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Structural Option
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John Jay College Expansion Project
New York, NY

Thesis Proposal

Executive Summary

The John Jay College Expansion project is an academic building for the John Jay College of Criminal Justice located in Manhattan. A midrise tower includes classroom, laboratory, and office spaces and reaches a maximum height of approximately 240 feet above 11th avenue. This tower is connected to the existing building by a 5 story "grand cascade".

The project also has a major site restriction: Amtrak tracks cross the South-West corner of the site. This problem was solved by transferring gravity loads over the tracks in two places. Built-up steel transfer girders are used to transfer 5 levels of gravity loads and trusses at the penthouse level of the midrise tower transfer the remaining 9 levels of gravity loads. Perimeter steel plates hang from the trusses at the penthouse level and support the floors below.

This complicated solution to transfer over the trusses calls for a unique and expensive construction method. Therefore, the proposed thesis is intended to simplify the transfer system. Transfer trusses will be moved from the penthouse level and redesigned for the 5th or 6th level. By transferring gravity loads over the Amtrak tracks at the 5th or 6th level, typical steel framing can be used to support all floor levels. This change will also impact the lateral force-resisting systems, which are steel braced frames. In the North-South direction, the transfer trusses act as a coupling beam at the penthouse level between braced frame cores. After studying the behavior of the braced frame core in technical report three, it was found that the coupling behavior was needed to control lateral drift requirements. Therefore, an in-depth lateral analysis will be performed to determine the impact on the lateral system caused by changing the location of the transfer trusses.

Moving the location of the transfer trusses not only impacts the structural system, but it also affects other aspects of the building. An architectural breadth must be implemented to adjust the floor plans to meet functional and aesthetical requirements of exposed steel trusses. A construction breadth must also be studied to determine the necessary changes in the construction methodology to build the new system. To do this, a revised construction schedule will be created and cost differentials will be presented.

Final comparisons between the new and existing structural systems will then be presented based on structural steel weight, cost, incorporation with architecture, and construction time. These criteria will lead to a final recommendation.