

Continuous Indoor Air Quality Ventilation in a High Mountain Apartment Project

Truckee, California is known for year-round mountain sports, tourists, and quick-changing temperatures. Winter brings skiers and an average snow pack of eight feet. At nearly 6,000 feet of elevation in the Sierra Mountains, daily temperature swings of forty to fifty degrees are common.

So when construction company owners Jeff and Patty Baird of Ventana Sierra built an apartment project, they wanted buildings that could maintain comfort in a climate that can drop fifty degrees in a matter of hours. And because they would retain the project, they wanted low building maintenance and high occupant satisfaction.



Jeff and Patty Baird of Ventana Sierra, CA

The result was **The Aspens**, a well-insulated, thirty-two unit complex with radiant floor heating and an ALDES continuous ventilation system. Tight construction and high levels of insulation keep apartment temperatures comfortable in spite of the weather. The ALDES ventilation system continuously removes moisture, odors and pollutants and brings in the mountain air that draws health-oriented sports enthusiasts to the area.

"There's a lot of pride in the fresh, clean air up there," says Jeff Baird about Truckee. "This was our first time using an ALDES ventilation system. We were building units that were very tight, so we felt compelled to invest the money to get people good ventilation."

Eight Fans, Eight Roof Jacks

In traditional construction, ventilating The Aspens' 32 kitchens and 48 bathrooms would require 80 ceiling mounted fans ducted to 80 wall caps or roof jacks. Instead, The Aspens has eight multi-port fans mounted in the building attics, connected to eight roof jacks -- a dramatic reduction in fans, wiring and noise.

Four MPV 300 fans (multi-port ventilators with twelve exhaust ports) pull exhaust from the bathrooms and kitchens in the two-



The Aspens - Multifamily Apartment Project in Truckee California

32 units in two buildings
A units: 1200 square feet, 2 bedroom/2 bath
B units: 720 square feet, 1 bedroom/1 bath

bedroom/two-bath units. Four MPV 200 fans (multi-port ventilators with eight exhaust ports) serve the one-bedroom/one-bath units. The system continuously exhausts 25 cubic feet per minute (cfm) from each kitchen and 20 cfm from each bathroom. Each exhaust pickup has a dedicated duct run to the MPV fan in the attic.

Unlike the central shaft systems common in many apartment buildings, dedicated ducting eliminates cross contamination between units. Odors and moisture from each unit are moved directly to the fan and roof jack -- not to the neighbor's apartment. The amount of air exhausted from each pickup point is controlled by an ALDES Constant Airflow Regulator (CAR), a unique passive flow control device that automatically regulates the air flow from each exhaust pickup in the system. In spite of the influences of duct length, outside weather or position in the building, each exhaust pickup removes the amount of air called for in the system design. Even in multistory buildings, CARs establish and maintain the desired exhaust airflow from each room, without adjustment by a balancing contractor. A CAR is located in each exhaust pickup box in bathrooms and kitchens, and come in multiple sizes to meet a variety of exhaust flow needs.

Because The Aspens is built with tight construction techniques, outside air is brought into each bedroom and living area through ALDES AIRLET 200s, makeup air inlets installed through outside walls. AIRLET 200s have no manual or mechanical controls that require maintenance or occupant adjustments. A self-regulating damper automatically limits the effects of strong winds to prevent uncomfortable drafts. Each inlet has a filter easily accessed for cleaning and an interior grille that can be oriented to ensure a draft-free air supply.



AIRLET 200

Continuous Low-flow Ventilation

The ALDES ventilation system operates 24 hours a day at the rates specified in ASHRAE Standard 62-1989. This national ventilation standard says that whenever a residence is occupied, people need ventilation equivalent to the great of two numbers: .35 air changes per hour or 15 cubic feet per minute (cfm) per person. In most areas of the country, building codes allow ventilation provided by mechanical equipment or operable windows. In Truckee where winter temperatures are often below freezing,

operable windows are not a good choice. In general, while operable windows may meet minimum building codes, occupants don't use them consistently enough to provide good ventilation. Conventional bath fans and range hoods can be used to meet the standard for intermittent operation, but their sporadic use by tenants means that residential ventilation is often substandard.

The ASHRAE standard says that effective ventilation can be provided by equipment operated continuously or intermittently. It allows the use of a 20 cfm continuous pickup in a bathroom in lieu of a 50 cfm fan that is used intermittently. In the kitchen, it allows a 25 cfm continuous pickup in lieu of a 100 cfm range hood. Low-flow, continuous ventilation removes odors and moisture at a slower rate than large, noisy, conventional fans, but because the system is always operating, overall indoor air quality is improved.

According to Jeff Baird, operating the system continuously works well at The Aspens. "The main issue is that you're removing the smells and creating an atmosphere within the units that is much healthier for the tenants."

"When you have a bathroom fan or kitchen fan with a separate switch, they're either not used or they're left on too long. If occupants don't use their switch-type fan, then mold and foul smells stay around long enough to plant themselves and become a problem -- part of the carpet, the drapes, and so on. With the ALDES system, our tenants don't have a choice. The system is constantly on, 24 hours a day."

The ALDES system's continuous operation also eliminates the unit-to-unit pressure differences that are common in buildings with conventional range hoods and ceiling-mounted bath fans. When a bath fan and range hood are operating in one apartment, it's easy to pull smoke and odors from the hallway or the unit next door. Continuous exhaust ventilation and outside air supply in all units eliminates this unpleasant cross-contamination by equalizing pressures in the units.

System Installation

ALDES multi-port ventilation systems are straightforward to install. MPV fans are centrally located in the attic and ducted to

each unit with insulated duct, therefore fan noise is virtually eliminated for the tenants. One fan serves multiple units, so framing, wiring, and ducting are reduced.

In multifamily projects, a ventilation subcontractor, the HVAC subcontractor, or the general contractor usually installs the equipment. Jeff Baird worked with one of his crew members installing the ALDES equipment in the first several units. After that, two crew members installed the rest of the system. "It went rather quickly," said Jeff.

A conventional ventilation design for The Aspens would call for:

- 32 kitchen range hoods
- 48 bath fans
- 48 bath fan switches
- 40 wall caps
- 40 roof jacks
- 128 wiring evolutions

The ALDES ventilation system required:

- 8 Multi-Port Ventilator fans
- 8 roof jacks
- 8 wiring evolutions
- 80 AIRLET 200 wall inlets



Multi-Port Ventilator

Advantages for Building Owners

Since The Aspens was completed and rented in November 1997, the Bairds have discovered some of the advantages of quality ventilation. They've avoided the problems from moisture and cigarette smoke that are common in rentals. Bathing and cooking cause high humidity levels in many apartments, but continuous ventilation keeps humidity at healthy levels and prevents lingering odors.

"We haven't had to repaint or re-carpet any units yet. All smells and moisture issues are pretty much alleviated," says Jeff. He tells a story about an elderly tenant who was a heavy smoker and rarely left her apartment. "We went into her unit when she left and did normal cleaning -- vacuumed the rugs and so on. Two days later there wasn't even a hint of an odor left in there. The smoke doesn't have a chance to actually penetrate the walls or the ceilings or the carpet."

Would the Bairds use an ALDES ventilation system again?

"I wouldn't go any other way. The ALDES system was one of the most important investments we made in our project," says Jeff. "We're looking at a new project now and it will have the ventilation system designed in. We like it."

The installed cost of a high quality ALDES continuous ventilation system using MPV fans, AIRLET through-wall inlets for makeup air, Constant Airflow Regulators for system balancing, and insulated duct is almost always less expensive than conventional ventilation system designs. Experienced installers report that the system is also easier to install.

The total wattage of the eight ALDES fans at The Aspens is 880 watts: four MPV 300 fans at 120 watts plus four MPV 200 fans at 100 watts. That is an average of less than 28 watts per unit. Despite this extremely low power consumption, the ventilation system meets the ASHRAE standard, and all units are continuously ventilated with exhaust pickups in kitchens and bathrooms.

In comparison, using ceiling-mounted bath fans to meet the ASHRAE Ventilation standard would require continuous operation of at least one bath fan in each unit. Since standard bath fans draw 50-75 watts, 32 units with one fan continuously operating would result in a minimum of 1,600 watts -- nearly twice the wattage of the ALDES system. Exhaust air would be drawn at a higher rate from one room rather than at a lower rate from two or three rooms, so the quality of ventilation would be lower. When the intermittent use of 32 kitchen range hoods and fans in 16 second bathrooms is factored in, the cost of traditional ventilation would be even higher.

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