

## PROVIDE INSTRUCTIONS AND RESOURCES FOR ASSESSMENT AND TRAINING IN EARTHBUILDING - THE PIRATE PROJECT

Stephan Jörchel<sup>1\*</sup>, Lydie Didier<sup>2</sup>, Rowland Keable<sup>3</sup> and Paulina Faria<sup>4</sup>

1: German Association for Building with Earth  
PO Box 1172, 99409 Weimar  
Germany

e-mail: [dvl@dachverband-lehm.de](mailto:dvl@dachverband-lehm.de), web: <http://www.dachverband-lehm.de>

2: CRAterre International Centre for Earth Construction  
BP 53, 2 rue de la Buthière, 38092 Villefontaine Cedex  
France

3: Earth Consultant and UNESCO Chair on Earthen Architecture  
86 Brougham Road, London, E8 4PB  
United Kingdom  
e-mail: [rowland@rammedearthconsulting.com](mailto:rowland@rammedearthconsulting.com)

4: NOVA University of Lisbon and Centro da Terra Association  
Faculty of Sciences and Technology, 2829-516 Caparica  
Portugal

e-mail: [paulina.faria@fct.unl.pt](mailto:paulina.faria@fct.unl.pt), web: <http://www.fct.unl.pt>; <http://www.centrodatterra.org>

**Keywords:** Earth Building, Learning Outcomes, Education, Vocational Training, ECVET

**Abstract** *Earth is a unique building material which is easily accessible and available. Building products and processes using earth need little embodied energy during the whole life circle. The use of earthen building material reduces the carbon dioxide emissions and contributes to a healthy indoor climate. Moreover earth architecture has an aesthetic value. Historic and modern buildings take advantage of these technical, aesthetic, environmental and social benefits. There is a still small but growing market in earth construction. The advances obtained with PIRATE project, trying to contribute for the growth of this specific market, will be presented in this paper. The PIRATE project aims to disseminate the benefits of modern earth construction by creating lifelong learning opportunities, putting the emphasis on competence standards in this sector. Eighteen organisations from eight European countries, all active in the earth construction sector as professional associations, education and training providers or small companies, have come together to develop units of learning outcomes and get them recognised within national certified courses. The new standards comply with the European Qualification Framework (EQF) and the European Credit System for Vocational Education and Training (ECVET).*

## 1. OVERVIEW

Earth is a unique building material which is easily accessible and widely available. Building products and processes using earth need little embodied energy during their whole life cycle. The use of earthen building material reduces carbon dioxide emissions and contributes to a healthy indoor climate. Moreover earth architecture has an aesthetic value: historic and modern buildings take advantage of its ecological and its aesthetic benefits (Figure 1).



Figure 1. Earth building uses both new and old technologies, like this rammed earth in a recent project in London

There is a small but growing market in earth construction. But earthen construction has been systematically ignored or removed from general use around the world through a lack of generally agreed norms or standards. While other technologies have created norms as a regular pattern of practice it is only in the last decade that earthen structures have begun to find a voice.

Norms and standards are commonly thought to relate to products, an important area of development for advancing earth building. But without trained workers, without recognised qualifications, product standards cannot go far. Who will use these products? Who will take the risk in designing with them and commissioning them?

Both training standards and codes of practice are areas which require urgent attention if earth is to compete with ‘conventional’ construction. Of course convention in this case is something extremely recent, reaching back perhaps to the middle of the 20th century. Prior to that earth was a widely used and accepted building material since unrecorded historical times.

## 2. WHAT IS PIRATE

The PIRATE project aims to disseminate both the ecological, technical and aesthetic benefits of modern earth construction by creating lifelong learning opportunities and thus also contributing to social needs. Eighteen organisations from eight European countries, all active in the earth construction sector as professional associations, education and training providers or small companies, have come together to develop competence standards in this sector. The new standards comply with European Qualification

Framework (EQF<sup>i</sup>) [1] and European Credit System in Vocational Training and Education (ECVET) [2]. ECVET is a European instrument to support lifelong learning, the mobility of European learners (and professionals) and the flexibility of learning pathways to achieve professional qualifications. The three year project applies these European tools to the earth building sector by identifying learning outcomes. Project partners have analysed crafts and trades, which use earth as a building material in the eight EU countries: Czech Republic, France, Germany, Portugal, Slovakia, Spain, Serbia and United Kingdom (Figure 2). The intense and dense dissemination activities of the consortium have evoked an increased interest in education and training both for craftspeople and in higher education. A growing Earth building community of training providers is interested to offer outcome-orientated training and to create new qualifications by integrating these new Earth building units. They will offer ECVET Earth Building certificates to interested learners in future. Dissemination will increase addressing both training providers and a wider earth building community.

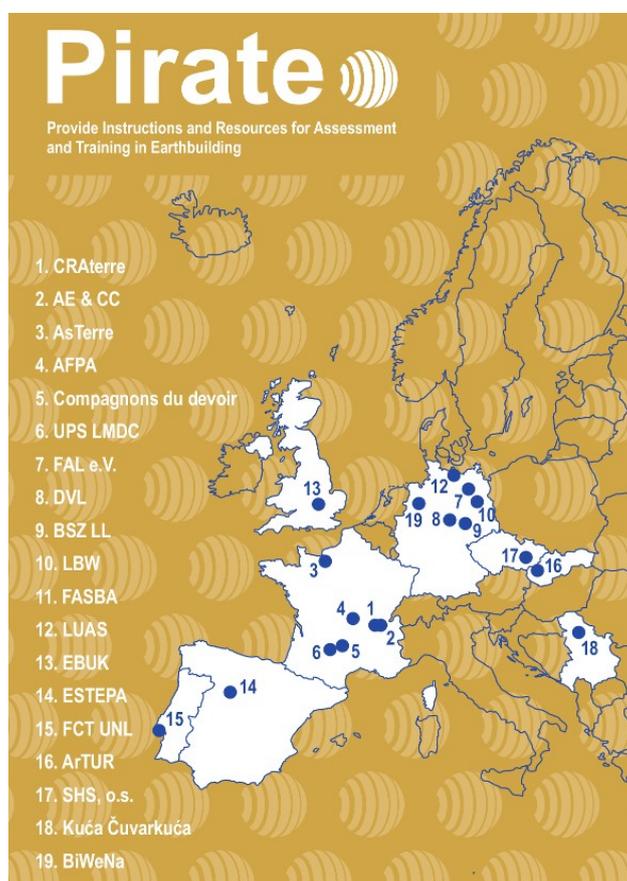


Figure 2. Excerpt of the PIRATE flyer showing contributing countries and partners.

The advances obtained with project PIRATE will be presented on this paper, trying to contribute for the growth of this specific market.

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### **3. RISK AND NEED**

The project partners come from existing organisations with interests in earthen construction and training, whether in new build or conservation. Many of the partners were involved in the earlier ECVET process defining and writing training standards for earth plasters. Beginning with the plasters was a logical decision. It is one of the fastest growing markets for earthen building products and work. It covers both new build and conservation and is low risk as a material and process for designers, clients and builders. It marked a serious departure for the partners in defining exactly what is involved in a wide range of activities in delivering earth plaster.

The experience of the earth plasters project LEARN WITH CLAY [3] [4] was massively positive in defining the need for the PIRATE project which focuses on earth as a structural medium, with all the associated and perceived risks. While the risks in the earlier project were to do with understanding the process of writing competence standards and agreeing modes of cooperation across borders, the PIRATE project touches on risk measurable by failure and collapse of structures, thus very real risks.

These risks are what have kept growth in earth building slow. While other sectors have written product, code of practice and competence standards as they have gone along, earth building have been left behind. Without these standards earth building soon seems untenable, uninsurable, unbuildable and very soon it becomes so. It is not that other materials have a perfect record in safety and success, far from it. There is an industry with a range of associated professionals dealing with the area of construction law and litigation. Are they there to protect the public from earth builders? No, they are there to pick up the pieces after products, codes and training have failed or been ignored in the use of a wide range of materials and processes.

However the perceived risk of materials without regulated training regimes are well founded, and that is why PIRATE project was conceived.

### **4. PROCESS**

For the first time, professionals in the construction sector, vocational education and training (VET) and higher education (HE) institutions from 8 European countries work together. The project partners bring many years of experience in the field of eco-construction, renovation and decoration with unfired clay materials to the project. They include practitioners, company owners, architects, trainers and academics (Figure 3). Knowledge of the processes in building and training have been worked through and developed in the heat of commercial practice and the cool of researched thought. Some countries are represented in the project by several partners while other countries are represented only by one partner. All the partner organisations can rely on a network of regional or national specialist practitioners and teachers.



Figure 3. PIRATE partners are a diverse and highly skilled group, seen here at the kick off-meeting in Grenoble 2012.

One of the challenges to the partners has been to find a means to bring all this experience to a common point of understanding and expression. The situation and state of art in earth building in the 8 countries of the 18 partners is quite different and not easy to compare. The partners started by analysing the crafts and trades already used to present earth as a building material which can be assessed to a common standard. To develop and disseminate competence standards for EQF levels 3 to 6, the project pursues two different objectives:

- Outputs, by describing learning outcomes and gather them as units classified according to the main market activities; enough outputs are now available to list these future units.
- Dissemination, by involving decision makers to get these units recognised and used in national qualifications.

To achieve the goals of the project the partners of the 8 countries - even the countries that are represented by only one partner - try to collect in each country the opinion of the majority of professionals who work and study on earth building and express the state of art not of the partner but of the country.

The work of the project is divided in three groups: MONO, BRICK and SUPERV. The first two groups focus on monolithic earth walls and masonry earth unit walls, respectively, for EQF levels 3 and 4; the third group will apply for both monolithic and brick earth walls but for levels 5 and 6.

Nevertheless there are links between all the groups, that assure a convergence between each working groups, merging the units to as common an output as possible

## 4.1. Outputs

Although the outputs are not training materials they do guide trainers and employers in what needs to be assessed [5]. The outputs are a guide to trainers and assessors but are not prescriptive about the setting or structure of the training. Thus training may be delivered on site in one country and in training college in another, delivered by someone with no qualifications themselves but with many years of training experience, or little practical knowledge of the materials but qualifications in training.

The consortium produces the following tools and resources:

- a common-core syllabus for earth building activities in crafts and trades;
- a European-wide matrix of units of learning outcomes for earth building, with assessment criteria,, both for load-bearing earth bricks masonry and monolithic earth walls (rammed earth and cob), available in 8 languages.

The units of learning outcomes, vehicles of new standards of competence needed by a growing market, will:

- empower professionals and offer modular qualification;
- further skills training to help job search;
- encourage employment opportunities and mobility;
- guide teachers when defining new content and assessment procedures, judging learners performance;
- be a tool for certifying bodies when reviewing or creating qualifications, looking for transnational compatibility.

So what do the ECVET units cover? Earth Building– units of learning outcomes for eco-construction, renovation and decoration with unfired clay materials, developed under the PIRATE project, add to existing units for clay plasters (U2 plaster, U4 decorate, U5 ornaments) [6]. New units M, P, F, B, R, E cover the following activities:

- Unit M – Prepare the earth to make building materials
  - Produce earth building material for:
    - rammed earth mix or mix for making compressed earth blocks (CEB);
    - cob mix;
    - mortar for brick laying, mortar for plastering, mortar for making moulded or extruded bricks.
  - From extraction to mixing:
    - convert the raw material (dry, grind, sieve, soak);
    - select and add other earths, aggregates, fibres or organic stabilizers;
    - transport, store;
    - master the water content depending on the material being produced.
- Unit P – Production of compressed, moulded or extruded mud bricks
  - On site or in small workshop prefabrication,
    - starting from the already prepared mix;

- ensure the brick manufacturing steps (manual or mechanical), drying, handling and storage.
- Unit F - Make formwork for rammed earth
  - Choose materials and type of formwork, taking into account the pressures, the assembly-disassembly and turnover of the formwork.
  - Set up formwork to ensure complete stability.
- Unit B - Cob, rammed earth and brick masonry building (3 separate units)
  - From the foundation or base,
    - raise monolithic or masonry walls, load-bearing or not, straight or curved,
    - build structural details, openings and technical installation,
    - prepare surfaces to receive finishes.
  - Organize the site, including the lifting and material storage and protection of materials and structures.
- Unit R - Maintain, repair, renovate, restore
  - Diagnose and intervene on structures and earthen surfaces:
    - major interventions or underpinning work;
    - cleaning, recycling, repair, introducing new elements;
    - maintenance and minor repairs;
    - surface treatments.
- Unit E - Developing business activity
  - As a manager of a small construction company, in order to develop business using the earth,
    - create the desire for earthen architecture in the old and new building;
    - make bills of quantities and costings to draw up quotes.

At levels 3 and 4 of the EQF, the units cover usual building site practical activities.

At levels 5 and 6 of the EQF, the activities and competence cover also the supervising process.

At the higher levels of the EQF (level 7, engineers and architects), «make» becomes «design» and «calculate».

At present the project has conducted a test with earth building trainers and trainees to evaluate contents and tools for monolithic earth building vocational training assessment (Figure 4). Another test will follow in February 2015 to see how the units can be applied to a brick training situation.



Figure 4. MONO TEST meeting where content and assessment tools for vocational training examinations were tested.

## 4.2. Dissemination

The work involves finding the key actors, the possible certification scenarios in each country, setting up national committees that define an action plan (though the actions will go beyond the time limit of pirate project).

Professional federations of the construction sector or other organisations representing the professionals and taking part in the process of reviewing qualifications should take part in the process. We have to show that we are talking about new skills for existing jobs that up to now ignored the specifics of the material.

There is a growing earth building practice in Europe connected by our network. The PIRATE project work shows that despite the cultural, historical and economical differences between our countries and earth building practices, there is consensus about quality standards in the new built as well as in the renovation of earthen architecture. Earth is a creative and a local material. Encouraging its use as such should not aim at a standardisation of its application through industrial large scale production. What we seek is a practise based dissemination, founded on a deep understanding of the properties and behaviour of clay.

ECVET offers a framework for description of competence and thus for building processes. It does not automatically lead to a transnational certification: there will not be a European diploma for earth builders at the end of PIRATE project. Nevertheless, attaching criteria and indicators for assessment to the units of learning outcomes is a way of creating a common quality standard. To make it tangible and to valorise the achievements of people who successfully passed an exam for one or several of our units of learning outcomes, we created certificates. These certificates are not yet credit value in any existing qualification. As a long term objective, the partners expect to get some of the units recognized at a given level for a given diploma in some of the countries. In the meanwhile, the value of the ECVET Earth building certificates will result from their widespread use amongst a training community in expected 18 countries already having been involved in current or previous European projects about earth building learning and training. The framework for these certificates is a

Memorandum of Understanding (MoU) [5] [7]. The organisations signing up the MoU commit themselves to:

- offer or support training in earth building techniques;
- offer assessment for the units of learning outcomes of the ECVET Earth building;
- recognise the certificates delivered by the other partners;
- work towards an official recognition and integration of units of earth building learning outcomes in national qualifications.

There will be a MoU text with procedures for admittance by the end of PIRATE project in September 2015 latest.

The project's evolution and results can be followed online at <http://pirate.greenbuildingtraining.eu/public/> [8]. Twice a year a newsletter is available in the website and disseminated by each partner.

Like the competence standards for clay plaster already published [9], the new units of learning outcomes will be online and free for download.

## 5. CONCLUSIONS

Although the project is in its second year, with a year still to go, some conclusions can be drawn. Because PIRATE follows on from the earlier plasters projects there is already experience in writing, publishing, using training standards across the partner countries.

These are not training materials, each partner country delivers their training in very different ways, at training institutions, through workshops or on site. But the rigour to achieve comparable results has been shown by the partners, and this is a positive sign for the future.

Even the existence of the project has opened dialogues in partner countries between partners and their national networks. These conversations are given a shape by the existence of the project, framing further work in codes, in funding, in teaching and in new building in new and positive ways.

The project has also given a more international direction to the partners, increasing co-operation and networking, sharing experience. It is very much hoped this will be built on further in the coming years both in the partner countries but also in other EU and non EU states.

Since 2002 [5] [7] there have been European projects focussing on clay in 18 EU countries! This community of exchange and practise is fertile ground for future mobility of learners, professionals and trainers. It is more and more connected to a more academic network, with more exchange in international conferences initially focussing on conservation issues and progressively enlarging their concerns [10]. Both the practitioners and the scientific partners need each other for cross fertilization. As teaching earthen architecture at the university level also increases, it will be possible to consider links between ECVET earth building units and ECTS credits.

## ACKNOWLEDGMENTS

The authors acknowledge the support of the Leonardo da Vinci programme of the European Union. This project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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