

Building competences of construction professionals in NZEB

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Introduction

The consistent availability of qualified specialists involved in the construction process at all levels, in relation to the delivery of high energy performing renovations, and in particular Nearly Zero Energy Buildings (NZEBS), is vital for strengthening the EPBD implementation. This includes construction workers, designers, engineers (site and supervision), building managers, the civil administration of building permits and building owners or their representatives. Moreover, qualified specialists are the key to addressing the lack of compliance with building energy regulations and building energy performance targets.

Thus, an adequately qualified construction workforce is considered a key factor for the realisation of the EPBD objectives and, consequently, training is regarded as a necessary upstream measure. This is clearly outlined by the Directive of the European Parliament and of the Council Amending Directive 2010/31/EU on the Energy Performance of Buildings and Directive 2012/27/EU on Energy Efficiency which states the following:

"Article 2a Long-term renovation strategy

... Each long-term renovation strategy shall be submitted in accordance with the applicable planning and reporting obligations and shall encompass:

...

- f) *an overview of national initiatives to promote smart technologies and well-connected buildings and communities, as well as **skills and education in the construction and energy efficiency sectors...***

In Article 10, paragraph 6 is replaced by the following:

"6. Countries shall link their financial measures for energy efficiency improvements in the renovation of buildings to the targeted or achieved energy savings, as determined by one or more of the following criteria:

- a) *the energy performance of the equipment or material used for the renovation; in which case, the equipment or material used for the renovation is **to be installed by an installer with the relevant level of certification or qualification;***

The results of a short survey among countries' representatives organised in October 2017 helps to capture the current levels of training and the types of training schemes operated in different countries. The survey showed that in half the countries (out of 25 countries responding) there are a number of experts for this topic, but the **learning and training offer has to be increased** to generate sufficient qualified experts who can achieve the goals set in the EPBD. A quarter of the countries that responded said that there are learning and training courses in place, but the **accessibility needs to be increased** in terms of employers enabling or sponsoring training for workers, duration and timing of training, etc.



Regarding the education programmes in universities, 62% of the questionnaire responses said that courses focusing on deep energy renovations and the design of NZEBs are **not routinely part of the curriculum**. If they are included in existing courses, then this is due to **individual efforts**, while 15% said these subjects are included in the education system curriculum in their country. Looking at a wider scale of training, 58% of the respondents said that large-scale training about deep energy renovations and the design of NZEBs is **not in place as part of lifelong learning**. Many countries have certain schemes in place but not necessarily on a large scale covering a broad range of sectors and professions, e.g., designers, engineers and building managers. Most countries that have a large-scale programme provide this on a voluntary basis to professionals. Many different organisations provide the training courses, including universities, energy agencies and chambers of engineers. **None of the countries** that responded to the questionnaire currently **oblige designers and engineers to take specific training** in the field of deep energy renovations and NZEBs in order to become authorised professionals. It is thus interesting to see which are the main initiatives currently in place to tackle the issue of the energy efficiency skills of building professionals.

BUILD UP Skills initiative (<http://www.buildup.eu/en/skills>)

The European strategic BUILD UP Skills initiative was launched by the European Commission in 2011 under the Intelligent Energy Europe Programme to strengthen the qualifications and training of 'blue collar' workers in the building sector (craftsmen, builders, systems installers), after their initial education or after they have entered working life.

In the first phase of the initiative, all countries involved (EU 28 + Norway and the former Yugoslav Republic of Macedonia) analysed their current situation and made a critical review of the skill gaps of the 'blue collar' workers, in terms of their technical qualifications in energy efficiency as well as their existing curricula. This work led to developing a set of recommendations in the form of National Roadmaps. The National Roadmaps also embedded training priorities on intelligent energy solutions for buildings in the mainstream curricula, which would boost the competitiveness of the building sector.

The BUILD UP Skills initiative was congruent to the European Qualification Framework (EQF) with its learning outcome and competences approach concerning the application of mechanisms of recognition among different national education and training schemes. This was declared in the European Directive 2005/36/EC on the recognition of professional qualifications and its recast 2013/55/EU.

Through the activities of the BUILD UP Skills initiative, key national stakeholders were gathered in the frame of National Qualifications Platforms (NQPs) (Figure 1). NQPs included all relevant sectors and actors, namely: ministries responsible for construction, energy, labour and lifelong learning; relevant federations and professional associations; institutions and organisations dealing with Continuous Vocational Education and Training (CVET); accreditation and certification bodies; professional chambers; trade unions; training providers; building industry and financing bodies.



Figure 1. Croatian NQP discussing the qualification framework.

In many countries, NQPs unveiled the critical need for the establishment of appropriate qualification frameworks, suitable training methodologies and dynamic monitoring mechanisms. Only in a few countries did the NQPs conclude that the current qualification framework was satisfactory or needed only small adjustments (i.e., cross-crafting issues in Austria).

In a second phase, BUILD UP Skills supported projects turning the National Roadmaps into qualification and training schemes, tailored to the national reality. Due to the increased construction activity in many countries, it was often difficult to attract 'blue-collar' workers to enrol in long lasting (several months) full professional retraining and to convince construction companies of the need to train their workforce. To address this difficulty, many projects developed short training programmes, often with an e-learning component, which could then be validated as informal learning. This was straight-forward in countries having a system of knowledge and skills validation of informal learning, while other countries had to tackle the issue of the recognition of construction workers' knowledge in other ways (i.e., the Croatian Ministry of Construction and Physical Planning developed a regulation, other countries developed voluntary certification schemes).

Overall, the impacts of the 22 BUILD UP Skills national projects implemented in the second phase of the initiative are summarised in Table 1.

Table 1. Impacts achieved by BUS Pillar II projects [Source: BUILD UP Skills Pillar II Overview report, February 2018].

IMPACTS PURSUED	ACHIEVED RESULTS
Number of training courses developed	805
Number of people trained	8,570
Number of hours taught	27,726
Costs to qualify each trainee (median, EUR/ trainee)	638 €

It is important to note that the above figures are conservative, not counting for people trained after the end of the project, which in some cases was very significant. If these figures seem low compared to the overall objective of upskilling 3 million workers by 2020 (as identified in the national Roadmaps), it should be stressed that BUILD UP Skills never aimed to fund the actual operation of training courses. Instead, the dynamic initiated by this initiative should now be continued through other means (national/regional/local support, structural funds, commercial trainings, etc).

From 2014 onwards, the Horizon 2020 Framework Programme is providing continued support to BUILD UP Skills. The focus has been shifted to large-scale multi-country qualification and training schemes, while also addressing “white-collar” professions (e.g., engineers, architects, building managers, etc.). Seventeen (17) projects are ongoing or have recently been finalised.

Overall, the EU contribution to BUILD UP Skills since 2011 amounts to 38 million €.

CROSKILLS project

The BUILD UP Skills Croatia project (CROSKILLS) created extensive training materials for trainers as well as ‘blue-collar’ workers. Indeed, the Croatian NQP had identified that there were no adequate training materials on energy efficiency in the context of building works reflecting the latest technologies and products (Figure 2). These newly developed training materials are not only being used for training according to the CROSKILLS training programme but were also recognised by the Croatian Agency for Vocational Education and Training and Adult Education as suitable materials to be used in the formal education of construction workers.



Figure 2. Training of trainers session within the CROSKILLS project introducing latest technologies and quality control issues.

The learning outcomes and training programme developed in the CROSKILLS project were incorporated by the Croatian Ministry of Construction and Physical Planning in the regulations through which the CROSKILLS certification scheme was officially recognised. This way, the Ministry of Construction and Physical Planning followed the same approach for the training of professionals as with the previously developed Ordinances on Renewable Energy Sources Installer Certification (for PVs, Solar Thermal Collectors, small-scale biomass boilers and furnaces, shallow geothermal systems and heat pumps), which have been developed according to the RES Directive.

Additionally, an online Register of training centres (Figure 3), a Register of trainers as well as a Register of certified workers developed during the project became an official Register of the Croatian Ministry of Construction and Physical Planning.

The Registers were created:

- as a means of generating new business leads (i.e., registered members can use the annual CROSKILLS logo in their promotional material);
- to create a direct link between training and employment opportunities (construction workers can join the Register and display their training and skills; employers can search the Register for construction workers who are trained in skills for low-energy building quality);
- as a “control” tool for investors and supervising engineers to use with skilled workers involved in the project.

Naзив	Mjesto	OIB centra	Klasifikacijski broj	Uruđbeni broj	Datum suglasnosti
Zagrebačka uđilite	Zagreb	67219776080	1	1	01.12.2016.
Mještvo industrijsko-obrtniĉka Škola Karlovec	Karlovec	68371339805	2	2	01.12.2016.
Strukovna Škola Sisak	Sisak	11624056245	3	3	01.12.2016.
Gradišajpska gođestvska Škola Osijek	Osijek	4103409234	4	4	01.12.2016.
Gradišajpska Škola Ćakovec	Ćakovec	5528545901	5	5	01.12.2016.
Uđilite Cibalice	Vinkovci	58874773395	6	6	01.12.2016.
Publiĉno otvoreno uđilite Liber	Slavonski Brod	81401358327	7	7	01.12.2016.
Publiĉno otvoreno uđilite Omega	Virovitica	04071501201	8	8	01.12.2016.
Publiĉno otvoreno uđilite Marinkovai	Gorešnica	36812030573	9	9	01.12.2016.
Industrijska obrtniĉka Škola Pula	Pula	21765234516	10	10	01.12.2016.
Srednja Škola Bedekoviĉna	Bedekoviĉna	05274910037	11	11	01.12.2016.
Obrtniĉka Škola Pušega	Pušega	/	12	12	01.12.2016.

Figure 3. The online register of CROSKILLS training centres (<http://seminar.croskills.hr>).

A mutual recognition clause was incorporated in the regulations, thus enabling the recognition of certification schemes of other countries involved in the BUILD UP Skills initiative and in turn to enable the free movement of certified workers from country to country.

PROF-TRAC (<http://proftrac.eu>)

The PROF/TRAC project (PROFessional multi-disciplinary TRAINing and Continuing development in skills for NZEB principles) developed an Open Training and Qualification platform for continuing professional development of professionals dealing with NZEBs.

The platform offers a repository for the structured collection of the available educational and training materials from recent European projects as well as international and national initiatives about NZEB design, construction and operation. The repository acts as a knowledge hub supporting training for NZEB concepts with advanced teaching methods and training materials.

PROF/TRAC compiled a comprehensive list of technologies and interdisciplinary skills related to NZEBs. These technologies and skills represent the “highest common denominator” for the qualification of the targeted building professionals, meaning that any construction sector ‘white-collar’ professional involved in NZEB design and construction will necessarily have at least one of these skills. The more skilled the professionals, the more successful the NZEB design.

Four areas of expertise were identified: Energy Management, Energy Production, Energy Reduction, and Interdisciplinary Skills. For each of them, PROF/TRAC listed the essential technologies and skills required for professionals dealing with NZEB. For each technology and interdisciplinary skill, a precise description of recommended competences is also provided. Since not all professions are expected to have the same skills and qualifications levels for all the identified NZEB technologies, PROF/TRAC has established skills levels and set up recommendations about the minimum skills level for each work field as per the skills and qualifications.



EU NZEB SKILLS LEVELS FOR BUILDING PROFESSIONALS

PROF / TRAC RECOMMENDATIONS

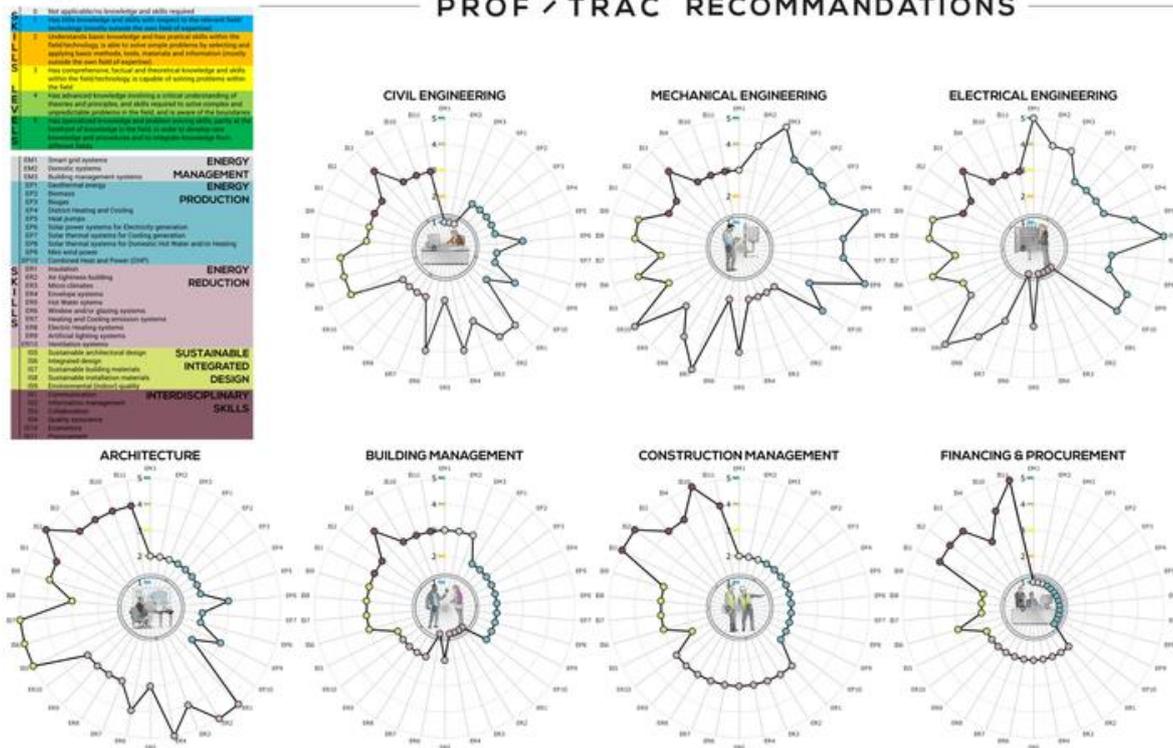


Figure 4. Minimum recommended nZEB skills levels for the listed skills which refer to the professions represented in these work fields [Source: Project Prof/Trac <http://proftrac.eu/nzeb-skills-and-qualification-scheme/nzeb-skills-recommendations.html>].

These specific competences, here named as “qualifications”, describe in more detail the needed knowledge, skills and behaviour of a professional in NZEB. In the Qualification Scheme each qualification is linked to a skill level. By cross-referencing these skills levels recommendations per qualification against the PROF/TRAC EU skills levels recommendations per work field (Figure 4), the Qualification Scheme offers an EU-harmonised NZEB skills mapping tool.

The project has trained and certified 128 trainers from 23 countries, who then went on to train 1,300 architects, engineers and building managers in pilot courses. The project ended in February 2018, but courses will continue with 1,700 more professionals to be trained in the next five years.

Fit-to-nZEB (<http://www.fit-to-nzeb.com/>)

The complex nature of renovation of existing buildings up to the NZEB level requires a different approach and understanding than constructing new NZEBs. The Fit-to-NZEB project sets as its leading objective to produce all necessary requisites for the introduction of educational content (at EQF 3-7) on the **deep energy renovation of buildings** in the curricula at all levels of the system of vocational education and training in South-eastern Europe - universities, professional high schools, colleges and vocational training centres. This will be done both through the incorporation of new educational content in existing curricula and through the development of new specialised programmes. This process will be guided by the need for special attention to the practical nature of the training which involves various disciplines regarding the construction of NZEBs. An essential element of the project is the creation and deployment of certification schemes and accreditation procedures corresponding to the European Qualifications Framework (EQF) as well as the development of a scheme for validating knowledge, skills and competences acquired at the workplace.

The new training programmes on deep energy renovation will add a number of issues to the existing activities rarely addressed so far in the target countries (due to underdeveloped training programmes). These are the application of BIM solutions, integrated retrofitting design, energy saving potential, step-by-step retrofitting, indoor air quality, comfort and health requirements, humidity in the premises, etc.

Conclusions

This factsheet highlighted the importance of educating all professionals involved in the building value chain in achieving truly compliant NZEBs and thus highlighting the need for their lifelong learning and training.

The projects briefly described above, together with many other projects, have helped to set the basis for a number of improvements. These are, to name a few, the education of building professionals (at EQF levels 3-7), the development of high quality and innovative training materials, the development of a good network of stakeholders and raised awareness among building professionals and policy makers on the importance of energy efficiency, RES and cross-craft skills for building professionals.

There are several lessons that can be learnt from the experiences gained thus far in the continued education of building professionals in energy efficiency and NZEBs.

Professionals concerned with advancing their skills seek flexible, company-specific training, which is ideally practical on-site training.

It must be emphasised here that the work needs to continue to harmonise learning outcomes across Europe to enable the mutual recognition of competences among building professionals in the field of energy efficiency.

Even though a number of programmes for building envelope and RES systems workers were developed through BUILD UP Skills as well as other programmes throughout Europe, there is still a high number of non-professionals and non-qualified actors working at construction sites.

In addition, there is also a need to increase the demand for qualified and/or certified building professionals delivering NZEBs. This can be done in many ways, e.g., regulations, specific clauses in public procurement procedures (awarding extra points for the use of skilled and knowledgeable professionals), and more broadly raising the awareness of investors, building owners and tenants regarding the link between skills, construction quality and building energy performance.

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