SOLUTION OVERVIEW
The Boston Public Library’s Central Library in Copley Square opened in 1895, when architect Charles Follen McKim completed his “palace for the people.” As part of a major renovation project, the facility, which serves as headquarters for the Boston Public Library (BPL), was selected to undergo improvements to its energy management system which was significantly outdated and inefficient. As a result of these efforts, the Central Library has realized an annual energy savings of 24% and annual cost savings of 17% from Phase I renovations.

In 1972, the BPL expanded the Central Library with the opening of an addition designed by Philip Johnson. Today, the McKim building houses the BPL’s vast research collection and the Johnson building holds the circulating collection of the general library. In 1986, the National Park Service designated the McKim building as a National Historic Landmark citing it as “the first outstanding example of Renaissance Beaux-Arts Classicism in America.” Within the McKim building are fine murals series, collections of rare books and manuscripts, maps, and prints, and gallery space for displaying the numerous treasures assembled over the past 160 years. Amenities include a restaurant and café, an inner courtyard, and several Wi-Fi accessible reading areas. The Johnson building occupies ten levels, including four levels of public services, one level of behind-the-scenes library processing and administration services, four levels of book stacks for the research collection, and one level shared by utilities, maintenance, and stacks. New overall renovations to the Johnson building include interior design and exterior landscaping, new digital elements, beautiful new spaces for studying and reading, refreshed collections, and new public computers.

SECTOR TYPE
Local Government

LOCATION
Boston, Massachusetts

PROJECT SIZE
940,000 Square Feet

FINANCIAL OVERVIEW
$91,800

https://betterbuildingssolutioncenter.energy.gov/showcase-projects/boston-public-library-copley-square-branch
For more information, visit https://betterbuildingssolutioncenter.energy.gov
SOLUTIONS
The Central Library in Copley Square installed its first generation Direct Digital Control (DDC) energy management system (EMS) in 1984. This system only provided basic, scheduled start/stop operations. To improve system performance, the BPL installed a state-of-the-art energy management system to integrate legacy HVAC controls equipment and introduce optimal start and stop times along with HVAC operations based on outside temperature conditions.

Most of the heating and cooling distribution systems are controlled via electro-pneumatic control transducers. Some newer air handling units and fan control units have been installed over time, but did not integrate well with the 1980’s vintage EMS. The new EMS monitors outdoor conditions and optimizes equipment run times. As outdoor air temperatures approach the library’s balancing point, the HVAC occupy command will be initiated closer to the building scheduled opening time. In addition, the EMS has the ability to integrate other energy using systems such as lights, security, and water use to allow building management greater control of the entire building’s operation. The new EMS allows BPL facilities staff to monitor aggregate building electrical load in real-time, and has built in protocols for unoccupied/occupied settings, as well as a custom-built load-shed protocol. The load shed protocol shuts down banks of lighting in non-public stacks of the library and modestly sets back temperatures throughout the building using variable frequency drives (VFDs) on most major HVAC mechanical components. This allows the library to shed between 200-400 kW on command with little to no impact on library visitors. This protocol is used in a formal demand response program, as well as regularly scheduled voluntary curtailments.

OTHER BENEFITS
The City of Boston leveraged the new Green Communities Act (MGL 25A, Sec. 14) which allows municipalities to procure projects under a design-build format versus the traditional design-bid-build format. This project was a valuable learning exercise as the BPL discovered that projects under the design-build methodology are implemented faster than design-bid-build procurements.

Since the Central Library’s EMS was one of the first projects to take advantage of the new procurement procedures under the Green Communities Act, the city was faced with overcoming the challenges of obtaining city stakeholder buy-in, implementing the procurement procedures, and developing new construction protocols. To date, Boston has carried out 42 projects across the city’s 25 library locations since 2009, generating over 1.6 million in annual kWh savings.

As part of an Open Government initiative sponsored through the City’s Department of Innovation and Technology, the 5-minute interval electric load data will be made available through Boston’s Open Data Portal. This data will allow library visitors, students, and other interested parties to view near real-time energy data for one of Boston’s most iconic buildings.

As an iconic city structure and an energy-saving success, the Central Library was featured in Season 3 of the Better Buildings Challenge SWAP, launched in Spring 2017. SWAP Season 3 had the Cities of Boston and Atlanta take energy efficiency from planning to implementation in a behind-the-scenes reality TV format. View Season 3 here!
## Annual Energy Use
(Source EUI)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Use</td>
<td>173 kBtu/sq. ft.</td>
<td>131 kBtu/sq. ft.</td>
</tr>
</tbody>
</table>

### Energy Savings
24%

## Annual Energy Cost

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>$2,284,524</td>
<td>$1,878,951</td>
</tr>
</tbody>
</table>

### Cost Savings
$405,573

The Central Library in Copley Square Exterior

For more information, visit [https://betterbuildingssolutioncenter.energy.gov/showcase-projects/boston-public-library-copley-square-branch](https://betterbuildingssolutioncenter.energy.gov/showcase-projects/boston-public-library-copley-square-branch)
The Central Library in Copley Square Interior

Children’s Library Entrance

https://betterbuildingssolutioncenter.energy.gov/showcase-projects/boston-public-library-copley-square-branch
For more information, visit https://betterbuildingssolutioncenter.energy.gov