

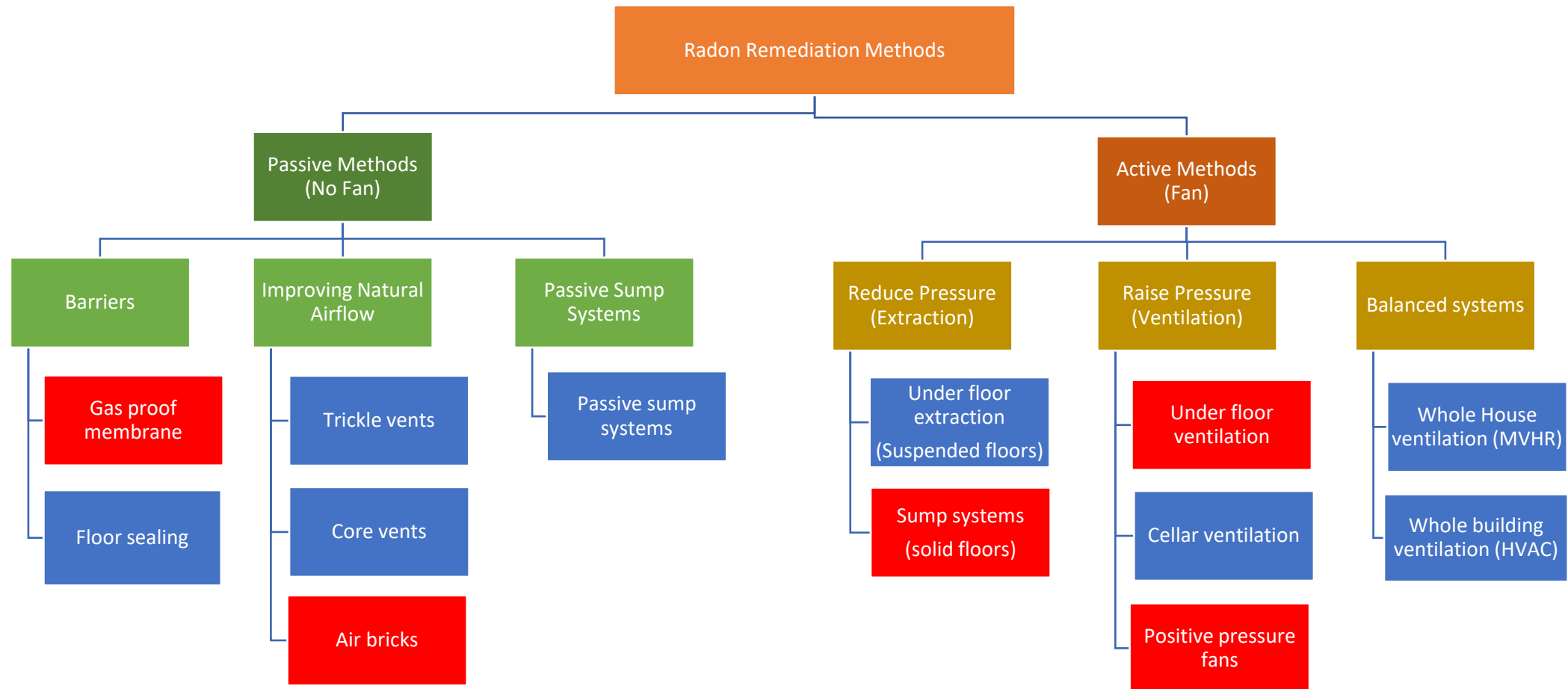
Radon Remediation: The many ways to reduce Radon in properties:



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Jerry Board, Director, UK Radon Ltd

There are many different types of radon remediation



Why do we need to know all the remediation methods?

Choice

- You will have choices of ways to remediate, so you will need to know the range of methods available

Best Value

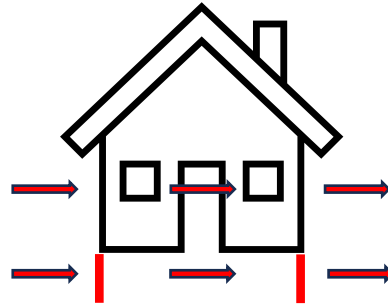
- To be successful with radon remediation you must be able to employ the best value solution for each property you work on.

Passive systems (no fan used).....

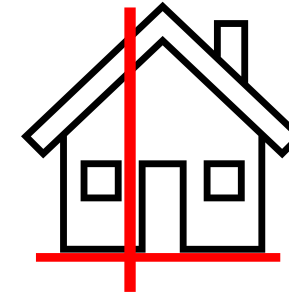
Barriers



Natural Air Flow



Passive sump systems



Think about the ground floor type, the lived-in space, and is there a cellar

*Solid

*Suspended

* Mixed

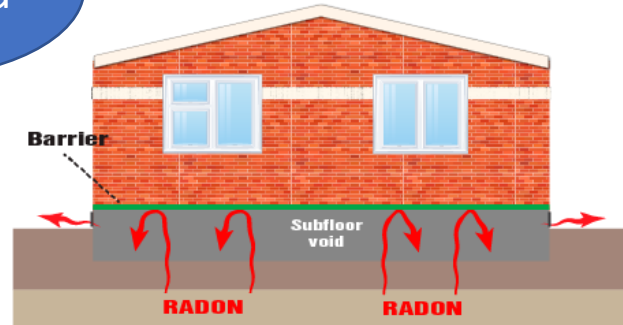
*'Lived-in' Space

*Cellar

Barriers

- Gas proof membrane

Solid & suspended floors



Gas proof membrane

- Simple construction ✓
- Cheap and effective in new build ✓
- Very labour and materials intensive ✗
- Difficult to retro fit, as it is difficult to seal around the edges ✗
- Highly effective at reducing radon levels, if fitted well ✓

Notes.... It is worth fitting a precautionary sump underneath a gas proof membrane

- Floor sealing

'Lived-In' space

Solid & suspended floors



Floor sealing

- Simple method ✓
- A 'must' for fixing large holes in floors ✓
- Very Labour intensive ✗
- Not very effective at reducing radon levels ✗

Under-floor insulation can work well with floor sealing to improve energy efficiency as well ✓

Improving Natural Airflow

- Trickle Vents and louvres

'Lived-In' space



- Trickle Vents & louvres
Simple design ✓
Must be permanent
Difficult to retro fit ✗

- Trickle Vents & louvres
Can be a problem with cold air, if permanent

- Core Vents

'Lived-In' space



- Core Vents
Simple design ✓
Must be permanent

- Core Vents
Very important if you have a fireplace or boiler to stop pressure reduction in the lived-in space

- Air Bricks

Suspended floors



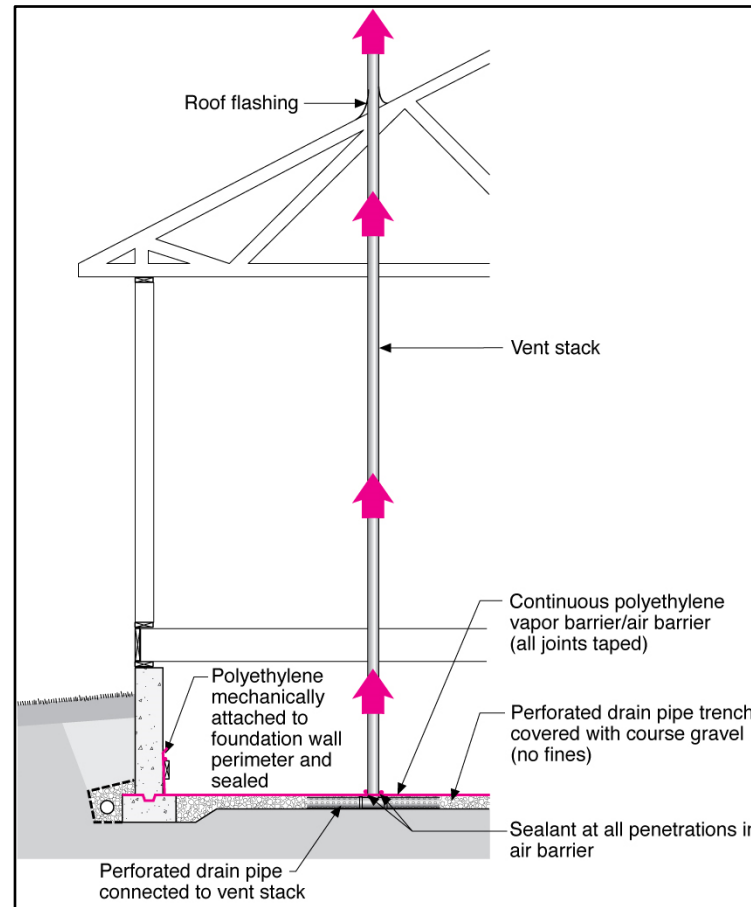
- Air Bricks
Simple design ✓
Replace old with new ✓
Good radon reduction possible ✓

- Air Bricks
Proven to be very effective with suspended floors

Passive Sumps

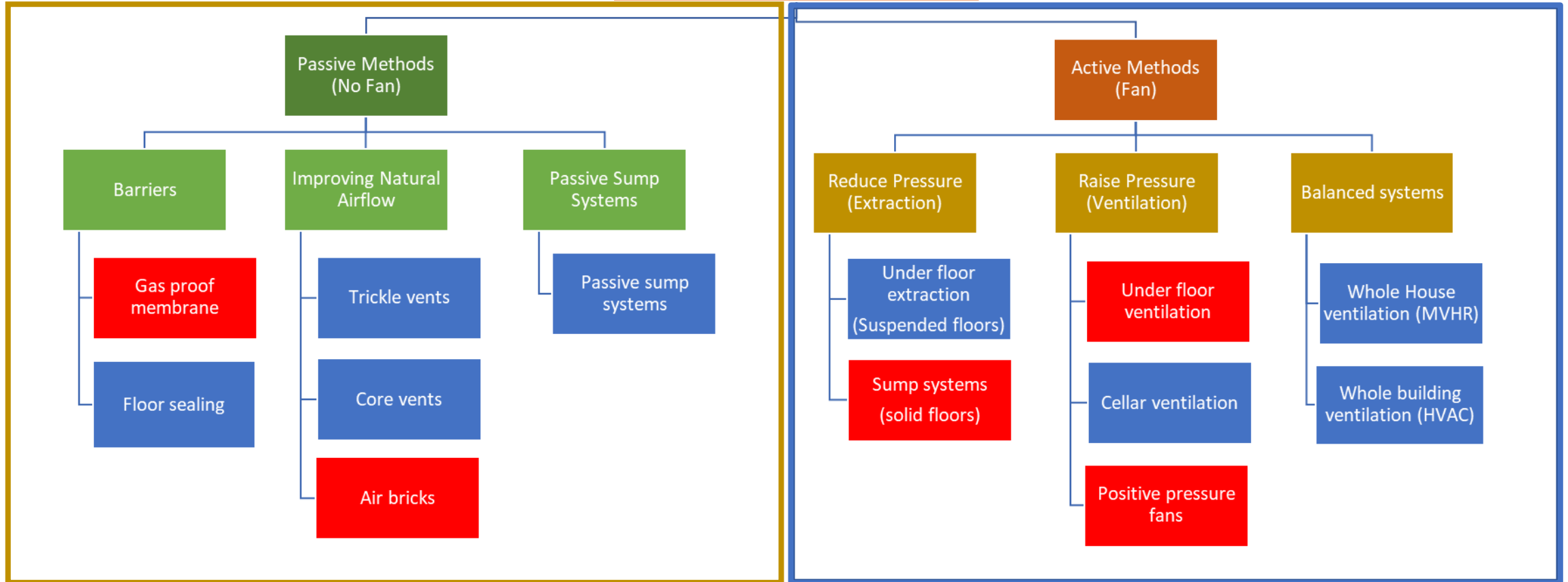
Under solid floors or 'capping'

- Passive sumps work best if they are within the house as the warmth of the building aids radon removal
- Can work up to 300 Bqm-3, but are problematic in their effectiveness



- Uses 'chimney effect' to create an up-flow of radon/air up the flue pipe
- No on-going costs, associated with active radon system ✓
- if it doesn't work a fan can be fitted to a passive sump system ✓
- Can be expensive to fit ✗

Radon Remediation Methods

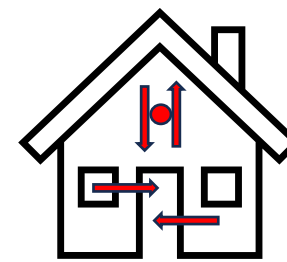
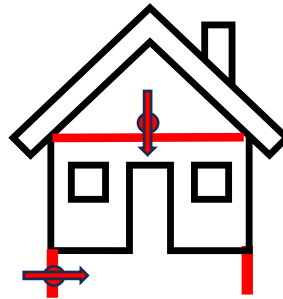
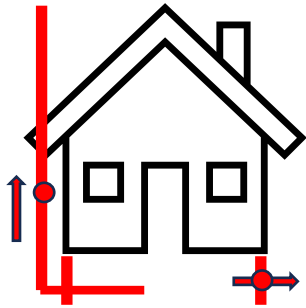


Active Radon systems (use a fan).....

Reduce Pressure

Increase Pressure

Balanced



Think about the ground floor type, lived-in space, and is there a cellar

*Solid

*Suspended

*Mixed

*'Lived-in' Space

*Cellar

Reducing the Pressure

Extraction

'Lived-In'
space &
Suspended
floors

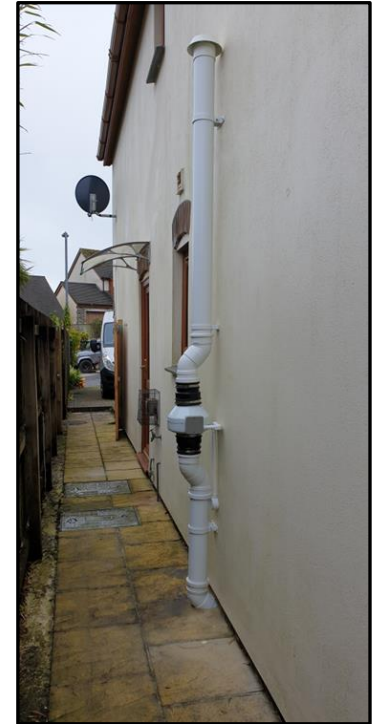
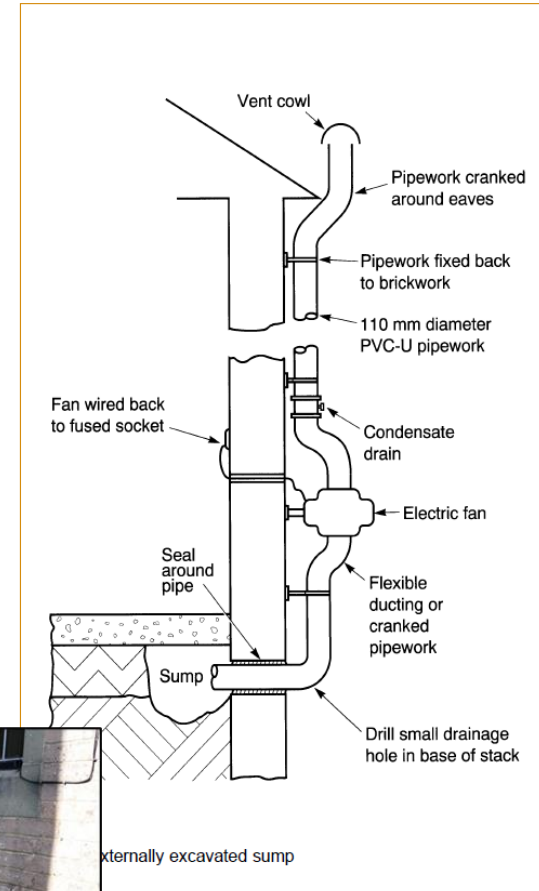
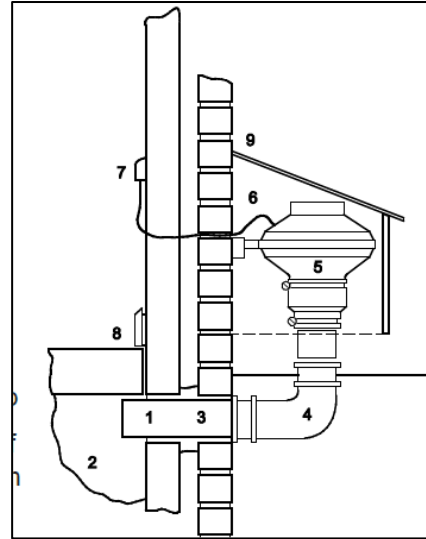


Diluting radon concentrations by sucking air out of a room or building

- Not as effective as ventilating a space, as it reduces the pressure in a room which can pull more radon into that room, but sometimes useful in conjunction with a positive pressure fan ✘

Sump Systems (Sub-floor depressurisation)

- The most effective radon system that you can fit for solid Floors ✓ ✓
- More expensive than passive systems as a fan is fitted ✘



Solid Floors
and under
Cellars

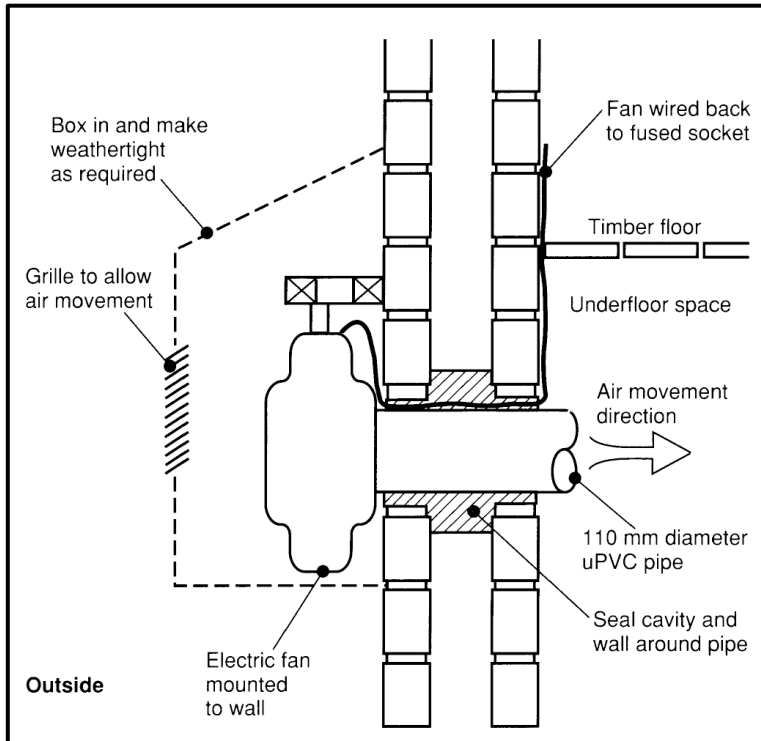
Increasing the Pressure.....

Cellars & suspended floors

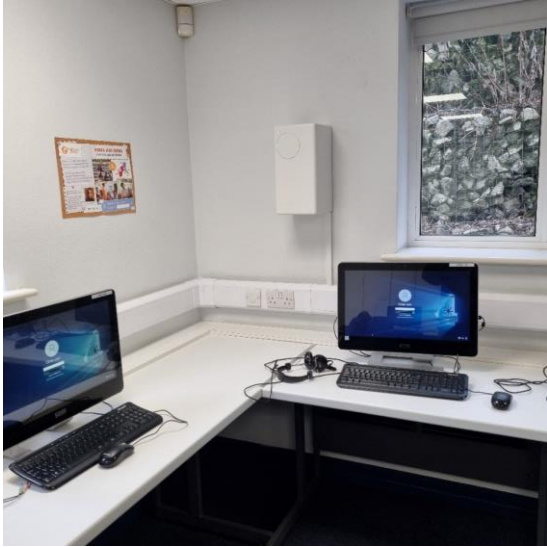


Under-floor/Cellar ventilation

- Can be fitted on an existing air brick ✓
- Very effective at reducing high radon concentrations under suspended floors ✓
- Also reduces moisture in sub-floor voids ✓
- Has a fan so can be more expensive to fit and run than a passive system ✗



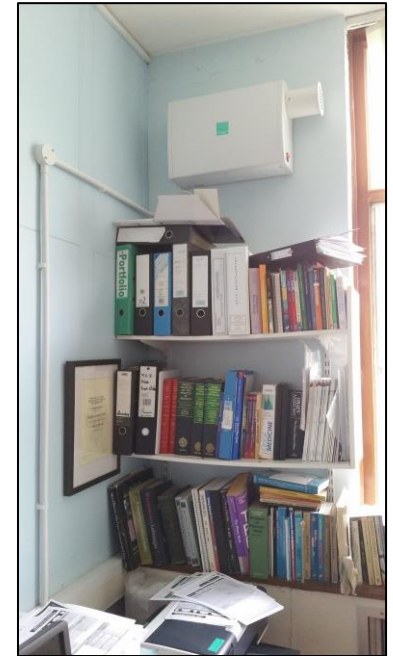
Increasing the Pressure



Positive Pressure Fans (Positive Input Ventilation)

- Low to medium impact on radon
- Can be wall mounted or loft mounted
- Can reduce condensation as well as radon
- Low energy use
- A good general ventilation unit which can improve air quality
- Useful for flats, cellars, and smaller homes
- Can be expensive to purchase
- Can cause drafts in the lived-in space
- Not as effective as other methods at high radon concentrations, or in larger properties

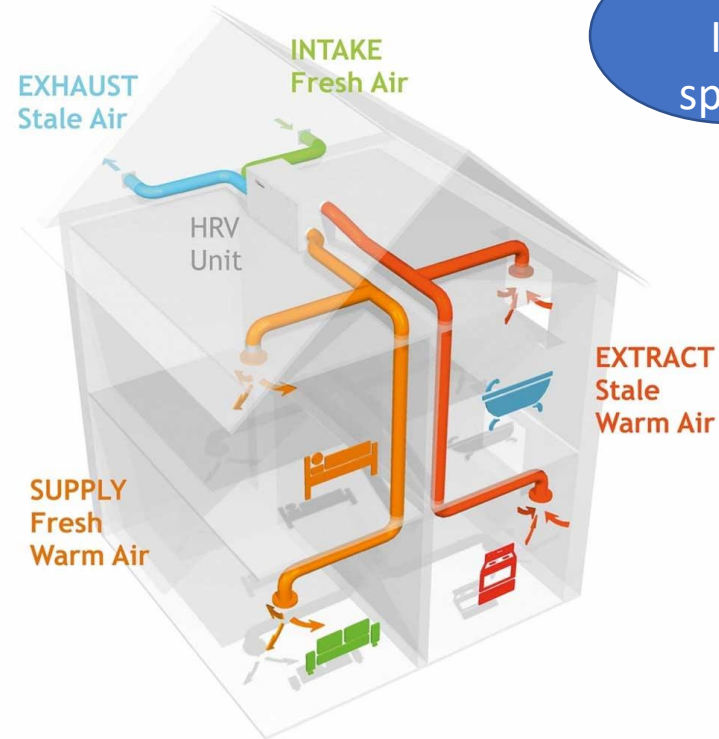
'Lived-In'
space



Balanced, whole house systems

Whole house or mechanical ventilation and heat recovery (MVHR)

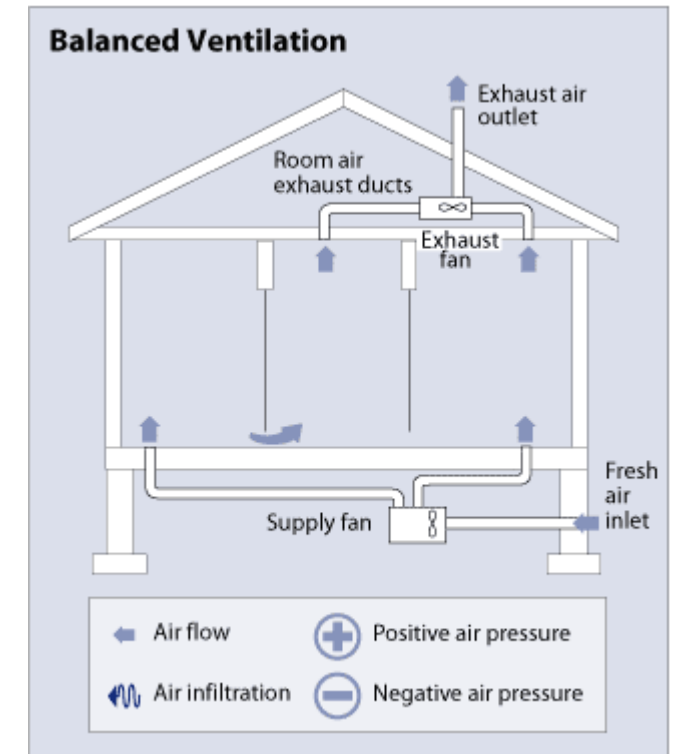
- A good system can operate as a balanced or slightly positive pressure radon system
- Probably the only option in an energy efficient home like a Passiv Haus
- Expensive to fit and specialist knowledge to service and adjust the system



<https://youtu.be/dwXGYIFm8Ko>

A MVHR unit fits in the loft space usually

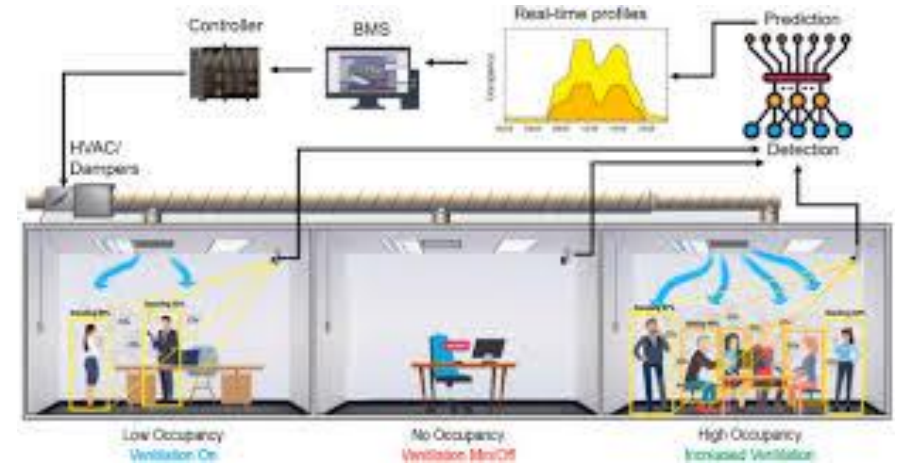
'Lived-In' space



Whole Building Ventilation – HVAC (Heating and Ventilation Air Conditioning)

- Normally designed as an integral part of a large building
- Very expensive to fit and maintain
- Specialist ventilation Engineers service these systems
- Can be adjusted to reduce radon levels if local remediation has not worked, or a large part of the building needs remediating
- There can be problems with engineers having a lack of understanding of radon

'Lived-In' space



Summary: Methods of remediating radon

- Different radon systems for different:
 - Floor types (or lived-in space), and
 - Radon concentrations
- Passive Radon systems: cheaper effective at lower radon concentrations
- Active systems: high impact on radon..... but can cost more, and on-going costs
- Whole Building Ventilation For new buildings, but can be adjusted to provide radon remediation

Passive Remediation Type	Method	Cost L/M/H	Labour L/M/H	Floor/ space	Radon Impact	Advantage	Disadvantage
Barrier	Gas proof membrane	M	M	Mixed	High	Very good system, but best fitted constructing a new building	Difficult to get a complete barrier when retro-fitted
Barrier	Floor sealing	L	M	Mixed	Low	Works well with large holes	Very labour intensive. Not much impact
Natural Airflow	Trickle vents & louvres	L	L	Lived in space	Low	Easy to open vents and louvres	Possible low impact on radon. Not good in winter, or for energy efficiency.
Natural Airflow	Core vents	M	M	Lived in space	Low	Very useful for fireplaces	Not good in winter, or for energy efficiency
Natural airflow	Air bricks	L/M	L/M	suspended	High	Very good for reducing radon under suspended floors	Can cost more to put new air brick in
Passive sump	Passive sump	M	M	Mixed	medium	Can have a reasonable impact on low radon levels	More difficult to fit than other passive methods. Unreliable outcome on radon levels

Active Remediation Type	Method	Cost L/M/H	Labour L/M/H	Floor/Space	Radon impact	Advantage	Disadvantage
Reduce pressure	Under-floor extraction	M	L	Suspended	medium	Can be used well with positive pressure fans	Not good on its own, as it can draw more radon into a building
Reduce pressure	Sump system	M	M	Solid	Very High	The best system that can be fitted for dealing with radon under solid floors	Multiple fans needed for large buildings with many radon sources.
Increase pressure	Under-floor ventilation	M	L	Suspended	Very High	Very effective at reducing radon from high levels under suspended floors	Sub floor division can reduce its impact across a building
Increase Pressure	Cellar ventilation	M	L	Cellar	Very High	Very effective at reducing high radon levels in cellars	Cannot be used in lived-in cellars (cold room in winter)
Increase Pressure	Positive Pressure fan	M	L	Lived in space	Medium	Very good for controlling condensation. Works to medium levels of radon	Can cause a draft in lived-in spaces
Whole Building ventilation	MVHR	H	M	Lived in space	High	Needs to be fitted with building construction to reduce costs	Can cause a problem (if too much extraction)
Whole Building Ventilation	HVAC	H	H	Lived in space	High	Can reduce radon levels across a wide area if adjusted properly	Can cause a problem (if too much extraction)