Executive Summary

40 Bond is located on a 13,600 ft^2 parcel of land located on Bond Street between Lafayette and Bowery Street in New York City. The footprint of the building is 64'-8" by 134'-4" and the building has an overall height of 152'-0" from the cellar to the top of the penthouse structure. There is a 20'-0" setback at the seventh floor with a roof terrace that occupies this space. Typical spans range from 19'-6"×25'-0" to 23'-2 ½"×25'-0" and floor-to-ceiling heights range from 10'-10" to 14'-0". A total of 23 condominium units and 5 townhouses are contained within this building and the plans vary as the type and number of units change throughout. In addition to the building there is also a 140'-0" long, 22'-0" high cast aluminum gate located along Bond Street that was designed to withstand the lateral forces that are present at this site.

After reviewing the existing conditions, examining alternate framing systems and verifying the current lateral system, it is necessary to propose certain changes to 40 Bond that will develop into a study for the remainder of thesis coursework. For the structural depth, the transfer system will be redesigned using Vierendeel trusses in place of the transfer beams at the second, third and seventh floor. The architecture governed the dimensions and resulted in either deep, narrow beams or wide, slender beams; all of which were overly congested with reinforcement and required couplers because there was not a sufficient amount of area for typical splicing to be done. The trusses aim to work more efficiently in transferring loads and allow for an opportunity to incorporate more fully the cast iron architecture prevalent in lower Manhattan. An optimization study will be done on the lateral system and calculations will be done to determine if the existing 30" mat foundation can resist the forces provided by the gravity and lateral systems.

An architectural breadth will be studied due to the introduction of the Vierendeel trusses. Although these proposed structural elements may increase in width in comparison to the existing 10"×10" perimeter columns, the possibilities associated with alternating the architecture at transfer levels can further develop the cast iron typology while still maintaining its modern charm. An additional breadth topic relates to the cladding system. Because of the highly specialized nature of the curved glass and copper mullions, design and detailing must be done to ensure the current cladding can be used when the architecture is altered. Connections to the structural elements must also be considered along with research into the thermal and moisture protection provided by the system.

Breadth Topic 1 – Facade Architecture Study

Figure 1 – 40 Bond and Neighboring Buildings

Figure 2 – Old Stern's Department Store (Credit: *Cast Iron Architecture in New York*)

Located in the NoHo (North of Houston Street) neighborhood of Manhattan, 40 Bond Street is an iconic piece of architecture intertwined with an equally interesting structure. The idea behind this project is a reinvention of the cast iron building typology that is prevalent in this area of New York City and can be seen in buildings located on either side of 40 Bond (Figure 1). With the introduction of Vierendeel trusses, an architectural breadth will be required to redesign the facade. Because the members of the truss will differ from the existing 10"×10" columns, the mullion arrangement will need to be altered in order to enclose this new structure. To stay consistent with the original architecture, the new structure will also be completely hidden within the facade. One possible change could include conical capitals that may be needed at the top joints of the truss to provide adequate room for the required reinforcing at that connection. A change like this would directly mimic the columns seen on the storefronts and apartment buildings throughout lower Manhattan. Another possibility is that the spans of the vertical members of the truss will most likely exceed the 6'-3" spacing of the 10"×10" concrete columns. Therefore at the second and third floor where the trusses will be required, a variation in the mullions will be produced similar to the varied column locations seen on the front of Old Stern's Department Store on West 23rd Street in 1878 (Figure 2). Additional photographs taken from *Cast Iron Architecture in New York* by Margot Gayle and Edmund V. Gillon Jr. are located in Appendix A.

The aforementioned possibilities are just a few that may result from the structural depth study. When going through the iterative truss analyses, the different options are going to be designed with the intent to not only efficiently transfer loads, but also to provoke architectural interest and complement the remaining facade. Although historic guidelines are not imposed on this building, trying to incorporate it more closely with the surrounding architectural context is one goal for the overall thesis study.

Breadth Topic 2 – Thermal, Moisture, and Facade Connection Study

40 Bond Street is attached on both its east and west faces. The north and south side then display two distinct facades. Along cobble-stoned Bond Street there are 5'-0”×10'-0” tilt-and-turn operable aluminum windows tinted to meet the necessary shading coefficient surrounded by bell-shaped green glass mullions (Figure 3). The Crisunid Cridecor curved glass produced by Cricursa in Barcelona is a combination of 5mm thick green glass laminated to 5mm thick clear glass. The mullions have a gray and green ceramic frit pattern on the edges of the bell to cover the frame but eventually lead to translucent glass at the apex. Below this layer of glass are No. 8 mirror stainless steel plate covers that allow for interesting reflections of the surrounding neighborhood. A rain screen of aluminum frames is also a part of the window assembly. This complicated facade was put in place by ornamental ironworkers and the fine craftsmanship is seen in the detail (Figure 4). The north face employs the same windows but the material used for the mullions is replaced with pre-patina copper (Figure 5). Over time this material will develop a green patina and be closer in color to its parallel face.


Figure 3 – South Facade


Figure 4 – Typical Mullion Intersection

The proposed study is to examine the facade components, how they interact together, how they are required to connect to the structure, and how the architectural changes made within this thesis study will be constructed. Information is provided by Cricursa, the manufacturer of the curved glass from Barcelona, on additional shapes, forms, allowable radii and installation. The existing structural slab has 1” slab depressions on either side of the perimeter concrete columns, so it is likely that some type of alteration will need to be made to the trusses to provide an adequate connection plane. Similar to the information required to work with the glass mullions, research will be done to determine how to produce the copper shapes necessary to enclose the Vierendeel truss as well as to understand how the mullions work as a system. In addition to creating facade elements to enclose the proposed structural members, research will also be


Figure 5 – North Facade

done in regards to proper thermal and moisture protection of this cladding system, including the operable aluminum windows.

Appendix A

1-5 Bond Street (1880)

Old Bond Street Bank, 330 The Bowery (1874)

453-455 Broome Street (1873)

Old McCreery's Dry Good Store, 801 Broadway (1868)

351-353 Canal Street (1871)

116-118 Franklin Street (1869)

(1974) *Cast Iron Architecture in New York,* Dover Publications, Inc., New York,