

Executive Summary:

This final thesis report contains a main structural depth study along with two breadth studies. These studies are the resultant of a thesis proposal that dealt with the relocation of the Northwest Science Building from New York, NY to Miami, FL. This relocation causes several design concerns for the author. These concerns are addressed in the main depth and breadth studies of this final thesis report. Below is a brief description of the main structural depth study, and two breadth studies. Along with each description is a brief summary of the design changes needed due to the relocation of the building.

Structural Depth Study – Lateral System Redesign:

The main goal of this thesis is to produce a lateral system redesign due to the relocation of the Northwest Science Building to Miami, FL. This relocation will cause more severe wind forces acting upon the lateral system due to Miami, FL being in a hurricane prone region.

Upon analysis of the lateral system the author determined that an additional amount of stiffness was needed in the East-West direction frames of the structure to limit drifts and story drifts. The exterior braced frames in this direction were redesign completely. They now provide continuous diagonal bracing over the full height of the structure. These exterior grids did not provide all the additional stiffness needed, therefore, another interior braced frame was designed. This braced frame consists of chevron bracing over the full height of the structure to provide architectural accessibility. Along with the increased stiffness of the structure, lateral strength requirements were checked and redesign where needed. The increased overturning moment was determined not to be a design concern.

Breadth Topic One - Building Enclosure:

The relocation of the building to Miami, FL causes water condensation and heat transmission concerns. An analysis of the current building enclosure will be performed and modified accordingly for Miami, FL. This breadth will consist of R-value, air leakage, and condensation analyses. ASHRAE recommendations based on climate data will also be researched and discussed.

Upon analysis of the building enclosure it was determined that a reduction in the insulation layer was achievable. The 4 inch foam glass insulation layer was able to be reduced to 2.5 inches. A bare material cost analysis of this reduction was performed, and a savings of \$185,900 was concluded.

Breadth Topic Two - Architecture:

The relocation of the building to Miami, FL also causes exterior architectural concerns. The author wants the exterior appearance of the building to be representative of Miami architecture. Therefore, research will be performed and discussed concerning the history of Miami's architecture. The building's architecture will be modified based on this research.

Research of Miami, FL architecture included Streamline Modern, Art Deco, and Mediterranean Revival styles. These three styles are prevalent within the area. The author was able to produce an exterior architecture redesign, blending these three styles and the redesigned lateral system.

Masters of Architectural Engineering (MAE) Course-Related Studies:

AE 542 (Building Enclosure Science and Design) and AE 597A (Computer Modeling of Framed Structures) are graduate level courses that will be used within this senior thesis study. The Building Enclosure Breadth Study will utilize learned material of AE 542. An analysis of the curtain wall system will take place. This study will involve an R-value, condensation, and air leakage analyses. These analyses were all learned during AE 542 class work and studies. The main structural depth will utilize AE 597A by incorporating an ETABS model and analysis of the building's lateral system.

This Senior Thesis Final Report will accomplish the following goals:

Goals (Based on Relocation of Building to Miami, FL):

- Redesign building's lateral system to meet code requirements.
- Provide analysis of lateral system through means of ETABS and hand calculations.
- Research, analyze, and modify building enclosure appropriately for water condensation and heat transmission concerns.
- Redesign exterior architecture of building for Miami, FL.