

Arup**Research+Development**

Maintain our Heritage

Maintaining Value

Research Module 4:
Technology- A review
of products and
services within the field
of preventative
inspection and
maintenance of
buildings.

APPENDICES

Arup**Research+Development**

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Research Module 4: Technology - A review of products and services
within the field of preventative inspection and maintenance of
buildings.

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A1. MONUMENTENWACHT FLANDERS

The following documents are included by kind permission of Monumentenwacht Vlaanderen.

A1.1 Training programme

TRAINING PROGRAM

MONUMENTENWACHT VLAANDEREN

1. General context – Conservation of cultural heritage

- 1.1. Conservation of Cultural heritage: Theory – Introduction
- 1.2. Law concerning Cultural Heritage (in Flanders)
- 1.3. Administrations, Institutes, Associations, etc. working for the Cultural Heritage
- 1.4. Historical ways of building (in Flanders): General architectural, historical and typological principles
- 1.5. Historical ways of building (in Flanders): General structural and constructional principles
- 1.6. Inspection- and report techniques
- 1.7. Safety regulations: theory and practice (Advanced Industrial Rope Techniques)

2. Maintenance of Historic Buildings


- 2.1. Roof covering
 - 2.1.1 used materials,
 - 2.1.2. construction techniques
 - 2.1.3. causes of deterioration, decay and damage and its interpretation
 - 2.1.4. recommendations of maintenance or repair
- 2.2. Rainwater disposal
 - 2.2.1 used materials,
 - 2.2.2. construction techniques
 - 2.2.3. causes of deterioration, decay and damage and its interpretation
 - 2.2.4. recommendations of maintenance or repair
- 2.3. Roof structures
 - 2.3.1 used materials,
 - 2.3.2. construction techniques
 - 2.3.3. causes of deterioration, decay and damage and its interpretation
 - 2.3.4. recommendations of maintenance or repair
- 2.4. Walls and vaults (structural, inside and outside)
 - 2.4.1 used materials,
 - 2.4.2. construction techniques
 - 2.4.3. causes of deterioration, decay and damage and its interpretation
 - 2.4.4. recommendations of maintenance or repair

- 2.5. Floors and ceilings (structural)
 - 2.5.1 used materials,
 - 2.5.2. construction techniques
 - 2.5.3. causes of deterioration, decay and damage and its interpretation
 - 2.5.4. recommendations of maintenance or repair
- 2.6. Finishes, fixtures and fittings
 - 2.6.1 used materials,
 - 2.6.2. construction techniques
 - 2.6.3. causes of deterioration, decay and damage and its interpretation
 - 2.6.4. recommendations of maintenance or repair
- 2.7. Cellars and foundations
 - 2.7.1 used materials,
 - 2.7.2. construction techniques
 - 2.7.3. causes of deterioration, decay and damage and its interpretation
 - 2.7.4. recommendations of maintenance or repair)
- 2.8. Doors, windows and stairs
 - 2.8.1 used materials,
 - 2.8.2. construction techniques
 - 2.8.3. causes of deterioration, decay and damage and its interpretation
 - 2.8.4. recommendations of maintenance or repair)
- 2.9. Accessibility of all parts of the building
- 2.10. Services (heating and ventilation, electrical fittings, fire fighting, lightning security, ...)

A1.2 Inspection checklist



MONUMENTENWACHT ANTWERPEN VZW
Turnhoutsebaan 232
2100 ANTWERPEN (Deurne)

 **If you have any questions about this report or about works to be carried out, please do not hesitate o contact us.**

ARCHITECTURAL INSPECTION	INSPECTIONNUMBER
OBJECT	:
LOCATION: Street + number City	:
LISTED MONUMENT	:
PRESENT FUNCTION	:
SUBSCRIBER	:
DATE(S) OF INSPECTION	:
INSPECTORS	:
TOTAL DURATION OF INSPECTION	: # Hours
WORKS CARRIED OUT	: /
USED MATERIALS	: /
PREVIOUS INSPECTIONS	: Month/year, month/year
REMARKS	: /

Recommendations

Works to be carried out to insure an optimal accessibility and safety

Reference to detail in status report

Urgent

:

In short term

:

In long term

:

Works to be carried out in view of the preservation of the monument

Urgent

:

In short term

:

In long term

:

Special attention required in view of durable maintenance

:

The following criteria are used to judge the state of the different parts of the building:

G = Good. For a good maintenance of the monument are no immediate works to be carried out

R = Reasonable. The recorded defects are not acute. However, a raised vigilance is needed in order to intervene in good time.

M = Moderate. Local defects were established. These need to be repaired in good time

B = Bad An Urgent and thorough repair is needed.

Those arts which could not be inspected because e.g. of a lack of safety, are pointed out as N = not. You will find a justification in the explanation column. A fast and thorough intervention is needed.

The numbers between [] refer to a situation plan at the back. The letters point out local defects.

1. Roofing

1.1. Surfaces					
1.1.1. Tiles					
1.1.2. Slates					
1.1.3. Metal (Zn, Pb, Cu, ...)					
1.1.4. Organic materials					
1.1.5. Bituminous materials					
1.1.6. Other					
1.2. Connections					
1.2.1. Ridges					
1.2.2. Hip rafters					
1.2.3. Valleys					
1.2.4. Gables					
1.2.5. Head Flashings					
1.2.6. Rising Walls (sideways)					
1.2.7. Other					

2. Penetrations

2.1. Dormers						
2.2. Sky-lights/Lanterns/Ridge-furrets						
2.3. Garrer windows/Trapdoors						
2.4. Chimneys (above roof)						
2.5. Crownings						
2.6. Ladder- en climb hooks						
2.7. Aeration						
2.8. Other						

3. Trusses and Attics

3.1. Main structure – wood						
3.2. Main structure – Metal						
3.3. Main structure - Concrete						

4. Rainwater disposal

<p>4.1. Gutters</p> <p>4.1.1. <i>(fill in type of gutters or type of used material according to specific situation)</i></p> <p>4.1.2.</p> <p>4.1.3.</p> <p>4.1.4.</p>						
<p>4.2. Drainpipes</p> <p>4.2.1. <i>(fill in type of material that has been used)</i></p> <p>4.2.2.</p> <p>4.2.3....</p> <p>4.2.4....</p> <p>4.2.5. Other</p>						
<p>4.3. Sewerage</p>						

5. Exterior work

<p>5.1. Brickwork + pointing</p>						
---	--	--	--	--	--	--

<p>5.2. Natural Stone + pointing</p> <p>5.2.1. <i>(fill in type of Natural stone according to used materials)</i></p> <p>5.2.2.</p> <p>5.2.3.</p> <p>5.2.4.</p>						
<p>5.3. Concrete a.s.o.</p>						
<p>5.4. Wooden structures</p>						
<p>5.5. Metal structures</p>						
<p>5.6. Finishes</p> <p>5.6.1. Plaster</p> <p>5.6.2. Painting</p> <p>5.6.3. Other</p>						
<p>5.7. Anchors/gratings/...</p> <p>5.7.1. Wallanchors</p> <p>5.7.2. Bars</p> <p>5.7.3. Other</p>						

<p>5.8. Crownings</p> <p>5.8.1.</p> <p>5.8.2.</p> <p>5.8.3.</p>						
<p>5.9. External stairs</p>						
<p>5.10. External capentry</p> <p>5.10.1. Carpentry</p> <p>5.10.2. Finishes</p>						
<p>5.11. Glazing</p> <p>5.11.1.</p> <p>5.11.2.</p> <p>5.11.3. Other</p>						
<p>5.12 Projecting windows/Balconies</p>						
<p>5.13. Louvre –boards</p>						
<p>5.14. Other</p>						

6. Interior

<p>6.1. Structural elements</p> <p>6.1.1. Interior walls & vertical structures</p> <p>6.1.2. Floors & ceilings</p> <p>6.1.3. Vaults</p> <p>6.1.4. Cellars</p> <p>6.1.5. Foundations</p>						
<p>6.2. Finishes</p> <p>6.2.1. Wall</p> <p>6.2.2 Ceilings</p> <p>6.2.3. Floor</p>						
<p>6.3. Interior Carpentry</p>						
<p>6.4. Interior stairs & gangways</p>						
<p>6.5. Other</p>						

7. Other interior elements

7.1. Church furniture							
7.2. Civilian furniture							
7.5. Other objects							

8. Technical equipment

8.1. Lightning conductors							
8.2. Bells/Carrillons/Tower clocks							
8.5. Other							

9. Climate

9.1. Relative humidity & temperature							
9.2. Light							
9.3. Other							

10. Prevention

10.1. Fire							
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10.2. Theft & vandalism						
10.3. Conservation						
10.4. Cleaning						
10.5. Other						

11. Safety /Accessibility/Hygiene

11.1. Accessibility	■	■	■	■	■	
11.1.1. Exterior						
11.1.2. Interior						
11.2. Dirt/Garbage						
11.2.1. Exterior						
11.2.2. Interior						
11.3. Animals						
11.4. Other						

12. Site

12.1. Surrounding area/pavement						
12.2. Fences						

12.3. Trees/Growth						
12.4. Other						

A2. BATH PILOT (Extract from Inspection Report)

2.2 THE INSPECTION PROCESS

The building was inspected as follows:

Front and rear elevations were examined using binoculars from ground level. Access via harnesses and blocks were not considered necessary. Basement and vaulted cellar areas were also visually inspected.

Main roof coverings to the front and rear elevations were inspected via dormer roof extensions set into the front and rear roof slopes. Roof voids to both front and rear roof structures were also accessed.

Sections of wall etc were examined by looking out of windows on each floor. Internal wall surfaces and suspect damp areas were all examined visually from within.

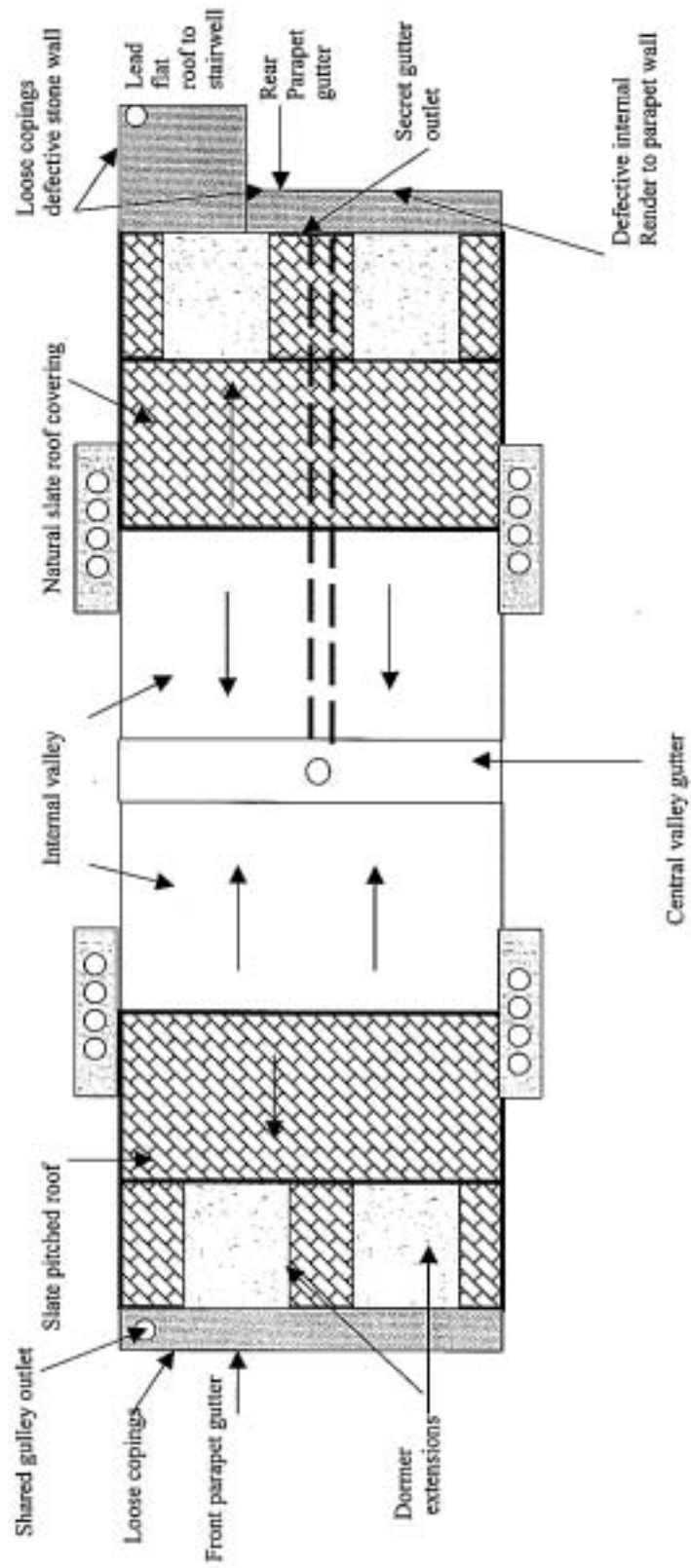
Recommendations for work items are prioritised in the following way:


- 'A' – Work should be done immediately
- 'B' – Should be done within the next six months or before winter
- 'C' – Should be done within the year
- 'D' – Should be done as part of a regular maintenance programme

3. A & B PRIORITIES NOTED DURING INSPECTION

Item Number	Priority	Description
2.1	B	Provide balloon gratings to gulley openings within parapet gutters
3.1	B	Renew lead detailing into hopper head draining from lead flat roof area, ensure lead is well pointed into wall opening
4.1	B	Provide grating/covers to gulley opening of secret gutter
4.2	A	Provide access hatch within roof void to gain access to central roof valley
5.1	B	Ease and adjust dormer windows and redecorate all joinery
7.1	B	Clear and clean downpipes to front and rear elevations
8.1	B	Improve weather bar detail to door frame of rear entrance door.
10.1	B	Specialist advice should be gained regarding existing movement cracks to vaulted cellar area.
10.1	B	Repoint and renew defective brickwork to vaulted cellars. Clear and clean all gullies and channels, relay cracked/uneven flagstones.

4. INSPECTION REPORT



MAINTAIN OUR HERITAGE		Roof Coverings – Main Building			
Photograph	Description	Condition	On Site Action	Recommendation	Priority
	1.1 Roof covering Main Building	Natural slate roof covering to front and rear roof slopes. Mansard roof construction with dormer window extensions set into roof structure to lower pitches to both elevations. Detail between change in roof pitch is protected by an external lead flashing and with internal roofing felt (sarking). Roof coverings in reasonable condition, evidence of metal tingles holding a number of slates into position. Surface of slates to front elevation slightly more weathered due to increased exposure to pollution and climate variations. No evidence of loose/slipped slates, roof vents have been installed to rear roof slope. No evidence of water ingress internally within roof void or top floor flat. Stone ridges are present to the apex of both pitches, appear to be well bedded/secure, minor pointing defects seen, especially to more exposed front elevation. Lead flashings present at junction with slate roof coverings and party walls. Lead in reasonable condition though past cement pointing repairs are evident adjacent to base of chimney stacks. Quality of past pointing repairs is poor in areas with cement cracking and 'blowing' off face underlying stone. Outlet to secret gutter is evident to rear roof slope. Outlet drains directly onto roof slope; there is no hopper head/downpipe present. Lead detailing to outlet is weathered and worn.	Inspect slate roof coverings every 6-12 months. Ensure that slates remain well secured and use tingles to refix loose/slipped slates. Ensure that roofing felt and lead flashings at change in roof line adjacent to dormer windows remains watertight and secure. Any worn/defective areas should be replaced. Ensure that ventilation grills within slate vents remain clear and unobstructed. Ensure that stone ridges remain well bedded and secured. Repoint loose/defective mortar where missing and replace worn/decayed stones where necessary. Inspect lead flashings annually. Ensure that lead is well detailed into party wall junctions and below slates. Hack off loose/defective past cement mortar and replace in hydraulic lime mortar. Ideally existing render to stacks should be replaced at the same time to ensure continuity of finish. Provide appropriate hopper head and downpipe for outlet for secret gutter. Ensure that it is well detailed against slate covering and is secured with fixings. Lead overflow must drain adequately into hopper head.	D D C C C C	

LISTED BUILDING DESCRIPTION:

Stables, c.1800. Gault brick with plain tile roof. 2 storeys and symmetrical disposition. Central carriage doors flanked to right and left by round-headed loose box doors. Granary floor above with central loading door and square windows right and left. Gabled roof. Tumbling in gable heads.

Meaning of Architectural Terms:


Gault brick – buff coloured brick manufactured from the Gault clay bed found locally.

Tumbling – angled brick inserts down the edge of a gable end.

6

Buildings 'At Risk' Register


Summary Report

Stables (25m N of) London Lode Hall, London Lode <i>(Asset No. 1702)</i>		Upwell		
Address: Stables London Lode Hall London Lode Wisbech NORFOLK PE14 9JW				
'Buildings at Risk' Grade: 3 (in need of substantial repair)		Date 'Buildings at Risk' Grade registered: 10/12/2002		
Summary of General Inspection				
FEATURE	CONDITION			
	1	2	3	4
	Very Bad	Poor	Fair	Good
ROOF	X			
WALLS		X		
WINDOWS & DOORS		X		
STRUCTURAL CONDITION		X		
Comment: The Stables are an important contribution to the historic character of the London Lode Hall complex. The owners are anxious to repair the building for uses associated with their commercial interests. The Borough Council is in discussion about grant assistance on the basis of the building being 'at risk'.				

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Buildings 'At Risk' Register

Summary Report

London Lode Hall, Three Holes <i>(Asset No. 1701)</i>		Upwell		
Address: London Lode Hall Three Holes Wisbech NORFOLK PE14 9JW				
'Buildings at Risk' Grade: 5 (not at risk)		Date 'Buildings at Risk' Grade registered: 10/12/2002		
Summary of General Inspection				
FEATURE	CONDITION			
	1	2	3	4
	Very Bad	Poor	Fair	Good
ROOF			X	
WALLS			X	
WINDOWS & DOORS			X	
STRUCTURAL CONDITION			X	
Comment: London Lode Hall is in reasonable condition overall although the house would benefit from some general maintenance				

A3. OWNERS LOG BOOK

A3.1 Introduction

This handbook has been prepared to assist [you] in the care and maintenance of your property[ies].

The information that it contains will be of interest to you and to any future purchaser. It also sets out a regime intended to maintain the value of the property in terms of both monetary value and cultural heritage.

The building is listed Grade [..]. Its listing confirms that it has some particular architectural historic interest. This may apply to the whole building or only a part of it – either internal or external.

In England and Wales the classification is as follows (the designation differs in Scotland and Northern Ireland):

- Grade I buildings are of exceptional interest
- Grade II* are particularly important buildings of more than special interest
- Grade II are of special interest, warranting every effort to preserve them.

While traditionally listed buildings are thought of as being ‘old’, in practice this is not only the case. More post-World War 2 buildings are now being listed, and some of these may be no more than thirty years old.

A3.2 History of the Building

- A3.2.1 General**
- A3.2.2 Construction materials**
- A3.2.3 Later alterations/additions**

A3.3 Repair and maintenance

- A3.3.1 General**
- A3.3.2 Recent work**
- A3.3.3 Anticipated maintenance regime**
- A3.3.4 Names, addresses and telephone number of specialists, suppliers and maintenance contractors**

A3.4 Pro-forma

PROPERTY Location: Owner: Use: Other comments:			
DATE OF WORK			
DESCRIPTION OF WORK UNDERTAKEN [eg inspection, routine maintenance, emergency repair etc]			
WORK UNDERTAKEN BY [organisation, address/contact details]			
COMMENTS			
RECOMMENDATIONS FOR FURTHER INSPECTION/MAINTENANCE/OTHER WORK			

**A4. EXTRACT FROM KING'S LYNN AND WEST NORFOLK BOROUGH
COUNCIL 'LISTED BUILDING PROPERTY LOGBOOK'**

Contents

- 1. Why have a Listed Building Logbook? ✓**
- 2. Listed Buildings – Some Basic Facts:**
 - What are "Listed Buildings"?
 - What is the background to "Listing"?
 - How are Listed Buildings identified?
 - How many Listed Buildings are there, and how are they classified?
 - What about the Listed Buildings of West Norfolk?
 - What is the Borough Council's role in respect of Listed Buildings?
 - What do I need to know about owning a Listed Building?
- 3. The Repair of Historic Buildings – Advice on Principles and Methods**
- 4. The Logbook Report for your Property**
- 5. Registration of Listed Buildings "At Risk"**
- 6. Is your property considered to be "At Risk"? –**
- 7. Useful Contacts, Organisations and Sources of Information**
- 8. Bibliography of Useful Publications for the Care of Listed Buildings**
- 9. Copies of any Research Information held on your Property by the Borough Council (Planning)**

LISTED BUILDING DESCRIPTION:

House, Mid C18. Gault brick with slate roof. 2 storeys and dormer attic. Symmetrical west front in 3 bays. Central panelled door under 4 vaned fanlight. Sash windows retain original glazing bars beneath gauged segmental arches. Plain parapet and Mansard roof in which are 3 gabled dormers with casements. Internal gable end stacks and to south an additional external stack serving lean-to single storeyed extension abutting gable wall. East facade articulated by central 2 storey porch and corner pilasters. 3 bays with sash windows retaining original glazing bars under gauged segmental arches. 3 gabled dormers in roof.

Meaning of Architectural Terms:

casement: a window frame hinged on one side so that it swings out or in to open.

fanlight: a window above a door, usually semi-circular, with glazing bars radiating out like a fan.

mansard roof: a roof with two sloped, the lower almost vertical to allow extra roof space for the attic rooms.

parapet: a low wall surmounting the exterior wall of a building.

pilaster: a flat rectangular classical column fixed against a wall, or used to frame a doorway, fireplace, etc.

sash window: a window formed with sashes – that is, glazed wooden frames which slide up and down in vertical grooves by means of counterbalanced weights. The standard form has two moveable sashes and is termed a "double-hung sash".

LISTED BUILDING DESCRIPTION:

Stables, c.1800. Gault brick with plain tile roof. 2 storeys and symmetrical disposition. Central carriage doors flanked to right and left by round-headed loose box doors. Granary floor above with central loading door and square windows right and left. Gabled roof. Tumbling in gable heads.


Meaning of Architectural Terms:

Gault brick – buff coloured brick manufactured from the Gault clay bed found locally.
Tumbling – angled brick inserts down the edge of a gable end.

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Buildings 'At Risk' Register


Summary Report

Stables (25m N of) London Lode Hall, London Lode <small>(Asset No. 1702)</small>		Upwell		
Address: Stables London Lode Hall London Lode Wisbech NORFOLK PE14 9JW				
'Buildings at Risk' Grade: 3 (in need of substantial repair)		Date 'Buildings at Risk' Grade registered: 10/12/2002		
Summary of General Inspection				
FEATURE	CONDITION			
	1	2	3	4
	Very Bad	Poor	Fair	Good
ROOF	X			
WALLS		X		
WINDOWS & DOORS		X		
STRUCTURAL CONDITION		X		
Comment: The Stables are an important contribution to the historic character of the London Lode Hall complex. The owners are anxious to repair the building for uses associated with their commercial interests. The Borough Council is in discussion about grant assistance on the basis of the building being 'at risk'.				

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Buildings 'At Risk' Register

Summary Report

London Lode Hall, Three Holes <i>(Asset No. 1701)</i>		Upwell		
Address: London Lode Hall Three Holes Wisbech NORFOLK PE14 9JW				
'Buildings at Risk' Grade: 5 (not at risk)		Date 'Buildings at Risk' Grade registered: 10/12/2002		
Summary of General Inspection				
FEATURE	CONDITION			
	1	2	3	4
	Very Bad	Poor	Fair	Good
ROOF			X	
WALLS			X	
WINDOWS & DOORS			X	
STRUCTURAL CONDITION			X	
Comment: London Lode Hall is in reasonable condition overall although the house would benefit from some general maintenance				

A5. DERBYSHIRE CHURCHES AND CHAPELS PRESERVATION TRUST**INTERNET REGISTER TO HELP WITH BUILDING REPAIRS**

Derbyshire County Council has joined forces with the Derbyshire Historic Buildings Trust to publish a web-based register of tradesmen able to carry out maintenance or repair work on traditional and historic houses to make it easier for people interested in building conservation to find help.

The list includes general tradesmen (eg builders and joiners) and specialists (eg plasterers who work with lime hair plaster). It also has details of specialist advisors (eg conservators of sculpture) and sources of materials (such as cast-iron gutters).

Councillor Geoff Carlile, Derbyshire County Council's cabinet member for regeneration, said: 'We have had a paper copy of this register in our offices for many years, from which we use to give out information to members of the public who ring us up. But we wanted to find a way of making that information more freely available and thought the Internet would be the ideal way of doing this.'

The website can be visited at <www.derbyshirehistoricbuildings.org.uk>.

The following pages are taken from the website.

History	<ul style="list-style-type: none"> • Who we are and what do we do?...
Building Craft Register	<ul style="list-style-type: none"> • Advice on where to buy materials or products to repair your historic building • Find a builder or building craftsperson. • Find a specialist adviser...
<p>* The CRAFTS REGISTER has been produced by Derbyshire County Council . The Derbyshire Historic Buildings Trust is pleased to host it on its web page for the benefit of owners of historic buildings in Derbyshire.</p>	
Buildings at Risk	<ul style="list-style-type: none"> • Information on Derbyshire's historic buildings at risk as a result of disrepair or disuse click on Buildings at Risk...
Churches & Chapels Preservation Trust	<ul style="list-style-type: none"> • Preserving churches and chapels in Derbyshire...



If you have any queries or comments about the website, please email us at dhbt@clara.net

Derbyshire Churches & Chapels Preservation Trust

The churches and chapels of Derbyshire are visual and historical landmarks of their own towns or villages as well as being places of worship for their communities and for the celebration of significant moments in people's lives. Many of them, too, are more than 500 years old and provide the most obvious and generally accessible examples of our architectural heritage.

As such there is an obligation upon all of us to prevent them suffering irreversible decay.

Each year the congregations of many of the County's Anglican, Roman Catholic and Non-Conformist Churches are faced with raising money to carry out necessary and sometimes emergency repairs to the fabric of their church.

In many counties, therefore, Church Preservation Trusts have been formed with the principal object of raising funds, not to supplant but to offer that first contribution to an appeal which so often encourages others.

In 1993 The Derbyshire Churches & Chapels Preservation Trust was launched with His Grace The Duke of Devonshire as President and the Bishops of Derby and Nottingham, and the Nottingham and Derby Methodist Chairman as Patrons. The principal object of the Trust is to raise funds to be used primarily as 'pump primers', particularly for those buildings or repairs which would not ordinarily attract other grant aid.

Since July 2000 the Trust has been supported by grants from Waste Recycling Environmental under the Landfill Tax Credit Scheme.

A total of 135 churches and chapels have so far received grants.

Buildings at Risk Register Local Authorities in Derbyshire

Visit <http://www.derbyshirehistoricbuildings.org.uk/register/results-district.asp> to view the Buildings at Risk Register

This register, first published in 1989, was produced as a result of a survey of listed "buildings at risk" undertaken by the Derbyshire Historic Buildings Trust.

The present edition has 282 entries. Since the last edition in 1999, 64 buildings have been removed from the list and 31 added. Details of the buildings which have been removed from the register are printed in Appendix 2.

The register is arranged in order of District or Borough Council, then alphabetically by parish or town.

Appendix 1 contains a summary of the buildings which are Grade I or II* on the statutory lists and further details about what is being done to protect and preserve these buildings.

Many of the buildings listed in this register are not for sale, unless specifically noted. This does not mean that the owner is unwilling to sell his/her property. However, anyone interested in purchasing a building which is not identified FOR SALE is advised to contact the Conservation Officer either at the County Council or the Local Planning Authority. A list of Conservation Officers is printed on the following pages.

The Derbyshire Historic Buildings Trust was established in 1974. One of its primary aims is to identify neglected or abandoned historic buildings in the County in danger of decay or demolition, and to work for their preservation and modernisation without damage to their essential character. The Trust has carried out many exemplary schemes of restoration on "buildings at risk" within Derbyshire.

The Trust's policy is to acquire only those buildings for which no other restorer or purchaser appears.

For details of membership of the Derbyshire Historic Buildings Trust please contact:-

Andrea Hambleton
DHBT
1 Greenhill
Wirksworth
DE4 4EN
Tel: 01629 824904 : e-mail dhbt@clara.net

Save Britain's Heritage is a charity which campaigns for the preservation of the architectural heritage. Save has also produced a selective register covering England and Wales.

For further information contact: Adam Wilkinson or Ricky Reginejaszinski at Save, 70 Cowcross Street, London EC1M 6EJ tel: 0207 253 3500 (email: save@btinternet.com).

CONSERVATION STAFF IN LOCAL AUTHORITIES

Amber Valley: Rob Thorley
Borough Development Department
Amber Valley Borough Council
PO Box 18, Town Hall
Ripley
DE5 3SZ
Tel: 01773 841582

Bolsover: Kim Carlen
Department of Planning Services

The District of Bolsover
Sherwood Lodge
Bolsover
S44 6NF
Tel: 01246 242288

Chesterfield: Paul Staniforth
Development Management Section
Chesterfield Borough Council
Town Hall
Chesterfield
S40 1LP
Tel: 01246 345782

Derby City: Harry Hopkinson
Development and Cultural Services Department
Derby City Council
Roman House
Friargate
Derby DE1 1XB
Tel: 01332 255062

Derbyshire County: Allan Morrison or Paul Warren
Environmental Services Department
Derbyshire County Council
County Hall
Matlock
DE4 3AG
Tel: 01629 580000
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A6. MATERIALS INFORMATION

A6.1 General

The focus of the module in relation to products is on those relating to inspections and monitoring. The availability and use of products in the sense of *materials* for carrying out maintenance will not be examined in detail: this is potentially a large area on its own and could form the subject of a separate study, although significant repositories of such information already exist. However, given the importance of specifying and implementing maintenance work in accordance with established conservation principles, this Appendix looks broadly at issues relating to materials, and in particular those used for the external envelope. This would apply to materials and elements such as masonry, timber, rainwater goods and roofing.

This information was sourced in the course of the research and although not directly relevant to maintenance inspections, it is relevant to the implementation of maintenance and repair tasks.

Some brief information on *repairs* to masonry is also included. As set out in 2.1, this covers work 'beyond the scope regular maintenance' and may be necessitated by excessive weathering and decay.

One of the benefits of a logbook or 'owner's handbook' (see 5.7 below) would be its use as a reference for sources of traditional materials and products, using local suppliers and specialists where this is possible and giving contacts in other areas where necessary.

Guidance may also be obtained on materials and elements such as windows and brickwork for repair and restoration work through the various publications produced by national organisations such as SPAB, English Heritage and the Georgian Group. Some of these are listed in the references section. Some conservation areas produce their own documents for the use of residents (see 5.4.5 below). The intention here is that not only will appropriate materials be used but that there will also be consistency of detail within the area, for example in the case of joinery.

Further information may be obtained from the websites of specialist product suppliers, local authorities [eg Hampshire County Council <http://www.hants.gov.uk>], the Heritage Information Trust and the Building Conservation website (<http://www.buildingconservation.com/>) designed and maintained by Cathedral Communications Ltd. A number of websites from North America also contain extensive guidance and articles on traditional construction materials, their use and restoration eg [<http://theoldhouseweb.com> and 'Preservation Briefs' provided through the National Park Service at <http://www2.cr.nps.gov/tps/briefs>

For the most modern buildings this information should be broadly available, although experience suggests this is not always the case, in the Health and Safety File, required at the end of any project for retention by the building owner.

A6.2 Lime

The word that probably comes to mind most frequently in the context of historic buildings is 'lime' – as mortar, render, plaster or limewash. There are extensive references on lime, its manufacture, properties and use in the different forms and the information will not be replicated in this report. Some sources of information are given in the References section.

The benefits of lime are being more widely disseminated, not only within the context of conservation and maintenance work but also for new construction.

The use of lime in plasters and renders goes back for thousands of years, predating the various materials that have come into fashion (and in several cases then fallen out of favour) in more recent times.

The importance of its use in various forms is acknowledged in *An introduction to Building Limes* by Michael Wingate[23] in the simple statement “Anyone working on historic buildings should be thoroughly familiar with lime as it is central to good conservation practice”.

In general terms the lime-based materials allow the structure to breathe because of their porosity, and are able to accommodate general movement without cracking as they are less brittle than their cement-based counterparts. This is seen, for example, in terraces of houses with few or no vertical joints, and in long boundary walls, both old and of more recent origin such as at Darwin College in Cambridge.

The benefits of the traditional materials are seen particularly clearly where alternative modern technologies have not worked as hoped. For example, products claiming never to need maintenance have led to locked in moisture or salt deposition through water ingress at joints and subsequent cracking and spalling.

Care is needed in the selection and use of lime-based materials. Matching the original material will always be important in terms of both appearance and performance. For conservation work, *non-hydraulic* lime is usually used in the saturated form known as 'lime putty'. Other materials may incorporate hydraulic limes. Depending on the degree of hydraulicity (eminently – moderate- feebly) these will have faster setting characteristics and develop higher strengths, but may conversely be more brittle than the weaker forms . The material most commonly available from builders merchants is 'dry-hydrate' or 'bag lime', a dry form of non-hydraulic lime sold in bags. This can be used like lime putty once it has been allowed to soak in water for some time and 'knocked up', but it is generally considered to be an inferior product.

Skilled labour is needed for work with lime materials: the selection, mixing and application are all critical to the finished product and differ from the techniques needed for gypsum and cement products.

The use of lime in *limewash* serves both a decorative and a protective function. The wash contains mature lime putty in solution, often with a binder such as linseed oil, tallow or casein which will provide a water repellent to the coating. A wide variety of additives have been used historically. The wash should be applied thinly and allowed to dry slowly.

A number of coats will be needed, depending on the nature and condition of the substrate. Limewash is available in a range of colours using added pigments. These are generally, but not exclusively, in softer, more traditional shades.

At present there are limited sources of limestone within the United Kingdom and lime is also imported from abroad.

At the time of writing there is particular concern over the likely closure of the limestone quarry at Appledoor in Somerset. Hydraulic Lias Limes Ltd, who had applied to deepen the quarry and construct a lime manufacturing plant is the only producer of hydraulic blue lias lime, and the alternatives may include either increased use of cement-based products or other non-authentic materials.

A6.3 Gutters and rainwater goods

Historically these would have been constructed from lead, cast iron or even timber. The more modern plastic equivalents are generally unsightly by comparison and certainly do not provide a good aesthetic match for the older materials.

Many longstanding problems with roof drainage are to do with failed joints and/or a simple failure to carry out routine maintenance to clear gutters that causes the problems. While the remedy may be straightforward there are more advanced technologies available. Overflowing gutters and drains can be monitored using one of the H+R Curator building monitoring systems (http://www.handr.co.uk/curator_home.html). Damage caused by ice and snow may be prevented by the installation of roof and gutter de-icing systems such as G-TRACE manufactured by Heat Trace Ltd (<http://www.heat-trace.com>) (see also 5.2.2.2).

In other cases the difficulty lies with overflowing gutters that cannot be enlarged rather than deterioration of the elements themselves. It may be possible to overcome this in some cases by introducing siphonic drainage.

A6.4 Roofs

Roofs of historic properties are likely to be tiled, with clay or slate tiles, or possibly stone slates, or thatched. Copper and lead and other sheet metals have also been used.

Routine maintenance of gutters and downpipes, prompt attention to known leaks and regular checking for – and repair or replacement of – corroding roof fasteners will all help to protect a roof. Reference is given above to de-icing systems that may be considered in this context.

Clay tiles are manufactured using a process not dissimilar to that used for bricks. Provided they are properly fired they provide a durable roof covering: deterioration is likely to be due to frost action on the bricks or, over larger areas, due to the failure of the fixing system. This may be wooden pegs that have rotted, or the iron nails that replaced them which have in turn corroded.

Roof tiles are often re-usable and sources of similar materials should be sought where replacements are needed. More modern concrete or asbestos cement tiles may have some similarities with traditional clay products but will not adequately match either appearance or weathering characteristics.

Thatching is a specialist activity and in general will be undertaken by local craftsmen, ideally members of a Thatchers' Association, using local materials (straw or reed). Advice is available on the care and maintenance of thatch on various websites and in the SPAB publication *The Care & Repair of Thatched Roofs* [24].

Authentic slate tiles are produced by a small number of companies, two of which are referenced below. Imported materials may also be used provided there is a good match in terms of weathering, colour and texture. Slate colours vary considerably, and those from, for example, Spain or Africa, may not prove to be an adequate match.



Figure A6.1. Blue-grey slate [Burlington Slate image]

Production has resumed relatively recently at the Honister Slate Mine in Cumbria <http://www.honister-slate-mine.co.uk/Pages/home.htm> where both random and sized Honister green slate tiles are available.

Burlington Slate <http://www.burlingtonslate.co.uk/> produces Blue Grey slate and Westmorland green slate as 'patterns', 'randoms' and sized slates, while Snowdonia Slate and Stone in North Wales http://www.snowdoniaslate.co.uk/welsh_roofing_slates.htm produces welsh slates in blue grey and heather blue colours, both from the same sedimentary rock.

Regular inspection of tiled or slate roofs is important as slipped or broken tiles, even in small number, provide a route for ingress of water and may thus be the source of more serious problems with the fabric. In particularly vulnerable areas leak detector tape may be installed to provide early warning of problems, for example the system manufactured by Hydro-Temp Inc (<http://www.hydro-tempinc.com/leakdetc.htm>).

A6.5 Masonry

A6.5.1 General

Traditionally brickwork and masonry were built with relatively soft lime mortar. The softness of the mortar enabled the walls to move without cracking the bricks or stones. Another benefit was that water could dry out of the walls through the joints concentrating the efflorescence and frost damage in them. Any remedial work, which was required, was restricted to simple repointing. In the last hundred years many of these walls have been repointed with hard cement mortar. This has prevented the water drying out through the joints with resultant damage to the brick and stone, which is very expensive to repair.

Amongst the distinguishing features that may provide information on date and provenance of brickwork are the colour and texture, and also the *size* of the units. Dating by size is not wholly reliable, however, as a certain amount of variation is encountered even within a specific building, suggesting that neither mould sizes nor the correct filling of the mould was constant. The size increased, not surprisingly, when bricks were taxed by *unit*. The material used to manufacture the brick may also give some clues as to its origin. Traditionally all masonry walling materials were produced near to the place of use.

Modern production techniques allow bricks to be manufactured with colours and textures that are not solely determined by local clay properties. Modern methods of transportation also now allow bricks to be used more readily in locations far removed from where they are made.

In looking at maintenance and repair, a detailed survey will be required to carry out a 'triage' classification of areas that are irreparable, in need of repair and repairable, and not needing repairs.

Masonry products are some of the most durable, inert and maintenance-free of all building materials. They also offer significant potential for reuse. Practically all bricks older than the mid - 18C are generally soundly made and are worth salvaging. Early mass produced bricks from the late Georgian period onwards should be salvaged more selectively.

Where replacement units are needed, these should be sound, selected in the first instance from salvaged matching units from demolition or alteration works, either from buildings on the same site or from a reputable source. Units should be selected to achieve a match of size, colour, and texture with the removed units and with the adjacent masonry. Units should be carefully cleaned of mortar, using relatively gentle techniques such as wire-brushing to avoid damage. Units with damaged facings, including chipped arrises, should not be re-used.

Where sufficient matching units cannot be obtained from salvaged material, new units should be selected, in discussion with manufacturers, to match existing units as closely as practicable in appearance and weathering characteristics.

Where brickwork is to be *repaired*, the location of the brickwork and the extent of the damage will determine the appropriate technique to be adopted.

Spalled or otherwise damaged facing bricks, cut headers resulting from demolition of adjacent work, and uncleanable bricks where these are judged to be unacceptable in newly-exposed areas should be removed and replaced.

‘Plastic repair’ may be applied in locations where renewal of individual bricks is either not practicable or not warranted by the small size of the hole or other blemish. A particular application of this method is to the filling of screw holes and other small holes.

For larger repairs, pins or small-diameter rods (usually of stainless steel for durability) can be inserted to provide mechanical connection of the repair to the original material behind. This is drilled to receive these fixings, which are set in mortar.

Cleaning of masonry is a specialist area and needs to be undertaken with great care. Use of inappropriate methods can cause permanent damage to colour and texture.

A6.5.2 Repointing.

There is a tendency to repoint for cosmetic reasons when it is not really required. Detailed advice exists on when and how to carry out repointing [25]. Surviving original lime-based work should not be removed unnecessarily.

Advice on choice and use of mortar for joints and re-pointing is given in *BS 8221-2*[26]. The mortar used in repair work should be compatible with that used in the original construction, matching it wherever possible. In older buildings this will almost invariably involve the use of weaker mortars, in some instance with lime as the binder and no cement.

Correct and detailed specifications for such work are required - covering the preparation of joints, the preparation of mortar and the placing and finishing of the mortar. The use of lime in construction generally requires a greater level of skill than that needed for work with Portland cement. This relates to the preparation of the material, particularly where lime putty is used, and then its placing.

In some cases the particular problem identified with the masonry may require the installation of remedial wall ties, for example in cases where the original ties have been found to have corroded, or where ties were not provided and separation of the inner and outer skins is apparent. Several different remedial ties systems are manufactured. Helifix Ltd, for example [<http://www.helifix.com/main/uk.html>], produce four separate systems of ties for different applications. Other products are used for crack stitching and the post-installation of bed joint reinforcement.

A6.5.3 Terracotta and faience

These are the other ceramic materials commonly encountered in historic buildings. Both are moulded clay products, usually well vitrified, with a hardness, compactness and sharpness of detail not usually obtained with brick. The two terms seem to be used interchangeably in some instances, although there are differences in both appearance and form.

‘Terracotta’ is generally used to describe moulded clay blocks that can be used structurally. The blocks are formed by hand-pressing the clay into absorbent moulds to form hollow boxes, possibly with clay walls (known as ‘webs’ or ‘straps’). Faience is used either to describe glazed terracotta or for large glazed ceramic tiles or slabs. The tiles often have a ribbed back and are often used as a facing over steel framing. In the past faience has also been used extensively as decoration on stone and brick structures. There are extensive references on these materials, their manufacture, use and repair and these are not replicated here.

Manufacture of terracotta and faience has been substantially reduced since the period when these materials were fashionable. Only Hathernware Ceramics Ltd of Loughborough produce the full range of terracotta products in England, though Shaws of Darwen have recently resurrected their terracotta, faience and glazed white brick production lines. There are manufacturers on the Continent (Belgium, Germany and Italy).

46.5.4 Stone

The use of stone and the various repair methods that may be appropriate is a major topic in itself and is not covered here. There are excellent references on the subject, as for the sub-section above. Specialists should be employed both to advise on any work required and to implement it subsequently.

Where stone is used, either as a facing or as a structural element, much of the comment above on brickwork will be generally applicable.

Where new stone is needed it should match the existing in terms of durability and colour. The situation will be different where more extensive replacement is needed as the best practicable option may be selected rather than trying to match the original precisely.

A6.6 Insulation

It is unlikely that insulation will have been part of original historic fabric, but there may be occasions where benefits can be obtained in adding insulation, possibly as part of new work or in order to reduce damaging condensation. Natural products available for such use include sheepswool; loose fill cellulose fibre from recycled paper has also been manufactured. At the same time, however, care is needed when considering any intervention such as increasing insulation, changing heating and other measures that may upset the equilibrium of the building's fabric and lead to its deterioration.

A6.7 Fibre-reinforced Polymer Materials

Fibre-reinforced polymer ('FRP') materials can be used to strengthen concrete, steel, cast iron, masonry and timber structures. Strengthening may be needed for a number of reasons, including the corrosion of structural steel sections and reinforcement. The use of pultruded CFRP plates bonded adhesively to structures provides a method of strengthening that is non-destructive, 'honest' and strictly reversible, although where strengthening is needed to restore capacity rather than to enhance for an alternative use, this would probably be theoretical rather than put into practice. It would however allow the substitution of an alternative scheme should this be proposed at some future date.

A6.8 Cathodic protection

A significant number of masonry-clad steel-framed buildings from the early 20C in particular have shown signs of corrosion where moisture has penetrated the masonry joints and come into contact with the frame. Cathodic protection systems have been used on the embedded iron and steel frames as a means of preventing further protection, and also for retarding corrosion of reinforcement in reinforced concrete.

The system used is known as 'impressed current cathodic protection', as opposed to the 'sacrificial' system used for marine applications. There are some issues with this relatively new application, particularly with regard to the former application and specialist input is required to ensure that cathodic protection is a viable option and that the installation is carried out correctly. Failure to do this can result in *accelerated* corrosion to parts of the framework. The first application to iron elements in listed buildings was in 1991, with a protection system used for a complete façade some five years later.

When this system is used, inspection and monitoring have to be carried out regularly to ensure its efficacy. The latter may be carried out remotely, and may be part of the service offered by the specialist installer. A particular benefit of such a system in terms of conservation is that the protection can be applied without the need to remove extensive areas of cladding.

Further information is available from websites of organisations in both Europe and North America eg <http://www.cpi-online.dk/> and from other references [27, 28].

A6.9 Timber treatments

A6.9.1 General

Treatment of timber may be required where rot or other infestation has occurred. The most common form of treatment will be the use of chemicals; timber may also be affected by the injection of chemical damp proof courses.

A separate report into the impact of chemical treatments [29] considers how these may affect the health of those who live in treated buildings – and those who carry out the treatment – notes the reported incidence of medical problems where remedial treatment has been carried out. It concludes that where such treatment is required it should be

implemented by trained supervisors and operatives strictly in accordance with current guidelines and regulations.

Many of the conditions where such treatment is needed are the consequence of moisture ingress. Clearly there is a need to control this, by appropriate maintenance and environmental regulation. The report provides numerous references on work in this area. It notes that the need for “regular and appropriate levels of repair and maintenance can reduce dampness and prevent the conditions necessary for fungal and insect decay” and that “this is particularly the case with unoccupied buildings”.

A6.9.2 Preservatives

Proposed changes under European regulations to permitted timber treatments will have no impact on existing internal timber. Externally, there will be some issues with the use of softwoods for future work, be it new construction or repairs.

A6.9.3 Protective coatings

A surface sealer is the lightest form of protective coating generally applied to timber. Varnishes and paints may also be used, but these are more substantial and will provide a coating of measurable thickness. Such coatings will provide a water barrier, but are liable to local failure as a consequence of the moisture related movements of timber and require maintenance on a four-to-five year cycle [30].

A6.10 Protection against flooding

The current discussions on climate change suggest that precipitation will increase and that the flooding experienced in parts of the country in the last few years may become a more frequent occurrence. This is considered briefly below, in relation to historic buildings and more recent construction.

Habitations have historically grown and flourished around and on the banks of major rivers; this is not specific to the United Kingdom but a more general feature of human settlement. One of the consequences of this is the historic siting of major buildings in areas that are vulnerable to extreme rises in water. In these cases any protective measures adopted can only be retrofitted.

Improvement of flood resistance may be characterised as:

- Dry-proofing: measures to keep water out of buildings eg barriers to doors and low-level windows, non-return valves on sewers to prevent backflow, covers to airbricks and low-level vents.



Figure 2. Flood barrier across external door (<http://www.antiflood.com/>)

- Wet-proofing: measures to improve the ability of the property to withstand the effects of flooding once it has occurred eg raise electrical fittings (and sockets), improve finishes to walls in lowest storey etc, encase metal services supports.

A6.11 Sources of salvaged materials

Salvaged materials are advertised through various websites and in various trade journals. It would be useful to building owners to have a means of identifying a limited number of reputable sources of the various materials in any one area. The sources of such materials are not always evident and there is obviously a risk that they may be obtained by stripping down empty properties. Every effort must be made to avoid such illicit and destructive activities.

REFERENCES

1. <http://www.scoss.org.uk/publications/cladding.html>
2. <http://www.scoss.org.uk/publications/rtf/AssessmentAndInspections2.doc>
3. BS 7913:1998: Guide to The principles of conservation of historic buildings
4. Maintaining Value: Research by The University of the West of England, Bristol
Module 1: Best Practice Maintenance Management for Listed Buildings
Module 2: Individual Owners' Approaches to the Maintenance of their Listed Buildings
Module 3: The Provision of Commercial Maintenance Services for Listed Buildings
5. Society for the Protection of Ancient Buildings <http://www.spab.org.uk/>
6. http://www.maintainourheritage.co.uk/articles/context_nd.htm
7. The Burra Charter: The Australian ICOMOS charter for the conservation of places of cultural significance (1999)
8. PPG15 Planning and the Historic Environment (Department of the Environment,(now ODPM) 1994)
http://www.odpm.gov.uk/stellent/groups/odpm_planning/documents/page/odpm_plan_606900.hcsp
9. <http://www.bsee.co.uk/news/>
10. <http://www.scoss.org.uk/publications/rtf/CIBeamFailure.doc>
11. The Volunteer Monitor's Guide to Quality Assurance Project Plans. United States Environmental Protection Agency. EPA 841-B-96-003 September 1996
12. Implementation of Digital 3-D Models in Building Surveys Based on Multi Image Photogrammetry, Gunter Pomaska, Prof. Dr-Ing Fachhochschule Bielefeld
13. Hornak, Joseph. The Basics of MRI, <http://www.cis.rit.edu/htbooks/mri/>
14. CIRIA Research Project RP645, Strengthening metallic structures using externally-bonded fibre-reinforced polymers.
15. Maintaining Europe's Built Cultural Heritage, Nigel Dann
[http://www.medicif.org/Events/MEDICI_events/Milan_nov00/Proposals/Nigel_Dunn.htm]
16. Maintain our Heritage PILOT INTERIM REVIEW June – December 2002 and PLAN January – May 2003
17. <http://www.nationaltrust.org.uk/environment/html/features/papers/feat11.htm>
18. <http://www.bedfordpark.org/>
19. <http://www.hgs.org.uk/reference/designguide/index.html>
20. Planned Building Maintenance: A Guidance Note. RICS. 1990.
21. BS 8210: 1986. Guide to Building maintenance management.
22. CIRIA Research Project RP649, Safe Access for Maintenance and Repair
23. An introduction to Building Limes - Michael Wingate
24. Brockett, P and Wright, A. The Care and Repair of Thatched Roofs. SPAB Technical Pamphlet TP/10
25. Preparation and use of lime mortars – Historic Scotland Technical Advice Note TAN 1
26. BS 8221-2:2000 Code of practice for cleaning and surface repair of buildings – Part 2: Surface repair of natural stones, brick and terracotta.
27. Corrosion in masonry clad early 20th century steel framed buildings, Historic Scotland Technical Advice TAN Note 20
28. Cathodic Protection of Early Steel Framed Buildings, Corrosion Prevention Association Monograph No 7
29. Watt, D.S., Colston, B.J. and Spalding, D. (2000). Assessing the Impact of Chemical Treatments on the Health of Buildings and their Occupants. RICS Research Paper Series, Vol 3, No 13, 48 pp. ISBN 1-84219-041-5.
30. Ross, P. Appraisal and Repair of Timber Structures. Thomas Telford, 2002. ISBN 0 7277 2051 1.