



LEONARDO DA VINCI PARTNERSHIPS
“THERMOVALorisations”

WORKSHOP 3

European Vocational Training
Curriculum to the job of EPD
Diagnostician with IR Camera

CONTENTS BY MODULE

MODULE 1 – ANALYSIS AND evaluation OF ENERGY PERFORMANCES : 4 days to 8 days

MODULE 2 – THERMOGRAPHIC CAMERA OR INFRARED CAMERA : 1 day to 2 days

MODULE 3 – BLOWER DOOR : 1 day

MODULE 4 – ADVISING CUSTOMERS : 1 day

GLOBAL TRAINING : 7 days to 12 days

This vocational training curriculum is aimed at :

- * Basic Building Technicians
- * Job rehabilitation applicants
 - * The man of the street ?
 - * Architects, Engineers

MODULE 1
ANALYSIS AND EVALUATION
OF ENERGY PERFORMANCES :
4 days to 8 days

General Aim : to be able to analyse the building characteristics in order to estimate its energy performance to determine the possible energy improvements.

Module 1 - ANALYSIS AND EVALUATION OF ENERGY PERFORMANCES - Day 1

Educational objectives	Length	Methods and tools used
<p>Identification of the trainees' knowledge towards the energy and thermic renovation of buildings.</p>	<p>1 hour</p>	<p>multiple-choice question paper, to determine the level of skills of applicants :</p> <p>Two types of courses : 1 for skilled workers, 1 for less qualified (basic level)</p>
<p>The different legislations and norms and the general context of the thermic diagnosis and the recommendations</p>	<p>3 hours/ 7 hours</p>	<p>General context (Kyoto protocol, European Directive, Climate Action Plan....)</p> <p>Legislation and norms (law, decrees, 2005, 2012 RT bylaws)</p> <p>Fiscal measures</p> <p>Time devoted depend on the background of the group</p>
<p>Heat science applied to the buildings : - Name the different heat transfers and give their characteristics.</p>	<p>3 hours</p>	<p>Define the concepts and give examples of the phenomena applied to the buildings</p> <p>Characteristics of thermal insulators and conductor materials.</p> <p>(Basic level : only definitions, higher level revision of basic equations and principles)</p>

Module 1 - ANALYSIS AND EVALUATION OF ENERGY PERFORMANCES - Day 2

Educational objectives	Length	Methods and tools used
<p>Identify the various checkpoints of climatic regulation and energy consumption</p> <p>Some reminders :</p> <ul style="list-style-type: none">- the building envelope, walls and joinery- the building ventilation,- air-conditioning and heating equipment,- programming and regulation equipment,- Emission and distribution equipment-Production of Domestic Hot Water equipments- Notions of how to read cut and measured plans	<p>7 hours</p> <p>7 hours too short for basic learners (2 or 3 days more suitable)</p>	<p>Realisation of a diagnosis in a "sample" building</p> <p>Data capture on a software by the trainees</p>

Module 1 - ANALYSIS AND EVALUATION OF ENERGY PERFORMANCES - Day 3

Educational objectives	Length	Methods and tools used
<p>To carry out calculations of energy consumption and consumption losses using an adapted software and relevant parameters.</p>	<p>3 hours/8 hours (Depending on the software)</p>	<p>Continuing with the diagnosis (data capture, how to use the software) Case study with energy improvement.</p>
<p>To identify the possible weaknesses and the axes of thermal and hygrometric progress of a building according to its typology.</p>	<p>Half a day</p>	<p>Case study : Suggestions made by trainees and tested with the <u>IR Camera</u> (First use of the camera)</p>
<p>To suggest a wide range of solutions for improvements of the energy performance to :</p> <ul style="list-style-type: none"> - Obtain an energy/climate label of the building concerned, - Put back to standards, - Decrease the energy consumption , -(Study the cost and the origin of the consummate energy in the building. Reserved to higher level) 	<p>Half a day</p>	<p>Case Study Basic trainees can supply only EPD test with IR camera</p>

Module 1 - ANALYSIS AND EVALUATION OF ENERGY PERFORMANCES - Day 4

Educational objectives	Length	Methods and tools used
To carry out EPD (Standard calculations : 3CL method and calculations based on energy bills).	1 day/2days (Basic trainees : 2 days Higher level : 1 day)	Case Study and application : To carry out a diagnosis on a sample building (visit and data)

Associated Knowledge

Statutory Context (Kyoto Protocol, European Directives, Climate Action Plan....)

Legislation Texts (laws, decrees, 2005, 2012 RT by laws)

Fiscal Measures

Temperature / flows of heat

Measure by contact and measure without contact

Radiation Heat transfer :

- Conduction
- Convection
- Radiation

The various orders of size of different physical parameters for various materials.

Define R and U for the various materials

Use standards and proper physical measures in the good unit for calculations
(conversions units)

Energy scales and CO₂ defined for various regulations.

Estimate the impact of some parameters on the final calculation result

Condensation, Dew point, Wet air diagram

Power and energy

MODULE 2
THERMOGRAPHIC OR IR
CAMERA : 1 Day to 2 days

General Aim : To be able to use a thermographic camera to carry out useful measures within the framework of the Building energy improvements

Module 2 – THERMOGRAPHIC OR IR CAMERA - Day 1

Educational objectives	Length	Methods and tools used
<p>Thermographic Cameras technology and associated uses. Importance of the use of the IR camera and of its association with other types of measures (Infiltrometer or blower-door test). To set up a grading of the camera to optimize the accuracy of the measure.</p>	<p style="text-align: center;">1 day The best solution : do the same exercice at two different seasons of the year</p>	<p>IR Camera and adequate site with problematic materials : plastics, glasses, metals, patches with various roughness and various painting colours.</p>
<p>To carry out temperature measures and pictures to :</p> <ul style="list-style-type: none"> • Detect insulation defects, • Highlight the building defects • Locate thermic bridges (connections between walls), • Decline of an insulating material behind a partition, • Look for the defects that are hidden by the fillers, • Visualize the structure of a wooden section of a wall, • Look for leaks in the network of on the ground heating, • Determine zones potentially exposed to the proliferation of fungi, • Look for and locate air infiltrations around joineries , • Detect water leaks at the level of water mains, <p>Calculate U the Heat transfer coefficient of a partition. Use complementary tools – associated and adequate in function of the nature and of the objectives of the measure. Analyze IR pictures and use the image processing software. Interpret the measures carried out to identify the weak points of the building and Clarify them afterwards in understandable terms for the customer</p>		<p>Application IR Camera (s) + Thermometer probes, Hygrometric and temperature probes, hot wire anemometer.</p>
<p>Save the significant pictures with the aim of the thermic audit report Transfer images and associated data towards a computer in the aim of writing a report.</p>		<p>Application IR Camera (s) + computers + software</p>

Temperature Problem to use the camera at certain time of the year (Exple : In Bulgaria, France)

ASSOCIATED KNOWLEDGE

Reminders about IR notions, about emissivity and about reflected apparent temperature.

Nominal and normal conditions to use a IR camera

Conversion emissivity /temperature

Typical weak points of a building according to its typology

Meaning of an IR image and knowledge of typical problem identified thanks to images (notions of radiometric images)

Images and information linked to IR images

Simple image processing (re-size, convert, shaping ,...)

Dew point

Planet conservation (Global warming, green house gas effect,...)

MODULE 3

BLOWER DOOR : 1 day

General Aim : to be able to use a blower door test and other techniques of air tightness to increase the energy conservation of the building

Module 3 – BLOWER DOOR - Day 1

Educational Objectives	Length	Methods and tools used
<p>Determine the equipment to use according to the wished measures</p> <ul style="list-style-type: none"> - Blower door - Systems of smoke (smoke pen, smoke machine, smoke pencil) <p>Lasermetre (determination of volumes et surface area)</p> <ul style="list-style-type: none"> - Thermometre/ thermo-anemometre. <p>Identify the stakes / utilities of the use of the blower door and of its association with other tools/ measure devices of measure.</p> <p>Analyze the conditions of the measure to determine the impact with regard to the various existing standards.</p>	2 hours	<p>Characteristic techniques of the used materials</p> <p>Statutory texts</p> <p>Application</p> <p>Discovery of the equipment in situation</p> <p>Blower doors</p> <p>System of smoke</p> <p>Thermometres</p> <p>Anemometres</p>
<p>Carry out the construction of the blower door to minimize the errors of measure (suspension of the fan, air tightness of the blower door, closing entrances and air outlets, weather conditions ??, orientation of the chosen opening??).</p> <p>Use the blower door to :</p> <ul style="list-style-type: none"> - measure a flow of leak in the building - look for leaks and carry out the correlative measures with the adequate complementary associated tools according to the nature and the objectives of the measure. <p>Handling a data acquisition and processing software.</p> <p>Interpret the carried out measures to identify the weak points of the building, to compare the obtained level according to current standards and clarify them afterwards in understandable terms for the customer.</p>	3.5 hours	<p>Application</p> <p>Data acquisition</p>
<p>Interpret the carried out measures to identify the weak points of the building according to the blower door test explain them to the customer in the aim of couselling.</p>	1.5 hours	<p>Application</p> <p>Case study</p>

Associated Knowledges

Technical Characteristics of the used equipments.

Statutory Conditions :

RT2012

BBC Label

article 17 Chapter II [October 26,2010 bylaw](#)

EN 13829:2000

NF EN 13829:2001

Technical rules : Effinergie application Guide P50-784 February 2010 :

Housing ventilation

Air quality notion

Data acquisition and processing

Impact of over/under ventilation of a house

Reminders of hygiene rules related to the quality of air- conservation of the planet (global warming, green house gas,...)

MODULE 4

ADVISING CLIENTS : 1 day

General Aim : to be able to synthesize the demand, the measures and the study in order to advise the customer within the framework of the energy improvement of the building.

Module 4 - **ADVISING CLIENT** - Day 1

Educational Objectives	Length	Methods and tools used
<p>Select among all the considered improvements , the most appropriate solutions and classify them according to : The demand of the customer, the legislation, the budget (the estimate, tax rebates, long term benefit).</p>	7 hours	<p>Study case Application IT Typical documents For higher level course</p>
<p>Communicate using explicit words about the results of the diagnosis and technical choice which were done. Take into account the demand of the customer.</p>		<p>Professional communication Explanation, Active Listening</p>
<p>Exert a monitoring on statutory, fiscal and technical documents to have arguments anchored in the economic reality. Argue the decisions taken to convince the client of the relevance of the choice that were made. Induce the customer to change his installation in order to improve the quality of energy.</p>		<p>Case study, application</p>
<p>Write a summary and advice to the client. Return on investments.</p>		<p>Application Computer + software</p>

Associated Knowledge

Costs management

Calculation of a budget,

Creation of estimate

Management of the commercial relation

Information sources about various fields (sites, Persons resources in communities and institutions)

Assertive communication

Elements to articulate during the proposition:

- technical analysis
- legislations, standards
- realized savings (in the long term)
- introduction of the global cost
- evolution of the energy costs
- tax rebate

Conservation of the planet (global warming, green house gas,...)

Use of a software of office automation

Written Professional Communication