Building America Case Study

Technology Solutions for New and Existing Homes

Steam System Balancing and Tuning for Multifamily Residential Buildings

Chicago, Illinois

PROJECT INFORMATION

Project Name: Steam System Balancing and Tuning for Multifamily Residential Buildings

Location: Chicago, IL

Partners:
Partnership for Advanced Residential Retrofit
www.gastechnology.org

Building Component: Steam heating distribution system and controls

Application: Retrofit; Multifamily

Year Tested: 2011–2012

Applicable Climate Zone(s): Cold humid continental

PERFORMANCE DATA

Cost of Energy Efficiency Measure (including labor): $9,000 on average

Projected Energy Savings: 10.2% heating savings

Chicago's older multifamily housing stock is primarily heated by centrally metered steam or hydronic systems. Often, significant temperature differentials exist between apartments in the same building. As a result, some residents receive insufficient heat while others open their windows in the middle of winter. A common response to these heating imbalances is to simply increase temperature set points and the output from the heating system. This solution leads to unnecessary energy waste by overheating a building to address a couple of units that are not receiving enough heat.

The Partnership for Advanced Residential Retrofit (PARR), a U.S. Department of Energy Building America team, conducted a study to identify best practices, costs, and savings associated with balancing steam distribution systems through increased main line air venting, radiator vent replacement, and boiler control system upgrades. In heating plants with distribution systems that have remained largely the same since they were converted from the original coal-fired systems to natural gas, the venting and controls are often inadequate to keep the system performing efficiently. During the PARR study, venting and controls were upgraded and in-unit temperature and boiler run-time data were collected pre- and post-retrofit for 10 test buildings in Chicago. Tenant comfort surveys were also conducted.

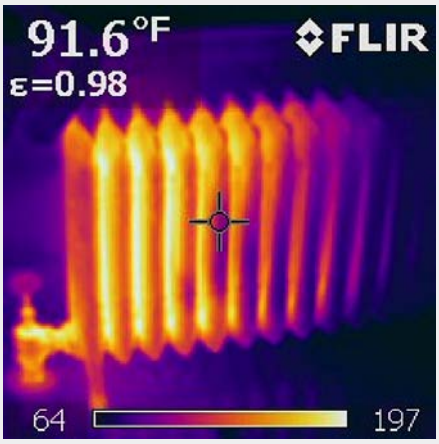
Results of these measures included a more even distribution of heat throughout the buildings. This led to increased tenant comfort and an average savings of 10.2% of the natural gas heating load.

Building America SM
U.S. Department of Energy

DESCRIPTION

PARR upgraded the main line venting on steam mains in all of the test buildings. These vents allow steam to be distributed quickly and evenly throughout a building.

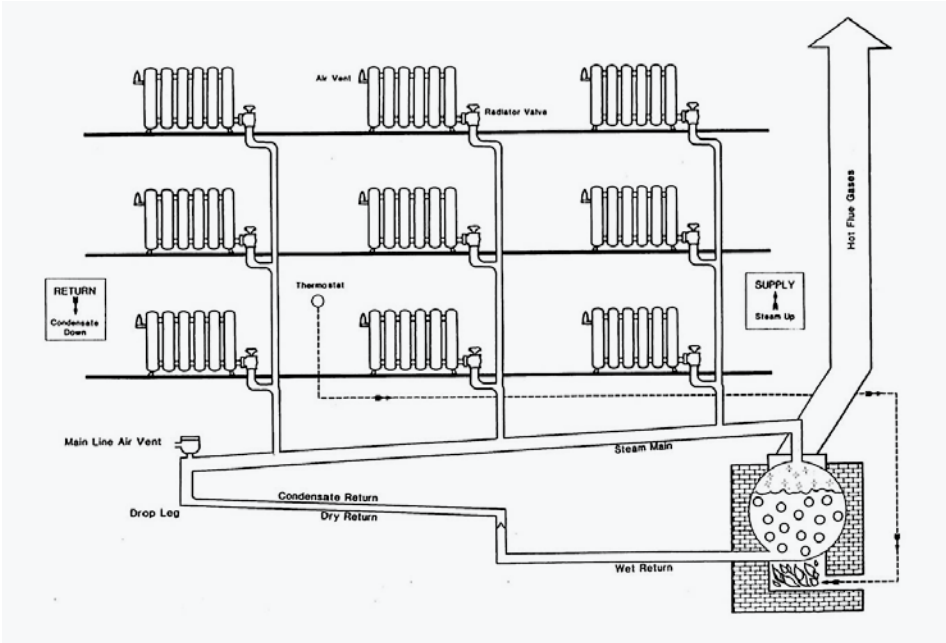
All the radiator vents in the test buildings were replaced.



Properly functioning radiator vents allow air to escape and steam to fill the radiator.

For more Information, see the Building America report, *Steam System Balancing and Tuning for Multifamily Residential Buildings in Chicagoland—Second Year of Data Collection,* at *www.buildingamerica.gov*

Image credit: All images were created by the PARR team.



In a one-pipe steam system, there should be a main line vent at the end of each steam main, about 15 in. before the piping drops down into a return. Each radiator should have a properly sized and functional air vent.

Lessons Learned

- Balancing is a multistage process. After an initial round of balancing and tuning work is completed, a building may need to be rebalanced, reassessed, and perhaps further adjusted.
- Unit locations and building layout are important considerations when balancing and assessing a building.
- Tenants and building managers need to be informed about the balancing process and alerted to the fact that its success will require time and cooperation.
- Test buildings are projected to save an average of 10.2% on natural gas heating loads following the balancing work.
- Balancing and tuning the controls in a steam heated building can greatly increase tenant comfort.

Looking Ahead

For steam balancing and tuning to become a widespread energy efficiency measure, it is important to educate building owners, operations and maintenance staff, and tenants about the process. Training on how steam systems work and how to properly address heating imbalances will help building owners avoid unnecessary energy waste. Utility rebates for replacing venting and upgrading controls also help by offsetting initial costs and encouraging more building owners to take on and complete the measures.

U.S. DEPARTMENT OF ENERGY
Energy Efficiency & Renewable Energy

For more information, visit:
www.buildingamerica.gov

The U.S. Department of Energy's Building America program is engineering the American home for energy perfomance, durability, quality, affordability, and comfort.

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 10% post consumer waste.

DOE/GO-102013-4063 • October 2013