



# Introduction to Radon

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## 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

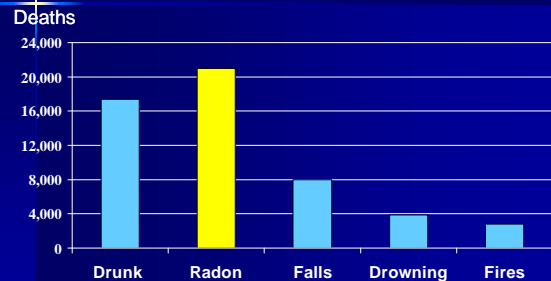
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## Why do we really care ?

- 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)

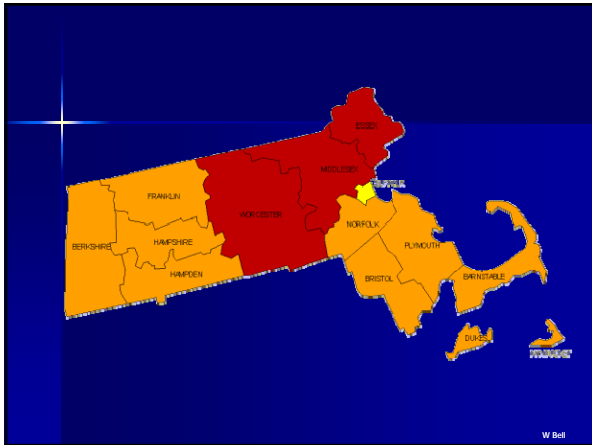
Consider Action (2 - 4 pCi/L)

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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  $\geq 4$  pCi/L 600,000
- Housing Units  $\geq 20$  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 !!

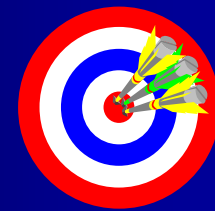
- Action Guide  
(4 pCi/L)
- ALARA



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## ALARA Principle

- As
- Low
- As
- Reasonably
- Achievable



Less than 2  
pCi/L

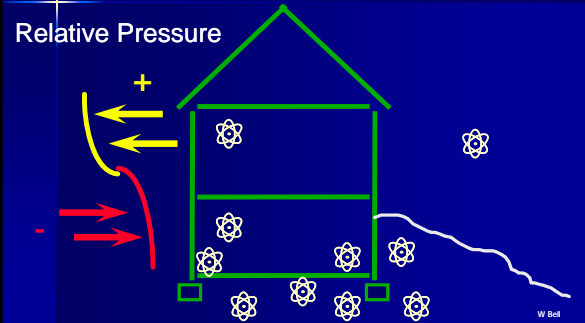
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## Pressure Driven Flow



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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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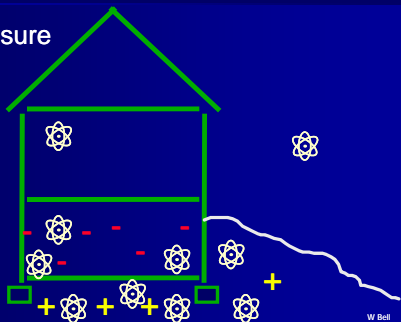
## Radon Mitigation Approach

- Seal cracks 
- Ventilate 
- Active Soil Depressurization 

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## Reduce Radon by Treating Cause !

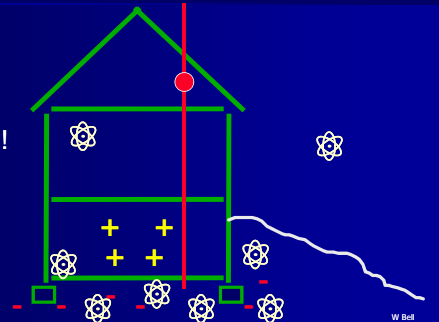
Relative Pressure



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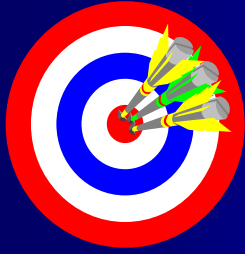
## Active Soil Depressurization

Works by Changing Relative Pressure !



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## Results



Less than  
2 pCi/L

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## Any Questions ?

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