

Ventilation and Indoor Air Quality (IAQ) in New California Homes with Gas Appliances and Mechanical Ventilation

“Measured concentrations were below health guidelines for most pollutants, indicating that IAQ is acceptable in new California homes when whole-dwelling mechanical ventilation is used... Corrective action needs to be taken to improve labeling and controls for ventilation systems.”

Project Description

This project studied the impacts of California’s Title 24 mechanical ventilation requirements in new homes with natural gas appliances. The study included field measurements in 70 new single-family homes with mechanical ventilation; simulations assessing the impact on chronic exposures to an indoor emitted pollutant as air tightness improves in California; and a survey about satisfaction and activities that impact IAQ. Field measurements included time-resolved data (PM_{2.5}, NO₂, CO₂, formaldehyde, temperature and relative humidity) that allowed more detailed analysis of the role of ventilation system over a one-week period in each monitored home. Study results will be used to inform future California Title 24 requirements.

Key Findings

- Results of the field measurements showed that mechanically ventilated single-family homes had acceptable indoor air quality that was an improvement over homes built prior to the ventilation requirements.
- Installed whole-house ventilation systems had averaged 50% more air flow than the minimum requirements in the Title 24 standards.
- Three-quarters of homes had their ventilation systems turned off when field team first visited the home. It is critical to improve user understanding of mechanical ventilation through better labeling of ventilation controls.
- Simulations showed that introducing a 3 ACH50 air tightness limit does not result in any significant energy savings due to California’s mild climates and new ventilation requirements in standards that scale the required fan flows with envelope leakage.

- Survey results suggest that homes with mechanical ventilation are correlated with higher IAQ satisfaction.



Mechanical ventilation air flow measurement (left), monitoring (upper right), and control label (lower right).

| | This Study | Prior Study |
|-------------------|-----------------------|------------------------|
| Formaldehyde | 19.8 ppb | 36.3 ppb |
| PM _{2.5} | 8.3 µg/m ³ | 13.3 µg/m ³ |
| NO ₂ | 6.1 ppb | 5.4 ppb |

Comparison of mean concentrations with a prior study (conducted in 2007-08) of California new homes that mostly had electric cooking appliances.

Benefit for California

- Demonstrated that current and future ventilation requirements in Title 24 standards are resulting in good IAQ that provides a healthy indoor environment in California homes.
- Avoiding additional air tightness requirements and verification in new homes will help control costs for California builders.
- Use of better labeling with clearer messages to significantly improve the use of mechanical ventilation systems to ensure good IAQ in California new homes.