

"We have serious and pervasive problems with poor air conditioning installation work in California," Pennington says. "We have not given up on our programs aimed at improving installer performance, but in the meantime, we believe that TXVs can mitigate installation and maintenance errors and probably reduce the associated energy penalties by one half or more."

CEC estimates that the four items listed above will enable home builders to downsize air conditioners by an average of 1.7 kilowatts per house and to substantially offset the cost of the new features in the prescriptive packages. All together, the more stringent requirements proposed in Title 24 will reduce the state's peak load by 155 megawatts a year, CEC believes.

New California Appliance Standards

In light of the state's peak load problems, California regulators also want to raise the efficiency standards for new air conditioners, heat pumps, and water heaters. They say the new efficiency levels being contemplated by DOE don't go far enough (see *EDU*, September and November 2000).

For example, DOE is considering a new rule that would raise the seasonal energy efficiency ratio (SEER) on central air conditioners from 10 to 12. But California wants to bump the minimum up to 13 and require a TXV on every new system sold in the state.

"We'd also like to see all new air conditioners tested for and assigned an energy efficiency ratio [EER]," Pennington says. "The truth is, the SEER is of very little value to us in assessing an air conditioner's hot climate or on-peak performance. It's the EER that's really significant."

Pennington tells *EDU* that a recent CEC analysis of air conditioners found that their performance varies widely relative to their SEER ratings, especially at higher ambient temperatures when peak loading is most critical. "Some air conditioners with high SEERs are no better than low-SEER systems when it comes to on-peak performance," he asserts. "The EER, by contrast, is a much better indicator of performance, because the tests used to determine EER are conducted at 95°F [versus 82°F used to determine SEER]."

With that distinction in mind, California officials are prodding DOE and air conditioning manufacturers to initiate equipment testing and certification for EER ratings and proposing a minimum EER standard of 11.3.

State regulators would also like to see the minimum Energy Factors for water heaters raised from 0.54 to 0.60 for gas-fired models and from 0.86 to 0.90 for electric, respectively. At this point, DOE is contemplating new minimums of 0.59 and 0.90, respectively.

Pennington tells *EDU* that if DOE's new minimum efficiency standards aren't high enough to meet California's needs, the state may establish more stringent levels of its own. To do that, the state would have to win an exemption from federal guidelines, but the law does provide for such appeals.

Of course, if California were to go its own way and set efficiency standards for air conditioners and water heaters exceeding the DOE rules, it would put enormous pressure on appliance manufacturers to meet such requirements. After all, the Golden State has 30 million people and comprises 13% of the national market for HVAC equipment and appliances.

More information on Title 24 is available at: www.energy.ca.gov/ab970_standards/documents/index.html. Information about the Appliance Standards is located at: www.energy.ca.gov/appliances/documents/index.html. Information on the Electricity Peak Load Efficiency Grant Program can be found at: www.energy.ca.gov/efficiency/ab970/index.html.

ASHRAE to Lower Mechanical Ventilation Requirement in 62.2P

How much mechanical ventilation does a home need to maintain good indoor air quality and avoid moisture problems?

If you don't have a definitive answer, you're not alone. Researchers, practitioners, and policymakers have been wrangling over the subject for years. The working consensus, though somewhat arbitrary, has been that mechanical ventilation should provide 15 cubic feet of fresh air per minute (cfm) per person, plus 1 cfm for every 100 ft² of floor space. This assumes that leaks in the home's envelope contribute an additional 1 cfm per 100 ft² of floor space.

But in mid-November the fan requirement was substantially lowered — to just 7.5 cfm per person — when some of the industry's best thinkers convened in Washington, DC, to discuss the matter. The occasion was a symposium on ventilation sponsored by the Building Environment and Thermal Envelope Council (BETEC), which operates under the National Institute of Building Science.

"There was general agreement that mechanical ventilation in homes is good and necessary but that 15 cfm is too much," says Antoni TenWolde, who moderated the symposium. TenWolde, a research physicist at the US Forest Products Laboratory in Madison, Wisconsin, tells *EDU* that the 15 cfm level could be especially problematic in the Southeast, where incoming fresh air often carries a lot of heat and humidity. "The question is, how can you economically remove that heat and moisture from the ventilation airstream?" he says. "Several participants noted that there's no dehumidification

equipment available to handle that additional load at an affordable price."

Without proper dehumidification, it was feared, a mechanical ventilation rate of 15 cfm could actually harm indoor air quality by increasing the incidence of mold.

In northern climes, introducing cold, dry air during the winter exacts a price in heating and humidification. But the incremental equipment and operating cost would typically be less than in the South. In either climate, the lower cfm requirement for mechanical ventilation will mean less up-front expense to the home builder and lower operating cost to the homeowner.

One key speaker at the symposium was Max Sherman, chairman of the American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE) 62.2 technical committee. Standard 62.2, which has just completed its first public review and comment period, spells out minimum measures for mechanical ventilation and acceptable indoor air quality for new homes and other low-rise residential buildings (see *EDU*, July 2000).

Sherman tells *EDU* that the 62.2 technical committee, which convened the day before the symposium, endorses the new 7.5 cfm benchmark for mechanical ventilation and other changes, which will be presented at ASHRAE's *Winter Meeting* in Atlanta, Georgia, this month.

The committee sorted through about 2,500 comments before making changes to the standard. About 90% of the comments came from home builders who were protesting some portion of the proposed standard or urging ASHRAE to scrap it altogether. The National Association of Home Builders (NAHB), which has been a staunch opponent of 62.2, reportedly orchestrated some of the responses through a mass mailing to builders.

"Our thinking about the minimum ventilation requirements for people has not really changed," Sherman explains. "But in response to the comments we received, the committee was persuaded that it's appropriate to raise the infiltration credit to 2 cfm per 100 ft² — reflecting typical house leakage — and to lower the fan requirement to 7.5 cfm per person."

Sherman tells *EDU* that, in light of the comments received during the review period that ended October 10 and the input from the BETEC symposium, the following changes to 62.2 will be proposed:

1. The mechanical ventilation requirement will be lowered from 15 cfm per person to 7.5, plus 1 cfm for each 100 ft² of floor space. The infiltration credit will be doubled to 2 cfm per 100 ft². For example, a 2,000

ft² home with 3 bedrooms (4 people) would now require 90 cfm of fresh air ventilation, with 50 cfm provided by a fan (4 x 7.5 + 20) and 40 cfm derived from infiltration (2 cfm per 100 ft²). Under the old formula, 80 cfm would have come from a fan and only 20 cfm from infiltration. Overall, the new method requires slightly less fresh air per person than the old (22.5 cfm versus 25).

2. Carbon monoxide (CO) alarms, required in the earlier version, have been dropped from the standard. NAHB, the American Gas Association, and others fought this provision, in part because of accuracy and reliability questions about CO alarms (see *EDU*, November and April 2000). The committee decided to yield on the point, but added provisions 3 through 6 below to compensate.
3. If there are air handlers or return air ducts in the garage, they must be tested for tightness.
4. Range hoods must be vented to the outside. (The earlier version had allowed recirculating fans with filters.)
5. New homes with large exhaust fans (e.g., powerful range hoods) must have a backdraft test or interlocking supply ventilation system to prevent backdrafts.
6. All unvented combustion appliances (e.g., unvented gas fireplaces) must have an exhaust fan in the room.

"The change in fan size requirements is significant," Sherman says, "but we're not significantly changing the impact to indoor air quality when you consider both infiltration and the source control measures that were added to the standard."

Sherman tells *EDU* that all of the commentators will receive drafts of the modified standard and are invited to attend public sessions scheduled January 26-27 during ASHRAE's *Winter Meeting* in Atlanta. The 62.2 committee will then vote on the standard on January 28. If ASHRAE approves the amended standard, it will be released for a second review and comment period in the spring.

Industry Forum Charts the Future for Building Envelopes

"In 2020, building envelopes will be self-sustaining, energy-positive, adaptable, affordable, environmental, healthy, intelligent, and durable." That's the vision statement adopted by the 100-member team that's crafting the Building Envelope Technology Roadmap, or BETR 2020.

Members of the team, including building product manufacturers, industry organization representatives, non-profit public interest groups, architects, designers, and builders met in Arlington, Virginia, on December 12 to