



# Building Science Bootcamp Alternatives to A/C

Advances in Whole House Fan and Building Cooling Technology



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# Alternative Cooling “Low-Tech” Pre-2010 Whole House Fan

## Pros:

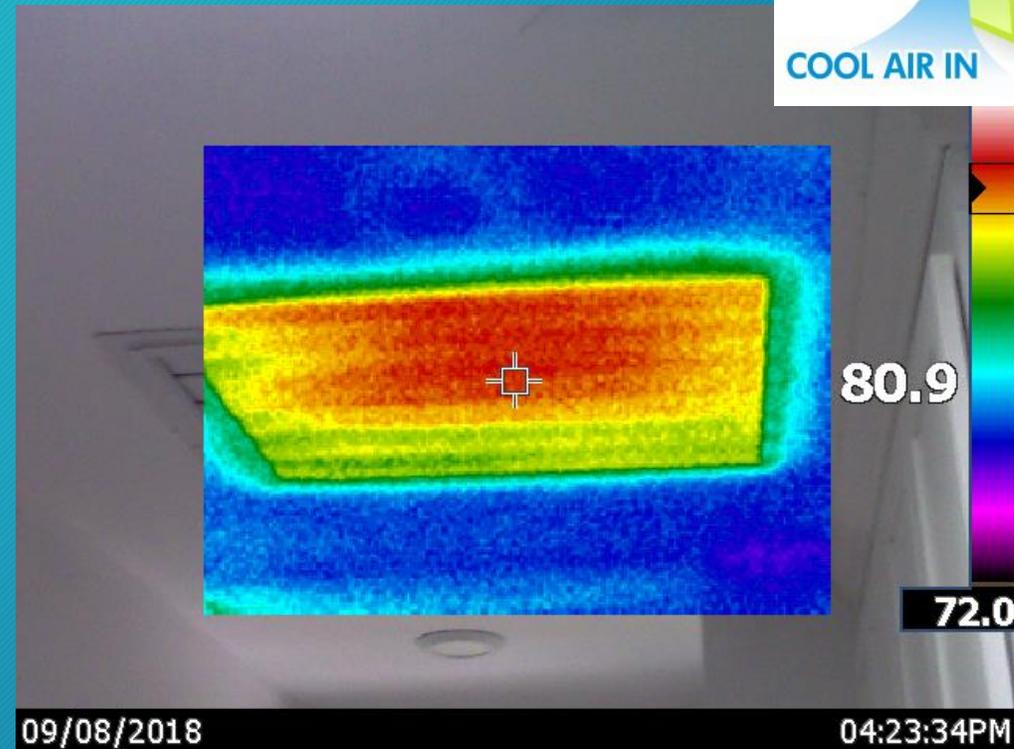
- Inexpensive & low-risk installation,
- Capable of 5,000 CFMs, but needs 10 net-free sq. ft of ventilation,
- Simple to operate, maintain, and replace parts,
- Historically durable & lasting.



# Alternative Cooling “Low-Tech” Pre-2010 Whole House Fan

## Cons:

- Leaky and uninsulated,
- “*Too loud*” to leave on all night, cavitates and vibrates too much,
- Higher power consumption (permanent-split-capacitor) motors,
- Frequent motor burn-outs due to inexpensive mass production, and excessive heat and pressure buildup during operation.



# Alternative Cooling Modern Whole House Fan Technology

## Pros:

Quiet operation promotes effective overnight, *'all night long'* use,

Air-tight, insulated dampers stop energy loss when not in use,

Efficient variable-speed DC brushless motors save energy,

High-volume, low-pressure fans; move large amounts of air with ample ventilation.



2<sup>nd</sup>-Generation Whole House Fan (WHF)



# Alternative Cooling Concepts

## Air temperature vs. Mass Temperature

### Back to Basics:

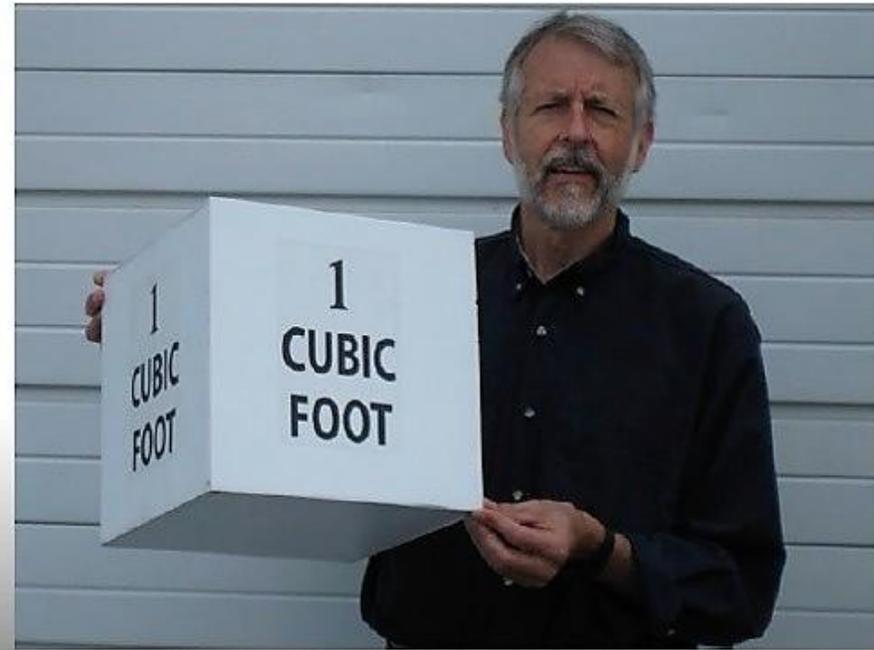
A pound of air and a pound of building materials have the same amount of heat, when both are at the same temperature,

The volume of air in an average sized home only weights about 1,300 lbs,

The conditioned building materials and contents of the home weigh 300,000 lbs!

So you can pre-chill the mass of the building overnight for 10 cents in electricity, and stay cool all day!

1 cubic foot weighs 1/10 lb.  
(almost)



# Air-conditioning vs. Whole House Fan Annual Cost to Operate

Air Conditioning: \$300 - \$500



Whole House Fan: \$15 - \$20



# Air-conditioning vs. Whole House Fan Efficiency Ratings

## Example Calculations for A/C:

3-Ton AC = 36,000 BTUs

Outdoor Compressor = 3,000 watts  
Indoor blower motor = 600 watts

Temperature Split = 22 degrees

Target Airflow = 1500 CFMs

$(22 \times 1500) \times 1.1 = 36,000$  BTUs

BTUs / Watts = 10 SEER



# Air-conditioning vs. Whole House Fan Efficiency Ratings



## Example Calculations for WHF:

Model 3200 Airscape WHF

ECM Fan Motor = 250 w

Temperature Split = 15°

Target Airflow = 3000 CFMs

$(15 \times 3000) \times 1.1 = 50,000$  BTUs

BTUs / Watts = 200 SEER



*The modern whole house fan is up to 20 times more efficient than AC.*

# Air-conditioning vs. Whole House Fan New Home Builder Upgrade



## New Construction Builder Option:

Wholesale Fan Cost: \$1,250

Labor at Rough-In: \$250

Margin on Upgrades = 35%

Cost to Homeowner = \$2,300\*

Monthly Mortgage = \$7

*Retail Retrofit = \$2,995*

\*may eliminate need for AC in better designed homes, and 2<sup>nd</sup> AC unit in attic of larger homes, savings thousands of dollars.



# Air-conditioning vs. Whole House Fan Eliminating Attic-based AC Saves \$\$\$



## Expensive \$\$\$

Save materials & labor; cooling equipment, electrical, condensation drain system, duct installation, etc.



## Duct Work Problems

The majority of ductwork mistakes are made in attics; during initial installation & damaged otherwise over time.



## Inefficient \$\$\$

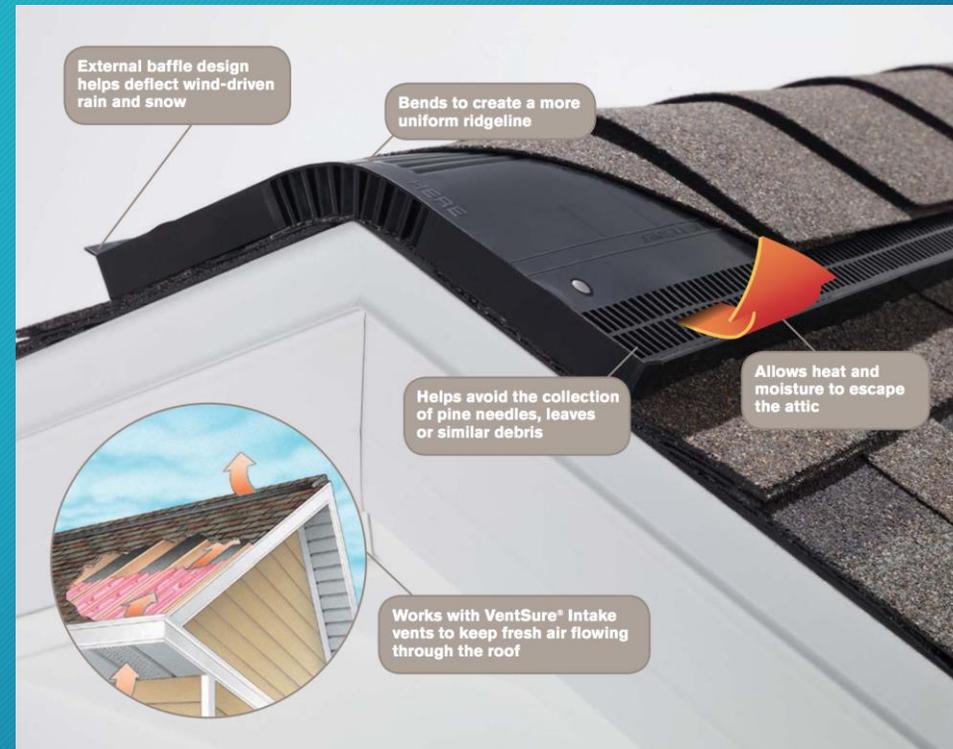
Air conditioning system work hard to produce and deliver 55° airflow in 135° attics.

# Alternative Cooling Attic Ventilation Requirements



## Building Code Consideration:

- Current ventilation requirements are adequate in most cases,
- 2<sup>nd</sup> generation whole house fans need 5 - 7 net free sq ft total,
- Homes with cathedral ceilings and/or hip-roofs will need supplemental venting,
- Ventilation could be calculated by volume of home, for WHFs.



# Alternate Cooling Quality Control for WHFs

## Best Practices include;

- Sealed plenum & framing,
- Well installed ductwork with smooth radius elbow, mechanically fastened and junctions taped,
- Avoid contact of low-voltage CAT-5 cables with high-voltage 110 wiring or sharing empty wall cavities,
- Test static-pressure on high-speed, confirm less than 0.05 i.w.c.



*This installation wasn't working  
for obvious reasons.*

# Alternative Cooling Commissioning Whole House Fans



## Check Air-flow

Bench-testing done using Proctor Engineering Flow-plate, and DG700 Manometer.



## Check Air-flow

Confirms manufacturer's fan flow performance in CFMs and wattage, at various speeds.



## Check Static Pressure

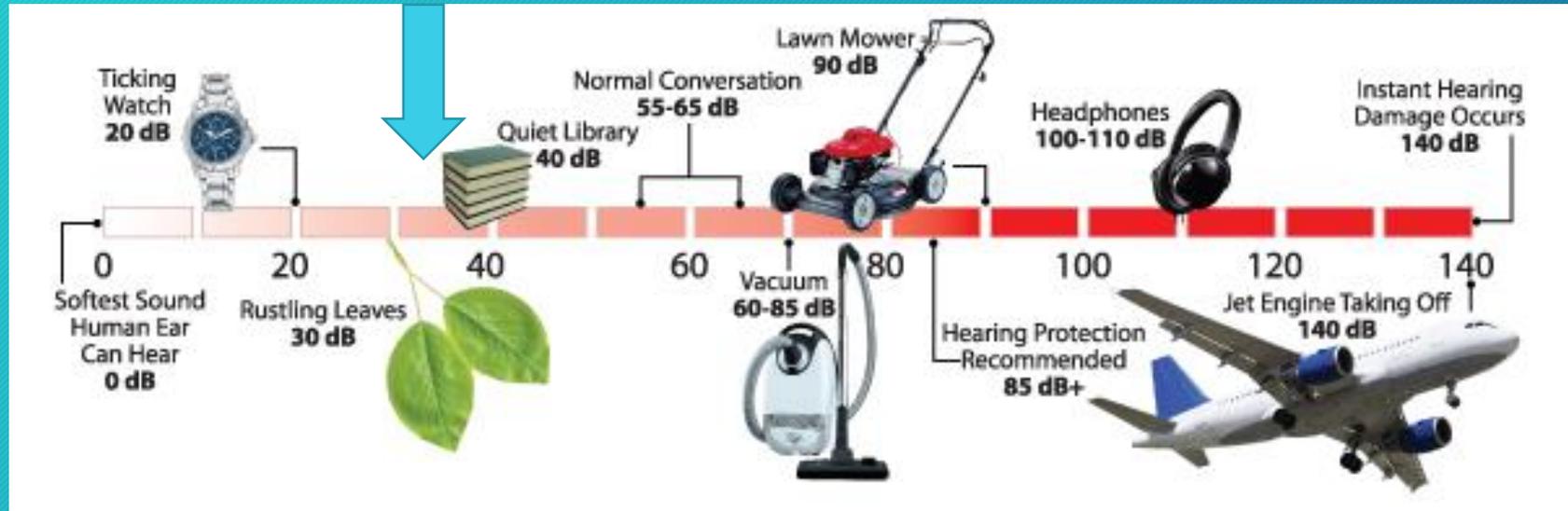
'High volume, low pressure fans' save energy, run quietly, reliable, but only with ample ventilation.

*Effective cooling with WHF's requires enough ventilation to exchange all of the air in the home 8 to 10 times per hour of operation.*

# Alternative Cooling Quiet Second Generation WHF's



Modern Whole House Fans Deliver Quiet Efficient Comfort



Links to Example Brands of 2<sup>nd</sup> Generation Whole House Fans:

<https://www.tamtech.com/>

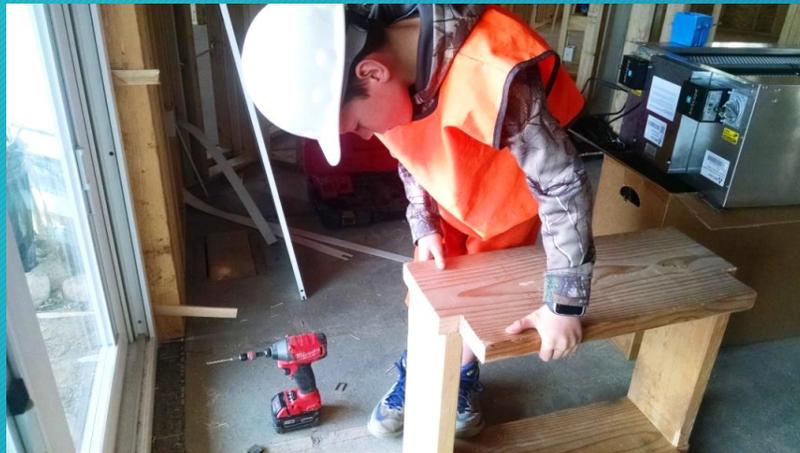
<https://airscapefans.com/blogs/airscapeing-101>

<https://quietcoolsystems.com/homeowners/thermal-mass-cooling/>

# Alternative Cooling Simple and Effective



Be sure to build risers to allow for full depth insulation in the area of blowing fan blades, and to further reduce the noise/decibel levels if desired.



*"So easy a rookie can do it"*

*Our Jesse helping out his Dad with a whole fan install on summer break a few years ago.*

# Building Science Bootcamp Alternatives to Air-Conditioning

To Learn More about Energy Codes or  
Green Building, please contact:

Community Development

<https://www.larimer.org/building>

Building: 970-498-7700 or

Planning: 970-498-7683



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