



## **SHOWCASE PROJECT: CAMBRIDGE HOUSING AUTHORITY: FRANK J. MANNING APARTMENTS**

### **SOLUTION OVERVIEW**

Frank J. Manning Apartments is a 19-story concrete high-rise owned by Cambridge Housing Authority (CHA), originally built in 1976 with 198 units and intended as public housing for elder and disabled residents. The building was designed when electricity costs were low and concrete brutalist exteriors were popular. Since then, operating costs have increased significantly. Concrete proved ill-suited to New England winters; the building envelope was designed without thermal breaks, causing significant energy loss through the exterior.

After nearly 40 years of continuous operation and only isolated repair work, the building's concrete exterior was scaling and subject to leaks, drafts, and negative pressure. The building was designed as a master-metered "all electric" high-rise with electric resistance heat and window air conditioners in units. An attempted water fixture retrofit had failed because the building was unable to achieve the pressure necessary to accommodate low-flow fixtures.

By 2015 the property had an ENERGY STAR® score of 1, benchmarked as one of the most inefficient buildings in the Commonwealth of Massachusetts.

The property is in an extremely dense urban area in the Central Square neighborhood of Cambridge, with improvements constrained due to the small .04-acre footprint. The location remains popular with residents due to its convenience and proximity to services.

### **SECTOR TYPE**

Multifamily

### **LOCATION**

Cambridge, Massachusetts

### **PROJECT SIZE**

160,580 Square Feet

### **FINANCIAL OVERVIEW**

Project Cost \$66,000,000

### **SOLUTIONS**

CHA engaged an architectural firm to work on existing conditions and schematic plans while the

Authority established a means of funding the overall modernization scope. From prior experience with a similar high-rise, CHA knew how to leverage operational energy savings to achieve higher equity investments.

The integrated design plan allowed the property to be certified under the Enterprise Green Communities substantial rehabilitation program. In total, the project has reduced energy intensity by 60%, with over \$350,000 in annual operating savings.

The project scope was a complete modernization of the building and immediate surroundings, renovating a small park and creating a building entrance canopy and semi-circular driveway to allow for resident drop off and pick-up. Balconies were enclosed to create more usable community space and six additional units were added on what was formerly CHA's administrative space. A number of new community spaces were created, and all units were completely renovated.

## **Project Details**

The energy scope included installation of a CHP cogeneration system, new condensing gas plant and chiller, upgrades to the building envelope and windows, new LED lighting and water efficiency upgrades.

Building envelope: New exterior clad envelope rated an effective R 19, operable windows with a U value of 0.24, and interior unit air sealing.

HVAC: New high-efficiency condensing gas plant and high-efficiency chiller installed in a new penthouse constructed on the roof and distributed to units via a 4-pipe fan coil system. Each unit has a programmable thermostat monitored via a building management system. Building ventilation is provided to units and common areas via a roof top energy recovery system.

Combined heat and power: The building features a combined heat and power (CHP), or cogeneration system which provides heating and domestic hot water, while generating free electricity 'behind the meter' at the building.

Lighting: LED lighting was installed throughout, including exterior, corridors, and in units.

Water: Water costs were substantially reduced with the installation of new plumbing risers and low-flow water fixtures, including .08 GPF high-efficiency toilets.

## **Project Financing**

CHA was able to convert the building from the federally-assisted Public Housing Program to the project-based Section 8 Voucher program as part of HUD's Rental Assistance Demonstration (RAD) Program. The project was funded with private activity bonds provided by MassDevelopment, a CHA program loan, equity provided through the Low-Income Housing Tax Credit program, and conventional financing. The local utility provided over \$350,000 of energy incentives.

## **OTHER BENEFITS**

The ENERGY STAR® score rose from a 1 to a 95 while improving overall resident comfort through central air conditioning and unit ventilation. The building's CHP system also reduced carbon dioxide emissions by 1,642 metric tons—the equivalent of 197 homes' energy use for one year— more than 68 percent in four years.

## Annual Energy Use

(Source EUI)

Baseline(2014)



Actual(2018)



**Energy Savings**

**60%**

## Annual Energy Cost

Baseline(2014)



Actual(2018)



**Cost Savings**

**\$350,000**



Exterior view of Manning Apartments before construction



Exterior view of Manning Apartments post construction