

# New Solution for a Historic Landmark Saves Energy and Maintenance Costs

Lighting a national historic landmark while drastically reducing energy was not an easy task, but the results were very dramatic for one of the world's largest libraries, The New York Public Library. Through the Consolidated Edison, Inc. (Con Edison) Load Reduction Program, Quality Conservation Services, Inc. (QSC), New York, N.Y., developed a lighting program that highlights the library's interior architecture and reduces more than 1.35 million kilowatt hours (kWh) and 1,485,000 lbs. of carbon dioxide annually.

Completed on May 23, 1911, the library stretches along Fifth Avenue and fills two blocks from 40th street to 42nd street. More than 15 million visitors annually are greeted at the library's plaza stairway entrance by two magnificent lions, named Patience and Fortitude by Mayor Fiorello LaGuardia, for the qualities that he believed were needed by New Yorkers during the Depression years. The lions are set against the huge front expanse of Vermont white marble and its multiple tiers of stairways, fountains and sculptures, culminating with the visual impact of the triple-arched portico based on Roman triumphal arches.

The rooms in the library, containing treasures like the Gutenberg Bible, Thomas Jefferson's manuscript of the Declaration of Independence, George Washington's Farewell Address and Shakespeare's First Folio, reflect the extraordinary workmanship and artistry of the craftsmen and designers of the early 1900s. Many of the rooms have intricate, ornate frescoes, gilded plaster ornamentations and surrounding panoramic views.

To light the facility, the library was using a variety of lighting systems for both functional lighting and ambiance. One of the big challenges was to convert the chandeliers to more energy efficient lighting, while maintaining lumen levels. For instance, the Rose Reading Room has 20 massive four-tiered chandeliers that each contained 90 60-watt incandescent clear globes. As a result, the lighting system had to be re-evaluated to determine potential lighting efficiencies.



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## Team Approach

Quality Conservation Services, Inc. (QCS) knew that they would have many challenges while developing this project. Thus, veteran Energy Specialists, Ken Adams and Lisa Monroe, both from QCS, were selected to begin assessing the potential to deliver energy savings and demonstrate the effectiveness of current compact fluorescent lamp (CFL) technology. Adams and Monroe evaluated the lighting systems and developed a comprehensive lighting plan under one of Con Edison's Load Reduction Programs, which is administered by SESCO, Inc.

To complete the massive lighting project, James P. Maitilasso, President of QCS, assembled a team of manufacturers, suppliers and service personnel, which included Technical Consumer Products (TCP), Aurora, Ohio, and AM Conservation Group, Inc., Charleston, S.C., who were responsible for the majority of the products for the project. Personnel involved in the project from QCS included Karen West, Program Manager; Larry Dukes, Senior Technical Advisor; and Kurt Benziger and Ken Parlin, who were supported by their design, engineering and auditing team. David Natarelli from TCP assisted the team, who worked diligently to collectively specify, test and recommend all of the diverse lighting improvements.

Maitilasso, West, Dukes worked with Joanna Pestka, AIA, the library's VP of Capitol Planning and Facilities Operation, James Minto, Director of Facilities and Christopher A. Williams, Senior Property Manager as well as the library's Historical Preservation Committee and senior management team and various consultants and internal professional departments. Input was secured from the library's architect and their architectural and lighting designers. In addition, comments from various benefactor committees and the general public were all solicited.

### Criteria: Energy Reduction and Appearance

The team found that most of the library's existing fixtures were large ornate, bronze and glass hanging chandeliers. Each grouping of fixtures was consistent with the general purpose and appearance of the area. In some cases, the hallways resembled that of a cathedral, extending the entire width of the two-block long building. Replicating the light pattern, light distribution and light quality while reducing energy were extremely important, but it was the "overall appearance" that was the library's primary criteria.

QCS initiated a sampling process that took place throughout every location in the building. Each area, each hallway and every room has different lighting fixtures and unique aesthetic requirements. As a result, the color of the lighting or color temperature, measured in degrees Kelvin (K), were based on the specific application, the color of the walls, certain appointments within the space and "color reflection" that would meet the pre-CFL "color" condition.

For the 20 chandeliers, which were comprised of 90 60-watt incandescent clear globes burning 5,400 watts per chandelier, the solution was a 9-watt, 2700 K, G20 CFL that successfully matched the light value and color of the pre-existing incandescent bulbs. The TCP globe solution now only burns 810 watts per chandelier, but allowed a reduction of 4,590 watts for each chandelier. By switching to the CFLs, the library maintenance electrician no longer spends the entire day replacing the failed incandescent G20 60-watt bulbs.

In addition to uniquely shaped and specific color needs, QCS also found 150-, 200- and 300-watt incandescent bulbs located in many domed chandeliers throughout the building. For this application, QCS selected TCP's 289 series 32- and 42- watt, 2700 and 4100 K, spiral CFLs to meet color and light levels requirements.

QCS also investigated possible solutions for the High Intensity Discharge (HID) fixtures. They determined that the HID fixtures could be replaced with one of the newest and most efficient large wattage CFLs: a spiral based lamp with a separate electronic ballast. The existing 250-watt metal halide lamps, which were rated at 285 watts, including the ballast, were replaced with 85-watt CFLs. While the wattage was reduced, lumen levels were maintained.

The Dorot Jewish Division of the library, which contains one of the greatest Judaic collections in the world, had in-line series of 48 magnetic ballasts operating 24 250-watt metal halide lamps. The fixture was a pendant-mounted, marbled base-down dome producing an up light on the white ceiling. The heat and "hum" produced by the series of ballasts in the research room were a major concern for Christopher Williams, the library's Building Manager. However, Michael Terry, Dorot Chief Librarian, had one another concern. Terry wanted the light level at the scholar's desk height to be three times the lumen level of the existing lighting source. QCS removed all of the magnetic ballasts

and re-wired the dome components to accept the new electrical system. QCS also took out the down-light shield and altered the fixture to accept the installation of two of 42-watt, 4100K CFLs. Heat and noise were instantly reduced, while light levels were increased.

In the Lionel Pincus and Princess Firyal Map Division, the team faced another obstacle. The Map Division, which houses over 431,000 maps and over 16,100 atlases from the 16th century to the present, has two walls of windows and four three-tiered chandeliers. The chandeliers had clear 60-watt incandescent globes in the lower tiers and 50-watt PAR lamps in the top row, which highlight the ornate ceiling's panoramic painting and gilded figures. The chandeliers are on a dimming circuit.

Together, QCS and TCP provided a "removable cover" attached to the dimming 9-watt CFL, shaped like a G30 incandescent bulb, for the lower two tiers of the chandelier. Meanwhile, an 11-watt CFL with a reflector was installed for the third tier's up lighting, which highlighted the magnificent ceiling and surrounding appointments. This task was accomplished by isolating the dimmer circuit that was serving the top tier of the chandelier.

In other areas of the library, high wattage incandescent bulbs, some as high as 300 watts, were damaging some of the wiring and socket components. The replacement of the high temperature lamps with the much cooler CFL technology not only helped to preserve the lighting system components, but also enabled a 70 to 80 percent reduction of the heat generated by the incandescent bulbs as well as reducing maintenance cost.

Williams said, "Some of these fixtures are original, 100 years old, and the great reduction in the number of times that these historic and irreplaceable fixtures have to be handled is very important to maintaining their performance life, which added another dimension to the value of the project."

### Bright Future

Overall, the new lighting system sustained or improved 5,311 fixtures, without the library incurring the cost of materials and labor, and substantially reduced the energy demand on New York's electrical distribution grid. In fact, the project reduced an estimated 1,350,000 kWh, which will save the library more than \$242,962 annually. The library will also benefit from the extended life of 10,000 hours on average provided by the CFLs in both maintenance and purchasing costs compared to the incandescent bulbs, which only last an average life of 1,000 to 1,500 hours.

Just as important, nearly 1,485,000 pounds of carbon dioxide (CO2) were eliminated annually. Other environmental effects were a 10,118 lbs. reduction in Sulfur Dioxide (SO2), and 3,869 lbs. reduction in NO2. ■

<b>Total Lamps Improved</b>	<b>5,311</b>
<b>Total kW Saved</b>	<b>308.172</b>
<b>Estimated kWh Savings</b>	<b>1,349,793.36</b>
<b>Estimated Energy Savings @ \$.18 kWh</b>	<b>\$242,936.00</b>