



The Green Architect

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Green Air Conditioning Systems

Over the past year I've heard sustainable architects and engineers around the world say how practical it is for Southern California buildings to be naturally ventilated. My interest was piqued when I recently learned that the San Francisco Federal Building was naturally ventilated. I found the "HVAC vs. Mother Nature: Operable Windows in Commercial Buildings" session at June's Convention so educational that I thought I would share my notes with you.

According to Gail Brager with the Center for the Built Environment in Berkeley, there are three variations of "naturally ventilated" buildings:

- Naturally Ventilated
- Mechanically Ventilated
- Mixed Mode

Naturally ventilated buildings use operable windows and ceiling fans as their sole source of ventilation. This system reduces the construction and utility costs. The money saved can be spent on a more energy-efficient building envelope or other green components.

There are limitations, though: floor plan layout and total building width are a few of the issues to be understood before the system of air flow arrows on your sections actually work.

Although the mechanical building code does not require mechanical ventilation, there are requirements for fresh air intake and limitations on the occupant's proximity to operable windows. ASHRAE's Standard 55, which includes the Adaptive Comfort Standard, was adopted in 2004 to assist in the design of naturally ventilated buildings.

Mechanically ventilated buildings include electric fans to move air into and/or out of the building. These fans allow you to easily overcome many of the code challenges that the naturally ventilated building faces. Be aware, however, of the confusion that occupants may have when they enter a space and see ductwork or diffusers but can't figure out how to turn on the air.

The **mixed-mode** building is quickly becoming the most popular trend for new buildings. They are hybrids utilizing natural ventilation during the temperate time of year and mechanical systems for the climatic extremes.

Another type of mixed-mode building is similar to the San Francisco Federal Building. Its lower portions are ventilated while floors 6–18 are naturally ventilated. In order to improve occupant experiences, the separation of these two systems must be psychologically clear.

Keep in mind that in addition to operable windows, any of the natural ventilation systems can be supplemented with cooling towers, wind ventilators, or industrial ventilators.

Ongoing studies by ASHRAE, with the help of mechanical engineers from around the globe, have found that the ability to control their environments by just having an operable window gives building occupants a greater sense of satisfaction. Surprisingly, people that work in naturally ventilated buildings actually experience a change in their physiology as temperature fluctuates.