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Fit-to-NZEB
Innovative training schemes for retrofitting to nZEB-levels

Training programme for EQF level 6-7

Development of the educational programme

Deliverable 4.1

of the FIT-TO-NZEB project, financed under grant agreement No 754059 of the HORIZON 2020 Programme of the EU

Led by:

CVUT – České vysoké učení technické v Praze (Czech Technical University in Prague)

D4.3 Development of the educational programme

The first task of this WP covers development of the educational programme for levels 6-7 under the EQF. All modules will consist of basic topics, specification of knowledge, skills and competences to be acquired, time allocation for the lectures and exercises, indication of the examination forms and specification of the necessary training materials, aids and equipment. The programme will be developed in English, with translations in all national languages.

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List of Topics

1. Curriculum

FIT-TO-NZEB

Development of the educational programme

CURRICULUM

WP4 - Training programmes for institutions of higher education
Levels 6-7 under the EQF

Subject	**Deliverable 4.1 of the** **FIT-TO-NZEB** **Development of the educational programme**
Academic hours	1-2 hours lecture + 1-2 hours seminar Total: 60 hours - 30 hrs lectures and 30 hrs seminars
Type of discipline	e-learning tools, facilities for practical demonstration and training, and examination programmes
EQF level	6 - 7
	Control and evaluation - ongoing assessment and examination
Acquired knowledge	advanced and highly specialised knowledge on: (a) The physical properties of the object; (b) Thermal gains and losses of the building; (c) Properties of the building envelope; (d) Passive standards, nZEB; (e) Requirements for the operation and maintenance of buildings; (f) Proposals for energy-saving building measures; (g) The economic efficiency of the design, construction and operation of the building; (h) Principles of building ecology and sustainability.
Acquired skills	General and specific skills: (a) To explain the main building physics principles; (b) To carry out a fine tuning to optimize the building envelope, and the building services depending on the climate conditions; (c) To understand passive solar design in different climates – cold, warm, continental; (d) To generate solutions to specific problems related to risks and construction damage; (e) To integrate knowledge from different field; (f) To apply basic methods, tools, materials and information.
Acquired responsibility and autonomy	Self-management and/or management and supervision in: (a) Within the guidelines of work related to the design process of energy saving buildings;

	(b) Manage complex technical or professional activities or projects; (c) For decision-making contributing to professional knowledge and practice in unpredictable work; (d) In recommending measures/actions to optimize the functionality of a defined system; (e) For the proposed/promised benefits; (f) For completion of tasks related to preparation of construction project.
Preliminary requirements	Participants are expected to have basic knowledge of: • Building physics; • Building materials; • Building insulation; • Energy measures; • Energy economy; • Project planning and management.
Exam procedure	Final test and regular practical testing during the seminars.
Technical secure (hardware and software)	• White board; • Multimedia facility; • Laptop; • Demonstration models; • Practical training models; • Samples of components and materials, suitable for deep renovation; • Demonstration videos.
Leading lectors	Lecturers will be nominated per countries.

2. Annotation

The objective of the Fit to NZEB programme is to extend the knowledge in the field of design, building and use of buildings. The programme is divided into 60 hours (30 hours of theoretical lectures and 30 hours of practical seminars) in which 17 topics will be taught.

The programme will focus on the physical properties of materials and buildings, their influence on the energy losses of the building and other parameters influencing the use of energy in the building. The principles of nZEB and passive houses will be further understood. It will contain on expanding knowledge and understanding of the operation and use of buildings, impact of building use on energy consumption, impact on the environment and building life.

One of the topics is introduction to the building physics necessary for understanding the interrelations of the major principles in deep energy renovation (DER), principles of windows orientation, their dimensions and impact on the operation of the building, the shading and ventilation of the building.

Further knowledge on building envelope, especially insulation, thermal bridges and risks, will be expanded. Another part of the programme is focused on the understanding and implementation of the nearly Zero Energy Neighbourhood in deep energy renovation projects, defined as a cluster of residential and/or non-residential units where the overall energy demand is low and is partly met by renewable energy self-produced within the neighbourhood.

Learners will be acquainted with energy-efficient building designs. The national software tools and the national legislation approaches will be used. The proposed energy-saving measures will be evaluated from an economic point of view. Knowledge about the national and international strategic objectives, funding systems and opportunities will be enhanced. Students will be acquainted with the legal regulations and requirements for building specialists and technicians. The end of the programme will extend the knowledge in ecology as a starting point for energy efficiency in building, climate change and CO_2 levels.

3. Distribution of lectures and seminars

Development of the educational programme - schedule of lectures and seminars[1]

№	Subject	Academic Hours	
		Lectures	Seminars

1.	**Basics of building physics**
	• Heat and Heating Energy (Heat Flux/Thermal Conduction);
	• Thermal Comfort.
	
	1.1 PH Principles
	• The 5 passive house Pillars;
	  • Thermal envelope;
	  • Windows;
	  • Airtightness;
	  • Thermal Bridges;
	  • Mechanical Ventilation System.
		2	2

2.	**Optimal solar gains**
	• Climate data and climate zones;
	  • Extent of shading and solar access to the site;
	  • Climatic conditions using the average annual weather Data or extreme design conditions;
	  • Hourly internal temperatures and comfort conditions;
	  • Extent of daylight penetration and likely illuminance Levels;
	  • Annual, seasonal, monthly, daily or hourly heating and cooling loads;
	  • Peak heating and cooling loads;
	• Solar radiation and window orientation;
	  • Reduction factor for solar gains;
	  • Windows comfort criterion;
	  • Windows U-value calculation;
	• Windows installation;
	  • Concept sketches;
	• Glazing;
	  • Descriptions of the glazing;
	  • g-Values (in accordance with EN410);
	• Special aspects in curtain wall facades;
	• Shading;
	  • Calculation of shading reduction factors;
	  ○ Horizontal obstruction factor;
	  ○ Vertical shading factor;
	  ○ Horizontal shading factor;
	  • Additional shading elements;
		2	2

[1] The programme itself will consist of all topics listed in Task 2.3, spread within a general framework of 60 academic hours. The programme will consist of 60 academic hours (30 hours theoretical lectures and 30 hours of practical training). Subtopics are included in the main topics.

	○ A line of deciduous trees; ○ Optimum roof overhangs; ○ Reveal shading on one side; ○ Courtyards; • Software for calculating shading; • Temporary shading; • Cool materials for building envelop; • Solar Reflectance Index (SRI); • Thermal mass; • Mitigation of urban heat islands; • Green roofs.		
3.	**Building Envelope** • Thermal insulation; • Insulating materials and their properties; • Hydrothermal and physical properties of materials (thermal conductivity, water vapour diffusion resistance factor, reaction to fire, etc.); • Unbroken thermal envelope (external, internal insulation; diffusion-impermeable and diffusion-permeable solutions); • Properties of elements comprising building envelope (U-values, water vapour resistance, fire behaviour on different kind of building envelopes, noise protection, etc.); • Correct installation of thermal insulation; • Risks and construction damage resulted from poor workmanship; • Quality control of thermal insulation; • Cross-crafting; • Minimizing thermal bridges; • Thermal bridges; • Moisture related building damage due to thermal bridges; • Influence of thermal bridges on the heat losses; • Prevention and minimisation of thermal bridges; • Thermal bridge optimised window installation; • Cross-crafting; • Highly efficient windows; • General function of windows; • General requirements for windows (airtight, thermally insulating (U-value), transparent, possibility of opening and providing shade when necessary); • Glazing and glazing edge, overview of requirements, g-value; • Role of windows regarding energy efficiency and comfort (view towards the outside, thermal protection, solar gains, ventilation during day and during night);	2	2

	• Thermal comfort in the buildings and the resultant requirements for windows, temperatures at the window; • Window installation in a thermal bridge minimised/free manner; • Airtight window installation; • Qualitative energy balance of a window.		
4.	**NZEB Neighbourhoods** • Nearly Zero Energy Neighbourhood - principles and methods for extended building system boundary determination and performance evaluation; • Distributed energy generation regarding the basic of smart grid concept, technologies, and systems; smart grid standards; • Principles and technical characteristics of various distributed energy production technologies; • Impact and benefits of the distributed electrical energy generation grid integration; • Energy Management Systems (EMS) and District Energy Systems; advanced distribution automatization including advanced metering infrastructure (AMI) technologies • Connection of the decentralized production units with the equipment placed inside or on/near the buildings; • Energy user behaviour and pattern of energy use on the overall performance of the nZEB neighbourhood. • Temporal energy match characteristics: load match, grid interaction and fuel switching; • Legal framework for energy management, tariffs and inter-connection and inter-operability of energy systems; • Cooperatives energy management systems and correlation with new business opportunities.	2	2
5.	**Airtightness, vapour and moisture movement, wind-tightness** • Key psychometric concepts relating to (1) temperature (dry-bulb, wet-bulb and dew-point) and (2) vapour (relative humidity, humidity ratio and absolute humidity) and ability to interpret a simplified psychometric chart; • Sources of vapour in dwellings (generated internally and externally); • Vapour pressure and vapour drive in different climates and the optimal location for positioning the vapour control layer (internal, central or external); • Conditions that favour mould growth and condensation; • Understanding the term ‘breathable’ construction as it related to vapour diffusion; • Sd (or Perm) rating for different materials and best practice use according to different site conditions (vapour closed, vapour permeable / semi-permeable, vapour open and vapour variable); • Metrics used in airtightness testing including air changes per	2	2

	hour (h-1) as well as air permeability (m3/hr.m2) and targets for deep retrofitting, including 1.0 h-1 for EnerPHit; • Hands-on airtightness installation at key junctions, penetrations and connections for different construction types and using different materials (membranes, plaster, wooden boards (plywood), tapes, caulks and so forth); • Airtightness testing methods for local code compliance as well as Passive House / EnerPHit (considering pressure differences, testing direction (negative and / or positive), exterior weather conditions (temperature and wind speed)); • Airtightness demonstration test, including volume calculation, identification and fixing of leaks and re-testing; • Wind-tightness and its influence on interior comfort and performance of the insulation layer; • Materials used for achieving wind-tightness; and • Cross-crafting and quality assurance issues, including risks of failure.		
6.	**Building Services** • Overview of key building services including ventilation, heating, cooling and domestic hot water; • Key air quality indicators including relative humidity and CO2; • Mechanical ventilation strategies (centralised, de-centralised or hybrid) and methods (extract only or balanced, with heat recovery); • Calculation of supply and extract ventilation rates to ensure high indoor air quality; • Principles of air-to-air heat exchange and mechanical ventilation with heat recovery (MVHR); • Identification of key components in an MVHR unit (heat exchanger, fans, filters, condensate drain) • Optimal placement of an MVHR unit considering minimisation of thermal bridging from cold air ducts; • Vapour-proof insulation and air-sealing of cold air ducts to MVHR unit and penetration through the thermal envelope; • Duct sizing, materials, routing, air-sealing and consideration of pressure losses; • Supply and extract registers – types, placement, adjustment; • Balancing the MVHR system (including interior registers to ensure meeting designed supply and extract air flow rates as well as ensuring that the flow rates measured externally are within 10% of each other); • Heating generation strategies (boiler, heat-pump, direct-electric, CHP, district heating and others); • Heating distribution strategies (using the ventilation air, hydronic (radiators, underfloor, wall or ceiling panels) or refrigerant); • Cooling (latent and sensible) generation strategies (heat-	2	2

	pump); • Cooling (latent and sensible) distribution strategies (using the ventilation air, hydronic (radiators, underfloor, wall or ceiling panels) or refrigerant); • Domestic hot water generation and distribution; • Insulation materials and thicknesses suitable for vessels, ducts and pipes conveying hot and cold water / refrigerant; • Application of insulation materials to pipework, including paying particular attention to awkward connections and junctions (which are typically poorly insulated); and • Drain water heat recovery systems.		
7.	**Conservation of historic building fabric** • retrofit for non-residential historical buildings with high IHG; • Improving thermal protection towards the ground when modernising historical buildings; • Solutions for ventilation in retrofits of historical buildings; • Natural light and artificial light; • Thermal comfort in summer; • Barriers to carry out comprehensive energy refurbishments; • The house-in-a-house principle; • Built examples; • Step-by-step Refurbishment Examples.	2	2
8.	**RES in building renovation** • Energy sources; • Decentralized versus Centralized renewable energy systems in building; • Long and short-term energy storage; • Autonomous buildings; • Equipment for RES: Smart metering / Control strategies; • Demand response and forecasting.	2	2
9.	**Cost effectiveness** • Existing methods to assess cost-effectiveness, optimal cost effectiveness; • Sustainable economic development with reference to buildings, long-term benefits of DER and nZEBs; • Relationship between capital costs and costs relating to energy saving measures; • LCCA methods, comparison of renovation measures with respect to cost-effectiveness.	2	2
10.	**Planning and design instruments** • PHPP: verified performance; • PHPP: the tool; • Design PH: plugin for 3D modelling.	2	2
11.	**Comfort, health and safety requirements in buildings, incl. indoor air quality** • Criteria for comfort in buildings and healthy indoor climate, including indoor air quality (contaminants and performance	1	1

	levels), thermal comfort, daylight and lighting, noise, connection to the nearby landscape: • Key-factors influencing indoor comfort during summer: solar loads, air exchange, indoor heat sources, impact of external colours, of thermal insulation and of thermal masses inside the building, automatic calculation tools used to assess shading in summer; • Passive cooling technologies to avoid overheating / to reduce the cooling demand during summer; • Safety requirements in buildings and the compliance ensured during the renovation process: Fire Safety and legal responsibilities in Buildings, Principles of Passive and Active Fire Protection, Environmental regulations affecting building system design and occupancy health and safety, Emergency operations and safety plan		
12.	**Step-by-step retrofit plans** • Potential for energy savings assessment; • Renovation standards; certification of the energy performance; • Details, products and materials; • Step-by-step retrofit plans; • RES; • Economic efficiency of the different steps, Life-cycle assessment.	2	2
13.	**Energy efficiency and building renovation policies** • EU legislation relevant to energy efficiency policy (EPBD and EED, EcoDesign, "winter package" 2016); • National support programmes for energy efficient renovation; • Requirements to issue energy performance certificate of building and perform energy audit; • Results and recommendations of energy audits of the buildings.	1	1
14.	**Achieving measurable results** • Energy audits; • Energy performance certificates; • Monitoring and evaluation; • International retrofitting standards; • Calculation of economic effective variant; • Calculation of emission factors; • Foot print of CO2.	2	2
15.	**Engaging stakeholders** • Benefits of DER; • Stakeholders groups: demands, needs and requirements; • National and EU policies to support DER; • Financial instruments; • Sources of information.	1	1

16	**Project management** • Introduction – basic principles; • Planning, executing, monitoring and controlling; • Life-cycle assessment; • Energy efficiency; • Legislation; • Energy management.	2	2

17.	**Ecology and Sustainability**
	• Efficient use of resources:
	  • Energy;
	  ○ Equipment efficiency;
	  ○ Measuring technologies;
	  ○ Renewable Heating and cooling system (might be an overlapping with chapter Topic 6 – building services and 17 – RES in building renovation);
	  ○ Grey energy;
	  ○ Natural lighting (might be an overlapping with chapter 2 – optimal solar gains);
	  • Water;
	  ○ Low water demand technologies: ultra-low flush toilets; dry toilets (specially country side buildings);
	  ○ Water recycling/reuse concept: grey water;
	  • Waste;
	  ○ Waste recycling;
	  ○ Waste reuse;
	  • Materials;
	  ○ Degradability;
	  ○ Recyclability;
	  ○ Dismount by material exchange or end of life;
	• Building and Environment:
	  • Transport connections;
	  • Bicycle places;
	  • E-Mobility;
	  • Heat island (Green surfaces; green roof);
	  • Climate change.
		1	1

	TOTAL	**30**	**30**

4. Sources

Directive 2010/31/EU, 2010. In: DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the energy performance of buildings. EU: Official Journal of the European Union

ECOFYS, 2015. *Assessment of cost optimal calculations in the context of the EPBD* (ENER/C3/2013-414): Final report

BPIE, 2013. *Implementing the Cost-optimal Methodology in EU Countries* [online]. Buildings Performance Institute Europe (BPIE)

European Commission, General Directorate Energy / EnEffect. GREEN VITRUVIUS. *Principles and practices of architectural design*. Bulgarian edition, Sofia. 2010

International Passive House Association / EnEffect. *Active for more comfort: the Passive Building*. Information for contractors, builders and clients. 2016

EnEffect / Bulgarian Construction Chamber / National Agency for Professional Education and Training. *Roadmap for training on Smart Energy Efficient Building Solutions*. BuildUPSkillsProject. 2013

EnEffect, Center for Energy Efficiency. *Ten books on green architecture*. Sofia. 2010

4.1. Topic sources

Topic 1: Basics of building physics

Nesi F., *PASSIVHAUS*, Maggioli edizioni, 2017

CPHD (Certified Passivhaus Designer Course), developped within the CEPH and SEEDPass European Projects, Darmstadt, 2016.

ANSI/ASHRAE 55-2013, *Thermal environmental conditions for human occupancy, American Society of Heating, Refrigerating and Air-Conditioning Engineers*, Atlanta, 2013.

ANSI/ASHRAE 62.1-2016, *Ventilation for Acceptable Air Quality, American Society of Heating, Refrigerating and Air-Conditioning Engineers*, Atlanta, 2016.

CEN report CR 1752, *Ventilation for Buildings: Design Criteria for the Indoor Environment*, PD CR 1752, 1999.

Fanger P.O., *Thermal comfort, Danish Technical Press*, Copenhagen, 1970. Reprinted McGraw-Hill, New York, 1972.

Gagge A.P., Stoiwijk J.A.J., Nishi Y., *An effective temperature scale based on a simple model of human physiological regulatory response*, ASHRAE Transactions. 77(1), pagg. 246-262, 1971.

Nishi Y., Gagge A.P., NAPS Document 02S44, *Aviation, Space and environmental Medicine*, 48(2), pagg. 97-107, 1977.

Dubois D., Dubois E.F., *A formula to estimate the approximate surface area if height and weight be known, Archives of Internal Medicine*, Vol. 17, pagg. 863-871, Chicago, 1916.

Physiological principles and thermal comfort, ASHRAE Handbook Fundamentals, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, pagg. 8.1-8.32, 1993.

Humphreys M.A., Nicol J.F., *The validity of ISO-PMV for predicting comfort votes in every-day thermal environments*, Energy and Buildings, Vol. 34, pagg. 667-684, 2002.

Alfano G., d'Ambrosio F.R., Riccio G., *Thermal comfort in the design and construction of built environments*, Procs. della conferenza "Healthy Indoor Air '94", Capri, pagg. 273-280, 1994.

Toftum J., Melikov A., *Human response to air movement*. Part 1: Preference and draught discomfort, ASHRAE Project 843-TRP, Technical University of Denmark, 2000.

Olesen B.W., Scholer M., Fanger P.O., *Vertical Air Temperature Differences and Comfort*, Indoor Climate, Danish Building Research Institute, Copenhagen, Denmark, pagg. 561-579, 1979.

Pfluger R., Schnieders J., Kaufmann B., Feist W., *Hochwärmedämmende Fenstersysteme*: Untersuchung und Optimierung im eingebauten Zustand, Anhang zum Teilbericht A, Bauphysikalische Untersuchungen und Optimierung des Baukörperanschlusses, Teilbericht Passivhaus Institut del progetto di ricerca HIWIN per conto di ifT Rosenheim, Darmstadt, 2003.

Schnieders J., *Simulationen zur Effizienz der Wärmeübergabe*, Protokollband Nr. 28 des Arbeitskreises kostengünstige Passivhäuser, Passivhaus Institut, Darmstadt, 2004.

Schnieders J., *Dynamisches Verhalten und Wärmeübergabeverluste von Flächenheizungen*, Hessisches Ministerium für Wirtschaft, Wiesbaden, 2005.

Schramek E.-R., *Taschenbuch für Heizung und Klimatechnik*, Recknagel-Sprenger, 71a Edizione, München 2003.

DIN 4108-2, *Wärmeschutz und Energie-Einsparung in Gebäuden*, parte 2: Mindestanforderungen an den Wärmeschutz, Beuth Verlag, Berlin 2003.

Bastian Z., Feist F., Baumgärtner C., Ebel W., Gollwitzer, Ebel W., Gollwitzer E., Grove-Smith J., Kaufmann B., Krick B., Schnieders J., Schulz T., *Altbaumodernisierung mit Passivhaus-Komponenten*, Passivhaus Institut, Darmstadt, 2009.

Feist W., Bastian Z., Schulze Darup B., Stärz N., *EnerPHit-Planerhandbuch – Altbauten mit Passivhaus-Komponenten fit für die Zukunft machen*, Passivhaus Institut, Darmstadt, 2012.

Savov, R. And D. Nazarski. Energy efficiency. *Thermal insulation of buildings*. A series of specialized editions of the Bulgarian Association of Insulation in Construction. Technika. 2006

Topic 2: Optimal solar gains

Feist, W.: *Heating load in Passive Houses – Validation through measurement*. Final Report. IEA SHC TASK 28 / ECBCS ANNEX 38. Passive House Institute, Darmstadt 2005

Temperature differentiation in apartments, Research Group for Cost-effective Passive Houses Phase III, Protocol Volume No. 25, Passive House Institute, Darmstadt 2004

Feist, W. and Werner, J: *Initial measurement results from the Passive House in Darmstadt Kranichstein*; gi 114 (1993), Issue 5, page 240 ff

Krick, B.: *Component Award for Passive House Windows*: comfortable, profitable, innovative, and future-proof. In: Feist, W. (editor): Proceedings of the 19th International Passive House Conference 2015 in Leipzig, Passive House Institute, Darmstadt, 2015.

Wolfgang Feist (Hrsg.): "*Gedämmte Fensterläden im Passivhaus*"; Passivhaus-Bericht Nr. 9; Institut Wohnen und Umwelt; Darmstadt, 1995.; ("*Insulated shutters in the Passive House*"; Passive House Report No. 9; Institute for Housing and Environment, Darmstadt-1995)

Pfluger, R.; Schnieders, J.; Buyer, B.; , W. Feist: *Highly insulating window systems*: Investigation and optimization in the installation (appendix to interim report A),

Schnieders, J.; Betschart, W.; , W. protects: *Room air currents in the passive house*: Measurement and simulation HLH 03-2002, page 61

Lipp, B. and Moser, M.: *Heating systems and comfort*: Is comfort physiologically measurable? in: AkkP proceedings NR. 25, Darmstadt, 2004

Hermelink, Andreas: *Do desires become true? Temperatures in passive houses for tenants*; in: AkkP proceedings NR. 25, Darmstadt, 2004

Feist, Wolfgang: „*Passivhaus Sommerklima-Studie*“; Passivhaus Institut, Darmstadt 1998 (see PHI's list of publications) (“*Passive House Summer Climate Study*”; Passive House Institute, Darmstadt 1998)

Kolmetz, S.; „*Thermische Bewertung von Gebäuden unter sommerlichen Randbedingungen – Ein vereinfachtes Verfahren zur Ermittlung von Raumtemperaturen in Gebäuden im Sommer und deren Häufigkeit*“; Dissertation Universität Gesamthochschule Kassel 1996. (“*Thermal Assessment of Buildings under Summer Conditions – A simplified method for determining indoor temperatures in buildings and their frequency in summer*”; Dissertation, Comprehensive University of Kassel 1996)

Schneider, U.: Grünes Licht, *Lichtstandards für Passivhäuser*; im Tagungsband der 10. Passivhaustagung, Hannover, Passivhaus Institut Darmstadt, 2006 (see PHI's list of publications) (*Natural Light Standards for Passive Houses*; in the Conference Proceedings of the 10th International Passive House Conference, Passive House Institute Darmstadt, 2006)

Stahl, Wilhelm; VOSS, Karlo: *Das Energieautarke Solarhaus*; Institut für Solare Energiesysteme, Freiburg 1992; (*The energy-autarchic Solar House*; Institute for Solar Energy Systems, Freiburg 1992)

Rudolf, H.; Rudolf, R.: *Haus ohne Heizung*; Deutsche Bauzeitung (db) 128 (1994) Nr.12, S. 122-126; (*The house without heating*; Deutsche Bauzeitung (db) 128 (1994) No.12, pages 122-126)

Fingerling, Anne: *Eine neue Fenstergeneration*; glas+rahmen 18/1995, S. 970-972; (*A new generation of windows*; Glazing+frames 18/1995, pages 970-972)

Website of the European project EuroPHit: www.europhit.eu

Topic 3: Building Envelope

Hugo Hens. *Applied Building Physics: Ambient Conditions*, Building Performance and Material Properties. Ernst & Sohn. 2010

Hugo Hens. *Performance Based Building Design 1*: From Below Grade Construction to Cavity Walls. Ernst & Sohn. 2012

Hugo Hens. *Performance Based Building Design II*: From Timber-framed Construction to Partition Walls. Ernst & Sohn. 2013

Wolfgang M Willems; Simone Dinter; Kai Schild. *Handbuch Bauphysik Teil 1* - Wärme- und Feuchteschutz, Behaglichkeit, Lüftung. Vieweg

Wolfgang M Willems; Simone Dinter; Kai Schild. *Handbuch Bauphysik Teil 2* - Schall- und Brandschutz, Fachwörterglossar. Vieweg

Croskills project. *Continuous education of construction workers in energy efficiency - Manuals* (7 manuals in Croatian), University of Zagreb, Faculty of Civil Engineering, 2016

Bulgarian Association for Insulation in Construction (BAIC). *Guide for energy efficient renovation of the building envelopes*. Sofia. 2016

Topic 4: NZEB Neighborhoods

Buildings Performance Institute Europe (BPIE) / Ecofys Germany / Danish Building Research Institute. *Principles for nearly zero energy buildings*. Paving the way for effective implementation of policy requirements. Final draft. November 2011

Topic 5: Airtightness, vapour and moisture movement, windtightness

BS EN ISO 9972:2015. *Thermal performance of buildings. Determination of air permeability of buildings*. Fan pressurization method. Available: https://shop.bsigroup.com/ProductDetail/?pid=000000000030242976.

O'Sé, Gavin. *Guidelines for Blower Door Testing of Passive Houses*. 2018. Available: http://www.greenbuild.ie/PassiveHouseBlowerDoorTesting.pdf.

ATTMA. *Technical Standard L1. Measuring Air Permeability of Building Envelopes* (Dwellings). 2010. Available: http://www.bindt.org/downloads/ATTMA TSL1 Issue 1.pdf.

ATTMA. Temporary Sealing Guidance for Dwellings. 2015.

ATTMA. Are You Ready to Test? 2015.

Building Science Corporation. *Vapor Permeance of Some Building Materials* (Sheet 312). 2013.

ASHRAE. *HVAC Psychrometric Chart*. Available on the iOS App Store: https://itunes.apple.com/us/app/id584295008?utm_source=promotion&utm_medium=landingpage&utm_campaign=pyschrometrics.

Irish Department of Housing, Planning and Local Government. *Limiting Thermal Bridging and Air Infiltration Acceptable Construction Details Introduction*. Date unknown. Available : http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownLoad%2C18749%2Cen.pdf.

Pro-Clima. *Permanent safe Constructions Interior air sealing provides protection against structural damage and mould*. 2014. Available: https://www.ecologicalbuildingsystems.com/docs/pro clima internal sealing for airtightness & vapour control 2014.pdf.

Isover – St. Gobain. *Vario Airtight Intelligence – the Multi-Tasking Membrane*. Available: https://www.isover.ie/sites/isover.ie/files/assets/documents/61437_13_vario_smart_brochure_web_0.pdf..

SIGA. *Manual for the professional craftsman. All you need to know about the quick and reliable application of SIGA high-performance products*. Available: http://www.siga.ch/fileadmin/user_upload/Web_Englisch/42._Downloads/Gebrauchsanleitungen/Manual_en_KM9830.pdf.

Build Desk. *Vapour resistances and μ-values*. Available : http://www.builddesk.co.uk/wp-content/uploads/2013/01/vapourResistances.pdf.

National Occupation Standards. ASTATT1. *Prepare to carry out air tightness testing*. 2014.

National Occupation Standards. ASTATT2. *Prepare building for air tightness testing*. 2014.

National Occupation Standards. ASTATT3. *Carry out air tightness testing for single dwellings and other small buildings*. 2014.

National Occupation Standards. ASTATT4. *Carry out air tightness testing for non-simple buildings*. 2014.

National Occupation Standards. ASTATT5. *Prepare and issue the air tightness test report*. 2014.

National Occupation Standards. ASTATT6. *Calculate the area of building envelopes*. 2014.

National Occupation Standards. ASTATT7. *Manage all calibrated equipment*. 2014.

National Occupation Standards. ASTATT8. *Initiate and progress contracts with clients to carry out air tightness testing*. 2014.

National Occupation Standards. ASTATT9. *Quality assure the air tightness testing process*. 2014.

National Occupation Standards. ASTATT10. *Carry out air tightness testing on large and complex, high rise and phased hand over zonal buildings*. 2014.

NSAI. Thermal Performance of Buildings. Determination of Air Permeability of Buildings – Fan Pressurisation Method (ISO 9972: 2015). 2015.

Topic 6: Building Services

Irish Department of Environment, Community and Local Government. *Installation and Commissioning of Ventilation Systems for Dwellings - Achieving Compliance with Part F* 2009. Available: http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/DevelopmentandHousing/BuildingStandards/FileDownLoad%2C27963%2Cen.pdf.

Vent-Axia. *Installation Guide to MEV and MVHR Systems*. Available: http://www.vent-axia.com/files/Installation Guide Self Build.pdf.

The Electric Heating and Ventilation Association have developed this guidance and checklist document in partnership with the Residential Ventilation Association (a HEVAC association), BRE and EST. Standard Assessment Procedure 2005 – Appendix Q MVHR Installation Guide Installation Guide and Checklist Mechanical Ventilation with Heat Recovery. Available: https://www.ncm-pcdb.org.uk/sap/filelibrary/pdf/Check_Lists/MVHR_Installation_Guide_Final_11_02_11.pdf.

Loveday, DL, and K Vadodaria Project CALEBRE: *Consumer Appealing Low Energy technologies for Building REtrofitting*: A summary of the project and its findings, Loughborough, UK. Available: http://www.retrofitscotland.org/media/17819/hwu-calebre.pdf.

Installation Guide and Checklist Mechanical Ventilation with Heat Recovery (Version – 11 February 2011) The Electric Heating and Ventilation Association have developed this guidance and checklist document in partnership with the Residential Ventilation Association (a HEVAC association), BRE and EST.

Banfill, P.F.G., et al. (2011) *Mechanical ventilation and heat recovery for low carbon retrofitting in dwellings*, Proceedings of the World Renewable Energy Congress 2011, Linköping, Sweden

Banfill, P.F.G., et al. (2011) *The potential for energy saving in existing solid wall dwellings through mechanical ventilation and heat recovery*, Proceedings of ECEEE 2011 Summer Study on energy efficiency, France

Topic 7: Conservation of historic building fabric

Bauphysik, 29th Volume. Jahrgang, June 2007, Issue 3, ISSN 0171-5445, Publisher: Ernst & Sohn, Berlin, 2008)

Conrad, Häupl, Petzold, Löber: *Energy-efficient and structurally optimised modernisation of a protected historical building in Görlitz,* in [Bauphysik 2007, Issue 3], page 221 ff.

Conrad, Häupl, Gruenewald, Petzold: *Energy-efficient and structurally optimised modernisation of a protected historical building*, in [Feist (Publisher) 2008] page 67 ff.

Conrad, Häupl, Gruenewald: *Structural assessment of an energy-efficient optimised modernisation of a protected baroque building and its practical implementation*; in [Feist (Publisher) 2010] page 79 ff

Endhardt, Martin; Passivhaus auf historischem Fundament; in [Feist (Hrsg.) 2006], S. 367 ff; (*Passive House on a historical foundation*; [Feist (Publisher) 2006] page 367 ff.

Endhardt, Martin; Brauereigasthof mit Hotel; in [Feist (Hrsg.) 2011] (unveröffentlicht); (*Brewery Restaurant with Hotel*; [Feist (Publisher) 2006] (previously unreleased))

Feist, Wolfgang; Fenster: Schlüsselfunktion für das Passivhaus-Konzept, 14. Arbeitskreis kostengünstige Passivhäuser, Passivhaus Institut Darmstadt; Dezember 1998.; (*Main function of the Passive House concept, 14th Research Group for Cost-efficient Passive Houses*, Passive House Institute Darmstadt; December 1998)

Protokollband Nr. 24 des Arbeitskreises kostengünstige Passivhäuser Phase II: Passivhaus Komponenten bei der Altbausanierung, Passivhaus Institut Darmstadt, 2003; (*Protocol Volume No. 24 of the Research Group for Cost-efficient Passive Houses Phase II: Passive House components in the modernisation of old buildings*, Passive House Institute Darmstadt; December 2003)

Protokollband Nr. 32 des Arbeitskreises kostengünstige Passivhäuser Phase III: Faktor 4 auch bei sensiblen Altbauten: Passivhauskomponenten + Innendämmung; Passivhaus Institut Darmstadt, 2005; (*Protocol Volume No. 32 of the Research Group for Cost-efficient Passive Houses Phase III: Factor 4 also for susceptible old buildings: Passive House components + interior insulation*, Passive House Institute Darmstadt; December 2005)

Tagungsband der 10. Internationalen Passivhaustagung 2006, Hannover; Passivhaus Institut Darmstadt, 2006; (*Conference Proceedings of the 10th International Passive House Conference*, Passive House Institute Darmstadt; 2006)

Tagungsband der 12. Internationalen Passivhaustagung 2008, Nürnberg, ISBN 978-3-00-024074-4, Passivhaus Institut Darmstadt, 2008; (C*onference Proceedings of the 12th International Passive House Conference*, Passive House Institute Darmstadt; 2008)

Tagungsband der 14. Internationalen Passivhaustagung 2010, Dresden, ISBN 978-3-00-031154-3, Passivhaus Institut Darmstadt, 2010; (*Conference Proceedings of the 14th International Passive House Conference*, Passive House Institute Darmstadt; 2010)

Tagungsband der 15. Internationalen Passivhaustagung 2011, Innsbruck, Passivhaus Institut Darmstadt, 2011 (unveröffentlicht); (*Conference Proceedings of the 15th International Passive House Conference*, Passive House Institute Darmstadt; 2011 (previously unreleased))

Häupl, Löber, Schmidt, Conrad; Bauklimatische, messtechnisch validierte Gebäudesimulation und Ausarbeitung eines Regelwerkes zur energetisch und umwelttechnisch optimierten Sanierung am Beispiel eines Baudenkmals in Görlitz, Endbericht des durch die Deutsche Bundesstiftung Umwelt geförderten Projektes; (Metrologically validated building simulation and development of regulations for energy-efficient and environmentally optimised modernisation using the example of a historical monument in Görlitz*, Final Report of the project sponsored by the DBU* (German Environemental Foundation))

Kaufmann, Peper: Optimierte Anschlussdetails bei Innendämmung – Wärmebrückenreduktion und Luftdichtheit; in [Feist (Hrsg.) 2005], S. 175 ff; (*Optimised connection details for interior insulation – Thermal bridge reduction and airtightness*, in [Feist (Publisher) 2005], page 175 ff.

Ratzlaff, Schnieders: Mehrfamilienwohnhäuser in Ludwigshafen; in [Feist (Hrsg.) 2005], S. 157 ff; (Multi-family houses in Ludwigshafen; in [Feist (Publisher) 2005], page 157 ff.)

Wohlgemuth, Bolsius: Denkmalschutz und Energieeffizienz Modellvorhaben „Weiße Villa“; in [Feist (Hrsg.) 2010], S. 97 ff; (*Preservation of historical buildings and energy efficiency model project*: “Weisse Villa” in [Feist (Publisher) 2010], page 97 ff.)

Zaman: Hohenzollerhöfe, Sanierung einer denkmalgeschützten Wohnanlage mit Passivhauskomponenten; in [Feist (Hrsg.) 2010], S. 91 ff; (*Modernisation of a protected historical housing complex using Passive House components*, in [Feist (Publisher) 2010], page 91 ff).

Topic 8: RES in building renovation

Passive House Institute. *The road to nearly zero energy buildings*. The passive house + RES. Passive house regions with renewable energies (PassREg) project. 2015

Topic 9: Cost effectiveness

ECOFYS, 2015. *Assessment of cost optimal calculations in the context of the EPBD* (ENER/C3/2013-414): Final report [online]. BUIDE13705,

https://ec.europa.eu/energy/sites/ener/files/documents/Assessment%20of%20cost%20optimal%20calculations%20in%20the%20context%20of%20the%20EPBD_Final.pdf

European Commission Report: REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL - *Progress by Member States in reaching cost-optimal levels of minimum energy performance requirements*, 2016. In: COM(2016) 464 final. Brussels: EUROPEAN COMMISSION, https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-464-EN-F1-1.PDF

Greenhalgh, Brian, 2013. *Introduction to Estimating for Construction*, Routledge, Taylor & Francis Group, New York, ISBN 978-0-415-50987-9. https://www.routledge.com/Introduction-to-Estimating-for-Construction/Greenhalgh/p/book/9780415509879

CIOB, 2009. *Code of Estimation Practice*, Seventh Edition, Wiley-Blackwell. ISBN 978-1-4051-2971-8. http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1405129719.html

FLEITER, Tobias, Simon HIRZEL a Ernst WORRELL, 2012. *The characteristics of energy-efficiency measures – a neglected dimension*. Energy Policy. 51(-), 502-513. DOI: http://dx.doi.org/10.1016/j.enpol.2012.08.054. ISSN 03014215, http://www.sciencedirect.com/science/article/pii/S0301421512007367

CHEGUT, Andrea, Piet EICHHOLTZ a Rogier HOLTERMANS, 2016. *Energy efficiency and economic value in affordable housing*. Energy Policy. 97(-), 39-49. DOI: http://dx.doi.org/10.1016/j.enpol.2016.06.043. ISSN 03014215, http://www.sciencedirect.com/science/article/pii/S0301421516303482

Schneiderova Heralova, 2014, R. *Life Cycle Cost optimization within decision making on alternative designs of public buildings*. Procedia Engineering. 85, 454-463., https://doi.org/10.1016/j.proeng.2014.10.572, http://www.sciencedirect.com/science/article/pii/S1877705814019389

Hromada, E, 2016. *Real Estate Valuation Using Data Mining Software*. Procedia Engineering. 164 284-291.,https://doi.org/10.1016/j.proeng.2016.11.621, http://www.sciencedirect.com/science/article/pii/S1877705816339625

Topic 10: Planning and design instruments

Nesi F., *PASSIVHAUS*, Maggioli edizioni, 2017

CPHD (*Certified Passivhaus Designer Course*), developped within the CEPH and SEEDPass European Projects, Darmstadt, 2016.

Feist W., *Dynamische Wärmebilanzen mit dem Programm „DYNBIL",* Universität Tübingen, 1981.

Feist W., *Thermische Gebäudesimulation – Kritische Prüfung unterschiedlicher Modellansätze*, Verlag C.F. Müller GmbH, Heidelberg, 1994.

Källblad K., JULOTTA – *Datorprogram för beräkning av värmebalans i rum och byggnader*, Universität Lund, Rapport BKL 1986:28.

Feist W., Ebel W., Peper S., Hasper W., Pfluger R., Kirchmair M., *25 Jahre Passivhaus Darmstadt Kranichstein*, Passivhaus Institut, Darmstadt, 2016.

CEPHEUS (*Cost Efficient Passive Houses as EUropean Standards*), progetto europeo finanziato nell'ambito del programma Thermie, 1998-2001.

Schnieders J., Feist W.*, Passivhaus-Reihenhäuser: Über die Zuluft beheizbar?* Simulation des thermischen Gebäudeverhaltens bei Variation ausgewählter Parameter und bei Zuluftnachheizung. CEPHEUS-Projektinformation Nr. 5, Fachinformation PHI-1998/12, Passivhaus Institut, Darmstadt, 1998.

Feist W., Baffia E., Schnieders J., Pfluger R.*, Passivhaus Projektierungs-Paket '99*, Passivhaus Institut, 3. Überarbeitete Auflage, Darmstadt, 2000.

Schnieders J., Betschart W., Feist W., *Messung und Simulation von Raumluftströmungen in einem Passivhaus*, in "HLH Heizung Lüftung/Klima Haustechnik", n. 7/2001, Springer-VDI-Verlag, 2001.

Pfluger R., Feist W., *Messtechnische Untersuchung und Auswertung*; Kostengünstiger Passivhaus-Geschoßwohnungsbau in Kassel Marbachshöhe, CEPHEUS-Projektinformation Nr. 15, Fachinformation PHI-2001/2, Passivhaus Institut, Darmstadt, 2001.

Passive-On (*Marketable Passive Homes for Winter and Summer Comfort*), progetto europeo finanziato nell'ambito del programma EIE Save Projekt, 2004-2007.

EuroPHit (*Improving the energy performance of step-by-step refurbishment and integration of renewable energies*), progetto europeo finanziato nell'ambito del programma IEE, 2013-2016.

CONAVI, *Criterios e indicadores para desarrollos habitacionales sustentables*, CONAVI 1a Edición México, D.F. 2008.

CONAVI, SEMARNAT*, Supported NAMA for Sustainable Housing in Mexico – Mitigation Actions and Financing Packages*, Mexico City, 2011.

3EnCult (*Efficient Energy for EU Cultural Heritage*), progetto europeo finanziato nell'ambito del programma FP7, 2010-2014.

Feist W., Stellungnahme zur Vornorm DIN-V-4108-6:*2000 aus Sicht der Passivhausentwicklung*. CEPHEUS-Bericht, 1. Auflage, Passivhaus Institut, Darmstadt, 2001.

Højbjerg K., *PH-Tool*, Bjerg Innovation, disponibile online: http://ph-tool.com.

NORFAC (*Nordic Facade*), http://norfac.net/bim.html

Stojanovic V., Falconer R., Blackwood D., Paterson G., Fleming M., Bell S., *Interactive visualisation of heat loss and gain for early-stage energy appraisal of the built environment*, in Raiden A. B. and Aboagye-Nimo E. (Eds), Procs 30th Annual ARCOM Conference, Portsmouth, 2014.

Cemesova A., Hopfe C.J., Rezgui Y., *PassivBIM – a new approach for low energy simulation using BIM*, in eWork and eBusiness in Architecture, Engineering and Construction – Gudnason & Scherer (Eds), Taylor & Francis Group, London, 2012.

Cemesova A., Hopfe C.J., Mcleod R.S., *PassivBIM: enhancing interoperability between BIM and low energy design software*, in "Automation in Construction", n. 57/2015, pagg.17-32, Elsevier B.V., 2015.

Malzer H.K. and Edwards D., *Design PH: 3D Passive House Design Tool*, Passivhaus Institut, disponibile online: http://www.designph.org

Topic 11: Comfort, health and safety requirements in buildings, incl. indoor air quality

Buildings Performance Institute Europe (BPIE). *Indoor air quality, thermal comfort and daylight*. Analysis of residential Building regulations in eight Member States. March 2015

Topic 12: Step-by-step retrofit plans

Passive House Institute, *Step-by-step retrofits with Passive House components*, 2016, http://europhit.eu/sites/europhit.eu/files/EuroPHit_Handbook_final_Optimized.pdf

Topic 13: Energy efficiency and building renovation policies

Directive 2010/31/EU, 2010. In: *DIRECTIVE 2010/31/EU* OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the energy performance of buildings. EU: Official Journal of the European Union, 2010, number 31.

Buildings Performance Institute Europe (BPIE*). A Guide to Developing Strategies for Building energy renovation*. Delivering the Energy Efficiency Directive Article 4 requirements on long term strategies for mobilising investment in renovation of national building stocks. February 2013

BPIE, 2010. *Cost Optimality: Discussing methodology and challenges within the recast Energy Performance of Buildings Directive* [online]. THE BUILDINGS PERFORMANCE INSTITUTE EUROPE - BPIE [2017-05-02].

BPIE,2013. *Implementing the Cost-optimal Methodology in EU Countries* [online]. Buildings Performance Institute Europe (BPIE) [2017-05-07]. ISBN 9789491143083.

DELMASTRO, Chiara, Guglielmina MUTANI a Stefano Paolo CORGNATI, 2016. *A supporting method for selecting cost-optimal energy retrofit policies for residential buildings at the urban scale*. Energy Policy. 99(-), 42-56. DOI: http://dx.doi.org/10.1016/j.enpol.2016.09.051. ISSN 03014215, http://www.sciencedirect.com/science/article/pii/S0301421516305158

TRIANNI, Andrea, Enrico CAGNO a Alessio DE DONATIS, 2014. *A framework to characterize energy efficiency measures*. Applied Energy. 118(-), 207-220. DOI: http://dx.doi.org/10.1016/j.apenergy.2013.12.042. ISSN 03062619, http://www.sciencedirect.com/science/article/pii/S0306261913010416

ENTRANZE: Home [online], 2012. [2017-04-05]. http://www.entranze.eu

Topic 14: Achieving measurable results

European Commission (2006). *Action Plan for Energy Efficiency: Realising the Potential*. COM(2006)545, Brussels.

Haas, R. (1997). *Energy efficiency indicators in the residential sector*. Energy Policy, Vol. 25, Nos. 7–9, pp. 789–802.

Hall, D. (2004). *External Costs of Energy*. Encyclopedia of Energy. Elsevier, San Diego.

EnerPHit, *Criteria for the Passive House*, EnerPHit and PHI Low Energy Building Standard, version 9f, revised 15.08.2016, Available at: https://passipedia.org/certification/certified_passive_houses/certification_criteria_in_other_languages

Carbon Footprint Ltd. "Carbon Calculator." *Carbon Footprint Calculator*, 2018. Available at: https://www.carbonfootprint.com/calculator.aspx.

Becchio, C.; Bottero, M.C.; Corgnati, S.P.; Ghiglione, C. *nZEB design: Challenging between energy and economic targets*. Energy Procedia 2015, 78, 2070–2075.

Vyhláška č. 309/2016 Sb., kterou se mění vyhláška č. 480/2012 Sb., o energetickém auditu a energetickém posudku.

HUDCOVÁ, Lenka. *Energetická náročnost budov: základní pojmy a platná legislativa*. Praha: EkoWATT, 2009. ISBN 8087333039;9788087333037;.

KULHÁNEK, František, Česká komora autorizovaných inženýrů a techniků činných ve výstavbě a Česká komora autorizovaných inženýrů a techniků činných ve výstavbě. Rada pro podporu rozvoje profese. *Tepelná ochrana a energetika budov*: *TP 1.8.1 : technická pomůcka k činnosti autorizovaných osob*. 1. vyd. Praha: Pro Českou komoru autorizovaných inženýrů a techniků činných ve výstavbě vydává Informační centrum ČKAIT, 2014. ISBN 8087438485;9788087438480;.

EU H2020 *ODYSSE-MURE*. Available online: http://www.indicators.odyssee-mure.eu/.

EU IEE *ENTRANZE Data Tool*. Available online: http://www.entranze.eu/tools/interactive-data-tool

EU IEE *ENTRANZE Cost Tool*. Available online: http://www.entranze.eu/tools/cost-tool

Topic 16: Project management

OBERLENDER, Garold D. *Project management for engineering and construction*. International;Third;. New York: McGraw-Hill Education, 2015. ISBN 9789814670869;9814670863;

BENNETT, J. M. a Danny HO. *Project management for engineers*. New Yersey: World Scientific, 2014. ISBN 9789814447928;9814447927.

ECOFYS, 2015. *Assessment of cost optimal calculations in the context of the EPBD* (ENER/C3/2013-414): Final report [online]. BUIDE13705,

CHEGUT, Andrea, Piet EICHHOLTZ a Rogier HOLTERMANS, 2016. *Energy efficiency and economic value in affordable housing*. Energy Policy. 97(-), 39-49. DOI: http://dx.doi.org/10.1016/j.enpol.2016.06.043. ISSN 03014215, http://www.sciencedirect.com/science/article/pii/S0301421516303482

SVOZILOVÁ, Alena. *Projektový management: systémový přístup k řízení projektů*. 3., aktualizované a rozšířené vydání. Praha: Grada Publishing, 2016. ISBN 8027100755;9788027100750;.

DOLEŽAL, Jan. *Projektový management: komplexně, prakticky a podle světových standardů*. První vydání. Praha: Grada Publishing, 2016. ISBN 9788024756202;802475620X;.

DOLEŽAL, Jan a Jiří KRÁTKÝ. *Projektový management v praxi: naučte se řídit projekty!.* První vydání. Praha: Grada, 2017. ISBN 9788024756936;8024756935;.

OBERLENDER, Garold D. *Project management for engineering and construction*. International;Third;. New York: McGraw-Hill Education, 2015. ISBN 9789814670869;9814670863;

BENNETT, J. M. a Danny HO. *Project management for engineers*. New Yersey: World Scientific, 2014. ISBN 9789814447928;9814447927;.

Topic 17: Ecology and Sustainability

Passive House Institute (Germany). *Building a sustainable energy future*. A Guide to Success. Passive House Regions with Renewable Energies (PassREg) Project. 2015