

Friday Oct. 30, '20

The Delicate Moisture Balance

for BCBEAC AGM

**Member ASHRAE
Life Member HAVAN
President of Eneready**



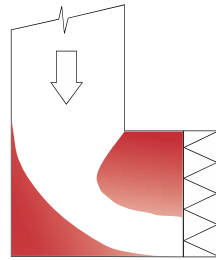
**Founding Board Member
Volunteer Chair
1) Ventilation Committee
2) POMA Committee**

ENEREADY PRODUCTS LTD.





Principles of Moving Air Quietly & Efficiently

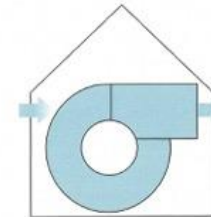


1st Edition 2018



Ventilation Guidelines

A Simplified Guide to Section 9.32 Ventilation of the
2012 British Columbia Building Code



With Mechanical Ventilation Checklists

Seventh Edition, December 2015



Introduction to terms:

1) Ventilation is a universal health/safety requirement for occupied buildings, 3 jobs

‘Winter’ ventilation: req’d when building closed

Activity Ventilation: requires localized exhaust

**Occasionally: Summer ventilation: ‘Free?’
cooling**

2) ‘Ventilation’ implies an air exchange with outdoors, air which is almost always cleaner.

3) ...but is often misused to describe ‘circulation’ of the air.

ASHRAE Std. 52

To repeat:

- 1) Heating and cooling is required for thermal comfort
- 2) Ventilation is required for human (& building) health

Note: ventilation rate is dependent on occupancy

Ventilate for People!

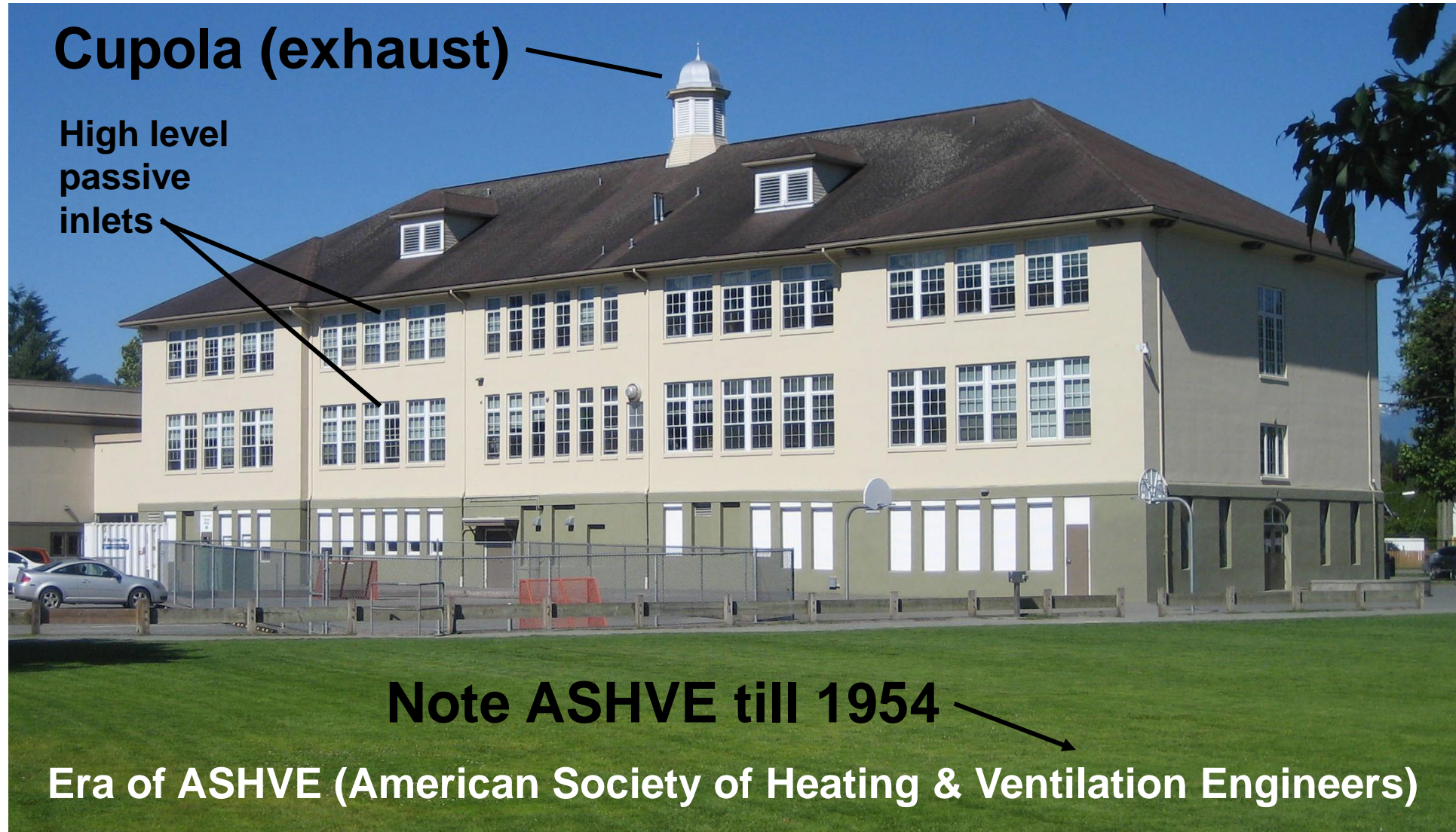
Ventilate for People Activities!

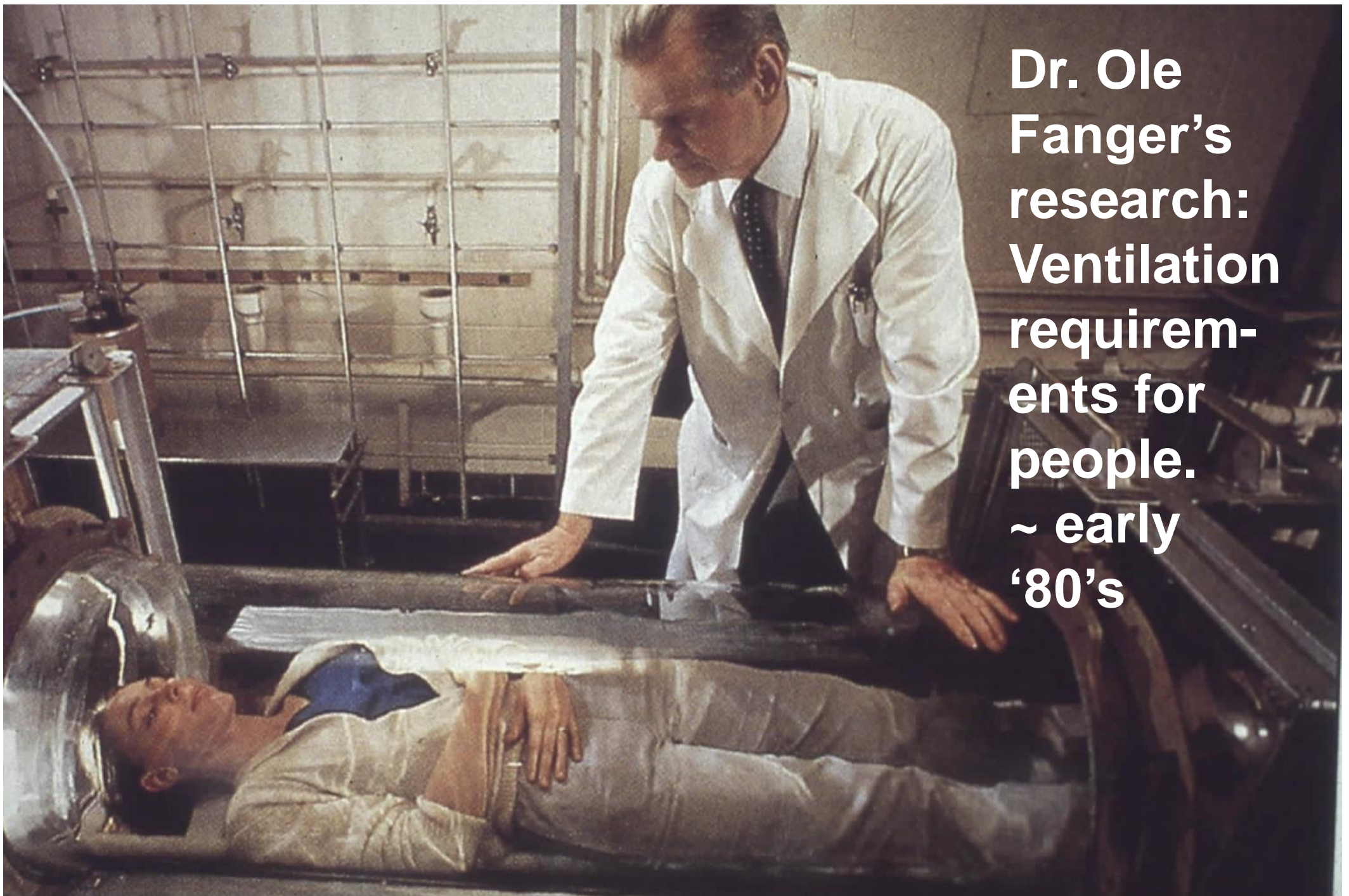


ASHRAE Std. 62.1 (Commercial) or .2 (Residential)

1920's & 1930's School Ventilation

Recent zenith of ventilation awareness

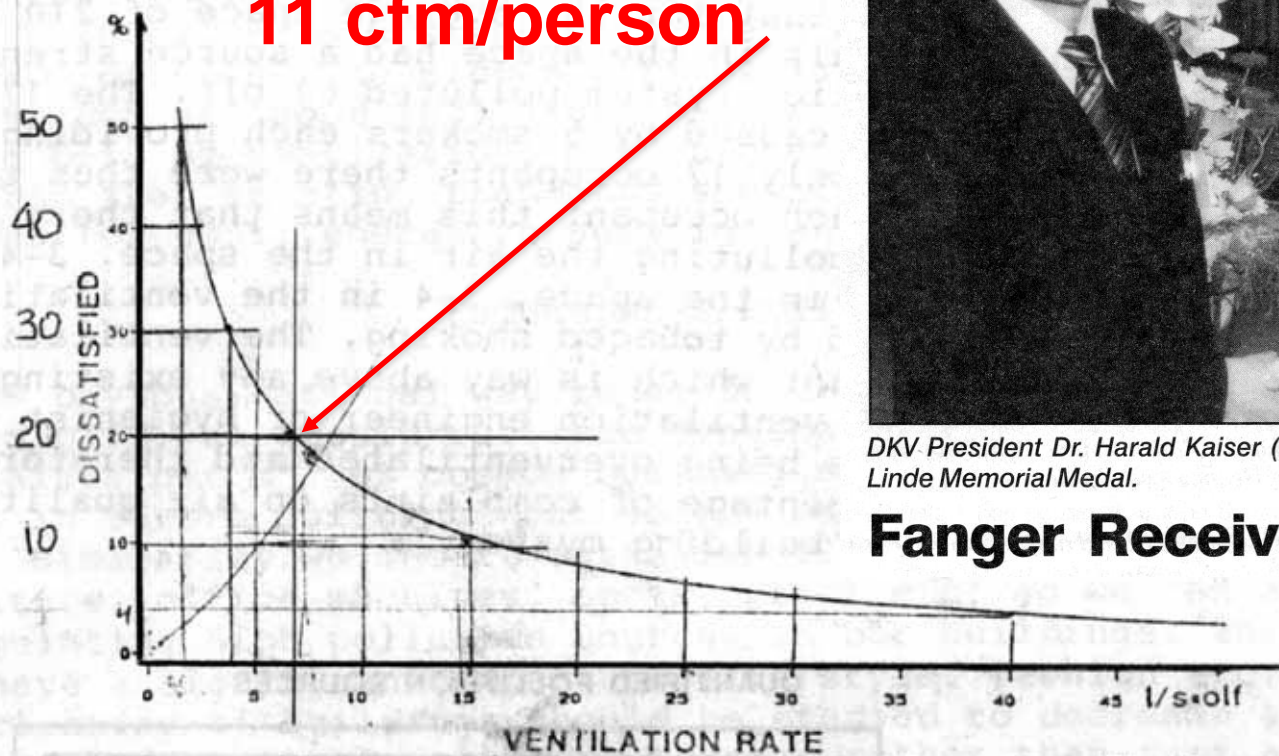




**Dr. Ole
Fanger's
research:
Ventilation
requirem-
ents for
people.
~ early
'80's**

Dr. Fanger's Research 1980's

**80% satisfied @
11 cfm/person**



DKV President Dr. Harald Kaiser (left) presents Ole Fanger with the Carl von Linde Memorial Medal.

Fanger Receives German Award

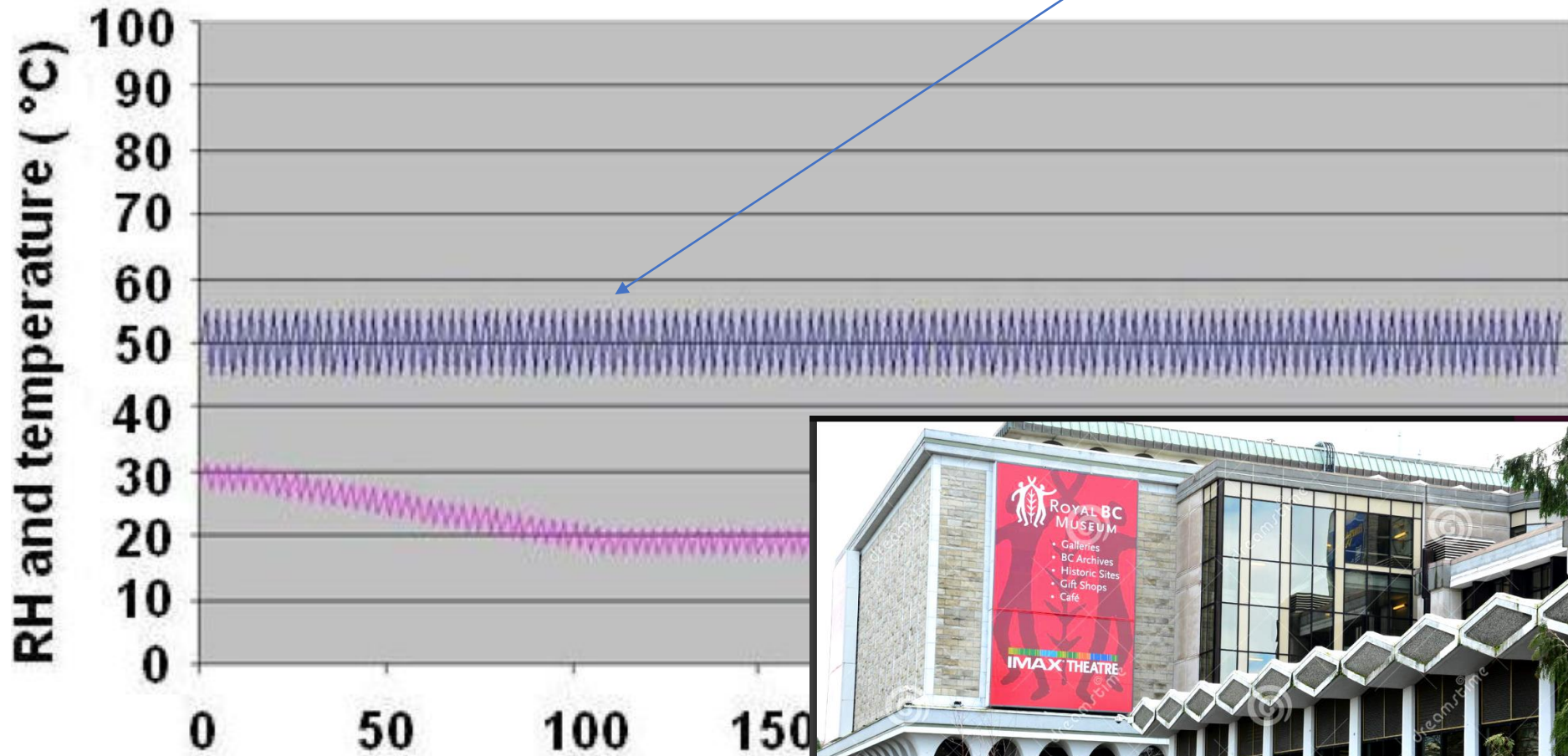
- | Ventilation Rate (l/s*olf) | Percentage Dissatisfied (%) |
|----------------------------|-----------------------------|
| 10.5 | 21 |
| 31.5 | 42 |
| 52.5 | 63 |
| 73.5 | 84 |
| 94.5 | 94.5 |
1. The percentage of persons finding the air quality unacceptable when entering a space with a given ventilation rate (air supply per occupant). The curve is based on comprehensive studies involving more than one thousand sedentary male and female occupants judged by nearly two hundred male and female judges. The original data (2,3) have been slightly corrected for the olf-value of the space where the experiments took place. The figure appli-

Ventilation required must always be calculated using absolute CFM, (Not as a % of building volume)



"AA" class of control with max. allowable seasonal temperature setback of $\pm 5\text{ }^{\circ}\text{C}$.

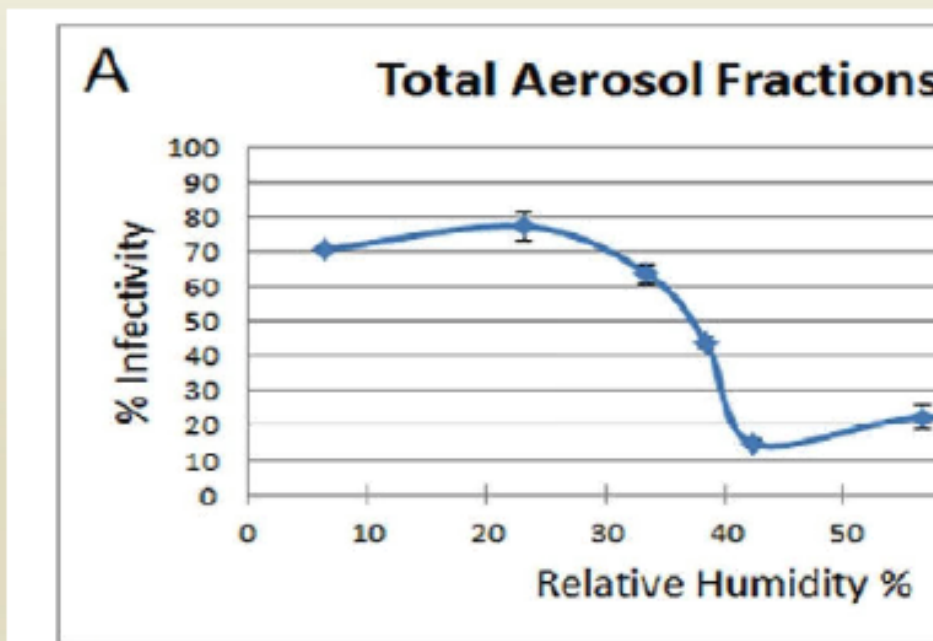
RH 50% +/- 5%



GET EDUCATED

What do we know* about Airborne Transmission?

Relative Humidity between (40%-60%) slows the Transmission



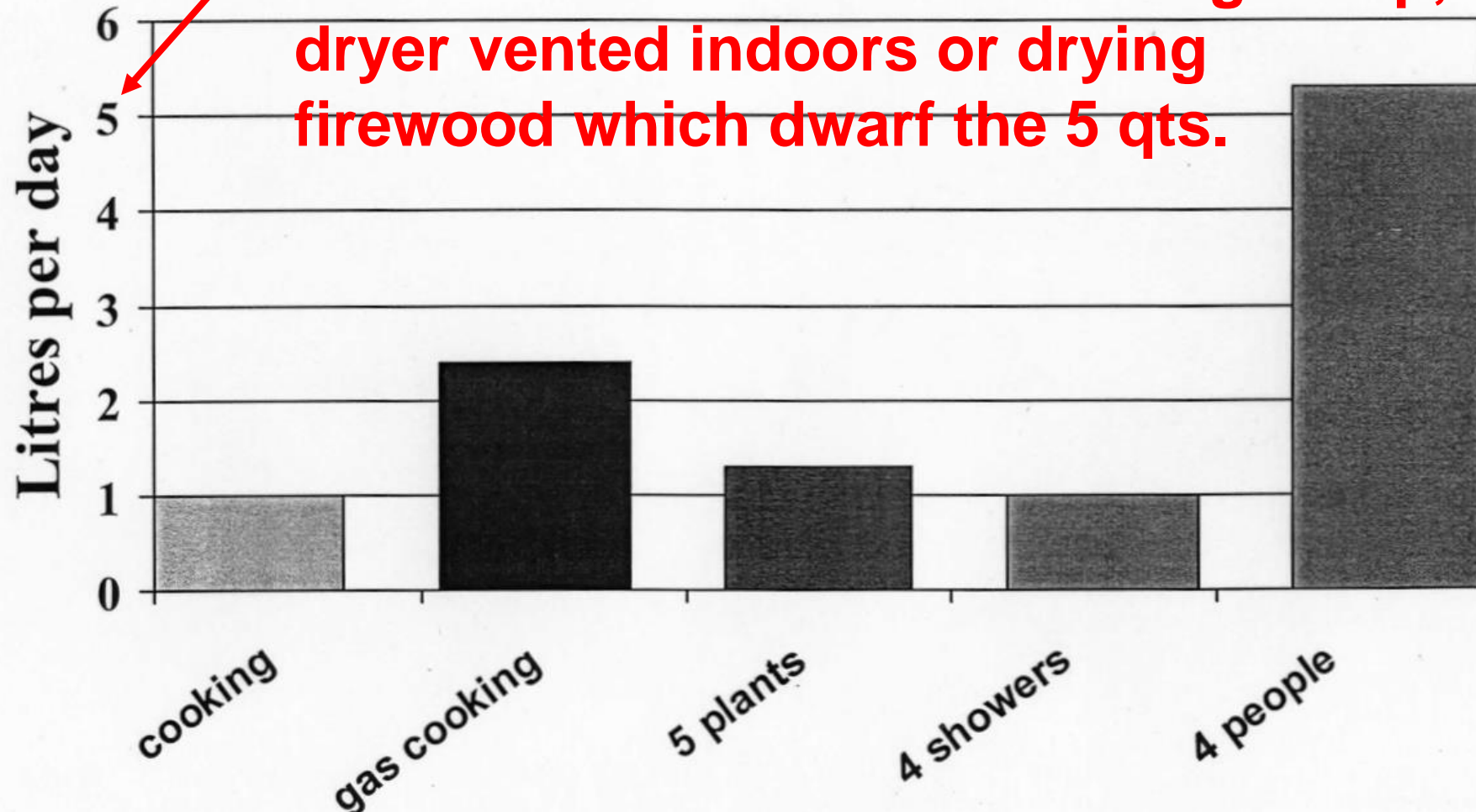
Stephanie Taylor, M.D.

* Noti, John D., et al. "High humidity leads to loss of infectious influenza virus from simulated coughs." *PloS one* 8.2 (2013).

* Wan Yang and Lindsey Mars, "Mechanisms by Which Ambient Humidity May Affect Viruses in Aerosols", 2012 Oct.

Normal House Moisture Sources

Ventilation can handle 5 quarts/day but not the moisture from rising damp, dryer vented indoors or drying firewood which dwarf the 5 qts.



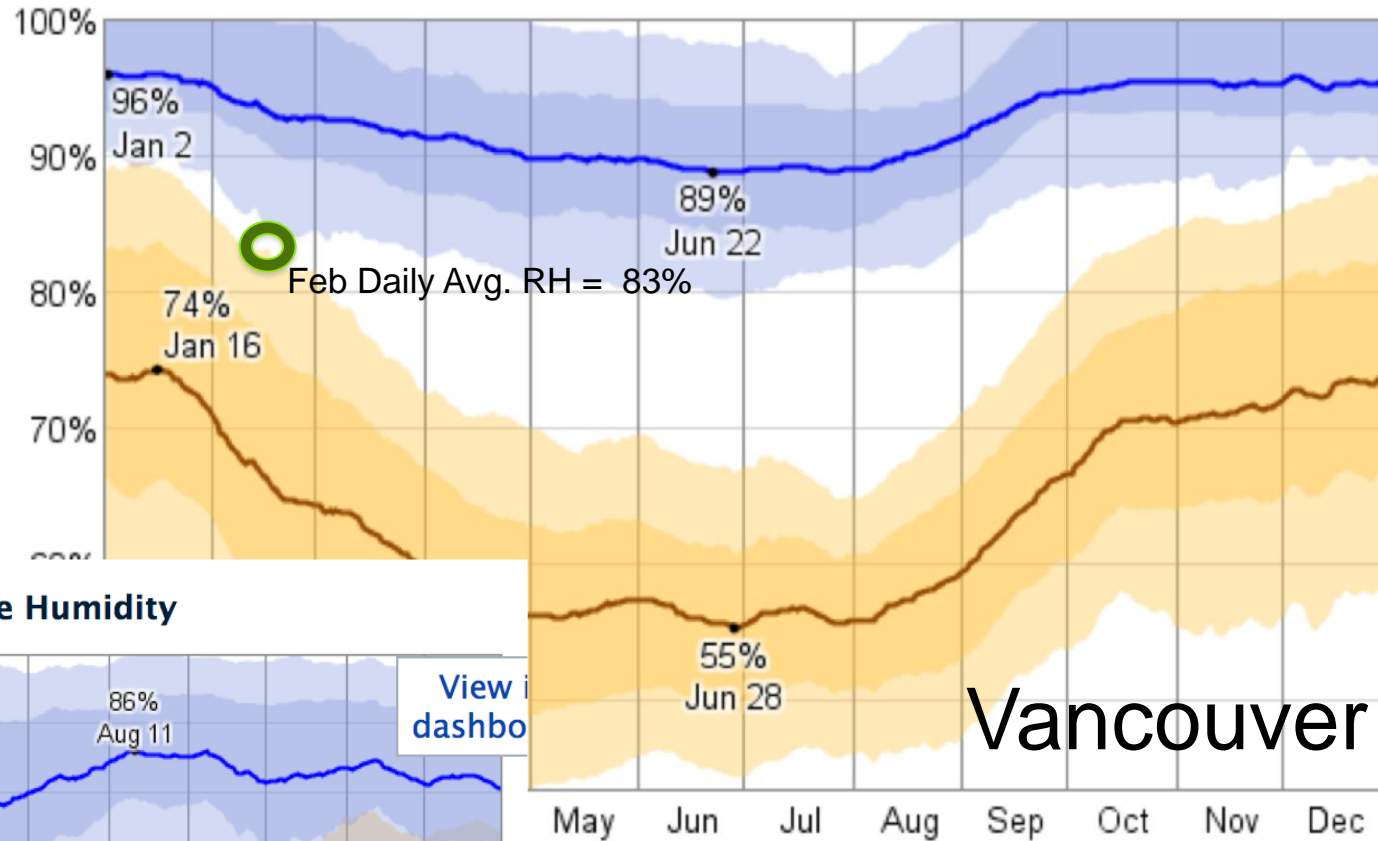
What's the big Elephant in a residence?



Moisture!

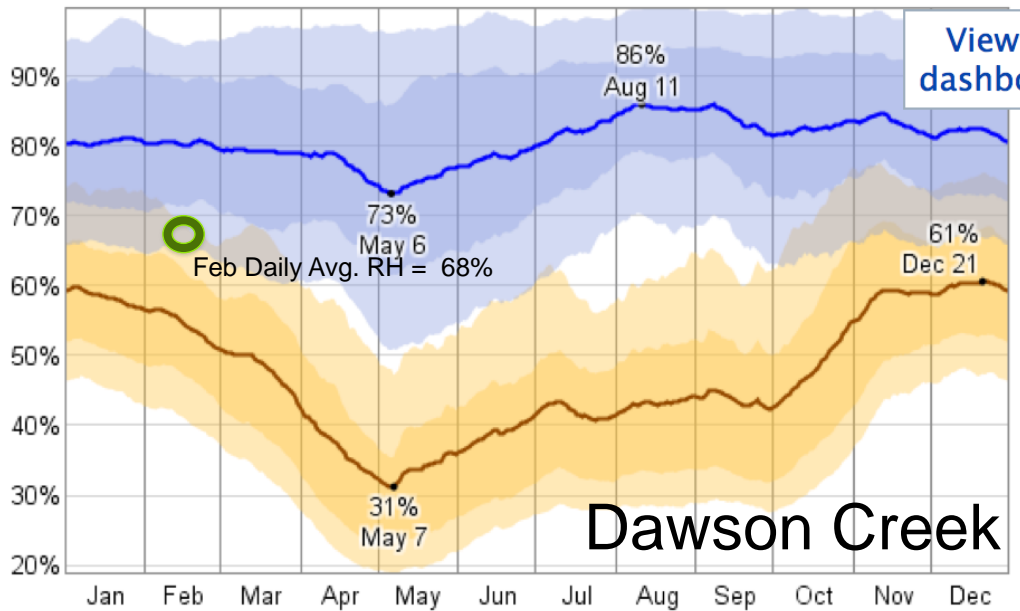
Environment Canada long term averages

Relative Humidity



Vancouver

Relative Humidity



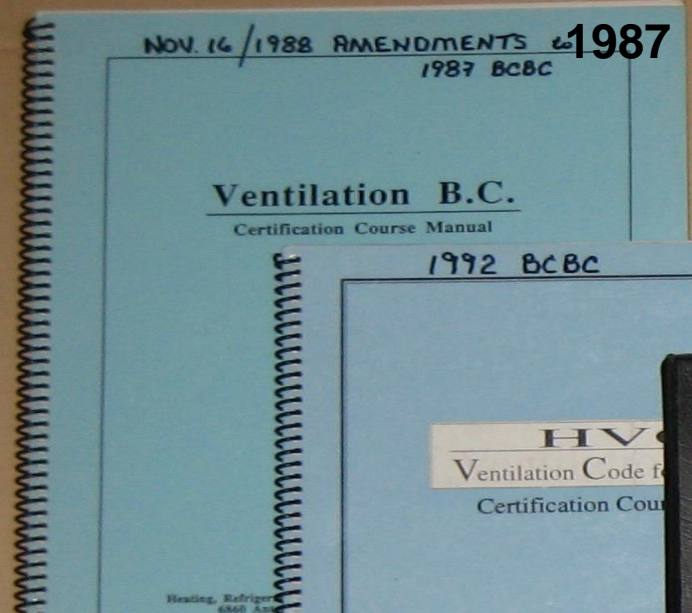
Dawson Creek

The average daily high (blue) and low (brown) relative humidity with

Or CFM/person/day to maintain required %RH

• <u>City</u>	30%	40%	50%
• Tofino/Van	156	23	17
• Osoyoos	25	13	11
• Dawson Ck.	13	8.7	8

- Note: @Osoyoos & especially Dawson Ck, it is so dry it is difficult to build a tight enough building to generate comfortable indoor RH without adding humidity.



Ventilation B.C.
Certification Course Manual

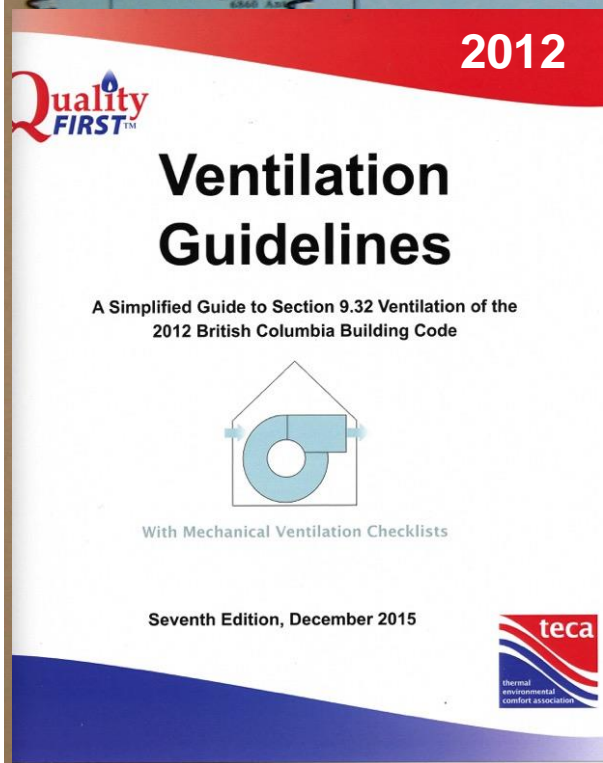
1992 BCBC 1992

HVCI
Ventilation Code for
Certification Course



1998

HVCI
Ventilation Guidelines
to Section 9.32 of the
1998 BCBC



2012



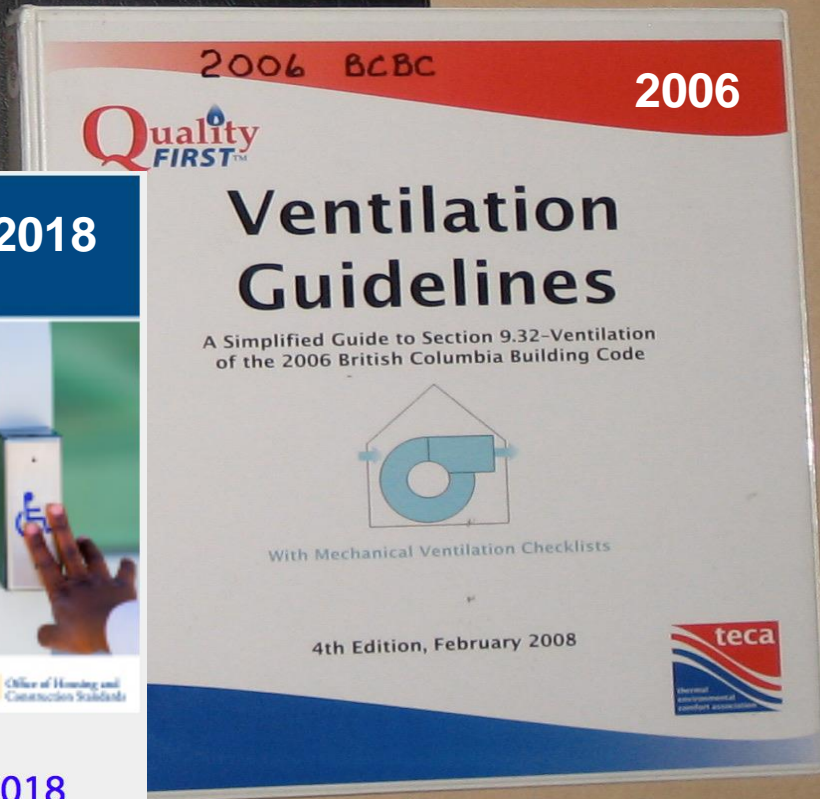
Ventilation Guidelines

A Simplified Guide to Section 9.32 Ventilation of the
2012 British Columbia Building Code



With Mechanical Ventilation Checklists

Seventh Edition, December 2015

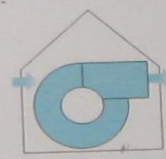


2006



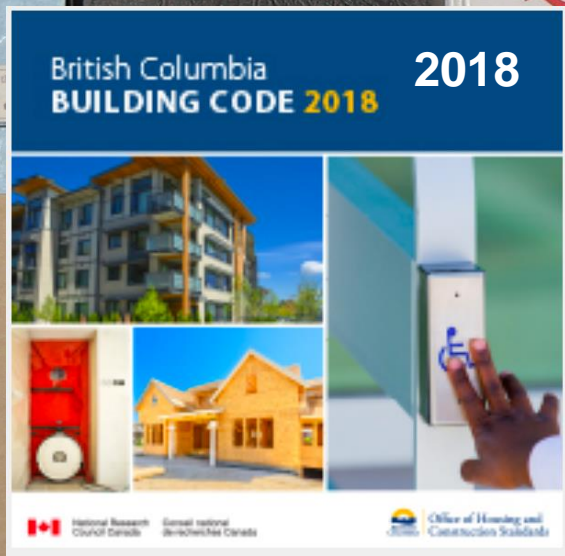
Ventilation Guidelines

A Simplified Guide to Section 9.32-Ventilation
of the 2006 British Columbia Building Code



With Mechanical Ventilation Checklists

4th Edition, February 2008



2018

British Columbia
BUILDING CODE 2018



National Research Council Canada / Conseil national de recherches Canada
Office of Housing and Construction Standards

[BC Building Code 2018](#)

For all Part 9 building (housing) permits applied for after Dec 19, 2014, the amended Mechanical Ventilation Sub-Section 9.32.3 of the 2012 BC Building Code will take affect.

Over-arching Changes Updated from 2006, Dec. '18; ~~-unchanged since 2014~~

Fresh air distribution to bedrooms is now required. Operation of the principal system must be continuous; no more timers or dehumidistats for the principal system.

Further, a permitted secondary suite will require a continuously operating system meeting the same distribution requirements as that required of the principal dwelling unit.

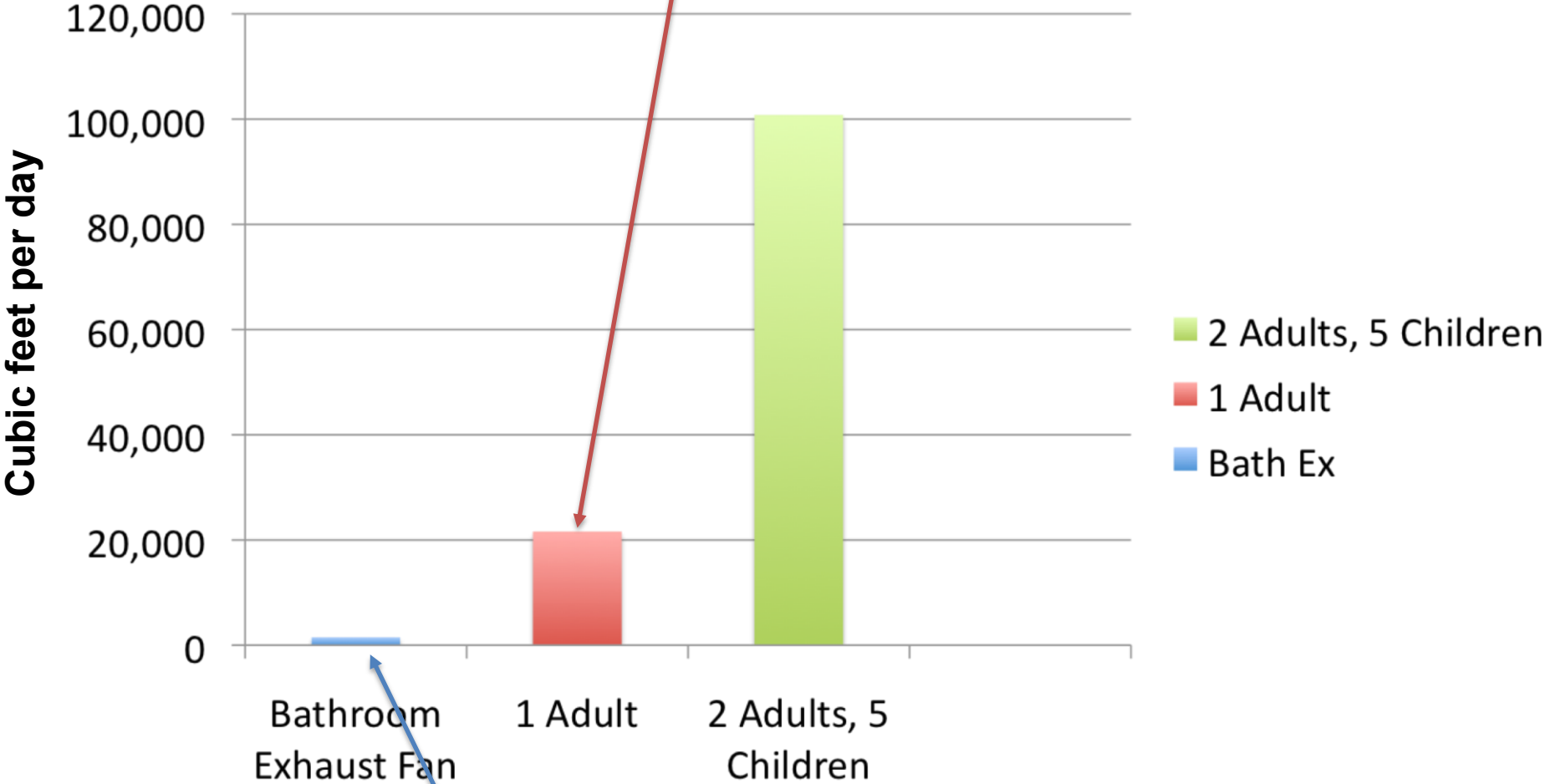
Rationale

Today housing industry professionals especially and secondarily home owners are becoming increasingly aware of the problems resulting from rising interior relative humidity. This is driving an increasing awareness of the need for improved ventilation.

- a) Radiant floor panel and especially smaller baseboard heated dwelling units have had a long spotted history of moisture problems, of varying severity. As many such dwellings do not have a chimney and all are without an air circulation system, none have simple means to incorporate a fresh outdoor air intake duct as can be done for forced air heated dwellings.
- b) Ventilation systems for dwelling units heated by natural gas forced air are quietly changing. When heated by a standard efficiency forced air furnace and co-vented with a natural gas water tank, this vent system and the 2 appliances' draft diverters provided these dwelling unit with 40–80 cfm of 'stealthy' continuous exhaust (ventilation). This appliance pair (and its shared vent system) have been the unsung ventilation heroes for over 50 years and

Ventilation rate comparison

people need 10 to 15 cfm continuously!



50 cfm bath fan exhausting 25 run for 30 minutes/day

through two generations of home owners. Unbeknownst to most, this 'system' is being phased out with the recent mandated furnace efficiency upgrades in combination with the market shift to improved efficient domestic hot water heating appliances.

Principal Ventilation System Sizing:

Sizing of the principal system is based on requirements of 2010 ASHRAE Standard 62.2. This is primarily a people based standard, but with a small floor area factor added in. Since 'people' based ventilation was first introduced into BC in 1998, occupancy of the first bedroom has been assumed to be 2 persons, the remaining bedroom occupancy at 1 person each. This assumption has remained unchanged. While the 'people' ventilation rate has been halved from 15 to 7.5 cfm/person, the addition of the building allowance of 10 cfm/1000 square foot floor area has essentially counter balanced the lowered people rate for all but very large dwelling units. Only those having over 4000 square feet and/or over 5 bedrooms will see an increase in capacity from the original 1998 sizing.

Bedroom Ventilation—The most significant change

All bedrooms must now have an air exchange, as must every level of the dwelling unit, including the basement, if no bedroom is present on that level. There are four air distribution methods permitted, prescriptively described in 9.32.3, illustrated in the BCBC Appendix and expanded within this manual. The user's choice will depend on climate, heating system, dwelling unit size and the energy impacts of ventilation. The system chosen will be determined in part by the requirement to comply with the prescriptive path or energy 'budget' allotment specified under the new 9.36 Energy Efficiency requirements.

Table 9.32.3.5**Principal Ventilation System Exhaust Fan Minimum**

Floor Area ft ²	Minimum Air-flow Rate, cfm				
	Number of Bedrooms				
	0–1	2–3	4–5	6–7	>7
<1500	30cfm	45cfm	60cfm	75cfm	90cfm
1500–3000	45	60	75	90	105
3001–4500	60	75	90	105	120
4501–6000	75	90	105	120	135
6001–7500	90	105	120	135	150
>7500	105	120	135	150	165

**Don't oversize! Today's code allows this, tomorrow's won't.
The capacity of this system determines the annual operating cost.**

Relative Size Chart of Common Air Contaminants

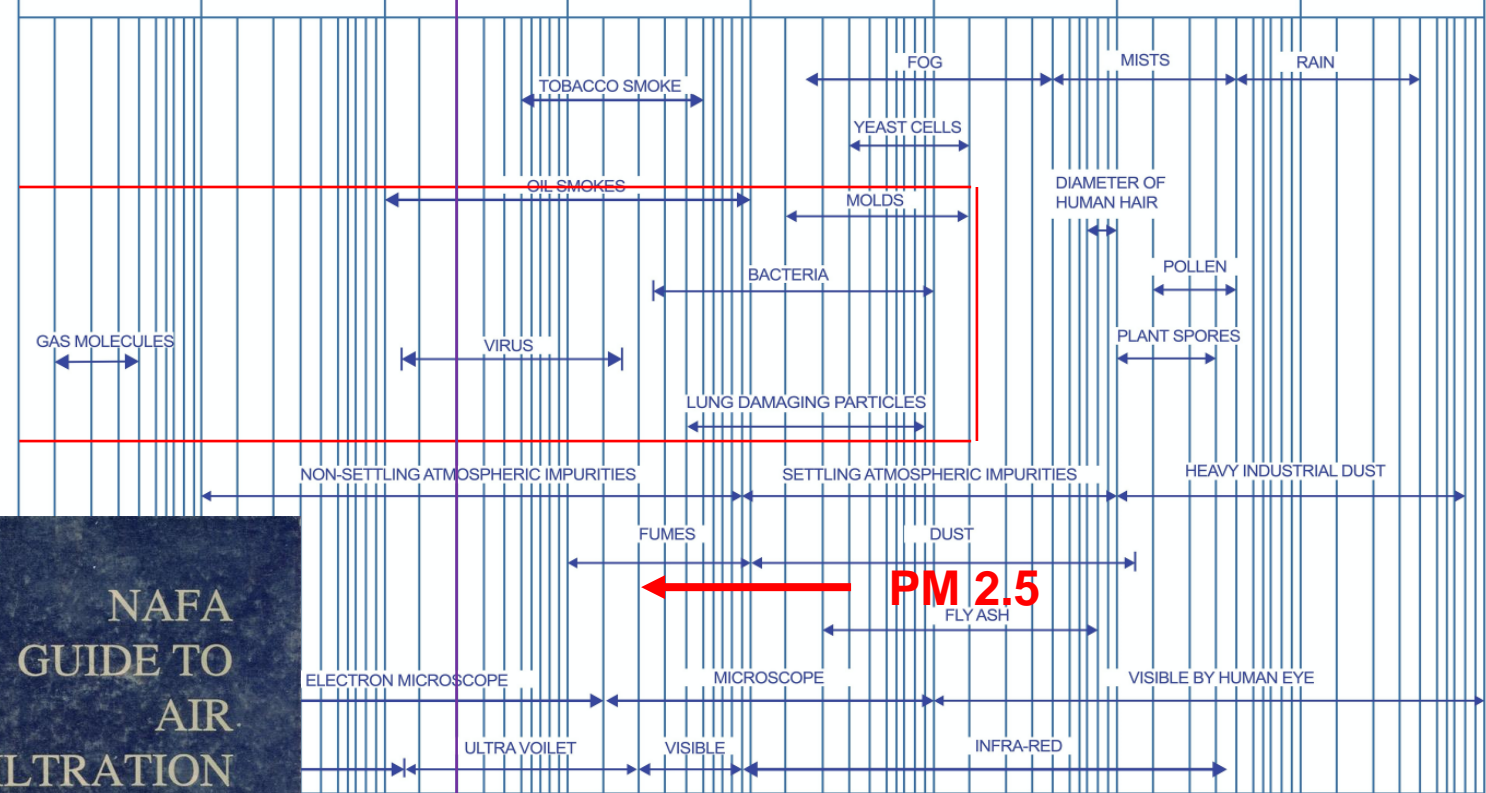
0.3



> 10 DAY ← 10 HR → < 5 SEC. TIME TO SETTLE

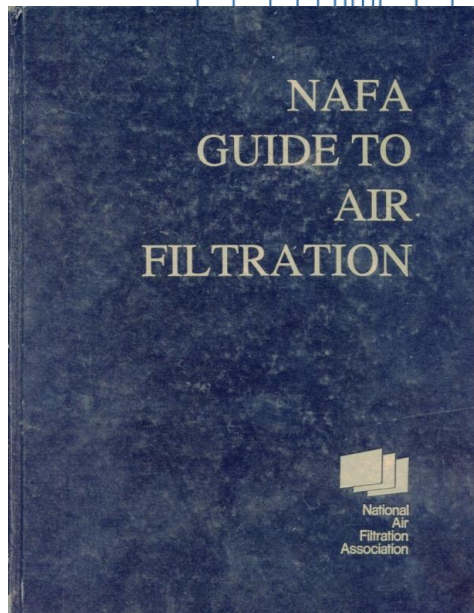
Particulate Diameter (Micrometers)

0.0001 0.001 0.01 0.1 1 10 5 MIN. 100 1,000 10,000



ASHRAE DUST SPOT EFFICIENCY

(NEW) MERV RATING

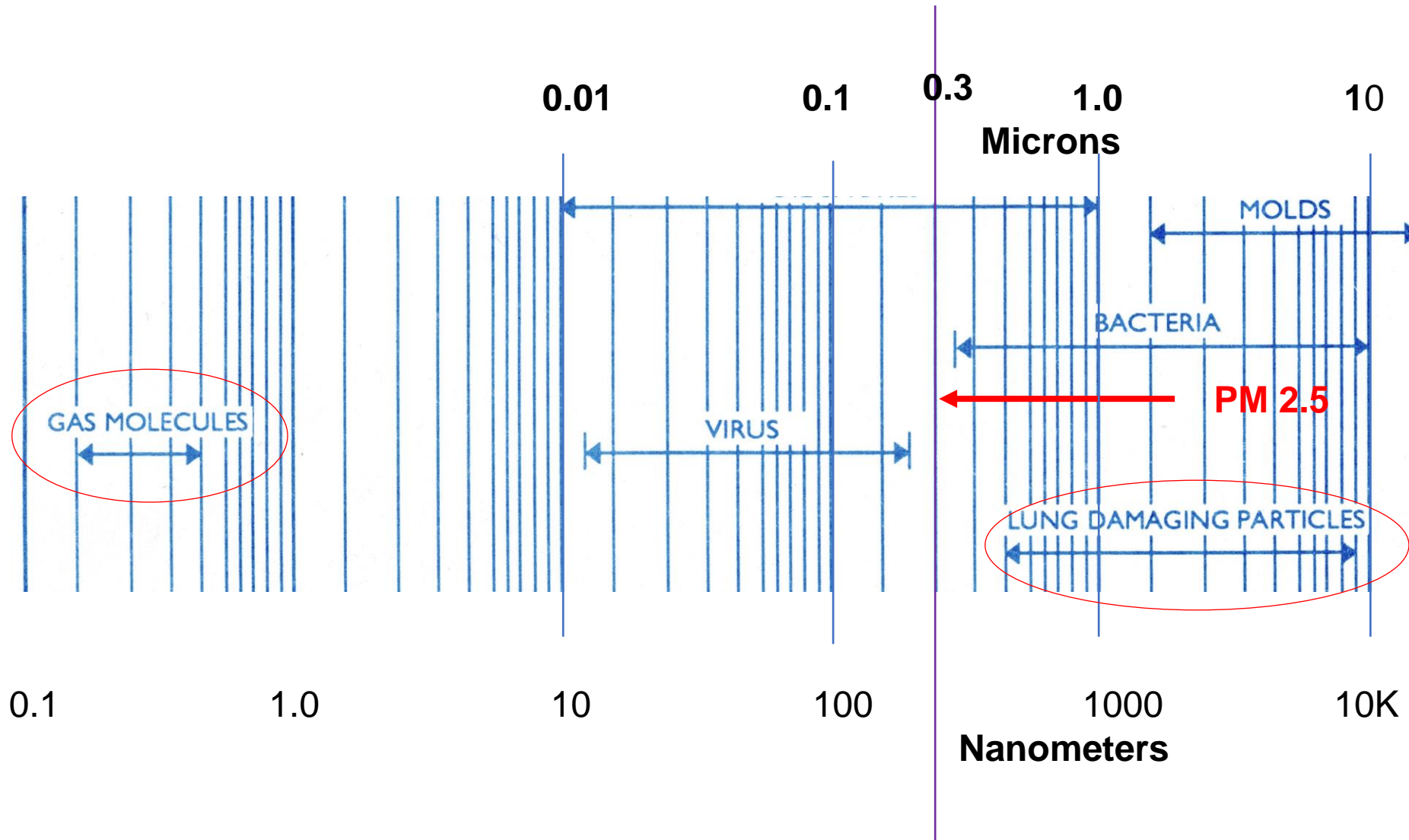


60	80	93	100%	95%		
40	60	82	94	100%	85%	
	45	65	88	98	100%	65%
	10	56	98	100%	25%	

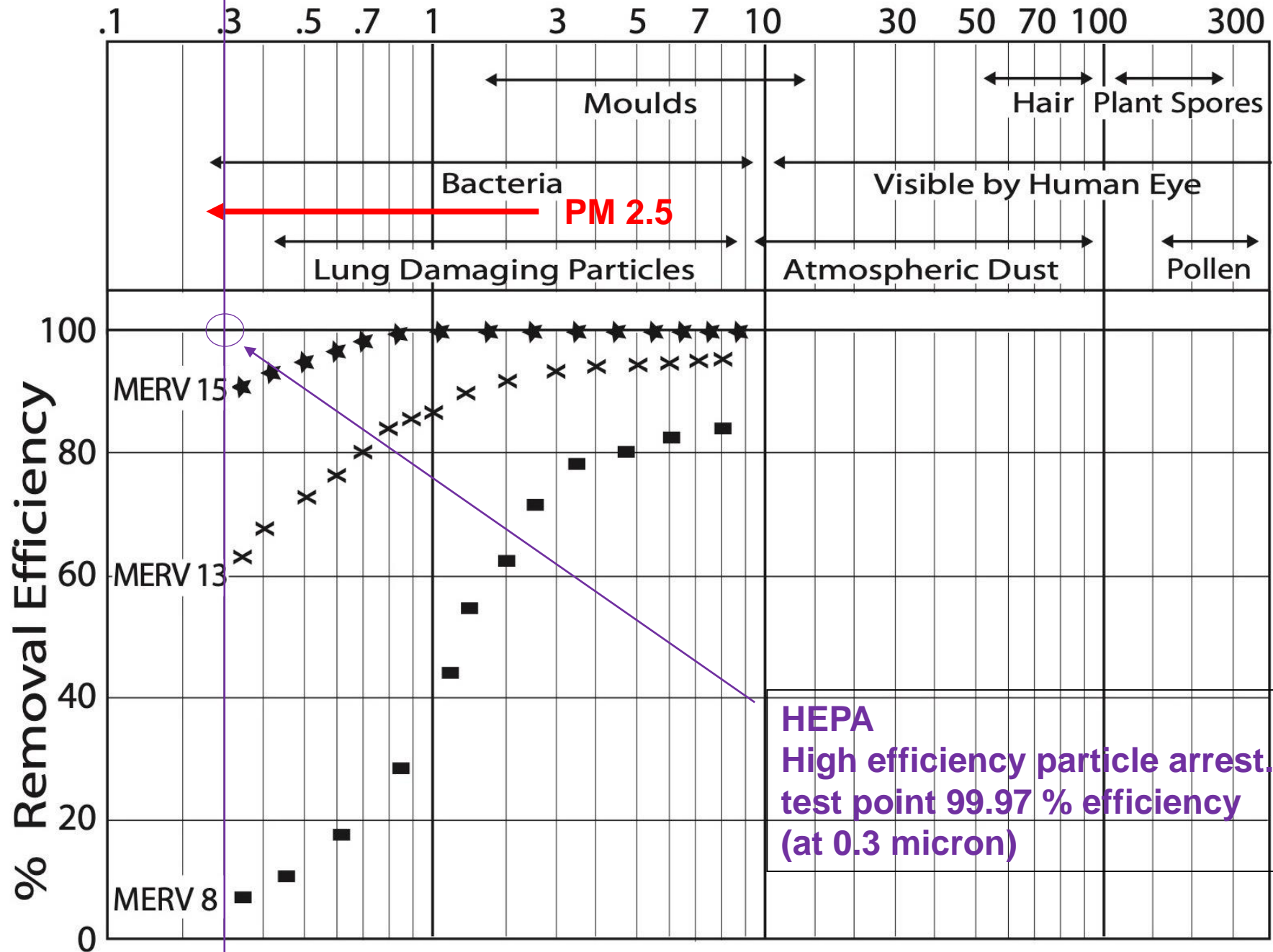
PRODUCTS LTD.
 by, British Columbia CANADA V5J 4N3
 88-8906 • www.enreadyproducts.com

14
13
11
7

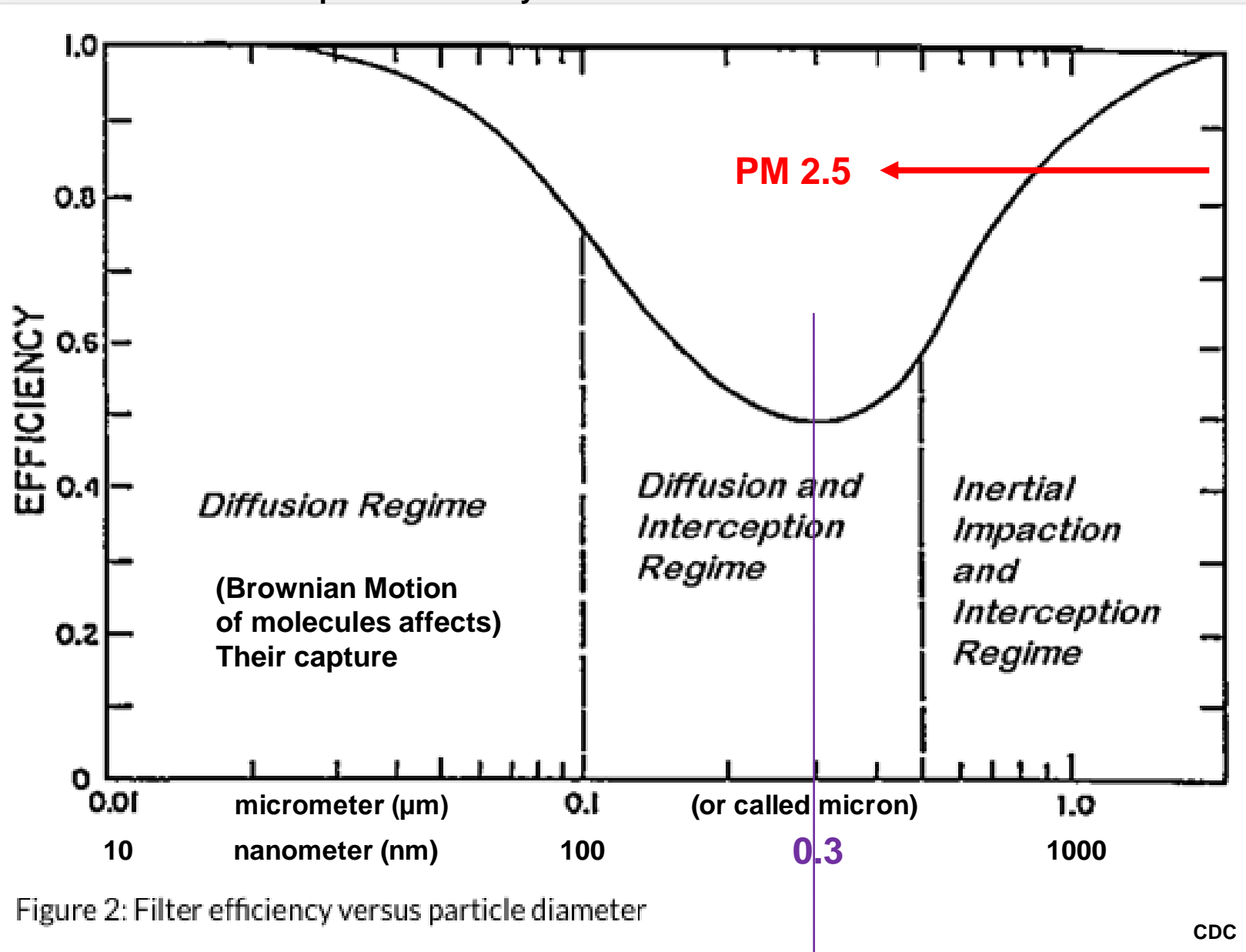
The (Broad) Respiratory Range



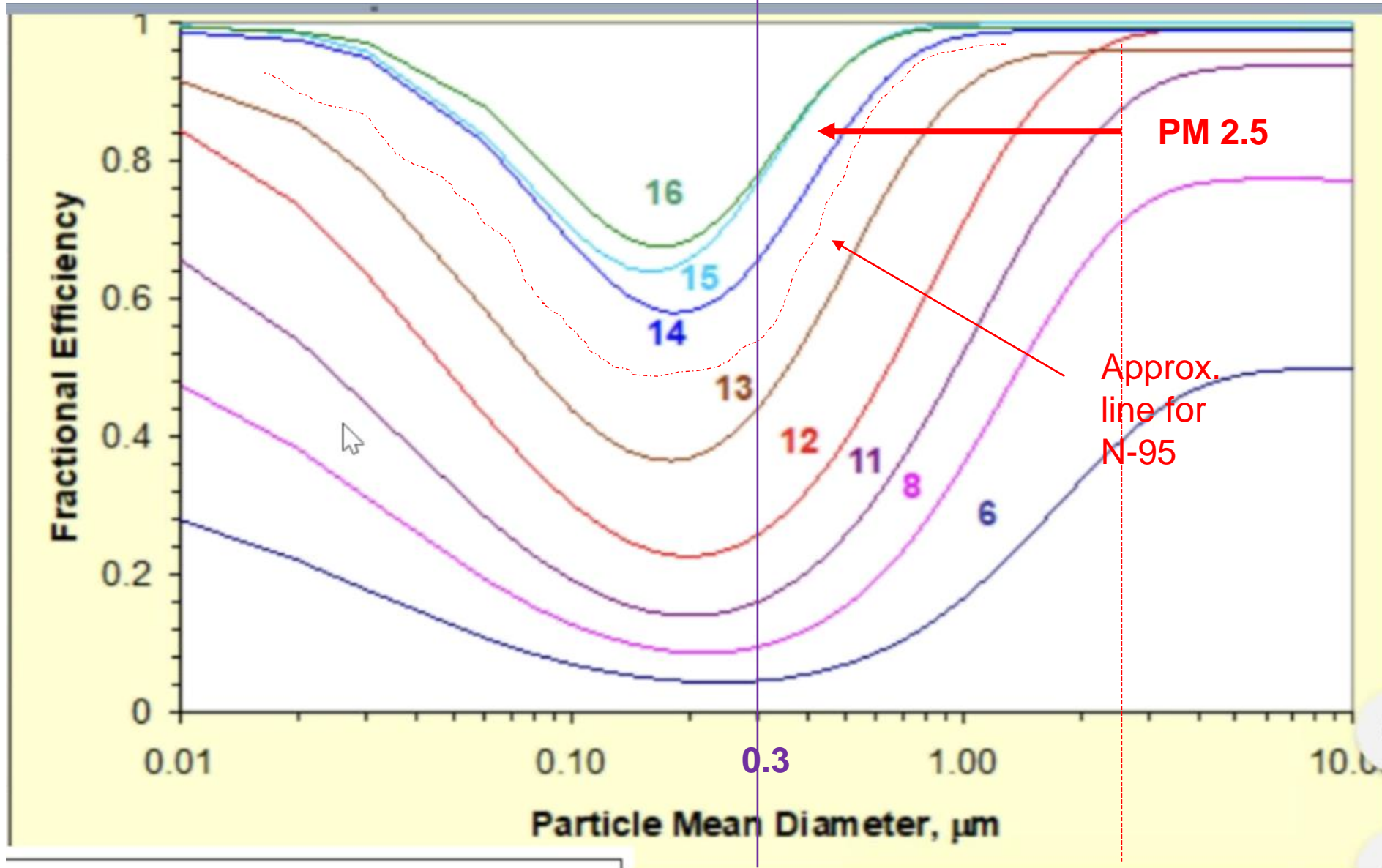
Particle Size in Microns



N-95 Mask Particle Capture Efficiency



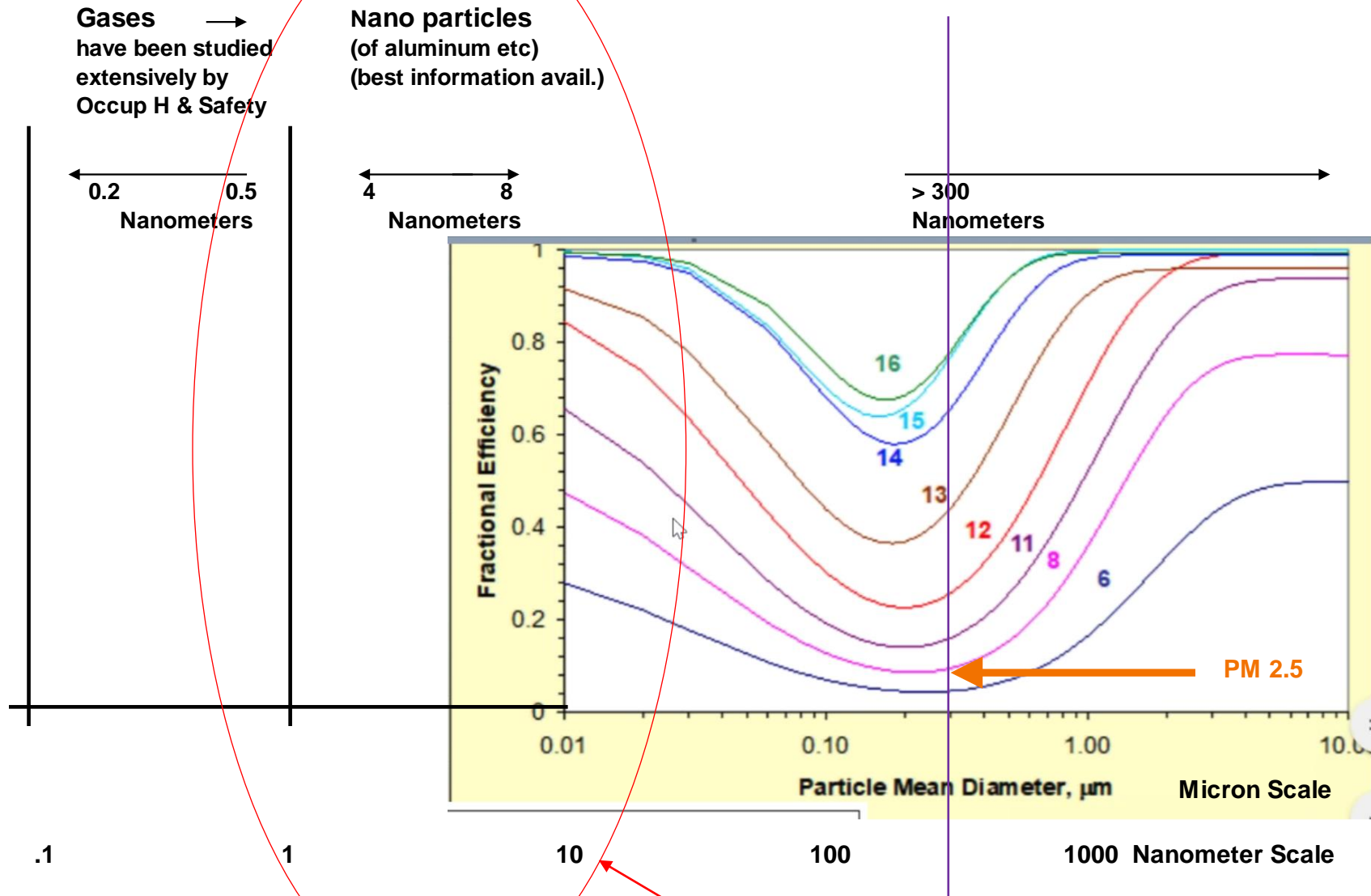
Food and Drug Admin. (USA for surgical masks)



The Really Small Stuff

Recently studied

The normal size stuff (Concerns of Mech. Engr's)



New Area of Interest (1 to 10 nm)

Adjuvants in vaccines
Invented 1926, still used today

Dr. Chris Exley PhD
Prof Bioinorganic Chem.
Keely University UK
The go-to guy on
aluminum and its affect on
the human brain



Aluminum in Chem Spraying

Factors which govern annual heating costs of small buildings

1) Fuel Cost

2) Climate

3) Building Losses

Skin: (insulate) 60%

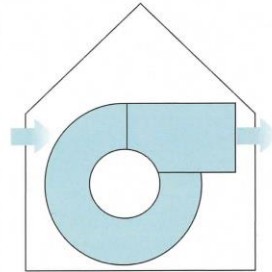
Drafts: (air seal) 20%

Ventilation: (reduce rate) 10%



Ventilation Guidelines

A Simplified Guide to Section 9.32 Ventilation of the
2012 British Columbia Building Code



With Mechanical Ventilation Checklists

Seventh Edition, December 2015



1000 persons have taken & passed

Course covers
1 Section (9.32)
of Part 9 of
2012 BCBC



Written &
presented
in IP units



Each 6"Ø elbow contributes 8' of joint/gore leakage

