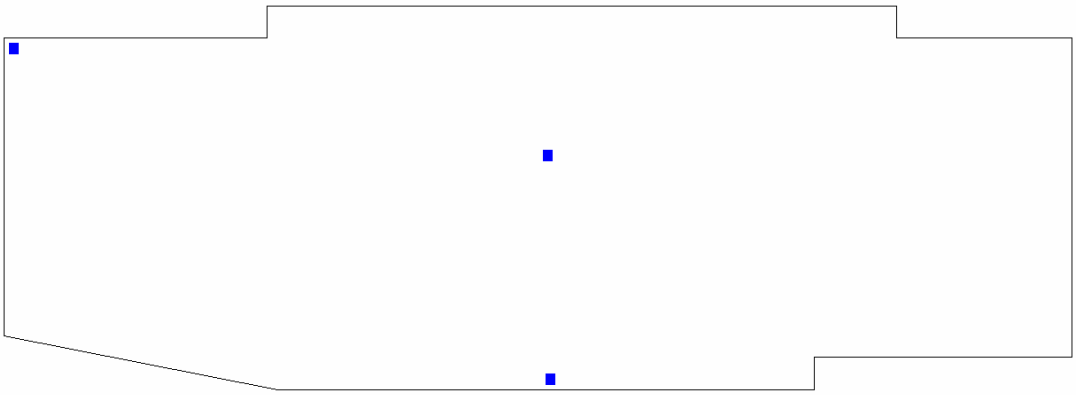
Column Re-design

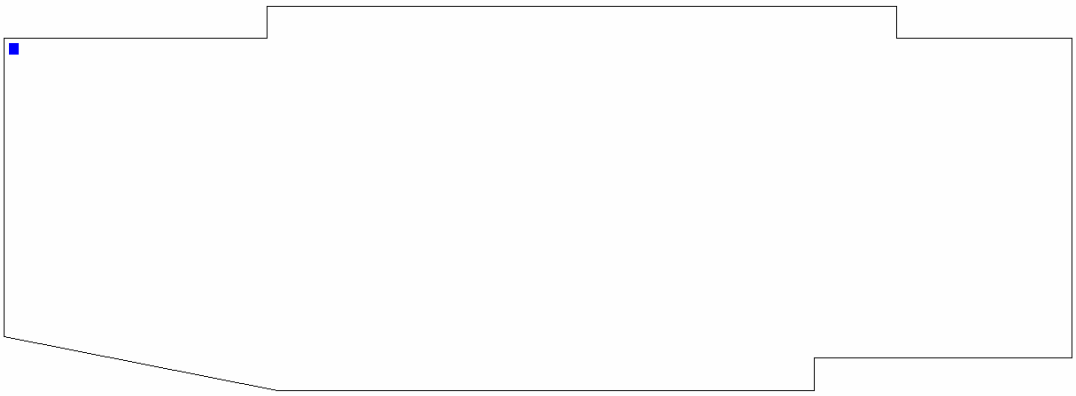
With the column locations being moved and the floor system re-designed, the column for the building will also have to be re-designed to compensate for the new loads to be supported. The diagram below outlines which columns will be considered for this section of the report.



Columns considered for example calculations

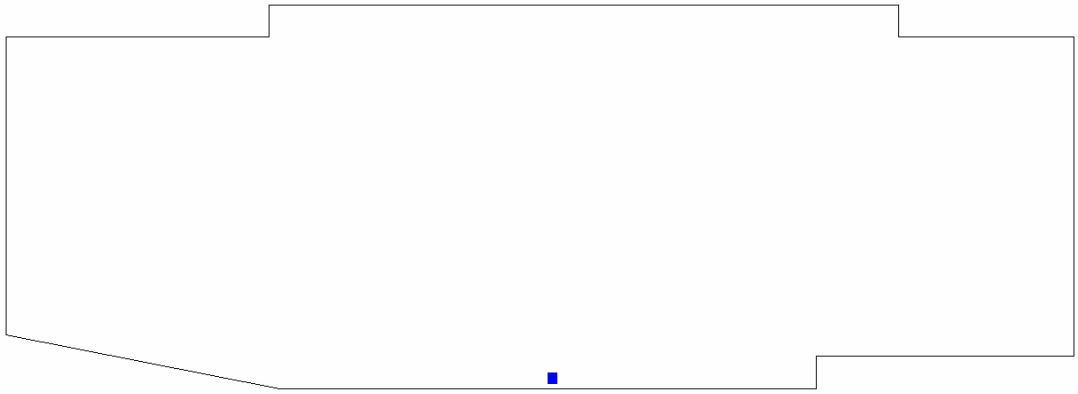
The columns will be designed from reinforced concrete using the Concrete Reinforcing Steel Institute (CRSI) Design Handbook 2002. The re-locating of columns means a more typical layout making design more consistent throughout the floor plan. Because the columns around the perimeter and at corners have different influence areas, several different columns in the floor plan were considered. First, the loads from the re-designed floor system were used and then transferred into the columns. These loads were used for the axial compression load placed onto the column for design. These loads as well as the moment put onto the column by the un-balanced area of floor system around the column are taken into the column tables in the CRSI Design Handbook and a size and reinforcing is determined from these loads. The columns were designed using the design handbook for rectangular and round tied columns, with concrete compression strength of 4000 psi instead of the 5000 psi used in the existing building. The axial compressive loads and moments were found and then taken

into the tables to determine the new sizes for the members. The sizes of the members were found to be comparable to those of the existing members. The use of the typical bay system as well as adding a few columns where necessary to complete the grid spread out the load better to each column thus reducing the size required. Also, if the designed compressive strength of the concrete used in the existing building was taken into account for the new column design, the sizes would then be taken to be even smaller. This design will not only help with the distribution of the loads on each column but it will keep each column size to a minimum allowing for the freeing up of more interior space for architectural use. Below is a comparison of sizes between two columns used for example design calculations.



Corner column used for design example

	Existing column	New column
Floors 24-38	16” Φ	12” Φ
Floors 11-23	20” Φ	12” Φ
Floors 8-10	24” Φ	12” Φ
Floors 2-7	24” Φ	12” Φ



Edge column used for design example

	Existing column	New column
Floors 24-38	16”x16”	14”x16”
Floors 11-23	20”x28”	18”x20”
Floors 8-10	20”x28”	18”x20”
Floors 2-7	20”x32”	18”x20”

The use of the grid column layout distributed the load much better to each column meaning less load on each column leading to a smaller size. This will allow the utilization of more architectural space. The impact of the re-location of the columns can be seen through this design example stating another reason why this proposal deserves serious consideration. Calculations for these examples can be found in the Appendix.