fantech®
a systemair company

Makeup Air System

What goes out, must come in

Exhaust Air System

Remote mounted inline exhaust system is a quiet and efficient solution for your kitchen exhaust.

The concept is simple: No fan motor in the kitchen hood makes for a silent yet powerful kitchen exhaust system. Enjoy entertaining a little more by not having to yell over the drone of a noisy kitchen exhaust hood. Mount the inline fan in an out-of-the-way location such as the attic or the crawlspace to take advantage of all that power with very little exhaust noise. Add a Fantech LD Engineered silencer for even better sound performance.

Inline Fan

A multi-purpose inline duct fan for exhaust or supply air.

*Options on page 9.

Silencer

Sound attenuation silencer for circular ducts. The silencer effectively reduces noise in the duct.

*Options on page 9.

MUAH 10/10 (Optional) Makeup Air Heater

The heater automatically varies its heat output to deliver air at the temperature set point, even as the air flow rate and outdoor air temperature vary.

Kitchen Hood Liner

This series features a built-in infinite speed control for the fan, washable aluminum filters and dimmable halogen lights.

Makeup Air System

A MUAS automatically compensates for an exhaust system with fan-powered, proportionally adjusting makeup air. Fantech's MUAS is designed for residential kitchen supply systems that have exhaust needs of up to 1200 CFM. It can be set up for a variety of pressure schemes: slightly negative, slightly positive, or **balanced**. The MUAS provides the exact amount of air selected.

*As of 2009 the IRC requires MUAS on 400 cfm or greater kitchen hood exhaust hoods.

MUAS 1200 includes:
FML 10 Wall Intake Hood
FGR 10HV Filter Cassette
PrioAIR 10 EC Inline Fan
LD 10 Silencer

Our Fan Story • Exhaust & Makeup Air Systems

A residential makeup air system needs to be both simple and effective. It must be versatile in how and where it can be installed in the home. It must operate automatically to accommodate a fluctuating exhaust air flow rate and a wide range of outdoor temperatures. A makeup air system also needs to replenish exhausted air while not endangering occupants with the potential for backdrafting appliance vents and hearth chimneys. Fantech's Makeup Air System does more than provide a means to satisfy the building code – it's an engineered solution for a complex application.

Kitchen Solution
Exhaust with Makeup Air System

Why do we need makeup air?

In a nutshell - we would otherwise have problems. Today's homes are built to be more energy-efficient. "Tighter" construction resists the infiltration of outdoor air in and out of the home's exterior, which limits the amount of makeup air the home will permit.

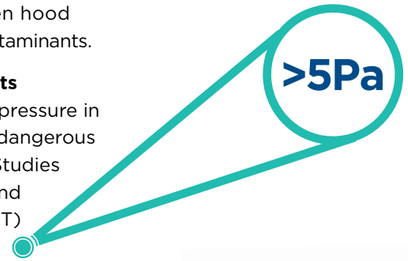
When an exhaust fan operates without sufficient makeup air, some undesirable results can occur:

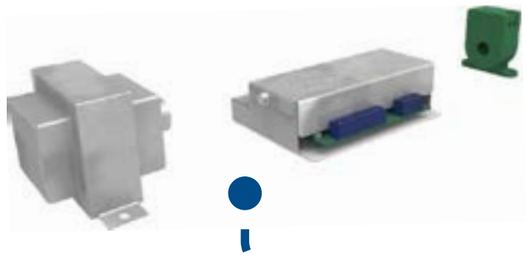
The exhaust system will not work to its intended capacity
Kitchen hood exhaust systems are sized to remove cooking-generated heat, odors and contaminants based on the cooking equipment's dimensions and heat rating. Inadequate makeup air can prevent a kitchen hood exhaust system from adequately removing contaminants.

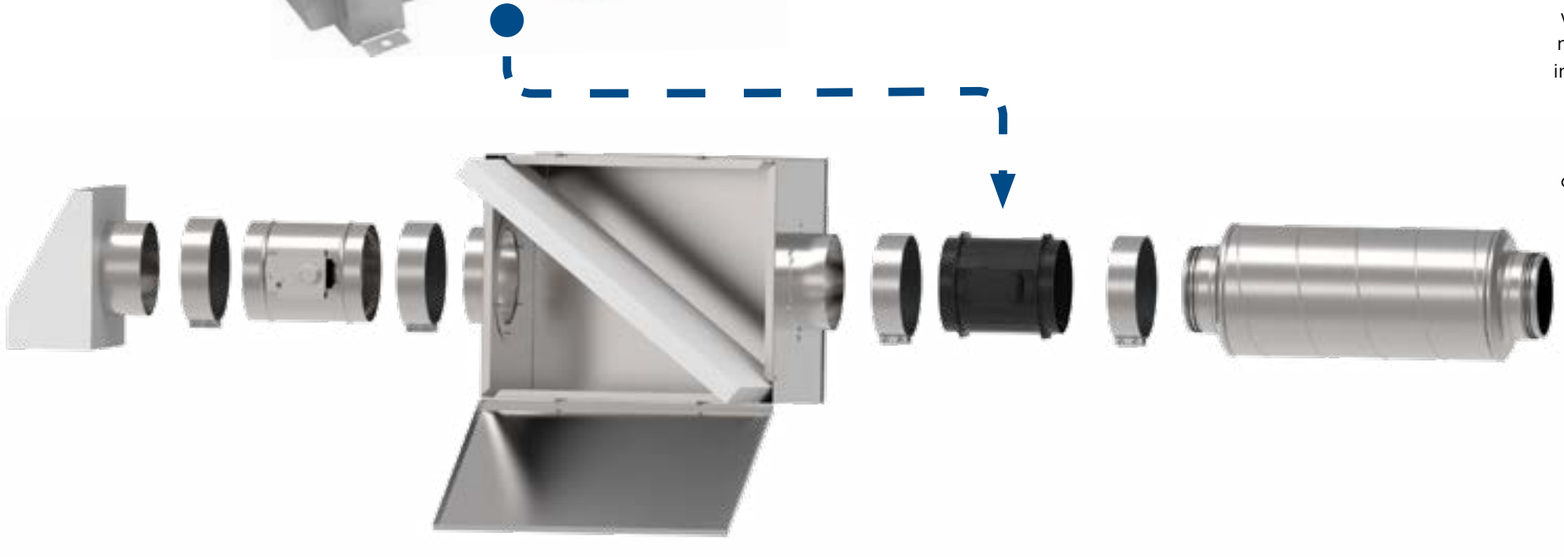
Backdrafting of chimneys and appliance vents
Insufficient makeup air will result in negative pressure in the home. This "backdrafting" can result in a dangerous accumulation of harmful gases in the home. Studies by the Building Performance Institute (BPI) and Residential Energy Services Network (RESNET) have shown that as little as **5 Pa (0.02" w.g.)** depressurization can cause backdrafting.

Non-compliance with the US and Canadian building codes
Beginning in 2009, the International Residential Code (IRC) has required that makeup air be provided for kitchen hood exhaust systems with capacity of 400 cfm or greater.

Canada's National Building Code has a section titled, Protection Against Depressurization. Essentially, any exhaust device operating at a higher airflow rate than the normal operating exhaust capacity for the dwelling shall have provision for make-up air.







White paper available
SPECIFIERS: please visit our website at **fantech.net** to view our Independent Engineering White Paper, Residential Exhaust Makeup Air: Explanations and Solutions, which explains why active makeup air is the only proper solution for your customers.

The Fantech Makeup Air System is the only solution

A home builder could actually satisfy a home's makeup air requirement by leaving a relatively large hole (or several) in the exterior wall. Although, a hole in the wall might satisfy the makeup air requirement in the code, most would agree that such a solution is hardly ideal, especially during peak seasonal weather conditions.

The "passive" solution is similar to the hole in the wall. This solution has no fan supplying air into the home, so the home MUST be depressurized for air to flow in. This results in a very large opening (or multiple ones) in order to keep the level of depressurization below the backdrafting threshold. The passive solution does not accommodate direct filtering and tempering, since it is not fan-forced.

The Fantech's Makeup Air System (MUAS) is a "powered" or "fan-forced" system. The MUAS is triggered when the compensated exhaust system is energized. The MUAS damper opens and the MUAS fan is powered on. The fan is speed-controlled proportionally to the speed of the compensated exhaust system's fan speed. In other words, as you speed up the exhaust fan, the MUAS fan speeds up too.

Fantech Makeup Air System advantages at glance:

- Automatic, infinitely modulating air flow in proportion to the exhaust
- Particulate matter is filtered from the outdoor air before it is delivered to the home
- Since it is fan-forced, makeup air can be ducted to where it can be most suitably delivered to the home
- Cold outdoor air can be tempered with optional MUAH heater kits
- MUAS can be set up by the installer for a variety of pressure schemes:
  - Slightly negative, slightly positive, or balanced
- MUAS provides the EXACT amount of air needed - no more, no less
- Complies with the building code (2018 IRC)

Fantech Makeup Air Controller (FMAC)
The patented FMAC is the brains of the makeup air system. While the compensated exhaust system is operating, the makeup air fan supplies air at a rate necessary to maintain the desired building pressure scheme as set up by the installer. The makeup air flow rate automatically and infinitely varies proportionally with the speed at which the exhaust is operated by the homeowner. A neutral (balanced) pressure scheme is common, but the installer can also employ a slightly positive or negative pressure scheme as desired.

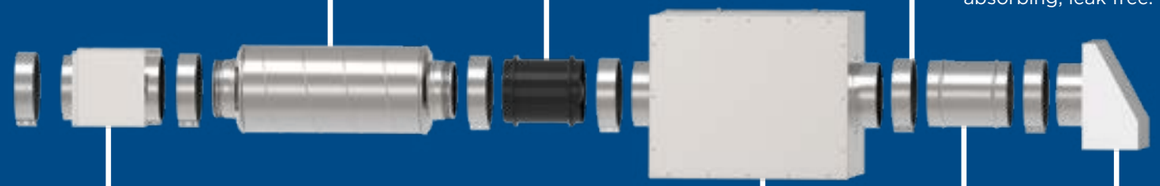
The FMAC includes a current transducer, system controller, transformer, and a NEMA electrical enclosure.

Makeup Air System
Ducted Components

Duct Silencer
Provides ducted sound attenuation between makeup air fan and the location of makeup air delivery to the home.

Makeup Air Fan
EC motor-driven fan is automatically speed-controlled by the makeup air system controller.

Fast Clamp
Lined with neoprene to give a vibration-absorbing, leak free.



Duct Heater (optional)
Controlled via discharge air temperature, the heater automatically varies its modulating heat output to deliver air at the temperature set point, even as the air flow rate and outdoor air temperature vary.

Filter Cassette
Galvanized housing with filter access includes MERV 10 filter for removing dust and pollen before air is delivered to the home.

Shut-off Damper
Normally closed, motorized damper is open only when makeup air system is operating.

Wall Intake Hood
Air inlet to makeup air system; includes bug screen.

Beginning in 2009, the International Residential Code® (IRC®), used in the US has included a kitchen makeup air requirement. A paragraph in chapter 15 of the 2018 IRC® reads:
M1503.6 Makeup air required.
Where one or more gas, liquid or solid fuel-burning appliance that is neither direct-vent nor uses a mechanical draft venting system is located within a dwelling unit's air barrier, each exhaust system capable of exhausting in excess of 400 CFM shall be mechanically or passively provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not fewer than one damper complying with IRC®.

MUAS that fits your home

Our system

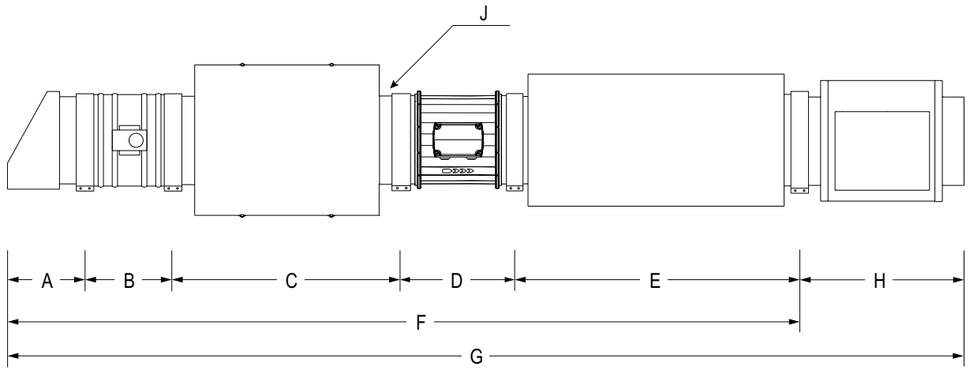
The MUAS includes all system component items except a heater (optional accessory), wiring, duct work, insulation and electrical disconnect.

Specification data

Model			MUAS 1200
	Maximum Airflow Rate	cfm	1,156[1]
Included components	FMAC Makeup Air Control[3]		(1) FMAC
	Metal Wall Intake Hood		(1) FML 10
	Motorized Shut-off Damper		(1) ADC 10
	Filter Cabinet w/ Pleated Filter		(1) FGR 10HV
	Fan with EC-motor		(1) PrioAIR® 10 EC
	Duct Silencer		(1) LD 10
	Mounting Clamp (in pairs)		(2) FC 10
	Item #		K46014
Shipping Weight		lbs (kg)	132 (60)

[1] Air flow rate for fan operating at full speed against 0.2" w.g. static pressure

Dimensions



Model	A	B	C	D	E	F	H (optional)	G	J
MUAS 1200	10 (254)	10 (254)	30 1/2 (775)	9 13/16 (249)	38 1/2 (986)	98 13/16 (2510)	14 (356)	112 13/16 (2865)	10 (254)

Dimensions are in inches (mm).

Exhaust Fans for Internal Installations

The products listed below are featured in the renderings on pages 2-3. Visit us at **fantech.net** to find the full selection and product descriptions for the following products.

INLINE DUCT FAN • FKD Series

This mixed-flow series inline duct fan combines high airflow with the high static pressure. The FKD Series can be used for exhaust or supply applications where high static pressures need to be overcome.

FKD 8 shown in rendering could be used for supply or exhaust.

Specification data

Model	Duct size	Rated power	Voltage / phase	Max amps	RPM	0.0" P_s	0.5" P_s	0.75" P_s	1.0" P_s	1.5" P_s	Max Ps	Shipping weight	Item #
	in (mm)	W	V / -	A	min^{-1}	cfm					in.wg.	lbs (kg)	
FKD 10	10 (254)	305	120 / 1	3.01	2,700	908	750	653	544	338	2.6	18 (8)	40014
FKD 10XL	10 (254)	485	120 / 1	4.48	2,850	1,266	1,096	1,006	901	681	3.01	24 (11)	40013

Performance shown is for installation type D - Ducted inlet, Ducted outlet. RPM shown nominal. Performance is based on actual speed of test. Performance ratings do not include the effects of appurtenances.

Accessories

Kitchen Hood Liners compatible with most hood designs. Attractive stainless steel fascia supported by a sturdy, galvanized steel housing. AC controller included.

Model	Item #	Duct Collar in (mm)	Size in (mm)
HL 42	54046	10 (254)	42 (1067)
HL 48	56045	10 (254)	48 (1219)

Mounting Clamps FC help facilitate the installation and removal of fans for service and cleaning.

Model	Item #	Duct Size in (mm)
FC 10	411122	10 (254)

Silencers LD for circular ducts are fitted with a gasket collar and is compatible with most hard duct. Verify fit and use transitions as necessary.

Model	Item #	Duct Size in (mm)
LD 10	411286	10 (254)

Roof Cap RC for installation on sloped roofs are assembled with pre-painted black painted steel sheet. They include 1/4" discharge screen, aluminum backdraft damper with rubber gasket, and 3" duct collar extension.

Model	Item #	Duct Size in (mm)
RC10P	79959	10 (254)

Optional Heater

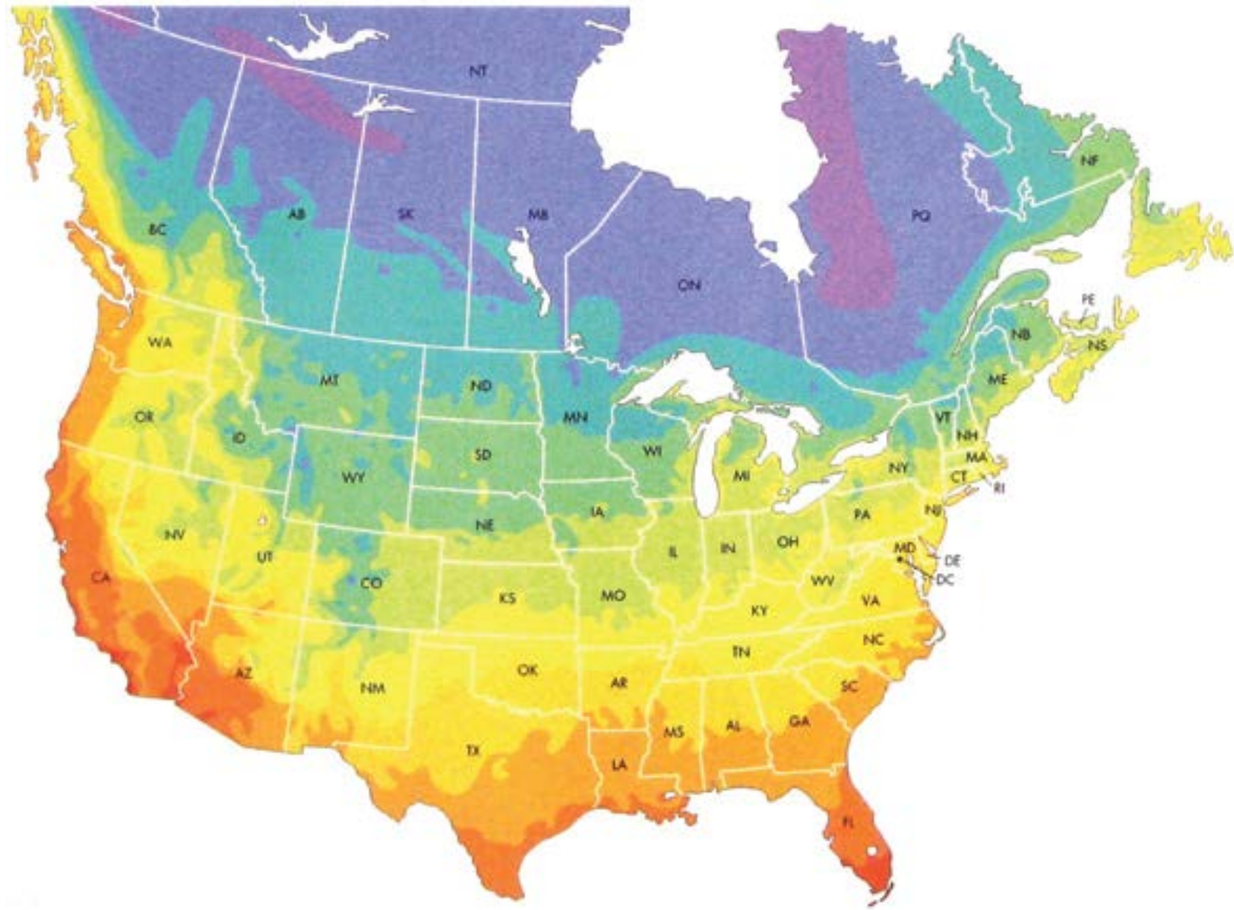
Makeup Air Heater's are not required everywhere, but we suggest them, especially for colder air temperature zones.

Specification data

Model			MUAH 10 / 10	
Maximum Allowable Airflow Rate		cfm	1,200	
May be used with MUAS model			MUAS 1200	
Maximum Heat Output		kW / BTUh	10 / 34,120	
Heater Duct Connection Diameter		inch (mm)	10 (250)	
Electric Heater Application Table			Zones	Temp Rise °F (°C)
Suggested Heater Selection for Map Zones[1, 2]	400	cfm	4 - 7	79 (26)
	500	cfm	5 - 7	63 (17)
	600	cfm	6 - 9	53 (12)
	700	cfm	7 - 11	45 (7)
	800	cfm	7 - 11	40 (4)
	900	cfm	7 - 11	35 (2)
	1,000	cfm	8 - 11	32 (0)
	1,100	cfm	8 - 11	29 (-2)
Included Components	Mounting Clamp (in pairs)		(1) FC 10	
Item #			K46017	
Shipping Weight		lbs (kg)	25 (11)	

[1] Map zones 9 -11 have a climate that does not necessarily require a heater for makeup air. Heat may be included, if desired.
[2] MUAH models can only provide the temperature rise as indicated. During very cold conditions heaters might not deliver air at the temperature set point.

Outside average air temperature by zone*



* **NOTE:**
Some areas, particularly those at high elevation, might experience colder average temperatures than the map suggests.

	Fahrenheit	Celsius
Zone 1	below -50°	below -46°
Zone 2	-50° to -40°	-46° to -40°
Zone 3	-40° to -30°	-40° to -34°
Zone 4	-30° to -20°	-34° to -29°
Zone 5	-20° to -10°	-29° to -23°
Zone 6	-10° to 0°	-23° to -18°
Zone 7	0° to 10°	-18° to -12°
Zone 8	10° to 20°	-12° to -7°
Zone 9	20° to 30°	-7° to -1°
Zone 10	30° to 40°	-1° to 4°
Zone 11	above 40°	above 4°

Colorado Homebuilder Meets Kitchen Makeup Air Requirement with Fantech

Bruce Fraser of Fraser Construction LLC knows something that many builders do not. You can have a suitably sized kitchen exhaust system and still meet the IRC M1503.4 makeup air requirement without breaking the bank.

This "good-to-know" information came as a 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 assimilated nicely with 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 cfm (0.19 m^3/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."

Luckily, Fraser's mechanical contractor had solution: a new Fantech Makeup Air System with an electric coil for makeup air heat.

The Fantech makeup air system was specifically designed to help builders and contractors to meet IRC M1503.4. Per the code's requirement, the Fantech system automatically supplies makeup air at a rate that is equal to the exhaust air of the kitchen fan. An integral transducer actually measures the current draw from the exhaust fan and uses that information to precisely regulate the volume of make-up air so air is always balanced.

The packaged duct heater was particularly beneficial in this project since the Cordillera home relies on radiant rather than forced air for space heating.

> "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 Justin Nielsen, owner of Skyline Mechanical.

Although IRC M1503.4 has challenged builders, 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 an excessive pressure inside the home. This can result in back-drafts from fuel-burning appliances, which can lead to unsafe levels of carbon monoxide and other toxins inside the home, in addition to bad odors that will linger.

Bruce Fraser understands and respects the purpose of the code.

> "My greatest concern as a builder was to avoid any potential for carbon monoxide poisoning. And of course we have to be able to meet code within the budget constraints of the project."

Project location: Cordillera, Eagle County, CO
Builder: Fraser Construction LLC
Contractor: Skyline Mechanical Inc.

Mercer Way Home
with Fantech's Makeup Air System

Connected by a bridge to Seattle from the west and Bellevue from the east, Mercer Island features 475 acres of parks and open space that includes three public beaches, and over 50 miles of hiking trails. The island also is one of the 100 richest ZIP codes in the USA according to the IRS figures for adjusted gross income.

In 2015, JayMarc Homes built a then new spec home on Mercer Way Avenue. The 3-story home is 4,300 ft² with 5 bedrooms, 4-1/2 bathrooms, and a 3 car garage. Sitting just off the coast of Lake Washington, residents are showered with views of the lake from almost every angle.

Homes with large cooking areas generally use a large kitchen exhaust fan to move cooking odors and smells out. Within this residential home on Mercer Way, the kitchen uses an exhaust system that can exhaust up to 400 CFM and then some. Built in 2015, the home was built to the International Residential Code (IRC) under the 2012 version. This version was the first iteration that included section M1503.4, which states,

> "Exhaust hood systems capable of exhausting in excess of 400 cubic feet per minute (0.19 m3/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."

Without a makeup air system, operation of this kitchen's exhaust system can create negative pressure and cause "back-drafting" of hazardous combustion products from vent/chimney systems, including carbon monoxide into the living spaces.

To protect the health & safety of future occupants and to satisfy the IRC code, Doug Quinn, General Manager of Bob's Heating, chose the makeup air system by Fantech.

Fantech's makeup air system is an all-in-one solution to the M1503.4 code. 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 makeup air. This control activates the system when the kitchen exhaust fan activates. Once activated, the makeup air system detects the amount of air moving out and brings in the exact same amount of fresh air; keeping the pressure scheme balanced. This kind of control is essential to meet M1503.4 where the makeup air system must be automatically controlled and must start and operate simultaneously with the exhaust system. Quinn told Fantech,

"I'm not aware of any other exhaust makeup air solution that allows the flexibility to automatically adjust the makeup air CFM and preheat the incoming air. The installation went pretty darn well so we are encouraged."

Jeremy DeBoer, site supervisor for JayMarc Homes, worked alongside Doug Quinn of Bob's Heating to build this Mercer Way Home. Fantech would like to congratulate all involved on a successful project!

Project location: Mercer Island, WA
Builder: JayMarc Homes
Contractor: Bob's Heating and Air Conditioning Inc.

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