Jim Castle  BSc(Hons) FRICS FHEA PgCLTHE

Building Pathology & Maintenance

For: Argyll Bute Council
Introduction

• Definitions
• Marriage and the result …
• Pathology - questions
• Maintenance – questions
• Starting points (for pathology and maintenance)
• Pathology application
Definitions

- **Maintenance** - *the work needed to keep a building, road, machine, etc. in good condition:*

- **Pathology** – *the scientific study of disease*

(Cambridge Dictionaries Online, 2014)

But, who can combine these skills?
Need a marriage of building technology and pathology skills
Marriage!

Building Technologist

Pathologist
The result ..... 

A Chartered Building Surveyor
Pathology

Questions
PATHOLOGY – the study of building “disease”

Examples of building “disease”

- Subsidence
- Dry rot
- Wet rot
- Dampness
- ASR
- Carbonation
- UV degradation
- Sulphate attack
- Cavernous erosion
- Et al – (literally thousands !!!!!!!)
Pathology – questions

• What is the host material?
• What “disease” is the host material susceptible to?
• What factors are contributing to the “disease”?
• Which precise “disease” is affecting the host?
• What is its extent?
• How long has it been there?
• What is the resultant damage and its extent?
• Has the problem affected its neighbours (and how)?
• Is the “disease” active or inactive?
• Could activity return and what might cause its return?
• Does anything need to be done?
• If so, what and when?
Maintenance

Questions
MAINTENANCE - “Disease” prevention and eradication

Re-active – Fire fighting? Panic? Big money?

Pro-active - The clever answer?
Pro-active Maintenance

“A stitch in time saves nine”?
Pro-active Maintenance

Planned Preventative Maintenance
(Planned Maintenance or Scheduled Maintenance)
Pro-active Maintenance

- Naval origins
- Regular inspection
- Intervals and timing to suit the case (pathology)
- Maintenance programme
- Pay now; save later
- Costs distributed more evenly
- No shocks!
- **But**, ongoing labour requirements and costs associated
- Over cautious approach may cost more
- **Optimum programme defined by pathology**
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Pathology and maintenance

Starting points … *the Big Bang*
Surveys …

Integral to maintenance …
Integral to pathology …
Know your buildings …

Asset register

- Age
- Quantity
- Condition
- Where does the building fit in your “plans”?
  1. Retain?  SURVEY
  2. Upgrade?  SURVEY
  3. Dispose?  SURVEY?
Bute – Council Building
Rosneath – shop unit
Helensburgh – Clyde Street School
Survey types ...

- **Stock condition** (multiple) … Collect and record data
- **Condition** (individual) … Collect and record data
- **Measured Survey** … Collect and record data
- **Building Survey** … Collect, record and *analyse* data
- **Bespoke** … Collect, record and *analyse* data
Horses for courses ... (Survey choice)

Pro-active maintenance (PPM)
• Which survey type?
• Asset register & Measured survey (Quantum & typology)
• Stock/Individual Condition survey
• Building (whole) Survey (old and/or complex)
• Bespoke Survey (where a common theme)

Re-active maintenance
• Bespoke survey (identify cause and effect)
• Building Survey (where implications on other parts)
Horses for courses … (Survey choice)

Pathology

• Which survey type?
  • Building Surveys (our focus)
  • Bespoke surveys

• Why?
  • Offers detailed examination
  • Opportunity to analyse
  • Facilitates defect pathology
Building Surveys

- Pre-survey desk studies
- Qualified personnel
- On-site inspection
- Use of onsite sketching and photographs
- The written report
Pre-survey desk studies
Old maps

Google (2011)

Old-maps (1859)

http://www.old-maps.co.uk/maps.html
Flooding

SEPA

http://map.sepa.org.uk/floodmap/map.htm

Indicative Flood Map

SEPA (2014)
Radon

- Naturally occurring radioactive gas
- HPA
- http://www.hps.scot.nhs.uk/
- "Indicative Atlas of Radon in Scotland"
- HPA-CRCE-023 (2011)
- Radon Action Level – *recommended limit for activity concentration in UK homes*
- 200 Bq/m³
- Becquerel – measures activity of a radionuclide
- 1 Bq = 1 transformation per second
HPA (2014)
Risk and perspective

“People living all their lives at the Action Level run the risk of a few per cent of developing lung cancer. ....................... about one in thirty people (3.3%) exposed for a lifetime at the Action Level would be expected to develop lung cancer.”

HPA (2012)

15-20% of smokers develop lung cancer

Roy Castle Lung Cancer Foundation (2012)
Radon sump
Mining

The Coal Mining History Resource Centre (Raley’s Solicitors – Barnsley, Doncaster, Rotherham Wakefield)
http://www.cmhrc.co.uk/site/maps/scotland/index.html
Scottish Division

British Geological Survey
http://www.bgs.ac.uk/mineralsUK/mines/coal/home.html
Scottish Division Map 32
Geology

British Geological Survey
http://mapapps.bgs.ac.uk/geologyofbritain/home.html
Maps of superficial deposits ("Drift Maps") and "solid"
Geology of Britain viewer

Map Key (close this window to activate map)

1:50 000 scale geology

Superficial deposits

- Alluvium - Clay, silt, sand and gravel
- Raised marine deposits of flandrian age - clay, silt, sand and gravel [unlithified deposits coding 5]
- Raised marine deposits, devensian - clay, silt, sand and gravel
- Till, devensian - diamicton
- Beach and tidal flat deposits (undifferentiated) - clay, silt, sand and gravel [unlithified deposits]
- Glaciofluvial deposits - gravel, sand and silt

Visible geology: 1:50 000 scale

Geology Key

Surface Geology

- Superficial only
- Bedrock only
- Bedrock and Superficial

More on digital geology

(BGS, 2016)
Google Earth
“Streetview” – Duntarvie Road, Easterhouse
Qualified personnel
Chartered Building Surveyors (RICS)

Experts in pathology (and technology) for whole building

Others may have speciality in certain areas
- Structural engineers (MIStrucE; ICE)
- Building Services engineers (CIBSE; MIMechE; MIEE; etc)

Others may have developed skills
- Chartered Surveyors (RICS GP division)
- Chartered Architects (RIBA; RIAS)
- Those with other technical background
RICS governance and professional standards

Example (from Guidance Notes)

Surveyors are not required to follow the advice and recommendations contained in this guidance note. They should, however, note the following.

When an allegation of professional negligence is made .... the court is likely to take account of the contents of any relevant guidance notes published by RICS in deciding whether or not the surveyor has acted with reasonable competence.
“Follow the trail of suspicion ...”

Roberts and another v J Hampson and Co

• Queens Bench Division 1988
• Mr Justice Ian Kennedy HELD that .... He (Hampson) did not test the wood blocks of the floor and appeared to have ceased to follow the “trail of suspicion” in the skirtings because of the intervention of a piece of furniture ....
On-site inspection

- Talk to the occupier and/or owner
- Equipment
- Field sheets
- Note taking
- Sketches
- Photographs
Field sheets

• Prescriptive
• Non-prescriptive
• Semi-prescriptive

BUILDING SURVEY FIELD SHEETS

Surveyor:
Job No:
Have signed T & C been returned:
Details of others present during the inspection:
Vendor Enquiry Form completed and returned:

- Use reverse of sheets, or insert blank sheets if additional “white space” is required
- Company and RICS safety policy to be adhered to at all times

1. INTRODUCTION

1.01 Scope of Instructions:

1.02 Address of Property:

1.03 Client’s Name and Details:
Sketching

SKETCH PLANS (external including building and site size)

External show:

- Boundary, trees and large shrubs/hedges, manhole covers/septic tank/cess pit, paths, pools, garages, conservatories, outbuildings, dimensions, slopes, retaining walls, etc.
Detailed notes

5.03 Main Roof

5.03.01 Structure (Note: Collect other data whilst in void and transfer to application)

- Unseen areas
- Accessibility
- Frame design
- Frame condition (shakes, joint separation, etc)
- Water penetration - general/ below valleys/ parapets
- Wood boring beetle
- Fungal decay
- Lining-type/ condition
- Torching/ nibs/ undersides of slates or tiles/ nail corrosion
- Daylight
- Alterations/ roof timbers/ upper floor walls removed
- Condensation
- Excessive loading
- Roof thrust
- Sagging timbers/ ineffective previous repairs
- Bracing/ straps
- Chimney breasts
- Party walls/ fire walls/ lack of
- Gable walls
- Birds/ bats/ vermin/ insects
- Asbestos
- Plumbing (see Section 6.03 and 6.05)
- Electrics (See Section 6.01)
Photographs
Pathology application

- Case studies
- A look at structural analysis
Case study 1
5.05 Chimneys

- Unseen areas
- Sole/shared use
- Damp proof course
- Height
- Access
- Lean
- Sulphate attack
- Bulge
- Brickwork
- Stonework
- Rendering
- Pointing
- Aerials/Satellite dish
- Chimney pots/sealed openings/vents/number
- Flaunching
- Flashings/soakers
- Flue terminals (boilers, fires etc)
Squat stacks … height less than 4.5 times the width … only leaning slightly … limited mortar deterioration, … be repaired by repointing. If … loose or crumbling bricks, the stack should be dismantled to a point where it is stable and then rebuilt.

Slender chimneys … height more than 4.5 times width … leaning or showing signs of condensation damage … dismantled and rebuilt completely. … possible to rebuild them with a reduced height, provided their appearance is acceptable and no risk of smoking problems due to down-draughts

(BRE GRG 15)
Case study 2
Structural Analysis – a pathological approach

Influencing factors - considerations
Distortion surveys
Analysis and pathology
Geology and hydrology

- Superficial deposits or bedrock?
- Cohesive or non-cohesive?
- Mining?
- Peat?
- Water table or groundwater level?
Cracking

- Subsidence or something else?
- How can we diagnose; former or latter?
- If former, anything to indicate passive or active?
- Size
- Orientation
- Coincident with distortion (or not)
Bond?
Crack width?
Age?
Associated distortion?
Distortion

- Vertical and horizontal plane
- Location - Ground level; wall head; intermediate
- Distortion survey
• Bed joint reinforcement (red)
• Lateral restraint strapping (yellow)
• Wall ties (blue)
Drains

- Age?
- Type?
- Modes of failure?
- Associated ground and vegetation?
Vegetation

• Trees
• Large shrubs
• Type; age; size now; size when mature; proximity
• Associated ground
• Proximity of drains
SAFE DISTANCE FROM TREE TO BUILDING

5m Yew
7m Spruce
10m Birch
11m Rowan
12m Hawthorne
15m Beech
17m Sycamore
20m Lime
21m Ash
23m Horse Chestnut
30m Oak
Construction

- Load distribution via foundation
- Soil bearing capacity
- Flexible
- Rigid
- Load paths
- Cavity or solid
- Lateral restraint
Eccentric partition loads

Other signs:
• Twisted door heads
• Cracking?
Outward force leads to walls being pushed out (roof spread).

Deflected shape if rafters are not sufficiently stiff.

Rafters

Collars

Eaves
Thank you – any questions?

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