



Introduction to Radon

William J. Bell
Mass Dept. of Public Health
Radiation Control Program
Northampton, Massachusetts

Call Your State Radon Program!!

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What We Will Discuss

- What is Radon ?
- Why We Should Care
- Radon Occurrence
- Radon Testing
- Follow up and Mitigation Strategies

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What We Will NOT Discuss

- Radon in Stone Counter Tops
- Radon in Private Well Water
- Radon Testing in Schools
- Radon Control in New Construction

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WHAT IS RADON?
Radon is a deadly gas from underground.
This is what you should know about radon:
You can't see it.
You can't hear it.
You can't feel it.
You can't smell it.
You can't taste it.
But... You can detect radon!
Common sense says: test for radon today.

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What is Radon ?

- Naturally occurring radioactive gas
- Found everywhere
- Member of Uranium decay series
- Direct descendant of Radium-226
- Produces other radioactive elements
- Can have high concentrations indoors

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Why do we really care ?

- Large fraction of US Radiation Exposure

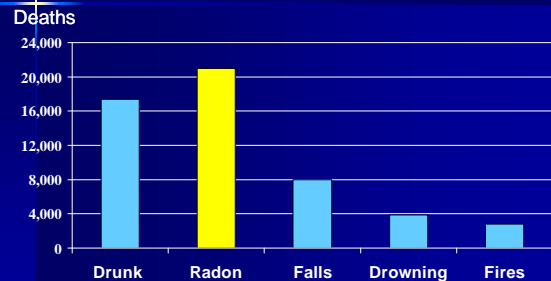
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Why do we really care ?

- Large fraction of US Radiation Exposure
- #1 cause of Lung Cancer - Non-Smokers
- #2 cause of Lung Cancer - Smokers
- 21,000 Lung Cancer Deaths per year in US

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Causes of Death



Accident Facts 2002, National Safety Council

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Why do we really care ?

- Large fraction of US Radiation Exposure
- #1 cause of Lung Cancer - Non-Smokers
- #2 cause of Lung Cancer - Smokers
- 21,000 Lung Cancer Deaths per year in US
- Many Deaths are Preventable

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Bottom Line



**RADON is a
known
human
carcinogen**

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How much is too much?

Action Guide (4 pCi/L)

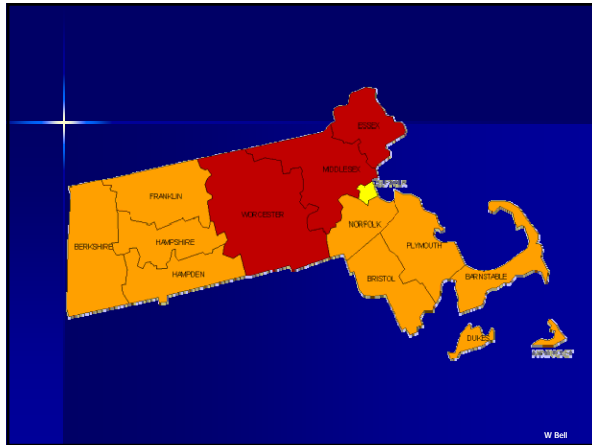
Consider Action (2 - 4 pCi/L)

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Radon in Massachusetts

- 1988 State/EPA Survey of 1650 homes
- 23.9% were 4 pCi/L or more
- 1.3% were 20 pCi/L or more
- Statewide Median value 1.9 pCi/L

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Percent of Homes \geq 4 pCi/L

Worcester	38 %
Essex	36 %
Middlesex	26 %
Bristol	23 %
Franklin, Hampshire	23 %
Berkshire	21 %
Norfolk	21 %
Barnstable	15 %
Plymouth	12 %
Hampden	11 %

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Median Rn Conc. in pCi/L

Worcester	2.8
Essex	2.8
Middlesex	2.2
Bristol	1.8
Franklin, Hampshire	1.6
Berkshire	1.9
Norfolk	1.9
Barnstable	1.6
Plymouth	1.4
Hampden	1.3

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Parameters Tested

- County
- Having a Basement
- Canister Placement
- Basement Floor or Wall Material
- Type of Heating System
- Age of Structure
- Using a Private Well
- Attic or Roof Insulation

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High Homes in Massachusetts

- Housing Units ≥ 4 pCi/L 600,000
- Housing Units ≥ 20 pCi/L 33,000

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Occurrence Conclusions -MA

- Radon is a serious health threat !
- Elevated Radon Levels have been found in all regions of our state !
- We Cannot predict which buildings are high
- Test All Homes !
- Test All Schools !

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Radon Risk Reduction

- ➔ Test
- Fix



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Conducting a Radon Test



- Short Term - 48 hours
- Closed house condition
- Lowest liveable area
- During heating season

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Closed House Condition

- Begin 12 hours before and all during the test period
- All doors and windows in **whole house** closed except for normal entry & exit
- Building should be heated



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Lowest Liveable Level

- Usually a basement
 - Could people spend time here ?
- Could be a living level above a crawl space or unliveable basement
- Slab on grade
- "Avoid" Kitchen, Laundry, Bathrooms & Closets

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How much is too much?

Action Guide (4 pCi/L)

Consider Action (2 - 4 pCi/L)

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Radon Risk Reduction

- Test
- Fix



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Time to Hire a Radon Mitigation Contractor ?



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Call Your
State Radon Program !!



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Mitigation Goals !!

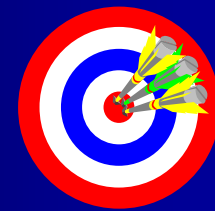
- Action Guide
(4 pCi/L)
- ALARA



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ALARA Principle

- As
- Low
- As
- Reasonably
- Achievable



Less than 2
pCi/L

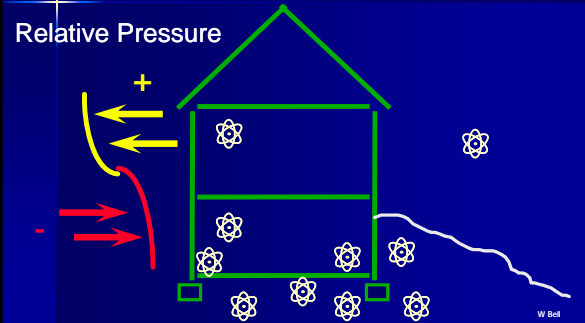
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Pressure Driven Flow



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Pressure Driven Flow



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What Causes The Driving Force ?

- Wind Effect
- Barometric Pressure
- Stack Effect - thermal bypasses
- Combustion Effect
- Mechanical Exhaust Ventilation

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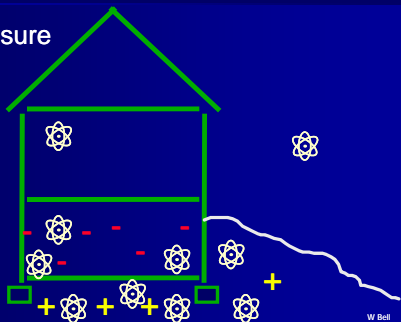
Radon Mitigation Approach

- Seal cracks 
- Ventilate 
- Active Soil Depressurization 

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Reduce Radon by Treating Cause !

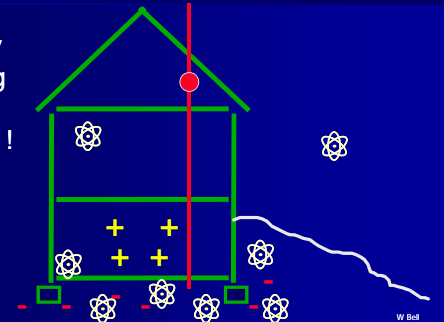
Relative Pressure



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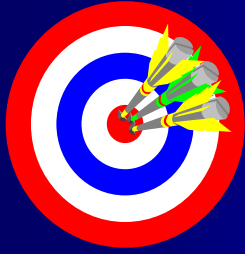
Active Soil Depressurization

Works by Changing Relative Pressure !



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Results



Less than
2 pCi/L

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Any Questions ?

William Bell
Mass Dept of Public Health
23 Service Center
Northampton, MA 01060

(413) 586-7525

william.j.bell@state.ma.us



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