Construction Challenges in DOE Zero Energy Ready and ENERGY STAR Multifamily Housing

Multifamily construction plays a vital role in the U.S. housing market – for both enhancing equity and addressing climate issues. However, without a focus on high-performance, multifamily housing can seriously under-perform leaving occupants with out-of-control utility bills. Multifamily housing offers both benefits and challenges:

Multifamily Equity Benefits

- Lowest-cost option for renting or owning
- The only financially viable option for some.

Multifamily Energy Benefits

- Condensed footprint and shared walls minimize envelope area, reducing thermal losses
- Higher occupant density
- Efficient central systems

Energy and Equity Challenge

 Poor energy performance leads to a lifetime of high bills and energy waste.

Energy and Equity Solutions

- DOE Zero Energy Ready Home and ENERGY STAR Multifamily certifications offer
 - Energy savings for occupants
 - 45L tax credit for builders.

Multifamily Construction Challenges

- Thermal bridging details
- Ventilation and exhaust strategies
- Air-sealing and compartmentalization
- Central heat pump water heater systems.

DOE Construction Solutions

 Find new construction and installation guidance in the Building America Solution Center.

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THERMAL BRIDGING DETAILS

Unlike single-family homes, multifamily buildings are often made of steel and concrete. Steel is 300 times more conductive than wood. Even with exterior rigid insulation, thermal bridging can still occur at balconies and siding attachments. This thermal bridging can reduce the effectiveness of the insulation by 50% to 75%. New guides in the Solution Center provide details on how to install thermal breaks at these common heat transfer pain points: Concrete balconies, podiums, and plazas Garage ceiling columns and walls Mass walls and steel-framed walls Post-tensioned slabs.





heat transfer

AIR SEALING AND COMPARTMENTALIZATION

In a multifamily building, every dwelling unit needs to have a continuous air barrier to separate it not just from the outside but also from other dwelling units and common spaces. This is for both energy efficiency and indoor air quality reasons – no one wants to smell their neighbors' fried onions!

See the Building America Solution Center for new guidance on • What compartmentalization is and how to achieve it in low- and high-rise buildings • The importance of the stack effect in high-rise buildings and how to counteract it • What layers of the interior and exterior wall assembly to use for continuous air barriers • Where and how to air seal at shared walls.



compartmentalization.

Concrete balconies are often big sources of



Air sealing at party wall interfaces is critical for maintaining

-Fully adhered membrane

The joint at the top of the party wall at the intersection with the exterior wall is air sealed with a fully adhered membrane.

- building
- heaters
- Clustered units.

CENTRAL AND DISTRIBUTED HEAT PUMP WATER HEATER SYSTEMS

Heat pump water heaters can heat water at a fraction of the energy use of other water heating systems. New guidance in the Solution Center provides detailed recommendations for specifying, sizing, and locating heat pump water heaters, for various configurations:



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VENTILATION AND EXHAUST STRATEGIES

In multifamily structures builders must find ways to provide ventilation to individual units as well as to corridors, elevators, and common areas, while providing safety in the event of smoke or fires. See the Solution Center for new guidance on

- Whole-unit ventilation
- Spot ventilation for kitchens and baths
- Central ventilation systems versus systems for individual dwellings
- Compartmentalization to stop unwanted airflow between units



An energy recovery ventilator (ERV) trai both heat and moistu between incoming and outgoing streams of air.



for each dwelling unit in a multi-family building will equire large numbers o vents in exterior walls.

DUCT SYSTEM AIRFLOW TESTING

"Expect what you inspect." This old adage applies to leakage in HVAC and ventilation systems in all homes but especially multifamily buildings where airflow testing of central ventilation and heating duct systems can stymie builders and HVAC installers alike. See the Solution Center for guidance on

- Developing a duct leakage test plan
- Measuring mechanical ventilation airflow
- Testing mechanical ventilation systems
- Testing total duct leakage and duct leakage to outdoors
- Final testing of 100% of duct system before balancing.



A duct test fan is set up in an access door of a roof top central ventilation unit using a blower door tarp and blower door frame to test air leakage in multifamily ventilation duct systems. Source: Advanced Building Analysis, LLC



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Visit the **DOE Zero Energy Ready Home and ENERGY STAR Multifamily checklists** In the Building America Solution Center basc.pnnl.gov