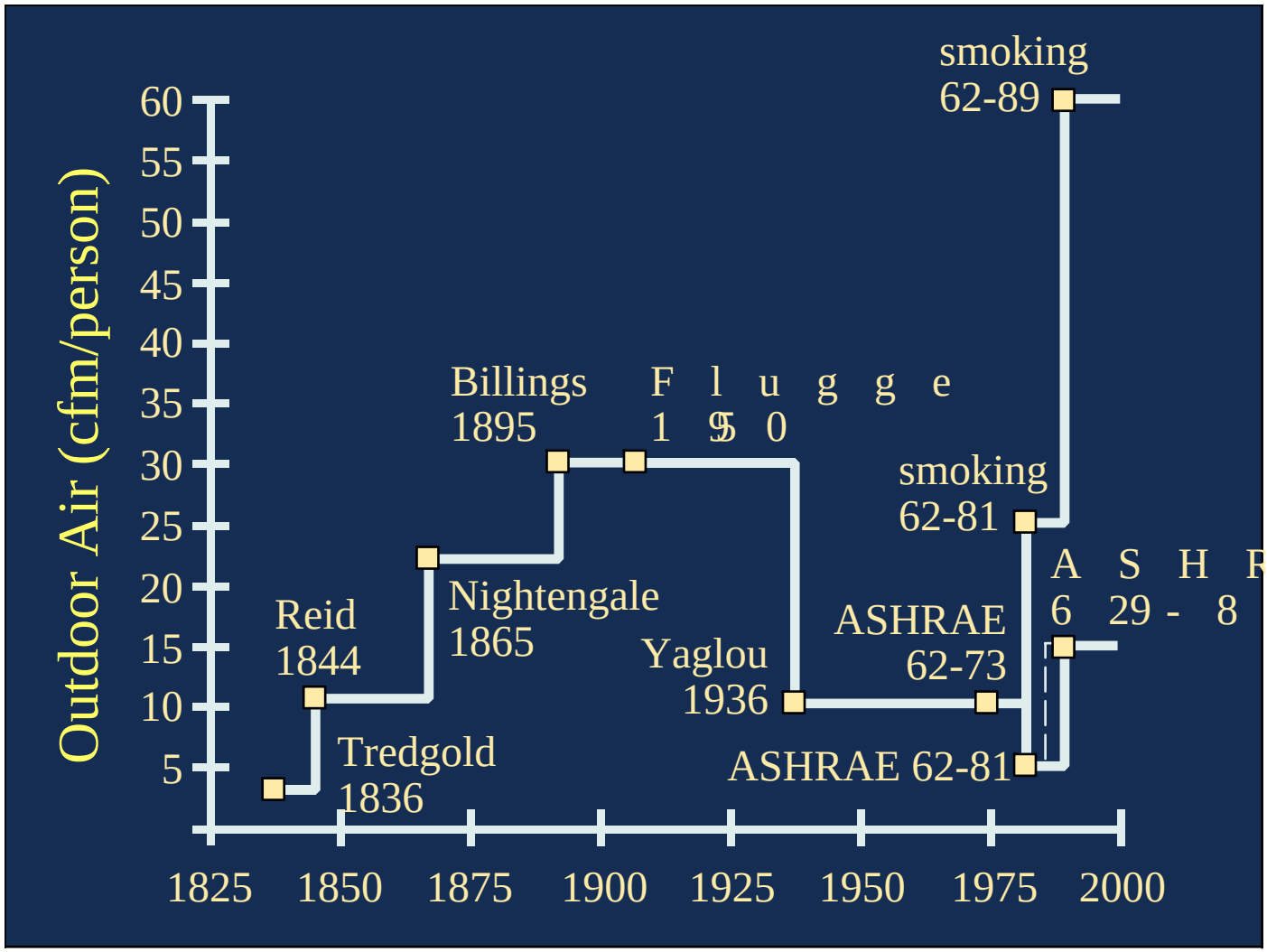
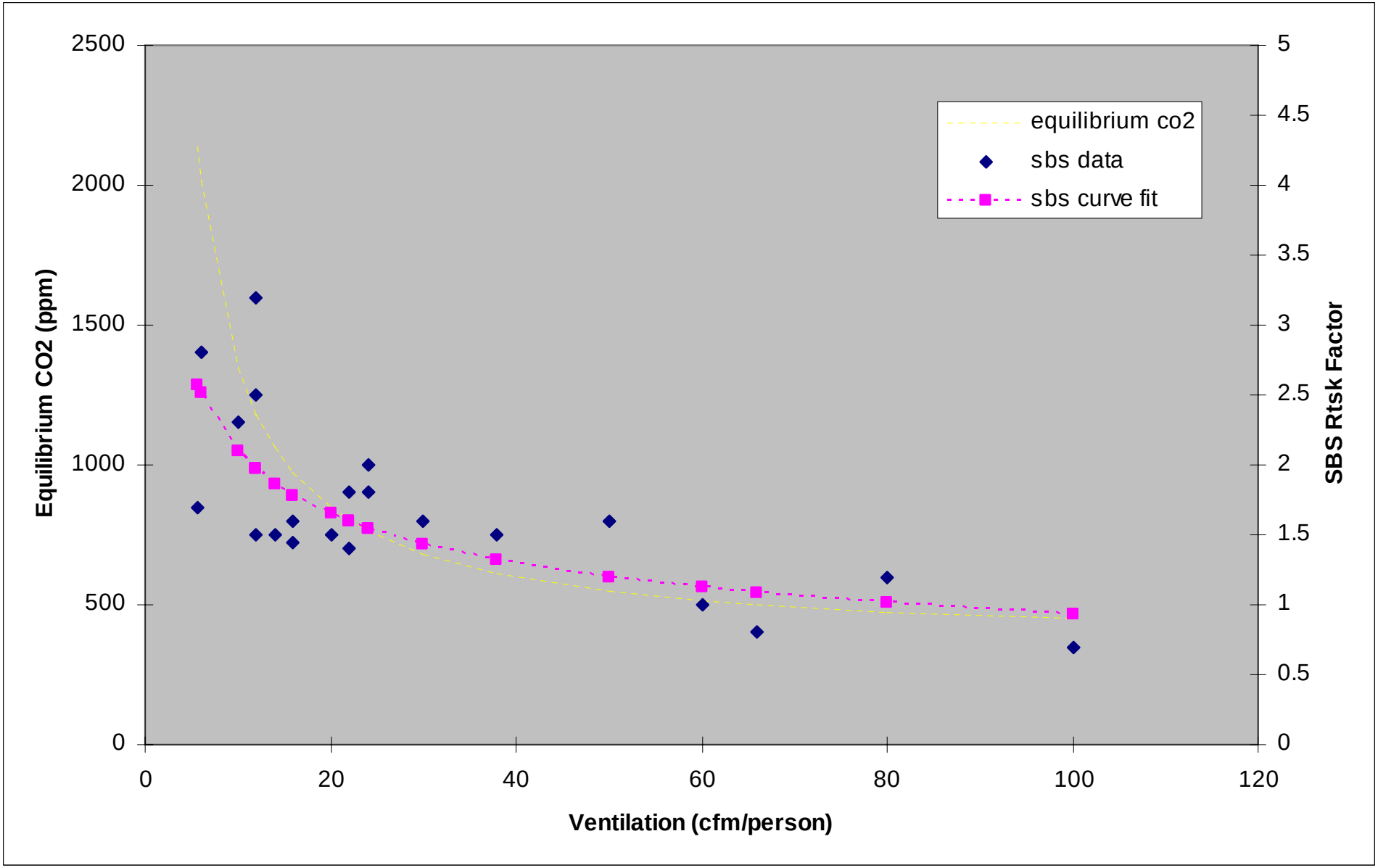

A
B

Why ventilate?

- Dilute contaminants
- Control or aggravate humidity
- Comfort or lack of cooling
- Odors
- Provide oxygen

History of Minimum Ventilation Recommendations





Sick Building Syndrome data from Jan Sundell Swedish Office Building Study[4]

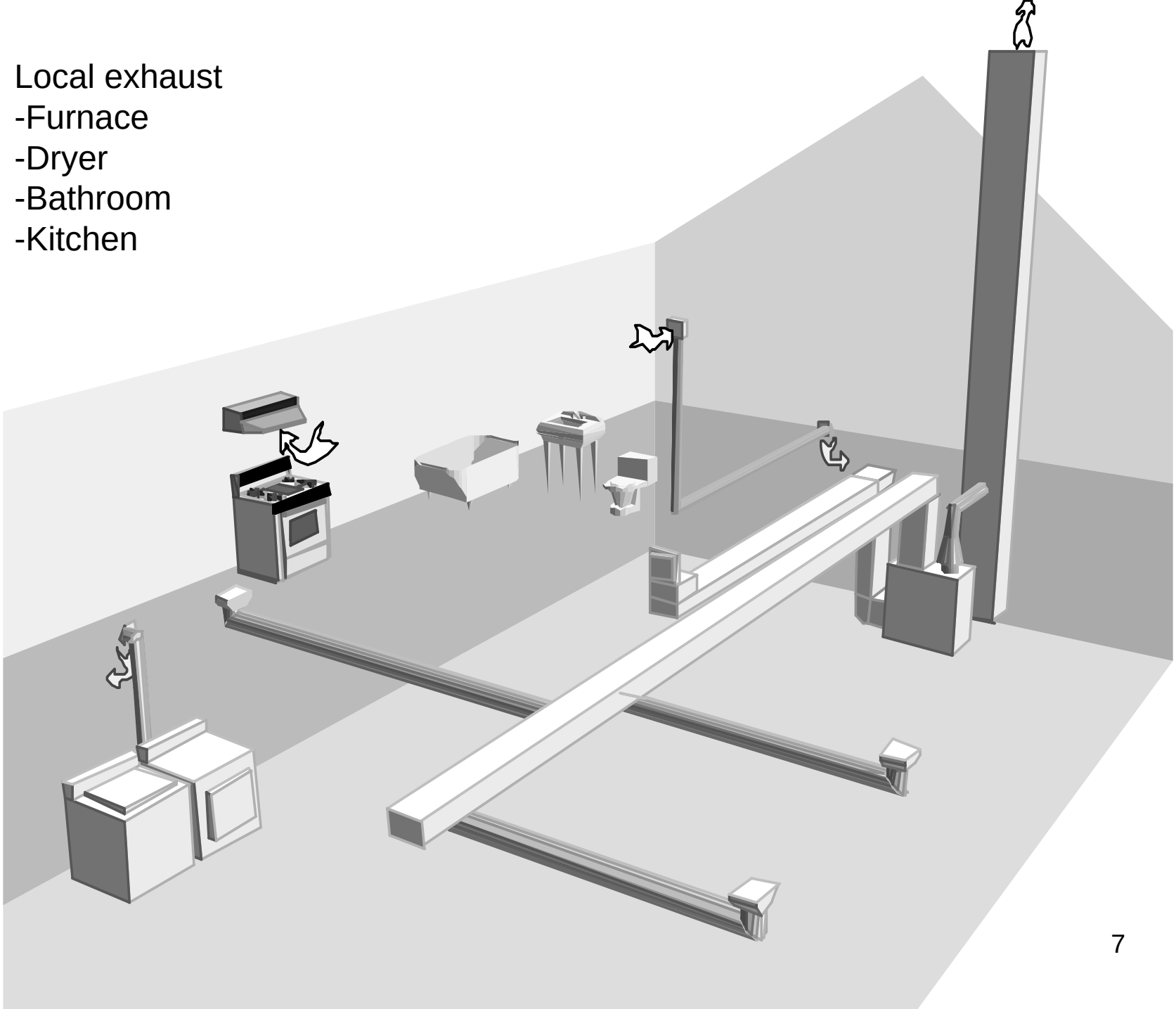
More than a Fan

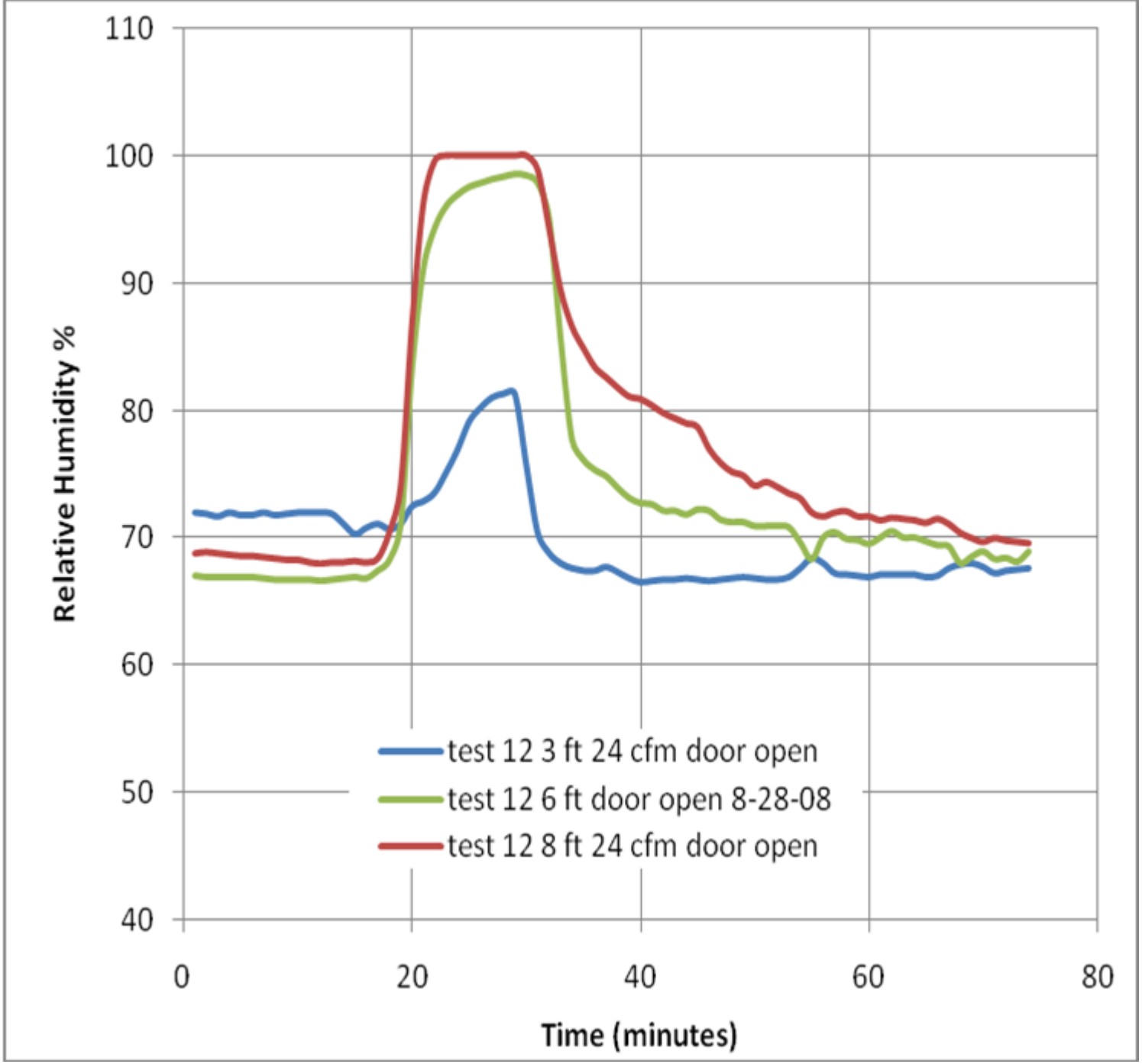
- Exhaust vent point sources to the outside
  - Kitchen, bathroom, dryers (except condensing dryers), combustion devices, laundries
- Provide dilution ventilation
  - Exhaust, supply, both
- Effective distribution
  - Central air handlers?
  - Baseboard or radiant heat?
- Air seal enclosure
  - 1.25 in2 per 100 ft2 enclosure
- Multi-family issues

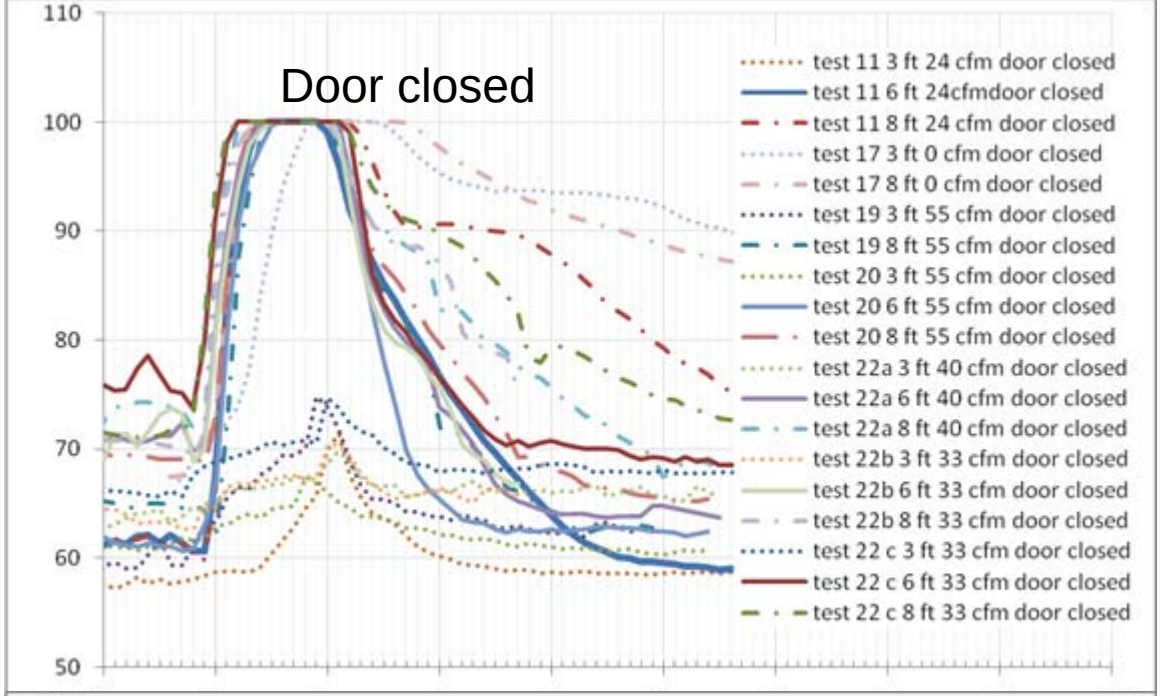
Ventilation Standards and Codes?

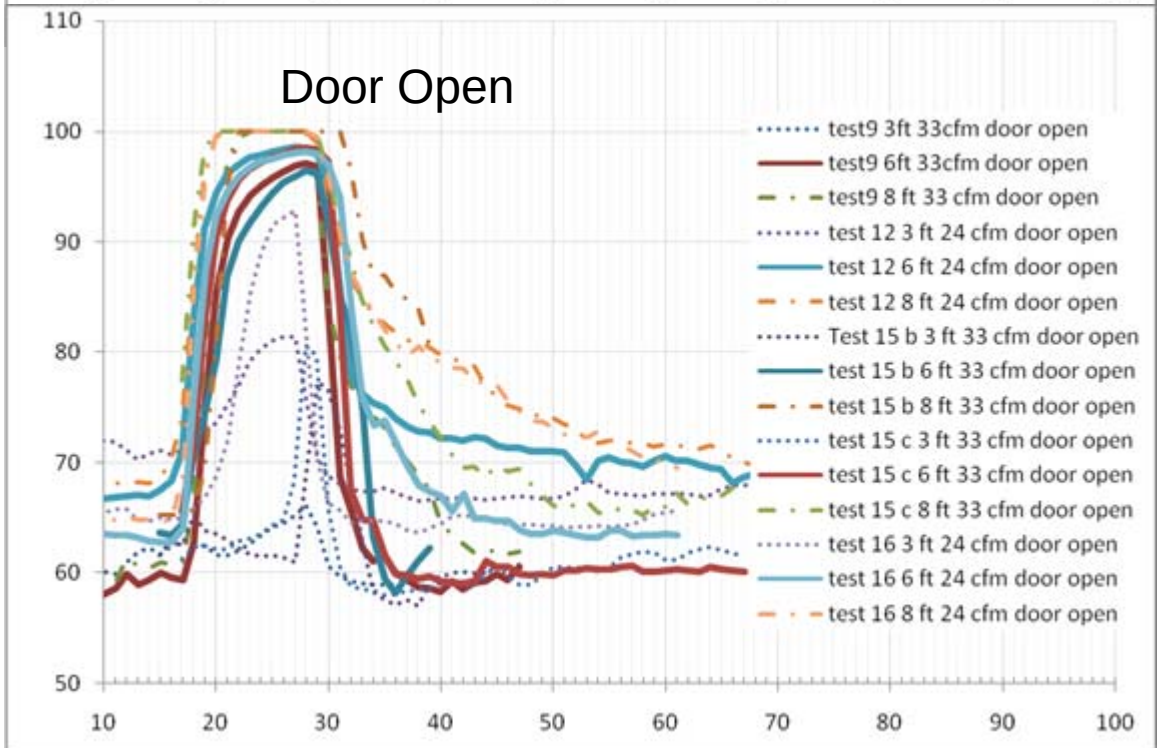
- IRC, IMC 2003
  - 4 ft2window/100ft2 or 0.35 ach (not less than 15 cfm/person) mechanical
  - Bath 1.5 ft2 window(1/2operable) or 50 cfm intermittent or 20 cfm continuous exhaust to outside
  - Kitchens 100 cfm intermittent, 25cfm continuous
  - Dryer must exhaust
- ASHRAE 62.2 2003 Residential Buildings
  - 7.5 cfm/person+1cfm/100sq.ft. fan powered
    - assumes additional 2cfm/100ft2 infiltration
    - <4500 infiltration degree day exclusion
  - Exhaust: Intermittent 100cfm kitchen, 50 cfm bath, or continuous 5 ach kitchen , 20 cfm bath (continuous exhaust fans can be used to meet the dilution requirement)
  - Dryer must exhaust; range hood required if flow less than 5 ach
  - Some noise and installation requirements

Local exhaust
-Furnace
-Dryer
-Bathroom
-Kitchen

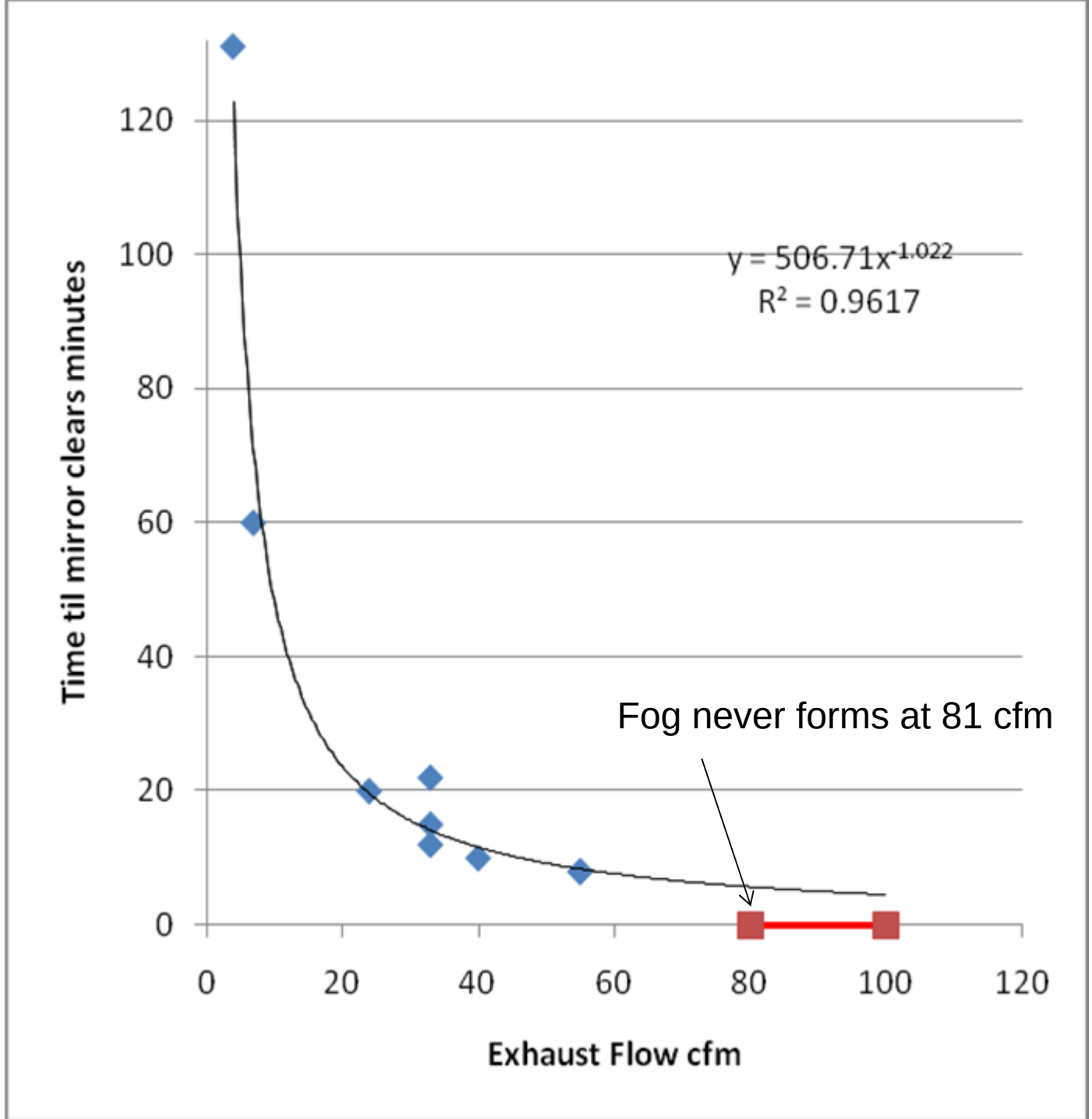



110
100
90
80
70
60
50
40
Relative Humidity %
0
20
40
60
80
Time (minutes)
test 12 3 ft 24 cfm door open
test 12 6 ft door open 8-28-08
test 12 8 ft 24 cfm door open


Door closed
110
100
90
80
70
60
50
test 11 3 ft 24 cfm door closed
test 11 6 ft 24cfmdoor closed
test 11 8 ft 24 cfm door closed
test 17 3 ft 0 cfm door closed
test 17 8 ft 0 cfm door closed
test 19 3 ft 55 cfm door closed
test 19 8 ft 55 cfm door closed
test 20 3 ft 55 cfm door closed
test 20 6 ft 55 cfm door closed
test 20 8 ft 55 cfm door closed
test 22a 3 ft 40 cfm door closed
test 22a 6 ft 40 cfm door closed
test 22a 8 ft 40 cfm door closed
test 22b 3 ft 33 cfm door closed
test 22b 6 ft 33 cfm door closed
test 22b 8 ft 33 cfm door closed
test 22 c 3 ft 33 cfm door closed
test 22 c 6 ft 33 cfm door closed
test 22 c 8 ft 33 cfm door closed

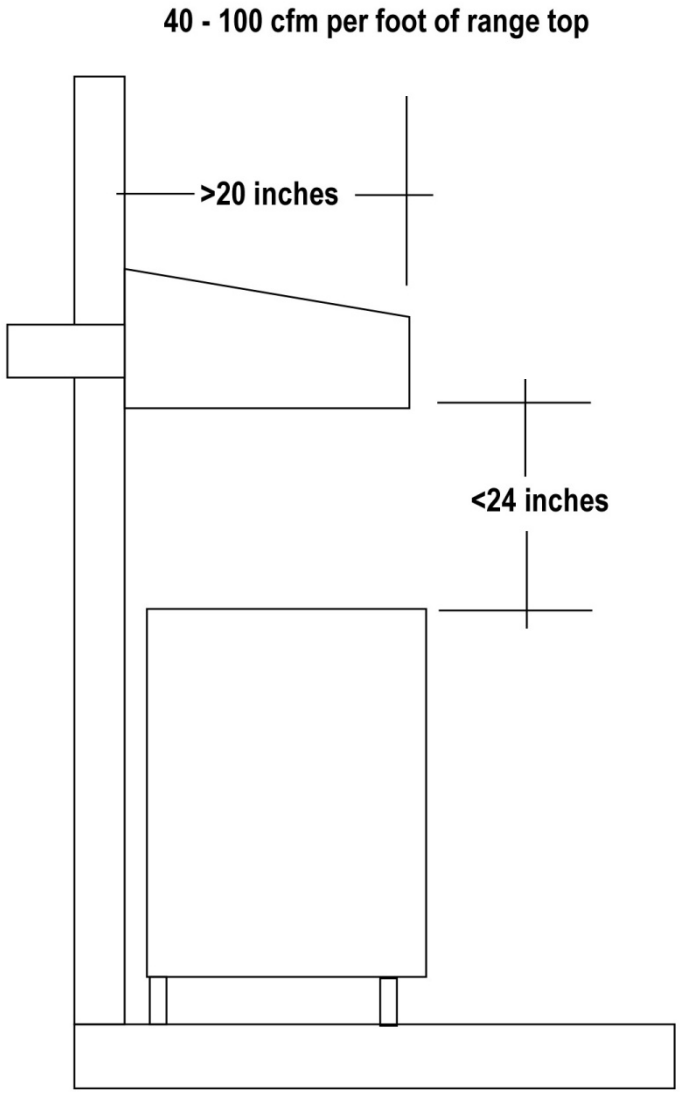

Door Open
110
100
90
80
70
60
50
10
20
30
40
50
60
70
80
90
100
test9 3ft 33cfm door open
test9 6ft 33cfm door open
test9 8 ft 33 cfm door open
test 12 3 ft 24 cfm door open
test 12 6 ft 24 cfm door open
test 12 8 ft 24 cfm door open
Test 15 b 3 ft 33 cfm door open
test 15 b 6 ft 33 cfm door open
test 15 b 8 ft 33 cfm door open
test 15 c 3 ft 33 cfm door open
test 15 c 6 ft 33 cfm door open
test 15 c 8 ft 33 cfm door open
test 16 3 ft 24 cfm door open
test 16 6 ft 24 cfm door open
test 16 8 ft 24 cfm door open

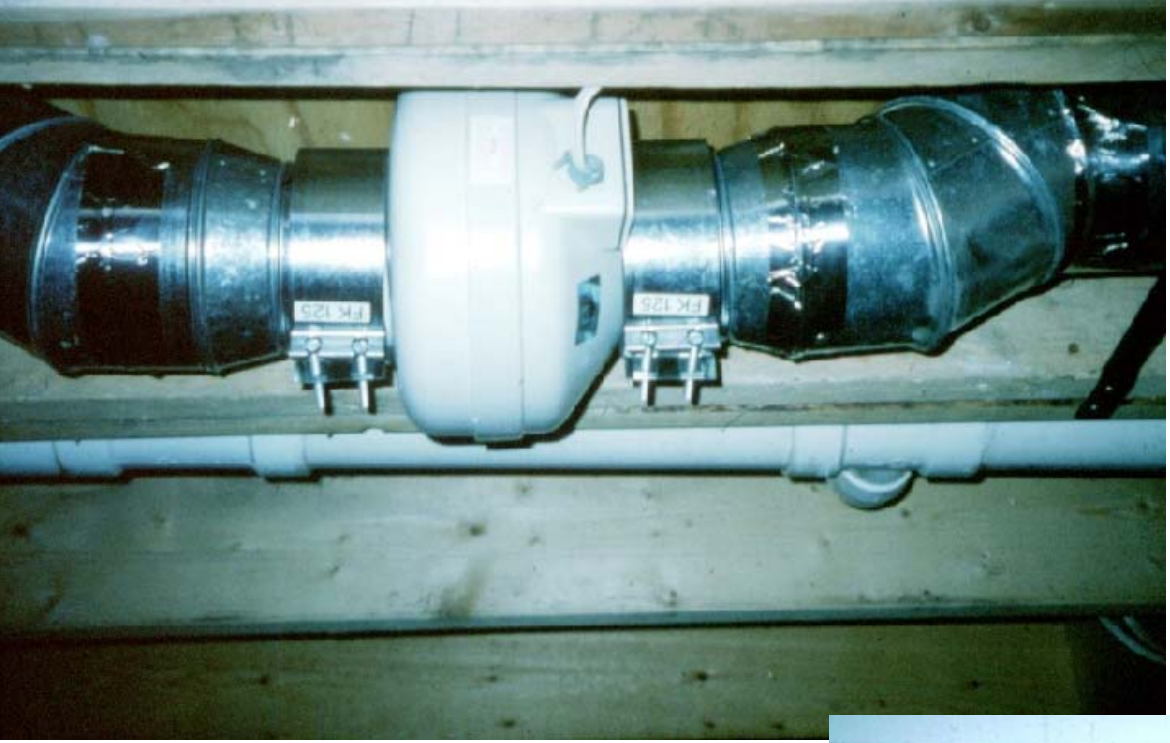

St John
EXTECH


Time til mirror clears minutes
120
100
80
60
40
20
0
0
20
40
60
80
100
120
Exhaust Flow cfm
y = 506.71x-1.022
R² = 0.9617
Fog never forms at 81 cfm

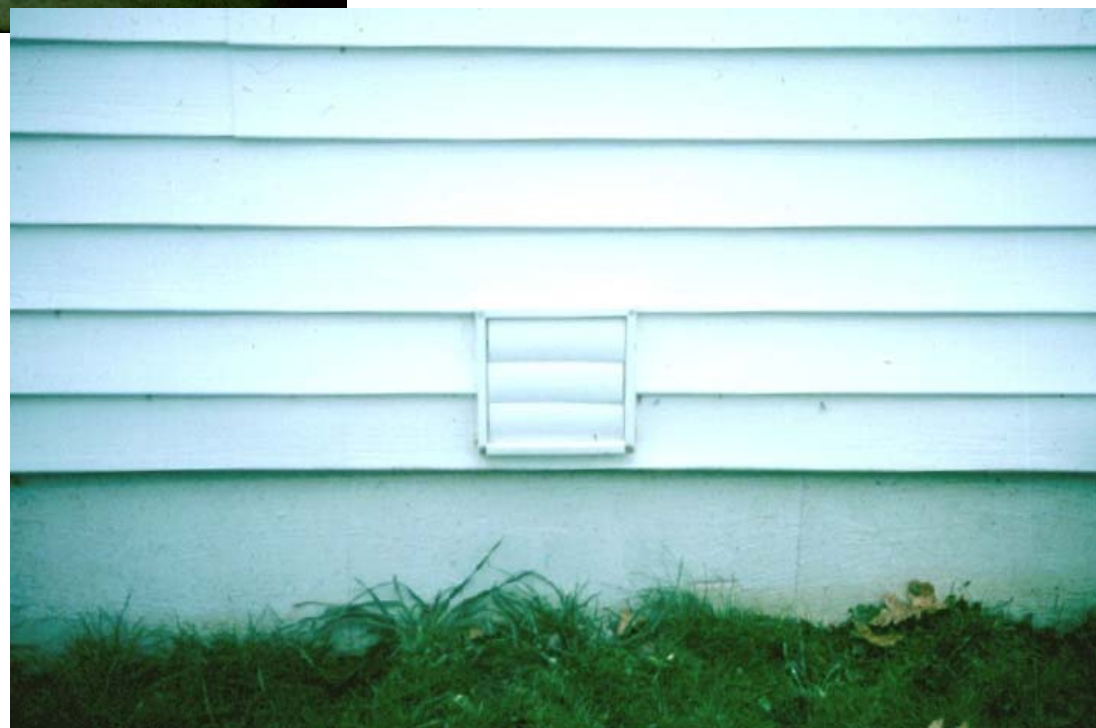
Recommendations for Bathroom Exhaust

- Grille within 6 inches of ceiling
- 20 cfm continuous
- 80 cfm boost controlled by motion sensor (light switch of timer switch ok)


40 - 100 cfm per foot of range top
>20 inches
<24 inches



Exhaust fan in basement, vented through rim joist fitting

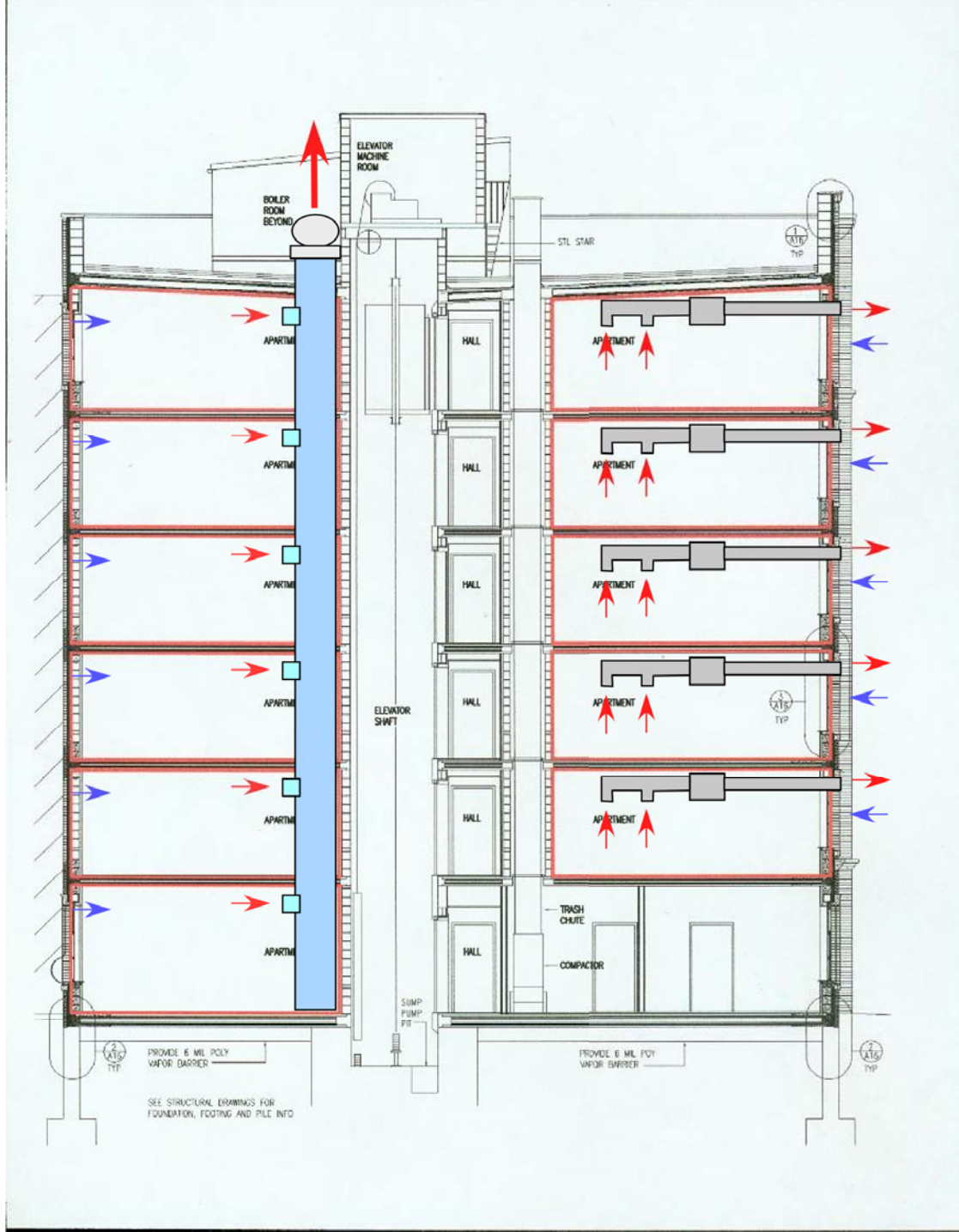


Is it working?

Is it the right amount?

IRIS 100
Open
Close

- **Compartmentalize**
- **Provide exhaust for baths and kitchens**
- **Stack effect in cold climates**

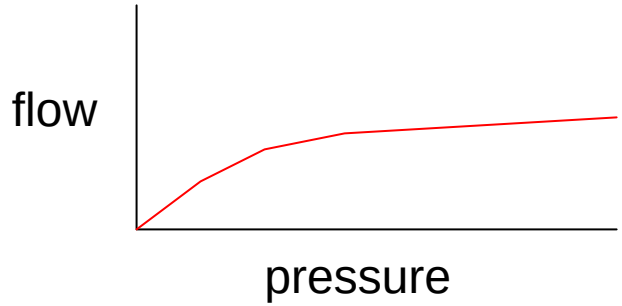


Exhaust System Components

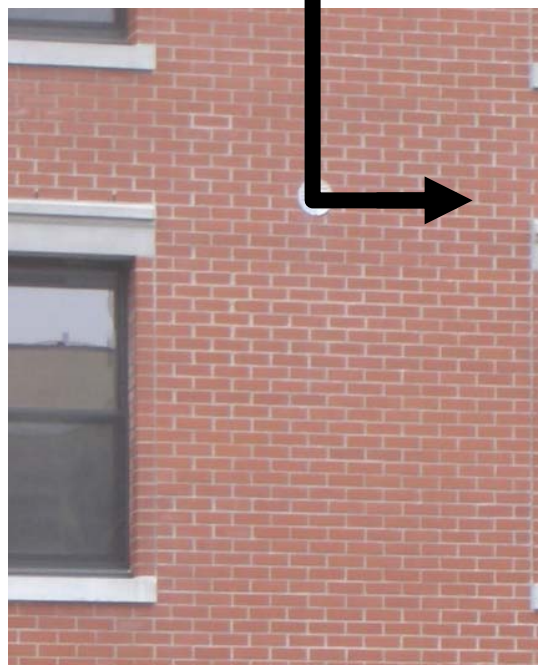
- Grilles in apartments or corridors
  - Bathrooms
  - Kitchens
- Mushroom fans on roofs

Leakage at Sheetrock Connection

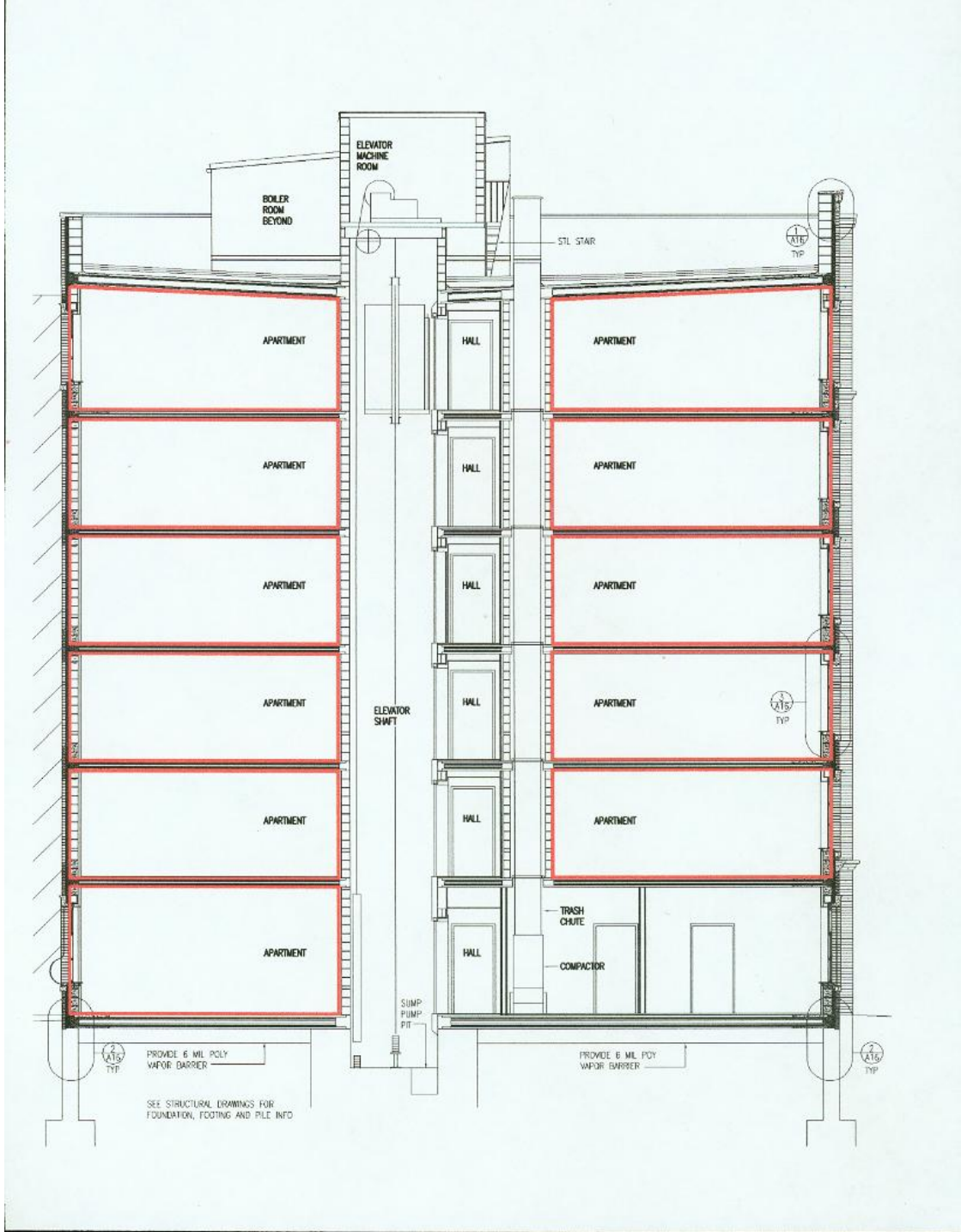
Leakage at Roof Curb

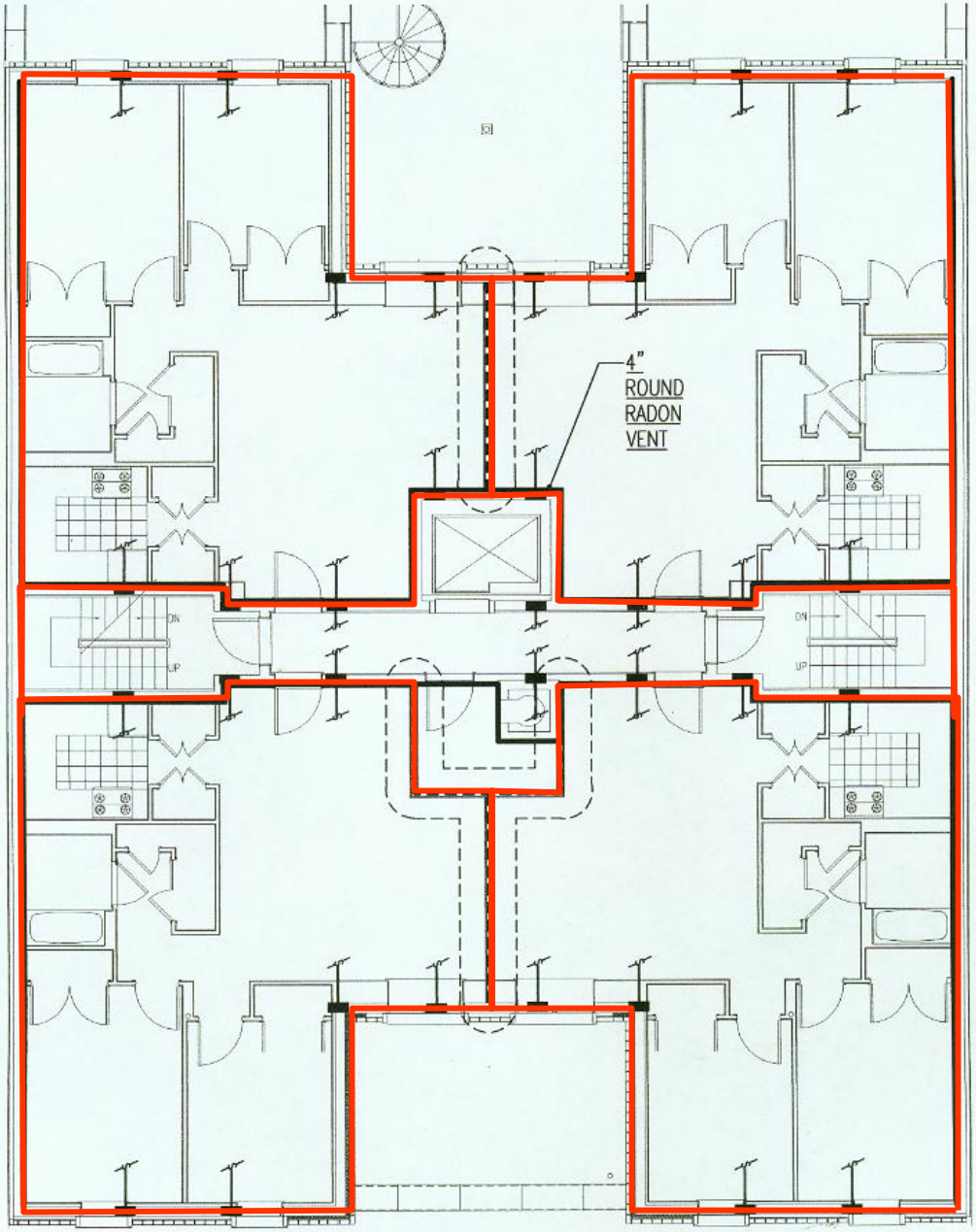

flow
pressure

Multi-family ventilation issues



- Each unit airsealed to 1.25 in2 per 100 ft2 enclosure
- No transfer to neighbors when system's on
- 4% transfer when one unit turned off
- 1-3% exhaust re-enters through trickle vents worst case


ELEVATOR MACHINE ROOM
BOILER ROOM BEYOND
STL STAIR
APARTMENT
HALL
ELEVATOR SHAFT
TRASH CHUTE
COMPACTOR
SUMP PUMP PIT
PROVIDE 6 MIL POLY VAPOR BARRIER
SEE STRUCTURAL DRAWINGS FOR FOUNDATION, FOOTING AND PILE INFO



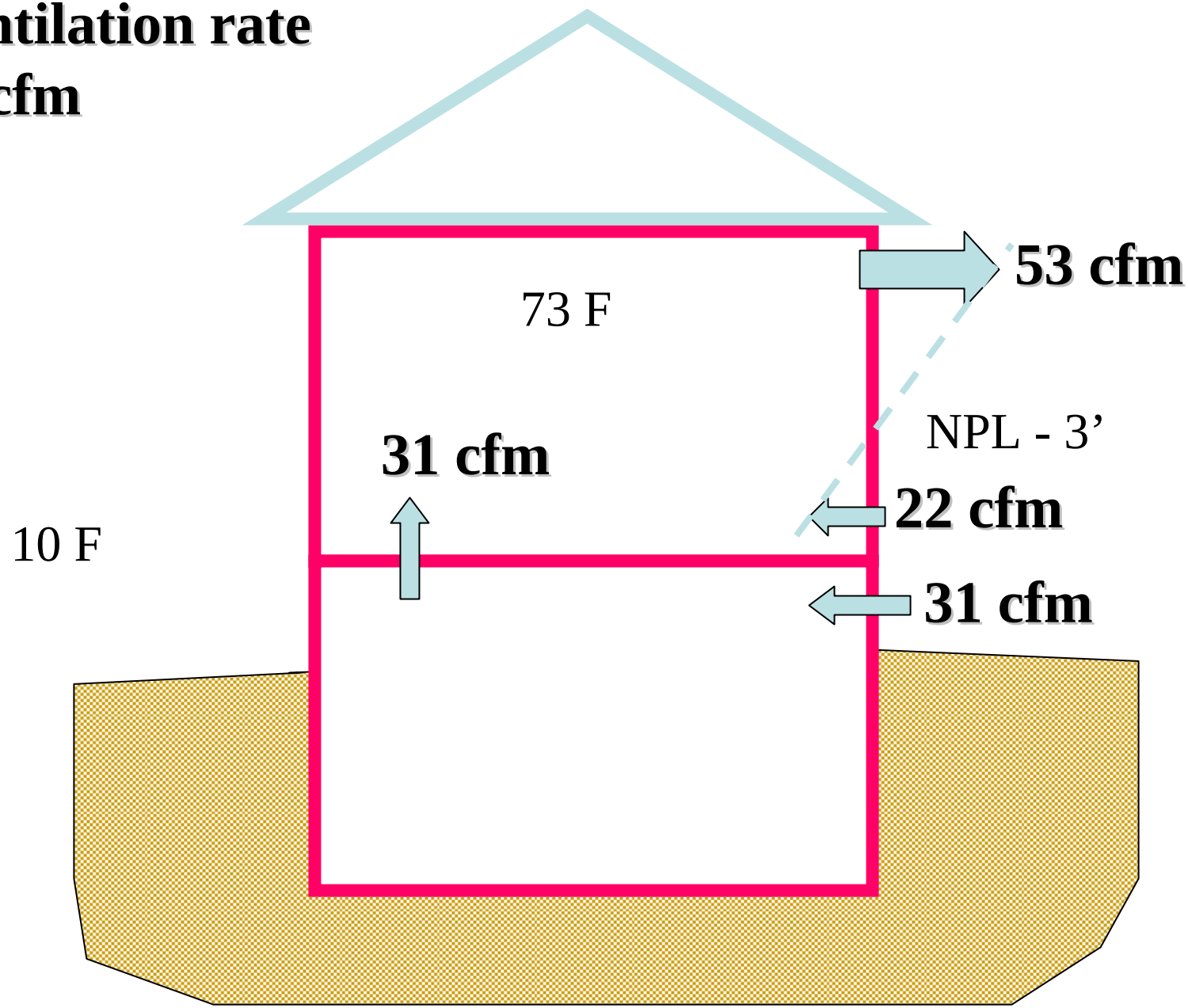
2 SECOND THROUGH SIXTH FLOOR PLAN

Tightness Specifications
LEED ETS multifamily
Battery Park City Multifamily

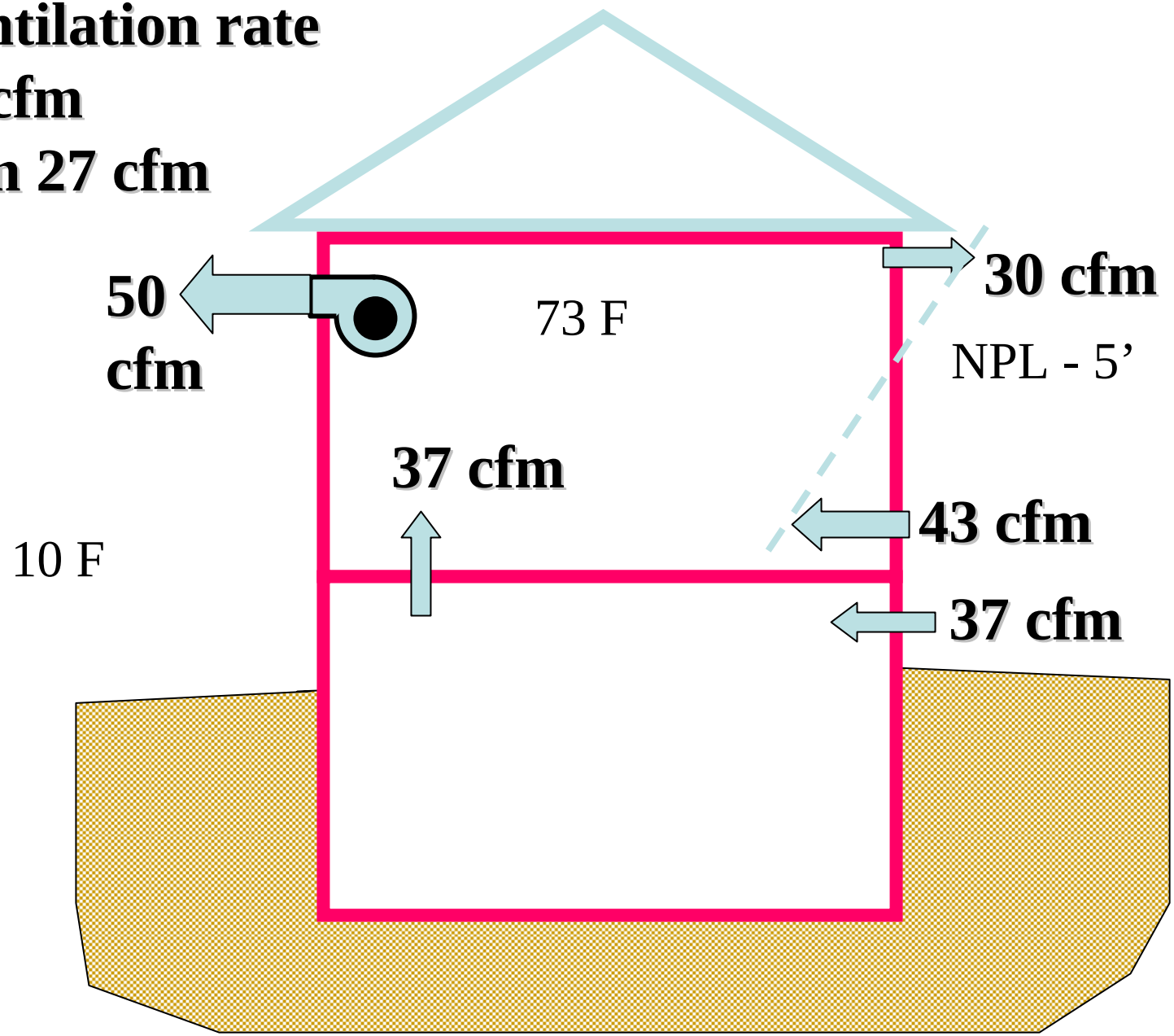
- 1.25 ELA/ 100ft2 enclosure
- 22.8 cfm50/100ft2 enclosure
- ~ 5-6ACH50


Panasonic

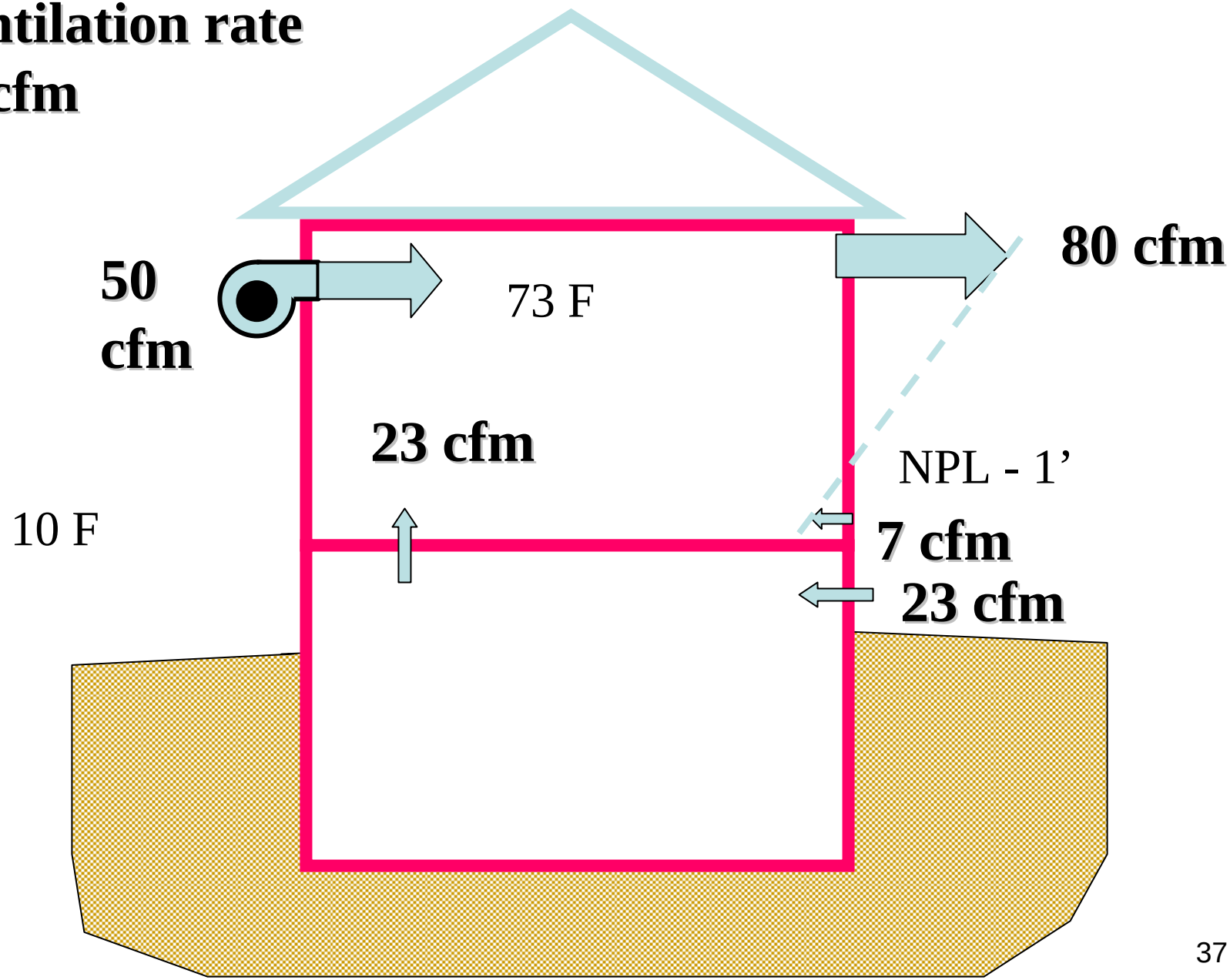
Ventilation rate
53 cfm



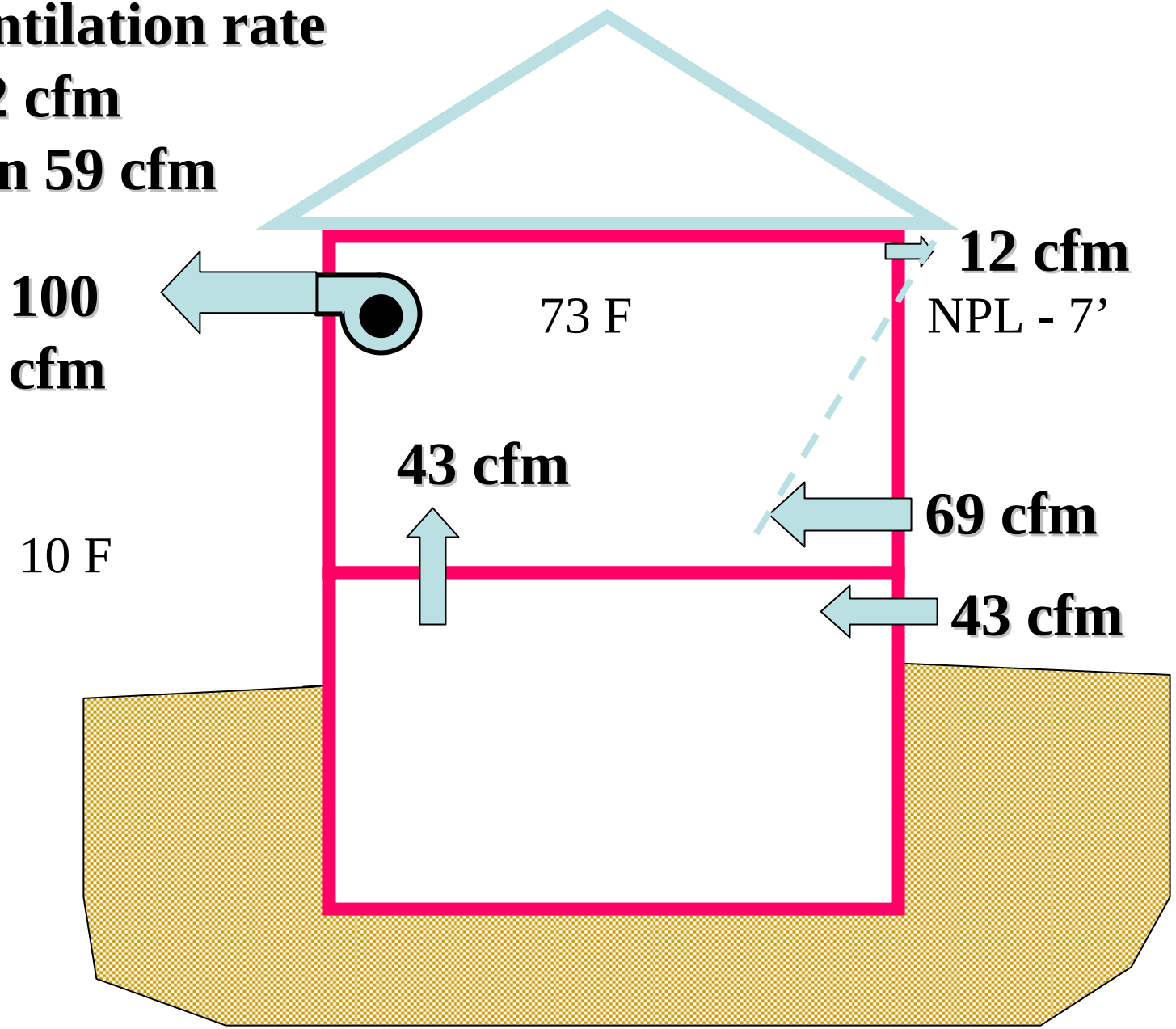
Ventilation rate
80 cfm
gain 27 cfm



Ventilation rate
80 cfm



Ventilation rate
112 cfm
gain 59 cfm



Ventilation rate
103 cfm
gain 50 cfm