

**ARIC HEFFELFINGER**  
**FORDHAM PLACE**  
**BRONX, NY**  
**STRUCTURAL OPTION**  
**ADVISOR - DR. HANAGAN**



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*Structural Proposal*

A viable solution will be to use an all concrete building as opposed to an all steel building. Due to architectural features, column locations will remain in the same locations; therefore leaving bay sizes the same. Considering the existing, 28' x 28' bay size, the only viable concrete system is a two way slab with drop panels. The new concrete floor system will require replacing the existing lateral force resisting system from concentric steel chevron braced frames to either concrete moment frames or shear walls. Both moment frames and shear walls will be further evaluated to determine which is better suited. Other design considerations will be floor to floor height, duct work / pipe / electrical paths, weight of building, and both story and total building drift.

The design of Fordham Place using a two-way flat slab with drop panels will be done using the existing footprint and column locations of the building. A model of the building will be constructed using a finite element analysis computer program such as ADOSS or ETABS. Parameters such as slab thickness, gravity and lateral loads, concrete strength, etc. will be either hand calculated or assumed and inputted into the model. The modeling program will be used to design reinforcement; however spot checks will be done to assure a satisfactory design. Once, gravity loads are transferred throughout the building and slabs and columns are designed, the lateral system will

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then be considered. Concrete shear walls and concrete moment frames will be considered as possible lateral resisting systems. With both systems, torsional effects can have a significant effect on the lateral design. However if they can be placed so that their center of rigidity is located near the geometric center of the building, the effects will be negligible. Floor deflection, story drift and total building drift will be checked. All designs of concrete elements will conform to ACI 02.

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*Breadth Work Proposal*

*Construction Management*

With a switch from a steel building to a concrete building, impacts will be made on the construction schedule and methods used. Therefore, an analysis of each change in the depth work will be a crucial part in determining which solution is most economical and feasible. One analysis will compare the cost of a concrete slab on composite metal deck supported by steel beams to that of a two way flat slab with drop panels. This analysis will include the price difference due to a change in the lateral system from concentric chevron braced frames to either shear walls or concrete moment frames. Both shear walls and concrete moment frames will be researched to determine which a better option is. Another analysis will be of the construction schedule. This will clearly show critical paths and task durations for optimum construction processes for both the steel and concrete buildings. With all the changes made to the structure, there will be additional construction issues such as material availability, cost, constructability, and labor forces.

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**Mechanical**

As a result of redesigning the structural system, mechanical system issues will arise. Changing the floor system to a two way flat slab will affect a number of things related to the current mechanical system design; such as routes of duct work, optimal mechanical systems used. Running duct work along walls may yield a smaller concrete slab rather than the current design of running it through interior sections of the floor. Also, it may be more efficient to use a totally different HVAC system such as individual units. This could possibly eliminate the need for punching large holes in the slab for duct work. Calculations will be performed to determine whether the current mechanical system is adequate to service the new structural systems. Adjustments to the mechanical system will be made as necessary.