



METROPOLIS

at Dadeland



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AE Senior Thesis

Structural Option



Existing Building

- 28 Stories
- Primarily Residential
 - Lofts, Condos, and Penthouses
- Includes Parking and Commercial Space
- Location
 - Suburban Miami, Florida
 - Part of a “New Downtown”





Current Building

- Structure
 - Concrete
 - 4 to 10 ksi
 - Post-Tensioned Slabs
 - 8-9.5" thick
 - 5 ksi
 - All but S.O.G. and 22 floor
 - Mat Foundation
 - 5' thick
 - Sitting on array of auger-cast piles



Current Building

- Other Aspects of the Building
 - Elevated pool
 - Trailer location
 - Separated air handling systems



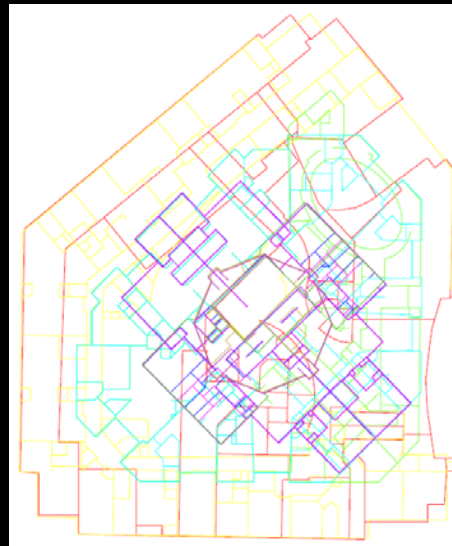
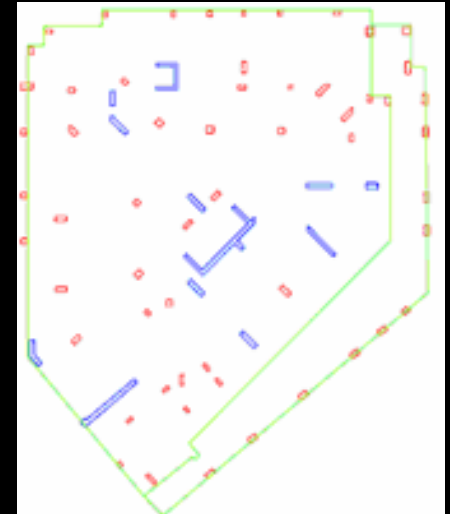
Proposal for Investigation

- Depth
 - Column Gridding
 - Gravity Members
 - Lateral Resistance
- Breadth
 - Electrical
 - Add recessed lighting into units
 - Calculate resulting changes to panel and feeder
 - CM
 - Estimate difference in cost between Concrete and Steel Building



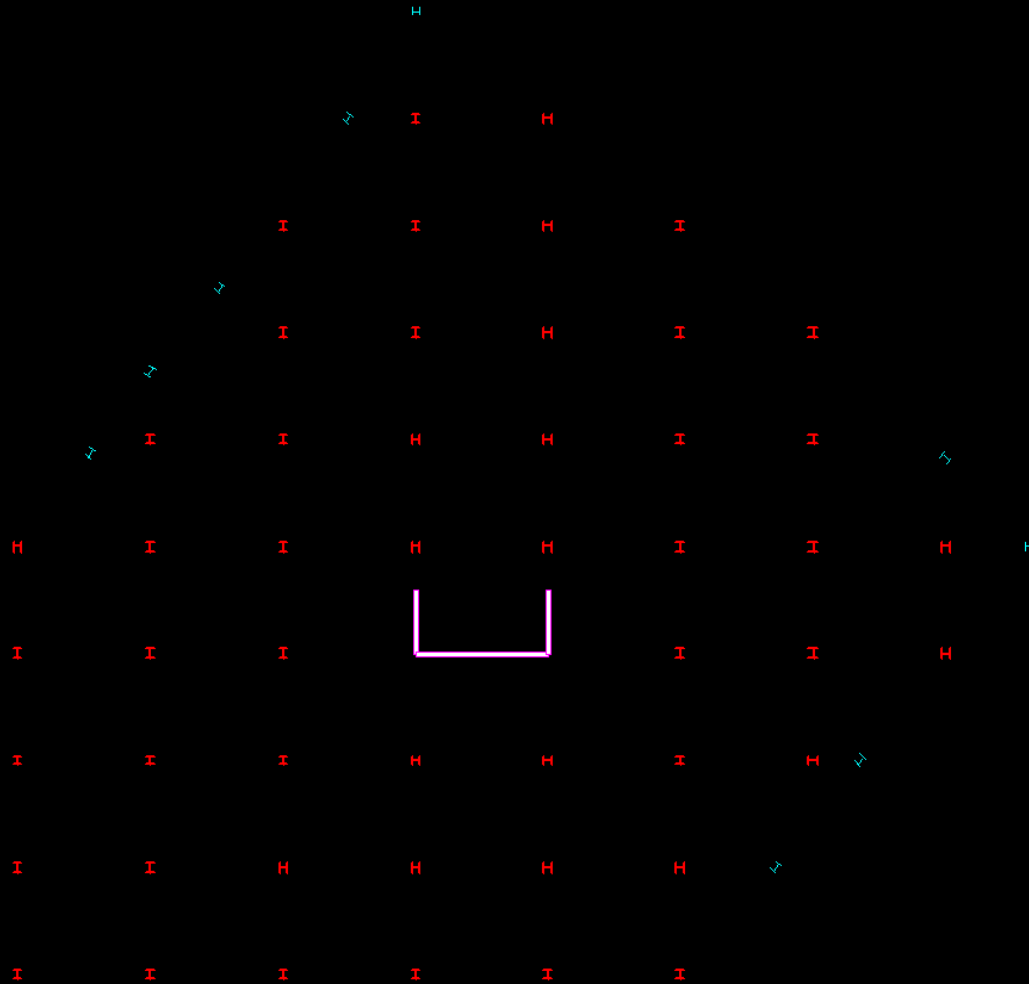
Column Gridding

- Only efficient way to use steel
- Goals:
 - Use good bay ratio
 - 1:1.25-1.5
 - Have all columns lie within walls / existing columns





Column Gridding





Gravity Loading

- Based on prescribed loads from existing building
- Largest loads on 8th floor for fitness facilities
- Composite construction is useful on nearly all members
 - Some larger perimeter beams overstressed the concrete



Lateral Loading

- Seismic is Minimal
 - Not even accounted for in original design
- Large Wind loads
 - 150 mph
 - Easily controlled design

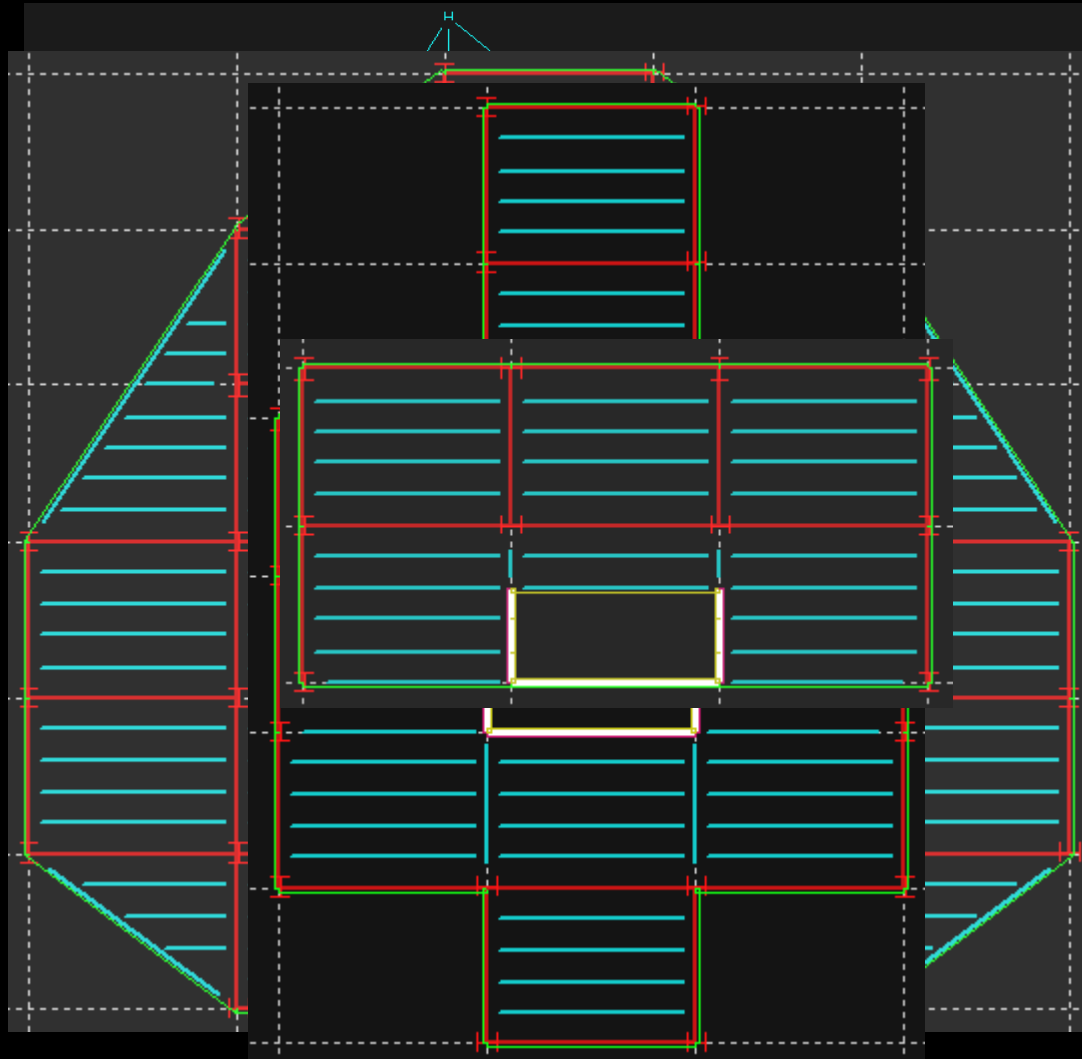


Lateral Framing

- Tried to use as many braced frames as possible
- Limited number of column pairs within walls
- Forced to go to moment frames
- Began to engulf entire grid



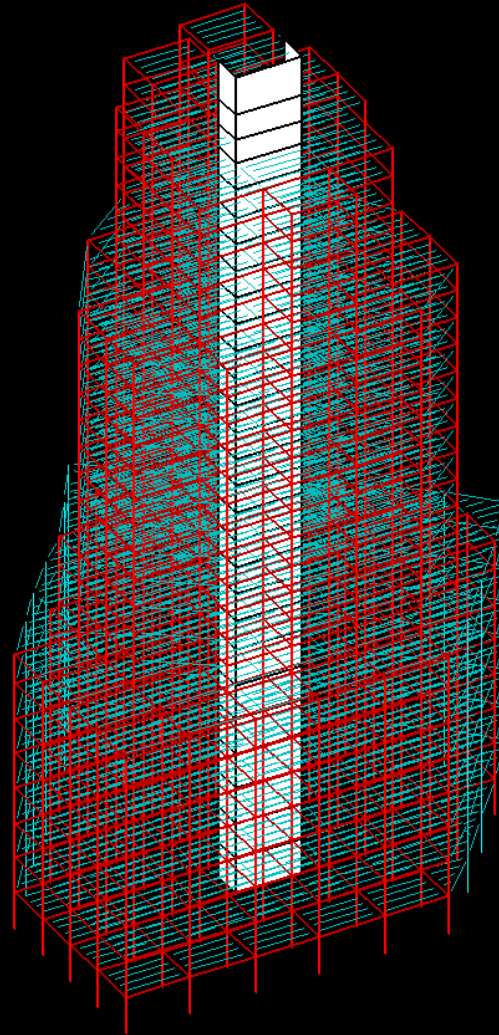
Lateral Framing



*Red indicates lateral frame



Lateral Framing



*Red indicates lateral frame



Lateral Deflections

- Total Building
 - 47.8”
- Individual Stories
 - 1.6”
- Neither is Acceptable
- Many Possible Solutions



Drift Solutions

- More Places for Braced Frames
 - Grid friendly floor plans
- Location
 - Less Exposure
 - Lower Wind Speed





Drift Solutions

- When placed in 90mph wind region
 - 16” in critical direction
 - Compared to 13” of real structure
 - Some stiffer frames may be possible



Breadth Studies

- Electrical
 - Loads from increasing lighting within the unit
- Construction Management
 - Cost comparison between two structural systems

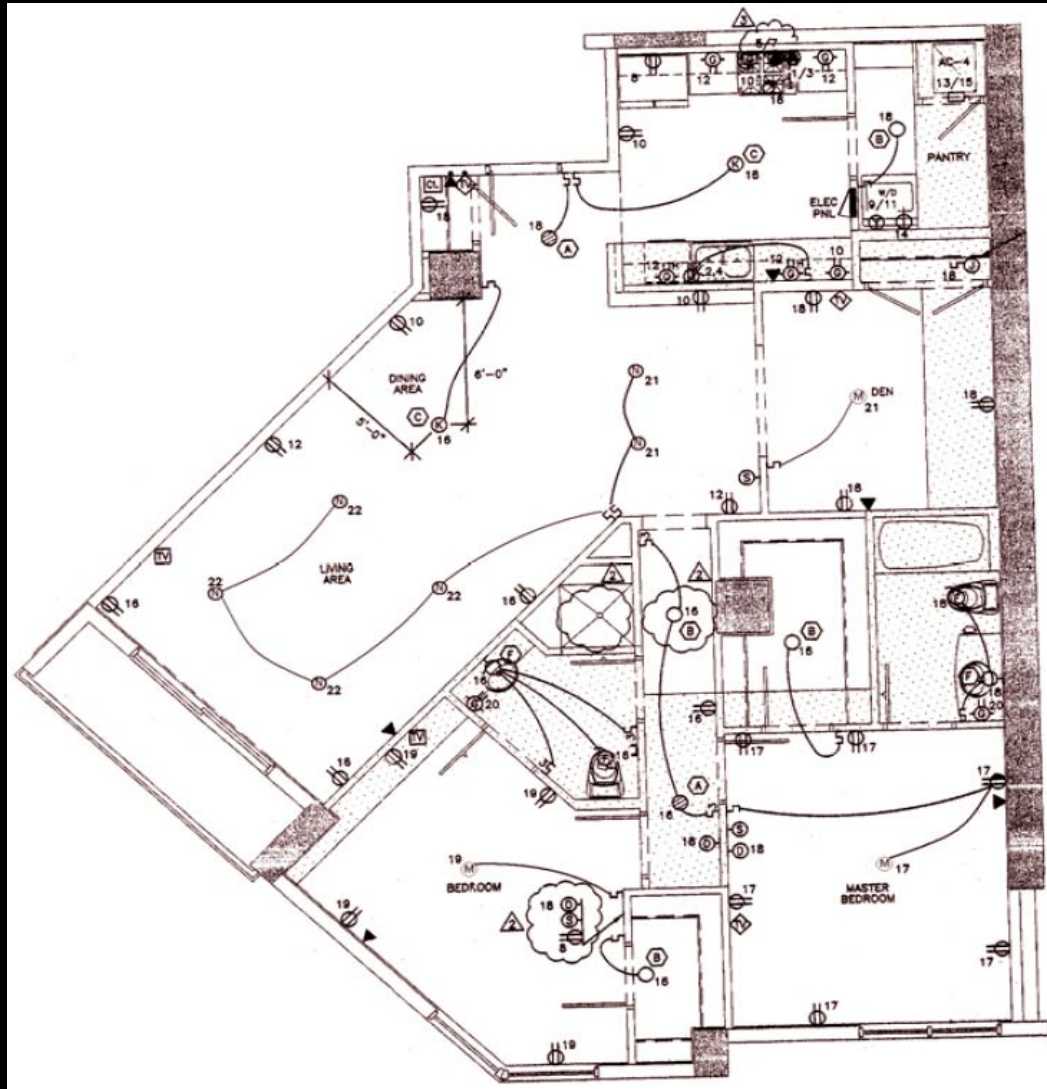


Electrical Additions

- New suspended ceilings encourage use of lights within space
- Added lights require more circuits in the space
- Also increase loads on some existing circuits



Layout





Estimate

- Concrete Structure
 - Forms = \$2.41 Million
 - Reinforcing = \$1.1 Million
 - Post-tensioning = \$4 Million
 - Concrete = \$1.2 Million
 - Finish and Cure = \$200,000
 - **Total = \$9.1 Million**



Estimate

- Steel Structure
 - Steel Members = \$2 Million
 - Deck = \$300,000
 - Concrete = \$300,000
 - Concrete Accessories = \$350,000
 - **Total = \$4 Million**
 - Plus Fireproofing, etc. = **\$15 Million**



Uncalculated Differences

- Savings from smaller foundation
 - Lighter steel does not need 5' mat
 - Approximately \$700,000
- Added cost from additional electrical components
 - Depends on quality of components



Conclusions

- Steel is not viable with given constraints
- Can work if building is originally catered to its use
- Electrical system is a reasonable addition if steel is used
 - Not necessary as the structure currently is
- Cost off steel offsets faster construction



Thank You

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Questions?

All the AE Faculty who answered questions over the past year

And my fellow AE students who were always around to answer random questions as they arose