

Imagen que contiene edificio, cerca

Descripción generada automáticamente

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

*methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

*methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

*methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

*truction methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

*methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

*methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

*methods for energy-efficient buildings*

UPWOOD

*Up-skilling construction workers in wood construction methods for energy-efficient buildings*

**TRAINING & ASSESSMENT**

**MATERIAL**

Project name: **UP-SKILLING CONSTRUCTION WORKERS IN WOOD CONSTRUCTION METHODS FOR ENERGY EFFICIENT BUILDINGS**

More details on UPWOOD can be found at [www.upwoodproject.eu](http://www.upwoodproject.eu)



TABLE OF CONTENTS

INTRODUCTION .............................................................................. 3

LEARNING OUTCOMES ..................................................................... 4

COURSE DESCRIPTION .................................................................. 10

PURPOSE OF THE TRAINER HANDBOOK ........................................... 11

DELIVERY GUIDELINES – UNIT 1 .................................................... 12

DELIVERY GUIDELINES – UNIT 2 ..................................................... 18

DELIVERY GUIDELINES – UNIT 3 .................................................... 25

DELIVERY GUIDELINES – UNIT 4 .................................................... 31

INTRODUCTION

Construction with wood yields high energy efficiency value, becoming increasingly relevant in the construction materials market, as this material has several advantages within the construction field. Wood construction has many benefits in terms of resources within the projects. In addition, this material also presents advantages to the environment. That is why wood is given a lot of prominence, since the energy resources used to work the wood are less than the used with the concrete.

Correspondingly, skills relevant to innovative woodworking methods and applications are in high demand in the EU construction market. However, construction employers note a gap between the skills and knowledge acquired by workers and apprentices through Work-Based Learning (WBL) in the construction sector and the woodworking skills needed in the workplace. Stringent renovation requirements and policy measures seeking to stimulate the transformation of existing buildings (e.g. Energy Performance of Building Directive) and the fast­ paced emergence of relevant new markets (e.g. green building) exacerbate this gap even further.

Upskilling construction workers with innovative woodworking skills through work-based learning VET is therefore essential to meet the current and future demand for energy efficient solutions in the construction and renovation sector.

UPWOOD is in an EU-funded project with the objective to enhance the construction skills of workers and apprentices in woodworking and timber constructions, funded by the Erasmus+ programme.

LEARNING OUTCOMES

Previous to the developing of all the didactic material, all the Learning Outcomes expected from this project were set, in order to stablish the knowledge and the skills that all the professionals in the construction sector should have gained with this project.

Learning Outcomes have been developed to reflect sector needs and can be integrated into existing VET offerings for generally all construction site managers. These evidence based learning outcomes address the skills needs of site managers and building professionals in wooden construction.

The learning outcomes of UPWOOD are listed below in figure 1, and integrated in each of the Learning Units to ensure the consideration of every outcome in all the training material.

|  |  |
| --- | --- |
| LO1 | Develop knowledge and understanding of the different types of wood and their properties. |
| LO2 | Give an account of the limitations that wood presents as a building material in a given situation. |
| LO3 | Understand the benefits of using wood in the active and passive design of a building in terms of energy efficiency. |
| LO4 | Evaluation of the climate influence in wooden buildings in order to reduce energy consumption. |
| LO5 | Autonomously select the most appropriate type of wood or wood building product (e.g. CLT) according to construction project requirements. |
| LO6 | Demonstrate the skills to work with prefabricated wooden building products. |
| LO7 | Autonomously select the appropriate wooden structure. |
| LO8 | Assess the use of wood in renovation, extension or deconstruction projects. |
| LO9 | Be able to organize/prioritize tasks and collaborate with team members. |
| LO10 | Understand fire/sound protection and building physics in the construction pcocess. |
| LO11 | Be able to integrate technical building components in timber construction. |

*Figure 1: List of the learning outcomes*

The learning outcomes are grouped into learning units, each unit addressing a few specific topics.

*Figure 2: Breakdown of the 5 units and course topics*

**Learning Unit 1: Learning Outcomes**

|  |  |
| --- | --- |
| **Title** | **Qualities of wood & its various applications in construction** |
| Description | This learning unit aims to enhance learner’s knowledge of different topics related to wood properties, such as its structure, the possibility to increase its durability with chemical processes, and other timber related information |
| Overall acquired knowledge | The three main outcomes of this Learning Unit are to learn the different types of wood and their properties, understand the limitations that wood presents as a building material in a given situation and learn the most suitable type of wood used in chemical processing technologies and their impact on the economy, ecology, as well as its promising future directions. |
| Overall acquired skills | With this learning Unit, learners will be able to choose the best wood species for constructive operational technology in building constructions. Also, they will have the ability to apply knowledge of the chemical timber deep processing of existing processes and the implementation of a new system, as well as to see the potential for innovation. |
| Overall acquired competence | The learners will be capable of autonomously select the most appropriate type of wood or wood building product according to construction project requirements, and also of access, select, analyze and summarize information on the chemical wood processing technologies and their potential positive and negative impacts on the environment and the economy, as well as competence to explain the chemical wood processing development needs of professionals and their use impact other stakeholders or customers. |
| **Learning Unit 2: Learning Outcomes** | |
| **Title** | **Timber construction, renovation and deconstruction** |
| Description | This LU examines all the structural timber application types mentioned in the previous Unit, the establishment of the basic principles, as well as usability |
| Overall acquired knowledge | The main purpose of the project is to let the apprenticeships to know the use of wood in renovation, extension or deconstruction projects, together with the timber structural and non-load bearing construction elements it uses. Also it is important to get to understand the wood as a construction material with advantages and disadvantages. |
| Overall acquired skills | The learners should be able to work with prefabricated wooden building products and with various wood products and product design. |
| Overall acquired competence | They will be able to autonomously select the most appropriate type of wood or wood building product according to construction project requirements, as well as autonomously select the appropriate wooden structure. They will also be able to find the best ecological and economically advantageous design of wood product design and performance options. |

|  |  |
| --- | --- |
| **Learning Unit 3: Learning Outcomes** | |
| **Title** | **On-site wood construction assembling management** |
| Description | The LU3 aims to provide the knowledge of the basic principles of the timber material assembling between pieces, and the understanding of the pieces movement on building site and many more technical specifications. |
| Overall acquired knowledge | After the development of the course, the professionals will understand the methods of transportation and storage of wooden building elements on the building site. They will be prepared to face topics related to fire protection, thermal and sound insulation necessity and building physics in the construction process. Also they will comprehend the rules and standards for insulation and quote techniques, materials and products for water/air tightness. |
| Overall acquired skills | The learners will be able to select and apply appropriate execution methods of construction operations corresponding to building site situation as well as to prepare an execution documents. They should be able to organize work in accordance with the basic principles of ergonomics and observing requirements of labor safety, and to choose and apply appropriate technical units and equipment for execution of works with timber structural elements. |
| Overall acquired competence | Apprenticeships will be capable to organize/prioritize tasks and collaborate with team members, orientate in the regulatory framework of construction industry, particularly regulation set and technical documentation for building site processes. Also, they will have the competences to choose appropriate building technology based on technical and economic calculations of rational construction machinery and to select appropriate materials and technology derived from the creation of a constructive solution and fire protection point of view. |

|  |  |
| --- | --- |
| **Learning Unit 4: Learning Outcomes** | |
| **Title** | **Functionality and efficiency of wooden buildings** |
| Description | This Learning Unit aims to provide the knowledge and understanding of the properties of wood as an insulation material, as well as its sustainable features as a construction material. Also, this LU provides information about the integration of all facilities in the timber buildings. |
| Overall acquired knowledge | They will understand the benefits of using wood in the active and passive design of a building in terms of energy efficiency. Also they will comprehend the best performance of wood materials for direct application in structures. |
| Overall acquired skills | Learners will be able to integrate technical building components in timber construction, being capable of developing step by step processes for plumbing, drywall construction, sealing creation. |
| Overall acquired competence | Apprenticeships will be skilled to find the best ecological and economically advantageous, as well as a correlation in terms of suitable wood design solutions. They will have the knowledge to evaluate the climate influence on wooden buildings in order to reduce energy consumption, as well as to choose best way to heat, ventilate, cooling, lighting, provide information communications technologies system for timber constructions. |

|  |  |
| --- | --- |
| COURSE DESCRIPTION | |
| **Title** | **Up-skilling construction workers in wood construction methods for energy efficient buildings** |
| Description | Construction with wood yields high energy efficiency value, becoming increasingly relevant in the construction materials market. Correspondingly, skills relevant to innovative woodworking methods and applications are in high demand in the EU construction market. However, construction employers note a gap between the skills and knowledge acquired by workers and apprentices through Work-Based Learning (WBL) in the construction sector and the woodworking skills needed in the workplace. Stringent renovation requirements and policy measures seeking to stimulate the transformation of existing buildings (e.g. Energy Performance of Building Directive) and the fast-paced emergence of relevant new markets (e.g. green building) exacerbate this gap even further.  Upskilling construction workers with innovative woodworking skills through work-based learning VET is therefore essential to meet the current and future demand for energy-efficient solutions in the construction and renovation sector. |
| Contact hours | Around 25 |
| Total hours | > 80 |
| General prerequisites | Vocational education, basic knowledge about construction sector. |

## PURPOSE OF THE TRAINER HANDBOOK

The Trainer Handbook (TH) is a guide to help the instructor to provide skills to construction workers in wood construction methods for energy efficient buildings. The TH will summarise the methodology to be used by the instructor for each unit. The intention of the handbook is not to be over prescriptive so that there is flexibility for the trainers to employ their own pedagogical approaches and concentrate on areas they feel need greater attention. The objective is to achieve the learning outcomes outlined for the course.

The Trainer Handbook will outline the objectives for each unit, clearly demonstrate what is required of the trainers, listing resources required. The TH provides directions for the students as how to complete the activities and direction to the trainers regarding assessment. It will provide a pool of assessments, exercises and various activities to be completed by the students.

To better facilitate training and ensure completion of its goals, the project’s curriculum has been organized in four thematically consistent Units, which have been further broken up into a number of topics and activities designed to engage students in learning. Activities include some PowerPoint presentations, FAQs, Case studies, multiple choice questions and exercises that can be either individual or group work. These will be discussed in greater detail below. Activities may be assessed for certification purposes.

It should be noted that both the organisational structure and the exact content of the course should not be considered invariable and thus become restrictive and unwieldy; in fact Trainers are encouraged to tailor the materials‘ forms and content to the perceived specific needs of their audience/trainees to the extent that this is possible to ensure that the core of the project’s curriculum remains intact and can thus be accurately transferred to the trainees.

Trainers need to ensure that appropriate links are made between theory and practical application and that the knowledge base is applied to the sector. This is ensured by development of relevant and up-to-date teaching materials that allow learners to apply their learning to actual events and activity within the sector.

Demonstration

## DELIVERY GUIDELINES – UNIT 1

**Unit Summary:**

This Learning Unit aims to enhance learners’ knowledge of different wood species properties, wood structure, increase biological durability by the chemical process technology point of view, wood - chemical, biological, physical modification technology, wood and its components, the new generation of self-binding protection products for wood and wood materials, impregnation materials and technology and other wood deep processing processes and perspectives.

**Key Topics:**

* Wood properties (physical-mechanical, technological, operational, etc.), its limitations and wood construction physics.
* Possibilities of improving the properties of the wood and wood protection, durability.
* Availability and environmental friendliness of wood as a building material.

|  |  |
| --- | --- |
| **UNIT 1:** | |
| Suggestions for the developing of the lectures | |
| Lesson beginning | The main focus of the beginning of the topic is to make sure that the wood’s Benefits are clear.  Since wood is wrongly popularly known as a weak and bad durable material, it is very important to prove from the beginning the great structural properties of the wood. |
| Engage/motivation | Provide an understandable proof of the good properties of the wood, such as its great durability against fire, might be a really good idea to ensure the comprehension of the timber properties. |
| Development of lessons | The Trainer should try to keep the attention of the attendants, by providing an interesting way to provide the lessons. One way to make sure the attendants keep attention and get a great understanding of the timber properties might be by showing some samples of wood that help the learners to understand the differences in features among the different timber species. Also a very helpful way to make the apprenticeships understand the benefits and capabilities of wood might be by comparing them with other known materials such concrete or steel. |
| Closing activities | Summarise the main key elements learnt and provide the common feedback based on learners’ input; focusing on the different properties of wood, depending on its species, the different applied treatments and their specific uses (such as fire protection, wet protection, or fungus protection as well as the shape of the constructive elements. |

|  |  |  |
| --- | --- | --- |
| **Materials and teaching resources – Unit 1** | |  |
| **Type of resource** | **Notes** | **Anotations** |
| **PowerPoint presentation 1**  Wood properties, its limitations and wood construction physics | Main topics covered in the presentation:   * Wood structure and appearance * Physical properties * Mechanical properties * Technological properties * Operational properties | The most important consideration for the trainer is to provide a clear explanation about the timber elements properties. It is essential to highlight the improvement of the timber features once the pieces have been treated and disposed correctly. For instance, varnishing the timber elements provide a higher durability to the material, and cutting and placing the wood elements in the right disposition makes all the difference in terms of structural stability. |
| **PowerPoint presentation 2**  Possibilities of improving the properties of the wood and wood protection, durability | Main topics covered in the presentation:   * Improvement of properties by appearance * Technological improvement of wood properties * Chemical improvement of wood properties * Thermal improvement of wood properties * Operational improvement of wood properties * Wood degrading microorganisms | In this topic, the main consideration is to make sure that the apprenticeships understand the relevance of each treatment and comprehend the different usage of each one. Not all treatments are protective, since some are simply regarding aesthetics, some others are preventive against structural threats, and other to durability threats. |
| **PowerPoint presentation 3**  Availability and environmental friendliness of wood as building material | Main topics covered in the presentation:   * The forests - sustainable forestry in partnership countries * Certification schemes in partnership countries * Wood species used as structural timber * Building structural materials – in general * Overview of glued wooden construction materials | The overall highlight of this presentation is to let the pupils understand the great advantages that the wood can carry a constructive material since it is a much cleaner material for the environment. Nevertheless it is crucial to understand the conditions for the better usage of wood and the most environmentally friendly ways of treating forest and wood reserves. |
| **Case Studies:** | Fifteen case studies regarding qualities of wood and its various applications in construction | The point of these case studies is to give the pupils the chance to get along with the knowledge acquired on the training material, in order to reinforce their learning. |
| **Questions and answers** | - Eighteen questions regarding wood properties, its limitations and wood construction physics.  - Eleven questions regarding the improvements of wood, wood protection and wood durability  - Fourteen questions regarding the availability and environmental friendliness of wood as building material | It is important for the trainer to have a previous look to the questions and all the answers in order to be able to clarify any further question that the pupils may have regarding the specific topic. |
| **Multiple choice questions** | - Ten questions regarding wood properties, its limitations and wood construction physics.  - Six questions regarding the improvements of wood, wood protection and wood durability  - Eleven questions regarding the availability and environmental friendliness of wood as building material | It is important that the trainer understand the overall progress of the pupils, in order to be able to evaluate the success of the training. |

## DELIVERY GUIDELINES – UNIT 2

**Unit Summary:**

This Learning Unit aims to gain knowledge about wood materials classification, nomenclature and types, terminology, wood materials sizes and volume determination, wood humidity and its influence, wood defects, processing defects and their influence to the wood material quality, wood materials quality evaluation, standardization and conformity checking as well as different type of modern wooden structural materials, their connectivity with different types of connectors, adhesives etc. One big part related to understand how to make wooden structural element restoration, reconstruction and dismantling of wooden building elements.

**Key Topics:**

* Performance and durability of wooden structures.
* Guidelines on work with sawn materials, wood-based panel and engineered wood products (EWP).
* Guidelines on work with Glued Laminated Timber (GLT) and Cross Laminated Timber (CLT).
* Guidelines on work with different construction products (windows, doors, etc.).
* Use of connectors and adhesives.
* Restoration, reconstruction and dismantling of wooden elements.
* Wooden trusses.

|  |  |
| --- | --- |
| **UNIT 2:** | |
| Suggestions for the developing of the lectures | |
| Lesson beginning | It is important to get the attention of the pupils by letting them understand the great performance of wood as structural material. Nevertheless, it is also important to make clear that the timber elements need to be perfectly shaped and treated before using it for construction uses. It is crucial for the stability of the building that all the pieces are perfectly cut and treated. |
| Engage/motivation | In order to motivate the pupils, it might be interesting to provide examples of great constructions with timber structures, such as skyscrapers or ancient buildings, that gain the interest on the timber structures |
| Development of lessons | The trainer should develop calmly the lecture, trying to provide as many domestic examples as possible to make all the learning topic more reachable. The trainer should try to encourage the pupils to ask as many doubts and questions as they might have. |
| Closing activities | Summarise the main key elements learnt and provide the common feedback based on learners’ input; focusing on the technics of wood construction. |

|  |  |  |
| --- | --- | --- |
| **Materials and teaching resources – Unit 2** | |  |
| **Type of resource** | **Notes** | **Anotations** |
| **PowerPoint presentation 1**  Performance and durability of wooden structures | Main topics covered in the presentation:   * Introduction * Environmental aspects * Benefits * Durability of wood structure * EN & Eurocode standards * Frequently asked questions | The most important consideration for the trainer is to make sure that the apprenticeships understand that the wood can be a great material to use for most elements in a construction, from structure to design. But it is also very important that they understand that timber elements perform its best when it is properly conditioned and treated. |
| **PowerPoint presentation 2**  General instructions for the use of wood material | Main topics covered in the presentation:   * Terms * CE marking * Sawn timber applications * Building components * The use of wood material in construction * Storage and handling * Frequently asked questions | During this lecture, the main highlight is to provide the consciousness about the relevance of using well certificated pieces of wood, and the importance of taking care of all processes while working with wood elements. |
| **PowerPoint presentation 3**  Guidelines of work with GLT and CLT | Main topics covered in the presentation:   * GLT * CLT * Using GLT and CLT products * Installation * Frequently asked questions | The main purpose of this lesson is to ensure the understanding the difference between Glue Laminated Timber and Cross Laminated Timber, and their differences on treatments and purposes. |
| **PowerPoint presentation 4**  The use of construction products | Main topics covered in the presentation:   * Product approval * Eco-labels * Selecting the product * Doors * Windows * Quality of installation * Benefits * Module element * Frequently asked questions | After this lesson, the apprenticeships should comprehend that the timber products are not only used on structural purposes. Wood is a very versatile material for several other products, such as carpentry, furniture, and design finishes. Also, it is remarkable to consider the advantages that timber pieces can provide to the modular typology of building. |
| **PowerPoint presentation 5**  Connectors and adhesives | Main topics covered in the presentation:   * Screw fastening * Adhesives * Different adhesives * Use of connectors and adhesives * Frequently asked questions | The main highlight of this lesson is to be able to differentiate between the features of the different connection systems. It is important to highlight the most suitable connection system for the different building situations and typologies. |
| **PowerPoint presentation 6**  Restoration, reconstruction and dismantling. | Main topics covered in the presentation:   * Terminology * Life cycle * Dismantling of building * Benefits * Frequently asked questions | Make clear that, since wood is a very resourceful material, it has a huge catalogue of chances for its restoration or dismantling. Nevertheless, it is very important to differentiate among the terms of Renovation, Reconstruction and Restoration. |
| **PowerPoint presentation 7**  Wooden trusses | Main topics covered in the presentation:   * In general * Storage * Installation of truss * Benefits * Frequently asked questions | It is important to make clear that, besides the wooden trusses perform greatly as structural elements, its handling is very delicate and fragile. Since these elements are very plain, its transportation, storage and handling must be carried very carefully |
| **Case Studies:** | Seven case studies regarding timber construction, management and treatment | The point of these case studies is to give the pupils the chance to get along with the knowledge acquired on the training material, in order to reinforce their learning. |
| **Questions and answers** | - Four questions regarding performance and durability of wooden structures  - Four questions regarding general instructions for the use of wood material  - Four questions regarding guidelines of work with GLT and CLT  - Four questions regarding the use of construction products  - Four questions regarding connectors and adhesives  - Four questions regarding restoration, reconstruction and dismantling.  - Four questions regarding wooden trusses | It is important for the trainer to have a previous look to the questions and all the answers in order to be able to clarify any further question that the pupils may have regarding the specific topic. |
| **Multiple choice questions** | - Four questions regarding performance and durability of wooden structures  - Four questions regarding general instructions for the use of wood material  - Four questions regarding uidelines of work with GLT and CLT  - Four questions regarding the use of construction products  - Four questions regarding connectors and adhesives  - Four questions regarding restoration, reconstruction and dismantling.  - Four questions regarding wooden trusses | It is important that the trainer understand the overall progress of the pupils, in order to be able to evaluate the success of the training. |

## DELIVERY GUIDELINES – UNIT 3

**Unit Summary:**

This Learning Unit aims to provide the knowledge of the basic principles of the timber material movement on building site, the technological documentation of construction processes and the procedures for drawing up such works, brings to builders the basic knowledge to carry out efficient buildings according thermal, sound insulations, fire protection aspects, as well as transporting and storing of the wood structures on building site. Ability to comply with construction technology in accordance with construction standards in a work with timber structures, as well as to determine basics of the labour safety measures.

**Key Topics:**

* Work planning and team management.
* Workspace organization – ergonomic and labour safety.
* Guidelines for transporting and storing structures on building site.
* Architectural design – drawings and schemes.
* Building physics, installing of vapour barrier and risks of the resulting condensation.
* Fire safety and protection solutions.
* Wood-based thermal and sound insulation in assembling process.

|  |  |
| --- | --- |
| **UNIT 3:** | |
| Suggestions for the developing of the lectures | |
| Lesson beginning | For the beginning of this lesson, it can be really helpful to try to picture the idea of a building site, and make the big difference between the woodworking on the workshop and in the building site. This second one carries a more important set of organization and management. |
| Engage/motivation | Help the pupils to picture themselves as part of the construction team, and explain the different relevant points of the learning unit as understandable examples of the classroom parts can help the pupils to understand and interiorize the relevance of each topic |
| Development of lessons | The trainer should develop calmly the lecture, trying to provide as many domestic examples as possible to make all the learning topic more reachable. The trainer should try to encourage the pupils to ask as many doubts and questions as they might have. |
| Closing activities | Summarise the main key elements learnt and provide the common feedback based on learners’ input; focusing on the proper management of all the tasks in the building site. |

|  |  |  |
| --- | --- | --- |
| **Materials and teaching resources – Unit 3** | |  |
| **Type of resource** | **Notes** | **Anotations** |
| **PowerPoint presentation 1**  Work planning and team management | Main topics covered in the presentation:   * Introduction * Work management * The benefits of good management * Frequently asked questions | It is important to remark the benefits of a proper management on the work site from the beginning, since it can save several potential issues for the construction process. |
| **PowerPoint presentation 2**  Ergonomics and labor safety | Main topics covered in the presentation:   * Legislation * Ergonomics * Risks * Safety as a common thing * Benefits * Frequently asked questions | In contraposition to the examples of well-carried labour safety practices, providing hilarious and absurd examples of bad-carried labour practices can help the learners to interiorize the relevance of the proper carried labour safety practices. |
| **PowerPoint presentation 3**  Guidelines for transporting and storing | Main topics covered in the presentation:   * Protection and local storage * Benefits * Frequently asked questions | On this topic is important to remind the pupils that wood is a delicate material in certain ways, and that it is important to take care of the transported material in order to ensure the better quality of the product. |
| **PowerPoint presentation 4**  Architectural design. Drawings and schemes | Main topics covered in the presentation:   * Building design process | It is important to remind the learners that the design of the building has a very relevant paper on the development of timber pieces and materials. A good architectural design on the details can be really helpful in order to ease the production of wood elements. |
| **PowerPoint presentation 5**  Short vapour barrier | Main topics covered in the presentation:   * Short Vapor Barrier. * Materials * Disposition | It is crucial to make the apprenticeships understand the relevance of shorting the vapour barrier for the adequate durability of the timber elements, the structure and therefore, the stability of the whole building. |
| **PowerPoint presentation 6**  Fire safety of timber buildings – Basics of fire engineering | Main topics covered in the presentation:   * Terms and definitions * Nominal temperature-time curves * Fire load density * Reaction to fire classification * Limitations of calculation method * Fire resistance prediction method using calculations * Fire resistance classification | Despite wood behaves much better against fire than how it is popularly believed, it is crucial to provide the timber elements with the most careful measures against the fire, in order to enhance its properties against it. |
| **Case Studies:** | Seven case studies regarding wood construction assembling management on-site | The point of these case studies is to give the pupils the chance to get along with the knowledge acquired on the training material, in order to reinforce their learning. |
| **Questions and answers** | - More than two questions regarding each topic. | It is important for the trainer to have a previous look to the questions and all the answers in order to be able to clarify any further question that the pupils may have regarding the specific topic. |
| **Multiple choice questions** | - More than two questions regarding each topic. | It is important that the trainer understand the overall progress of the pupils, in order to be able to evaluate the success of the training. |

## DELIVERY GUIDELINES – UNIT 4

**Unit Summary:**

This Learning Unit aims to provide the knowledge and understanding of the properties of wood as an insulation materials, as well as its sustainable features as a construction material. Also, this LU provides information about the integration of all facilities in the timber buildings.

It presents the fundamental principles, requirements and environmental impacts of use of timber material in construction site, having consideration of the benefits that this material has to the environment in comparison to other traditionally used materials such as concrete or bricks.

**Key Topics:**

* Energy-efficiency value of wood as a building material and wooden constructions.
* Climate influence on wooden buildings.
* Trainings for plumbing, drywall construction, sealing.
* Insight to heating, ventilation, air conditioning, lighting, information and communications technologies systems and its applications in modern buildings.

|  |  |
| --- | --- |
| **UNIT 4:** | |
| Suggestions for the developing of the lectures | |
| Lesson beginning | Assess that the group knows what is the thermal transmittance, the paper it takes in energy savings, and that the group has the knowledge of basic mathematics. |
| Engage/motivation | Provide an understandable example of how thermal transmittance works, such as the difference between standing next to an old badly closed window and a new one with good insulating properties. |
| Development of lessons | The trainer should develop calmly the lecture, trying to provide as many domestic examples as possible to make all the learning topic more reachable. The trainer should try to encourage the pupils to ask as many doubts and questions as they might have. |
| Closing activities | Summarise the main key elements learnt and provide the common feedback based on learners’ input; focusing on the principles of thermal transmittance. |

|  |  |  |
| --- | --- | --- |
| **Materials and teaching resources – Unit 4** | |  |
| **Type of resource** | **Notes** | **Anotations** |
| **PowerPoint presentation 1**  Energy-efficiency value of wood as a building material and wooden constructions. | Main topics covered in the presentation:   * Thermal transmittance Principles * Thermal insulation * Thermal bridges * Energy Efficiency Certificates | The most important consideration for the trainer is to make sure that the apprenticeships understand the **good properties** of the wood in terms of thermal conductance. It is important build **awareness** between the pupils of the wood as a very good alternative to conventional materials. |
| **PowerPoint presentation 2**  Climate influence on wooden buildings. | Main topics covered in the presentation:   * Climate influence on wooden buildings * Influence of wood use in the environment | During this lecture, the main highlight is to provide the consciousness about the risk of keep using conventional materials in the construction sector, and how wood could become a potential replacement. |
| **PowerPoint presentation 3**  Trainings for plumbing, drywall construction, sealing. | Main topics covered in the presentation:   * Plumbing * Dry construction and seal system | Besides this topic is a bit too technical, it is important to ensure the overall understanding of the plumbing system, getting the system to choose between best material for each case. |
| **PowerPoint presentation 4**  Insight to heating, ventilation, air conditioning, lighting, information and communications technologies systems and its applications in modern buildings. | Main topics covered in the presentation:   * Electrical notions * Notions of ventilation * Notions of air conditioning * Notions of telecommunications. | The purpose of this topic is to get to have an insight of the overall system to place all the required facilities into a building build mainly with a timber-frame system. |
| **Case Studies:** | 1,2,3. Calculation of the heat transmitted through a timber wall. Different cases. | The point of these case studies is to give the pupils the chance to get in touch with basic calculations of the thermal transmittance of the wood as a construction material. |
| 4. Energy saving comparative between different wood materials. | After the resolution of this case study, pupils should understand that the wood species don’t work all the same, and that it is important to find the most suitable type of timber for each case, in terms of design, and efficiency. |
| **Questions and answers** | - Twelve questions regarding timber energy efficiency and climate influence of wood materials.  - Twelve questions regarding training in plumbing, drywall and installations. | It is important for the trainer to have a previous look to the questions and all the answers in order to be able to clarify any further question that the pupils may have regarding the specific topic. |
| **Multiple choice questions** | - Twelve questions regarding timber energy efficiency and climate influence of wood materials.  - Twelve questions regarding training in plumbing, drywall and installations. | It is important that the trainer understand the overall progress of the pupils, in order to be able to evaluate the success of the training. |