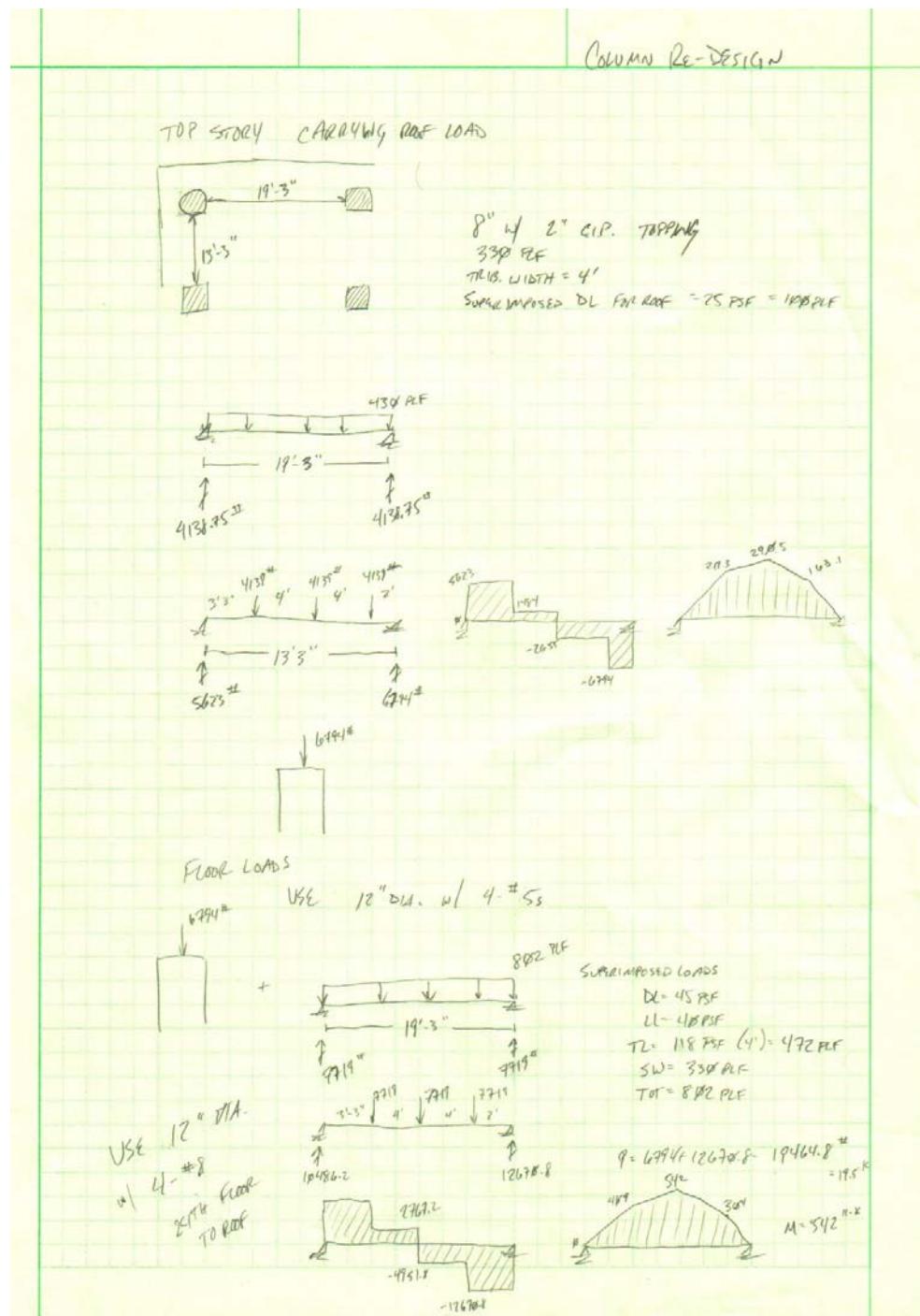




Appendix III





$M = 542 \text{ in}^k$ FOR REST OF RESIDENTIAL FLOORS

KEEP RE-CALCULATING P

SAME LAYOUT & LOADS FOR THIS COLUMN THROUGHOUT FLOORS 2-38

∴ KEEP ADDING ADDING 12.7 k onto P LOAD CAPACITY

19.5 k @ 37th Floor

$$19.5\text{k} + 12.7(8) = 259\text{k}$$

$x = 18.8 \approx 19$ FLOORS

@ 18th Floor Column Must Be Re-Sized

LAYOUT CHANGES @ 18th Floor SO DESIGN COLUMN FOR 11th FLOOR LOAD

$$19.5\text{k} + 12.7(26) = 349.7\text{k}$$

USE 12" DIA w/ 5-#9's 11th FLOOR TO 23rd FLOOR

LAYOUT CHANGES AGAIN @ 7th Floor ∴ DESIGN @ 8th FLOOR

$$349.7\text{k} + 12.7(3) = 387.8\text{k}$$

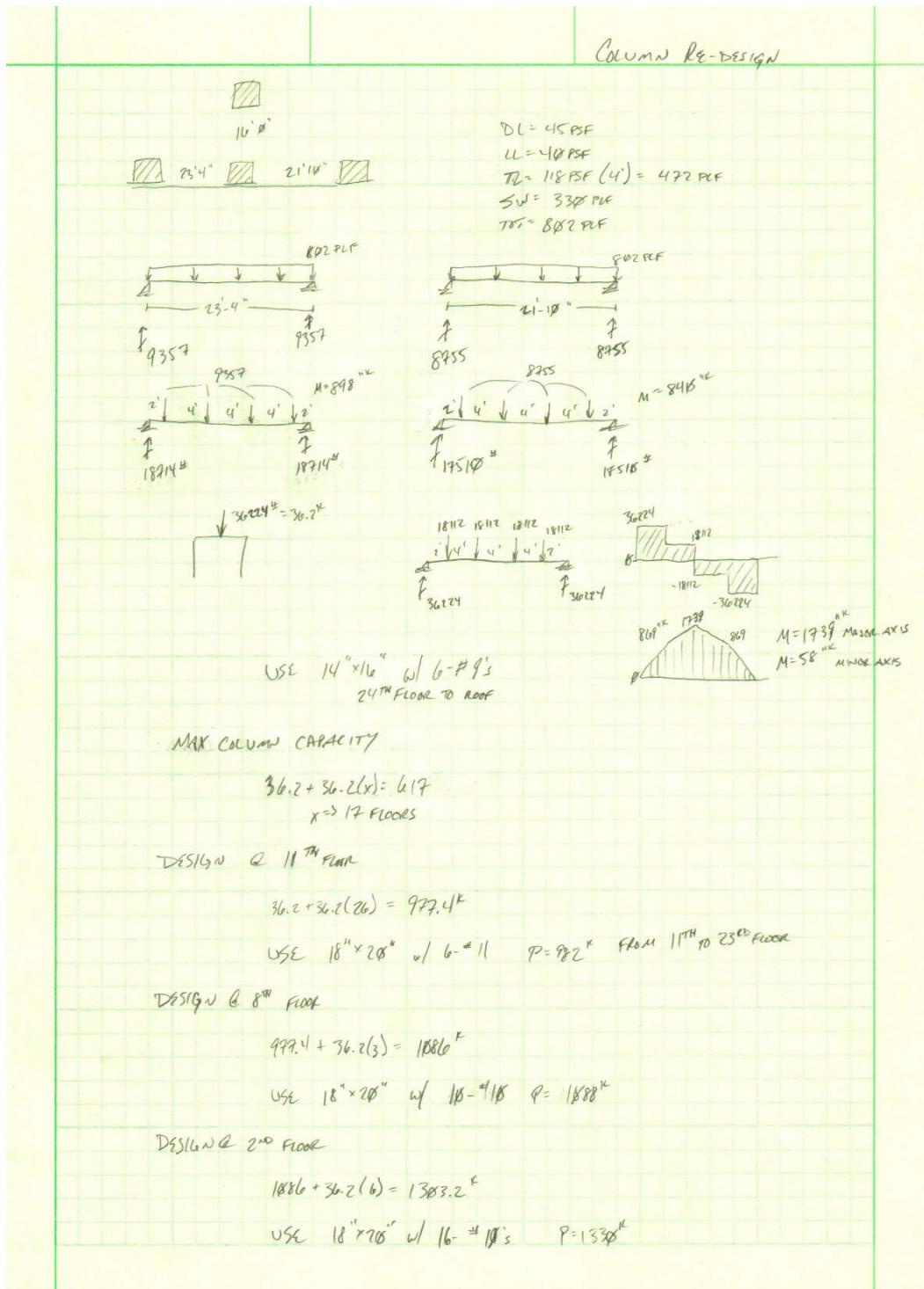
USE 12" DIA w/ 6-#9's

FROM 8th TO 18th FLOOR

LAYOUT CHANGE @ GROUND FLOOR ∴ DESIGN @ 2nd FLOOR

$$387.8 + 12.7(6) = 464\text{k}$$

USE 12" DIA w/ 4-#14's FROM 2nd-7th FLOOR



| RECTANGULAR TIED COLUMNS 18" x 20" | | | | | | | | | | | |
|--|-------|----|------|---------|-------|--------|--------|---------|---------|---------|---------|
| $f_y = 60,000 \text{ psi}$ | | | | | | | | | | | |
| $f'_y = 4,000 \text{ psi}$ | | | | | | | | | | | |
| ϕP in kips | | | | | | | | | | | |
| Short columns - no sideways bending on major or minor axis | | | | | | | | | | | |
| Bending on minor or minor axis | | | | | | | | | | | |
| Zero Axial Load | | | | | | | | | | | |
| ϕf_y in kips | | | | | | | | | | | |
| BARS | RHO | X | A | Max Cap | 0% fy | 25% fy | 50% fy | 100% fy | 100% fy | 100% fy | 100% fy |
| S | I | φM | φP | φM | φP | φM | φP | φM | φP | φM | φP |
| 4#9 | 1.11 | MA | 1650 | 812 | 2221 | 719 | 2740 | 604 | 3033 | 513 | 3447 |
| 2E | | MA | 1468 | 812 | 2022 | 709 | 2842 | 596 | 2966 | 513 | 1782 |
| 4#10 | 1.41 | MA | 1714 | 846 | 2388 | 738 | 3271 | 521 | 3664 | 517 | 2749 |
| 2E | | MA | 1532 | 846 | 1727 | 639 | 2519 | 521 | 3664 | 517 | 1895 |
| 4#11 | 1.73 | MA | 1863 | 881 | 2575 | 753 | 3245 | 518 | 3664 | 514 | 2749 |
| 2E | | MA | 1670 | 881 | 2355 | 726 | 3068 | 518 | 3664 | 514 | 1935 |
| 4#12 | 1.73 | MA | 1865 | 901 | 2326 | 726 | 3068 | 518 | 3664 | 514 | 1935 |
| 2E | | MA | 1685 | 901 | 2068 | 703 | 3068 | 518 | 3664 | 514 | 1935 |
| 4#14 | 2.50 | MA | 1902 | 927 | 2068 | 803 | 3068 | 518 | 3664 | 514 | 1935 |
| 2E | | MA | 1676 | 971 | 2667 | 791 | 3222 | 564 | 3498 | 518 | 1935 |
| 4#18 | 4.44 | MA | 2029 | 1133 | 3916 | 931 | 479 | 540 | 4131 | 518 | 1935 |
| 2E | | MA | 1926 | 1133 | 3473 | 919 | 4206 | 746 | 4771 | 518 | 1935 |
| 6#8 | 1.32 | MA | 1703 | 836 | 2326 | 726 | 2862 | 616 | 3210 | 521 | 3589 |
| 2L#8 | | MA | 1396 | 836 | 2326 | 726 | 2862 | 616 | 3210 | 521 | 3589 |
| 6#9 | 1.67 | MA | 1870 | 872 | 2022 | 703 | 3068 | 518 | 3664 | 514 | 1935 |
| 2L#9 | | MA | 1870 | 927 | 2765 | 783 | 3448 | 545 | 3439 | 518 | 1935 |
| 6#11 | 2.12 | MA | 1466 | 927 | 2168 | 786 | 3236 | 512 | 3439 | 518 | 1935 |
| 2L#11 | | MA | 1503 | 982 | 3021 | 876 | 3455 | 555 | 4892 | 518 | 1935 |
| 6#14 | 3.75 | MA | 1656 | 1113 | 3606 | 892 | 3455 | 550 | 3450 | 518 | 3586 |
| 2L#14 | | MA | 1656 | 1113 | 2657 | 777 | 3596 | 594 | 4131 | 518 | 3449 |
| 6#15 | 6.67 | MA | 1656 | 1146 | 3606 | 892 | 3455 | 550 | 3450 | 518 | 3586 |
| 2L#15 | | MA | 1656 | 1146 | 3217 | 703 | 3596 | 594 | 4131 | 518 | 3449 |
| 6#18 | 8.32 | MA | 1555 | 836 | 2068 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#18 | | MA | 1554 | 836 | 2114 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 6#9 | 1.67 | MA | 1598 | 876 | 2221 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#25 | | MA | 1577 | 876 | 3033 | 537 | 3347 | 378 | 2844 | 518 | 1935 |
| 6#10 | 2.12 | MA | 1653 | 927 | 2388 | 798 | 2842 | 624 | 3620 | 518 | 1935 |
| 2L#23 | | MA | 1653 | 927 | 2484 | 739 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#12 | 2.60 | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 2L#12 | | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#15 | 3.75 | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#15 | | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#18 | 6.67 | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#18 | | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#25 | 12.02 | MA | 1555 | 836 | 2068 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#25 | | MA | 1554 | 836 | 2114 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 6#9 | 1.67 | MA | 1598 | 876 | 2221 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#28 | | MA | 1577 | 876 | 3033 | 537 | 3347 | 378 | 2844 | 518 | 1935 |
| 6#10 | 2.12 | MA | 1653 | 927 | 2388 | 798 | 2842 | 624 | 3620 | 518 | 1935 |
| 2L#23 | | MA | 1653 | 927 | 2484 | 739 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#12 | 2.60 | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 2L#12 | | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#15 | 3.75 | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#15 | | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#18 | 6.67 | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#18 | | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#25 | 12.02 | MA | 1555 | 836 | 2068 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#25 | | MA | 1554 | 836 | 2114 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 6#9 | 1.67 | MA | 1598 | 876 | 2221 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#28 | | MA | 1577 | 876 | 3033 | 537 | 3347 | 378 | 2844 | 518 | 1935 |
| 6#10 | 2.12 | MA | 1653 | 927 | 2388 | 798 | 2842 | 624 | 3620 | 518 | 1935 |
| 2L#23 | | MA | 1653 | 927 | 2484 | 739 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#12 | 2.60 | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 2L#12 | | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#15 | 3.75 | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#15 | | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#18 | 6.67 | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#18 | | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#25 | 12.02 | MA | 1555 | 836 | 2068 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#25 | | MA | 1554 | 836 | 2114 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 6#9 | 1.67 | MA | 1598 | 876 | 2221 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#28 | | MA | 1577 | 876 | 3033 | 537 | 3347 | 378 | 2844 | 518 | 1935 |
| 6#10 | 2.12 | MA | 1653 | 927 | 2388 | 798 | 2842 | 624 | 3620 | 518 | 1935 |
| 2L#23 | | MA | 1653 | 927 | 2484 | 739 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#12 | 2.60 | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 2L#12 | | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#15 | 3.75 | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#15 | | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#18 | 6.67 | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#18 | | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#25 | 12.02 | MA | 1555 | 836 | 2068 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#25 | | MA | 1554 | 836 | 2114 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 6#9 | 1.67 | MA | 1598 | 876 | 2221 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#28 | | MA | 1577 | 876 | 3033 | 537 | 3347 | 378 | 2844 | 518 | 1935 |
| 6#10 | 2.12 | MA | 1653 | 927 | 2388 | 798 | 2842 | 624 | 3620 | 518 | 1935 |
| 2L#23 | | MA | 1653 | 927 | 2484 | 739 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#12 | 2.60 | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 2L#12 | | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#15 | 3.75 | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#15 | | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#18 | 6.67 | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#18 | | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#25 | 12.02 | MA | 1555 | 836 | 2068 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#25 | | MA | 1554 | 836 | 2114 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 6#9 | 1.67 | MA | 1598 | 876 | 2221 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#28 | | MA | 1577 | 876 | 3033 | 537 | 3347 | 378 | 2844 | 518 | 1935 |
| 6#10 | 2.12 | MA | 1653 | 927 | 2388 | 798 | 2842 | 624 | 3620 | 518 | 1935 |
| 2L#23 | | MA | 1653 | 927 | 2484 | 739 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#12 | 2.60 | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 2L#12 | | MA | 1701 | 927 | 2570 | 826 | 3049 | 624 | 3620 | 518 | 1935 |
| 6#15 | 3.75 | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#15 | | MA | 1829 | 1113 | 3215 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#18 | 6.67 | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 2L#18 | | MA | 1829 | 1146 | 3217 | 881 | 3439 | 547 | 4232 | 518 | 3586 |
| 6#25 | 12.02 | MA | 1555 | 836 | 2068 | 726 | 2861 | 591 | 3439 | 518 | 1935 |
| 2L#25 | | MA | 1554 | 836 | 2114 | 726</ | | | | | |