

SEISMIC LOADING - DESIGNED W/ ASCE 7-05.

FROM USGS.GOV @ ZIP 37862

SITE CLASS C.

$$S_{MS} = 0.624 g$$

$$S_{M1} = 0.199 g$$

[SECTION 11.4.4]

$$S_{DS} = 2/3 S_{MS} = (2/3)(0.624 g) = 0.416 g$$

$$S_{D1} = 2/3 S_{M1} = (2/3)(0.199 g) = 0.133 g$$

$$T = C_T h_n^{3/4}$$

$C_T = 0.02$  FOR SHEARWALLS

$$h_n = 75.4'$$

$$T = (0.02)(75.4')^{3/4} = 0.51$$

$$T_0 = 0.2 S_{D1} / S_{DS}$$

$$= (0.2)(0.133) / (0.416) = 0.064$$

$$T_s = S_{D1} / S_{DS} = (0.133) / (0.416) = 0.32$$

$$T_L = N/A$$

$$S_a = S_{D1} / T$$

$$= (0.133) / (0.51) = 0.261$$

[TABLE 11.6-2] & [TABLE 11.6-1]

OCCUPANCY CATEGORY C.

ORDINARY STEEL BRACED FRAMES  $R = 3/4$   
(CONCENTRIC)

$$B_s = \frac{S_{DS}}{(R/I)} = \frac{(0.416 g)}{(3/4)/1.0} = 0.128$$

ORDINARY REINFORCED MASONRY  
SHEARWALLS.  $R = 2$

$$0.128 \geq 0.01 \text{ OK}$$

$$C_s \leq \frac{S_{D1}}{T(R/I)} = \frac{(0.133 g)}{(0.51)(3.25)/1.0} = 0.0802 \leftarrow \text{CONTROLS.}$$

$$V = C_s W = (0.0802)(8804 k) = 706 k.$$

SEE SUPPLEMENTAL INFORMATION

FOR BUILDING WEIGHTS & DISTRIBUTION.

REVISION OF LOADS TO IBC 2003.  $\frac{1}{2}$  ASCE 7-05.  
SNOW LOADING - DESIGNED W/ IBC 2003  $\frac{1}{2}$  ASCE 7-05.

[ASCE 7-05 SECTION 7.0]

[FIGURE 7.2]

$$p_g = 15 \text{ psf}$$

[SECTION 7.3]

$$\begin{aligned} p_f &= 0.7 C_e C_t I p_g \\ &= (0.7)(1.0)(1.0)(1.0)(15 \text{ psf}) \\ &= 10.5 \text{ psf} \end{aligned}$$

[SECTION 7.4]

[FIGURE 7-2a]

$$\begin{aligned} p_s &= C_s p_f & C_s &= 0.53 \\ &= (0.53)(10.5 \text{ psf}) \\ &= 5.6 \text{ psf} \end{aligned}$$

[SECTION 7.6.1.7]

UNBALANCED SNOW LOADS FOR HIP  $\frac{1}{2}$  GABLE ROOFS.

$$\begin{aligned} p_u &= (0.3)(p_s) \\ &= (0.3)(5.6 \text{ psf}) \\ &= 1.68 \text{ psf} \end{aligned}$$

$$p_b = p_s = 5.6 \text{ psf}$$

[SECTION 7.7.1]

DRIFTS ON LOWER ROOF

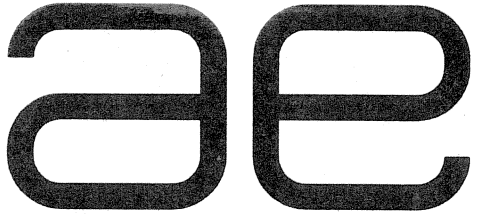
$$\begin{aligned} \gamma &= 0.13 p_g + 14 \leq 30 \text{ psf} \\ &= (0.13)(15 \text{ psf}) + 14 \\ &= 16 \text{ psf} < 30 \text{ psf} \text{ OK} \end{aligned}$$

FOR ROOF STRUCTURE @ COLUMN A TO COLUMN A.2.

SAME AS 7-95

$$h_d = 2.76' \quad h_b = 0.66' \quad h_c = 79.34'$$

$$\begin{aligned} p_d &= h_d \gamma \\ &= (2.8')(16 \text{ psf}) \\ &= 45 \text{ psf} \end{aligned}$$



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DATE: 11-21-06

ASSIGNMENT: TECH REPORT #3

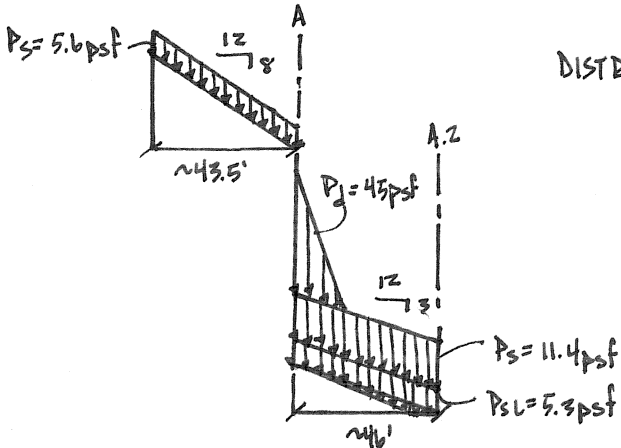
LOADING REVISION/UPDATE:

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SNOW LOADING - DESIGNED WITH IBC 2003 & ASCE 7-05.

[SECTION 7.9]

SLIDING SNOW:



STRIP ON UPPER ROOF:

$$W = (5.6 \text{ psf})(1')(43.5') = 243.6 \text{ lbs}$$

DISTRIBUTE ON LOWER ROOF:

$$P_{SL} = \frac{(243.6 \text{ lbs})}{(1')(46.0')} = 5.30 \text{ psf}$$

$$P_s = C_s P_f = (0.85)(10.5 \text{ psf}) = 11.4 \text{ psf}$$

TOTAL LOAD ON LOWER ROOF:

$$\begin{aligned}
 P_T &= P_{SL} + P_s \\
 &= 5.3 \text{ psf} + 11.4 \text{ psf} \\
 &= 16.7 \text{ psf}
 \end{aligned}$$

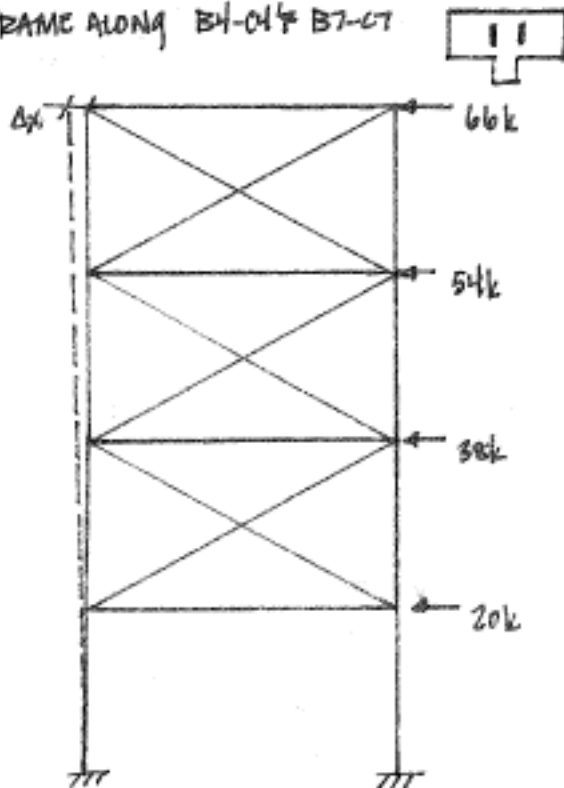
IMPACT FACTOR:

$$P_T = (1.5)(16.7 \text{ psf})$$

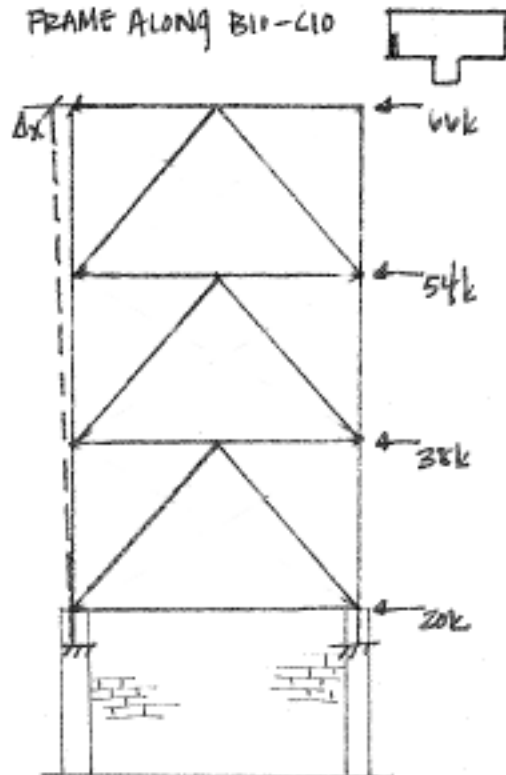
$$= 19.4 \text{ psf OVER LOWER ROOF SPAN. - BE SURE TO INCLUDE DRIFT.}$$



FRAME ALONG B4-C4 & B7-C7



FRAME ALONG B10-C10



UNDER LOADS EVENLY DISTRIBUTED TO FRAMES:

$$\Delta_x = 1.752''$$

$$k = 1.752'' / 1.752'' = 1.0$$

- 66k → 36.6k
- 54k → 29.9k
- 38k → 21.1k
- 20k → 11.1k

$$\Delta_x = 0.315''$$

DEFLECTION AS FOUND BY RISA 3D [AVAILABLE UPON REQUEST]

RELATIVE STIFFNESS BASED ON DEFLECTION.

ADJUSTED LOADING BASED ON RELATIVE STIFFNESSES.

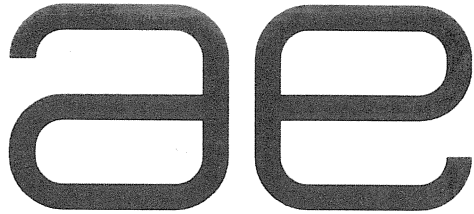
ADJUSTED DEFLECTION AS FOUND BY RISA 3D.

$$\Delta_x = 0.722''$$

$$k = 1.752'' / 0.722'' = 2.27$$

- 66k → 83.1k
- 54k → 60.0k
- 38k → 47.9k
- 20k → 25.2k

$$\Delta_x = 0.396''$$



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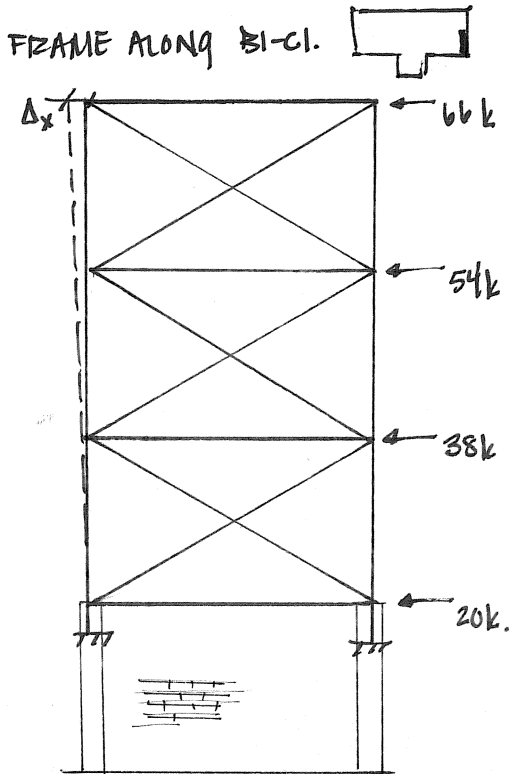
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BRACED FRAME STIFFNESS E-W CONT.

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$$\Delta x = 0.595''$$

$$k = \frac{1.752''}{0.595''} = 2.94$$

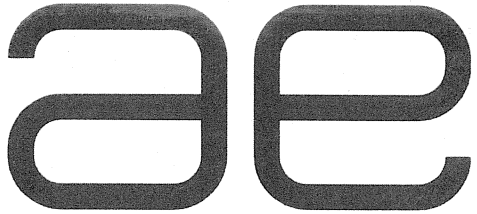
$$66k \rightarrow 107.7k$$

$$54k \rightarrow 88.1k$$

$$38k \rightarrow 62.0k$$

$$20k \rightarrow 32.6k$$

$$\Delta x = 1.014''$$



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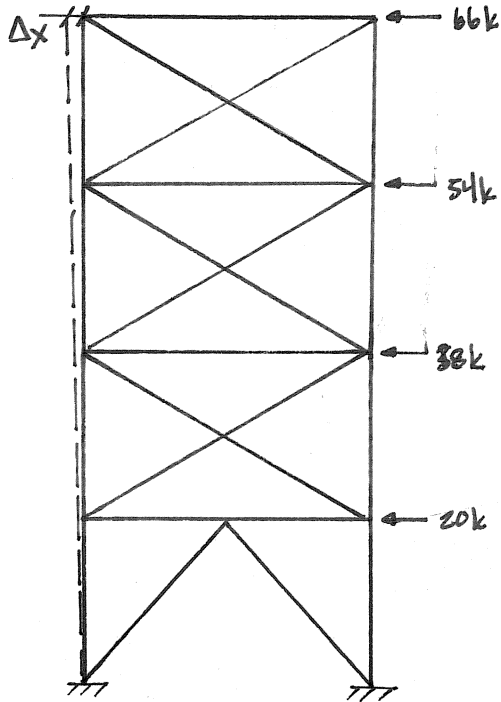
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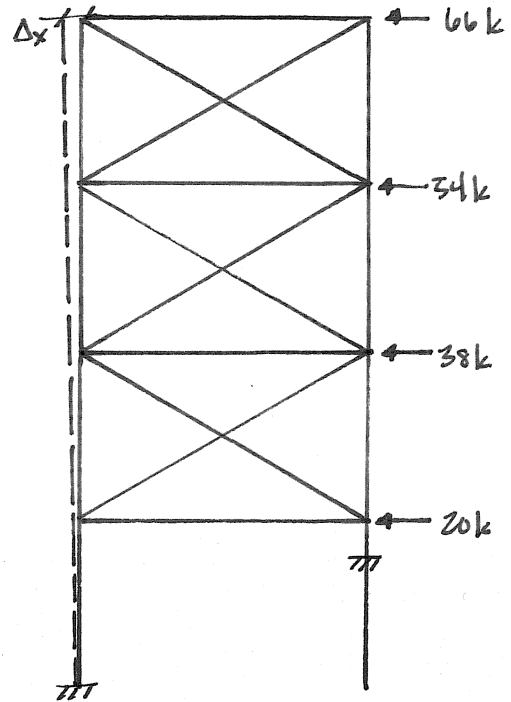
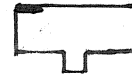
BRACED FRAME STIFFNESSES N-S

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FRAME A1-A2.



FRAME A9-A10



DRAWN W/ LOADS EVENLY  
 DISTRIBUTED TO EACH FRAME.  
 Δx VALUES AS FOUND BY RISA3D.  
 [AVAILABLE UPON REQUEST]

$\Delta x = 0.652''$

$\Delta x = 0.446''$

$k = 1.0$

RELATIVE STIFFNESSES  
 BASED ON DEFLECTION

$k = (0.652'' / 0.446'') = 1.46$

- 66k → 53.1
- 54k → 43.5
- 38k → 30.6
- 20k → 16.1

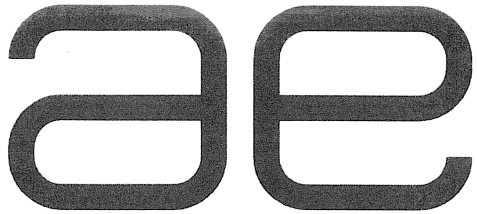
ADJUSTED LOADING  
 BASED ON STIFFNESSES

- 66k → 77.6k
- 54k → 63.5
- 38k → 44.9
- 20k → 23.5

$\Delta x = 0.508''$   
 $\leq 2.08''$  OK

ADJUSTED Δ VALUE BY RISA3D.

$\Delta x = 0.533''$   
 $\leq 2.08''$  OK.



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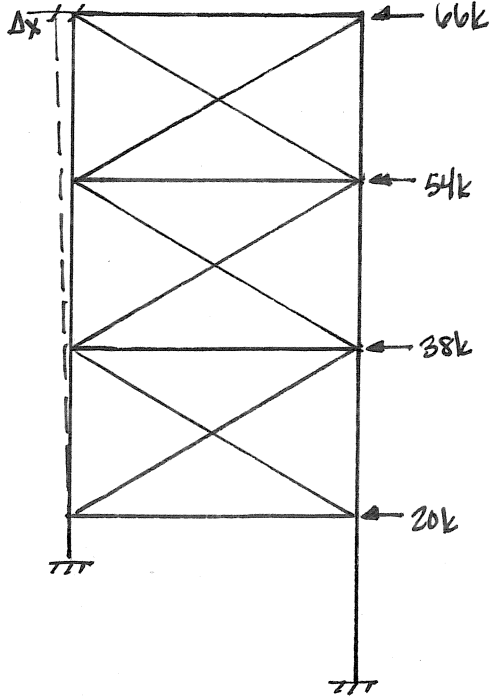
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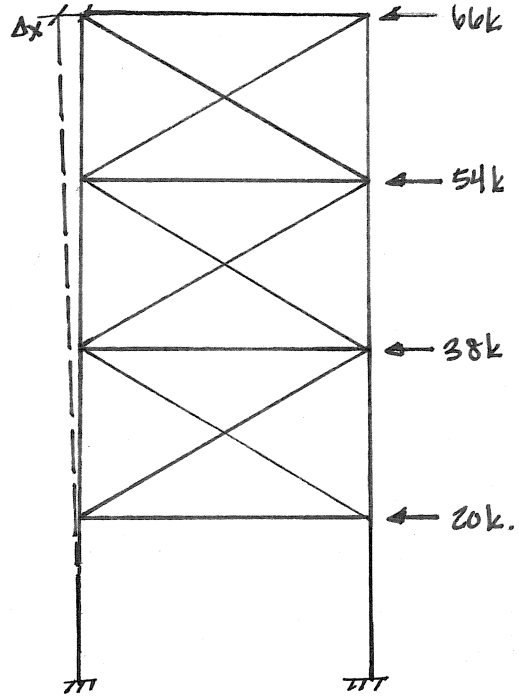
BRACED FRAME STIFFNESSES. CONT. N-S.

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FRAME C1-C2.



FRAME D8-D9



DRAWN W/ LOADS EVENLY

DISTRIBUTED TO EACH FRAME

$\Delta x = 0.53''$   $\Delta x$  VALUES AS FOUND BY  $\Delta x = 0.511''$

EISA 3D [AVAILABLE UPON REQUEST]

RELATIVE STIFFNESSES

BASED ON DEFLECTION

$k = 1.23$   $k = 1.28$

ADJUSTED LOADING

BASED ON STIFFNESSES.

66k →	65.3	66k →	68.0
54k →	53.3	54k →	56.1
38k →	37.6	38k →	39.2
20k →	19.8	20k →	20.6

$\Delta x = 0.524''$

$\leq 2.08''$  OK

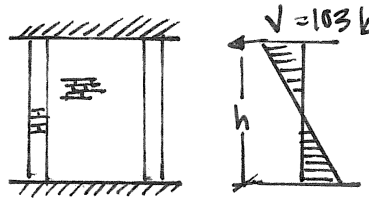
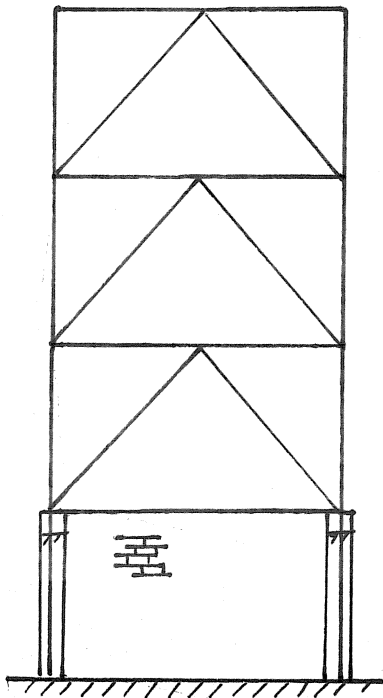
ADJUSTED  $\Delta$  VALUE BY EISA 3D.

$\Delta x = 0.529''$

$\leq 2.08''$  OK.



MASONRY SHEAR WALL ALONG B10-C10.



$$M = \frac{1}{2} h V$$

$$= \left( \frac{1}{2} \times 17.3' \right) (103 \text{ k})$$

$$= 891 \text{ k}$$

W/ REIN:

$$F_{vm} = \frac{1}{3} \left[ 4 - \frac{M}{Vd} \right] (f'_m)^{1/2}$$

$$= \frac{1}{3} \left[ 4 - \frac{(891 \text{ k})}{(103 \text{ k}) (30')} \right] (1500 \text{ psi})^{1/2} = 47.9 \text{ psi}$$

$$F_{vm} = 80 - 45 \left[ \frac{M}{Vd} \right]$$

$$= 80 - 45 \left[ \frac{(891 \text{ k})}{(103 \text{ k}) (30')} \right] = 67.02 \text{ psi USE } 47.9 \text{ psi.}$$

$$f_{vm} = \frac{V}{td} = \frac{103 \text{ k}}{(1' \times 30')} = 3.43 \text{ ksf} = 23.8 \text{ psi} \leq 47.9 \text{ psi}$$

OK

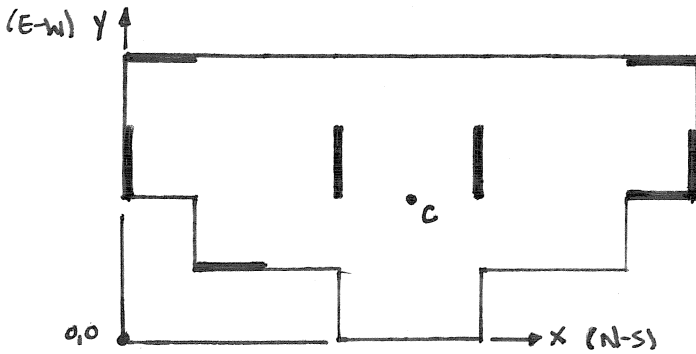
$$A_v = \frac{V_s}{F_s d} = \frac{(103 \text{ k}) (8'')}{(60 \text{ ksi}) (30' \times 12'')} = 1.15 \text{ in}^2$$

↳ MIN #10. = 1.23 in<sup>2</sup>

$$\Delta = \frac{h^3 F_b}{0.01 E_m t} = \frac{((17.3') (12''))^3 (0.3) (1500 \text{ psi})}{(0.01) (1000) (1500 \text{ psi}) (12'')}$$

$$= 108'' \quad 0.748''$$

CENTER OF STIFFNESS.



ALL BRACED FRAMES  
 ARE SAME STIFFNESS  
 IN SIMILAR DIRECTION.

1" = 30'

$$\begin{aligned}
 X\text{-DIR} &= 15' + 45' + (2)(225') = 510' & 510' / 4 &= 127.5' & e &= 240' / 2 - 127.5' = 9.5' \rightarrow \\
 Y\text{-DIR} &= (4)(75') = 300' & 300' / 4 &= 75' & e &= 120' / 2 - 75' = 15' \uparrow
 \end{aligned}$$

7% ecc MINIMUM:  $(240')(0.05) = 12'$  ← CONTROLS  
 $(120')(0.05) = 6'$  USE 15' CONTROL.

BUILDING TORSION:

	X (N-S)	Y (E-W)
1ST FLOOR	$(12')(88k) = 1056k$	$(15')(88k) = 1320k$
2ND FLOOR	$(12')(154k) = 1848k$	$(15')(154k) = 2310k$
3RD FLOOR	$(12')(212k) = 2544k$	$(15')(212k) = 3180k$
4TH FLOOR	$(12')(231k) = 2772k$	$(15')(231k) = 3465k$