



Sustainable Energy Authority of Ireland

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

Research, Development & Demonstration Funding Programme 2018

FINAL REPORT

SECTION 1: PROJECT DETAILS

Table 1.1 – Summary of Project Details

Project Title	Fundamentals of Energy Renovation for Traditional Buildings: CPD Lecture Series 2019-2020
Lead Applicant (Organisation)	The Heritage Council
Lead Applicant (Name)	Colm Murray
Report Prepared By:	Colm Murray
Total Project Duration (months)	One year

	Name	Organisation
Partner Applicant(s)		
Collaborator(s)		
External Consultant(s)	Peter Cox & Caroline Engel and colleagues	Carrig Conservation International Ltd

Project Summary/Abstract (max 500 words)
<p>This Continuing Professional Development (CPD) course built on research conducted under the 2018 SEAI RD&D funded project <i>Deep Energy Renovation of Traditional Buildings: Addressing Knowledge Gaps and Skills Training in Ireland</i>, by providing training for building professionals to overcome in practice the barriers inhibiting the uptake of deep energy renovation of traditional buildings in Ireland. A lack of training materials (and certification systems) has been acknowledged as a major risk and information deficit in the roll out of a future large-scale energy renovation programmes that encompasses traditional buildings. The IGBC's <i>Build-Up Skills Ireland</i> project found that knowledge of energy efficient construction and renovation is lacking at all levels in the construction industry, and that training is not sufficiently aligned with the approaches required to achieve enduring low energy usage in existing buildings.</p>

A number of recent reports by heritage-related bodies have shown that building professionals are unaware of best practice guidance on thermal and energy improvements for traditional buildings: the improper installation of solid wall insulation has led to thermal bridges and excessive damp within a few years of renovation.

We addressed this technical knowledge gap through a five-day CPD training course, focused specifically on the deep energy renovation of traditional hygroscopically-open buildings. The course was developed with the NSAI, ICOMOS Ireland, SEAI, IBCI, IGBC, RIAI, SCSi and Engineers Ireland, and run in November 2019 and January 2020.

The building stock to which this project relates is the estimated 240,000 (16-20%) that are traditionally-built, i.e., not built on principles of excluding all moisture, but vapour-permeable, and well-ventilated. (This set is larger than the 40,000 Protected Structures). The course was devised on the principle that existing buildings should play their part in using less energy and carbon; and that they can be adapted without significant loss of heritage value. Most importantly, to be effective in energy-reduction terms, works must be based on an understanding of how the building fabric works.

The course provided specifiers with information on 'pathways to compliance' with the energy efficiency and fuel saving section of the Building Regulations (*Part L - Conservation of Fuel and Energy – Dwellings*). The model of the course participants was of information-starved specifiers with a prior basic understanding of traditional building construction, decay, and repair techniques, and a professional duty as Assigned Certifier and Design Certifier to certify the compliance of their specified works with the regulations. Specifiers need to be able to generate choices, in order to exercise judgment in their approaches to compliance and other design objectives, such as conservation. There are issues for traditional buildings with regard to energy measures and Part L.

Keywords (min 3 and max 10)

CPD, risk-led specification skills, hygroscopically-open buildings, long-term outcomes

SECTION 2: EXCELLENCE & INNOVATION

(max 2 pages)

2.1 Overall Project Update

Please provide an overview of your annual project progress, the context, objectives, key results and outcomes. If applicable, please include any relevant photographs/graphs, etc.

The project (and the course) straddled two calendar years, and is now completed.

Context

The Government's Climate Action Plan will see the renovation of 500,000 dwellings over the next ten years. This includes some estimated 240,000 houses built before 1919 and therefore using older 'traditional' non-weather-tight building tectonic approaches to air and moisture movement. Whilst this target is benchmarked in terms of Building Energy Ratings, there is an awareness that this cohort of buildings (16-20% of the total) may need to be given bespoke treatment to achieve energy reduction aims, and without damaging their architectural heritage value. Much research has been carried out documenting the need for special approaches which recognise the other qualities of 'breathable' vapour-permeable traditionally-built buildings, but the direct and simplified objectives and procedures set out in *Part L - Conservation of Fuel and Energy – Dwellings: Technical Guidance Document* (2019) makes the process of designing in compliance, whilst respecting the historic qualities of these buildings difficult. The *Deep Energy Renovation of Traditional Buildings: Addressing Knowledge Gaps and Skills Training in Ireland* Report (Funded by SEAI under RDD/00155, 2017) was taken as the background technical report; the recommendation for CPD was made in it.

Objectives

The project set out to upskill a cohort of building renovation works specifiers (architects, engineers and building surveyors) in the thermal renovation of traditional buildings, in the format of CPD. It intended to turn research reports into useful knowledge in the awareness of specifiers as they propose works to older existing buildings. It looked beyond narrow target specification in terms of fabric-preparedness to energy-in-use, indoor air quality, occupants' influence and the protection of the architectural heritage. Through the ambition to achieve quality in these many aspects of building renovation, it also intended to avoid the risk of failure on energy performance terms, which has been a feature of some renovation projects and programmes, where a simplistic view of building performance was taken. Whilst not central to the curriculum, it introduced an awareness of the climate change mitigatory value of embodied carbon in existing buildings: their adaptive re-use in its own terms has a role to play in reducing carbon emissions.

Key results

The CPD course was run over five Fridays in November 2019 and January 2020 at Richmond Barracks Visitors Centre, Dublin 8. A detailed *Post Event Report* on the five sessions is appended. This is largely generated by the 'Teachable' web-based learning support interface, which permitted the collation of rough numerical data to describe the learning experience. It is notable how participants self-assessed confidence to specify energy renovation works was shifted as a result of the course from a median of 5 out of 10 to 7 out of 10 (see p. 82 and 84 of *Post Event Report*).

Outcomes

CPD certificates have been issued to 89 participants who substantially completed the course; there were a further 32 who attended some but not all lectures. 29 experts delivered 27 modules and contributed to the discussions. Innovations were achieved in reaching a target audience in at least six respects, listed below.

The data from the Post Course Survey indicate that the lecture series content was beneficial to the attendees and that their confidence in their ability to specify energy renovation measures was improved as a result of the course.

2.2 Innovation / Novelty – Beyond State-of-the-Art

Please provide an update on your project achievements during this reporting year, detailing how your project has furthered the current state-of-the-art, current knowledge or current practice. Clearly highlight the degree of novelty and innovation demonstrated.

Address each innovation (achieved or anticipated) in a bullet point below. Add as many bullet points as required:

- **Innovation 1: Engaging the most relevant stakeholders in co-devising (or at least expressing an opinion on) the course content.**

A series of three workshops were undertaken prior to the commencement of the project in Spring 2019 to engage with relevant representative bodies about the content of the course. This ensured that it was designed with the preoccupations of potential participants in mind. It also ensured that the organisations were aware of, and 'owned', the concept of the course, and were able to communicate positively with their members about its worth when it was launched.

- **Innovation 2: Analysis of the knowledge-gap problem for specifiers of energy renovation works in existing traditionally-built buildings**

We bridged a gap in the knowledge of a relevant cohort of specifiers who will have a significant impact on the quality of thermal upgrades that will be delivered to Irish buildings in the next ten years. An initial curriculum of ten modules was drawn up, and subsequently modified as a result of the above process. This was further refined and each of the ten topics was broken into three parts, matched against the expertise that the project manager and consultant were aware of in Ireland, Europe, and the UK, who would be able and available to deliver lectures on the topic. This process of refinement and analysis of the knowledge gaps, available expertise, the topics that the speakers were given to address, and how these together provided a 'foundational', packaged analysis, and a lecture programme to bridging the gap.

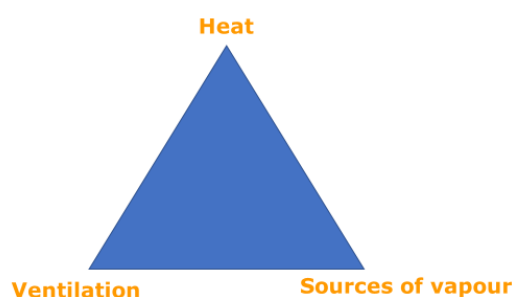
- **Innovation 3: Provision of a structure to access a large amount of technical information with lectures, videos of lectures, reading lists, and the web-link-enabled previous report as an index to the information.**

In parallel with devising the curriculum, the research reports reviewed in the 2017 study (the starting point of the project) were organised in accordance with the lecture programme. The required learning outcome necessitated active collegiate participation, with the participant being in a 'classroom', to ask questions, discuss course content with colleagues over coffee-break and lunch, etc. To augment this conventional learning approach, the 'Teachable' software was used to host videos of most of the lectures, as a means of revising on the content, catching up with mixed nuances, and self-assessment of familiarity with the content. It also made available the relevant technical literature most relevant to the lecturers subject-matter. The interface also allowed for feedback on the reception of the lectures, what subject-matter was missing, or particularly useful to participants. This method of organising the material and making it available for review was innovative and appreciated by participants.

- **Innovation 4: Fixing and communicating a sophisticated and robust aim for the specification of energy renovation works, that takes into account factors that would otherwise pose the risk of undermining the energy-reduction-in-use objective, that will minimise intervention, thus saving cost and historic fabric, and that will withstand scrutiny and comparison in terms of efficacy.**

The lecture series introduced participants to the concept of the Indoor Air Quality (IAQ) triangle, which must be kept in balance in the outcome of renovation works that aim to reduce energy use.

Triangle of Moisture Balance



From Colin King presentation of the forthcoming revision to BS 5250 (2020)

In addition, emphasis was placed on the occupants' role in understanding energy use in the building, and how this could be augmented by the material and legibility of the controls over the energy systems used, commissioning and the hand-over processes. Also, psychological factors in thermal comfort were addressed.

- **Innovation 5: Providing participants with copies of an otherwise-out-of-reach good practice guide as course material**

Each Participant was given a copy of *ISEN 16883 'Conservation of cultural heritage – Guidelines for improving the energy performance of historic buildings'*. This European Norm, referenced in *Part L - Conservation of Fuel and Energy – Dwellings: Technical Guidance Document* (2019: p. 13, para. 0.6.1), provides a structured procedure for approaching the analysis of existing buildings, and the design or specification of works to improve their energy efficiency. A copy was given to each of the participants. Lecturers were asked to refer to its provisions in structuring their inputs. This is a significant broadcasting of a provision of the Irish Building regulatory regime.

- **Innovation 6: Training a cohort of energy specifier to think holistically and robustly about strategies to reduce energy-use-in-buildings by adoption of norms from conservation specification**

The quality assurance or control approaches that are essential as a marker of success in building conservation are based on thinking holistically and strategically about buildings – this approach was transferred to the issue of energy renovation in buildings, looking beyond regulatory requirements to long-term successful environmental outcomes. Whilst life cycle assessment of embodied carbon was not central to any discussion, it was raised as a background criterion against which measures could be judged (alongside IAQ, dealt with separately above).

SECTION 3: RELEVANCE & IMPACT

(max 3 pages)

3.1 Communication, Dissemination and Exploitation

Please provide details of all dissemination activities undertaken during this reporting year, providing references and links where applicable.

The primary purpose of this project was to turn research knowledge into practical knowledge for the design and specification of energy renovation works in traditional buildings.

121 people interested in the specification of energy renovation works to these buildings were in attendance at the course, and their confidence and level of awareness of the issue relating to the energy renovation of traditional buildings was increased in their own reported estimation.

Using the terminology of the RIAI to describe the competency of their profession, the participants came to the course with some degree of 'Awareness' or 'Knowledge of the issues, and left with an enhanced 'Understanding' and perhaps 'Ability', though the course did not set out to assess or certify such ability as its goal. The measure of their advancement can be gauged through the comments and feedback captured in the Teachable learning support web interface, as distilled in the *Post Event reports*, appended herewith.

Annual Dissemination Summary Tables

If applicable, please list details of any scientific publications in Table 3.1 on the next page. Please mention papers published in peer-reviewed journals or papers disseminated at conferences (e.g., on the conference website, etc.).

Please list details of all dissemination activities in Table 3.2 on the next page (e.g., publications, conferences, workshops, websites/applications, press releases, flyers, articles in press, videos, presentations, exhibitions, thesis, interviews etc.).

Not applicable.

3.2 Intellectual Property Management & Exploitation

If applicable, please provide details of any patents or IP generated as a result of this research award, or underway.

The chief 'property' of this project is the curriculum structure and the network of contacts with international experts that the project manager and consultancy were able to bring to the organisation of the CPD course. There is no doubt that a course like this will be needed again; indeed there is a waiting list of attendees for a future iteration of the course should the promoting organisation, the Heritage Council, run it again. Nonetheless, the curriculum structure is freely available to be used by others.

The intended learning outcome for this course necessitates the students participating in the classroom. Videos of the lectures were made as *aide memoires*, and not for further or future training purposes. The permission of the lecturers to have themselves recorded was made on this basis. In any case, the rate of development of regulations, good practice and technical know-how in this fast-evolving area means that the lessons imparted will also change with time, and we will not hold the presenters as having the last word as regards their knowledge field at the time of making the presentation. Therefore, it is not intended to re-use the videos.

Table 3.1 – List of Scientific Publications

Title	Main Author	Journal Title	Number, Date or Frequency	Publisher	Year of Publication	Is/will open access be provided? If you marked “will”, please provide an estimate of the date	Peer-reviewed (Y/N)?

Table 3.2 – List of Dissemination Activities

Type of Activity	Main Leader	Title	Date/Period	Location	Type of Audience*	Size of Audience
CPD lecture course	Colm Murray Peter Cox, Caroline Engel Purcell, Leila Budd	Fundamentals of Energy Renovation for Traditional Buildings: CPD Lecture Series 2019-2020	November 2019 and January 2020	Richmond Barracks Visitors Centre, Dublin 8	Industry: Specifiers – Architects, Engineers and Building Surveyors	120

*Scientific Community (Higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).