



Thesis Proposal

December 5, 2003

Executive Summary

The Miranova Condominiums Building in Columbus, Ohio is a 28 story luxury condominiums building with 4 stories of parking for residents and visitors. The structure of the building consists almost entirely of an 8" post-tensioned flat plate slab for resisting gravity loads and a complex arrangement of concrete shear walls for resisting lateral loads. The mechanical system is composed of separate heating and cooling equipment. The residential spaces are heated by electric baseboard heaters placed around the perimeter of the building while separate water-cooled air conditioning units for each condominium accomplish the cooling. The building is clad in a blue tinted glass curtain wall system on the North face and 6" precast concrete panels on the remaining sides. The cladding allows the building to be very open to the city of Columbus to the North of the building and closed off from Interstate highway directly behind the building. This feature of the building causes the building to act as a "book end to the city."

The proposed solution to the problem of the limited ability for a resident to expand their living spaces horizontally or vertically by purchasing an adjacent unit and combining them is to convert the structure of the building from a concrete system to a steel system. By replacing a majority of the shear walls with steel braced frames, the ability to create door openings between condominium units will be much easier. Although the actual locations of openings will be limited because of the braces, there will still be more capability of expansion than with the existing shear walls. The existing post-tensioned concrete floor system will be replaced with a system that combines a 10" long span steel deck in one direction with a concrete slab on form deck in the other direction. This type of system was originally developed and studied by Thomas Murray in the late 1980's and early 1990's. The loads from the combination of decks will be carried by W10 beams and girders. The 10" deck will be placed within the depth of the beams creating a total floor depth of approximately 13". Not only will this system create a greater capability for vertical expansion between condominium units, it will limit the overall height increase of the building compared to other typical steel systems.

The use of a very deep steel deck may also create savings in cost and time for the mechanical system. The proposed thesis will also investigate the possible use of the open spaces in the deck ribs to be used as ducts; therefore, reducing the amount of required ductwork. The thesis will also investigate the use of electric reheat coils in lieu of baseboard heating. The proposed changes will not only affect the structural and mechanical systems, but will also affect the schedule of the project. Although steel takes longer to fabricate, it can usually be erected faster than forming and placing the concrete. Time may also be saved by reducing the amount of mechanical equipment. A study of the required schedule for the new system will be compared with the schedule of the existing system for any possible advantages or disadvantages.