

## **Executive Summary**

The Commonwealth Medical College is a brand new state of the art medical science building, completed in April, 2011 with over 185,000 square foot of building space. It is located on an urban setting, in Scranton, PA. The cost of the entire project was around \$120 million, at over \$600 per square foot. TCMC is clad in brick, stone, and glass, with a modern architectural look compared to the surrounding buildings. The main gravity system is composite steel deck with concrete topping and steel beams resting on steel columns. The lateral system consists of 15 moment frames scattered throughout the building.

This report emphasized on two redesigns of the original lateral structure, from a given problem statement that the author was interested in. Because the existing structure is so well designed to meet all code requirements, nothing can be done to improve the building under the current scenario. Therefore, a new scenario was created in which The Commonwealth Medical College was proposed to be built on a typical urban site in Miami, FL. The new structures were designed to be adequate for both strength and serviceability at this new site.

The two new redesigns were steel moment frame and chevron braced frame. Having steel moment frames will increase the current building weight by approximately 5%, compared to a 1% increase by braced frames. Also, moment frames are around three times the cost of braced frames. It was determined that braced frames are a much better choice than moment frames in terms of strength, serviceability, cost, and constructability. However, moment frames have more architectural freedom.

In addition to the lateral system redesigns, three breadths were also undertaken. The first breadth was on façade design. A rainscreen cladding system, TerraClad Rain Screen, made by Boston Valley Terra Cotta, was chosen for the new outer façade of TCMC because of its advantages in the new site. As for glazing, laminated glass units designed as a sacrificial ply were used to handle debris loading.

The second breadth was on solar panel design. It was easy to see the great opportunities for solar energy in Florida, so a solar panel system was designed. The model of the panels chosen was the HIT Power 220A, made by Panasonic. This model has the highest output of energy on cloudy days. The inverter was chosen to be SMA Sunny Boy 3800 because this was recommended by Panasonic for this 220A model and this inverter is built to cool itself, which increases its lifespan. The solar panels would save the owner approximately \$10,000 per year and the whole system will have a payback period of approximately 27 years.

The last breadth was on small mechanical and electrical modifications. The number of steam boilers was cut down because it wasn't needed anymore. Most importantly, a more powerful dehumidifier was added because Miami is very humid compared to Scranton. The model chosen for the dehumidifier was the RLNL-G dehumidifier, made by Rheem. The only main electrical change was from a simply electrical gird connection to a gird-tied connection. This allows TCMC to use the energy from the solar panels and energy from the electrical supplier at the same time.