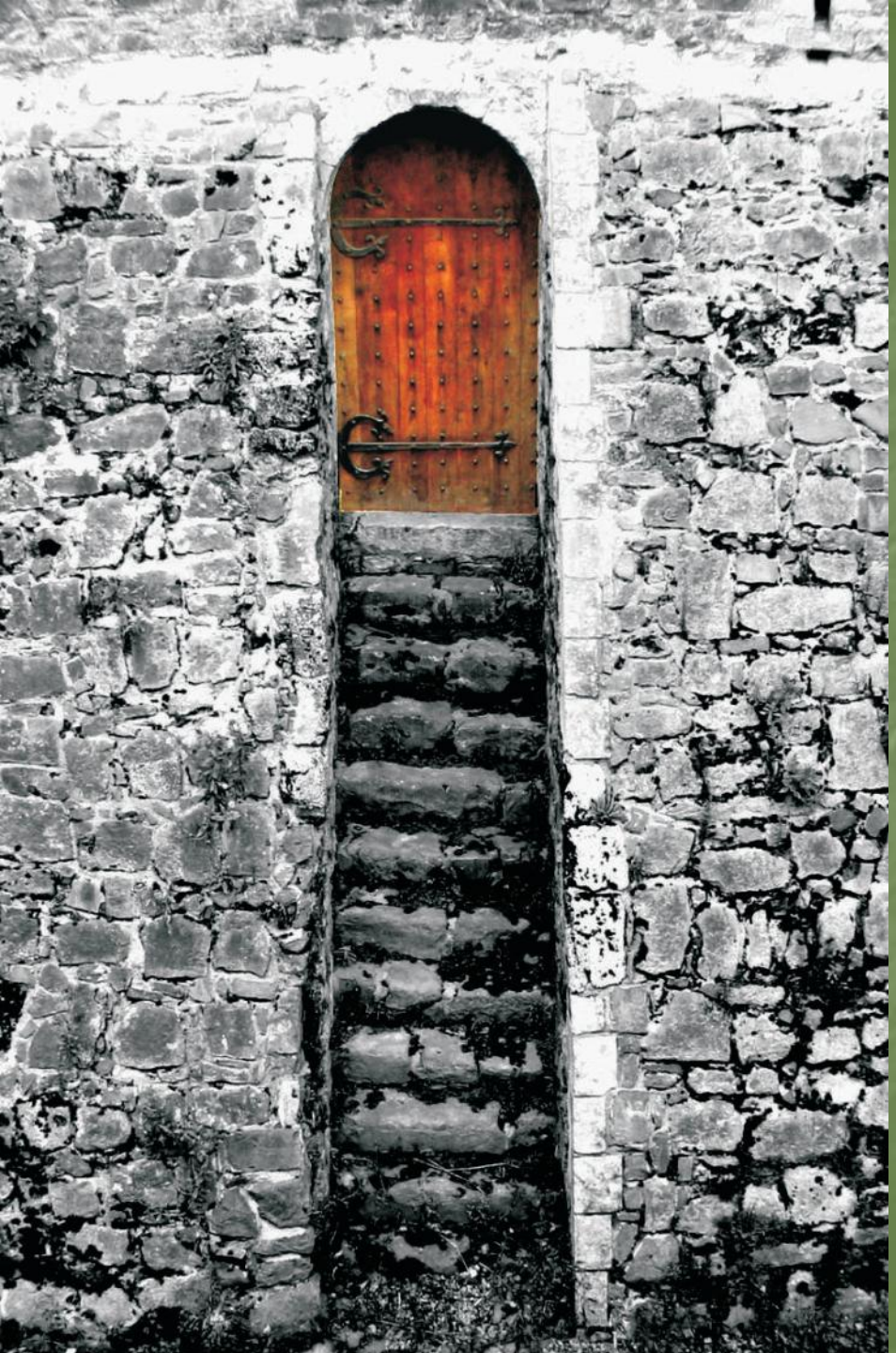


Can Old Buildings be Green Buildings?

Dawson Stelfox

Consarc Design Group

Inherent sustainability

Upgrading thermal efficiency

Incorporating Renewables

Inherent sustainability - Embodied Energy

The energy lost by demolishing a typical Victorian house is enough to fill a car with 15,000 litres of petrol and drive it round the world 5 times (English Heritage)

Inherent sustainability - Avoiding Waste

A quarter of UK landfill is demolition waste

Only 4 % of 70 million tons of demolition waste is recycled

Production of new materials accounts for 10% of UK energy consumption

Re-using buildings and materials saves money, saves energy, saves the environment

Inherent sustainability - Value for money

Research for English Heritage by 'SAVE' showed that full life cycle costs for historic buildings are considerably less than modern buildings

Analysis of the UK 'Pathfinder' scheme showed that the cost of replacement was £60,000/unit whilst the cost of refurbishment of existing terrace houses was £25,000/unit.

The 'Pathfinder' project caused large scale blight whilst large schemes were assembled and procured, whilst refurbishment could have happened on a house by house basis

Respect for the original is not always prevalent!

Inherent sustainability – Imaginative re-use

Chimney Pot Park, Salford by Urban Splash

Inherent Sustainability - Choice of materials

Wood v pvc

nothing is 'maintenance free'

whole life costs rarely considered

Lime v Cement

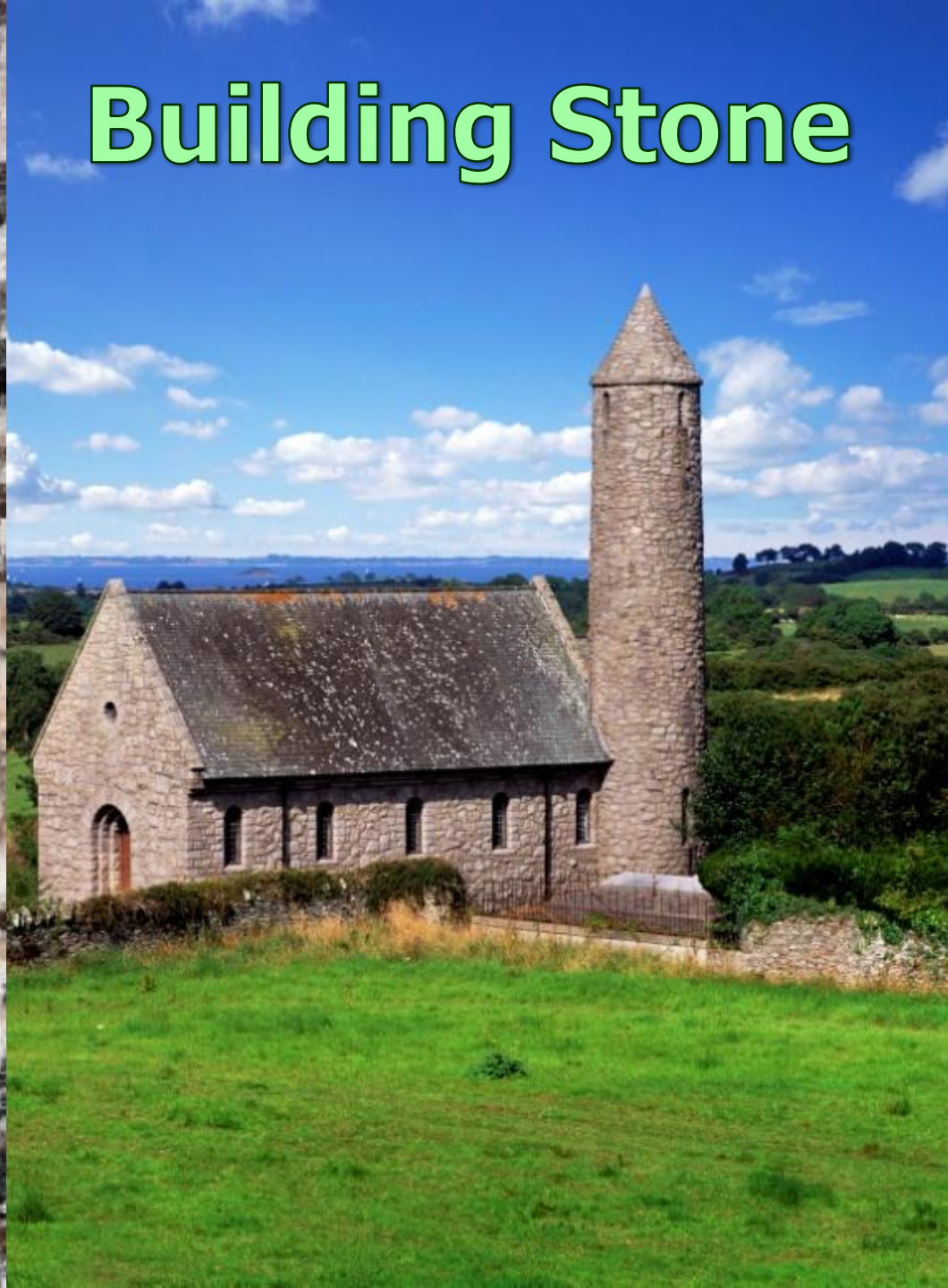
Better for historic buildings

Less energy use in manufacture

Local v imported

Jobs, transport, energy

Building Stone



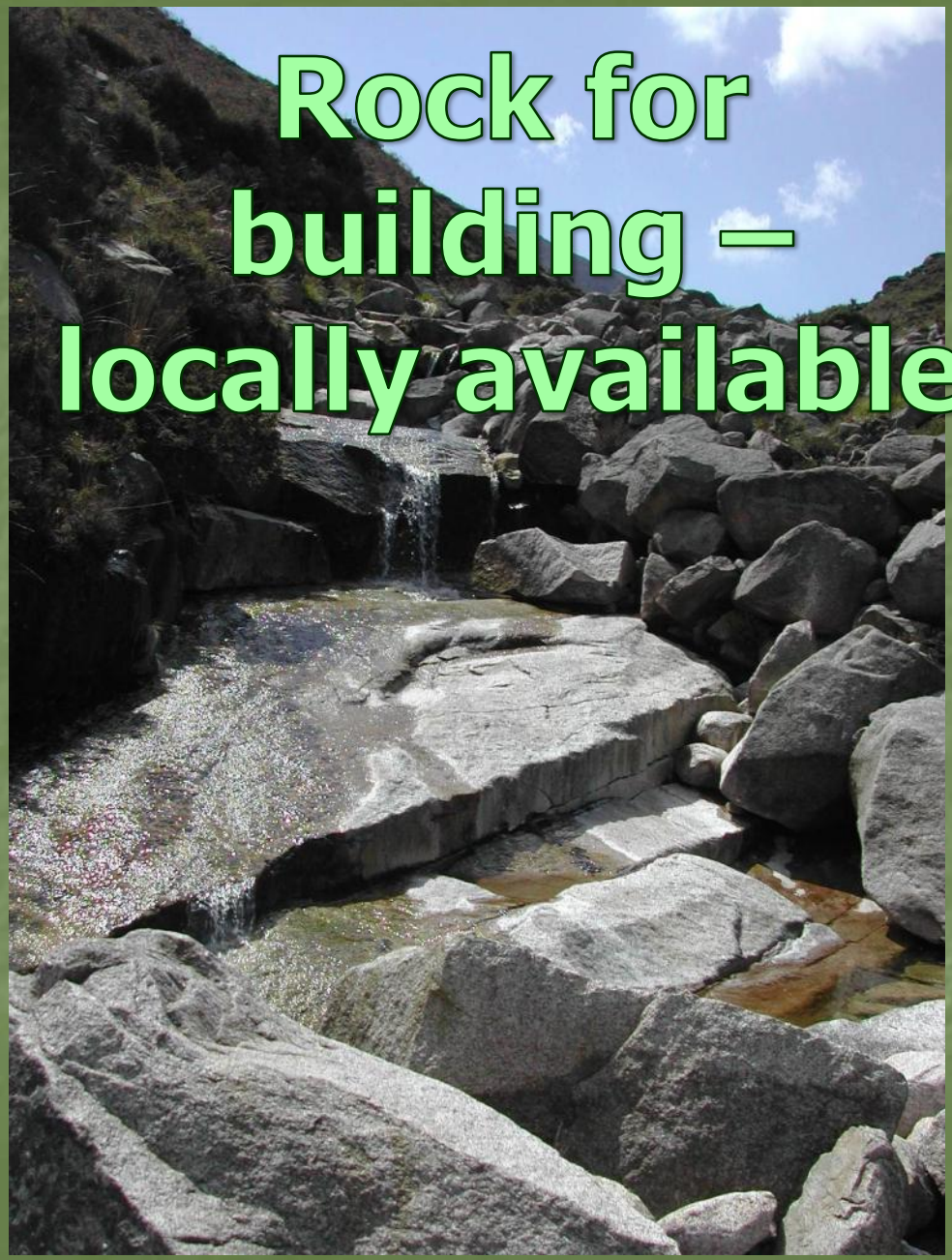
A future for stone

Mourne Mountains, County Down

Public Realm Works in Newcastle, Co. Down
at the foot of the Mourne Mountains

Public Realm Works
Newcastle, Co. Down

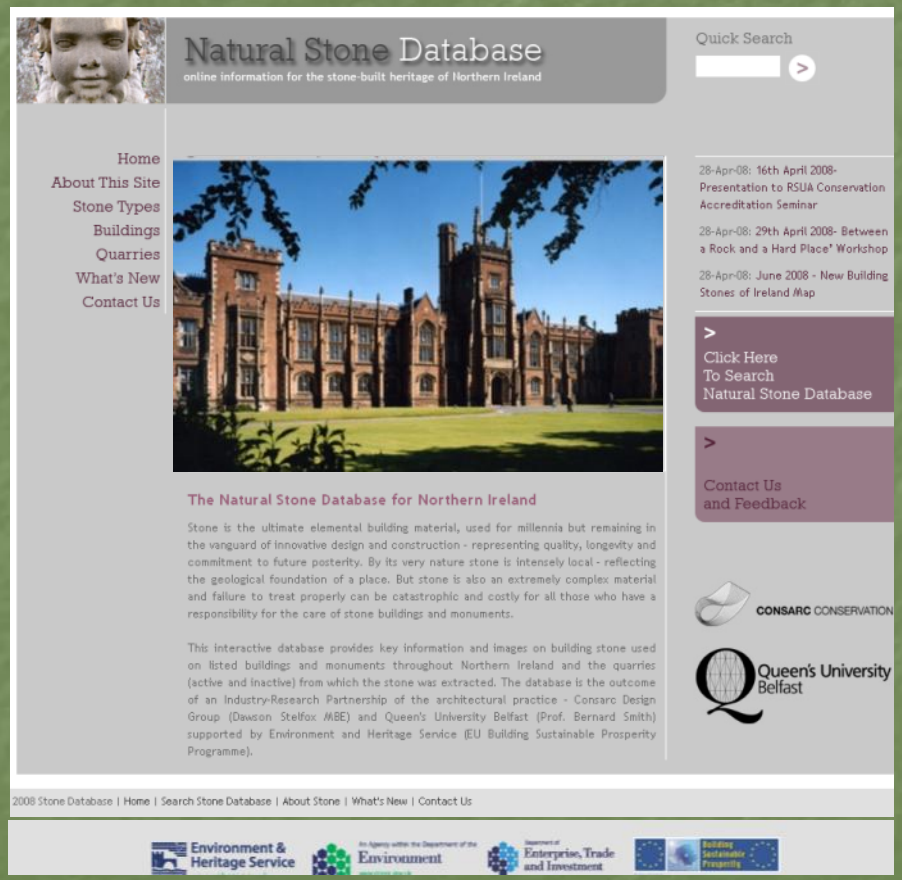
Rock for building – locally available

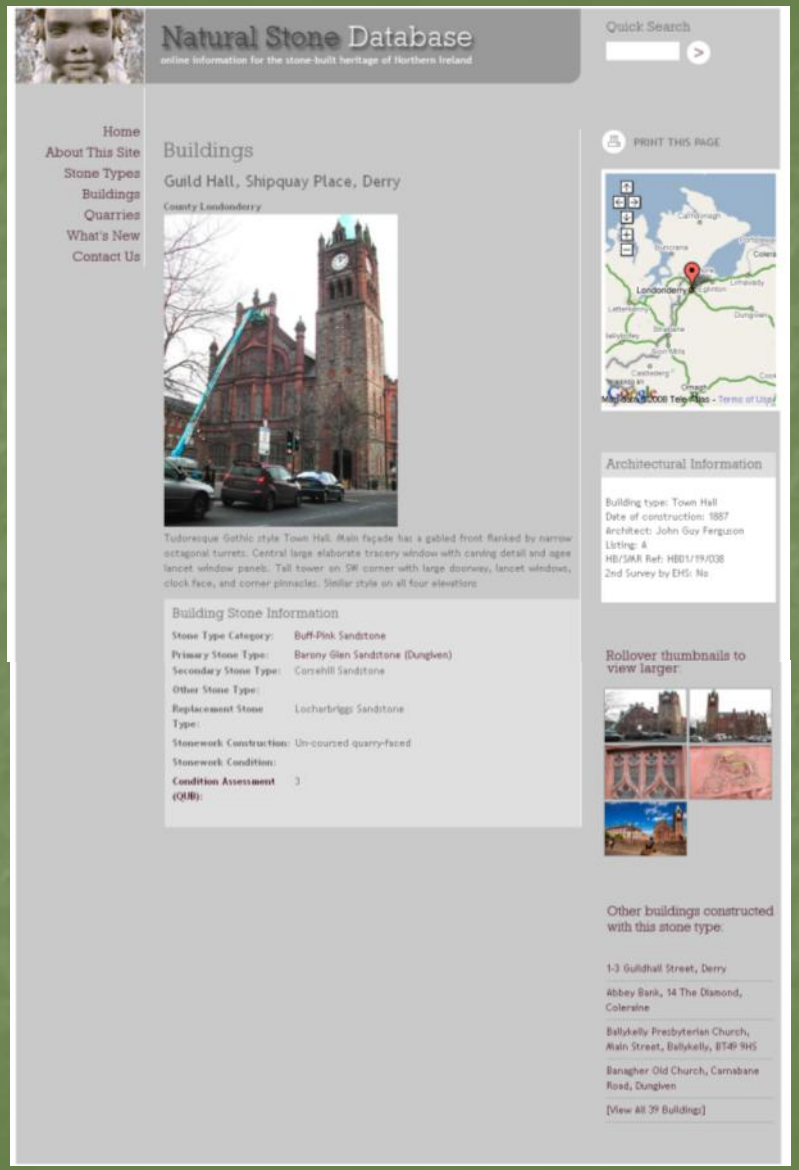


or from further away..

Sourcing Locally

- **The Northern Ireland Stone Database**





Commissioned through NIEA

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http://www.stonedatabase.com//buildings.cfm?bk=1732

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Clady Cottage, 17 Clady Road, Dunadry, BT41 4QR

County Antrim

Thatched cottage. ½ hipped roof. 2 large square windows flank door with sidelights and fanlight. Modern 1 storey extension at rear. Brick dressings

Building Stone Information

Stone Type Category:	Basalt
Primary Stone Type:	Basalt
Secondary Stone Type:	
Other Stone Type:	
Replacement Stone Type:	
Stonework Construction:	Rough-coursed rubble
Stonework Condition:	Stonework in good general condition with no evidence of deterioration.
Condition Assessment (QUB):	1

Architectural Information

Building type: House
Date of construction: c1780
Architect: Not Assigned
Listing: B1
HB/SMR Ref: HB20/12/012
2nd Survey by EHS: Yes

Rollover thumbnails to view larger:

Other buildings constructed with this stone type:

1 Sand Road, Galgorm

104-106 Main Street, Moira

1-12 Cliff Terrace (AKA 12 Apostles)

Internet 80%

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Stone Types

Basalt

Basalt, dolerite and gabbro are basic igneous rocks. The distinction between the three varieties of is based on grain size:

Basalt- fine-grained. Individual crystals are rarely visible to the naked eye

Dolerite- medium-grained. Crystals can be distinguished with the naked eye

Gabbro- coarse-grained. Individual crystals visible

The most common type of local igneous rock is basalt. Local basalt formed during the Tertiary (60-65 million years ago) and formed an extensive plateau that covers most of County Antrim and extends into Londonderry. Its most famous expression is at the Giant's Causeway World Heritage Site. Local basalt is black and fine-grained often with visible vesicles (air bubbles which formed as the rock was cooling). It is an extremely durable stone type although surface discolouration caused by oxidation of iron-rich minerals can give it a 'rusty' appearance. It is used as rock-faced blocks and rubble stone

Choose a sub-category stone type:-

Rollover thumbnails to view larger:

Other buildings constructed with this stone type:

- 1 Sand Road, Galgorm
- 104-106 Main Street, Moira
- 1-12 Cliff Terrace (AKA 12 Apostles), Castlerock
- 2 Lurgan Road, Ballymacanallen, Gilford
- 2 Montgomery Street, Gracehill
- 2 Sand Road, Galgorm
- 31 Church Square, Kilrea
- 7 Academy Street, Gracehill
- Achdi Church, Aghalee
- [View All 281 Buildings]

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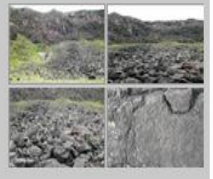
Quarries

Little Deer Park Basalt Quarry (Q108)

Coast Road, S of Glenarm, Little Deer Park County Antrim

PRINT THIS PAGE

Rollover thumbnails to view larger



Quarry Information

Status	Inactive
Stone Type (S):	Basalt
Rock Formation:	Lower Basalt Formation
Open Porosity (%):	2.80 %
Apparent Density (kg/dm3):	2775.94
Probe Permeability (mD) :	

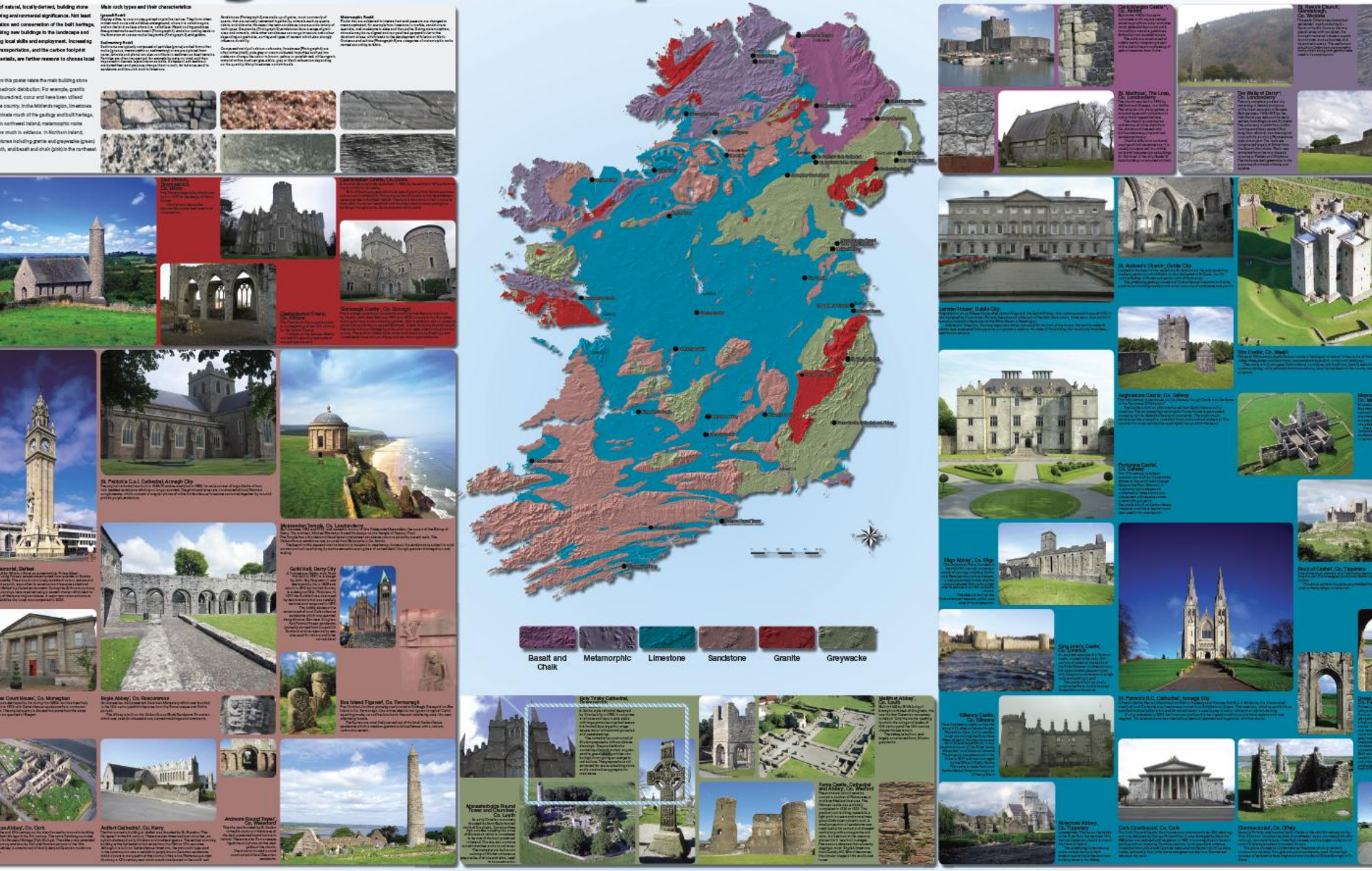
Environment & Heritage Service www.ehsni.gov.uk
An Agency within the Department of the Environment
Department of Enterprise, Trade and Investment
Building Sustainable Prosperity
Department of Enterprise, Trade and Investment
Geological Survey of Northern Ireland
Queen's University Belfast

Internet 80%

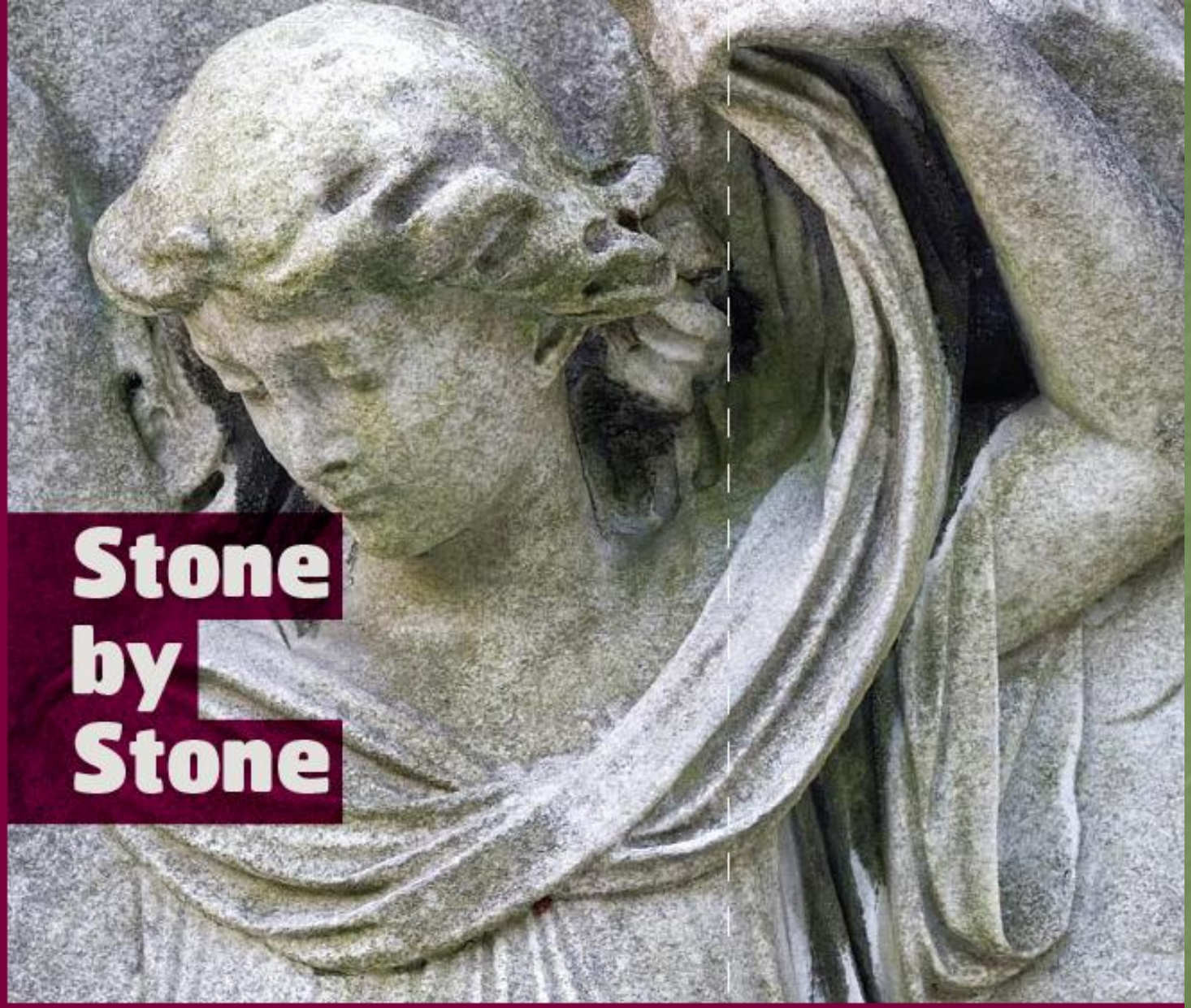
Building Stones Map

A material of almost infinite variety stone is naturally attractive when used as building material. The Building Stones Map illustrates the main stone types used in construction and demonstrates the links between our heritage, the built environment, and Ireland's natural geological foundation.

From Neolithic times to the present Ireland has a history of using stone for building. Many areas, and indeed some counties, developed a distinctive character based on their built heritage. Only with the advent of modern transportation has the movement of local stone, and the importation of exotic varieties, blurred the boundaries of such areas.



Geological Survey of Northern Ireland



Stone by Stone

A Guide to Building Stone in the Northern Ireland Environment

Joanne Curran, Patricia Warke, Dawson Stelfox,
Bernard Smith and John Savage.

Stone by Stone A Guide to Building Stone in the Northern Ireland Environment

Appletree Press

Armagh Limestone

North South Ministerial Council Building
The Merchant Hotel, Extension, Belfast

FEASIBILITY STUDY REPORT

USE OF LOCAL TERTIARY BASALT

AS BUILDING STONE

FOR

CAUSEWAY VISITOR CENTRE

FOR

THE NATIONAL TRUST

September 2009

STONE CONSERVATION SERVICES
Consarc Design Group
The Gas Office
4 Cromac Quay
Ormeau Road
Belfast
BT7 2JD

Tel: 028 90 828 400
Fax: 028 90 241 182
conservation@consarc-design.co.uk

Bradley's Quarry, Kilrea

Basalt blocks for testing

Causeway Visitor Centre

Causeway Visitor Centre

Upgrading thermal efficiency

Typical Heat Loss

25%	Roof
35%	Walls
15%	Floor
15%	Doors
10%	Windows

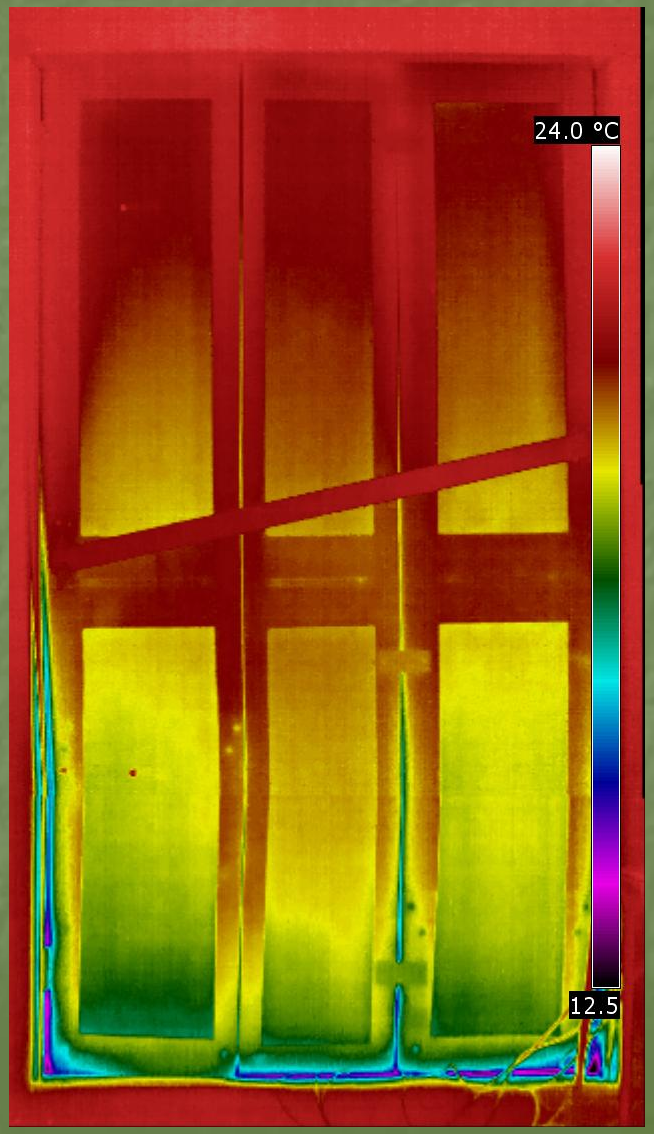
Starting from a shell – upgrading to contemporary standards is relatively straightforward

Key is understanding of the differences between traditional and modern construction, in particular the nature of breathable construction and required air changes

See English Heritage Climate Change Workshop booklet

Is this sustainable?

Improving the thermal performance of traditional windows

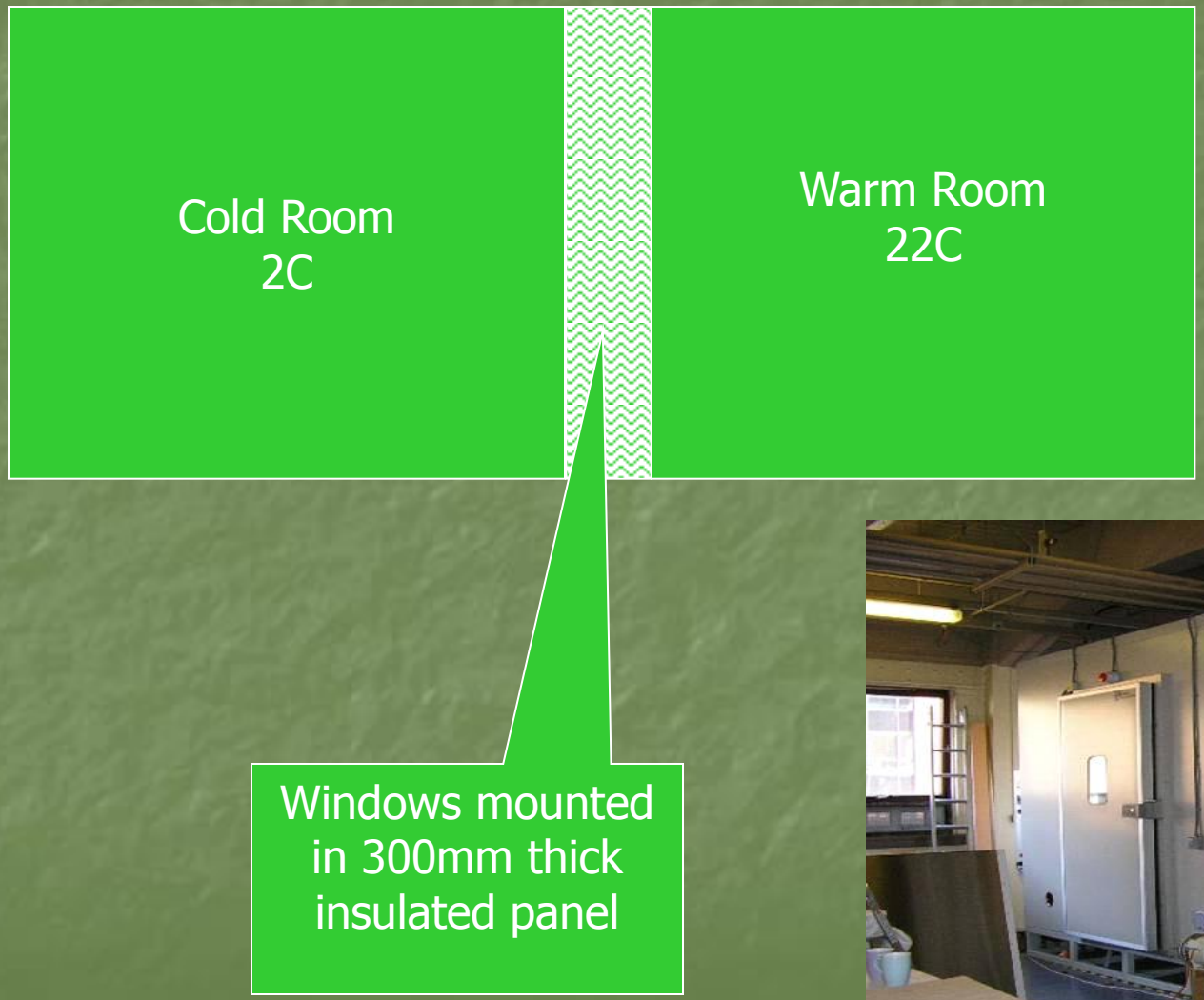


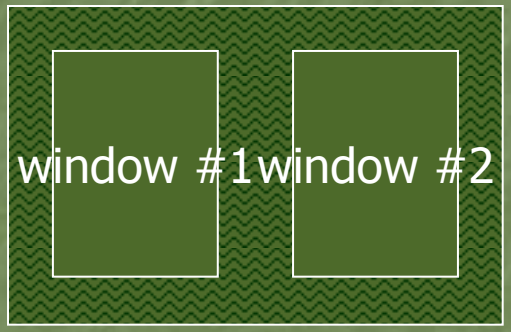
Refurbishment of English Heritage Window before testing

Repair joinery

Gap filling & coat of white primer

Environmental Chamber





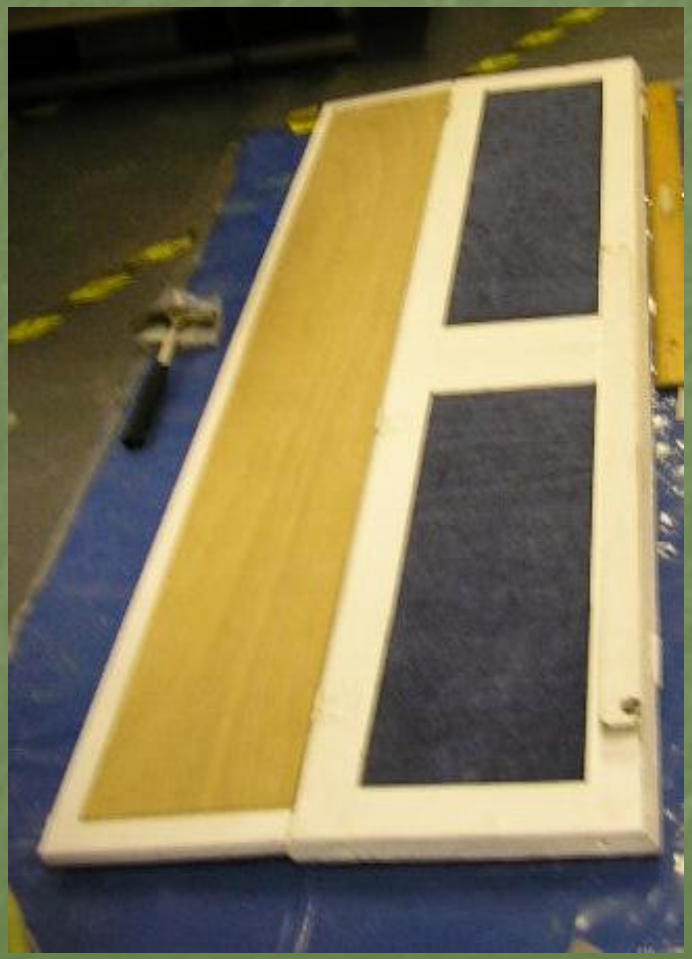
Options tested

- Heavy curtains.
- Traditional Timber shutters
- Modified traditional shutters, with 9mm aerogel insulation inserted into panels and covered with 6mm plywood.
- Modern roller blind.
- Modern roller blind, covered with a low emissivity film.
- A “thermal” honeycomb blind.
- Secondary glazing with low-e coated glazing.
- Double glazed replacement panes

Heavy Curtains

Traditional Shutters

Insulated shutters with 9mm aerogel insulation



Modern Roller Blind

Blind with low-e foil applied

Victorian Blind

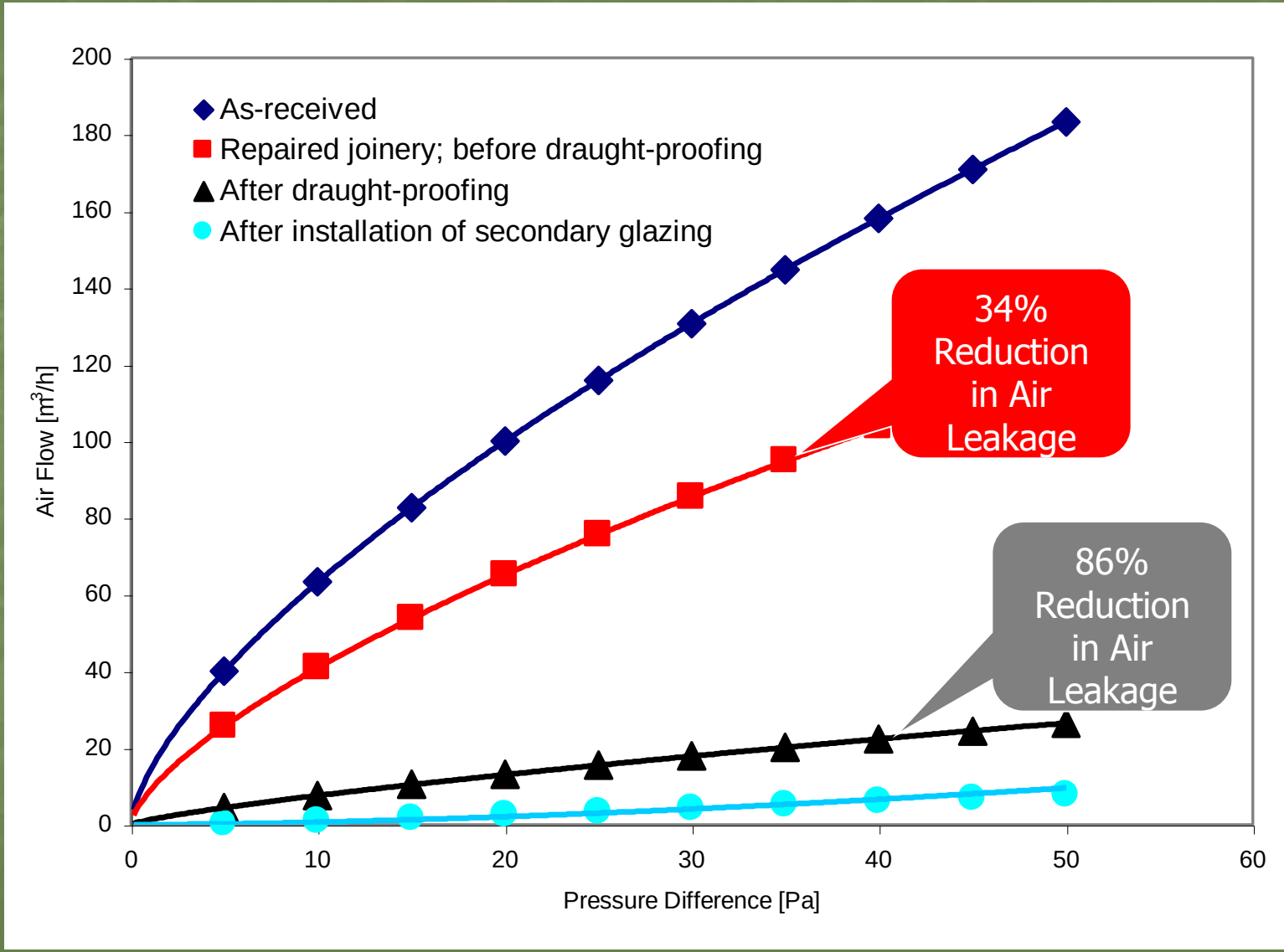
Honeycomb Blind

Low-e secondary glazing system

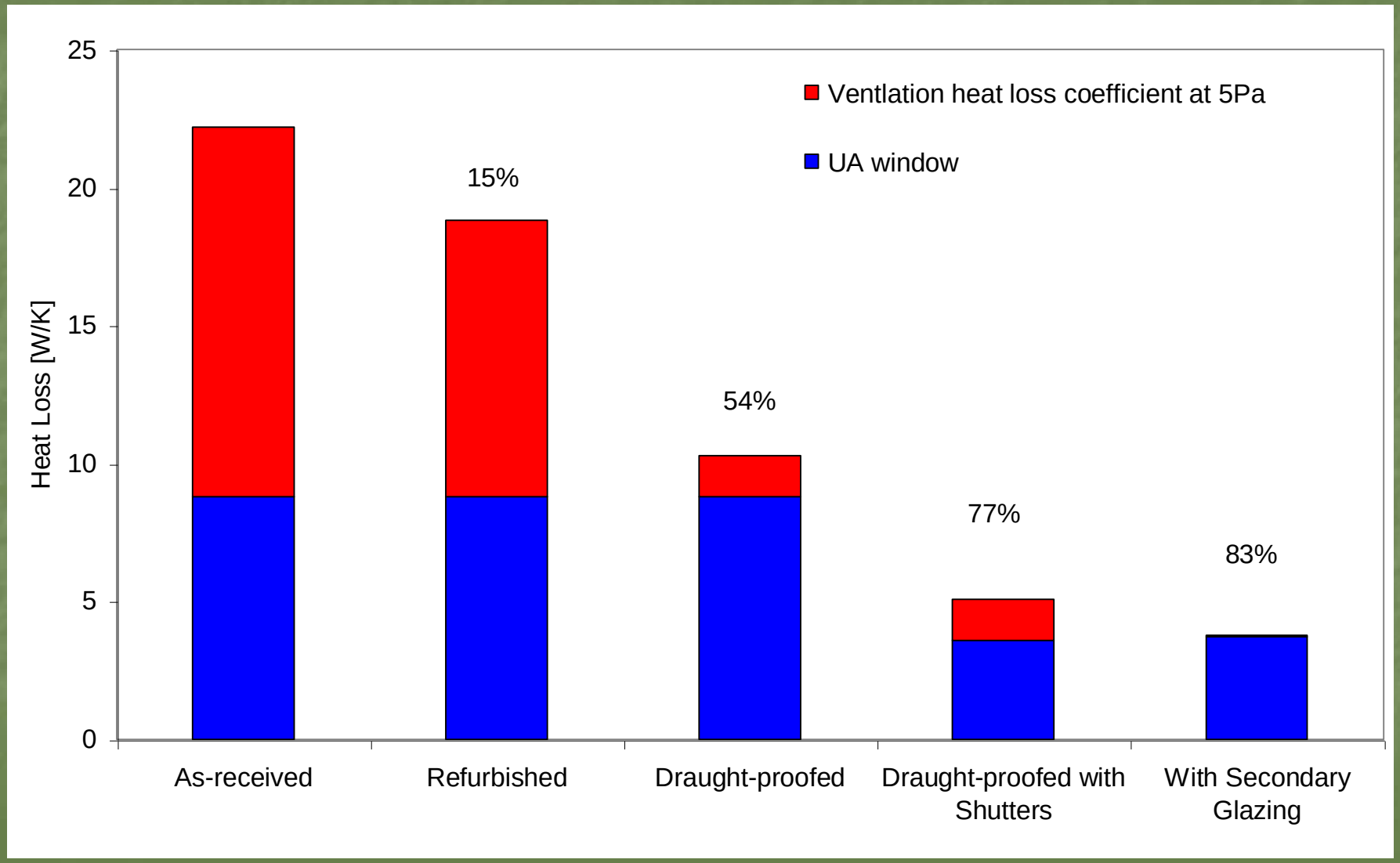
Results

	U-value, W/m²K	Reduction in heat loss through glazing
Centre of glazing only	5.2	-
Curtains	3.2	39%
Victorian blind	3.1	41%
Roller blind	3.1	41%
Roller blind with low-e foil	2.0	61%
Duette honeycomb blind	2.3	56%
Shutters	2.1	60%
Insulated shutters	1.6	70%
Secondary glazing	1.8	66%
Secondary glazing & curtains	1.3	75%
Secondary glazing &shutters	1.3	76%
Secondary glazing & insulated shutters	1.0	81%
Double glazing	1.9	64%

EH Window – Air leakage



Combined effects of reduced conduction and ventilation



Christchurch - the Challenge

- Listed
- Redundant
- Vandalised
- Burnt out

Christchurch – upgrading thermal efficiency

Burnt out shell – therefore :-

New insulated floors

New insulated roof

Dry lined and insulated walls

Efficient air handling and heat recovery

Replacement of single glazed cast iron and timber windows – energy loss compensated by other measures and secondary glazing for sound insulation

Making it Happen

Partnership between RBAI and Belfast Buildings Preservation Trust

NIEA support and grant aid vital

Contemporary Interior within restored historic shell

Historic ceiling restored with original ceiling ventilators used to house air handling and heat recovery system in attic

Christchurch - historic character and thermal efficiency

The Ulster Hall

Keeping the historic interior whilst upgrading thermal efficiency and comfort levels

Upgrading thermal efficiency – retaining historic interiors

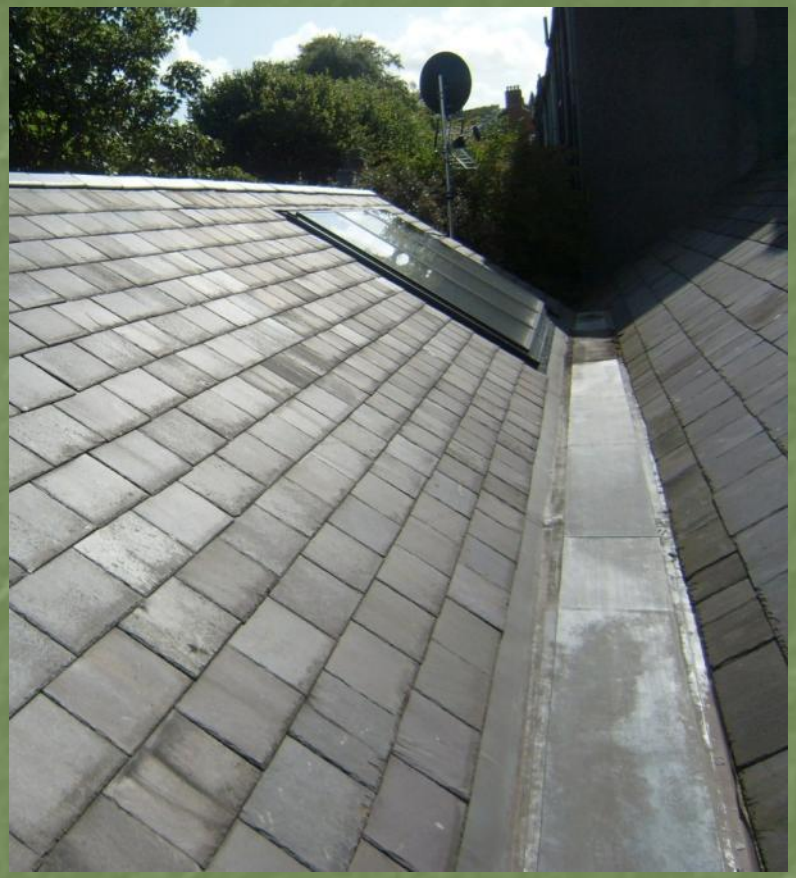
- New roof and insulation
- Reduce air leakage
- Double glazing in original frames
- Air handling and heat recovery in attic space
- Dry lining walls in ancillary spaces

Lowering ceilings, insulating and concealing services, energy efficient lighting

Before

After

Incorporating Renewables



Holywood Old School – Solar panels on hidden, south facing slope

Incorporating Renewables

Green Power in Edinburgh's World Heritage site – the Renewable Heritage Project 2009

Installation of solar water heating in 7 listed Georgian tenements with multi-occupancy.

Project supported by Edinburgh World Heritage

"This project will help dispel the myth that historic buildings are not capable of being sensitively retrofitted with sustainable energy measures"

Solar thermal on listed tenements

Micro renewables – photovoltaics on remote sites

Incorporating Renewables

Air and Ground source heat pumps

Low grade constant heat compatible with high thermal mass traditional buildings

Ground or air source heat pumps linked to underfloor heating with an air handling system that incorporates heat recovery, can be incorporated into traditional structures if a comprehensive restoration is necessary

"The greenest building is one that's already built"

Carl Elefante National Trust US

Embodied Energy Low Carbon Assessment

Research carried out for Historic Scotland, concluded

- Traditional buildings that are well insulated and with efficient heating and lighting have the potential to out perform new buildings over a 100year life when total embodied energy is taken into account
- The simplest energy improvements are ones where there is the most cost/benefit
- In terms of building replacement, even when compared to traditional buildings with very poor thermal performance, investing in a replacement building, even a highly efficient building, is unlikely to recoup the investment over the life of the building
- In terms of cost returns on investment the traditional building refurbishment option has significant cost benefits over the life of the new building, regardless of the energy performance level

Old Buildings are Green Buildings

Embodied Energy

Avoidance of waste and landfill

Repair often more cost effective than replacement

Use of Local Materials – low transport impact and local jobs

Insulation standards usually easily increased

High thermal mass compatible with renewables

It is possible to achieve just as high environmental standards as modern buildings and keep the historic character

Environmental, Economic and Cultural sustainability