



**POLITECNICO**  
MILANO 1863

**ABC<sup>PhD</sup> DOCTORAL PROGRAM**  
IN ARCHITECTURE BUILT ENVIRONMENT  
AND CONSTRUCTION ENGINEERING

**ABC<sup>PhD</sup> CALL4SCHOLARSHIP 32b**

Research topic T4: ENERGY RETROFIT OF HISTORIC BUILDINGS

**(32b-T4 Energy Retrofit of Historic Buildings)**

# ABC PhD Programme – CALL 4 SCHOLARSHIPS 32b

Thematic Scholarship 32b-T4 “Energy Retrofit of Historic Buildings”



**POLITECNICO**  
MILANO 1863

**EURAC**  
research

## Funding and management of the thematic scholarships

- Number of scholarships: 1 (one)
- Monthly net income: € 1.400,00 (max 36 months)  
[In case of a change of the welfare rates during the three-year period, the amount could be slightly modified]
- Additional support: Funding for educational activities<sup>(\*)</sup>: € 1.370 per student [for the 2<sup>nd</sup> and 3<sup>rd</sup> year]
- Starting of PhD activity: 1/11/2016
- Deadline for application to the call: 9/09/2016
- Research Director: prof. Niccolò Aste
- Research Group: proff. Niccolò Aste, Valeria Pracchi, Alexandra Troi (EURAC).
- Funding and cooperating Institutions: the scholarship is co-funded by Politecnico di Milano, Department ABC and EURAC, *European Academy of Bozen/Bolzano*.

(\*) (purchase of study books and material, funding for participation in courses, summer schools, workshops, conferences)

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## Thematic Scholarship 32b-T4 “Energy Retrofit of Historic Buildings”

### Context of the research activity

Historic buildings make up a considerable part of our building stock (one fourth for Europe). They are the trademark of numerous cities, and they will only survive if maintained as a living space. This means, that in order to save this heritage for future generations, we need to find conservation compatible energy retrofit approaches and solutions, which allow to preserve the historic and aesthetic values while increasing comfort, lowering energy bills and minimizing environmental impact.

In the last 10 years a shift in paradigm could be observed: While in times of the first EPBD, a strong opposition from conservators and architects could be observed – “don’t touch these buildings” – there is growing a new openness, a much more constructive approach – “let’s find the right solutions together”. Examples for this development are last but not least the installation of the International Scientific Committee on Energy and Sustainability within ICOMOS and the development of “Guidelines for improving the energy performance of historic buildings” (FprEN16883, now under final vote) by the CEN TC 346 on Conservation of Cultural Heritage.

Realised examples show that a reduction of “Factor 4” (i.e. reduce the energy demand by 75%) and beyond is possible also in historic buildings preserving their heritage value, depending however on the specific case. Since there will be also historic buildings where only little improvement is possible, on regulation level a minimum performance as for “standard” buildings would not make sense - historic buildings profit from a “negotiation space”. When looking at the specific building, however, the design team should not “stop thinking” too early!

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## Thematic Scholarship 32b-T4 “Energy Retrofit of Historic Buildings”

### **Motivation and objectives of the research**

The objective of this PhD position is to deepen the knowledge on how to save energy in renovation of historic and protected buildings in a cost efficient way without losing their heritage value.

The research will assess replicable procedures on how experts can work together with integrated design to maintain both the heritage value of the building and at the same time make it energy efficient. At the same time, it will identify conservation compatible retrofit solutions in a “whole building perspective”, taking into account the range of aspects from hygrothermal compatibility over life cycle performance to conservation principles.

### **Educational objectives**

At the end of the doctoral program, the Candidate will know in depth the topic of energy retrofit of historic buildings.

It is expected that the candidate will take part in the IEA SHC task on “Deep Renovation of Historic Buildings towards lowest possible energy demand and CO2 emission (NZEB)”, which is now in task definition phase and will start mid 2017. EURAC is operating agent for this Task and will be actively involved, with Politecnico di Milano, Dept. ABC in all the activities of the Tasks.

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## Thematic Scholarship 32b-T4 “Energy Retrofit of Historic Buildings”

### **Methods and techniques that will be used to carry out the research**

The research activity will be closely related to the IEA SHC task “Deep Renovation of Historic Buildings towards lowest possible energy demand and CO<sub>2</sub> emission (NZEB)”, which is planned to be divided in four subtasks with several activities beneath. The Candidate is expected to complete his/her skills following a series of courses to be planned as soon as possible and to gain research experience taking part to the four subtask activities:

**Knowledge Base** - Collection and analysis of Best Practice cases with the aim of understanding and demonstrating retrofit feasibility and the criticalities of expert collaboration in complex projects towards the same goal.

**Multidisciplinary planning process** – Identification of replicable “integrated design procedures” (how experts can work together and make compatible conservation issues with energy efficiency) and collection of feedbacks from the application of EN 16883 and the practice of comprehensive diagnosis, identification and assessment of potential measures on multiple criteria on a multidisciplinary basis.

**Conservation compatible retrofit solutions** – Identification of replicable solutions from case studies and R&D experience on conservation-compatible retrofit solutions.

**Demonstration and dissemination** – **Organization and participation** to a series of workshops for different target groups. Writing of guidelines and recommendations for policy makers.

It is expected that the candidate will develop publication record in recognized international peer review journals, and presented at scientific conferences. The “dissemination-plan” will be defined and periodically updated in agreement with the Politecnico di Milano and EURAC supervisors.

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## Skills of the candidate

At the end of the research project the candidate will have acquired skills and expertise to operate in the fields of:

- Knowledge of building physics
- Building modelling, energy dynamic simulation, optimization strategies
- Comprehension of conservation principles
- Familiarity with RES integrated in building system
- Energy economics fundamentals

## Job opportunities

This research offers to young graduated as well as to professionals, an indepth knowledge in the field of energy efficient buildings, energy storage and optimization strategies, that can be used afterwards in academia or in the professional market.