Worksheet Example

Client Name:	#REF!	Job #:	#REF!
Address:	#REF!		
Phone #:	#REF!	Date:	
		Stage:	

INPUT RELVANT DATA INTO YELLOW CELLS

Existing Home Information (Section 4.1)

Living Space	1200
Volume	9600
Number of stories	1
# Bedrooms	3
# Occupants	4
Location:	ansing Capital City Airpor
CFM50 (post Wx)	1350
Sqft of living space surface area	1
Sqft of living space surface area NOT shared	1
Attached dwelling tightness measurement	.

Local Exhaust (Section 5.1)

Kitchen volume	800
Is there an operable window?	YES
Is the fan rated for continuous use?	NO
Is the fan a range hood?	NO FAN
Measured fan flow rate (cfm)	0
In compliance?	NO

	Bath 1	Bath 2	Bath 3
Does this bathroom exist?	YES	YES	
Is there an operable window?	NO	YES	
Measured fan flow rate (cfm)	35	0	
Is the fan rated for continuous use?	NO	NO	
In compliance?	NO	NO	NO

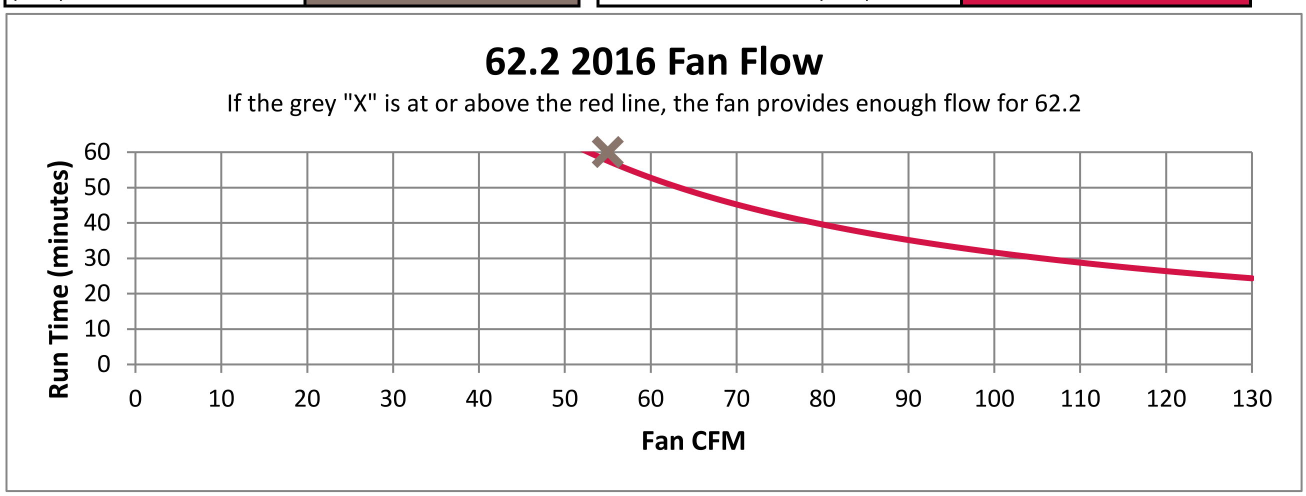
Local exhaust inputs valid?	Yes

Outputs

Whole house vent. req. (cfm):	66
Local ventilation deficit (cfm):	31
Infiltration Credit (cfm):	44
No need to ventilate rate (cfm):	2480

Final documentation

If a fan was used to comply with 62.2, in what room is it located?	Bath
Measured CFM of fan used to comply with ASHRAE 62.2:	55
Minutes fan is set to run per hour:	60
Continuous Mechanical Ventilation needed (cfm):	53



This is intended to be a methodology for estimating how much savings/costs would be provided with the addition of an ASHRAE compliant occupant ventilation fan instead of having uncontrolled air leakage for ventilation. It would be very difficult to make a universal savings estimation due to different blower door reductions, types of buildings, their location, building height…etc. This process would be site specific.

Two formulas will be used to calculate the cfm of estimated average natural infiltration and also to determine the cost savings for infiltration reduction and the cost of operation for the ASHRAE fan.

$Q_{inf} = .052 \times Q_{50} \times wsf \times (H/H_r)^z$
Where:

- Q_{inf} = CFM of estimated natural infiltration
- Q_{50} = CFM50 from blower door test
- *wsf* = weather and shielding factor – Appendix B
- $(H/H_r)^z$ = height correction factor
- H = height of above grade pressure boundary
- Hr = reference height – 8.2 feet
- z = 0.4 constant used in calculations

Btu/yr in Therms = cfm x 60 x 0.0182 x HDD x 24 / 100,000
Where:

- CFM = cubic feet/minute of air for exfiltration or fan exhaust
- 60 = minutes in an hour
- 0.0182 = specific heat of air
- HDD = heating degree days – yearly average
- 24 = hours in a day
- 100,000 = Btu content of 1 therm

1) Scenario:

- 1,200 sq.ft. single story ranch in Lansing, MI – 6,500 HDD
- 9,600 cu.ft. volume/9.5 ft. above grade
- 3,000 cfm@50 – reduced to 1,500 cfm@50 – 1,500 cfm50 reduction
- Natural gas at $0.90 therm/95% efficient furnace
- ASHRAE ventilation requirement 50 cfm continuous

Heating season savings from infiltration reduction:
Qinf = 0.052 x 1500 x .63 x 1.06 Qinf = 52 cfm
Btu/yr = 52 x 60 x 0.0182 x 6500 x 24 / 100,000 = 88.6 therms
88.6 therms / .95 x .90 = **$83.94 saved from infiltration reduction**

Heating season cost of operation for the fan:
50 x 60 x 0.0182 x 6500 x 24 / 100,000 = 82.5 therms
82.5 therms / .95 x .90 = **$78.16 cost to re-condition air - plus the electric cost of fan operation**

In this example, it is about even. The savings from the 1500 cfm50 infiltration reduction is offset by the cost of the ASHRAE fan operation.

How about for a two-story building?

2) Scenario:
- 2,000 sq.ft. two- story Lansing, MI – 6,500 HDD
- 16,000 cu.ft. volume/18 ft. above grade
- 3,500 cfm@50 – reduced to 2,000 cfm@50 – 1,500 cfm50 reduction
- Natural gas at $0.90 therm/95% efficient furnace
- ASHRAE ventilation requirement 40 cfm continuous

Savings from infiltration reduction:
Qinf = 0.052 x 1500 x .63 x 1.37 Qinf = 67 cfm
Btu/yr = 67 x 60 x 0.0182 x 6500 x 24 / 100,000 = 114 therms
114 therms / .95 x .90 = **$111.52 saved from infiltration reduction**

Cost of operation for the fan:
40 x 60 x 0.0182 x 6500 x 24 / 100,000 = 68.1 therms
68.1 therms / .95 x .90 = **$64.52 cost to re-condition air - plus the electric cost of fan operation**

This building, being taller, has a greater natural infiltration rate than the single-story. The cost of fan operation is substantially less than what the cost of natural infiltration would be.

How about if we are starting with a relatively tight house in the first place?

3) Scenario:
- 1,200 sq.ft. single story ranch in Lansing, MI – 6,500 HDD
- 2000 cfm@50 – reduced to 1350 cfm@50 – 650 cfm50 reduction
- Natural gas at $0.90 therm/95% efficient furnace
- ASHRAE ventilation requirement 55 cfm continuous

Savings from infiltration reduction:
Qinf = 0.052 x 650 x .63 x 1.06 Qinf = 22.6 cfm
Btu/yr = 22.6 x 60 x 0.0182 x 6500 x 24 / 100,000 = 38.5 therms
38.5 therms / .95 x .90 = **$36.47 saved from infiltration reduction**

Cost of operation for the fan:
55 x 60 x 0.0182 x 6500 x 24 / 100,000 = 93.7 therms
93.7 therms / .95 x .90 = **$88.77 cost to re-condition air - plus the electric cost of fan operation**

It is very likely that in single story home that are reasonably tight to begin with, the ASHRAE fan will cost more than the savings achieved by infiltration reduction.

Obviously, the potential cost savings will be greater if the blower door reduction is greater for each building or if the cfm ASHRAE requirement is less. This was just intended to give an idea of what is saved from infiltration reduction versus the cost of operation for an occupant ventilation fan.