



The New York City Bus Depot

New York, NY

EXECUTIVE SUMMARY:

The senior thesis final report represents a full academic year of study on a particular building. This study includes analyses on the building's existing systems and proposals for new systems to better the constructability, efficiency, and functionality of the building. This report presents a redesign of the New York City Bus Depot's lateral system. This redesign replaces the moment frames of the original bus depot design with buckling restrained braced frames for the purpose of making construction more efficient both in terms of cost and schedule. The redesign also serves to solve deflection problems on the third floor mezzanine and high roof as well as to alleviate the lateral loads transferred to the foundation in the weak soils of the site.

The New York City Bus Depot is a three story building divided into three separate structures. The third structure, C, contains a third floor mezzanine and a high roof structure. This mezzanine level contains office space, and, in its original design, is not currently connected to a lateral system frame in the East-West direction. Instead, East-West lateral forces are resisted only by posts continuous from the third floor to the high roof. This causes large deflections under design conditions which can be supplemented by the vibrations of the busses and other large vehicles below. For these reasons, the laterally braced frames along column lines 1 and 5 are moved east to span between column lines S.1 and U and connect both the roof and high roof sections for consistent lateral control.

This shift in frames results in a need for reevaluating the exterior architecture of the building. The move of the lateral frames allows for an additional set of windows to be placed between column lines Q and R on the north and south facades. Analysis shows, however, that daylighting levels are already satisfactory for a majority of the day; the addition of a window, small relative to the length of the wall in the bus parking area, does not add any measurable amount of light to the space.

A study of construction impacts is also conducted, as there are changes in materials and methods. This change from moment frames to buckling restrained braced frames, which leads to the increased frame stiffness, lowers the cost for the lateral systems of the building by 8%. By decreasing the complexity of the connections, the lateral frame erection time is shortened, aiding in the value engineering of the design.

The following pages present a summary of the original design and the newly proposed design of the New York City Bus Depot. The methods for properly completing this redesign are outlined within the report and include the codes, standards, references, and analysis programs utilized. The redesign relies heavily on the 2006 international Building Code, 2010 New York State Building Code, Ram Structural System, and SAP 2000.

The goals of this redesign are met, as is stated in the outcome of each section of the report and visible through the numerous calculations and analyses present. This design represents an innovative way to lower the forces transferred into the site class E soils of the building site while economizing the design by decreasing construction costs and schedule durations.