

## **STRUCTURAL SYSTEM REDISIGN**

COST ESTIMATE  
ARCHITECTURAL REDESIGN

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CENTER

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## **EXECUTIVE SUMMARY**

The Northbrook Corporate Center is a 5 story building located on 1150 Northbrook Drive, Philadelphia, PA. After its completion in the spring of 2006, the building will provide roughly 104,000 square foot of usable office space. With each story being 14 feet high, the total height of the building is 74 feet. The building will provides a parking garage on its lowest level.

The structural system of the building consists of steel columns, composite steel girders, and composite steel joists. Steel joist support a 4 inch concrete slab on metal deck; joists are spaced at 3 feet o.c., and span 30 feet between the girders. Steel girders, typically W24x68, are connected to steel columns, typically W12x72, with a moment resisting connection in order to resist the lateral loads.

This report provides a background description of the Northbrook Corporate Center, and provides a detailed description of the building's lateral load resisting system. In the report it is proposed that a braced frame system can be more feasible system for the building. The redesign of the lateral resisting system is motivated by the high costs of the currently used moment frame system.

The main point of interest of this report is the redesign of the lateral force resisting system. The analysis of a load development and distribution, placement of braced frames, and the design of each individual member of the braced frame system are included in this report. This report also includes the design of additional columns, additional footings, the redesign of affected columns, connections, and footings. Also a detailed cost estimate of both, the moment frame and the braced frame systems, and their cost comparison calculations are performed as a breadth study of this report. The results of these estimates show that the braced frame system is less expensive than the moment frame system by about \$90,000. This advantage, however, is counterbalanced by the unfavorable impact the redesign system has on the layout of the interior space. Two of the braced frames have blocked the access to the two handicap parking spaces and the main

traffic path in the electrical room. To correct this problem an interior space layout of the garage level was redesigned as a part of the architectural breadth study. The redesign of the electrical room was successful; however, one parking space was lost in the redesign of the garage layout.

There are several problems with the redesigned system. First the overturning moment of braced frames C and D is questionable. Second, the flexibility of the interior design is slightly altered. And thirdly there is mistake in the seismic load development section of this report, which leads to more uncertainty of the accuracy of the overall design.

Because of the stated problems this report concludes that the braced frame system is not a more feasible lateral load resisting system for the Northbrook Corporate Center.