



Knowledge, Training & Understanding Deep Energy Renovations of Traditional Buildings.

Peter Cox

Managing Director of Carrig Conservation International



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Peter Cox, Managing Director
Dr Caroline Engel Purcell, Head of Research

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Some Carrig Projects



Building
Structure
Foundation
Roof
Interior
Exterior
Site
Access
Utilities
Other



We have been involved in the following studies

- Fraunhofer Institute of Building Physics
- CEN Technical Committee 346 – WG 8 which delivered EN16883:2017
- 2010 Climate Change and it's Effect on Heritage
- Vulnerability Atlas for Heritage Sites in Wexford
- Gap Analysis of Deep Energy Retrofit Skills & Training
- 10 Module CPD Course on the above
- Understanding Carbon in the Built Environment
- Future of our Past

What I will cover in my talk:

- A Short Background
- Our Experience
- Gap Analysis in Deep Retro Fit Skills & Knowledge
- New CPD Course
- Understanding Carbon in the Built Environment
- Worst Case Scenario



Location: Monastery Benediktbeuern



Benediktbeuern



The Building: Alte Schäflerei / *Old Cooperage*



Front view of the building before renovation.

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Fraunhofer-Zentrum für energetische Altbausanierung und Denkmalpflege Benediktbeuern



Kopfbau der Alten Schäferei

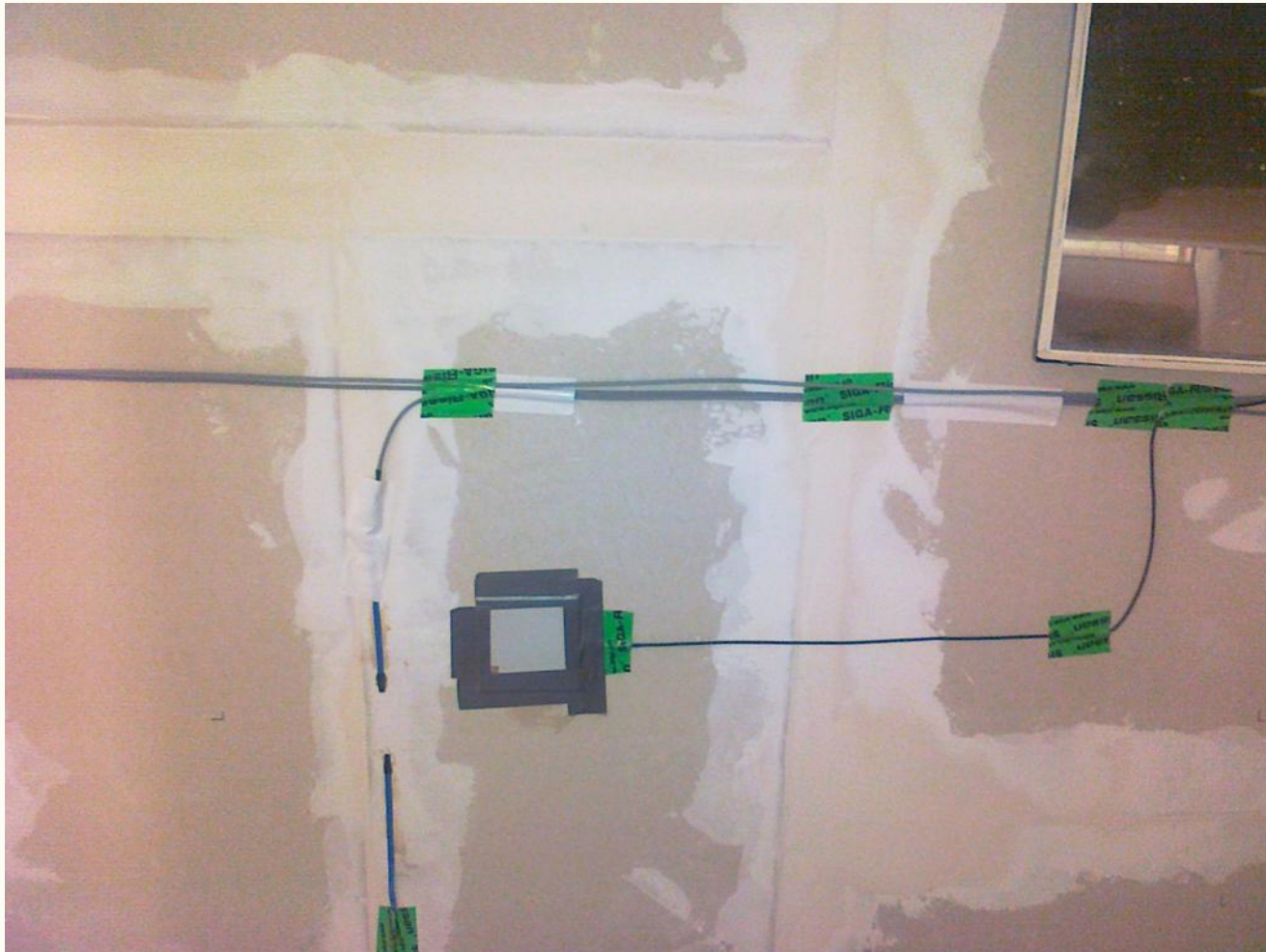
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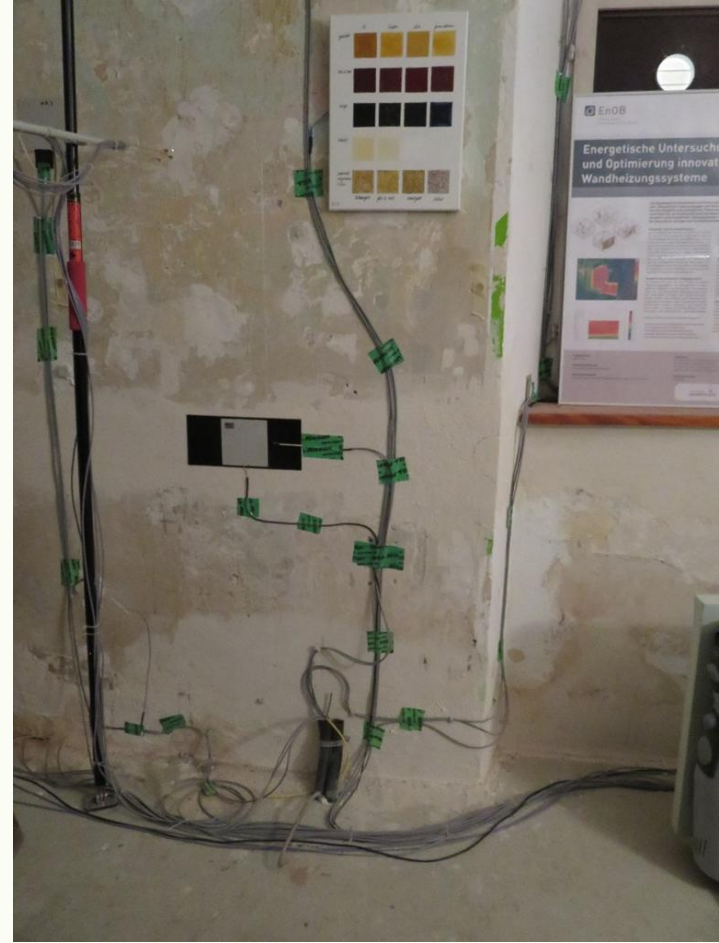
Benediktbeuern



Benediktbeuern



Benediktbeuern



Building Typologies





Deep Energy Renovation of Traditional Buildings

Addressing knowledge
gaps and skills training
in Ireland

Deep Energy Renovation of Traditional Buildings

Addressing Knowledge Gaps and Skills Training in Ireland

Navigating
Gaps in Research
Practice

The Sustainable Energy Authority of Ireland

The Heritage Council

Carrig Conservation International, Ltd.

ICOMOS Ireland National Scientific Committee on
Energy, Sustainability and Climate Change (NSCES+CC)

Author

Caroline Engel Purcell, PhD Arch, MSc Arch Cons, BA Arch

NSCES+CC Steering Committee

Colm Murray, The Heritage Council; **Peter Cox**, ICOMOS International Scientific Committee on Energy, Sustainability and Climate Change and Carrig Conservation International Ltd; **Leila Budd**, Carrig Conservation International Ltd.; **Deirdre McDermott**, Vice President of ICOMOS Ireland.

March 2018



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2.4 Understanding Traditional Buildings

2.4.1 Building Physics and Hygrothermal Behaviour

Nearly all buildings constructed in Ireland from medieval times up until 1940 were constructed using traditional methods³⁴, but what is a 'traditional' building? According to the 2010 DEHLG Advice Series publication *Energy Efficiency in Traditional Buildings*, traditional buildings in Ireland primarily consists of those built with solid masonry walls of brick or stone, often originally finished with a lime-based render, single-glazed timber or metal windows, and a timber-framed roof clad in slate, tiles, copper or lead. Solid masonry walls do not contain an air-filled cavity but were instead often filled with small stones or lime mortar. Brick walls were finished internally with a lime-based plaster while rubble walls were finished both internally and externally with a breathable lime-based plaster that allowed internal moisture to escape through the walls.

Traditional buildings require sufficiently thick external walls to ensure that drying cycles occur before atmospheric moisture reaches the internal wall face. It is essential that all materials and finishes, including mortars³⁵ and renders³⁶, used on traditional walls are porous to allow this natural transfer of moisture to occur. Basic guidance on the detriment of non-porous materials like cement is provided in the HES Inform Guide *Lime and Cement Mortars in Traditional Buildings*³⁷.

The 2007 Conservation Advice Series publication *Maintenance: A Guide to the Care of Older Buildings* also provides a brief overview for homeowners on how old buildings work and how to deal with three common types of damp: rising, penetrating and condensation.³⁸

Under the Intelligent Energy Europe TABULA Project (2009-2012), a study of common Irish residential building typologies and their typical energy and thermal properties was developed into an

[Advice Series: Energy Efficiency in Traditional Buildings \(2010\)](#)

[Advice Series: Maintenance - A Guide to the Care of Older Buildings \(2007\)](#)

[HES Technical Advice Note 15: External Lime Coatings on Traditional Buildings \(2001\)](#)

[HES Short Guide 6: Lime Mortars in Traditional Buildings \(2014\)](#)

[HES INFORM Guide: Lime and Cement Mortars in Traditional Buildings \(2016\)](#)

³⁴ *Advice Series: Energy Efficiency in Traditional Buildings* (2010), Dublin: Department of the Environment, Heritage and Local Government. Available at: <https://www.chg.gov.ie/heritage/built-heritage/architectural-heritage-advisory-service/advice-for-owners/>, p 5.

³⁵ Snow, J. and Torney, C. (2014) *Short Guide 6: Lime Mortars in Traditional Buildings*. Edinburgh: Historic Environment Scotland.

³⁶ Newsom, S., Gibbons, P. and Brown, S. (2001) *Technical Advice Note 15: External Lime Coatings on Traditional Buildings*, Edinburgh: Historic Environment Scotland. Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=33c274be-9e98-49d5-9b24-a5c2009c7bb>.

³⁷ Mitchell, D. D. and Torney, D. C. (2016) *INFORM Guide: Lime and Cement Mortars in Traditional Buildings*, Edinburgh: Historic Environment Scotland. Available at: <https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=9410b4db-0fbb-41e4-ba8d-a59500f5618d>.

³⁸ Donnelly, J. (2007) *Advice Series: Maintenance - A Guide to the Care of Older Buildings*, Dublin: Department of Culture, Heritage and the Gaeltacht. Available at: <https://www.chg.gov.ie/heritage/built-heritage/architectural-heritage-advisory-service/advice-for-owners/>.

ENERGY RENOVATION & MOISTURE- RELATED RISKS

- **Reputable Information Sources**
- UK Centre for Moisture in Buildings (UKCMB)
- Building Research Establishment (BRE)
- Sustainable Traditional Building Alliance (STBA)
- Society for the Protection of Ancient Buildings (SPAB)
- Historic Environment Scotland (HES)
- Historic England (HE)



UKCMB UK CENTRE FOR MOISTURE IN BUILDINGS

Search Go

Home

Welcome to the UKCMB

Two new projects within the UKCMB

UKCMB launches blog with first post: 'Mould: is it really an unbeatable monster?' by Yasemin Aktas

UKCMB's Knowledge Transfer Partnership (KTP) to investigate dampness in buildings

Neil May's White Paper on moisture mentioned in the long-awaited Bonfield Review

Dr Marcella Ucci presents UKCMB findings at the Bartlett Research Exchange

UKCMB Director Neil May awarded MBE in the Queen's Birthday Honours List

UKCMB re-launch event

Hygrothermal Risk Evaluation for the Retrofit of a Typical Solid-walled Dwelling

Avoidance and diagnosis of problems associated with internal wall insulation

Outputs from the UKCMB re-launch event

UKCMB launches a report on the health impact of buildings which are too dry or too damp

UKCMB launches a new video on moisture guidance for existing homeowners

Vacancy: Research Associate - Hygrothermal Modeller at Loughborough University

Feedback from the UKCMB re-launch conference (October 20th 2017)

An update on standards and policy work

UKCMB launches a public report on mould testing and benchmarking

An update on our training programme

New UKCMB management team members

UKCMB launches a new video on moisture guidance for existing homeowners
2 November 2017

The video aims to provide guidance to homeowners on how to avoid moisture problems in existing homes. It provides an introduction to moisture in buildings, explaining in simple terms and images what damp means, where moisture in buildings comes from, as well as, introduce the notion of balance and how this can be achieved.



Moisture guidance for existing homeowners

Watch later Share

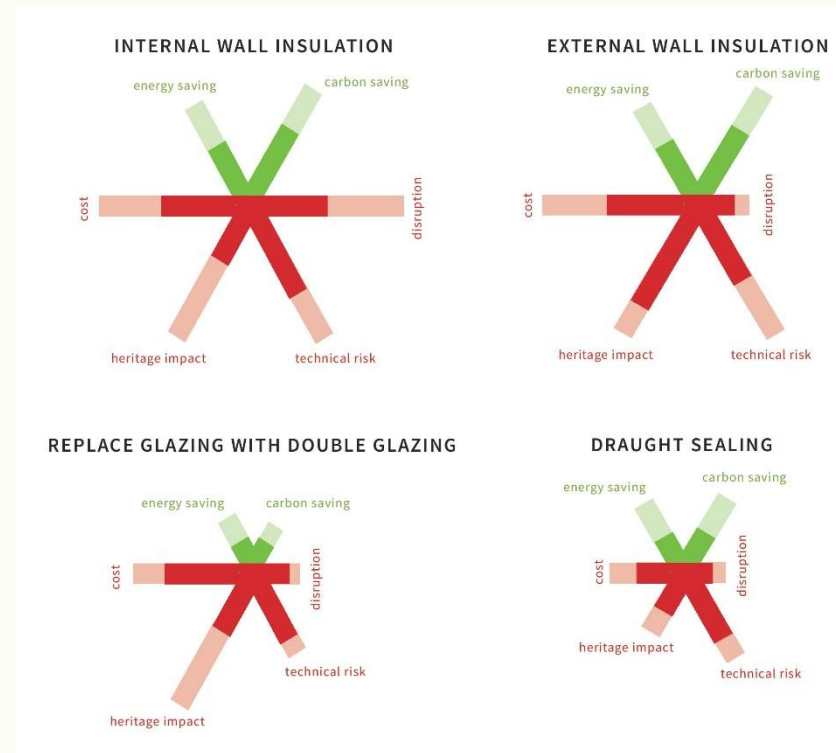
The UKCMB team are also developing an interactive web-based tool which shows how different measures or problems can push a building out of balance in a particular way and how we can start to restore balance. A highly-visual interface will collect information from the user and will provide summary advice for particular problems and where to go for more information.

[Click here to learn more about the research project](#)

<http://www.ukcmb.org/resources/Outputs>

Reputable Information Sources

- **Historic Environment Scotland (HES)**
 - Technical Reports, Technical Advice Series & Refurbishment Case Studies
 - Little, J., Ferraro, C. and Arregi, B. (2015) [HES Technical Paper 15: Assessing Risks in Insulation Retrofits using Hygrothermal Software Tools - Heat and Moisture Transport in Internally Insulated Stone Walls](#)
- **Historic England (HE)**
 - Energy Efficiency and Historic Buildings series:
 - [How to Improve Energy Efficiency](#) (2018)
 - [Insulating Solid Walls](#) (2016)
 - Research Report Series:
 - [Hygrothermal Modelling of Shrewsbury Flax Mill Maltings](#)
 - [External Wall Insulation in Traditional Buildings - Case Studies of Three Large-scale Projects in the North of England](#)
- **Sustainable Traditional Building Alliance (STBA)**
 - May, N. and Sanders, C. (2017) [Moisture in Buildings: An Integrated Approach to Risk Assessment and Guidance](#)
 - [STBA Responsible Retrofit Wheel](#) (2017; adapted for France 2018)



Measuring risk vs benefit of energy renovation options (Historic England, *How to Improve Energy Efficiency*, 2018)

Type search here ...

All Categories



RESPONSIBLE RETROFIT
GUIDANCE WHEEL

Colour key

Building context

Please select the context of your building here:

Heritage
What is the heritage value of the building?
Listed - Important (Listed - Grade 2 in E&W, C ▼)

Condition/State of repair
What is the condition/state of repair of the building?
Fair (Acceptable condition, likely to need some ▼)

Exposure
What is the exposure of the building to wind driven rain? (see B.Regs AD C diagram 12 shows map for UK zones). Apply correction factors if known and as described in BS 8104:1992
Moderate (Wind driven rain (in l/m2 per spell) ▼)

Energy User Type
How does the energy user compares with others in terms to energy use as assessed in the Green Deal Occupancy assessment?
Medium (Typical) Energy Use (Within 20% eitt ▼)

User interest and involvement In Operation
What is the user's level of motivation and knowledge when operating the building?
Uninterested User ▼

Number of exposed sides
How many sides of the building are exposed to wind for ventilation?
Single (Dwelling has a single exposed side) ▼

Wall
Internal Wall insulation

Reset wheel

Deep Energy Renovation of Traditional Buildings Addressing Knowledge Gaps and Skills Training in Ireland

Contracting Authority: Sustainable Energy Authority of Ireland (SEAI)
Partner: The Heritage Council



Deep Energy Renovation of Traditional Buildings

Addressing Knowledge Gaps and Skills Training in Ireland

The Sustainable Energy Authority of Ireland

The Heritage Council

Carrig Conservation International, Ltd.

ICOMOS Ireland National Scientific Committee on
Energy, Sustainability and Climate Change (NSCES+CC)

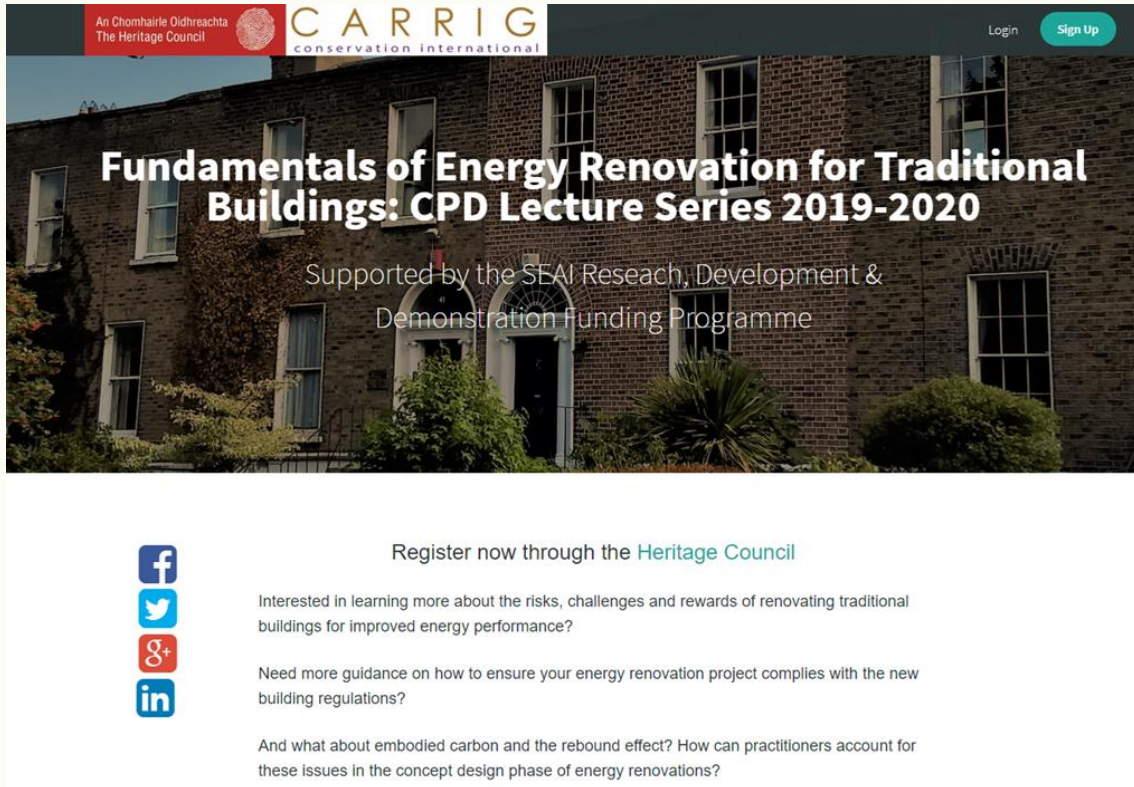
Author

Caroline Engel Purcell, PhD Arch, MSc Arch Cons, BA Arch

NSCES+CC Steering Committee

Colm Murray, The Heritage Council; **Peter Cox**, ICOMOS International Scientific Committee on Energy, Sustainability and Climate Change and Carrig Conservation International Ltd; **Leila Budd**, Carrig Conservation International Ltd.; **Deirdre McDermott**, Vice President of ICOMOS Ireland.

March 2018



The screenshot shows the Carrig Conservation International website. At the top left, it says "An Chomhairle Oidhreachta The Heritage Council" and "CARRIG conservation international". At the top right, there are "Login" and "Sign Up" buttons. The main image is a photograph of a traditional brick building with white window frames. Overlaid on the image is the title "Fundamentals of Energy Renovation for Traditional Buildings: CPD Lecture Series 2019-2020" and the text "Supported by the SEAI Research, Development & Demonstration Funding Programme". Below the image, there are social media icons for Facebook, Twitter, Google+, and LinkedIn. To the right of the icons, there is a registration link "Register now through the Heritage Council" and three bullet points of text.

An Chomhairle Oidhreachta
The Heritage Council

CARRIG
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Login Sign Up

Fundamentals of Energy Renovation for Traditional Buildings: CPD Lecture Series 2019-2020

Supported by the SEAI Research, Development & Demonstration Funding Programme

Register now through the [Heritage Council](#)

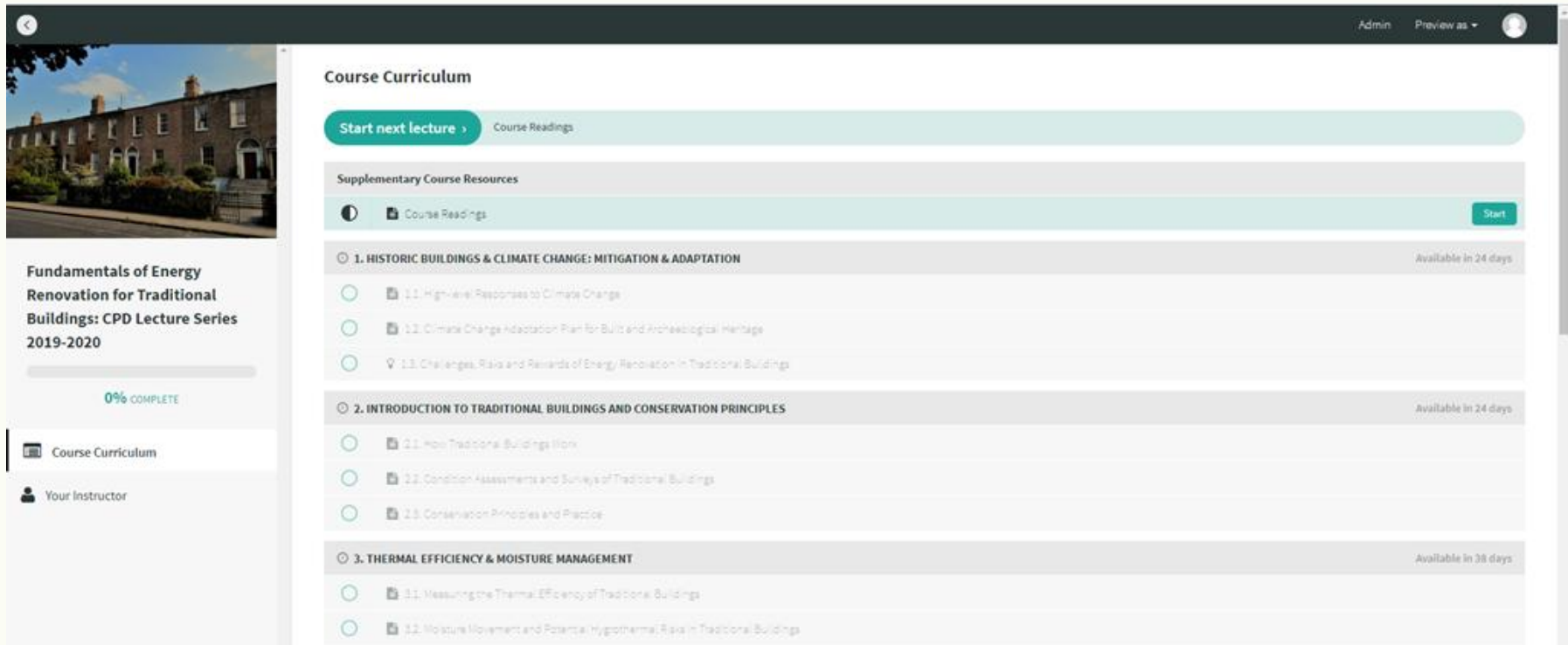
Interested in learning more about the risks, challenges and rewards of renovating traditional buildings for improved energy performance?

Need more guidance on how to ensure your energy renovation project complies with the new building regulations?

And what about embodied carbon and the rebound effect? How can practitioners account for these issues in the concept design phase of energy renovations?

- Developed in conjunction with the Heritage Council
- Attendance fees subsidised by SEAI
- 5 lecture days from November 1st 2019 to January 31st 2020
- Continuing Professional Development (CPD) credits provided by Royal Institute of the Architects of Ireland (RIAI) and Engineers Ireland (EI)

Fundamentals of Energy Renovation for Traditional Buildings: CPD Course



The screenshot displays the course curriculum for 'Fundamentals of Energy Renovation for Traditional Buildings: CPD Lecture Series 2019-2020'. The page is divided into several sections:

- Course Curriculum:** A top navigation bar with a 'Start next lecture >' button and a 'Course Readings' link.
- Supplementary Course Resources:** A section containing a 'Course Readings' link and a 'Start' button.
- 1. HISTORIC BUILDINGS & CLIMATE CHANGE: MITIGATION & ADAPTATION:** Available in 24 days. This section includes three sub-topics:
 - 1.1. High-Level Responses to Climate Change
 - 1.2. Climate Change Adaptation Plan for Built and Archaeological Heritage
 - 1.3. Challenges, Risks and Rewards of Energy Renovation in Traditional Buildings
- 2. INTRODUCTION TO TRADITIONAL BUILDINGS AND CONSERVATION PRINCIPLES:** Available in 24 days. This section includes three sub-topics:
 - 2.1. How Traditional Buildings Work
 - 2.2. Condition Assessments and Surveys of Traditional Buildings
 - 2.3. Conservation Principles and Practice
- 3. THERMAL EFFICIENCY & MOISTURE MANAGEMENT:** Available in 38 days. This section includes two sub-topics:
 - 3.1. Measuring the Thermal Efficiency of Traditional Buildings
 - 3.2. Moisture Movement and Potential Hygrothermal Risks in Traditional Buildings

On the left side of the page, there is a sidebar with a course image, the title 'Fundamentals of Energy Renovation for Traditional Buildings: CPD Lecture Series 2019-2020', a progress indicator showing '0% COMPLETE', and navigation links for 'Course Curriculum' and 'Your Instructor'.

Attendees will be supported by an online resource with suggested readings, speaker presentations and practice quizzes to test knowledge and comprehension.

Modules (2 per day):

1. HISTORIC BUILDINGS & CLIMATE CHANGE: MITIGATION & ADAPTATION
2. INTRODUCTION TO TRADITIONAL BUILDINGS AND CONSERVATION PRINCIPLES
3. THERMAL EFFICIENCY & MOISTURE MANAGEMENT
4. UPGRADING BUILDING SERVICES & INTEGRATING RENEWABLE ENERGY SOURCES
5. LOW-RISK, HIGH-IMPACT ENERGY RENOVATION WORKS
6. SOLID WALL INSULATION
7. COMPLYING WITH BUILDING REGULATIONS & TAKING A BALANCED APPROACH TO RENOVATION
8. PROJECT COORDINATION AND RISK MANAGEMENT
9. REDUCING THE ENERGY PERFORMANCE GAP
10. DEALING WITH KNOWLEDGE GAPS AND UNCERTAINTIES IN PRACTICE

Fundamentals of Energy Renovation for Traditional Buildings: CPD Course



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conservation international

Fundamentals of Energy Renovation for Traditional Buildings: CPD Lecture Series 2019-2020

Lecture Topics

The following 10 modules will be delivered over the 5 days of the lecture series (2 modules per day).

1. HISTORIC BUILDINGS & CLIMATE CHANGE: MITIGATION & ADAPTATION

- 1.1. High-level responses to climate change – *Peter Cox, Carrig Conservation International Ltd.*
- 1.2. Climate Change Adaptation Plan for Built & Archaeological Heritage – *Dr Cathy Daly, University of Lincoln*
- 1.3. Challenges, risks and rewards of energy renovation – *Chris Morgan, Scottish Ecological Design Association*

2. INTRODUCTION TO TRADITIONAL BUILDINGS AND CONSERVATION PRINCIPLES

- 2.1. How traditional buildings work – *Carl Raftery, Dublin City Council*
- 2.2. Condition assessments and surveys of traditional buildings – *Frank Keohane, Chartered Building Surveyor*
- 2.3. Conservation principles and practice – *Jacqui Donnelly, Dept of Culture, Heritage & the Gaeltacht*

3. THERMAL EFFICIENCY & MOISTURE MANAGEMENT

- 3.1. Measuring the thermal efficiency of traditional buildings – *Joseph Little, Technical University Dublin*
- 3.2. Moisture movement and potential hygrothermal risks – *Colin King, UK Centre for Moisture in Buildings*
- 3.3. Case Study: New Court, Trinity College, Cambridge – *Dr Caroline Rye, Archimetrics Ltd.*

4. UPGRADING BUILDING SERVICES & INTEGRATING RENEWABLE ENERGY SOURCES

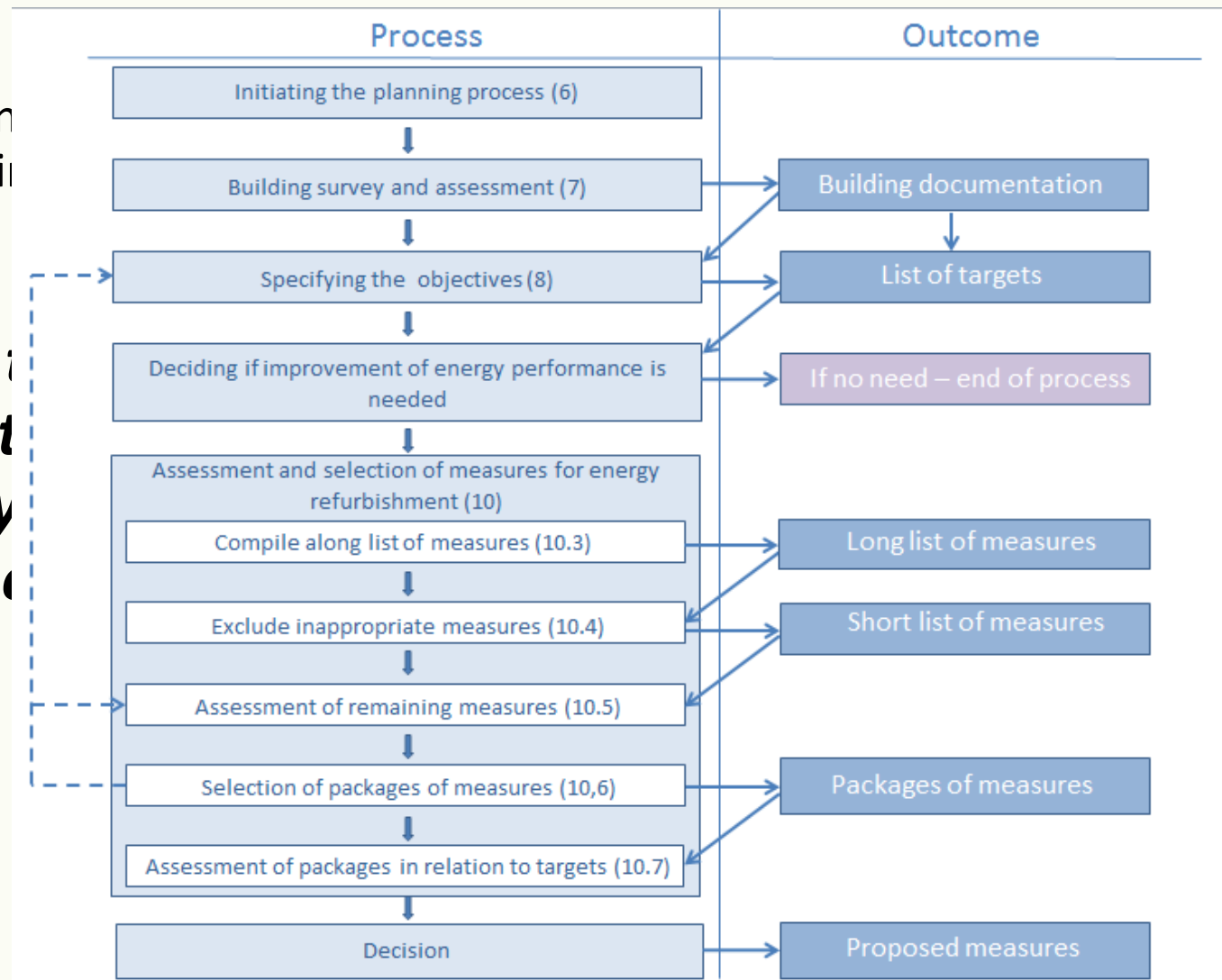
- 4.1. Introduction to low carbon energy sources and heating solutions – *Lis O'Brien, Limerick Institute of Technology*
- 4.2. Managing the design of mechanical and electrical installations – *Edith Blennerhassett, ARUP*
- 4.3. Case Study: Decarbonising National Trust Properties – *Keith Jones, UK National Trust*

Speakers from Ireland, UK and Europe:

- *Dr. Cathy Daly*
- *Chris Morgan*
- *Keith Jones*
- *more examples...*

This is a little known
Standard or Guideline

Guidelines for the Retrofit of Historically Architecturally Culturally Important Buildings.



Deep Energy Renovation Of Traditional Buildings

Social Housing in Preston, UK



 alamy stock photo

BJGM0Y
www.alamy.com

Deep Energy Renovation Of Traditional Buildings

What not to do



Deep Energy Renovation Of Traditional Buildings



Deep Energy Renovation Of Traditional Buildings

Internal Conditions within 7 Years

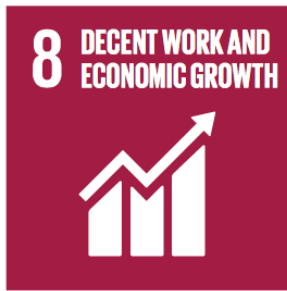


Deep Energy Renovation Of Traditional Buildings

Closer to Home



Sustainable Development Goals



We Need to Stop This.



We Hope to Get to This.



Thar



tion.