



REACH COMMUNITY DEVELOPMENT'S COMMITMENT TO PASSIVE HOUSE STANDARDS FOR AFFORDABLE HOUSING

SOLUTION OVERVIEW

For 33 years, REACH Community Development has built and managed innovative and affordable housing for low-income families and individuals in Oregon and Washington. REACH also provides supportive services to residents and free home repairs to senior homeowners. Today, REACH's portfolio includes 2,073 units of affordable housing within single family homes, apartment buildings, and mixed-use developments. REACH has won numerous state and national awards for its creative approach to building healthy communities and innovative housing projects.

REACH is committed to affordable living—it is a mantra embraced in the housing developments in the Oregon and Washington service area. As utility costs rise, REACH believes in constructing affordable, transit-oriented rental housing that is certified to Passive House standards, enabling energy savings to be passed down to tenants who pay for electricity in their units. REACH estimates that it will reduce energy by 90% for heating and 60%-70% for overall energy use, compared to a U.S. Green Building Council LEED® certified building. Beyond developing affordable housing with restricted rents, REACH strives to build near light rail and other types of transit to ensure tenants have the ability to commute to their jobs and travel within the region. The developer plans to improve indoor air quality with continuous ventilation, provide better comfort in the units for the tenants, improve construction quality to reduce the risk of moisture intrusion, and reduce noise from the adjacent light rail line. Together, affordable rent, utilities, and transportation will allow REACH tenants to improve their quality of life, as they can dedicate more income to items like food, health care, child care, and education. For more information, visit <http://reachcdc.org>.

ORGANIZATION TYPE

Multifamily affordable rental housing non-profit developer and owner

BARRIER

Rising utility costs on low-income households

SOLUTION

Integrating passive house in affordable rental housing

OUTCOME

The largest multi-family building built and certified to Passive House energy standards in North

America

POLICIES

REACH believes strongly that livability and sustainability are closely aligned. By incorporating renewable, energy-efficient practices into its current and future affordable housing developments, REACH promotes greater environmental and social health for the communities it serves and the planet. REACH began incorporating green building practices in 1994 and now develops all of its projects with sustainable features. Green building has several benefits: it promotes economic, environmental, and social health of the community, and also incorporates renewable or energy-efficient, cost-saving practices and sustainable materials into building processes. Green buildings are better for REACH's residents and the community, by reducing its energy "footprint." Finally, these buildings reduce REACH's operations and maintenance costs and lower residents' utility bills.

REACH's commitment to Passive House began in 2010 when REACH's former CEO first visited rental developments in Germany on a tour with the Housing Partnership Network and the International Housing Partnership. She was impressed with the energy performance of the buildings and the benefits provided to building. She brought the idea back to REACH as it was going through its five-year strategic planning process. As a result, the Board of Directors highlighted building a Passive House-certified development within five years in their strategic plan.

To make this possible, REACH pursued public policies around green buildings at the state and local levels. At the state level, the Oregon Housing and Community Services Department established a process that connected REACH to three existing green building paths available in relation to REACH's application to the state for 9% Low-Income Housing Tax Credits: Enterprise Green Communities, Earth Advantage Homes, and LEED for New Construction or Homes. The Earth Advantage Homes certification dovetailed with the Passive House standards in its focus on energy efficiency, and was a logical standard since it would also be the Passive House rater on the project. Locally, the Washington County Office of Community Development had a public policy that provided bonus points for green buildings in its evaluation of REACH's application for HOME Investment Partnerships Program funds. Thus, the focus on Passive House gave REACH a more competitive application with the County for scarce federal resources to develop affordable housing in the City of Hillsboro.

PROCESS

To integrate Passive House into the affordable housing model, REACH began the design process with a goal of meeting Passive House standards, rather than layering Passive House ideas on top of a typical affordable housing development. Given the climate in the Willamette Valley, REACH felt that the Passive House standard would be achievable compared to more marine climates where moisture can often be a deterrent. The first element in integrating Passive the development was to examine the solar orientation and massing of the building. The project is within a Community Design overlay which required building articulation and high street frontage, which necessitated

compromises for ideal massing and orientation. The team made up for this by taking a critical look at optimizing the window-to-wall ratio in order to provide day-lighting for residents while reducing energy loss and materials cost.

Working with the architect and contractor, the team examined five different wall assemblies to find one that not only had the necessary R value and eliminated thermal bridging, but also was the most cost effective constructible for commercial trades, and the least susceptible to moisture issues. The team chose a triple pane window that can both tilt and turn that is manufactured in Canada and often used in similar climates in British Columbia.

One of the largest challenges REACH faced was in developing air barrier detailing which met the strict air tightness requirements for a large commercial building. The team scrutinized critical details such as the wall to roof connection at the conceptual phase, then worked closely with the structural engineer and general contractor to engineer and detail this connection so as to maintain air barrier continuity within typical subcontractor sequencing. REACH had to find commercial exterior doors that not only met air tightness requirements, but also had the capacity for electric hardware—security access controls and an ADA (Americans With Disabilities Act) door operator—as well as sills that met strict federal accessibility standards. Because of the federal housing dollars used in the project, the project also had to meet UFAS (Uniform Federal Accessibility Standards) which are stricter than ADA. The team selected an American made, thermally broken, triple-pane glass storefront door. These doors are not as airtight as European models but will accept standard hardware and access controls and have a UFAS-compliant sill.

The team removed portions of the building from the Passive House envelope including the laundry and trash rooms due to concerns regarding Passive House airtightness requirements and high ventilation rates. In addition, doors to these spaces were custom built for this project to meet not only Passive House airtightness but also provide doors with the appropriate electric hardware for accessibility and fire rating. Initially, the elevator was also outside of the Passive House envelope but was brought back in after preliminary blower testing determined that the air leakage at the elevator louver would not put the project over the limit.

The building structure consists of three-story wood-framed construction on top of a concrete slab-on-grade foundation. Typical enclosure walls have 2x10 framing with blown-in fiberglass cavity insulation in the stud cavities and 1-1/2" of rigid mineral wool exterior insulation. Mineral wool was chosen specifically for its permeability and capacity to facilitate drying to the exterior as environmental conditions allow. Plywood exterior sheathing (with taped seams) serves as the primary air barrier at the enclosure walls. A mechanically-attached spun-bonded polyolefin sheet membrane, installed over the plywood sheathing, serves as the water-resistive barrier. The vapor barrier is located on the interior face of the wall framing. This is a polyamide membrane with variable perm rating to facilitate wall drying to the interior. The ground floor slab sits atop a 4" layer of EPS insulation, which also wraps around and under the perimeter and interior footings. Type II EPS is used under the slab and at the sides of the footings; however, Type IX EPS is used under the footings for its higher bearing capacity. Capping off the building structure is a prefabricated wood truss roof with 12" of polyisocyanurate insulation and a fully adhered single-ply roof membrane. A self-adhered rubberized asphalt membrane is installed over the plywood roof sheathing, serving as the vapor barrier at the roof assembly. Decks and sun shades were designed to provide resident

outdoor space, architectural interest, and summer shading. Vertical shading was not allowed by the City design commission.

Developers that are pursuing Passive House standards and also aiming to enable tenants to enjoy the associated utility cost savings should understand that additional resources will be needed. These resources may not be capital investments that pay themselves back over time. The additional resources to pursue Passive House standards came to \$1,071,100 in hard and soft costs, which was an 11% premium compared to a building REACH would typically construct in the communities it serves in the Portland metropolitan region. REACH was able to secure private resources it would not normally pursue due to the innovation of seeking Passive House certification on the project. A land swap with a private developer provided some resources, and REACH also secured a \$500,000 Meyer Memorial grant dedicated specifically to this innovation. REACH added to these resources with an Energy Trust of Oregon incentive focused on reimbursing REACH for the energy efficiency measures to make the project feasible above and beyond code.

OUTREACH

In terms of outreach, REACH began leasing activities in April 2015. Initially, REACH heard from a lot of applicants who were not only looking for affordable rental housing in a transit-oriented area with many amenities but also had already researched Passive House. These tenants felt that a building built to that standard would have better indoor air quality and comfort. After occupancy, REACH implemented an energy monitoring system at the Orchards at Orenco development installed by ImagineEnergy that highlights each unit's weekly energy usage on a display board on the first floor for all residents to see. It also tracks the energy usage on a monthly basis with a budget tool in hopes that managing the energy usage like a budget enables residents to alter their daily behaviors to limit plug loads.

Now that the project is leasing, one of the challenges has been consistent tenant education to ensure tenants use their triple pane windows at appropriate times to maximize their comfort as well as the energy efficiency measures designed into the building. This would entail "nightflushing" by opening the windows at night and closing them during the day in the summer. It also entails communication with the tenants on an ongoing basis regarding the building and their units to ensure energy usage is limited. If the tenants are able to adjust their behaviors over time, they will be more likely to see the added energy savings in their electric bill contributed by the Passive House certification of the building.

TOOLS AND RESOURCES

Key innovative features include triple-pane windows, a thick thermal wall assembly, a heat recovery system with energy recovery ventilators, and a super-insulated building envelope including insulation under the slab. The Orchards at Orenco development also has an energy monitoring system used as a tenant education and monitoring tool to help limit energy usage. Learn more about Passive House on the Passive Housing Institute's [website](#).

OUTCOMES

The Orchards at Orenco development emphasizes REACH's goals of providing a comprehensive model of affordable living, using transit-oriented design, and green building technology. With its proximity to light rail and multiple community amenities, this development addresses REACH's

strategy of connecting people to economic growth hubs. REACH is also tackling the growing shortage of affordable rental housing in the region by offering this three-phase development with rents affordable to residents earning approximately 50% of area Median Family Income (MFI), or approximately \$30,000 for a single-person household. Rents at the 57-unit first phase building range from \$611-\$733/month. REACH was also able to extend eight units in Phase I to households earning at or below 30% MFI through eight Project-Based Section 8 vouchers provided by the Housing Authority of Washington County.

MEASURING SUCCESS

Orchards at Orenco is now the largest multifamily building built and certified to Passive House standards in North America. As a result, tenants will receive unprecedented savings on their energy bills, achieve nearly 90% energy reduction for heat usage, and reduce overall energy use by 60-70% compared to a LEED Certified building. The Orchards at Orenco recently won the Portland Business Journal's Better Bricks Sustainable Project of the Year award for its commitment to green technology and energy efficiency. It achieved 0.13 Air Changes per Hour (ACH), making it one of the tightest buildings currently certified to Passive House standards in the country. Orchards at Orenco was also certified to Earth Advantage Platinum standards, and landed a spot in the book Net Zero Energy Buildings: Passive House + Renewables, published by North American's Passive House Network.

Moving forward, REACH will be examining how replicable of a model Orchards at Orenco will be for integrating Passive House into affordable housing. Phase II of Orchards at Orenco is currently under construction and does not have the 11% cost premium embedded in its construction budget. However, it will be built with many of the same features and may in fact be a better example of how other affordable housing developers can design to Passive House standards in an environment of cost containment. If Phase II has similar airtightness to the first phase of the development, it will be a testament that a building can be built to Passive House without such a cost premium.

