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Train-the-trainer (TTT) training programmes in all focus countries

Deliverable 3.3

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Led by:

Passive House Academy (PHA)



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Executive Summary

Development of Train-the-Trainer programmes is a core objective of the Fit-to-NZEB project. Right across Europe, trainers and educators working in the field of energy retrofitting of existing building are generally unfamiliar with the requirements for NZEB which is about to be rolled out across the Continent. Furthermore, most trainers are currently delivering training which is centred on so-called 'shallow retrofits' where the energy savings arising from such measures is, at best, modest and where there has not been a major focus on the parallel improvement of thermal comfort as well as indoor air quality. The Fit-to-NZEB project, on the other hand, is entirely focused on ensuring that energy efficiency, comfort and indoor air quality is optimised. Accordingly, the trainers working in this sector have to be upskilled (through train-the-trainer programmes) in all aspects of deep-retrofitting.

This report provides details on the various train-the-trainer programmes undertaken by this project, commencing with a series of such training delivered by the Irish partner, PHA in the summer of 2018. Following this, an overview of pedagogical training provided by PRO-NZEB is outlined. Pedagogical training is regarded as a critical element of this project in order to prepare highly-skilled craftspersons (who are expert in delivering deep-retrofit projects) to share their knowledge in a class-room setting. These experts represent an incredible valuable training resource and such pedagogical upskilling will enable them to share their knowledge with others. Reference is then made to the existing TTT course provided by the German Passive House Institute as part of their Passive House training programme. The fourth element of this report refers to training programmes developed as part of EU-financed projects and the fifth and final section below details the TTT programmes to be used by the partner countries participating in this project.

1. Training programmes provided by Passive House Academy

1.1. Programme for Fit-to NZEB Train-the-trainer course, May/June 2018

DAY 1 Wednesday (30th May) *Building envelope*

9.00- 9.30		Induction, introduction as group and overview of training
9.30- 10.30	<i>Unit 1:</i>	Basis of building physics, Passive house principles <i>Referring to LO topic 1, 1.1. Lead: PHA</i>
10.30- 10.45		<i>Break</i>
10.45- 11.30	<i>Unit 2:</i>	Comfort, health and safety requirements in buildings, incl. indoor air quality <i>Referring to LO topic 11, 11.2. Lead: PHA / support by Romanian team</i>
11.30- 12.15	<i>Unit 3:</i>	Optimal solar gains, Solar Energy – Introduction and basic concepts. <i>Referring to LO topic 2. Lead: HPHI / support by UACEG</i>
12.15- 1.15	<i>Unit 4:</i>	Thermal insulation and thermal bridges <i>Referring to LO topic 3.1, 3.2. Lead: PHA / support by UniZag</i>
1.15-2.00		<i>Lunch</i>
2.00- 3.00	<i>Unit 5:</i>	Highly efficient windows: products and installation <i>Referring to LO topic 3.3. Lead: PHA / support by UniZag</i>
3.00- 4.00	<i>Unit 6:</i>	Airtightness, vapour and moisture movement, windtightness <i>Referring to LO topic 5. Lead: PHA</i>
4.00-5.00		Discussion

DAY 2 *Building services* (31st May)

9.00 - 10.15	<i>Unit 7:</i>	Mechanical Ventilation with Heat Recovery (MVHR) <i>Referring to LO topic 6.1. Lead: PHA</i>
10.15- 11.15	<i>Unit 8:</i>	Heating and cooling + DHW <i>Referring to LO topic 6.2, 6.3. Lead: PHA</i>
11.15- 11.30		<i>Break</i>
11.30 - 12.15	<i>Unit 9:</i>	Summer comfort/ passive cooling strategies <i>Referring to LO topic 11.1. Lead: ZEPHIR / support by HPHI</i>
12.15 - 1.15	<i>Unit 10:</i>	Efficient lighting <i>Referring to LO topic 6.5. Lead: PHA</i>
1.15 – 2.00		<i>Lunch</i>
2.00 - 3.00	<i>Unit 11:</i>	RES in building retrofit, Long and short term energy storage <i>Referring to LO topic 8, 8.1. Lead: TU-Wien</i>
3.00 - 4.15	<i>Unit 12:</i>	“Step-by-step” renovation. The EnerPHit standard. Conservation of historic building fabric <i>Referring to LO topic 12. Lead: PHA / Support by EnEffect</i>
4.15 – 5.00	<i>Unit 13:</i>	NZEB neighbourhoods, Energy cooperatives

Referring to LO topic 4, 4.1, 4.2. Lead: Romanian team

5.15 - 6.45 SITE VISIT TO WICKLOW HOUSE RETROFIT

DAY 3 PH Theory and Practical + RES Theory and Practical

9.30- 10.00		Induction and overview of Training Centre and demonstration models
10.15 - 11.15	<i>Unit 14:</i>	Project management, Quality assurance, Achieving measurable results <i>Referring to LO topic 14, 16, 16.1. Lead: Czech Technical University in Prague / Support by UACEG</i>
11.15 - 12.15	<i>Unit 15:</i>	Economic efficiency of existing buildings energy renovation up to the level "passive" and "nearly zero energy" buildings <i>Referring to LO topic 9, 9.1, 9.2, 13. Lead: SEVen</i>
12.15 - 12.45	<i>Unit 16:</i>	Engaging stakeholders <i>Referring to LO topic 15. Lead: EnEffect</i>
12.45 - 1.30		<i>Lunch</i>
1.30 - 2.30	<i>Unit 17:</i>	Ecology and sustainability <i>Referring to LO topic 17. Lead: TU-Wien</i>
2.30 - 5.00	Site visit:	NZEB retrofit of a social housing financed by the City of Dublin



1.2. 5-day Train-the-Trainer course provided by PHA

PASSIVE HOUSE & RENEWABLE ENERGY SYSTEMS

Daily Structure

8.30-10.00	Classroom
10.15-11.15	Break
11.15-12.45	Classroom
12.45-1.30	Lunch

DAY 1 PH Theory and Practical

8.30- 9.00		Induction, Introduction as group and overview of training
9.00- 10.00	<i>Unit 1:</i>	Summary of Passive House bases and overview of PHPP
10.00- 10.15		<i>Break</i>
10.15- 11.45		Insulation , including Lambda and U-values and materials demo
11.45- 12.45	<i>Unit 2:</i>	Thermal (and repeating) thermal bridging
12.45-1.30		<i>Lunch</i>
1.30- 2.30		Introduction to and tour of Building Workshop, model description
2.30-3.45		Model sketching by Trainees and description / critique

DAY 2 PH Theory and Practical

8.30- 9.30		Increased airtightness and site examples
9.30- 10.00		Airtightness equipment and testing
10.00- 10.15		<i>Break</i>
10.15- 11.15		Passive House windows and doors, including U-value calculation demo
11.15-12.45		Mechanical ventilation

12.45-1.30	<i>Lunch</i>
1.30- 4.30	Practical – Passive House construction using different practice models

DAY 3 *PH Theory and Practical + RES Theory and Practical*

8.30- 10.00	Mechanical ventilation flow calc. demo + cooling and dehumidification system
10.00- 10.15	<i>Break</i>
10.15- 11.45	Practical: introduction to and demo of mechanical ventilation systems
11.45- 12.45	Demonstration of airtightness construction and testing
12.45-1.30	<i>Lunch</i>
1.30- 2.45	RES: Introduction to and theory of photovoltaic and solar thermal systems
2.45-4.30	RES Practical demonstration of photovoltaic systems

DAY 4 *PH Theory and Practical + RES Theory and Practical*

8.30- 9.15	Passive House Quality Assurance and Certification
9.15- 10.00	Economics/Energy cost comparison between PH and Normal
10.00- 10.15	<i>Break</i>
10.15- 11.45	Whole-house Passive House design example – Demo
11.45- 12.45	Whole-house Passive House design exercise – Trainees
12.45-1.30	<i>Lunch</i>
1.30- 2.45	RES: Introduction to and theory of wind energy systems
2.45-4.30	RES Practical demonstration of wind energy systems

DAY 5 *PH Theory and Practical*

8.30- 10.00	Passive House detail design exercise (new build and retrofit) – Trainees
10.00- 10.15	<i>Break</i>
10.15- 11.45	Construction and energy performance of 4 case study retrofits
11.45- 12.45	Practical – Passive House construction using different practice models
12.45-1.30	<i>Lunch</i>
1.30- 4.30	Practical – Passive House construction using different practice models



1.3. 3-day Train-the-Trainer course provided by PHA

Day 1

9.30- 9.45	Induction, Introduction as group and overview of training
9.45-11.00	<i>Unit: 1</i> Summary of Passive House bases / demo constructions + calculations of building compactness ratio

11.00- 11.15		<i>Break</i>
11.15- 1.00	<i>Unit 2:</i>	Insulation , U-values + calculations and materials demo
1.00-2.00		<i>Lunch</i>
2.00- 3.15	<i>Unit 3:</i>	Lambda and U-values + calculations
3.15-3.45	<i>Unit 4:</i>	Repeating Thermal Bridging and Thermal Bridging
3.45- 4.15	<i>Unit 5:</i>	Increased airtightness and site examples

Day 2

9.30- 10.00	<i>Unit 6:</i>	Airtightness equipment and testing
10.00-10.15		Video
10.15- 11.00	<i>Unit 7:</i>	Passive House windows and doors, including U-value calculation demo
11.00- 11.15		<i>Break</i>
11.15- 12.00	<i>Unit 7:</i>	- continuation
12.00-1.00	<i>Unit 8:</i>	Mechanical ventilation with heat recovery + Mechanical ventilation flow calc. demo
1.00-2.00		<i>Lunch</i>
2.00- 2.45	<i>Unit 9:</i>	Passive House requirements for heating demand
2.45- 3.45	<i>Unit 10:</i>	Whole-house Passive House design example/ checklist
3.45-4.15		Whole-house Passive House retrofitting design exercise

Day 3

9.30- 11.00		Whole-house Passive House design exercise
11.00- 11.15		<i>Break</i>
11.15- 12.30		Passive House detail design exercise (new build and retrofit)
12.30- 1.00		Construction and energy performance of 4 case study retrofits
1.00-2.00		<i>Lunch</i>
2.00- 2.45	<i>Unit 11:</i>	Passive House Quality Assurance and Certification
2.45- 3.30	<i>Unit 12:</i>	Economics/Energy cost comparison between PH and Normal
3.30- 4.00		Economics/Energy cost comparison between PH and Normal
4.00- 4.15		Introduction to the examination system of the Passive House Institute



2. Pedagogic training provided by PRO-NZEB

1. Section A: Basic notions

1.1. Basic notions of learning theories

1.2 About vocational education and training (Vocational and educational training - VET)

This section is about basic notions of vocational education and training methodologies for adult learning. The roles and competences of the trainer, part of the Train the Trainer (TTT) module course will be analyzed.

Items to be presented in Section 1:

- Role of the trainer,
- Classic learning vs. vocational learning,
- Experiential learning cycle (Kolb),
- Learning styles,
- Experiential cone (classification of learning levels)¹

2. Section B: Group dynamics

- 2.1. Learning in groups,
- 2.2. Steps in developing groups,
- 2.3. Roles in groups.
- 2.4. Group dynamics and performances. Group management.

In this section a group/team will be defined.

Group learning and building the group potential is an important learning technique for ensuring pro-active participation and peer-to peer learning.

We will present The Tuckman's (1) theory about groups' development in 5 steps: Group forming, Storming, Norming, Performing, and Transforming/Closing.

We will discuss about the management principles of groups (size of groups. Splitting groups, location set of materials available etc.) and methodologies used by trainers to eliminate the problems that might occur in groups.

We will present the stages of group performance model: Orientation, Trust Building, Goal clarification, Commitment, Implementation, High performance, Renewal.

Training strategies for conflict solving in groups will be an important item to be treated in this chapter (typologies of group members, where the conflict starts, types of conflicts, strategies to manage the conflicts).

3. Section C: Management of training process

- 3.1. Assessment of training needs,
- 3.2. Design and development of training programme,
- 3.3. Implementing the training programme,
- 3.4 Monitoring and evaluation of training programme,

There are 4 steps in management of training process:

- Training needs assessment

¹ Bruce Tuckman, Developmental sequence in small groups, Psychological Bulletin, 1965

-Design and development of training process

-Implementation of training

-Monitoring and process evaluation

All methodologies should follow the 5 principles, no matter the type or moment of assessment:

- Validity (to measure what is really needed)

- Reliability (data should be accurate and valid)

-Fairness (equal opportunity for all participants in the process)

- Transparency

- Practicality (to take care about costs and time consumption)

In this section we will present the *training needs assessment (TNA)*, as part of the assessment methodologies available for the construction sector.

Design of the training process will include discussions about: development of training goals, set up the course structure, agenda of training sessions, selection of methodologies of training, adaptation of practical situations in nZEB sector, creation of all course supports like manuals, PPT presentations, movies, disks, questionnaires etc.

Implementation of the training should focus on *impact* on the group.

3. Train-the-trainer courses provided by Passive House Institute, Darmstadt, Germany (to serve as reference)

3.1. Framework of the Train-the-trainer course (pedagogic) offered by Passive House Institute



AGENDA "Train the trainer" course for Certified Passive House Tradesperson course

	Start	09:00	TTT course Day 1	Start	09:00	TTT course Day 2	
	End	17:55		End	17:25		
Part 1 – Passive House Knowledge	1.TU	09:00 00:45 09:45	Welcome to the Passive House train the trainer course	10.TU	08:30 00:45 09:15	Information on the Passive House Standard: exam	Part 2 - Courses
	2.TU	09:45 00:45 10:30	Introduction to the Passive House Designer course material (10 days) and to the Train the trainer course.	11.TU	09:15 00:45 10:00	How to teach: How to plan a unit	Part 3 - Teaching techniques
	3.TU	10:30 00:45 11:15	Introduction to the Passive House Tradesperson course material (3 days) and the PassREg project.	12.TU	10:00 00:45 10:45	How to teach: Practical tips for planning	
		00:20	Coffee break		00:20	Coffee break	
	4.TU	11:35		13.TU	11:05		

Part 2 - Courses		00:45 12:20	Knowledge of the Passive House Standard		00:45 11:50	How to teach: Types of slides	
	5.TU	12:20 00:45 13:05	Knowledge of the Passive House Standard	14.TU	11:50 00:45 12:35	How to teach: How to deal with different types of charts	
	6.TU	13:05 00:45 13:50	Parallel session: Information on the Designer/ Tradesperson course: content and curriculum	15.TU	12:35 00:45 13:20	How to teach: Practical tips for Powerpoint presentations (PPP)	
		01:30	Lunch break		01:30	Lunch break	
	7.TU	15:20 00:45 16:05	Information on the Passive House Standard: course material	16.TU	14:50 00:45 15:35	How to teach: Practical tips for teaching	
	8.TU	16:05 00:45 16:50	Information on the Passive House Standard: exercises	17.TU	15:35 00:45 16:20	How to teach: How to handle tricky questions professionally	
		00:20	Coffee break		00:20	Coffee break	
	9.TU	17:10 00:45 17:55	Information on the Passive House Standard: exercises with PHPP	18.TU	16:40 00:45 17:25	Evaluation and Goodbye	
	TU = Training unit (45min)						

3.2. Framework of the online Train-the-trainer course (technical) offered by Passive House Institute (http://passivhausplaner.eu/index.php?page_id=299&level1_id=239)

1 - PASSIVE HOUSE : Principles, aim and scope

1.1 What is a Passive House

> Review quiz

1.2 Passive House and NZEB

> Review quiz

1.3 Economics, life cycle costs

> Review quiz

Final quiz about the Passive House principles

2 - BASICS : Heat and humidity

2.1 Heat transfer

> Review quiz

2.2 Humidity basics

> Review quiz

2.3 Humidity in the building

> Review quiz

Final quiz about physical basics

3 - BUILDING ENVELOPE : Opaque elements

3.1 Continuous insulation layer

> Review quiz

3.2 Insulation materials

The image displays three screenshots of the online course interface for Passive House training. The first screenshot shows the course overview with a 'TO REMEMBER' list. The second screenshot shows the course structure with a tree view. The third screenshot shows the content for '3 - BUILDING ENVELOPE : Opaque elements' with a list of topics and a video player.

TO REMEMBER

- EU Energy Efficiency Plan 2020
- Passive House solution: Energy efficiency, thermal comfort and excellent air quality
- 5 Passive House principles
 - Insulation
 - Passive House windows
 - Airtightness
 - No thermal bridges
 - Ventilation with heat recovery
- 5 certification criteria
 - Heating demand
 - Cooling demand
 - Overheating frequency
 - Primary energy renewable and non-renewable

Course Structure:

- 1 - PASSIVE HOUSE : Principles, aim and scope
- 2 - BASICS : Heat and humidity
 - 2.1 Heat transfer
 - 2.2 Humidity basics
 - 2.3 Humidity in the building
- 3 - BUILDING ENVELOPE : Opaque elements
 - 3.1 Continuous insulation layer
 - 3.2 Insulation materials

Final quiz about physical basics

> Review quiz

Final quiz about opaque elements

4 - BUILDING ENVELOPE : Transparent elements

4.1 Passive House windows and installation

> Review quiz

5 - BUILDING ENVELOPE : Thermal bridging

5.1 What is a thermal bridge?

> Review quiz

6 - BUILDING ENVELOPE : Airtightness

6.1 Importance of airtightness

> Review quiz

6.2 Airtightness implementation basics

> Review quiz

6.3 Airtightness testing basics

> Review quiz

Final quiz about airtightness

7 - TECHNICAL EQUIPMENT : Ventilation

7.1 Why do we need to ventilate

> Review quiz

7.2 Ventilation concepts for a Passive House

> Review quiz

7.3 MVHR anatomy and specifications for certification

> Review quiz

Final quiz about ventilation

8 - TECHNICAL EQUIPMENT : Heating and DHW

8.1 Heat supply for space heating and DHW

> Review quiz

8.2 Heat storage and distribution

> Review quiz

Final quiz about heating

9 - TECHNICAL EQUIPMENT: Cooling

9.1 Passive House in warm conditions

> Review quiz

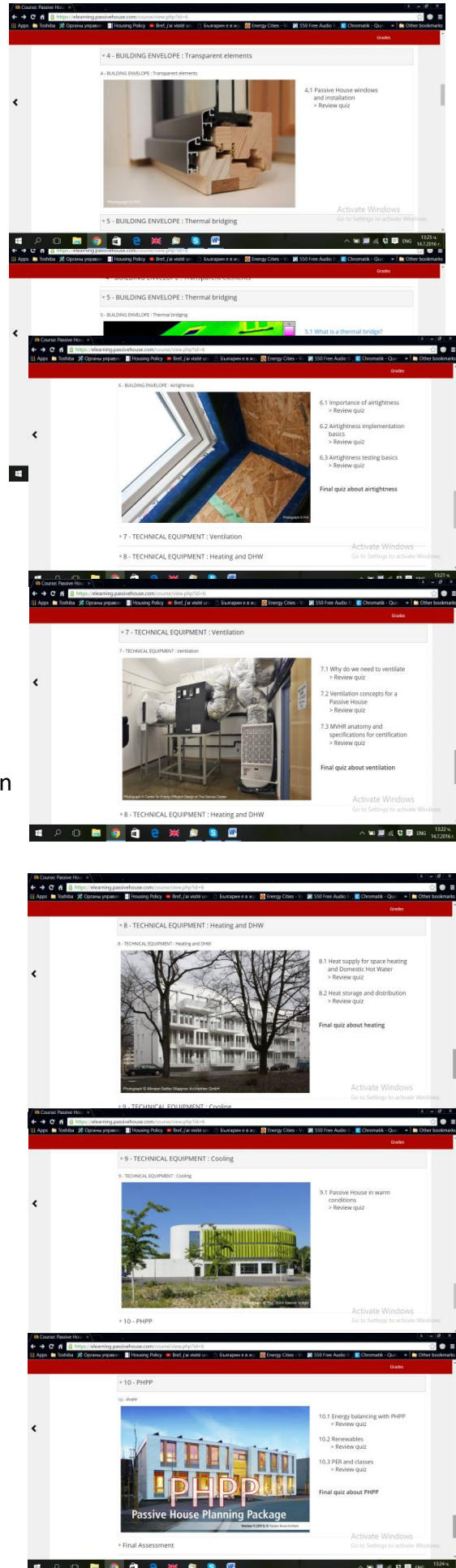
10 - PHPP

10.1 Energy balancing with PHPP

> Review quiz

10.2 Renewables

> Review quiz



10.3 PER and classes

> Review quiz

4. Training programmes from other EU-financed projects

Name/Website/partners	Topic	Type of training materials	Notes	Availability/ languages
POWERHOUSE resources database http://www.powerhouseeurope.eu/cases_resources/resources/	Energy efficiency and RES in all areas	Case studies, tools, methodologies, guidelines, brochures, booklets, presentations, etc.	A broad database of training materials with well developed search engine allowing selection by multiple categories	Available online EN
EDUCATE http://www.educate-sustainability.eu/home	Environmental Design in University Curricula and Architectural Training in Europe	Frameworks for curriculum development, Results of course and curriculum development, Criteria for professional education, etc	Targeted to architectural training in universities	Available on Dropbox EN
PROF/TRAC http://proftrac.eu/open-training-platform-for-nzeb-professionals.html	Training on energy efficiency and RES	A database of training materials developed by EU projects and other sources	A Horizon 2020 project; opportunities for cooperation	Available online EN, etc
nZEB training in the Southern EU countries – Maintaining building traditions (SOUTHZEB) http://www.southzeb.eu/	NZEB trainings for architects, engineers, building technicians	10 training modules: nZEB Basic module, nZEB Advanced module, Thermal bridging, Thermal Comfort, SouthZEB framework	No training available for download; possible exchange and cooperation. TTT course on offer. Project certification scheme (2 mandatory +	Available online – after registration/fee

	and municipal experts	module and local architectural regulations, nZEB simulation and design software module, Low carbon technology and automation for nZEB, Retrofitting towards nZEB, Construction management and field supervision of nZEB, Preparation of funding schemes and other incentives for nZEB	2 optional lead to “certified NZEB designer).	
Training for Rebuilding Europe (TRAINREBUILD) http://www.trainrebuild.eu	Trainings for renovation	Training materials for owners, financiers, municipalities and trainers	Available (.ppt) at http://trainrebuild.eu/project-results	Available on Dropbox EN
Continuous, practice-oriented implementation and dissemination of the EPBD 2002 and energy end-use efficiency and energy services 2006 by training craftsmen and trainers in the construction trade (TRAINENERGY) http://tea.ie/projects/train-energy/	Training for low-energy buildings	Training course consisting of 15 modules / 9 days.	4 video clips in YouTube https://www.youtube.com/user/TraInenergy	Available on Dropbox EN
Quality certification & accreditation for installers of small-scale renewable energy systems (QUALICERT) http://www.qualicert-project.eu/	Trainings for RES installers	Guidebook for installer (EN)		Available on Dropbox
Transferring Open Content on Energy-efficient Buildings www.toceb.eu	Open content learning platform on	The topics covered are “Energy-efficient building”, “Insulation materials”,	Convenient to use and well-developed pool of training	Available online,

	energy efficiency in buildings	“Thermal renovation” and “Façade systems”. http://www.e-genius.at/themenuuebersicht	materials, designed for teachers and students in vocational schools	Austria, the Czech Republic, Italy, Lithuania and Poland
TRAINING TOOLS FOR SUSTAINABLE BUILDINGS www.construction-durable.org	Sustainable buildings:	Network of training providers with online platform for creating and delivering courses: The Concept of Sustainability, Renewable Energy, Energy Efficiency, Air Quality, Water management, Materials, Waste,	After registration for network members	Available online, EN DE GR FR IT RO
NaSaBau - Transfer of innovative curricula of consulting building owners (KOMBAU) in the area of sustainable renovation http://www.nasabau.de	Renovation	2 TTT schedules		
Skills Alliance Energy Saving and Sustainable Construction in Baltic Sea Region www.skills-energy.eu	Innovative training programmes	Module contents and descriptions: Description Curriculum Vocational Training Specialist for Building Insulation	Specific country concepts for the Baltic region Modules for SMEs and TTT Materials of the advanced training for SMEs and Train-the-Trainer: in English:	Available on Dropbox Available online EN,DE

		<p>Module Map Curriculum Vocational Training Specialist for Building Insulation</p> <p>1st module content Preparing Object for Insulation</p> <p>1st module description Preparing Object for Insulation</p> <p>2nd module contents Preparing surfaces for insulation</p> <p>2nd module description Preparing surfaces for insulation</p> <p>3rd module contents Assembling thermal insulation</p> <p>3rd module description Assembling thermal insulation</p> <p>4th module contents Application of finish layers</p> <p>4th module description Application of finish layers</p>	<p>Curriculum Advanced Training for SMEs Energy efficiency</p> <p>Curriculum Advanced Training for SMEs Solar Energy</p> <p>Curriculum Advanced Training for SMEs Waste and Water Management</p> <p>Curriculum Advanced Training for SMEs Energy Efficient Construction</p> <p>Curriculum Advanced Training Train the Trainer Energy Sector</p>	
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Training courses for installers of small-scale renewable energy systems in buildings (INSTALL+RES) http://www.resinstaller.eu/	RES installers in the building sector	Courses on PV, Solar Thermal, Thermal Pumps, Biomass	Free training materials available on request	German, English, Italian, Polish, Slovenian, Bulgarian and Greek
Training of Photovoltaic Installers (PVTRIN) http://www.pvtrin.eu	OV installers	Training course and certification scheme	Textbook and additional materials available only online http://pvcert.gr/en/training_material_for_pvtrin_trainees/index.html	Other materials available on Dropbox, BG, EN
ISO 17024:2003 certification: Qualified Construction Worker ISO 17024:2003 www.iso-construct.eu	Validation of competences of unskilled workers in the construction sector applying ISO 17024 standards	Checklists, appraisal sheets, examination programmes, certification schemes, etc.	Qualification level 1 and 2	Available online, EN, DE, SL, FI, ES
Ecoshopping (Energy efficient & Cost competitive retrofitting solutions for Shopping buildings) www.iso-construct.eu FP7	Guideline and methodology for holistic retrofitting solutions in commercial buildings	Guideline and methodology Retrofitting methodology, Envelope and lighting systems solutions, HVAC Retrofitting systemic solutions	Reports, Publications, Brochures, Presentations, Posters, Videos http://ecoshopping-project.eu/index.php/download/	Available online, EN, ES, IT

<p>Green training for construction managers (ingREes) http://www.ingrees.eu/en/libraries/</p>	<p>Development of training programmes on energy efficiency and using renewable energy in buildings specifically for middle and senior level construction professionals</p>	<p>Roadmaps for setting up national qualification and training schemes focused on enhancement of skills of craftsmen and on-site workers in the sectors of buildings, to middle and senior level construction professionals</p>	<p>Training programmes developed for: Civil Engineer – Site Manager; Construction Site Supervisor; Civil Engineer – Energy Counsellor; Architects and Planners; Assessors of the Achieved Energy Efficiency of the Buildings http://www.ingrees.eu/en/services/training-programmes/</p>	<p>CZ, EN, SK</p>
<p>PROF/TRAC (PROFessional multi-disciplinary TRaining and Continuing development in skills for NZEB principles) http://proftrac.eu/open-training-platform-for-nzeb-professionals.html</p>	<p>PROF/TRAC (PROFessional multi-disciplinary TRaining and Continuing development in skills for NZEB principles), upskilling professionals, addressing skill gaps</p>	<p>Open training platform, training and qualification scheme, TTT programmes, self-assessment tools</p>	<p>http://proftrac.eu/training-material/search-training-material.html</p>	<p>Various, depending on the material itself</p>

Training construction workers on energy efficient building practices (BUStoB)	Development of a large number of training modules covering a range of subjects related to green skills for the building and installation workforce	Training modules, App		
Meeting of Energy Professional Skills (MEoS) http://www.mens-nzeb.eu/en/	Provision an enhancement of the NZEB skills of building managers such as engineers and architect through a series of accredited training	Courses, Case studies, Webinars		DE, DK, EN, ES, GR, FR, MK, NL
A2PBEER (Affordable and Adaptable Public Buildings through Energy Efficient Retrofitting) http://www.a2pbeer.eu/	Development, demonstration and evaluation of an	Workshops, Webinars, TTT Workshop	http://www.a2pbeer.eu/e-learning/training-resources/	EN

	innovative systemic retrofitting methodology for Public Building and District.			
Towards a learning building sector by setting up a large-scale and flexible qualification methodology integrating technical, cross-craft and BIM related skills and competences (BIMplement) http://www.bimplement-project.eu/	Achieve an improved quality for NZEB construction and renovation by setting up a large scale, training, CPD and qualification schemes	Methodology for a BIM enhanced Qualification Framework		DE, EN, ES, GR, FR, LT, NL, PL
CEN standard Certified ExpertsEU-wide qualification and training scheme based on EPBD mandated CEN standards (CEN-CE) http://www.mens-nzeb.eu/en/	Set up a large-scale qualification and training schemes to increase the skills of HVAC professionals	Qualification and training schemes		

<p>New competence for building professionals and blue collar workers – certified qualification schemes to upgrade the qualification for building nZEBs (NEWCOM) http://www.newcomtraining.com/index.php?id=30</p>	<p>Development of missing qualification and certification schemes for blue collar workers and building professionals who inspect and control the most relevant qualities with a specific focus on mutual recognition.</p>	<p>Trainings focused on cross craft construction interfaces and quality assurance by building inspections to guarantee low energy costs and high indoor comfort. The trainings address actual deficiencies in the construction of nearly zero-energy buildings and in the renovation of the existing building stock up to a very high energy standard.</p>		<p>DE, EN Contact for participation required.</p>
<p>BUILD UP Skills BEET http://beet.mk/</p>	<p>Development of two voluntary qualification schemes for five skills for the construction sector.</p>	<p>Qualification schemes, TTT course, Methodology</p>		<p>EN, MK</p>

5. List of programmes to be used in the Fit-to-NZEB Train-the-trainer courses

5.1. Country: Bulgaria

PART 1: ONLINE TRAIN-THE TRAINER COURSE DEVELOPED BY PHI (see 3.2 above):

accounting for 28 hours

PART 2: CLASSROOM/DEMO FACILITIES TRAINING: accounting for 12 hours

TRAIN-THE-TRAINER COURSE

Deep Energy Building Retrofit

Two-day training course for trainers

Day 1	Topics	Accessories and exercises
13:30 – 13:45	Opening and introduction	
13:45 – 14:45	1 EU AND NATIONAL STRATEGY, SUPPORT INSTRUMENTS AND REGULATIONS FOR DEEP ENERGY RETROFIT (DER) <i>Impact of the new regulations on the design and construction practice.</i> <i>Comfort, health and safety requirements in buildings, incl. indoor air quality</i>	Poster exhibition
14:45 – 15:30	2 WHAT IS THE ESSENCE OF THE NZEB CONCEPT? <i>Basic of building physics, situation and optimal solar gains, building envelope, major building components, MVHR</i>	Video on insulation materials
15:30 – 16:00	Coffee break	
16:00 – 16:45	3 HOW TO DESIGN AND EXECUTE NZEB RETROFIT PROJECTS? <i>Thermal insulation and thermal bridges</i> <i>Highly efficient windows</i> <i>Airtightness, vapour and moisture movement, windtightness</i>	Video on airtightness in buildings

16:45 – 17:30	<p>4</p> <p>HOW TO HEAT AND VENTILATE AN NZEB RETROFIT?</p> <p><i>Centralized and decentralized ventilation systems</i></p> <p><i>Heating and cooling + DHW</i></p>	<p>Video on ventilation systems</p> <p>Measuring and adjusting the airflow</p>
17:30 – 18:00	<p>5</p> <p>WHAT SHOULD WE KNOW ABOUT RES INSTALLATIONS IN BUILDINGS?</p> <p><i>Assessment of the potential for installation of small-scale RES solutions in passive buildings:</i></p> <p><i>Electricity - autonomous PV systems and mini-wind installation</i></p> <p><i>Thermal energy - solar thermal collectors, heat pumps</i></p>	<p>Announcement of RES course providers</p>

Day 2	Topics	Accessories and exercises
09:00 – 09:15	<p>WHAT ELSE SHOULD WE KNOW ABOUT DEEP ENERGY RETROFIT?</p> <p><i>Review of Day 1 and presentation of the agenda for Day 2</i></p>	
09:15 – 10:00	<p>6</p> <p>HOW TO RETROFIT EXISTING BUILDINGS FOR OPTIMAL ENERGY SAVINGS?</p> <p><i>The “EnerPHit” standard and the step-by-step renovation approach</i></p>	<p>Video on EnerPHit retrofit project</p>
10:00 – 10:45	<p>7</p> <p>PRACTICAL EXERCISE</p> <p><i>1. Design of a continuous insulation layer and airtight building envelope and design of a ventilation system according pre-given conditions</i></p> <p><i>2. Evaluation of the potential of a particular building for installation of renewable energy systems</i></p>	
10:45 – 11:00	Coffee break	
10:30 – 11:15	<p>8</p> <p>ECONOMIC EFFICIENCY OF DER</p> <p><i>Existing methods to assess cost-effectiveness, optimal cost effectiveness;</i></p>	

	<p><i>Sustainable economic development with reference to buildings, long-term benefits of DER and nZEBs;</i></p> <p><i>LCCA methods, comparison of renovation measures with respect to cost-effectiveness.</i></p>	
11:15 – 11:45	<p>9</p> <p>NZEB MEANS QUALITY</p> <p><i>Project management, Quality assurance, Achieving measurable results</i></p>	Review of the awarded projects
11:45 – 12:30	<p>10</p> <p>BEST PRACTICES ON ENERGY EFFICIENCY IN EXISTING BUILDINGS</p> <p><i>NZEB neighbourhoods, Energy cooperatives</i></p> <p><i>Ecology and sustainability</i></p> <p><i>Engaging stakeholders</i></p>	Promotional video of the Brussels-based PH association PMP (optional)
12:30 – 13.00	Discussion	
13:00-14.00	Lunch	
14.00-17.00	<p>11-12</p> <p>REVIEW AND EXERCISE ON THE DEMONSTRATION FACILITIES</p> <p><i>Drawings and explanation of the principles presented on the construction models and hands-on exercises on the practice walls</i></p> <p><i>Practical exercise</i></p>	<p>Multimedia 3D building/component models shown</p> <p>Application of airtight tape on internal and external corners and penetrations</p> <p>Pressurization (blower-door) testing and infrared thermography</p>

5.2. Country: Croatia

PART 1: ONLINE TRAIN-THE TRAINER COURSE DEVELOPED BY PHI (see 3.2 above):

accounting for 28 hours

PART 2: CLASSROOM/DEMO FACILITIES TRAINING: accounting for 12 hours

TRAIN-THE-TRAINER COURSE

Deep Energy Building Retrofit

Two-day training course for trainers

Day 1	Topics	Accessories and exercises
13:30 – 13:45	Opening and introduction	
13:45 – 14:45	1 EU AND NATIONAL STRATEGY, SUPPORT INSTRUMENTS AND REGULATIONS FOR DEEP ENERGY RETROFIT (DER) Impact of the new regulations on the design and construction practice. Comfort, health and safety requirements in buildings, incl. indoor air quality	Poster exhibition
14:45 – 15:30	2 WHAT IS THE ESSENCE OF THE NZEB CONCEPT? Basic of building physics, situation and optimal solar gains, building envelope, major building components, MVHR	Video on insulation materials
15:30 – 16:00	Coffee break	
16:00 – 16:45	3 HOW TO DESIGN AND EXECUTE NZEB RETROFIT PROJECTS? Thermal insulation and thermal bridges Highly efficient windows Airtightness, vapour and moisture movement, wind tightness	Video on airtightness in buildings Video on Blower door Test Blower door Test Execution
16:45 – 17:30	4 HOW TO HEAT AND VENTILATE AN NZEB RETROFIT? Centralized and decentralized ventilation systems Heating and cooling + DHW	Video on ventilation systems Measuring and adjusting the airflow

17:30 – 18:00	<p>5</p> <p>WHAT SHOULD WE KNOW ABOUT RES INSTALLATIONS IN BUILDINGS?</p> <p>Assessment of the potential for installation of small-scale RES solutions in passive buildings:</p> <p>Electricity - autonomous PV systems and mini-wind installation</p> <p>Thermal energy - solar thermal collectors, heat pumps</p>	Announcement of RES course providers
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Day 2	Topics	Accessories and exercises
09:00 – 09:15	<p>WHAT ELSE SHOULD WE KNOW ABOUT DEEP ENERGY RETROFIT?</p> <p>Review of Day 1 and presentation of the agenda for Day 2</p>	
09:15 – 10:00	<p>6</p> <p>HOW TO RETROFIT EXISTING BUILDINGS FOR OPTIMAL ENERGY SAVINGS?</p> <p>The “EnerPHit” standard and the step-by-step renovation approach</p>	<p>Video on EnerPHit retrofit project</p> <p>Video on Bračak energy center</p>
10:00 – 10:45	<p>7</p> <p>PRACTICAL EXERCISE</p> <p>1. Design of a continuous insulation layer and airtight building envelope and design of a ventilation system according pre-given conditions</p> <p>2. Evaluation of the potential of a particular building for installation of renewable energy systems</p>	<p>Use of models constructed for demonstration and exercise.</p> <p>Use of Condetti for practical exercise</p>
10:45 – 11:00	Coffee break	
10:30 – 11:15	<p>8</p> <p>ECONOMIC EFFICIENCY OF DER</p> <p>Existing methods to assess cost-effectiveness, optimal cost effectiveness; Sustainable economic development with reference to buildings, long-term benefits of DER and nZEBs;</p> <p>LCCA methods, comparison of renovation measures with respect to cost-effectiveness.</p>	

11:15 – 11:45	9 NZEB MEANS QUALITY Project management, Quality assurance, Achieving measurable results	Review of the awarded projects
11:45 – 12:30	10 BEST PRACTICES ON ENERGY EFFICIENCY IN EXISTING BUILDINGS NZEB neighbourhoods, Energy cooperatives Ecology and sustainability Engaging stakeholders	Promotional video of the Brussels-based PH association PMP (optional)
12:30 – 13.00	Discussion	
13:00-14.00	Lunch	
14.00-17.00	11-12 REVIEW AND EXERCISE ON THE DEMONSTRATION FACILITIES Drawings and explanation of the principles presented on the construction models and hands-on exercises on the practice walls Practical exercise	Multimedia 3D building/component models shown Application of airtight tape on internal and external corners and penetrations Pressurization (blower-door) testing and infrared thermography

5.3. Country: Czech Republic

PART 1: ONLINE TRAIN-THE TRAINER COURSE DEVELOPED BY PHI (see 3.2 above):

accounting for 28 hours

PART 2: CLASSROOM/TRAINING IN THE ABF FOUNDATION TRAINING CENTRE: accounting

for 12 hours

TRAIN-THE-TRAINER COURSE

Deep Energy Building Retrofit

Two-day training course for trainers

Day 1	Topics	Accessories and exercises
13:30 – 13:45	Opening and introduction	
13:45 – 14:45	<p>1</p> <p>EU AND NATIONAL STRATEGY, SUPPORT INSTRUMENTS AND REGULATIONS FOR DEEP ENERGY RETROFIT (DER)</p> <p>Impact of the new regulations on the design and construction practice.</p> <p>Comfort, health and safety requirements in buildings, incl. indoor air quality</p>	Poster exhibition based on exhibition of Building of the year in the premises of the centre
14:45 – 15:30	<p>2</p> <p>WHAT IS THE ESSENCE OF THE NZEB CONCEPT?</p> <p>Basic of building physics, situation and optimal solar gains, building envelope, major building components, MVHR</p>	Practical training on thermal insulation materials with the samples, presentation on national definition
15:30 – 16:00	Coffee break	
16:00 – 16:45	<p>3</p> <p>HOW TO DESIGN AND EXECUTE NZEB RETROFIT PROJECTS?</p> <p>Thermal insulation and thermal bridges</p> <p>Highly efficient windows</p> <p>Airtightness, vapour and moisture movement, windtightness</p>	Video on airtightness in buildings, practical training on blower door testing
16:45 – 17:30	<p>4</p> <p>HOW TO HEAT AND VENTILATE AN NZEB RETROFIT?</p> <p>Centralized and decentralized ventilation systems</p> <p>Heating and cooling + DHW</p>	<p>Video on ventilation systems</p> <p>Discussion in front the ventilation units</p>

17:30 – 18:00	<p>5</p> <p>WHAT SHOULD WE KNOW ABOUT RES INSTALLATIONS IN BUILDINGS?</p> <p>Assessment of the potential for installation of small-scale RES solutions in passive buildings:</p> <p>Electricity - autonomous PV systems and mini-wind installation</p> <p>Thermal energy - solar thermal collectors, heat pumps</p>	Announcement of RES course providers
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Day 2	Topics	Accessories and exercises
09:00 – 09:15	<p>WHAT ELSE SHOULD WE KNOW ABOUT DEEP ENERGY RETROFIT?</p> <p>Review of Day 1 and presentation of the agenda for Day 2</p>	
09:15 – 10:00	<p>6</p> <p>HOW TO RETROFIT EXISTING BUILDINGS FOR OPTIMAL ENERGY SAVINGS?</p> <p>The “EnerPHit” standard and the step-by-step renovation approach</p>	Selected video and discussion
10:00 – 10:45	<p>7</p> <p>PRACTICAL EXERCISE</p> <p>1. Design of a continuous insulation layer and airtight building envelope and design of a ventilation system according pre-given conditions</p> <p>2. Evaluation of the potential of a particular building for installation of renewable energy systems</p>	Practical training with the construction models
10:45 – 11:00	Coffee break	
10:30 – 11:15	<p>8</p> <p>ECONOMIC EFFICIENCY OF DER</p> <p>Existing methods to assess cost-effectiveness, optimal cost effectiveness; Sustainable economic development with reference to buildings, long-term benefits of DER and nZEBs;</p> <p>LCCA methods, comparison of renovation measures with respect to cost-effectiveness.</p>	Presentation and exercise on pay back period calculation

11:15 – 11:45	9 NZEB MEANS QUALITY Project management, Quality assurance, Achieving measurable results	Review of the awarded projects in Building of the year competition
11:45 – 12:30	10 BEST PRACTICES ON ENERGY EFFICIENCY IN EXISTING BUILDINGS NZEB neighbourhoods, Energy cooperatives Ecology and sustainability Engaging stakeholders	Promotional video of the Brussels-based PH association PMP (optional)
12:30 – 13.00	Discussion	
13:00-14.00	Lunch	
14.00-17.00	11-12 REVIEW AND EXERCISE ON THE DEMONSTRATION FACILITIES Drawings and explanation of the principles presented on the construction models and hands-on exercises on the practice walls Practical exercise	Multimedia 3D building/component models shown Application of airtight tape on internal and external corners and penetrations Pressurization (blower-door) testing and infrared thermography

5.4. Country: Greece

PART 1: ONLINE TRAIN-THE TRAINER COURSE DEVELOPED BY PHI (see 3.2 above):

accounting for 28 hours

PART 2: CLASSROOM/DEMO FACILITIES TRAINING: accounting for 12 hours

TRAIN-THE-TRAINER COURSE

Deep Energy Building Retrofit

Two-day training course for trainers

Day 1	Topics	Accessories and exercises
13:30 – 13:45	Opening and introduction	
13:45 – 14:45	1 EU STRATEGY, SUPPORT INSTRUMENTS AND REGULATIONS FOR DEEP ENERGY RETROFIT (DER) Impact of the new regulations on the design and construction practice. Comfort, health and safety requirements in buildings, incl. indoor air quality	Poster exhibition
14:45 – 15:30	2 WHAT IS THE ESSENCE OF THE NZEB CONCEPT? Basic of building physics, situation and optimal solar gains, building envelope, major building components, MVHR	Video on insulation materials
15:30 – 16:00	Coffee break	
16:00 – 16:45	3 HOW TO DESIGN AND EXECUTE NZEB RETROFIT PROJECTS? Thermal insulation and thermal bridges Highly efficient windows Airtightness, vapour and moisture movement, wind tightness	Video on airtightness in buildings Video on Blower door Test Blower door Test Execution
16:45 – 17:30	4 HOW TO HEAT, COOL AND VENTILATE AN NZEB RETROFIT? Centralized and decentralized ventilation systems Heating and cooling + DHW	Video on ventilation systems Measuring and adjusting the airflow

	Use of Mini-split units	
17:30 – 18:00	<p>5</p> <p>WHAT SHOULD WE KNOW ABOUT RES INSTALLATIONS IN BUILDINGS?</p> <p>Assessment of the potential for installation of small-scale RES solutions in passive buildings:</p> <p>Electricity - autonomous PV systems and mini-wind installation</p> <p>Thermal energy - solar thermal collectors, heat pumps</p>	<p>Announcement of RES course providers</p> <p>Visit the PV and Solar System</p>

Day 2	Topics	Accessories and exercises
09:00 – 09:15	<p>WHAT ELSE SHOULD WE KNOW ABOUT DEEP ENERGY RETROFIT?</p> <p>Review of Day 1 and presentation of the agenda for Day 2</p>	
09:15 – 10:00	<p>6</p> <p>HOW TO RETROFIT EXISTING BUILDINGS FOR OPTIMAL ENERGY SAVINGS?</p> <p>The “EnerPHit” standard and the step-by-step renovation approach</p>	<p>Video on the Passivistas Project in Athens, a certified EnerPHit PLUS retrofit project.</p>
10:00 – 10:45	<p>7</p> <p>PRACTICAL EXERCISE</p> <p>1. Design of a continuous insulation layer and airtight building envelope and design of a ventilation system according pre-given conditions</p> <p>2. Evaluation of the potential of a particular building for installation of renewable energy systems</p>	<p>Drawings of the Passivistas project in Athens</p>
10:45 – 11:00	Coffee break	
10:30 – 11:15	<p>8</p> <p>ECONOMIC EFFICIENCY OF DER</p> <p>Existing methods to assess cost-effectiveness, optimal cost effectiveness; Sustainable economic development with reference to buildings, long-term benefits of DER and nZEBs;</p> <p>LCCA methods, comparison of renovation measures with respect to cost-effectiveness.</p>	

11:15 – 11:45	9 NZEB MEANS QUALITY Project management, Quality assurance, Achieving measurable results	Review of the greek projects until now.
11:45 – 12:30	10 BEST PRACTICES ON ENERGY EFFICIENCY IN EXISTING BUILDINGS NZEB neighbourhoods, Energy cooperatives Ecology and sustainability Engaging stakeholders	Promotional video of the Passivistas project in Athens (optional)
12:30 – 13:00	Discussion	
13:00-14.00	Lunch	
14.00-17.00	11-12 REVIEW AND EXERCISE ON THE DEMONSTRATION FACILITIES Drawings and explanation of the principles presented on the construction models and hands-on exercises on the practice walls Practical exercise	Multimedia 3D building/component models shown Application of airtight tape on internal and external corners and penetrations Pressurization (blower-door) testing and infrared thermography Visit the Passivistas project in Athens.

5.5. Country: Italy

PART 1: ONLINE TRAIN-THE TRAINER COURSE DEVELOPED BY PHI (see 3.2 above):

accounting for 28 hours

PART 2: CLASSROOM/DEMO FACILITIES TRAINING: accounting for 12 hours

TRAIN-THE-TRAINER COURSE

Deep Energy Building Retrofit

Two-day training course for trainers

Day 1	Topics	Accessories and exercises
13:30 – 13:45	Opening and introduction	
13:45 – 14:45	1 EU STRATEGY, SUPPORT INSTRUMENTS AND REGULATIONS FOR DEEP ENERGY RETROFIT (DER) Impact of the new regulations on the design and construction practice. Comfort, health and safety requirements in buildings, incl. indoor air quality	Poster exhibition
14:45 – 15:30	2 WHAT IS THE ESSENCE OF THE NZEB CONCEPT? Basic of building physics, situation and optimal solar gains, building envelope, major building components, MVHR	Video on insulation materials
15:30 – 16:00	Coffee break	
16:00 – 16:45	3 HOW TO DESIGN AND EXECUTE NZEB RETROFIT PROJECTS? Thermal insulation and thermal bridges Highly efficient windows Airtightness, vapour and moisture movement, wind tightness	Video on airtightness in buildings Video on Blower door Test Blower door Test Execution
16:45 – 17:30	4 HOW TO HEAT, COOL AND VENTILATE AN NZEB RETROFIT? Centralized and decentralized ventilation systems Heating and cooling + DHW	Video on ventilation systems Measuring and adjusting the airflow

	Use of Mini-split units	
17:30 – 18:00	<p>5</p> <p>WHAT SHOULD WE KNOW ABOUT RES INSTALLATIONS IN BUILDINGS?</p> <p>Assessment of the potential for installation of small-scale RES solutions in passive buildings:</p> <p>Electricity - autonomous PV systems and mini-wind installation</p> <p>Thermal energy - solar thermal collectors, heat pumps</p>	Announcement of RES course providers

Day 2	Topics	Accessories and exercises
09:00 – 09:15	<p>WHAT ELSE SHOULD WE KNOW ABOUT DEEP ENERGY RETROFIT?</p> <p>Review of Day 1 and presentation of the agenda for Day 2</p>	
09:15 – 10:00	<p>6</p> <p>HOW TO RETROFIT EXISTING BUILDINGS FOR OPTIMAL ENERGY SAVINGS?</p> <p>The “EnerPHit” standard and the step-by-step renovation approach</p>	Video on the Passivistas Project in Italy.
10:00 – 10:45	<p>7</p> <p>PRACTICAL EXERCISE</p> <p>1. Design of a continuous insulation layer and airtight building envelope and design of a ventilation system according to pre-given conditions</p> <p>2. Evaluation of the potential of a particular building for installation of renewable energy systems</p>	Drawings of the Passivhaus project in Italy
10:45 – 11:00	Coffee break	
10:30 – 11:15	<p>8</p> <p>ECONOMIC EFFICIENCY OF DER</p> <p>Existing methods to assess cost-effectiveness, optimal cost effectiveness; Sustainable economic development with reference to buildings, long-term benefits of DER and nZEBs; LCCA methods, comparison of renovation measures with respect to cost-effectiveness.</p>	

11:15 – 11:45	9 NZEB MEANS QUALITY Project management, Quality assurance, Achieving measurable results	
11:45 – 12:30	10 BEST PRACTICES ON ENERGY EFFICIENCY IN EXISTING BUILDINGS NZEB neighbourhoods, Energy cooperatives Ecology and sustainability Engaging stakeholders	
12:30 – 13.00	Discussion	
13:00-14.00	Lunch	
14.00-17.00	11-12 REVIEW AND EXERCISE ON THE DEMONSTRATION FACILITIES Drawings and explanation of the principles presented on the construction models and hands-on exercises on the practice walls Practical exercise	Multimedia 3D building/component models shown Application of airtight tape on internal and external corners and penetrations Pressurization (blower- door) testing and infrared thermography

5.6. Country: Romania

PART 1: ONLINE TRAIN-THE TRAINER COURSE DEVELOPED BY PHI (see 3.2 above):

accounting for 28 hours

PART 2: CLASSROOM/DEMO FACILITIES TRAINING: accounting for 12 hours

TRAIN-THE-TRAINER COURSE

Deep Energy Building Retrofit

Two-day training course for trainers

Day 1	Topics	Accessories and exercises
09:00 – 09:15	Opening and introduction	
09:15 – 10:15	1 EU AND NATIONAL STRATEGY, SUPPORT INSTRUMENTS AND REGULATIONS FOR DEEP ENERGY RETROFIT (DER) Impact of the new regulations on the design and construction practice. Comfort, health and safety requirements in buildings, incl. indoor air quality	Poster exhibition
10:15 – 11:00	2 WHAT IS THE ESSENCE OF THE NZEB CONCEPT? Basic of building physics, situation and optimal solar gains, building envelope, major building components, MVHR	Video on insulation materials
11:10 – 11:30	Coffee break	
11:30 – 12:15	3 HOW TO DESIGN AND EXECUTE NZEB RETROFIT PROJECTS? Thermal insulation and thermal bridges Highly efficient windows Airtightness, vapour and moisture movement, windtightness	Video on airtightness in buildings
12:15 – 13:00	4 HOW TO HEAT AND VENTILATE AN NZEB RETROFIT? Centralized and decentralized ventilation systems Heating and cooling + DHW	Video on ventilation systems Measuring and adjusting the airflow

Day 1	Topics	Accessories and exercises
13:00-14.00	Lunch	
14:00 – 14:30	<p>5</p> <p>WHAT SHOULD WE KNOW ABOUT RES INSTALLATIONS IN BUILDINGS?</p> <p>Assessment of the potential for installation of small-scale RES solutions in passive buildings:</p> <p>Electricity - autonomous PV systems and mini-wind installation</p> <p>Thermal energy - solar thermal collectors, heat pumps</p>	Announcement of RES course providers
14:30 – 15:15	<p>6</p> <p>HOW TO RETROFIT EXISTING BUILDINGS FOR OPTIMAL ENERGY SAVINGS?</p> <p>The “EnerPHit” standard and the step-by-step renovation approach</p>	Video on EnerPHit retrofit project
15:15 – 15:30	Coffee break	
15:30 – 16:15	<p>7</p> <p>PRACTICAL EXERCISE</p> <p>1. Design of a continuous insulation layer and airtight building envelope and design of a ventilation system according pre-given conditions</p> <p>2. Evaluation of the potential of a particular building for installation of renewable energy systems</p>	
16:15 – 17:00	<p>8</p> <p>ECONOMIC EFFICIENCY OF DER</p> <p>Existing methods to assess cost-effectiveness, optimal cost effectiveness;</p> <p>Sustainable economic development with reference to buildings, long-term benefits of DER and nZEBs;</p> <p>LCCA methods, comparison of renovation measures with respect to cost-effectiveness.</p>	Case studies from RePublic_ZEB project

Day 2	Topics	Accessories and exercises
09:00 – 09:15	WHAT ELSE SHOULD WE KNOW ABOUT DEEP ENERGY RETROFIT? Review of Day 1 and presentation of the agenda for Day 2	
09:15 – 09:45	9 NZEB MEANS QUALITY Project management, Quality assurance, Achieving measurable results	Review of awarded projects
09:45 – 10:30	10 BEST PRACTICES ON ENERGY EFFICIENCY IN EXISTING BUILDINGS NZEB neighbourhoods, Energy cooperatives Ecology and sustainability Engaging stakeholders	Promotional video of the Brussels-based PH association PMP (optional)
10:30 – 11:00	Discussion	
11:00 – 11:30	Coffee break	
11:30-14:00	11-12 REVIEW AND EXERCISE ON THE DEMONSTRATION FACILITIES Drawings and explanation of the principles presented on the construction models and hands-on exercises on the practice walls Practical exercise	Multimedia 3D building/component models shown Application of airtight tape on internal and external corners and penetrations Pressurization (blower-door) testing and infrared thermography