



French Apartments Comprehensive steam heating system upgrades helped this affordable rental property enhance tenant comfort and save more than \$69,000 a year.



Project Type
Two-Pipe Steam Heating System Upgrade
Location
Manhattan, NY
Project completion
2014
Base building completed
1929
Building Size
148,000 sf/174 units
Building Type
Multifamily Residential;
Affordable Rental

project team

Project Owner
Related Companies
Project Design & Oversight
Steven Winter Associates, Inc.
Service and Installation
Air Seal Insulation Systems
Ultra Plumbing Inc.
PAR Group
PEPCO
Remediation Specialists, Inc.
Westside Windows
Incentive Provider
NYSERDA
Multifamily Performance Program

primary energy figures

Simple payback
11.3 years
Annual ROI
\$69,065 (9%)
Incentive Amount
15% project cost
Heating Fuel Use Savings



- Before
- After



strategies

Related Companies worked with an engineering firm to explore the best options for replacing French Apartments' aging boilers. After analyzing the steam system's performance, the firm determined that Related could dramatically improve energy efficiency and enhance tenant comfort by completing a comprehensive scope of work that also included steam distribution system, radiator, and envelope improvements. The completed suite of work not only cut annual heating fuel use in half, but also resolved under- and over-heating problems and quieted noisy pipes and radiators.



steam system measures

- 1 Boiler & Burner Upgrades**
Upgraded to right-sized boilers with linkageless burners and new header piping, improving system performance and efficiency.
- 2 Radiator Improvements**
Installed TRVs, orifice plates, and radiant barrier insulation, helping ensure all units are properly heated.

- 3 Master Venting**
Installed high-capacity vents on the tops of steam risers, helping balance the flow of heat across the building.
- 4 Multi-Sensor Controls**
Upgraded to internet-based controls, with wireless indoor and outdoor temperature sensors, improving heating system responsiveness.

Additional Measures
Completed building envelope improvements (including air-sealing around doors and windows and installing low-e storm windows, spray-foam insulation, and bathroom vent occupancy sensors), helping to minimize building heat loss, improve heating system efficiency, and reduce costly fuel waste.

benefits

- Balanced flow of steam with more consistent and even heating to all apartments.
- More responsive heating system, with increased tenant control over in-unit temperatures.
- More efficient boiler and burner operation, with energy and fuel cost savings.
- Higher quality steam, with quieter pipes and radiators and improved equipment longevity.
- Reduced building heat loss and costly energy waste.
- Increased tenant comfort and satisfaction.

project description

The steam system upgrades were a greater success than I expected. French Apartments now uses far less energy and residents are more comfortable. Based on this experience, we're looking into similar improvements across our portfolios.

— Paul Rode, Related Companies

Related Companies took a proactive approach to improving the two-pipe steam heating system at French Apartments, their 174-unit affordable rental property in Midtown Manhattan. Related used the property's scheduled refinancing as an opportunity to invest in holistic retrofit measures that included significant steam system upgrades, greatly improving energy efficiency, enhancing tenant comfort, and saving more than \$69,000 a year.

summary

When French Apartments' scheduled refinancing coincided with the end of the boilers' useful lives, Related Companies seized the opportunity to invest in substantial steam system upgrades to improve building performance and boost tenant comfort. The upgrades were extremely successful, cutting annual heating fuel use by 48% and inspiring Related to implement similar measures in buildings across their portfolio.

Related knew they needed to replace the boilers at French Apartments, but after meeting with Steven Winter Associates (SWA), a building energy consultant, they learned that they could maximize life-cycle savings and qualify for financial incentives by completing additional steam system and energy efficiency measures. SWA analyzed the building's energy use and savings potential, and designed a cost-effective and comprehensive scope of work that included boiler, burner, and control system upgrades, along with piping, ventilation, radiator, and building envelope improvements.

Partnering with French Apartments' staff, the consultant helped to coordinate work by six contracting teams and streamline scheduling for the completion of in-unit measures. Active communication with contractors and tenants was essential to getting the project completed quickly and with minimal disturbance to residents.

The completed scope of work helped to maximize steam system efficiency, correct heating imbalances, quiet noisy radiators, and increase tenant control over apartment temperatures. The

comprehensive measures also reduced utility costs by more than \$64,500 a year and maintenance costs by \$4,500 a year. With incentives, the upgrades will pay back in about 11 years. (Steam system measures, taken in isolation, can pay back in as little as 4 years.) Project incentives provided by the New York State Research and Development Authority (NYSERDA) Multifamily Performance Program covered 15% of the total project cost.

existing conditions

French Apartments' steam heating distribution system dated back to the building's 1981 residential conversion. The two aging boilers were due to be replaced, and other system components were in need of significant tuning and maintenance.

In 2011, French Apartments completed a voluntary energy audit under NYSERDA's FlexTech Benchmarking program. The audit, followed by a more in-depth analysis of the building's steam heating system, revealed major opportunities for reducing energy consumption through efficiency improvements, including steam system upgrades.

The analysis found that not only were the aging boilers much larger than needed to efficiently heat the building, but the entire steam distribution system was performing poorly, with overly hot and cold apartments, no resident control over temperature, clanging pipes, and broken equipment. Heat generated by the steam system was also being lost through leaks in the building envelope, resulting in the boiler running frequently and wasting expensive fuel.

details of the retrofit

The comprehensive scope of steam heating system work included boiler room, common area, and in-unit measures, and required coordination between building staff, tenants, and six teams of contractors. Work began in the summer of 2013 and continued through fall 2014.

Radiator Improvements: Radiator improvements were completed in every unit and included the installation of thermostatic radiator valves (TRVs) that allow residents to control the amount of heat released by radiators into their apartments. Small metal discs, called orifice plates, were installed in radiator supply lines, helping balance steam flow and prevent water accumulation that can cause steam system problems, such as banging pipes and broken steam traps. For most radiators, orifice plates also render steam traps unnecessary.

Radiant barrier insulation was then installed behind all radiators to prevent heat from escaping through the building's exterior wall. To further reduce heat loss through the building envelope, Related installed low-emissivity storm windows and weatherstripping in each apartment. Weatherstripping and spray foam insulation were also installed in common areas, such as stairwells and offices.

Master Venting: To ensure heat would reach all units quickly and evenly, contractors installed high-capacity air vents at the tops of vertical steam riser lines – a practice known as 'Master Venting.' This venting required cutting into walls in tenant spaces where the tops of risers were located (about 15% of all apartments), and creating access panels behind which vents were concealed. Mineral wool insulation was also installed behind these panels. Master Venting typically includes venting of horizontal steam mains, in addition to vertical riser lines. This was not necessary at French Apartments, as the building already had a vacuum system in place to vent steam mains.

Boiler and Burner Upgrades: Boiler room upgrades included replacing the two aging boilers with smaller, more efficient models that provide the same amount of heat as the old, larger models. The boilers were replaced a year apart, allowing

one to remain on-line while the other was out of commission. Burners were also upgraded to 'linkageless' models that provide greater control of the boiler's firing rate and significantly increase combustion efficiency. Steam header piping was redesigned to prevent water droplets from being carried into steam mains and radiators, where they can lead to cold or hissing radiators, banging pipes, and even equipment damage. Anode bars were also added to boiler water tanks to prevent corrosion and help ensure high-quality steam production. Anode bars must be replaced annually.

Multi-Sensor Controls: Contractors also installed a *Pepco Energuard* internet-based energy management system with new boiler controls that communicate with wireless apartment temperature sensors, an outdoor sensor, and a steam main pressure sensor. The new controls greatly improve the steam system's ability to respond to changing conditions and maintain comfort across the entire building.

challenges and lessons

The residents asked a lot of questions, but once they understood the process, they were on board. — Resident Liaison, French Apartments

Scheduling: With six different teams of contractors – and five of them requiring apartment access – scheduling presented one of the biggest project challenges. In order to streamline the process and minimize disturbance to residents, SWA scheduled specific days for work to be completed on each floor, and had contractors rotate through each apartment in turn.

Resident Communication: To obtain resident consent for in-unit work, French Apartments' staff worked with SWA to develop educational materials in four languages – English, Spanish, Mandarin, and Cantonese – to inform residents about why and when work would be completed in their apartments. They also held community meetings with translators present, to answer tenant questions and explain the benefits of the steam system upgrades. While tenants were initially a bit skeptical, the outreach efforts were highly successful in gaining their cooperation.

The Building Energy Exchange is a resource hub connecting the New York real estate community to energy efficiency solutions through exhibits, education, research, and reports.

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