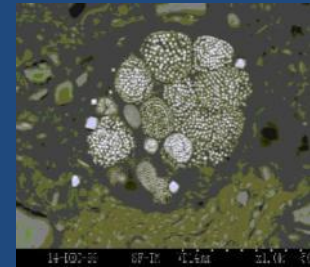




Pyrite in Aggregates to be used as fill material under concrete floors and footpaths



December 4th 2013
63 Merrion Square



Outline

- Course overview
- The Pyrite Problem
- Pyrite Resolution Board
- Report of the Pyrite Panel

Session 1

Time	Topic	Speaker
09.15 – 09.45	The pyrite problem – The Pyrite Panel Report and its recommendations	(Ms Sarah Neary (DECLG)) Mr. Gerry Stanley (GSI)
09.45 – 10.15	Standards, specification and protocols – what they all mean, the language of standards and their status	Ms Therese Clarke (NSAI)
10.15 – 10.45	Aggregates in building construction – what's used where, why and what specifications apply	Mr. Eoin Wyse (Arup)

Session 2

Time	Topic	Speaker
11.00 – 12.00	The geology of pyrite with respect to building stones: What is reactive pyrite? When is pyrite reactive and when is it not? How does pyrite cause heave? What rock types are likely to host reactive pyrite? What other factors are important?	Dr. John Kelly (SLR)
12.00 – 13.00	IS 398-1 – what's in it and the role of the geologist	Dr. Michael Maher (Golder Associates)

Session 3

Time	Topic	Speaker
14.00 – 15.00	Tests explained: Total sulphur; acid soluble sulfate; water soluble sulfate; oxidizeable sulfides; pyrite content; XRD analysis; petrographic description; water absorption	Dr. Bernadette Azzie (Golder Associates)
15.00 – 15.30	Communicating results to the client	Mr. Conor Taafe (Homebond)

Session 4

Time	Topic	Speaker
15.45 – 16.45	SR 21: what's in it and the role of the geologist	Mr. Cathal MacMathuna (Consultant)
16.45 – 17.30	Case histories and/or Practical session with samples	Mr. Paul Quigley and Mr. Dafydd O'Shea (IGSL)
17.30 – 18.00	Discussion and questions	Gerry Stanley

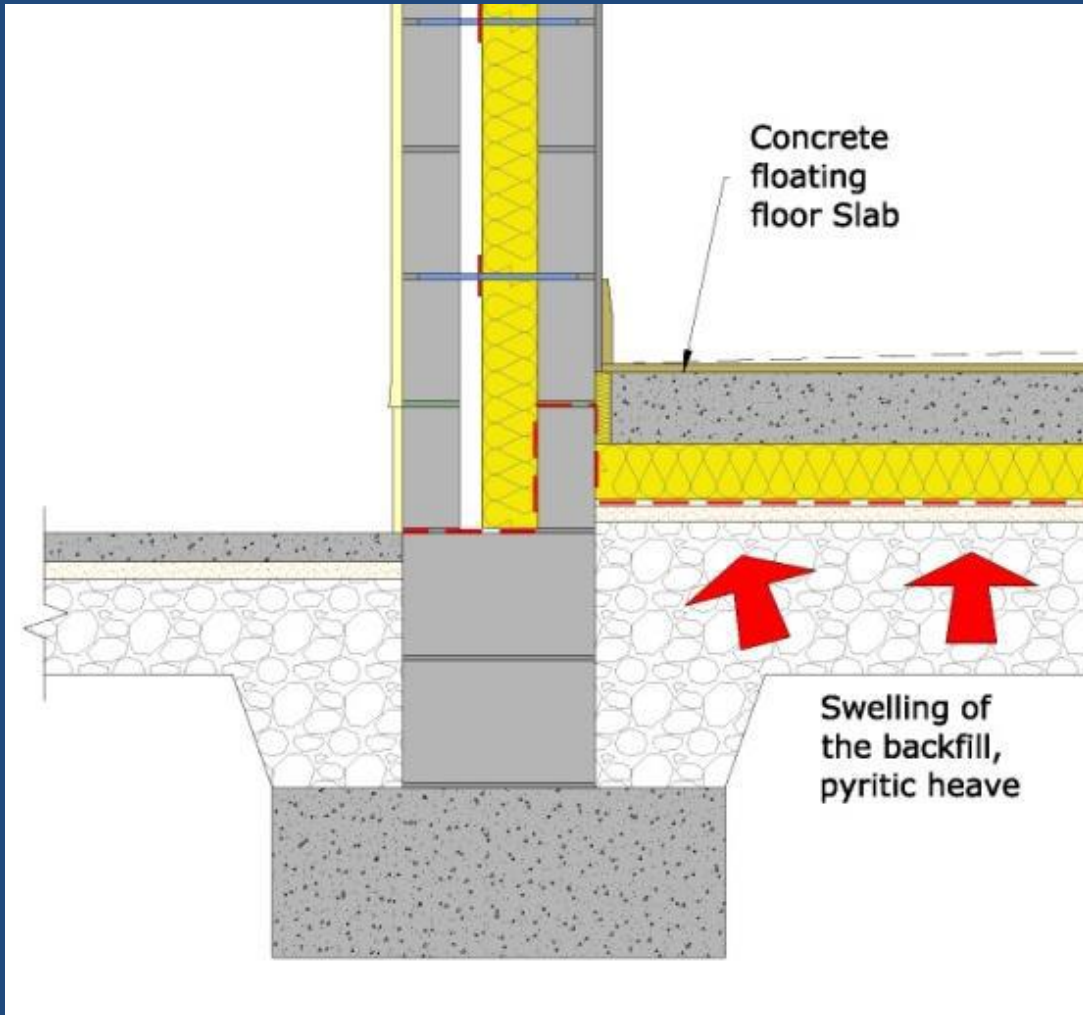
The Pyrite Problem

- First came to attention of DECLG mid-2007
- Known a few years earlier
- Issues that have arisen due to reactive pyrite
- Houses in the area of north County Dublin, Kildare, Offaly and Meath
- The oxidation of pyrite, its expansion and resultant heave is regarded as the main cause of damage to the buildings concerned

The Pyrite Problem

- Pyrite + moisture + oxygen → pyrite will oxidise to form sulfuric acid (H_2SO_4) and other products
- Sulfuric acid may react with other minerals – e.g. calcite + sulfuric acid → gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)
- Gypsum, formed in the manner described, has a approximately twice the volume as that of the source pyrite
- The growth of gypsum crystals, in between the laminations of a weak rock has the effect of prising open cracks and causing further expansion

The Pyrite Problem

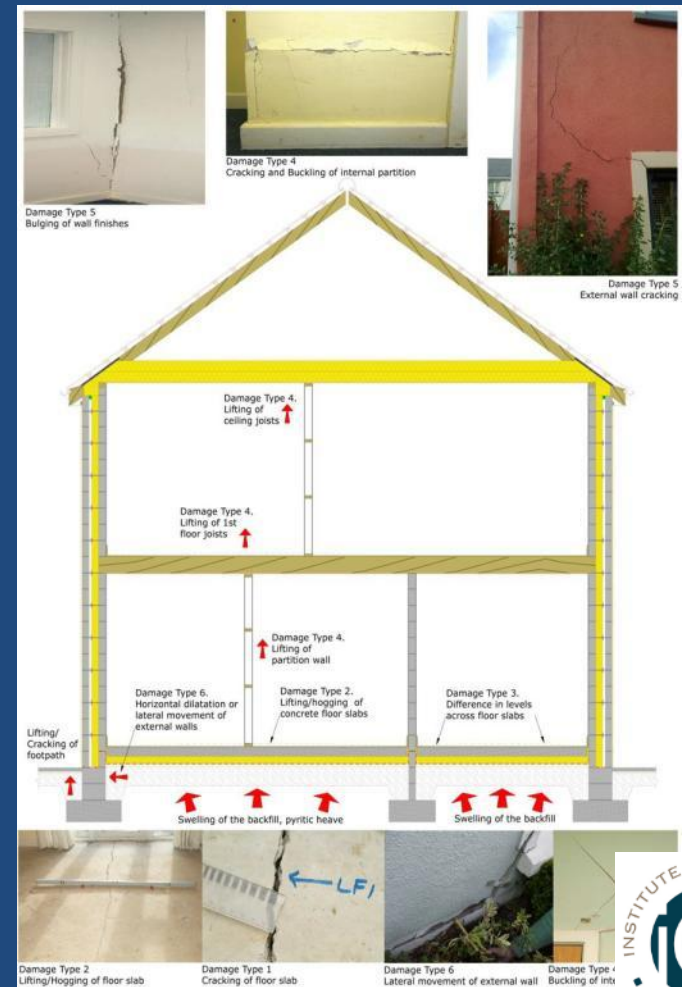


- Hardcore
- Fill
- Unbound aggregates

Damage Induced by Pyrite Heave

Expansion in compacted hardcore and confined between the rising walls and ground floor concrete slab it may result in:

1. Cracking of concrete floor slabs
2. Lifting/hogging of concrete floor slabs
3. Differences in levels across concrete floor slabs
4. Cracking, buckling and/or lifting of elements resting on the concrete floor slabs e.g. partitions, doors
5. Cracking and/or bulging of internal or external walls
6. Lateral movement of external walls



Pyrite Resolution Board

- Appointed by the Minister for the Environment, Community and Local Government - 2013
- To establish a scheme for the remediation of significant damage to dwellings caused by pyritic heave and
- To oversee and ensure the effective implementation of a programme of remediation works for affected dwellings

The Pyrite Resolution Board

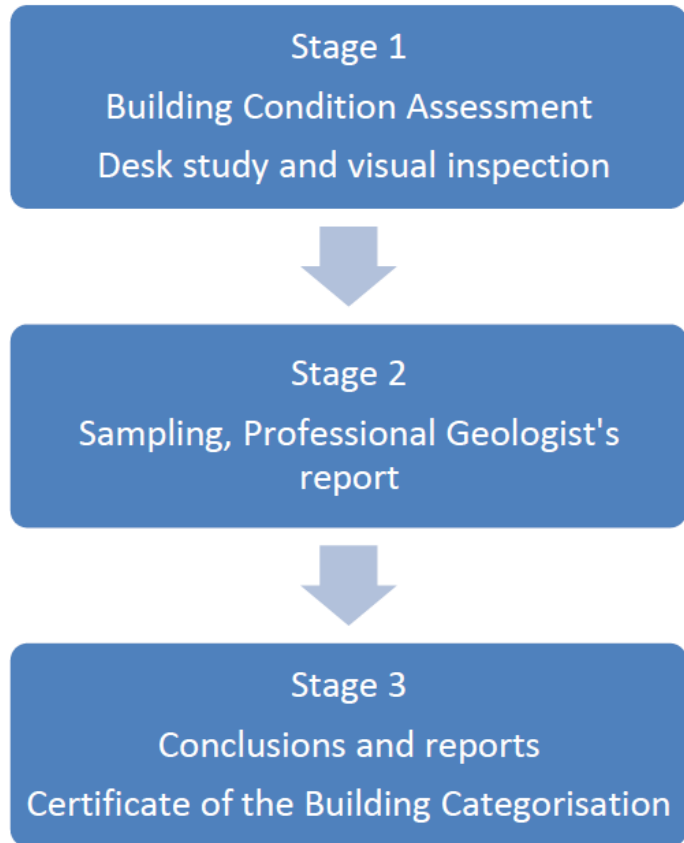
- The Pyrite Resolution Board consists of the Chairman and 3 other Members:
 - **John O'Connor, Chairman** (formerly Chairperson of an Bord Pleanála)
 - **Sean Balfe** (Director of Sustainability and the Built Environment, NSAI)
 - **Matt Gallagher** (Formerly President of CIF and Chairman of Irish Home Builders Association)
 - **Caroline Gill** (Barrister, formerly Insurance Ombudsman and Deputy Financial Services Ombudsman)
- The General Manager of the Board is **Noel Carroll**, BE, BCL



The Pyrite Resolution Board

- For owner-occupier dwellings only
- Legislation promised before year end to put PRB on a statutory footing
- To be funded by the Exchequer (€10m initially)

How the Scheme will Operate



I.S. 398-1-2013 Process Flowchart

**Professional
Registers**

Outline of Remediation Scheme

- Certain conditions must be satisfied:
 - Location; date of construction, purchase and occupation; assessed according to IS 398-1
- Once eligible – certain costs will be met:
 - Sampling, testing and reporting of hardcore (max €500); management and tendering of remediation works; remediation of the dwelling; monitoring; removal storage and return of furniture of appliances (max €2,500); alternative accommodation (max €3,000)

http://www.pyriteboard.ie

The screenshot shows the website for the Pyrite Resolution Board (PRB). The browser address bar displays the URL <http://www.pyriteboard.ie/Frequently-Asked-Questions.aspx>. The page features a blue header with the PRB logo and the text "PYRITE RESOLUTION BOARD" and "Lo Call 1890 252 842". A navigation menu on the left includes links for "About the Pyrite Resolution Board?", "Outline of the Pyrite Remediation Scheme", "How it Operates", "Applications", "Frequently Asked Questions", "Publications", and "Contact PRB". A central image shows a yellow hard hat, a hammer, and a measuring tape on a blueprint. The "Frequently Asked Questions" section is expanded, listing 14 questions related to pyritic heave, applications, and remediation costs and duration.

PRB

PYRITE RESOLUTION BOARD

Lo Call 1890 252 842

About the Pyrite Resolution Board?

Outline of the Pyrite Remediation Scheme

How it Operates

Applications

Frequently Asked Questions

Publications

Contact PRB

Frequently Asked Questions

Expand All | Collapse All

- 1 What is the typical damage that can occur when a dwelling is subject to pyritic heave?
- 2 How do I establish if my dwelling has significant damage due to pyritic heave?
- 3 What are the criteria for making an application to the Pyrite Resolution Board?
- 4 How do I select a consultant to carry out the Building Condition Assessment?
- 5 Who pays for the Building Condition Assessment?
- 6 Can the cost of the Building Condition Assessment be recouped?
- 7 When will applications be accepted by the Pyrite Resolution Board?
- 8 How do I make an application to the Pyrite Resolution Board?
- 9 How will I know when applications are being accepted?
- 10 What happens after my application is validated?
- 11 What costs are covered by Pyrite Remediation Scheme?
- 12 Who will manage the remediation process?
- 13 What is the anticipated duration of the remediation works?

The Setting up of the Pyrite Panel

- Withdrawal of HomeBond from providing insurance cover for structural defects due to pyrite induced heave (August 2011)
- Panel set up – September 2011
- Panel report – June 2012

The Pyrite Panel

Mr. Brendan Tuohy

Mr. Noel Carroll

Mr. Malcolm Edger

with assistance from

Ms Marion Kiernan (Secretary to the Panel)

Ms Sarah Neary

Mr. John Wickham

Mr. Oliver O'Brien and

Other DECLG staff

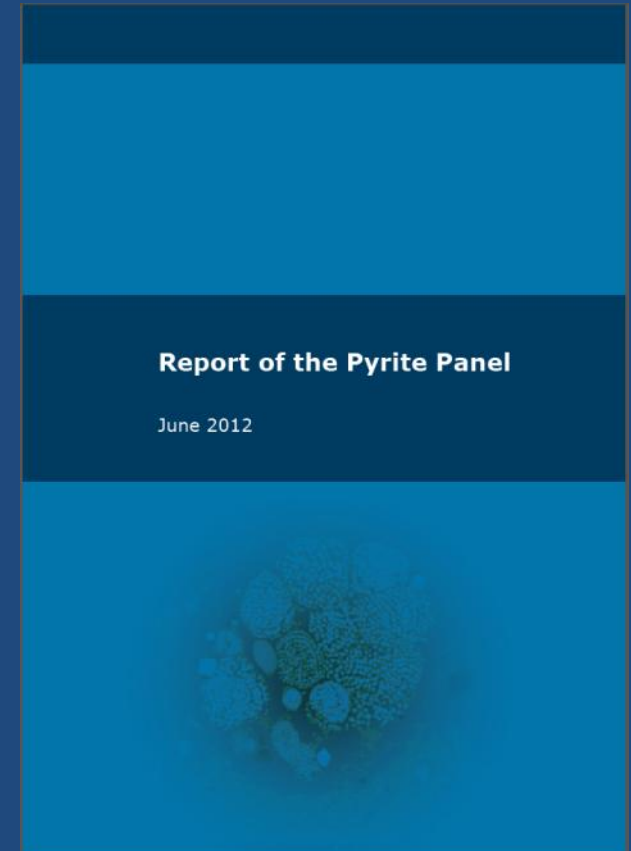


Scope of the Report

- Examine how the problem arose
- Suggest remedies for the problems and
- Make suggestions to ensure that similar problems might never arise again

The Report

- 200 pages
- 8 Chapters
- 17 Appendices
- 24 Recommendations
- Submissions from 44 individuals or groups
- Some groups declined invitation to submit views (5)



Findings (Quarries 1)

- 5 quarries identified as possible sources
- Damage arising from pyritic heave is not limited to:
 - one quarry
 - one geological structure, or
 - one rock type
- Pyrite occurs most commonly in sedimentary rocks such as argillaceous (clayey or shaley) or carbonaceous (coaly) rocks

Findings (Quarries 2)

- There was not an effective testing and inspection regime in place in quarries to identify the presence of pyrite or to ensure that the hardcore material being supplied was of an acceptable quality
- Often not enough documentation to establish from where fill in a particular dwelling came

Findings (Professions)

- Design professionals and the construction sector were unaware of the problems associated with pyritic heave prior to 2007
- Unreasonable to expect that the unprecedented issue relating to pyrite could have been identified by building control officers or other building professionals during normal inspections of construction sites at the time
- Pyrite does not appear to have been covered in any detail in the engineering or architectural courses

Findings (Scale of the Problem)

- Problems occur 2 – 9 years after construction
- 74 estates identified to the Panel
- 12,250 ground floor dwellings
 - 850 of these have made a claim
 - Approx 1,100 have been remediated or are in the process of being remediated (12 estates)
- 10,300 dwellings with reactive pyrite in hardcore (pessimistic view)

Findings (Specifications for Hardcore)

- Prior to 2008 there were two commonly used specifications
 - HomeBond specification (House Builders Manual)
 - Specification for road sub-base materials (Clause 804)
- Hardcore used where pyritic heave had occurred was unlikely to have met either of these
- Technical Guidance Document C (issued under the Building Control Acts) stated *“The hardcore bed should be at least 150mm thick and should be broken stones, broken brick or similar suitable material well compacted and clean and free from matter liable to cause damage to the concrete.”*

Recommendations

1. Categorisation and remediation approaches

R1 Development of a testing protocol

R2 Guidance on approaches to remediation

R3 Development of a method statement for remediation works

R4 Certification of dwellings

Recommendation 1: Development of a testing protocol

- an expert industry group should be established immediately by the National Standards Authority of Ireland (NSAI) to develop an Irish testing protocol (within a three month timeframe) capable of determining whether:
 - (a) there is reactive pyrite in sub-floor hardcore material, and
 - (b) if it has caused pyritic heave.
- **Result: IS 398-1**

Recommendations

2. Proposals for a resolution of the pyrite problem

R5 Insurers and mortgage providers

R6 Responsibilities of stakeholders in the construction industry
(including quarrying sector)

R7 Immediate engagement by builders/ developers/ insurers
to facilitate remediation

R8 Engagement by construction industry representatives

R9 Re-engagement by HomeBond in facilitating remediation

R10 Engagement by the Insurance industry

R12 Role of Government

R14 Establishment of a Resolution Board

Recommendations

3. Reducing burden on affected homeowners

R11 Funding by mortgage providers

R13 Exemption from proposed property tax

Recommendations

4. Review and propose measures to strengthen the provisions to protect consumers.

R15 Specification for hardcore

R16 Requirements for quarries supplying hardcore

R17 Enforcement of Building Control legislation

R18 Mandatory certification system

R19 Registration of builders

R20 Statute of Limitations

R21 General Insurance issues

R22 Home Insurance issues

R23 Continuing Professional Development and Education

R24 Dissemination of Information

Recommendations 15 & 16:

- Recommendation 15 (Specification for hardcore):
 - Review Standard Recommendation S.R. 21.:2004+A1:2007 Guidance on the use of I.S. EN 13242:2002 -Develop standalone specification for hardcore
 - Make expertise gained over past 5 years available to NSAI
 - Review technical Guidance Document C
- Recommendation 16 (Requirements for quarries supplying hardcore):
 - Regular testing
 - Testing certificates
 - Traceability
 - Insurance
 - Delivery dockets
- **Result: S.R. 21: GUIDANCE ON THE USE OF I.S.EN 13242: 2013 (out for consultation at the moment)**



Thank you

