



## Conquering Code in Colorado

### A Real World Solution To Residential Makeup Air Requirement

Bruce Fraser of Fraser Construction LLC knows something that many builders have yet to discover. You can have a suitably sized kitchen exhaust system and meet the IRC M1503.4 makeup air requirement without breaking the bank.

## 2 | Conquering Code in Colorado

This “good-to-know” information came as result of a major kitchen addition/renovation that Fraser completed at a home just west of Vail, Colorado, in the upscale community of Cordillera. The kitchen already had a high-end, 1200 cfm exhaust hood that would assimilate nicely into the renovation – but the building inspector had some bad news. The home did not meet the newly adopted IRC M1503.4 code, which states:

Exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (0.19 m<sup>3</sup>/s) shall be provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with a means of closure and shall be automatically controlled to start and operate simultaneously with the exhaust system.

In 2012 the code became mandatory in Eagle County, Colorado, several years after the Cordillera home was built. Since that time, homebuilders in this and other areas of the country where the code has been adopted have struggled to meet the requirement without imposing intolerable expense on the homeowner.



“When the client doesn’t want to pay the cost [of mechanical make-up air], we usually just install fan hood rated at 399 CFM,” said Fraser.

It is an imperfect solution at best since many of the homes Fraser builds and renovates are in excess of 5000 sq. ft. with large, commercial ovens. But while the code has challenged builders like Fraser, it is rooted in safety. Since modern homes are built with far less air leakage than they have in the past, the operation of a high-cfm exhaust hood can cause a negative pressure inside the home. This places the home at risk of back-drafting from fuel-burning appliances, which can lead to unsafe levels of carbon monoxide inside the home. Still, this level of mechanical intervention is a costly requirement for builders (and homeowners).

### A REAL Solution

Justin Nielsen, owner of Skyline Mechanical and the contractor hired to complete the mechanical side of the renovation to the Cordillera home, has also found IRC M1503.4 difficult to meet. According to Nielsen, homeowners have typically opted to downsize the kitchen exhaust hood rather than provide a means for makeup air.

“Before this new code it was pretty difficult to even find a kitchen hood that was under 400 cfm. Now manufacturers are specifically making 399 CFM hoods just so builders can meet this code,” said Nielsen.

The Cordillera home, however, triggered something in Nielsen’s recent memory. He recalled hearing about a new exhaust makeup air solution from Fantech that included an electric coil for makeup air reheat. The reheat coil tempers the incoming makeup air to offset the heat loss from the exhausted air. Upon further investigation, Nielsen learned that the Fantech makeup air system also included all of the necessary components to meet M1503.4 in one easily applied package, including a control system.

### Radiant and Retrofits

It was the perfect solution in this home, which like so many Colorado homes has radiant floor heating. Without a makeup air solution that included integral reheat, Nielsen would have had to install separate hot water coils for reheat of makeup air and tie them into the boiler system.

“At this home it would have been really expensive to connect the supply and return for the makeup heat back to the boiler plant. We would have had to purchase an additional pump, and getting all that piping through an existing home would have been tough,” said Nielsen.

Fortunately, the Fantech system is completely modular, so it can be ducted together to accommodate just about any space configuration. All of the necessary components are included -- the air intake hood, filter, makeup air fan, duct heater, and everything in between. Most important, the system includes an easy to set up controller that assures automatic, energy efficient operation for the homeowner.

## How it works

Fantech’s makeup air system goes into action as soon as the kitchen exhaust fan is activated. It is only energized during periods of kitchen exhaust. The control package includes a transducer that measures the current that the exhaust fan is drawing and uses that information to regulate the volume of make-up air. So no matter how much air the kitchen hood is exhausting, the makeup air system is bringing in the exact same amount of fresh air.

This air can be delivered into the kitchen near the exhaust appliance or it can be ducted into the return air duct of a forced air/ heating system located elsewhere in the home. The inline duct heater and shut-off damper are also controlled by the Fantech control. The heater tempers the make-up air as needed during the heating season.

During the set-up procedure, the installing contractor follows a few simple steps that “teach” the control system what current is associated with the minimum and maximum exhaust speed on the kitchen fan. Once the controller has this information, all future operation will be based on some percentage of that range, but always in exact concert with the exhaust fan itself.

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**- Bruce Fraser**

This set-up provides for a completely balanced air pressure inside the home during operation of the exhaust fan. This is recommended mode of operation. However, some builders may prefer a slightly positive or slightly negative pressure inside the home – sometimes as a means to minimize migration of moisture through the walls of a home. The Fantech make-up air solution can accommodate these operational preferences as well.

## Flexibility and Cost Savings

Since the Fantech solution is completely modular, Skyline mechanical was able to duct the make-up air directly into an air handler that was installed as part of a new air conditioning system, which Skyline also installed.

“The make-up air gets dumped into the central air handler so that it mixes

with the conditioned air and gets distributed throughout the main living area of home,” explained Nielsen.

During winter operation, the heating coil that is part of the make-up air system has the capacity to provide approximately 80% of the capacity to pre-heat the make-up air during design heating conditions in Colorado. Should the outdoor temperature exceed this capacity there is a back-up heating coil in the same air handler.

“The installations went really well. The system cuts down on a lot of wiring and relay installation. Overall I’d say it saves at least 30% of the labor associated with other make-up air solutions. We’ll definitely be using this in the future,” said Nielsen.

### First Cost Comparison - Fantech MUAS vs. Passive MUAS

	Fantech MUAS	Passive MUAS
Size of Exhaust Hood	1,200 cfm	1,200 cfm
Number of Supply Dampers Needed	1	9
Size of Supply Damper(s)	12”	8”
Cost of Components	\$2,245	\$3,249
Installation Costs	\$580	\$2,093
<b>Total Cost</b>	<b>\$2,825</b>	<b>\$5,342</b>

- Labor costs taken from the National Construction Estimator 2015
- Assume at least 10’ of exhaust duct from hood to home’s exterior
- Assume 5 Pa depressurization limit – fireplaces w/o combustion air provisions
- Assume a home in CO will be built to tight, energy-efficient standards: 3 ACH50
- Assume makeup air supply duct will be at least 10’ in length

For Bruce Fraser, the Fantech make-up air system alleviated his two greatest concerns: homeowner safety and meeting code.

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For builders like Fraser who will inevitably be faced with the same challenges on future projects, the Fantech make-up air system could not have arrived any sooner. Now they can have a ready solution long before the code official comes calling.



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