EXECUTIVE SUMMARY

The Center for Science & Medicine is an 11-story research laboratory located in New York City's Upper Manhattan. Situated within the building is a spacious lobby area, 6 floors of wet lab research space, 1½ floors of clinical space, a clinical trial area, and space for research imaging. The building stands a total of 184'-0" above grade, with a typical floor to floor height of 15'-0." It is a steel structure designed with a core of braced frames in the center of the building and moment frames around the perimeter. The footprint of CSM is approximately 172 feet by 200 feet.

Courtesy of Skidmore, Owings and Merrill, LLP.

The primary goal of this report is optimization of existing design. Several building systems and processes will be evaluated and redesigned with efficiency as a driving factor. Specifically, the optimization of the following items will be addressed:

- Lateral load resisting system
- Construction means & methods of this system
- The design and coordination process
- A typical laboratory lighting system

Depth Study: Lateral System Re-Design

At its current phase of design, the Center for Science and Medicine has been planned to utilize a combination of perimeter moment frames and core braced frames to resist lateral loads. After careful study of this system, it has been determined that moment frames are not significantly stiff, due to their double-heighted configuration, and braced frames pose coordination headaches as well as constructability issues. Therefore, an alternative system will be proposed to in an attempt to eliminate these inefficiencies.

The lateral system re-design consists of a core-only system of coupled shear walls which replace the braced frames currently existing at the building core. These shear walls are designed to resist 100% of the lateral load in both directions, therefore also eliminating the need for perimeter moment frames. It has been determined that the proposed core-only system provides more stiffness than the current dual system, provides added resistance to uplift, and presents a more efficient means of lateral force resistance. Moreover, the proposed design is expected to require less construction time while saving cost in the elimination of expensive moment connections and heavy framing members.

Breadth Study 1: Construction Management & Building Information Modeling (BIM)

One of the unique aspects of the Center for Science & Medicine is that it has been designed in 3D, utilizing BIM (building information modeling) technology. Since this is a relatively new design tool in an industry based on historically-rooted standards and practices, it is a question as to

whether this cutting-edge design method will truly pay off. This breadth study investigates the BIM implementation techniques used on this project by Skidmore, Owings and Merrill, evaluates the advantages and disadvantages of the technology, and identifies lessons learned by the project team. From the research conducted, it was determined the BIM is, indeed, a valuable and pertinent design tool with its potential benefits far greater than its shortcomings. Building information modeling is the future of the AEC industry, and the successful implementation of the technology by SOM can serve as an example to other firms adopting the software.

Breadth Study 2: Laboratory Lighting Redesign

Lighting can be critical in laboratory spaces, where important procedures are carried out and visibility is critical. There are 6 typical "wet" laboratory spaces in the Center for Science and Medicine, and investigation has determined that the lighting systems of these spaces have actually been overdesigned, almost with too much care. Illuminance levels on the work plane exceed IES target ranges for laboratories, and lighting power density exceeds the limit set forth in ASHRAE Standard 90.1-2007. This breadth study proposes an alternative design to the existing lighting system in an attempt to reduce illuminance levels and LPD. The redesign will consider efficiency, aesthetics, and environment in the selection of new luminaires. Final design of the space successfully achieved target illuminance levels and lighting power density. Thus, this optimized system can be put in place throughout the building at every wet lab location to reduce energy use and better comply with industry standards.