

# IES GREEN REVIEW

INTELLIGENT ENERGY SOLUTIONS LLC

## ATTIC FANS

A building science review of safety, indoor air quality and energy efficiency.

There are many opinions about attic fans and their impact on lowering utility bills. I will start off by saying that attic fans have a potential to offset cooling costs, but we need to keep in mind that a house is a system, and the attic is part of that system.

The living space of your house and attic are connected. Air exchanges between them given temperature and pressure difference. Now insert a fan in the attic pulling 1000+ Cubic Feet per Minute (CFM) of air. Air is like water and electricity in that it follows the path of least resistance. The fan will pull air from where ever it can, resulting in air being pulled from both the attic and house. This is a situation that we have observed, measured and corrected on numerous occasions. We have measured pressure differences from -5 Pascal's (PA) to -20 PA. Now consider your hot water heater and furnace need to operate in a zone where they can naturally draft on their own and we have a potential issue.

*The Building Performance Institute (BPI) has established depressurization limits for the areas around combustion appliances typically no greater than -5 PA.*

Health and safety are always the first consideration. Under conditions where the house is depressurized, atmospherically vented hot water heaters and furnaces **cannot** establish draft, and spew their exhaust gases into the house instead of up the flue. The hot water heater exhaust contains unwanted indoor air contaminants including Carbon Monoxide (CO), Carbon Dioxide (CO<sub>2</sub>), Nitrous Oxide (NO<sub>x</sub>), Sulphur Dioxide (SO<sub>2</sub>), Volatile Organic Compounds (VOCs) and particulate matter (PM). Let's not forget the added heat and moisture from the exhaust.

Secondly the volume of air being pulled out of the house through the attic fan must be replaced with air from the outdoors. We recently observed and measured a situation where the attic fan was pulling 350 CFM of air from



the house. Given a typical 4-bedroom single family home with approximately 32,000 cubic feet of volume, 350 CFM is 21,000 cubic feet per hour, in other words 66% of the total volume of air in the house is being replaced every hour. Although a home needs fresh air, an overabundance can **increase** energy costs and produce comfort issues such as excess humidity.

Attic fans use electricity and so does your air conditioner. To phrase it another way, you are spending money on electricity to try and save money on electricity. An average attic fan (not solar powered) consumes

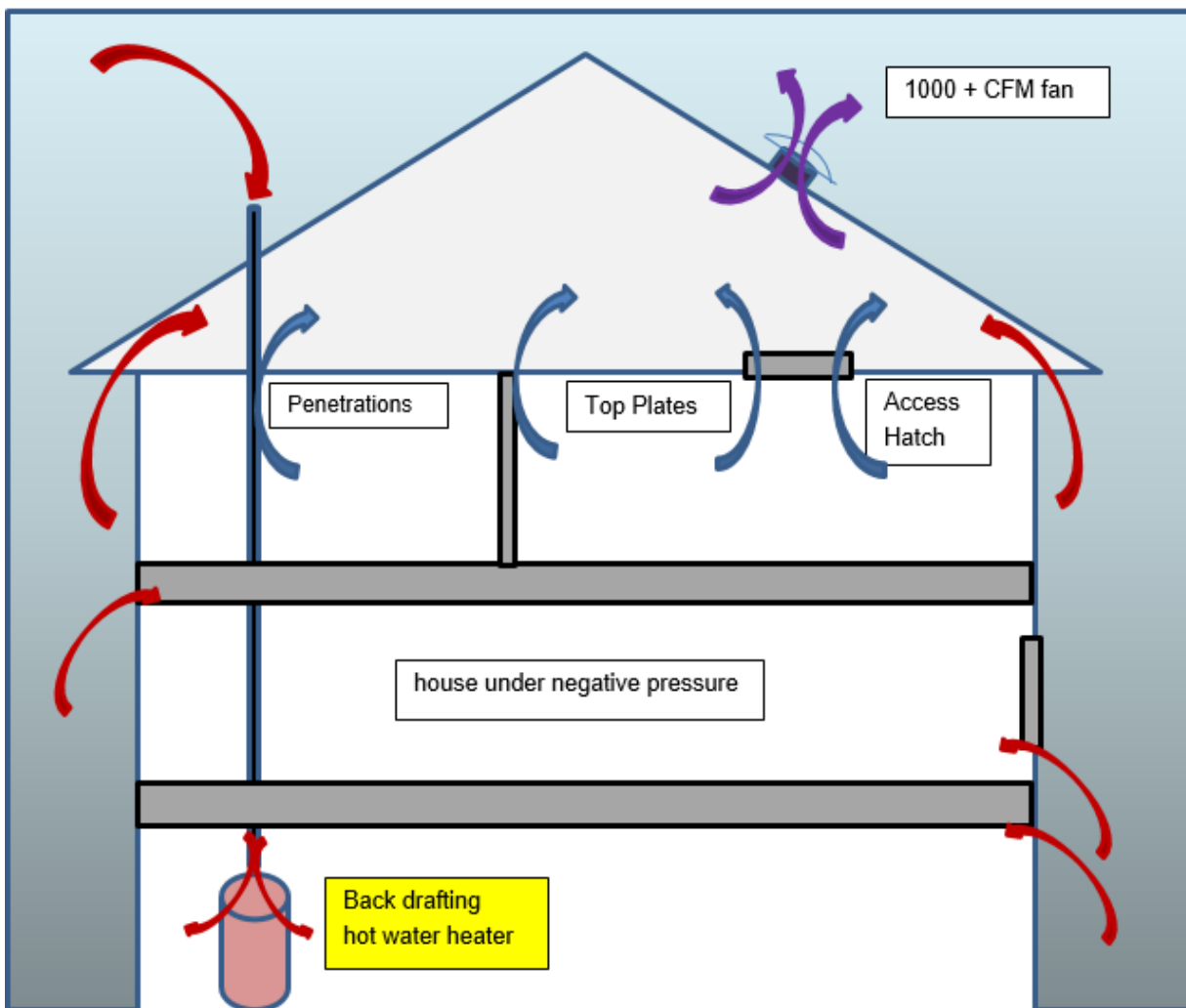
between 300 and 500 watts of electricity. Assume 300 watts running for 12 hours per day equals 3.6 Kilowatt Hours (kWh). Over a three-month period, the fan would consume 324 kWh of electricity.

**Solution** – attic fans can only work safely and effectively if all four of the following conditions are met:

1. Proper air sealing between house and attic.
2. Proper ventilation in attic.
3. Testing to ensure the above two conditions are met. RESNet or BPI certified company.
4. Minimal power consumption of attic fan.

reducing if not eliminating the need for an attic fan. As an added bonus, the increased insulation and air sealing would also save you money during the heating season.

An alternative approach would be to properly air seal, ventilate and insulate the attic therefore



Outside air – Summer    In-Door Conditioned Air

With the attic fan extracting 1000 + CFM of air, where is the air being extracted from? The answer: the path of least resistance. The house and attic are connected, without proper air sealing between the house and the attic and sufficient vents to accommodate the flow of air through the attic fan, then the air will be extracted from the house.



Additional Recourses:

[https://www.energystar.gov/index.cfm?c=diy.diy\\_attic\\_ventilation](https://www.energystar.gov/index.cfm?c=diy.diy_attic_ventilation)

References:

<https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf>

[http://www.bpi.org/standards\\_approved.aspx](http://www.bpi.org/standards_approved.aspx)