



A Study of the Effects of the Use of  
Imported Contaminated Granite Sub-  
base/Stone on Radon Gas Levels in  
Buildings

By

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Experiments carried out by RPW Radon Wales Ltd at:

20 Blue Street  
 2<sup>nd</sup> Floor Offices  
 Carmarthen  
 SA31 3LE

## 2- Introduction:

Whilst conducting remedial works at various locations in Wales, Richard Waters, a leading radon gas remedial expert, identified the possibility that contaminated granite stone from local quarries could be contributing to high levels of radon gas in buildings where it is used.

## 3- Objectives:

As a result of these suspicions a series of experiments were carried out to determine the amount of radon gas given off over specified time periods from samples of quarried granite taken from the infill of buildings.

## 4- Method:

The experiments were carried out to determine whether the granite infill from the base of a building contained radon gas.

The experiments were carried out in an office on the 3<sup>rd</sup> floor of a building, an area which had low Radon readings.

The extracted materials used for the experiments were from previous remedial works.

For the experiment large plastic containers were used, one for each location. The infill from each location was placed into the containers along with a monitor. The containers were then sealed with tape in order to prevent contamination of the results by the external atmosphere. The containers were labelled with the relevant locations, the monitor numbers and the amount of time the experiment would continue for.

After one month we unsealed each box and recorded readings from each monitor. We then re-sealed the boxes using tape.

After 3 months the containers were opened and the final results were recorded.

Two monitors were also placed on the window sill of the room where the experiment took place, as a control with the results very low.

Infill was taken from the following locations:-

Brynsaron School  
 Saron  
 Llandysul

Carmarthenshire  
SA44 5EB

Ysgol Gyfun Emlyn  
Newcastle Emlyn  
Carmarthenshire  
SA38 9LN

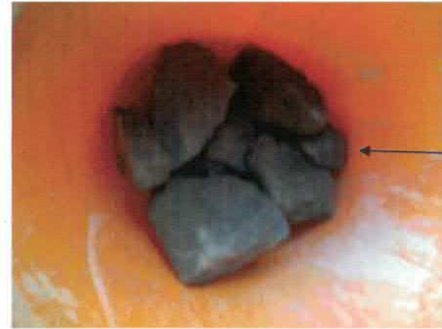
Yorke Street Health Centre  
Yorke Street  
Milford Haven,  
Dyfed  
SA73 2LL

RAF St Athan  
MOD St. Athan  
Barry  
Vale of Glamorgan  
CF62 4WA

Hakin Health Centre  
Observatory Avenue,  
Hakin  
Pembrokeshire  
SA73 3EU

### 5 – Photos:

#### 5.1 - Brynsaron School:



Size of Granite sub/rock  
Taken from remedial works

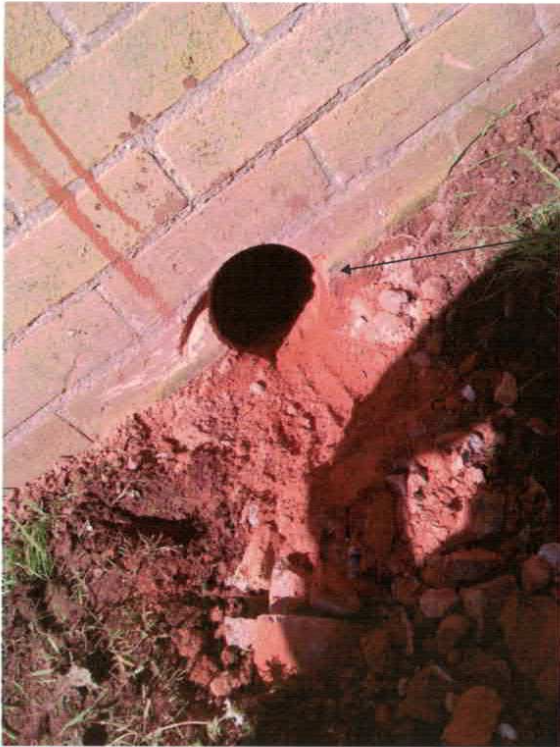


Evidence of Material Collected



Sub Base Rock Material

5.2 - Hakin Health Centre:



Typical Core Hole into Sub base of Building of where Extracts were taken from

5.3 - Additional Photos:



Samples of different Rocks and Sizes  
Have been taken from remedial works



Size of Sample Taken from Sub Base



Each box was labelled with the location of the infill used and the monitor numbers:



Each monitor was placed on top of the infill in the containers:



Different sizes of rock samples.

All materials were put into plastic containers the following day with no more than a two day wait.

## Hakin Health Centre:

### Dates of Experiment:

#### 1 Month

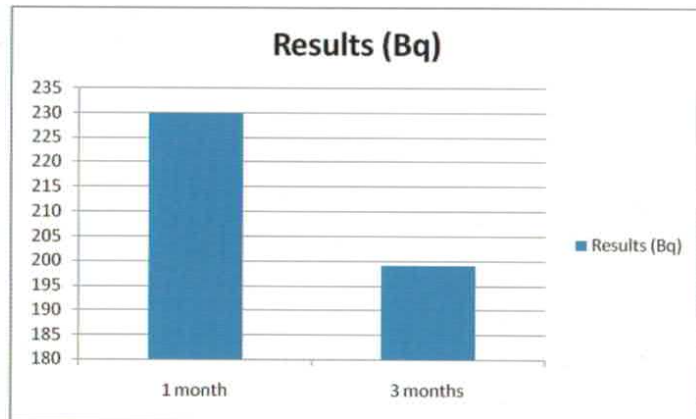
14/6/2012 – 13/7/2012

#### 3 Month

14/6/2012 – 14/9/2012

### Results:

Length of time each Radon Monitor was in the sealed container	Test result
1 Month Test	230 Bqm <sup>3</sup>
3 Month Test	199 Bqm <sup>3</sup>



## RAF St. Athan:

### Dates of Experiment:

#### 1 Month

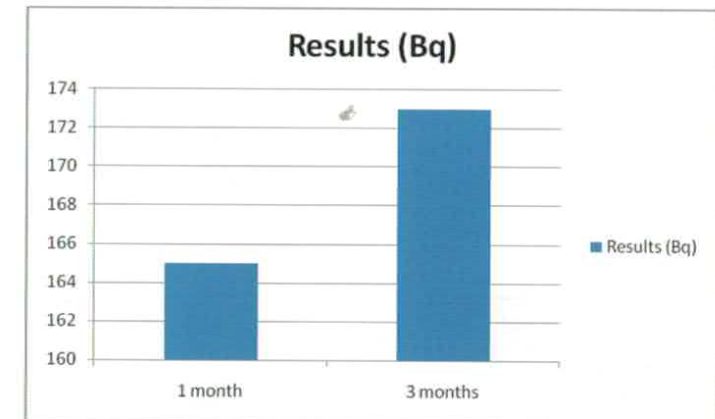
26/6/2012 – 26/7/2012

#### 3 Month

26/6/2012 – 26/9/2012

### Results:

Length of time each Radon Monitor was in the sealed container	Test result
1 Month Test	165 Bqm <sup>3</sup>
3 Month Test	173 Bqm <sup>3</sup>



## Yorke Street Health Centre:

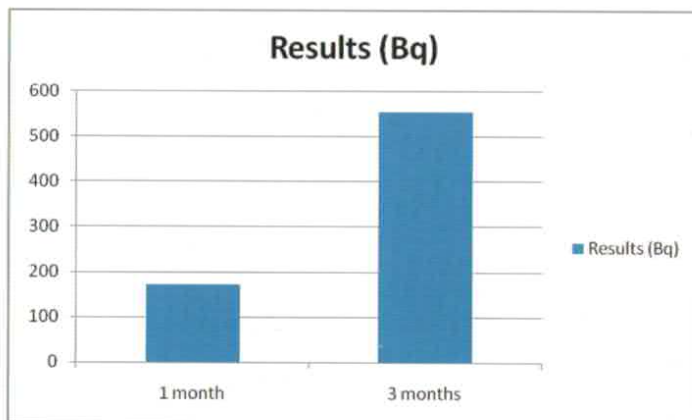
Dates of Experiment:

1 month: 9/7/2012 – 8/8/2012

3 months: 9/7/2012 – 9/10/2012

### Results:

Length of time each Radon Monitor was in the sealed container	Test result
1 Month Test	171 Bqm <sup>3</sup>
3 Month Test	555 Bqm <sup>3</sup>



## Ysgol Gyfun Emlyn:

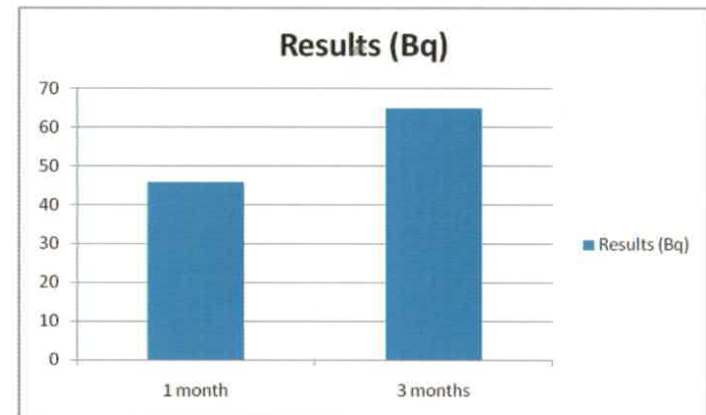
Dates of experiment:

1 month: 17/8/2012 – 17/9/2012

3 months: 17/8/2012 – 17/11/2012

### Results:

Length of time each Radon Monitor was in the sealed container	Test result
1 Month Test	46 Bqm <sup>3</sup>
3 Month Test	65 Bqm <sup>3</sup>



**Brynsaron School:**

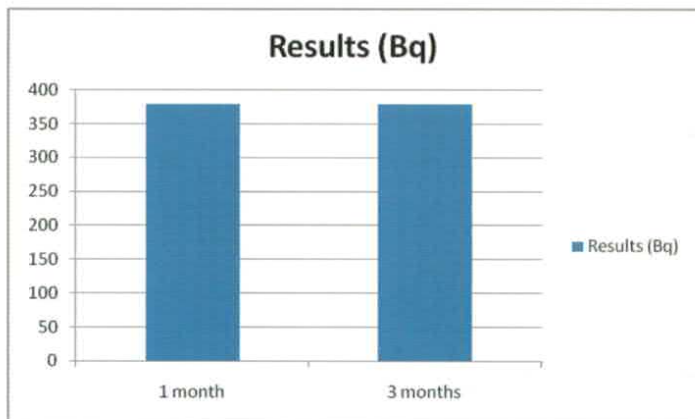
**Dates of Experiment:**

1 month: 24/8/2012 – 24/9/2012

3 months: 24/8/2012 – 24/11/2012

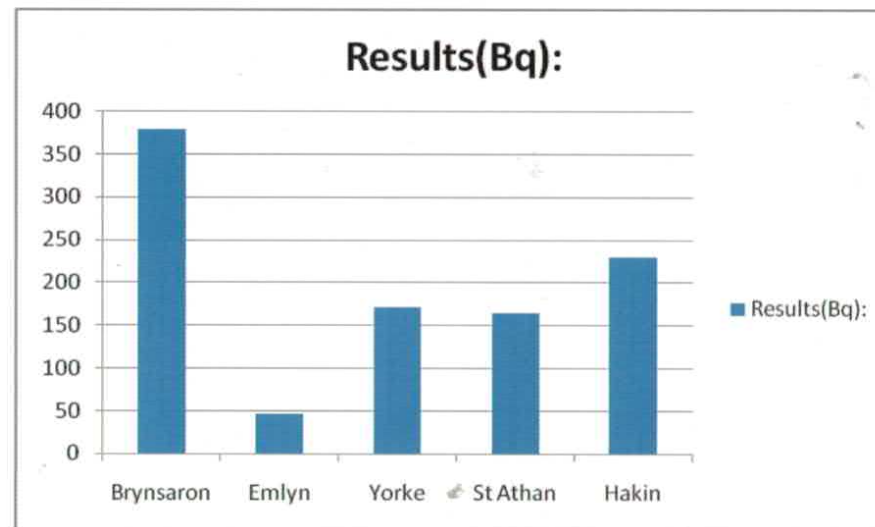
**Results:**

Length of time each Radon Monitor was in the sealed container	Test result
1 Month Test	380 Bqm <sup>3</sup>
3 Month Test	380 Bqm <sup>3</sup>



**Results of the 1 month experiment:**

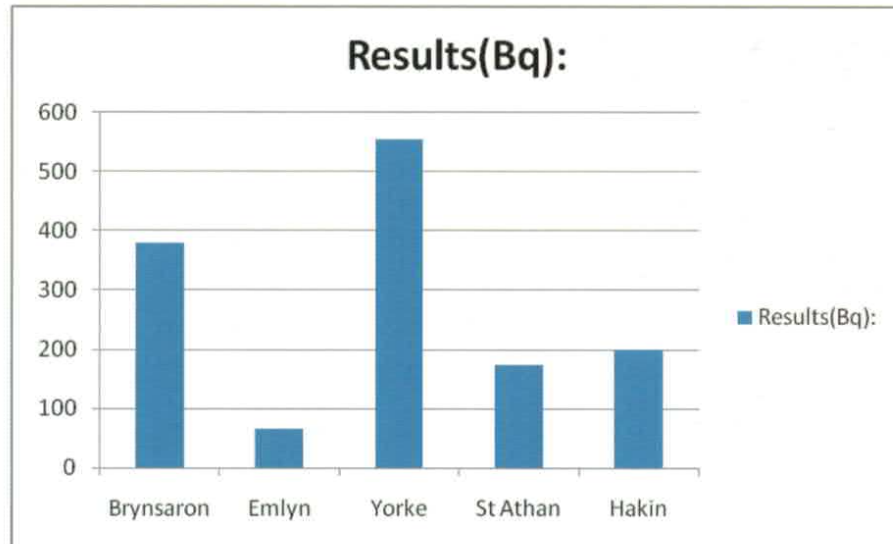
Address	Date carried out experiment	Result after 1 month
Brynsaron School	24/8/2012 – 24/9/2012	380 Bqm <sup>3</sup>
Ysgol Gyfun Emlyn	17/8/2012 – 17/9/2012	46 Bqm <sup>3</sup>
Yorke Street	09/7/2012 – 9/8/2012	171 Bqm <sup>3</sup>
RAF St Athan	26/6/2012 – 26/7/2012	165 Bqm <sup>3</sup>
Hakin	14/6/2012 – 14/7/2012	230 Bqm <sup>3</sup>





### Results of the 3 month experiment:

Address	Date carried out experiment	Result after 3 month
Brynsaron School	24/8/2012 – 24/11/2012	380 Bqm <sup>3</sup>
Ysgol Gyfun Emlyn	17/8/2012 – 17/11/2012	65 Bqm <sup>3</sup>
Yorke Street	09/7/2012 – 9/10/2012	555 Bqm <sup>3</sup>
RAF St Athan	26/6/2012 – 26/9/2012	173 Bqm <sup>3</sup>
Hakin	14/6/2012 – 14/9/2012	199 Bqm <sup>3</sup>



### Findings:

The results collected, show that the use of local contaminated quarried granite, does in fact contribute to high radon levels in buildings. The Quantity of granite rocks runs into tons of imported materials clearly increasing the risk of raised levels. Building regulations should pay particular attention to this as contaminated sub/base is being introduced to areas not recognized as risk areas.

### Recommendations:

After reviewing the evidence collected and being satisfied that the hypothesis proposed is correct, RPW Radon Wales recommends the following changes to the regulations for new builds, extensions, and renovations:

- 1) A radon membrane should be installed in every new build/ extension in Wales by a qualified radon remedial installation expert and on our evidence alone in areas where there is supposed to be low risk is now incorrect.
- 2) Every new build should have secondary preventative measures installed i.e. a sump with pipe work, as shown in Fig 4 and 5:

The reason is now self explanatory as with the importation of these materials raising the levels of radon gas, there are no safe areas as defined in local searches.

By putting these preventative methods in at ground work stages, they will greatly reduce levels of radon gas.

Also there is a small increase in cost as a typical sump value is £30 and £20 per metre for 110mm pipe, to save lives there is no comparison.

Building regulations should now adapt to new recommendations as there is now

no Low risk / medium risk or high risk areas.

**Every area should be treated the same.**

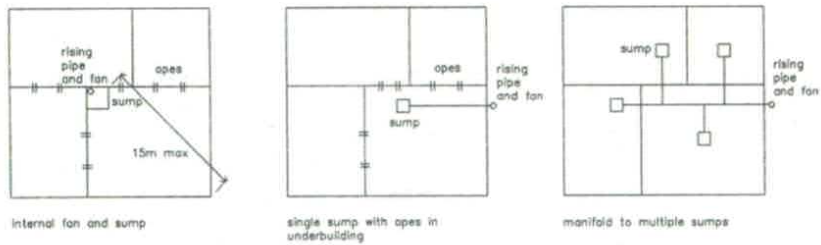


Fig 4 sump layout options

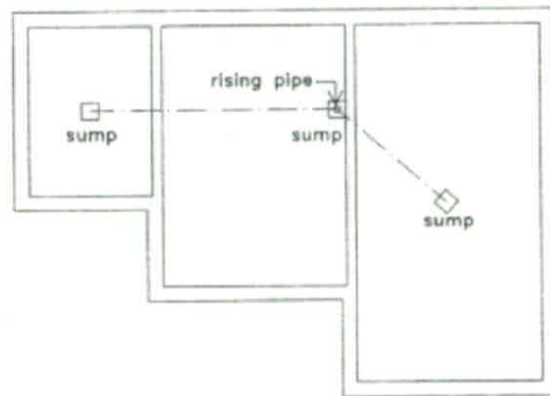


Fig 5 interconnected sumps

- 3) After completion of a new build/Extension developers have to monitor the house for a minimum of 3 months with radon gas detectors to determine the levels of radon in the property. The sump can then be activated by fan or by passive sump system.
- 4) All planning applications to local authorities for conservatories, extensions or renovations should be approved conditional on the existing property having radon gas tests. This will determine the level of radon gas already present in the property.

Acting from these findings, remedial work can be done both easily and cost-effectively, and local authorities can build an up to date database of recorded radon levels, allowing them to identify danger areas and hotspots.

#### Conclusion:

The levels of radon, given off from the contaminated sub-base cannot be checked in quarries (an outdoor environment). They must be checked in a closed environment; therefore it is essential to take action on the above recommendations.

Radon gas is ubiquitous throughout the country - it is the indoor concentrations we have to measure as it is the second biggest cause of lung cancer after smoking.

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For More Information visit our websites

<http://rpwradonwales.co.uk>