 SF		
	2,476.0 SF		
Lower Level Floor Area	2,060.0 SF		
Proposed Gross Floor Area	**4,536.0 SF**	**26.9%**	
Allowable Gross Floor Area	6,751.2 SF	40.0%	

*Measured from exterior face of building
*Includes attached covered deck floor area



1 GROSS FLOOR AREA DIAGRAM
1/16" = 1'-0"

Lot Slope 29.29%

Highest Elevation Point	87.83	feet
Lowest Elevation Point	44.58	feet
Elevation Difference	43.25	feet
Horizontal Difference	147.66	feet

87.83 - 44.58 = 43.25 / 147.66 = 29.29%

Lot Coverage

House, including eaves	3,374.0 SF		
Driveway	1,300.0 SF		
Guest Parking	583.0 SF		
Proposed Lot Coverage	**5,257.0**	**SF**	**31.1%**
Allowable Lot Coverage	5,907.3	SF	35.0%

*Includes all buildings measured to the eaves and all driving surfaces

Hardscape

Entry Walkway	112.0 SF		
Pantry Walkway	187.0 SF		
Garage Walkway	58.0 SF		
Deck	144.0 SF		
Flagstone Patio	200.0 SF		
Retaining Wall	9.0 SF		
Proposed Hardscape	**710.0 SF**		**4.2%**
Allowable Hardscape	1,519.0 SF		9.0%

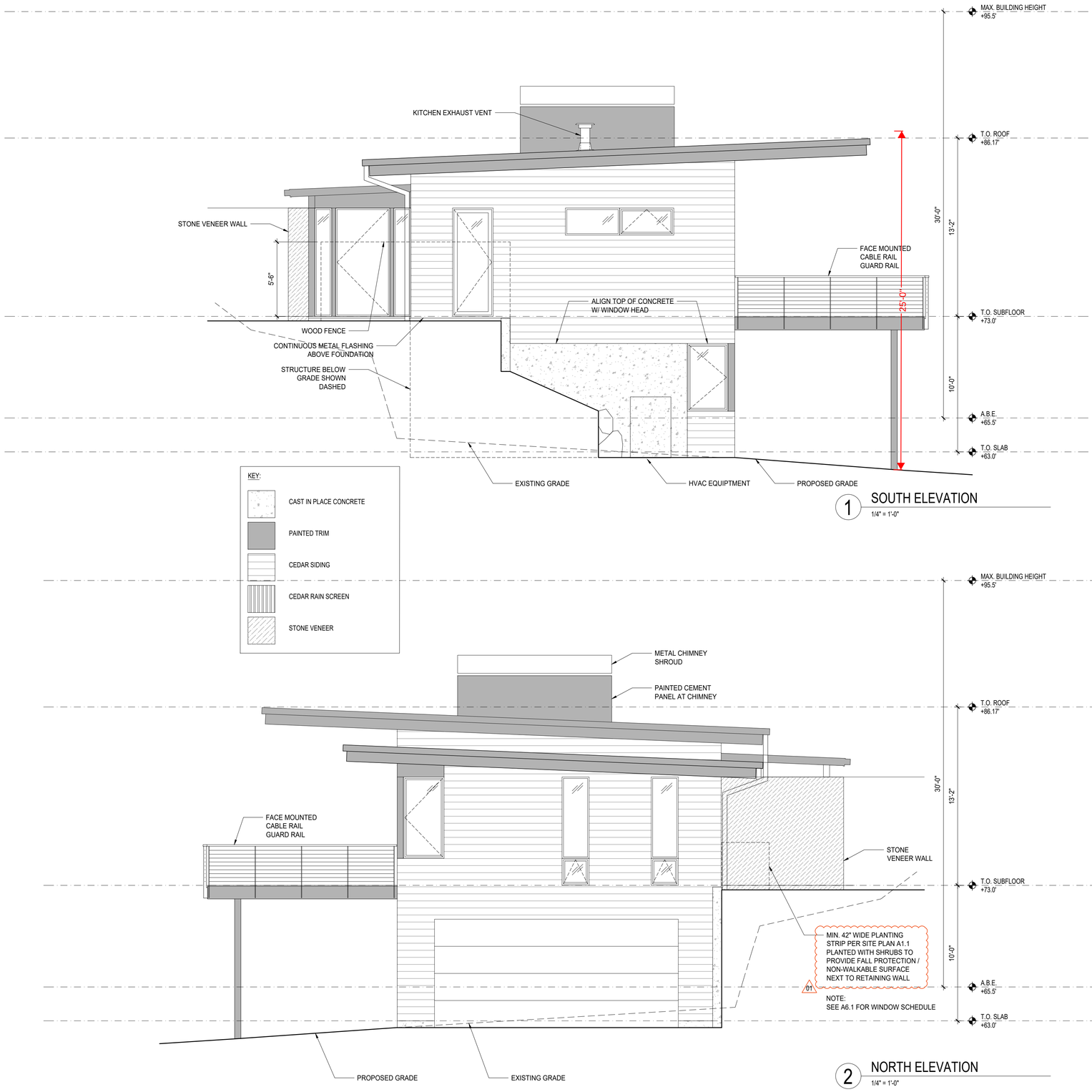
*Includes walkways, decks, patios; Does NOT include driving surfaces or buildings

Average Building Elevation

	Midpoint Elevation	Segment Length	Elev x Length
A	63.0	24.0 feet	1512.0
B	62.5	86.0 feet	5375.0
C	64.0	24.0 feet	1536.0
D	70.5	53.0 feet	3736.5
E	71.0	7.5 feet	532.5
F	71.0	8.0 feet	568.0
G	71.0	7.5 feet	532.5
H	64.0	25.3 feet	1619.2
Total	537.0	235.3 feet	15411.7

Average Building Elevation = 65.5 feet
Maximum Building Height = 95.5 feet

Example 4


MAX. BUILDING HEIGHT
+95.5'
KITCHEN EXHAUST VENT
T.O. ROOF
+86.17'
STONE VENEER WALL
5'-6"
FACE MOUNTED
CABLE RAIL
GUARD RAIL
30'-0"
13'-2"
25'-0"
ALIGN TOP OF CONCRETE
W/ WINDOW HEAD
T.O. SUBFLOOR
+73.0'
WOOD FENCE
CONTINUOUS METAL FLASHING
ABOVE FOUNDATION
STRUCTURE BELOW
GRADE SHOWN
DASHED
10'-0"
A.B.E.
+65.5'
T.O. SLAB
+63.0'
EXISTING GRADE
HVAC EQUIPTMENT
PROPOSED GRADE
KEY:
CAST IN PLACE CONCRETE
PAINTED TRIM
CEDAR SIDING
CEDAR RAIN SCREEN
STONE VENEER
1 SOUTH ELEVATION
1/4" = 1'-0"
MAX. BUILDING HEIGHT
+95.5'
METAL CHIMNEY
SHROUD
PAINTED CEMENT
PANEL AT CHIMNEY
T.O. ROOF
+86.17'
30'-0"
13'-2"
FACE MOUNTED
CABLE RAIL
GUARD RAIL
STONE
VENEER WALL
T.O. SUBFLOOR
+73.0'
MIN. 42" WIDE PLANTING
STRIP PER SITE PLAN A1.1
PLANTED WITH SHRUBS TO
PROVIDE FALL PROTECTION /
NON-WALKABLE SURFACE
NEXT TO RETAINING WALL
10'-0"
01
NOTE:
SEE A6.1 FOR WINDOW SCHEDULE
A.B.E.
+65.5'
T.O. SLAB
+63.0'
PROPOSED GRADE
EXISTING GRADE
2 NORTH ELEVATION
1/4" = 1'-0"