Project Description

The Cascade Apartment complex is a multi-family community located in Washington state. It is owned and operated by Building America partner King County Housing Authority (KCHA). Built in the 1960s, the community includes 25 two-story apartment buildings and two one-story apartment buildings. Each building has four apartments, for a total of 108 units with common walls. The buildings are wood framed with pitched roofs and vented crawlspaces. The units are all electrically heated with zonal baseboard heat controlled by wall-mounted thermostats, and all units have 50-gallon electric water heaters.

Cascade is an ethnically diverse community that includes people who originate from Russia, Sudan, Ethiopia, and various other cultures. This diversity led to challenges in conveying how to operate the equipment as intended and restricted the ability of occupants to accurately convey complaints or reservations concerning building operations.

The energy retrofits sought to address several deficiencies, including excessively high utility bills and moisture levels, which directly impacted the financial and physical health of the community members.

Energy retrofit measures were selected after conducting energy audits Cascade Apartment units. These audits, conducted by KCHA staff, included multi-point blower door tests, assessing existing insulation, and observing moisture-related issue identified in the units. These audits also included the use of BA partners’ tools such as the Fluke Ti32 Thermal Imaging equipment and software and The Energy Conservatory blower doors and TECHLOG2 software.

Working with local contractors, KCHA proposed nine retrofit measures that were selected after conducting the energy audits. These measures were designed to reduce energy consumption, increase comfort, increase indoor air quality, attenuate sound, increase building durability, and enhance community longevity.
### Lessons Learned

- TREAT was selected as the research analysis tool because at the time the current version of BEOPT could not be used to assess complex multi-family structures such as Cascade. TREAT also provides the opportunity to “true-up” the predicted energy use from the model to actual energy use.

- Relocating the whole-house ventilation system to the main area of the home per ASHRAE 62.2 provided a positive benefit to the occupants. KCHA staff have noted a significant decrease in occupant IAQ complaints since the retrofits took place.

- SIRs could not be determined for individual retrofit measures because there is no established methodology for identifying the reduction in air leakage from dense wall pack insulation and from window and door retrofits. Assigning air leakage reductions to insulation, window and door retrofits in multifamily apartment is a key area for future work in order to better assess the SIR of the individual measures.

- The utility billing analysis suggest average energy savings of 10,691 kWh per year, a 22% reduction. These results are typical of comparisons of modeled and measured energy use. The utility billing analysis suggests significant savings from the retrofit measures, with the majority of the savings (over 40%) coming from heating energy use.

- Each unit realized approximately $23 in monthly utility savings; these savings will continue throughout the life of the units.

- Some occupants were concerned that the continuous operation of the ERV would reduce comfort and raise utility bills. After education and consulting with KCHA staff, the occupants better understand and accept the ERVs, and feel that the IAQ has improved.

- KCHA staff need to continue to engage occupants on the use and purpose of the ERVs.