

New Mandatory Requirements for Indoor Air Quality Ventilation in Low Rise Residential Buildings

2008 California Building Energy Efficiency Standards

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Why Mandatory Ventilation



- Recent Research indicates that ventilation rates in new CA homes are lower than we had assumed.
 - Houses are much tighter
 - Many occupants do not use windows enough
- Inadequate ventilation can contribute to unhealthy pollutant concentration

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Overview of Proposed Requirements



- Requirements reference ANSI/ASHRAE Standard 62.2-2004
- Mechanical ventilation is required. Window operation is not permitted as a means of meeting the required ventilation.

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Fan Power



- If performance approach is not used, the total fan power used to meet this requirement shall not exceed 1.2 W/cfm of required ventilation air. If performance approach is used, total fan power in the standard design is equal to the proposed house but not greater than 1.2 W/cfm of required ventilation air.

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COMPLIANCE



- Whole-House Mechanical Ventilation
 - Or equivalent
- Fans in Kitchens and Baths
- Windows in Most Rooms
- Some Source Control
- “Good” Equipment

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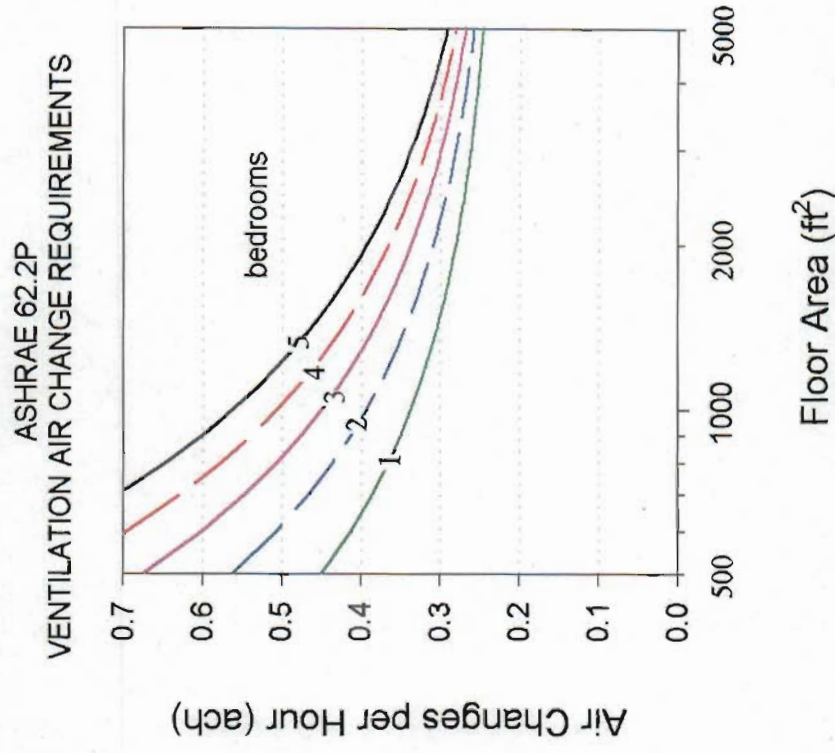
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OUTDOOR AIR TARGET



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- Building+People
 - 3 cfm/100 ft².
(15 l/s/100 m².)
 - + 7.5 cfm/person
(3.5 l/s/person)
 - Count Bedrooms
- Compare w/0.35 ACH from 62-01



10 ft²=1 m²

NATURAL VENTILATION



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- Required in Most Rooms
- Openings
 - 4% of Floor Area
- Extra Capacity
- Whole-House
 - **rarely**
- **NOT** Local Exhaust

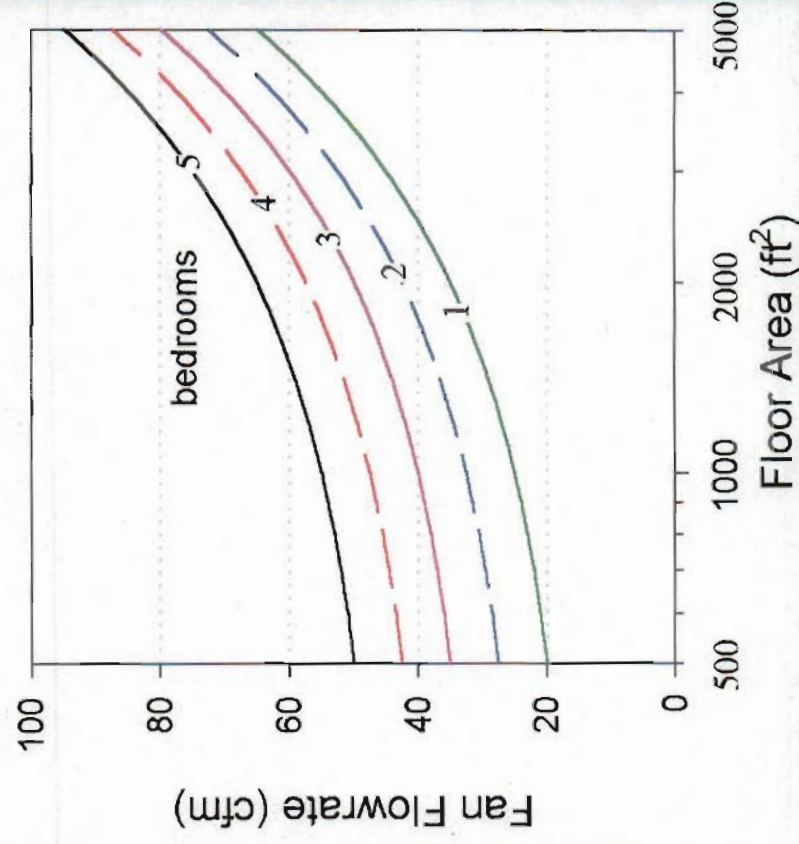
MECHANICAL VENTILATION



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- Building+People
 - 1 cfm/100 ft².
(5 l/s/100 m².)
 - +7.5 cfm/person
(3.5 l/s/person)
 - Count
Bedrooms
- Control System

FAN FLOWRATE (CFM)



INTERMITTENT VENTILATION



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- Must Cycle: At least 1 hr out of 12
- Timer to Assure Minimum On-time
 - e.g. “Fan Recycler”
- De-rate Flow if Cycle > 3 hours:

<i>Fractional On-time, f</i>	<i>Ventilation Effectiveness, ϵ</i>
$f < 35\%$	0.33
$35\% < f < 60\%$	0.50
$60\% < f < 80\%$	0.75
$80\% < f$	1.0

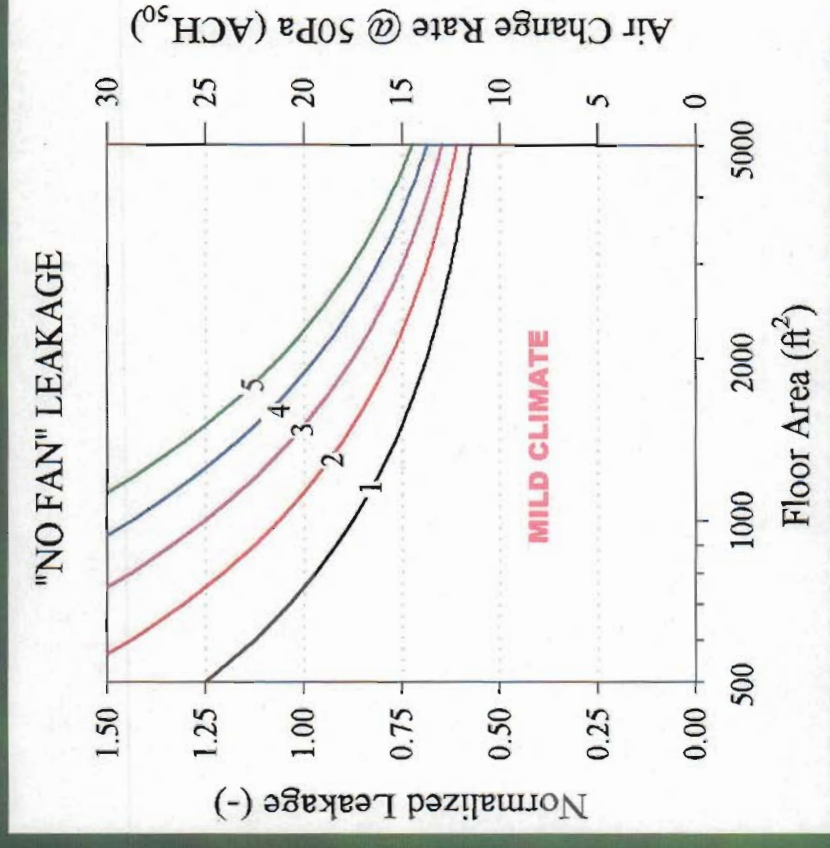
Not flexible enough

INFILTRATION



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- Default in 62.2
 - 2 cfm/100 ft²
(10 l/s/100 m²)
- Extra Credit
 - Half of Std 136
 - Starts @ NL=.25
 - Existing only
- Implied Benchmark



Not flexible enough

10 ft²=1 m²

MYTHS & GHOST STORIES



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- The South Needs Less Air
- Infiltration is Bad Air
 - Can be a robust and cost-effective contributor to whole-house rate
- Unbalanced Ventilation Will Rot Walls
 - Not at minimum rates

❖ **Unless envelope is too tight!**

SYSTEM TYPES

- Balanced System
 - E.g. Can have HRV
- Exhaust System
 - E.g. Bath Fan Upgrade
- Supply System
 - E.g. Integrated with Air Handler

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LOCAL VENTILATION



- Intended to Exhaust Contaminants
- For Rooms with Known Sources
 - Kitchen, Bathroom
- Normally Requires Exhaust Fan
 - Intermittent Preferred
 - Windows Restricted
- Also Rooms Have Natural Ventilation

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KITCHENS AND BATHS



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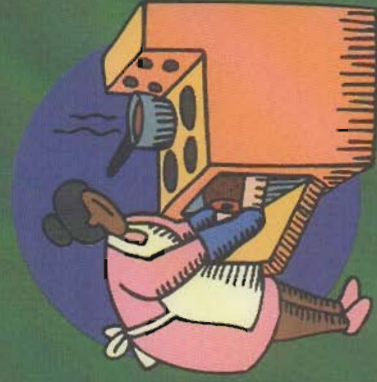
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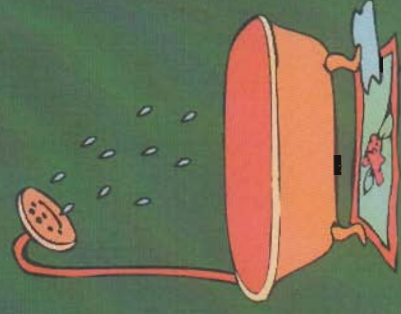
➤ Kitchens

- 100 cfm (50 l/s)
range hood or
- 5 (kitchen) ACH
- Exhaust only

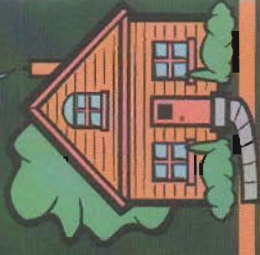


➤ Bathrooms

- 50 cfm (25 l/s)
capacity or
- 20 cfm (10 l/s)
continuous
- Exhaust only



OTHER REQUIREMENTS



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- Transfer Air
- Labeling
- [Source Control](#)
- [Natural Ventilation](#)
 - Beyond Minimum
- [Ventilation Openings](#)

SOURCE REQUIREMENTS



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- Clothes Dryers: Exhausted to Outside
- Combustion Appliances Not Allowed in Conditioned Space
 - When sufficient exhaust fans
 - Unless Exhaust Fans Compensated
- Air Handlers in Garages Must Meet Tightness Spec.
- Particle Filtration

SOURCES & PRESSURES



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➤ Clothes Dryers
➤ Combustion
Appliances



➤ Outdoor Air
– Regional
– Transient
➤ Garages
– Cars
– Chemical
Storage

VENTILATION CAPACITY



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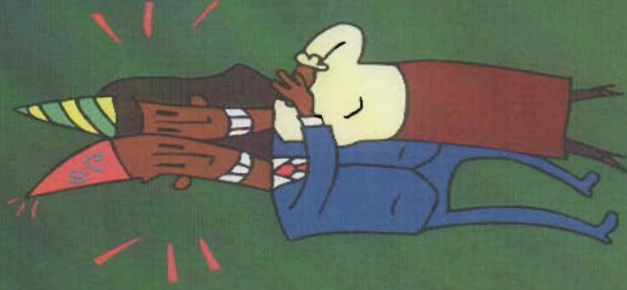
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➤ Normally Satisfied By Windows

– Fans like Bathroom if No Window

➤ Not Required in Toilets and Laundries

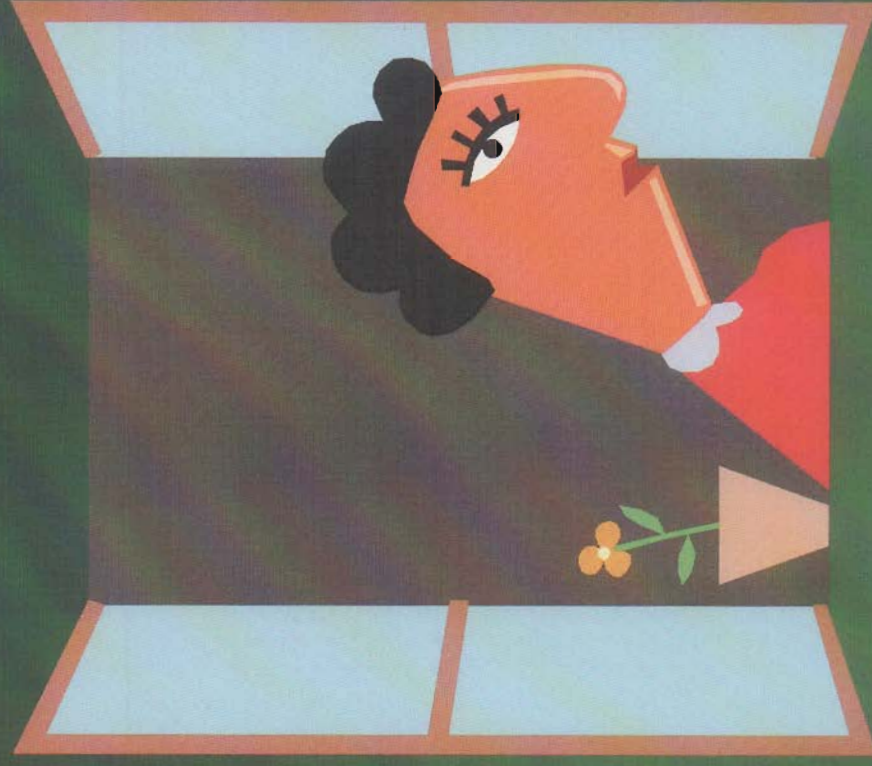


VENTILATION OPENINGS



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- Should Not Allow (Re) entrainment
- Separation from Flues, Cars, etc.
 - 2 to 10 ft
- Natural Ventilation Openings Must Be Accessible

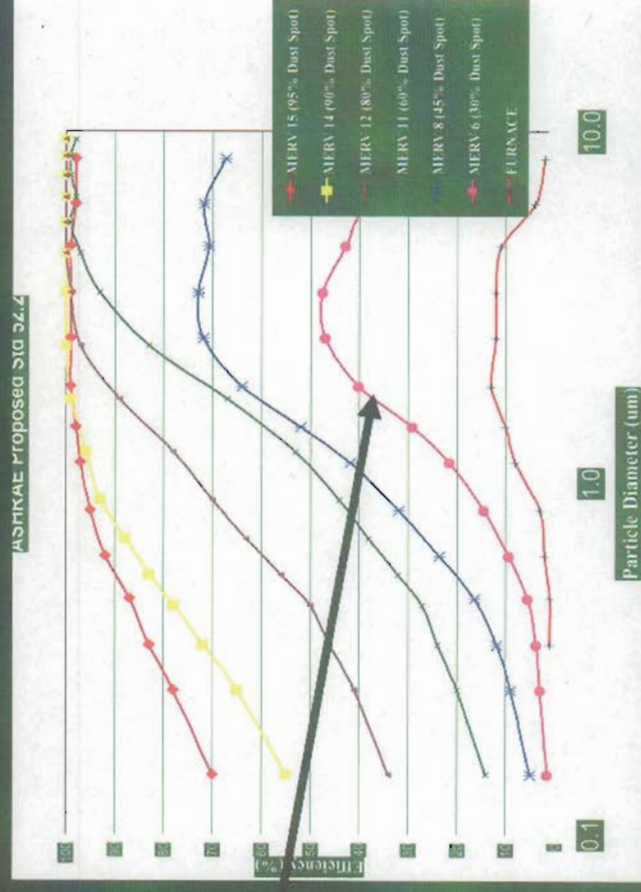


PARTICLE FILTRATION



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- On Ducts > 10 ft.
- 60% for 3 micron
 - MERV 6
- Primarily to Keep Supply Air Clean
 - System as Source
- Pressure Concerns

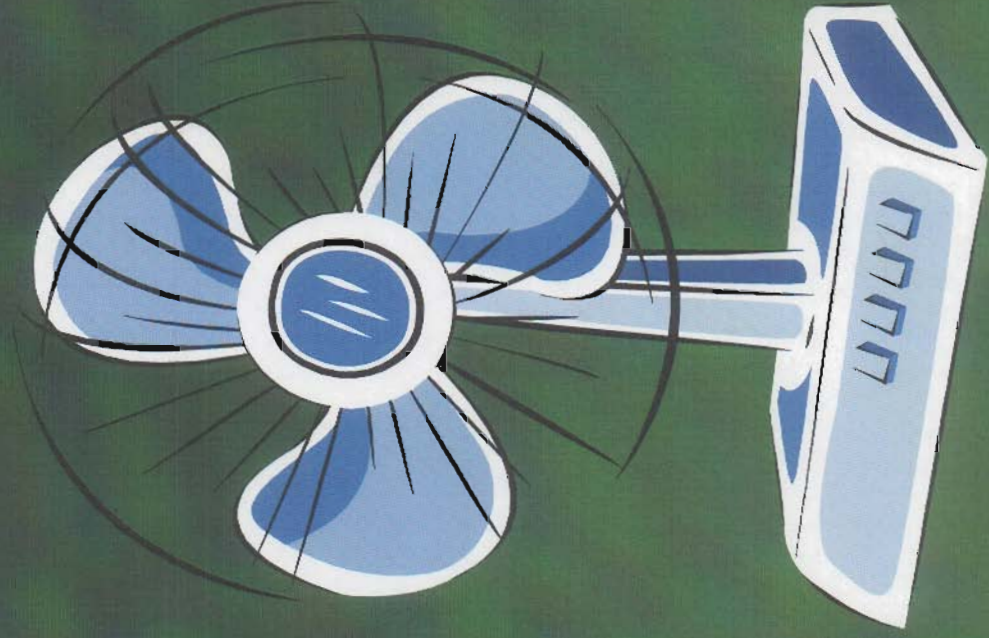


AIR MOVING EQUIPMENT



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- Must be Rated for Continuous Use
- Must Deliver Air Flow
- Dampers in Multi-family
- Control System
- Must be Quiet
 - 1 Sone (continuous)
 - 3 Sone (intermittent)
 - Downdraft kitchen exhaust is “special”



CALIF. MODIFICATIONS



- No “or equivalent” on minimum airflow
 - i.e. Mech. vent. not windows
 - ARB study shows windows not used much for IAQ control
- More Flexible “Intermittent Ventilation”
 - Use improved algorithm
 - Enables better response to peak and outdoor AQ problems

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MY SUGGESTIONS



- **Mandatory 5% Duct Leakage**
 - For ducts outside conditioned space
 - Limits contaminant entrainment
- **Add 25 cfm to Mech. Vent**
 - New CA houses are tight
 - Allows 4 hours of no vent. per day
 - ❖ Better peak performance
 - ❖ Protection against bad OAQ

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