



Building America Efficient Solutions for New Homes

Case Study: Mutual Housing at Spring Lake

Woodland, CA

PROJECT INFORMATION

Construction: New Home

Type: Multi-family, affordable

Developer:

Mutual Housing California

<http://www.mutualhousing.com/>

Builder:

Sunseri Construction

<http://www.sunsericonstruction.com/>

Size: 709 to 1,515 ft²

Date completed: 2015

Climate Zone: Hot-dry

PERFORMANCE DATA

2013 Title-24 Compliance Margin:

17% - 23%

% Better than ZERH Target Home:

13% - 15%

Projected annual energy cost

savings: \$285 / Apt

Incremental cost of energy-efficiency

measures: \$8,110 / Apt

The 62-unit Spring Lake project developed by Mutual Housing California (MH) is the first multi-family project nationwide to be certified under DOE's Zero Energy Ready Home (ZERH) program. MH is a non-profit whose mission is to develop, operate and advocate for sustainable housing in Sacramento and Yolo counties. Their Spring Lake project located in Woodland, CA includes sixty-two affordable apartment flats and town-homes for agricultural workers and their families. The Alliance for Residential Building Innovation (ARBI) Building America team led by California based Davis Energy Group worked with Mutual Housing throughout this project to provide support for ZERH as well as the LEED for Homes program.

The key to increasing adoption of high performance homes by builders and developers in the California market is to show them how they can leverage development agreement requirements, code compliance requirements, incentives, and competitive market advantages of ZERH certification, and to help them navigate through this process. An objective of this project was to gain a highly visible foothold for residential buildings built to the DOE ZERH specification that can be used to encourage participation by other California builders.



Exterior walls were framed using 2x6 studs 16" on center with high density R-21 fiberglass batt. Quality insulation installation (QII) is more challenging with fiberglass batts than foam or blown fiberglass or cellulose; however, the insulation job at Spring Lake passed the QII inspection easily. Structural requirements precluded the use of such advanced framing techniques as 24" on center spacing, but corners and intersecting walls were insulated to minimize thermal shorts. All other ENERGY STAR Thermal Enclosure System Checklist items were verified.

KEY ENERGY-EFFICIENCY MEASURES

HVAC:

- Inverter-driven variable speed air-to-water heat pumps deliver hot and chilled water to fan coils in each unit and heat domestic hot water.
- Ductwork in flats is located in dropped soffits. In townhomes top floor ductwork is buried under 3.5" of blown attic insulation. All air handlers are in interior closets.
- Duct leakage to outside = 8-21 cfm @ 25 Pa
- Return air transfer grilles were provided in all bedrooms.

Envelope:

- Light colored shingle roof, CRRC certified
- R-49 blown ceiling insulation in vented attic
- R-21 grade-1 batt insulation in 2x6 frame wall
- Double-pane, low-e, vinyl windows. $U = 0.29$, $SHGC = 0.19$
- Tightly sealed enclosures, $ACH50 = 1.7-4.0$

Lighting, Appliances, and Water Heating:

- 100% CFL & LED
- ENERGY STAR® exhaust fans
- ENERGY STAR® refrigerator & dishwasher
- Heat pump water heating

For more Information, please visit:

www.buildings.energy.gov



A three-function air-to-water heat pump provides space heating and cooling along with water heating. The "hydrobox" (left image) includes a refrigerant to water heat exchanger and distributes hot or chilled water to a fan coil and the hot water storage tank also shown.

Lessons Learned

- Communication initiated early on in the design process and maintained throughout the project is crucial to success of high performance buildings. It is recommended that roles and responsibilities be clearly defined and an individual identified to manage and coordinate ZERH related work.
- Early design meetings and periodic reviews of construction documents to ensure all measures and testing requirements are addressed will help avert future change orders and reduce costs.
- Detailed scopes of work listing unique ENERGY STAR and ZERH requirements should be provided to the bidding contractors and reviewed again prior to construction. Compliance should be reviewed by the ZERH verifier as construction progresses.
- Building sealing can be a challenge in multi-family buildings. The air barrier should be explicitly defined in construction documents. Particular care should be taken in sealing rim joists and sealing drywall to top plates, which requires coordination between the drywall contractor and insulator.
- Proper design, installation, and sealing of ductwork is still important even when ducts are located fully within conditioned living space. Duct and equipment sealing, methods for avoiding pressure imbalances, and air balancing requirements must be clearly addressed in the design and managed during construction.
- Use of low-leakage air handlers and providing adequate access in mechanical closets to seal equipment to plenums will reduce the efforts required to mitigating leakage when systems do not pass initial pressure tests.