

UNION STATION EXPANSION AND RESTORATION

WASHINGTON DC

BREADTH STUDIES



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Structural Option

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EXECUTIVE SUMMARY

Throughout the past three technical reports composed by the author, a detailed look at the existing structural system of the expansion to Union Station, gravity and lateral systems, as well as exploring different floor systems for the building was looked at. All three technical reports have played a role in the decision making of how to address the following two major concerns for Union Station: having an open floor plan for the track, ground, and mezzanine levels and keeping the overall weight of the building low since the soil is considered weak on the site. By addressing the following two concerns as well as trying to come up with a signature concept for the expansion to Union Station in Washington DC, the author went forward with these concepts in mind to come up with the following proposal.

The ultimate goal of this thesis will be to incorporate the following three structural studies:

- 1) Using a composite structural steel system as the floor system for levels one through three
- 2) Incorporating the use of king post trusses as transfer structures on the mezzanine and ground level
- 3) An alternative lateral system composed of shear walls

The main intent is to incorporate the king post trusses not only as a gravity load transfer element that can hold up the new composite steel floor system, but to give a signature expression to the expansion of Union Station as well as keeping the open floor plan to the lower levels. Since a brand new gravity system is being incorporated into Union Station, the existing lateral system of moment frames will be replaced with shear walls and the strength of serviceability of the system will be checked.

Two breadth studies will be accomplished within this thesis. The first breadth deals with the architectural layout of the ground floor. Since the king post trusses will now be on the ground level, moving spaces around as well as determining the correct areas for the busses to park and circulate around will be addressed in this breadth. Within the lighting breadth, a lighting scheme for the king post trusses as well as a new lighting plan for the bus terminal area will be determined.

Within this proposal, a more detailed problem statement, problem solution, and solution method can be found. Since this is a demanding amount of work, a complete breakdown of tasks can be found on page 8 of this proposal as well as a calendar that tracks the preliminary effort to accomplish all the required work. At the very end of the spring 2009 semester, the author will address the work done and present the recommendations concluded to the jury.

SOLUTION METHOD

Architectural Breadth:

Within this breadth, the author will look at the architectural layout for the ground level. Since the king post trusses will be incorporated as not only part of the structural design, but as an architectural feature as well, the author will determine a new functional layout that allows the busses to park by and travel through each truss. In order to achieve the proper use of shear walls as the new lateral system in the expansion to Union Station, moving the mechanical rooms, stairwells, elevator towers, and lobbies around will be accomplished. It is important to note that the new locations of the above mentioned rooms will be addressed in the upper levels as well.

Lighting Breadth:

Since the architecture floor plan on the ground level will change due to the king post trusses, a new lighting system for the level will be incorporated. A lighting scheme will be used to illuminate each king post trusses throughout the ground floor to express the signature idea within the expansion to Union Station. In addition to lighting the king post trusses, a new lighting plan for the bus terminal on the ground floor will be designed as well. This is to ensure the proper balance between natural day lighting and the required foot candles needed to light this portion of Union Station.