

NEWCOM

New qualification schemes
to build high quality

EVALUATION REPORT ON EXISTING CERTIFICATION SCHEMES AND ORGANISATIONS

Deliverable 2.1



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Abstract

This report summarises the results of work package 2 of the NEWCOM project, which consists of the tasks of collecting and evaluating the existing range of qualifications, identifying missing offers and reviewing available training material.

The NEWCOM project has set itself the task of determining existing training offers for the correct execution of the building envelope, the building services with the focus on ventilation installation as well as for the quality control accompanying the planning and construction process for the new construction and renovation of nearly zero energy buildings or nZEBs in Austria, Hungary, the Netherlands and Slovakia and, based on this, determining the need for missing offers. This report will serve as a basis on the one hand for the development of training and certification and on the other hand for cross-country comparison and recognition of competences. Together with a database of common descriptors for skills, knowledge and competences and a platform of available existing training material, the report provides an overview on the relevant trainings and prepares the next steps in the project: setting up pilot train-the-trainer courses for three professions identified within the project.

The work was carried out in the form of desk research, interviews and workshops with experts and stakeholders.

The desk research was done in all partner countries by using a questionnaire to gather all relevant information which was then collected and summarized by the work package-leader. In addition the results of other projects and earlier investigations have been included. The questionnaire is available under www.newcomtraining.eu. The interviews were conducted using a guideline containing general questions regarding the Small and Medium Size Enterprises (SME), questions on structural damage and quality assurance, as well as company-related questions on training and further education of the employees. The full text of the guideline is available at www.newcomtraining.eu.

In addition to the interviews, workshops and round-table discussions were implemented with stakeholders and educational institutions.

As an essential result of the investigations in the project it was confirmed, that the importance of personal certifications in the construction sector is not particularly high. This is

illustrated by the decline in demand for personal certification according to ISO 17024 in the field of building services engineering and the end of personal certification for passive house craftsmen within the CertCraft project in Austria. Only binding certifications for safety-relevant work can assert themselves on the market. This applies to all four partner countries of NEWCOM.

Certifications developed by educational institutions have better chances. This allows the following conclusions to be drawn for the further development of the project:

The completely new development of qualifications in the form of personal certification has little chance of being accepted by the market. The development of modules and qualifications as a supplement to already established courses is considered to be significantly more successful.

The greatest similarities and thus prospects of success in the partner countries Austria, Hungary, the Netherlands and Slovakia arise in the following areas and trades:

- Flat roof construction and building waterproofing
- Installation of ventilation systems
- Building inspection: modules for quality assurance and quality control for several existing training courses

The identification and collection of relevant existing training material is a central issue of the project to ensure that already available material can be optimally used. Extensive research was carried out in this field as part of the performed surveys within this project. For collecting the training materials the project-moodle-platform www.newcomtraining.eu was established. This platform offers materials in English, German, Dutch, Hungarian and Slovak and is structured in the chapters “building envelope”, “building techniques” and “building inspections”. The moodle-platform is a progressing platform and will be maintained and updated during the whole project lifetime and beyond. It will be used both as a knowledge hub for trainers and as a training platform for participants of courses.

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1 Introduction

The construction and renovation of nearly zero-energy buildings (nZEB) is a big challenge for the construction industry. Using innovative design processes and technologies requires new competences. To accomplish successful design, construction and use of energy efficient buildings, an integrated design process and multi-disciplinary teams are required. Therefore, the successful implementation of cross craft knowledge is essential.

Professionals need to gain a mutual (basic) understanding of each other's disciplines and skillsets, and have to be able to operate outside their own discipline to achieve optimal nZEB construction and retrofitting. This goes for both energy efficiency and cost effectiveness.

The focus of the project "NEWCOM" is to set up large-scale qualification schemes in order to implement missing professional qualifications and certifications of blue collar workers and building inspectors with a special focus on the possibility of mutual recognition between different member states. These schemes will enable the building workforce to be qualified for the construction and renovation of nZEB buildings.

The results of this report will be used in the development of needed certification schemes for blue collar workers and building inspectors in the participating countries as well as in the elaboration of a database of common/harmonized descriptors for skills, knowledge and competences.

The findings of this report are another step to enable the sustainable development and implementation of missing cross craft training schemes for nZEB.

2 Identification and evaluation of existing and identification of needed certification schemes in all partner countries

2.1 Preamble

According to the project targets of NEWCOM, this report focuses on the further education of craftsmen in short term and nonformal qualifications and trainings. The regular vocational education, according to the country-specific regulations, is not mentioned in the following chapters. As the vocational education and training (VET) systems of the partner countries vary, there is also a brief description of the VET systems given in the following chapters, as well as a short summary of the national BUILD UP Skills roadmaps.

2.1.1 Overview and methodology

As announced in the project proposal, NEWCOM intends to deal with the following issues in the field of blue-collar workers: Thermal insulation of walls, insulation of roofs, installation of windows and impact of details (facade, roof, ventilation outlets) on air tightness and thermal bridges as well as installation of ventilation systems, PV and solar thermal collectors. In order to move from this list of components into the profession as target groups, the trades involved in the building envelope were examined for their relevance for nZEB quality as well as their susceptibility to damage and complexity with regard to interfaces, since many damages occur when components and systems are connected. As a result, the survey in this project focused on the following activities/occupations:

External Thermal Insulation Composite Systems (ETICS):

The correct planning and execution of ETICS is of great importance for the thermal performance of buildings; this applies equally to new construction and renovation. The

execution of ETICS also results in a series of interfaces with other components. The correct execution requires a high level of competence from all parties involved.

Flat roof construction and building waterproofing:

Since the thermal insulation and waterproofing of practically all flat roofs is carried out by the same trades/persons, the correct design is highly relevant both for the thermal quality of the roof (including the minimisation of thermal bridges) and for avoiding damage regarding rainwater and for extending the life cycle. In addition, flat roofs are usually used for the installation of the renewable energy plants and are therefore particularly often affected by penetrations for fastenings and media ducts. Irrespective of this, a flat roof is touched by a particularly large number of interfaces between building components and trades. Two characteristics of a flat roof are of particular relevance in connection with climate change: On the one hand, in new buildings as well as in the refurbishment of flat roofs, it must react correctly to the higher precipitation caused by climate change; on the other hand, the possibility of greening roofs offers effective support in avoiding overheating in summer.

Installation of windows:

Windows, as another essential part of the building envelope, are nowadays an industrial or handcrafted product of high quality. However, the correct installation of windows requires sufficient knowledge and skills in the area of interfaces, both in the area of structural design and the construction process.

What these three trades/areas have in common is that the on-site workers are predominantly semi-skilled workers with different qualifications.

Ventilation systems:

Ventilation systems with heat recovery are a key technology for the optimal energetic performance of nZEBs. The deficiencies in the implementation of this technology have been documented by several studies in all partner countries. If it is assumed that the demand for energy-efficient solutions is increasing due to the increasing demands on overall energy efficiency. Request for efficient ventilation systems with heat recovery (comfort ventilation) will continue to increase; therefore the need for qualification is high.

The identification and evaluation is based on desk research and longtime professional experience as well as on interviews with stakeholders, craftsmen and experts.

2.1.2 Desk research

The desk research was done in all partner countries by using a survey form to gather all relevant information and then collected and summarized by the workpackage-leader. In addition, the results of other projects and earlier investigations have been included. The survey form is available under www.newcomtraining.eu.

2.1.3 Interviews

The interviews were conducted using a guideline containing general questions regarding the SME, questions on structural damage and quality assurance as well as company-related questions on training and further education of the employees. The full text of the guideline is available under www.newcomtraining.eu.

2.1.4 Workshops and round tables

In addition to the already mentioned interviews, workshops and round-table discussions were implemented with stakeholders and educational institutions.

2.2 Austria

2.2.1 Brief description of the VET system

The Austrian education system is very similar to the German and the Swiss system. Characteristic of the Austrian system is the four-year elementary school, followed by secondary education, which is divided into lower secondary and secondary education. Secondary school level I ends after the 8th grade.

At this time, there is a choice between general education at a general secondary school (AHS), a secondary vocational school (BHS) and vocational training. The general education lasts four years and concludes with the school leaving exam (Matura), which represents a public university entrance. The first year of secondary education (grade 9) corresponds to the last compulsory school year.

If secondary school students choose vocational training in the dual system, they must complete the ninth school year of compulsory schooling. This is usually done on the one-year pre-vocational polytechnic school. There, the students receive a targeted orientation for their future education choice through a corresponding variety of subjects, company visits and practical work days. The subsequent apprenticeship training takes place both in teaching (practical training, about 80% of the training period) and in the vocational school. The task of the vocational school is to deepen the general education and to supplement the knowledge imparted in the teaching enterprise. Depending on the profession the apprenticeship lasts between two and four years, but for the most part three years. In the end, every apprentice can take a final apprenticeship exam. Upon successful completion, a “Berufsreifeprüfungszeugnis” (professional maturity certificate) will be issued.

Another vocational education at secondary level II is the vocational middle school - “Berufsbildende mittlere Schulen” (BMS). There, students are given the basic technical skills that are needed, empowered directly to practice a profession, but also taught general subjects. BMS usually take between three and four years and lead also to a “Berufsreifeprüfungszeugnis”. There are one- and two-year forms as well, in which partial vocational training is taught.

In addition to apprenticeship training and vocational training in a BMS, secondary school students also have an upper secondary vocational school – BHS, open to higher vocational training in various fields (eg tourism, mechanical engineering, electrical engineering, etc.) and a well-founded general education. The vocational college - “Berufsbildende Höhere Schule” (BHS) - lasts five years and closes with an examination including diploma. Students thus acquire a vocational qualification and a general university entrance (double qualification).

Following the vocational training, it is possible to visit a building craftsman or master craftsman school. This is a special form of technical and vocational school (vocational middle school) for the extension of the specialized education of persons with completed vocational training. They last one to two years and complete with a masters degree exam.

The successful completion of an AHS or BHS as well as the passing of the “Berufsreifeprüfung” leads to a higher education entrance qualification and thus enables access to the following post-secondary institutions: Academies that are qualified for certain social and health activities, and universities that are primarily aimed at AHS graduates who wish to complete a BHS education. Graduates are issued a diploma.

Since 1997 graduates of apprenticeship training and three- and four-year-BMS have the opportunity to take the “Berufsreifeprüfung”. This entitles the transfer to every post-secondary or tertiary institution (university entrance qualification).

Another option to obtain the entry requirement for post-secondary and tertiary education is the completion of a postgraduate course. Graduates of an apprenticeship must attend a preparatory course to enter this educational path. Advanced courses complete after three years with a maturity or diploma examination.

Finally, participation in a university entrance exam is also an opportunity to gain university entrance qualification. However, it only enables students to study a specific degree programme.

At colleges and universities there can be three-year undergraduate and subsequent at least two years of Master's degree programmes. Until 2012, there were also diploma courses at both types of higher education institutions.

Sources: Institute for Educational Research of the Economy (IBW), www.bildungssystem.at

2.2.2 Summary of BUILD UP Skills Austria

The qualification needs in the building sector in Austria were derived from the analysis of the “BUILD UP Skills Status quo report” [1] and the stakeholder discussion process within the platform. The project results can be summarized as follows:

It is very important to improve the cross-trade understanding at the construction site with a focus on energy in the overall system “building” by cross-craft trainings. The development of a broadly coordinated modular qualification concept was recommended in close cooperation

with corporate associations that collaborate on the development and dispatch their staff to vocational training.

A new service “Quality coach on-site” was proposed to increase the quality of the workmanship. The task profile "Quality coach on-site" should be built on an appropriate qualification and of an organizational concept in combination with company associations and “Public Employment Service Austria” (AMS).

Furthermore it was recommended that additional qualification for the inspection of heating and air conditioning systems is needed to ensure qualified staff for the inspection of heating, ventilation and air conditioning systems following the recommendations of the Buildings Directive.

Moreover a concept for the continuous upskilling of teachers in vocational schools was recommended.

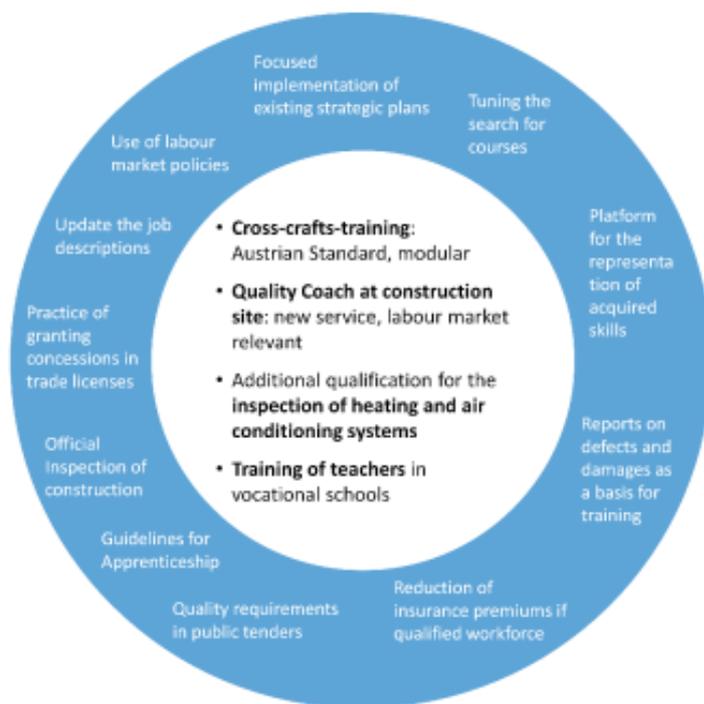


Figure 1: The action plan presenting the core and accompanying measures; sources 17&4

2.2.3 Identification and evaluation of existing and needed certification schemes

2.2.3.1 External Thermal Insulation Composite System for walls (ETICS)

As there were a lot of damages found in the field of ETICS (external thermal insulation composite system, also named EIFS: exterior insulation and finish system) at the beginning of the new millennium, a “group of quality assurance for ETICS” was established in 2001. As the founders (producers, manufacturers and the building industry) mentioned in a press release, “External Thermal Insulation Systems (ETICS) have been in use in Austria for more than 35 years with growing success. The most of the construction industry cost-effective facade systems have become veritable high-tech products and currently reach every year a market share of around 5 million square meters in Austria.” “The primary goal is to guarantee professional work for the client and to avoid mistakes in the new building but also in the refurbishment, as every year follow-up costs of millions of EUR arise as result of improper work. Costs ultimately are passed on to the general public due to possible bankruptcy cases”, said DI Wilhelm Sedlak, chairman and spokesman of the ten founding members’ association [2]. The most important effort of the group was the establishment of a “certified installer of ETICS”, (Zertifizierter WDVS-Fachverarbeiter) [3]. The education for this certificate, which takes 40 hours, is offered by the training institute “Bauakademie Österreich” [4] and includes the certification by an external authority. There are also other institutions offering the training e.g. WIFI [5]. Both, training and certification, is offered by TUEV Austria [6].

Although the trainings started 17 years ago, there is still a high demand for them, as the extent of damages due to wrong installation of ETICS does not decrease. Thus further need for trainings is high, as the “4th Austrian report of construction damages, Part 1, ETICS” [7] finds out: “To reduce the error rate on the construction sites with ETICS facades, it is also necessary to train the workers or to refresh existing knowledge. That could be done either by training directly at the construction site or by semi- or full-day courses at the training institutions.”

2.2.3.2 Flat roofing and waterproofing

As there are no apprenticeship occupations for flat roofing and waterproofing in Austria, the need for qualified craftsmen in this trade is very high, which is also proved by the “3rd Austrian report of construction damages, waterproofing of flat roofs and terraces” [8]. One of the main results was that the water-stressed component groups accounted for almost 50% of the damages on buildings: 25% of the damage occurred on the earth-contacting components and damages at roofs, balconies and terraces were 24.5%. Concerning the last group, the most common defects and damages of waterproofing flat roofs, balconies and terraces occur - in the opinion of surveyed planners - at penetrations and door connections, which indicates, that further quality improvement needs the improvement of communication and coordination between the trades and between planning and execution.

The [Institute for flat roofing and waterproofing](#) (IFB) started to offer qualification programmes for flat roofing and waterproofing 15 years ago and trains about 300 participants per year, which counts up to appr. 2000 qualified persons all together. The qualifications are offered by the IFB and several other training institutions, e.g. Bauakademie Oberösterreich [9].

2.2.3.3 Windows

According to experts, up to 80% of damages regarding windows are caused by installation errors, because the installation of (aluminum, wood, plastic) windows is - due to the price pressure - increasingly carried out by mainly unskilled subcontractors. Therefore, the correct installation needs a lot of attention regarding training and qualifications.

There is actually neither a general qualification scheme nor a nationwide offer of trainings for the window installers available in Austria. Singular trainings for installers of windows are offered by a few training institutions (e.g. WIFI OOE - actually not available), by the windows industry itself (e.g. REHAU) [10] and also by the federal guild of carpenters for Lower Austria [11]. A labor agency funded training for the installation of windows is offered in Styria [12]. The trainings have a wide range - both on the duration and on the contents.

2.2.3.4 Ventilation systems

According to the inventory made within the “BUILD UP Skills Status Report Austria” [1], there are about 86 trainings with approximately 1500 participants in the area of HVAC systems per year. At the actual inventory, carried out within NEWCOM, just 56 trainings with less than 1000 participants could be counted in the year of 2017. This indicates the decreasing demand for qualification and certification schemes in this area, which was already stated in the report “Analysis of market barriers towards Cross-Craft training schemes” [13]. This thesis is underlined by the interviews carried out within NEWCOM, which proves, that in the field of ventilation systems the number of offered trainings and certification courses (regarding further education) is actually higher than the demand in Austria. Therefore in Austria further development and implementation of courses for ventilation systems is not pursued.

2.2.3.5 Building inspection

Within the “BUILD UP Skills”-projects, executed in the NEWCOM partner countries, a need for nZEB building inspection was identified. Although various aspects of quality are managed and supervised by local construction supervisors, site coordinators or site supervisors in the planning and building process, which are relevant issues for the energy performance, are not covered. The administration does not have the resources to check if the built quality corresponds to the information in the energy certificate. The Austrian project team has evaluated the needs, and it was shown that administrations and energy consultants as well as education providers in the construction industry are interested in such a qualification.

The nZEB building inspector has the task to control the quality of buildings and to verify the nZEB standard. Thus, he or she transfers the knowledge of the quality requirements to the building’s owner, planners and craftsmen involved in the construction project. Typical tasks are the support during planning, implementation, hand over and operation phases of a new construction or renovation. This all leads to the avoidance of structural building errors and to guarantee cost effectiveness, comfort, energy efficiency, ecological construction, long-term optimal operation cost and maintenance.

In Austria there are no certification schemes existing that cover all of these tasks. The work field of building consultants offers more or less these services. Especially larger companies with an integral planning approach have often personnel that have knowledge in the required tasks of a building inspector.

As part of the skills for building inspectors we could also determine the work areas for energy consultants (EnergieberaterInnen). Energy consultant is not a regulated trade in Austria and there is no certification scheme for this profession.

Since the early 1990s ARGE EBA (Arbeitsgemeinschaft EnergieberaterInnen Ausbildung = Working Group Energy Consultancy Traineeship) offers trainings for energy consultants. The task of ARGE EBA is to guarantee quality assurance and further development of the high-quality training for energy consultants. ARGE EBA traineeship enables a differentiation between energy consultants in the market ensuring specific knowledge and consulting capabilities of their graduates. ARGE EBA exists in all Austrian provinces and is coordinated by the energy agencies of the provinces respectively. The provinces are responsible for the course but the "Units of learning Outcomes" (ULOs) are the same for all, so it is mutually recognized all over Austria. An oral board examination and national coordination meetings ensure this recognition.

There is also a course provided by the Technical University of Vienna, Faculty of bi.f Training Center Civil Engineering and IFB - Institute of Flat Roof Construction and Structural Waterproofing with focus on the quality of the building envelope.

Within the first phase of the project, the need for certification schemes for a nZEB building inspector were examined and architects and companies in the construction work area were interviewed. Almost all of the respondents answered that they would integrate or consult a building inspector in their construction process of a nZEB to raise the quality. Architects and planners of high quality nZEB buildings control their own contracted personnel regarding their qualifications. Here certifications play a significant role (passive house planer certification was mentioned). Manufacturers of construction material often provide their own product specified trainings to raise quality of work. Ambitioned manufacturers are also part of

steering groups for external trainings for blue collar workers in this project. Some manufacturers mentioned that the existing offer of trainings in Austria is insufficient.

Architects stated that the critical part in a construction phase is the communication between the crafts and trades at the building site. There is a need for someone that brings attention to actual or predictable damages and takes financial responsibility towards the planners.

These are all indicators for the high need of a certification scheme for the nZEB building inspector in Austria.

2.3 Hungary

2.3.1 Brief description of the VET system

The central responsibility for the Hungarian VET system lies within the Ministry of National Economy (Nemzetgazdasági Minisztérium - NGM). It shares its responsibility with other ministries responsible for specific professional qualifications and with the Ministry of Human Capital (Emberi Erőforrások Minisztériuma - EMMI), which is responsible for education and social policy. Since 2012, the National Office for Vocational and Adult Education (Nemzeti Munkaügyi Hivatal, Szakképzési és Felnőttképzési Igazgatóság - NMH SZFI) has been helping to develop, coordinate, inform and advise on the VET system. The Klebelsberg Institute (Klebelsberg Kunó Intézményfenntartó Központ - KLIK), founded in 2012, is responsible for drawing up the education plans in the 198 school districts. Finally, the Hungarian Chamber of Commerce and Industry (Magyar Kereskedelmi és Iparkamara - MKIK) is also involved, as it has been taking on various former governmental tasks of vocational education and training since 2010 (e.g. taking exams).

The ten-year compulsory schooling in Hungary begins at the age of six and ends at the age of 16. After attending the first eight years at primary school (általános iskola), students of the age of 14, depending on their level of performance and interest, will have access to various vocational training courses besides attending the four-year high school (gimnázium): Attending a secondary vocational school (szakközépiskola - SZKI), the completion of a dual vocational training at a vocational school (szakiskola - SZI), participation in a transitional programme (Híd I) as well as, due to a physical and/or mental impairment, the attendance of

a special school (speciális szakiskola). All professional qualifications are listed in the National Register of Professional Qualifications (Országos Képzési Jegyzék - OKJ) as "OKJ degrees". The students receive a corresponding certificate (bizonyítvány) on passing the final examination (szakmai vizsga).

The Secondary Vocational Training Programme (szakközépiskola - SZKI) consists of both general and vocational elements with a practical part (since 2013) and leads to a double qualification: After four years an examination takes place (szakmai érettségi), by passing it the university entrance qualification (érettségi bizonyítvány) is acquired. In addition, graduates with a passed exam will receive a certificate entitling them to take at least one subject-related activity. The exam, however, does not result in obtaining an OKJ degree. However, after the first four years of the secondary vocational school, pupils can acquire a higher professional qualification (e.g. technician qualification) at the post-secondary level. Depending on one's occupation, this takes one to three years, by the possibility of crediting previous subject-related services, in most cases "worth" one year. Graduates of secondary schools can also enter post-secondary vocational education.

Alternatively, after completing the eighth school year of the General Education School, a three-year vocational training can be completed at a vocational school (szakiskola - SZI). Since the new Vocational Training Act is in force (01/03/2012), apprenticeship training is being gradually introduced which is comparable to dual vocational trainings existing in Germany. Since the school year 2013/14, the dual model at vocational schools is considered obligatory.

In addition since 2013, transitional programmes (Híd I; II.) have been in place for students with learning difficulties. The target group of Híd I. are young people who are still subject to compulsory education but who, due to their poor performance, do not have access to a secondary general or vocational school. The purpose of the transitional programme is to assist participants in acquiring basic knowledge and skills and to prepare them for vocational training. The transitional programme II (Híd II.) is aimed at young people who have not yet obtained a general school education qualification at the age of 16 due to poor performance until the end of compulsory education.

Special needs education programmes (speciális szakiskola) are available for eligible students between the ages of 14 and 23, with which they can attain an OKJ (partial) qualification (bizonyítvány) after at least four years of corresponding performance and passing the final examination. In addition to subject-specific content, the programmes may also contain a general education component, but this is not necessarily the case.

Following a visit to a secondary vocational school (szakközépiskola - SZKI), students have the opportunity to attend two-years Advanced Vocational Training Centers (felsőoktatási szakképzés - FSZ) and thereby acquire a higher OKJ qualification (e.g. technician qualification). The programmes have been offered and carried out exclusively by colleges and universities since 2013, varying in duration from four to five semesters. Attending the Advanced Vocational Training Centers does not lead to a university degree, but may (partially) count towards a bachelor's degree. Also graduates of the vocational school (szakiskola - SZI) can participate in the programme, provided that a substantive link to the initial vocational training exists. Another condition for participation is the acquisition of a higher general qualification (duration two years) or five years of work experience and the passing of the master's examination (mestervizsgamestervizsga).

Basically, in the field of adult education vocational training can also be completed in a shorter training period. The minimum duration is one year. Prerequisite for the shortening is professional experience in this professional field or training in a similar occupation.

Master's examinations (mestervizsgamestervizsga), organized by the Hungarian Chamber of Commerce and the Hungarian Chamber of Agriculture, do not require the acquisition of a professional degree, but the attendance of master's courses and relevant professional experience. Upon passing the exam the participants receive a master's certificate (mesterlevél).

After all, there are also individual courses of study which, in addition to the acquisition of an academic degree, also lead to a professional qualification.

The National Register of Professional Qualifications (Országos Képzési Jegyzék, OKJ) classifies the vocational qualifications that can be obtained in the Hungarian education

system. The classification of qualifications was made using an eight-digit number. The first two digits reflect the skill level:

Vocational qualifications can be obtained at the vocational school, whose classification numbers start with the numbers 21, 31, 32, 33 or 34.

Vocational qualifications that require university entrance qualification or upper secondary vocational secondary school education have classification numbers starting with the numbers 51, 52, 53, 54, 55 or 71.

The change of government in 2010 results in current reform processes and also in a complete restructuring of the education system. This was gradually implemented across the board in three major waves (September 1, 2012, January 1, 2013, and September 1, 2013) until the school year 2013/14. A major change in the organization is that the organizational and financial responsibility of the entire public education system has been with the state since 1 January 2013, and no more with the local governments.

The aim of the reforms is to better adapt vocational training to the needs of the labor market, thereby increasing the attractiveness of vocational training. In the future, vocational education and training, in line with dual vocational training in Germany, should have a higher proportion of practice and be carried out in close cooperation with the private sector. This should motivate especially "school tired" young people to turn to an education.

In future about two thirds of the total training time at vocational schools (szakiskola - SZI) should take place at practical training centers (e.g. in the workplace). The training period was also shortened to three years, as a prolongation of vocational training in the past did not bring the desired results (better preparation for work, lower drop-out rates). Teaching at secondary vocational schools (szakközépiskola - SZKI) now also includes practical parts.

The compulsory school age was reduced to 16 instead of 18 years by January 1, 2013. Therefore an earlier entry into vocational training is now possible than before.

Since 2010, students can also start vocational training at 14 instead of 16. Between 2010 and 2013, the so-called Early Vocational Training (szakiskolai képzés) was introduced, which led to the acquisition of a professional qualification (bizonyítvány) in three years directly after

the eight-year Primary School. This was, however, replaced by dual vocational training in the course of the reform processes.

The so-called advanced vocational training courses (felsőfokú szakképzés - FSZ) with a duration of two years are offered and carried out only by universities since the school year 2013/14 and are now called higher vocational training courses (felsőoktatási szakképzés - FSZ).

2.3.2 Summary of BUILD UP Skills Hungary

Changes in the structure of building sector professions, shortcomings and disproportions of professional modules and also lack of definite chamber regulations for certain professions have contributed to significant problems.

Publishing the new National Qualification Register and also increasing the role of chambers enabled emergence of stable professional and organizational bases that may be utilized in case of planned trainings. No further modification or reshaping of the National Qualification Register is aimed. However support shall be given to endeavours supporting a pyramid-shaped education within a given speciality, i.e. participants of trainings in case of simpler activities enter the labour market as soon as possible, e.g. for building engineering professions like piping-, system-, then equipment installers. All trainings recommended within the BUSH project shall be developed as non-school based trainings listed in the registry of training programmes, based on the National Qualification Register and the structure of professions shall also be maintained. Trainings shall be standardized, as because currently it is possible to start trainings with different contents under similar names.

The concept of the new National Qualification Register is exactly to establish a stable basis that enables organising appropriate adult education considering aspects of lifelong learning. In accordance with this concept the BUSH project aims at developing and starting trainings that will be possibly listed in the registry of training programmes, since these trainings can be managed in a rapid, effective and flexible way. It is important that trainings - while maintaining the professional content - are shorter, thus are cheaper at the same time. In the

survey prepared for the Status Quo Report of the BUSH project, the majority of respondents had indicated that trainings should have a preferred length of 30 - 60 or 60 - 120 hours.

Strategies and legislation for vocational and adult training and education have been detailed in a subsection earlier, mentioning that acceptance of the new adult education law is underway. There is no information yet regarding the exact content and wording of the law to be adopted, however its main objectives are known. The training programmes to be developed in the future shall consider the regulations and toolkit of the new adult education act that entered into force as of September 1, 2013.

Within the BUSH project all those building sector trainings are concerned to prepare for carrying out activities enabling Hungary to meet its committed objectives of climate and energy policy in association with the EU-2020 strategy. Taking measures in the following professions and trades is justified, based on the Status Quo Report, the questionnaire surveys, the personal interviews, the expert consultations and conferences related to the BUSH project:

- Building insulation installer
- Door-window installer
- Bricklayer
- Roofer
- Tinsmith
- Waterproofing installer
- Central heating and plumbing installer
- Gas equipment installer
- Air conditioning system installer
- HVAC technician

and also the following specialities in the area of utilising renewable energy sources: solar collector, PV, heat pump systems and biomass boilers.

In case of specialities affected by the Directive 2009/28/EC on the promotion of use of energy from renewable sources (solar collector, PV, heat pump systems and biomass boilers) it is recommended to examine the possible introduction of these trainings as part of the certification system (required and recognised by law to work in a particular profession).

Following aspects shall be represented in every training: knowledge related to the importance of energy saving and its means, modernisation of energy systems of buildings, use of renewable energy, benefits of environmentally friendly architecture and also importance of control technologies; as well as a system approach related to energetics and also knowledge content related to these principles. Appearance of knowledge contents and skills that enable execution and cooperation of specific professions and specialities during the realisation phase is also considered necessary. This fact is of particular interest in case of executing complex modernisation, implementation processes and also in case of modernisation elements that build on each other.

2.3.3 Identification and evaluation of existing and needed certification schemes

2.3.3.1 External Thermal Insulation Composite System for walls (ETICS)

The vocational training related to thermal insulation in Hungary is particularly incomplete. The insulation technician training is an available registered training (in the „other trainings” category) in vocational schools, but it is not included in the NQR. At the end of the training the participants will be able to use safety devices, to install insulation, install dowels and nosing on the facade and embedding glass fabric.

Due to a fatal accident with fire propagation on a retrofitted facade with relevant building failures, fire safety related right technology of ETICS made of polystyrene became of high importance. Projects which receive public grants for new thermal insulation should have a certificate from the fire authority which states that the installation was made properly. The Hungarian partner ÉMI made a row of inspections and found that most of the projects show failures resulting of errors during the installation phase, basically at the joints around the

windows. This proves that there is a high demand for an adequate training related to joint installation.

The existing trainings related to insulation are organized by manufacturers and trading companies usually for their own employees. There are no trainings focusing on energy efficiency or innovative technologies.

2.3.3.2 Flat roofing and waterproofing

In Hungary, related to vocational training a basic roofer training included in the National Qualification Registry (NQR) is available. The three-year long training provides the following skills: calculating the necessary amount of material for roofing, drawing cover profiles, using equipments, calculating cross-sections of ventilated roof's air gaps, check of tinner structures, placing insulation complying with safety regulations. Those who successfully complete the training receive a NQR certificate.

There are also voluntary trainings available for roofers organized by manufacturers and trading companies in the roofing industry. The trainings mainly focus on best practices, the use of innovative products and solutions. Most of these trainings usually include practical units (roofing exercises).

The available trainings are usually 8 - 16 hours long and participants receive in-house certificates.

Better understanding of the right fixing/reparation principles of new thermal insulations, waterproofing systems and also solar PV-elements is essential. It is also advisable to make the fixing points properly, especially in those cases where the solar system will be installed only in the future.

2.3.3.3 Windows

In Hungary a basic window, door and shutter installer training is available which is included in the NQR. The participants who complete the training will be able to prepare the labour process, examine the materials, move the structures at the site, complete the assembly work

of the windows and doors, glaze the windows, install the related insulations, close the process and handle the waste.

Related to installing doors and windows, company-organized trainings are also available, but these mainly focus on promoting their own innovative products. The right window installation is more important in the case of high buildings, where the water penetration risk is increased resulting from higher wind speed.

2.3.3.4 Ventilation systems

The current education and continuing training system is rather complex for the HVAC crafts. Regarding the continuing vocational training for workers including on-the-job-trainings, in order to meet the demand for vocational trainings not covered by the formal education system, more and more market based continuing education programmes are available. These courses are accredited and based on specific requirements (technical and HR) and are registered in the National Registry of Qualifications. The currently available building related accredited trainings are:

- Building engineering and technician
- Central heating and plumbing
- Climatisation technician
- Air-conditioning mechanic
- Electro-technician
- Renewable energy technician.

In terms of numbers there are 115,000 people working in the building sector in Hungary, out of which 35,000 people are working in the HVAC sub-sector according to their qualifications:

- 2,000 have tertiary qualifications (engineers)
- 7,000 have secondary qualifications (technicians)

- 25,000 have some qualifications which are registered in the National Qualification Registry (OKJ)
- 1,000 have no qualifications

Thus the major bulk of all HVAC professionals working in the building industry have National Qualification Registry qualifications. However the curricula for these qualifications have been upgraded in 2011 to include up-to-date information on renewable energy use and energy efficient products and equipment. Therefore there is a great need among the partitioning workers to upgrade their knowledge with energy related information and skills.

Currently in Hungary only health and safety related jobs require mandatory training such as F-gas certification which is a mandatory training/certification and post certification credit point training for HVAC qualified personnel who work with equipment containing F-gases and Ozone Depleting Substances (ODS).

There are voluntary trainings organised by trading companies, but these mainly aim at promoting their own products.

The BUILD UP Skills TRAINBUD project which was the second pillar of the BUILD UP Skills initiative in Hungary developed a voluntary training for HVAC craftsmen related to renewable energy and energy efficient solutions. This provides a system approach and demonstrates the building as a whole system. The training aims at providing up-to-date knowledge to craftsmen related to seven different fields of energy efficient solutions:

1. Solar collector, photovoltaic systems
2. Heat pump systems and biomass boilers
3. Surface heating and cooling
4. Condensation boiler, chimney
5. Heat recovery ventilation system
6. Control technology, measurements in energetics
7. Wall insulation, windows-doors.

The higher training demand is caused by the lack of adequate ventilation of renovated buildings, where the air transmission at the windows tends toward zero. The improper ventilation most frequently causes serious moulding, causing health issues. Also air penetration for improper sealing of lightweight structure like built in attic could cause high efficiency loss. Trainings focusing on this specific topic are a necessity - in Hungary and in partner countries as well.

2.3.3.5 Building inspection

Related to building inspector trainings there is a training included in the National Qualification Registry (NQR). The entrance criteria for the training are university/college degrees. The training provides the following skills: The building inspector as the representative of the builder facilitates and controls the compliance with the related laws, regulations, rules, contracts and construction documentation. Building inspectors in Hungary are usually architects and engineers who completed this training to have further expertise.

In Hungary the Basic Law of Building (Law LXXVIII of 1997) on the protection and forming of the built environment specifies the tasks of the building inspectors and the terms and responsibilities related to working as a building inspector.

The task of the building inspector is to foster and control the adequate implementation of the related regulations, standards, contracts and documentations during the whole construction. The building inspector must have vocational education and professional experience. It is mandatory to employ a building inspector in every construction activity which requires a construction permit.

According to Government Regulation 244/2006 (XII.5.), in Hungary currently it is not mandatory for building inspectors to complete a training, but in order to work they are obliged to pass an exam and prove to have at least three years of experience.

The exam is organised and maintained by the national professional chambers (Chamber of Hungarian Architects and Hungarian Chamber of Engineers) and consists of the following two major parts:

- 1) General part which is the same in the case of every type of entitlement
- 2) Special part which differs in the case of every different related profession.

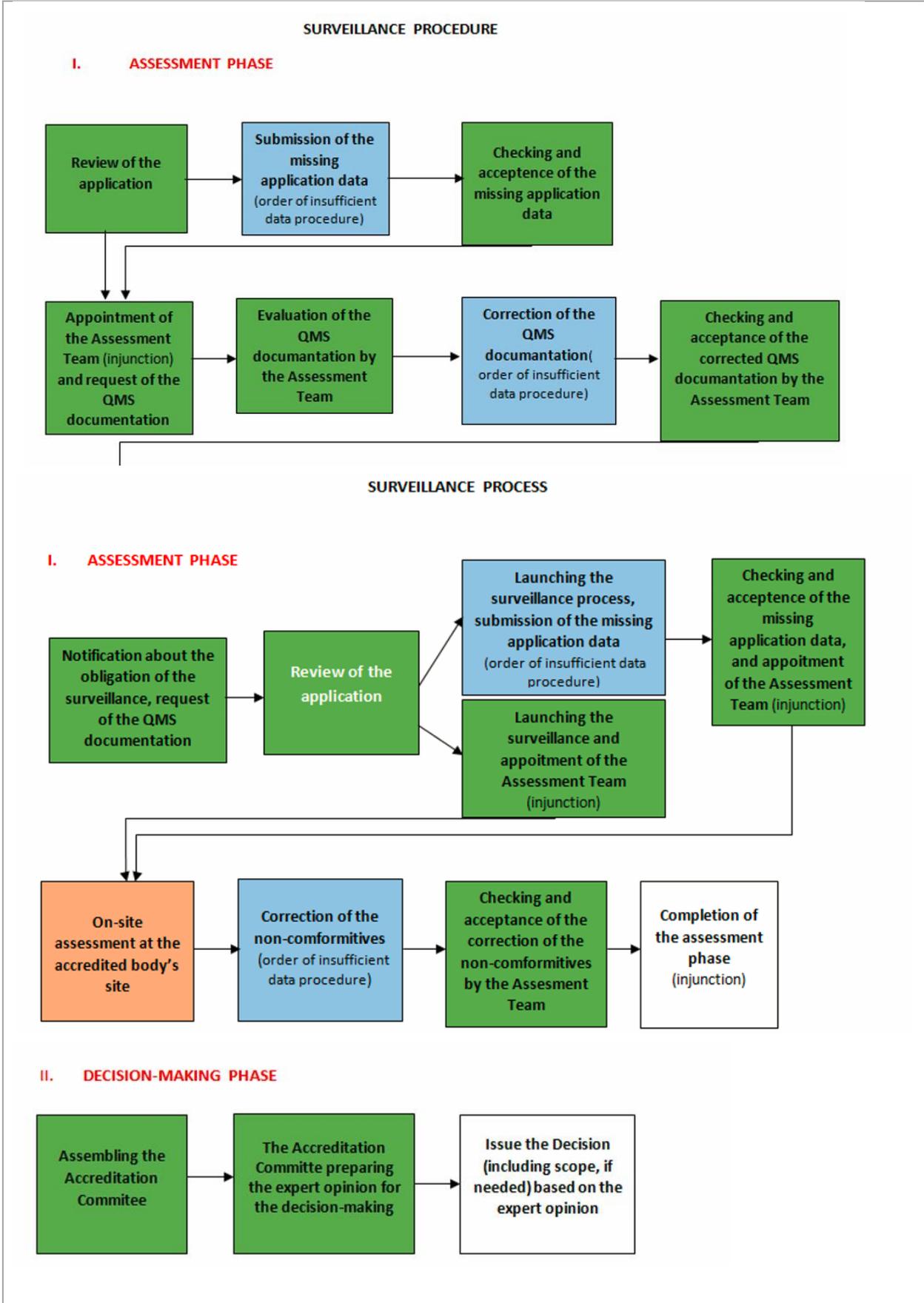
In case of college/university graduates three years of professional experience is required, in case of secondary/vocational education five years of professional experience must be proved.

Those who acquire the entitlement to perform activities as building inspectors also need to continuously participate in further trainings. There are mandatory (financial, law, standards) and voluntary sections and a minimum of 10 hours- and a maximum of 20 hours-training must be completed. It is not compulsory to be a member of the relevant national chambers, but one must be included in the chambers' register.

Energy efficiency and renewable energy related knowledge is missing. There is a high demand among building inspectors for also having cross craft related training, especially of the fixing method of solar systems on flat roofs, air tightness of lightweight structures, fire safety aspects of ETICS made of combustible materials and proper controlled ventilation systems.

In Hungary the **National Accreditation Authority** is the leading authority regarding accreditation of trainings. The Hungarian national accreditation is provided for in Act CXXIV of 2015 while provisions on the National Accreditation Authority and the accreditation procedure are laid down in Government Decree No. 424/2015. (XII.23). The National Accreditation Authority is a central budgetary organisation controlled by the minister in charge of industrial affairs, operating as a central office. The accreditation process became very complicated, expensive and long in Hungary, which is a challenge in the case of new trainings.

The following figure explains the accreditation process (*Source: <http://www.nah.gov.hu/process-of-accreditation>*):



There is also an opportunity to register trainings at the **Hungarian Chamber of Commerce and Industry**. The trainings are basically in line with the trainings included in the NQR, but there these are included in the “other trainings”-category. In case an organization intends to register a training at the Hungarian Chamber of Commerce and Industry a programme requirement document has to be submitted which must include the entrance criteria, the target group, the length of the training and the learning outcome (competences, skills). The experts of the Hungarian Chamber of Commerce and Industry evaluate the document and decide whether a training can be registered.

The **Hungarian Chamber of Engineers** apart from organizing short trainings and conferences recommends professional trainings held by other institutions. These trainings are usually recognized and approved by the chamber due to their high quality and professional content, but are not part of their mandatory trainings. In case an organization intends to include a training among the recommended trainings, the chamber must be informed and provided with the details of the training, after that, experts decide whether it can be included in the list of recommended trainings.

In Hungary vocational education is available in the school system and in adult education as well. The trainings that are included in the NQR are available in training institutions and **training centers** around the country.

Manufacturers and trading companies of the building industry also organise trainings in several fields including ETICS, flat roofers, windows and HVAC. These trainings are usually voluntary trainings with in-house certificates. Most of them focus on knowledge restoration, good practices and innovative technologies and products of the organizer company.

2.4 The Netherlands

2.4.1 Brief description of the VET system

The vocational training system of the Netherlands is uniformly regulated at national level, but managed on a decentralized basis. The main actors of the predominantly school vocational trainings are the regional training centers (Regional Opleidingscentra - ROC) and the agricultural training centers (Agrarian Opleidingscentra - AOC). In addition, there are the

Vocational Training and Economics Centers (ndl: kenniscentra beroepsonderwijs bedrijfsleven), which are affiliated to the Vocational Training Foundation (Samenwerking Beroepsonderwijs Bedrijfsleven - S-BB), and industry-related vocational schools (ndl Vak-scholen), which only specialize in occupations trainings (eg shipping, design and food industry).

Vocational preparatory education

After attending elementary school, which takes seven to eight years (ndl. Basicsschool), the students can study the four-year vocational training middelbaar beroepsonderwijs - VMBO („preparatory middle school”) and thus obtain professional education. This full-time school education, which exists since 1997, prepares for vocational training as part of so-called middle-level vocational training and leads to the "VMBO Diploma" (diploma). There are four learning pathways with a different ratio of vocational and general education subjects as well as a varying proportion of practical employment.

Initial vocational training

Admission requirements for intermediate vocational trainings (ndl. Middelbaar beroepsonderwijs - MBO) are a minimum age of 16 years and the successful completion of preparatory middle education (VMBO). The average vocational training is completed with the certificate "diploma beroepsonderwijs" (diploma vocational school) at four possible levels. Graduates should be able to

- Level 1 "assistentenopleiding" (“assistant training”) to carry out simple tasks under supervision (duration ½ - 1 year)
- Level 2 "baseberoepsopleiding" („basic vocational training”) to take over responsibility for work in one's own area of responsibility (duration 2 - 3 years)
- Level 3 "vakopleiding" (vocational training) to carry out activities independently and also to accompany and supervise the work of others (duration 2 - 4 years)

- Level 4 "middenkaderopleiding" („middle management training”) is self-sufficient to carry out activities in a wide range of applications, to take responsibility for an organizational area and to delegate tasks (duration 3 - 4 years).

Level 4 "specialistenopleiding" (“specialist training”) is able to independently carry out activities in a special field of application, to take responsibility for an organizational area and to delegate tasks. Admission requirement for this additional qualification is a "diploma beroepsonderwijs" at level 3 or 4 (duration 1 - 2 years).

For about half of the approximately 300 training courses of the Vocational Secondary Education (MBO) there are two different learning pathways where the level of practice (ndl beroepspraktijkvorming - BPV) varies:

- The vocational training pathway (BOL) is predominantly school-organized with a practical share of 20 to 60 percent.
- In contrast, the part-time learning pathway (BBL) with a practical share of at least 60 percent is comparable to a dual apprenticeship

Country-specific feature:

The Dutch vocational training system is characterized by a modular structure that allows a high degree of permeability between the individual programmes.

Current reform processes:

An important reform began on October 1, 2003 with the agreement "Aan de slag", which is supported by the main players in the field of vocational training. The objectives of the agreement are to increase the attractiveness of vocational training, greater practical relevance of vocational training, improved cooperation between VET programmes (VMBO, MBO and HBO) as well as improved competence assessment of trainees.

With the action plan "Focus on Skills 2011-2015" ("Actieplan mbo Focus op Vakmanschap 2011-2015"), which was adopted by the Dutch Parliament on February 16, 2011, the restructuring phase of the Dutch VET system has been legally anchored. On the one hand, the traineeship profiles should be formulated across all sectors with regard to competence,

problem solving and action, and the attractiveness of the trades should be increased. On the other hand, the number of training and further education professions should be further reduced. Since the school year 2012/2013, there are now only 237 qualification dossiers with 612 fields of study, instead of about 630 different vocational training courses (ndi kwalificaties).

In recent years the Netherlands started pilot projects to counteract the high drop-out rates and the lower appreciation of middle vocational education (MBO) compared to the general education pathways (HAVO and VWO). Since 2005, for example, so-called "competence-oriented vocational training" has been tested. In addition, integrated programmes (VMBO and MBO) have been started since 2008. The permeability between the middle vocational education system and the colleges should be promoted by the fact that MBO graduates, by participating in a so-called "ad-programma" at a college (duration 2 years) a small college degree called "Associate Degree" ("ad ") is earned. Since the trial phase of these "ad-programma's" was successful, they were included in the education programme for the 2014/2015 school year.

2.4.2 Summary of BUILD UP Skills Netherlands

From 'consciously incompetent'...

The status quo analysis (WP2) and the detailing of BUS-NL's Roadmap (WP3) show that the Dutch workforce in the building environment is insufficiently skilled to realise nearly zero-energy buildings. Indeed, a large part of the working population is up to now entirely ignorant of this. Many construction errors are caused by such ignorance.

to 'consciously competent'...

In Chapter 5 of this report (BUSK NL Roadmap), in a roadmap the measures are outlined that must be taken between 2013 and 2020 to move from consciously incompetent to consciously competent. One of the main drivers for this is the conclusion that in order to realise the 2020-objectives successfully and at high quality, upskilling will be needed for at least 150,000 - 200,000 craftsmen in the construction and installation sectors.

Key measures in the roadmap concerning the education in the construction sector (construction, installation, finishing and maintenance) are:

- Developing a sector qualification structure for craftsmanship based on the upgrade
- Professional competency profiles (BCP+) to be used to further develop post-initial retraining
- Developing multidisciplinary courses and education
- Guaranteeing the quality of post-initial education and persons/companies
- Updating of existing and development of new attractive teaching materials and forms of training

Due to the strong links between initial and post-initial education in the Dutch situation, it would be wise and therefore desirable to carry out a number of the above-mentioned measures in parallel with actions for initial intermediate vocational education.

For example, the findings of the BCP+ profiles may be used to further develop BCPs for initial education. The same applies to embedding innovations in BCPs. Updating and keeping up to date teaching materials for initial education plays an important role in this.

Finally, we concluded that the execution of the roadmap actions will be viable, provided the following preconditions are met:

1. there is a national and broadly supported platform from which actions are planned, coordinated and monitored
2. there is sufficient funding for the execution of the measures.

Based on the above, there can be no doubt about the importance of starting BUS-NL Pillar II as early as possible.

Performance of actions is laid down in the National Roadmap, focusing on the introduction of new and/or upgrading of existing qualification schemes, education and/or training for the benefit of post-initial education.

2.4.3 Identification and evaluation of existing and needed certification schemes

2.4.3.1 External Thermal Insulation Composite System for walls (ETICS)

For airtightness and thermal insulation there are practically no personal certifications. There are some participation certificates for manufacturers' trainings, but no general certification schemes. This might partly be because of great diversity in small specialism which all influence each other and are executed by a different person, which makes it hard to certify. These trainings should at least include: window frames, roofs (connections, roof ducts, etc.), but also interruptions of the building envelope caused by ventilation systems (grids, control), meter cupboards and air leaks (in general). Training should be focused on constant quality for the whole building process.

For ventilation installers there is the possibility to be certified under BRL 8010 for schools, dwellings and children day care centres. The BRL 8010 involves two types of assessment: a check if the new ventilation systems is complying with the building regulations and performance assessment of existing ventilation systems according to the building regulations on contractual obligations. Only a few installers are certified because of lacking competitive advantage.

Most existing trainings originate from collaboration between training institutes and manufacturers. These discuss both theory and specific products. Attention for cross craft can always be improved, same for more and better trainings. Airtightness together with insulation and ventilation are important issues. Products are good, but mistakes are made with the application.

Continued education does exist, which mostly arises from contact between companies and manufacturers. The construction companies want these trainings to increasingly focus on specific products, projects or profiles (so increasingly specialist). Because of the technological developments, training institutes need input from manufacturers - this results in better and most current trainings. That said cooperation is important, also in the construction column as a whole.

2.4.3.2 Flat roofing and waterproofing

There are almost no certification schemes in the roofing sector for flat roofs; the only known scheme is for 'Sustainable Roofs'. Thus there are still a lot of (construction) companies and employees who are not certified. They lack skill and knowledge, which results in mistakes both in their own expertise, as in related expertise. For pitched roofs there is BRL1513: roofer companies can be certified according to this.

In different interviews the importance of plural roof usage was mentioned. Plural roof usage will become more and more important, especially in urban areas. Plural roof usage describes roofs which combine blue, green and yellow systems. This leads to combination of PV on roofs and PV integrated in flat roof coverings and green roofs. The combining of these systems is where most mistakes are made. Specialisms are too far apart, and there is no attention for cross-craft elements. Right now these are installed by different companies (therefore also by different craftsmen). But clients want one company to have all the skill and knowledge needed to help them.

This means there is a need for a good integral basic training, to create basic understanding of possibilities, cross craft understanding and experience with overlapping specialisms. The existing educations and trainings need a better and more sustainable interpretation, and a more interdisciplinary focus (waterproofs, roof vegetation and solar systems).

Education institutes are not up to date on sustainable developments. Their teachers do not have yet all the knowledge, let alone they have trainings and training materials on the subject, with a few exceptions as installments of PV panels on a flat roof. Specialized training institutes and producer trainings are the only alternative, but most of them are pretty good. Also there is the combination of education programmes and ROC schools.

Continued education is not yet implemented enough in the roofing sector. There are some training institutes with good specialist trainings though (for instance OMEGA and BDA).

The interview results were mixed about the importance of personal certifications for roofing companies. Some mentioned a certain degree of education is important, others mentioned that personal certifications are not valued and that working experience is more important.

ISO 17024 is not a topic yet for the roofers. Certification for passive house craftsmen also is not a topic yet in the Netherlands. The result is that we are missing a real specialist on energy advice.

2.4.3.3 Windows

For the installation of windows there are a couple of certification schemes in the Netherlands. There is a great variety of Velux trainings. And there are three different certifications by Dakvenster Meesters. These certifications are: Daylight and pitched roofs; Daylight and Flat roofs; Daylight and solar. The uptake and evaluation of these schemes is not clear yet at this moment.

2.4.3.4 Ventilation systems

For the installation of ventilation systems, ISSO and the industry had written a training programme and an exam almost ten years ago. Although the exam exists there is no organization offering this training programme. There is a free course of half a day offered by different manufacturers which is very popular with installers who are starting in their job. Specific issues of nZEB dwellings when installing ventilation are:

- Penetration of the insulated and airtight skin with ducts, which causes cold bridges, air-leakage etc.
- Noise due to un-insulated ducts which can substantially raise noise levels in buildings
- Use of inadequate equipment to measure air flows (mostly abroad, in the Netherlands this is quite good)
- No insight in air-tightness: contractors of the building skin are not aware of the consequences of air leakage on for example heat recovery efficiency
- In apartments and high rise buildings fire safety is an issue with collective ducts built by third parties but used by the installer

- There are derivations of the components that are designed and installed in the buildings; these have consequences for the performance, particularly energy. This is in many cases not clear. There is a need for a good prediction of energy use.
- Demand control ventilation gives a better score of the energy label. The placement of the sensors for demand control ventilation raises problems for the installer.

2.4.3.5 Building inspection

There are no major schemes for building inspectors in the Netherlands. There are energy and EPBD related inspection/advisory programmes. But these are mainly focused on energy. Due to a new expected law on quality assurance, many post-initial education providers have added short courses on quality assurance in the building sector. But those are not subject to a certification scheme yet. Therefore, they differ strongly in content and duration.

For some of the organisations which provide these trainings, this is a side activity. Their main body of activities is to provide quality assurance. In some cases coaching is made part of their main job of providing quality assurance. But most of the time these are short courses which consist of half a day or a single day of training. Sometimes, these short trainings are also organized by education providers. In these cases one neither can speak of a certification, nor of a complete training which prepares the trainees to practice this skill themselves.

Other trainings are organized more extensively. Most of them are given by education providers. The extensive trainings aim to teach a lot of knowledge and skills and award the successful students with a diploma. These trainings take multiple days of training, e.g. a ten-day-course concluded with a practical assignment. After the trainees finish the training, they are able to start working as a quality assurance officer themselves.

Besides the quality assurance, there are certification schemes for energy performance assessment. The official certification is a scheme of KvINL, and implemented by ISSO and Cito. Additional certifications for specific specialisms are organised by FedEC. However, the official certification as the additional one are completely focused on energy usage instead of

building inspection. This means the scope of these certifications is way to narrow for the goal NEWCOM wants to achieve.

2.5 Slovakia

2.5.1 Brief description of the VET system

In September 2015, a new dual training system was introduced in Slovakia. The objective is a stronger demand and practice orientation of vocational training. This new training model was introduced as an addition to the existing, largely school-based training model. The four-year training has a practical share of 50% and leads to a double degree ("Abitur" and professional qualification). The companies select their trainees and conclude a training contract with them, which regulates the duration and contents of the training.

So far, the Slovak VET system has been largely school-based. The Slovak government has introduced dual training as another segment of the VET system. The legal basis came into force on April 1, 2015.

Since 2008, there are only two types of secondary schools. The former vocational schools (secondary vocational schools, stredné odborené učiliste - SOU) operate since then also under Specialized Secondary School (stredná odborná škola - SOS). The general upper secondary education is offered at grammar schools (Grammar Schools – Gymnázium).

Within the group of SOS there are programmes with different degrees of practical relevance. More practical are the "study branches with vocational training" (odbor s odborným výcvikom, internships, mostly in the summer) in contrast to the "study branches with practice" (odbor s praxou). They include curricular a change between theory and practice in the form of school workshops or at schools/training centers selected by the school.

Initial vocational training

The initial vocational training is subdivided into three branches depending on the desired qualification level. Lower secondary vocational education (nižšie stredné odborné vzdelanie, sec I) provides general and vocational subjects in a two-year programme and concludes with a certificate "vysvedčenie o záverečnej skúške". In certain apprenticeship subjects, the

degree can also consist of a vocational certificate called "Certificate of Apprenticeship" (výučný list).

Secondary vocational education (stredné odborné vzdelanie, sec. II) provides general and vocational subjects in a programme of at least three to four years and concludes with a certificate of completion "vysvedčenie o záverečnej skúške" for the level of education achieved and a vocational certificate called "Certificate of Apprenticeship" (výučný list) for the achieved qualification.

Secondary education (úplné stredné odborné vzdelanie, sec. II) provides general and vocational subjects in a programme of at least four to five years and concludes with the "Vysvedčenie o maturitnej skúške" school leaving certificate for the level of education achieved and the qualification obtaining access to higher education. In certain subjects, the degree may also consist of a vocational certificate called the "Certificate of Apprenticeship" (výučný list).

Higher technical education

The higher professional education (vyššie odborné vzdelanie) serves to further specialize or to increase the qualification in certain professions and is carried out in a minimum of two years and a maximum of three years programme and is completed with the specialist degree diploma "Diplomovaný špecialista".

Professional training

Vocational training is shared between public and public schools, colleges and private educational institutions. Public schools in the Slovak Republic are institutions in the public sense and are usually founded and financed by a regional self-governing body, the Regional Education Office (Krajský školný urad). State schools, on the other hand, are subordinate to the central state administration; they are financed out of the state budget.

While offers of public and state schools and colleges are mainly aimed at completing secondary education and higher, specialized education or for targeted preparation for specific subjects, private educational institutions are primarily concerned with continuing vocational training. The providers must have accreditation from the Ministry of Education.

This offer is supplemented by organizations such as the Chambers of Commerce and Industry. The offers are designed as part-time and evening studies (štúdium popri zamestnaní) for adults.

Responsibilities

The responsibility for the regulation of initial and continuing vocational training lies with the Ministry of Education, Science, Research and Sport (MSVVaS, Ministerstvo školstva, vedy, výskumu a športu). The other ministries play a minor role, except in special secondary schools such as health or police. Nevertheless, their role has grown after the introduction of the 2009 Vocational Training Act through their representation on the Governmental Committee on Vocational Education. For example, the sector committees are composed of representatives of business associations and chambers in cooperation with the Ministry of Labor, Social Affairs and Family (MPSVR, Ministerstvo práce, sociálnych vecí a rodiny).

Major institutions within the area of responsibility of the MSVVaS are:

The National Institute of Education (SPÚ, Státny pedagogický ústav), which provides support in vocational education curriculum development of general education subjects at vocational schools. The State Institute for Vocational Education (SIOV, Státny inštitút odborného vzdelávania) provides support for the development of vocational school curricula and is responsible for the development of national framework curricula. The MSVVaS is also competent for the regulation of continuing education and lifelong learning.

Role of enterprises in VET

Practical training is part of vocational education and takes place individually in workplaces in schools, practical training centers (shared facilities with laboratories or workshops across schools), medical facilities and partner schools.

The automotive sector is the leading economic sector in the Slovak Republic. There were numerous activities here, the results of which have been incorporated in the Vocational Training Act of 2009. They concern, for example, the way of planning and developing training programmes involving business, exam design and teaching staff.

2.5.2 Summary of BUILD UP Skills Slovakia

The “Strategy for the Creation and Implementation of a Comprehensive System of Further Education in the Buildings Sector” presents a structure to create a framework for the continuous improvement of building-education for construction workers in order to proactively respond to the green economy challenges by 2020, use of RES.

The proposed solution responds to the shortcomings identified by the analysis of the current situation in the sector and is based on the roadmap (outputs processed within the BUS SK project), which is necessary to conduct the successful implementation of the framework. The procedure and timetable for the implementation of the individual measures, including the allocation of the stakeholders’ responsibilities together with the proposal for their financial security, describes the action plan.

The introduction of the framework will create the prerequisites for the successful adaptation of the vocational training of workers in the building sector and the requirements evoked by the time horizon up to 2020. At the same time, the conditions for a further increase of the competitiveness of the Slovak construction sector beyond 2020 will be created through coordinated monitoring of ongoing measures and of new market demands and trends in construction.

The core of the proposed system is the establishment of a competence center and a network of its specialized workplaces to ensure networking of VET institutions and stakeholders in order to establish a coordinated management of construction education. This creates the prerequisites for a correct set-up of the entire system and for the alignment of the individual components of the whole system, which are currently managed relatively "shattered" - depending on the competencies of the individual ministries and other stakeholders.

The proposed system of measures introduces a comprehensive approach to the following issues in the areas of construction, energy efficiency of buildings and RES in buildings:

- Employment and labor market transparency
- A system of qualifications, further vocational education and training

- Preparation and creation of study programmes, educational programmes, courses and trainings
- Accreditation of training and certification of workers
- Establishment of an institutional framework to ensure a continuous stakeholder dialogue, labor market monitoring, the education system, accreditation of education, their financial security, as well as the monitoring of new trends and requirements in this field
- Coordinated approach to the financing of all these activities in order to effectively align all available financial flows, in particular resources from EU-funds and initiatives, resources from the state budget of the Slovak Republic and relevant private sources.

2.5.3 Identification and evaluation of existing of needed certification schemes

2.5.3.1 External Thermal Insulation Composite System for walls (ETICS)

There are two training and certification schemes for ETICS in Slovakia. These certification schemes are providing services for whole Slovakia and have the adequate capacity in delivering the needed training and certification. ETICS certification is currently required for construction projects co-financed by state, for example for construction of apartments benefiting from the State Fund for Supporting Housing.

2.5.3.2 Flat roofing and waterproofing

During the interviews with the experts, the flat roofing and waterproofing has been highlighted as a key area for needed action. As was stressed during assessment of further training schemes for craftsmen, specific action is needed in the area of flat roofing and waterproofing. This outcome validated the results of the pre-application survey in Slovakia, in which the needs in improving further education and training of roofers and hydro-insulators (hydro-insulator is a separately listed trade and this trade is also responsible for waterproofing of the buildings) were examined. Therefore, Slovakia will join the efforts of NEWCOM for developing and implementing the qualification and training scheme on flat roofs. To complement this scheme with training on building waterproofing, Slovakia is

implementing a project CraftEdu (GA No 785036) in which this topic will be addressed in coordination and concertation with the NEWCOM project.

2.5.3.3 Windows

Within the BUILD UP Skills II project StavEdu, partners developed training programmes for installers of fillings for building openings. The training for installing windows was implemented in cooperation with Slovenergookno, an organisation specialising in certification of window installers. This training will be further developed under the CraftEdu project. Dissemination of the training is to be supported by ESF Operational Programmes „Human Resources “, together with other programmes developed within the StavEdu project and to be developed under CraftEdu and NEWCOM projects.

2.5.3.4 Ventilation systems

The qualification and training programme for HVAC installers was developed during the BUILD UP Skills II StavEdu project. The interviewed experts stressed that further attention needs to be given to the ventilation of residential buildings, as the inside air quality and increased humidity is impacting the health of the residents. Lack of quality in this area is amplified by negative case studies published in the national media that are hurting demand in energy renovation of buildings.

2.5.3.5 Building inspection

There is no such a position of a building inspector in Slovakia. The supervisory role on the construction site is fulfilled by a site supervisor representing the investor (owner of the building). Within the Horizon 2020 ingREeS project, the further education and training scheme was set up by the Slovak Chamber of Civil Engineers for site supervisors focused on energy efficiency and use of renewable energy sources in buildings. This scheme will be reviewed to consider outcomes of the NEWCOM project. The ingREeS training continues to be delivered on a regular basis and the aspects of the energy efficiency and use of renewable energy sources in buildings are to be included in the testing for required authorisation of civil engineers according to the applicable laws.

3 Conclusions and recommendations

3.1 Austria

3.1.1 External Thermal Insulation Composite System for walls (ETICS)

Trainings for becoming a certified ETICS installer are available in Austria since 2007 in cooperation with the Austrian Building Academies as an educational institution and with WIEN-ZERT as an external certification body. At present, approximately 5,000 participants have attended these trainings. The confirmation of successful participation in an appropriate training in a certified institution, e.g. the Austrian Building Academies or in another training of independent institutions is the proof of the special qualification.

Within the framework of a standardised written examination, which is carried out by the Austrian Building Academies, WIEN-ZERT offers trainings to become a "certified ETICS installer", i.e. then knowing the applicable processing guidelines for External Thermal Insulation Composite Systems (ETICS). The training comprises theory and practice alike and concludes with an equally standardised examination. The test, which is carried out by WIEN-ZERT (the testing and certification body of the Municipal Department 39 - Testing, Surveillance and Certification Body of the City of Vienna) is considered as proof of compliance with the special qualification. The prerequisite for admission to the examination is at least a half-year practice in an ETICS company. The certification is valid for three years and is renewed with each refresher for further three years.

Regarding this, a further development of trainings for installers of ETICS within NEWCOM is not necessary.

An outcome-oriented learning-presentation of the competencies of a "certified ETICS installer" as well as a classification into an NQF level has not yet been established. NEWCOM could provide input here within the framework of the project. A considered "internationalisation" of the course would be possible. The Quality Group ETICS is member in the EAE - the European Association for External thermal insulation composite

systems - and could give support in the case of across-the-border-recognition of this certification.

3.1.2 Flat roofing and waterproofing

In the area of flat roof construction and waterproofing, there is still a great need for training and further education. The largest training provider in Austria is the "Institut für Flachdachbau und Bauwerksabdichtung" (IFB), which itself or in cooperation with educational institutions (e.g. building academies) tries to cover the demand. In a modular system, training is offered to become a "certified building surveyor", which includes both practical modules and theory. Within the framework of this project, this course is to be extended to include the description of competences in terms of learning outcomes. Then, it is planned to prepare this qualification and to accompany its entry into the National Qualification Register (NQF). With the entry in the NQF, which is also linked to the EQF database, a feasible model for mutual recognition is also to be created. In addition, the development of the three modules (which are particularly relevant to nZEB) "Green roof as a contribution to climate change adaptation", "Integration of renewable energy systems in flat roofs" as well as "Renovation of flat roofs to nZEB standard" is also planned. The existing training materials will be extended to include ULOs and adapted for incorporation into the e-learning system or newly developed for the new modules.

3.1.3 Windows

As also described in 2.2.3.3, the installation of windows in Austria is increasingly carried out by smaller, independent installation companies and there is a high demand for quality assurance and improvement, especially when replacing windows during renovation. The situation is aggravated by the fact that - especially with small projects - the planning and coordination of the execution by an architect or a site manager is missing and especially the necessary preliminary and ancillary services are not optimally coordinated and provided. Also the assembly personnel often lack the appropriate qualification. The well-known window manufacturers in Austria react to this situation by carrying out their own product-specific training courses, which they want to make compulsory for the fabricators of their windows and doors. However, these measures do not include the increasing number of windows that

are being installed on the construction site in the refurbishment sector using windows directly from wholesalers or building material dealers without the manufacturers having any influence.

Within the framework of the surveys on the current training situation, it was examined whether the development of an Austrian qualification/certification programme for contractors installing windows could be realised within the framework of the present project. Due to the heterogeneous structures which exist in this area (the different materials (metal/plastics/wood) are predominantly produced by different manufacturers and the possible contact persons for qualifications are organised in different interest groups), it seemed, however, less promising to establish such a module, which would be supported by all interest groups. In addition, a relevant module is to be developed in the H2020 project CraftEdu (Grant agreement No 785036), in which two NEWCOM project partners are represented (ViaEuropa and 17&4), and these results are also to be used and disseminated in NEWCOM. Hence a development of new courses for the installation of windows will not be considered in Austria within NEWCOM.

3.1.4 Ventilation systems

Ventilation technology is a key technology for the nearly zero-energy buildings. Several investigations document lots of errors in planning and construction of ventilation systems. In order to combat these errors, many educational institutions and system providers started offering special courses, among them a “Certified comfort ventilation technician”-course offered by AIT (Austrian Institute of Technology). This course provides an (product-independent) overview of the systems commonly used in the market and is intended to provide reliability for the initial consultation as well as for the planning, commissioning and servicing of comfort ventilation systems.

During the survey carried out within the project BUILD Up Skills Austria, in the category “heating, ventilation, air conditioning” the largest offer of courses (also certified courses) among courses regarding further education of professionals - and at the same time the largest number of participants - was recorded. The increased demand for ventilation systems and a stricter regulatory framework require a better skilled staff for assembling, operating and

maintaining these systems in future. Providers such as the Austrian construction academies, the Energieinstitut Vorarlberg, the Oberösterreichischer Energiesparverband, the AIT and the WIFI offer courses in this area. A list of certified Austrian ventilation systems installers is available under the following link <http://www.komfortlüftung.at/installateure-planer>. At present the Austrian market is saturated with trainings for the implementation of ventilation systems. Therefore the development of new courses for ventilation systems will not be considered in Austria within NEWCOM as available courses cover the needs of the market.

3.1.5 Building inspection

The control of qualities of buildings - required by building laws and subsidies' conditions - plays an important role in securing energy goals and also influences essentially the demand for further training, as the companies have to take action if the handing over tests are not to passed. The EU Buildings Directive also requires: "In order to ensure the quality of the identity cards issued via the energy performance and the inspection of heating and air-conditioning systems throughout the Union, an independent control system should be put in place in each Member State".

"Since the regional and local authorities are responsible for the successful implementation of this Directive of crucial importance, they should, where appropriate, be adopted in accordance with national provisions legislation relating to planning aspects, the preparation of information, training and awareness-raising programmes and the implementation of this Directive at national and regional level are consulted and integrated. These consultations could also be used to provide local planners and building inspectors with appropriate guidance on how to carry out the necessary tasks".

Quality assurance and quality control in the planning and construction process:

In order to achieve and maintain the quality of buildings necessary for nZEBs, continuous quality assurance and control throughout the entire planning and construction process would be required. Currently this is only the case in isolated examples in Austria and requires a structured approach which is applied within building certifications (e.g. klimaaktiv Gebäude-deklaration, DGNB, ÖGNI, LEED, BREEAM). In the vast majority of housing construction

projects, both in new construction and renovation, qualities are defined once (most of the nZEBs-relevant qualities are described in the energy certificate), and are then later hardly or only inadequately tested. Although the building energy certificate is a binding component of building applications and permits in Austria as well, compliance with the qualities prescribed therein is not checked by the authorities, or is not checked across the board. In the area of publicly subsidised housing construction, technicians of the subsidy office occasionally check compliance with certain qualities (telephone call with the housing technician of a federal state on June 14, 2018), but this check is carried out according to verbally agreed on rules and not quality assured. Neither the authority nor the installer/operator has comprehensive control over the handover of buildings to the users or the commissioning. Although the building authority requires a foreman, who is responsible to the authority for the construction of buildings, to confirm the "proper construction", he only checks compliance with these qualities in isolated cases.

In principle, there are two types of final inspection:

1. The permit for use issued by the building authority (the official final inspection), in which the house is inspected in accordance with the building police regulations and, if relevant, criteria for subsidies (the house may be inspected only after this official final handing over).
2. The handing over of construction services or partial services by the client or his agents, where the fulfilment of the contract is checked and confirmed.

The understanding must be induced that in future the following points, relevant for planners and executors, will be checked:

- Consistency of declared components and qualities in the energy performance certificate in planning (planning protocol) and in execution
- Performance of plants via handing over protocols.

One recommendation - that has emerged from the surveys carried out to date within the framework of this project - is that official handing over inspections in the construction sector should not be reduced under any circumstances (the inspection of the construction site after

completion is described in some federal states), but on the contrary should be strengthened, in particular with regard to energy aspects. As a result, the monitoring of the energy performance certificate (in particular solar yields at larger systems, annual performance factors of heat pumps) is recommended to be executed mandatory.

The handing over, by which the client acknowledges the services of his contractors as fulfilled, is basically regulated in ÖNORM B 2110. The acceptance tests should also include the criteria of energy efficiency. In addition to the standard handing over protocols, there are a number of additional recommendations and checklists, as the standard handing overs are currently the most important criteria of energy efficiency.

The information of customers (and building owners) about differences in quality should be intensified so that there is a demand for higher-quality offers and designs on the market. This is an important prerequisite for qualitative differences in training to have an impact on the market.

In the course of the surveys implemented during the project, it turned out that in Austria the chances for the establishment of a new, additional specialist in the construction sector, the "building inspector", who is committed to quality assurance during planning, construction and commissioning, were rated low by all the target groups surveyed. The strategy of imparting the competences necessary for quality assurance in connection with nZEB to those occupational groups or target groups which are already active in the construction sector is seen as more promising. This includes energy consultants as the primary target group. In some federal states there is already an intention to expand the field of activity of energy consultants, who are primarily concerned with advisory activities in connection with building energy efficiency, to include tasks of quality assurance during planning and construction. In the province of Carinthia, for example, it is planned to extend the training as an energy consultant to include modules for quality assurance and to promote the implementation of these measures for the end consumer. Similar modules are also available in Vorarlberg and Tyrol. Thus, the cooperation with ARGE EBA, the umbrella organisation for energy consulting, has also proven to be target-oriented for the further development within the

framework of NEWCOM and modules for quality assurance will be developed and implemented within this framework.

A further approach to introducing systematic quality assurance with regard to building and plant components relevant to energy efficiency is the development or adaptation of a quality assurance module for integration into the "Training as construction supervisor" course of the Austrian building academies. This course which addresses - in 9 modules with a total of 180 teaching units - the target groups "employees of the construction industry, of architecture and engineering offices, of property developers, as well as of ancillary building trades, who carry out the construction management of construction projects or want to carry them out in the future", currently offers only sporadically the imparting of quality assurance measures on building envelopes and building technology.

3.2 Hungary

3.2.1 External Thermal Insulation Composite System for walls (ETICS)

As already mentioned above, there is a need for qualified processors of ETICS systems in Hungary. This demand is reinforced by the fact that - due to the good economic situation - construction specialists from Hungary are increasingly being lured to other countries of the European Union and are being replaced by unskilled or unqualified workers from countries outside the European Union.

In Hungary, there is a special need for ETICS systems in the area of fire protection, as the awareness of public clients has been sharpened by major fire damage.

In the training courses currently offered by the system manufacturers, the topic of energy efficiency is not dealt with separately.

3.2.2 Flat roofing and waterproofing

The training focuses on the renovation of flat roofs since these are a bigger challenge compared to newly built roofs. During the construction work most of the time there is a lack of a detailed survey plan. Usually during the construction, workers are in groups of 3 to 5 and in case of bigger projects several groups are working at the same construction site. Usually the

plans and the technical documentation of the roof are not complete and sometimes even include mistakes. Due to this the building contractor needs to define most of the tasks especially in the case of creating 3D-jointing.

Due to the type of construction work three main activity-levels can be defined:

1. Planner: planning/design and theoretical works, logistics, specification
2. Foremen: leader of the workers at the site
3. Blue-collar worker: does the actual construction work.

The usual construction work takes from two weeks to two months, but sometimes there are delays due to technological requirements. One of the most important requirements related to near zero energy buildings is the installation, the fixing of significantly increased insulation often along with slope correction. In practice it is more common to sign contracts including activities related to regular maintenance which also includes fixing smaller failures.

3.2.3 Ventilation systems

Most HVAC related specialists are employed by construction companies who employ central heating and plumbing installers (62% of companies), gas consuming equipment and piping network installers (52%), plumbing and water equipment mechanics (50%), HVAC technicians (39%), air conditioning system installers (25%) and cooling and air conditioning mechanics (20%). There is a need to train more specialists and it is necessary to improve the specialists' preparedness. It is also important to know, whether the preparedness of specialists enables them to execute complete building energetic renovations.

In the school based education the basics are taught, but further trainings in the non-school based education (adult education) are not always available. Mostly manufacturers and trading companies offer trainings. Although these are valuable, they mostly focus on their own products.

The Hungarian Pillar II of the BUILD UP Skills initiative (BUSTRAINBUD) offered a complex training for HVAC skilled blue-collar workers. The training is focusing on the up-to-date energy efficient solutions for the whole building and was developed in partnership with

several companies and professional organisations. It can provide a basis for further nZEB training for HVAC workers.

3.2.4 Building inspection

In the case of building inspectors there was training within the non-school adult education listed in the National Qualification Register, however it is no longer available. Since currently those who intended to work as a building inspector only needed to pass an exam organised by the relevant chambers, but there are no more trainings available. However there is also a demand among building inspectors to obtain up-to-date knowledge related to nZEB solutions since from December 31, 2018 new public buildings and from December 31, 2020 every new building must comply with nZEB requirements.

Furthermore in Hungary it is mandatory to employ a building inspector in every construction activity which requires a construction permit. The task of the building inspector is to foster and control the adequate implementation of the related regulations, standards, contracts and documentations during the whole construction. The building inspector must have vocational education and professional experience. Since the nZEB requirements will be mandatory and there are not any nZEB trainings in Hungary, there is a high demand to fill this gap.

3.3 The Netherlands

3.3.1 Flat roofing

The education of basic craftsmanship for roofers is organised reasonably well in the Netherlands. Examples are for instance the KOMO certificaat for roofers which ensure the quality of work and also the safety of the roofer. Dakmerk certificaat guarantees ten years of waterproofing and insulation of the roofer company, and also ensures the quality of work.

An excellent greenroof certification is available through 'Groenkeur'. This certification is based on detailed units of learning outcome. The 'Groenkeur'-certification will be completely revised and updated in 2019.

3.3.2 Waterproofing

Other nZEB related roof aspects are not represented enough in the personal qualifications. This results in an education range which mostly consists of individual (self-contained) courses. The most realistic approach seems to focus on the cross over between different specialisations (like thermal bridges) which have a big impact on the energy performance of the building.

3.3.3 Ventilation systems

Quality assurance should be the starting point for nearly zero energy buildings. In general this includes also the ventilation system. The new upcoming Dutch law on quality assurance plays an important role to realise good quality assurance. This law holds the constructor responsible for the delivered quality of the final product (building). The constructor is obligated to guarantee a well functioning building (including the installations) for ten years. This is a huge difference compared to seven years ago and means it is in the constructor's interest to meet the new building standards. Verifiable craftsmanship is an essential and obvious prerequisite to deliver good quality.

The existing training materials were created in 2010 - 2011. Hence these do not include the proper focus on quality as the materials are oriented on the old building practices. Furthermore, the educational materials for ventilation need an overall update. The Dutch Building Decree of 2012 (and the directives and norms which resulted from this decree) are not incorporated in the current training materials. These decrees and connected rules will be further revised at the end of 2018. The requirements for quality (control) and execution will become stricter. But the new rules will also provide more possibilities for the usage of innovative techniques. To summarize, the existing educational materials need to be adapted to the new reality, (nZEB) building standards and quality control.

Furthermore, the old materials were a sector initiative with barely any organisational infrastructure to back it up. In comparison to seven years ago, currently there are multiple bodies in the sector which are capable of organising and maintaining the educational materials and market them properly. This means an update of the materials is better to achieve.

The timing seems perfect since demand for ventilation exams is on the rise again for the first time in a while.

3.3.4 Building inspection

There is no certification for building inspectors in the Netherlands yet. So NEWCOM has the perfect timing to fill this gap of missing certifications.

This means there is still a lot to be desired in the skillset and knowledge of building inspectors.

Inspectors need overarching knowledge of all specialisms (which is not the case at the moment in the Netherlands) and different interlinking systems, so they can determine the lifespan/cycle for the different systems and give a substantiated advice.

To be able to do this, they need a good education focused on the knowledge needs.

This way, they can increase the quality of nZEB. Otherwise inspection will just be a formality. For instance, there is no inspection on roofs and walls together as connected components. Interdisciplinary quality control is - as of right now -not enough of a topic yet, but could be very important for the quality of nZEB. An inspector can positively affect the quality of nZEBs on the condition he has the interdisciplinary skill and knowledge.

3.4 Slovakia

Considering the outcomes of the pre-application analysis which were validated by the NEWCOM survey, Slovakia needs to take further actions in the area of flat roofs and ventilation.

3.4.1 Flat roofing and waterproofing

Further development of qualification and further training schemes for roofers and hydro-insulators are urgently needed in Slovakia. Taking into consideration the responsibilities of these two trades regarding construction of nZEBs in Slovakia, a coordinated and concerted action is needed between the NEWCOM project (focusing on flat roofs) and the CraftEdu project (focusing, among others, on waterproofing of buildings). The training for roofers will be developed in cooperation with the Slovak Roofers' Guild and with VET schools.

3.4.2 Ventilation systems

Further action in improving further training on ventilation, especially in residential housing, is needed in Slovakia to ensure improvement of the works' quality and ensuring needs for in-house climate conditions and protection of human health.

3.4.3 Building inspection

The training for the site supervisors was set up by Horizon 2020 ingREeS project and the scheme for further training is successfully operated beyond the project expiry. This course should be reviewed and compared with the programme to be developed by NEWCOM, but no parallel training scheme shall be established to ensure consistency of the training delivered and avoiding cumulative financing from EU funding.

3.5 Conclusions and recommendations on the transnational level of the partner countries

3.5.1 Certifications and recognition of qualifications

Since the term "certification" - both in English and in German - is generously used for several degrees of training, it is necessary to describe the use of the term in this project. The term "personal certification" is described in the international standard ISO 17024:2012 as an internationally valid method; it guarantees a transparent and comprehensible standard competence orientation: "This should also include the recognition of skills acquired outside the education systems. This requires instruments and procedures to identify and recognise competences."

In connection with the competencies related to the nZEBs, in addition to this type of personal certification according to ISO 17024:2012, other personal certifications are also used, for example the "certified passive house planner". Both ISO and non-ISO certifications can be voluntary and mandatory. Binding certifications in almost all countries are only required for safety-relevant work (e.g. special electrical or gas installations).

As an essential result of the surveys in the project, it was confirmed that the significance of personal certifications in the construction sector is not particularly high. This shows the

decline in demand in the area of personal certification according to ISO 17024 for areas of building technology, as well as the end of personal certification for the passive house craftsman in the CertCraft project in Austria. Only mandatory certifications for safety-relevant work can establish themselves on the market; this applies to all four partner countries.

Certifications developed by educational institutions, such as the "Certified building waterproofer" in Austria or the "Groenkeur-Certification for Roof Justification" in the Netherlands, have better chances. In the following, the development and significance of the course "Training to become a construction supervisor" will be shown on the basis of the Austrian building academies.

The Austrian building academies are certified as educational institutions, which guarantee quality assurance of all essential procedural steps in connection with the development and implementation of qualification measures.

In the area of "course certification", the building academies rely on the jointly developed "Bauakademie certificate". Additional certification by an external certification body is not considered sensible or constitutes no added value. The construction academy's training courses, in particular the courses with certificates, are established on the market and are recognised by the companies that hire and pay the graduates after this qualification. From the point of view of the building academies, a personal certification according to ISO 17024 does not result in any particular benefit or added value for construction workers, which is also justified by the fact that the certification bodies or the persons commissioned by them with the certification sometimes lack the necessary building competences.

This allows the following conclusions to be drawn for the further development of the project:

The completely new development of qualifications in the form of personal certification has little chance of being accepted by the market. The development of modules and qualifications as a supplement to already established courses is regarded as much more successful.

The greatest similarities and thus prospects of success in the partner countries Austria, Hungary, the Netherlands and Slovakia arise in the following areas and trades:

- Flat roof construction and building waterproofing
- Installation of ventilation systems
- Building inspection: Modules for quality assurance and quality control for the following training courses
 - Energy consultant training
 - Construction supervisor training courses of several training institutes
 - Course for construction foreman.

4 Overview of existing training materials in all partner countries

4.1 Training materials in general

The identification and collection of relevant, already existing training material is a central issue of the project to ensure that already available material can be optimally used. Extensive research was carried out in this field as part of the performed surveys within this project. For collecting the training materials the project-moodle platform www.newcomtraining.eu was established. This platform offers materials in English, German, Dutch, Hungarian and Slovak and is structured in the chapters “building envelope”, building technics and building inspections. The moodle platform is a work in progress and will be maintained and updated during the whole project lifetime and also later on. It will be used as a knowledge hub for trainers and as a training platform for participants of courses as well.

The following relevant types of materials were identified and collected within this task:

- Presentations (ppt)
- Handbooks and guidelines
- Checklists
- Posters
- Books
- Scripts
- Sources, legal texts, standards
- Films
- Podcasts
- Practical examples
- Moodle-E-Learning
- Newspring-E-Learning
- Webinars
- Interactive question-answer sets
- Workpieces and demonstration models
- Didactic guides for trainers
- Pool of pictures and graphs for trainers.

An extremely extensive collection of "materials" is offered by the project PROF/TRAC "Professional multi-disciplinary Training and Continuing Development in skills for nZEB principles" [14] which presents the results of the projects:

- IDES-EDU
- POWERHOUSE
- TRAINREBUILD
- SHELTER
- EDUCATE
- MaTriD
- ZEB
- IEE INTEND
- AFTERPROJECT.EU
- COHERENO
- neZEH
- STREAMER

and which are available in a database. The database offers the option of using different filters for the search. Since the target groups of PROF/TRAC are the so-called "white collar workers", the documents in the NEWCOM project are particularly relevant for the area of "Building Inspection" as well as for the ventilation system.

The H2020 project "Fit-to-NZEB" [15] also offers an extensive collection of relevant materials. Classified according to the specialist areas

- Basics of building physics
- Optimal solar gains
- Thermal insulation
- Highly efficient windows
- Airtightness
- Minimizing thermal bridges
- Ventilation with heat recovery
- Vapour and moisture movement
- Conservation of historic building fabric
- RES in passive houses/nZEB
- Cost effectiveness
- Planning and design instruments

- Comfort and health requirements in buildings, incl. indoor air quality
- Step-by-step retrofit plans
- Energy efficiency and building renovation policies
- Achieving measurable results
- Engaging stakeholders

the available documents for the partner countries Austria, Bulgaria, Croatia, Czech Republic, Greece, Ireland, Italy and Romania are offered for blue collar workers as well as for white collar workers.

While the two mentioned projects mainly provide a collection of documents in the form of downloadable PDFs, the [e-genius](#) platform offers online and downloadable learning materials in DE - EN - IT - PL - LT - CZ - GR - NL - SR - HU. e-genius is a multilingual open-content platform published and managed by the scientific association "e-genius - Open Education Initiative on Technology & Natural Sciences". The materials are generated in collaboration with experts in the subject matter and in some cases with teachers, and are presented in a didactically helpful way.

The content is based on findings from the "Building the Future" and "Energy Systems of the Future" research programmes, both of which are funded by the Federal Ministry of Transport, Innovation and Technology (bmvit), as well as publications by Dr. Burkhard Schulze Darup, an expert on passive houses and renovation. The "Energy-efficient building approaches" theme cluster offers two learning units: an introduction to energy-efficient buildings and a detailed presentation of the passive house philosophy. The topics include integral planning, the implementation of the building envelope, the creation of the airtight layer and planning aids to avoid thermal bridges. In the "Thermal building renovation" theme cluster, a first learning unit provides basic knowledge about why the renovation of existing buildings is important and how to plan the renovation properly. A second session explains in detail how the different parts of the building envelope (wall, roof, upper floor ceiling, basement ceiling/floor slab, windows and doors) can be renovated and discusses different insulation materials and systems, their advantages and disadvantages and their correct use.

The topic cluster "Insulation materials and facade insulation systems" offers an introductory learning unit on the technical properties of insulation materials such as heat transfer coefficient (U-value), fire behaviour, vapour diffusion resistance factor (μ) and specific heat storage capacity. A second course unit deals with the different groups of insulating materials: Raw materials and production, application areas, installation and practical tips, health and safety aspects and final disposal are covered in detail.

In some units different insulation and facade systems are presented. There are alternative constructions for exterior walls (with the appropriate insulation systems); one unit explains when inside insulation is useful and what needs to be considered in practice in such cases.

4.2 Austria

4.2.1 Overview of existing training materials for flat roofing and waterproofing

For the trainings, offered by the IFB, there is a set of PowerPoint-slides available, structured into the following topics:

Introduction

1. Basics in planning and execution

- Underground-slope
- Vapour barrier
- Thermal insulation
- Roof sealing
- Connections
- Joints - Construction plumbing work

2. Used roof areas e.g. terrace constructions

- Concept - Execution
- Connections
- Drainage
- Quality assurance

In addition to these materials several instructions, drawings and guidelines of the manufacturers are available. For the practical parts of the trainings, models of typical details of flatroofs are prepared.

4.2.2 Overview of existing training materials for installers of ventilation systems

Certification courses:

The Austrian Institute of Technology (AIT) provides trainings for the certified HVAC installer according to the Guidelines BGBI. 2, part II "Qualification and certification measures in connection with stationary refrigeration and air conditioning systems and heat pumps" to the companies. By participating in total eight training modules developed by this institute and passing an exam, the participant fulfils the requirements for obtaining a personal certificate according to category II. Category II certified personnel are authorized to install, maintain, maintain and recover the refrigerant for systems with a capacity of less than 3 kg or hermetically sealed systems of less than 6 kg. Depending on the type of refrigerant and the design of the heat pump or refrigeration system, this corresponds to approximately 20 kW cooling or heating capacity. The modules consist of five teaching units, 45 minutes each and are blocked in recurrent order and offered on individual dates.

The content of the training:

- Introduction, environment relevance and the market for heat pumps
- Basics, components and function of heat pumps and cooling devices
- Refrigerants and their environmental impact
- Log (p)-h diagram in detail
- Refrigeration process of the system
- Maintenance of refrigeration systems and troubleshooting
- Practical work heat pumps and refrigeration.

Electrical engineering for refrigeration and air conditioning of the Technical Control Board TÜV (<https://www.tuv-akademie.at/kursprogramm/detail/back/13/p/119.004/Bereich/kaelte-klimatechnik/event/elektrotechnik-fuer-kaelte-un-10.html>):

The course contains two modules. The content of the course is:

- Fundamentals of electrical and control technology
- Representations in electrical engineering
- Construction, selection and arrangement of selected electrical equipment
- Typical refrigeration controls - safety chains and suction circuits
- Protective measures in electrical installations - protection classes, network forms
- Defrosting process of ventilation chillers
- Starting procedure of motors (star & triangle start, partial winding start)
- Electrical and electronic control and regulating devices in refrigeration.

This is a three day course. The lecture notes are not available online.

Training courses:

Ventilation with heat recovery for domestic buildings provided by **e-genius** (www.e-genius.at/):

e-genius is a teaching and learning platform with open educational resources (OER) for schools, colleges, universities, adult education and private individuals.

The ventilation course describes the principle of operation and components of a home ventilation system. It also explains how to plan and design a ventilation system in a building and which instruments can be used to ensure quality. Various devices that are suitable for the passive house are presented.

Learning goals:

- Listing of air quality factors and the main components of a controlled home ventilation system with heat recovery
- Explain the functional principle of a controlled ventilation system with heat recovery
- The planning steps for controlled home ventilation with heat recovery represent
- Comparison of different ventilation systems for the passive house
- Identification of planning errors and apply quality criteria.

Ventilation systems by klimaaktiv online platform (<http://www.klimaaktiv-elearning.at/-Lernplattform/mod/page/view.php?id=537>):

klimaaktiv has been working for many years with renewable energy technologies. It provides different online courses, among them domestic ventilation.

The contents are:

- Modern living comfort
- Mode of operation
- Air quality
- Ventilation and heating system
- Prerequisites
- Domestic ventilation in the renovation
- Order and tender criteria
- Domestic ventilation in single-family homes
- 8 Crucial conditions for user satisfaction
- 16 important criteria for the ordering and tendering of ventilation systems
- Quality criteria for the ventilation unit and the technical installations
- Quality criteria for the distribution system (air ducts)

The lecture notes can be found under www.e-genius.at/.

Domestic ventilation systems by **AIT - Austrian Institute of Technology**

(<https://www.ait.ac.at/themen/training-education/weiterbildung-im-bereich-komfortlueftung/-komfortlueftung-kompakt/>):

This course provides a (product-independent) overview of the systems commonly used on the market and provides security for the initial consultation as well as for the planning, commissioning and service of comfort ventilation systems. The target groups are: Gas, water and heating installers, planners and architects, building technical services and wholesalers. The course takes one day.

Course contents:

- Function and mode of action
- Requirements and limits
- Systems and components
- Air routing and dimensioning
- Possibilities of building integration
- Cleanliness and cleanability of the plant
- Control and regulation types
- Quality check, commissioning and briefing
- Maintenance and cleaning.

Domestic ventilation systems deepening by **AIT** (<https://www.ait.ac.at/themen/training-education/weiterbildung-im-bereich-komfortlueftung/komfortlueftung-vertiefung/>):

The specialization modules were designed by AIT, KLA and komfortlüftung.at and coordinated with klima**aktiv** and are a follow-up of the course domestic ventilation systems.

The content of the modules are: Energy efficiency, noise insulation and hygiene, planning of systems with hose systems including practice and planning of systems with spiral folding systems including practice. The course takes one day.

Comfort ventilation in practice of the Chamber of Commerce's education institute **WIFI** (example: <https://www.tirol.wifi.at/kurs/52824x-komfortlueftung-in-der-praxis>):

The practical course provides improving service, planning and implementation as well as avoiding errors. The content of the course is not available online.

Domestic ventilation systems by **Bauakademie** (Building Academy) (example: <http://www.noebauakademie.at/Kursdetail.aspx?ZG1=F&ZG2=FA&BBNR=206047>):

The course provides an (product-independent) overview of the systems that are common on the market and is intended to provide security for the initial consultation as well as planning, commissioning and service of comfort ventilation systems with many practical examples.

The course is aimed primarily at installers, professionals, technicians, sales people and klimaaktiv competence partners but also to all relevant interested parties.

Course contents:

- Function and mode of action
- Requirements and limits
- Systems and components
- Air routing and dimensioning
- Possibilities of building integration
- Cleanliness and cleanability of the plant
- Control and regulation types
- Quality check, commissioning and briefing
- Maintenance and cleaning.

The lecture notes are not available online. The course is a one day course.

Basics of ventilation technology of **BFI** (education institute: <https://www.bfi.wien/technik/bau/-kurs/grundlagen-der-lueftungstechnik/>):

In this seminar an overview of application areas, functionality, technical specifications and components of supply and exhaust air systems will be provided. By using pipe network calculations, the trainees will learn to plan ventilation systems according to requirements and to dimension them accordingly. The target groups are: Heating and ventilation technicians, architects, professional planners, energy and rehabilitation consultants, persons in the area of property and property management and interested homeowners.

The content of the course is:

- Applications of ventilation systems
- Supply and exhaust systems
- Technical specifications, components and control
- Heat recovery and air heater
- Fire protection elements
- Pipe calculation

- Air distribution
- Hygiene and air filter elements
- Formation and prevention of mold
- Repair and retrofits

The lecture notes are not available on-line.

4.2.3 Overview of existing training materials for building inspections

A comprehensive collection of documents is available in Austria for training as an energy consultant. These consist of learning target catalogues for the A and F courses, the revised manual for energy consultants as well as slide sets on the individual subject areas. The materials are structured in following chapters:

Introduction

General Introduction

- Contents of the consultation:
- Building envelope
- Heating installation
- Energy production installations and technical energy-operated equipment
- Analysis of buildings or facilities
- Notes on the reduction of energy consumption
- Recommendation of energetically optimised solutions with economically justifiable investment costs
- Measures adapted to the situation

Electricity

- Current General
- electricity development
- Household electricity consumption
- Stand-by losses
- Lighting

- Electricity bill
- Consumption habits - Saving electricity

Climate change protection customization

Legal basis

EU climate targets

- Achieving a low-carbon economy
- ensure affordable energy for all consumers
- Enhancing the EU's security of energy supply
- Reduce dependence on energy imports
- Create new opportunities for growth and jobs
- Contribute to the protection of the environment and health (e.g. by reducing air pollution)

Climate Targets Austria

- Need for action in the building sector
- Energy-efficient new construction and refurbishment
- More efficient use of space (spatial planning)
- Exit from fossil fuels
- Sector coupling - innovative and legal solutions are needed

Building Technology & Building Physics

- Building constructions
- Renovation solutions - details
- Air tightness
- Sustainable buildings

Refurbishment - Procedure

- Procedure for remediation consulting
- Objectives
- Inventory - findings

- appraisal
- Proposals for remediation - catalogue of measures
- Realization
- Checks
- Maintenance - care
- Documentation
- Refurbishment - example 1
- Refurbishment - example 2
- U-value

Building certification

Energy certificate

- Energy performance certificate basics
- What is the energy pass?
- Model calculation for the energy efficiency of a building
- Quality of the building envelope, type of heating system
- Legal basis
- Energy Performance Certificate Template Act
- OIB Guideline 6 (2015)
- Standards

Comparison of buildings with regard to thermal quality

Energy performance certificate example

Building services

- Heat output
- Heat distribution
- Control engineering

Energy consulting in practice

Calculating with key figures

Retrofit concept

- Retrofit concept - exercise example
- Retrofit concept - detailed solutions

4.3 Hungary

4.3.1 Overview of existing training materials for flat roofing and waterproofing

There is a roofer training available included in the NQR (National Qualification Register), although the related training material is not available for the public - only for those who participate in the training. However there are company organised trainings, mainly knowledge restoration and introduction of new technologies in order to use the companies' products better. These materials are also only available for workers who attend the courses. These are the companies' own training materials, some of them (eg. SIKA) organise more than 50 trainings per year with 5 - 12 participants. Furthermore there is a new postgradual, adult training in Szeged (organised by a vocational school) which includes roofer training, but it is held together with workers who implement flexible floor coverings (lino, PVC, etc.).

4.3.2 Overview of existing training materials for installers of ventilation systems

The basics related to ventilation are taught in vocational schools in the school system, but usually these materials are not available for others. Regarding adult education only company organised trainings are available. They mostly use their own materials which usually describe their products and how to install them, therefore they mainly focus on marketing and are included in company- and product specific brochures.

In the II. pillar of the BUILD UP Skills initiative within the BUSTRAINBUD project the consortium developed a complex training material which also includes a ventilation chapter. As the whole material, the ventilation chapter was also developed in collaboration with trading and manufacture companies. They all provided their own best practices without focusing on their products.

4.3.3 Overview of existing training materials for building inspectors

According to Government Regulation 244/2006. (XII.5.), in Hungary for building inspectors it is not mandatory to complete a training, but in order to work they are obliged to pass an exam and prove at least three years of experience.

The exam is organised and maintained by the national professional chambers and consists of the following two major parts:

- 1) General part which is the same in the case of every type of entitlement
- 2) Special part which differs in the case of every different related profession.

To complete the general part the participant must have knowledge related to the following topics:

- Legal environment (legal hierarchy)
- General rules applying to contracts
- Basic knowledge related to entrepreneurship including requirements of taxation
- Basic rights of employers and employees
- Rules related to public proceedings
- Basic Law of building (Law LXXVIII. of 1997. on the protection and forming of the built environment)
- Knowledge related to fire safety
- Laws and regulations related to working in the EU
- Rules related to procurements
- Basic knowledge related to historic preservation, environment protection
- Quality management system
- Rules related to certificate of conformity, CE marking
- Types of standards and how to apply them

- Health and safety.

To complete the specific part:

- They need to be aware of the condition system of working as a building inspector
- They need to know what are their tasks and responsibilities of a building inspector
- Conflicts of interest and disciplinary rules
- Rules, regulations, technical specifications
- Requirements related to the content of construction plans
- Requirements related to the content of building inspector contracts.

The examining board is organised by the national chambers (Chamber of Hungarian Architects and Hungarian Chamber of Engineers).

In case of college/university graduates three years of professional experience is required, in case of secondary/vocational education five years of professional experience must be proved.

Those who acquire the entitlement to perform activities as building inspectors also need to continuously participate in further trainings. There are mandatory (financial, law, standards) and voluntary sections and a minimum of 10 hours- and a maximum of 20 hours-training must be completed.

It is not compulsory to be a member of the relevant national chambers, but one must be included in the chambers register.

4.4 Netherlands

4.4.1 Overview of existing training materials for flat roofing and waterproofing

There are several trainings available at Tectum:

General trainings:

1. Level 1: Entrée level training
2. Level 2: Basic training roofer

3. Level 3: Basic training roofer allround
4. Level 4: Basic training staff
5. Practical education for less advanced roofers
6. Introduction course bitumen
7. Introduction course non bitumen (EPDM, PVC, etc.)

Specific trainings

8. Practical course for advance roofers
9. Roof details
10. Building mistakes
11. Basic courses focused on material (metal, EPDM, PVC, etc.)
12. Basic course supervisor

Safety courses

13. Safety on the roof
14. First aid and reanimation
15. Prevention of accidents
16. Scaffolding
17. Etc.

Courses on quality

18. Quality course roofer
19. Organisation of the room, beginner teamleader
20. Custom orientation
21. Etc.

Courses on education of staff

22. Entrepreneurship
23. New types of maintenance
24. Typical roof damages and consultancy

Special courses

25. Installation of PV solar systems for roofers
26. Maintenance and inspection of roofs.

4.4.2 Overview of existing training materials for installers of ventilation systems

For ventilation no trainings are currently being organised. The last training materials were developed in 2011. ISSO was the editor of these materials: They were realised with the support of and in collaboration with other organisations:

- RVO.nl (formerly known as Agentschap NL, Agency of Ministry of Economic Affairs)
- OTIB, educational and development fund for installation companies
- Stichting Promotie Installatietechniek (PIT)
- UNETO-VNI, branche association for the installation sector
- VLA, association for ventilation manufacturers.

The training materials consist of multiple instruction books. Together these books constitute the ventilation series. Each instruction book is a sort of module and covers certain aspects of ventilation systems.

The four modules are:

1. Basics of ventilation systems
2. Design of ventilation systems
3. Installation and produce of ventilation systems
4. Management and maintenance of ventilation systems.

Each instruction book (module) contains knowledge, examples, explanations and assignments (including elaborations). For each module a short insight of the content and scope will be given.

Basics of ventilation systems

This instruction book contains the basic principles about ventilation, the different types of ventilation systems and the rules about ventilation noise in houses from the Dutch Building Decree. After that, it is explained broadly how to design a ventilation system, as well as the selection of system components. Furthermore, the most important focus areas of installing and maintenance of the system are addressed. Based on this basic knowledge of domestic

ventilation, the student will learn to formulate a design brief and make a provisional system choice based on the situation and the customer requirements.

To be able to properly conduct activities in the programme phase, a basic knowledge of domestic ventilation and recognising system characteristics is of great importance. This instruction book offers a compact overview of the required knowledge. The knowledge in this book is acquired through experience, available norms and ISSO-publications.

The book is categorised in different themes. The themes are the following:

1. Basic knowledge of domestic ventilation
2. Programme phase
3. System choice
4. Design phase
5. Preparatory phase
6. Development phase
7. Maintenance phase.

The order of the themes is broadly the same as the customary practice: starting with a first exploration of the ventilation options till maintenance of a realised system. This instruction book puts the emphasis on the design brief and the provisional system choice for a ventilation system.

Design of ventilation systems

This instruction book deals with how a well functioning ventilation system should be designed. The design phase is the basis of a properly functioning ventilation system. To properly conduct work activities, knowledge of the technical workings of a ventilation system and the attunement of the different activities are of great importance. The knowledge in this instruction book is acquired through experience, available norms and ISSO-publications.

The book is categorised in different themes. The themes are the following:

1. Legislation, norms and directives
2. Ventilation capacity

3. System choice
4. Ventilation balance
5. Provision type service supply and demand guidance
6. Provision location air inlet and air vents
7. Thermal comfort
8. Accoustic comfort
9. Design of air ducts
10. Operations rooms.

Installation and produce of ventilation systems

In this instruction book the emphasis is on quality control and control procedures for installation work activities. The target is to guarantee a well functioning domestic ventilation system. The target groups of this book are: installers, service technicians, projectleaders, work planners, foremen and teachers in technical education.

The instruction book teaches how a well functioning ventilation system should be installed. The design is the basis for a well functioning system, but a careful realisation determines the eventual realised quality. To properly conduct work activities, knowledge of the technical workings of a ventilation system and the attunement of the different activities are of great importance. This instruction book offers a compact overview of the required knowledge. The knowledge in this book is acquired through experience, available norms and ISSO-publications.

The book is categorised in different themes. The themes are the following:

1. Legislation, norms and directives
2. Assembly of ventilation units
3. Assembly of air duct systems
4. Assembly of air vents and valves
5. Assembly of other components
6. Air overflow facilities and airtightness building envelope
7. Adjustment of ventilation system

8. Periodic checks and final check
9. Control procedures
10. Making ventilation system operational.

Management and maintenance of ventilation systems

In this instruction book for module 4, the emphasis is on planning, execution and control procedures for maintenance activities. The target is to guarantee a well functioning domestic ventilation system. The target groups of this book are: installers, service technicians, project-leaders, foremen and teachers in technical education.

This book teaches how to maintain a ventilation system to ensure it will function optimally. A good design and proper installation are the basis of a well functioning ventilation system. But diligent maintenance is also a determining factor.

To properly conduct work activities, knowledge of the technical workings of a ventilation system and the attunement of the different activities are of great importance. This instruction book offers a compact overview of the required knowledge. The knowledge in this book is acquired through experience, available norms and ISSO-publications.

The book is categorised in different themes. The themes are the following:

1. Legislation, norms and directives
2. Maintenance and management
3. Control procedures
4. Checks and maintenance of ventilation units
5. Checks and maintenance of air duct systems
6. Checks and maintenance of air vents and valves
7. Health, safety and energy efficiency.

4.4.3 [Overview of existing training materials for building inspectors](#)

The scope of the existing trainings for quality assurance and energy performance assessment are not truly relevant for the scope of NEWCOM. Furthermore, the training materials for the additional energy performance assessment trainings and for the quality assurance

trainings are not freely available. Especially the materials for the wide variety of quality assurance trainings are highly fragmented.

4.5 Slovakia

4.5.1 Overview of existing training materials for flat roofing and waterproofing

In the framework of the BUILD UP Skills II StavEdu project, the ULOs and curricula were developed to cover a wider area of construction trades, including roofing and water proofing. The relevant textbook was also developed. These materials will be used to develop more specific courses on flat roofs and waterproofing of buildings.

4.5.2 Overview of existing training materials for installers of ventilation systems

In the framework of the BUILD UP Skills II StavEdu project, the ULOs and curricula were developed to cover wider area of construction trades, including HVAC. The ULOs, curricula and textbook include the basic material to address ventilation. These materials will be used for developing more specific materials for training on ventilation systems.

4.5.3 Overview of existing training materials for building inspectors

In the framework of the Horizon 2020 ingREeS project, the ULOs, curricula, textbook and e-learning were developed to cover responsibilities of the site supervisors specifically relevant to energy efficiency and use of renewable energy sources in buildings. The results of the NEWCOM project will be transferred to the “ingREeS Qualification and Further Training Scheme for Middle- and Senior-level Professionals” in the construction sector.

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ABOUT NEWCOM

NEWCOM sets up large-scale professional qualification and certification schemes for of blue collar workers and building professionals. The special focus is on the mutual recognition between different European Member States. These schemes will enable the building workforce to be qualified for the construction, renovation and inspection of the nearly zero-energy buildings 2020.

www.newcomtraining.com

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to build high quality

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